



**MARINER**

**MERCURY**

# SERVICE MANUAL

**MODELS**

**135 • 150 • 175 • 200**

**With Serial Numbers**

**United States . . . . . 0G960500 and Above**

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



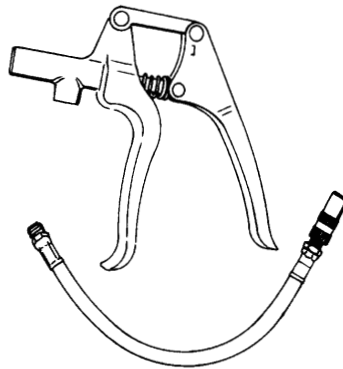
- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

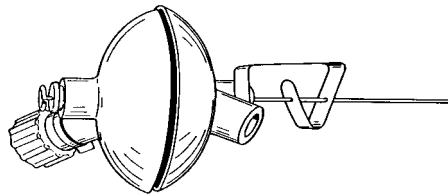


## Special Tools

1. Grease Gun 91-37299A1

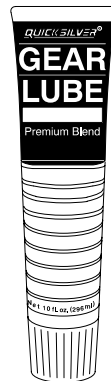


2. Flushing Attachment 44357A2

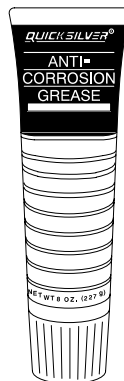


## Quicksilver Lubricant/Sealant

1. Gear Lubricant - Premium Blend 92-850737A1



2. Anti-Corrosion Grease 92-850735A1





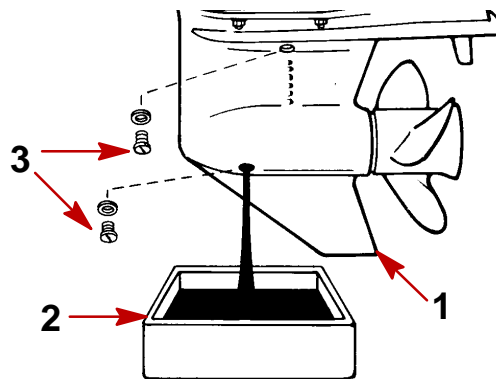
## Gear Case Lubrication

When adding or changing gear case lubricant, visually check for the presence of water in the lubricant. If water is present, it may have settled to the bottom and will drain out prior to the lubricant, or it may be mixed with the lubricant, giving it a milky colored appearance. If water is noticed, have the gear case checked by your dealer. Water in the lubricant may result in premature bearing failure or, in freezing temperatures, will turn to ice and damage the gear case.

### DRAINING GEAR CASE

**NOTE:** Some models may have the vent and fill/drain plugs on the opposite side.

1. Place outboard in a vertical operating position.
2. Place drain pan below outboard.
3. Remove vent plug and fill/drain plug and drain lubricant.



### GEAR CASE LUBRICANT CAPACITY

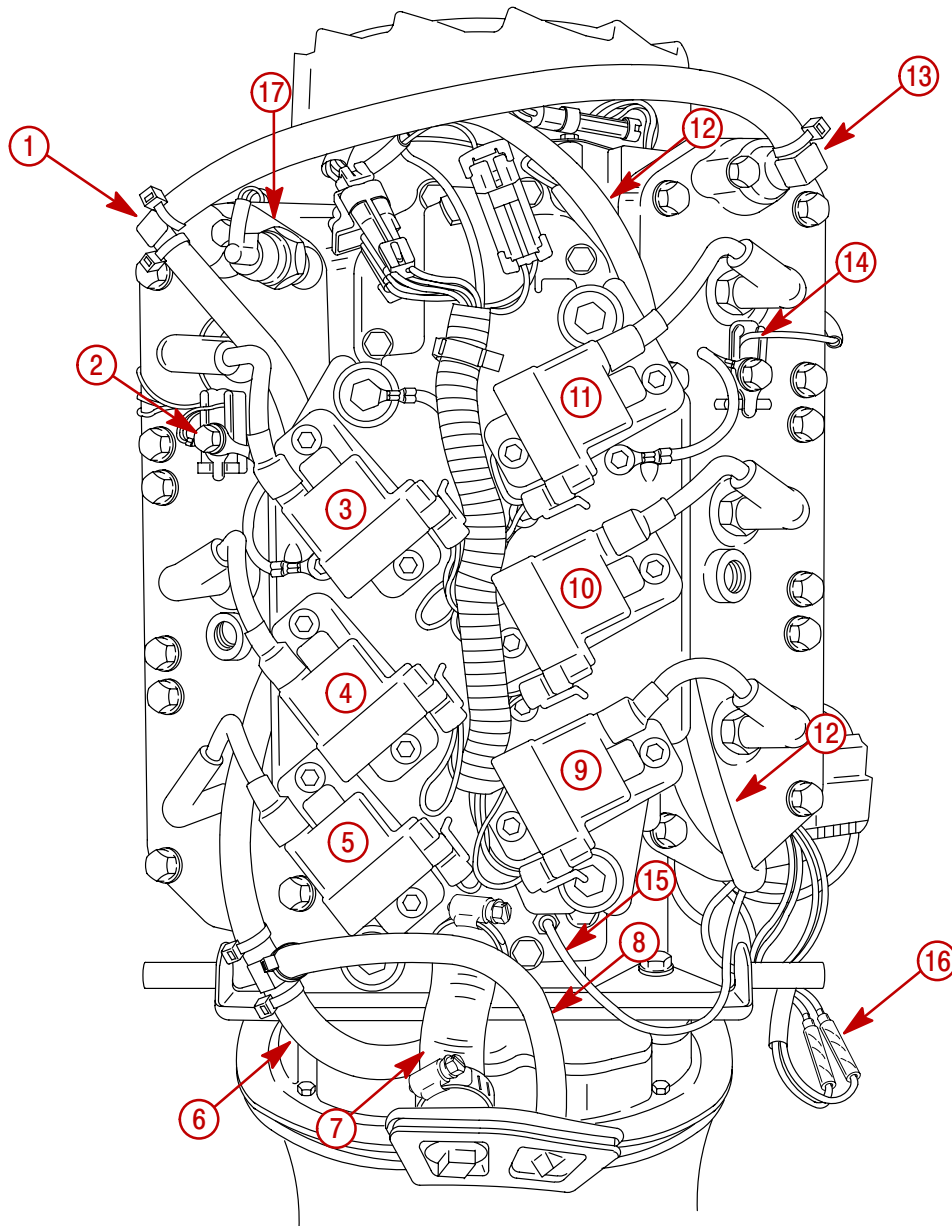
Gear case lubricant capacity is approximately 22.5 fl. oz. (665 ml).



- a. Remove remote oil hose (black without blue stripe) from pulse fitting on starboard side of engine.
  - b. Drain any water from hose and reconnect.
  - c. If water was present in hose, check for water in the remote oil tank. Drain tank if water is present.
15. Attempt to start engine, using a fresh fuel source. If engine starts, it should be run for at least one hour to eliminate any water in engine.
16. If engine fails to start, determine cause (fuel, electrical or mechanical). Engine should be run within 2 hours after recovery of outboard from water, or serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts. Apply oil as soon as possible.



# Model 150 XRI/175 XRI/200 XRI Powerhead Aft View



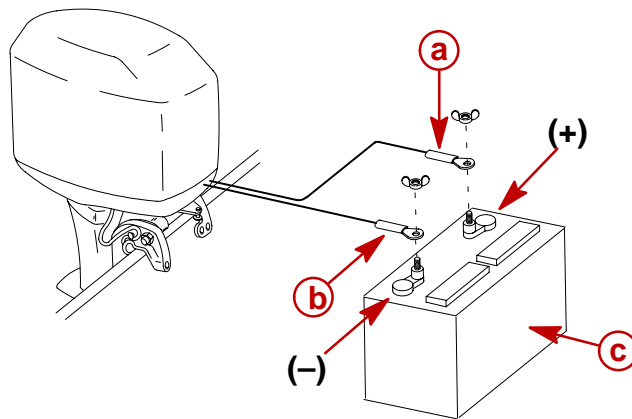
58030

- |  |  |
|--|--|
| <b>1</b> - Port Thermostat [143°F (61.7°C)]        | <b>10</b> - #3 CDM                                   |
| <b>2</b> - Temperature Sensor (Temperature Gauge)  | <b>11</b> - #1 CDM                                   |
| <b>3</b> - #2 CDM                                  | <b>12</b> - Water By-Pass Hose to Poppet Valve Cover |
| <b>4</b> - #4 CDM                                  | <b>13</b> - Starboard Thermostat [143°F (61.7°C)]    |
| <b>5</b> - #6 CDM                                  | <b>14</b> - Temperature Sensor (Engine Overheat)     |
| <b>6</b> - Thermostat Outlet Hose to Adaptor Plate | <b>15</b> - Water Pressure Gauge Hose                |
| <b>7</b> - Cylinder Block Flush Hose               | <b>16</b> - Trim Motor Bullet Connectors             |
| <b>8</b> - Tell-Tale Hose                          | <b>17</b> - Detonation Sensor                        |
| <b>9</b> - #5 CDM                                  |  |



## Battery Cables

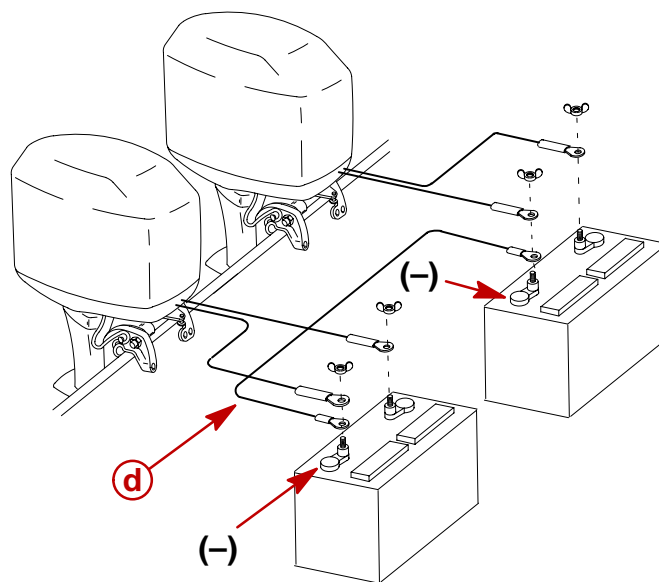
### SINGLE OUTBOARD



- a** - RED Sleeve (Positive)
- b** - BLACK Sleeve (Negative)
- c** - Starting Battery

### DUAL OUTBOARD

Connect a common ground cable (wire size same as engine battery cables) between NEGATIVE (-) terminals on starting batteries.



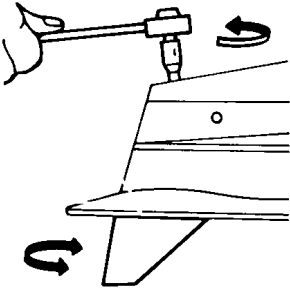
- d** - Common Ground Cable



If adjustment is necessary, loosen trim tab bolt until trim tab moves freely (does not rub against locking ridges). DO NOT strike tab to make adjustments. Make small adjustments at a time. If the boat turns more easily to the left, move the trailing edge of trim tab to the left. If the boat turns more easily to the right move the trailing edge of trim tab to the right. Position trim tab in one of the locating grooves BEFORE tightening bolt to prevent damage to holding mechanism. Torque bolt to 40 lb-ft (54 Nm) and retest.

**Models With Power Steering**

Trim tab adjustment is not required. The trailing edge of the trim tab should be set straight back.





# CDM Mounting

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	POWER HARNESS			
2	1	COVER			
3	3	FUSE			
4	3	STA STRAP			
5	2	CLIP			
6	1	CDM MOUNTING PLATE			
7	4	SCREW (.312-18 x 1-1/4)		20	27
8	4	WASHER			
9	4	GROMMET			
10	4	BUSHING			
11	15	SCREW (M6 x 16)	70		8
12	2	CABLE			
13	6	CDM			
14	6	SPARK PLUG (NGK#BPZ8HS10)		20	27
15	1	CDM HARNESS			
16	1	CABLE			
17	1	CLIP			
18	1	ENGINE HARNESS			



## CDM Stop Diode Trouble Shooting (Con't)

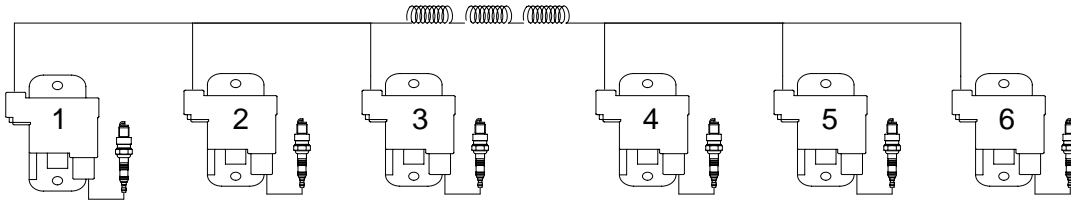
### 2.0/2.5 Litre 6 Cyl.:

CDM #1, #2 and #3 get their charging ground path through CDM #4, #5 or #6

CDM #4, #5 and #6 get their charging ground path through CDM #1, #2 or #3

A shorted Stop Diode in CDM #1, #2 or #3 would prevent CDMs #4, #5 and #6 from sparking.

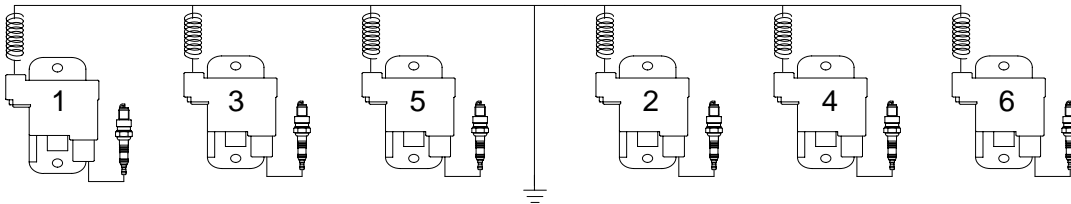
A shorted Stop Diode in CDM #4, #5 or #6 would prevent CDMs #1, #2 and #3 from sparking.



### 3.0 Litre 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.



**ENGINE RUNNING AT 2500 RPM**

It is not necessary to perform this test if the voltage output was tested in the previous step.

<b>Stator Output Test</b>		<b>400 DVA Scale</b>
<b>Positive Meter Lead (+)</b>	<b>Negative Meter Lead (-)</b>	<b>DVA Reading</b>
Connect to Green Test Harness Lead	Connect to Black Test Harness Lead	160 - 320

If stator output is low, go to "Testing Stator Resistance".

<b>CDM Trigger Input Test</b>		<b>20 DVA Scale</b>
<b>Positive Meter Lead (+)</b>	<b>Negative Meter Lead (-)</b>	<b>DVA Reading @ Idle to 2500 RPM</b>
White Test Harness Lead	Black Test Harness Lead	2 - 8 Volts

If reading is below specifications, go to "Testing Trigger Resistance". If reading is above specifications, check CDM and ground connections.

2.0/2.5L V-6 Models Only - Check control module bias circuit

<b>Bias Circuit Test (All Models Except 200 EFI)</b>		<b>40 DVA Scale @ 2500 RPM</b>
<b>Positive Meter Lead (+)</b>	<b>Negative Meter Lead (-)</b>	<b>DVA Reading</b>
Engine Ground	Black/White Shift Switch Wire	25 - 40 Volts

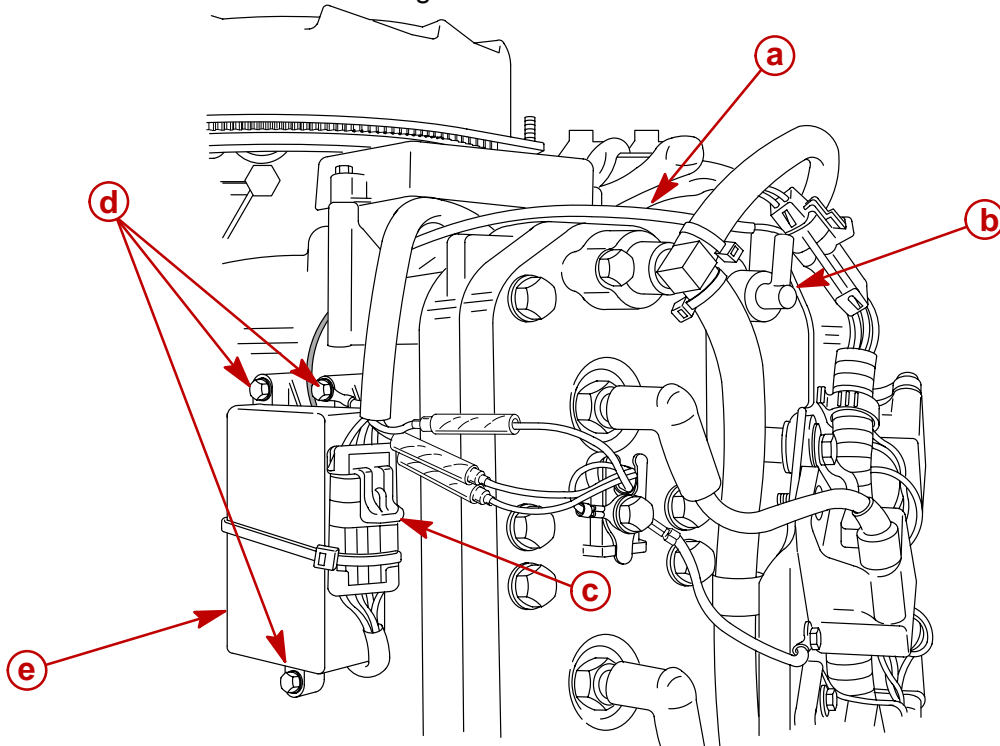
<b>Bias Circuit Test (200 EFI)</b>		<b>40 DVA Scale @ 2500 RPM</b>
<b>Positive Meter Lead (+)</b>	<b>Negative Meter Lead (-)</b>	<b>DVA Reading</b>
Engine Ground	Disconnect 4 wire Detonation Control Module connector. Insert bent paper clip into Black/White terminal.	25 - 40 Volts

If reading is below specifications, replace control module.



## Detonation Module Removal (200 XRI only)

1. Remove detonation sensor lead from sensor.
2. Disconnect detonation module harness connector.
3. Remove 3 bolts securing module and remove module.



58052

**a** - Sensor Lead  
**b** - Sensor  
**c** - Harness Connector

**d** - Bolts (3)  
**e** - Detonation Module

## Detonation Module Installation

1. Secure module with 3 bolts. Torque bolts to 30 lb. in. (3.4 Nm).
2. Reconnect 3 harness connectors.
3. Reconnect sensor lead to sensor.



1. Remove battery from its installation as soon as possible and remove all grease, sulfate and dirt from top surface by running water over top of battery. Be sure, however, that vent caps are tight beforehand, and blow off all excess water thoroughly with compressed air. Check water level, making sure that plates are covered.
2. When adding distilled water to battery, be extremely careful not to fill more than 3/16 in. (4.8 mm) above perforated baffles inside battery. Battery solution or electrolyte expands from heat caused by charging. Overfilling battery will cause electrolyte to overflow (if filled beyond 3/16" above baffles).
3. Grease terminal bolts well with 2-4-C Marine Lubricant and store battery in a COOL-DRY place. Remove battery from storage every 30-45 days, check water level and put on charge for 5 or 6 hours at 6 amperes. DO NOT FAST CHARGE.
4. If specific gravity drops below 1.240, check battery for reason and recharge. When gravity reaches 1.260, discontinue charging. To check specific gravity, use a hydrometer, which can be purchased locally.
5. Repeat preceding charging procedure every 30-45 days, as long as battery is in storage, for best possible maintenance during inactive periods to ensure a good serviceable battery in spring. When ready to place battery back in service, remove excess grease from terminals (a small amount is desirable on terminals at all times), recharge again as necessary and reinstall battery.

## Flywheel Removal and Installation

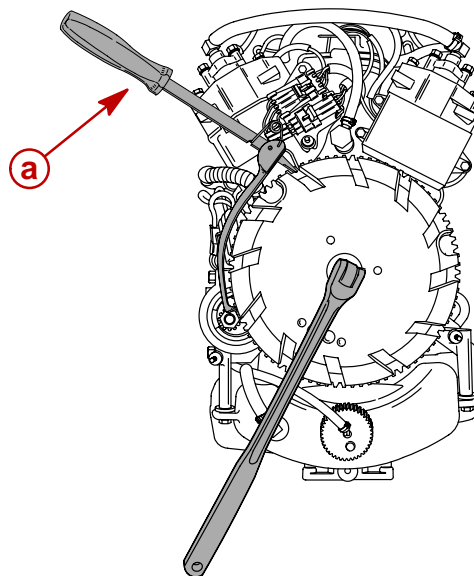
### Removal

1. Remove flywheel cover from engine.

#### **⚠ WARNING**

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

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

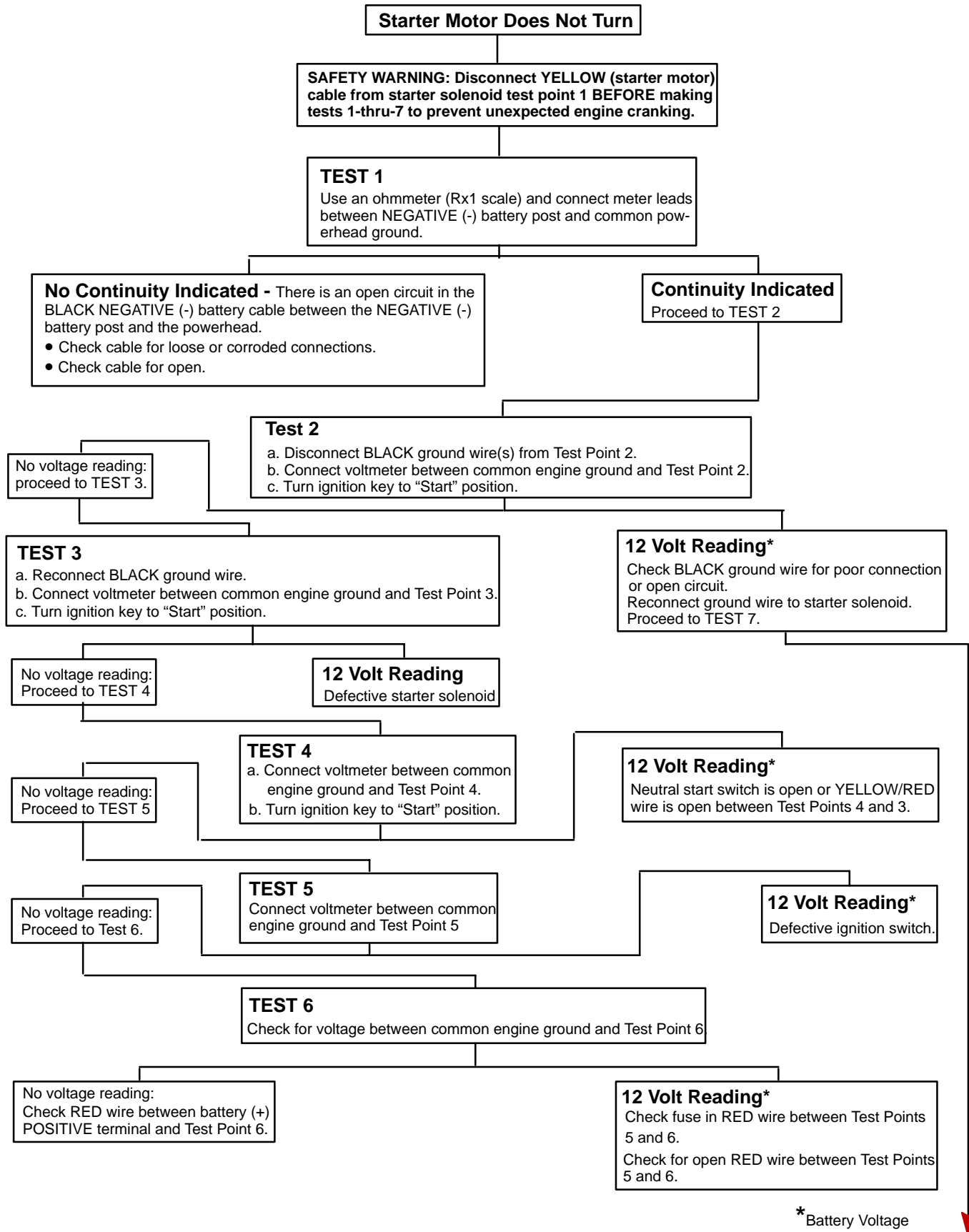


**a** - Flywheel Holder (91-52344)

58035

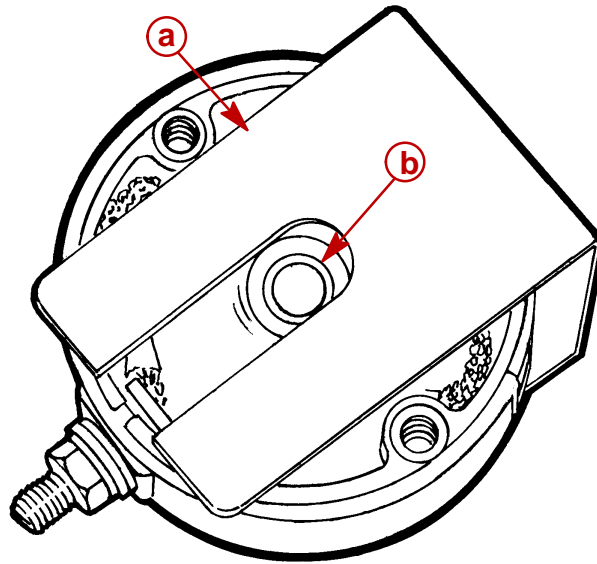


# Starter Circuit Troubleshooting Flow Chart





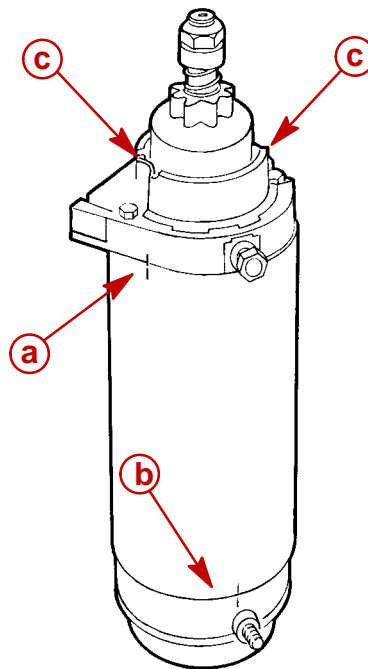
8. Place springs and brushes into brush holder and hold in place with brush retainer tool.



11661

- a** - Bushing Retainer Tool
- b** - Bushing (do not over lubricate)

9. Install armature into starter frame and align match marks (a). Install commutator end cap onto starter frame and align match marks (b). Remove brush retainer tool. Install through bolts (c) and torque to 70 lb. in. (8.0 N·m).



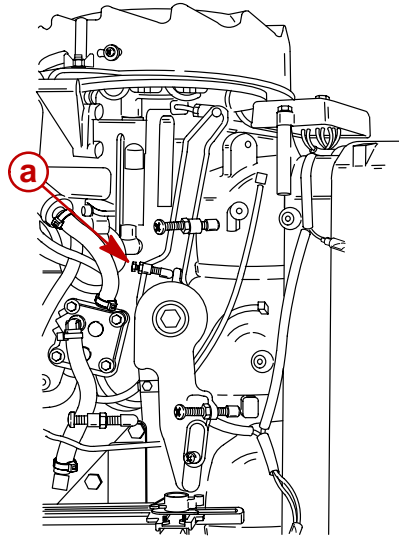
11648

- a** - Alignment Marks
- b** - Alignment Marks
- c** - Bolts [Torque to 70 lb. in. (8 N m)]



## IDLE SPEED ADJUSTMENT

1. With engine in water, connect fuel line to engine. Start engine and allow to warm up.
2. Place outboard in gear and monitor engine RPM. If RPM is above or below recommended RPM (see specifications), readjust primary pickup screw to attain recommended engine speed. Retighten jam nut.



58046

**a** - Primary Pickup Screw

### **CAUTION**

**Engine idle RPM must NEVER EXCEED 750 RPM in gear.**

3. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
4. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

**IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)**

**NOTE:** Carburetors are equipped with idle mixture adjustment screws. See carburetor specifications for mixture screw adjustment.

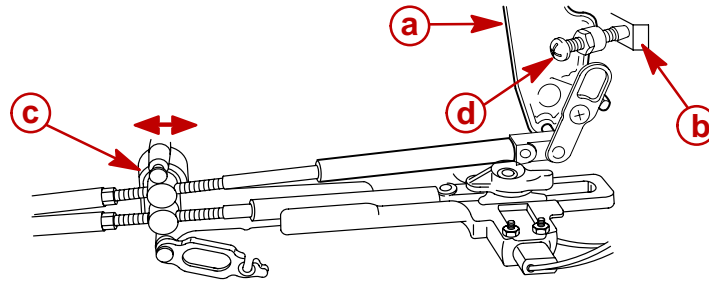
**NOTE:** If sufficient throttle cable barrel adjustment is not available, check for correct installation of link rod between the throttle lever and throttle cam. The throttle end of this link rod must be threaded into its plastic barrel until it bottoms against the throttle lever casting, then turned out only far enough to obtain correct orientation of link rod (less than one turn). All timing adjustments must be reset after this procedure.



## THROTTLE CABLE INSTALLATION

1. With end of throttle cable connected to throttle lever, hold throttle lever (a) against idle stop (b). Adjust throttle cable barrel to slip into barrel recess of control cable anchor bracket, with a light preload of throttle lever against idle stop. Lock barrel in place.

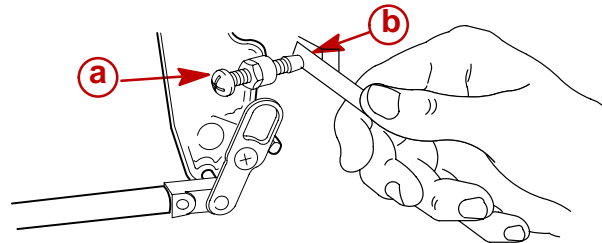
**IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from “FORWARD” to “NEUTRAL” (readjust throttle cable barrel, if necessary).**



57838

- a - Throttle Lever
- b - Idle Stop
- c - Cable Barrel – Adjust To Hold Idle Stop Screw Against Stop
- d - Idle Stop Screw

2. Check preload on throttle cable by placing a thin piece of paper between idle stop screw (a) and idle stop (b). Preload is correct when paper can be removed without tearing, but has some drag on it (readjust throttle barrel, if necessary).



57839

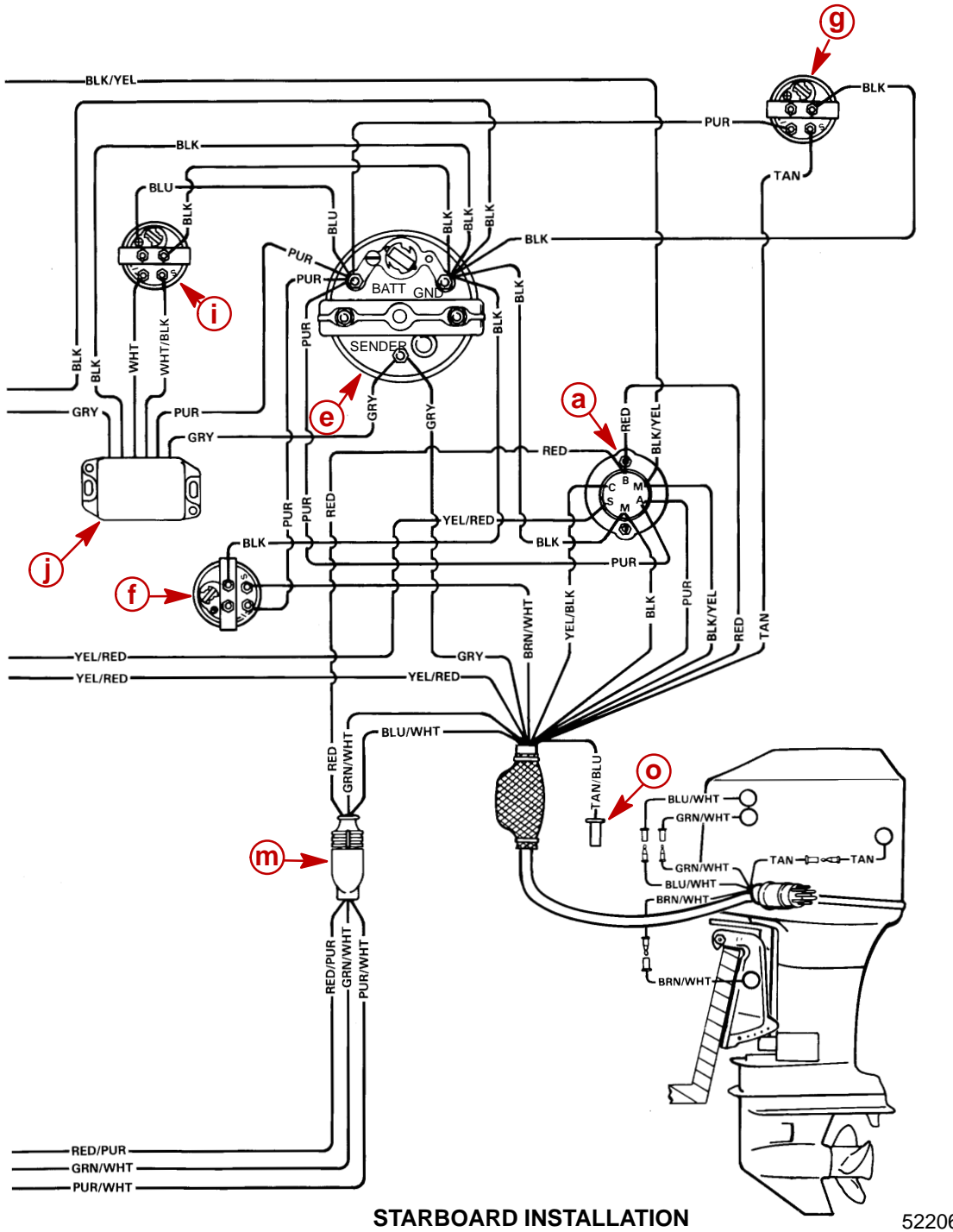
- a - Idle Stop Screw
- b - Idle Stop

## DETONATION CONTROL (200 MODEL)

1. With outboard running in “FORWARD” gear, advance throttle to 3500 RPM and check that spark timing has electronically advanced timing to 24° BTDC. This indicates knock control circuit is functioning.



**IMPORTANT: On installations where gauge options will not be used, tape back and isolate unused wiring harness leads**



STARBOARD INSTALLATION

52206

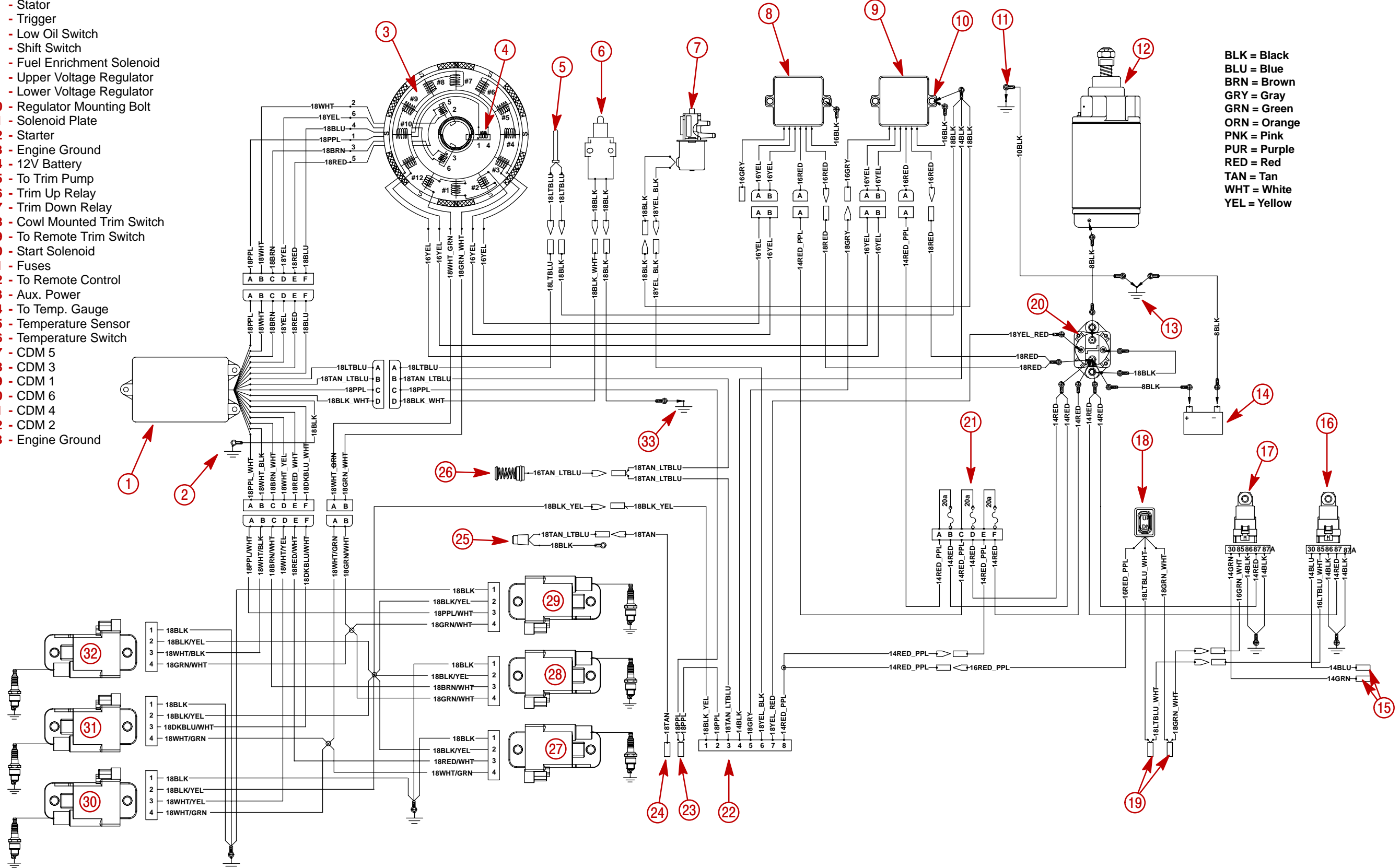
- i** - Synchronizer Gauge
- j** - Synchronizer Module
- k** - Lanyard Switch (Isolation) Diode
- l** - Y Harness
- m** - Power Trim Harness Connector
- n** - Connect Wires together with Screw and Nut (4 Places); Apply Liquid Neoprene to Connections and slide Rubber Sleeve over each Connection.
- o** - Lead to Visual Warning Kit



# 2.5 Litre V-6 Carburetor Wiring Diagram 2000 Models

- 1 - Control Module
- 2 - Control Module Mounting Bolt
- 3 - Stator
- 4 - Trigger
- 5 - Low Oil Switch
- 6 - Shift Switch
- 7 - Fuel Enrichment Solenoid
- 8 - Upper Voltage Regulator
- 9 - Lower Voltage Regulator
- 10 - Regulator Mounting Bolt
- 11 - Solenoid Plate
- 12 - Starter
- 13 - Engine Ground
- 14 - 12V Battery
- 15 - To Trim Pump
- 16 - Trim Up Relay
- 17 - Trim Down Relay
- 18 - Cowl Mounted Trim Switch
- 19 - To Remote Trim Switch
- 20 - Start Solenoid
- 21 - Fuses
- 22 - To Remote Control
- 23 - Aux. Power
- 24 - To Temp. Gauge
- 25 - Temperature Sensor
- 26 - Temperature Switch
- 27 - CDM 5
- 28 - CDM 3
- 29 - CDM 1
- 30 - CDM 6
- 31 - CDM 4
- 32 - CDM 2
- 33 - Engine Ground

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



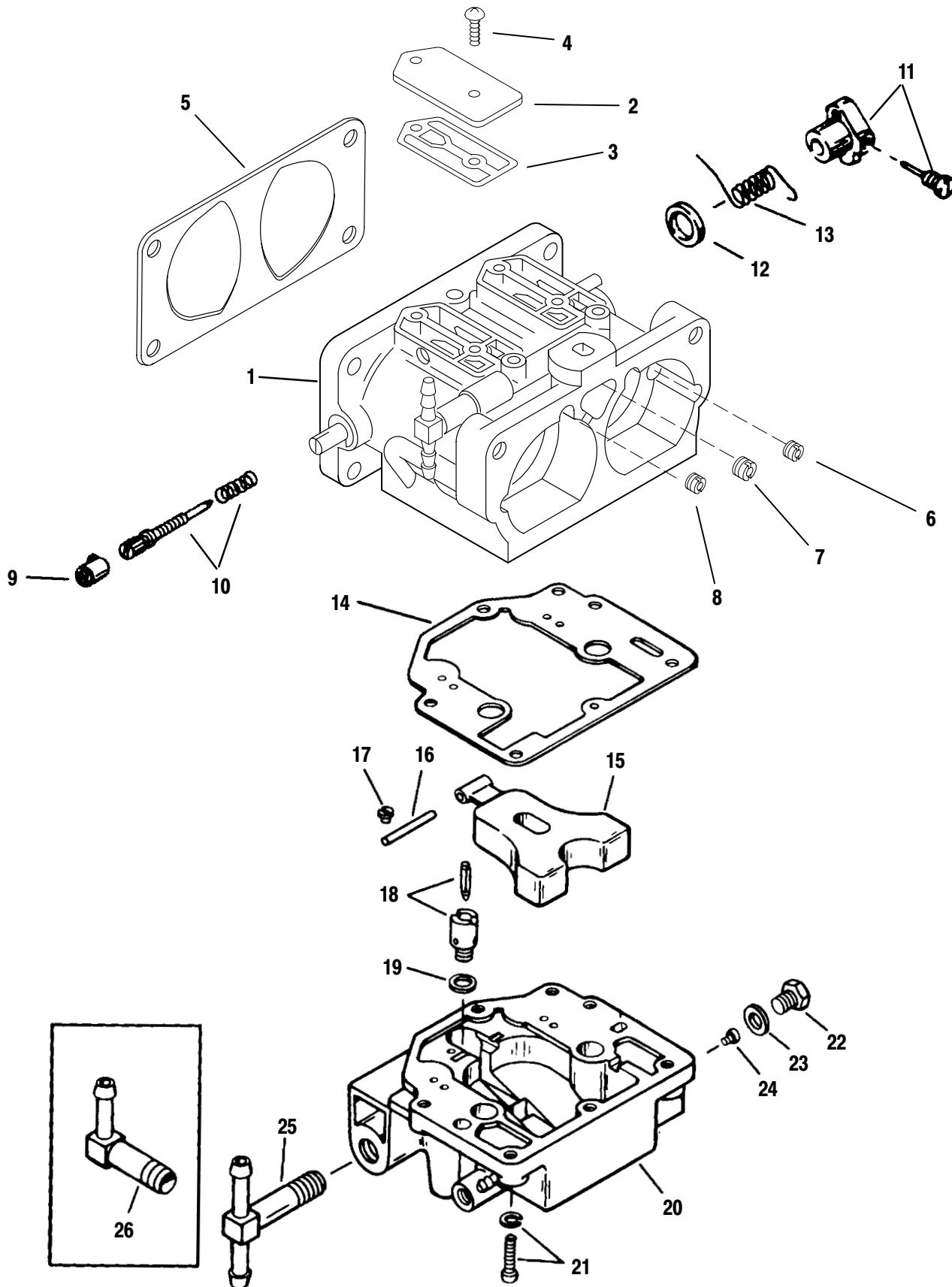


## Testing Fuel Pump

<b>Problem: Air Bubbles in Fuel Line</b>	
Low fuel in tank.	Fill tank with fuel.
Loose fuel line connection.	Check and tighten all connectors.
Fuel pump fitting loose.	Tighten fitting.
A hole or cut in fuel line.	Check condition of all fuel lines and replace
Fuel Pump anchor screw(s) loose.	Tighten all screws evenly and securely.
Fuel Pump filter cover anchor screw loose.	Tighten screws securely.
Fuel pump filter gasket worn out.	Replace gasket.
Fuel pump gasket(s) worn out.	Rebuild fuel pump.
Fuel vaporizing	Fuel with high reed vapor pressure (winter grade fuel) may vaporize (form bubbles) when used in hot/warm weather. Use fuel with a lower reed vapor pressure (summer grade fuel)
<b>Problem: Lack of Fuel Pump Pressure</b>	
An anti-siphon valve.	See "Checking for Restricted Fuel Flow" preceding.
Air in fuel line.	See "Air Bubbles in Fuel Line", above.
A dirty or clogged fuel filter.	Clean or replace fuel filter.
The fuel pickup in fuel tank is clogged or dirty.	Clean or replace pickup.
Worn out fuel pump diaphragm.	Rebuild fuel pump.
Worn out check valve(s) in fuel pump.	Rebuild fuel pump.
A leaky check valve gasket.	Rebuild fuel pump.
Pulse hole(s) plugged.	Remove fuel pump and clean out holes.
Hole in pulse hose.	Replace pulse hose.
Loose pulse hose.	Tighten connection(s).
Fuel hose internal diameter too small.	Use 5/16 I.D. fuel hose.
Primer bulb check valve not opening.	Replace primer bulb.
Excessive fuel lift required.	Fuel lift exceeds 2.5 in. of vacuum (mercury)

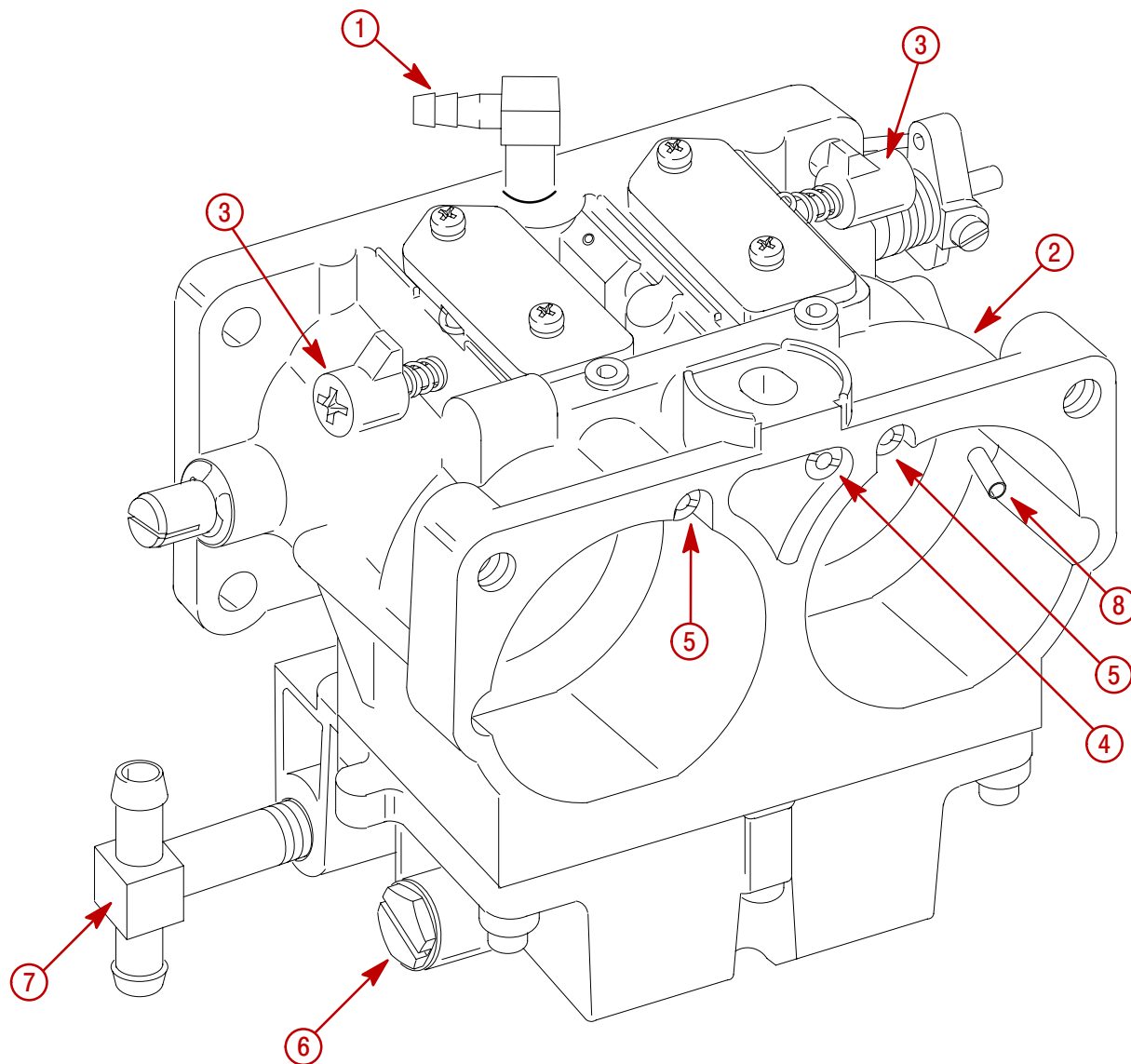


# Carburetor





# Carburetor



54350

- 1 - Enricher Hose Fitting
- 2 - Carburetor Number
- 3 - Fuel Mixture Adjustment Screw
- 4 - Back Draft Vent Jet
- 5 - Idle Air Bleed Jet
- 6 - High Speed Fuel Jet Access Plug (2)
- 7 - Fuel Line Fitting
- 8 - Main Nozzle Well Vent (2)



## High Altitude Jet Chart

Factory installed main fuel jets are normally adequate for proper performance up to approximately 5000 feet (1524m) above sea level. Between 2000 feet (609.6m) and 5000 feet (1524m) the reduction of the main fuel jet(s) may result in improved performance and fuel economy. Above 5000 feet, however, it is recommended that main jet size be reduced as shown per 1000 feet (304.8m) in the following chart.

Feet Meter	1000 304.8	2000 609.6	3000 914.4	4000 1219.2	5000 1524	6000 1828.8	7000 2133.6	8000 2438.4	9000 2743.2	10000 3048	11000 3352.8	12000 3657.6
Jet Size												
0.034	0.034	0.034	0.032	0.032	0.032	0.032	0.032	0.032	0.030	0.030	0.030	0.030
0.036	0.036	0.036	0.034	0.034	0.034	0.034	0.034	0.032	0.032	0.032	0.032	0.032
0.038	0.038	0.038	0.036	0.036	0.036	0.036	0.036	0.034	0.034	0.034	0.034	0.034
0.040	0.040	0.040	0.038	0.038	0.038	0.038	0.038	0.036	0.036	0.036	0.036	0.034
0.042	0.042	0.042	0.040	0.040	0.040	0.040	0.038	0.038	0.038	0.038	0.038	0.036
0.044	0.044	0.044	0.042	0.042	0.042	0.042	0.040	0.040	0.040	0.040	0.038	0.038
0.046	0.046	0.046	0.044	0.044	0.044	0.044	0.042	0.042	0.042	0.042	0.040	0.040
0.048	0.048	0.048	0.046	0.046	0.046	0.046	0.044	0.044	0.044	0.042	0.042	0.042
0.050	0.050	0.050	0.048	0.048	0.048	0.046	0.046	0.046	0.046	0.044	0.044	0.044
0.052	0.052	0.050	0.050	0.050	0.050	0.048	0.048	0.048	0.048	0.046	0.046	0.046
0.054	0.054	0.052	0.052	0.052	0.052	0.050	0.050	0.050	0.048	0.048	0.048	0.048
0.056	0.056	0.054	0.054	0.054	0.054	0.052	0.052	0.052	0.050	0.050	0.050	0.048
0.058	0.058	0.056	0.056	0.056	0.056	0.054	0.054	0.054	0.052	0.052	0.052	0.050
0.060	0.060	0.058	0.058	0.058	0.056	0.056	0.056	0.054	0.054	0.054	0.052	0.052
0.062	0.062	0.060	0.060	0.060	0.058	0.058	0.058	0.056	0.056	0.056	0.054	0.054
0.064	0.064	0.062	0.062	0.062	0.060	0.060	0.060	0.058	0.058	0.058	0.056	0.056
0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.062	0.060	0.060	0.060	0.058	0.058
0.068	0.068	0.066	0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.060	0.060	0.060
0.070	0.070	0.068	0.068	0.068	0.066	0.066	0.064	0.064	0.064	0.062	0.062	0.062
0.072	0.072	0.070	0.070	0.070	0.068	0.068	0.066	0.066	0.066	0.064	0.064	0.062
0.074	0.074	0.072	0.072	0.070	0.070	0.070	0.068	0.068	0.068	0.066	0.066	0.064
0.076	0.076	0.074	0.074	0.072	0.072	0.072	0.070	0.070	0.068	0.068	0.068	0.066
0.078	0.078	0.076	0.076	0.074	0.074	0.074	0.072	0.072	0.070	0.070	0.068	0.068
0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074	0.072	0.072	0.070	0.070
0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074	0.072	0.072
0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.076	0.074	0.074
0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076	0.076	0.074
0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078	0.078	0.076
0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080	0.080	0.078
0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082	0.082	0.080
0.094	0.094	0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086	0.084	0.084	0.082
0.096	0.096	0.094	0.094	0.092	0.092	0.090	0.090	0.088	0.086	0.086	0.084	0.084
0.098	0.098	0.096	0.096	0.094	0.092	0.092	0.090	0.090	0.088	0.088	0.086	0.086



# Ignition Controller and Detonation Module

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	3	SCREW (10-32 X 7/8)	30		3.5
2	3	WASHER			
3	1	IGNITION CONTROLLER			
4	1	PLATE			
5	3	BUSHING			
6	3	WASHER			
7	3	SCREW (3/16-32 X 1-5/8)	30		3.5
8	1	DETONATION MODULE			



<b>⚠ CAUTION</b>
Wipe up fuel spills immediately.
<b>⚠ CAUTION</b>
Depressurize fuel system prior to opening line connections or removing fuel system components.
<b>⚠ DANGER</b>
Perform the tests in this section in a well ventilated area to avoid being overcome by fuel vapors or poisonous exhaust gases.

## Fuel Injection System Function

Fuel is delivered directly to the engine by way of fuel injectors. These injectors are provided with a constant supply of fuel (34 to 36 psi; 234 to 238 kPa) delivered to the fuel rail. The injectors are opened and closed electronically by the Electronic Control Module (ECM). The ECM receives input signals from various sensors in the EFI system which in turn transmits controlling outputs (open/close) to the injectors. The length of time the injectors stay open is considered pulse width. The pulse width will widen (richer) or narrow (leaner) depending on signals ECM receives from sensors, to allow efficient operation at all speeds and conditions.

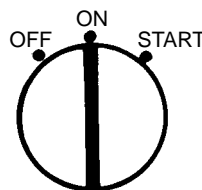
**IMPORTANT:** The following preliminary steps **MUST BE FOLLOWED** before attempting EFI problem diagnosis.

## Preliminary Checks

### Ignition Spark Check

**Purpose:** This test determines if the ignition system is delivering usable spark to the spark plugs. By performing this test, the probable cause can be isolated to either the ignition system or fuel system.

1. Disconnect all spark plug wires from spark plugs.
2. Connect spark gap tester Quicksilver (91-850439T) to a good ground on engine. Connect Spark Plug Extensions (91-877870A1) between tester and spark plug leads.
3. Connect Remote Starter Switch Quicksilver (91-52024A1).
  - a. Connect RED lead from switch to large positive (+) terminal with RED banded cable attached [(+) cable from battery].
  - b. Connect BLACK lead from switch to small terminal with YELLOW/RED lead attached.
4. Turn ignition key switch to the "ON" position.



5. Look at spark gap tester viewing port for presence of good quality spark.

Results: **IMPORTANT:** The presence of a good spark will not necessarily indicate condition of timing. Ignition timing may be off far enough to prevent the engine from starting, but still allow a good spark to be present in the spark gap tester.



# EFI System Test Procedures

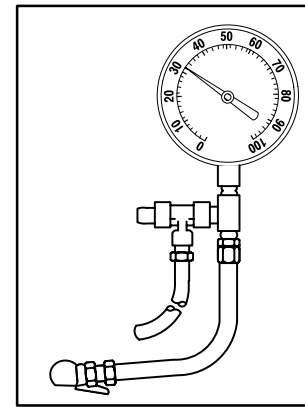
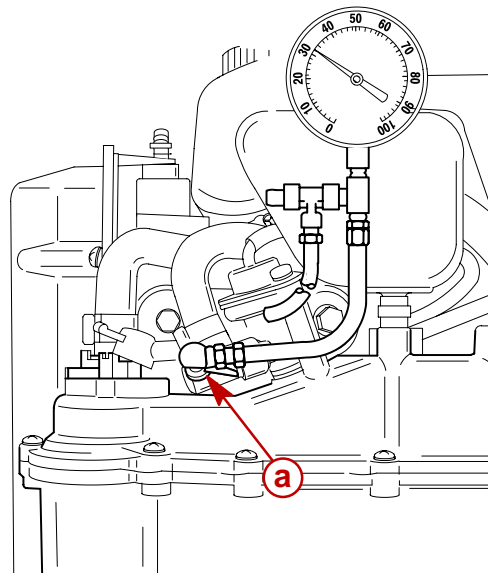
## Fuel Gauge Connection/Pressure Test

**IMPORTANT:** When checking fuel pressure while engine is running, fuel pressure may fluctuate. Fuel pressure fluctuation (i.e. 34 to 36 psi “234 to 248 kPa”) is common, as the regulated pressure is a differential between fuel rail and manifold vacuum.

**Purpose:** Checking fuel manifold pressure ensures that fuel under usable pressure is available to the fuel injectors. This test isolates the probable cause as either a fuel delivery or EFI electrical system failure.

**IMPORTANT:** Fuel pressure should be monitored through full RPM range to determine fuel supply problems at high engine speeds.

1. Connect fuel pressure gauge to induction manifold pressure port.

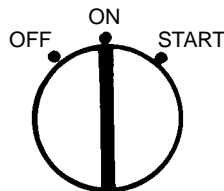


91-16850

55180

**a** - Pressure Port

2. Turn ignition key switch to “ON” position.



3. Operate electric fuel pump for approximately 10 seconds.

**NOTE:** Fuel pump will only operate for approximately 30 seconds. By turning the key switch to “OFF” and then back to “ON” the pump will operate for 30 seconds more.

4. Take reading on fuel pressure gauge.

**Results:** If pressure reading is 34 to 36 psi (234 to 248 kPa), the electric fuel pump is providing fuel with enough pressure to be used by the injectors. Pump malfunction is not the cause of EFI trouble.

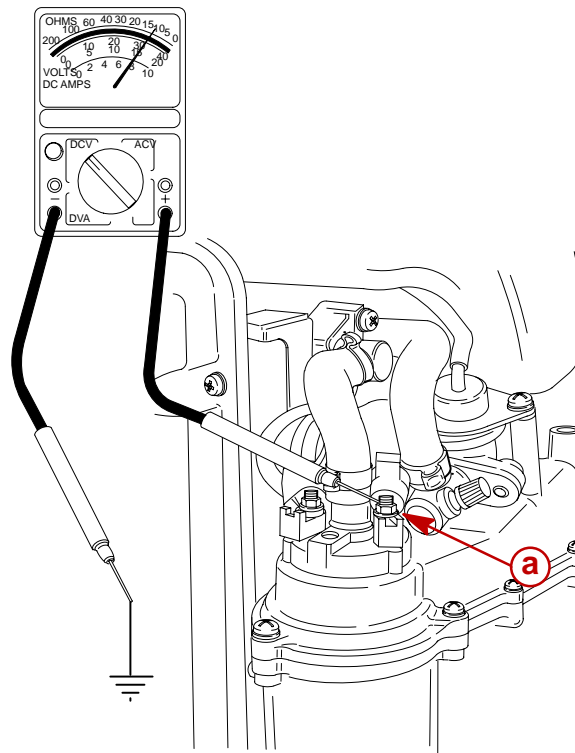
If fuel pressure is well below 34 psi (234 kPa), fuel delivery to electric fuel pump, fuel pump failure or other related problem exists. Follow low/high fuel pressure flow charts.

If fuel pressure is above 36 psi (248 kPa) go to fuel pressure regulator test.



- Set volt meter to read battery voltage and connect BLACK test lead to ground, POSITIVE test lead to NEGATIVE (-) post of fuel pump.

#### Negative Test Terminal



55192

**a** - Negative (-) Terminal

- Perform voltage tests below.

#### VOLTAGE TEST CHART

Engine Mode	BLACK Meter Lead to Engine Ground; RED Meter Lead to:	Approximate Voltage Reading	If Approximate Voltage is not obtained, this indicates:
1. All models	(+) terminal of fuel pump	12 – 13.5 volts	If reading is below 12 volts, the battery is bad, discharged or has bad connection(s). If reading is higher than 13.5 volts, the battery is over-charged
2. Ignition key in "OFF" position.	(-) terminal of fuel pump.	Same reading should be obtained as reading in check No. 1 (above)	If reading is lower than in test 1, the ECM is bad or there is an open circuit in fuel pump.
3. Ignition key in "ON" position and engine NOT running.	(-) terminal of fuel pump.	1.5 volt or less (voltage should rise to 12 – 13.5 volts after approximately 30 seconds.	Bad ECM or bad fuel pump*.
4. Engine being cranked.	(-) terminal of fuel pump.	1.5 volt or less.	Bad ECM or bad fuel pump.*

\*Check for proper electrical operation of electric fuel pump. (Step 4)

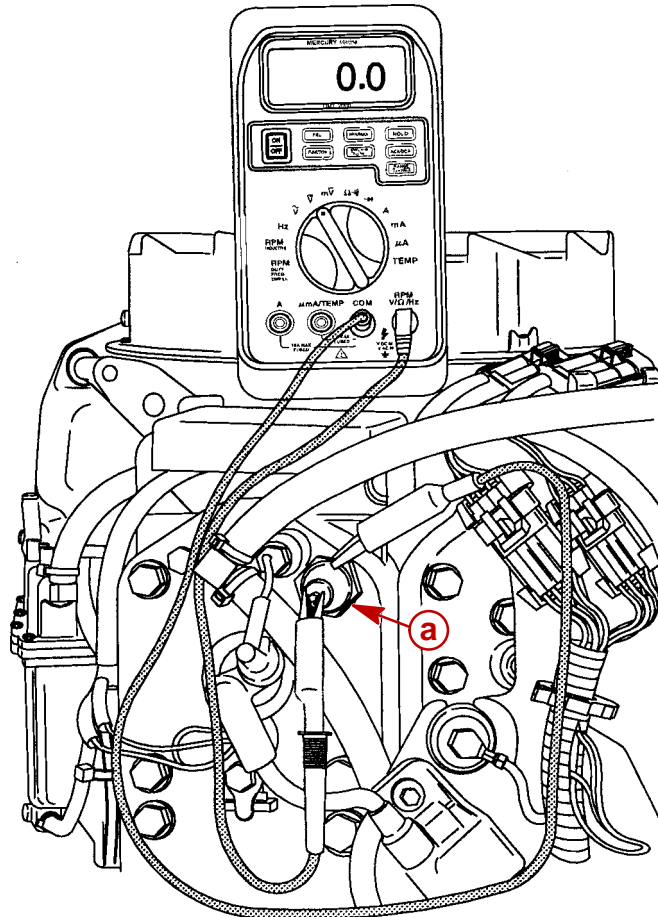


## Detonation Sensor Check

**IMPORTANT:** When testing detonation control system keep all test leads away from high tension leads (i.e. spark plug lead, electrical wiring etc.) to avoid false readings.

**Purpose:** This check will determine if sensor is correctly signaling control module.

1. Connect DMT 2000 Digital Tachometer Multi-Meter (91-854009A1) to detonation sensor as shown. RED "V- $\Omega$ " test lead to sensor terminal, BLACK "com" test lead to sensor housing (ground).



58067

**a** - Detonation Sensor

2. Turn meter dial to 200 MV volts, AC position and power switch in ON position. Place outboard in water.
3. Start and operate engine at idle speed.
4. Check meter reading. A typical reading of 0.075 to 0.120 volts AC should be present.

**NOTE:** As RPM increases, volt readings will increase.

**Results:** If voltage reading is not within 0.075 to 0.120 volts AC replace detonation sensor. Torque sensor to 144 lb. in. (16.0 N·m).

If voltage reading is within 0.075 to 0.120 volts AC perform check on detonation control module.

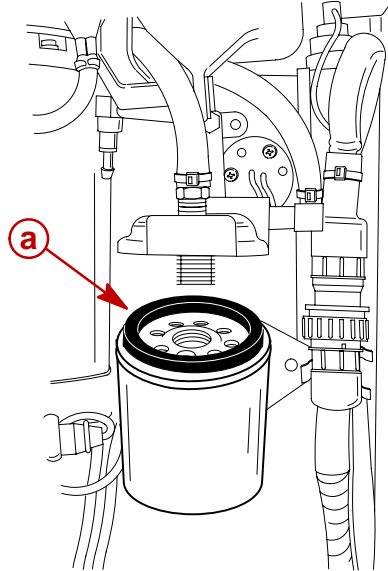
**IMPORTANT:** Handle detonation sensor with care when testing or replacing. Rough handling could cause undetectable internal damage causing false readings to be transmitted to detonation module.



## Water Separating Filter Assembly Installation

**IMPORTANT:** Apply a light coat of outboard oil to the rectangular sealing ring on the water separator before installation.

1. After applying oil to sealing ring of water separator, install separator onto bracket.
2. **HAND TIGHTEN SEPARATOR.** DO NOT use strap wrench or other tool to tighten separator.
3. Reconnect water sensor lead to bottom of separator.

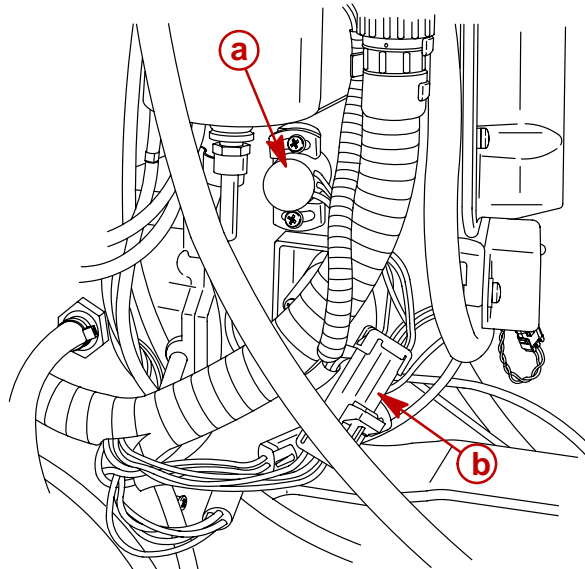


55185

**a** - Sealing Ring

## Throttle Position Sensor and Temperature Sensor Fuel Injector Harness Disconnections

1. Disconnect throttle position sensor at 3 pin connector.



58055

**a** - Throttle Position Sensor  
**b** - 3 Pin Connector



## ELECTRIC FUEL PUMP INSTALLATION

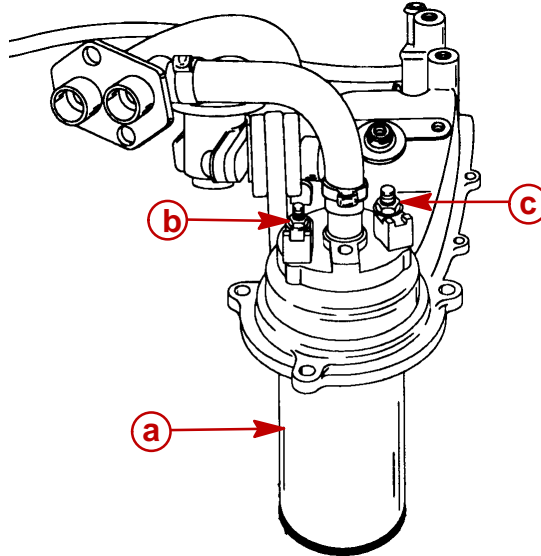
1. Slide fuel pump into separator cover.

**NOTE:** Fuel pump electrical studs are different diameters. Pump will install properly into cover only one way.

### **CAUTION**

**DO NOT** over torque fuel pump **POSITIVE** and **NEGATIVE** attaching nuts as damage to fuel pump will result.

2. Secure pump to cover with 2 nuts. Torque **POSITIVE** nut to 6 lb. in. (0.7 Nm). Torque **NEGATIVE** nut to 16 lb. in. (1.8 Nm).

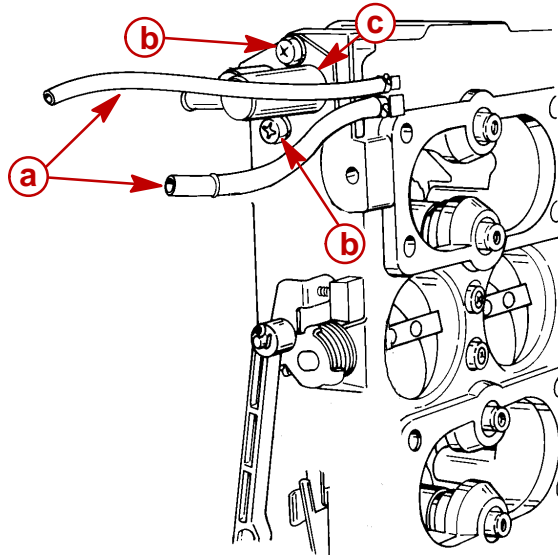


- a** - Electric Pump
- b** - POSITIVE (+) Stud (Small Diameter)
- c** - NEGATIVE (-) Stud (Large Diameter)



## Fuel Rail Removal

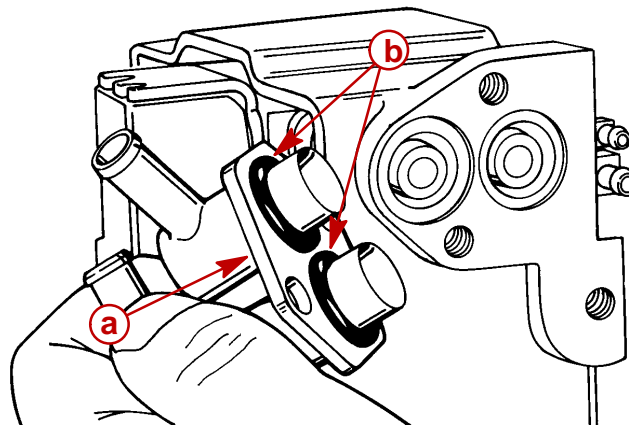
1. Remove manifold vacuum hoses.
2. Remove engine bleed hose.
3. Remove screws securing manifold fitting to manifold.



51789

- a** - Vacuum Hoses
- b** - Screws
- c** - Manifold Fitting

4. Remove manifold fitting and O-rings.



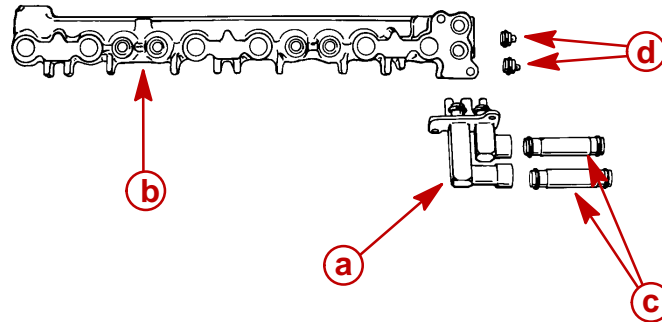
51791

- a** - Manifold Fitting
- b** - O-rings



## Fuel Rail Assembly

1. Install inspected O-rings to plugs, tube support and tubes.
2. Install tubes to tube support.
3. Install plugs to fuel rail.
4. Install tube support to fuel rail.

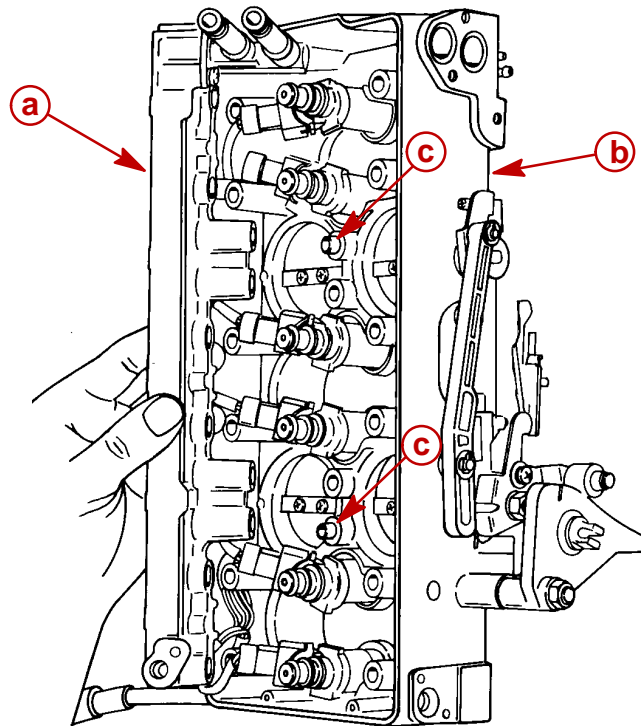


- a** - Tube Support
- b** - Fuel Rail
- c** - Tubes
- d** - Plugs

51795

## Fuel Rail Installation

1. With fuel rail guides in place, install fuel rail to manifold.



- a** - Fuel Rail
- b** - Manifold
- c** - Guides

51788

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



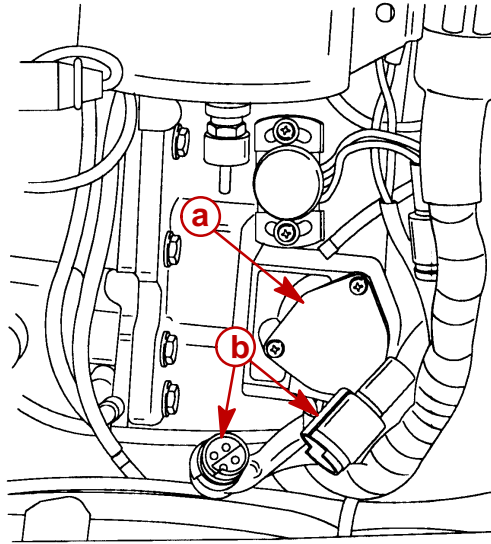
- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL



## Throttle Position Sensor, Air Temperature Sensor and Fuel Injector Harness Connections

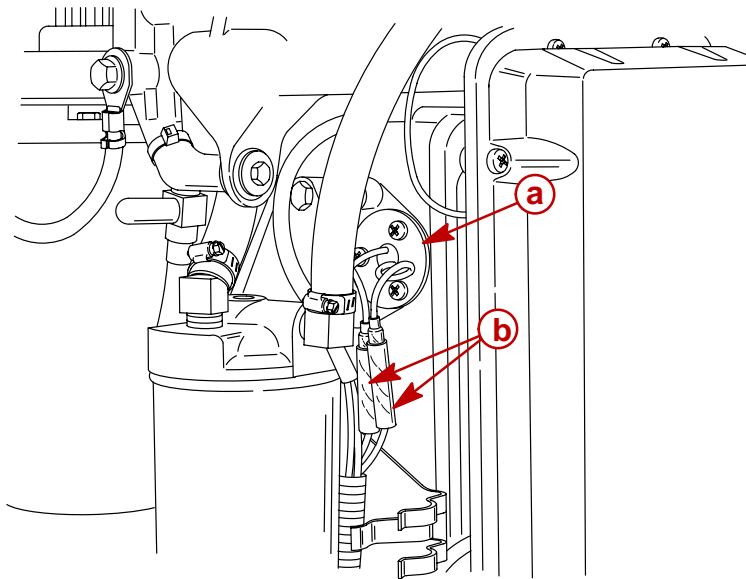
1. Connect fuel injector harness at 4 pin connector.



55193

- a** - Fuel Injector Harness
- b** - 4 Pin Connector

2. Connect air temperature sensor leads to bullet connectors.

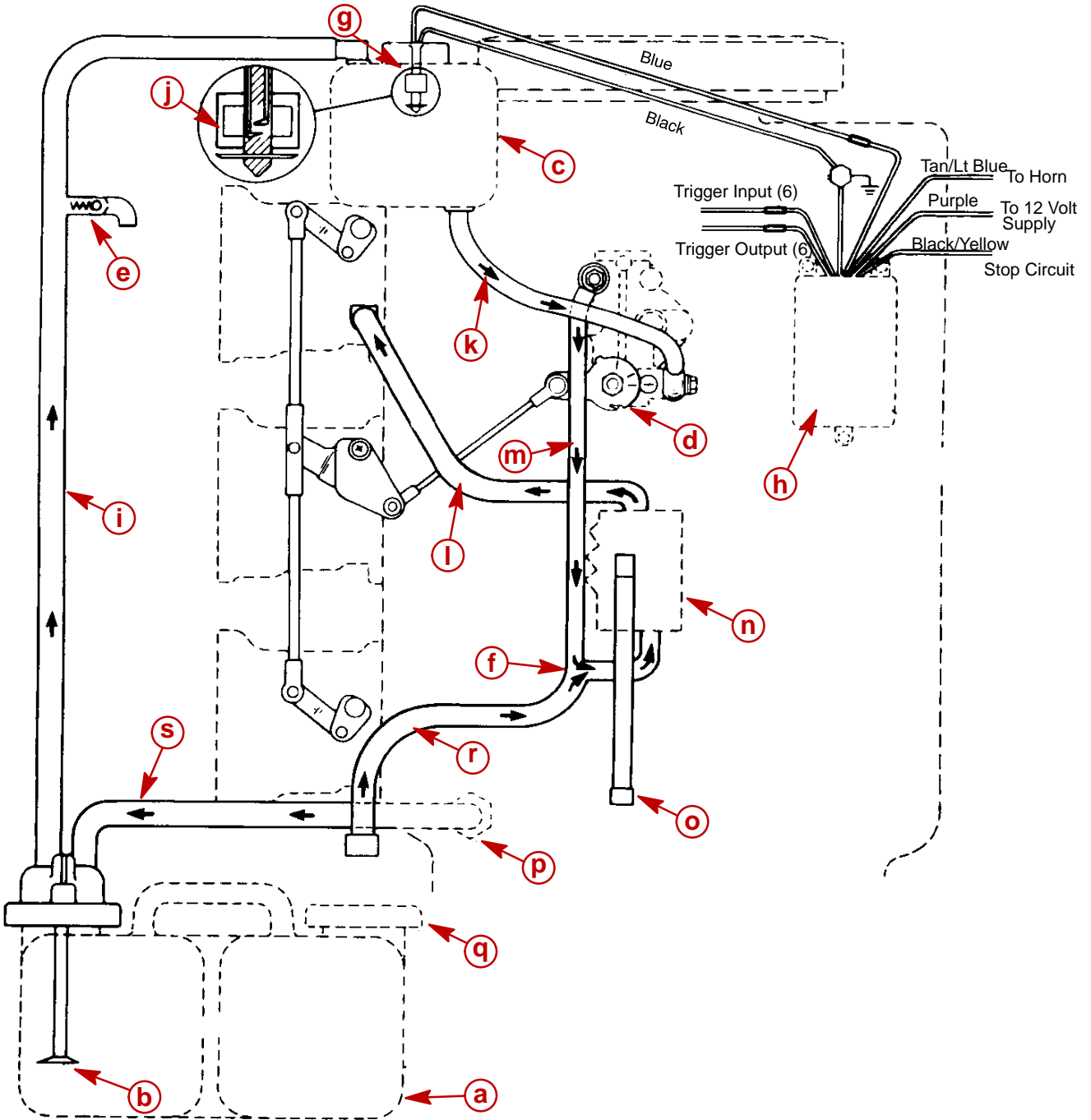


58170

- a** - Air Temperature Sensor
- b** - Connectors



# Oil Injection Flow System



- a** - Remote Oil Tank
- b** - Oil Pick-up Tube
- c** - Oil Reservoir
- d** - Oil Injection Pump
- e** - 2 PSI Check Valve
- f** - 2 PSI Check Valve
- g** - Low Oil Float Sensor
- h** - Control Module (mounted on top of cylinder block)
- i** - Oil Line (Blue Stripe)
- j** - Magnetic Float
- k** - Oil Flow
- l** - Fuel/Oil Mixture
- m** - Oil Inlet
- n** - Fuel Pump
- o** - Crankcase Outlet Fuel Pump
- p** - Crankcase Pressure with One Way Check Valve
- q** - Filler Cap
- r** - Fuel Inlet
- s** - Air Pressure

**Problem: Oil Level in Engine Oil Reservoir Tank is Low But Not Low in Remote Oil Tank.**

Possible Cause	Corrective Action
Quick disconnect on remote oil tank is not fully connected	Reconnect
Remote oil hose (blue stripe) is blocked.	Check length of hose for a kink.
Remote pulse hose (second hose) is blocked or punctured.	Check length of hose for a kink.
Remote pulse hose check valve is faulty (this valve is located at the engine end of the hose).	Replace check valve.
A restricted oil outlet filter in the remote tank.	Remove filter and clean.
Leak at upper end of remote oil tank pick-up tube.	Check tube for cracks or leaks.
Oil and Pulse hoses reversed.	Check hose connections.
Low crankcase pressure.	Check pressure from pulse hose check valve (2 psi minimum).

**Problem: Warning Horn Does Not Sound When Ignition Key is Turned to “ON” Position.**

Possible Cause	Corrective Action
Horn malfunction or open (TAN/BLUE) wire between horn and engine.	Use a jumper wire to ground TAN/BLUE lead (at engine bullet connector starboard temperature sensor) to engine ground. Warning horn should sound. If not, check TAN/BLUE wire between horn and engine for open circuit and check horn.
Faulty Ignition Control Module	Check if all Control Module leads are connected to harness leads. If so, module may be faulty.
Using incorrect side mount remote control or ignition/choke assembly.	See info on remote control Section 1D.

**Problem: Warning Horn Stays on When Ignition Key is Turned to “ON” Position.**

Engine overheat sensor/Control Module	If horn sounds a continuous signal, the engine overheat sensor starboard head may be faulty. Disconnect overheat sensor and turn ignition key to “ON” position. If horn still sounds a continuous signal, the Control Module is faulty. Replace module and re-test. If signal does not sound, then engine overheat sensor is faulty. Replace and re-test.
---------------------------------------	---

**Problem: Warning Horn sounds when Engine is Running and Oil Level in Engine Reservoir is Full.**

Possible Cause	Corrective Action
Defective low oil sensor (located in fill cap of engine oil reservoir).	Do not remove cap from oil reservoir. Disconnect both low oil sensor leads from terminal connectors. Connect an ohmmeter between leads. There should be no continuity through sensor. If continuity exists, sensor is faulty. Replace cap assembly.

If all of the checks are positive, the Control Module is faulty. Replace Module and re-test.



# POWERHEAD

## Section 4A - Powerhead

### Table of Contents

Powerhead Specifications (2 Liter Model 135) .....	4A-2	Crankshaft .....	4A-38
Powerhead Specifications (2.5 Liter Model 150/175/200) .....	4A-3	Crankshaft (and End Cap) Bearings ....	4A-39
Special Tools .....	4A-4	Reed Block Assembly .....	4A-39
Powerhead Repair Stand .....	4A-5	Reed Block Housing .....	4A-40
Cylinder Block Assembly .....	4A-7	Connecting Rods .....	4A-40
Exhaust Manifold and Exhaust Plate .....	4A-8	Powerhead Reassembly and Installation ...	4A-43
Crankshaft, Pistons and Connecting Rods ..	4A-10	General .....	4A-43
Reed Block and Cylinder Head .....	4A-12	Crankshaft Installation .....	4A-48
Bleed System Routing (Carburetor Models) .	4A-14	Piston and Connecting Rod Reassembly	4A-50
Bleed System Routing (EFI Models) .....	4A-15	Piston and Piston Ring Combinations ...	4A-53
Torque Sequence .....	4A-16	Piston Installation .....	4A-53
General Information .....	4A-17	Crankcase Cover Installation .....	4A-57
Powerhead Removal from		Assembly of Reed Blocks to	
Driveshaft Housing .....	4A-18	Intake Manifold .....	4A-59
Removing Engine Components .....	4A-22	Assembly of Exhaust Manifold to Block ..	4A-59
Powerhead Disassembly .....	4A-23	Cleaning and Inspection .....	4A-61
Cleaning and Inspection .....	4A-34	Cylinder Block and Crankcase Cover ...	4A-61
Cylinder Block and Crankcase Cover ...	4A-34	Reinstalling Engine Components .....	4A-63
Special Service Information .....	4A-34	Throttle Lever and Shift Shaft .....	4A-64
Cylinder Bores .....	4A-35	Powerhead Installation On	
Pistons and Piston Rings .....	4A-36	Driveshaft Housing .....	4A-68
Cylinder Heads and Exhaust		Gasoline/Oil Break-in Mixture .....	4A-73
Divider Plate .....	4A-38	Break-In Procedure .....	4A-73



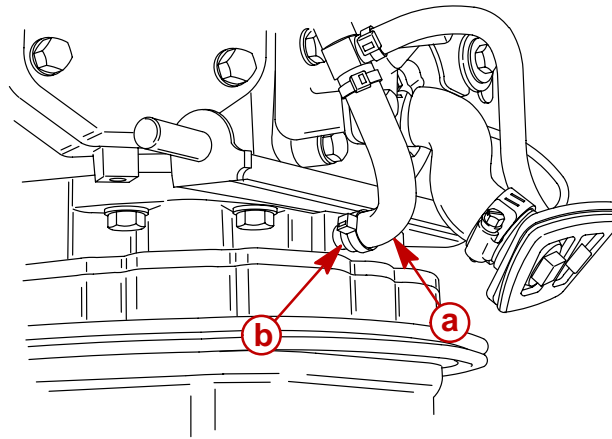


# Crankshaft, Pistons and Connecting Rods

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	CRANKSHAFT ASSEMBLY			
2	1	WEAR SLEEVE			
3	1	BALL BEARING (LOWER)			
4	1	RETAINING RING			
5	1	DRIVE GEAR			
6	2	SCREW	8		1.0
7	2	NUT			
8	1	CARRIER ASSEMBLY			
9	1	SEAL			
10	7	RING—sealing - crankshaft			
11	2	ROLLER BEARING—crankshaft			
12	2	BEARING			
13	3	PISTON (STARBOARD-STANDARD)			
	AR	PISTON (STARBOARD-.015 O.S.)			
	AR	PISTON (STARBOARD-.030 OS.)			
	3	PISTON (PORT-STANDARD)			
	AR	PISTON (PORT-.015 O.S.) 135			
	AR	PISTON (PORT-.030 O.S.)			
	3	PISTON (STARBOARD-STANDARD)			
	AR	PISTON (STARBOARD-.015 O.S.) 150/XR6			
	AR	PISTON (PORT-.015 O.S.) Magnum III 200			
14	1	PISTON RING (STANDARD)			
	AR	PISTON RING (.015 O.S.) 135			
	AR	PISTON RING (.030 O.S.)			
	1	PISTON RING (STD.) 150/XR6/Magnum III/200			
	2	PISTON RING (.015 O.S.)			
15	12	LOCK RING			
16	6	PISTON PIN			
17	6	CONNECTING ROD ASSEMBLY			
18	12	SCREW—connecting rod	1st Torque - 15 lb-in (1.5 Nm.) 2nd Torque - 20 lb-ft (27 Nm.) Turn bolt additional 90 degrees after 2nd torque		
19	12	WASHER—needle locating			
20	6	ROLLER BEARING ASSEMBLY			
21	174	NEEDLE BEARING—piston end			



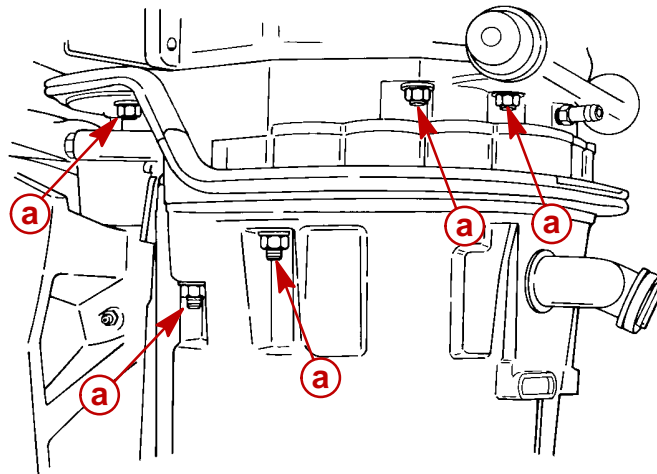
13. Remove water hose from fitting on exhaust adaptor plate.



58069

- a** - Water Hose
- b** - Fitting

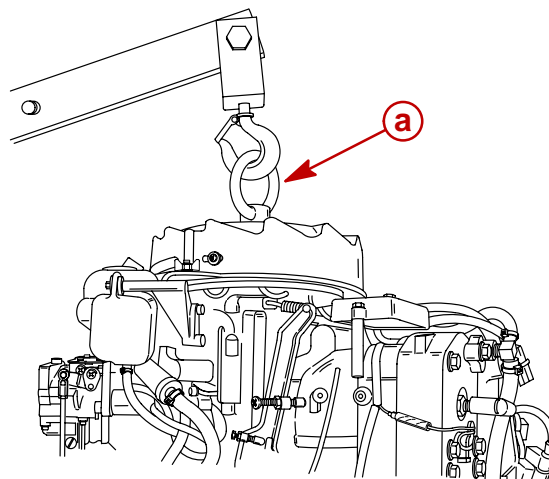
14. Remove 10 nuts and 10 washers (5 each side) from powerhead base.



51846

- a** - Nuts and Washers (5 each side)

15. Remove plastic cap from center of flywheel and install Lifting Eye 91-90455 into flywheel at least 5 full turns. Using a hoist, lift powerhead assembly from driveshaft housing.

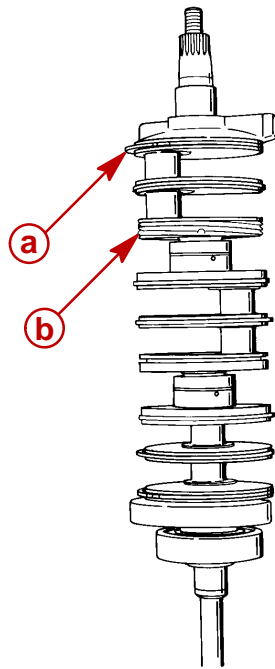


58070

- a** - Lifting Eye 91-90455



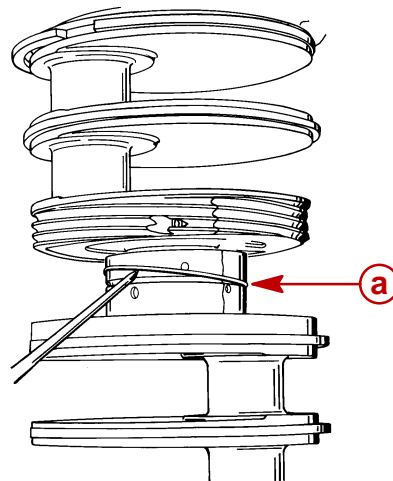
**IMPORTANT: DO NOT** remove oil pump drive gear on crankshaft unless gear is damaged; i.e. cracked, gear teeth chipped or fretting, or excessive looseness. Refer to Section 3D for proper oil drive gear installation procedures.



51847

- a** - Sealing Rings
- b** - Oil Pump Drive Gear

26. Remove retaining ring as shown.

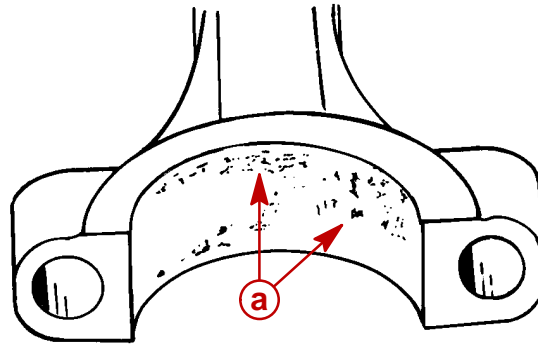


51850

- a** - Retaining Ring



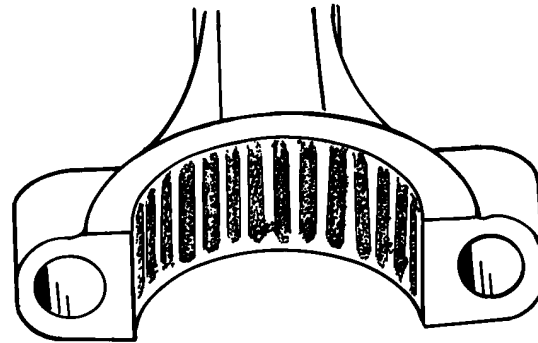
3. **Rust:** Rust formation on bearing surfaces causes uneven pitting of surface(s).



51853

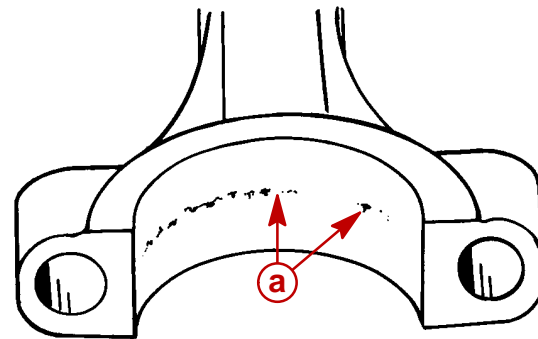
**a** - Pitting

4. **Water Marks:** When bearing surfaces are subjected to water contamination, a bearing surface “etching” occurs. This etching resembles the size of the bearing.



51853

5. **Spalling:** Spalling is the loss of bearing surface, and it resembles flaking or chipping. Spalling will be most evident on the thrust portion of the connecting rod in line with the “I” beam. General bearing surface deterioration could be caused by or accelerated by improper lubrication.

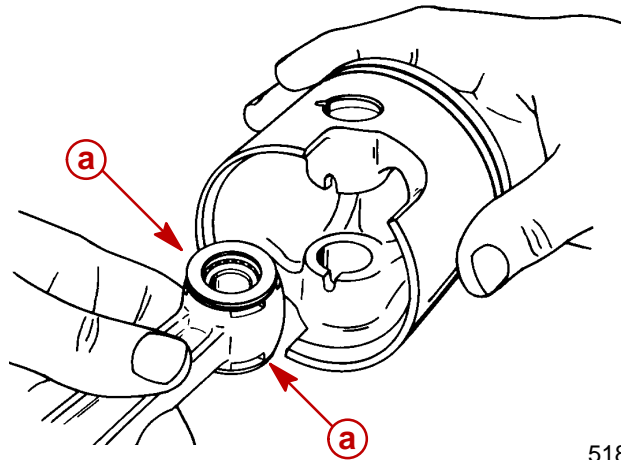


51853

**a** - Spalling



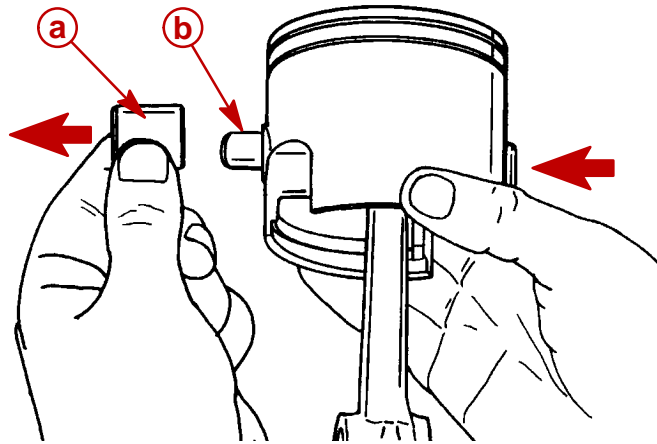
Carefully position piston over end of rod. Make sure locating washers remain in place.



51851

**a** - Locating Washers

4. Insert piston pin tool (91-74607A3) and push sleeve out of piston. Keep piston pin tool in piston.

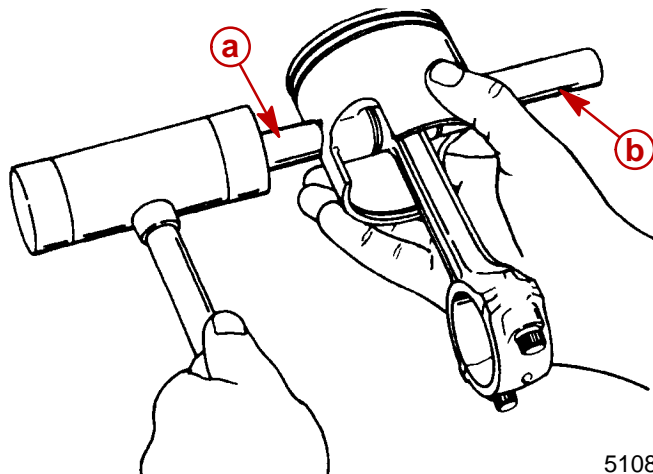


51080

**a** - Piston Pin Tool (91-74607A3)

**b** - Sleeve

5. Use a mallet and tap piston pin into piston and push piston pin tool out.



51086

**a** - Piston Pin

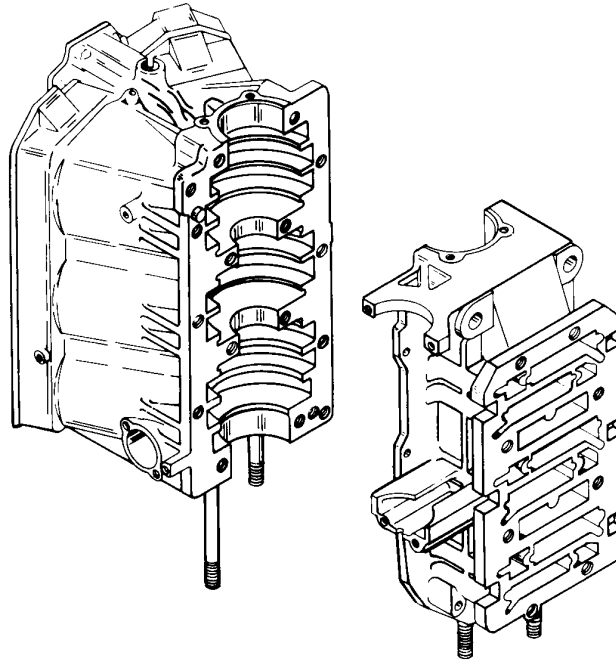
**b** - Piston Pin Tool



# Cleaning and Inspection

## Cylinder Block and Crankcase Cover

**IMPORTANT:** Crankcase cover and cylinder block is a matched, line-bored assembly and should never be mismatched by using a different crankcase cover or cylinder block.



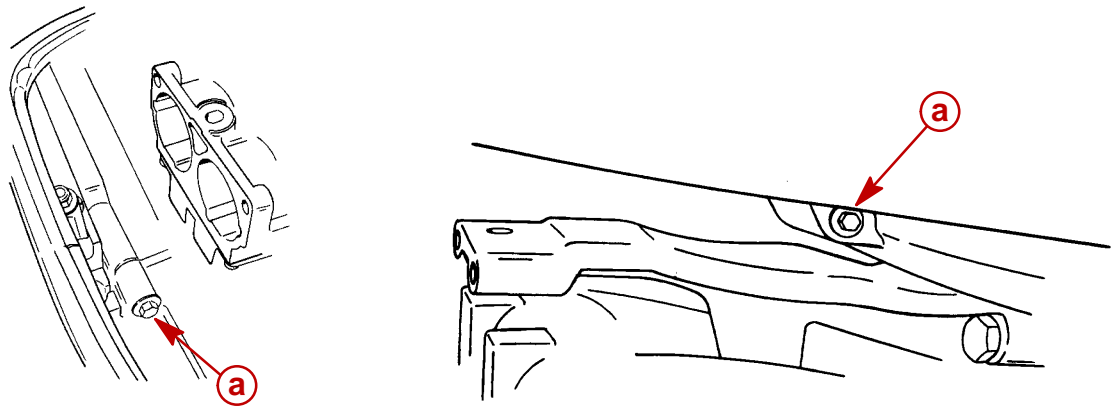
### **⚠ CAUTION**

**It crankcase cover or cylinder block is to be submerged in a very strong cleaning solution, it will be necessary to remove the crankcase cover/cylinder block bleed system from crankcase cover/cylinder block to prevent damage to hoses and check valves.**

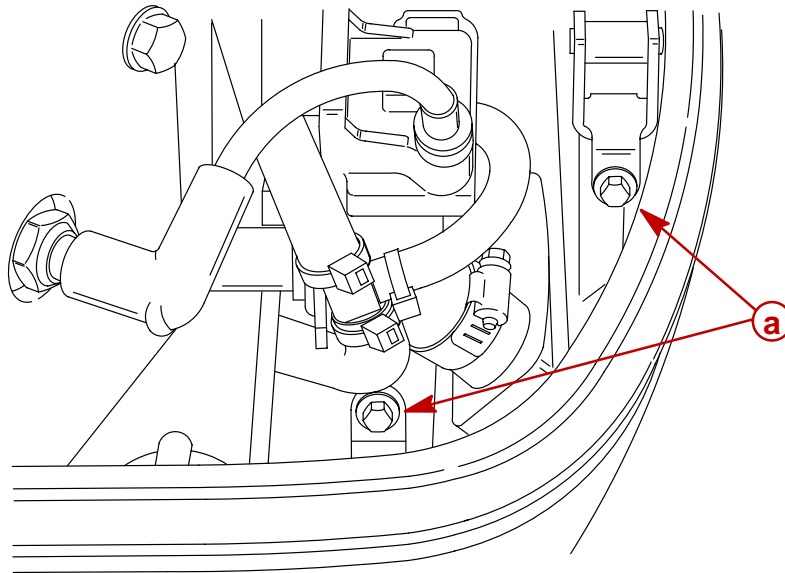
1. Thoroughly clean cylinder block and crankcase cover. Be sure that all sealant and old gaskets are removed from matching surfaces. Be sure that carbon deposits are removed from exhaust ports.
2. Inspect cylinder block and crankcase cover for cracks or fractures.
3. Check gasket surfaces for nicks, deep grooves, cracks and distortion that could cause compression leakages.
4. Check all water and oil passages in cylinder block and crankcase cover to be sure that they are not obstructed and that plugs are in place and tight.



13. Install bottom cowls.

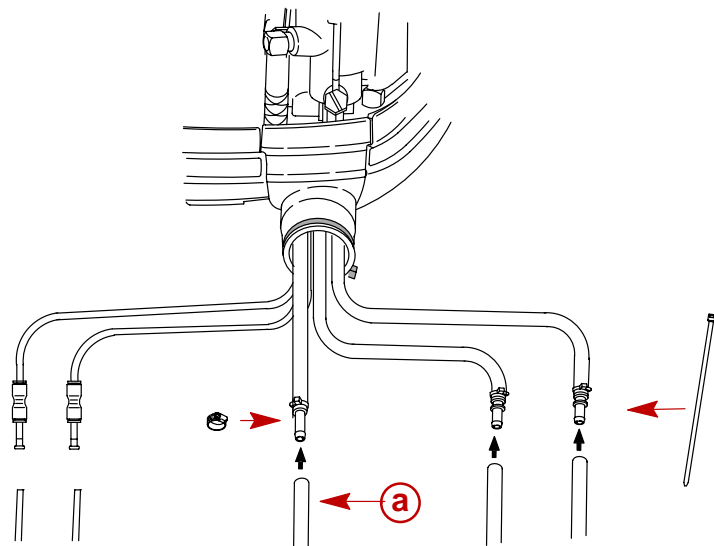


**a** - Bolts



58068

14. Reconnect input fuel line.



**a** - Input Fuel Hose



## Water Pressure Check

Water pressure may be checked by attaching a test pressure gauge to the top of the engine block.

A water pressure line (GRAY colored) is provided that exits at the front of the lower cowl. A dash style gauge may be connected to this line to register water pressure.

### **⚠ WARNING**

**Shut off engine and refer to troubleshooting chart if water pressure is not within specification. DO NOT exceed 3000 RPM in neutral.**

<b>Idle</b>	1.0 – 3.0 PSI (6.8 – 20.5 kPa)
<b>Poppet Valve Opening</b>	4 – 9 PSI (27.4 – 61.6 kPa)
<b>W.O.T.</b>	12.0 PSI (82.1 kPa) Minimum

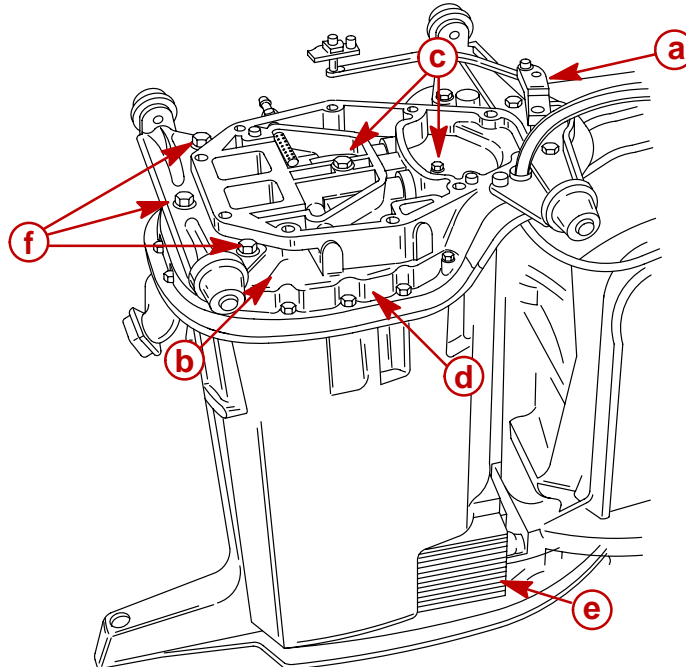


# Drive Shaft Housing and Dyna-Float Suspension

Refer to “Powerhead Removal” section to remove powerhead. Refer to “Lower Unit Removal” in this section to remove lower unit.

## Removal and Disassembly

1. Remove shift shaft from driveshaft housing by pulling straight up on shaft.
2. Remove 5 bolts which secure exhaust extension plate to drive shaft housing. After bolts are removed, lift exhaust extension plate off drive shaft housing.
3. Remove screws, which secure lower mount covers to drive shaft housing, then remove covers.

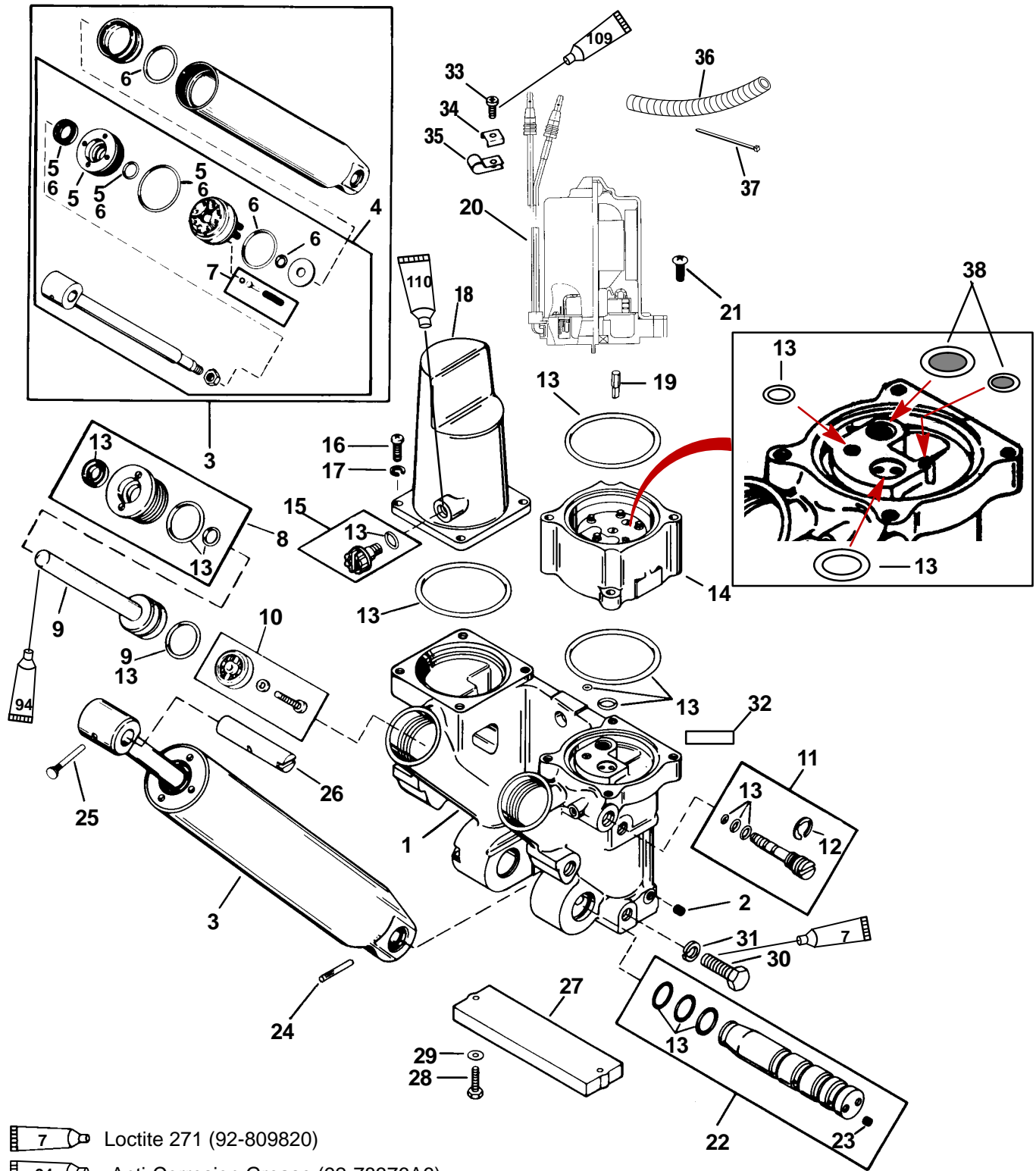


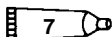
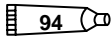
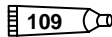
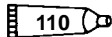
57729

- a** - Shift Shaft Linkage
- b** - Exhaust Extension Plate
- c** - Exhaust Plate to Drive Shaft Housing Bolts
- d** - Driveshaft Housing Plate
- e** - Lower Mount Cover (One Each Side)
- f** - Mounting Bracket Bolts (3)



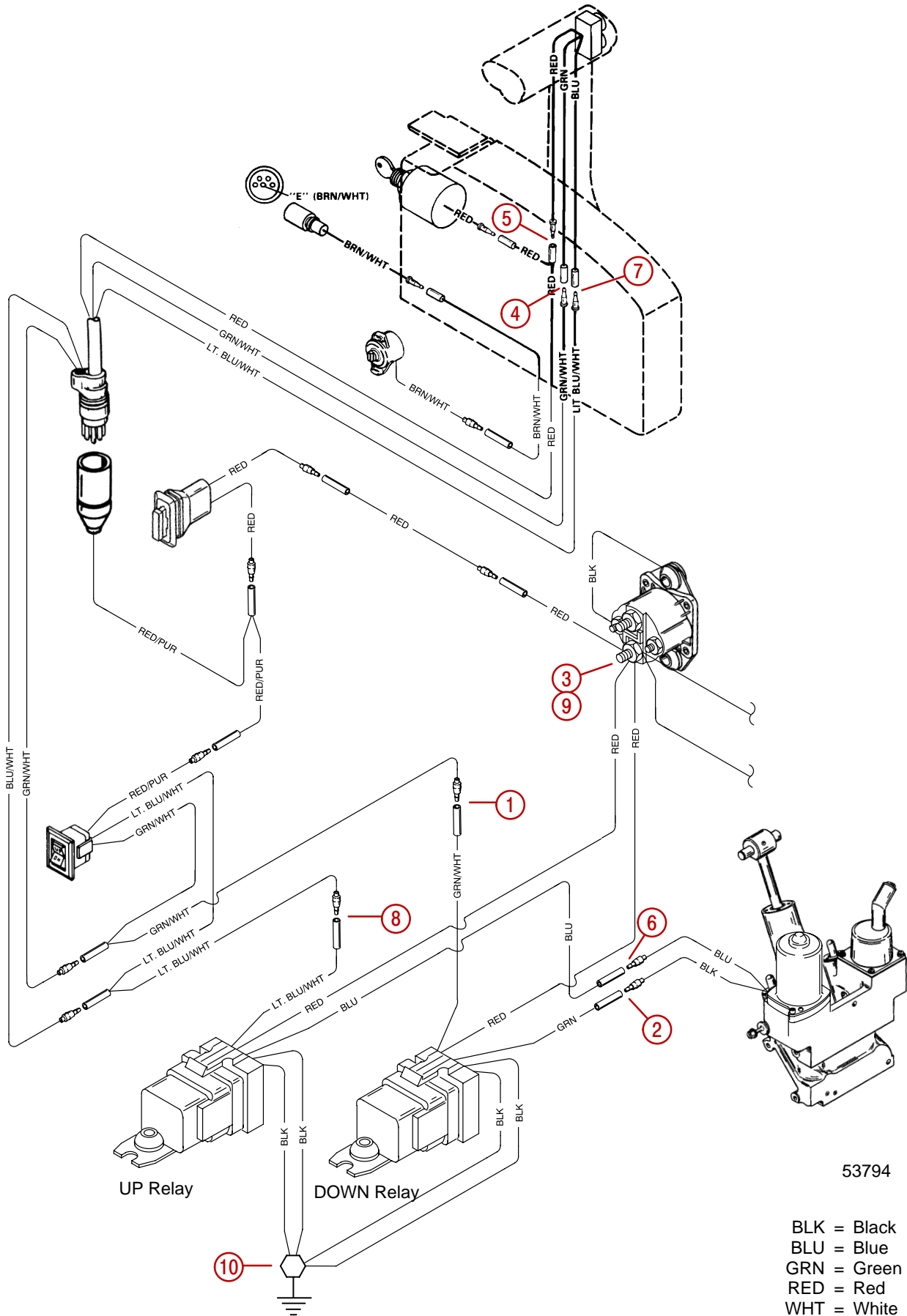
# Power Trim Components



-  7 Loctite 271 (92-809820)
-  94 Anti-Corrosion Grease (92-78376A6)
-  109 GM Silicone Sealer (92-91600-1)
-  110 Power Trim & Steering Fluid (92-90100A12)

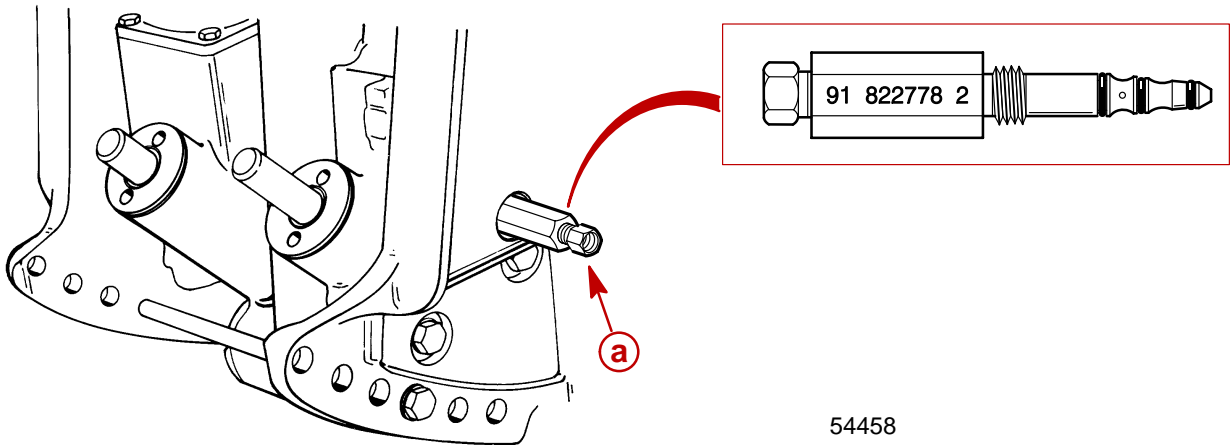


# Power Trim System with Relays and 2 Wire Trim Motor



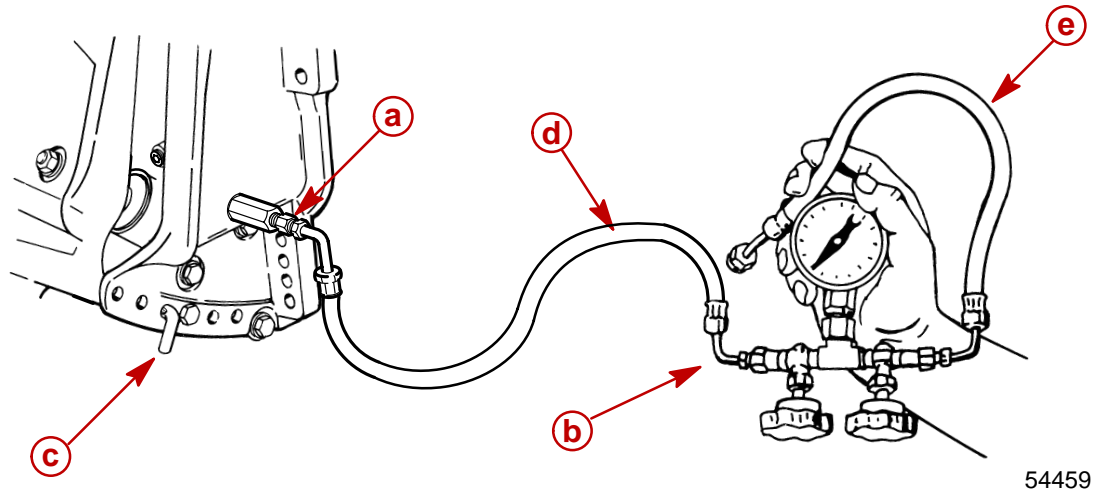


4. Install test adaptor 91-822778A2 into manual release valve hole.



**a** - Test Adaptor (91-822778A2)

5. Thread hose from Test Gauge Kit (91-52915A6) into brass fitting on adaptor.



**a** - Brass Fitting  
**b** - Test Gauge Assembly  
**c** - Tilt Pin (Position in Hole Shown)  
**d** - Hose  
**e** - Hose (Not Used)

6. Reinstall fill plug.

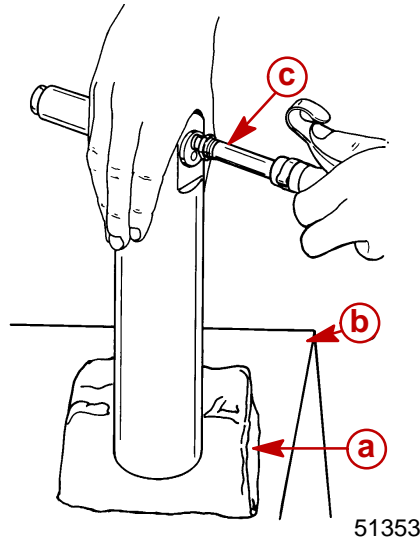
7. Disengage tilt lock lever.



## ⚠ WARNING

**Memory Piston Cup may be expelled at a high velocity when air pressure is applied. Failure to place cylinder as shown below could result in personal injury.**

- Place cylinder as shown. Hold down on cylinder and inject air into shaft opening.



- a** - Shop Cloth
- b** - Solid Surface
- c** - Air Nozzle

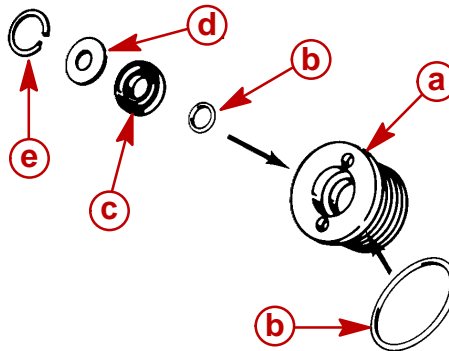
- Remove shaft after Memory Piston Cup has been expelled. Replace allen plug removed in Step 5 and tighten securely.

## CLEANING AND INSPECTION

- Inspect all internal parts for damage or wear. Clean and replace parts as necessary.
- Inspect tilt rod for scratches. Replace scraper seal in rod end cap if tilt rod is scratched or worn.
- Slight scratches or tool marks less than 0.005 in. (0.1 mm) deep in cylinder are acceptable.

## Scraper Seal Replacement

- Remove components from end cap.



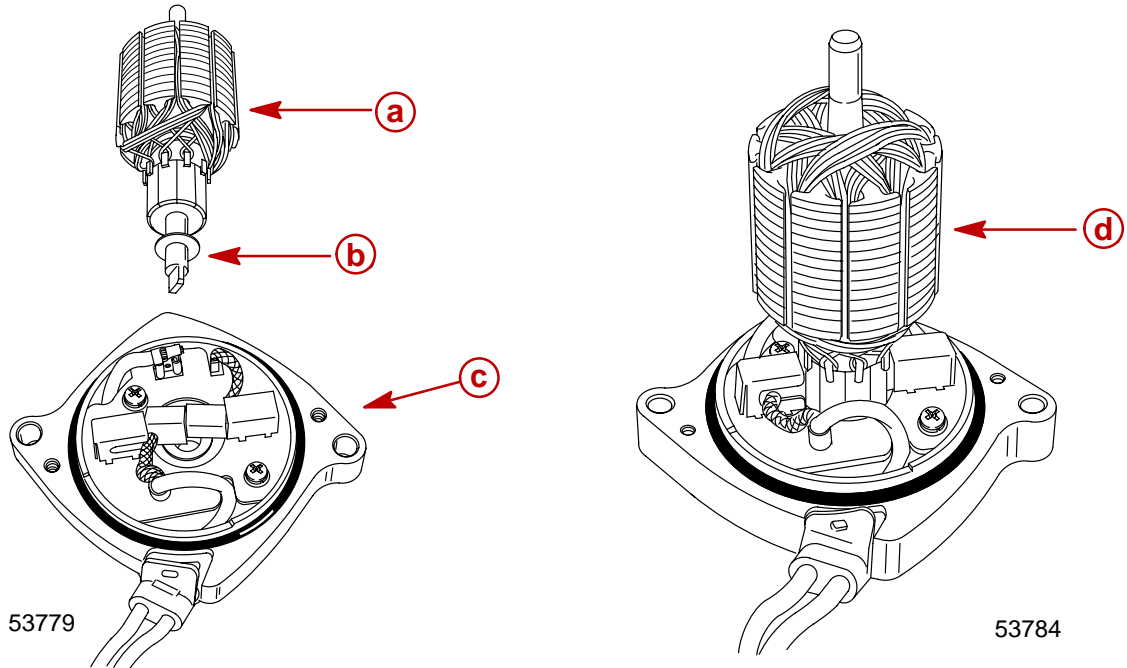
- a** - Cap
- b** - O-ring (2)
- c** - Scraper Seal
- d** - Washer
- e** - Retaining Ring



## Reassembly

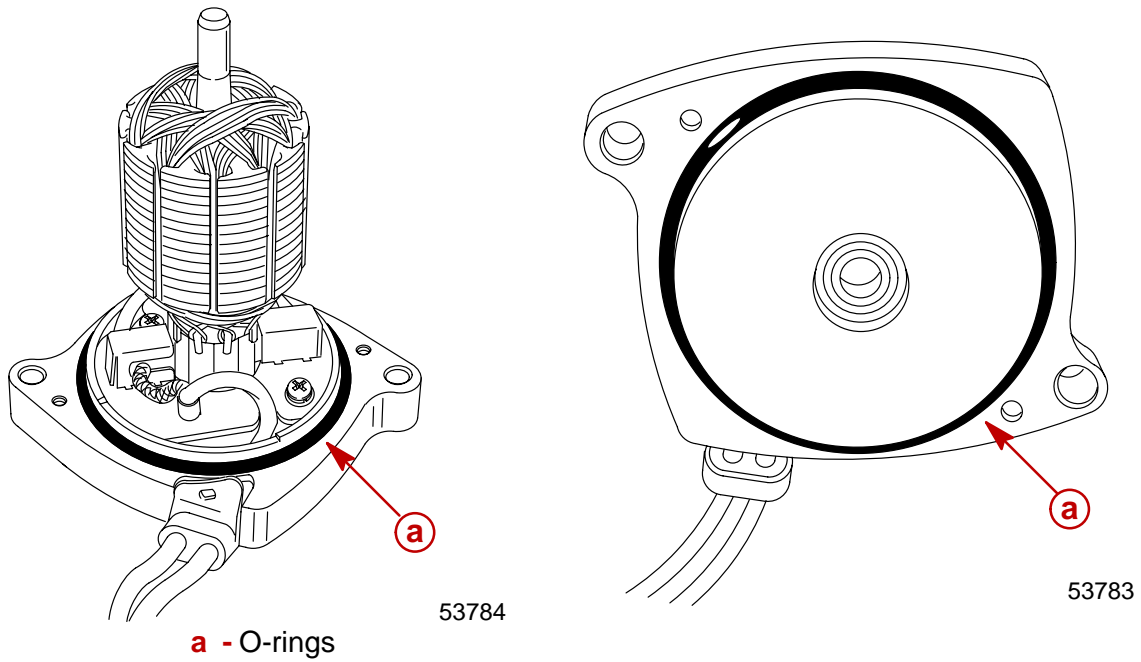
**IMPORTANT: Components must be clean. Any debris in power trim system can cause system to malfunction.**

1. Install armature into end cap/brush card assembly.



- a** - Armature
- b** - Shim
- c** - End Cap Assembly
- d** - Armature (Spread brushes to install armature into end cap)

2. Install O-rings in end cap.

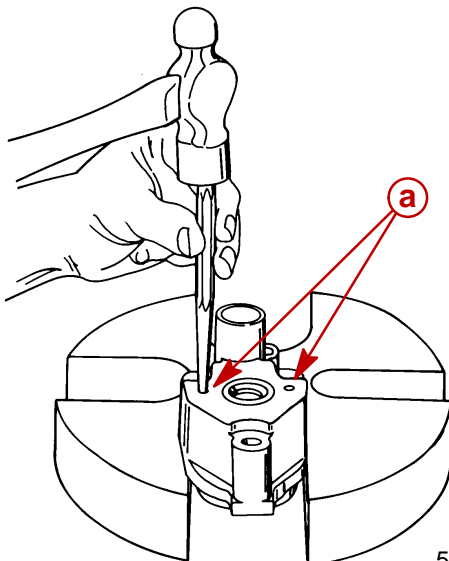




## Notes:

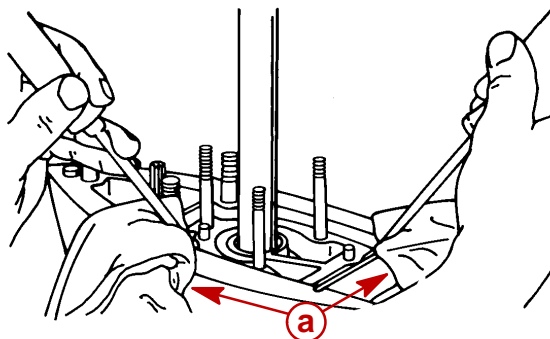


- b. Drill two 3/16 in. (4.8mm) diameter holes thru the top of water pump cover (but not thru insert). Drive insert out of cover with a punch and hammer.



**a** - Drill Two Holes at These Locations

7. Remove impeller from driveshaft. (It may be necessary to use a punch and hammer to drive impeller upward on driveshaft. In extreme cases, it may be necessary to split hub of impeller with a hammer and chisel.)
8. Once impeller is removed, remove impeller drive key from driveshaft.
9. Remove water pump face plate and both gaskets (one above and below face plate) from water pump base.
10. Using 2 pry bars, positioned and padded as shown, lift water pump base up and off driveshaft.



**a** - Pads

11. Remove (and discard) O-ring from O-ring groove on water pump base.
12. Using a screwdriver, pry oil seals out of water pump base from gear housing side of base.



## Forward Gear

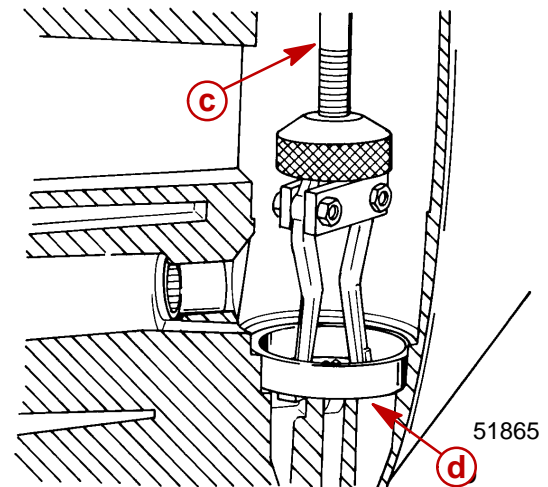
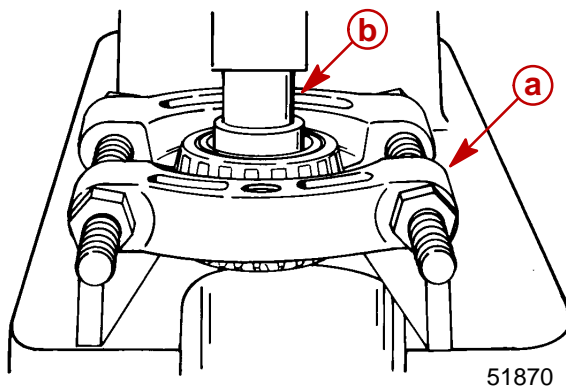
### REMOVAL AND DISASSEMBLY

**NOTE:** Forward gear can only be removed from gear housing after driveshaft and pinion gear have been removed.

1. Reach into gear housing and lift out forward gear.

**IMPORTANT: DO NOT remove tapered bearing or needle bearings from forward gear, unless replacement of bearings is required. (Bearings cannot be reused after they have been removed.)**

2. If inspection determines that replacement of forward gear tapered bearing is required, remove bearing from gear and bearing race from gear housing (tapered bearing and race MUST BE replaced as a set), as follows:
  - a. Install Universal Puller Plate (91-37241) between forward gear and tapered bearing.
  - b. Place forward gear, bearing and puller plate on a press and press gear out of bearing with a suitable mandrel.
  - c. Use Slide Hammer (91-34569A1) to remove forward gear tapered bearing race.

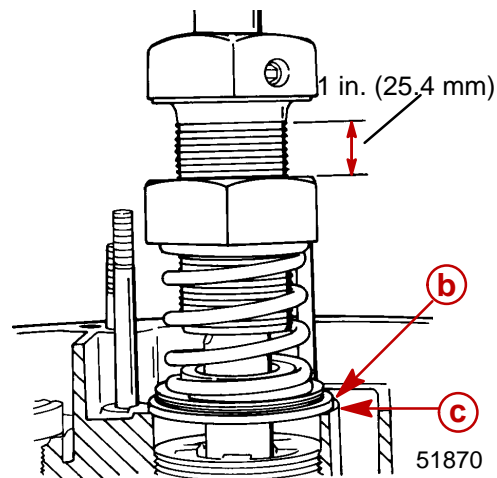
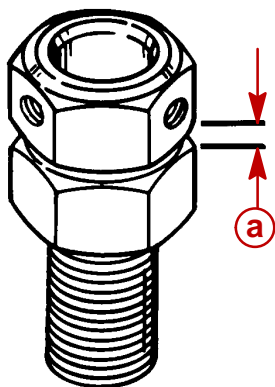


- a - Universal Puller Plate
- b - Mandrel
- c - Slide Hammer
- d - Tapered Bearing Race

- d. After forward gear tapered bearing race is removed from gear housing, lift out and retain shims which were behind bearing race.
3. If inspection determines that replacement of propeller shaft needle bearings in forward gear is required, remove bearing from gear as follows:
    - a. Clamp forward gear in a soft jaw vise securely.
    - b. From toothed-side of gear, drive propeller shaft needle bearings out of gear with a punch and hammer.

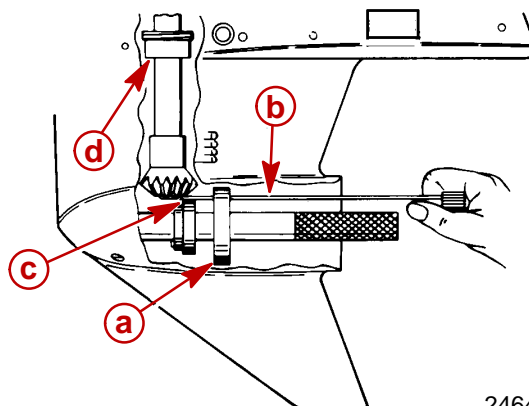
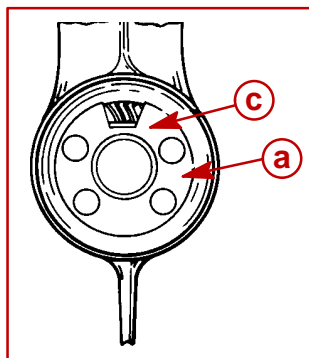


5. Measure distance (a) and increase that distance by 1 in. (25.4 mm) by turning bottom nut away from top nut.



- a** - Distance  
**b** - Adaptor  
**c** - Ledge

6. Turn driveshaft clockwise 2 or more turns to seat driveshaft bearings.
7. Insert Pinion Gear Locating Tool\* (91-74776) into gear housing until it bottoms out on bearing carrier shoulder.
- \*Pinion Gear Locating Tool (91-12349A2) can be used. Use flat #7 and disc #2. Follow instructions supplied with tool.
8. Determine pinion gear depth by inserting a feeler gauge thru access slot in pinion gear shimming tool.
9. Clearance between shimming tool and pinion gear should be 0.025 in. (0.64 mm).
10. If clearance is correct, leave Bearing Preload Tool on driveshaft for "Determining Forward Gear Backlash," following.
11. If clearance is not correct, add (or subtract) shims at location shown to raise (or lower) pinion gear. When reinstalling pinion nut, apply Loctite 271 on threads of nut and re-torque pinion nut.



- a** - Pinion Gear Tool (91-74776 or 91-12349A2)  
**b** - Feeler Gauge  
**c** - Obtain 0.025 in. (0.64 mm) Clearance between Shimming Tool and Pinion Gear  
**d** - Add or Subtract Shim(s) Here



## Gear Lubricant Filling Instructions

1. Remove any gasket material from “Fill” and “Vent” screws and gear housing.
2. Install new gaskets on Fill and Vent screws.

**IMPORTANT: Never apply lubricant to gear housing without first removing Vent screw, or gear housing cannot be filled because of trapped air. Fill gear housing ONLY when housing is in a vertical position.**

3. Slowly fill housing thru Fill hole with Quicksilver Super Duty Lower Unit Lubricant until lubricant flows out of “Vent” hole and no air bubbles are visible.
4. Install Vent screw into Vent hole.

**IMPORTANT: DO NOT lose more than one fluid ounce (30cc) of gear lubricant while reinstalling Fill screw.**

5. Remove grease tube (or hose) from Fill hole and quickly install Fill screw into Fill hole.

## Installing Gear Housing to Driveshaft Housing

### ⚠ WARNING

**Disconnect high tension leads from spark plugs and remove spark plugs from engine before installing gear housing onto driveshaft housing.**

1. Tilt engine to full up position and engage the tilt lock lever.
2. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant onto driveshaft splines.

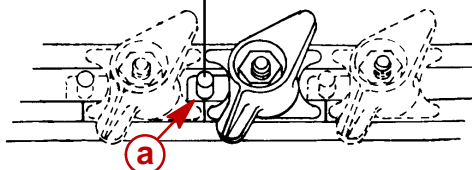
### ⚠ CAUTION

**DO NOT allow lubricant on top of driveshaft. Excess lubricant, that is trapped in clearance space, will not allow driveshaft to fully engage with crankshaft. Subsequently, tightening the gear housing nuts (while excess lubricant is on top of driveshaft) will load the driveshaft/crankshaft and damage either or both the power-head and gear housing. Top of driveshaft is to be wiped free of lubricant.**

3. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant onto shift shaft splines. (DO NOT allow lubricant on top of shift shaft.)
4. Apply a thin bead of G.E. Silicone Sealer (92-91600-1) against the top of divider block.
5. Insert trim tab bolt into hole in rear of gear housing to driveshaft housing machined surface.
6. Shift gear housing into forward gear and place guide block anchor pin into forward gear position.

### Right Hand Rotation Outboard

Forward Gear ← → Reverse Gear



**a** - Guide Block Anchor Pin

7. Position gear housing so that the driveshaft is protruding into driveshaft housing.



# Gear Housing (Drive Shaft)(Counter Rotation)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
1	1	GEAR HOUSING (BASIC)			
2	2	DOWEL PIN			
3	1	STUD (3-11/16 IN.)			
4	2	STUD (2-1/16 IN.)			
5	1	STUD (3-3/8 IN.)			
6	2	STUD (3-1/8 IN.)			
7	1	FILLER BLOCK			
8	1	ROLLER BEARING			
9	2	ANODE			
10	1	SCREW			
11	1	NUT	60		7
12	1	HOSE (12 IN.)			
13	1	FITTING	50		5.5
14	1	PINION GEAR (1.87:1 - 15 TEETH- 150)			
	1	PINION GEAR (2:1 - 14 TEETH - 135)			
15	1	WASHER			
16	1	NUT		75	101
17	AR	SHIM (006 thru 048)			
18	2	SCREW–drain	60		7
19	2	WASHER			
20	1	SHIFT SHAFT			
21	1	O-RING			
22	1	BUSHING ASSEMBLY		50	68
23	1	OIL SEAL			
24	1	WASHER–rubber			
25	1	DRIVE SHAFT			
26	1	ROLLER BEARING			
27	1	CUP			
28	1	RETAINER		100	135
29	1	WATER PUMP BASE			
30	1	RETAINER			
31	1	GASKET			
32	1	O-RING			
33	1	OIL SEAL			
34	1	OIL SEAL			
35	1	GASKET–lower			
36	1	GASKET–upper			
37	1	FACE PLATE			
38	1	WATER PUMP BODY ASSEMBLY			
39	1	INSERT			
40	1	SEAL–rubber			
41	1	IMPELLER			
42	1	KEY			
43	1	SCREW (#14-8 x 2-1/4 IN.)	35		4
44	2	WASHER			
45	2	NUT	50		5.5
46	1	WASHER			
47	1	NUT	50		5.5
48	1	SLEEVE			
49	1	DECAL-Counter Rotation			



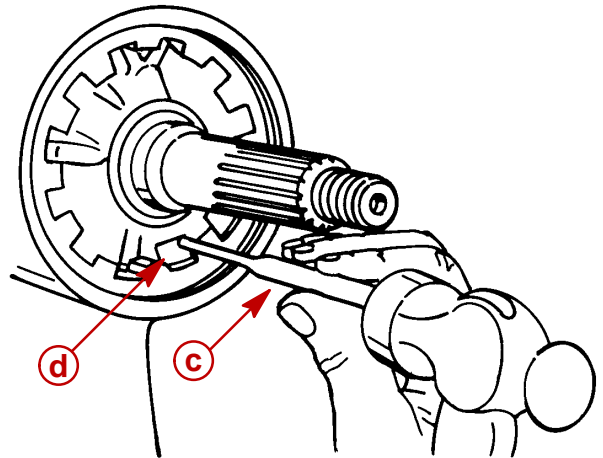
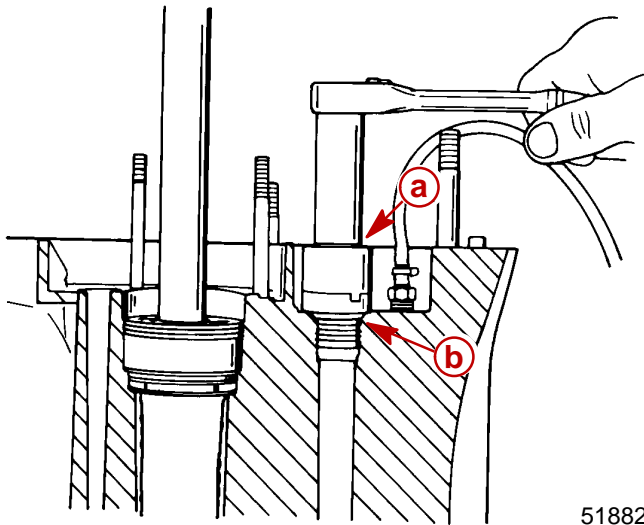
## Bearing Carrier and Propeller Shaft

### REMOVAL

#### ⚠ CAUTION

**Gear housing MUST BE in neutral position, and shift shaft MUST BE removed from gear housing before propeller shaft can be removed from gear housing.**

1. Place gear housing in a suitable holding fixture or vise with propeller shaft in a horizontal position.
2. Use Shift Shaft Bushing Tool (91-31107) to un-thread shift shaft bushing. (DO NOT remove bushing from shift shaft at this time.)
3. Bend retainer nut lock tab out of retainer nut recess.

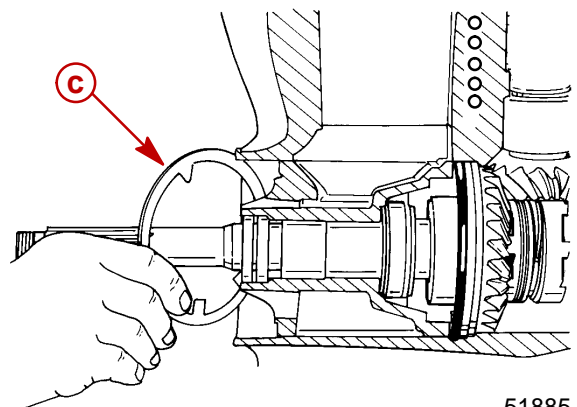
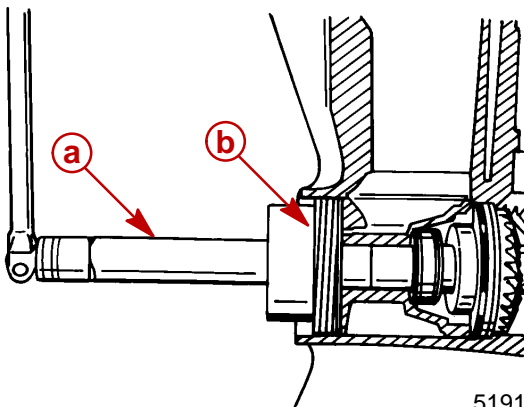


51882

51865

- a**-Shift Shaft Bushing Tool (91-31107)
- b**-Shift Shaft Bushing
- c**-Punch
- d**-Tab of Tab Washer

4. Remove gear housing retainer nut with Retainer Nut Tool (91-61069).
5. After retainer nut has been removed, remove lock tab washer from gear housing.



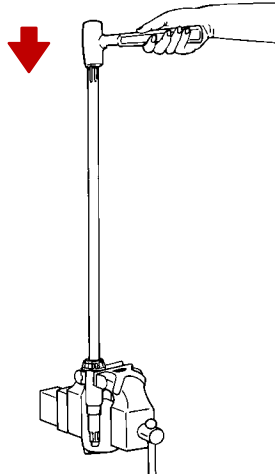
51911

51885

- a**-Retainer Nut Tool (91-61069)
- b**-Retainer Nut
- c**-Tab Washer



8. After driveshaft is removed from gear case, remove and retain shim(s) that were located under upper tapered driveshaft bearing.
9. If inspection determines that replacement of driveshaft tapered bearing is required, remove bearing from driveshaft as follows:
  - a. Position driveshaft in a vise; DO NOT tighten vise jaws against shaft.
  - b. Strike shaft with a lead hammer; take care not to drop shaft.

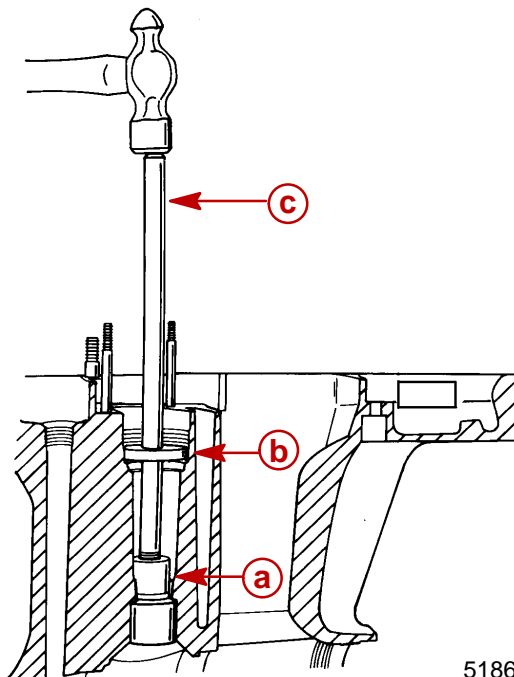


51866

10. Remove 18 loose needles from outer race of driveshaft needle bearing.
11. If inspection of driveshaft needle bearing surface determines that replacement of needle bearing is required, the 18 loose needle bearings previously removed must be reinstalled in bearing race to provide surface for mandrel to drive against.

**NOTE:** Reverse gear must be removed first before removing driveshaft needle bearing.

**IMPORTANT:** Discard driveshaft needle bearing after removal. (Bearing cannot be reused.)



51869

- a**-Mandrel (91-37263)
- b**-Pilot\* (91-36571)
- c**-Driver Rod\* (91-37323)

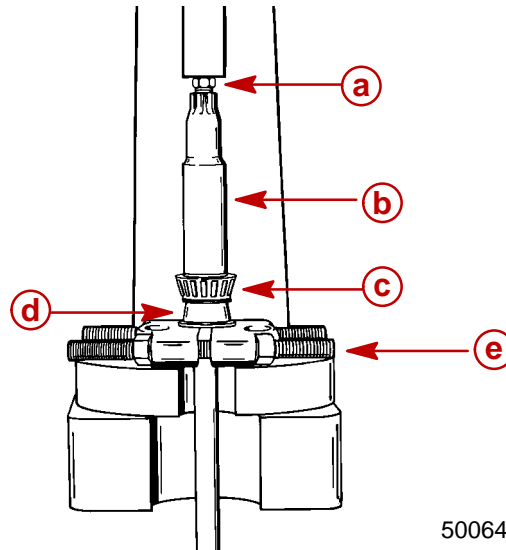
\*From Bearing Removal and Installation Kit (91-31229A5)



## Driveshaft and Pinion Gear

### REASSEMBLY/INSTALLATION

1. Apply a light coat of Quicksilver Super Duty Gear Lubricant on I.D. of driveshaft tapered bearing.
2. Thread a used pinion nut onto end of driveshaft. Leave approximately 1/16 in. (1.6 mm) of nut threads exposed. Driveshaft threads **MUST NOT** extend beyond nut or thread damage could result while pressing.
3. Place bearing over driveshaft.
4. Using an old driveshaft bearing inner race or other suitable mandrel (which applies pressing force on center bearing race only), press bearing onto shaft until seated.



- a**-Used Pinion Nut
- b**-Driveshaft
- c**-Tapered Bearing
- d**-Old Bearing Inner Race
- e**-Universal Puller Plate

5. Position pinion gear in gear housing below driveshaft bore with teeth of pinion gear meshed with teeth of reverse gear.
6. Insert driveshaft into driveshaft bore while holding pinion gear. Rotate driveshaft to align and engage driveshaft splines with pinion gear splines. Continue to insert driveshaft into gear housing until driveshaft tapered bearing is against bearing race.
7. Apply Loctite 271 to threads of pinion gear nut and install flat washer and nut on driveshaft with flat side of nut away from pinion gear.
8. Place shim(s) (retained from disassembly) into gear housing. If shim(s) were lost or are not reusable (damaged), start with approximately 0.010 in. (0.254 mm).



6. Install cross pin retaining spring onto sliding clutch as follows:

**IMPORTANT: DO NOT over-stretch retaining spring when installing onto sliding clutch.**

a. Install spring.

(1.) Spirally wrap spring into groove on sliding clutch.

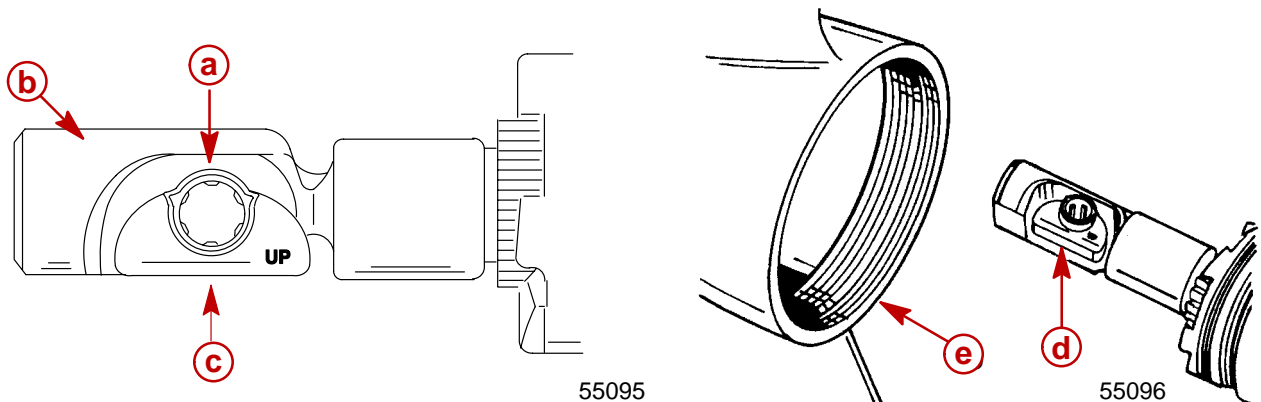
(2.) Position spring in groove so that straight end of spring is against the side of groove.

7. Place gear housing in a soft jaw vise with the driveshaft in a vertical position.

8. Coat cam pocket of cam follower with 2-4-C w/Teflon Marine Lubricant (92-90018A12).

9. Place shift cam into cam pocket of cam follower with numbered side of cam facing up.

10. Slide propeller shaft assembly into reverse gear assembly.



**a** -Cam Pocket

**b** -Cam Follower

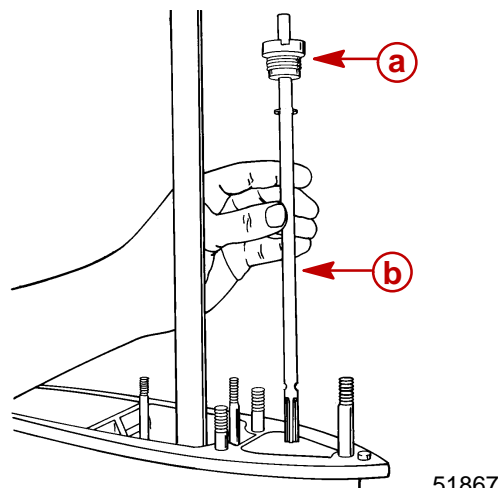
**c** -Shift Cam

**d** -Shift Cam (Position as Shown)

**e** -Gear Housing

11. Apply a light coat of 2-4-C w/Teflon to the threads of the shift shaft bushing.

12. Insert shift shaft down shift shaft hole in gear housing and into shift cam. It may be necessary to rotate shift shaft back-and-forth slightly in order for splines of shift shaft to match up with splines of shift cam. Thread bushing into position, but do not tighten down at this time.



**a** -Shift Shaft Bushing

**b** -Shift Shaft

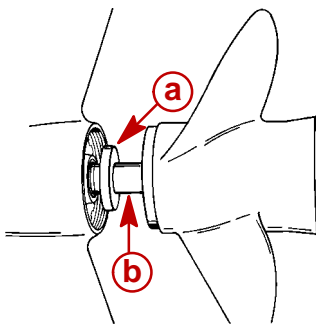


## Propeller Installation

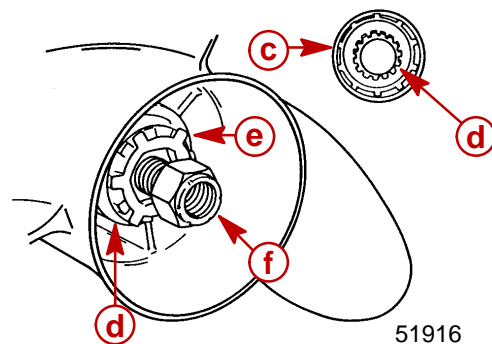
### ⚠ WARNING

When installing or removing propeller, because of the engine's ease in starting, **VERIFY** that the remote control is in **NEUTRAL** position and that the key switch is "OFF." Place a block of wood between the anti-cavitation plate and propeller to prevent accidental starting and to protect hands from propeller blades while removing or installing nut.

1. To aid in future removal of the propeller, liberally coat the propeller shaft splines with one of the following Quicksilver products:
  - Anti-Corrosion Grease (92-78376A6)
  - Special Lubricant 101 (92-13872A1)
  - 2-4-C Marine Lubricant (92-90018A12)
  - Perfect Seal (92-34227--1)
2. Place forward thrust hub over propeller shaft with shoulder side toward propeller.
3. Place propeller on propeller shaft and slide it up against thrust hub.
4. Place continuity washer (if equipped) onto shoulder of rear thrust hub.
5. Place rear thrust hub, tab washer and propeller nut on propeller shaft.
6. Thread propeller nut onto propeller shaft until nut is recessed into tab washer.
7. After propeller nut is recessed into tab washer, tighten nut securely [minimum of 55 lb. ft. (74.5 Nm) torque].
8. Bend 3 of the tabs of tab washer down in grooves of rear thrust hub to secure propeller nut. (If tab washer tabs do not align with slots, continue to tighten propeller nut to obtain alignment. **DO NOT** loosen nut to align tabs.)



- a** -Forward Thrust Hub
- b** -Propeller Shaft
- c** -Continuity Washer (If Equipped)



- d** -Rear Thrust Hub
- e** -Tab Washer
- f** -Propeller Nut

### ⚠ CAUTION

**DO NOT** misinterpret propeller shaft movement with propeller movement. If propeller and propeller shaft together move forward-and-aft, this is normal; however, propeller should not move forward-and-aft on propeller shaft.

9. After first use, retighten propeller nut and again secure with tab washer (Steps 7 and 8, preceding). Propeller should be checked periodically for tightness, particularly if a stainless steel propeller is used.

**⚠ WARNING**

After installation is complete [and before operating outboard(s)], check that boat will turn right when steering wheel is turned right and that boat will turn left when steering wheel is turned left. Check steering thru full range (left and right) at all tilt angles to assure interference-free movement.

## Maintenance Instructions

Maintenance inspection is owner's responsibility and must be performed at intervals specified, following:

**Normal Service** - Every 50 hrs. of operation or 60 days (whichever comes first)

**\*Severe Service** - Every 25 hrs. of operation or 30 days (whichever comes first)

\*Operation in a salt water area is considered "Severe Service."

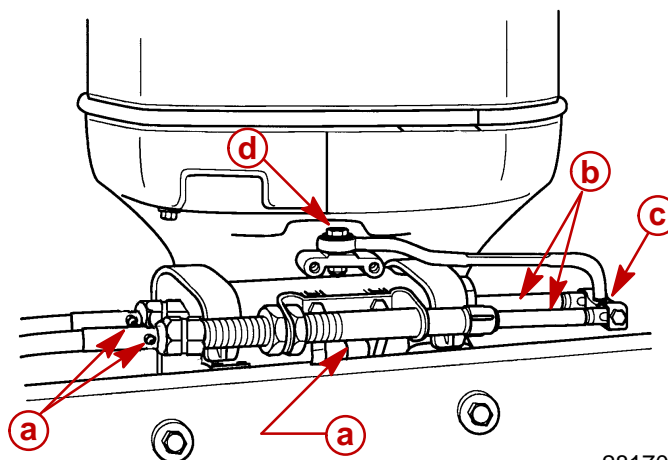
1. Carefully check steering system components for wear. Replace worn parts.
2. Check steering system fasteners to be sure that they are torqued to correct specifications.

**NOTE:** Ride-Guide Steering Cables are lubricated at the factory and require no additional lubrication at initial installation.

**⚠ WARNING**

Core of each steering cable (transom end) must be fully retracted into cable housing before lubricating cable. If cable is lubricated while extended, hydraulic lock could occur.

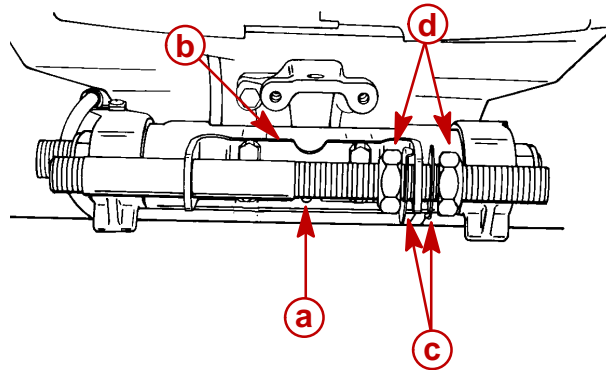
3. With core of Ride-Guide Steering Cable (transom end) fully retracted, lubricate transom end of steering cables thru grease fittings (a) with 2-4-C w/Teflon (92-825407A2). Lubricate exposed portion of cable ends (b) with 2-4-C w/Teflon.
4. Lubricate pivot point (c) of steering link rod and ball joint (d) of link rod/steering coupler with SAE 30W Motor Oil.
5. Inspection and lubrication of steering head assembly (rotary or straight rack) should be performed once each year (by your Authorized Dealer) or whenever steering mount and/or steering head are disassembled, or if steering effort has increased. Lubricate with 2-4-C w/Teflon.



28170



Temporarily adjust tube, so that longer threaded end of tube extends out the same distance as the outboard tilt tube. Do not tighten adjustment nuts at this time.



51891

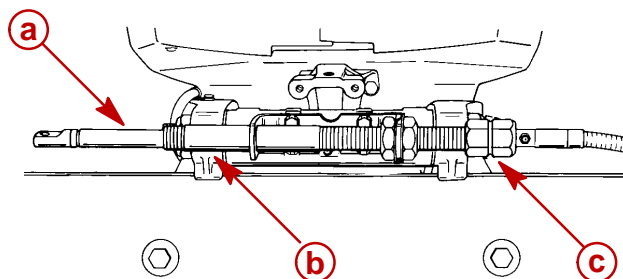
- a** - Steering Cable Mounting Tube (End of Tube with Longer Threads Toward Center of Boat Transom)
- b** - Mounting Bracket
- c** - Locking Tab Washers (2)
- d** - Adjustment Nuts (Flats of Nuts Facing Toward Locking Tab Washer)

**IMPORTANT:** Lubricate inside of steering mounting tube with 2-4-C w/Teflon (92-825407A12) before installing steering cable.

Lubricate inside of steering cable mounting tube (starboard outboard) with 2-4-C w/Teflon.

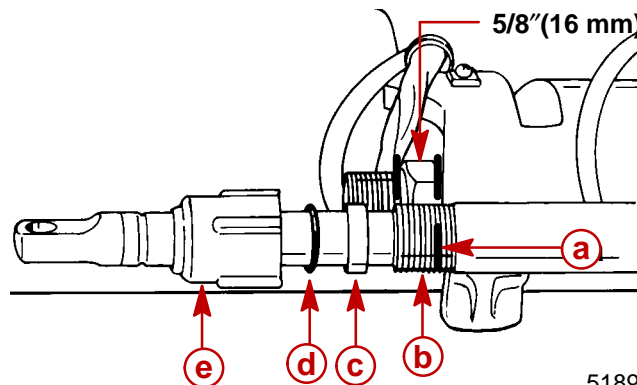
Insert steering cable end (a) (steering cable routed down port side of boat) thru cable mounting tube (b) and thread steering cable attaching nut (c) onto tube hand tight.

**NOTE:** Torque steering cable attaching nut only after final steering adjustments have been made.



51887

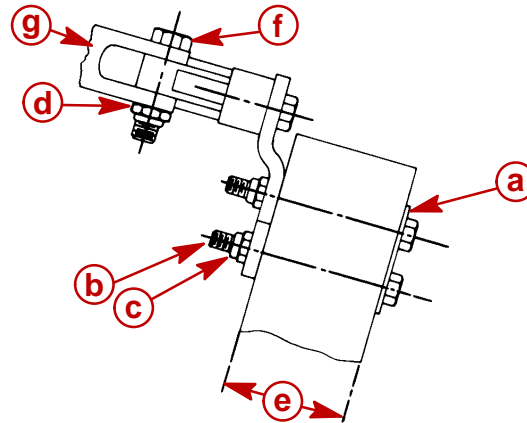
Place a mark (a) on steering cable mounting tube (b) 5/8 in (16 mm) from end of mounting tube. Slide plastic spacer (c), O-ring (d) and cap (e) over steering cable.



51890



- Place Ride-Guide yoke on pivot block and secure with 7/16 in. x 1-3/4 in. (11.1 mm x 44.5 mm) bolt and locknut, as shown in Figures 1 and 2. Torque locknut to 10 lb. ft. (13.5 Nm), **then back off 1/4-turn.**



**Figure 2**

- a** - Transom Backing Plate
  - b** - Bolt [5/16 in. x 3-1/4 in. (7.9 mm x 82.5 mm)]
  - c** - Locknut [Torque to 10 lb. ft. (13.5 Nm)]
  - d** - Ride-Guide Yoke Attaching Locknut [Torque to 10 lb. ft. (13.5 Nm)] **Then Back Off 1/4-Turn**
  - e** - 2-3/8 in. (60.3 mm) Maximum Transom Thickness
  - f** - Bolt [7/16 in. x 1-3/4 in. (11.1 mm x 44.5 mm)]
  - g** - Ride-Guide Yoke
- Install one cable tube jam nut onto steering cable tube. Place tab washer over Ride-Guide yoke, then insert cable tube thru tab washer and yoke. Install second cable tube jam nut onto cable tube but do not tighten at this time. (Figure 3)
  - Position transom attaching kit on transom as shown:
    - Determine centerline of outboard, then measure 15 in. (38.1 cm) over from this centerline and draw a vertical line on transom. (Figure 1)

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL