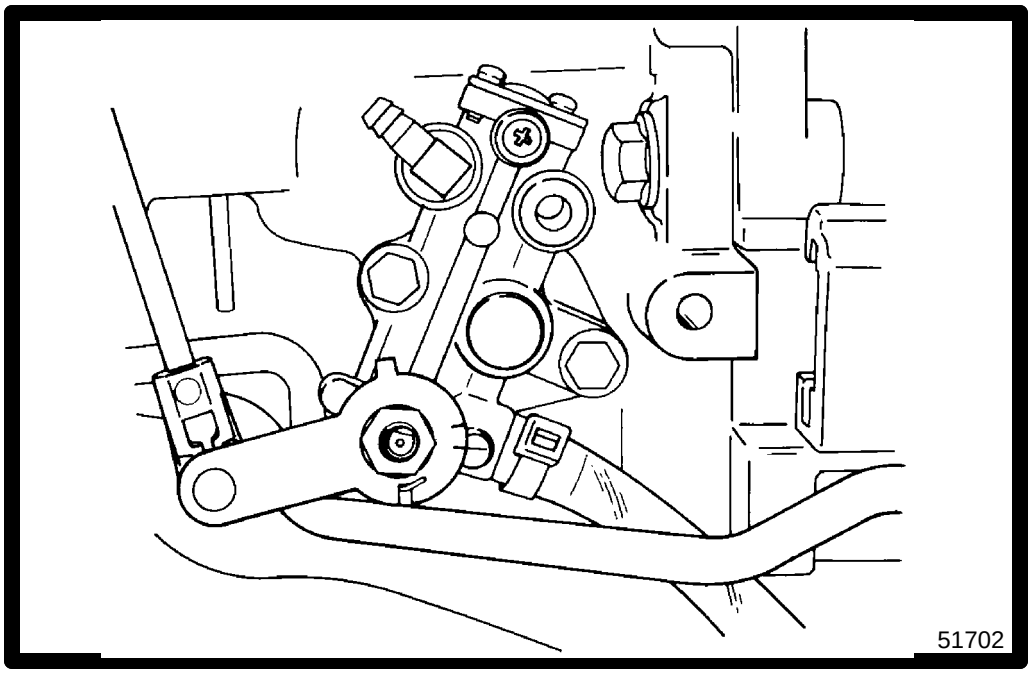
FUEL SYSTEM

3

D



OIL INJECTION

Table of Contents

3 Liter Oil Injection System

⚠ CAUTION

DO NOT allow dirt or other contamination to enter tanks, hoses or other components of the oil injection system during installation.

⚠ CAUTION

Engines with oil injection must be run on a fuel mixture of 50:1 for the first 30 gallons of fuel. Refer to engine break-in procedure in the Operation and Maintenance Manual.

⚠ CAUTION

If an electric fuel pump is to be used on engines with oil injection, the fuel pressure at the engine must not exceed 4 psig. If necessary, install a pressure regulator between electrical fuel pump and engine and set at 4 psig maximum.

Operation of the Oil Injection System

The oil injection system delivers oil mixture on engine demand, from 100 to 1 at idle to 50 to 1 at wide open throttle.

The remote oil tank can be removed from the boat for easy refilling. The remote tank holds enough oil for over 150 gallons of fuel at wide open throttle.

The remote oil tank supplies the oil reservoir mounted on the engine. The oil reservoir feeds the oil pump and contains enough oil for at least 30 minutes of full throttle running after the remote tank is empty. The warning horn will sound if the oil level in oil reservoir is low.

The oil injection pump feeds oil into the fuel just before the fuel pump. The oil injection pump is driven by the crankshaft and is connected to the throttle linkage for metering the varied flow of oil per engine RPM.

FINAL CHECKS BEFORE OPERATION OF ENGINE

- Verify fill cap gaskets are in place and caps are tight on engine oil reservoir and remote oil tank.
- Mix a gasoline and oil mixture of 50:1 in the remote fuel tank during the initial break-in of the engine.
- Be certain the warning horn is installed and is operational. Refer to Instrument and Warning Horn Installation.
- Each time the key switch is turned from the "off" to "on" position (engine not running); the warning horn will sound momentarily. This tells you the warning system for the oil injection system is functional and the warning horn is operational. If warning horn does not sound or horn stays on when key is turned to the "ON" position, refer to oil injection system troubleshooting chart following to correct the problem.

CHECKING OPERATION OF THE OIL INJECTION SYSTEM (ENGINE RUNNING)

1. Operate engine following the break-in procedure outlined in the Operation and Maintenance Manual. If warning horn should sound an intermittent "beep," "beep," "beep" during operation, this indicates a problem occurred in the oil injection system. Refer to troubleshooting following, to correct the problem.
2. After engine has been run for a short time, open cowl and check that no oil is leaking out of engine oil reservoir fill cap.

Oil Injection Components (See Page 3 for Location)

1 REMOTE OIL TANK

Holds 3 gallons of oil.

The tank is pressurized by air from crankcase pressure thus forcing oil up the outlet hose to the oil reservoir on engine.

2 OIL PICK UP TUBE

A filter screen is located in end of tube to prevent dirt or other particles from entering the system.

3 OIL RESERVOIR

The oil reservoir feeds the oil pump and contains enough oil for at least 30 minutes of full throttle running after the remote tank is empty. The warning horn will sound if the oil level in oil reservoir is low.

4 OIL INJECTION PUMP

Injection pump is driven off the crankshaft. See illustration on page 3.

The oil injection pump is a variable metering pump. At idle the pump will meter the oil at approximately 100 to 1 gasoline to oil ratio and at WOT, 50 to 1 ratio.

5 4 PSI CHECK VALVE

If oil flow to reservoir is obstructed and injection pump continues to pump oil, the 4 PSI valve will open to allow air to enter reservoir to prevent a vacuum.

6 2 PSI CHECK VALVE

This valve prevents gasoline from being forced into the oil lines.

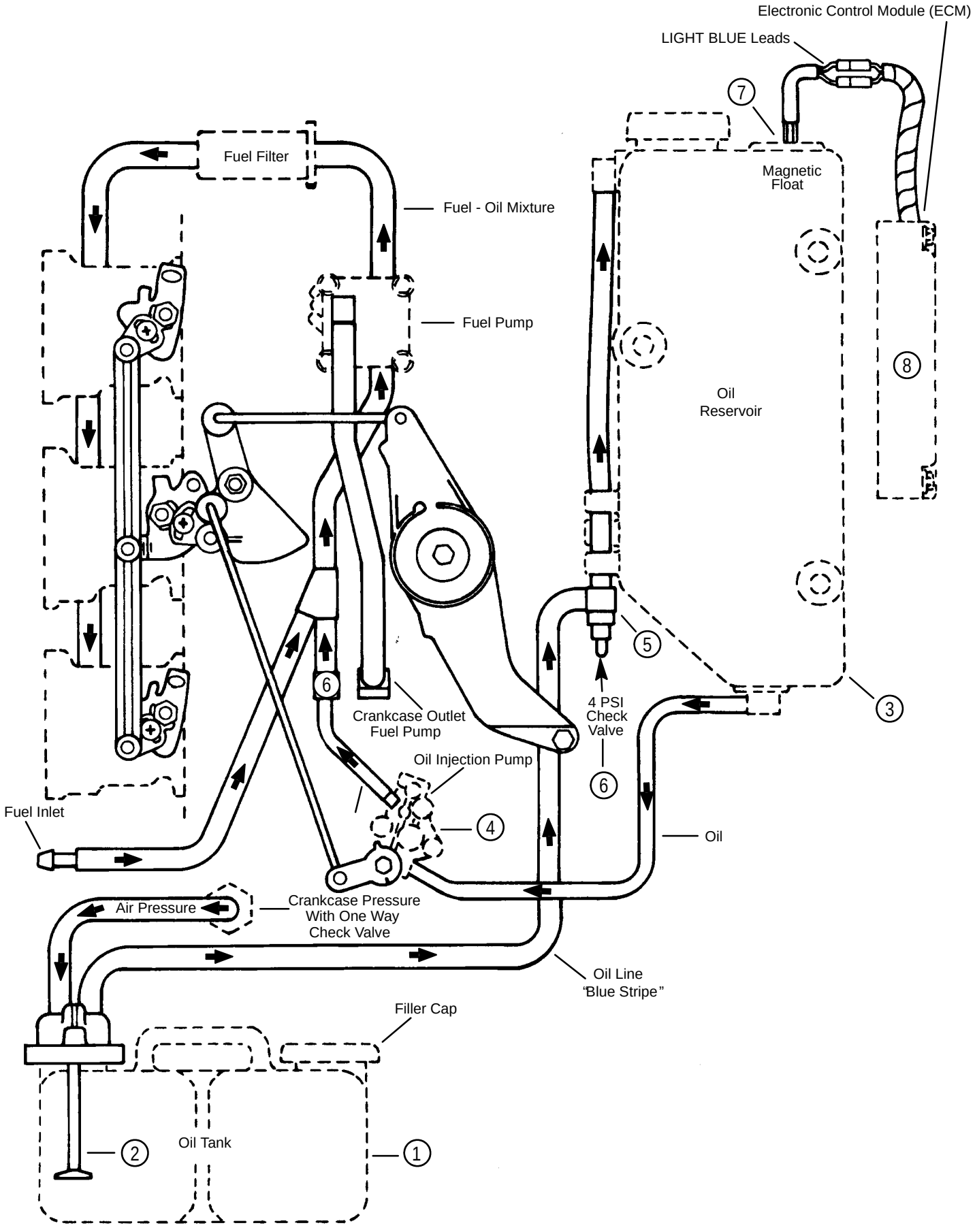
7 LOW OIL (FLOAT) SENSOR

If oil level drops in oil reservoir, the sensor will signal the warning module to sound the warning horn.

8 ELECTRONIC CONTROL MODULE

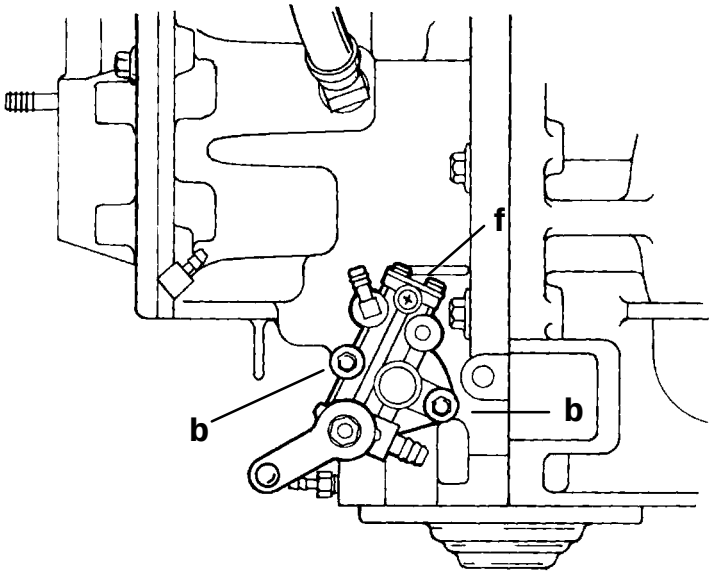
The Electronic Control Module (ECM) continuously monitors the oil reservoir oil level. The ECM activates the warning horn when signaled by the low oil sensor.

Oil Injection Flow System

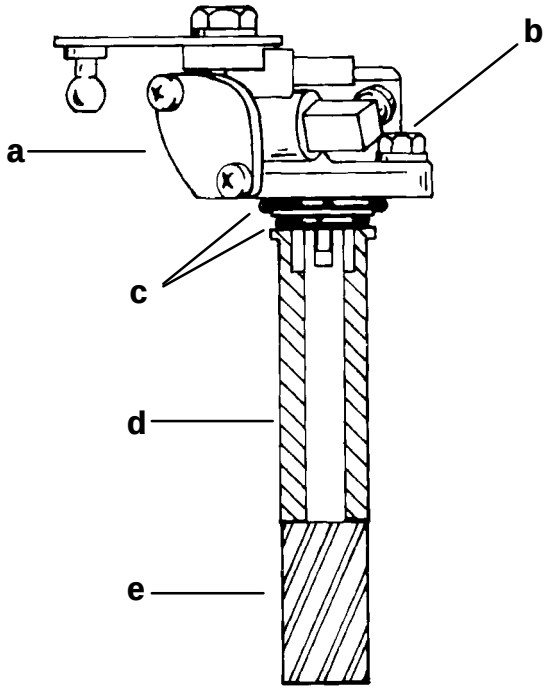


52350

Pump Drive Assembly

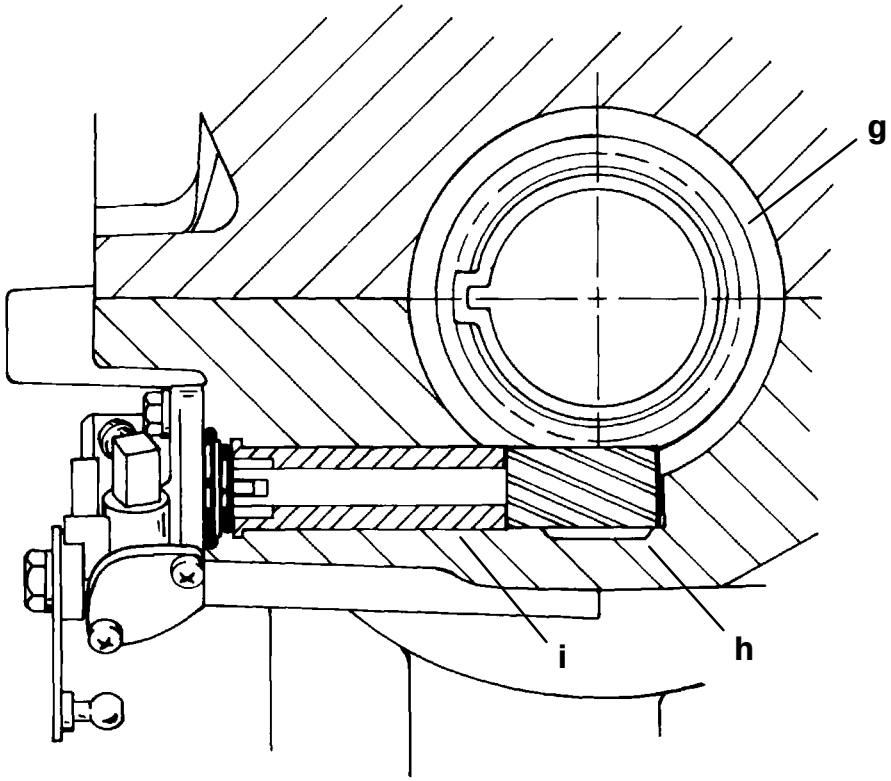


52358



52356

Pump Drive System



52357

a - Oil Pump
b - Retaining Bolts (2)
c - O-rings
d - Bushing
e - Driven Gear
f - Oil Pump (Installed)
g - Drive Gear
h - Driven Gear
i - Gear Bushing

Set Up Instructions for Oil Injection System

⚠ CAUTION

Be careful not to get dirt or other contamination in tanks, hoses or other components of the oil injection system during installation.

⚠ CAUTION

Oil injected engines additionally, must be run on a 50:1 gasoline/oil mixture in the fuel tank for the first 30 gallons of fuel. Refer to engine break-in procedures in the Operation & Maintenance Manual.

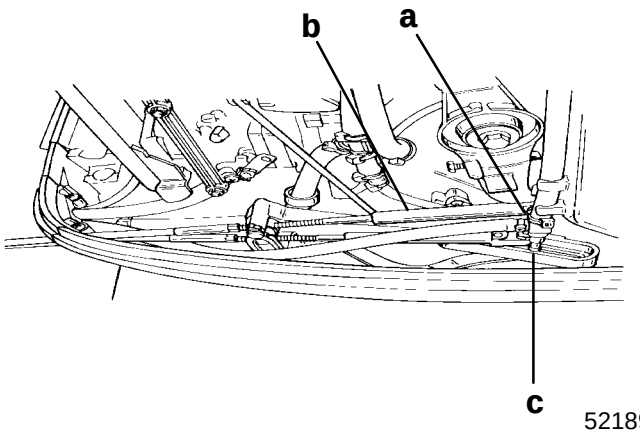
⚠ CAUTION

If an electric fuel pump is to be used on engines with oil injection, the fuel pressure at the engine must not exceed 4 psig. If necessary, install a pressure regulator between electrical fuel pump and engine and set at 4 psig maximum.

INSTALLING REMOTE OIL TANK HOSES TO ENGINE

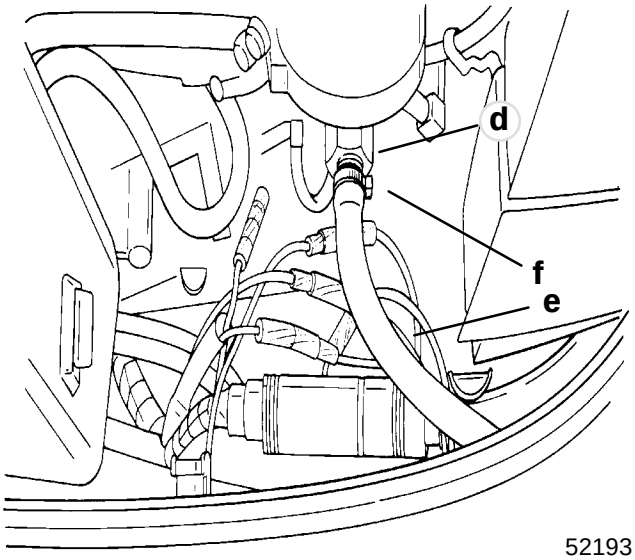
1. Remove (and discard) the shipping cap from hose fitting (a).
2. Connect oil hose "b" (with blue stripe) to fitting as shown. Secure with sta-strap.

NOTE: *The third fitting (c) is a vent and does not get connected.*



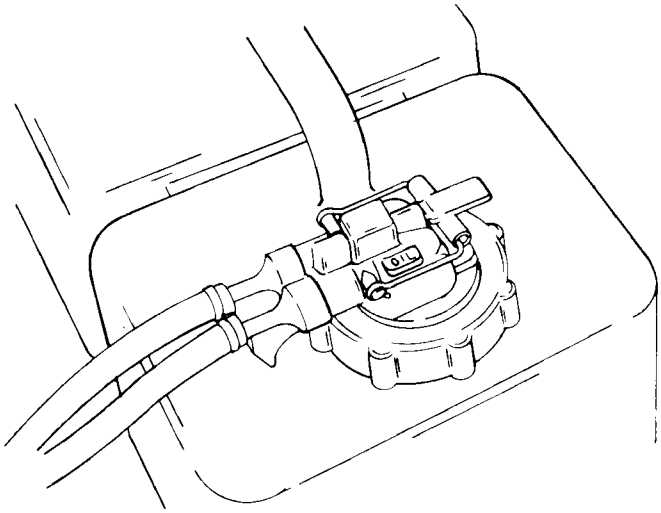
52189

3. Remove (and discard) the shipping cap from pulse fitting (d).
4. Route the second oil hose (e) behind retainer (f) and connect to pulse fitting as shown. Secure with sta-strap.



52193

NOTE: *An oil hose extension kit (41729A3) is available for the remote oil tank.*



22750

Quicksilver 2-Cycle Outboard Oil is recommended for this oil injection system. In emergency, when Quicksilver oil is not available, substitute a high quality 2 cycle oil that is intended for outboard use and meets BIA rating TC-W III, shown on oil container. BIA rating TC-W is the Boating Industry Association's designation for approved, 2-cycle water-cooled outboard oils.

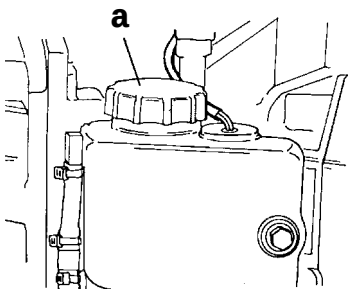
FILLING THE OIL INJECTION SYSTEM WITH OIL

Use Quicksilver 2-Cycle Outboard Oil which is NMMA/BIA Certified TC-W III. If Quicksilver 2-Cycle Outboard Oil is not available, substitute a major 2-cycle outboard manufacturers oil that is NMMA/BIA Certified TC-W III.

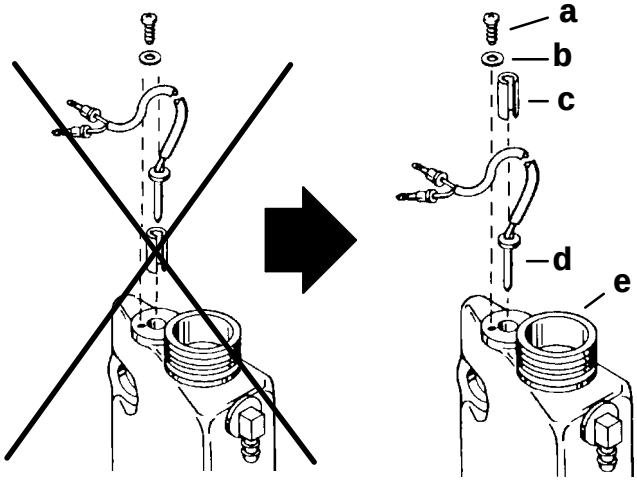
1. Fill the remote oil tank to the fill mark. Retighten the fill cap.
2. Fill the engine reservoir tank (a) with oil. Retighten the fill cap.
3. Loosen (1/2 turn) the engine reservoir tank fill cap. Run the engine until air from inside the remote oil hoses has been purged out of the reservoir and oil starts to flow out of the reservoir tank. Retighten the fill cap.

⚠ CAUTION

Be certain that the fill caps on the oil reservoir tank and the remote oil tank are installed tightly. An air leak, at the remote oil tank fill cap will prevent oil flow to the engine. An oil leak at the reservoir fill cap (a) will cause oil spillage.



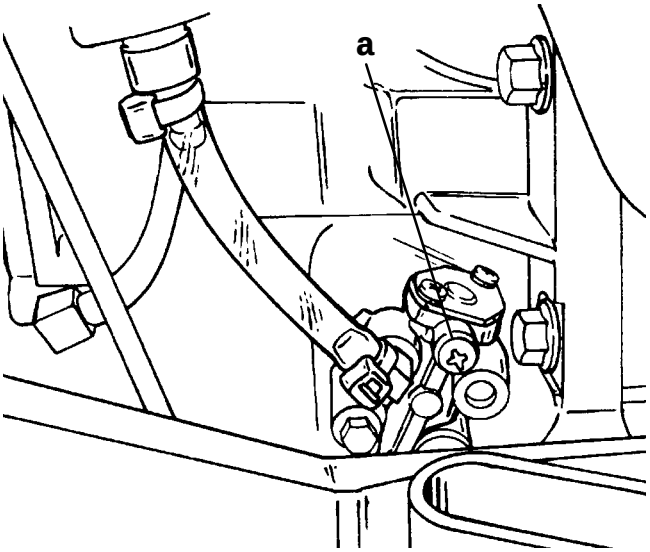
REPLACEMENT OF LOW OIL SWITCH



a - Screw (Tighten Securely)
b - Washer
c - Spacer
d - Low Oil Switch
e - Oil Tank

BLEEDING AIR FROM OIL INJECTION PUMP

With engine not running, place a shop towel below the oil injection pump. Loosen bleed screw (a) 3 turns and allow oil to flow from bleed hole. This procedure allows the pump to fill with oil.

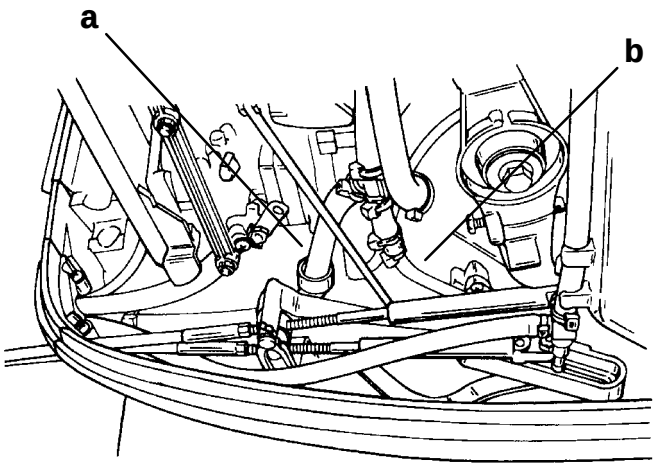


52190

Bleeding Air from Oil Injection Pump Outlet Hose

Any air bubbles in outlet hose in most cases will be purged out of the system during operation of the engine. Retighten bleed screw when bubbles are purged.

NOTE: *If air bubbles persist, they can be purged out of the hose by removing link rod and rotating the pump arm full clockwise while operating engine at 1000 to 1500 RPM: If necessary, gently pinch the fuel line between the remote fuel line connector and the oil injection pump "Tee" fitting. This will cause the fuel pump to provide a partial vacuum which will aid in removal of the air. Reinstall link rod.*

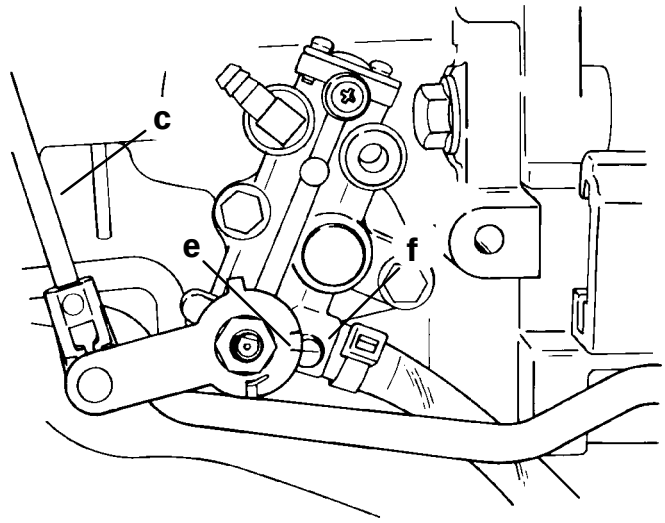


52189

a - Fuel Line
b - Oil Line

CONNECTING OIL INJECTION PUMP LINK ARM

When carburetor linkage is at idle position, alignment mark on oil injection arm should be in-line with mark on casting as shown.



51702

c - Link Rod
e - Alignment Mark
f - Casting Mark

OPERATION OF THE OIL INJECTION SYSTEM

IMPORTANT: The outboard is equipped with a warning system - horn and sensors - to alert the operator of an overheat or low oil situation. This system self-tests each time the ignition key is turned to the "ON" position. The horn will "beep" 4 times and pause. During an actual failure, the system will continue to beep and pause cyclically until the problem is corrected. THE OPERATOR MUST DETERMINE WHETHER A LOW OIL OR AN OVERHEAT CONDITION HAS OCCURRED.

1. Verify fill cap gaskets or O-rings are in place and caps are tight on engine reservoir tank and remote oil tank.
2. Verify a remote gasoline and oil mixture of 50:1 is used during the initial break-in of the engine or after extended storage.
3. Be certain the warning horn is operational.

Each time the key switch is turned from the "off" to "on" position (engine not running); the warning horn will sound momentarily. This tells you the warning system for the oil injection system is functional and the warning horn is operational. If warning horn does not sound or horn stays on when key is turned to the "ON" position, refer to oil in injection system troubleshooting chart following to correct the problem.

CHECK OPERATION OF THE OIL INJECTION SYSTEM (ENGINE RUNNING)

1. Operate engine following the break-in procedure outlined in the Operation and Maintenance Manual. If warning horn should sound an intermittent "beep", "beep", "beep" during operation, this indicates a problem occurred in the oil injection system. Refer to troubleshooting following, to correct the problem.
2. After engine has been run for a short time, open cowl and check that no oil is leaking out of engine oil reservoir fill cap.

REQUIRED SIDE MOUNT REMOTE CONTROL OR IGNITION KEY ASSEMBLY TO BE USED WITH ENGINES WITH OIL INJECTION

Boats Equipped with a Side Mount Remote Control

A Quicksilver Commander Series Side Mount Remote Control equipped with a warning horn, must be used with this outboard. This warning horn is necessary for both the oil injection warning system and the engine overheat warning system.

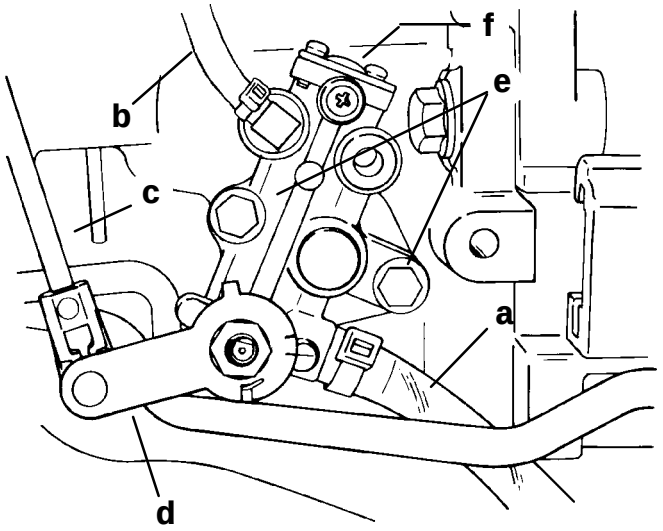
Boats Equipped with Panel or Console Mount Remote Controls

A Quicksilver Ignition Key/Choke Assembly equipped with a warning horn, must be used with this outboard. This warning horn is necessary for both the oil injection warning system and the engine overheat warning system.

Oil Injection Pump

Oil Pump Removal

1. Disconnect and plug inlet hose to oil pump.
2. Disconnect outlet hose on oil pump.
3. Disconnect link arm from oil pump injection arm.
4. Remove two bolts securing oil pump to power-head and remove pump.



51702

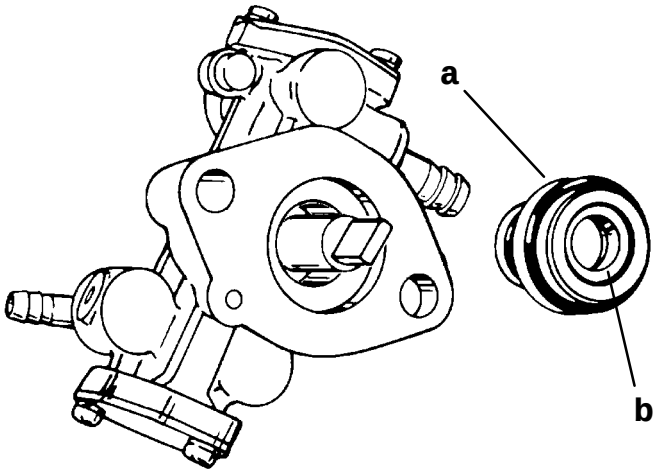
a - Inlet Hose
b - Outlet Hose
c - Link Arm
d - Injection Arm
e - Bolts
f - Oil Pump

Worm Bushing

Worm Bushing Removal

1. Grasp bushing and remove from oil pump.

NOTE: *If seal is defective, seal and bushing are replaced as an assembly.*

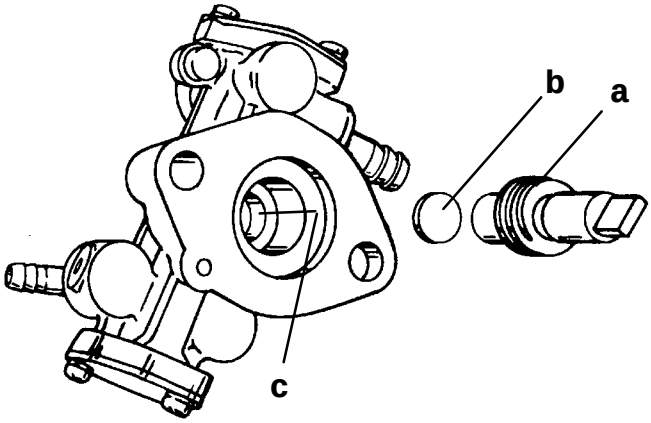


52356

a - Bushing
b - Seal

Worm Bushing Installation

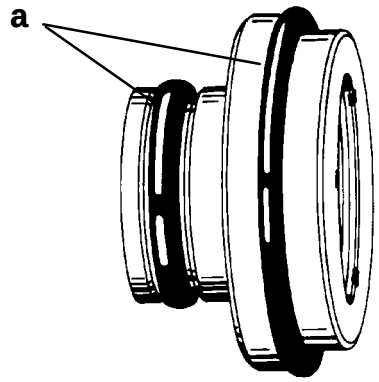
IMPORTANT: If worm shaft is removed from oil pump with worm bushing, verify thrust washer is positioned in center of worm shaft pocket before reinstalling worm shaft.



52316

a - Worm Shaft
b - Thrust Washer
c - Pocket

2. Inspect bushing O-rings for cuts and abrasions. Replace O-rings if necessary.



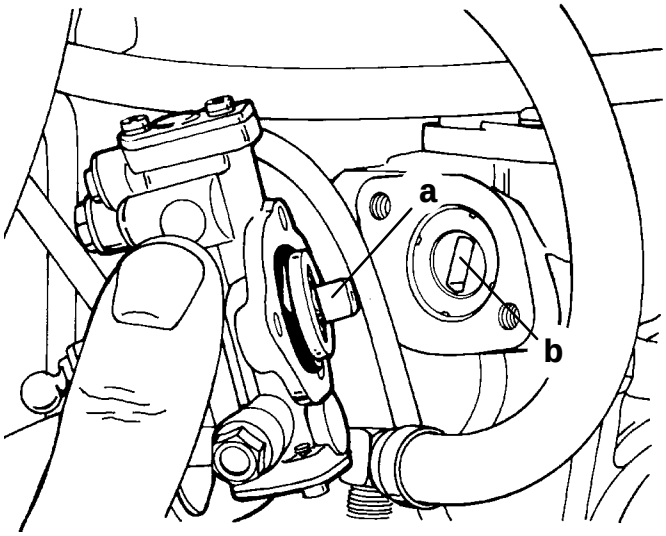
51782

a - O-rings

3. Reinstall bushing/seal assembly.

Oil Injection Pump Installation

1. Align oil pump worm shaft with coupler in powerhead.



51782

a - Worm Shaft
b - Coupler

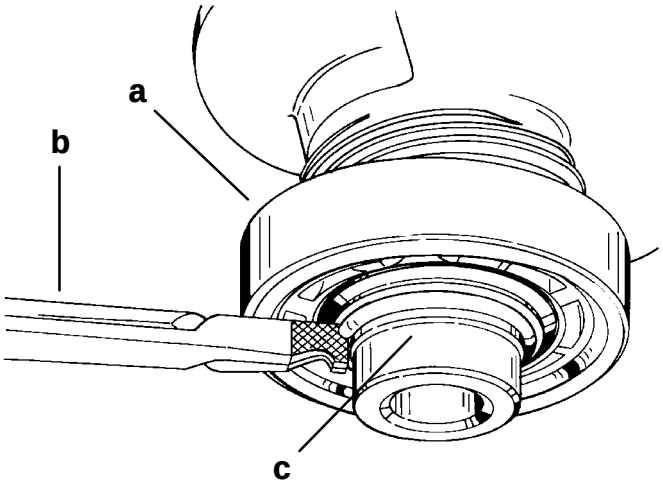
2. Secure oil pump to powerhead. Torque bolts to 55 lb. in. (6.2 N·m).
3. Connect inlet and outlet hoses to oil pump. Secure hoses with clamps.
4. Connect link arm to oil pump arm.
5. Prior to starting outboard, refer to "**BLEEDING AIR FROM OIL INJECTION PUMP**" and "**ADJUSTING OIL INJECTION PUMP**" Section 7.

Installing Drive Gear (for Oil Injection Pump) Onto Crankshaft

IMPORTANT: The removal of the oil pump drive gear from the crankshaft requires that the lower crankshaft ball bearing be removed first. The removal process of this bearing will normally damage the bearing thus requiring its replacement. DO NOT remove the oil pump drive gear unless it is damaged.

REMOVAL OF DRIVE GEAR

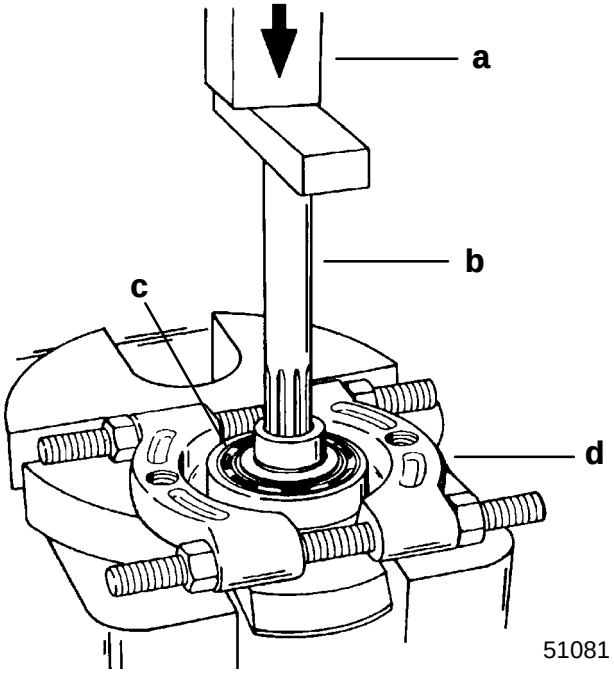
1. Remove lower ball bearing from crankshaft as follows:
   a. Remove retaining ring using a pair of snap ring pliers.



52319

a - Crankshaft Ball Bearing
b - Pliers
c - Retaining Ring

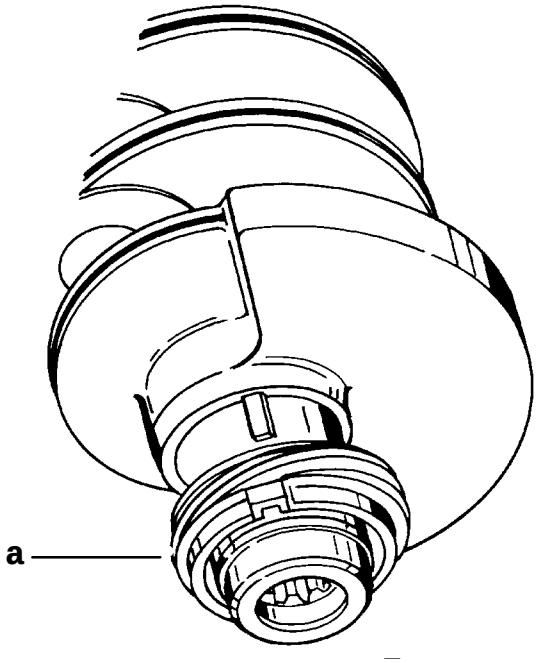
b. Press crankshaft out of lower ball bearing as shown.



51081

a - Press
b - Powerhead Stand (91-30591A1)
c - Crankshaft Ball Bearing
d - Universal Puller Plate (91-37241)

2. Slide oil pump drive gear off of crankshaft.

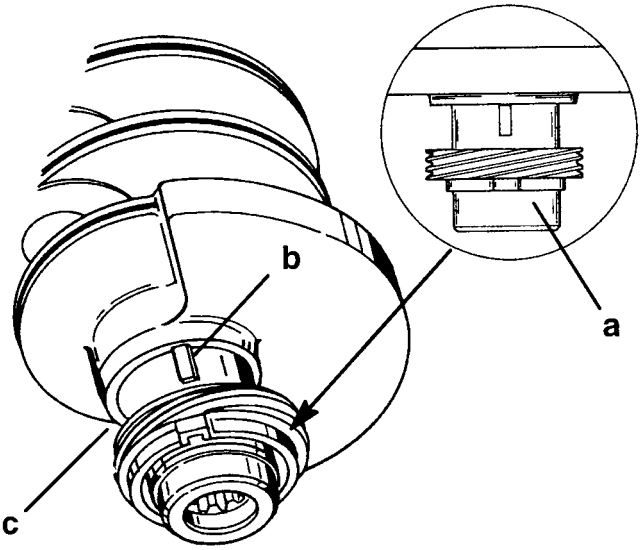


52326

a - Oil Pump Drive Gear

INSTALLATION OF NEW DRIVE GEAR

1. Slide oil pump drive gear (flange facing down) onto crankshaft. Align slot in gear with keyway on crankshaft. Seat gear against counter weight shoulder.

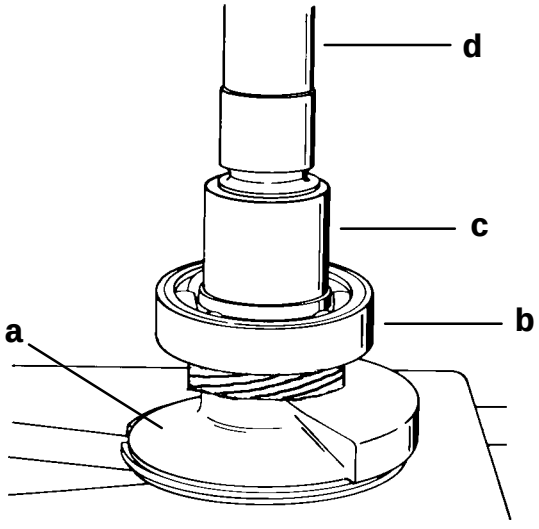


52326

a - Flange (Faces Down Towards Ball Bearing)
b - Keyway
c - Shoulder

IMPORTANT: If lower drive shaft ball bearing has been removed, it is recommended that a new bearing be installed as the removal process will damage the bearing.

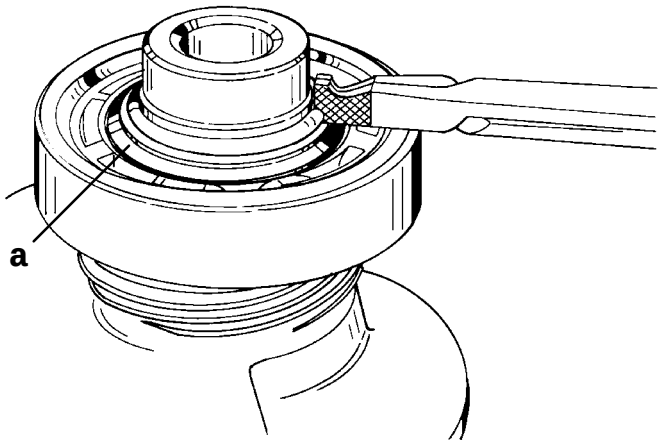
2. If removed, press new lower crankshaft ball bearing onto crankshaft as shown. Be sure bearing is pressed firmly against shoulder.



51852

a - Crankshaft
b - Crankshaft Ball Bearing
c - Suitable Mandrel
d - Press

3. Reinstall retaining ring using a suitable pair of Snap Ring Pliers.



52319

a - Retaining Ring

Oil Injection System Trouble Shooting Chart

TROUBLE SHOOTING THE OIL INJECTION SYSTEM

If a problem occurs with the oil injection system and the warning horn sounds in a pulsating manner, stop engine and check if problem is caused by (1) low oil level or (2) a faulty warning sensor.

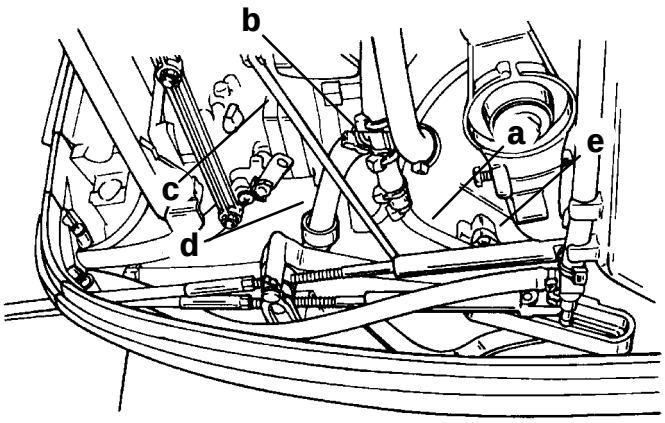
1. Open the cowling on engine and check oil level in engine reservoir tank. If oil is not to the top of tank, the problem is low oil. There is a safety reserve of oil left in the reservoir after the low oil warning is sounded that allows you enough oil for 30 to 40 minutes of full throttle operation. Refer to troubleshooting chart to correct the problem.

Problem: Oil Level in Engine Oil Reservoir Tank is Low But Not Low in Remote Oil Tank.	
Possible Cause	**Corrective Action**
Fill cap is leaking air on the remote tank.	Make sure O-rings or gaskets are in place and caps are tight.
Quick disconnect on remote oil tank is not fully connected.	Re-connect
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 or leakage.
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.
Air leak in upper portion of oil pickup tube.	Replace tube.
Problem: Warning Horn Does Not Sound When Ignition Key is Turned to “ON” Position.	
Possible Cause	**Corrective Action**
Horn malfunction or open (TAN) wire between horn and engine.	Use a jumper wire to ground TAN lead (at engine terminal block) to engine ground. Warning horn should sound. If not, check TAN wire between horn and engine for open circuit and check horn.
Electronic Control Module (ECM)	Check if all ECM leads are connected to harness leads. If so, ECM may be faulty.
Using incorrect side mount remote control or ignition/choke assembly.	Refer to Section 7.
Open circuit on PURPLE wire going to (+) terminal of horn.	Check for battery voltage at (+) terminal of horn when ignition key is turned on.

Problem: Warning Horn Stays on When Ignition Key is Turned to “ON” Position.	
Possible Cause	**Corrective Action**
Engine overheat sensor	If horn sounds a continuous signal, the engine overheat sensor may be faulty. Disconnect overheat sensor and turn ignition key to “ON” position. If horn still sounds a continuous signal, the ECM is faulty. Replace ECM and re-test. If signal does not sound, then engine overheat sensor is faulty. Replace and re-test.
Electronic Control Module (ECM)	Check connections – replace ECM.
Problem: Warning Horn sounds when Engine is Running and Oil Level in Engine Reservoir is Full.	
Possible Cause	**Corrective Action**
Defective low oil sensor	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.

Oil Pump Volume (Flow) Test

NOTE: *The following specifications are determined with the outboard running off a remote fuel supply with pre-mix fuel. The oil pump output hose (clear) must be disconnected from the input fuel line TEE fitting and directed into a graduated container. The input fuel line TEE fitting from which the oil line was removed MUST BE CAPPED OFF to prevent fuel leakage while the engine is running.*



52189

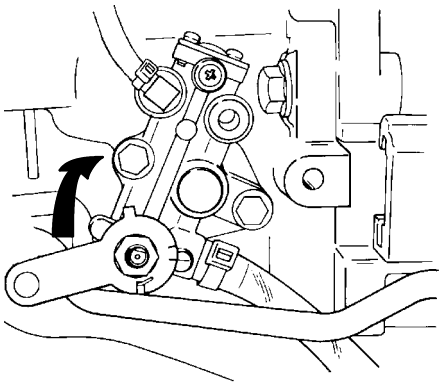
a - Oil Pump Output Hose (Clear)
b - Tee Fitting
c - Link Arm
d - Input Fuel Line
e - Oil Pump

Flow specifications are as follows:

225/250 Model:

@ 1500 RPM with oil pump link arm ATTACHED = 6.8cc ± 10% in 3 MINUTES.

@ 1500 RPM with oil pump link arm DISCONNECTED and PUMP ARM ROTATED FULL CLOCKWISE AND HELD AGAINST PUMP CASTING = 31.5cc ± 10% in 3 MINUTES.



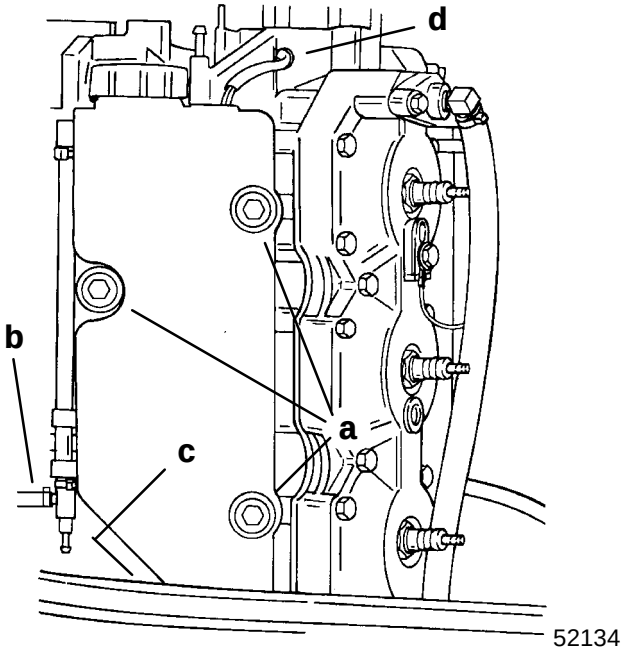
51702

Engine Mounted Oil Reservoir

REMOVAL

NOTE: *If oil reservoir contains oil, the clear oil hose going to the oil pump should be plugged upon removal to prevent oil spillage.*

1. Disconnect input oil hose to oil reservoir.
2. Disconnect LIGHT BLUE leads from their respective connections.
3. Disconnect clear input hose to oil pump and plug off hose.
4. Remove three bolts securing oil reservoir to powerhead and remove reservoir.



a - Bolts
b - Input Oil Hose
c - Oil Pump Output Hose (Clear)
d - LIGHT BLUE Leads

INSTALLATION

1. Secure oil reservoir to powerhead with 3 bolts. Torque bolts to 14 lb. ft. (19.0 N·m).
2. Reconnect input oil hose to oil reservoir and secure with sta-strap.
3. Reconnect LIGHT BLUE leads to their respective bullet connectors.
4. Connect clear output hose from oil reservoir to oil pump. Secure hose with sta-straps.