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# INSTALLATION MANUAL D7.3L D-TRONIC DIESEL ENGINES - BRAVO MODELS

## NOTICE to INSTALLER

After Completing Installation, These Instructions Should Be Placed with the Product for the Owner's Future Use.

## NOTICE to COMMISSIONING DEALER


Predelivery Preparation Instructions Must be Performed Before Delivering Boat To The Product Owner.

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# General Information

## Notice to Installer

Throughout this publication, “Warnings” and “Cautions” (accompanied by the International Hazard Symbol ) are used to alert the installer to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. — **Observe Them Carefully!**

These “Safety Alerts,” alone, cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus “common sense” operation, are major accident prevention measures.

### **WARNING**

**Hazards or unsafe practices which could result in severe personal injury or death.**

### **CAUTION**

**Hazards or unsafe practices which could result in minor personal injury or product or property damage.**

**IMPORTANT:** Indicates information or instructions that are necessary for proper installation and/or operation.

This installation manual, including all installation requirements, has been written and published by Mercury Marine to aid boat manufacturers and installers involved in the application and installation of the products described herein.

It is assumed that these personnel are familiar with the installation procedures of these products, or like or similar products manufactured and marketed by Mercury Marine. That they have been trained in the recommended installation procedures of these products which includes the use of mechanics’ common hand tools and the special Mercury Marine or recommended tools from other suppliers.

It is the responsibility of the OEM to select the appropriate engine/transom/drive package (including the correct gear ratio and propeller) for a given boat. Making an appropriate selection requires knowledge of the boat (weight, length, hull design, intended use and duty cycle, desired speed, etc.) that is uniquely in the possession of the OEM. While Mercury employs people capable of assisting the OEM on such issues, the final decision rests with the OEM. Mercury recommends that any new or unique hull/power package combination be thoroughly water tested prior to sale, to verify (among other things) that the boat performs as desired, and that the engine runs in the appropriate rpm range.

We could not possibly know of and advise the marine trade of all conceivable procedures by which an installation might be performed, and of the possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses an installation procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the product’s safety will be endangered by the installation procedure selected.

It is recommended that a Mercury Marine Field Product Engineer be contacted for assistance if specific application or installation problems are encountered.

All information, illustrations, and specifications contained in this manual are based on the latest product information available at time of publication. As required, revisions to this manual will be sent to all OEM boat companies.

**⚠ WARNING**

Electrical system components on this engine are not external ignition protected. **DO NOT STORE OR UTILIZE GASOLINE ON BOATS EQUIPPED WITH THESE ENGINES, UNLESS PROVISIONS HAVE BEEN MADE TO EXCLUDE GASOLINE VAPORS FROM ENGINE COMPARTMENT (REF: 33 CFR).** Failure to comply could result in fire, explosion and/or severe personal injury.

**Notice on Bravo Trim-In Limit**

**NOTE:** *Bravo One, Two and Three Models are equipped with a Trim-In Limit Pin Insert.*

It has been brought to our attention that some boats (predominantly deep-V heavy boats) will roll up on their side under certain, specific, operating conditions. The roll can be either to port or starboard and may be experienced while moving straight ahead, or while making a turn. The roll occurs most frequently at or near maximum speed, with the drive unit trimmed at or near full trim-in. While the boat will not roll completely over, the roll may be sufficient to unseat the operator or passengers, and thereby create an unsafe situation.

The roll is caused by stern-lift created from excessive drive unit trim-in. Under these extreme stern-lift / bow-down conditions instability can be created which may cause the boat to roll. Weight distribution to the stern can reduce stern-lift and, in some circumstances, help to control the condition. Weight distribution in the bow, port or starboard, may worsen the condition.

The Trim-In Limit Pin Insert reduces stern-lift by preventing the drive unit from reaching the last few degrees of full trim-in. While this device should reduce the rolling tendency, it may not eliminate the tendency entirely. The need for this Trim-In Limit Pin Insert, and its effectiveness, can only be determined through boat testing and is ultimately the responsibility of the boat manufacturer.

**⚠ WARNING**

**It is recommended that only qualified personnel adjust the Trim-In Limit Pin Insert. Boat must be water tested after adjusting or removing the device to ensure that the modified trim-in range does not cause the boat to exhibit an undesirable boat handling characteristic if the drive unit is trimmed in at higher speeds. Increased trim-in range may cause handling problems on some boats which could result in personal injury.**

## Multiple Sterndrive Steering Tie Bar Arrangements

With multiple sterndrives it is important to consider which of several possible steering systems should be selected.

### CAUTION

**Failure to observe the recommended Tie Bar Arrangements as presented in this section could result in serious damage to the steering and/or trim system components. This damage could adversely affect control of the boat.**

#### INTERNAL TIE BAR ONLY

At the lower end of the performance spectrum (boats not capable of speeds in excess of 60 MPH) the basic internal tie bar is recommended. It connects the slave sterndrive to the sterndrive that is directly connected to the factory power steering output. This internal tie bar is available in a variety of lengths from the sterndrive manufacturer.

#### INTERNAL AND EXTERNAL TIE BAR

As a boat moves into a moderate performance range (60-70 MPH) or for a reduction in steering backlash, an external tie bar should be added. External tie bars are usually designed to attach at the aft power trim cylinder bosses which is an excellent location because of its proximity to the propeller. HOWEVER, because of the potential overstress that can occur if one drive is trimmed much differently than the other, a dual trim control kit (Part Number 90362A3) should be installed so as to limit this potential tilt differential to about 20°.

#### EXTERNAL POWER STEERING

When boat speeds move past 70 MPH or if additional steering backlash reduction is desired, external power steering is recommended. This normally will include an external tie bar mounted at the same general location of the power steering cylinders which are generally attached at the top of the sterndrive's drive shaft housing. With this steering system, no internal tie bar should be used. These steering cylinders can be attached either inboard (between) or outboard of the sterndrives.

#### EXTERNAL POWER STEERING WITH LOW EXTERNAL TIE BAR

For the fastest boats (over 80 MPH) or for the ultimate in steering backlash reduction, use external power steering, BUT (where mechanically possible) with the external tie bar mounted at the trim cylinder boss location (as previously described in "Internal and External Tie Bar" statements). Again this system does not use an internal tie bar.

Mercury Marine does not recommend the use of an external tie bar ONLY (no internal tie bar) when using the internal power steering system. This can cause excessive loads on the steering components on the drive connected to the internal power steering system. These increased loads can damage the steering components, resulting in increased play in the steering of the boat.

## Quicksilver Products

### ACCESSORIES

Quicksilver remote controls, steering systems, propellers, etc. are available for this product. Refer to "Quicksilver Accessories Guide" for complete listing.

This "Guide" is available from:

Attn: Parts Department  
Mercury Marine  
W6250 W. Pioneer Road  
P.O. Box 1939  
Fond du Lac, WI 54936-1939

OR –

Outside of U.S.A., order through  
Distribution Center, or Distributor.

### INSTALLATION PRODUCTS

DESCRIPTION	PART NUMBER
Quicksilver Engine Coupler Spline Grease	92-816391A4
Quicksilver 2-4-C Marine Lubricant With Teflon	92-825407A3
Quicksilver U-Joint and Gimbal Bearing Grease	92-828052A3
Quicksilver Special Lubricant 101	92-13872A1
Quicksilver Liquid Neoprene	92-25711-2
Quicksilver Perfect Seal	92-34227-1
Transom Drilling Fixture	91-43693A2
Engine Alignment Tool	91-805475A1
Shift Cable Adjustment Tool	91-12427
Engine Lifting Eye Tool	91-806451A1
Engine Mount Drilling Fixture	91-807903A1

## Torque Specifications

DESCRIPTION	TORQUE		
	lb-in.	lb-ft	Nm
Speedometer Pickup Barb Fitting	10-15		1.2-1.6
Exhaust Pipe or Block-off Plate		20-25	27-34
Power Steering Hydraulic Hose Fittings		20-25	27-34
Power Trim Pump Hose Fittings	100-150		11-16
Propeller Nut (Bravo One and Two) <sup>1</sup>		55	75
Propeller Nuts (Bravo Three) <sup>1</sup>	Front	100	136
	Rear	60	81
Rear Engine Mounts		35-40	47-54
Steering Cable Coupler Nut		35	47
Steering System (Pivot Bolts)		25	34
Sterndrive Unit Fasteners		50	68
Transom Assembly Fasteners		20 25	27-34
Seawater Pickup Fitting	45		5
Power Trim Cylinder Fasteners	Tighten until they bottom out.		

<sup>1</sup>: Amount specified is MINIMUM.

## Serial Number Decal Placement

There are three sets of engine, transom assembly and sterndrive serial number decal strips provided with each power package. One set should be used for each of the following:

- Engine Specification Decal
- Warranty Registration Card
- Operation and Maintenance Manual identification page.

## Corrosion Protection

MerCruiser power packages are equipped with anodes, to help protect them from galvanic corrosion under moderate conditions. However, for severe conditions, or if using a stainless steel propeller, it is recommended that a Quicksilver Anti-Corrosion Anode Kit and/or a MerCathode System be installed (some models have a MerCathode System as standard equipment). A MerCathode Monitor also is available to allow the operator to check the operation of the MerCathode System with the push of a button. (Refer to "Quicksilver Accessories Guide" for part numbers.)

Boats which are connected to AC shore power, require additional protection to prevent destructive low voltage galvanic currents from passing through the shore power ground wire. A Quicksilver Galvanic Isolator can be installed to block the passage of these currents while still providing a path to ground for dangerous fault (shock) currents. (Refer to "Quicksilver Accessories Guide" for part number.)

**IMPORTANT: If AC shore power is not isolated from boat ground, the MerCathode System and anodes may be unable to handle the increased galvanic corrosion potential.**

## Antifouling Paint

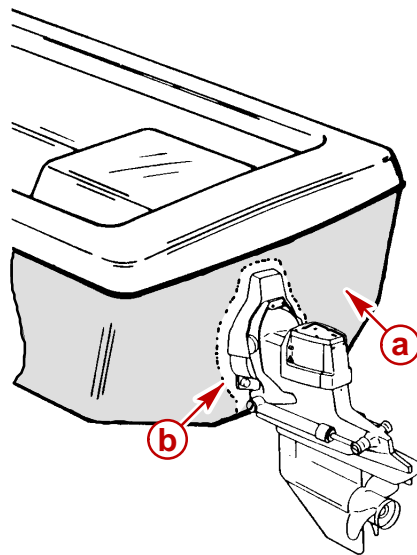
**IMPORTANT:** Corrosion damage that results from the improper application of anti-fouling paint will not be covered by the limited warranty.

**Painting Boat Hull or Boat Transom:** Antifouling paint may be applied to boat hull and boat transom but you must observe the following precautions:

**IMPORTANT:** DO NOT paint anodes or MerCathode System reference electrode and anode, as this will render them ineffective as galvanic corrosion inhibitors.

**IMPORTANT:** If anti-fouling protection is required for boat hull or boat transom, copper or tin base paints, if not prohibited by law, can be used. If using copper or tin based anti-fouling paints, observe the following:

- Avoid an electrical interconnection between the MerCruiser Product, Anodic Blocks, or MerCathode System and the paint by allowing a minimum of 1-1/2 in. (40mm) UNPAINTED area on transom of the boat around these items.



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**a** - Painted Boat Transom

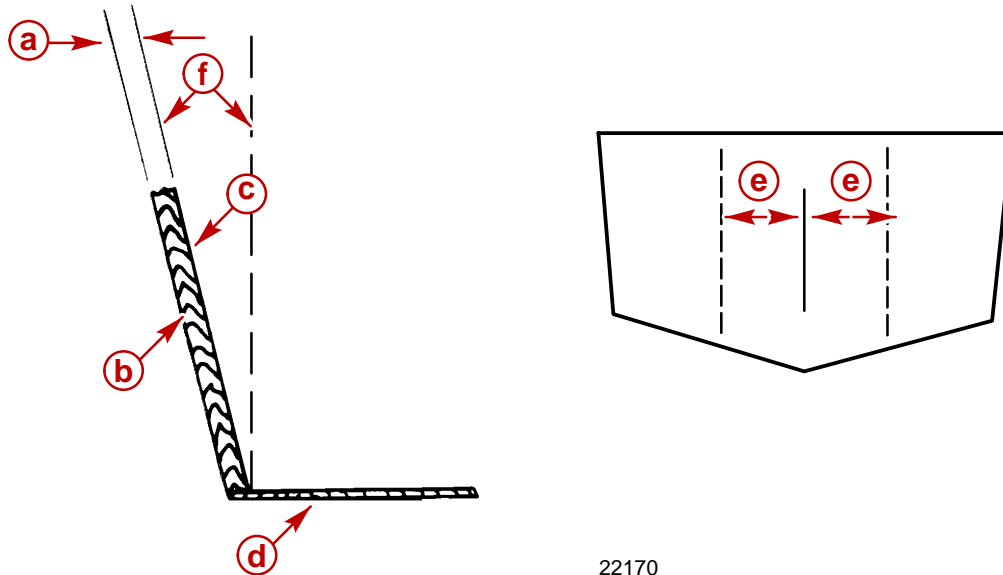
**b** - Minimum 1-1/2 in. (40 mm) UNPAINTED Area Around Transom Assembly

**NOTE:** Drive unit and transom assembly can be painted with a good quality marine paint or an anti-fouling paint that DOES NOT contain copper, tin, or any other material that could conduct electrical current. Do not paint drain holes, anodes, MerCathode system, and items specified by boat manufacturer.

# Installation Requirements

## Boat Construction

### TRANSOM



22033

22170

- a** - Transom Thickness - 2 in. (51mm) Minimum to 2-1/4 in.(57mm) Maximum
- b** - Inner Surface of Transom Must Be Parallel Within 1/8 in. (3mm) in Area Covered by Transom Plate **(e)** and Remain Within Transom Thickness Limits.
- c** - Outer Surface of Transom Must Be Parallel Within 1/16 in. (2 mm) in Area Covered by Transom Plate **(e)** and Remain Within Transom Thickness Limits.
- d** - Remove Keel (if Equipped) 4 ft. (1.2m) Forward to Transom
- e** - Transom Plate Covers 8 in. (203 mm) to either side of the vertical centerline
- f** - Transom Angle - 10 Degrees to 16 Degrees

### ENGINE BED

Distance between starboard and port engine mount is 22-1/2 in. (572mm). Engine bed must position engine so that a minimum of 1/4 in. (6mm) up and down adjustment still exists on mounts after performing final engine alignment. This is necessary to allow for realigning engine in the future.

**NOTE:** Although the engine mounts allow some adjustment, it is a good practice to insure that the front and rear mount locations in the vessel are in parallel planes. This may be checked by tying a string from the left front mount location to the right rear mount location and another from right front to left rear. The strings should touch where they cross.



## ENGINE COMPARTMENT

### **⚠ WARNING**

**Boating standards (NMMA, ABYC, etc.) and Coast Guard regulations must be adhered to when constructing the engine compartment.**

Care must be exercised in the design and construction of the engine compartment. Seams must be located so that any rain water, which may leak through the seams, is directed away from the air intake system. **Water, that runs onto the air intake, may enter the engine and cause serious damage to internal engine and/or turbocharger parts.**

**IMPORTANT: MerCruiser will not honor any warranty claim for engine damage as a result of water entry.**

## ENGINE COMPARTMENT VENTILATION

### General Information

According to Boating standards (NMMA, ABYC, etc.) and Coast Guard regulations the engine compartment ventilation system has multiple tasks. Included are the following:

1. To supply the engine with combustion air.
2. To maintain a low temperature in the engine compartment.

Fresh air should enter the engine compartment as low as possible and the heated air should be discharged from the highest point.

If a separate air shaft (or similar) is used to provide engine compartment ventilation, or additional ventilation, care must be taken to prevent seawater and spray from entering it.

### Combustion Air Requirements

Engine compartments with natural draft ventilation must have vent openings of sufficient size and location to accomplish the tasks previously outlined.

Furthermore, in part, and according to, ABYC H-32-89 specification - "Compartment Ventilation (Diesel)" states:

"Ventilating provisions and openings to the machinery space provided for supplying combustion air shall accommodate the air requirements required by the engine manufacturer(s) for each propulsion and auxiliary engine in that space. These openings may also function as means of providing natural ventilation."

**IMPORTANT: The size of ventilation openings must be increased if any auxiliary equipment is located in the engine compartment.**

The **combustion air requirement** (per engine) for the specified engines at Wide Open Throttle are shown in the chart below:

Combustion Air Requirements (Per Engine)	
Model	Engine Air Requirements at Wide Open Throttle
D7.3L D-Tronic and D7.3L D-Tronic LD	1000 ft. <sup>3</sup> /min. (28.2 m <sup>3</sup> /min.)

Multiplying the engine air flow (cfm) by 0.1 will *generally* determine the combustion air vent size requirement (per engine). Therefore:

Engine Combustion Air Flow (cfm) X 0.1	=	Combustion Air Vent Area Per Engine (Square Inches)
<b>OR</b>		
Engine Combustion Air Flow (m <sup>3</sup> /min.) X 22.8	=	Combustion Air Vent Area Per Engine (Square Centimeters)

D7.3 D-Tronic Example: \_\_\_\_\_ 1000 X 0.1 = 100 Square Inches<sup>1</sup>

**OR**                    28.2 X 22.8 = 642.9 Sq. Cm.<sup>1</sup>

<sup>1</sup> : For engine combustion air only - ***NOT*** total engine compartment ventilation requirement.

**IMPORTANT: The amount of vent area required, according to Boating standards (NMMA, ABYC, etc.) and Coast Guard regulations, for *complete* (total) engine compartment ventilation must include the engine vent area, determined by the above formula, plus the engine compartment ventilation requirements.**

### Compartment Temperature - Specifications

Too high an inlet air temperature lowers the engine performance. Therefore:

Engine compartment temperature shall not exceed outside air temperature by more than 30° F (17° C).

Since many factors influence engine compartment temperature, temperature measurements should always be carried out.

### Compartment Temperature - Testing

Test as follows:

1. The boat being tested shall be a standard production boat fitted as it would be for delivery to a dealer.
2. Temperature test meter used shall be of the type that can be read without opening the engine cover.
3. During the test, in Step 4, engine compartments are to remain closed. No outside air is to be forced into the engine compartment during the test and the bilge blower should not be running.
4. Engine Running and Heat Soak Test:
  - a. Use 1 meter and 1 thermal couple. Position the thermal couple at the engine air inlet (air filter).
  - b. Start engine to warm it up. After engine is at its normal operating temperature, run engine at WOT rpm for 20 minutes. Record temperature readings at 5 minute intervals.

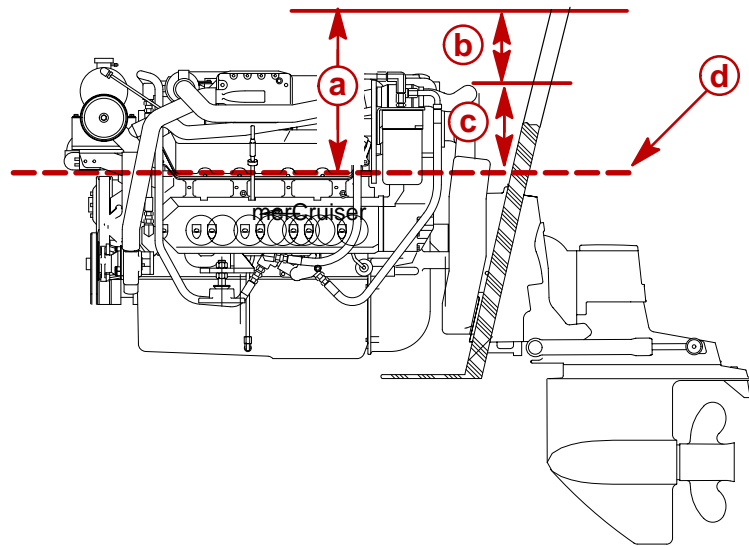
**IMPORTANT: If the temperature at the engine air inlet (air filter) exceeds specifications, the engine compartment will need additional engine combustion air openings, or an increase in engine compartment ventilation area, until the temperature remains within specification.**

## Exhaust System

**IMPORTANT:** It is the responsibility of the boat manufacturer or installing dealer to properly locate the engine and install the exhaust system. Improper installation may allow water to enter the exhaust manifolds and combustion chambers and severely damage the engine. Damage caused by water in the engine will not be covered by MerCruiser Warranty, unless this damage is the result of defective part(s).

Determine if an exhaust riser kit or a water lift muffler kit is required, by taking measurements (a) and (b), with boat at rest in the water and maximum load aboard. Subtract (b) from (a) to find (c). If (c) is less than specified in chart, an exhaust riser kit must be installed.

Model	(c) = (a) Minus (b)
All Models	(c) <b>Must Be</b> 13 in. (330 mm) <b>or More</b>

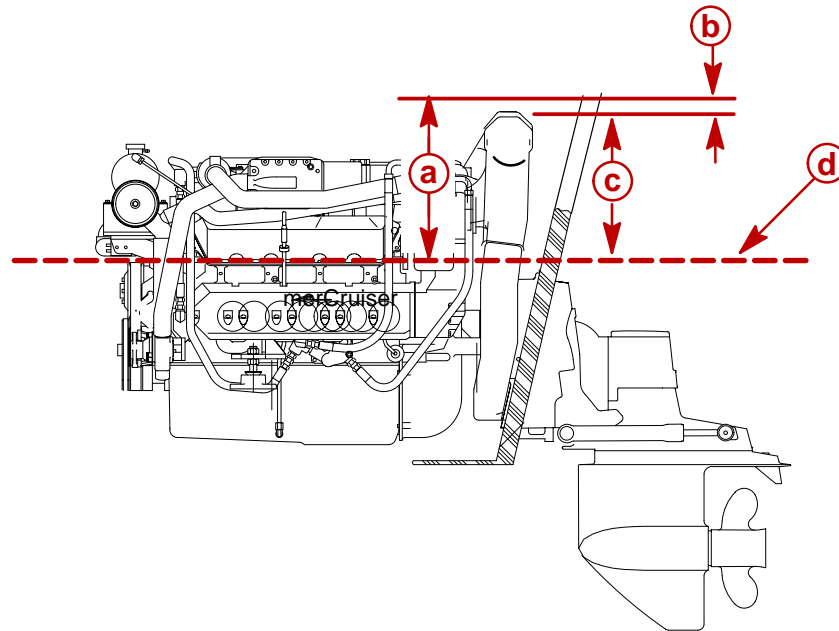


### Typical Engine Without Risers

- a** - From Waterline to Top of Transom
- b** - From Highest Point on Exhaust Elbow to Top of Transom
- c** - Equals (a) minus (b)
- d** - Waterline at Rest

Some engines may be equipped with a factory installed exhaust riser. Verify that the riser provides the required dimension "c", or a distance greater than "c", as indicated.

Model	(c) = (a) Minus (b)
All Models	(c) <b>Must Be</b> 13 in. (330 mm) <b>or More</b>



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### Typical Engine With Riser

- a** - From Waterline to Top of Transom
- b** - From Highest Point on Exhaust Riser to Top of Transom
- c** - Equals (a) minus (b)
- d** - Waterline At Rest

## Fuel Delivery System

### ⚠ WARNING

Boating standards (NMMA, ABYC, etc.) and Coast Guard regulations must be adhered to when installing fuel delivery system.

### GENERAL

The main concern of a boat's fuel system is safety; this must be achieved through a technically sound installation and constant inspection.

The fuel system, from the filler pipe to the fuel pump is the same, in principle, for all boats.

The Fuel Tank is an integrated component of the boat. Refer to the special information on service and maintenance, which you have received from the tank manufacturer.

Only a few points related to function and safety are listed here [Refer to boating standards (NMMA, ABYC, etc.) and Coast Guard regulations for complete guidelines]:

1. All connections should be on the upper side of the tank.
2. The drain plug at the lowest point on the tank serves to permit the removal of water and sediment.
3. The filler pipe outer diameter should be at least 2 in. (50mm).

4. The tank breather pipe must have an inner diameter of at least 1/2 in. (13mm) and must be fitted with a swan neck to prevent water from entering the tank.

It is recommended that the exact route and length of the fuel lines be established at the first installation of the engine to prevent problems later in connecting them to the engine.

All fuel lines must be well secured. The holes where the lines run through the bulkheads should be carefully rounded off, or protected with rubber grommets. This prevents damage to the lines from abrasion.

## FUEL CONNECTIONS

The following, but not limited to the following, additional fuel connection related points, *applying to all engines unless otherwise stated*, must be considered [Refer to boating standards (NMMA, ABYC, etc.) and Coast Guard regulations for complete guidelines]:

1. Fuel pickup should be at least 1 in. (25mm) from the bottom of fuel tank, to prevent picking up impurities.
2. Fuel supply lines must not be smaller than 3/8 in. (11 mm) I.D. tube for V8 model. A fuel return line between engine and fuel tank is *required*, for all models the return line must not be smaller than 5/16 in. (8 mm).
3. **On Multi-Engine Installations:** Use a *separate* tube for the fuel supply line and fuel return line for each engine.
4. Larger diameter (than previously specified) lines, and fittings must be used on installations requiring long lines or numerous fittings.
5. Fuel line(s) should be installed free of stress and firmly secured to prevent vibration and/or chafing.
6. Sharp bends in fuel lines should be avoided.
7. A flexible fuel line must be used to connect fuel supply line to fuel inlet fitting on engine, to absorb deflection when engine is running. Injection pump fuel return line must also have a flexible rubber hose segment.

## DIESEL FUEL FILTERS AND FUEL ADDITIVES

There is the possibility that contamination of diesel fuel and algae growth in the diesel fuel could cause the blockage of the lift pump resulting in poor performance.

**IMPORTANT: The engine is provided with an element type fuel filter, but to help eliminate water and dirt it is recommended to use an additional 10 micron, 60 gal/min. (227 L/min.) flow rated filter that has a water trap.**

It is recommended that in MerCruiser Diesel applications, an additional fuel filter equipped with a water trap be installed before the lift pump. MerCruiser recommends a 10 micron, 60 gallon per minute (227 L/min.) rated filter, such as a Racor Model 500® (Quicksilver Part Number 35-850481 with SAE threads, and 35-809867 with Metric threads) or equivalent. This will help to filter out contaminants in diesel fuel.

Select a suitable position in the fuel system between the fuel feed pump and the fuel tank for the additional filter. The position selected must be free from vibrations, and allow for easy inspection and replacement.

It is also recommended that a diesel fuel additive be added (to combat algae growth) particularly in warmer climates. Additives reduce the chances of algae growth in the diesel fuel.

## Battery

**IMPORTANT:** Boating industry standards (BIA, ABYC, etc.) federal standards and Coast Guard regulations must be adhered to when installing battery. Be sure battery cable installation meets the pull test requirements and that positive battery terminal is properly insulated in accordance with regulations.

**IMPORTANT:** It is recommended (required in some states) that battery be installed in an enclosed case. Refer to regulations for your area.

**IMPORTANT:** Engine electrical system is negative (–) ground.

Select a battery that meets all of the following specifications:

- 12-volt marine type.
- Tapered post connectors or side terminal connectors. Do *not* use a battery with wing nut connectors.
- Battery capacity rating of at least:

Engine (Cyl./type)	Minimum Required Cranking Battery Size
8 / V, D7.3L D-Tronic and D7.3L D-Tronic LD	1500 cca, 1920 mca or 300 Ah

## Battery Cables

Select proper size positive (+) and negative (–) battery cables, using chart. Battery should be located as close to engine as possible.

**IMPORTANT:** Terminals must be soldered to cable ends to ensure good electrical contact. Use electrical grade (resin flux) solder only. Do not use acid flux solder, as it may cause corrosion and a subsequent failure.

Battery Cable Length	Minimum Cable Gauge
Up to 3 ft. (0.9m)	2 ( 35mm <sup>2</sup> )
3 - 3-3/4 ft. (0.9 - 1.1m)	1 ( 50mm <sup>2</sup> )
3-3/4 - 4-3/4 ft. (1.1 - 1.4m)	0 ( 50mm <sup>2</sup> )
4-3/4 - 6 ft. (1.4 - 1.8m)	00 ( 70mm <sup>2</sup> )
6 - 7-1/2 ft. (1.8 - 2.3m)	000 ( 95mm <sup>2</sup> )
7-1/2 - 9-1/2 ft. (2.3 - 2.9m)	0000 (120mm <sup>2</sup> )
9-1/2 - 12 ft. (2.9 - 3.7m)	▲ 00 ( 70mm <sup>2</sup> )
12 - 15 ft. (3.7 - 4.6m)	▲ 000 ( 95mm <sup>2</sup> )
15 - 19 ft. (4.6 - 5.8m)	▲ 0000 (120mm <sup>2</sup> )
▲ :Two cables of specified gauge required for positive and two required for negative.	

## EDI Electrical System Precautions

**NOTE:** The following precautions apply to *all* EDI model Engines.

### CAUTION

Avoid damage to the Electronic Direct Injection (EDI) electrical system and components. Refer to the following precautions when working on or around the EDI electrical harness or when adding other electrical accessories:

- DO NOT tap accessories into engine harness.
- DO NOT puncture wires for testing (Probing).
- DO NOT reverse battery leads.
- DO NOT splice wires into harness.
- DO NOT attempt diagnostics without proper, approved Service Tools.

## Instrumentation

### GENERAL

We recommend using Quicksilver Instrumentation and Wiring Harnesses. Refer to “Quicksilver Accessories Guide” for selection.

**NOTE:** If using other than Quicksilver instrumentation and harnesses, refer to manufacturers' instructions.

The six basic gauges that must be used with the engine are:

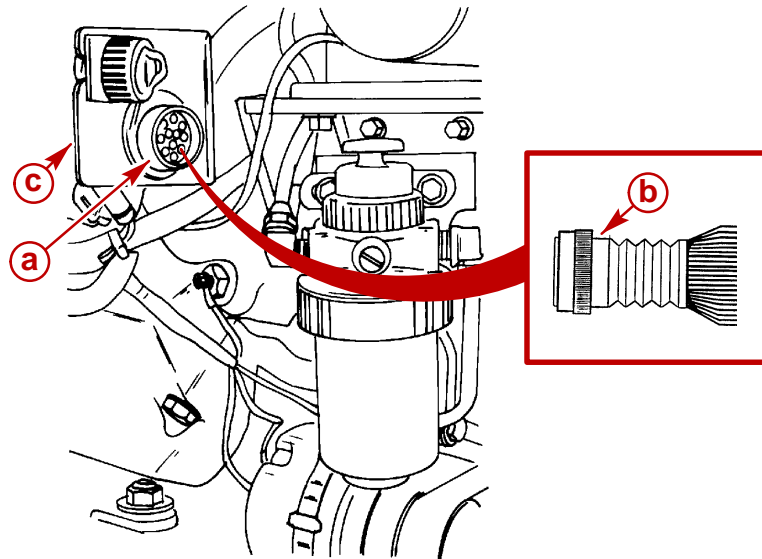
- Tachometer
- Oil Pressure
- Water Temperature
- Voltmeter
- Cruise Log (Engine Hour Meter)
- Trim Gauge

When using the instrumentation, instrument harness wire connectors are labeled. It will be necessary to connect them onto the individual Quicksilver instruments, switches and Engine System Monitor panel. The instrumentation harness ends are provided for connection into the appropriate extension harness ends. The wiring harnesses will then be ready to route to the engine.

On dual station applications, oil pressure and water temperature senders (on engine) must be changed.

Additionally, changes are needed in the primary station key switch wiring to allow use of start and stop switches common on dual station panels. Refer to instructions in kit.

When routing any wiring extension harness back to the engine, make sure that the harness does not rub or get pinched. Be sure all extension harness connector collars are secure. Fasten harnesses to boat at least every 18 in. (460 mm) using appropriate fasteners.



76010

### D7.3L D-Tronic Shown - All Similar

- a** - Engine Harness Connector
- b** - Extension Harness Connector (From Instruments)
- c** - Electrical Bracket

## TACHOMETER SPECIAL INFORMATION

**IMPORTANT:** If using a tachometer from another manufacturer, *do not use the magnetic tachometer pickup (or related wiring) mounted on the flywheel housing.*

If using the Quicksilver Tachometer provided with the engine package, the appropriate setting of the switch located on the back of the tachometer is given in the following chart.

Tachometer Switch Setting	
Model	Switch Position (Teeth Count on Flywheel)
D7.3L D-Tronic and D7.3L D-Tronic LD	4 (155)

## Power Trim Control

Any of the Quicksilver panel or in-handle type trim controls (that are specified for use with MerCruiser sterndrives) can be used with this Power Trim system. Install trim control in accordance with instructions that accompany it.

## Power Trim Pump Location

Select an appropriate mounting location for the trim pump that meets the following requirements:

- Within limits of black and gray hydraulic hoses (coming from gimbal housing assembly).
- Close to the battery so that trim pump battery leads can be connected.
- Allow easy access to trim pump oil fill and vent locations.
- Area where pump will not be exposed to water.
- Trim pump must be mounted so that when steering wheel is turned in either direction (right or left), the power steering booster cylinder does not come in contact with trim pump.



## Propeller Selection

### GENERAL INFORMATION

**IMPORTANT: Installed propeller must allow engine to run at its specified maximum wide-open-throttle revolutions per minute (rpm). Use an accurate service tachometer to verify engine operating rpm.**

It is the responsibility of the boat manufacturer and/or the selling dealer to equip the power package with the correct propeller(s). Specified engine wide-open-throttle (WOT) and operating rpm range are listed in the "Operation and Maintenance Manual" attached to the engine.

Select a propeller that will allow the engine power package to operate at or near the top end of the recommended wide-open-throttle operating rpm range with a normal load. High rpm, caused by an excessive trim angle, should not be used in determining correct propeller selection.

If full throttle operation is below the recommended range, the propeller must be changed to prevent loss of performance and possible engine damage. On the other hand, operating an engine above the recommended operating rpm range will cause higher than normal wear and/or damage. Generally, there is a 200 rpm change between propeller pitches.

After initial propeller selection, the following common problems may require that the propeller be changed to a lower pitch:

- Warmer weather and greater humidity cause an rpm loss.
- Operating in a higher elevation causes an rpm loss.
- Operating with increased load (additional passengers, pulling skiers, etc.).

For better acceleration, such as is needed for water skiing, use the next lower pitch propeller. However, do not operate at full throttle when using the lower pitch propeller but not pulling skiers.

Because of the many variables of boat design, only testing will determine the best propeller for a particular application. Available propellers are listed in the "Quicksilver Accessories Guide."

See "BOAT-IN-THE-WATER TESTS, Maximum rpm Test" in the power package Installation Manual.

### RPM REV-LIMITER

**IMPORTANT: When selecting a propeller consider this additional information:**

**The engines listed in the following chart are equipped with a device that limits engine rpm. Be sure that propeller being used does not allow engine to run against limiter, as a significant loss in performance will result.**

Engine rpm		
MCM Model	Engine Recommended Operating rpm Range	Rpm Limiter Setting (Begins At:)
D7.3L D-Tronic	3600-3800	3850
D7.3L D-Tronic LD	3400-3600	3650

## Hot Water Heater Installation Recommendation

**IMPORTANT:** When connecting a cabin heater or hot water heater, certain requirements must be met, including, but not limited to the following:

- Supply hose (from engine to heater) and return hose (from heater to engine) **MUST NOT EXCEED 5/8 in. (16 mm) I.D. (inside diameter).**
- Make heater connections **ONLY** at locations indicated in the following information.
- Refer to manufacturers' instructions for complete installation information and procedures.

**IMPORTANT:** Do not reposition engine temperature switch, it must remain where installed by factory.

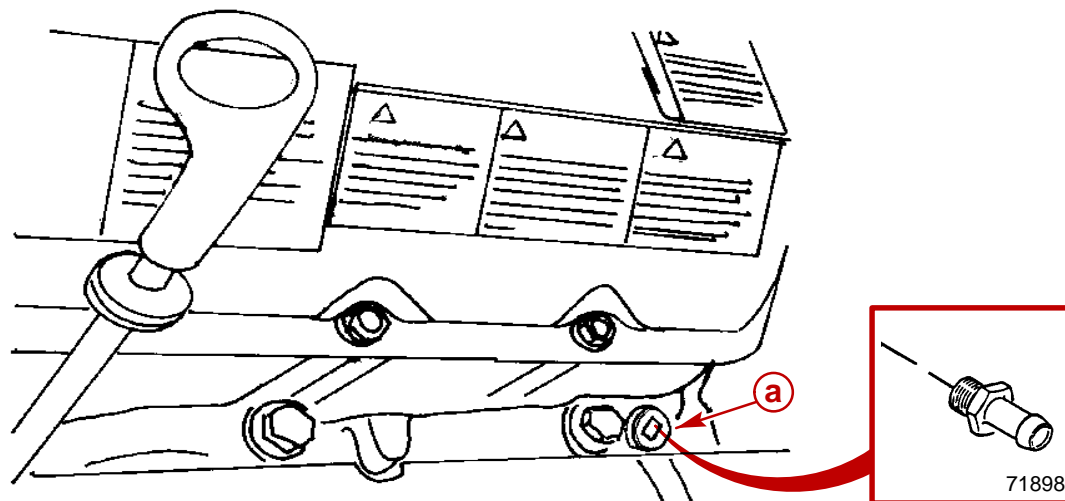
### ⚠ CAUTION

Heater must be mounted lower than the fill cap on the heat exchanger. If the heater is higher than the fill cap on the heat exchanger and some coolant is lost from system, an air pocket may form in the closed cooling system. This can cause the engine to overheat.

A Hot Water Heater Adaptor Kit is available from Quicksilver. This kit contains installation instructions. Locations for fittings are shown following.

PART NUMBER	DESCRIPTION
854570A1	Hot Water Heater Adaptor Kit

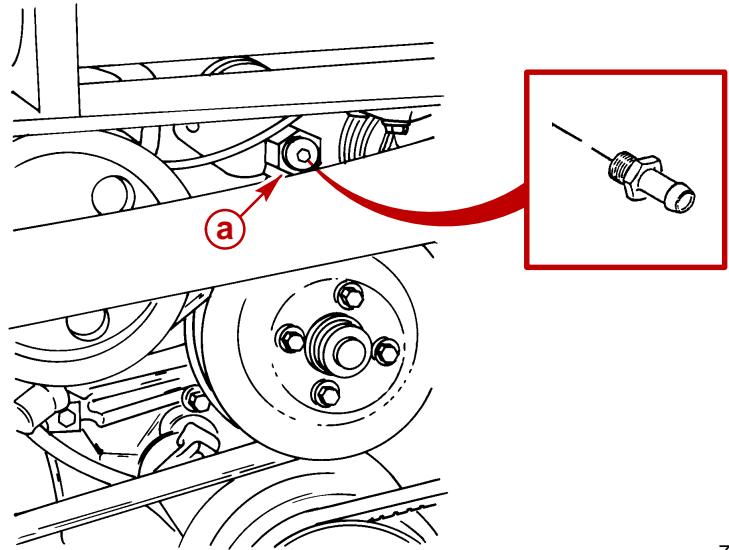
### SUPPLY HOSE CONNECTION



76024

**a** - Location for Water Heater Supply Hose (Bayonet Fitting Replaces Plug)

**RETURN HOSE CONNECTION**



76023

**a** - Location on Water Circulation Pump for Hot Water Return (Bayonet Fitting Replaces Plug)

**Seawater Connections**

D7.3L D-Tronic and D7.3L D-Tronic LD models must be equipped with a **through hull or through transom** water supply to ensure sufficient water flow to the engine. The transom assembly needs to be modified with the water passage block-off plate kit (P/N 818304A1) provided. It is necessary to cut the water hose that is located between the bell housing and the gimbal housing. This allows water to continue through the drive for cooling. Refer to "Drive Unit Seawater Routing." outlined later. Read and observe the following to select the proper seawater pickup hose, seacock size and seawater strainer.

**Seawater Connections - General Information**

**SEAWATER PICKUP HOSE**

Seawater inlet hose connections must be made with wire reinforced hose of adequate wall thickness to prevent it from collapsing from pump suction. Be sure to secure hose connections with hose clamps. Secure hose to prevent contact with any moving parts of the engine.

Seawater Pickup Hose Inner Diameter	
All Models	1-1/2 in. (38mm)

**SEACOCK SIZE**

Seacock used must have an internal cross-sectional area equal to or greater than seawater inlet hose to prevent restricting water flow. Install valve in an area where it will be easily accessible and supported adequately to prevent hose fatigue. A brass ball or gate valve is required.

Seacock Size (Internal Cross-Sectional Area Equal to or Greater Than Size Shown)	
All Models	1-1/2 in. (38mm)

**SEAWATER STRAINER**

Strainer used must be of sufficient size to ensure that an adequate supply of water will be maintained for cooling the engine.

<b>Seawater Strainer Minimum Flow Rate <sup>1</sup></b>	
All Models	40 (150)

<sup>1</sup> Amount listed is in gallons per minute and (liters per minute).

Install seawater strainer in an area where it will be easily accessible for inspection and cleaning. Strainer should be installed in water inlet hose after the seacock (water inlet valve) to allow operator to shut off water when cleaning strainer.

**Throttle/Shift Remote Control and Cables**

To ensure proper shift and throttle operation, we recommend the use of a Quicksilver remote control and cables. Refer to "Quicksilver Accessories Guide" for selection. However, if a control other than Quicksilver is to be used, control must provide the following:

<b>Shift Cable Travel (At shift plate end.)</b>	<b>Shift Cable Load (Applied to the cable end guide.)</b>
2-7/8 in. (73mm) to 3-1/8 in. (80mm)	15-20 lb. (6.8-9 kg)

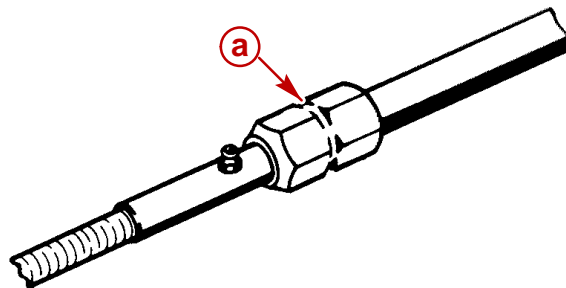
## Steering Helm and Cable

Transom assembly is shipped with the steering cable guide tube preset for cables with end dimensions that comply with ABYC standards as outlined in the NMMA certification handbook. The steering cable coupler nut must also have a means of locking it to the guide tube as specified in ABYC requirements.

### ⚠ WARNING

**Failure to use a steering cable locking device could cause loss of steering, which could cause damage to the boat and/or injury.**

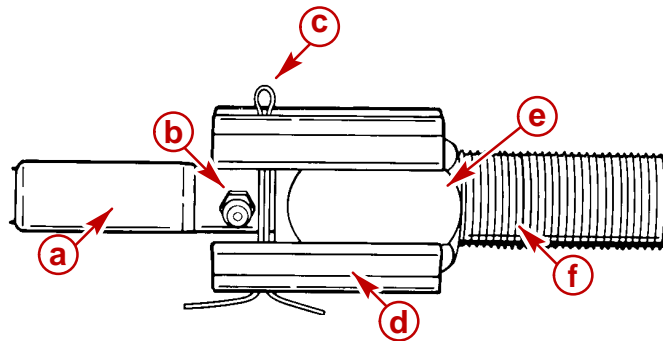
All current production Quicksilver Ride Guide steering cables have a self-locking coupler nut and do not require an external locking device. (Other cable manufacturers also make cables with self-locking coupler nut.)



22060

- a** - Quicksilver Ride Guide Steering Cable Self-Locking Coupler Nut (Identified by Groove)

If using a steering cable that does not have a self-locking coupler nut, an external locking device must be used.

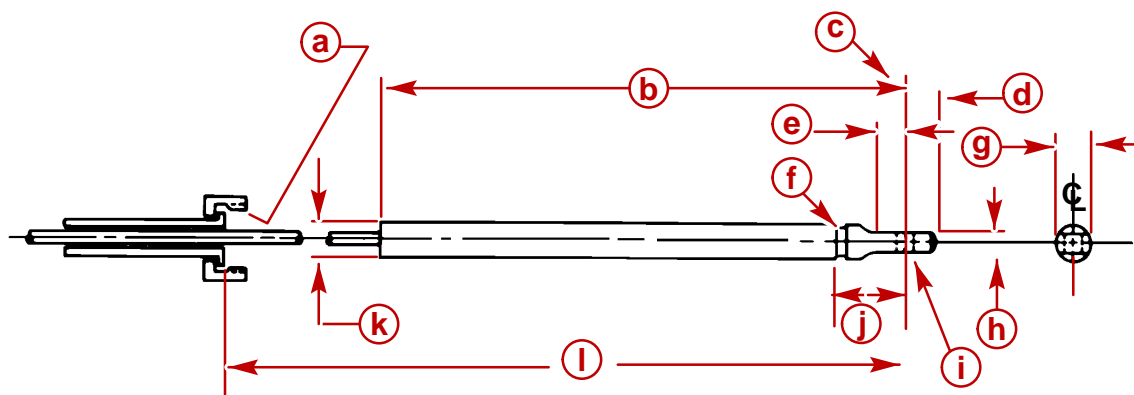


- a** - Steering Cable  
**b** - Grease Fitting  
**c** - Cotter Pin  
**d** - Locking Sleeve (If Required - Must Be Ordered Separately)  
**e** - Cable Coupler Nut  
**f** - Cable Guide Tube

**CAUTION**

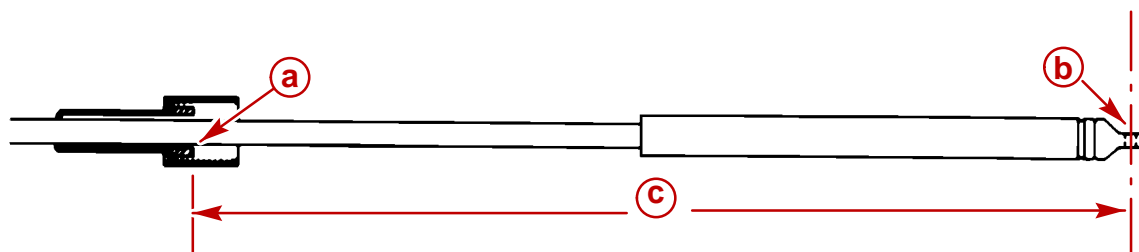
**POWER STEERING EQUIPPED UNITS ONLY:** If steering cable with improper dimensions is installed, severe damage to transom assembly and/or steering system may result.

1. Steering cable must be the correct length, particularly when installed in larger boats.
2. Avoid sharp bends, kinks or loops in cable.
3. Fully extended steering cable end dimension must be as shown.

**STEERING CABLE SPECIFICATIONS**

21435

- a** - Coupler Nut - 7/8 - 14 UNF - 28 Thread
- b** - 11-3/4 in. (298 mm) Min.
- c** - Interface Point
- d** - 1/2 in. (12.700 mm) Max.
- e** - .420 in. (10.668 mm) Min. Flat
- f** - .102 in. (0.508 mm) Min. Radius
- g** - 5/8 in. (15.875 mm) Max. Diameter End Fitting
- h** - 3/8 in. (9.525 mm)
- i** - .385 in. (9.779 mm) Diameter Thru Hole, Chamfered Each Side
- j** - 1-3/8 in. (34.925 mm) Max
- k** - 5/8 in. (15.875 mm) Diameter Tube
- l** - Mid-Travel Position - 16-7/8 in. (428.6 mm) Total Travel To Be 8 in. (203.2 mm) Min. to 9 in. (228.6 mm) Max Travel Each Side of Mid-Travel Position - 4 in. (101.6 mm) Min., 4-1/2 in. (114.3 mm) Max.



21436

- a** - Steering Cable Mounting Flange
- b** - Center of Hole in Steering Cable End
- c** - 21-3/8 in. (543 mm) Max.

# Transom Cutout

NOTICE to INSTALLER
Before Starting Installation Read "General Information" and "Installation Requirements" Sections Completely.

**IMPORTANT:** The following instructions will provide a sterndrive unit mounting location that is suitable for most boats. Best mounting location for a particular boat, however, can be determined only by testing.

**Bravo Models** use items 1 - 4.

1. **Below 25 m.p.h. (40 km/h):** Subtract 1/2 in. (13mm) from "X" Dimension Shown.
2. **Heavy Duty Applications:** Subtract 1 in. (25mm) from "X" Dimension shown.
3. **Above 25 m.p.h. (40 km/h):** Use "X" Dimension shown.
4. **Above 50 m.p.h. (80 km/h):** The "X" Dimension can be increased to improve performance in some applications, but pulling power (for skiing) will decrease. During testing, "X" Dimension should be increased 1/2 in. (13mm) at a time until desired performance is achieved but **in no case should it ever be increased by more than:**

**Bravo One/Two: 3 in. (76 mm) maximum.**

**Bravo Three: 1 in. (25 mm) maximum.**

**In ALL applications where cooling water is supplied through the sterndrive unit to the engine,** extreme care should be taken when raising drive unit to ensure that the water supply does not become aerated. Use a clear, water inlet hose to check incoming water for aeration. Monitor engine temperature gauge to ensure engine does not overheat.

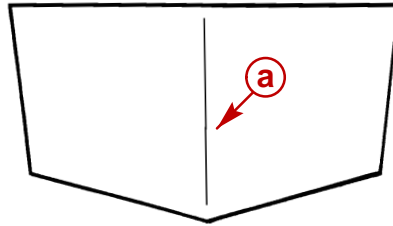
**In applications where cooling water is supplied to the engine by a fitting through the hull or transom,** the sterndrive height will not cause cooling water aeration.

**IMPORTANT:** Damage to MerCruiser products caused by too high of an installed height will not be covered by MerCruiser warranty.

## Finding Crankshaft Vertical Centerline

### SINGLE ENGINE

Locate and mark vertical centerline on transom.

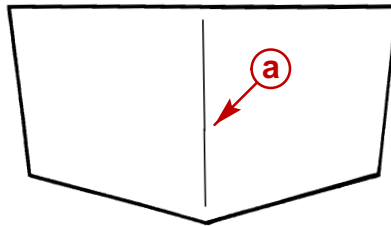


71620

**a** - Vertical Centerline

### DUAL ENGINE

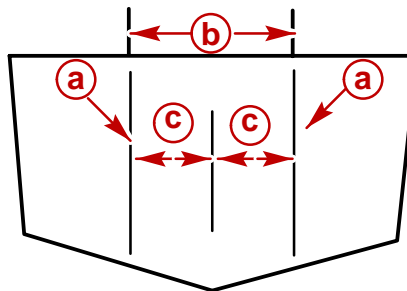
1. Locate and mark boat vertical centerline (a) on transom.



71620

**a** - Vertical Centerline

2. Locate and mark crankshaft vertical centerlines (a) on transom.



22033

- a** - Draw Crankshaft Vertical Centerline through Desired Mounting Locations
- b** - Minimum Distance between Crankshaft Vertical Centerlines
- c** - Crankshaft Vertical Centerlines Must Be an Equal Distance from Boat Vertical Centerline

Minimum Distance Between Crankshaft Vertical Centerlines (Dual Side-By-Side) Chart	
Model	Measurement [ in. (mm) ]
D7.3L D-Tronic and D7.3L D-Tronic LD	36-1/2 (927)

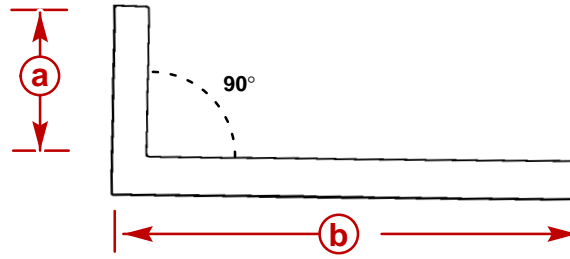


## Finding Crankshaft Horizontal Centerline (“X” Dimension)

“X” Dimension can be measured by the “90° Tool Method” or by the “Tape Measure Method.”

### 90° TOOL METHOD

1. Construct 90° tool.



71621

- a** - Dimension from Chart Below
- b** - Measurement: 4 ft. (1.2 m)

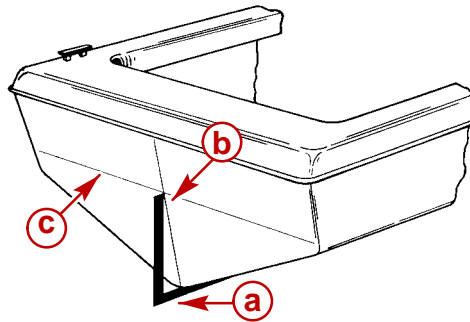
**To Lower Drive Unit** - Subtract from dimension “a”.

**To Raise Drive Unit** - Add to dimension “a”.

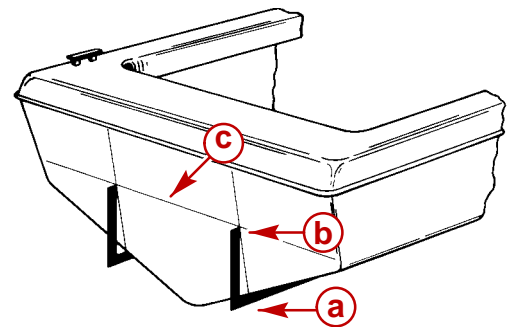
90° TOOL VERTICAL DIMENSION CHART	
Sterndrive Unit	Location
Bravo One/Two/Three	13-9/16 in. (345mm)

**IMPORTANT:** This dimension should only be raised or lowered after proper testing.

2. Determine “X” Dimension location of crankshaft centerline(s).



71622



71623

#### Single Engine

- a** - Place 90° Tool Along Boat Bottom at Vertical Centerline
- b** - Point at Which Top of Tool Contacts Transom on Vertical Centerline is Crankshaft Horizontal Centerline.
- c** - Draw a Line Perpendicular to Vertical Centerline at Crankshaft Horizontal Centerline.

#### Dual Engine

**TAPE MEASURE METHOD**

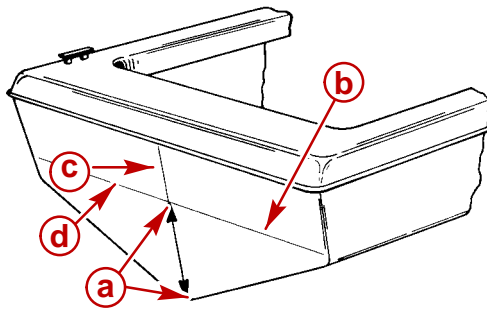
Transom angle must be known, then measure "X" Dimension with tape measure.

1. Determine "X" Dimension from the following chart.

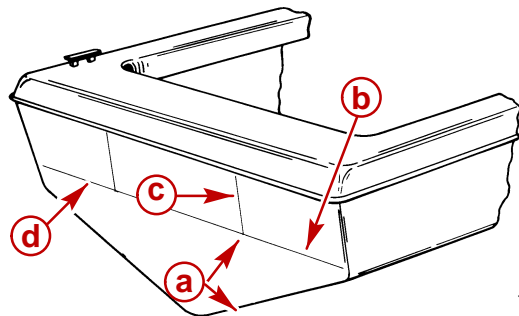
**Tape Measure Method Chart**

Model	Bravo One / Two / Three
<b>Transom Angle</b>	<b>This dimension should only be raised or lowered after proper testing.</b>
16°	14-5/16 in. (364 mm)
15°	14-1/4 in. (362 mm)
14°	14-3/16 in. (360 mm)
13°	14-1/8 in. (359 mm)
12°	14-1/16 in. (357 mm)
11°	14 in. (356 mm)
10°	13-15/16 (354 mm)

2. Measure and layout horizontal centerlines as shown.



71622



71623

**Single Engine****Dual Engine**

- a** - "X" Dimension (from Chart) that Corresponds to Transom Angle - Measure Up from Boat Bottom with Tape Measure
- b** - Crankshaft Horizontal Centerline
- c** - Vertical Centerline
- d** - Draw a Line Perpendicular to Vertical Centerline at Crankshaft Horizontal Centerline

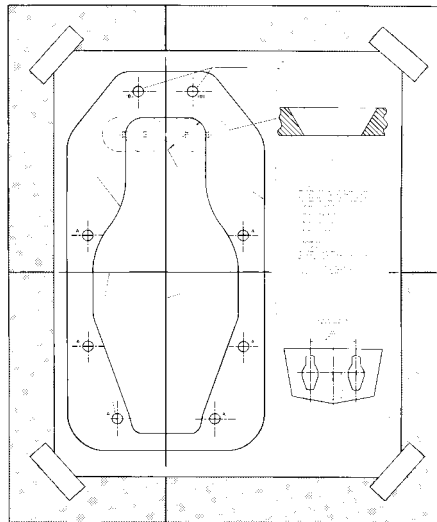
# Cutting Transom

Transom cutout can be made by either using the Template [shipped with transom assembly] or the Transom Drilling Fixture Kit (purchased separately).

Follow instructions indicated on template or provided with drilling fixture.

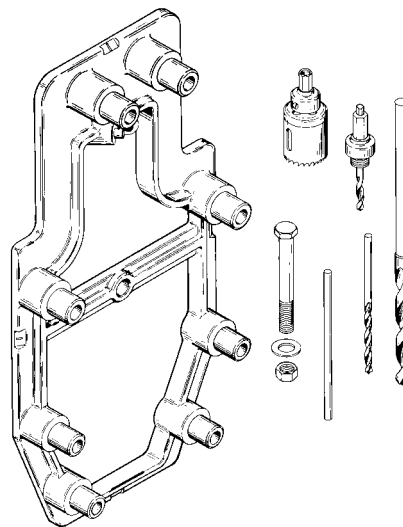
**IMPORTANT: Read and observe the following information:**

- Be certain that centerlines on either the template or transom drilling fixture align with lines previously marked on transom.
- Be sure to drill 1/4 in. pilot holes (for hole saw guide) at a 60° angle and to cut on the line when making transom cutout. If cutout is made incorrectly, drive unit steering lever may contact transom, thus limiting steering travel.
- Seal inside edge of transom cutout opening with a suitable sealant to prevent water absorption and deterioration of transom.



50017

**Transom Cutout Template**



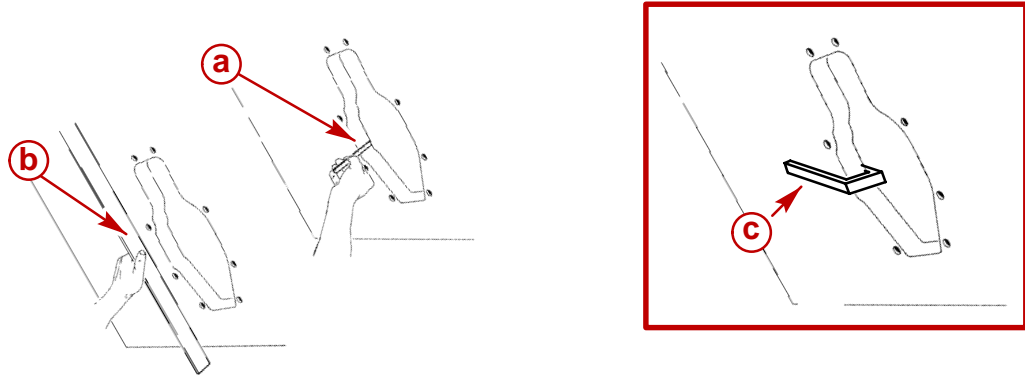
22056

**Transom Drilling Fixture Kit**

## Checking Transom Thickness

Ensure transom surface thickness and flatness conform to minimums specified in "Installation Requirements" listed previously.

**NOTE:** Transom must be between 2" (51 mm) and 2-1/4" (57 mm) a distance of 8" (203 mm) to either side of the vertical centerline.



- a** - Measuring Thickness
- b** - Measuring Flatness
- c** - Suitable Mandrel To Check For Uniform Transom Thickness.

# Installing Transom Assembly

## Gimbal Housing

1. Carefully remove transom assembly from shipping carton.
2. Remove and read all tags which are attached to transom assembly.

**IMPORTANT: Read and observe the following regarding your engine and the thru-propeller exhaust system:**

- With any application, installation of an exhaust tube will increase exhaust noise.
- With Bravo One, Bravo Two and Bravo Three Drive Models the exhaust bellows must be removed and an exhaust tube **MUST BE INSTALLED**.

**NOTE:** Exhaust tube parts (Quicksilver Part Number 78458A1) are provided with a Bravo Three Drive. They are located in the drive unit box.

3. Install exhaust tube on gimbal housing as follows:
  - a. Remove and discard clamps and exhaust bellows.

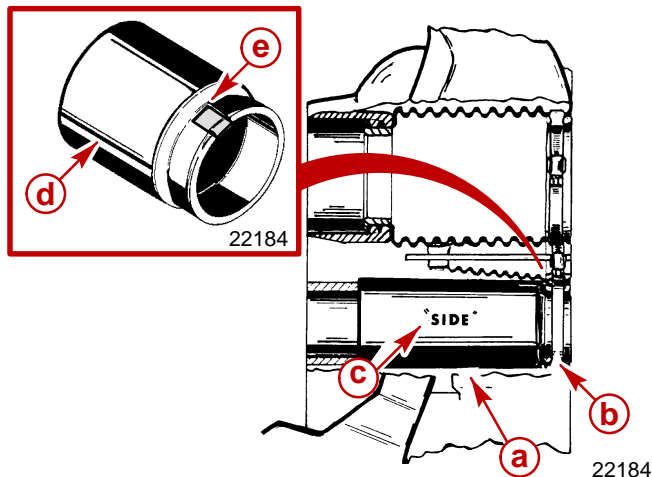
### CAUTION

Exhaust tube clamp may corrode if grounding clip is not installed.

- b. Install grounding clip on tube.

**NOTE:** Bellows adhesive is not used when installing an exhaust tube.

- c. Position tube so that "SIDE" markings on tube are facing toward the right and left sides.
  - d. Install clamp.
  - e. Tighten clamp. Torque to 35 lb-in. (4 Nm).



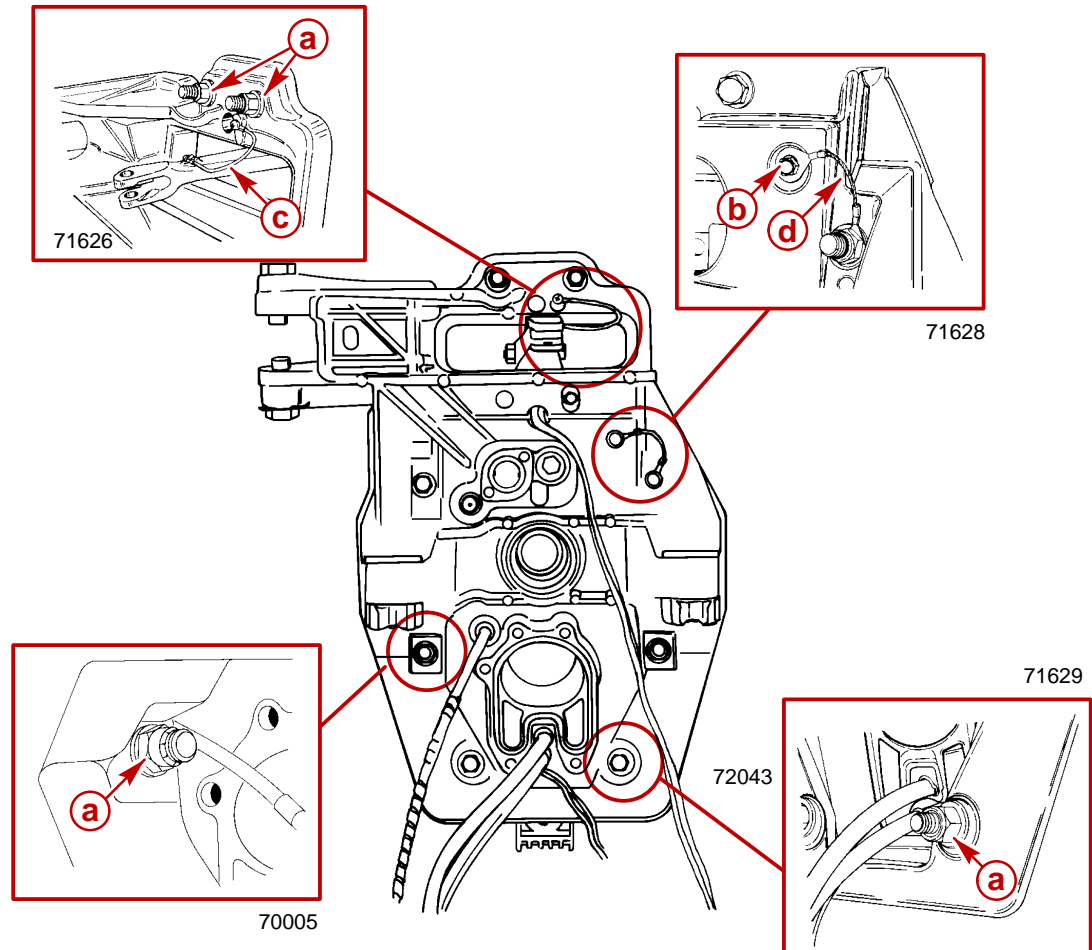
- a** - Exhaust Tube
- b** - Clamp
- c** - "Side" Marking
- d** - Exhaust Tube
- e** - Grounding Clip

## Inner Transom Plate

1. Insert wires, hoses and shift cable through appropriate openings in inner transom plate.
2. Position gimbal housing on transom and hold in place.

**NOTE:** When tightening transom assembly fasteners in the following step, start in the center and, using a circular pattern, move outward. Tighten in small increments and go around the pattern several times until the proper torque is achieved.

**IMPORTANT:** Steering lever continuity circuit wire must be positioned as shown to avoid stressing wire when steering lever moves.



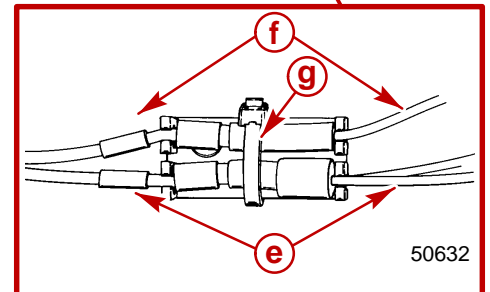
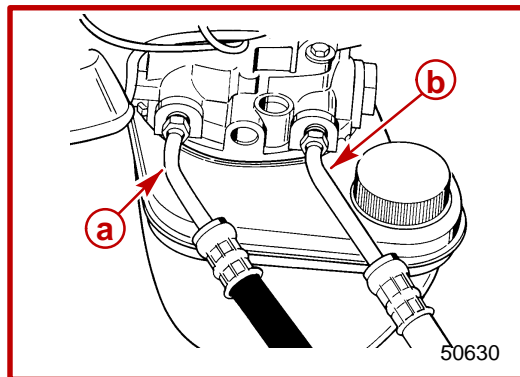
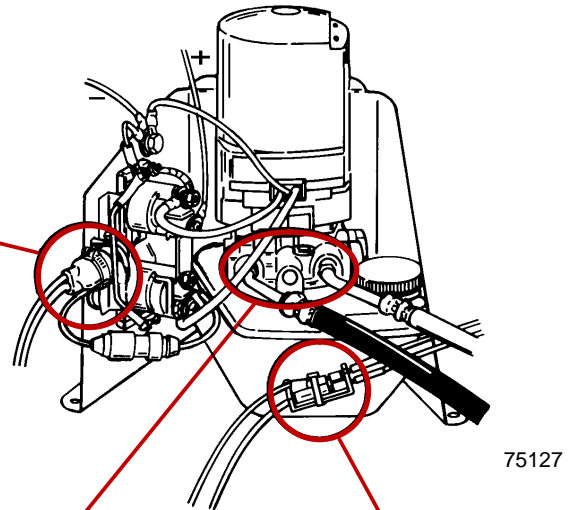
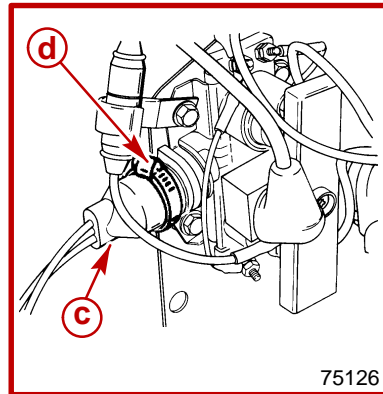
- a** - Locknuts and Flat Washers (8)
- b** - Bolt
- c** - Steering Lever Continuity Wire
- d** - Transom Plate Continuity Wire

3. Secure transom assembly with hardware as shown. Torque to 20-25 lb-ft (27-34 Nm).

## Power Trim Pump

1. Mount pump in desired location.

**IMPORTANT: Make hydraulic connections as quickly as possible to prevent oil from leaking out of system. Be careful not to cross-thread or overtighten hose fittings.**



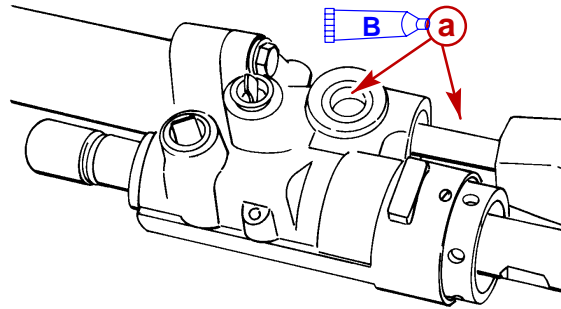
- a** - Black Hose (UP Circuit)
- b** - Gray Hose (DOWN Circuit)
- c** - Harness Connector
- d** - Clamp
- e** - Trim Limit Switch Wire (with Blue Sleeve) - to BLUE/WHITE Harness Wire
- f** - Trim Limit Switch Wire (with Purple Sleeve) to PURPLE/WHITE Harness Wire
- g** - Wire Retainer and Sta-Strap

2. Connect hydraulic hoses to trim pump. Torque fittings to 100-150 lb-in. (11-16 Nm).
3. Connect power trim pump control harness to trim pump. Secure with clamp.
4. Connect trim limit switch wires and secure with wire retainer and sta-strap.

## Steering System

**NOTE: For Dual Installations, Power steering unit can be mounted on port or starboard transom assembly. Measure exact distance between power package centerlines. Select a tie bar from Quicksilver Accessory Guide. Refer to tie bar installation instructions before proceeding.**

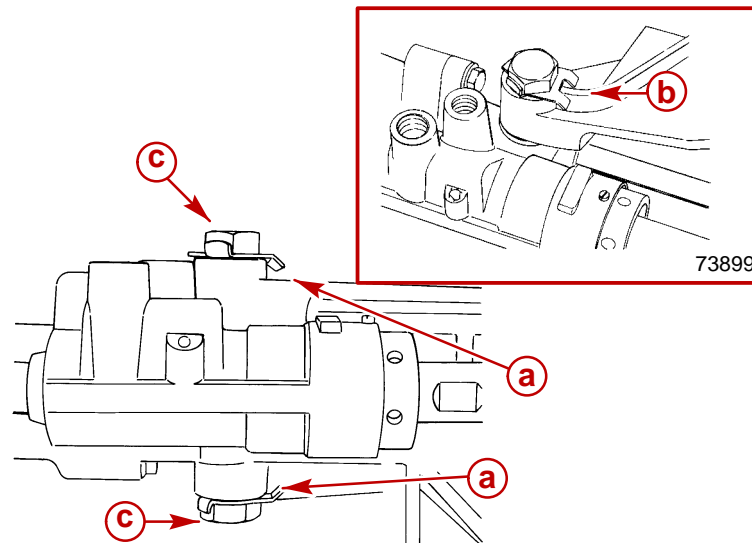
1. Inspect bushings for debris. Lubricate bushings with Special Lubricant 101.



73898

- a - Bushings
- b - Special Lubricant 101

2. Remove upper and lower pivot bolts and ensure threads are well lubricated with Special Lubricant 101.
3. Install steering assembly as follows:
  - a. Position steering assembly so that pivot bolts will enter bushings in pivot block or power steering control valve.
  - b. Install upper and lower pivot bolts along with tab washers. Ensure that tab washer tangs straddle the ridge on inner transom plate.
  - c. Turn pivot bolts all the way in by hand to ensure proper alignment.
  - d. Ensure steering assembly pivots freely.



73899

- a - Tab Washers
- b - Ridge
- c - Pivot Bolts

73900

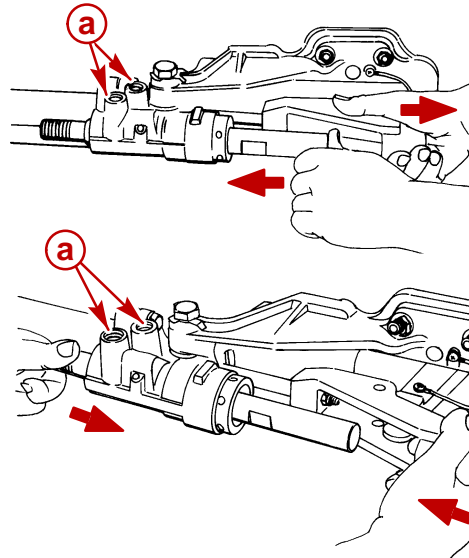


4. Torque pivot bolts to 25 lb-ft (34 Nm). Bend washer tabs against corresponding flats on bolt heads.

**⚠ CAUTION**

**MOVING THE CONTROL VALVE RAM with the hoses disconnected will expel fluid from the ports. Wear eye protection.**

5. The cylinder ram may be stiff and difficult to move when you attempt to pull it out or push it in for installation. First move the spool assembly in the direction(s) shown below.

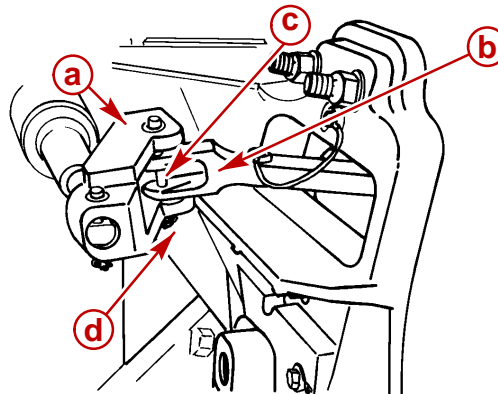


74145

74144

**a** - Ports

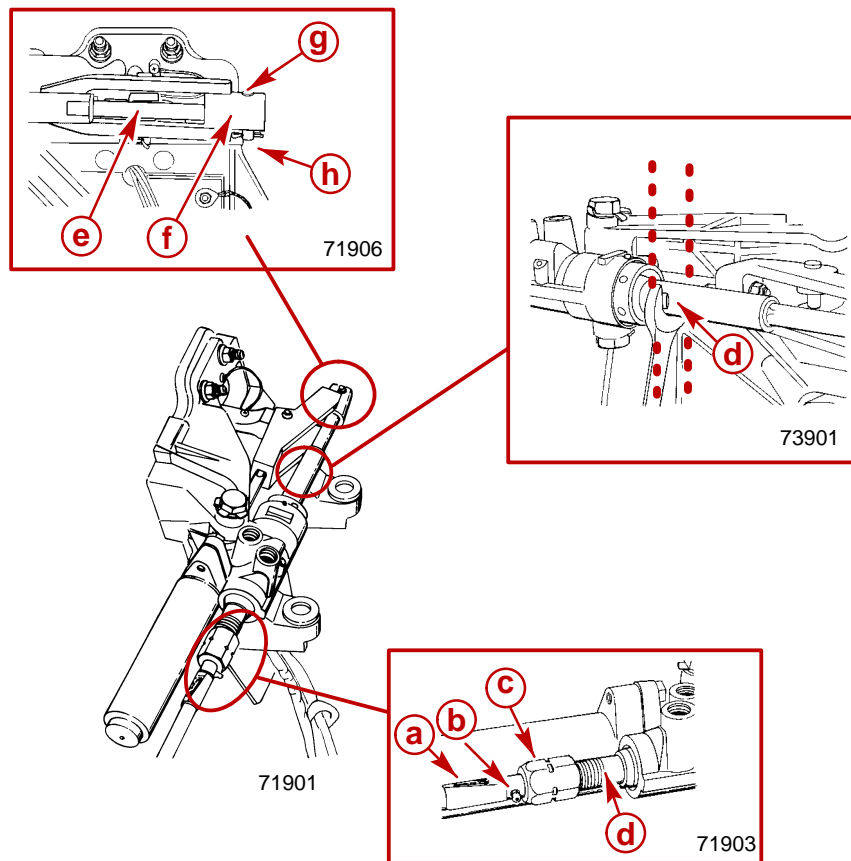
6. Connect clevis to steering lever. Lubricate clevis pin with Special Lubricant 101. Be sure to spread both ends of the cotter pin.



71904

**a** - Clevis  
**b** - Steering Lever  
**c** - Clevis Pin  
**d** - Cotter Pin

7. Connect steering cable as follows:
  - a. Remove shipping cap from both ends of steering cable guide tube.
  - b. Coat steering cable end with a liberal amount of Special Lubricant 101.
  - c. Install steering cable and secure with hardware as shown.



- a - Steering Cable
- b - Grease Fitting
- c - Cable Coupler Nut
- d - Cable Guide Tube
- e - Steering Cable End
- f - Clevis
- g - Clevis Pin
- h - Cotter Pin

**IMPORTANT: Slight feedback in the steering system could be encountered if the cable guide tube flat surfaces are not positioned vertically.**

- d. Using a suitable wrench hold the flat surfaces on the cable guide tube in the vertical position. Torque coupler nut to 35 lb-ft (47 Nm). **Be certain the flat surfaces are still aligned vertically after torque is applied to coupler nut.**

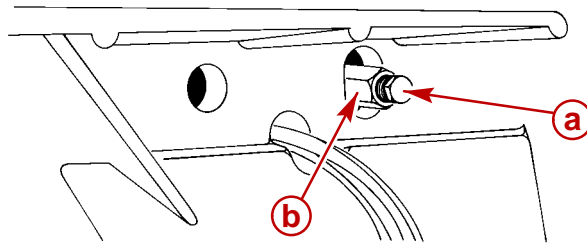
**⚠ CAUTION**

**Steering cable outer casing must be free to move back and forth for steering system to function properly. Do not fasten any items to steering cable.**

## Speedometer Pickup

**IMPORTANT: Do not disturb plug at speedometer fitting if no speedometer is to be fitted, or if an alternate speedometer pickup will be used.**

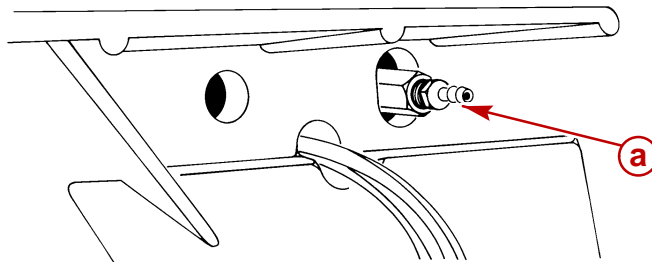
1. Remove plug from speedometer pickup tube fitting.



70037

- a** - Fitting Plug
- b** - Speedometer Pickup Tube Fitting

2. Apply Perfect Seal to threads of barb fitting. Install and torque to 10-15 lb. in. (1.1-1.7 N·m).



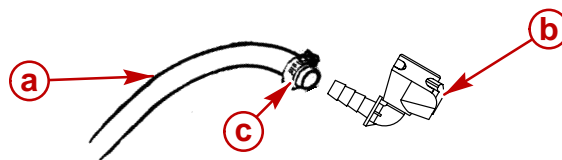
70015

- a** - Barb Fitting

3. Connect hose from speedometer to barb fitting. Secure hose with cable tie.
4. Mount speedometer hose to transom with hose clip and screw. Hose must not come in contact with steering system components or the engine coupler and drive shaft.

## Drive Unit Gear Lube Monitor Hose

1. Connect gear lube monitor hose to 90° hose fitting. Secure with hose clamp.



75874

- a** - Hose
- b** - Fitting
- c** - Clamp

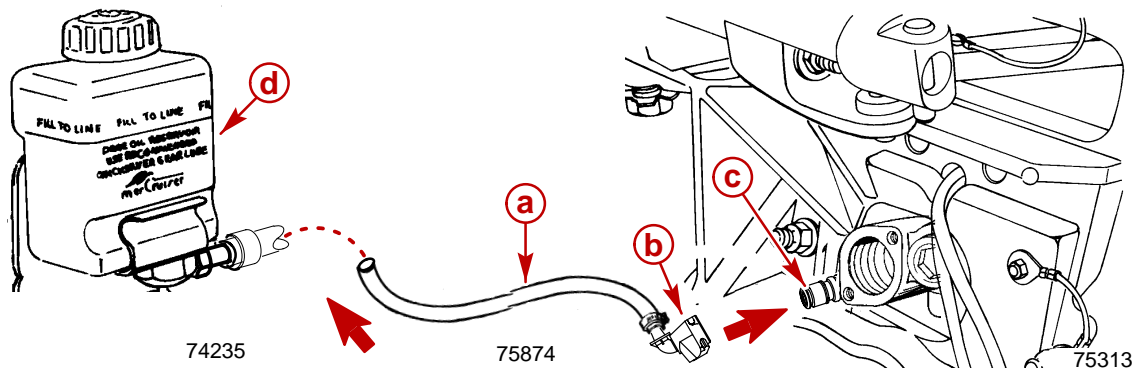
2. Connect 90° hose fitting and hose to gimbal housing fitting.

### ⚠ CAUTION

**Avoid drive unit damage. Ensure gear lube monitor hose is not kinked when connected. If hose is kinked, monitor will not function properly and damage to drive unit could occur.**

3. Route hose to monitor bottle mounted on engine and cut off excess hose.

**IMPORTANT: Avoid using excessive hose when routing to gear lube monitor. Hose should be routed directly, in as straight a line as possible, to avoid low spots (traps) in the system.**



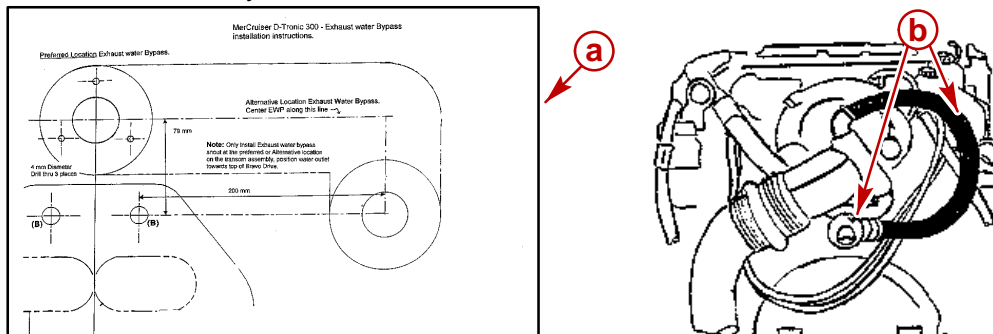
- a - Hose
- b - 90° Hose Fitting
- c - Gimbal Housing Fitting
- d - Gear Lube Monitor

**IMPORTANT: Hose must not come in contact with steering system components or the engine coupler and drive shaft.**

## Exhaust Water Bypass

MerCruiser D7.3L D-Tronic Models are equipped with an exhaust water bypass system. The purpose of this exhaust water bypass system is to calibrate the exhaust back pressure and to provide additional cooling to the drive assembly.

The exhaust water bypass outlet (provided with instructions for installation) must be installed within the Preferred or Alternative Area as indicated on the template. Refer to the full scale template (provided). Ensure that the water outlet snout is positioned in such a way that the water will flow over the top (preferred location) or upper side (alternative location) of the Drive Assembly.



- a - Template
- b - Preferred Exhaust Water Bypass Routing

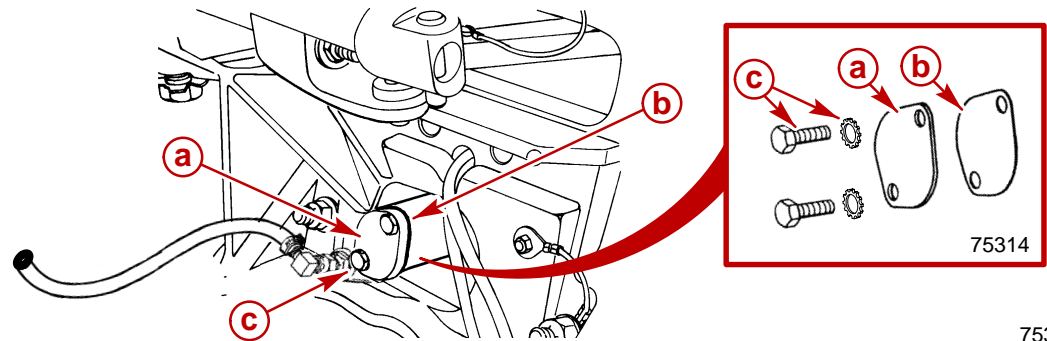
1. Cut template outline as required. Position on transom.
2. Drill or cut hole as indicated on template.
3. Use silicone or other Marine sealer and install exhaust water outlet on boat transom.
4. Exhaust outlet on transom must be grounded to inner transom plate assembly. Install ground strap provided.
5. Cut hose to required length. Install between exhaust elbow fitting and exhaust water bypass outlet. Use double clamps on hose connections.

## Drive Unit Seawater Routing

Seawater for engine cooling is supplied through a separate seawater pickup, not through the drive unit. Therefore, it is necessary to block the drive unit seawater passage and to cut the water hose that is located between the bell housing and the gimbal housing. This allows water to continue to circulate through the drive unit for cooling.

### BLOCK-OFF PLATE

1. Install block-off plate with gasket. Torque screws with star washers to 45 lb-in. (5 Nm).



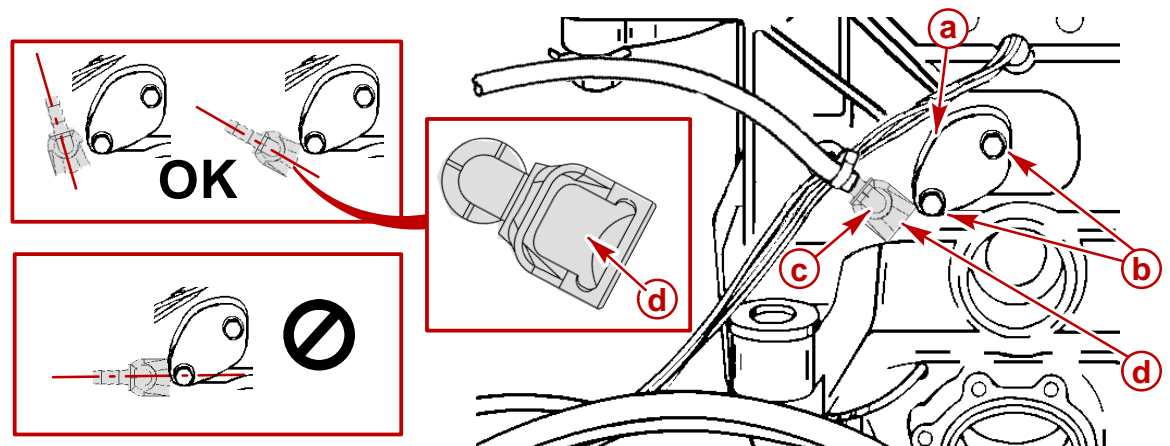
- a - Plate
- b - Gasket
- c - Screw And Washer

75313

### ⚠ CAUTION

**Avoid drive unit damage. Quick release button on gear lube monitor 90° hose fitting may not lock on gimbal housing if touching or depressed by block-off plate. Ensure quick release button does not contact block-off plate. Failure to do so could result in a loose 90° fitting causing a loss of gear lube and damage to drive unit.**

2. Position quick release button on hose fitting away from block-off plate. Release button must not contact block-off plate.



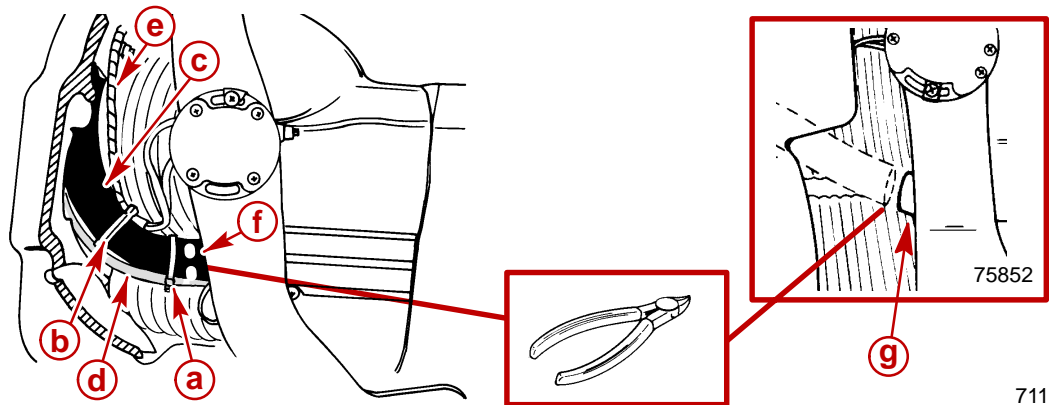
- a - Water Inlet Fitting
- b - Star Washer and Screw
- c - 90° Hose Fitting
- d - Quick Release Button

71998

## SEAWATER HOSE

**NOTE:** The trim limit switch wires and speedometer hose are attached to the water hose. Prior to cutting the hose, move the wires and speedometer hose to avoid cutting them when cutting water hose. The existing sta-strap and clip can be reused if they are moved out of the way while cutting the water hose.

1. Move existing sta-strap and clip. Cut the water hose in the area shown. Loosen clamp and remove short piece of hose remaining on gimbal housing.
2. Secure the trim limit switch wires and speedometer hose to remaining hose piece on transom assembly.

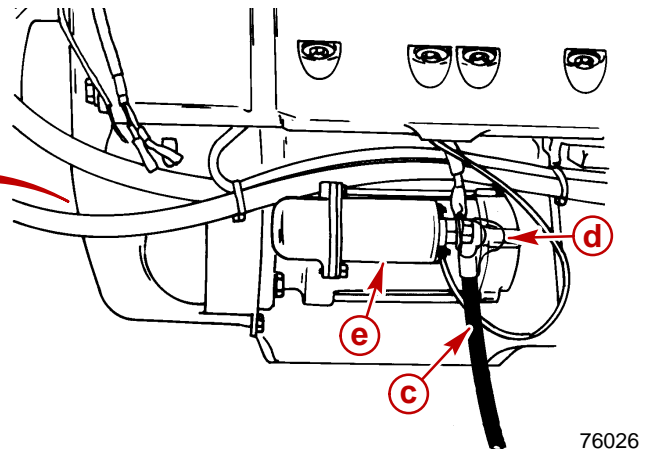
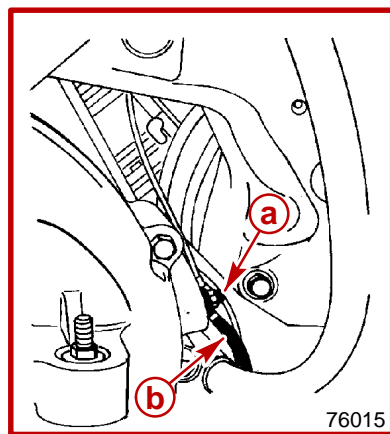


- a - Sta-Strap
- b - Clip
- c - Seawater Inlet Hose
- d - Speedometer Hose
- e - Trim Limit Wire Harness
- f - Cut Water Hose Here
- g - Hose Piece – To Be Removed

# Engine Installation

## Engine Preparation

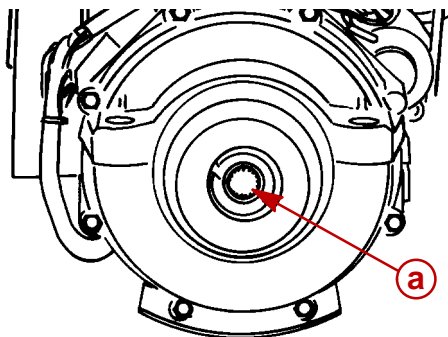
1. Remove and read all tags attached to engine.
2. Remove all hardware that secures engine to shipping container.
3. Loosen fasteners and remove exhaust pipe and exhaust hose from pallet.
4. Connect battery cables to engine. Be sure to observe the following:
  - a. Make sure that grounding stud and starter solenoid terminal are free of paint or any other material that could cause a poor electrical connection.
  - b. After battery cables are connected, apply a thin coat of Liquid Neoprene to the terminals.
  - c. Be sure to slide rubber boot over positive (+) terminal after making connection.
5. Drape battery cables over top of engine to prevent them from getting in the way during installation.



### Typical

- a** - Grounding Stud (Starboard Side - Port Similar)
- b** - Negative (-) Battery Cable
- c** - Positive (+) Battery Cable
- d** - Rubber Boot (Slide Over Terminal)
- e** - Starter Solenoid

6. Remove shipping plug from coupler and lubricate splines with Engine Coupler Spline Grease.

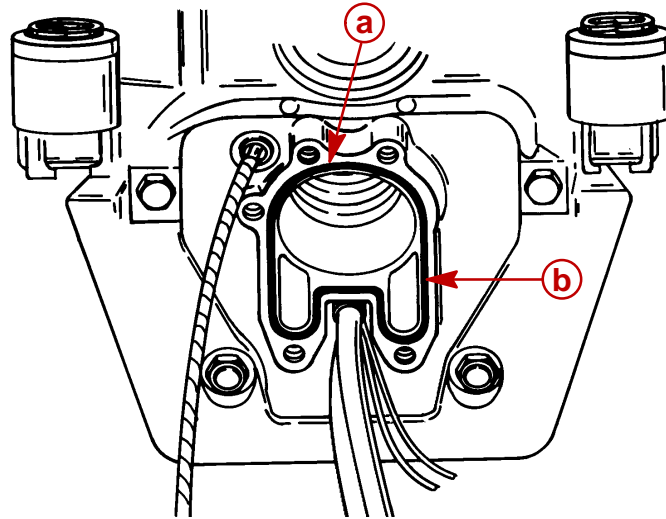


### Typical

- a** - Shipping Plug

## Transom Preparation

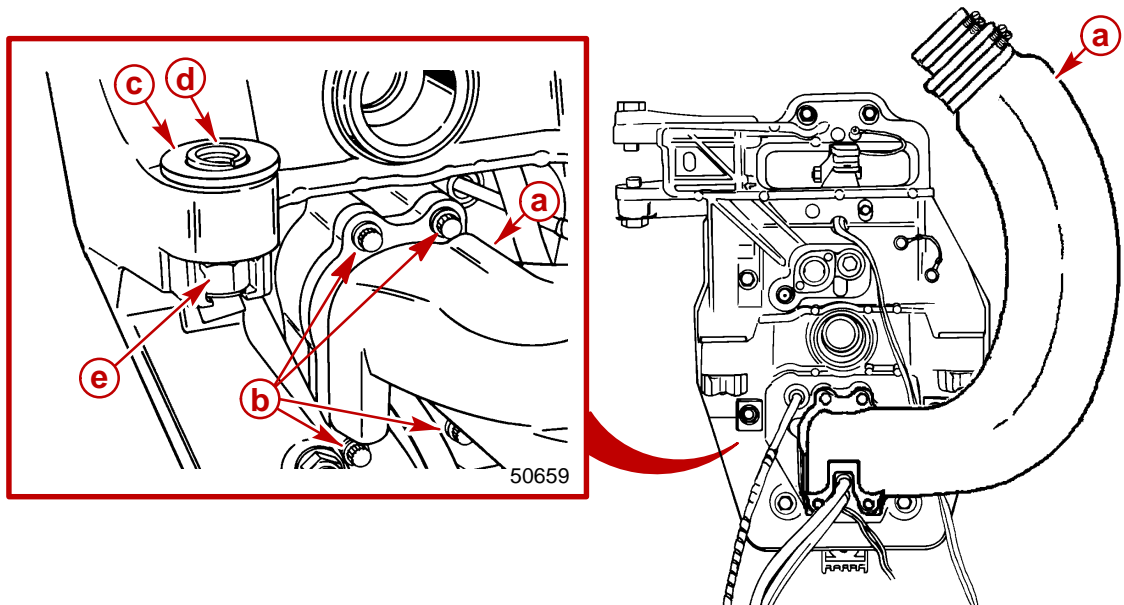
**IMPORTANT:** Exhaust pipe and gimbal housing mating surfaces must be clean and free of nicks and scratches, and O-ring must be properly seated in groove, or water and exhaust may leak into boat.



22059

- a** - Gimbal Housing Mating Surface
- b** - O-ring

1. Install exhaust pipe assembly as shown, using four (4) bolts and thick lockwashers. Torque bolts to 20-25 lb-ft (27-34 Nm).
2. Position rear engine mount attaching hardware on inner transom plate mounts as shown.



- a** - Exhaust Pipe
- b** - Bolts and Thick Lockwashers (4)
- c** - Fiber Washers
- d** - Double-Wound Lockwashers
- e** - Locknuts

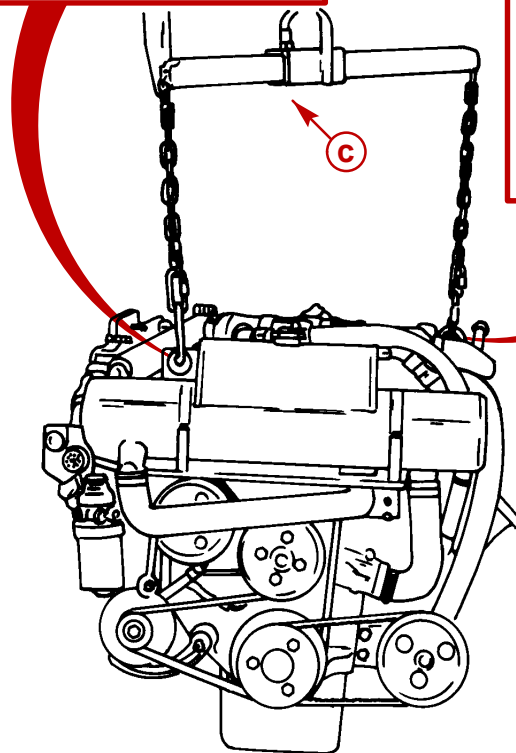
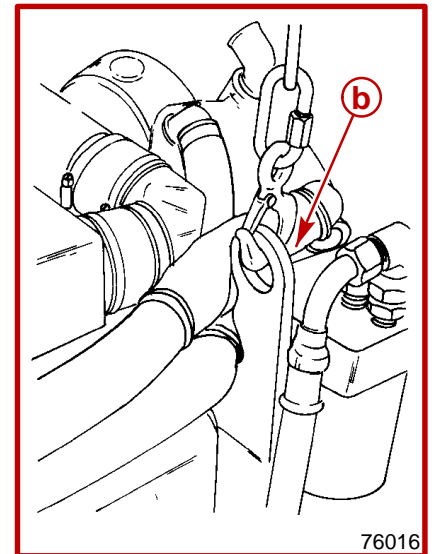
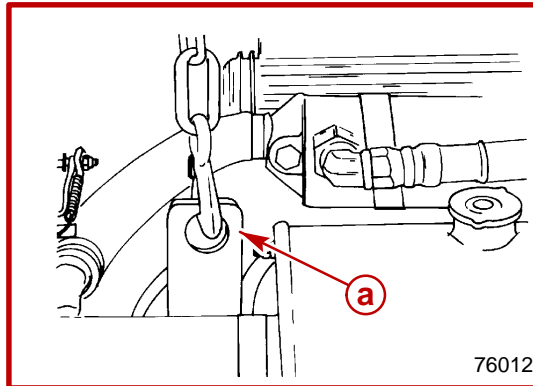


## Installing Engine / Alignment

1. Attach a suitable sling to lifting eyes on engine and adjust so that engine is level when suspended.
2. Lift engine into position (in boat), using an overhead hoist.

### ⚠ CAUTION

When lowering engine into position **DO NOT** set engine on shift cable. Shift cable outer casing can be crushed causing difficult or improper shifting.



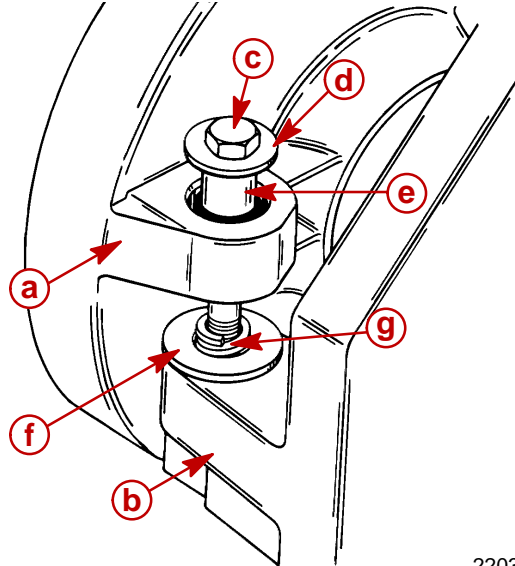
- a** - Front Engine Lifting Eye
- b** - Rear Engine Lifting Eye
- c** - Suitable Sling

76021

- Align rear engine mounts with inner transom plate mounts. Set engine onto front mounts and inner transom plate mounts, while simultaneously aligning exhaust elbow with exhaust tube. (Do not relieve hoist tension.)

**IMPORTANT: Engine attaching hardware must be installed in sequence shown.**

- Install both rear engine mounting bolts and hardware as shown. Torque to 35-40 lb-ft (47-54 Nm).



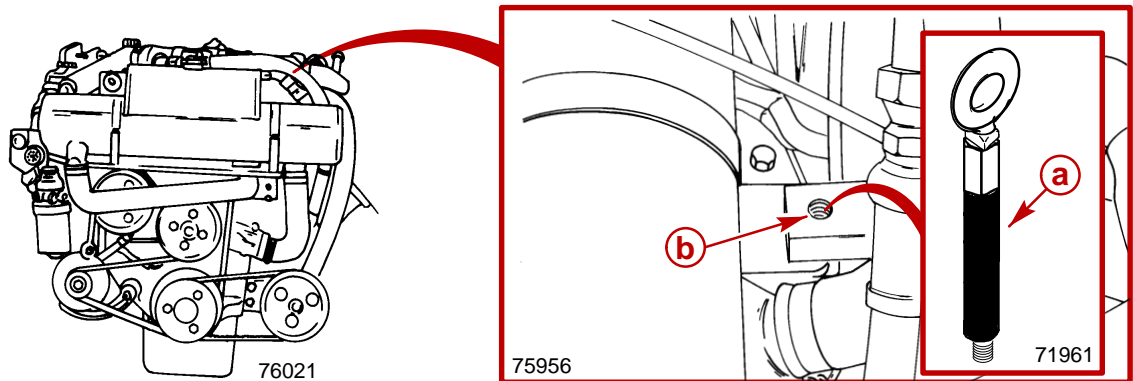
22032

- a - Rear Engine Mount
- b - Inner Transom Plate Mount
- c - Bolt
- d - Washer
- e - Spacer
- f - Fiber Washer
- g - Double-Wound Lockwasher

- Relieve hoist tension and disconnect sling from engine lifting eyes.

**NOTE:** Installing Engine Lifting Eye Tool shown will help equalize load on hoist during alignment procedure.

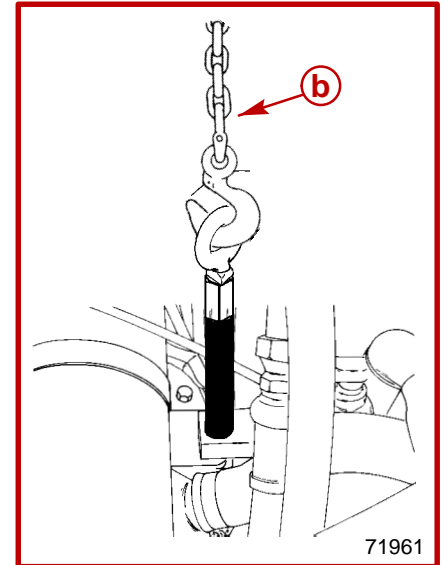
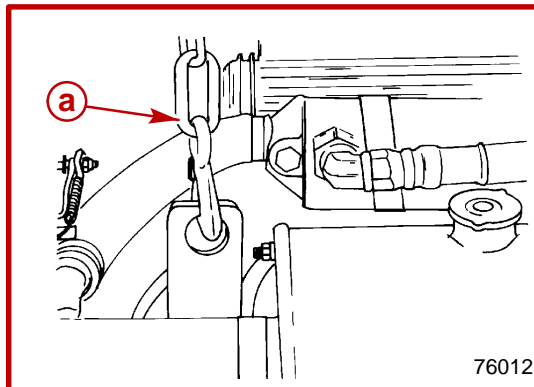
- Install lifting eye tool into metal bar with threaded hole near port end of engine oil cooler.



- a - Lifting Eye Tool
- b - Threaded Hole

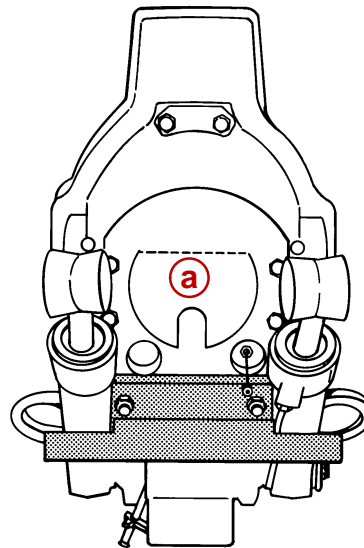
7. Attach chain and hooks from suitable engine sling to starboard front lifting eye and port mounted Engine Lifting Eye Tool. Attach a suitable hoist to this sling.

**NOTE:** Installing sling between specified lifting eyes will help equalize load on hoist during alignment procedure.



- a** - Engine Sling In Starboard Lifting Eye
- b** - Engine Sling In Port Mounted Engine Lifting Eye Tool

8. Align engine as follows:
  - a. Fold out perforated area in bell housing dust cover.



- a** - Dust Cover

22027

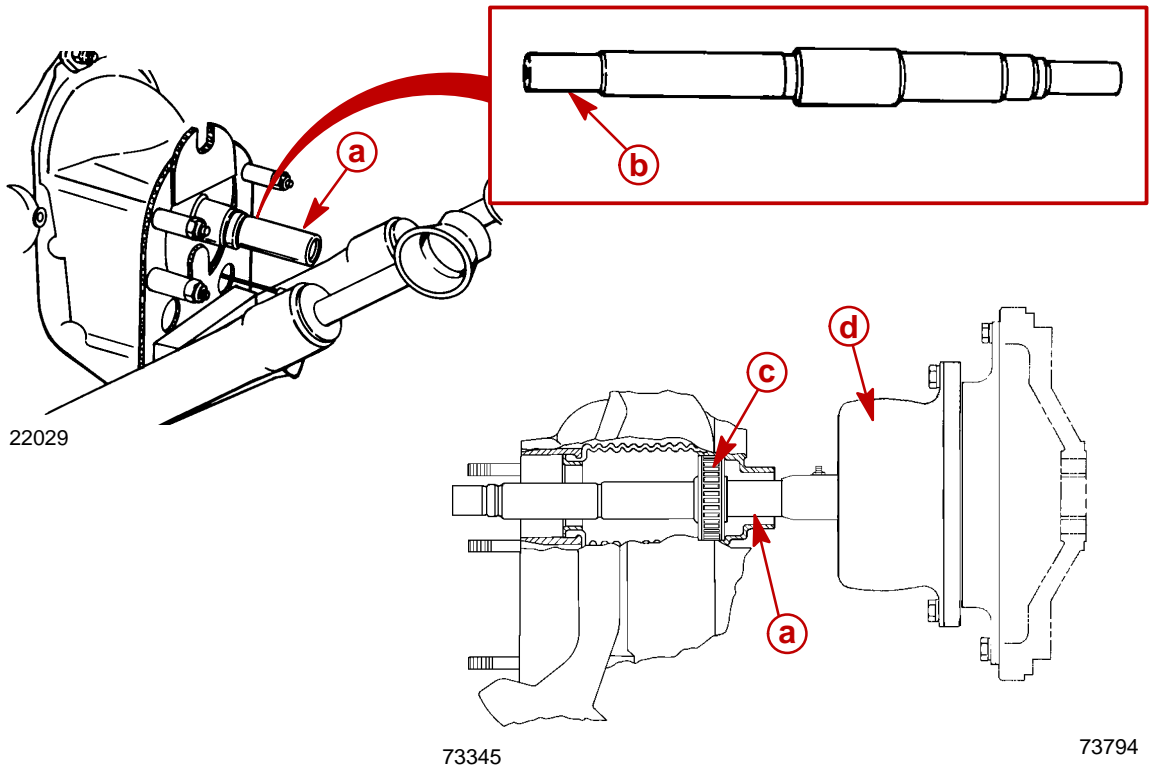
**⚠ CAUTION**

**DO NOT** use an alignment tool from another manufacturer. Alignment tools other than Quicksilver Alignment Tool may cause improper alignment and damage to gimbal bearing and/or engine coupler.

**⚠ CAUTION**

**To avoid damage to gimbal bearing, engine coupler, or alignment tool:**

- **DO NOT** attempt to force alignment tool!
- **DO NOT** raise or lower engine with alignment tool inserted (or partially inserted) in gimbal bearing or engine coupler.
  - b. Attempt to insert the solid end of the alignment tool thru the gimbal bearing and into the engine coupler splines.
  - c. If the tool does not fit, remove it and carefully raise or lower the front end of the engine, as necessary, and attempt to insert the alignment tool.
  - d. Repeat step "c" until the alignment tool installs easily (**SLIDES FREELY WITH TWO FINGERS**) all the way into and out of engine coupler splines. Do not check by turning.

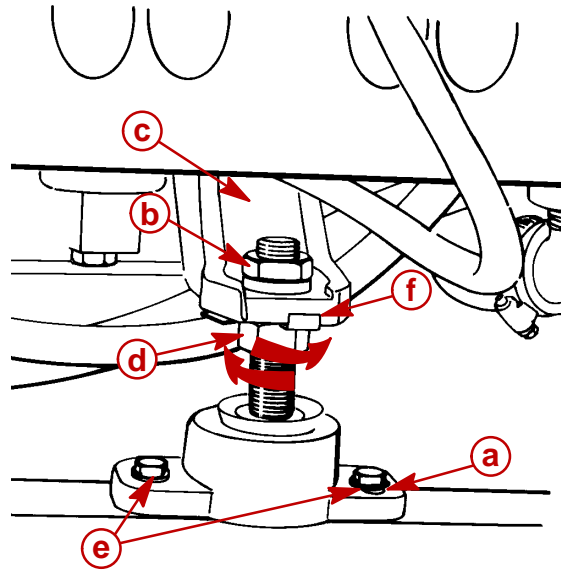


- a** - Alignment Tool (Use Only Recommended Alignment Tool)
- b** - Insert This End Of Alignment Tool Through Gimbal Housing Assembly
- c** - Gimbal Bearing
- d** - Engine Coupler

**IMPORTANT:** Finished boat stringer must position engine so that a minimum mount adjustment exists after front mount is adjusted down to stringer. This allows for future adjustments.

9. Adjust front mount assembly until it touches stringer.
10. Recheck alignment with alignment tool. Tool must enter coupler splines freely. If not, readjust front mounts.
11. When alignment is correct, tighten locknut or nut with lockwasher on each mount securely.
12. Bend tab washer down against flat on adjusting nut.

**NOTE:** Coat both nuts and threaded portion of mount with Perfect Seal if used in a saltwater environment to reduce rust and ease of serviceability.



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### Typical

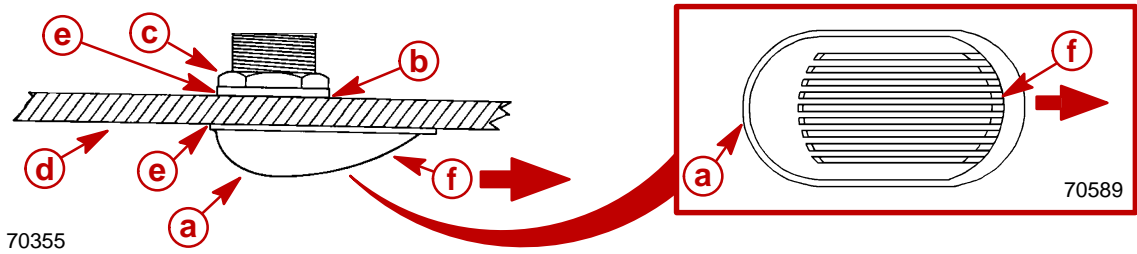
- a** - Slotted Hole Toward Front of Engine
- b** - Lock Nut
- c** - Bracket
- d** - Mount Adjustment Nut – turn left to lower, right to raise
- e** - Lag Screws (or Bolts)
- f** - Tab Washer

13. Remove alignment tool and fold bell housing dust cover flap back into place and tape shut for boat shipment.

# Engine Connections

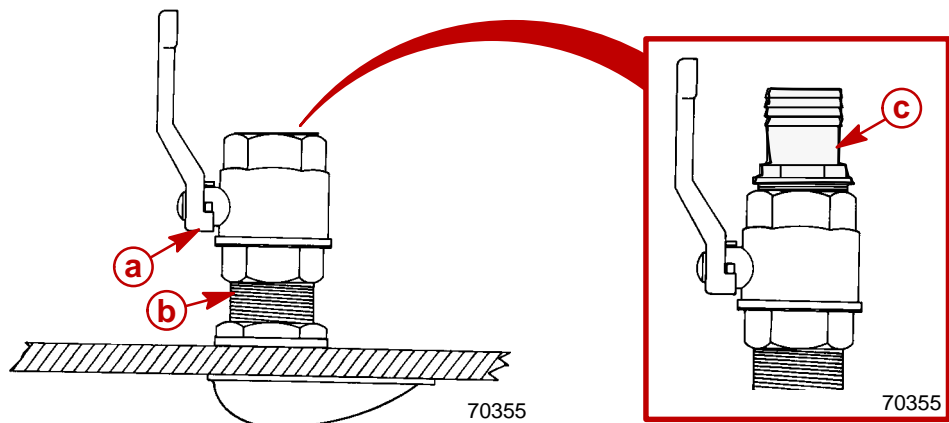
## Quicksilver Seawater Pickup and Seacock

1. Drill a 2 in. (50mm) hole thru hull in appropriate location (Refer to "Installation Requirements.>").
2. Apply marine caulking (sealer) to mounting surface on seawater pickup (thru-hull fitting) where hull contact will occur when installed.
3. Ensure slots in water pickup are **facing forward** and install water pickup. Position washer on fitting and install large nut. Tighten nut securely.



- a - Seawater Pickup (Thru-Hull Fitting)
- b - Washer
- c - Large Nut
- d - Hull of Boat
- e - Marine Caulking
- f - Slots Facing Forward (Toward Bow of Boat)

4. Install seacock on seawater pickup. Tighten securely.
5. Install 1-1/2 in. (38mm) hose connector on seacock. Tighten securely.



- a - Seacock
- b - Seawater Pickup (Thru-Hull Fitting)
- c - 1-1/2 in. (38mm) Hose Connector

**IMPORTANT: Seawater hose used must be wire reinforced to avoid collapsing hose when suction is created by seawater pump impeller.**

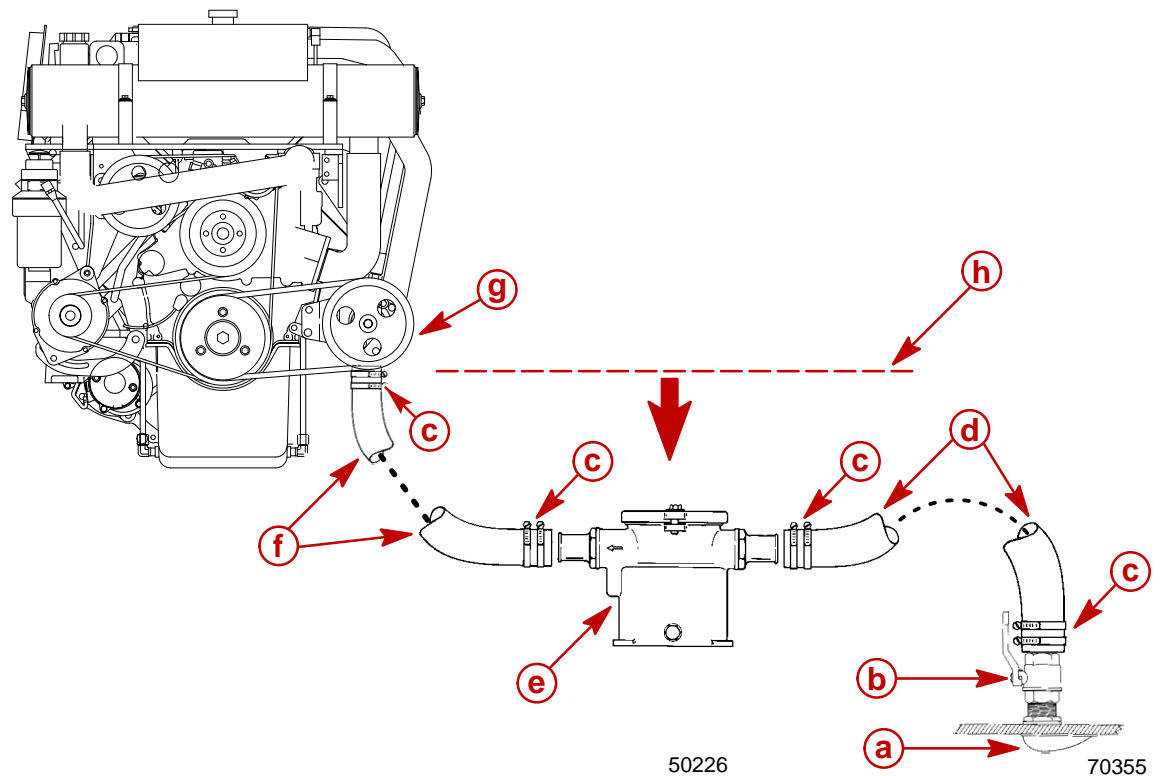
## Seawater Strainer

When using a seawater strainer other than Quicksilver Seawater Filter (Part Number 35-801763739) refer to manufacturer's instructions for installation, operation and maintenance.

Refer to the following when installing and connecting Quicksilver seawater strainer.

### IMPORTANT: Read and observe the following:

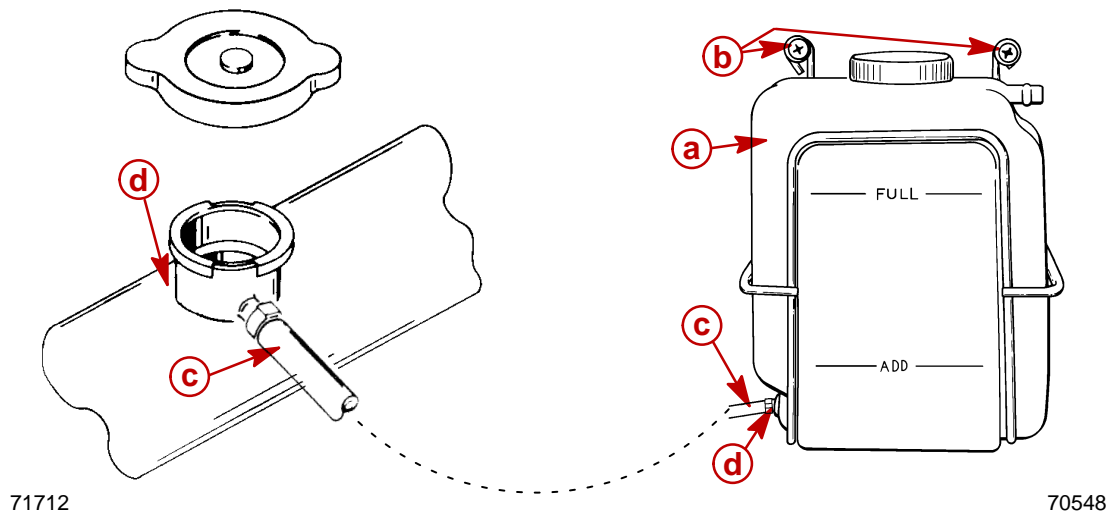
- **Mount the seawater strainer in a vibration free location.**
  - **Never mount the seawater strainer on the engine.**
  - **Hoses must not be kinked.**
  - **Hoses must not allowed to come in contact with hot or moving parts on the engine.**
  - **Seawater strainer must be mounted BELOW the level of the seawater pump.**
1. Mount seawater strainer as specified.
  2. Cut hoses to required length and make connections. Use double clamps on all hose connections.



- a** - Seawater Pickup (Thru Hull Pickup Shown)
- b** - Seacock
- c** - Double Hose Clamps
- d** - Hose from Thru Hull Pickup To Seawater Strainer
- e** - Seawater Strainer (Below Seawater Pump Level)
- f** - Hose from Seawater Strainer To Seawater Pump
- g** - Seawater Pump
- h** - Strainer Below This Level

## Closed Cooling Recovery Bottle

1. Connect plastic tubing (from kit) to bayonet fitting on heat exchanger. Secure with tubing clamp provided.
2. Select a mounting location for coolant recovery bottle and mounting bracket that meets all of the following:
  - a. Within limits of clear plastic tubing.
  - b. Below horizontal level of heat exchanger fill neck.
  - c. Accessible for observing coolant level and filling.
3. Mount coolant recovery bottle and mounting bracket in desired location, using two 3/4 in. long screws and flat washers.
4. Route plastic tubing to recovery bottle, making sure tubing is positioned away from any moving parts. Cut plastic tubing, as required, and connect to bottom connection on recovery bottle and secure with tubing clamp provided.
5. Fasten plastic tubing to boat, as necessary, with the 2 hose clips and 1/2 in. long screws provided.

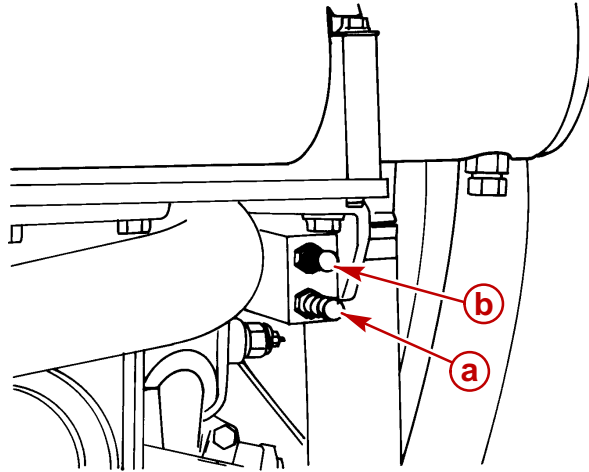


- a** - Recovery Bottle and Mounting Bracket
- b** - Screws and Flat Washers
- c** - Plastic Tubing
- d** - Tubing Clamp



## Fuel Lines

1. Connect flexible fuel line to fuel supply fitting. Secure with hose clamp.
2. Connect flexible fuel line to fuel return fitting. Secure with hose clamp.



- a** - Fuel Supply Fitting  
**b** - Fuel Return Fitting

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## Power Steering Hydraulic Hoses

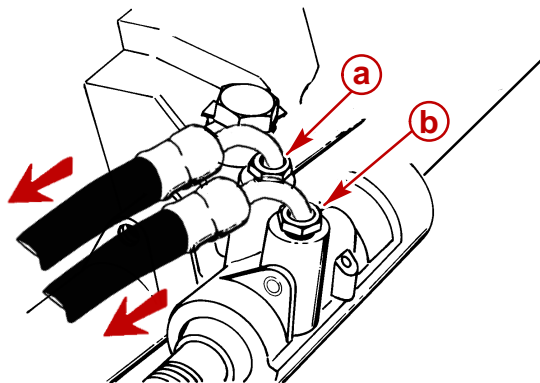
### ⚠ CAUTION

Route hoses exactly as shown below. This will help avoid stress on the hose fittings and will help avoid kinks in the hose.

1. Connect power steering hoses to control valve. Position hoses as shown.

**IMPORTANT:** Make hydraulic connections as quickly as possible to prevent oil leakage.

**IMPORTANT:** Be careful not to cross-thread or overtighten hose fittings.



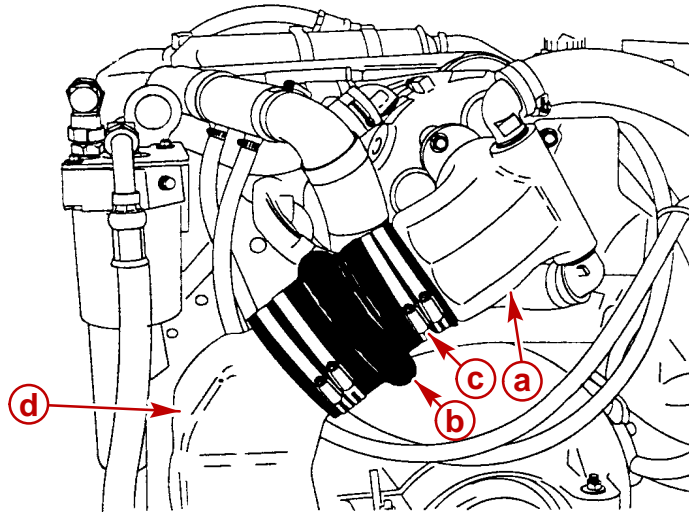
- a** - Rear Fitting (Pressure Hose)  
**b** - Front Fitting (Return Hose)

2. Torque fittings to 20 - 25 lb-ft (27 - 34 Nm).
3. Secure hoses to avoid contact with moving components.

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## Exhaust System

1. Tighten exhaust tube hose clamps securely.



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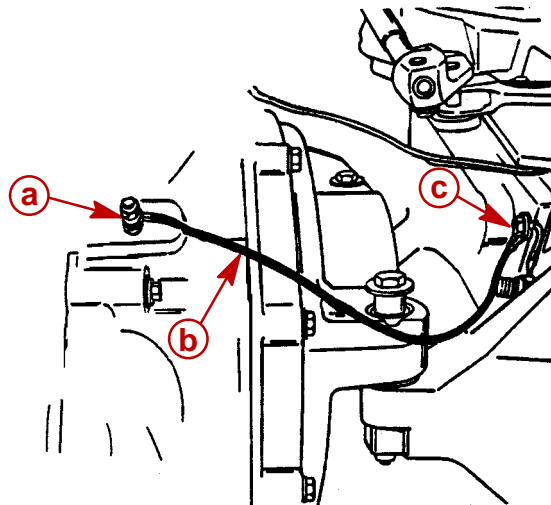
### Typical

- a** - Elbow
- b** - Tube
- c** - Hose Clamps (4)
- d** - Pipe

## Electrical Connections

### CONTINUITY CIRCUIT

1. Connect continuity circuit wire (supplied with engine package) from engine to transom assembly. Tighten inner transom plate screw securely.



74217

- a** - Flywheel Housing Screw / Stud
- b** - Continuity Circuit Wire
- c** - Inner Transom Plate Grounding Screw

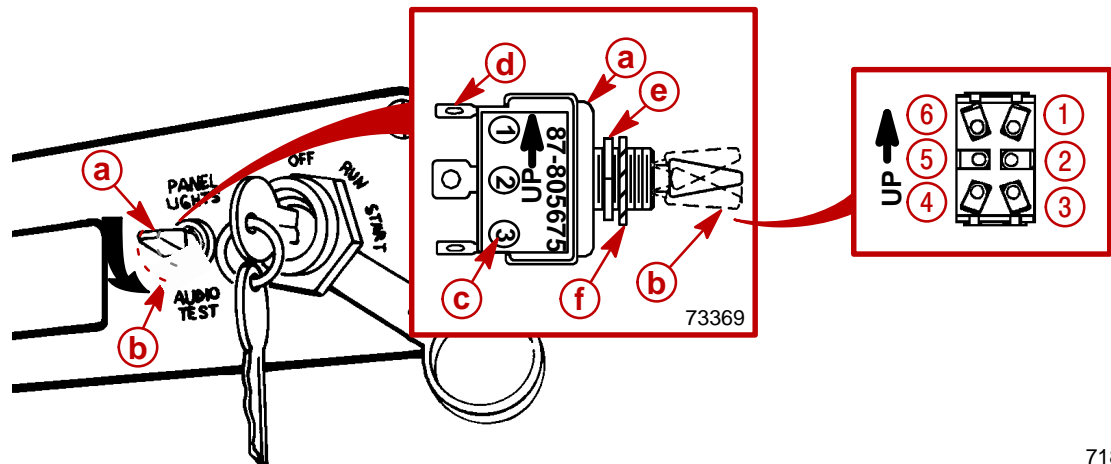
## INSTRUMENTS AND EXTENSION HARNESSSES

**NOTE:** If using other than Quicksilver instrumentation and harnesses, refer to manufacturers' instructions.

1. Follow the appropriate instructions "a", "b" and/or "c", depending upon boat configuration:
  - a. Prepare dash openings and/or mount gauges according to instructions provided with individual gauges.
  - b. Prepare dash opening and/or mount Engine System Monitor Panel to dashboard following Instruction Sheet/Template 90-806330.
  - c. Extend wires through dash openings and/or connect all instrument wiring harness leads to the individual gauges and Engine System Monitor Panel. Refer to Quicksilver Instrumentation Wiring Diagram, wire identification tags and instructions provided with individual gauges and kits.
2. The switch provided for the audio warning test and panel (dash) lights is a three-position toggle switch. It must be wired and installed correctly to provide proper operation of the systems. Refer to the following special installation instructions:
  - a. Hold the switch in your hand and press the switch toggle lever into its spring loaded momentary position. You must install the switch so that the "spring loaded", Audio Test end of the switch is oriented **DOWN** once the panel is installed in the boat.

**IMPORTANT:** The decal on the side of the switch with the arrow and the word "UP" refer to the position of the switch *when installed on the panel*. The circled numbers refer to wire terminals.

- b. Install jamb nut, and then locking washer, on switch threaded portion. Secure to panel using knurled nut. Tighten securely, to prevent switch from turning in hole. DO NOT overtighten.



### Typical

- a** - Audio Test/Panel Light Switch
- b** - Spring-Loaded Audio Test Portion (Direction of Movement DOWN When Installed)
- c** - Terminal Number(s)
- d** - Terminal(s)
- e** - Jamb Nut
- f** - Locking Washer

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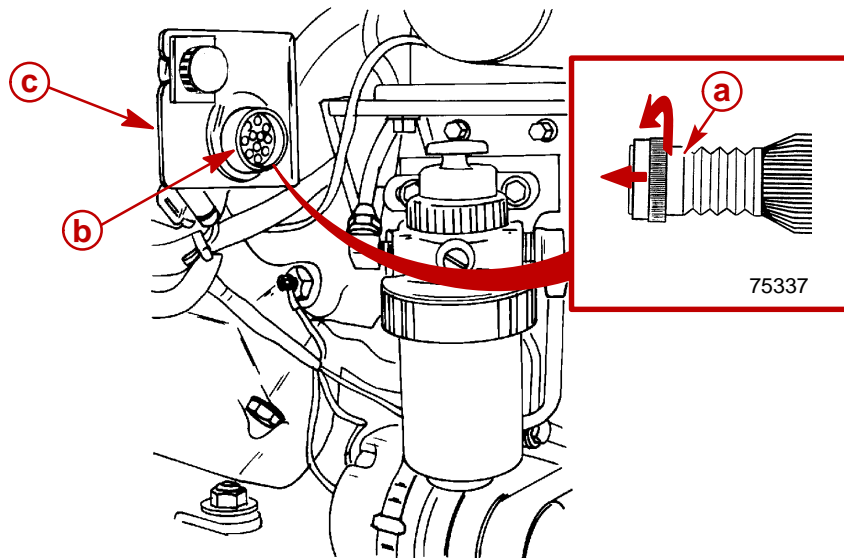
- Refer to Quicksilver Instrumentation Wiring Diagram. Using screws provided, connect the listed color coded wires to numbered switch terminals as shown.

D7.3L D-Tronic		
Harness Wire (Color Code)	Connect To:	Terminal Number
16C BLACK (BLK)	▶	2
40A YELLOW (YEL)	▶	1
LT1 BLUE (BLU)	▶	5
12C PURPLE (PPL)	▶	4

- Make sure that all instrument and switch connections are secure. Seal terminals with Liquid Neoprene (92-25711).
- Mount gauges according to instructions provided with individual gauges. Mount Engine System Monitor Panel to dashboard following Instruction Sheet/Template.
- Connect instrument extension harnesses to instrument harness ends. Connector collars must be fully engaged and secure.

**IMPORTANT: When routing any wiring extension harness back to the engine, make sure that the harness does not rub or get pinched.**

- Route instrument extension harnesses back to engine. Fasten harnesses to the boat at least every 18 in. (460 mm), using appropriate fasteners.
- Connect extension harness to engine harness end on side of electrical bracket. Tighten locking connector collar.

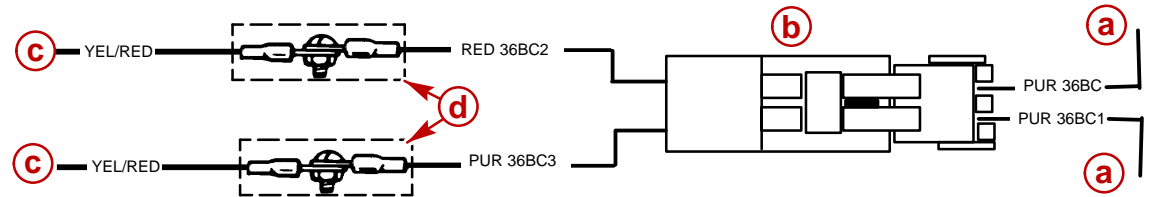


76010

- a** - Extension Harness From Instruments
- b** - Engine Harness and Connector End
- c** - Electrical Bracket

### NEUTRAL SAFETY SWITCH CONNECTION

1. Connect neutral safety switch wires at instrument panel and remote control. Refer to appropriate wiring diagram. Secure connections as shown and coat with Liquid Neoprene. Slide rubber sleeve over connections.



- a** - Instrument Harness Wires
- b** - Two Wire Connector
- c** - To Remote Control
- d** - Rubber Sleeves

### TRIM POSITION SENDER CONNECTION

1. Connect trim position sender leads from gimbal housing to leads from engine harness.

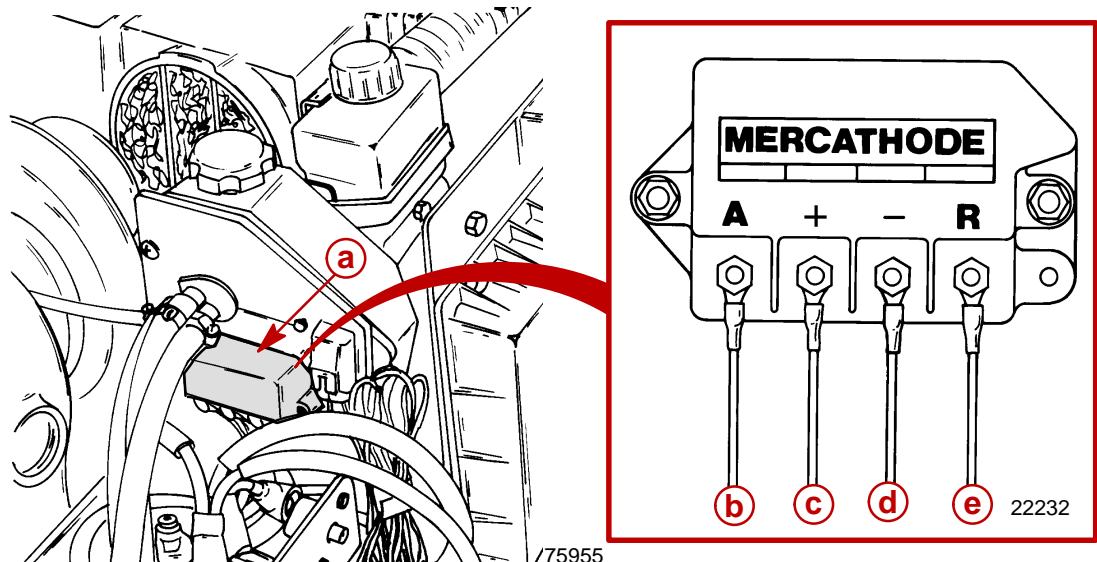


- a** - From Engine Harness
- b** - From Gimbal Housing

24841

### MERCATHODE CONTROLLER

1. Connect electrical leads to controller assembly.
2. Apply a thin coat of Liquid Neoprene to ALL electrical connections.



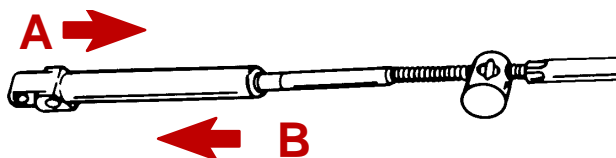
- a** - Controller Assembly Location
- b** - ORANGE Wire - From Electrode on Transom Assembly
- c** - RED/PURPLE Wire - Connect (Other End) to Positive (+) Battery Terminal
- d** - BLACK Wire - From Engine Harness
- e** - BROWN Wire - From Electrode on Transom Assembly

## Shift Cable Installation and Adjustment

**NOTE:** Shift Cable Adjustment Tool (91-12427) allows the shift cables to be installed and adjusted, with or without the sterndrive attached.

**IMPORTANT:** The direction of propeller rotation (RH or LH) for this drive unit is determined by the following method.

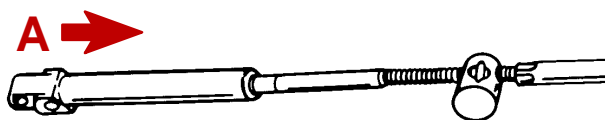
1. Determine desired propeller rotation according to "a", "b", or "c":
  - a. **Bravo One/Two** - If shift cable end guide moves in direction "A", when control lever is placed in Forward, remote control is setup for RIGHT HAND (RH) propeller rotation.
  - b. **Bravo One/Two** - If shift cable end guide moves in direction "B", when control lever is placed in Forward, remote control is setup for LEFT HAND (LH) propeller rotation.



71656

### Bravo One And Two

- c. **Bravo Three** - Front propeller on drive unit is always LH Rotation and rear propeller is always RH Rotation. Shift cable end guide must move in direction "A", when control lever is placed in Forward gear position.

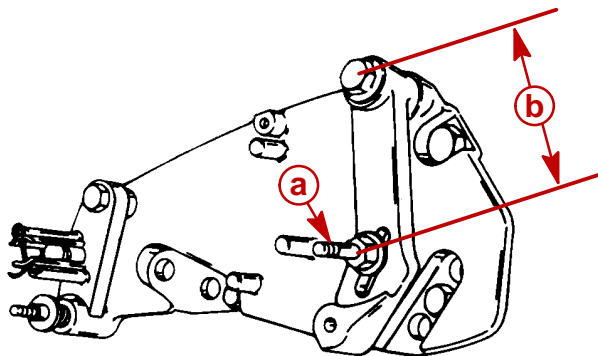


71656

### Bravo Three

**IMPORTANT:** When installing shift cables, be sure that cables are routed in such a way as to avoid sharp bends and/or contact with moving parts. **DO NOT** fasten any items to shift cables.

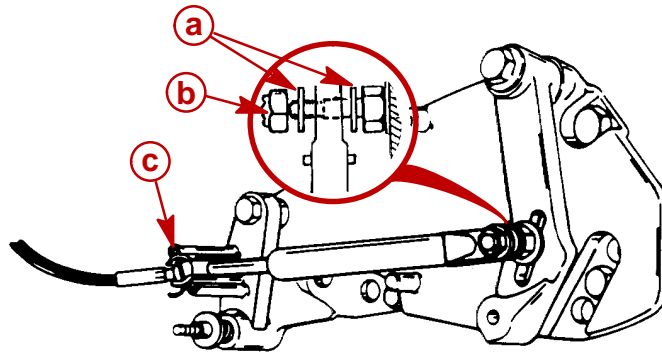
2. Install shift cable into remote control (refer to appropriate remote control instructions).
3. Loosen stud and move it to dimension as shown. Retighten stud.



23345

- a - Stud  
b - 3 in. (76mm) - Center of Pivot Bolt to Center of Stud

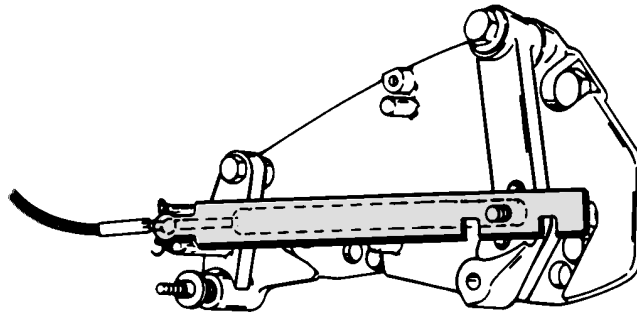
4. Install drive unit shift cable.



23345

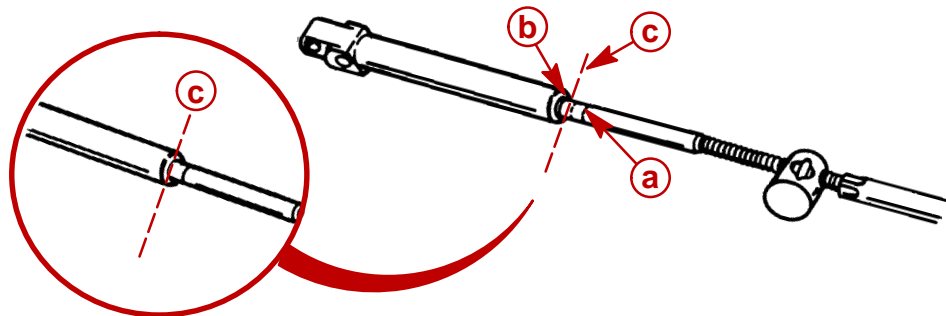
- a** - Washers (2)
- b** - Lock Nut - Tighten Until Contact, Then Back Off 1/2 Turn
- c** - Cotter Pin - Insert from Top and Spread Both Ends

5. Place adjustment tool over drive unit shift cable, as shown. Hold tool in place, using a piece of tape over the barrel retainer.



23242

6. Locate center of remote control and control cable play (backlash).
- a. Shift remote control to neutral.
  - b. Push in on shift cable end with enough pressure to remove play, and mark position "a" on tube.
  - c. Pull out on shift cable end with enough pressure to remove play, and mark position "b" on tube.
  - d. Measure distance between marks "a" and "b" and mark position "c" half-way between marks "a" and "b."



22024

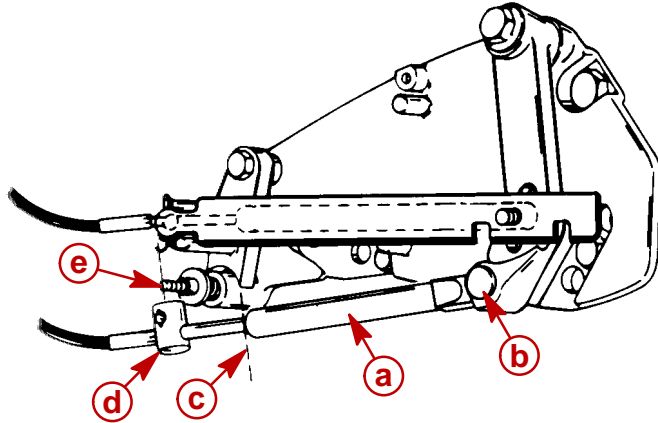
**IMPORTANT:** Be sure to keep center mark "c" aligned with remote control shift cable end guide edge when making the following adjustment.

7. Adjust remote control shift cable as follows:
  - a. Temporarily install shift cable end guide into shift lever, and insert anchor pin.
  - b. Adjust shift cable barrel so that hole in barrel centers with vertical centerline of stud. Ensure that backlash center mark is aligned with edge of control cable end guide.

**⚠ CAUTION**

**DO NOT attempt to install or remove remote control shift cable barrel from stud, without first removing end guide anchor pin from shift lever, and removing cable. Attempting to bend shift cable to install or remove barrel, will place undue stress on cable end guide and shift lever, and damage to both could occur.**

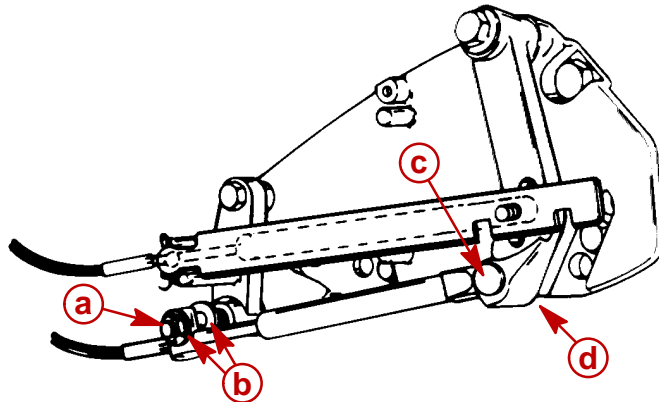
- c. Remove shift cable end guide from shift lever, by removing anchor pin.



23242

- a** - Control Cable End Guide
- b** - Anchor Pin
- c** - Backlash Center
- d** - Control Cable Barrel
- e** - Stud

8. Install remote control shift cable.



23242

- a** - Lock Nut - Tighten Until Bottomed Out
- b** - Washers - Both Sides of Barrel
- c** - Anchor Pin
- d** - Cotter Pin (Not Visible) - Spread Both Ends

9. Remove adjustment tool.

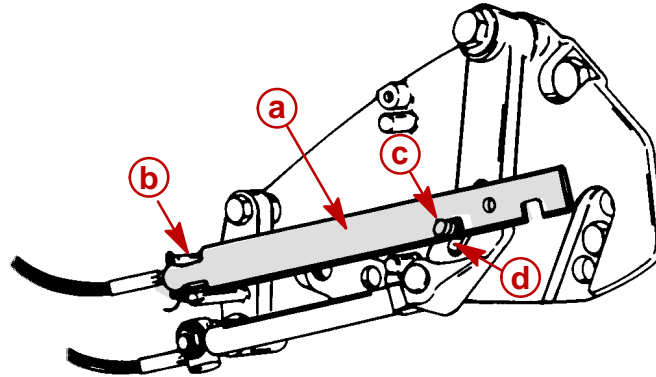


10. Shift remote control lever into full forward position. Place end of adjustment tool in barrel retainer.

RH ROTATION BRAVO ONE, TWO, THREE AND BLACKHAWK MODEL: Rear slot in tool should fit over shift lever stud.

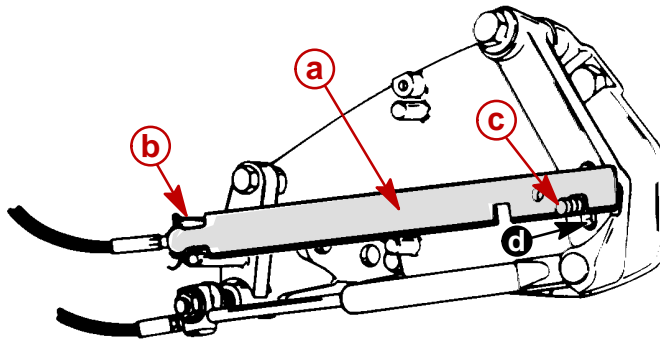
LH ROTATION BRAVO ONE AND TWO: Forward slot in tool should fit over shift lever stud.

If slot does not fit over stud, loosen shift lever stud and slide stud either direction, until slot in tool fits over stud. When adjustment is correct, retighten stud.



23242

**RH Rotation Bravo One, Two, Three**



23242

**LH Rotation Bravo One And Two**

- a** - Adjustment Tool
- b** - Barrel Retainer
- c** - Shift Lever Stud
- d** - Shift Lever Adjustment Slot

11. Remove adjustment tool.

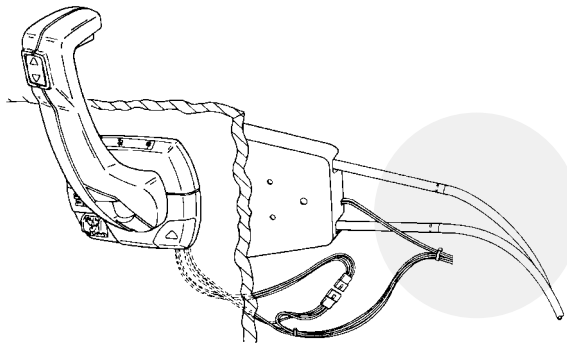
12. Lubricate shift cable pivot points with 30W oil.

## Troubleshooting Shift Problems

**NOTE:** The following information is provided to assist an installer in troubleshooting if hard shifting or chucking/racheting is encountered when shifting into forward gear.

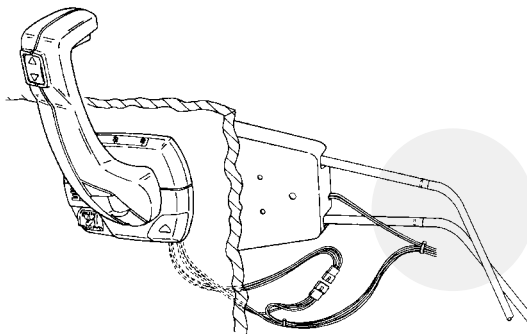
1. When installing the control box in the side panel of the boat, make sure that the cables have enough clearance to operate. This is necessary because the cables move up and down when the shift handle is moved. If the control box is mounted too far back toward any fiberglass structure, the cables will be interfered with; this will cause very hard shifting.

**NOTE:** The control box housing can be rotated in 30° increments to improve cable routing.



74688

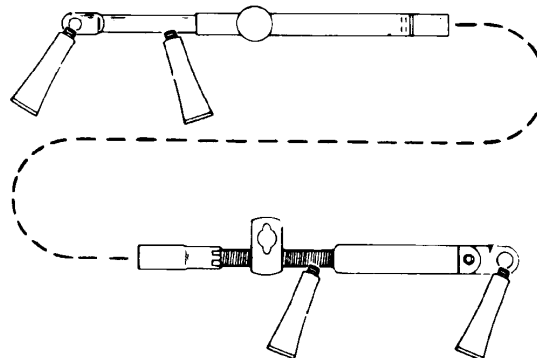
### Proper Cable Bend



74689

### Improper Cable Bend

2. Ensure that when the shift cable from the control box is led through the side gunnel of the hull, it does not have any extremely sharp bends in it as this will cause stiff shifting.
3. Before installing the shift cable into the control box, extend the stainless rod eye end of the cable and grease it with 2-4-C Marine Lubricant with Teflon. Move it back and forth to allow even distribution of the grease.



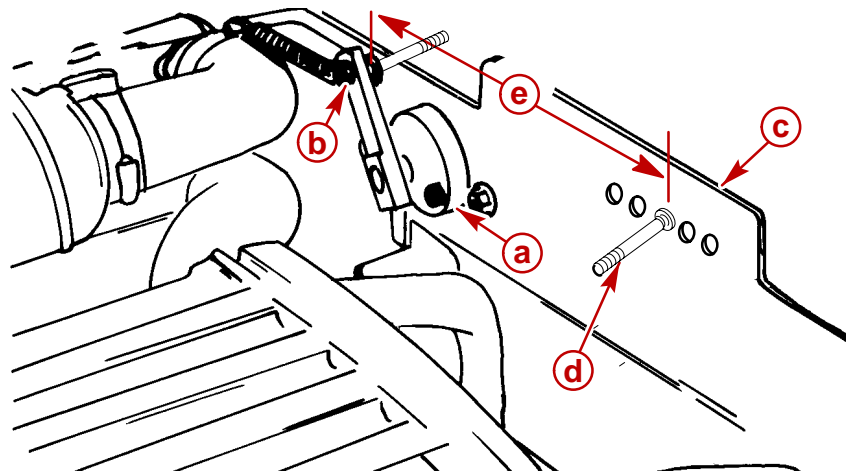
22005

4. Do not strap or clamp the control cables to any other cables or rigid structure within **three feet** of the control box.
5. Be sure the cable is not permanently kinked.
6. Make sure there is proper clearance for cable movement when the control box is installed in the side panel. The cables must have room to move up and down when the control handle is shifted into either forward or reverse.
7. Check to make sure that the engine was not set down on the intermediate shift cable during installation, as this will crush the inner cable tubing and cause improper and / or stiff shifting.
8. DO NOT fasten the shift cable with straps or clamps to any other cable within **five feet** of the shift plate.
9. DO NOT fasten the shift cable to the transom with any type of plastic clips or fasteners within **five feet** of the shift plate.
10. DO NOT overtighten the throttle or shift cable attaching nuts at the engine end. Barrel and cable end must be free to rotate on the mounting stud.

## Throttle Cable Installation and Adjustment

**IMPORTANT:** When installing throttle cables, be sure that cables are routed in such a way as to avoid sharp bends and/or avoid contact with moving parts. **DO NOT** fasten any items to throttle cables.

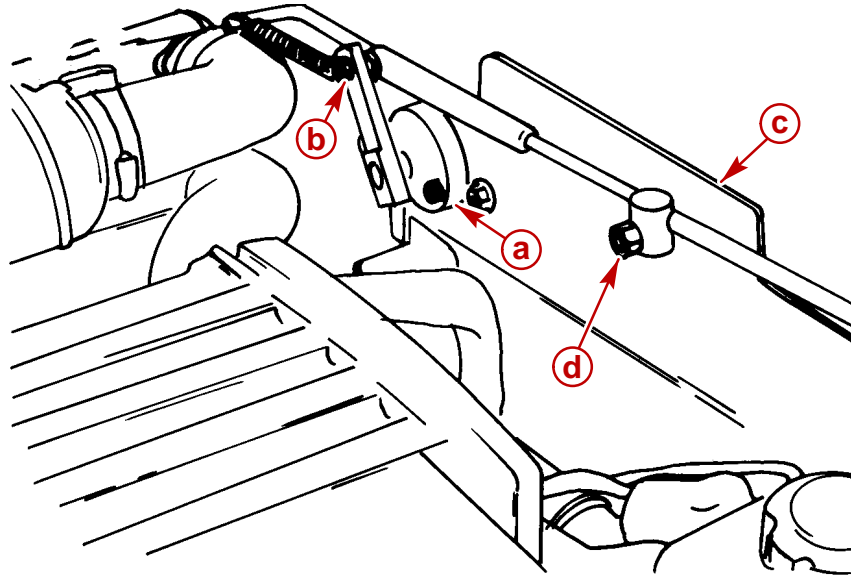
1. Place remote control lever(s) in neutral/idle position.
2. Measure between the center of the Accelerator Position Sensor anchor stud to the holes on the cable barrel end bracket. **Select the hole in the cable barrel end bracket that is closest to the distance of 7-1/8 in. (181 mm) between studs.**



76025

- a** - Accelerator Position Sensor (APS/IVS)
- b** - APS/IVS Anchor Stud
- c** - Cable Barrel End Bracket
- d** - Cable Barrel Anchor Stud
- e** - 7-1/8 in. (181 mm)

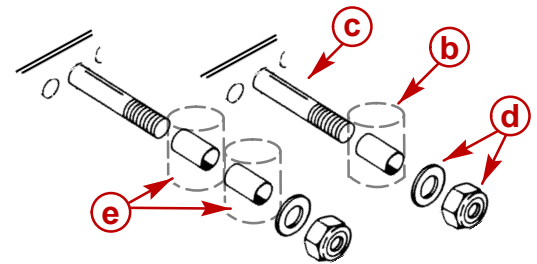
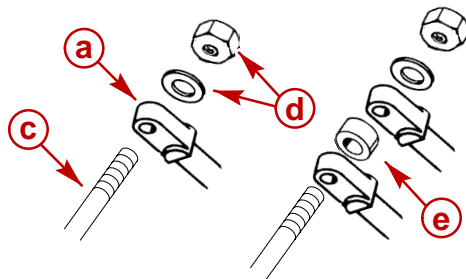
3. Install cable end guide on throttle lever, then push cable barrel end lightly toward throttle lever end. *(This will place a slight preload on shift cable to avoid slack in cable when moving remote control lever).* Adjust barrel on throttle cable to align with stud in anchor bracket. Ensure hole in barrel positions cable as shown. Install cable and secure with hardware as shown.



76025

### Single Cable Shown (Dual Similar)

- a** - Accelerator Position Sensor (APS/IVS)
- b** - APS/IVS Anchor Stud
- c** - Cable Barrel End Bracket
- d** - Cable Barrel Anchor Stud

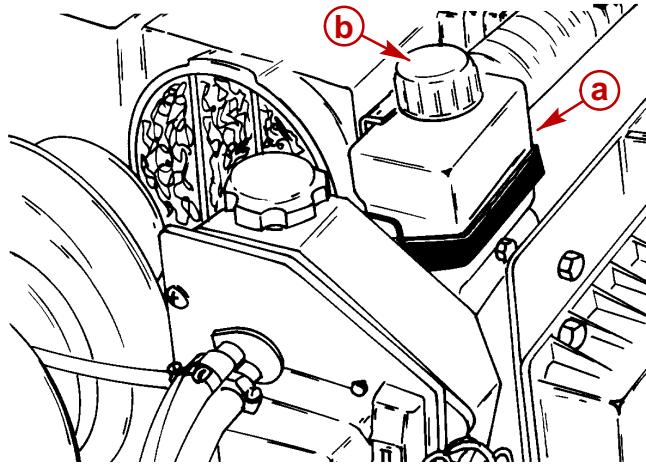


- a** - Throttle Cable End Guide
- b** - Cable Barrel
- c** - Anchor Stud
- d** - Flat Washer and Locknut
- e** - Spacer - With Dual Cables
- f** - Cable Barrel Locations - With Dual Cables

4. Tighten locknuts until they bottom and back off 1/2 turn.
5. Place remote control lever in full forward wide-open-throttle (W.O.T.) position.
6. Check to ensure Accelerator Position Sensor lever is contacting internal "override" spring. Be certain that the cable is not causing the Accelerator Position Sensor to be "over-pulled". Check to ensure that remote control and cable are providing proper output.
7. Place remote control lever in neutral/idle position and, if necessary, readjust throttle cable barrel.
8. Recheck that (when operated) Accelerator Position Sensor lever contacts internal override spring, indicating "W.O.T." (Wide Open Throttle) or 100% throttle position.

## Sterndrive Unit Installation

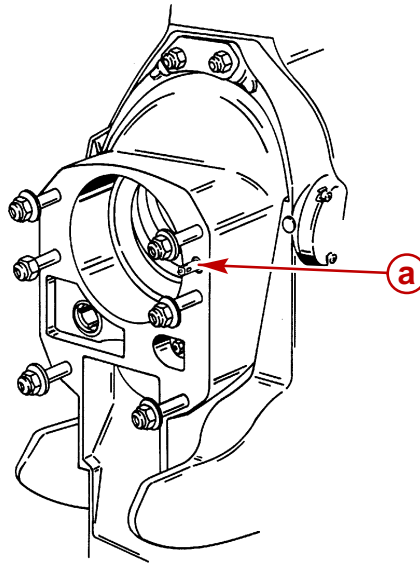
1. Remove trim cylinders' support and dust cover from bell housing studs. Retain locknuts and flat washers.
2. Remove cap and fill gear lube monitor.



75955

- a** - Gear Lube Monitor
- b** - Cap

3. Push in on dribble valve until gear lube appears.

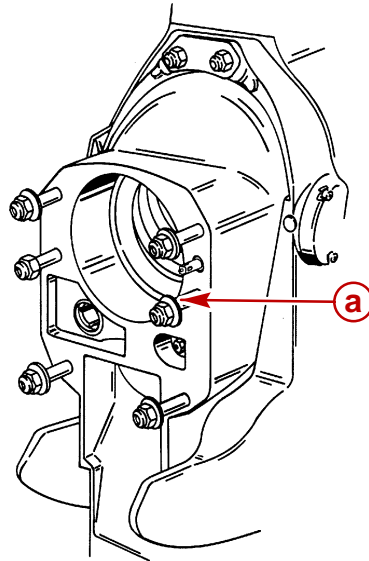


72471

- a** - Dribble Valve

4. Once gear lube appears, release dribble valve.
5. Fill monitor to FILL mark.
6. Replace monitor cap.

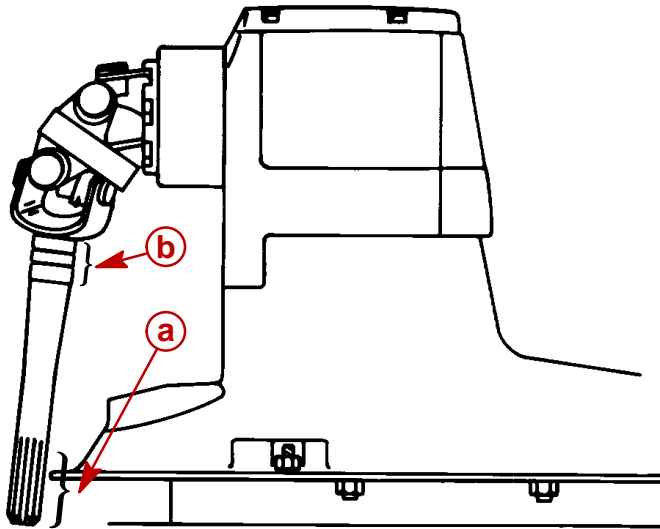
7. Coat studs with 2-4-C Marine Lubricant with Teflon.



72471

**a** - Studs (6)

8. Lubricate U-joint shaft splines and U-joint shaft O-rings with Engine Coupler Spline Grease.

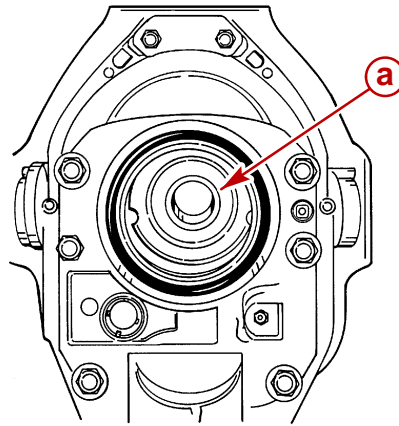


22026

**Typical**

**a** - Splines  
**b** - O-rings

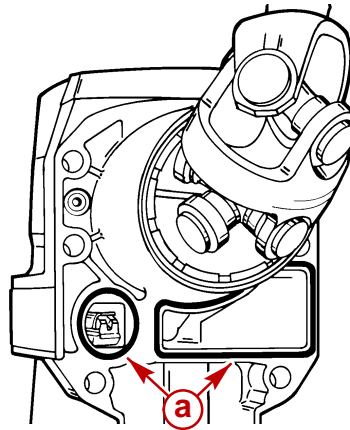
9. Check drive shaft bellows for cleanliness and absence of debris.



72472

**a** - Driveshaft Bellows

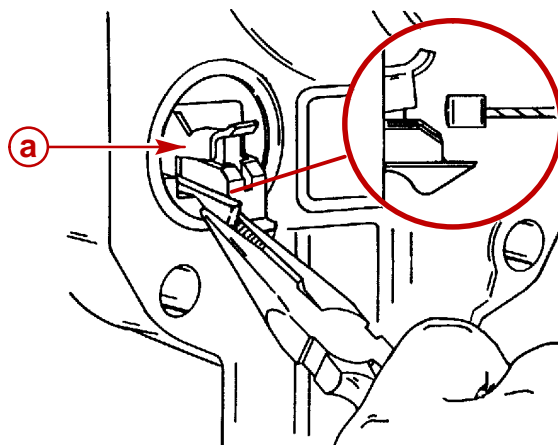
10. Lubricate O-ring seals with 2-4-C Marine Lubricant with Teflon.



72183

**a** - O-Ring Seals

11. Pull out shift linkage as far as it moves. "Jaws" will open, as shown.



72460

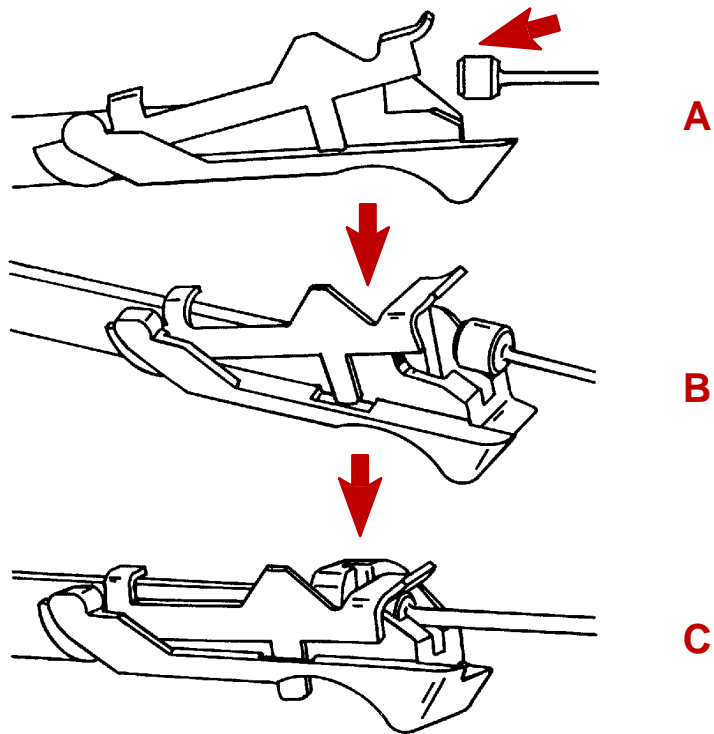
**a** - Shift Linkage

**IMPORTANT:** As sterndrive is inserted into drive unit, entry of the bell housing shift cable must be closely checked to make sure cable enters the "jaws" of shift linkage assembly in the sterndrive.



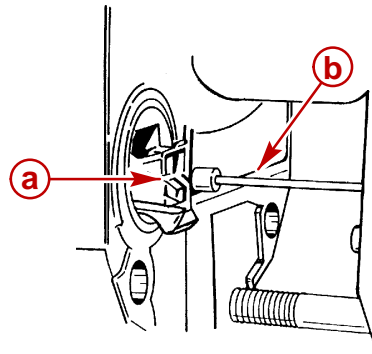
12. Place Remote Control in neutral position.

**NOTE:** As bell housing shift cable enters the shift linkage assembly, it pushes the assembly back into the sterndrive housing, and the "jaw" closes, securing the cable, as shown in steps "A", "B" and "C".



72467

**IMPORTANT:** If Bell Housing Shift Cable (b) does not line up to properly enter "jaws" of shift linkage assembly (a), cable will have to be aligned manually.



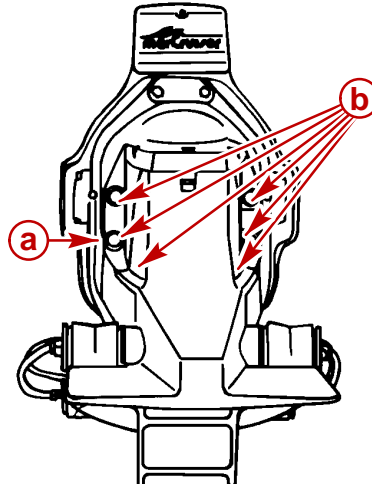
72457

- a** - Shift Linkage Assembly
- b** - Shift Cable

13. Place drive shaft housing in position on bell housing and install drive unit, as follows:

- a. Position trim cylinders so they point straight backwards.
- b. Position drive unit so that universal joint shaft aligns with bell housing bore.
- c. Guide U-joint shaft through bearing in gimbal housing and into engine coupler. Make sure that shift linkage "jaws" engage the bell housing shift cable assembly.
- d. If necessary, rotate propeller shaft counterclockwise slightly (using a propeller) to align U-joint shaft splines with splines in engine coupling, then slide drive unit all the way into bell housing.

- Secure drive unit to bell housing with 5 flat washers and 6 locknuts. Torque to 50 lb. ft. (68 N·m).

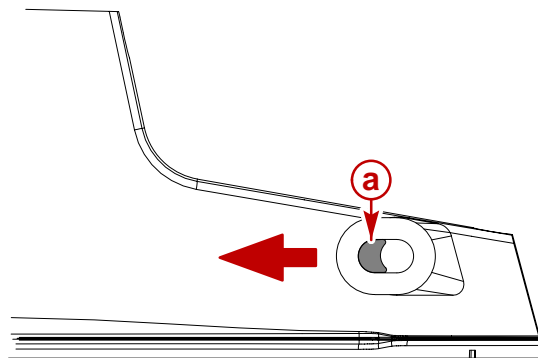


71244

- a** - Do Not Install Flat Washer Here
- b** - Elastic Stop Nuts (6) and Flat Washers (5)

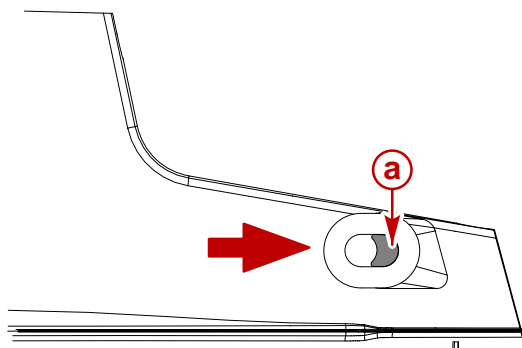
**IMPORTANT:** On Bravo One, Two and Three Models, the “Trim-In Limit Pin Insert” must be properly positioned before installing the trim cylinder anchor pin in the following steps.

- Ensure that the Trim-In Limit Pin Insert is positioned as shown for the appropriate Bravo model.



75157

**Bravo One and Two (Insert Positioned Forward)**



75158

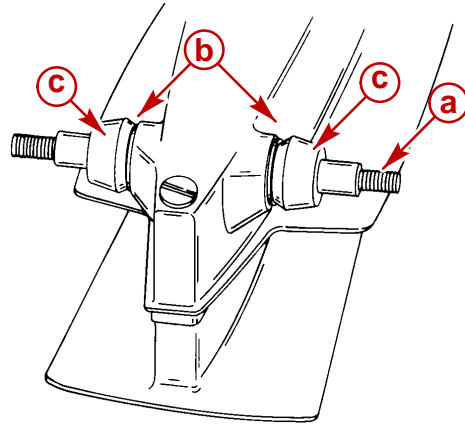
**Bravo Three (Insert Positioned Aft)**

- a** - Trim-In Limit Pin Insert

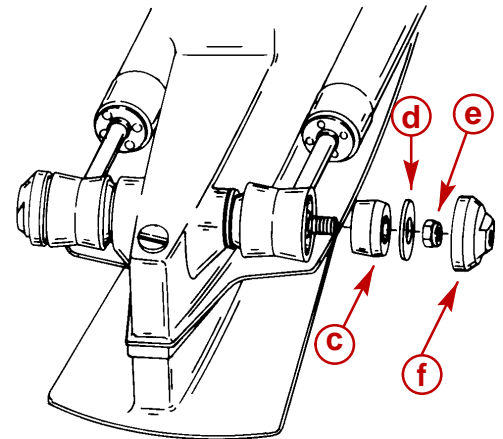
**IMPORTANT:** The position of the Trim-In Limit Pin on the Bravo Three sterndrive unit should only be changed after the boat has been properly tested. Refer to statement at the front of this manual entitled; "Bravo Three Notice: Trim-In Limit Pin".

**IMPORTANT:** To aid in installing rubber bushings, use a water and soap solution. **DO NOT** use oil or grease.

16. Install trim cylinders on aft end of drive unit with hardware as shown. Coat anchor pin threads with 2-4-C Marine Lubricant with Teflon and tighten nuts until they bottom. Install plastic caps and tighten hand tight only.



71668

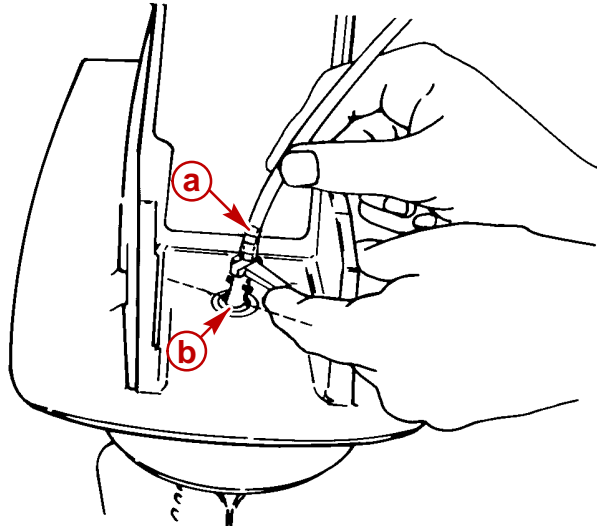


71669

- a** - Aft Anchor Pin
- b** - Large I.D. Flat Washers (2)
- c** - Rubber Bushings (4)
- d** - Small I.D. Flat Washers (2)
- e** - Locknuts (2)
- f** - Plastic Caps (2)

17. Place drive unit serial number decal as described in "General Information".

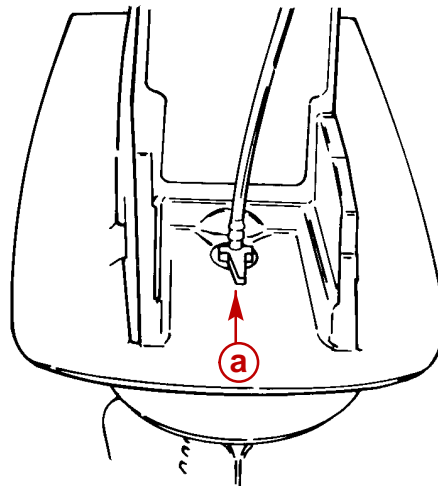
18. On **All Drive Units** - Perform steps 19 through 21.
19. Raise drive to gain access to area between gimbal housing and sterndrive, immediately atop the transom end of the anti-ventilation plate.
20. Insert speedometer tube fitting into opening on topside of anti-ventilation plate, in position shown.



22025

- a** - Tube Fitting
- b** - Opening

21. With fitting fully seated, turn handle to left to a tightly seated position, as shown.



22025

- a** - Handle

# Predelivery Preparation

## NOTICE

Before starting Predelivery read "General Information" and "Installation Requirements" completely.

## Battery Connection

**IMPORTANT: Engine electrical system is negative (-) ground.**

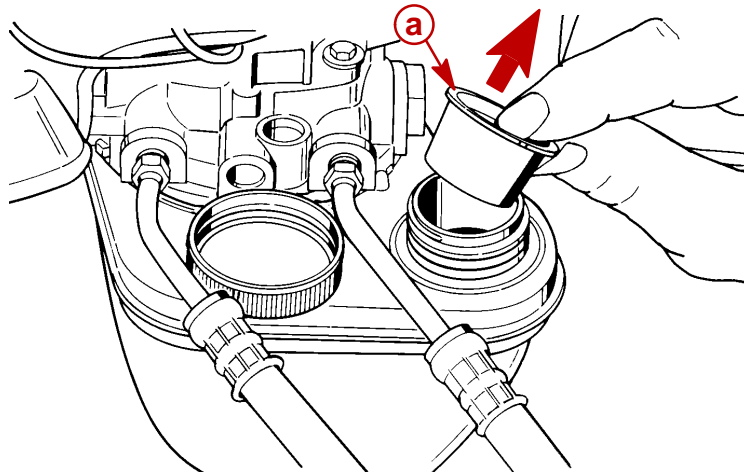
1. Connect engine positive (+) battery cable (usually RED) to positive (+) battery terminal.
2. Connect engine negative (-) battery cable (usually BLACK) to negative (-) battery terminal.
3. Connect Power Trim pump BLACK (-) battery cable to negative (-) battery terminal and pump RED (+) battery cable to positive (+) battery terminal.
4. Make sure that all battery terminal connections are tight, then spray terminals with a battery connection sealant to help retard corrosion.

## Power Trim Pump

**IMPORTANT: Check oil level with sterndrive unit in the full DOWN/IN position.**

**IMPORTANT: Use Quicksilver Power Trim and Steering Fluid, or SAE 10W-30 or 10W-40 engine oil in trim system.**

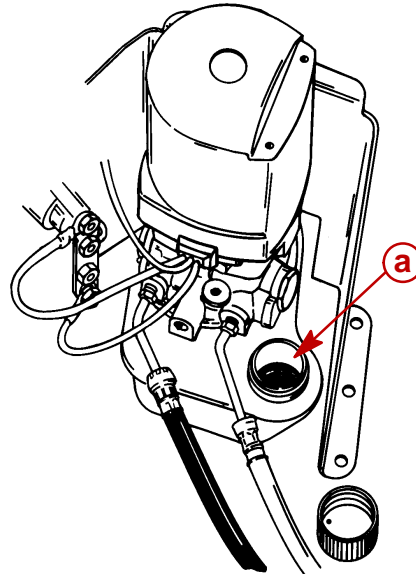
1. Unscrew fill cap and **remove** caplug from fill neck and **discard**. Replace fill cap.



**a** - Caplug

2. Raise and lower drive unit (to the full UP/OUT position) 6 to 10 times to purge air from system. Check oil level visually, (with drive unit in the full DOWN/IN position). Oil level should be maintained at bottom lip of fill neck.

50630



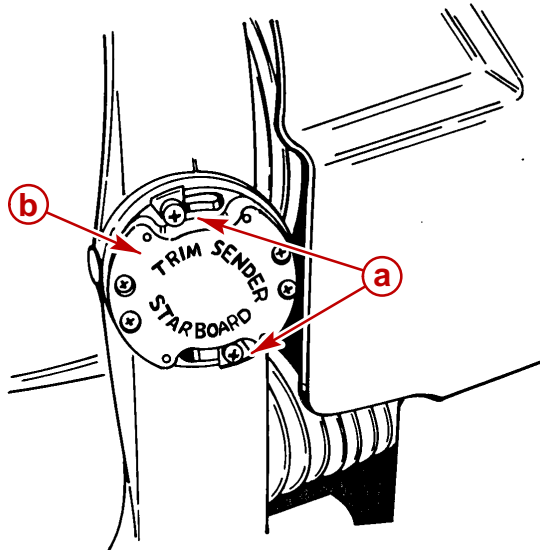
22031

**a** - Fill Neck

3. Check all trim line connection points for leaks. If fluid is visible at fittings, tighten fitting(s). Torque fitting(s) to 100-150 lb-in. (11-16 Nm).

## Trim Position Sender Adjustment

1. Loosen both trim position sender attaching screws.



71220

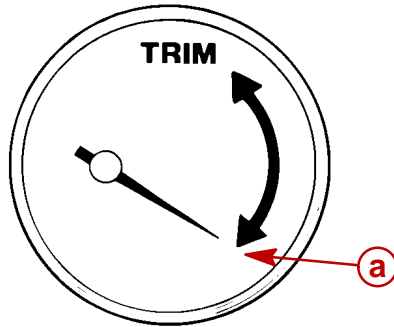
**a** - Attaching Screws  
**b** - Trim Position Sender

### **CAUTION**

**DO NOT start engine in the following step or damage to drive unit and engine could result from lack of cooling water.**

2. Turn ignition key to RUN position.
3. Trim drive unit to the full DOWN/IN position.

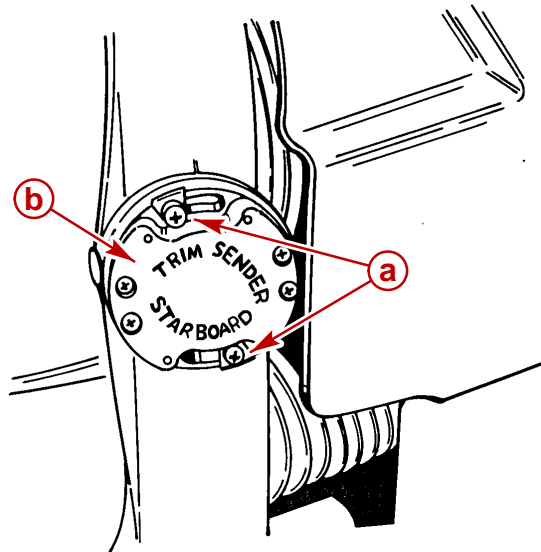
4. Rotate trim position sender as required to show full DOWN/IN position on dashboard instrument as shown.



71671

**a** - Trim Gauge Needle

5. Tighten retaining screws and turn ignition key to the "OFF" position.



71220

**a** - Retaining Screws  
**b** - Trim Position Sender

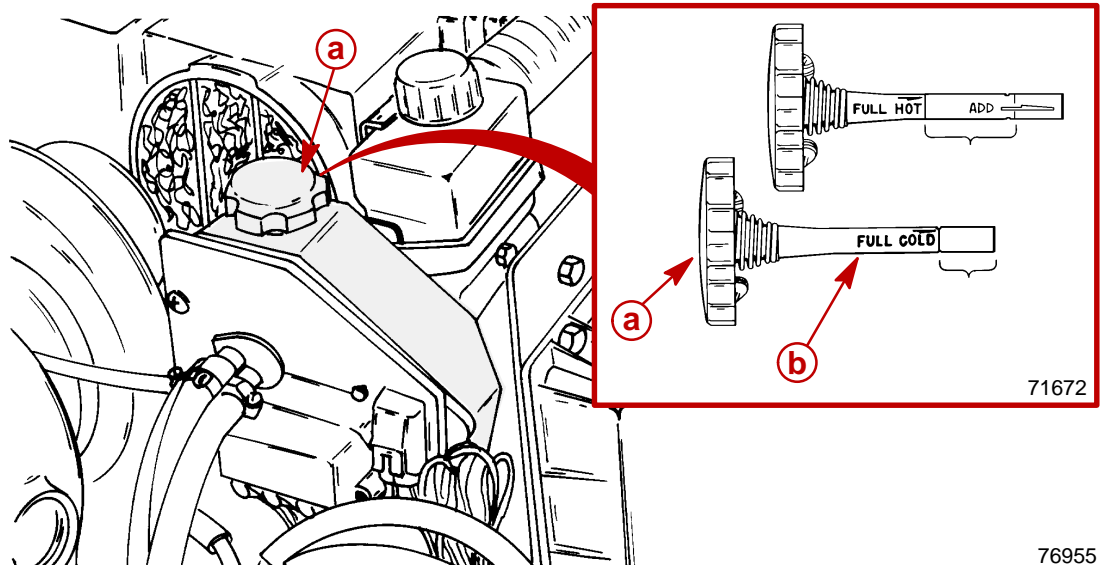
## Power Steering Fluid

**IMPORTANT:** Use only Quicksilver Power Trim and Steering Fluid, or Dexron III automatic transmission fluid (ATF), in power steering system.

### ⚠ CAUTION

**DO NOT RUN POWER STEERING DRY, or pump will be damaged.**

1. Position drive unit so that it is straight back.
2. Remove fill cap from power steering fluid reservoir, and check fluid level. Fill to "FULL COLD" line – do not over fill.

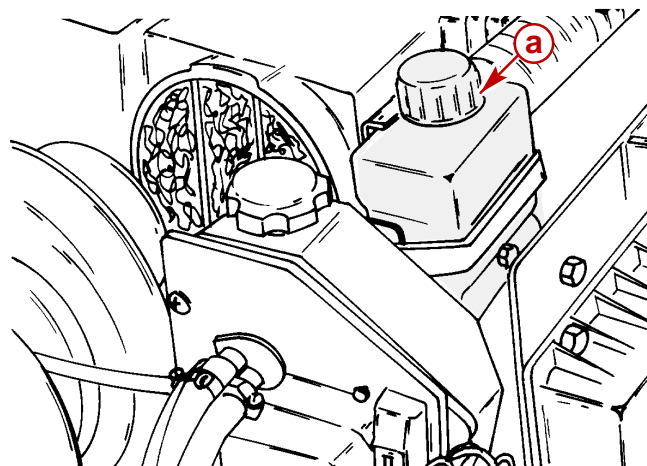


- a** - Power Steering Fluid Reservoir
- b** - Cap/Dipstick
- c** - FULL COLD Mark

76955

## Drive Unit Gear Lube Monitor

**IMPORTANT:** Oil level in monitor will rise and fall during drive operation; always check oil level when drive is cool and engine is shut down.



- a** - Gear Lube Monitor

75955

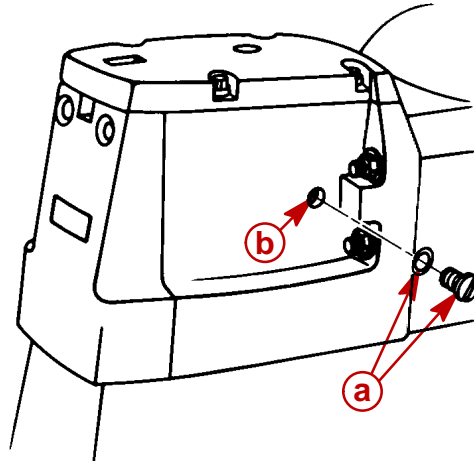


1. With drive in full down position, remove oil vent screw.

### CAUTION

Failure to fill drive unit to level of vent hole will result in a low drive oil level. Gear lube monitor only **MAINTAINS** drive oil level and will not correct an improperly filled drive unit.

2. Fill gear lube monitor with Quicksilver Gear Lube. When oil starts to run out the oil vent hole, reinsert oil vent screw, and sealing washer, and tighten securely.
3. Fill monitor to "FILL" mark. Lubricate O-ring in cap with sterndrive oil, to insure ease of installing and removing cap, and install cap. Do not over-tighten cap.
4. Recheck oil level after first use.



- a** - Oil Vent Screw and Sealing Washer  
**b** - Oil Vent Hole

70121

## Propeller Installation

### BRAVO ONE AND TWO

**IMPORTANT:** Correct rotation propeller **MUST** match direction of rotation of propeller shaft.

### WARNING

Be sure that remote control is in neutral position and ignition key is removed from switch prior to installing propeller.

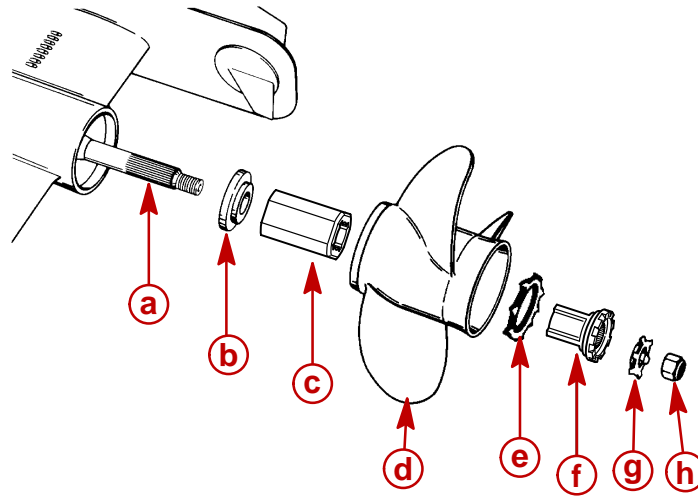
### WARNING

Place a block of wood between the anti-ventilation plate and propeller to protect hands from propeller blades and to prevent propeller from turning when tightening propeller nut.

1. To aid in future removal of the propeller, liberally coat propeller shaft splines with one of the following Quicksilver lubricants.
  - Special Lubricant 101
  - 2-4-C Marine Lubricant with Teflon

**IMPORTANT:** Installation is correct when at least 2 threads of propeller shaft are exposed through propeller nut after torquing it.

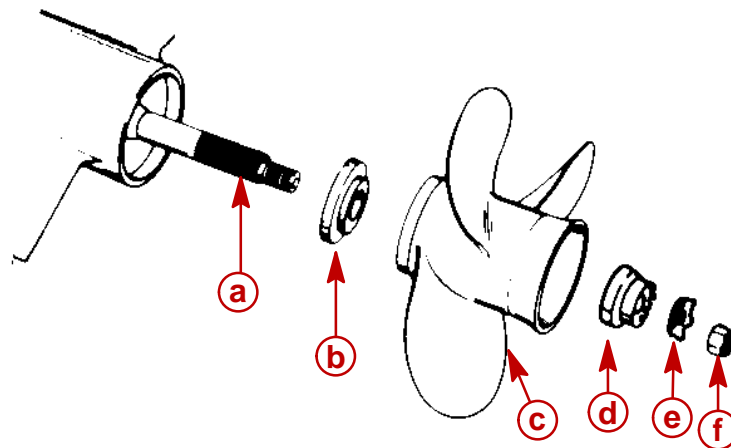
2. Install propeller with attaching hardware as shown. Tighten nut a minimum of 55 lb-ft (75 Nm), then continue to tighten until 3 tabs on the tab washer align with grooves on spline washer. Bend the 3 tabs down into grooves.



75492

### Bravo One

- a** - Forward Thrust Hub
- b** - Flo-Torque Drive Hub
- c** - Propeller
- d** - Continuity Washer
- e** - Drive Sleeve Adapter
- f** - Tab Washer
- g** - Locknut



70561

### Bravo Two

- a** - Apply Lubricant on Splines of Propeller Shaft
- b** - Forward Thrust Hub
- c** - Propeller
- d** - Continuity/Spline Washer
- e** - Tab Washer
- f** - Locknut

## BRAVO THREE

**IMPORTANT: Correct rotation propeller MUST match direction of rotation of propeller shaft.**

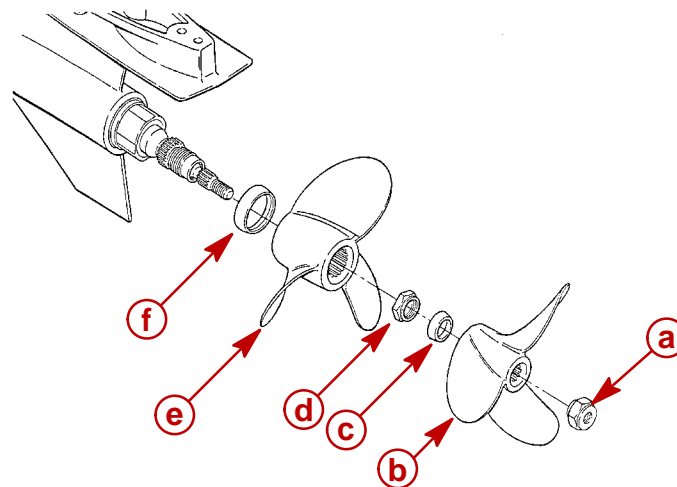
**⚠ WARNING**

Be sure that remote control is in neutral position and ignition key is removed from switch prior to installing propeller.

**⚠ WARNING**

Place a block of wood between the anti-ventilation plate and propeller to protect hands from propeller blades and to prevent propeller from turning when tightening propeller nut.

1. To aid in future removal of the propeller, liberally coat the propeller shaft splines with one of the following Quicksilver lubricants.
  - Special Lubricant 101
  - 2-4-C Marine Lubricant with Teflon
2. Install propellers with attaching hardware as follows:
  - a. Slide forward thrust hub onto propeller shaft, with tapered side toward propeller hub.
  - b. Align splines and place front propeller on propeller shaft.
  - c. Install front propeller locknut. Torque to 100 lb-ft (136 N·m).
  - d. Slide aft thrust hub onto propeller shaft with tapered side toward propeller hub.
  - e. Align splines and install aft propeller.
  - f. Install propeller locknut. Torque to 60 lb-ft (81 N·m).



72239

**Bravo Three**

- a** - Rear Propeller Locknut
- b** - Rear Propeller
- c** - Rear Propeller Thrust Hub
- d** - Front Propeller Locknut
- e** - Front Propeller
- f** - Front Propeller Thrust Hub

## Test Running Engine

### ⚠ WARNING

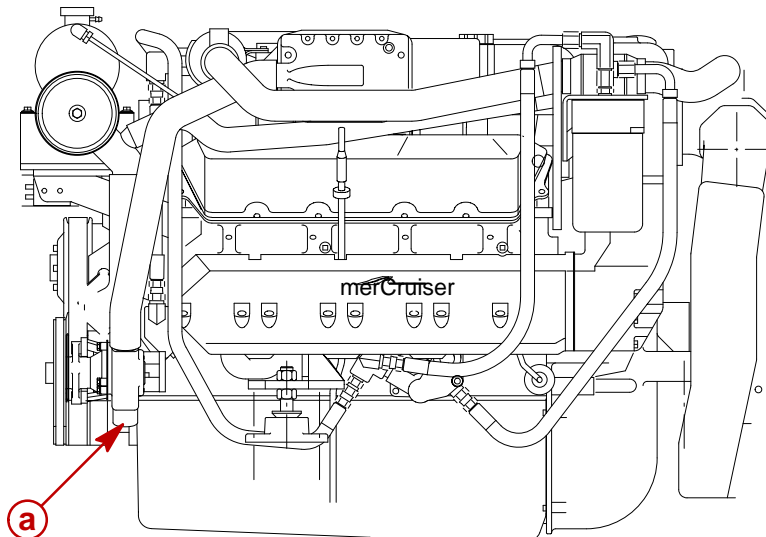
Electrical system components on this engine are not external ignition protected. **DO NOT STORE OR UTILIZE GASOLINE ON BOATS EQUIPPED WITH THESE ENGINES, UNLESS PROVISIONS HAVE BEEN MADE TO EXCLUDE GASOLINE VAPORS FROM ENGINE COMPARTMENT (REF: 33 CFR).** Failure to comply could result in fire, explosion and/or severe personal injury.

### ⚠ WARNING

If engine is to be tested with boat out of water, the propeller must be removed to avoid injury.

**IMPORTANT:** If engine is to be tested on land, water must be supplied to seawater pickup pump. **DO NOT** run engine above 1500 rpm, as suction created could cause water hose to collapse causing water supply to be cut off.

1. If engine is to be tested on land, supply water to seawater pump.



861606

**a** - Seawater Pump

### ⚠ WARNING

**Do not leave helm unattended when making test with boat in the water.**

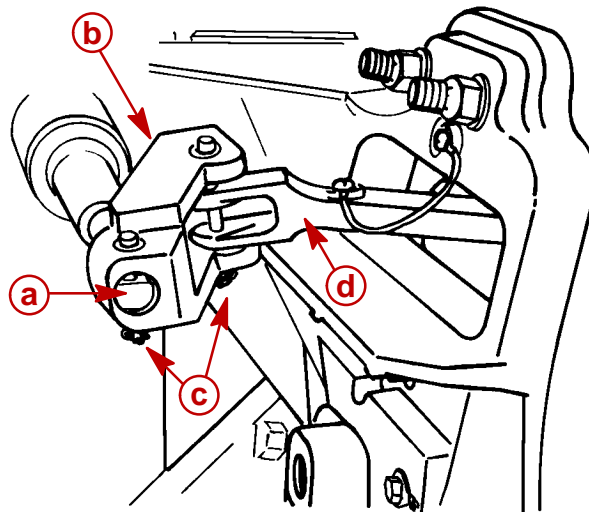
2. Check to ensure that cooling system drain plugs, petcocks, and hoses are installed and tight.

**NOTE:** Refer to "Operation, Maintenance and Warranty Manual" for operating specifications and fluid capacities.

3. Check closed cooling system fluid level.
4. Check crankcase oil level.
5. Check sterndrive unit oil level.
6. Check drive belt tension.
7. Test **Audio Warning System**.

8. Refer to "Operation and Maintenance Manual" and start engine. Run at idle rpm until water temperature is normal.
9. Watch all gauges for normal readings.
10. Turn steering wheel starboard, then port, and check to ensure drive unit turns the correct way.
11. Inspect engine compartment for water, oil, fuel and exhaust leaks.
12. Check for lugging condition.
  - a. Turn steering wheel **left** until it stops, and continue to apply pressure. If pump lugs (engine rpm drops and/or power steering pump tone changes), check the following:
    - (1.) Check for an obstruction between gimbal ring and gimbal housing and all moving steering components.
    - (2.) Check that steering lever is not contacting cutout in transom. If contact is being made, modify cutout.
  - b. Turn steering wheel **right** until it stops, and continue to apply pressure. If pump lugs (engine rpm drops and/or power steering pump tone changes), check the following:
    - (1.) Check same items as (1) and (2) above.
    - (2.) Check steering cable end dimension with cable FULLY EXTENDED. (See "Installation Requirements" for proper steering cable dimensions.)
13. Turn off engine. Lubricate steering cable and clevis with Special Lubricant 101.

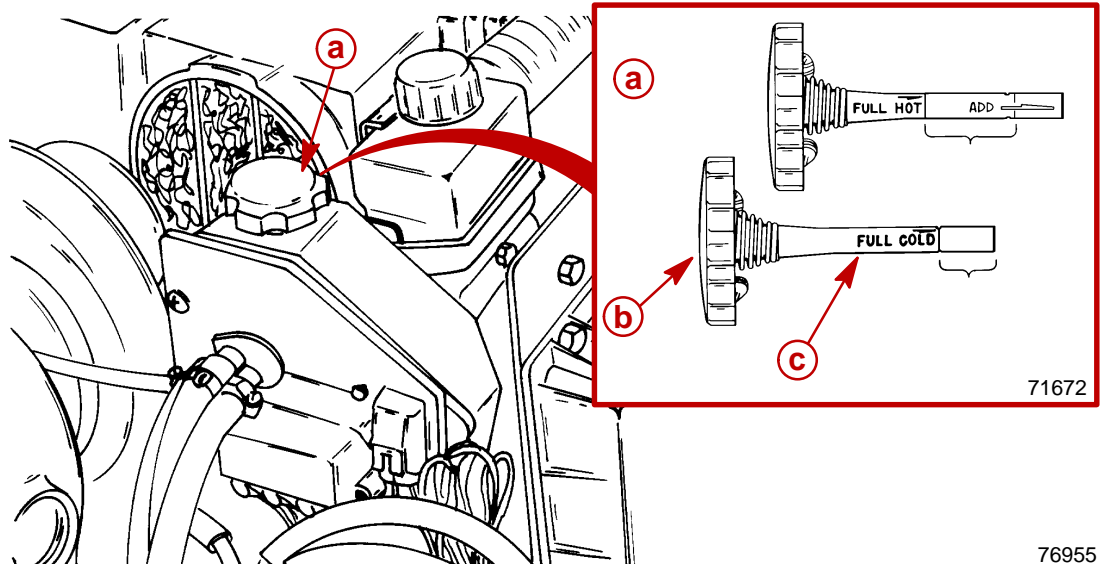
**IMPORTANT: Make sure the cable end that enters clevis is heavily lubricated with Special Lubricant 101.**



- a** - Steering Cable End
- b** - Clevis
- c** - Clevis Pins and Cotter Pins
- d** - Steering Lever

71904

14. Restart engine and observe drive unit. If drive unit creeps, an external tension may exist on steering cable. Ensure that there is nothing attached to steering cable casing. Cable must be free to move when actuated.
15. Check power steering pump fluid level:
  - a. Position drive unit so it is straight back. Turn off engine.
  - b. Remove cap/dipstick from power steering fluid reservoir. Check fluid level and add as necessary. Do not overfill.



- a** - Power Steering Fluid Reservoir
- b** - Cap/Dipstick
- c** - FULL COLD Mark

76955

## Boat-In-The-Water Tests

**IMPORTANT: Engine alignment MUST BE CHECKED with boat in the water, fuel tanks filled, and with a normal load onboard.**

**IMPORTANT: DO NOT perform the following with boat in a test tank or tied to dock.**

### ENGINE INITIAL BREAK-IN PROCEDURE

It is especially important that the following procedure be used on new diesel engines. This break-in procedure allows the proper seating of the pistons and rings, which greatly reduces the likelihood of low hour problems.

**IMPORTANT: It is recommended that the boat not be accelerated hard until this procedure has been completed.**

Initial Break-In Procedure is as follows:

1. Start engine and run at idle until coolant has reached minimum operating temperature 150° F (65° C).
2. Run engine in gear for 3 minutes at each of the following rpms: 1200 rpm, 2400 rpm and 3000 rpm.
3. Run engine in gear for 3 minutes at each of the following rpms: 1500 rpm, 2800 rpm and 3400 rpm.
4. Run engine in gear for 3 minutes at each of the following rpms: 1800 rpm, 3000 rpm and Maximum Rated Full-Throttle rpm.

### MAXIMUM RPM TEST

Power package should be equipped with a propeller that will allow engine to operate at its specified maximum wide-open-throttle revolutions per minute (rpm), with an average load aboard the boat. Best all around performance is obtained with the D7.3L D-Tronic engine propped at 3800 rpm and the D7.3L D-Tronic engine propped at 3600 rpm.

**IMPORTANT: Consider this additional information:**

**The engines listed in the following chart are equipped with an electronic device that limits engine rpm. Be sure that propeller being used does not allow engine to run against the device, as a significant loss in performance will result.**

Engine rpm		
MCM Model	Engine Recommended Operating rpm Range	Engine rpm Limiter Setting (Begins At:)
D7.3L D-Tronic	3600-3800	3850
D7.3L D-Tronic LD	3400-3600	3650

To check that the correct propeller has been installed, operate the boat with a light load (one person, fuel tank half full) at wide-open-throttle and optimal trim. (Optimal trim is the point where boat speed no longer increases when trimming-out. High rpm caused by excessive trimming should not be used when checking for correct propeller.) rpm should be near the top of specified range so that under a heavy load, engine speed will not fall below specifications. If engine speed is too high, replace propeller with one that has a higher pitch. If engine speed is too low, replace with a lower pitch propeller. Generally, there is a 200 rpm change between propeller pitches.

If a propeller cannot be obtained that will place the engine in the proper rpm range, it may be necessary to have the propeller reworked at a propeller repair station.

**IMPORTANT: To run engine at maximum rpm before the Engine 20-Hour Break-In Period is complete, follow this procedure only after the Engine Initial Break-in Procedure has been completed:**

1. Complete Engine Initial Break-In Procedures if not already accomplished.
2. Start engine and run at idle rpm until normal operating temperature is reached.
3. Run boat up on plane.
4. Advance engine rpm (in 200 rpm increments) until engine reaches its maximum rated rpm. If maximum rated rpm is not possible or engine runs against governor refer to preceding information for correct propeller selection.

**IMPORTANT: Do not run at maximum rpm for more than 2 minutes.**

## After Running Engine

### CAUTION

If Power Package will not be used for an extended period of time, or will be exposed to freezing temperatures, drain water from seawater cooling system, as explained in owner's "Operation, Maintenance and Warranty Manual." Water **MUST BE drained to prevent corrosion and freeze damage to engine.**

1. If Power Package will not be used for an extended period of time, or will be exposed to freezing temperatures, drain water from seawater cooling system.

### CAUTION

Sterndrive unit should be stored in full "down" position. Universal Joint bellows may develop a "set" if unit is stored in raised position and may fail when unit is returned to service.

2. If power package is to be stored, position sterndrive unit full "DOWN/IN".



## Cold Weather or Extended Storage Draining Instructions

### CAUTION

If Power Package will not be used for an extended period of time or will be exposed to freezing temperatures, drain water from seawater section of cooling system. Water **MUST BE** drained to prevent corrosion and freeze damage to engine.

### CAUTION

If boat is to remain in the water, seacock, if so equipped, must remain closed until engine is to be restarted to prevent water from flowing back into seawater cooling system. If boat is not fitted with a seacock, water inlet hose must be disconnected and plugged to prevent water from flowing into cooling system and/or boat. As a precautionary measure, attach a tag to the ignition switch or steering wheel with the warning that the seacock must be opened or the water inlet hose reconnected prior to starting the engine.

**IMPORTANT:** Mercury MerCruiser recommends that propylene glycol antifreeze (a nontoxic and environmentally safe) antifreeze be used in seawater section of the cooling system for cold weather or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer's recommendations.

**IMPORTANT:** Observe the following information to ensure complete draining of cooling system:

- Engine must be as level as possible.
- A wire should be repeatedly inserted into all drain holes to ensure there are no obstructions in passages.

**IMPORTANT:** Drain seawater section of closed cooling system only.

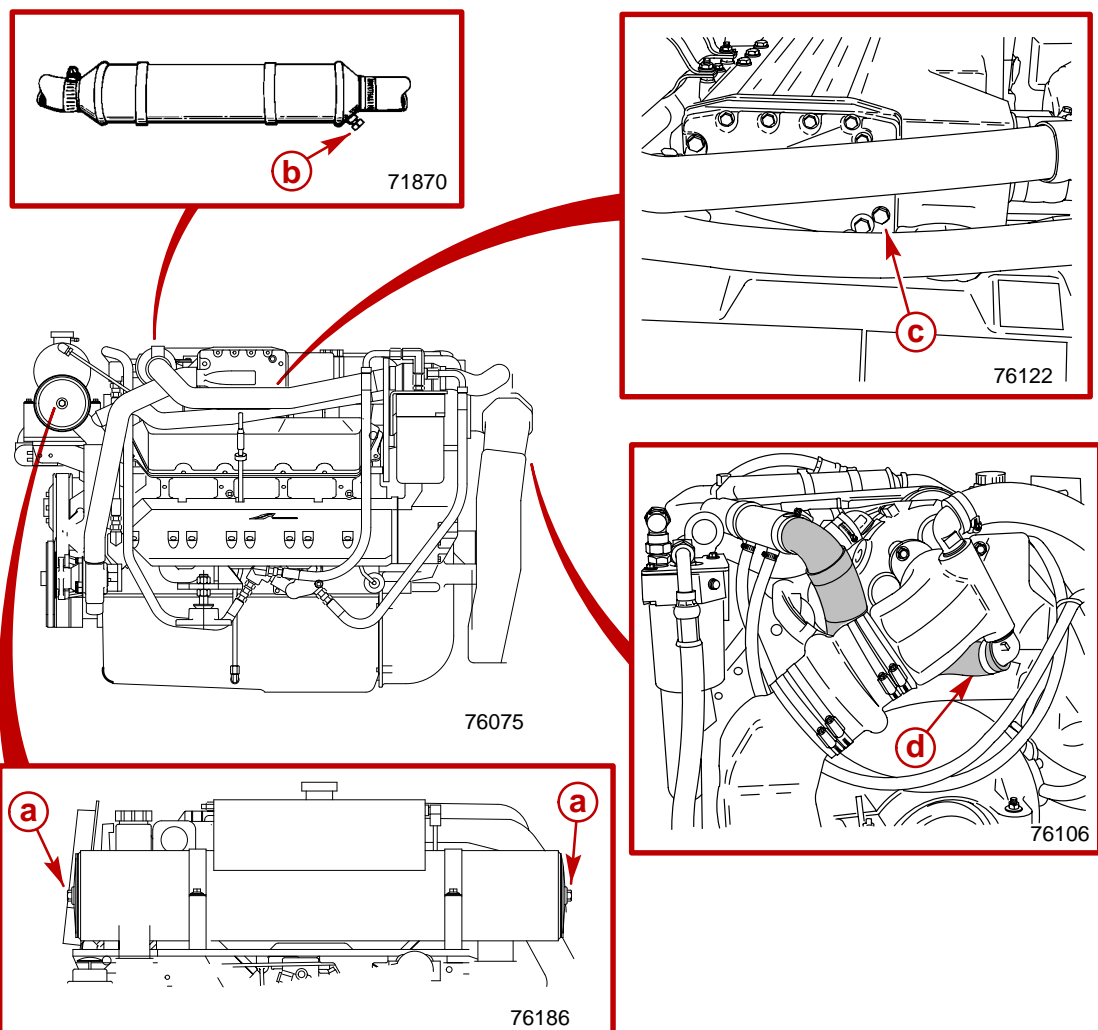
1. Close seacock, if so equipped, or disconnect and plug seawater inlet hose, if boat is to remain in the water.
2. Remove and drain the following:
  - a. The end covers from both the port and starboard sides of heat exchanger. Drain tank completely.

**IMPORTANT: Use compressed air to blow any remaining water from the tubes in the heat exchanger.**

- b. The drain plug on the lower side of the engine oil cooler.
- c. The aftercooler drain plugs located on the starboard and port aftercooler side covers.

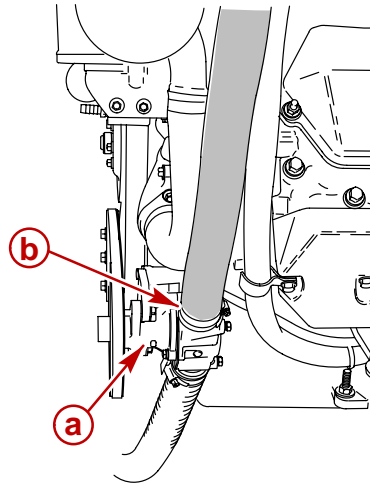
**NOTE: Only the port aftercooler side cover is shown. Starboard is similar.**

- d. Disconnect seawater outlet hose at bottom of exhaust elbow. Lower hose and drain completely.



- a - End Covers
- b - Oil Cooler Drain Plug
- c - Aftercooler Drain Plugs (Port and Starboard)
- d - Seawater Outlet Hose

3. Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.
4. Remove seawater pump outlet hose from top of seawater pump and drain.



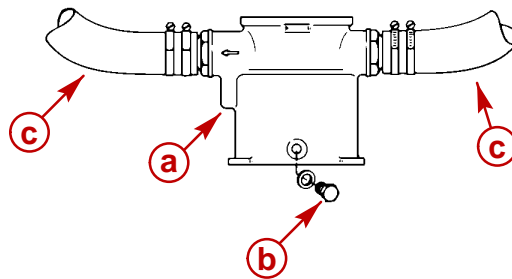
76107

- a** - Seawater Pump
- b** - Outlet Hose

### ⚠ CAUTION

**Avoid water entering boat. Do not unplug or disconnect seawater inlet hose unless a seacock is present and it is closed.**

5. Remove hose(s) at seawater strainer and drain hose(s) completely. Remove drain plug and empty seawater strainer. Reconnect hoses. Tighten hose clamps securely. Install drain plug. Tighten securely.



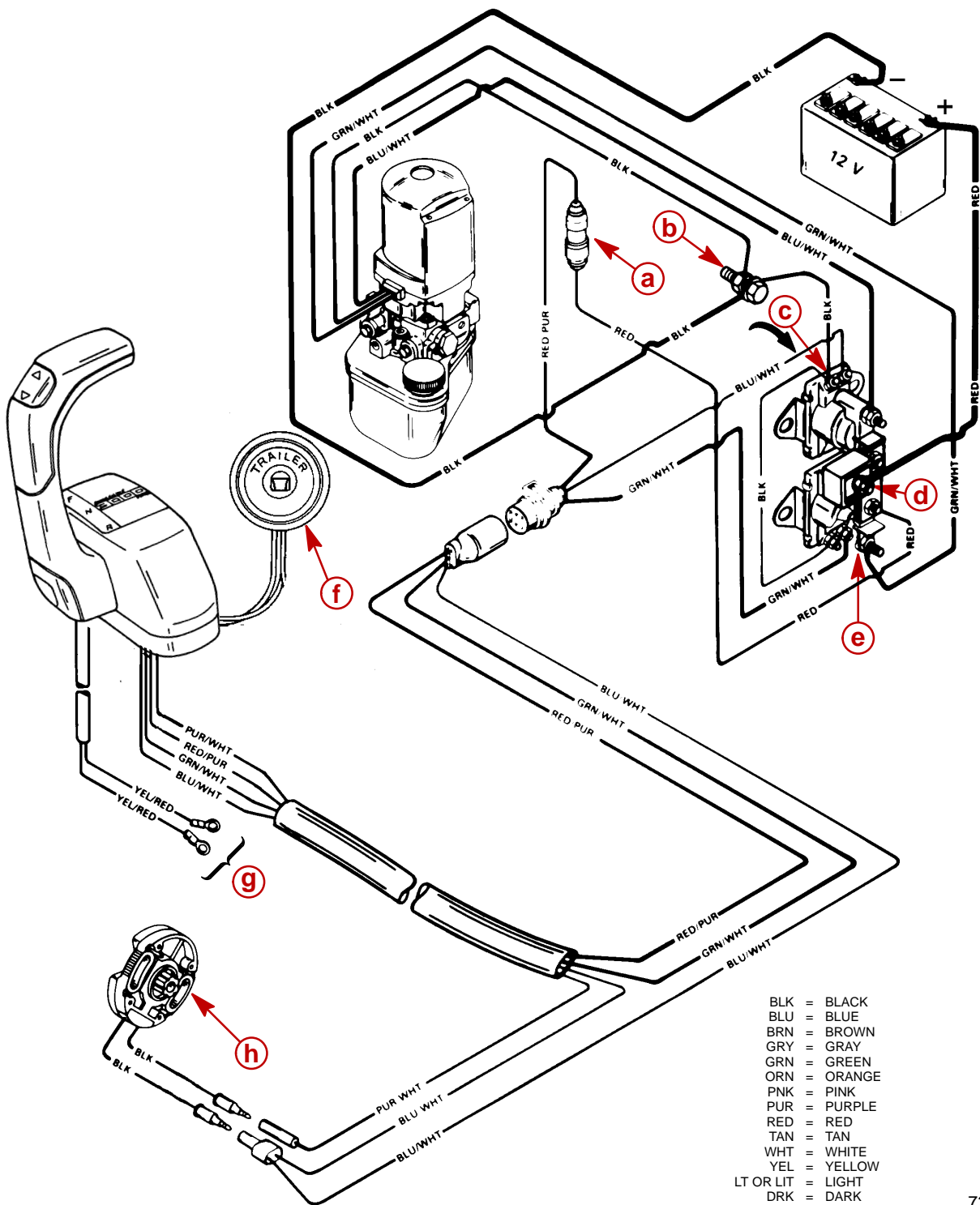
71362

- a** - Seawater Strainer
- b** - Drain Plug
- c** - Hose

6. After seawater section of cooling system has been drained completely, coat threads of drain plugs with Perfect Seal and reinstall. Tighten securely. Connect hose to seawater pump outlet (top). Tighten hose clamps securely. Replace end cover gaskets and seals, if worn or deteriorated. Install end cover assemblies on the heat exchanger. Torque the end covers to 120-132 lb-in. (14-15 Nm).

# Power Trim System Wiring Diagram

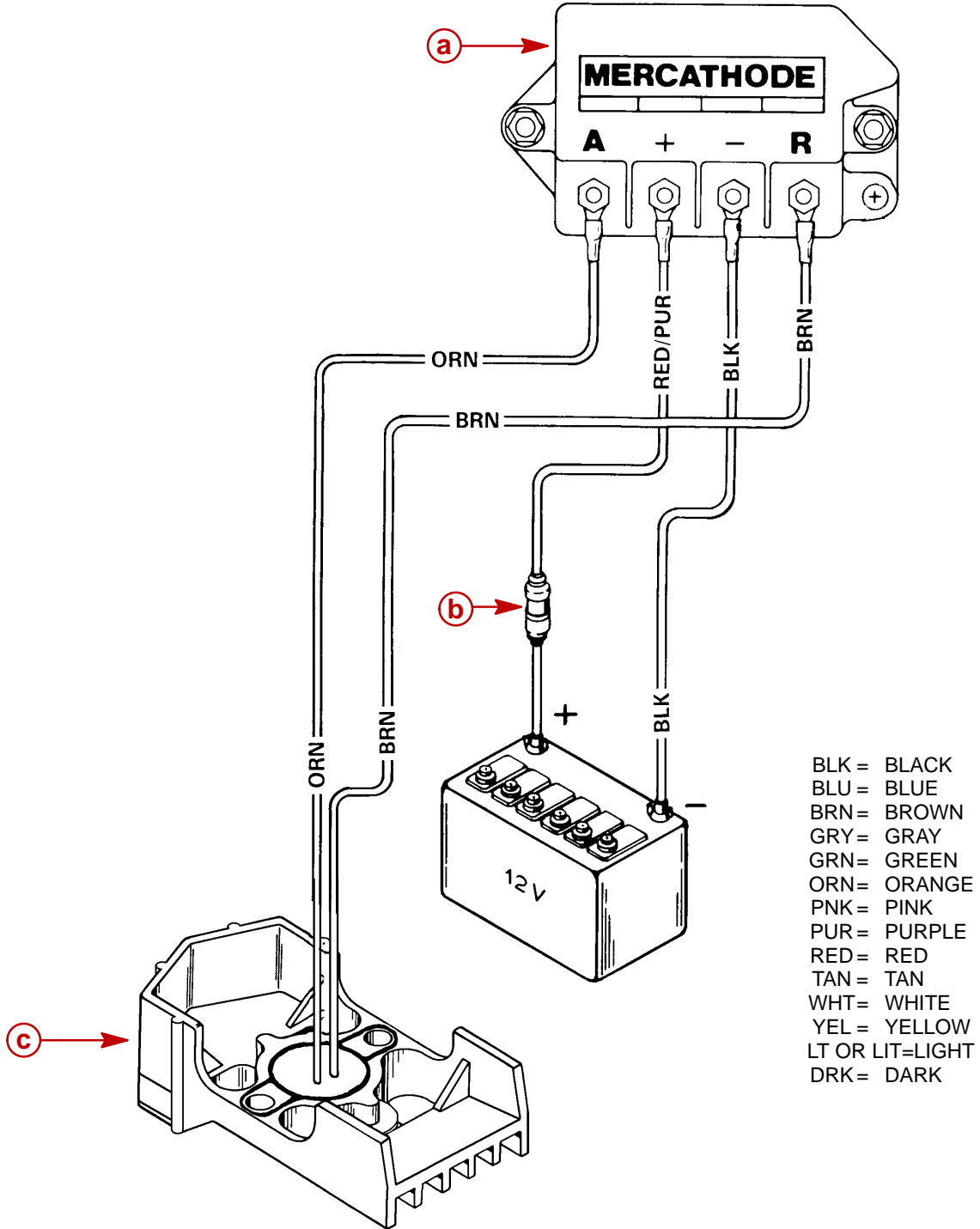
- a** - 20 Amp Fuse
- b** - Ground Bolt (Floor Mount)
- c** - "UP" Solenoid
- d** - 110 Amp Fuse
- e** - "DOWN" Solenoid
- f** - Trailer Switch
- g** - Neutral Switch to Instrument Wiring Harness
- h** - Trim Limit Switch



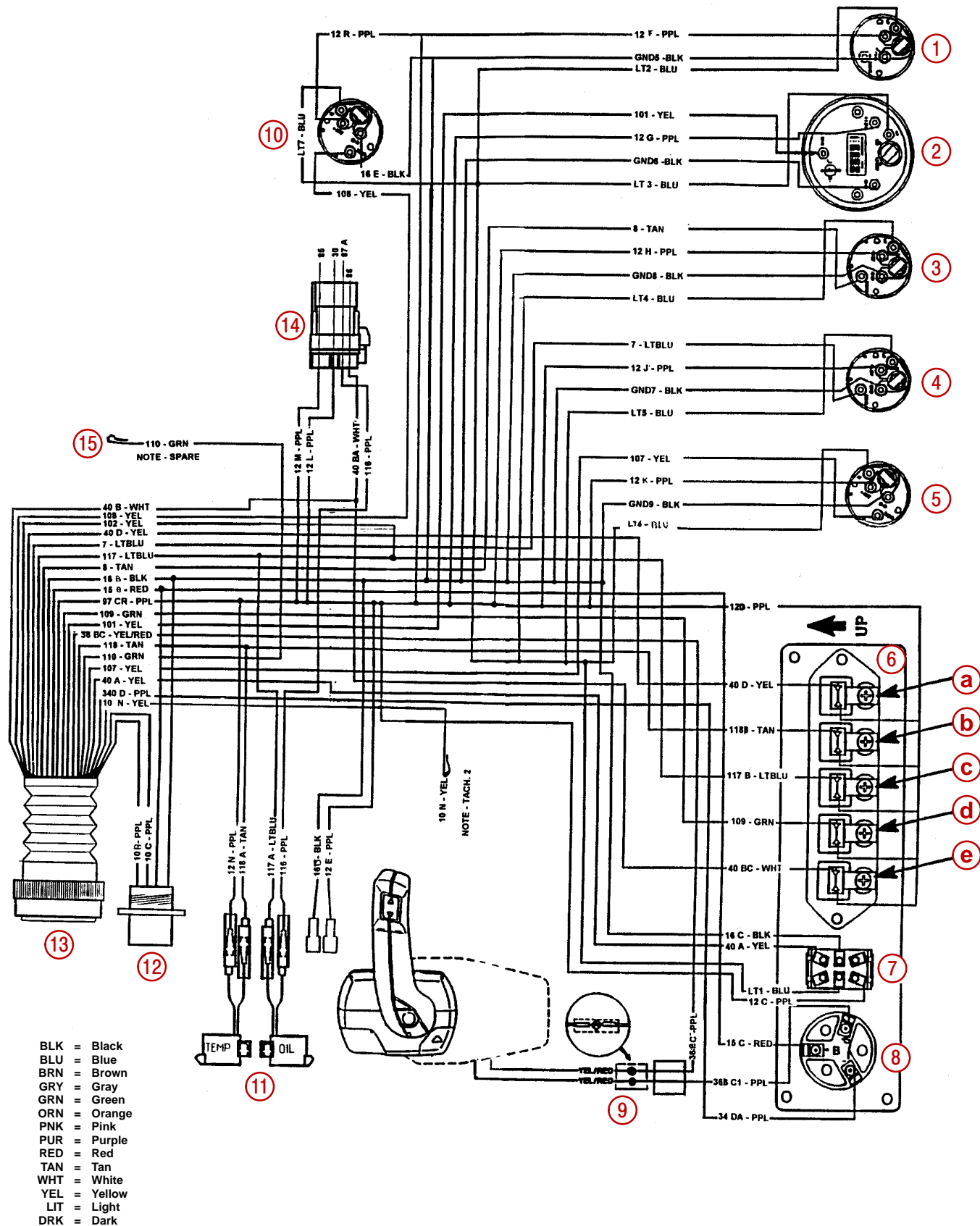
- BLK = BLACK
- BLU = BLUE
- BRN = BROWN
- GRY = GRAY
- GRN = GREEN
- ORN = ORANGE
- PNK = PINK
- PUR = PURPLE
- RED = RED
- TAN = TAN
- WHT = WHITE
- YEL = YELLOW
- LT OR LIT = LIGHT
- DRK = DARK

# MerCathode System Wiring Diagram

- a** - Controller
- b** - 20 Amp Fuse
- c** - Electrode



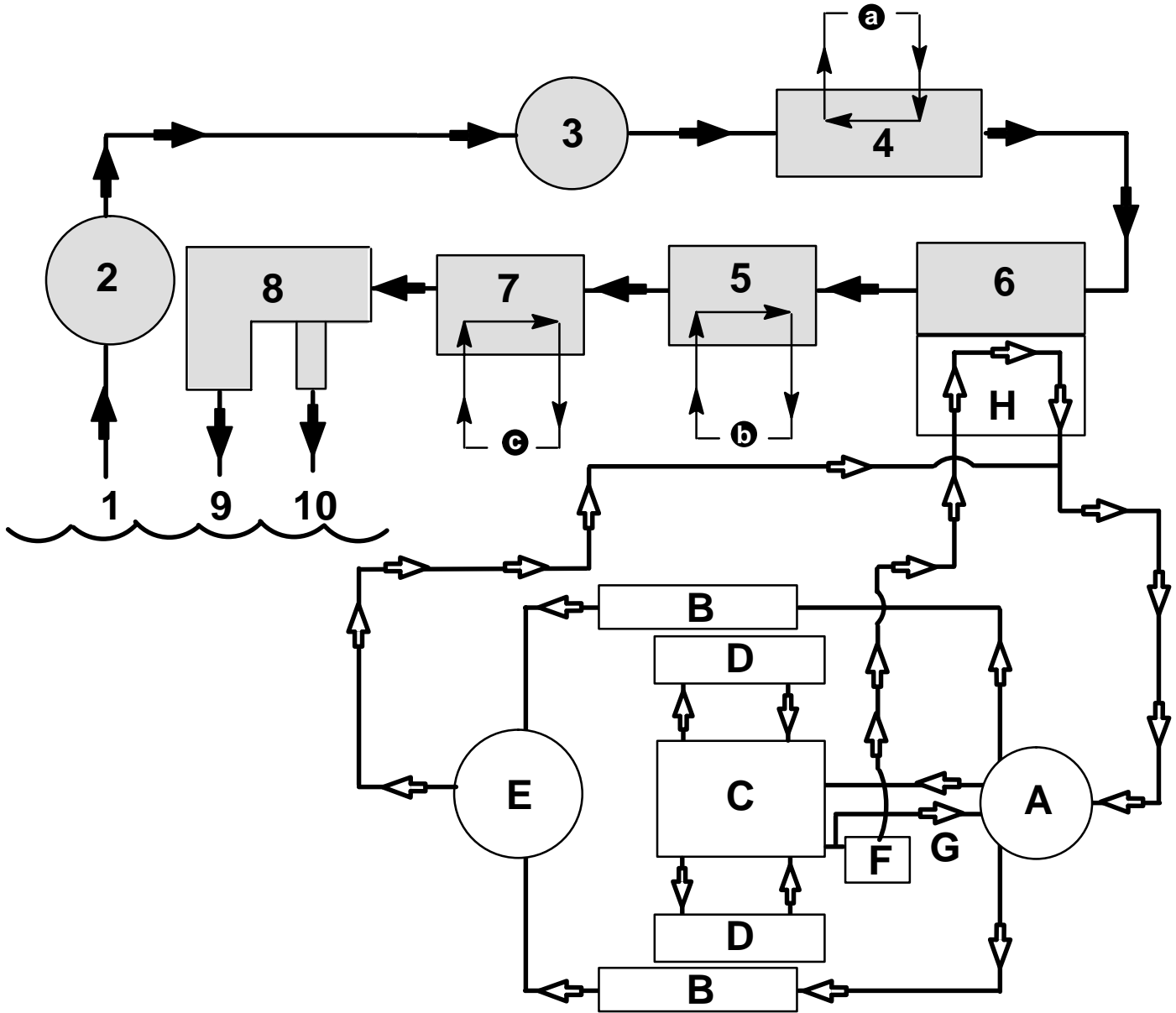
# Quicksilver Instrumentation Wiring



- 1** - Voltmeter Gauge
- 2** - Tachometer Gauge
- 3** - Water Temperature Gauge
- 4** - Oil Pressure Gauge
- 5** - Trim Gauge
- 6** - Engine System Monitor Panel
  - a** - Check Engine Light
  - b** - Engine Coolant High Temperature / Low Gear Lube Monitor Light
  - c** - Oil Pressure Warning Light
  - d** - Charge Indicator Light
  - e** - Preheat Indicator Light
- 7** - Panel Lights/Audio Warning Test Switch
- 8** - Key Switch
- 9** - Neutral Start Safety Circuit / Remote Control
- 10** - Hour Meter Gauge (Optional)
- 11** - Audio Warning Horns
- 12** - Diagnostic Tool Connection
- 13** - Instrument Harness Connector
- 14** - Wait-To-Start Relay
- 15** - Fuel Gauge (Optional)

Note 1: Connect these wires together with a screw and nut. Coat with Liquid Neoprene and slide rubber sleeve over connection.

# Cooling System Flow Diagram



76205



**SEAWATER COOLING CIRCUIT (RAW WATER)**

- 1 - Seawater Inlet
- 2 - Seawater Strainer
- 3 - Seawater Pump
- 4 - Aftercooler
- 5 - Engine Oil Cooler
- 6 - Heat Exchanger (Seawater Circuit)
- 7 - Power Steering Fluid Cooler
- 8 - Exhaust Pipe Water Jacket
- 9 - Seawater Outlet (Exhaust)
- 10- Seawater Outlet (Thru-Transom)

**CLOSED COOLING CIRCUIT (FRESH WATER/COOLANT)**

- A- Circulating Pump - Closed Coolant
- B- Exhaust Manifolds
- C- Engine Crankcase
- D- Cylinder Heads
- E- Turbocharger
- F- Thermostat
- G- Bypass
- H- Heat Exchanger (Closed Cooling Circuit)

**FLOW OF :**

- a** ENGINE AIR
- b** ENGINE OIL
- c** POWER STEERING FLUID

# Predelivery Inspection

Not Applicable	Check/ Adjust		Not Applicable	Check/ Adjust	
<b>CHECK BEFORE RUNNING</b>			<b>ON THE WATER TEST</b>		
<input type="checkbox"/>	<input type="checkbox"/>	Drain plug in and petcocks closed	<input type="checkbox"/>	<input type="checkbox"/>	Engine alignment (Inboards only)
<input type="checkbox"/>	<input type="checkbox"/>	Seawater inlet valve open	<input type="checkbox"/>	<input type="checkbox"/>	Starter neutral safety switch operation
<input type="checkbox"/>	<input type="checkbox"/>	Engine mounts tight	<input type="checkbox"/>	<input type="checkbox"/>	Water pump operation
<input type="checkbox"/>	<input type="checkbox"/>	Engine alignment	<input type="checkbox"/>	<input type="checkbox"/>	Instruments(s) operation
<input type="checkbox"/>	<input type="checkbox"/>	Drive unit fasteners torqued	<input type="checkbox"/>	<input type="checkbox"/>	Fuel leaks
<input type="checkbox"/>	<input type="checkbox"/>	Power trim cylinders fasteners tight	<input type="checkbox"/>	<input type="checkbox"/>	Oil leaks
<input type="checkbox"/>	<input type="checkbox"/>	Battery fully charged and secured	<input type="checkbox"/>	<input type="checkbox"/>	Water leaks
<input type="checkbox"/>	<input type="checkbox"/>	All electrical connections tight	<input type="checkbox"/>	<input type="checkbox"/>	Exhaust leaks
<input type="checkbox"/>	<input type="checkbox"/>	Exhaust system hose clamps tight	<input type="checkbox"/>	<input type="checkbox"/>	Ignition timing
<input type="checkbox"/>	<input type="checkbox"/>	All fuel connections tight	<input type="checkbox"/>	<input type="checkbox"/>	Idle _____ RPM, within specifications
<input type="checkbox"/>	<input type="checkbox"/>	Correct rotation propeller (installed and torqued)	<input type="checkbox"/>	<input type="checkbox"/>	Forward - Neutral - Reverse gear operation
<input type="checkbox"/>	<input type="checkbox"/>	Throttle, shift and steering system fasteners tightened properly	<input type="checkbox"/>	<input type="checkbox"/>	Steering operation throughout range
<input type="checkbox"/>	<input type="checkbox"/>	Throttle plates open and close completely	<input type="checkbox"/>	<input type="checkbox"/>	Acceleration from idle rpm
<input type="checkbox"/>	<input type="checkbox"/>	Crankcase oil level	<input type="checkbox"/>	<input type="checkbox"/>	WOT _____ RPM within specifications (in forward gear)
<input type="checkbox"/>	<input type="checkbox"/>	Power trim oil level	<input type="checkbox"/>	<input type="checkbox"/>	Power trim operation
<input type="checkbox"/>	<input type="checkbox"/>	Stern drive unit oil level	<input type="checkbox"/>	<input type="checkbox"/>	Trim tab adjustment
<input type="checkbox"/>	<input type="checkbox"/>	Power steering fluid level	<input type="checkbox"/>	<input type="checkbox"/>	Boat handling
<input type="checkbox"/>	<input type="checkbox"/>	Closed cooling level	<b>AFTER ON WATER TEST</b>		
<input type="checkbox"/>	<input type="checkbox"/>	Transmission fluid level	<input type="checkbox"/>	<input type="checkbox"/>	Propeller nut torque
<input type="checkbox"/>	<input type="checkbox"/>	Alternator belt tension	<input type="checkbox"/>	<input type="checkbox"/>	Fuel, oil, coolant, water and fluid leaks
<input type="checkbox"/>	<input type="checkbox"/>	Seawater pickup pump belt tension	<input type="checkbox"/>	<input type="checkbox"/>	Oil and fluid levels
<input type="checkbox"/>	<input type="checkbox"/>	Power steering pump belt tension	<input type="checkbox"/>	<input type="checkbox"/>	Apply Quicksilver Corrosion Guard to engine package
<input type="checkbox"/>	<input type="checkbox"/>	Audio warning system operation	<input type="checkbox"/>	<input type="checkbox"/>	

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