MERCURY MerCruiser

GASOLINE ENGINE INBOARD AND TOW SPORT MODELS INSTALLATION MANUAL

Models Covered

Inboard

Model	Serial Number or Year
5.7L	0L677946 and Above

Tow Sport

Model	Serial Number or Year
5.7L	0L678016 and Above
Black Scorpion	
MX 6.2L MPI Black Scorpion	

Notice

NOTICE
After completing installation, these instructions should be placed with the product for the owner's future use.

NOTICE
Predelivery preparation instructions must be performed before delivering boat to the product owner.

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General Information

Notice to Boat Manufacturer/Installer

Throughout this publication, Warnings and Cautions (accompanied by the International Hazard Symbol ⚠) are used to alert the manufacturer or 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.

NOTE: *Refer to the Mercury MerCruiser Product Applications Manual - Gasoline Sterndrive Models for application recommendations.*

This installation manual has been written and published by Mercury Marine to aid the boat manufacturer (OEM) in the installation of the products described herein.

It is assumed that these personnel are familiar with marine product installation. Furthermore, it is assumed that they are familiar with, if not trained in, the recommended installation procedures of Mercury MerCruiser product.

We could not possibly know of or advise the marine trade of all conceivable installations and of the possible hazards and/or results of each installation. Therefore, the OEM is responsible for any installation that does not fulfil the requirements of this manual.

It is the responsibility of the boat manufacturer to select the appropriate engine/transom/drive package (including the correct gear ratio and propeller) for a given boat. Mercury recommends that any new or unique hull/power package combination be thoroughly water tested prior to sale, to verify that the boat performs as desired, and that the engine runs in the appropriate rpm range.

It is recommended that a Mercury Marine Sales Application Engineer (SAE) be contacted for assistance.

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.

Torque Specifications

NOTE: *Securely tighten all fasteners not listed below.*

Description	Nm	lb-in.	lb-ft
Engine Mount Bracket Screws	64		47
Trunnion Clamping Bolt and Nut	68		50
Propeller Shaft Nut	68		50
Exhaust Manifold Screw	27		20
Fuel Line Inlet Fitting	Finger tight + 1-3/4 to 2-1/4 turns with a wrench. DO NOT overtighten.		
Coupler Bolts	68		50

Lubricants / Sealants / Adhesives

Description	Where Used	Part Number
Silicon Sealant or Equivalent	Screw Shaft	Obtain Locally
Marine Caulking	Seawater Inlet Mounting Surfaces	Obtain Locally
Loctite 271	Seawater Inlet Nut	92-809820
Loctite 592	Fuel Inlet Fitting	Obtain Locally
	Seawater Inlet Hose Fitting	
	Seawater Inlet Plastic Plug	
2 4 C Marine Lubricant with Teflon	Shift Cable End	92-825407A3
Special Lube 101	Steering Cable End	92-13872A1
Liquid Neoprene	Battery Terminals	92-25711-2
SAE 30W Engine Oil	Shift Cable Pivot Points	Obtain Locally

Quicksilver Products

Accessories

Quicksilver gauges, remote controls, steering systems, propellers and other accessories are available for this product. Mercury MerCruiser recommends the use of Quicksilver parts on all applications. Refer to *Mercury Precision Parts / Quicksilver Accessories Guide* for a complete listing.

This Guide is available from:

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

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

Serial Number Decal Placement

There are three engine serial number decal strips provided with each power package. One should be used for each of the following:

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

Affix engine serial number decal to Engine Specification Decal.

Engine Rotation

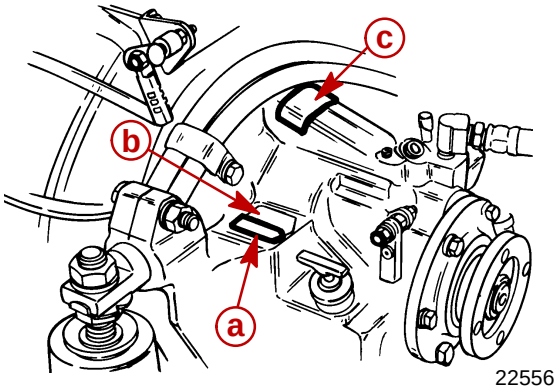
Engine rotation is described when observed from the rear of the engine (transmission end) looking forward (water pump end).

Engine rotation is indicated on engine specifications and serial number decal.

Transmissions

Velvet Drive Transmissions

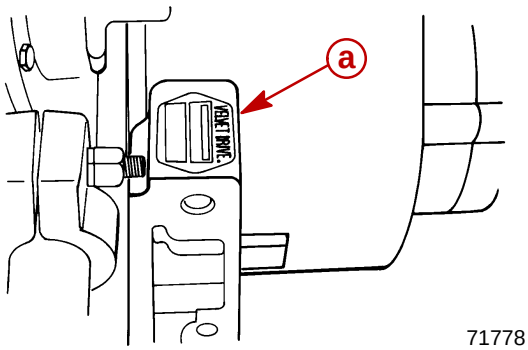
On Velvet Drive In-Line and V-Drive Transmissions (71C, 72C, 72C V-Drive, with or without Walter transmissions) the gear ratio (in forward gear) is marked on transmission identification plate. Transmission output shaft rotation and propeller rotation required (in forward gear) is indicated on a decal on transmission case. Transmission rotation is described when viewed from the rear of transmission.



In-Line Transmission Shown (Others Similarly Located)

a - Transmission Identification Plate
b - Gear Ratio (In Forward Gear)
c - Output Flange Rotation Decal (In Forward Gear)

On the Velvet Drive 5000A and 5000V Transmissions the transmission identification plate indicates gear ratio, serial number and model.

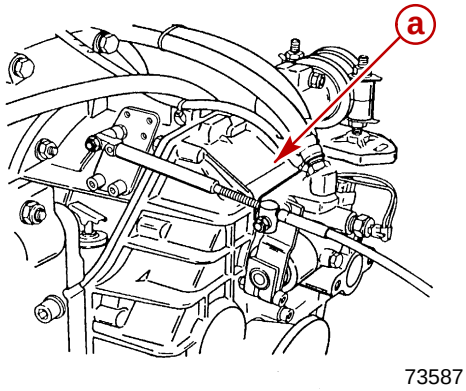


Velvet Drive 5000A - 8 Degree Down-Angle Transmission Shown (5000V - V-Drive Similar)

a - Transmission Identification Plate

ZF / Hurth Transmissions

On the Hurth 8 Degree Down-Angle and V-Drive Transmissions the transmission identification plate indicates gear ratio, serial number and model.

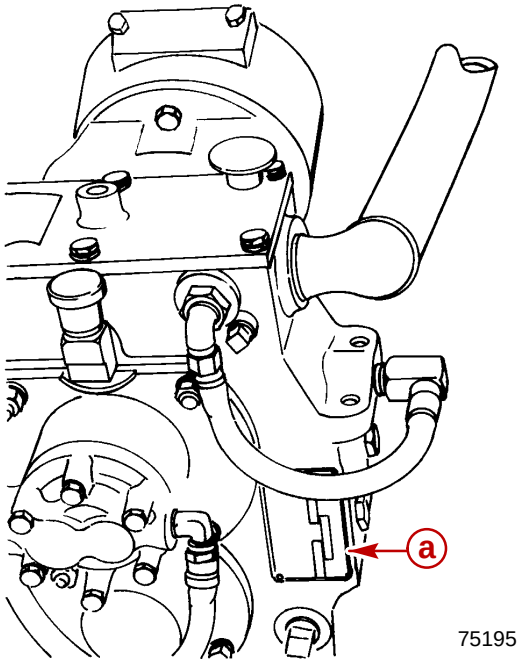


Typical Hurth Down-Angle Transmission Shown (V-Drive Identification Plate Similarly Located)

a - Transmission Identification Plate

WALTER V-DRIVE TRANSMISSIONS

On the Walter V-Drive Transmissions the transmission identification plate indicates gear ratio, serial number and model.



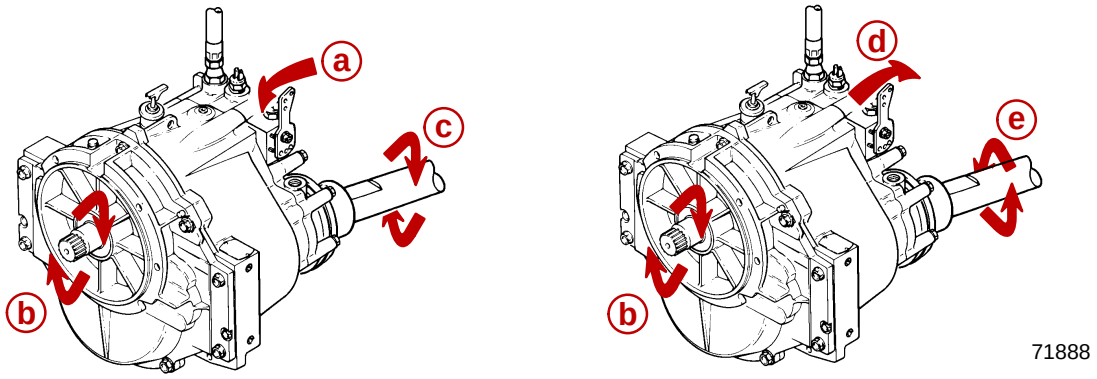
Walter RV-36 V-Drive

a - Transmission Identification Plate

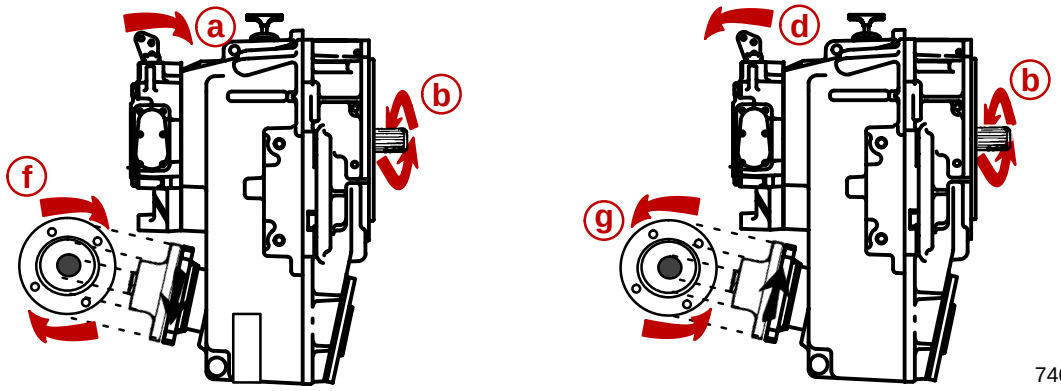
Propeller Rotation

Propeller rotation is not necessarily the same as engine rotation. Refer to the appropriate following information and drawings for specific information.

These transmissions are full power reversing transmissions, allowing a standard (LH rotation) engine to be used for both propeller rotations. Propeller rotation (output shaft rotation) is determined by shift cable attachment at the remote control. Be sure to use correct rotation propeller and shift cable hook up for direction desired.



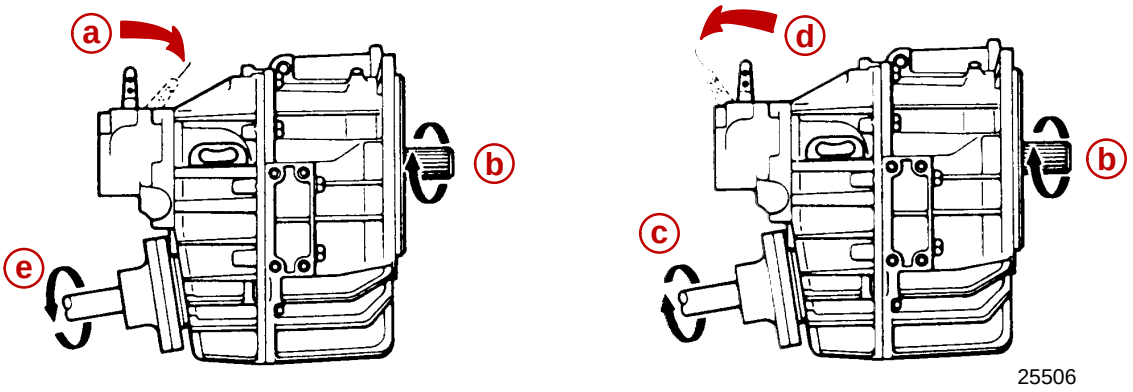
Velvet Drive 5000A - 8 Degree Down-Angle Transmission



Velvet Drive 5000V - V-Drive Transmissions

- **a** - Direction of Shift Lever Engagement (Toward Flywheel)
- **b** - Engine/Transmission Input Shaft Rotation Direction (LH)
- **c** - Transmission Output/Propeller Shaft Rotation Direction (LH)
- **d** - Direction of Shift Lever Engagement (Away From Flywheel)
- **e** - Transmission Output/Propeller Shaft Rotation Direction (RH)
- **f** - Transmission Output/Propeller Shaft Rotation Direction (LH as viewed at propeller)
- **g** - Transmission Output/Propeller Shaft Rotation Direction (RH as viewed at the propeller)

Propeller Rotation (Continued)



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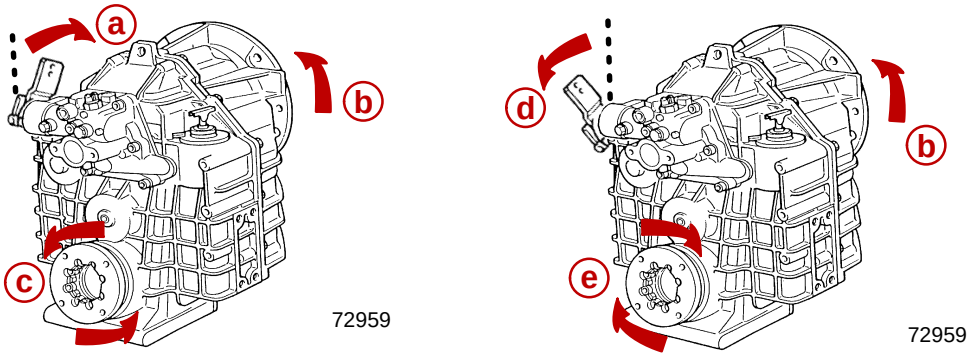
Hurth 630A or 800A - 8 Degree Down-Angle Transmissions



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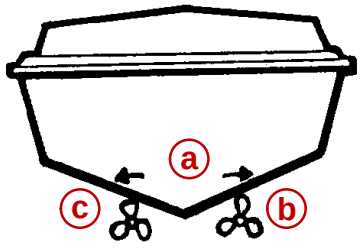
Hurth 630V - V-Drive Transmissions

a - Direction of Shift Lever Engagement (Toward Flywheel)
b - Engine/Transmission Input Shaft Rotation Direction (LH)
c - Transmission Output/Propeller Shaft Rotation Direction (LH)
d - Direction of Shift Lever Engagement (Away From Flywheel)
e - Transmission Output/Propeller Shaft Rotation Direction (RH)

PROPELLER ROTATION ON DUAL INSTALLATIONS

Best all-around performance usually is obtained by installing engines so that propellers turn outboard (looking at the stern).



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a - Outboard Propeller Rotation
b - RH Rotation
c - LH Rotation

APPLICATION / RATIO SELECTION

The propeller shaft speed is determined by engine speed and the transmission ratio. Every boat has a most desirable shaft speed which has a direct relationship to boat speed. If shaft speeds are too high an inordinately small propeller must be used which will result in poor performance. If they are too low then too large a prop must be used. Fast boats do best with direct drive or small reductions. Heavier and slower boats require corresponding greater ratios of reduction. 100 rpm of prop shaft speed for each MPH of boat speed is a rough rule of thumb for selecting the drive ratio.

COUPLING

The coupling is a flange type coupler (available through Quicksilver Accessories). All coupler bolts must be SAE Grade 8 (Metric Grade 10.9) or better, with a shoulder (grip length) long enough to pass through the face mating plane of couplers. All coupler bolts must be torqued to 50 lb-ft (68 Nm).

ENGINE/PROPELLER SHAFT INSTALLATION ANGLE

The transmission and engine should be mounted so that the angle relative to horizontal is as shown in the installation drawings. Refer to individual installation drawings for each specific engine and transmission.

IMPORTANT: Relative to horizontal, *never* install the engine with the front (pulley end) down.

IMPORTANT: On all engines, a high angle of installation [front (pulley end) of engine up] along with low transmission oil levels can permit transmission pump cavitation on some models when operating in rough water.

PROPELLER SHAFT DIAMETER

Propeller shaft diameter should be of sufficient size for the type of application.

VELVET DRIVE IN-LINE AND V-DRIVE TRANSMISSIONS (EXCEPT 5000 SERIES)

IMPORTANT: Velvet Drive In-Line and V-Drive Transmissions Only – Use of proper rotation propeller (specified on transmission output flange rotation decal) is critical since the transmission must be operated in forward gear selector position only to drive boat forward. If the wrong rotation propeller is installed and transmission is operated in reverse to propel the boat forward, transmission failure WILL occur.

IMPORTANT: On engines which are equipped with Velvet Drive In-line transmissions, a LH propeller is required.

Boat Construction

Engine Bed

Difference Between Starboard and Port Engine Mount	22-1/2 in. (572 mm)
Mount Adjustment Up and Down (minimum)	1/4 in. (6mm)

NOTE: *Although the engine mounts allow some adjustment, ensure that the front and rear mount locations in the vessel are in the same plane and parallel. 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.*

Seawater Connections

Seawater Pickup

IMPORTANT: Seal the edges of any hole made through the hull with a suitable sealant to prevent water absorption and deterioration.

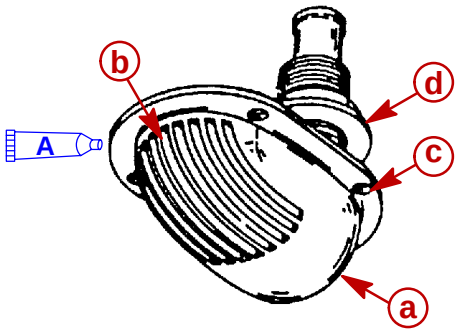
THROUGH THE HULL MOUNTED

1. Seal the inside edges of the 1-3/4 in. (44 mm) hole in the hull using a suitable sealer.
2. Apply marine caulking (sealer) to mounting surface on seawater pickup where hull contact will occur when installed.

Description		Where Used	Part Number
A	Marine Caulking	Mounting Surfaces	Obtain Locally

IMPORTANT: Seawater inlet slots must face forward - parallel with the flow of water.

3. Ensure slots in seawater pickup are facing forward (toward bow of boat) and install seawater pickup through hull.
4. Fasten pickup with four appropriate mounting screws (if so designed).
5. Apply marine caulking as needed inside boat. Apply sealant to the threads of the nut and install on the pickup on the inside of the boat and torque the nut.



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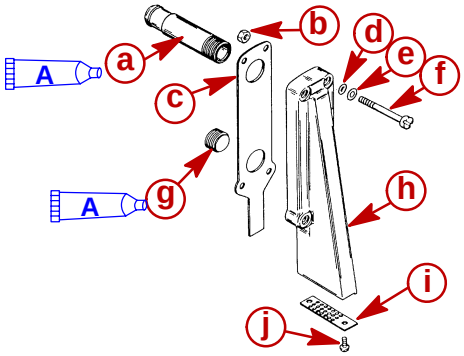
a - Seawater Pickup
b - Seawater Inlet Slots
c - Mounting Screw Holes (If Equipped)
d - Nut

Description		Where Used	Part Number
A	Loctite 271	Seawater Pickup Nut	92-809820

Description	Nm	lb-in.	lb-ft
Nut	42		35

NOTE: *If pickup being installed does not have mounting screws on underside where mounted to hull, be certain, after nut is torqued, that slots are still facing forward.*

Transom Mounted



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a - Hose Fitting
b - Nut (4)
c - Gasket
d - O-ring (4)
e - Washer (4)
f - Screw (4)
g - Plastic Pug
h - Pickup
i - Screen
j - Screw (2)

1. Seal the inside edges of the 1-1/2 in. (38 mm) hole hose fitting.
2. Be certain hose fitting and plastic plug are in place and threads have been sealed with Loctite Pipe Sealant with Teflon prior to tightening each securely.

Description		Where Used	Part Number
A	Loctite 592 PST	Hose Fitting Threads	Obtain Locally
		Plastic Plug Threads	
B	Silicon Sealant or Equivalent	Screw Shaft	Obtain Locally

NOTE: *Use a sharp knife or wood chisel to remove excess plastic plug material so that plug is flush with pickup casting.*

3. Position one flat washer and one rubber O-ring on each 5/16 in. x 4 in. (102 mm) long, round head screw as shown. Coat each screw shaft with silicone sealant or equivalent.
4. Place new gasket on pickup housing and hold pickup in place on transom. Install four round head screws (with washers and O-rings in place) into pickup mounting holes and through drilled 21/64 in. (8 mm) holes in transom.
5. Secure water pickup from inside with locknuts and washers (unless using lag bolts).
6. Tighten fasteners securely.

Preliminary Connections

Fuel Inlet Fitting

IMPORTANT: The following information is provided to ensure proper installation of brass fittings or plugs installed into fuel pump or fuel filter base:

- **Use #592 Loctite Pipe Sealant with Teflon on threads of brass fittings or plugs. DO NOT USE TEFLON TAPE.**

⚠ WARNING

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

⚠ WARNING

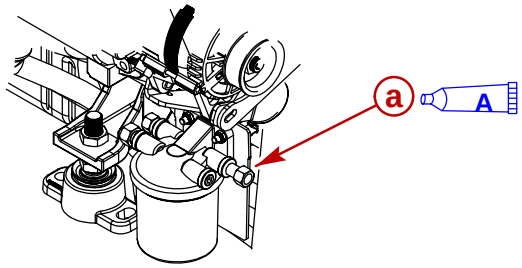
Avoid gasoline fire or explosion. Improper installation of brass fittings or plugs into fuel pump or fuel filter base can crack casting and/or cause a fuel leak.

1. Remove plastic plug from fuel inlet hole.
2. Apply sealant to threads of fuel inlet fitting. DO NOT USE TEFLON TAPE.

⚠ WARNING

Overtightening the fuel inlet fitting can lead to fuel leaks, avoid severe personal injury or death from a gasoline fire or explosion. DO NOT use a power tool (i.e. impact wrench) to tighten the fuel inlet fitting.

3. Install fuel fitting. To prevent cracking the casting or causing fuel leaks, turn inlet connector in by hand until finger tight, then tighten connector to 1-3/4 to 2-1/4 turns with wrench. DO NOT overtighten.



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Typical Fittings

a - Fuel Inlet Hose Fitting Location

Description		Where Used	Part Number
A	Loctite 592	Fuel Inlet Fitting	Obtain Locally

Description	lb-ft	lb-in.	Nm
Fuel Line Inlet Fitting	Finger tight + 1-3/4 to 2-1/4 turns with a wrench. DO NOT overtighten.		

SPECIAL INFORMATION ABOUT ELECTRIC FUEL PUMPS

⚠ CAUTION

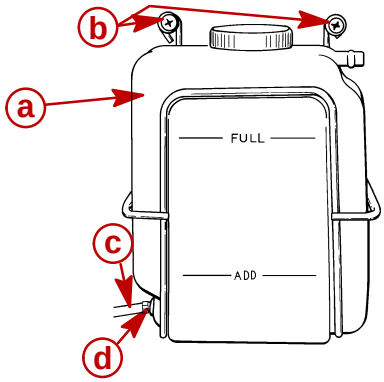
The electric fuel pump and factory installed water separating fuel filter have been carefully designed to function properly together. Do not install additional fuel filters and/or water separating fuel filters between fuel tank and engine.

The installation of additional filters may cause:

- Fuel Vapor Locking
- Difficult Warm-Starting
- Piston Detonation Due to Lean Fuel Mixture
- Poor Driveability

Coolant Recovery System Connections

1. 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. Level with or above the heat exchanger fill neck.
   c. Accessible for observing coolant level and filling.
2. Mount coolant recovery bottle and mounting bracket in desired location, using two 3/4 in. (19 mm) long screws and flat washers.
3. Route plastic tubing to recovery bottle. Ensure that 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.
4. Fasten plastic tubing to boat as necessary, with the 2 hose clips and 1/2 in. (13 mm) long screws provided.



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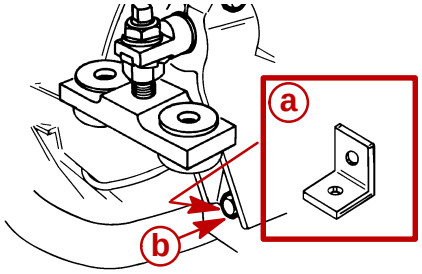
a - Recovery Bottle And Mounting Bracket
b - Screws And Flat Washers
c - Plastic Tubing
d - Tubing Clamp

Engine Mount Pre-Adjustment

1. Remove hardware holding engine to shipping pallet. Attach a suitable sling to lifting eyes on engine. Lift engine from pallet with an overhead hoist.
2. Remove L-shaped shipping bracket from both rear (transmission) mounts as shown. Retorque mount bracket attaching screw.



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Typical

a - L-shaped Bracket
b - Transmission Mount Bracket Attaching Screw

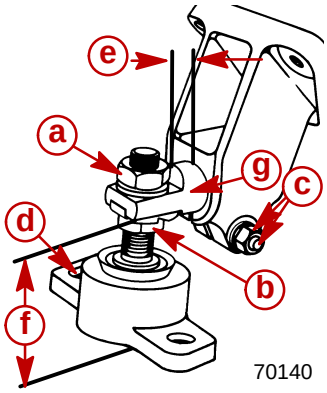
Description	lb-ft	lb-in.	Nm
Engine Mount Bracket Screws	47		64

IMPORTANT: Engine mounts must be adjusted, as explained in Steps 3. and 4., to center mount adjustment and establish a uniform height on all mounts.

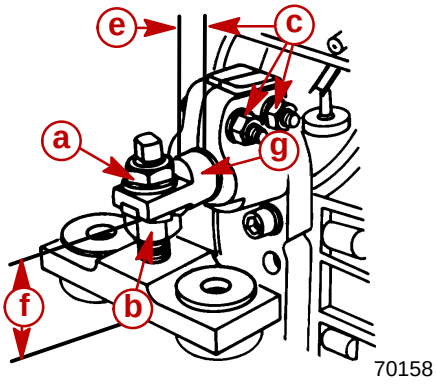
3. Check all 4 engine mounts (2 front, 2 rear) to ensure that distance from bottom of mount to bottom of trunnion is as shown. If not, loosen mount locking nut and turn adjusting nut in direction required to obtain proper dimension, then retighten locking nut. Be sure to leave mount positioned so that slot is forward.

4. Loosen clamping bolts and nuts on all 4 engine mount brackets to ensure the following:

- Large diameter of mount trunnion extended.
- Mount base slotted mounting hole forward, if so designed.
- Each mount base is downward. Tighten clamping bolts and nuts slightly to prevent moving in or out. Mounts must be free to pivot when installing engine.



Front Mount



Typical Rear Mount

a - Locking Nut
b - Adjusting Nut
c - Trunnion Clamp Screws And Nuts, With Lockwashers
d - Slot Forward
e - 3/8 in. + 1/16 in. (10mm + 2mm)
f - 2-5/8 in. + 1/16 in. (67mm + 2mm)
g - Mount Trunnion

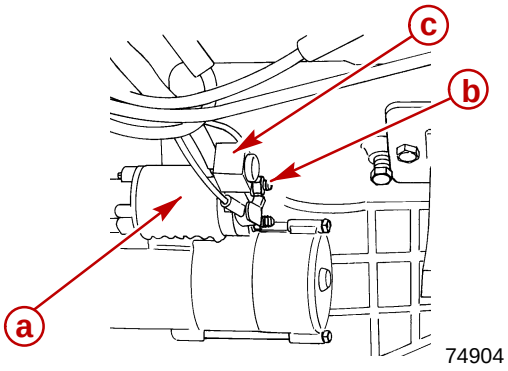
Engine Preparation

1. Remove and read all tags attached to engine.
2. Remove all hardware that secures engine to shipping container.
3. Connect battery cables to engine. Be sure to observe the following:
   a. Ensure 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 sealant to the terminals.

Description	Where Used	Part Number
Liquid Neoprene	Battery Terminals	92-25711-2

   c. Be sure to slide rubber boot over positive (+) terminal after making connection.

IMPORTANT: There is a fuse located at the starter solenoid. DO NOT remove this fuse. The positive battery cable must be connected to the same stud as the fuse.

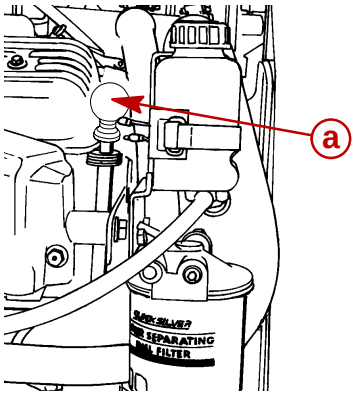


a - Positive (+) Battery Cable
b - Starter Solenoid
c - 90 Amp Fuse - DO NOT Remove

4. Drape battery cables over top of engine to prevent interference during installation.

Engine Oil Dipstick Relocation (If Equipped)

Engine crankcase oil dipstick can be located on either starboard or port side of engine to suit installation requirements. To move dipstick, remove dipstick from current location and install in opposite side. Place rubber cap over the open dipstick tube.



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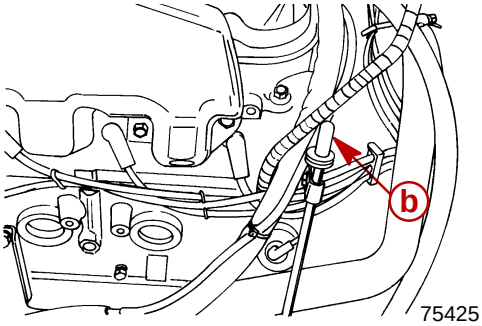

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a - Dipstick (Typical)
b - Rubber Cap

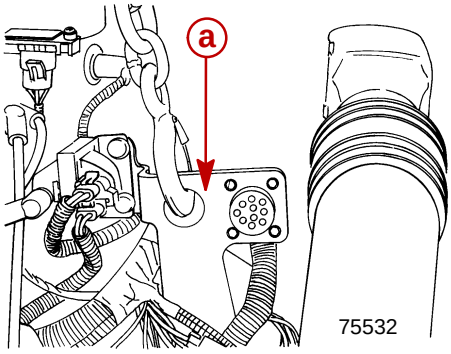
Engine Installation and Initial Engine Alignment

Models With 8 Degree Down Angle Transmissions - Velvet Drive or Hurth

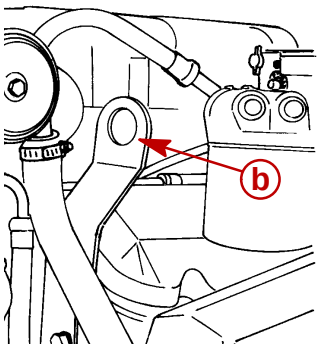
1. Remove the engine cover.
2. Attach a suitable sling to lifting eyes on engine and adjust so that engine is level when suspended.

⚠ CAUTION

Center lifting eye on top of thermostat housing is used for engine alignment only. Do not use to lift entire engine.



75532

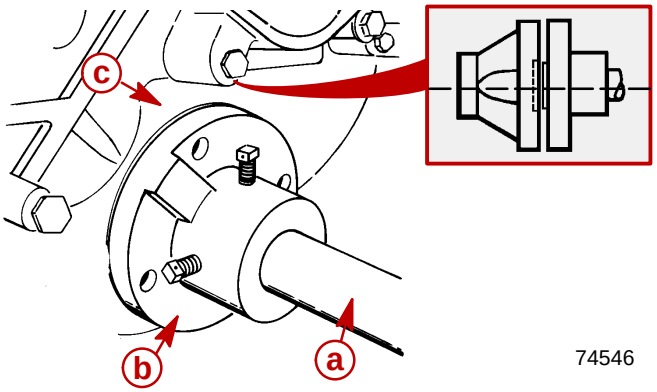


74510

a - Rear Lifting Eye
b - Front Lifting Eye

3. Lift engine into position in boat using an overhead hoist.
4. Position engine on engine bed so that transmission output flange and propeller shaft coupler are visibly aligned (no gap can be seen between coupling faces when butted together). **Adjust engine bed height** if necessary to obtain proper alignment. DO NOT use mount adjustments to adjust engine position at this time.
5. Ensure quick drain oil fitting is more than 1/2 in. (6 mm) above the boat bottom.

IMPORTANT: Engine bed must position engine so that a minimum of 1/4 in. (6 mm) up and down adjustment still exists on all 4 mounts after performing initial alignment. This is necessary to allow for final engine alignment.



74546

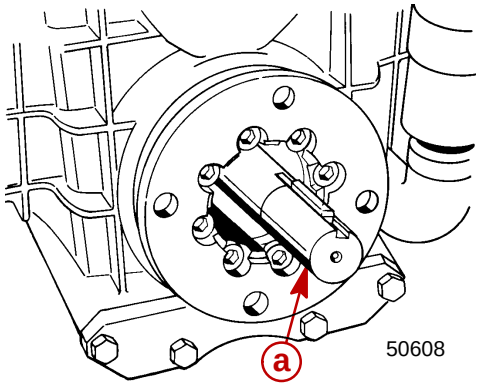
a - Propeller Shaft
b - Propeller Shaft Coupler
c - Transmission Output Flange

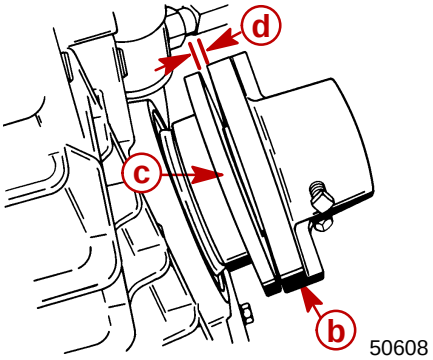
6. Ensure that all 4 mounts are still positioned properly, then fasten mounts to engine bed with 3/8 in. (10 mm) diameter lag bolts (of sufficient length) and flat washers. Tighten lag bolts securely.
7. Disconnect overhead hoist and remove sling.

Models with V-Drive Transmissions

1. Lift engine into position in boat using an overhead hoist.
2. Install quick drain oil hose plug in oil drain hose.
3. Position engine so that enough propeller shaft protrudes through transmission and output flange for propeller shaft coupler to be attached. Then install coupler and position engine (no gap can be seen between coupling faces when butted together). **Adjust engine bed height** if necessary to obtain proper alignment. DO NOT use mount adjustments to adjust engine position at this time.

IMPORTANT: Engine bed must position engine so that a minimum of 1/4 in. (6 mm) up and down adjustment still exists on all 4 mounts after performing final alignment. This is necessary to allow for final engine alignment.





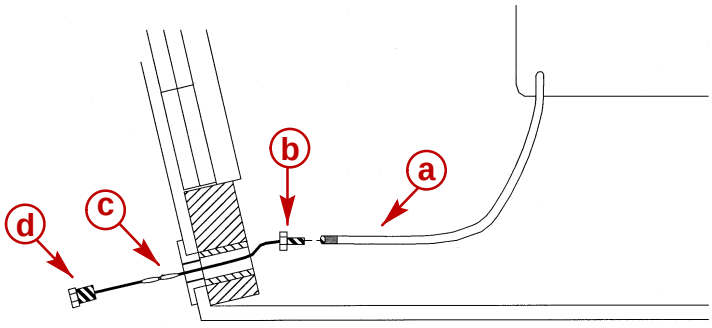
Hurth 630V (Others Similar)

a - Propeller Shaft
b - Propeller Shaft Coupler
c - Transmission Output Flange
d - **No Gap Allowed**

4. Ensure that all 4 mounts are still positioned properly. Fasten mounts to engine bed with 3/8 in. (10 mm) diameter lag bolts (of sufficient length) and flat washers. Tighten lag bolts securely.
5. Ensure quick drain oil fitting is more than 1/2 in. (6 mm) above the boat bottom.
6. Disconnect overhead hoist and remove sling.

All Models, If Equipped

1. Push end of oil drain hose out of boat hull through flange.
2. Pull oil drain hose out until it is 6 in. (152 mm) from the propeller.
3. Move alignment clip on the oil drain hose and squeeze to position it on the hose just inside of the boat hull against the flange.
4. Connect bilge drain plug to oil drain hose plug using clip.



78002

a - Oil Drain Hose
b - Alignment Clip
c - Clip
d - Bilge Drain Plug

IMPORTANT: If Quick Drain Oil Fitting is within 1/2 in. (6 mm) of boat bottom, remove fitting and install drain plug from parts bag directly into oil pan.

5. Push oil drain hose through flange into boat hull.
6. Install bilge drain plug in hull.

Hot Water Heater Installation Information

IMPORTANT: When connecting a cabin heater or hot water heater:

- **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.**
- **Do not reposition engine temperature switch.**

⚠ CAUTION

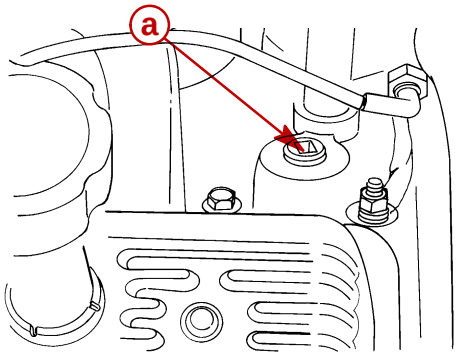
Avoid a performance loss and/or possible engine damage. Engine coolant must flow continuously from the engine intake manifold to the engine water circulating pump. NEVER close-off or block the coolant flow to or from a heater.

⚠ CAUTION

Avoid engine overheating which could result in engine damage. On models equipped with Closed Cooling, an air pocket may form in the closed cooling system if some coolant is lost from the system and the cabin heater or hot water is mounted higher than the fill cap on the heat exchanger. Heater must be mounted lower than the fill cap of the heat exchanger on models so equipped.

SUPPLY HOSE CONNECTION - ENGINES WITH SEAWATER OR CLOSED COOLING SYSTEM

NOTE: *Some models may be equipped with additional fittings.*



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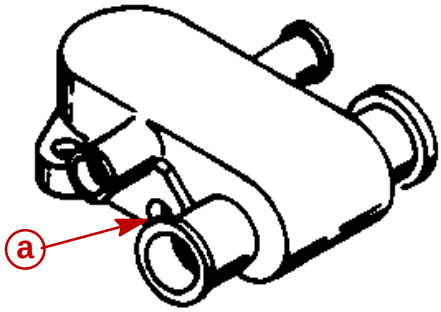
Seawater Cooled Models - If Available

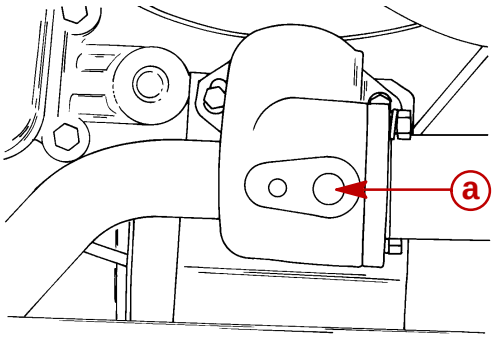
a - Location for Hot Water Supply



71758

Seawater Cooled Models

a - Location for Hot Water Supply (Install Bayonet Fitting Here)

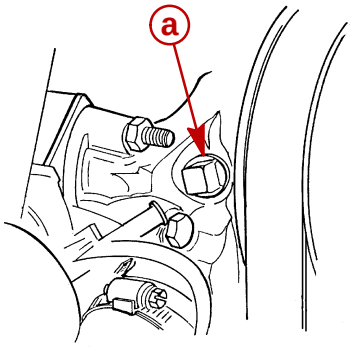


75503

Closed Cooled Models - If Available

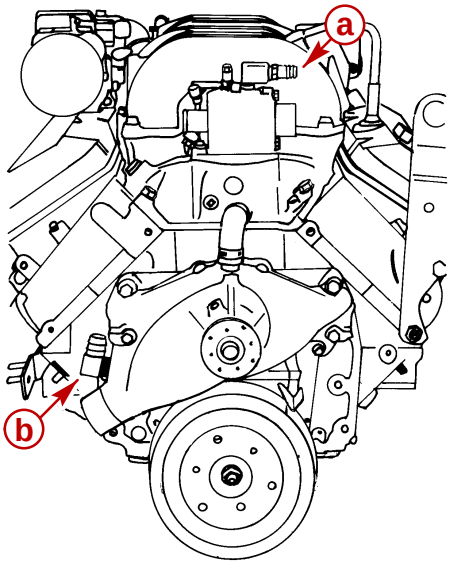
a - Location for Hot Water Supply As Viewed From Top Of Thermostat Housing (Install Bayonet Fitting Here)

RETURN HOSE CONNECTION - ENGINES WITH SEAWATER OR CLOSED COOLING SYSTEM



75480

a - Hot Water Return Hose Connection



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Alternate Connection Fitting - If Available

a - Supply Hose Connection
b - Hot Water Return Hose Connection

Exhaust System

⚠ CAUTION

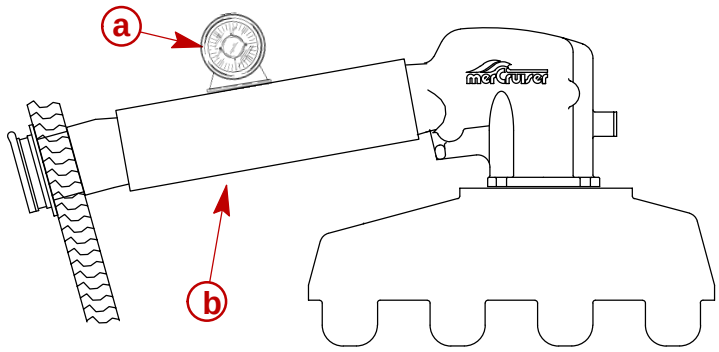
It is the responsibility of the boat manufacturer or installing dealer to properly locate the engine and install the exhaust system. Improper installation may allow water to enter the exhaust manifolds and combustion chambers and severely damage the engine. Damaged caused by the water in the engine will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

Measuring Procedure

1. Fill all fuel, water, gray water and heater tanks to maximum capacity.

NOTE: *Weight can be added in these locations to simulate full loaded condition.*

2. Add maximum allowable cargo weight to boat in areas where it will be stowed, including refrigerator and lockers.
3. Add 190 lb (86 kg) of weight in all locations where each passenger will sit during normal operation.
4. Measure exhaust elbow height. Refer to Measurement Methods. Also, measure exhaust system slope on applications with through the hull or through the transom exhaust.



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Using A Universal Protractor (Inclinometer) To Measure Slope

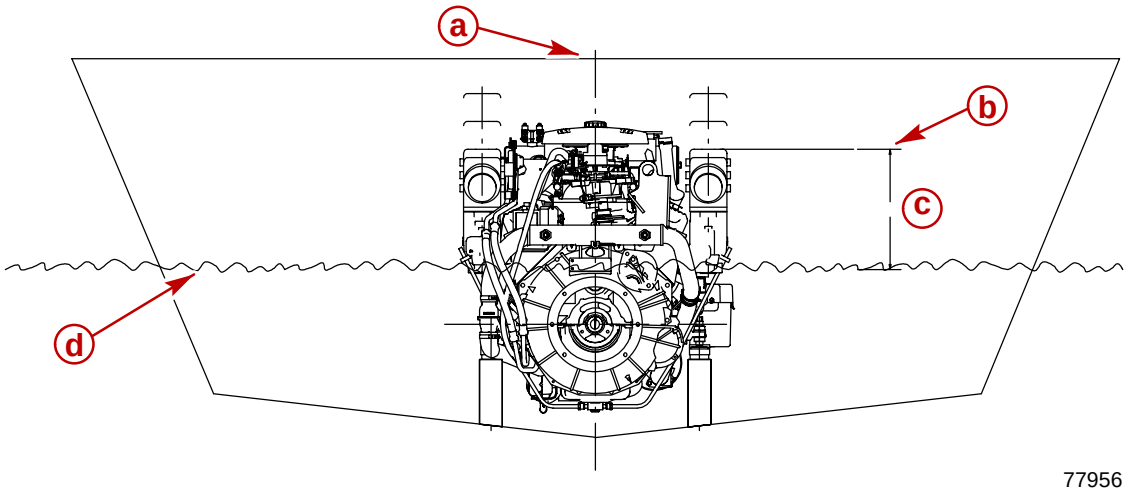
a - Protractor
b - Exhaust Hose Or Tube

5. Move load weight to bow to simulate greatest bow-down attitude the boat will encounter in normal operation.
6. Recheck exhaust system slope.
7. Move load weight and cargo weight to stern of boat to stimulate greatest stern-down attitude the boat will encounter such as when loading.

IMPORTANT: Be sure to consider swim platform loading and personal watercraft.

8. Recheck exhaust system measurements.

Minimum Exhaust Elbow Height from Top of Elbow to Waterline	
Model	**Measurement**
All V6 and V8	13 in. (330 mm)



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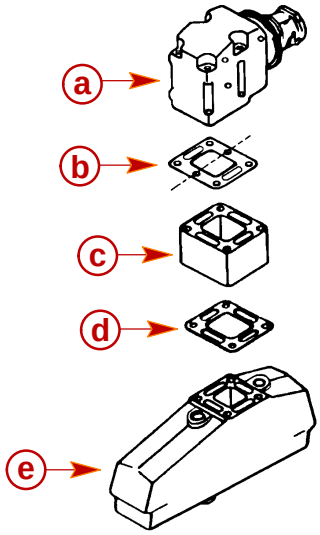
a - Top Of Transom
b - Highest Point On Exhaust Elbow
c - Measurement
d - Waterline

Minimum Continuous Downward Slope (Exhaust Hoses, Collector)	
Model	**Measurement (degrees)**
All Sterndrive	6

9. If measurements are less than specified, exhaust elbow risers must be installed to achieve proper dimension.



70621

Typical Riser Installation

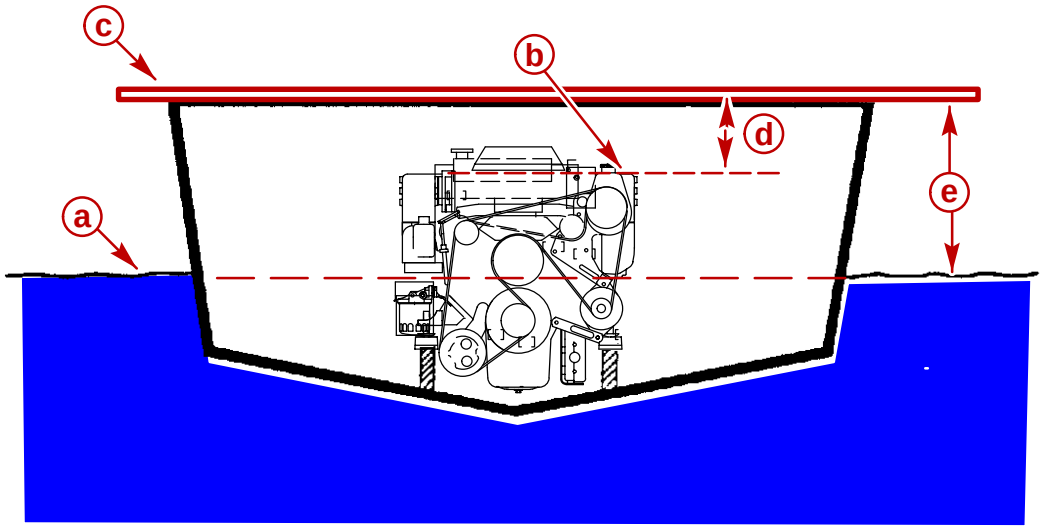
- **a** - Exhaust Elbow
- **b** - Restrictor Gasket
- **c** - Riser
- **d** - Open Gasket (4 Slots)
- **e** - Exhaust Manifold

NOTE: *Up to a maximum of 9 in. (229 mm) of riser height can be added.*

Measurement Methods

STRAIGHT EDGE METHOD

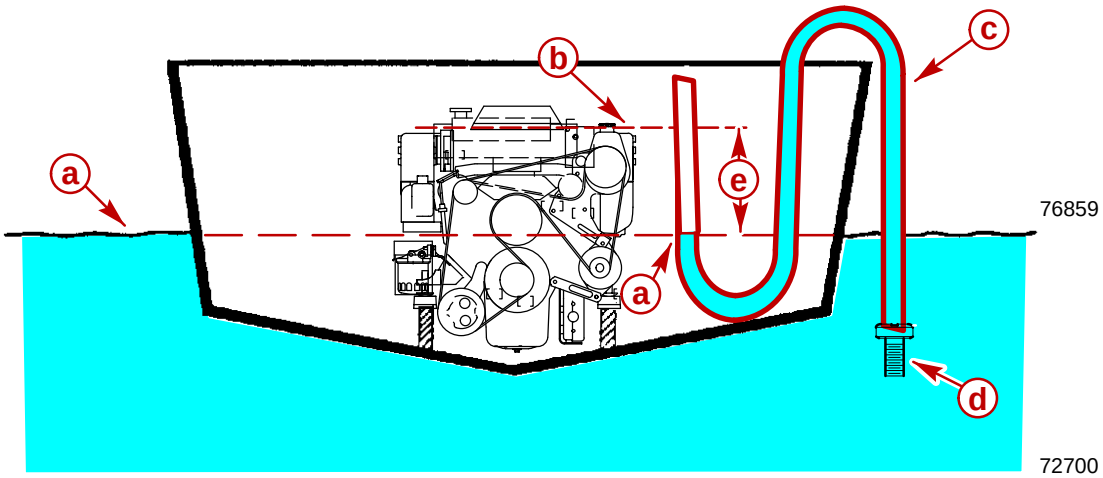
1. Place a straight edge across boat.
2. With the straight edge above the engine and parallel to the water, measure the distances between the straight edge and the top of the exhaust elbow.
3. With the straight edge above the engine and parallel to the water measure the distance between the straight edge and the outside waterline.
4. The difference between these two measurements is the exhaust elbow height above the water line. Refer to Measuring Procedure and compare measurement to Mercury MerCruiser's specifications.



a - Waterline
b - Top Of Exhaust Elbow
c - Straight Edge
d - Measurement Between Straight Edge And Top Of Exhaust Elbow
e - Measurement Between Straight Edge And Water Line

CLEAR HOSE METHOD

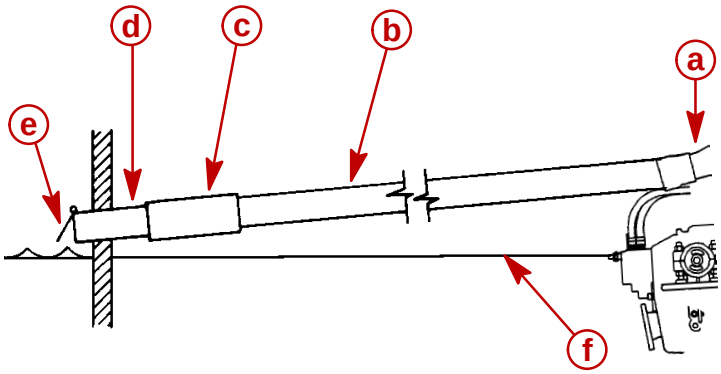
1. Obtain a 5/16 - 3/8 in. (8-10 mm) I.D. hose approximately 15 ft (4.5 m) long. Put a metal fitting or a weight on one end of the hose to keep that end of the hose below the water line.
2. Put the weighted end of the hose over the port or starboard side of the boat, keeping it in line with the engine's exhaust elbow.
3. Route the remainder of the hose toward the engine's exhaust manifold and elbow. Ensure that this open end section of the hose is as vertical as possible from the boat's bilge to the top of the exhaust elbow
4. Coil excess hose in bilge of boat, keeping it below the water line.
5. Lower open end of hose and siphon water until it starts to come out of the hose. Put a finger over the hose and lift open end until it is at the top of the exhaust elbow.
6. Slowly take finger off end of hose to let the water level stabilize. The water will seek the level of the water outside the boat. Keep hose close to exhaust elbow and as vertical as possible.
7. The measurement between water in hose and top of exhaust elbow is the exhaust elbow height. Ensure that boat is level.



a - Waterline
b - Top Of Exhaust Elbow
c - Clear Plastic Hose
d - Weight
e - Measurement - Waterline To Top Of Exhaust Elbow

Minimum Exhaust Outlet Hose Size		
Model	**Single Outlet**	**Dual Outlet**
Inboard		
5.7L	4 in. (102 mm)	3 in. (76 mm)
Tow Sports		
5.7L	3 1/2 (88.9 mm)	Not Applicable
Black Scorpion		
MX 6.2L Black Scorpion		

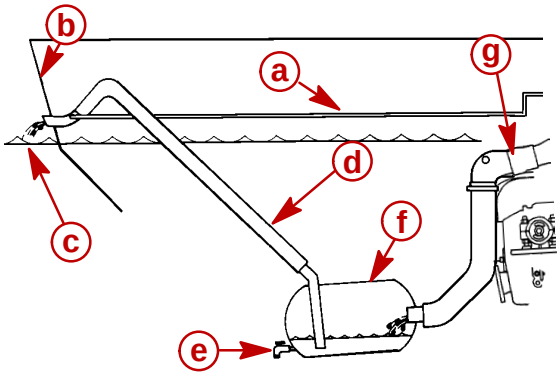
NOTE: A kit is available, when applicable, to reduce from the 4 in. (102 mm) to 3 in. (76 mm). Refer to the *Mercury Precision Parts / Quicksilver Accessories Guide*, for kit part number.



71774

Typical Continuously Sloping Exhaust Line

- **a** - Exhaust Elbow
- **b** - Exhaust Hose Or Pipe
- **c** - Muffler (If Equipped)
- **d** - Exhaust Outlet Internal Shutter
- **e** - Exhaust Flapper Valve
- **f** - Waterline



71775

Typical Waterlift Muffler Exhaust System

- **a** - Vent Line [1/4 in. (6 mm)]
- **b** - Transom
- **c** - Water Line
- **d** - Exhaust Hose
- **e** - Drain Fitting
- **f** - Water Lift Muffler
- **g** - Exhaust Elbow

⚠ CAUTION

Avoid severe engine damage. A 1/4 in. (6 mm) vent hose must be run from the highest point in the seawater system to the exhaust pipe after the water lift muffler to break the vacuum and prevent water from back-filling the engine.

Exhaust System Hose / Tube Connections

⚠ CAUTION

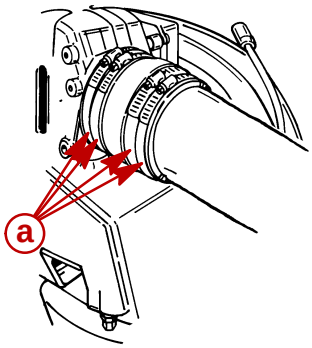
Avoid exhaust hose failure. Discharge water from exhaust elbow must flow around entire inside diameter of hose to avoid causing hot spots which could eventually result in burned-through exhaust hoses. Exhaust hoses and/or tubes must be correctly connected to exhaust elbows so that they do not restrict the flow of discharge water from exhaust elbow.

1. Exhaust hoses/tubes should be secured at each connection with at least 2 hose clamps.

71653

Correct Connection **Incorrect Connection**

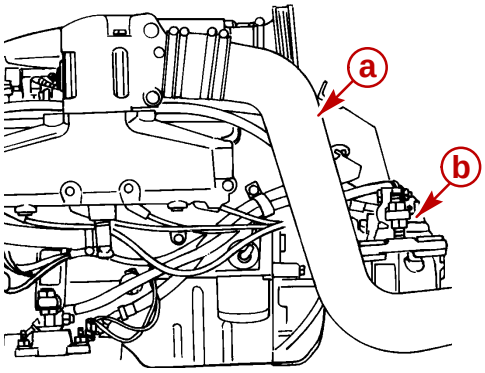
2. Tighten all exhaust hose and/or exhaust tube clamps securely.



73961

a - Hose Clamps

IMPORTANT: S-pipes must be routed under the transmission mounts.



74832

Tow Sport Models

a - S-pipe
b - Transmission Mount

Electrical Connections

⚠ CAUTION

Avoid damage to the EFI electrical system components: Refer to the following precautions when working on or around the EFI 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.**

IMPORTANT: When routing all wire harnesses and hoses, be sure they are routed and secured to avoid coming in contact with hot spots on engine and to avoid contact with moving parts.

Instrumentation Connections

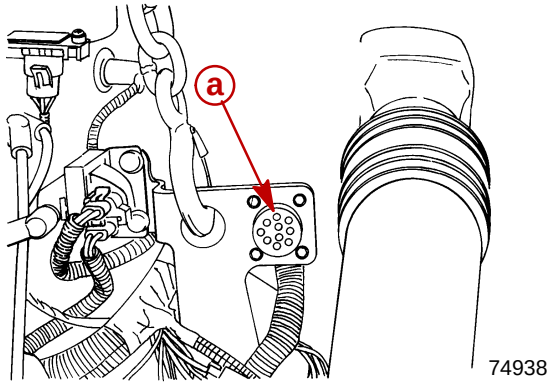
We recommend the use of Quicksilver Instrumentation and Wiring Harnesses which have been specifically designed for compatibility with our engines, and to the same high quality and performance standards. Instrumentation wiring extension harnesses are available in several lengths. Refer to *Mercury Precision Parts / Quicksilver Accessories Guide* for selection.

Refer to *Instrumentation Wiring Diagrams* for specific wiring diagrams.

⚠ CAUTION

If Quicksilver wiring harness is used and a fused accessory panel is to be installed (40-amp current draw maximum), be sure to connect it as shown in the wiring diagrams. Do not connect accessory panel at any other location as wires in wiring harness may not be of sufficient size to handle current load.

1. Place hose clamp over instrumentation wiring harness.
2. Connect the instrumentation wiring harness to engine harness plug at location shown.



Typical 350 and 377 cid model

a - Engine Harness Plug

3. Tighten hose clamp to secure wiring harness to engine harness plug.

Audio Warning System Connection

⚠ WARNING

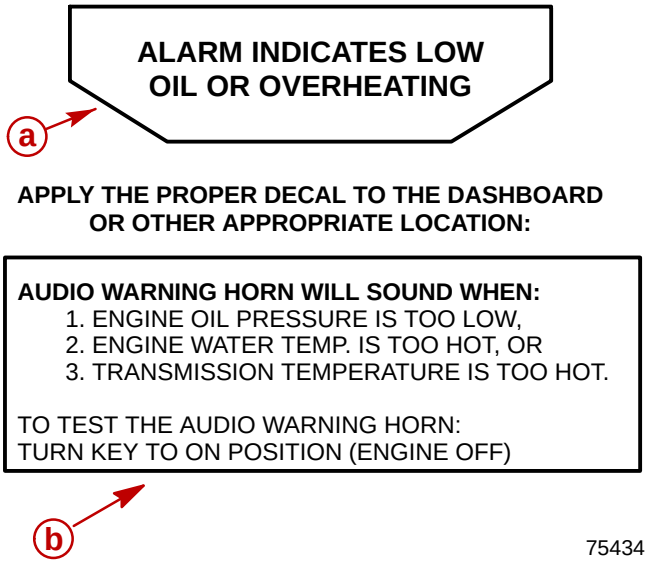
Alarm is not external ignition-proof, therefore, DO NOT mount alarm in engine or fuel tank compartments.

1. Select a location for audio warning alarm which meets all of the following:

- alarm can be easily heard, yet is out of sight
- alarm can be easily accessed for installation and maintenance
- alarm will remain dry
- alarm is within length limits of the 18 in. PURPLE alarm wire that connects to the “I” terminal or 12 volt source on switched side of ignition switch.

NOTE: *The terminal to which wire is attached must have no voltage when ignition switch is in the OFF position.*

2. Place alarm in desired location. Secure alarm to wire bundle with sta-strap provided.
3. Connect PURPLE wire from alarm to any 12-volt source on switched side of ignition switch. Tighten connection securely and coat with Quicksilver Liquid Neoprene.
4. Connect TAN/BLUE wire from the alarm to TAN/BLUE wire from instrument harness. Ensure that bullet connector is tight.
5. Place small (transparent) decals on the bottom of the water temperature and the oil pressure gauges.
6. Place the large decal on the instrument panel or other appropriate location easily viewed by the operator.



a - Small Decal (Transparent)
b - Large Decal

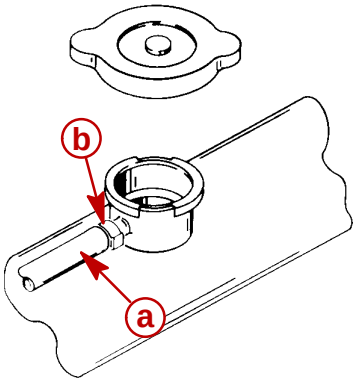
Fluid Connections

Coolant Recovery Bottle

⚠ CAUTION

Avoid engine overheating and subsequent damage to engine. The coolant recovery system will not operate properly without proper sealing. Plastic tubing MUST seal *completely* at connections.

1. Connect plastic tubing (from kit) to bayonet fitting on heat exchanger. Secure with tubing clamp provided.



70548

a - Plastic Tubing
b - Tubing Clamp

2. Remove cap from coolant recovery reservoir and fill to FULL mark with coolant solution. Reinstall cap.

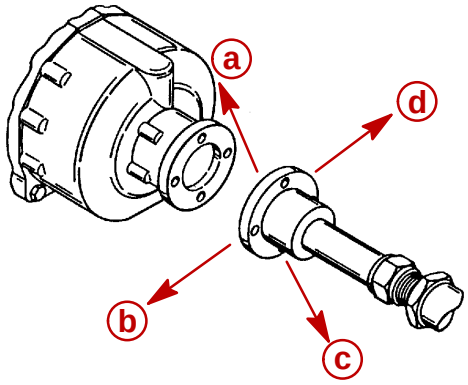
Final Engine Alignment

IMPORTANT: Engine alignment MUST BE RECHECKED with boat in the water, fuel tanks filled and with a normal load on board.

Engine must be aligned so that transmission and propeller shaft coupling centerlines are aligned and coupling faces are parallel within .003 in. (0.07 mm). This applies to installations with solid couplings as well as flexible couplings.

1. Check mating faces on transmission output flange and propeller shaft coupler to ensure that they are clean and flat.
2. Center propeller shaft in shaft log as follows:
   a. Push down and then lift shaft as far as it will move. Then place shaft in the middle of the movement.
   b. Move shaft to port and then to starboard as far as shaft will move. Then place shaft in the middle of the movement.

c. With shaft in the center of shaft log as determined by above procedures "**a**" and "**b**," align engine to shaft.



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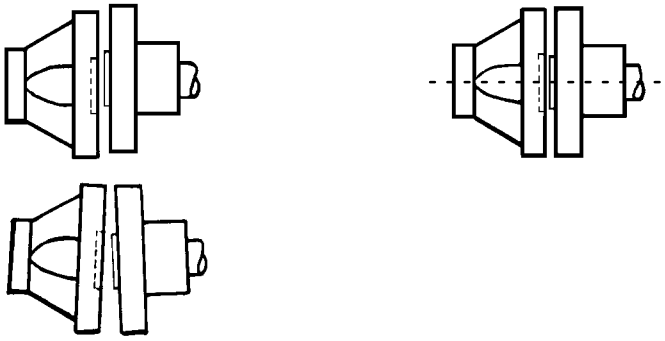
Typical Down Angle (V-Drive Similar)

a - Up
b - Down
c - Port
d - Starboard

3. Check that coupling centerlines align by butting propeller shaft coupler against transmission output flange. Shoulder on propeller shaft coupler face should engage recess on transmission output flange face with no resistance.



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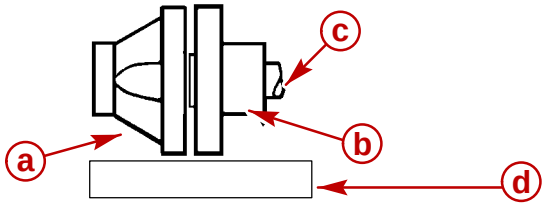
Incorrect **Correct**

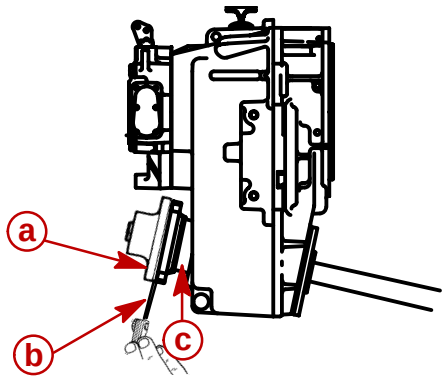
NOTE: *Some propeller shaft couplers may not have a shoulder on mating face. On these installations, use a straight edge to check centerline alignment.*



74483

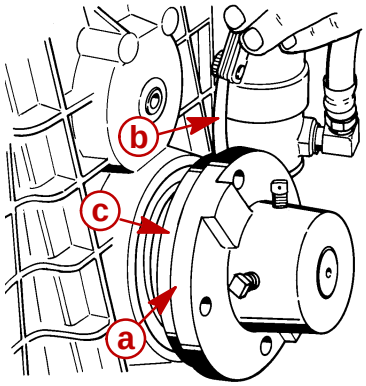
a - Transmission Output Flange
b - Propeller Shaft Coupler
c - Propeller Shaft
d - Straight Edge

4. Check for angular misalignment by hand holding coupling faces tightly together and checking for a gap between coupling faces with a .003 in. (0.07 mm) feeler gauge.
5. Check the gap at 90 degree intervals.



75534

Velvet Drive



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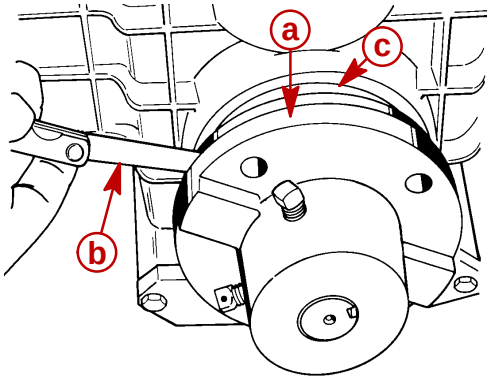

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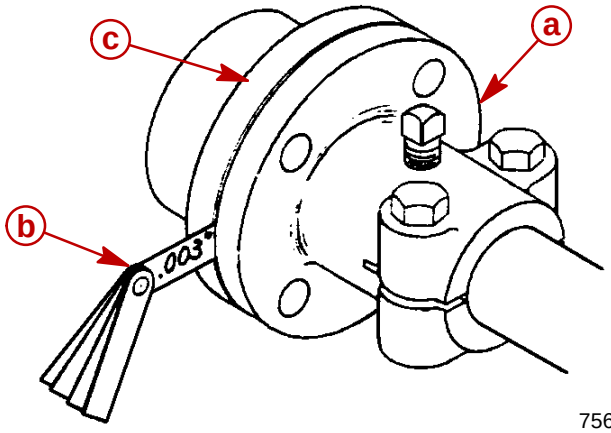
Hurth



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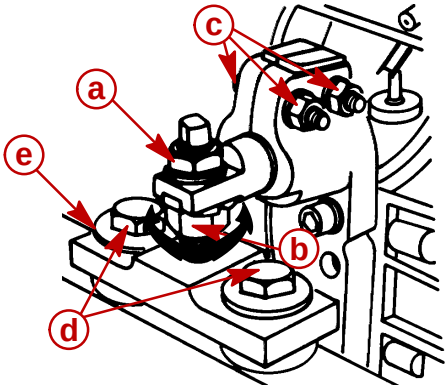
Walter V-Drive

a - Propeller Shaft Coupler
b - Feeler Gauge
c - Transmission Output Flange

6. If coupling centerlines are not aligned or if coupling faces are more than .003 in. (0.07 mm) out of parallel, adjust engine mounts.

   a. TO ADJUST ENGINE UP OR DOWN: Loosen locking nut on mounts requiring adjustment and turn adjusting nuts in desired direction to raise or lower.

IMPORTANT: Both front mounts (or rear mounts) adjusting nuts must be turned equally to keep engine level from side to side.



70056

Typical

- **a** - Locking Nut
- **b** - Adjusting Nut
- **c** - Clamping Screw(s) and Nut(s), with Lockwasher(s)
- **d** - Lag Screws
- **e** - Slot Forward

NOTE: *Some rear mounts have one (1) clamping screw and nut on each side.*

   b. TO MOVE ENGINE TO THE LEFT OR RIGHT: Loosen clamping screws and nuts on all 4 mount brackets and move engine to the left or right as necessary to obtain proper alignment. A small amount of adjustment can be obtained with slot on front end of some mounts. Loosen lag screws (which fasten mounts to engine bed) and move engine, as required. Retighten lag screws securely.

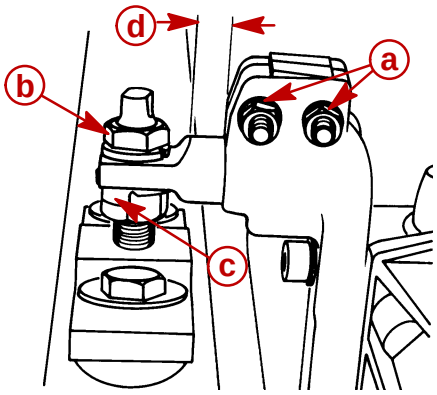
IMPORTANT: Large diameter of mount trunnion MUST NOT extend over 1 3/4 in. (45 mm) from mount brackets on any of the mounts.

7. After engine has been properly aligned, secure engine mounts.
8. Torque clamping screws and nuts on all 4 mount brackets.

Description	lb-ft	lb-in.	Nm
Clamping Bolts And Nuts	50		68

9. Tighten locknut on all four mounts.

10. Bend one of the tabs on the tab washer down onto the flat of the adjusting nut.



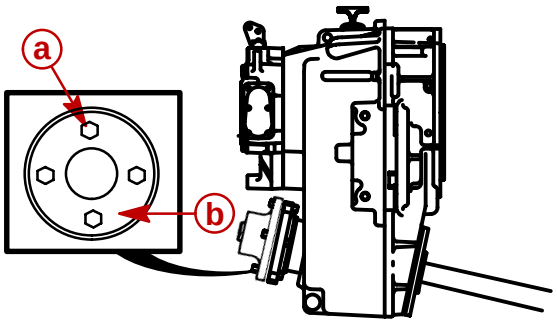
70057

a - Clamping Screws and Nuts
b - Locknuts On All 4 Mounts
c - Tab on Tab Washer
d - Measurement - 1-3/4 in. (45 mm)

NOTE: *Some rear mounts have one (1) clamping screw and nut on each side.*

IMPORTANT: All coupler bolts must be SAE Grade 8 (Metric Grade 10.9) or better, with a shoulder (grip length) sufficient to pass through the mating face plane of the couplers.

11. Secure coupling together with bolts, lockwashers and nuts. Torque fasteners.



75535

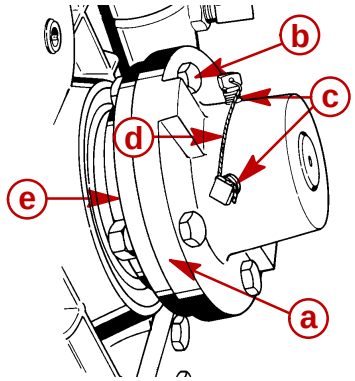
a - Bolts
b - Transmission Coupler

Description	lb-ft	lb-in.	Nm
Coupling Bolts And Nuts	50		68

a. If propeller shaft coupler has set screws, remove set screws and mark dimple locations using a transfer punch.

b. To drill dimples, remove propeller shaft coupler and drill shallow dimples at locations marked with punch.

c. Reinstall propeller shaft coupler and torque bolts. Install set screws and tighten securely. Safety wire set screws to ensure they do not loosen.



50608

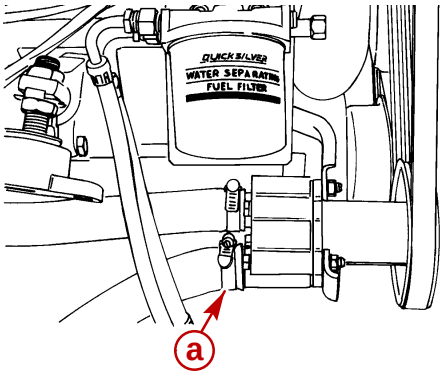
a - Propeller Shaft Coupler
b - Bolts
c - Set Screws
d - Safety Wire
e - Transmission Output Flange

Description	lb-ft	lb-in.	Nm
Coupling Bolts And Nuts	50		68

Engine Connections

Seawater Pickup Pump Connection

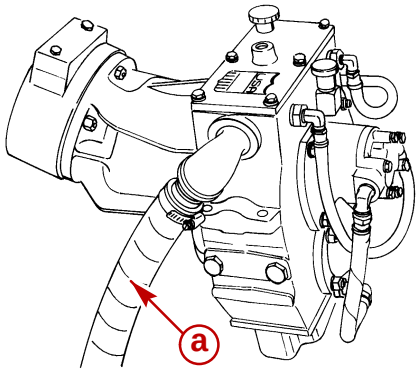
1. **On All Models Not Equipped With Walter V-Drive Transmission:** Remove shipping cap and connect seawater inlet hose to the lower fitting.



75533

a - Seawater Inlet Hose Attached To Lower Fitting

2. **On All Models With Walter V-Drive Transmissions:** Connect water inlet hose to the fitting on the transmission.



75191

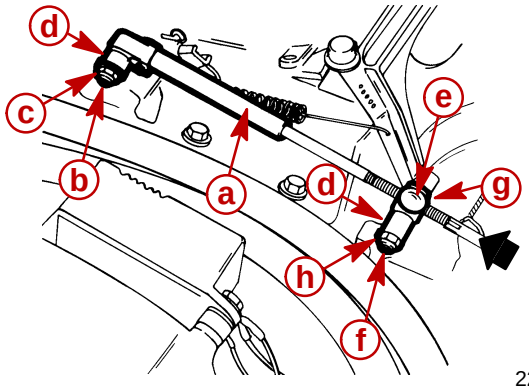
a - Water Inlet Hose Attached To Fitting

Throttle Cable Installation and Adjustment

Carbureted Models

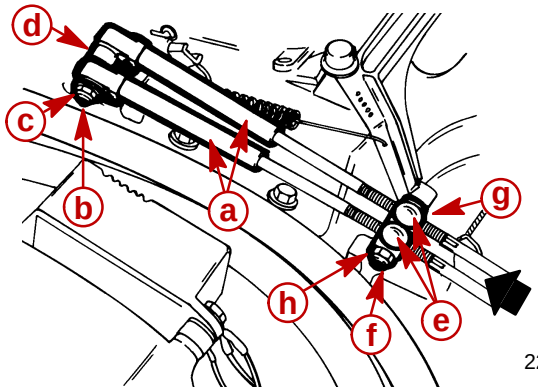
IMPORTANT: When installing throttle cable, be sure that cables are routed in such a way as to avoid sharp bends and/or contact with moving parts. DO NOT fasten any items to throttle cable.

1. Lubricate cable ends and barrels.
2. Place remote control throttle lever in idle position and attach cable end guide to carburetor throttle lever as shown.
3. Grasp cable behind barrel and push lightly in the direction shown. Adjust cable barrel to align hole with anchor stud, then slide barrel onto stud.



22552

SINGLE STATION



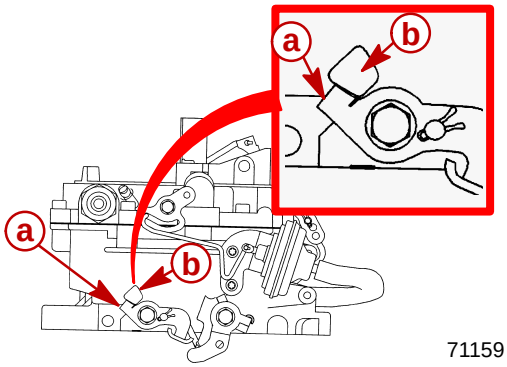
22553

DUAL STATION

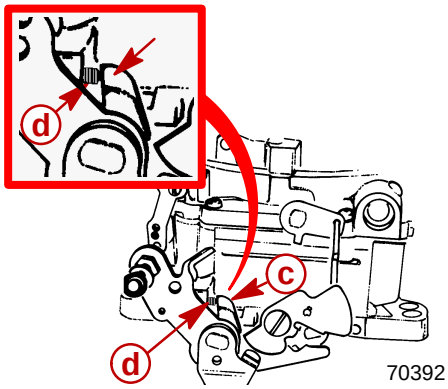
- **a** - Cable End Guide
- **b** - Throttle Lever Stud
- **c** - Elastic Stop Nut and Washer
- **d** - Spacer
- **e** - Cable Barrel
- **f** - Anchor Stud
- **g** - Washer
- **h** - Elastic Stop Nut

4. Secure throttle cable with hardware as shown and tighten securely. DO NOT Overtighten as cable must pivot freely.
5. Place remote control throttle lever in the WOT position. Ensure that throttle plates are completely open.

6. Return remote control throttle lever to idle position and ensure that throttle lever contacts idle speed adjustment screw at WOT.



71159



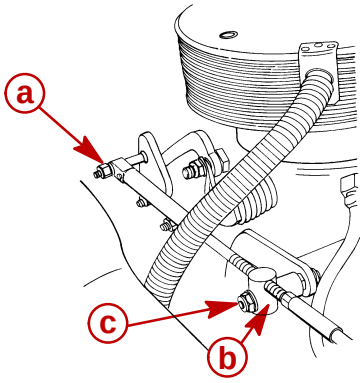
70392

a - Throttle Shaft Lever
b - Carburetor Body Casting
c - Throttle Lever
d - Idle Speed Adjustment Screw

Black Scorpion Models

IMPORTANT: When installing throttle cable, 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 throttle cable.

1. Place remote throttle lever in idle position and attach cable to throttle body, following cable manufacturer's instructions.
2. Adjust cable so that it can be placed on both studs simultaneously.
3. Place cable over studs. DO NOT adjust cable after installation.
4. Secure throttle cable with hardware as shown and tighten securely. Loosen locknut 1/2 turn.



74941

a - Cable End
b - Cable Barrel
c - Locknut and Flat Washer

Shift Cable Installation And Adjustment

IMPORTANT: When installing shift cables, be sure that cables are routed in such a way as to avoid contact with moving parts and/or sharp bends All bends must make greater than an 8 in. (203 mm) radius. DO NOT fasten any items to shift cables.

Shift cable must be hooked up to remote control before starting installation and adjustment procedures. Refer to Transmission - Propeller Rotation, as previously outlined in the front of this manual, for transmission shift lever direction of movement versus propeller shaft output direction of rotation.

Damage caused to transmission as a result of improper shift lever positioning will not be covered by warranty.

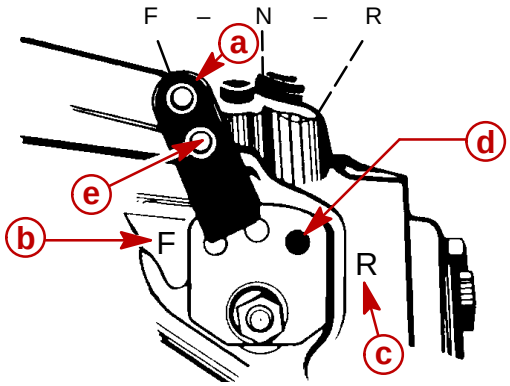
To ensure proper shift and throttle operation, we recommend the use of a Quicksilver remote control and cables. Refer to *Mercury Precision Parts / Quicksilver Accessories Guide.*

Shift Cable Travel	2-3/4 in. (70 mm)

Velvet Drive Transmissions

IN-LINE AND REMOTE V-DRIVE

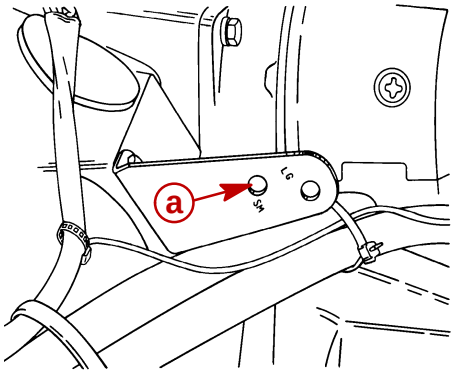
IMPORTANT: Velvet Drive Transmission Warranty is jeopardized if the shift lever poppet ball or spring is permanently removed, if the shift lever is repositioned or changed in any manner or if remote control and cable do not position shift lever correctly.



22457

- **a** - Transmission Shift Lever
- **b** - Shift Lever MUST BE Over This Letter In FORWARD
- **c** - Shift Lever MUST BE Over This Letter In REVERSE
- **d** - Poppet Ball MUST BE Centered in Detent Hole for Each F-N-R Position (Forward Gear Shown)
- **e** - Install Shift Lever Stud in This Hole, If Necessary, To Center Poppet Ball in Forward and Reverse Detent Holes

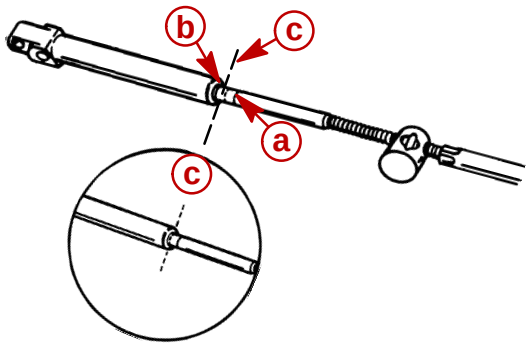
1. Verify shift cable stud is in appropriate stud hole as indicated. Tighten elastic stop nut securely.



50947

a - 5.7L Shift Cable Anchor Stud Hole

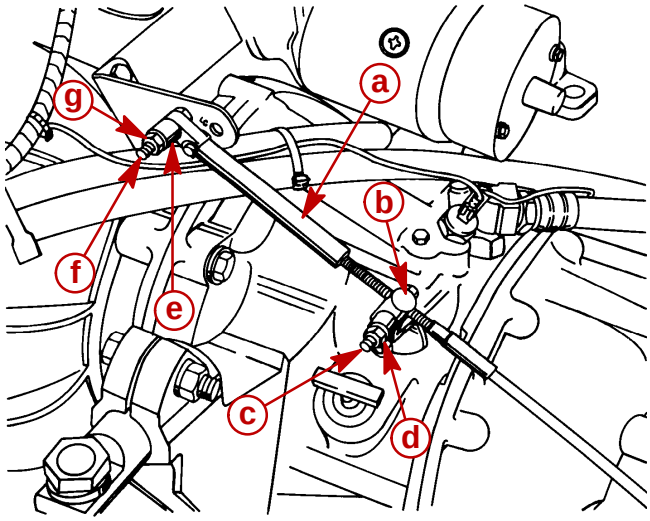
2. Place remote control shift lever and transmission shift lever in neutral position.
3. Remove nuts and washers from shift cable attaching studs.
4. Locate center of remote control and control shift cable play (backlash), as follows:
   a. Ensure that remote control is in neutral position.
   b. Push in on control cable end with enough pressure to remove play and mark position "**a**" on tube.
   c. Pull out on control 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

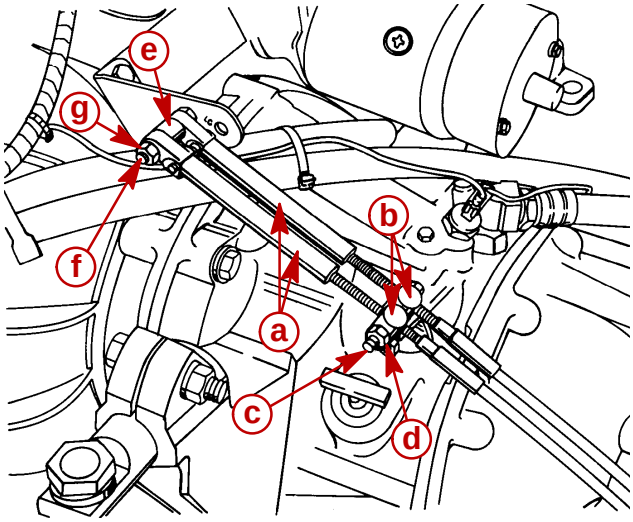
5. Center cable-end play, then adjust cable barrel to align holes in barrel and in cable end guide, with attaching points on transmission.
6. Temporarily install shift cable. Do not secure at this time.
7. Place remote control shift lever in FORWARD gear position and check position of transmission shift lever. Shift lever must be positioned as previously indicated.
8. Place remote control lever in REVERSE gear position and again check shift lever position. Lever must be positioned as previously indicated.

9. If transmission shift lever will position properly in one gear, but not in the other, recheck shift cable adjustment. If transmission shift lever will not position properly in either gear, move transmission shift lever stud, from top hole in shift lever to bottom hole, and recheck for proper positioning. If proper positioning is still not obtained, remote control does not provide sufficient shift cable travel and must be replaced.
10. Reattach nut and washer to cable end guide stud. Tighten until they contact, then loosen 1/2 turn.
11. Reattach nut and washer to cable barrel stud. Tighten until they contact. Tighten securely, but DO NOT overtighten.



50947

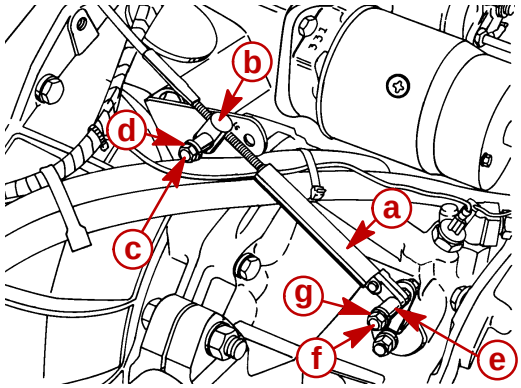
Rear Entry <u>Single Station</u> Installation In-Line And Remote V-Drive



50947

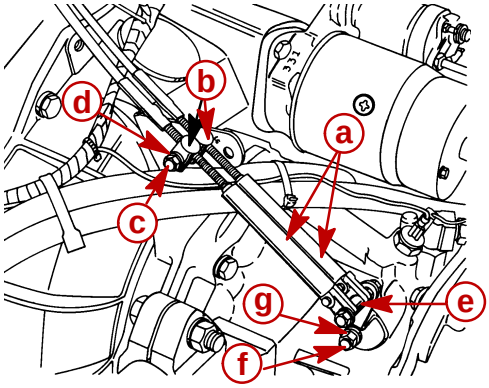
Rear Entry <u>Dual Station</u> Installation In-Line And V-Drive

a - Cable End Guide
b - Cable Barrel
c - Cable Barrel Stud
d - Elastic Stop Nut and Washer
e - Spacer
f - Cable End Guide Stud
g - Elastic Stop Nut and Washer



50946

Front Entry <u>Single Station</u> Installation In-Line And V-Drive

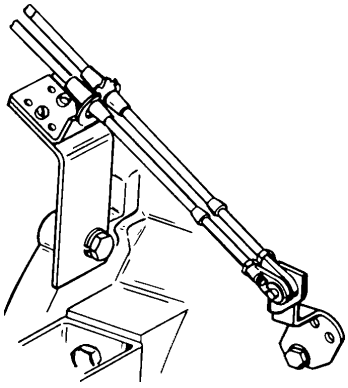


50946

Front Entry <u>Dual Station</u> Installation In-Line And V-Drive

- **a** - Cable End Guide
- **b** - Cable Barrel
- **c** - Cable Barrel Stud
- **d** - Elastic Stop Nut and Washer
- **e** - Spacer
- **f** - Cable End Guide Stud
- **g** - Elastic Stop Nut and Washer

NOTE: *For models equipped with a dual station shift bracket such as the one shown, refer to shift cable manufacturer's instructions for adjusting the cable. Shift lever must be positioned as stated in the preceding steps.*



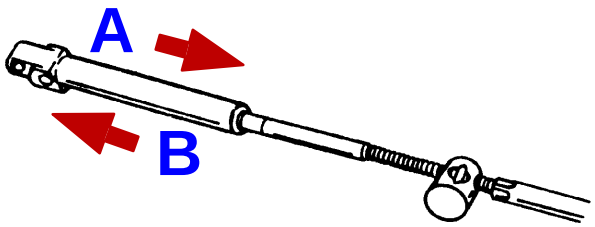
22457

Dual Station Shift Bracket (Not Quicksilver)

5000 SERIES (8 DEGREE DOWN ANGLE AND V-DRIVE)

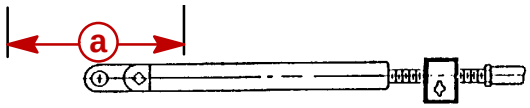
For Left-Hand Propeller Shaft Rotation: Shift cable hookup at remote control must result in shift cable end guide moving in direction "**A**" when remote control handle is placed in forward position.

For Right-Hand Propeller Shaft Rotation: Shift cable hookup at remote control must result in shift cable end guide moving in direction "**B**" when remote control handle is placed in forward position.



23242

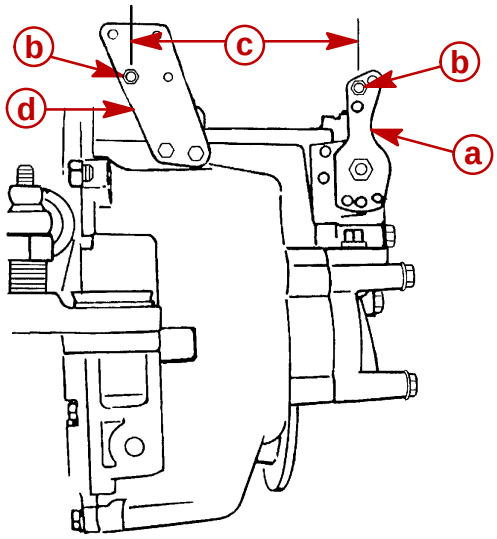
Remote control must provide a total shift cable travel (at transmission end) of at least 2-3/4 in. (70 mm). This is necessary to position transmission shift lever fully in the forward and reverse gear positions. Insufficient shift cable travel will cause transmission to slip and eventually fail.



72602

a - 2-3/4 in. (70 mm) Minimum

IMPORTANT: The distance between studs (Dimension "c") shown in the following illustration is set at 7-1/8 in. (181 mm).



73284

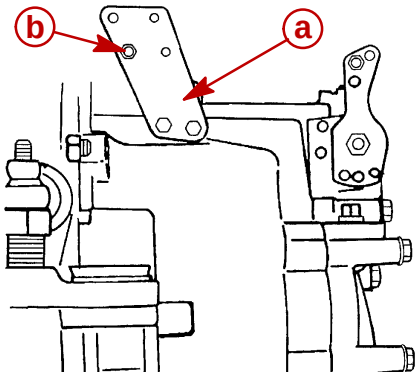
8° Down Angle Shown (V-Drive Similar)

a - Shift Lever
b - Anchor Stud
c - Dimension Between Studs - 7-1/8 In. (181 mm)
d - Shift Cable Bracket

⚠ WARNING

Avoid serious injury or property damage caused by improper shifting. Anchor stud for shift cable must be installed in the correct hole.

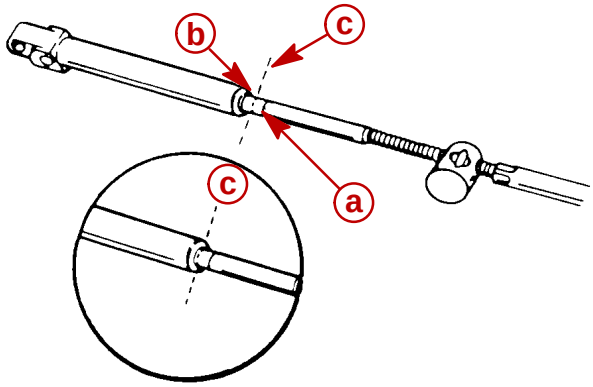
1. Be certain anchor stud is installed in the front hole as shown in the illustration following.



73284

a - Shift Cable Bracket
b - Anchor Stud In Front Hole

2. Place remote control shift lever and transmission shift lever in neutral position.
3. Remove nuts and washers from shift cable attaching studs.
4. Locate center of remote control and control shift cable play (backlash) as follows:
   a. Check that remote control is in neutral position.
   b. Push in on control cable end with enough pressure to remove play; mark position "**a**" on tube.
   c. Pull out on control cable end with enough effort to remove play; mark position "**b**" on tube.
   d. Measure distance between marks "**a**" and "**b**;" mark position "**c**," half-way between marks "**a**" and "**b**."



72603

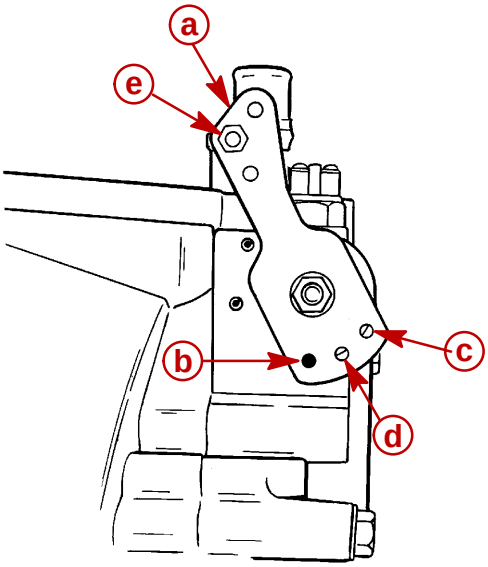
5. Center cable-end play, then adjust cable barrel to align holes in barrel and in cable end guide with attaching points on transmission.
6. Temporarily install shift cable. Do not secure at this time.
7. Place remote control shift lever in gear and check position of transmission shift lever. Shift lever must be positioned in the desired detent hole.

IMPORTANT: Transmission is fully in gear when shift lever comes to a stop in either direction.

IMPORTANT: Velvet Drive Transmission Warranty is jeopardized if the shift lever poppet ball or spring is permanently removed, if the shift lever is repositioned or changed in any manner or if remote control and shift cable do not position shift lever exactly as shown.

⚠ CAUTION

Remote control and shift cable must position transmission shift lever exactly as shown or transmission failure may occur. Do not remove poppet ball or spring.



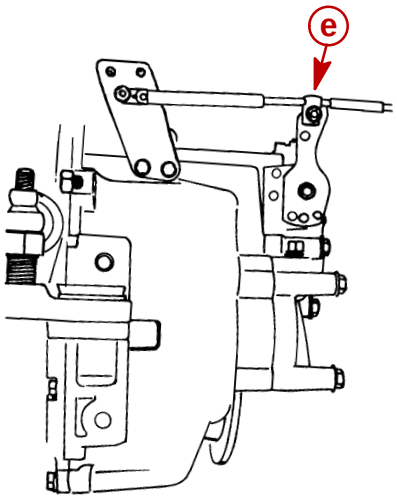
73248

Velvet Drive 5000 Series (8° Down Angle Shown, V-Drive Similar)

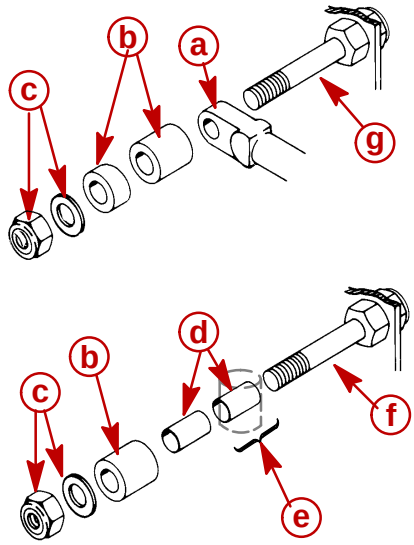
- **a** - Transmission Shift Lever
- **b** - Poppet Ball Must Be Centered In This Detent Hole When Left-Hand Propeller Shaft Rotation Is Desired
- **c** - Poppet Ball Must Be Centered In This Detent Hole When Right-Hand Propeller Shaft Rotation Is Desired
- **d** - Poppet Ball Must Be Centered In This Detent Hole For Neutral Position
- **e** - Install Shift Lever Stud In This Hole when Using Quicksilver Shift Cables

8. Place remote control shift lever in opposite gear position and again check transmission shift lever position. Lever must be positioned in the desired detent hole.
9. If transmission shift lever will not position properly in one gear or both gears, recheck shift cable adjustment and travel. If proper positioning is still not obtained, remote control does not provide sufficient shift cable travel and must be repaired or replaced.
10. Install nut and washer to cable end guide stud. Tighten until they contact, then loosen 1/2 turn.

11. Install nut and washer to cable barrel stud. Tighten until they contact. Tighten securely, but DO NOT overtighten.



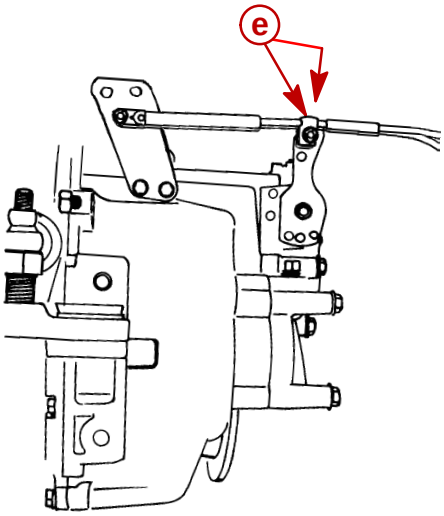
71780



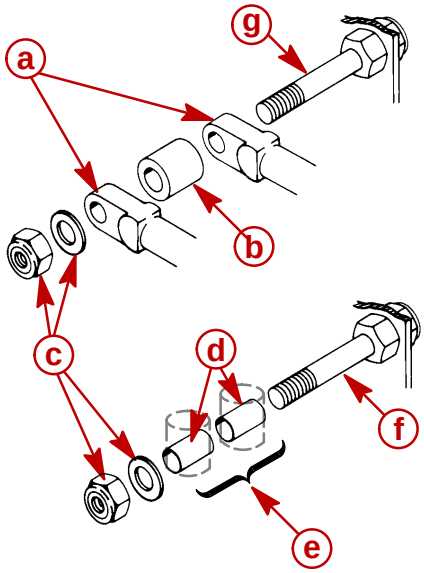
71972

Typical Single Cable Installation - Rear Approach

- **a** - Cable End Guide
- **b** - Spacer (As Required)
- **c** - Elastic Stop Nut and Washer
- **d** - Bushings
- **e** - Cable Barrel Location
- **f** - Cable Barrel Stud
- **g** - Cable End Guide Stud



71897



50073

Typical Dual Cable Installation - Rear Approach

- **a** - Cable End Guide
- **b** - Spacer (As Required)
- **c** - Elastic Stop Nut and Washer
- **d** - Bushings
- **e** - Cable Barrel Location
- **f** - Cable Barrel Stud
- **g** - Cable End Guide Stud

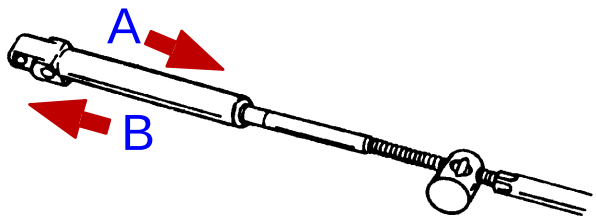
Hurth Transmissions

IMPORTANT: These Hurth transmissions are full reversing transmissions. Direction of output/propeller rotation is determined by hookup of shift cable at remote control.

Shift cable must be hooked up to remote control before starting installation and adjustment procedures. Refer to Transmission - Propeller Rotation, as previously outlined in the front of this manual, for transmission shift lever direction of movement versus propeller shaft output direction of rotation.

For Right Hand Propeller Rotation – Shift cable hookup at remote control must result in shift cable end guide moving in direction **"A"** when remote control handle is placed in forward position.

For Left Hand Propeller Rotation – Shift cable hookup at remote control must result in shift cable end guide moving in direction **"B"** when remote control handle is placed in forward position.

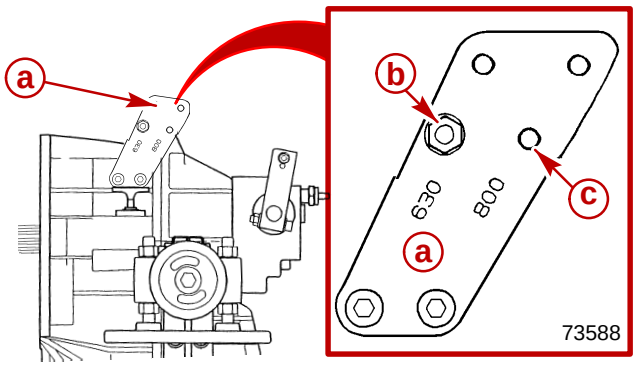


23242

⚠ WARNING

Avoid serious injury or property damage caused by improper shifting. Anchor stud for shift cable must be installed in the correct hole.

1. Be certain anchor stud is installed in the correct mount hole as shown by the following illustration.



71020

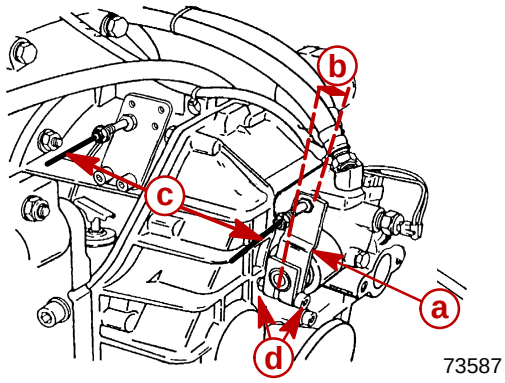
Shift Cable Bracket - Anchor Stud Positions

- **a** - Cable Bracket
- **b** - Quicksilver Shift Cable Anchor Stud Location - 630A and 630V
- **c** - Quicksilver Shift Cable Anchor Stud Location - 800A

IMPORTANT: When installing shift cables, be sure that cables are routed in such a way as to avoid contact with moving parts and/or sharp bends All bends must make greater than an 8 inch (203 mm) radius. DO NOT fasten any items to shift cables.

2. Check shift lever positioning as indicated:

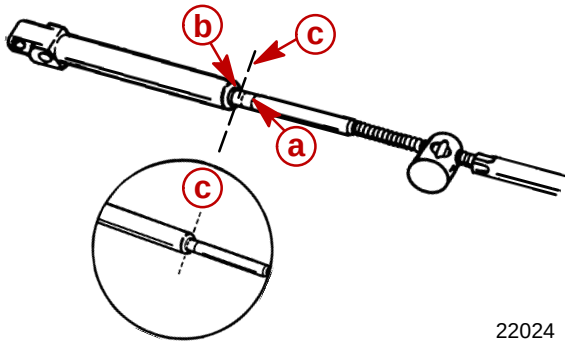
IMPORTANT: Check that shift lever is positioned approximately 10° aft of vertical when in the neutral detent position and that the distance "c" between studs in the following is set at 7-1/8 in. (181 mm). If necessary, loosen clamping bolt and position lever so that dimension "c" is as shown when in the neutral detent position and retighten bolt.



Typical Hurth Transmission Shown

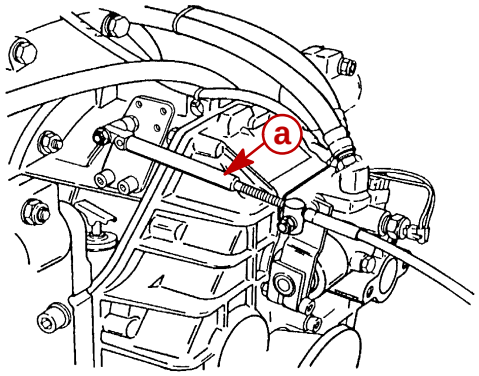
a - Shift Lever
b - Lever in Neutral Detent 10° Aft of Vertical
c - Dimension Between Studs - 7-1/8 in. (181 mm)
d - Clamping Bolt

3. Place remote control shift lever, and transmission shift lever, in neutral position.
4. Remove nuts and washers from shift cable attaching studs.
5. Locate center of remote control and control shift cable play (backlash), as follows:
   a. Check that remote control is in neutral position.
   b. Push in on control cable end with enough pressure to remove play, and mark position "**a**" on tube.
   c. Pull out on control 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**."



6. Center cable-end play, then adjust cable barrel to align holes in barrel, and in cable end guide, with attaching points on transmission.

7. Temporarily install shift cable. Do not secure at this time.



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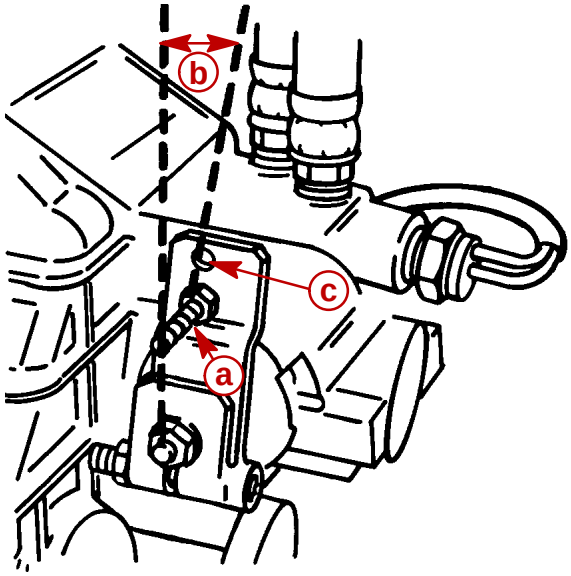
Typical

a - Shift Cable End Guide

IMPORTANT: Transmission is fully in gear when shift lever comes to a stop in either direction.

8. Place remote control shift lever in forward gear position. Ensure that transmission is fully in gear, as follows:
   a. Hold shift lever in position.
   b. Carefully slide shift cable off of anchor points.
   c. Attempt to move shift lever further.
9. Place remote control shift lever in the reverse gear position. Ensure that transmission is fully in gear, following same procedure.
10. If transmission shift lever will position properly in one gear, but not in the other, recheck shift cable adjustment. If transmission shift lever will not position properly in both gears, move transmission shift lever stud "**a**," from top hole in shift lever, to bottom hole, and recheck for proper positioning. If proper positioning is still not obtained, remote control does not provide sufficient shift cable travel and must be replaced.



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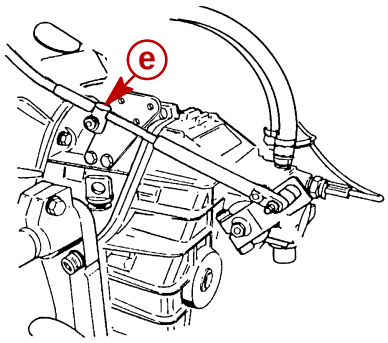
a - Shift Lever Stud (In Bottom Hole, If Required)
b - Lever in Neutral Detent 10° Aft of Vertical
c - Shift Lever Top Hole

11. Reattach locknut and washer to cable end guide stud. Tighten until they contact, then loosen 1/2 turn.
12. Reattach locknut and washer to cable barrel stud. Tighten until they contact. Tighten securely, but DO NOT overtighten.

NOTE: *To change cable approach direction on single or dual station installations, only the spacers/bushings have to be switched to the opposite stud (the studs are identical).*



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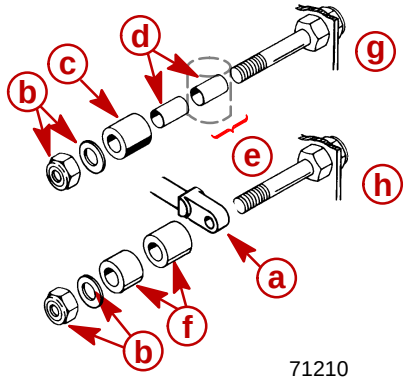
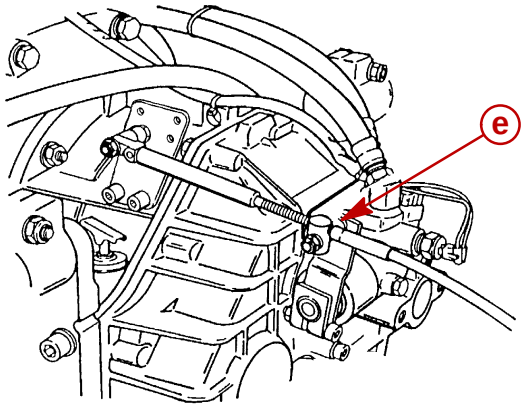


71210

Typical Single Cable - Forward Entry

- **a** - Cable End Guide
- **b** - Locknut and Washer
- **c** - Spacer (Fits over Bushings)
- **d** - Bushings
- **e** - Cable Barrel Location
- **f** - Spacer (Fit over Stud)
- **g** - Cable Barrel Stud
- **h** - Cable End Guide Stud



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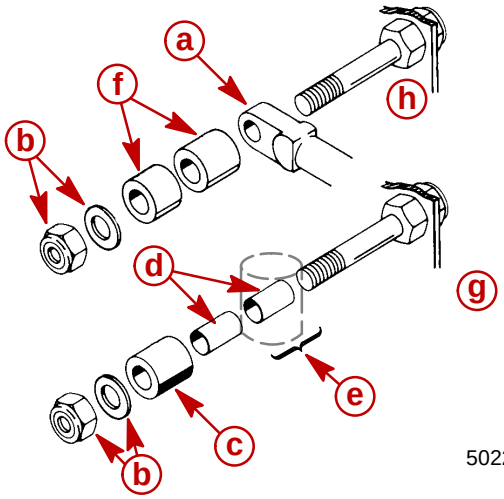
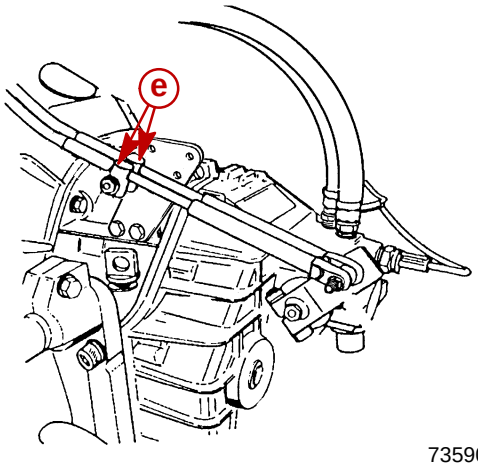


50229

Typical Single Cable - Rear Entry

- **a** - Cable End Guide
- **b** - Locknut and Washer
- **c** - Spacer (Fits over Bushings)
- **d** - Bushings
- **e** - Cable Barrel Location
- **f** - Spacer (Fit over Stud)
- **g** - Cable Barrel Stud
- **h** - Cable End Guide Stud



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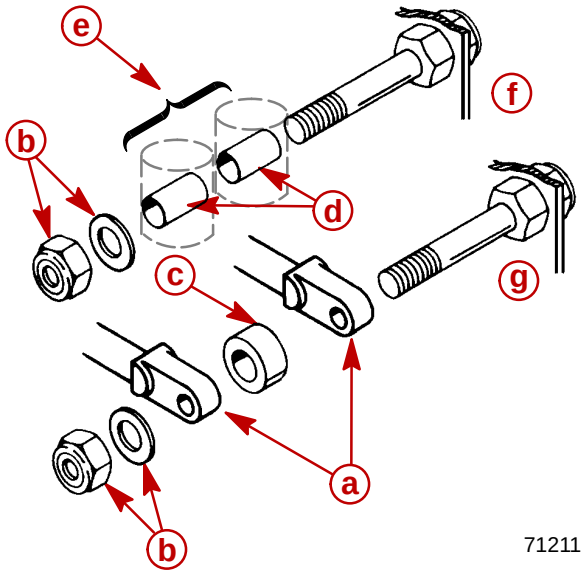
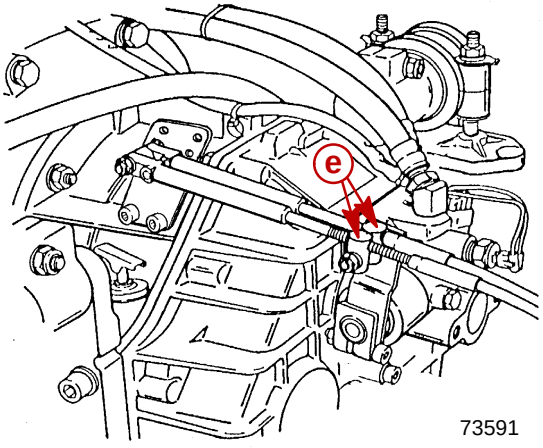


71211

Typical Dual Cable - Forward Entry

- **a** - Cable End Guides
- **b** - Locknut and Washer
- **c** - Spacer (Fits over Stud)
- **d** - Bushings
- **e** - Cable Barrel Locations
- **f** - Cable Barrel Stud
- **g** - Cable End Guide Stud



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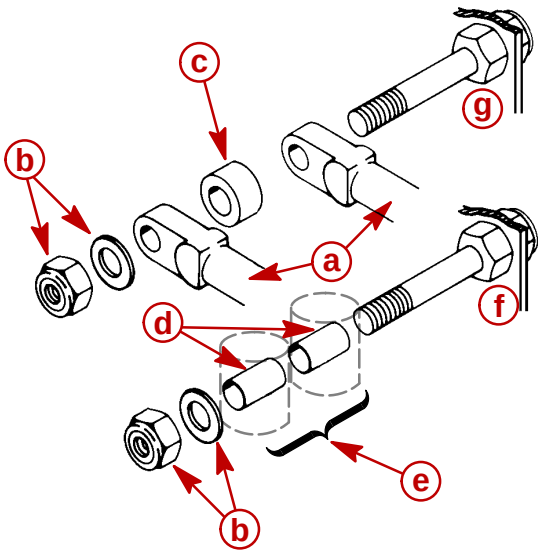

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Typical Dual Cable - Rear Entry

- **a** - Cable End Guides
- **b** - Locknut and Washer
- **c** - Spacer (Fits over Stud)
- **d** - Bushings
- **e** - Cable Barrel Locations
- **f** - Cable Barrel Stud
- **g** - Cable End Guide Stud

Predelivery Preparation

Once the power package installation is complete, the following final steps should be taken to prepare power package for delivery to the customer. It is the boat manufacturer's responsibility to perform these procedures, or to make arrangement with the dealer to have these procedures completed.

Propeller Selection

GENERAL INFORMATION

IMPORTANT: Installed propeller must allow engine to run at its specified maximum WOT 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. Refer to Quicksilver publication - *Everything You Need To Know About Propellers P/N 90-8614492.* Specified engine WOT and operating rpm range are listed in the *Mercury MerCruiser Operation, Maintenance and Warranty 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.

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.

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 a loss of rpm.
- Operating in a higher elevation causes a loss of rpm.
- Operating with increased load (additional passengers, pulling skiers) causes a loss of rpm.

For better acceleration, such as is needed for water skiing, use the next lower pitch propeller. 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 *Mercury Precision Parts / Quicksilver Accessories Guide.*

See BOAT IN THE WATER TESTS, Maximum RPM Test at the back of this manual.

Engine Rev-Limiter

IMPORTANT: The engines listed in the following chart are equipped with a rpm rev-limiter that is set to an upper (or limited) rpm amount. This limit is slightly above the normal operating range of the engine and is designed to help prevent damage from excessive engine rpm. When the engine reaches the rev-limit rpm, the horn will sound. Once the rpm drop into the recommended operating rpm range, normal engine operation resumes.

Model	Engine Recommended Operating RPM Range	Rev-Limit RPM Setting
Inboard		
5.7L	4200 - 4600	4750
Tow Sports		
5.7L	4400 - 4800	4950
Black Scorpion	4800 - 5200	5350
MX 6.2 Black Scorpion	4800 - 5200	5350

1. Hold the brass fuel inlet fitting with a suitable wrench and install the fuel line.

Fuel Line Connection

⚠ WARNING

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

1. Hold the brass fuel inlet fitting with a suitable wrench and install the fuel line.

Battery

IMPORTANT: Boating industry standards (BIA, ABYC, etc.), federal standards and Coast Guard regulations must be adhered to when installing the 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.

1. Select a battery that meets all of the following specifications:

- 12-volt marine type.
- Tapered post connectors or side terminal connectors.

IMPORTANT: Do *NOT* use a battery with wing nut connectors.

- Battery capacity rating of at least:

Model	Minimum Required Cranking Battery Size
5.7L Inboard or Tow Sport	375 cca / 475 mca / 90 Ah
Black Scorpion	550 cca / 700 mca / 120 Ah
MX 6.2L Black Scorpion	550 cca / 700 mca / 120 Ah

BATTERY CABLES

1. 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.

Cable Length	Cable Gauge
Up to 3-1/2 ft. (1.1m)	4 (25 mm^2)
3-1/2 - 6 ft. (1.1-1.8m)	2 (35 mm^2)
6 - 7-1/2 ft. (1.8-2.3m)	1 (50 mm^2)
7-1/2 - 9-1/2 ft. (2.3-2.9m)	0 (50 mm^2)
9-1/2 - 12 ft. (2.9-3.7m)	00 (70 mm^2)
12 - 15 ft. (3.7-4.6m)	000 (95 mm^2)
15 - 19 ft. (4.6-5.8m)	0000 (120 mm^2)

MULTIPLE EFI ENGINE BATTERY PRECAUTIONS

Batteries: Boats with multi-engine EFI power packages require each engine be connected to its own battery. This ensures that the engine's Electronic Control Module (ECM) has a stable voltage source.

Battery Switches: Battery switches should always be positioned so each engine is running off its own battery. DO NOT operate engines with switches in **BOTH** or **ALL** position. In an emergency, another engine's battery can be used to start an engine with a dead battery.

Battery Isolators: Isolators can be used to charge an auxiliary battery used for powering accessories in the boat. They should not be used to charge the battery of another engine in the boat unless the type of isolator is specifically designed for this purpose.

NOTE: *Sure Power Industries Inc., Model 32023A meets this design specification.*

1. The boat may have 2 engines connected to a single Model 32023A battery isolator.
2. The Model 32023A battery isolator is connected to 2 banks of batteries.
3. Each bank contains 2 batteries with the cranking battery for 1 engine in each bank.
4. The second battery in each bank is connected in parallel to the cranking battery.
5. The Model 32023A battery isolator is designed for this type of use; 2 battery banks, 2 charging sources, 120 amps (maximum alternator output).
6. When the engines are running, either engine's alternator could be charging either bank of batteries through the Model 32023A battery isolator.

Any other manufacturer's battery isolator that is the same type as the Sure Power Inc., Model 32023A could also be used.

Generators: The generator's battery should be considered another engine's battery.

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 trim 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.

Test Running Engine

⚠ 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.

⚠ WARNING

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

1. Ensure that cooling system drain plugs, petcocks and hoses are installed and tight.

NOTE: *Refer to appropriate Mercury MerCruiser Operation, Maintenance and Warranty Manual for operating specifications. Refer to appropriate Mercury MerCruiser Service Manual for fluid capacity information.*

2. Check crankcase oil level.

IMPORTANT: Oil level in monitor will rise and lower during drive operation. Always check oil level when drive is cool and engine is shut down.

3. Check drive belt tension.
4. Test Audio Warning System in accordance with instructions on instrumentation panel decal.
5. Start engine and run at idle rpm until water temperature is normal.
6. Watch all gauges for normal readings.
7. Inspect engine compartment for water, oil, fuel and exhaust leaks.
8. Stop the engine and turn the key switch OFF.

Boat-In-The-Water Tests

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

NOTE: On Tow Sport Applications: *If during testing for a particular application, you experience fuel starvation in sharp high speed turns, baffles or a fuel sump may be needed in the tank to help correct this condition.*

⚠ CAUTION

Avoid engine damage. Ensure that cooling water is supplied to the engine if it will be run with boat out of the water. See instructions in the Operation, Maintenance and Warranty Manual entitled "Flushing Cooling System" for instructions on connecting flush device.

ENGINE IDLE SPEED ADJUSTMENT (CARBURETED MODELS)

⚠ CAUTION

Avoid engine damage. Ensure that cooling water is supplied to the engine if it will be run with boat out of the water. See instructions in the Operation, Maintenance and Warranty Manual entitled "Flushing Cooling System" for instructions on connecting flush device.

The engine should idle at rpm (as specified in the Operation, Maintenance and Warranty Manual) with engine at normal operating temperature. If idle speed is incorrect, proceed as follows:

IMPORTANT: In order to properly set idle speed, the ignition module MUST BE locked in the Base Timing Mode. This is necessary because of the Idle Speed Control feature that exists in the ignition module. This must be done before the key switch is turned to the ON or START position.

1. Connect a shop tachometer to engine.
2. Using a jumper wire, connect the ignition system Timing Lead (PUR/WHT wire) to a good engine ground (–). This locks the ignition module into the Base Timing Mode. Refer to Engine Wiring Harness diagram in this manual.
3. Start engine and place the remote control lever in NEUTRAL, idle position.
4. Adjust idle speed to 650 rpm.
5. Stop engine. Readjust cable barrel and reinstall the throttle cable.

IMPORTANT: Be sure to disconnect the jumper wire from the ignition system test lead before attempting to resume normal operations. If the jumper wire is left in place, the ignition module will operate in the Base Timing Mode. This means that the additional timing advance features would not be functioning.

6. Remove the jumper wire from the timing lead.

ENGINE IDLE SPEED ADJUSTMENT (BLACK SCORPION MODELS)

⚠ CAUTION

Avoid engine damage. Ensure that cooling water is supplied to the engine if it will be run with boat out of the water. See instructions in the Operation, Maintenance and Warranty Manual entitled "Flushing Cooling System," for instructions on connecting flush device.

Engine should idle at rpm (as specified in Operation, Maintenance and Warranty Manual) with engine at normal operating temperature. If idle speed is incorrect, proceed as follows:

1. Ensure that throttle cable has been adjusted properly.
2. If idle speed is still not correct, it may be necessary to perform EFI System Diagnostic Tests on the idle circuit. Refer to the appropriate Mercury MerCruiser Service Manual for procedures.

WIDE-OPEN-THROTTLE TEST

IMPORTANT: To run engine at full throttle before the break-in period is complete, follow this procedure.

1. Start engine and run at idle rpm until normal operating temperature is reached.
2. Run boat up on plane.
3. Advance engine rpm (in 200 rpm increments) until engine reaches its maximum rated rpm.

To test if the correct propeller has been installed, operate boat (with normal load on board) at WOT and check rpm with an accurate tachometer. Engine rpm should be near top of the specified range so that, under a heavy load, engine speed will not fall below specifications. If engine speed is too high, replace propeller with a higher pitch propeller. Normally a 1 inch propeller pitch change causes an rpm change of 150 rpm.

4. Shut off engine.
5. Check coolant level and add coolant if necessary.

Cold Weather and Extended Storage Draining Instructions

⚠ CAUTION

If boat is to remain in water after draining, seawater inlet hose must be removed and plugged to prevent a siphoning action that may occur, allowing seawater to flow from the drain holes or removed hoses.

⚠ CAUTION

Seawater section of cooling system MUST BE COMPLETELY drained for winter storage, or immediately after cold weather use, if the possibility of freezing temperatures exist. Failure to comply may result in trapped water causing freeze and/or corrosion damage to engine.

IMPORTANT: Boat must be as level as possible to ensure complete draining of cooling system.

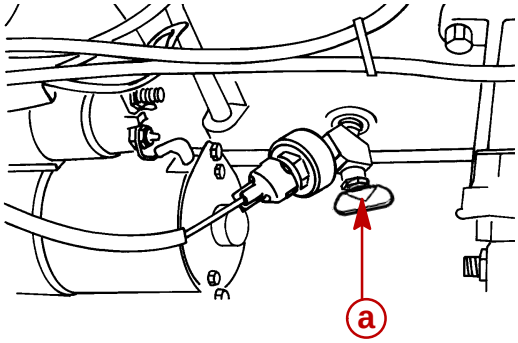
IMPORTANT: Mercury MerCruiser recommends that propylene glycol (a nontoxic and environmentally safe) antifreeze be used in the seawater section of the cooling system for cold weather or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use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

1. Ensure engine is as level as possible to ensure complete draining of cooling system.
2. **Remove** drain plugs from the following locations:
   a. **Port Side -** from cylinder block.

⚠ CAUTION

Avoid product damage. Do not disturb the Y-fitting when removing the drain plug. There is an ignition control "Knock Sensor" in the upper hole of the fitting. This sensor must not be loosened or removed. It is tightened to a critical specification at the factory.

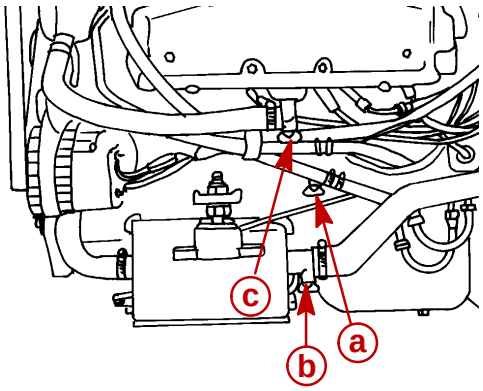
   b. **Starboard Side -** from Y-fitting.



a - Y-fitting

c. Fuel cooler, if equipped.

d. Bottom of exhaust manifolds (port and stbd).



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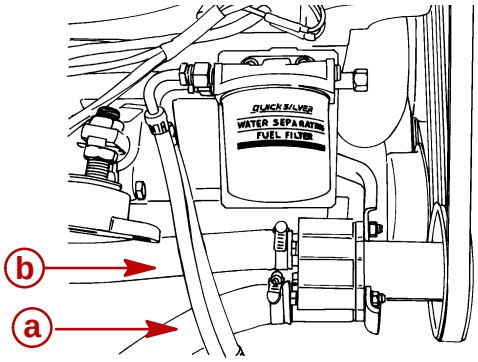
a - Cylinder Block Drain Location
b - Port Side Water Tube Drain Location
c - Exhaust Manifold Drain Location

3. **Repeatedly** clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

NOTE: *It may be necessary to lift or bend hoses to allow water to drain completely. Crank engine over slightly to purge any water trapped in seawater pickup pump. Do not allow engine to start.*

4. Remove hoses from the following locations:

a. **On All Models Not Equipped With Walter V-Drive:** Water inlet hose (bottom) and transmission cooler hose (top) from seawater pump.



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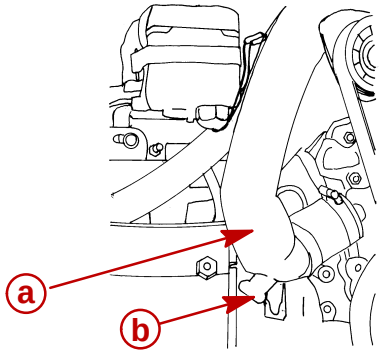
a - Seawater Inlet Hose
b - Transmission Cooler Hose

b. Hose from engine circulating pump or remove drain plug, if equipped..



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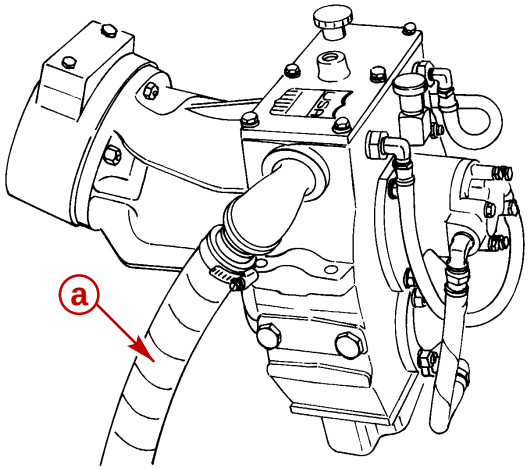
a - Engine Circulating Pump Hose
b - Drain Plug (if equipped)

c. Water inlet hose from Walter V-Drive if equipped.



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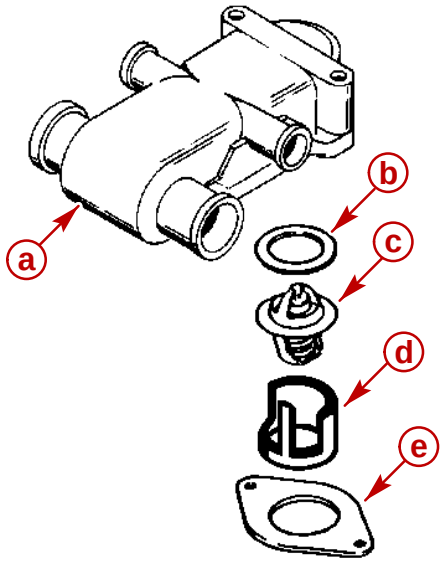
a - Water Inlet Hose Attached To Fitting

5. Turn engine over for 1 to 2 seconds to thoroughly drain system.
6. After cooling system has been drained completely, install drain plugs, reconnect hoses and tighten all hose clamps securely.
7. For additional assurance against freezing and corrosion in the internal water passages:
   a. Remove the thermostat housing and thermostat.
   b. Fill the engine seawater cooling system with a mixture of antifreeze and tap water. Follow the manufacturer's recommendation to protect engine to the lowest temperature that it will be exposed to during cold weather or extended storage.
   c. Reinstall thermostat and cover.
   d. Torque screws with lockwashers to 30 lb-ft (41 Nm).

NOTE: *Hoses shown removed for visual clarity. Do not remove hoses.*



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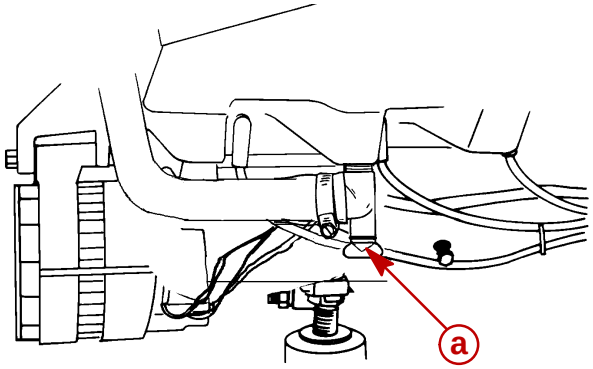
a - Thermostat Housing
b - Gasket
c - Thermostat
d - Spacer
e - Thermostat Housing-to-Intake Manifold Gasket

Closed Cooled (Coolant) Models

IMPORTANT: Closed cooling section must be kept filled year-round with recommended coolant. If engine will be exposed to freezing temperatures, make sure closed cooling section is filled with an ethylene glycol antifreeze and water solution properly mixed to protect engine to lowest temperature to which it will be exposed.

IMPORTANT: Do not use Propylene Glycol Antifreeze in the closed cooling section of the engine.

1. Ensure engine is as level as possible to ensure complete draining of cooling system.
2. Remove drain plug from port and starboard exhaust manifolds.



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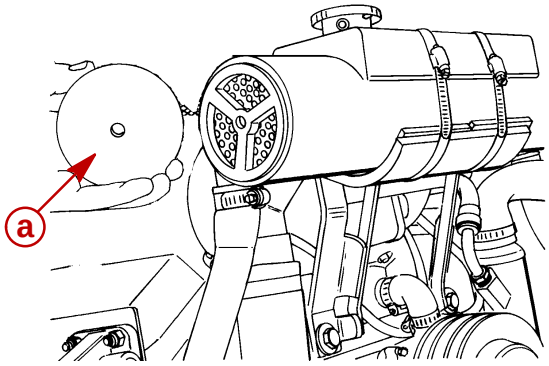
a - Exhaust Manifold Drain Plug

3. Repeatedly clean out all drain holes using a stiff piece of wire. Do this until entire system is drained.
4. Remove end caps from the heat exchanger.



74638

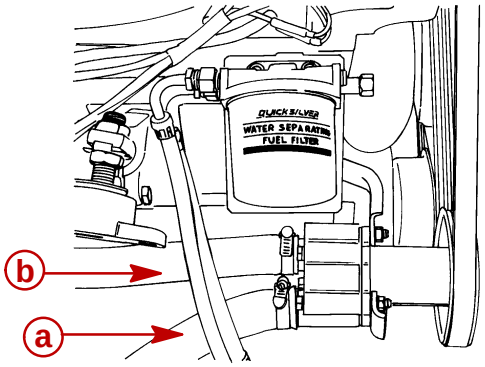
a - End Cap

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

NOTE: *It may be necessary to lift or bend hoses to allow water to drain completely. Crank engine over slightly to purge any water trapped in seawater pickup pump. Do not allow engine to start.*

5. Disconnect water inlet (bottom) hose from the inlet side of the seawater pump.

6. **On All Models Not Equipped With Walter V-Drive:** Remove upper hose from seawater pump.



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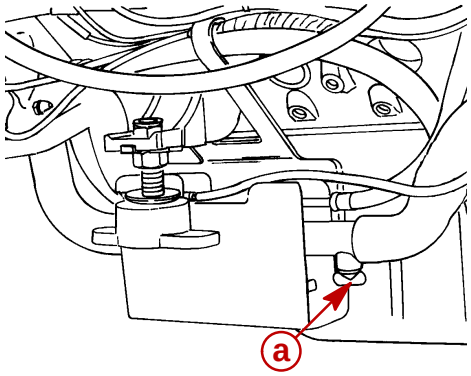
a - Seawater Inlet Hose
b - Upper Seawater Hose

7. Remove drain plug from fuel cooler.



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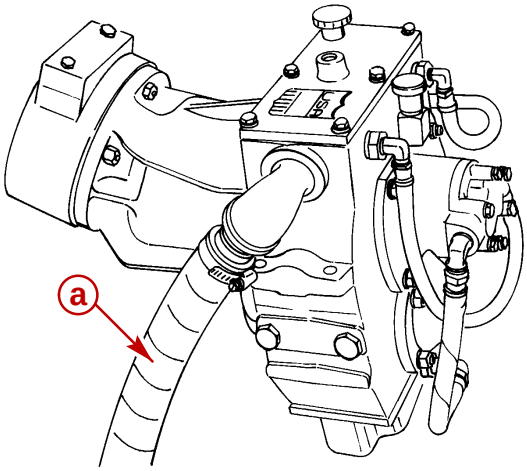
a - Fuel Cooler Drain Plug

8. Water inlet hose from Walter V-Drive if equipped.



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a - Water Inlet Hose Attached To Fitting

9. Reconnect all hoses, reinstall heat exchanger end caps with new gaskets using Perfect Seal, and reinstall drain plugs.

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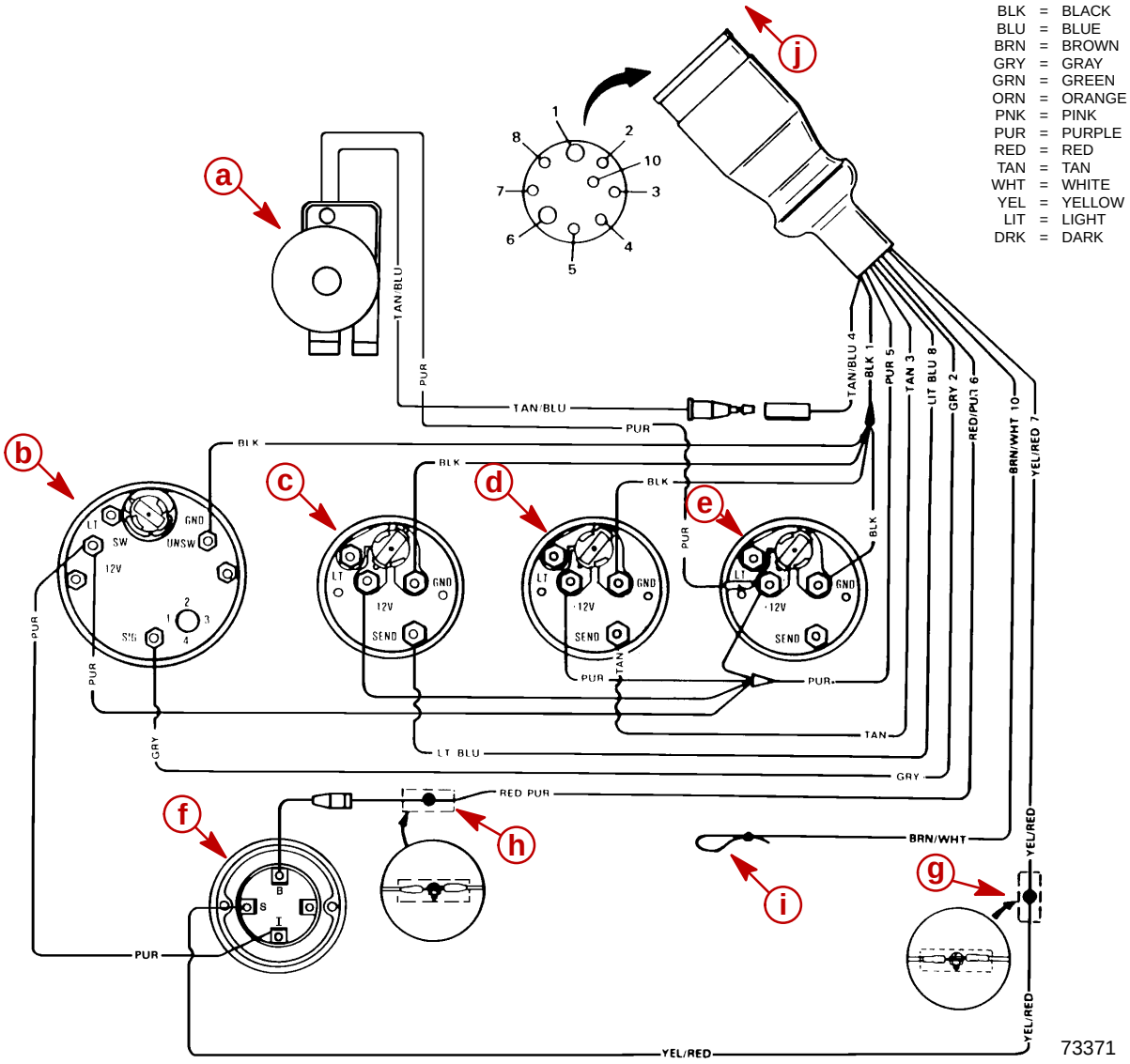
Wiring Diagrams

Instrumentation

SINGLE STATION INSTALLATIONS - TYPICAL



Refer to gauge manufacturer's instructions for specific connections.

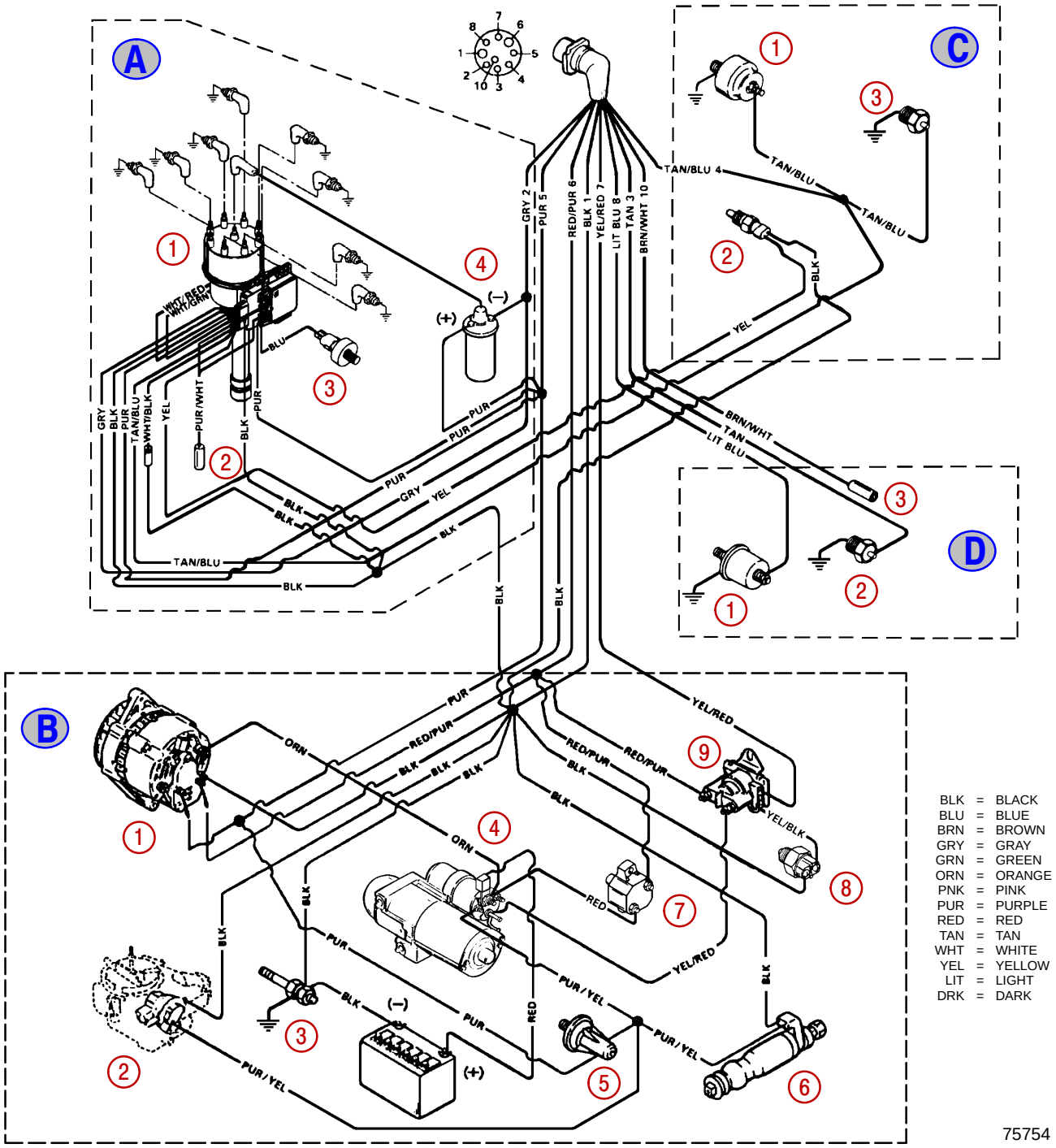
NOTE: *[1] Connect Wires Together with Screw and Hex Nut; Apply Liquid Neoprene to Connection and Slide Rubber Sleeve over Connection.*

NOTE: *[2] Power for a Fused Accessory Panel May Be Taken from This Connection. Load Must Not Exceed 40 Amps. Panel Ground Wire Must Be Connected to Instrument Terminal That Has an 8-Gauge BLACK (Ground) Harness Wire Connected to it.*

NOTE: *[3] Taped back BROWN-WHITE wire may be used for an accessory. LOAD MUST NOT EXCEED 5 AMPS.*

a - Audio Warning Buzzer	**f** - Ignition Switch
b - Tachometer	**g** - Read/Observe NOTE [1]
c - Oil Pressure	**h** - Read/Observe NOTE [1] and [2].
d - Water Temperature	**i** - Read/Observe NOTE [3].
e - Battery Meter	**j** - To Engine Wiring Harness

MIE 5.7L Inboard Engines



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

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NOTE: *BROWN/WHITE wire may be used for an Accessory. LOAD MUST NOT EXCEED 5 AMPS.*

A - Ignition Components

1 - Distributor
2 - Timing Lead
3 - Knock Sensor
4 - Ignition Coil

B - Starting, Charging and Choke Components

1 - Alternator
2 - Electric Choke
3 - Ground Plug
4 - Starter Motor
5 - Oil Pressure Switch
6 - Fuel Pump
7 - Circuit Breaker
8 - Neutral Safety Switch
9 - Starter Slave Solenoid

C - Audio Warning Components

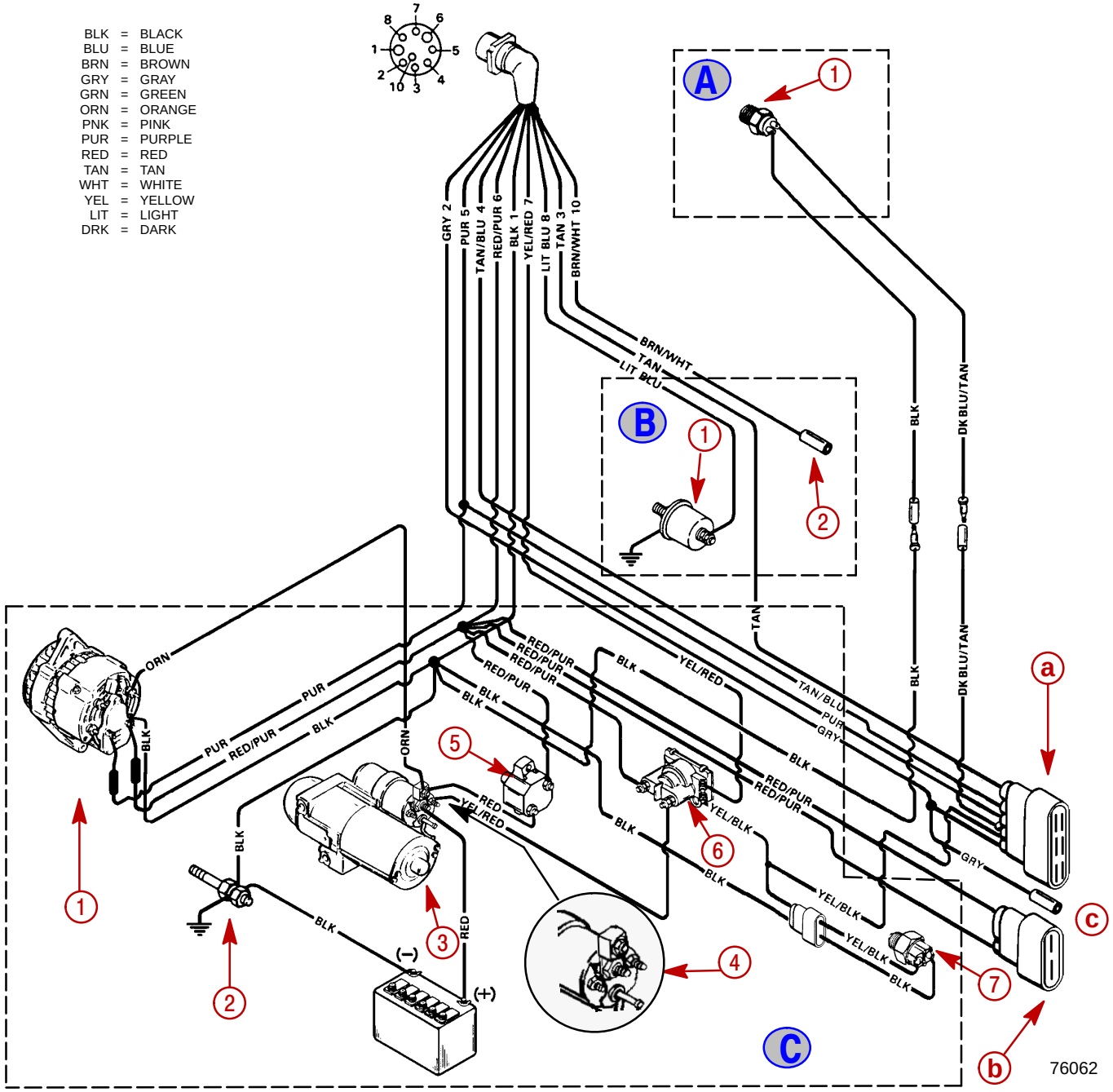
1 - Oil Pressure Switch
2 - Water Temperature Switch
3 - Transmission Temperature Switch

D - Instrumentation Components

1 - Oil Pressure Sender
2 - Water Temperature Sender
3 - See NOTE

MIE Black Scorpion Models -Starting and Charging System Harness

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



A - Audio Warning Components

1 - Transmission Temperature Switch

B - Instrumentation Components

1 - Oil Pressure Sender
2 - Wire Not Used

C - Charging and Starting Components

1 - Alternator
2 - Ground Stud
3 - Starter
4 - 90 Amp Fuse (DO NOT REMOVE)
5 - Circuit Breaker
6 - Starter Slave Solenoid
7 - Neutral Safety Switch

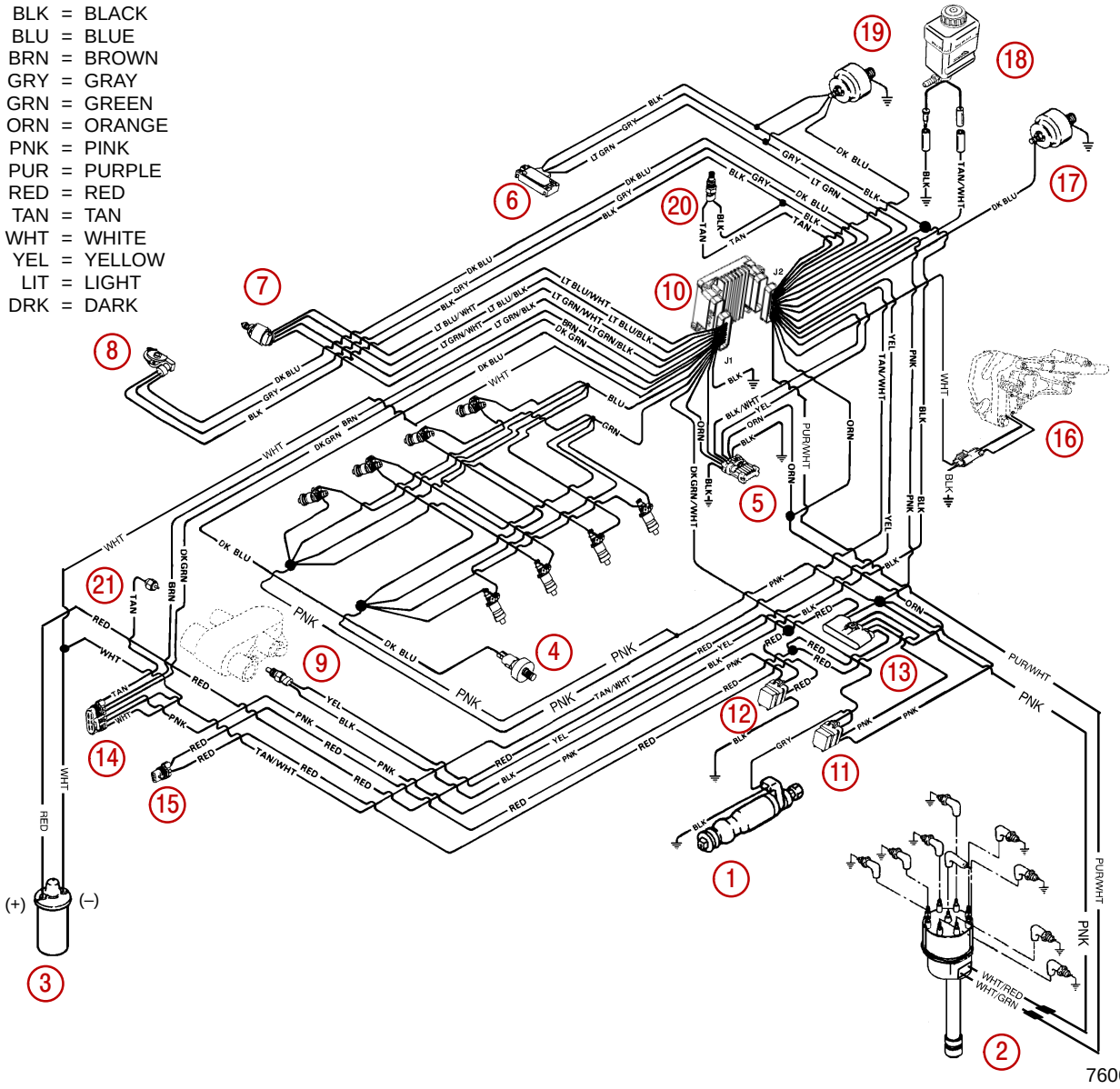
a - Positive Power Wire To EFI System Harness
b - Harness Connector To EFI System Harness
c - Auxiliary Tachometer Lead

MIE Black Scorpion Models - Fuel and Ignition System Harness

NOTE: *All BLACK wires with a ground symbol are interconnected within the EFI system harness.*

NOTE: *Component position and orientation shown is arranged for visual clarity and ease of circuit identification.*

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

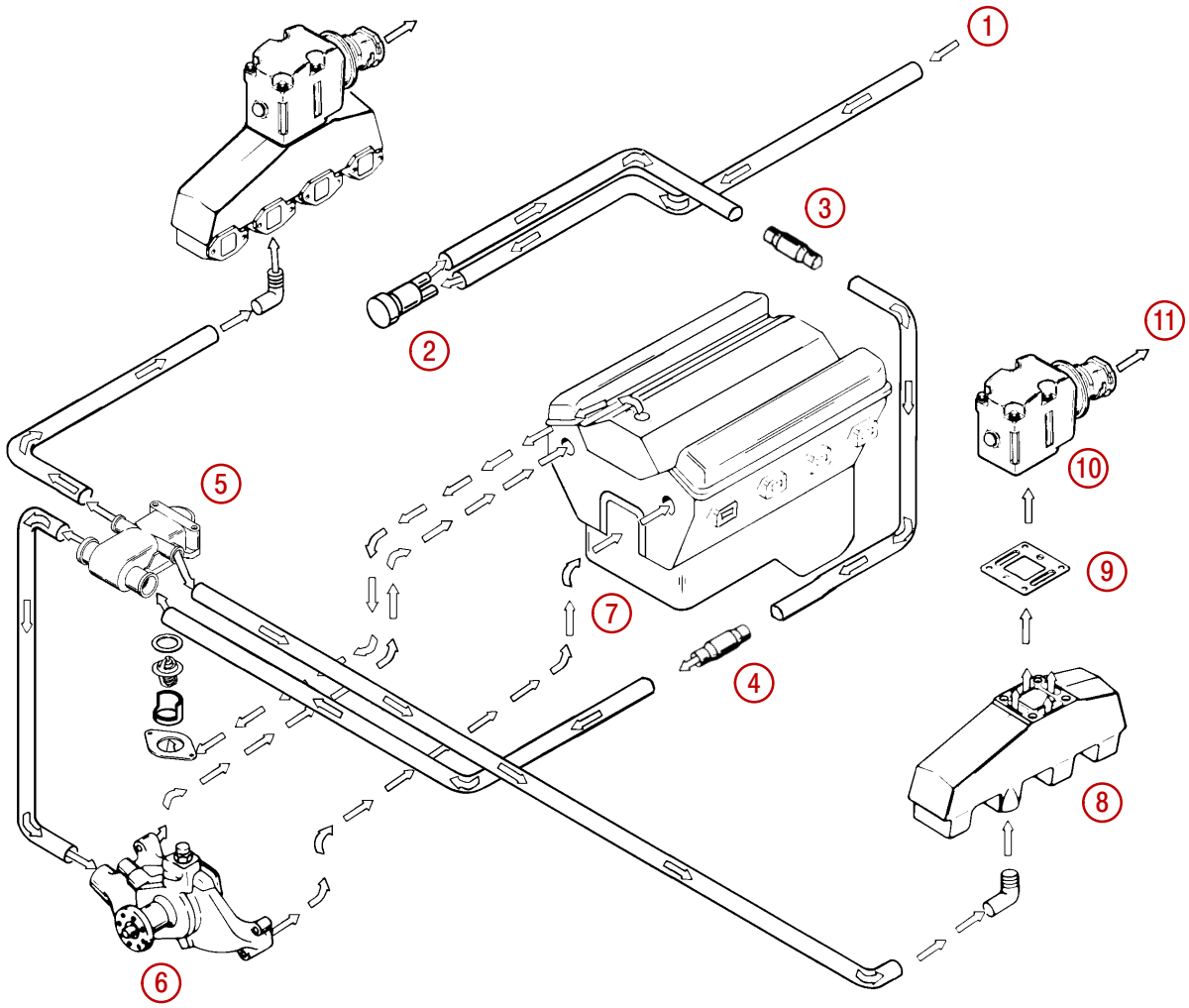


1 - Fuel Pump
2 - Distributor
3 - Coil
4 - Knock Sensor (KS) Module
5 - Data Link Connector (DLC)
6 - Manifold Absolute Pressure (MAP) Sensor
7 - Idle Air Control (IAC)
8 - Throttle Position (TP) Sensor
9 - Engine Coolant Temperature (ECT) Sensor
10- Electronic Control Module (ECM)
11- Fuel Pump Relay
12- Ignition/System Relay
13- Fuse (15 Amp) Fuel Pump, Fuse (15 Amp) ECM/DLC/Battery, Fuse (10 Amp) ECM/Injector/Ignition/Knock Module
14- Harness Connector To Starting/Charging Harness
15- Positive (+) Power Wire To Engine Circuit Breaker
16- Shift Plate (Not used on Inboard models)
17- Oil Pressure (Audio Warning System)
18- Gear Lube Bottle (Not used on Inboard models)
19- Fuel Pressure Switch
20- Water Temperature Sender

MIE Water Flow Diagrams

Gasoline Engines with Seawater (Raw-Water) Cooling System

NOTE: *Certain components in the following diagram may look different than on your particular power package, but the water flow paths remain similar on all engines.*



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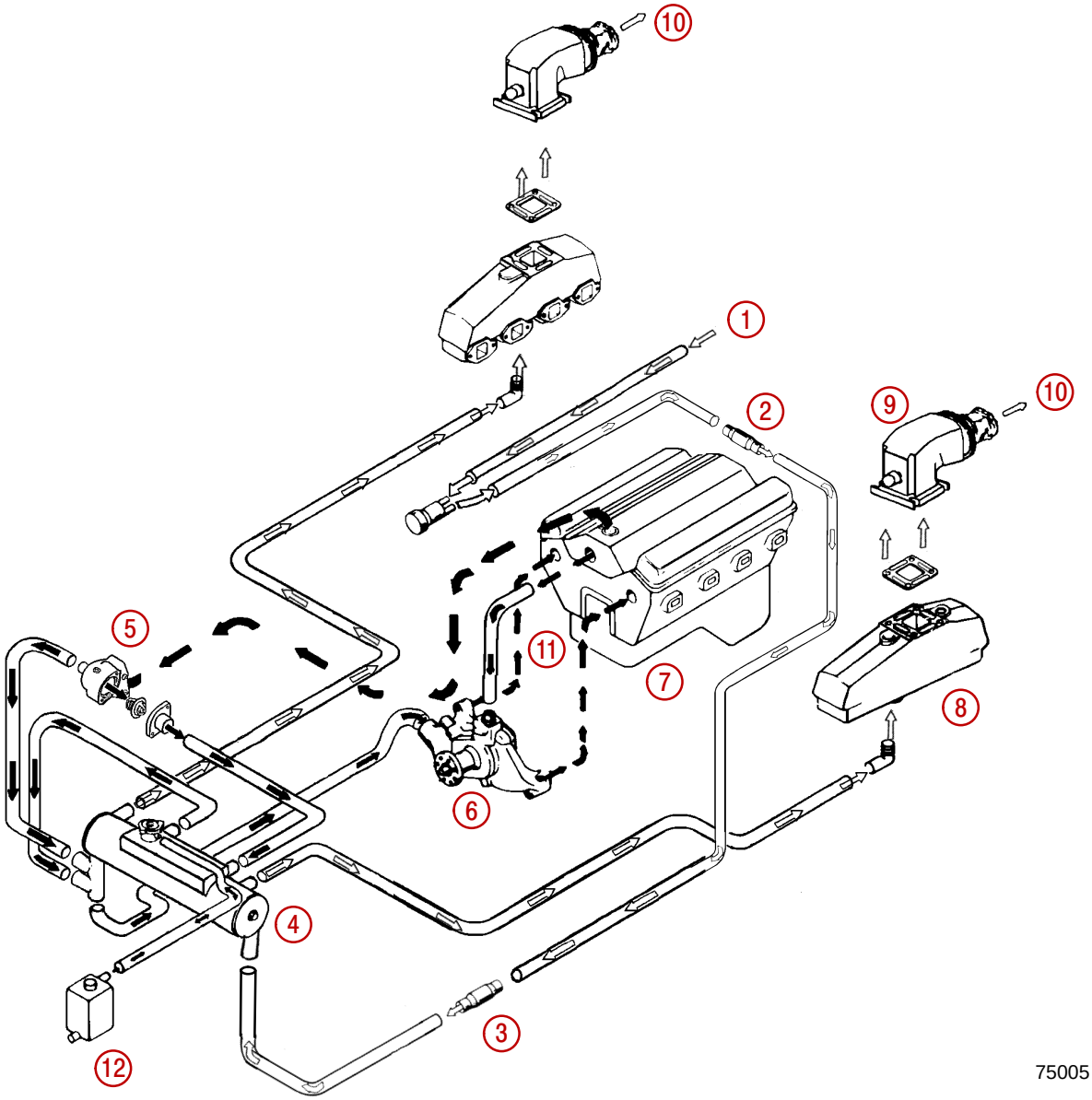
1 - Seawater Intake
2 - Seawater Pump
3 - Transmission Cooler
4 - Fuel Cooler (EFI Models)
5 - Thermostat Housing and Cover Assembly
6 - Engine Water Circulating Pump
7 - Engine Block and Cylinder Head Assembly
8 - Exhaust Manifold, Typical
9 - Restrictor Gasket
10 - Exhaust Elbow Assembly, Typical
11 - Water Flow Overboard

Gasoline Engines with Closed Cooling (Coolant) System

ALL MODELS

NOTE: *Certain components in the following diagram may look different than on your particular power package, but the water and coolant flow paths remain similar on all engines.*



1 - Seawater Intake (From Sterndrive)
2 - Transmission Cooler
3 - Fuel Cooler (EFI Models)
4 - Heat Exchanger, Typical
5 - Thermostat Housing and Cover Assembly
6 - Engine Water Circulating Pump
7 - Engine Block and Cylinder Head Assembly
8 - Exhaust Manifold, Typical
9 - Exhaust Elbow Assembly, Typical
10 - Overboard (Water and Exhaust Discharge)
11 - Coolant Recovery Bottle

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Predelivery Inspection

Not Applicable	Check/ Adjust	CHECK BEFORE RUNNING
☐	☐	Drain plug in and petcocks closed
☐	☐	Seawater inlet valve open
☐	☐	Engine mounts tight
☐	☐	Engine alignment
☐	☐	Drive unit fasteners torqued
☐	☐	Power trim cylinders fasteners tight
☐	☐	Battery fully charged and secured
☐	☐	All electrical connections tight
☐	☐	Exhaust system hose clamps tight
☐	☐	All fuel connections tight
☐	☐	Correct rotation propeller (installed and torqued)
☐	☐	Throttle, shift and steering system fasteners tightened properly
☐	☐	Throttle plates open and close completely
☐	☐	Crankcase oil level
☐	☐	Power trim oil level
☐	☐	Stern drive unit oil level
☐	☐	Power steering fluid level
☐	☐	Closed cooling level
☐	☐	Transmission fluid level
☐	☐	Alternator belt tension
☐	☐	Seawater pickup pump belt tension
☐	☐	Power steering pump belt tension
☐	☐	Audio warning system operation

Not Applicable	Check/ Adjust	ON THE WATER TEST
☐	☐	Engine alignment (Inboards only)
☐	☐	Starter neutral safety switch operation
☐	☐	Water pump operation
☐	☐	Instruments(s) operation
☐	☐	Fuel leaks
☐	☐	Oil leaks
☐	☐	Water leaks
☐	☐	Exhaust leaks
☐	☐	Ignition timing
☐	☐	Idle_____RPM, within specifications
☐	☐	Forward - Neutral - Reverse gear operation
☐	☐	Steering operation throughout range
☐	☐	Acceleration from idle rpm
☐	☐	WOT_____RPM within specifications (in forward gear)
☐	☐	Power trim operation
☐	☐	Trim tab adjustment
☐	☐	Boat handling

		AFTER ON WATER TEST
☐	☐	Propeller nut torque
☐	☐	Fuel, oil, coolant, water and fluid leaks
☐	☐	Oil and fluid levels
☐	☐	Apply Quicksilver Corrosion Guard to engine package