

# REMOVAL, INSTALLATION, AND ADJUSTMENTS

## Section 2A - All Models

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# Torque Specifications

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

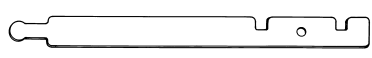
Description	Nm	lb-in.	lb-ft
Transom assembly attaching bolts and nuts	34		25
Water inlet fitting bolts	5	45	
Exhaust pipe to gimbal housing bolts	34		25
Block off plate to gimbal housing bolts	34		25
Power trim hydraulic hose fittings	9	80	
Steering system pivot bolts	34		25
Coupler nut	47		35
Power steering hydraulic hose fittings	34		25
Sterndrive unit to bell housing attaching nuts	68		50

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

## Lubricants / Sealants / Adhesives

Description	Where Used	Part Number
Perfect Seal	Water bypass fitting	92-34227-1
Special Lubricant 101	Steering system bushings	92-802865A1
	Steering system pivot bolts	92-802865A1
	Sterndrive shift linkage assembly	
	Clevis pins	
	Steering cable	
Liquid Neoprene	All electrical connections	92-25711-3
Engine Coupler Spline Grease	U-joint shaft splines and O-rings	92-802869A1
High Performance Gear Lube	O-ring seals	92-802854A1
SAE 30W Engine Oil	Shift cable pivot points	Obtain locally
2-4-C with Teflon	Shift cable end	92-802859A1
	Bell housing studs	

## Special Tools

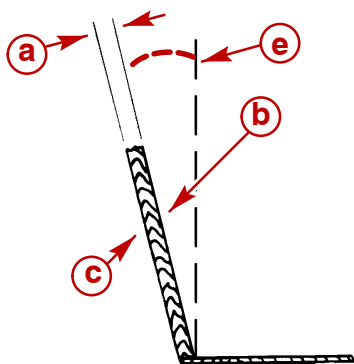
Shift Cable Adjustment Tool		
 73479	Attaches over the shift cable. Use for proper Bravo sterndrive unit shift cable adjustment at the shift plate.	91-12427

# Transom Thickness and Surface

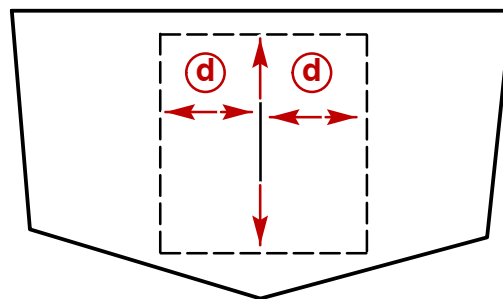
**IMPORTANT: Transom thickness and surface plane (flatness) must be controlled where the sterndrive unit mounts.**

Transom thickness and surface must conform to the following:

Transom Specifications	
Thickness	Between 51 - 57 mm (2 - 2-1/4 in.)
Parallelism	Inner and outer surfaces must be parallel within 3 mm (1/8 in.)
Flatness	Transom surfaces in area where transom assembly will be mounted (includes vertical as well as horizontal dimensions): Inner Surface - Flat within 3 mm (1/8 in.) Outer Surface - Flat within 2 mm (1/16 in.)
Angle	10 - 16 Degrees

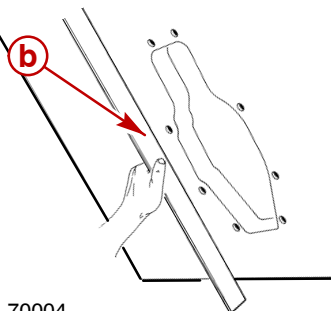
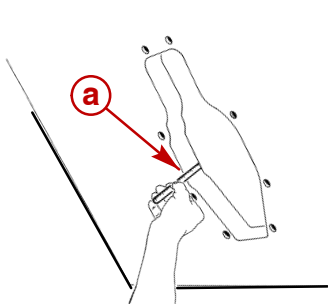


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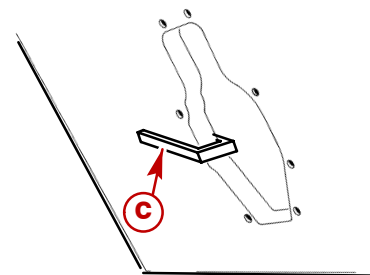


72700

- a** - Transom thickness
- b** - Inner surface
- c** - Outer surface
- d** - Transom plate coverage
- e** - Transom angle



70004



75479

- a** - Measuring thickness
- b** - Measuring surface flatness
- c** - Suitable mandrel to check for uniform transom thickness

## Special Information

### Bravo Three Notice: Trim-In Limit Insert

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

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

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

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

#### **WARNING**

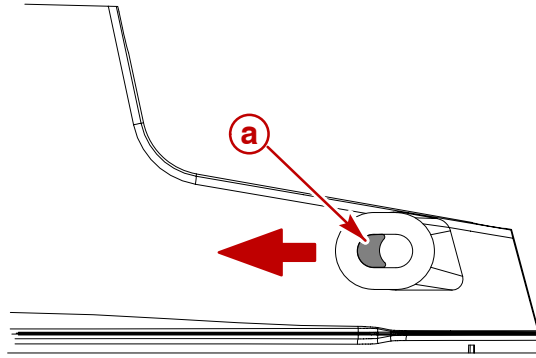
**It is recommended that only qualified personnel adjust the Trim-In Limit Insert. Boat must be water tested after adjusting the device to ensure that the modified trim-in range does not cause the boat to exhibit an undesirable boat handling characteristic if the sterndrive unit is trimmed in at higher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

### All Models

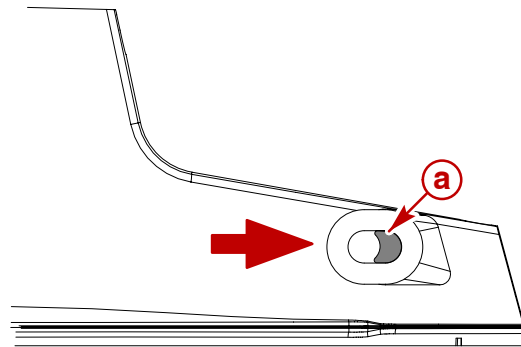
**IMPORTANT:** The trim-in limit insert must be properly positioned before installing the trim cylinder anchor pin.

**NOTE:** *When removing the sterndrive unit, make a note of the position of the insert for reference when reinstalling the sterndrive unit.*

1. Ensure that the trim-in limit insert is positioned as shown for the appropriate Bravo model.



75157

**Bravo One and Two (positioned forward)**

75158

**Bravo Three (positioned aft)****a** - Trim-in limit insert

**IMPORTANT:** The position of the trim-in limit insert on the Bravo Three sterndrive unit should only be changed after the boat has been properly tested. Contact the boat manufacturer if you are not sure of the original position for a particular boat application.

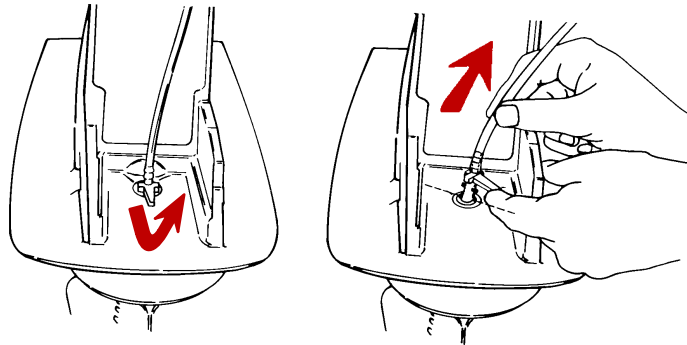
## Sterndrive Unit Removal

1. Shift remote control into NEUTRAL.
2. Place the sterndrive unit to the full UP/OUT position.

### ⚠ CAUTION

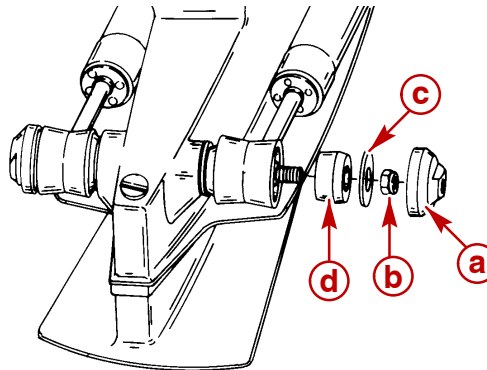
**Avoid speedometer hose fitting damage. Disconnect the speedometer hose fitting from the sterndrive shaft housing before removing the sterndrive unit.**

3. Disconnect the speedometer hose fitting from the sterndrive shaft housing.



22025

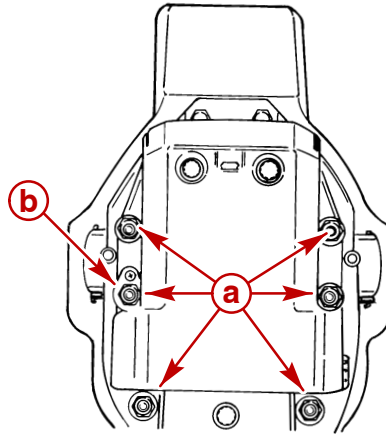
4. Place the sterndrive unit to the full DOWN/IN position and remove the power trim cylinder from the aft end of the sterndrive shaft housing.



22029

- a** - End cap
- b** - Nut
- c** - Flat washer
- d** - Bushing

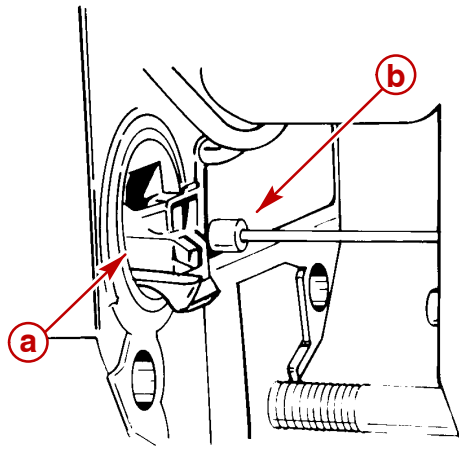
5. Remove the locknuts holding the sterndrive onto the bell housing and then remove the sterndrive unit.



22031

- a** - Locknuts (6) and flat washers (5)
- b** - Ground plate (flat washer not used here)

6. Ensure that the shift cable linkage jaws open and release the shift cable end.

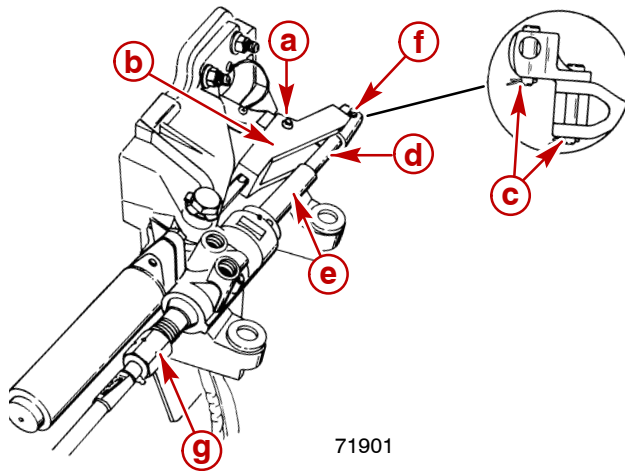


22025

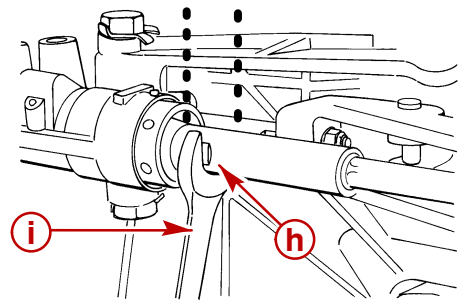
- a** - Shift linkage jaws
- b** - Shift cable end

# Transom Assembly Removal

1. Remove engine. Refer to the appropriate Mercury MerCruiser Engine Service Manual.
2. Completely disconnect the power steering assembly.
  - a. Disconnect the rear clevis pin from the steering lever.
  - b. Disconnect forward clevis pin from steering cable end.
  - c. Holds flats on cable guide in vertical position with suitable wrench. Loosen coupler nut and remove steering cable.



71901

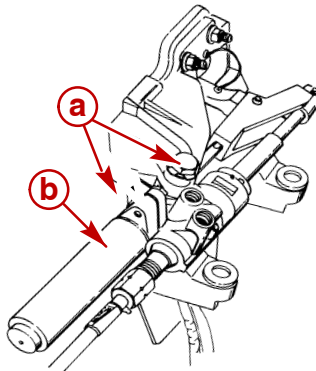


73901

### Control valve

- |                               |                               |
|-------------------------------|-------------------------------|
| <b>a</b> - Rear clevis pin    | <b>f</b> - Forward clevis pin |
| <b>b</b> - Steering lever     | <b>g</b> - Coupler nut        |
| <b>c</b> - Cotter pins        | <b>h</b> - Flats              |
| <b>d</b> - Steering cable end | <b>i</b> - Suitable wrench    |
| <b>e</b> - Cable guide        |                               |

- d. Bend tab washer tabs down and away from pivot bolt heads.
- e. Remove the pivot bolts.
- f. Remove the power steering control valve.

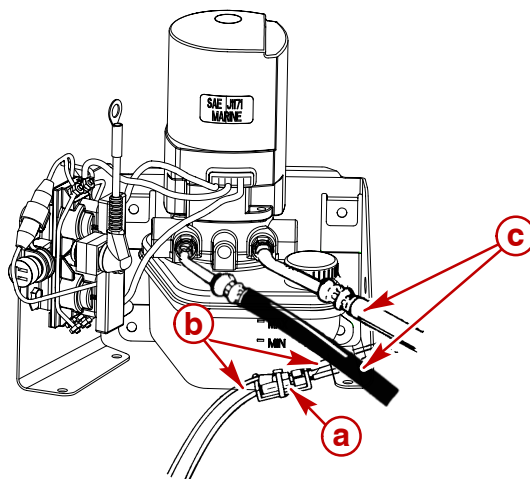


71901

- |                          |
|--------------------------|
| <b>a</b> - Pivot bolts   |
| <b>b</b> - Control valve |



3. Disconnect trim limit switch wires.
4. Remove power trim pump hydraulic hoses and disconnect trim limit switch wires. Cap hoses and plug pump fitting holes.

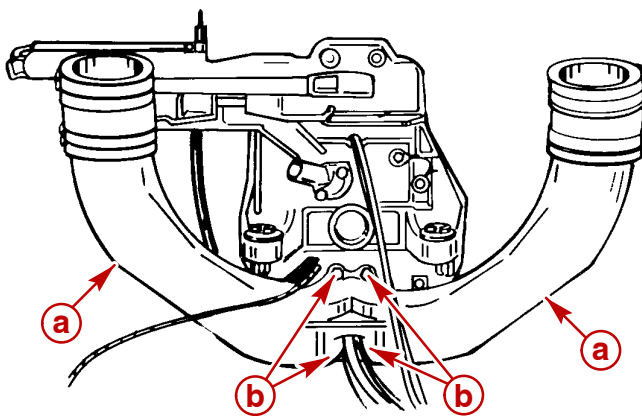


76631

- a** - Tie strap
- b** - Trim limit switch wires
- c** - Hydraulic hoses

5. Remove exhaust pipe.

**NOTE:** For through transom exhaust, it is not necessary to remove the block-off plate unless the gasket/mating surface is leaking or the exhaust system is to be modified.

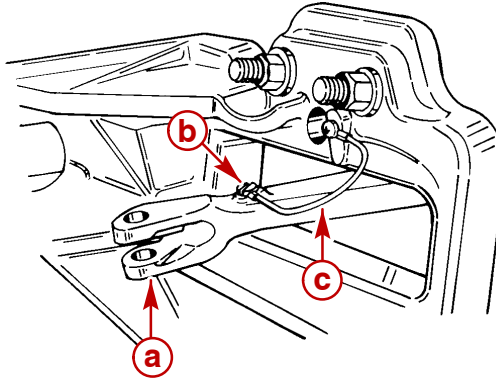


22028

**Standard through prop exhaust shown.**

- a** - Exhaust pipe
- b** - Bolts (4)

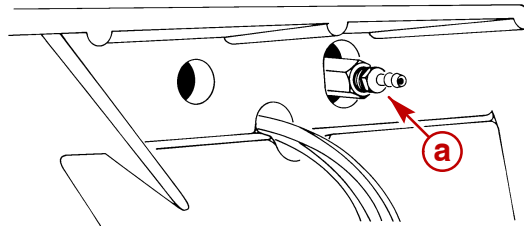
6. Remove the continuity wire from the steering lever.



22028

- a** - Steering lever
- b** - Screw
- c** - Continuity wire

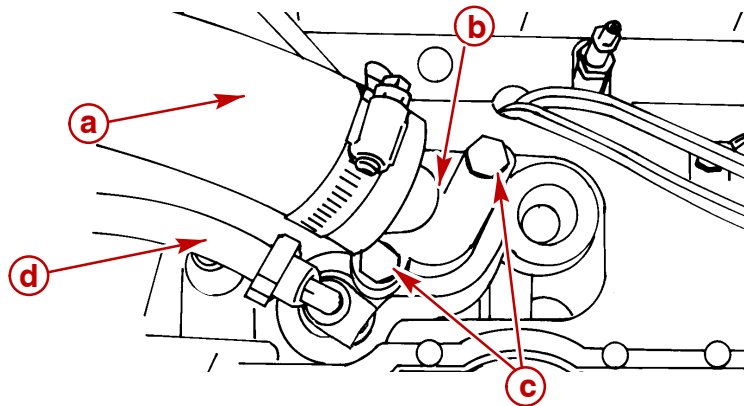
7. Disconnect the speedometer hoses.



70015

- a** - Speedometer fitting

8. Remove seawater inlet hose.



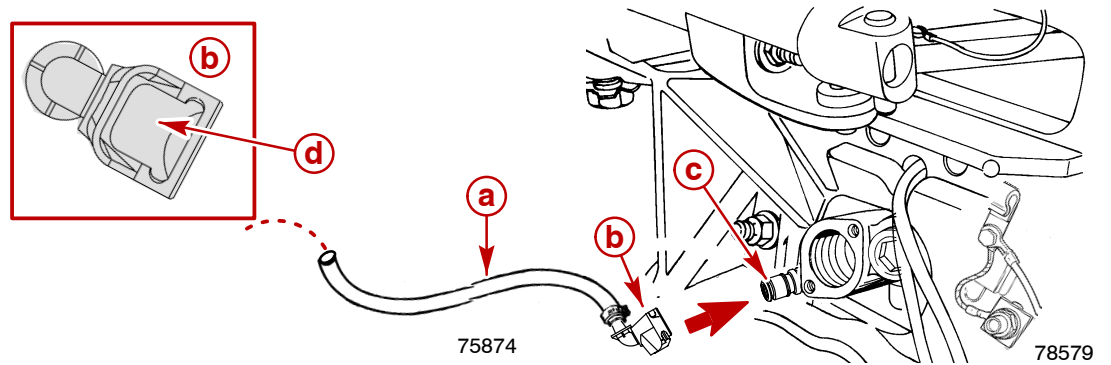
76636

- a** - Seawater inlet hose
- b** - Seawater pickup outlet
- c** - Bolts and star washers
- d** - Gear lube monitor hose

9. Remove seawater pickup outlet.

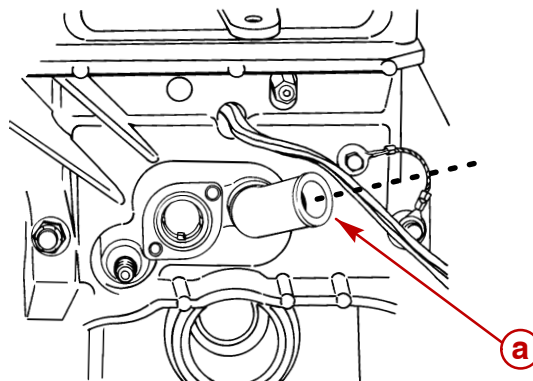
10. Remove gear lube monitor hose.

**NOTE:** Models not equipped with the quick release fitting use a gear lube monitor hose with a threaded brass fitting to the gimbal housing.



- a** - Gear lube monitor hose
- b** - Quick release 90 degree fitting
- c** - Gimbal housing fitting
- d** - Quick release button

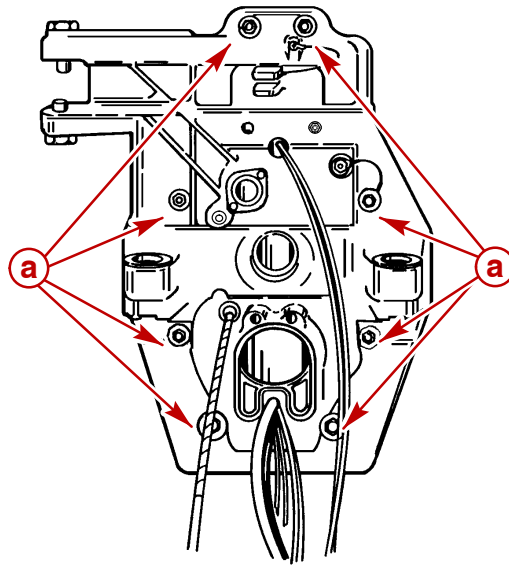
11. On diesel models with water bypass fitting, remove the fitting.



- a** - Water bypass fitting

72045

12. Remove transom locknuts and washers.



**a** - Locknuts and washers (8)

73902

13. Separate the inner transom plate from the gimbal housing assembly.

# Transom Assembly Installation

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

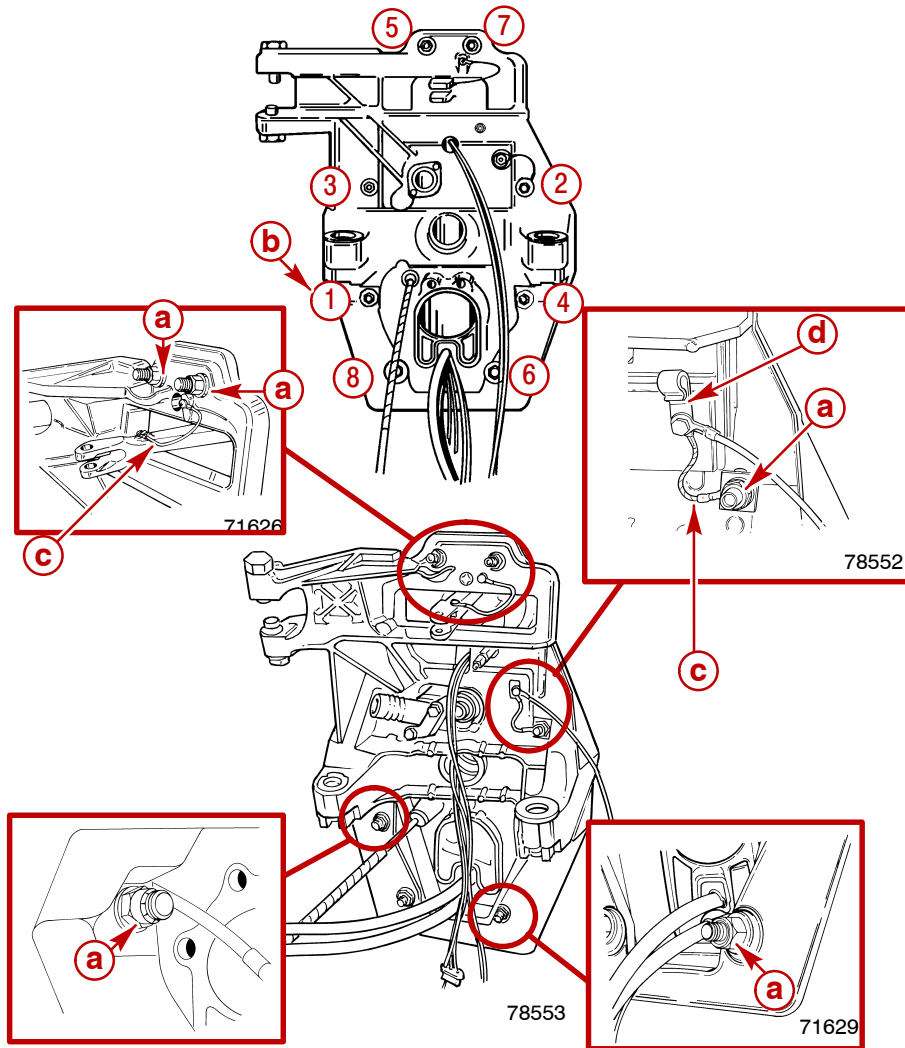
**IMPORTANT: Tighten the transom assembly fasteners using an X-pattern torque sequence, starting from the middle fasteners. Tighten in small increments and go around the pattern several times until the proper torque is achieved.**

3. Secure transom assembly with hardware as shown. Torque the hardware.

Description	Nm	lb-in.	lb-ft
Transom assembly hardware	34		25

4. Attach continuity wires.

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



- a** - Locknuts and flat washers (8)
- b** - Torque sequence
- c** - Continuity wires (2)
- d** - J-clip

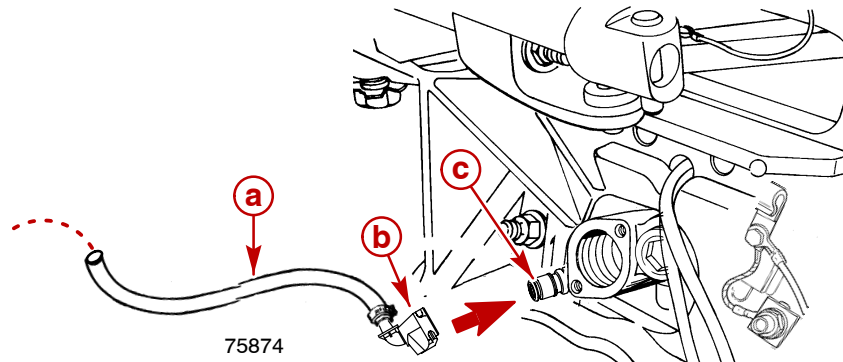
5. Connect gear lube monitor hose.

**⚠ CAUTION**

**Avoid sterndrive unit damage. Quick release button on gear lube monitor 90 degree hose fitting may not lock on gimbal housing if touching or depressed by water inlet fitting or block-off plate, if equipped. Failure to do so could result in a loose 90 degree fitting causing a loss of gear lube and damage to sterndrive unit.**

**NOTE:** Models not equipped with the quick release fitting use a gear lube monitor hose with a brass thread on the fitting to the gimbal housing.

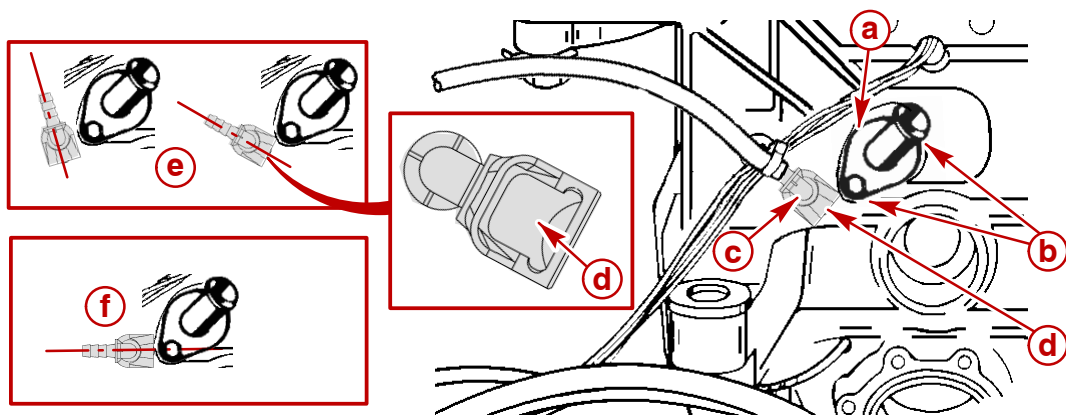
- a. Connect the quick release 90 degree fitting of the gear lube monitor hose to the gimbal housing.



- a - Hose
- b - Quick release 90 degree fitting
- c - Gimbal housing fitting

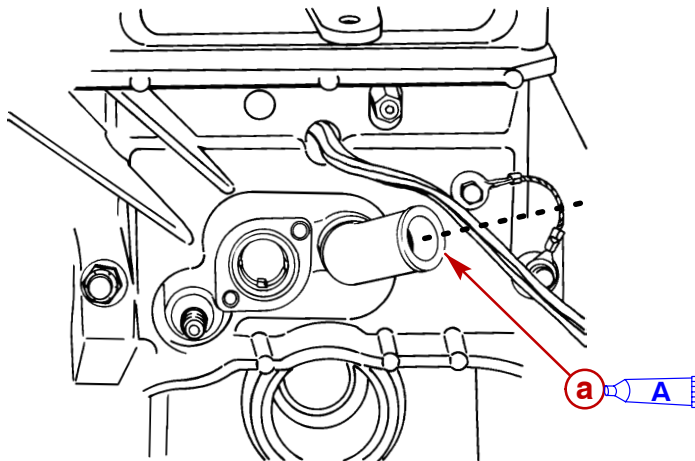
**NOTE:** The quick release button on hose fitting must be positioned away from water inlet fitting, or block-off plate if equipped. Release button must not contact water fitting or block-off plate, if equipped.

- b. Position quick release button on hose fitting away from water inlet fitting. Release button must not contact water inlet fitting.



- a - Water inlet fitting
- b - Star washer and screw
- c - 90 degree hose fitting
- d - Quick release button
- e - ACCEPTABLE positions
- f - NOT ACCEPTABLE position

6. **Models with Water Bypass Fitting:** Apply sealant to threads and install fitting. Tighten securely and position as shown.

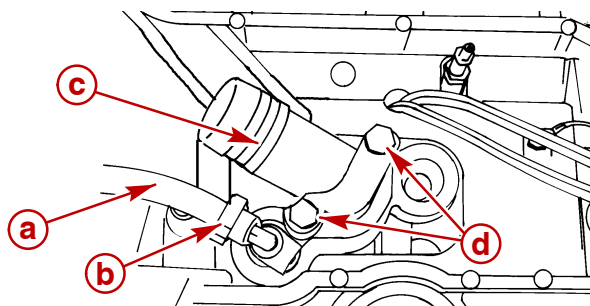


76656

**a** - Water bypass fitting

Description	Where Used	Part Number
<b>A</b> Perfect Seal	Water bypass fitting	92-34227-1

7. Install water inlet fitting with gasket.

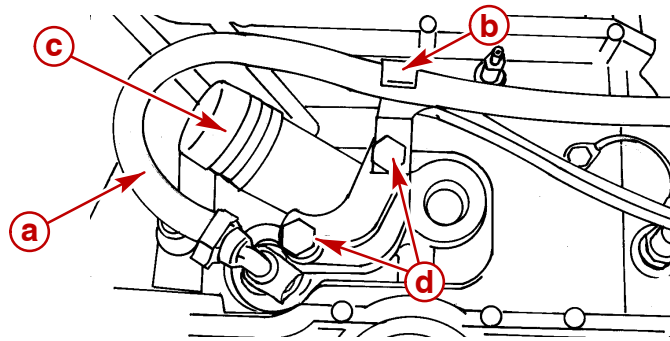


76640

- a** - Gear lube monitor hose
- b** - Hose clamp
- c** - Water inlet fitting
- d** - Bolts and star washers

Description	Nm	lb-in.	lb-ft
Water inlet fitting bolts	5	45	

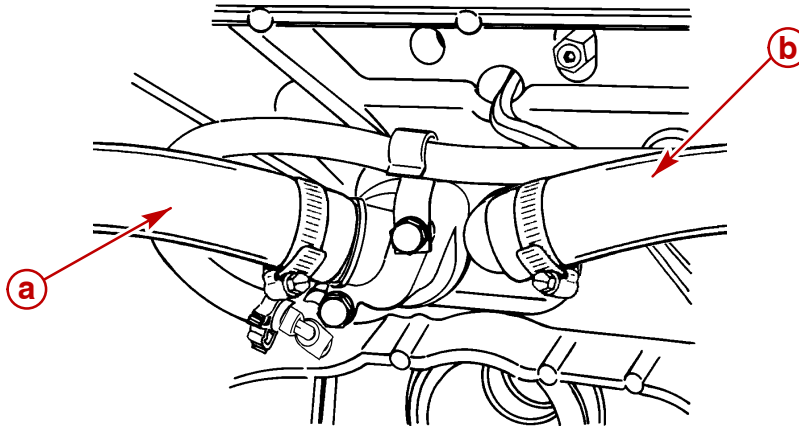
8. **On Some Models:** The gear lube monitor hose may be routed toward the port side of the engine. Secure the hose at the top side of the water inlet fitting using the hose clip as shown.



76635

- a** - Gear lube monitor hose
- b** - Hose clip
- c** - Water inlet fitting
- d** - Bolts and star washers

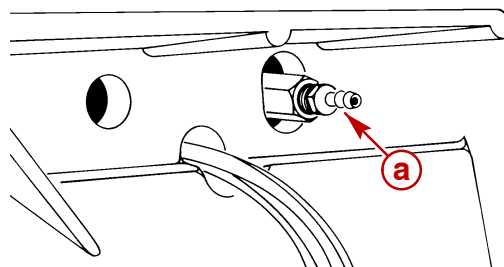
9. Connect water hoses to appropriate fittings. Tighten hose clamps securely.



76641

- a** - Seawater hose to engine seawater pump
- b** - Seawater pickup hose

10. Connect the speedometer hose to the speedometer fitting.



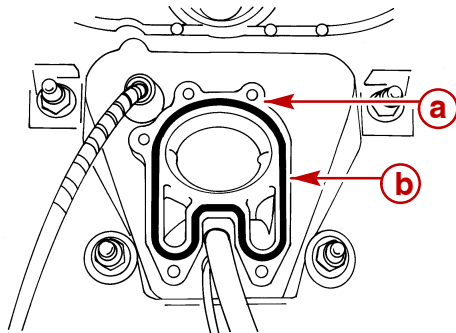
70015

- a** - Speedometer fitting

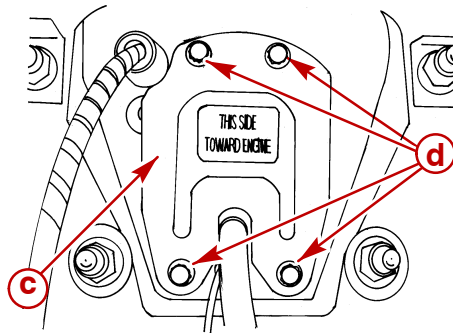


**IMPORTANT:** Exhaust pipe or block-off plate and gimbal housing mating surface must be clean and free of nicks and scratches and O-ring must be properly seated in groove or water may leak into boat.

11. **Through the transom exhaust models:** Install block-off plate as shown, using 4 bolts and lockwashers. Torque bolts.



76639

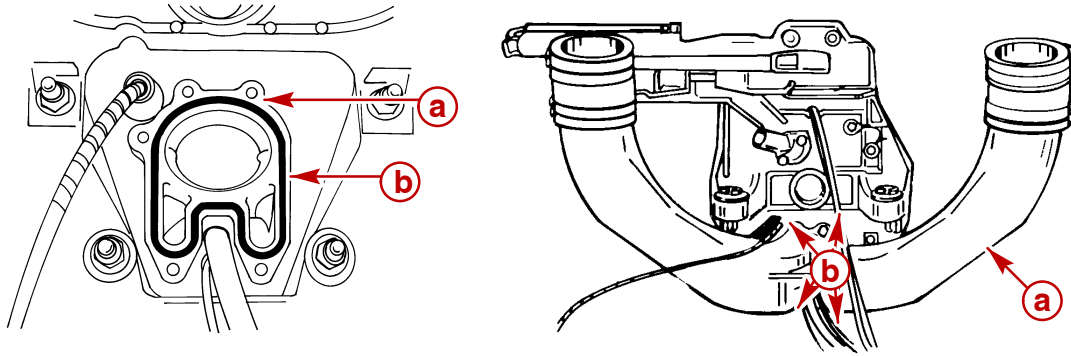


76638

- a** - Mating surface
- b** - O-ring
- c** - Bolts and lockwashers (4)
- d** - Block-off plate

Description	Nm	lb-in.	lb-ft
Exhaust block-off plate bolts	34		25

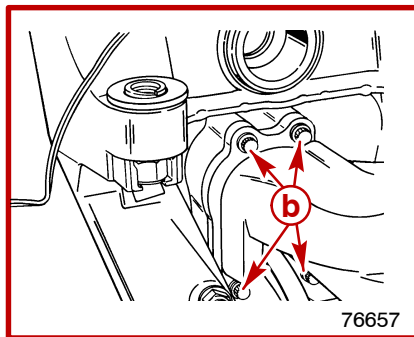
12. Through the prop exhaust models: Install exhaust pipe. Torque bolts.



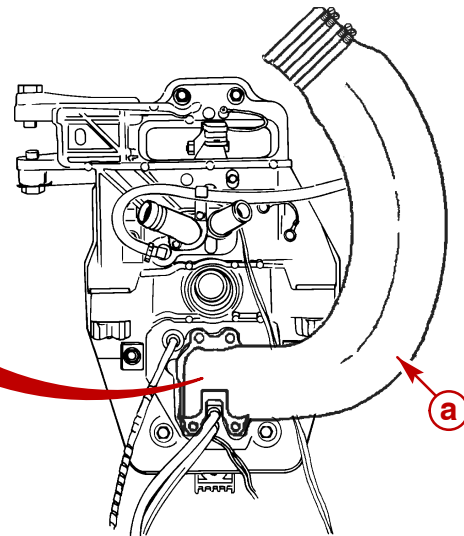
22028

**Typical V6 and V8 gasoline engines**

- a** - Mating surface
- b** - O-ring
- c** - Exhaust pipe
- d** - Bolts (4)



76657



71945

**Typical diesel engine**

- a** - Exhaust pipe
- b** - Bolts (4)

Description	Nm	lb-in.	lb-ft
Exhaust pipe to gimbal housing bolts	34		25

**IMPORTANT:** Make hydraulic hose connections as quickly as possible to prevent oil from leaking out of the system.

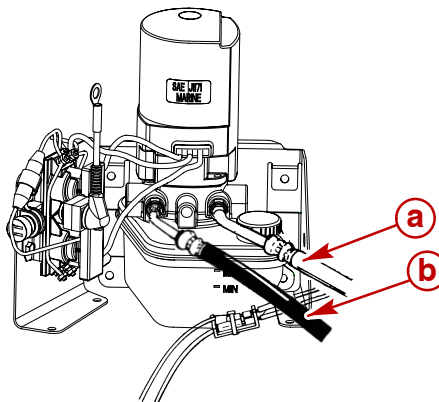
**⚠ WARNING**

Avoid serious bodily injury or death due to loss of steering control. Extreme heat will lower burst pressure or melt steering system hydraulic hoses. Stress on hose fittings or kinks in the hose may cause hose failure. In any case, instant loss of steering may occur. Route the hydraulic hoses to avoid extreme heat, stress on hose fittings and hose kinks.

**⚠ CAUTION**

Installing trim pump hoses improperly can damage the hose fittings and cause leaks or loose lines. Do not cross thread or overtighten the hose fittings.

13. Connect the power trim pump hydraulic hoses. Torque both hose fittings.



76631

- a** - DOWN pressure hydraulic line (GRY)
- b** - UP pressure hydraulic line (BLK)

Description	Nm	lb-in.	lb-ft
Power trim hydraulic hose fittings	9	80	

## Installing Steering System

### HYDRAULIC (HELM) STEERING

If your power package is equipped with Compact Hydraulic Steering, refer to the *Compact Hydraulic Steering Installation Instructions*. Complete the installation of the hydraulic steering system before proceeding to Transom Preparation.

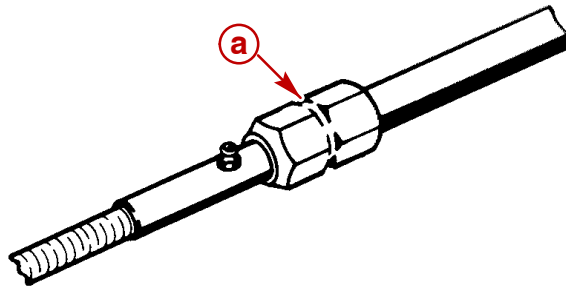
### STEERING HELM AND CABLE

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

#### WARNING

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

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



22060

**a** - Quicksilver RideGuide steering cable self-locking coupler nut (identified by groove)

**IMPORTANT:** If using a steering cable that does not have a self-locking coupler nut, an external locking device such as a locking sleeve must be used.

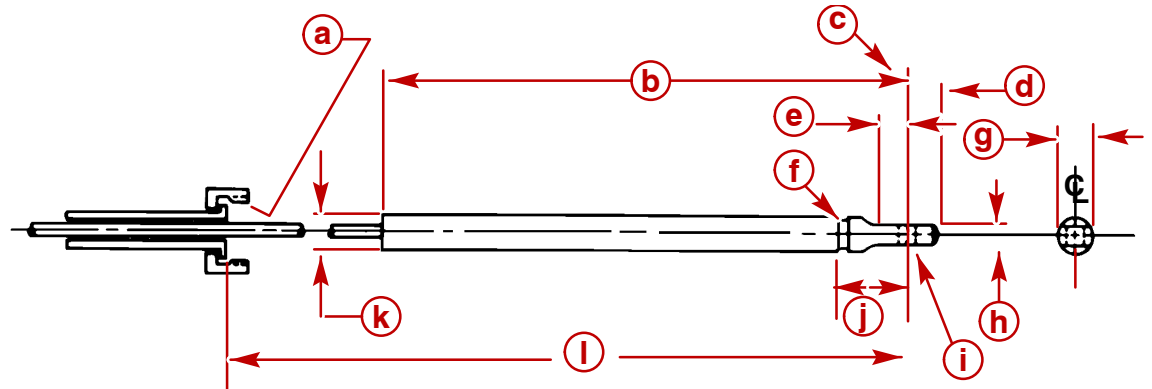
#### CAUTION

**If steering cable with improper dimensions is installed, severe damage to transom assembly and/or steering system may result.**

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

## STEERING CABLE SPECIFICATIONS

**IMPORTANT: Power steering pump lugging (squealing) in a hard right turn (against lock) may mean a steering cable has been installed that does not have the correct dimensions.**



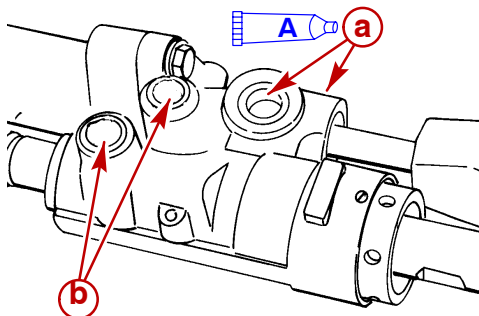
21435

- a** - Coupler nut - 7/8 - 14 UNF - 28 thread
- b** - 298 mm (11-3/4 in.) minimum
- c** - Interface point
- d** - 12.7 mm (1/2 in.) maximum
- e** - 10.7 mm (27/64 in.) minimum flat
- f** - 3.1 mm (7/64 in.) minimum radius
- g** - 15.9 mm (5/8 in.) maximum diameter end fitting
- h** - 9.5 mm (3/8 in.)
- i** - 9.8 mm (3/8 in.) diameter through hole (chamfered each side)
- j** - 34.9 mm (1-3/8 in.) maximum
- k** - 15.9 mm (5/8 in.) diameter tube
- l** - Cable travel: mid-travel position - 429 mm (16-7/8 in.)  
total travel to be 203 mm (8 in.) minimum to 228 mm (9 in.) maximum  
travel each side of mid-travel position - 102 mm (4 in.) minimum to 114 mm (4-1/2 in.) maximum

**POWER STEERING**

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

1. Inspect the upper and lower bushings for debris. Lubricate the upper and lower bushings.

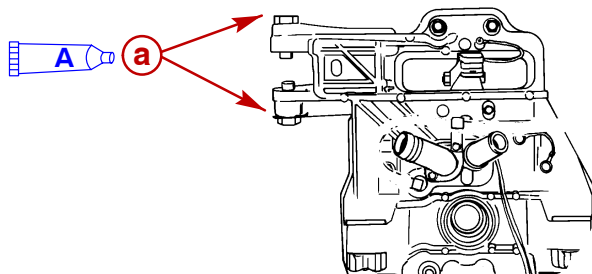


73898

- a** - Upper and lower bushings (lower bushing not shown)
- b** - Control valve ports

Description	Where Used	Part Number
<b>A</b> Special Lubricant 101	Steering system bushings	92-802865A1

2. Loosen the upper and lower pivot bolts and ensure that the threads are well lubricated. Add lubricant as necessary.



71945

- a** - Upper and lower pivot bolts

Description	Where Used	Part Number
<b>A</b> Special Lubricant 101	Steering system pivot bolts	92-802865A1

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

- Torque pivot bolts.

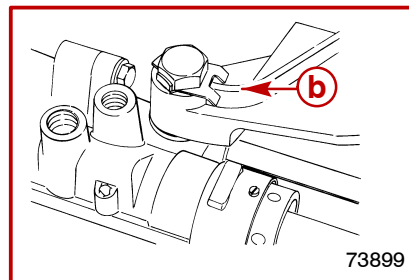
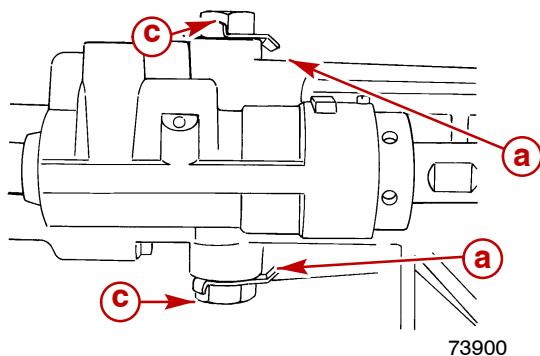
Description	Nm	lb-in.	lb-ft
Steering system pivot bolts	34		25

**NOTE:** It may be necessary to tighten further to align flats on pivot bolt with tangs on tab washer.

- Bend tab washer tangs against corresponding flats on bolt heads.

**CAUTION**

**Avoid injury or property damage due to loss of steering control. Always bend tab washer tangs against the corresponding flats of the steering pivot bolts.**

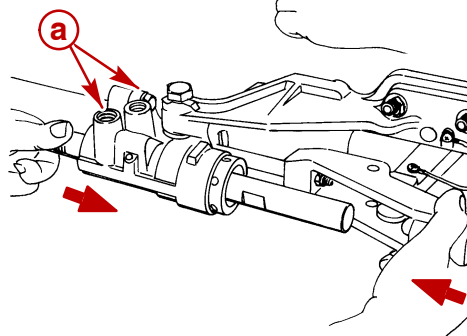
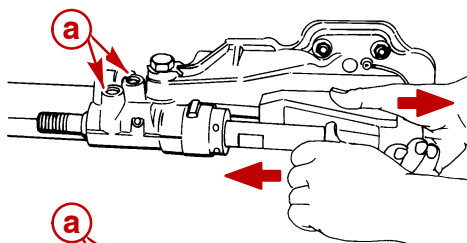


- a** - Tab washers
- b** - Ridge
- c** - Pivot bolts

**CAUTION**

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

- The control valve ram may be stiff and difficult to move when you attempt to pull it out or push it in for installation. Move the assembly in the directions shown below.

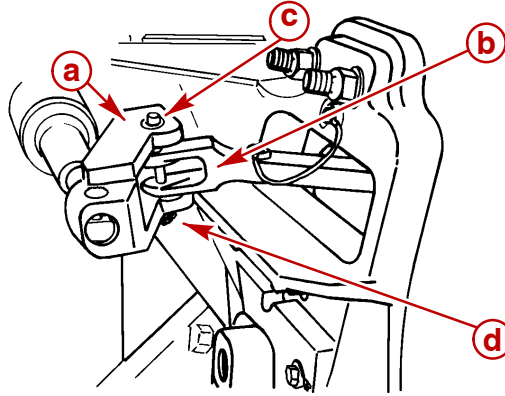


- a** - Control valve ports

7. Connect clevis to steering lever.
8. Lubricate clevis pin and insert clevis from top to connect the steering lever to the clevis.
9. Insert cotter pin through rear clevis pin and spread both ends of cotter pin.

### ⚠ CAUTION

**Avoid injury or property damage due to loss of steering control. Always install the clevis pin through the top of the clevis and steering lever.**



71904

- a** - Clevis
- b** - Steering lever
- c** - Rear clevis pin
- d** - Cotter pin

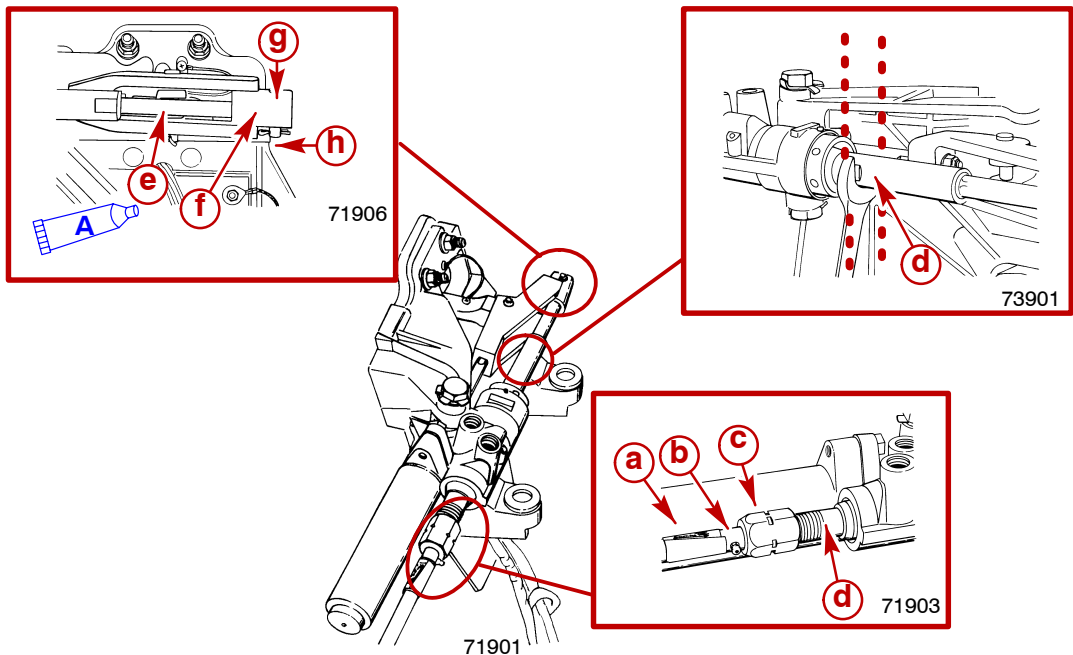
Description	Where Used	Part Number
Special Lubricant 101	Clevis pin	92-802865A1



**CAUTION**

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

- 10. Coat steering cable end with a liberal amount of lubricant.
- 11. Install steering cable and secure with hardware.



- a - Steering cable
- b - Grease fitting
- c - Cable coupler nut
- d - Cable guide tube
- e - Steering cable end
- f - Clevis
- g - Rear clevis pin
- h - Cotter pin

Description	Where Used	Part Number
A Special Lubricant 101	Steering cable end	92-802865A1

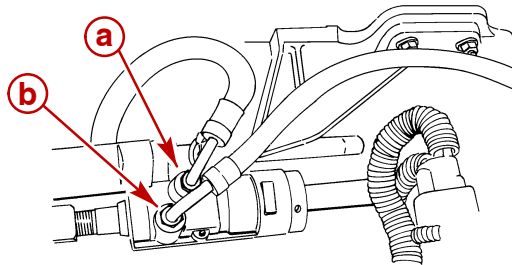
**IMPORTANT: Slight feedback in the steering system could be encountered if the cable guide tube flat surfaces are not positioned vertically.**

12. Using a suitable wrench hold the flat surfaces on the cable guide tube in the vertical position. Torque coupler nut.

Description	Nm	lb-in.	lb-ft
Steering cable coupler nut	47		35

**NOTE:** It may be necessary to tighten further to vertically align flat surfaces after torquing.

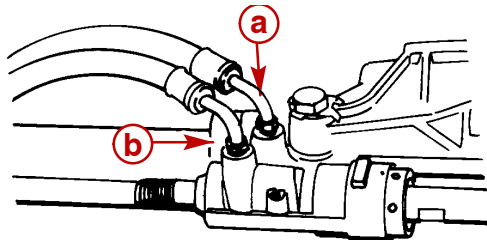
13. Install the engine. Refer to the appropriate Mercury MerCruiser Engine Service Manual.  
14. Attach both hydraulic hose fittings. Route hoses as appropriate to avoid contact with the steering system components.



73860

#### Models with one hose routed behind power steering control valve

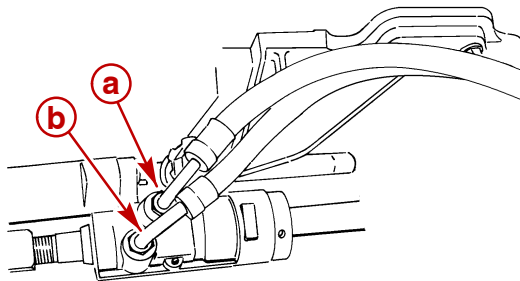
- a** - Rear pressure hose
- b** - Front return hose



74248

#### Models with both hoses routed behind power steering control valve toward starboard side

- a** - Rear pressure hose
- b** - Front return hose



73786

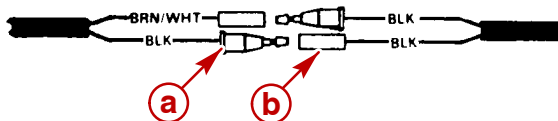
#### Models with both hoses routed over transom plate

- a** - Rear pressure hose
- b** - Front return hose

15. Torque both fittings.

Description	Nm	lb-in.	lb-ft
Power steering hydraulic hose fittings	34		25

16. Connect the trim sender leads from the gimbal housing to leads from the engine harness.

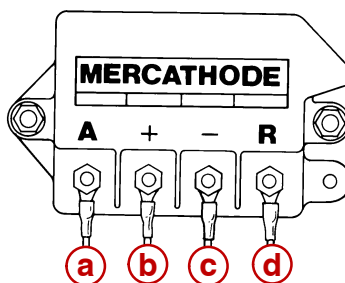


24841

- a** - Bullet connectors - from engine harness
- b** - Bullet connectors - from transom assembly

Description	Where Used	Part Number
Liquid Neoprene	All electrical connections	92-25711-3

17. Connect the MerCathode wires at the blue MerCathode controller or connect the male and female connectors of the quick connect.



22232

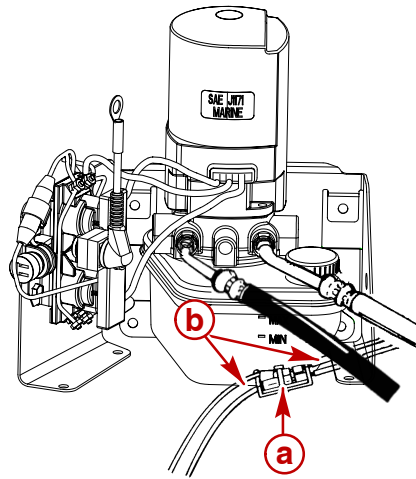
**Standard MerCathode connections shown**

- a** - ORN Lead - from anode on transom assembly
- b** - RED/PUR Lead - connect (other end) to positive (+) battery terminal
- c** - BLK Lead - from engine harness
- d** - BRN Lead - from electrode on transom assembly

18. Apply a thin coat of lubricant to all electrical connections.

Description	Where Used	Part Number
Liquid Neoprene	All electrical connections	92-25711-3

19. Connect the trim limit switch wires.



76631

- a** - Tie strap
- b** - Trim limit switch wires

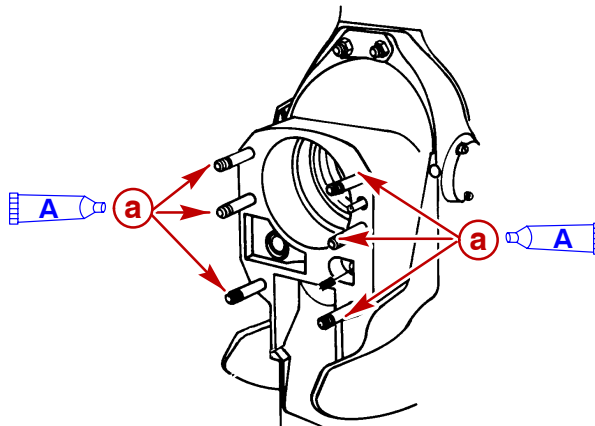
Description	Where Used	Part Number
Liquid Neoprene	All electrical connections	92-25711-3

# Sterndrive Unit Installation

1. Install and align the engine. Refer to the appropriate engine service manual.

**NOTE:** If the engine was removed and the shift cable was disconnected, reinstall and adjust the shift cable before proceeding.

2. Place the remote control shift lever in the NEUTRAL position.
3. Lubricate the bell housing studs.

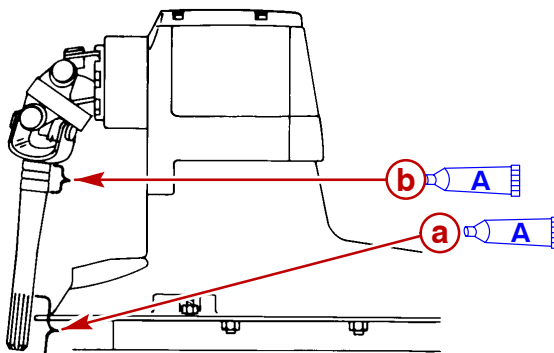


76674

**a** - Bell housing studs

Description	Where Used	Part Number
<b>A</b> 2-4-C with Teflon	Bell housing studs	92-802859A1

4. Lubricate the U-joint shaft splines and the O-rings.

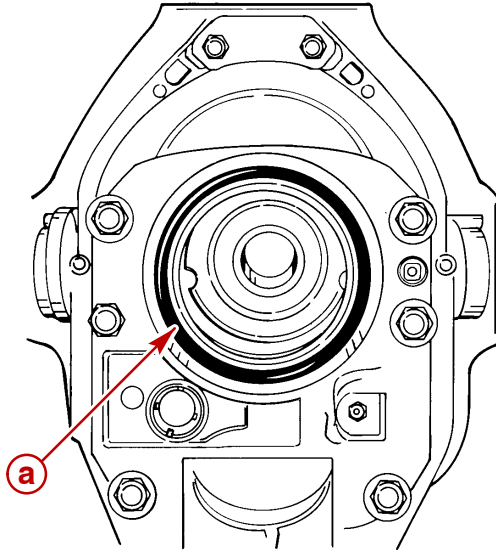


22026

**a** - U-joint shaft splines  
**b** - U-joint shaft O-rings

Description	Where Used	Part Number
<b>A</b> Engine Coupler Spline Grease	U-joint shaft splines and O-rings	92-802869A1

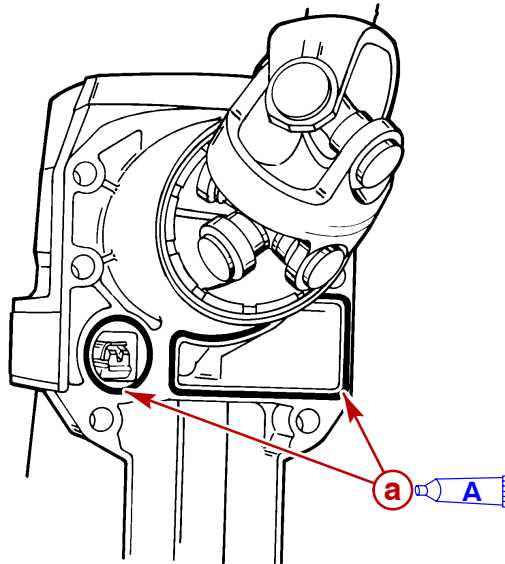
**IMPORTANT:** The edge of the U-joint bellows acts as a seal between the bell housing and the sterndrive shaft housing. Ensure that the surface is not damaged.



24725

**a** - Sterndrive shaft bellows edge

5. Inspect the U-joint bellows for cracks, nicks, and cleanliness. Replace or clean the bellows as necessary.
6. Lubricate the O-ring seals on the face of the sterndrive shaft housing.

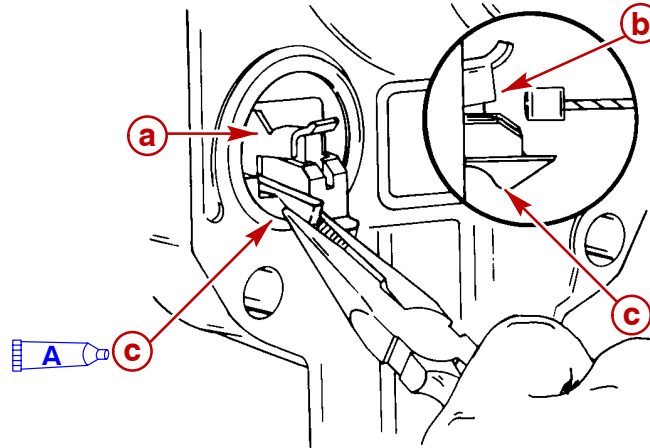


22031

**a** - O-ring seals

Description	Where Used	Part Number
<b>A</b> U-joint and Gimbal Bearing Grease	O-ring seals	92-802870A1

- Pull out the shift linkage as far as possible. The jaws will open. Lubricate the underside of the lower lip of the shift linkage assembly.



22025

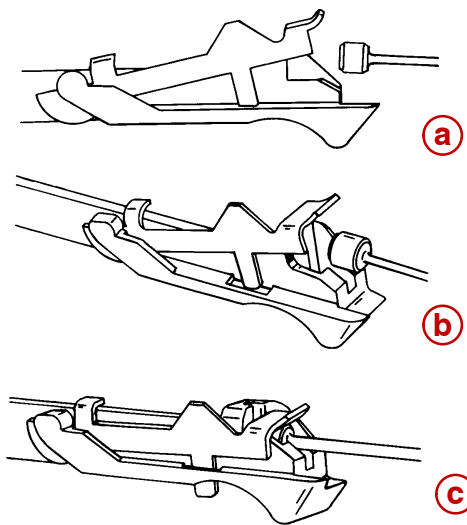
- a** - Shift linkage assembly
- b** - Jaws open
- c** - Underside of lower lip

Description		Where Used	Part Number
<b>A</b>	Special Lubricant 101	Sterndrive shift linkage assembly	92-802865A1

- Ensure that shift lever is in the NEUTRAL position.

**IMPORTANT:** As you are inserting the sterndrive unit into the bell housing, the entrance of the bell housing shift cable must be closely checked to ensure that the cable enters the jaws of the shift linkage assembly in the sterndrive unit.

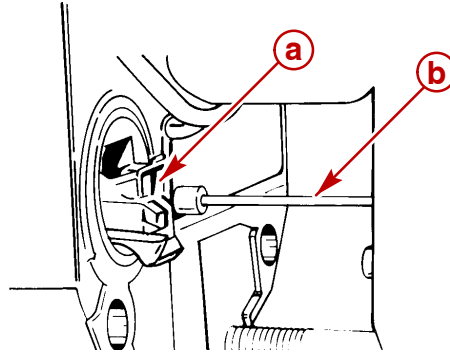
**NOTE:** As the shift cable enters the shift linkage assembly, it pushes the assembly back into the sterndrive shaft housing and the jaw closes securing the cable as shown in “a”, “b”, and “c.”



22025

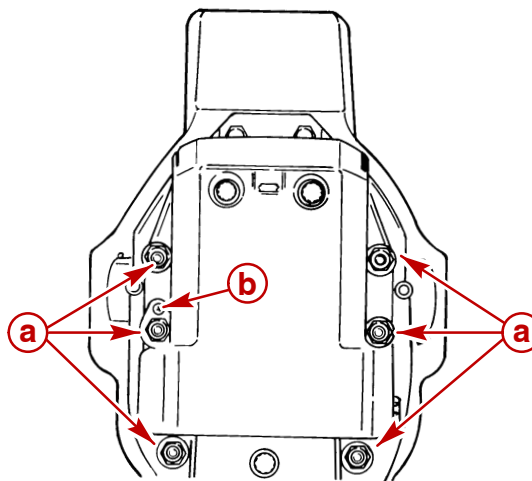
**Shift linkage assembly and shift cable**

**NOTE:** If the shift cable does not line up to properly enter the shift linkage jaws, use your hand to guide the cable into place while installing the sterndrive unit.



- a** - Shift linkage jaws
- b** - Shift cable

9. Install the sterndrive unit.
  - a. Position the trim cylinders so that they point straight backwards (aft).
  - b. Align the U-joint shaft with the bell housing bore. Ensure the studs on the bell housing align with the appropriate holes on the sterndrive unit.
  - c. Guide the U-joint shaft through the gimbal bearing and into the engine coupler. Ensure that the shift linkage jaws engage with the shift cable.
  - d. If necessary, rotate the propeller shaft slightly to align the U-joint shaft splines with the engine coupler splines, then slide the sterndrive unit completely into the bell housing.
  - e. Rotate the propeller shaft slightly to ensure that the sterndrive unit is still in NEUTRAL once installed.
10. Fasten the sterndrive unit to the bell housing. Start from the center and torque the nuts.



- a** - Locknuts (6) and flat washers (5)
- b** - Ground plate (flat washer not used here)

22031

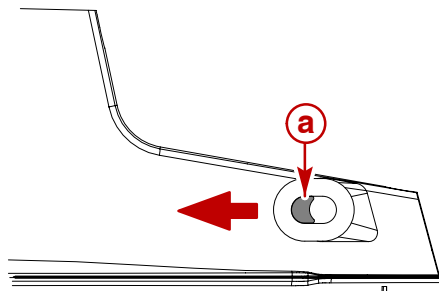
Description	Nm	lb-in.	lb-ft
Sterndrive unit to bell housing attaching nuts	68		50



**IMPORTANT:** On Bravo One, Two and Three Models, the trim-in limit insert must be properly positioned before installing the trim cylinder anchor pin in the following steps.

**NOTE:** Ensure that the trim-in limit insert is reinstalled in the same position that it was in prior to removal of the sterndrive unit. If you are not sure of it's original position, contact the boat manufacturer for their recommendation. Refer to Special Information at the front of this section before installing the trim-in limit insert.

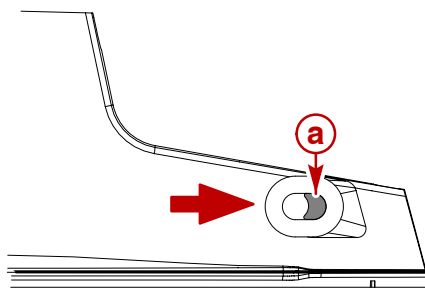
11. Ensure that the trim-in limit insert is positioned as shown for the appropriate Bravo model.



75157

#### Bravo One and Two (positioned forward)

**a** - Trim-in limit insert



75158

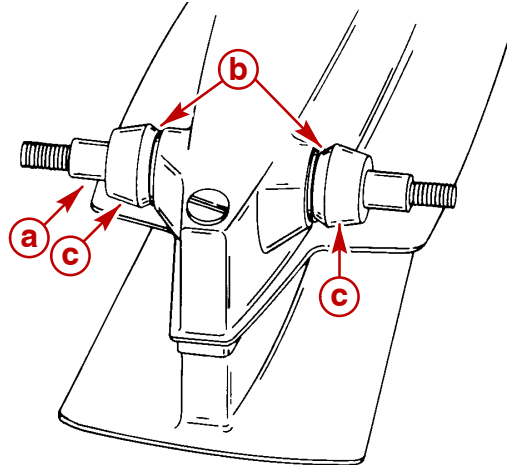
#### Bravo Three (positioned aft)

**a** - Trim-in limit insert

**IMPORTANT:** The position of the trim-in limit insert on the Bravo Three sterndrive unit should only be changed after the boat has been properly tested. Contact the boat manufacturer if you are not sure of the original position for a particular boat application.

12. Insert the aft anchor pin through the hole in the sterndrive shaft housing.

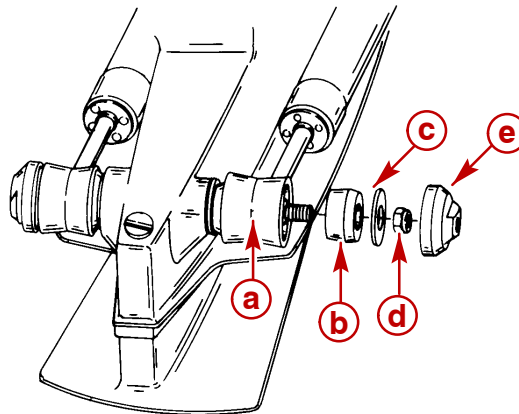
13. Place a large ID flat washer and bushing on each end of the anchor pin. Install the bushings with the small diameter end facing outward.



22029

- a** - Anchor pin
- b** - Large ID washers
- c** - Bushings

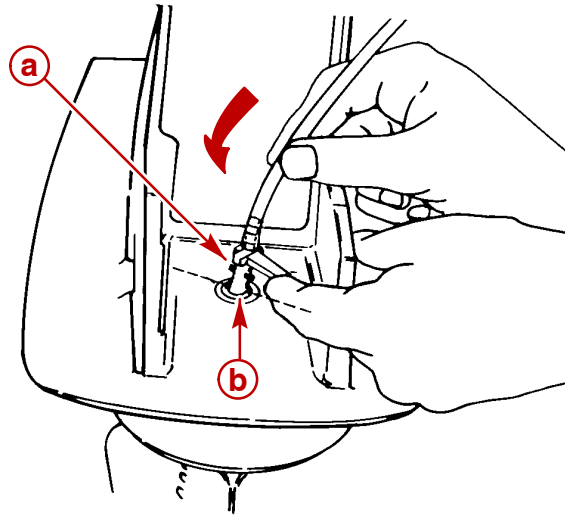
14. Loosen the nuts that secure the trim cylinders to the forward anchor pins. Move the cylinder pivot ends outward and place them over the aft anchor pin.
15. Place the bushings (with the smaller diameter end facing inward) and the small ID flat washers onto each end of the anchor pin. Install locknuts.
16. Tighten the forward and aft anchor pin locknuts until the locknuts and washers contact against anchor pin shoulder.
17. Attach the trim cylinder caps hand-tight. If the caps will not catch the threads, check the tightness of the anchor pin nuts.



22029

- a** - Trim cylinder pivot ends
- b** - Bushing
- c** - Small ID flat washer
- d** - Locknut
- e** - Trim cylinder cap

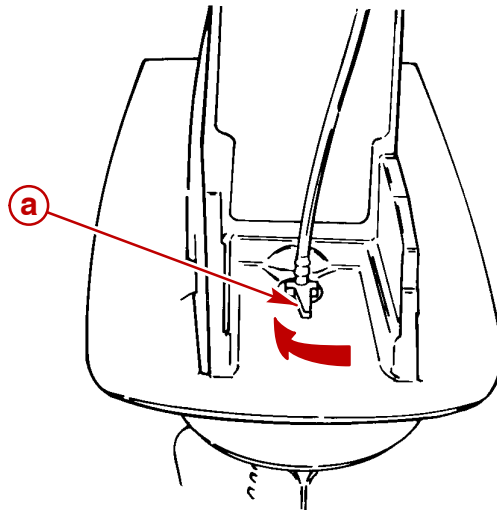
18. Attach the speedometer hose fitting to the sterndrive unit.
  - a. Raise the sterndrive unit to gain access to the area between the gimbal housing and the sterndrive unit. Locate the opening in the forward end of the anti-ventilation plate.
  - b. Insert the speedometer hose fitting into the opening.



22025

- a** - Speedometer hose fitting
- b** - Opening

- c. With the fitting fully seated, turn the handle clockwise to a tightly seated position.



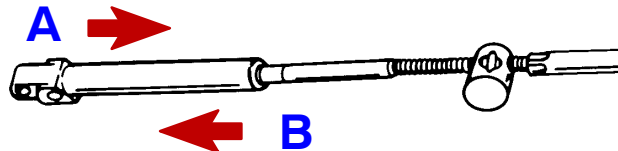
22025

- a** - Speedometer hose fitting installed (handle pointing forward)

## Shift Cable Installation

**IMPORTANT:** Sterndrive unit propeller rotation is determined by the shift cable installation in the remote control.

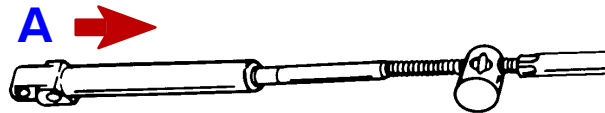
- **Bravo One/Two** - If shift cable end guide moves in direction “A” when control lever is placed in FORWARD, remote control is set up for RIGHT-HAND (RH) propeller rotation.
- **Bravo One/Two**- If shift cable end guide moves in direction “B” when control lever is placed in FORWARD, remote control is set up for LEFT-HAND (LH) propeller rotation.



71656

Control box shift cable. Arrow indicates direction of motion

- **Bravo Three** - Front propeller on sterndrive unit is always LH Rotation and rear propeller is always RH Rotation. Shift cable end guide must move in direction “A” when control lever is placed in FORWARD gear position.



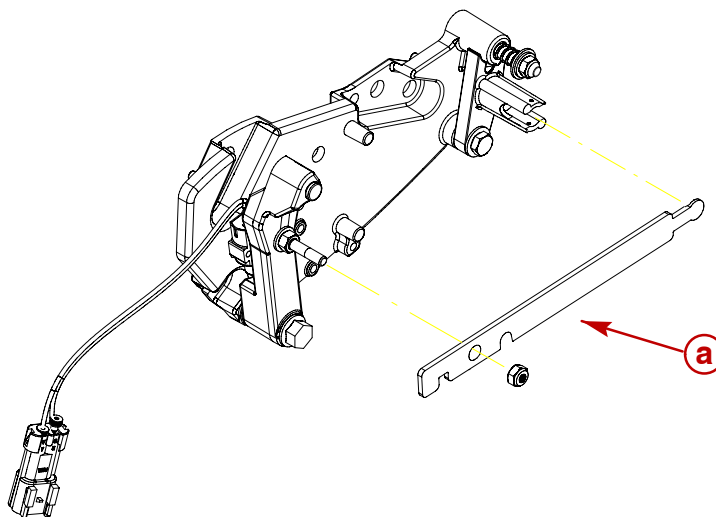
71656

Control box shift cable. Arrow indicates direction of motion

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

**NOTE:** Bravo Models Only: Using Adjustment Tool (91-12427), shift cables can be adjusted without or with the sterndrive installed.


1. Remove the adjustment tool.



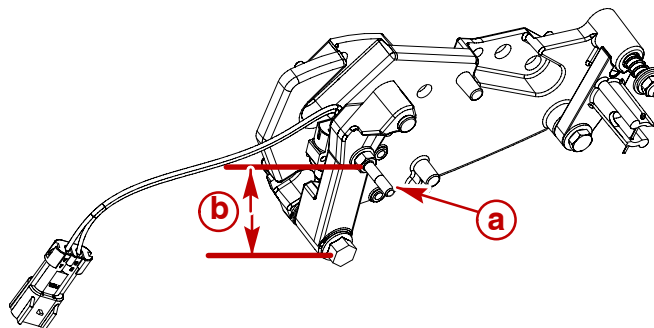
78544

**Typical shift plate**

- a** - Shift cable adjustment tool

Shift Cable Adjustment Tool		
 73479	Attaches over the shift cable. Use for proper Bravo sterndrive unit shift cable adjustment at the shift plate.	91-12427

2. Loosen the adjustable stud and move it to dimension shown. Retighten stud.

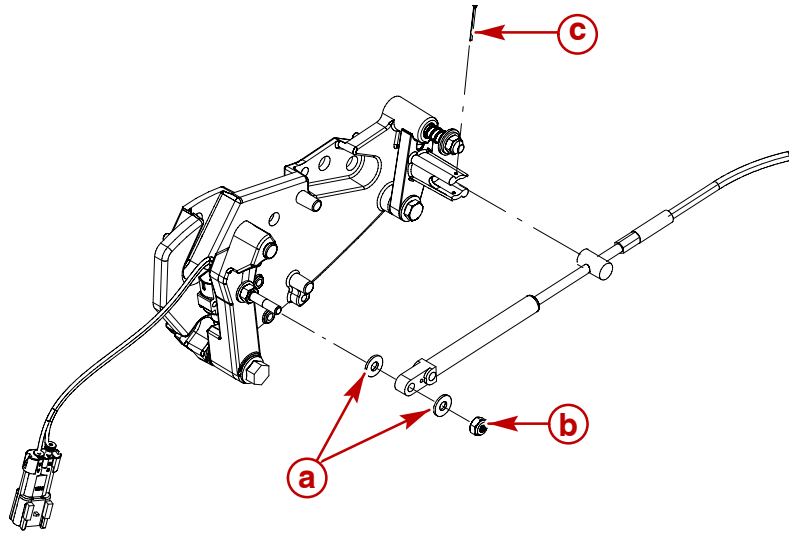


78496

**Typical shift plate**

- a** - Adjustable stud
- b** - 76 mm (3 in.) (Center of pivot bolt to center of stud)

3. Install sterndrive unit shift cable.
4. Tighten locknut until it contacts and then loosen 1/2 turn.
5. Insert cotter pin from top and spread ends.

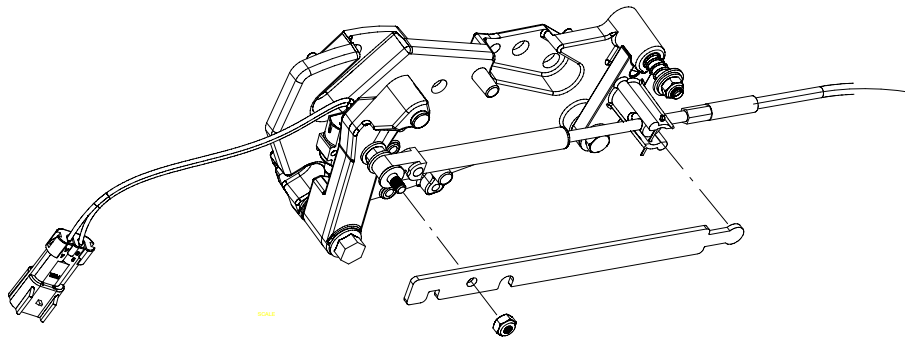


78609

**Typical shift plate**


- a** - Washers (2)
- b** - Locknut
- c** - Cotter pin

6. Place adjustment tool over sterndrive unit shift cable. Hold tool in place, using a piece of tape over the barrel retainer.



78498

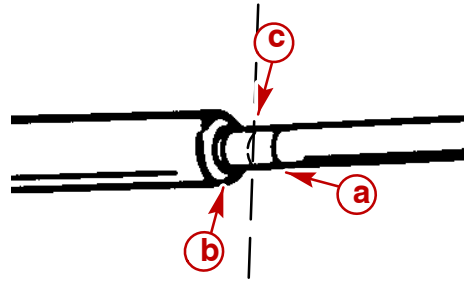
**Typical shift plate**

Shift Cable Adjustment Tool		
 73479	Attaches over the shift cable. Use for proper Bravo sterndrive unit shift cable adjustment at the shift plate.	91-12427

7. Locate center of remote control and control cable play (backlash).

**IMPORTANT: Ensure center mark "c" is aligned with control cable end guide edge when making the following adjustment.**

- a. Shift remote control to NEUTRAL.
- 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."



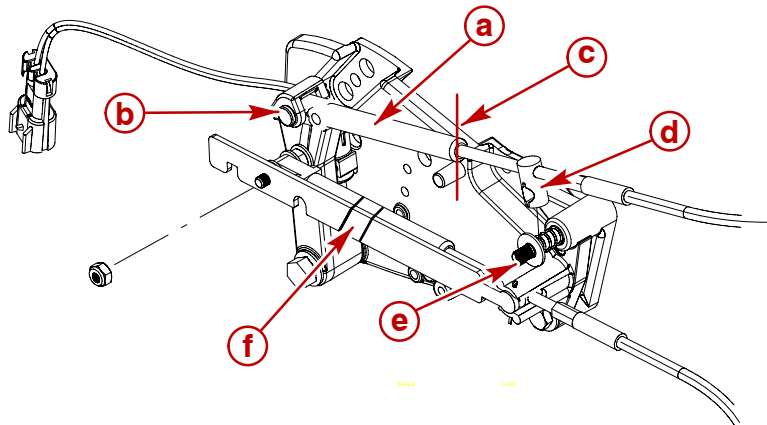
71656

8. Temporarily install control cable end guide into shift lever and insert anchor pin.
9. Adjust control cable barrel so that hole in barrel centers with vertical centerline of stud. Ensure that backlash center mark is aligned with edge of control cable end guide.

### ⚠ CAUTION

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

10. Remove control cable end guide from shift lever by removing clevis pin.

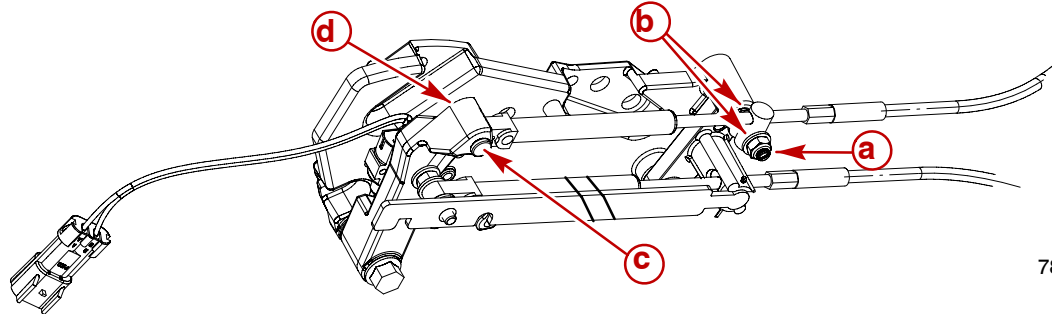


78499

#### Typical shift plate

- a** - Control cable end guide
- b** - Clevis pin
- c** - Backlash center
- d** - Control cable barrel
- e** - Stud
- f** - Tape

11. Install the control cable.
12. Install the washer and locknut.
13. Tighten the locknut until it contacts and then loosen 1/2 turn.
14. Install the clevis pin.
15. Install the cotter pin into the clevis pin from the top and spread the ends.



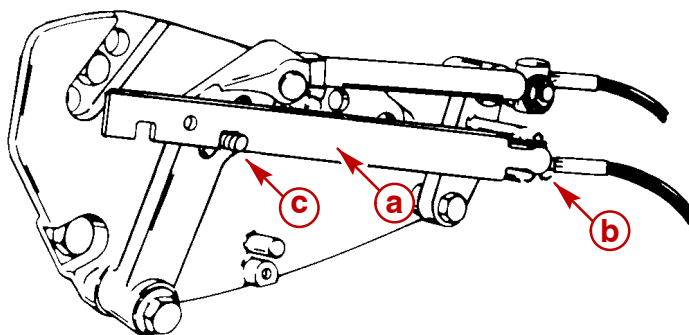
78500

**Typical shift plate**

- a** - Locknut
  - b** - Washers - both sides of barrel
  - c** - Clevis pin
  - d** - Cotter pin (not shown)
16. Remove the adjustment tool.
  17. Shift remote control lever into FORWARD position. Place end of adjustment tool in barrel retainer. If slot does not fit over stud, loosen shift lever stud and slide stud up or down until slot in tool fits over stud. When adjustment is correct, retighten stud.
  18. Lift the adjustment tool so that the slot is above the stud.



19. Shift the remote control into REVERSE and repeat the adjustment process.

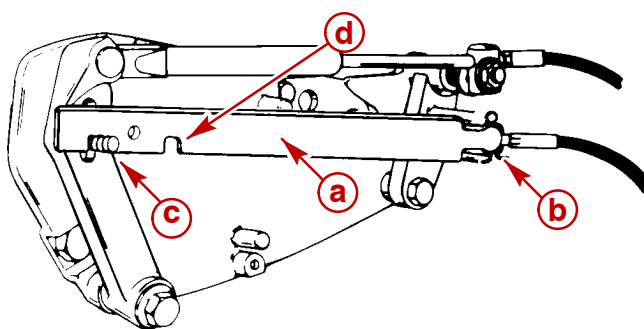


71662

**Typical shift plate**

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

**LH Rotation Bravo One and Two Reverse**



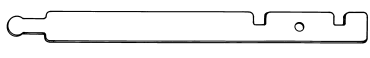
71663

**Typical shift plate**

**RH rotation Bravo One, Two and Three reverse**

**LH rotation Bravo One and Two forward**

- a** - Adjustment tool
- b** - Barrel retainer
- c** - Shift lever stud
- d** - Shift lever adjustment slot

Shift Cable Adjustment Tool		
 73479	Attaches over the shift cable. Use for proper Bravo sterndrive unit shift cable adjustment at the shift plate.	91-12427

20. Remove adjustment tool.

21. Lubricate shift cable pivot points.

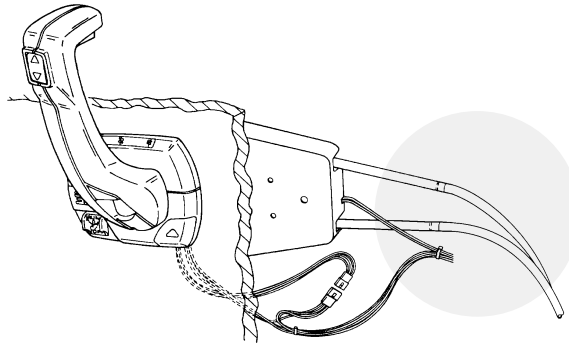
Description	Where Used	Part Number
SAE 30W Engine Oil	Shift cable pivot points	Obtain locally

## Troubleshooting Shift Problems

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

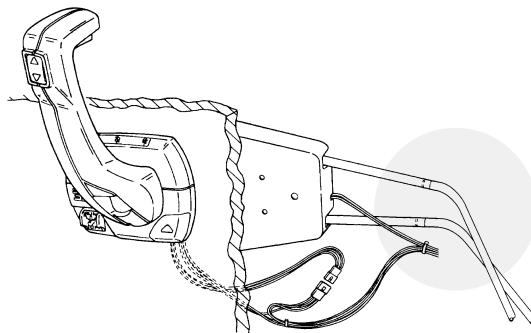
1. When installing the control box in the side panel of the boat, ensure that the cables have enough clearance to operate. This is necessary because the cables move up and down when the shift handle is moved. If the control box is mounted too far back toward any fiberglass structure, the cables will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

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



74688

### Proper cable bend

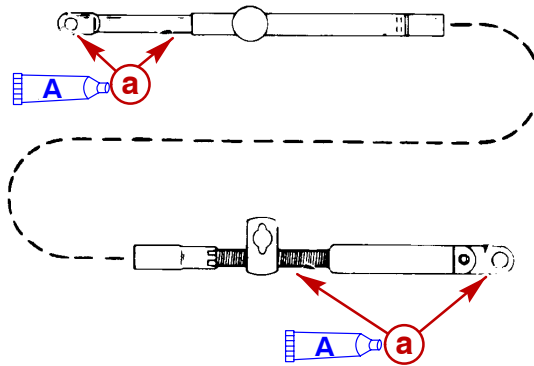


74689

### Improper cable bend

2. Ensure that when the shift cable from the control box is led through the side gunnel of the hull, it does not have any extremely sharp bends in it as this will cause stiff shifting.

- Before installing the shift cable into the control box, extend the stainless rod eye end of the cable and grease it with lubricant. Move it back and forth to allow even distribution of the grease.



22005

**a** - Shift cable end

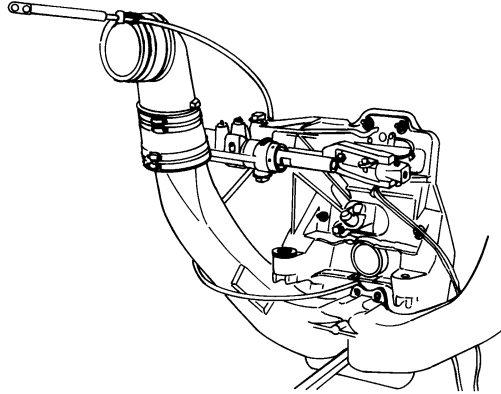
Description	Where Used	Part Number
<b>A</b> 2-4-C with Teflon	Shift cable end	92-802859A1

- Do not strap or clamp the control cables to any other cables or rigid structure within 9.14 m (3 ft) of the control box.
- Ensure that the cable is not permanently kinked.
- Ensure that there is proper clearance for cable movement when the control box is installed in the side panel. The cables must have room to move up and down when the control handle is shifted into either FORWARD or REVERSE.
- Ensure that the engine was not set down on the intermediate shift cable during installation, as this will crush the inner cable tubing and cause improper and / or stiff shifting.
- Do not fasten the shift cable with straps or clamps to any other cable within 1.5 m (5 ft) of the shift plate.
- Do not fasten the shift cable to the transom with any type of plastic clips or fasteners within 1.5 m (5 ft) of the shift plate.
- Do not overtighten the throttle or shift cable attaching nuts at the engine end. Barrel and cable end must be free to rotate on the mounting stud.
- Lubricate attaching points with engine oil.

Description	Where Used	Part Number
SAE 30W Engine Oil	Shift cable pivot points	Obtain locally

12. Check the intermediate shift cable routing from the transom assembly to the shift plate as follows:
  - a. The cable should come through the transom, above the exhaust pipe and make a turn toward the starboard side of the boat between the exhaust pipe and the engine flywheel housing.
  - b. The cable should then be routed under the starboard rear engine mount and turn toward the transom.
  - c. The cable should then go up behind the power steering valve and loop over to the shift plate on the engine, where it is connected to the anchor points on the shift plate.

Following this routing will prevent the engine coupler from damaging the cable.



74901

**NOTE:** A final check of the adjustments should be made with the boat in the water and engine running. If this cannot be done or is not done at your manufacturing facility, arrangement should be made with the dealer to do this as part of the predelivery inspection.