Installation and Adjustments

Section 2A - All Models

Table of Contents

Torque Specifications.....2A-3
Special Information.....2A-4
- Transom Thickness and Surface.....2A-4
- Trim-In Limit Insert.....2A-5
- All Models.....2A-5
- Engine Height Adjustment.....2A-6
- Drive Shaft Extension Models.....2A-7
- Bravo Models Exhaust Preparation.....2A-7

Transom Assembly Installation.....2A-8
- Installing Inner Bravo Transom Plate 2A-8
- Connecting Speedometer Pickup.....2A-10
- Seawater Inlet Fitting Installation (Bravo) 2A-11
- Water Inlet Block-Off Plate Installation. . .2A-11
- Gear Lube Monitor Connection At Gimbal Housing.....2A-14
- Alternative Mounting Of Gear Lube Monitor On Transom.....2A-15
- Transom Exhaust Connections.....2A-15

Power Trim Pump Installation.....2A-16
- Power Trim Pump.....2A-16
- Power Trim Pump Connections and Filling 2A-16

Steering System Installation.....2A-18
- Hydraulic (Helm) Steering.....2A-18
- Steering Helm and Cable.....2A-18
- Steering Cable Specifications.....2A-20
- Installing Steering System.....2A-20
- Shift Cable Routing.....2A-24

Engine Installation.....2A-25
Transom Connections.....2A-25
- Continuity Wire Connection.....2A-25
- Trim Position Sender Connections.....2A-26
- Trim Limit / Sender Harness.....2A-26
- MerCathode Connections (If Equipped) 2A-27
- Power Trim Pump Connections.....2A-28
- Gear Lube Monitor Connection.....2A-28
- Power-Assisted Steering Hoses.....2A-28
- Seawater Inlet Fitting Connection.....2A-29

Shift Cable Installation and Adjustment.....2A-32
- Bravo Models Shift Cable Installation.....2A-32
- Bravo Models Shift Cable Adjustment. . .2A-33
- Shift Cable Installation For DTS System 2A-36

Bravo Installation.....2A-37
- Engine Alignment Check.....2A-37
- Bravo Sterndrive Installation.....2A-40
- Speedometer Connections - Bravo Models 2A-49
- Bravo Sterndrive Shift Check (Engine Running).....2A-50
- Troubleshooting Shift Problems.....2A-52

Bravo Trim Limit Switch Adjustment - Analog Gauges 2A-54
Trim Position Sender Adjustment - Analog Gauges 2A-56
Trim Position Sender Adjustment - SmartCraft Gauges Scan Tool Method.....2A-57
Trim Position Sender Adjustment - SmartCraft Gauges Multimeter Method.....2A-58
Bravo One Propeller Hub General Information 2A-59
- Bravo One Propeller Hubs Rated for Under 400 HP.....2A-59
- Bravo One Propeller Hub Rated for 400 HP and Over.....2A-60
- Bravo One XR Propeller Hub.....2A-60

Bravo Sterndrive Propeller Installation.....2A-61
- Bravo One Models.....2A-61
- Bravo Two Models.....2A-63
- Bravo Three.....2A-64

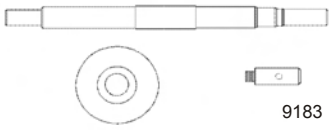
Lubricant, Sealant, Adhesives

Tube Ref No.	Description	Where Used	Part No.
25	Liquid Neoprene	MerCathode connections	92- 25711 3
		Battery Terminals	
27	Bellows Adhesive	Exhaust bellows mounting surface	92-86166Q1
34	Special Lubricant 101	Power steering bushings	92-802865Q02
		Upper and lower pivot bolts	
		Clevis pin	
		Steering cable end	
		Shift cable stud	
		Propeller shaft splines	
80	SAE Engine Oil 30W	Shift cable pivot points	Obtain Locally
87	High Performance Gear Lubricant	Gear Lube Monitor	92-858064K01
91	Engine Coupler Spline Grease	U-joint O-rings	92-802869A 1
		Driveshaft splines	
94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1
95	2-4-C Marine Lubricant with Teflon	Bell housing studs	92-802859A 1
		O-ring	
		Water passage seals	
		Anchor pin threads	
		Trim cylinder hardware	
		Shift cable end	
		Propeller shaft splines	
114	Power Trim and Steering Fluid	Power trim pump	92-858074K01

Special Tools

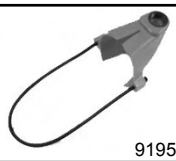
Tapered insert tool	91-43579
 9197	Removes and installs the tapered insert retainer into the water inlet hose.

Shift Cable Adjustment Tool	91-12427
 9186	Attaches over the shift cable, and aids in proper shift cable adjustment at the shift plate.

Alignment Tool Assembly	91-805475A 1
 9183	Used to align the engine to the Standard Bravo Transom Assembly for sterndrive installation.

Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1
 9194	Blocks off the front water inlet holes on the dual water inlet gearcases.

Flushing Device	91-44357Q 2
 9192	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.

Flushing Kit	91-849996T 1
 9195	Use for flushing gearcases with low water inlets.

Propeller Nut Tool	91-805457T 1
 10677	Aids in the removal and installation of the front propeller nut.

Torque Specifications

NOTE: *Securely tighten all fasteners not listed below.*
The propeller torque stated for propeller nut is the minimum torque value for Bravo One and Two.
The propeller torque stated for forward and aft propeller nut is the minimum torque value for Bravo Three.

Description	Nm	lb. in.	lb. ft.
Transom assembly attaching nuts	34		25
Water inlet fitting bolts	5	45	
Exhaust pipe to gimbal housing bolts	34		25
Exhaust block-off plate bolts	34		25
Steering system pivot bolts	34		25
Steering cable coupler nut	47		35
Sterndrive fasteners	68		50
Bravo One propeller nut	75		55
	Then align tabs with grooves		

Description	Nm	lb. in.	lb. ft.
Bravo Two propeller nut	81		60
	Then align tabs with grooves		
Bravo Three front dual propeller nut	136		100
Bravo Three rear dual propeller nut	81		60
Propeller shaft anode screw	19	168	

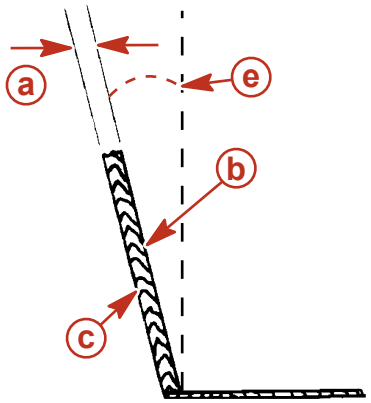
Special Information

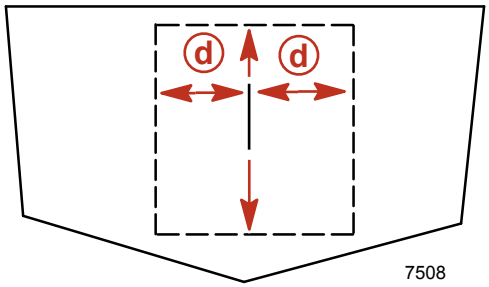
Transom Thickness and Surface

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

Transom thickness and surface must conform to the following:

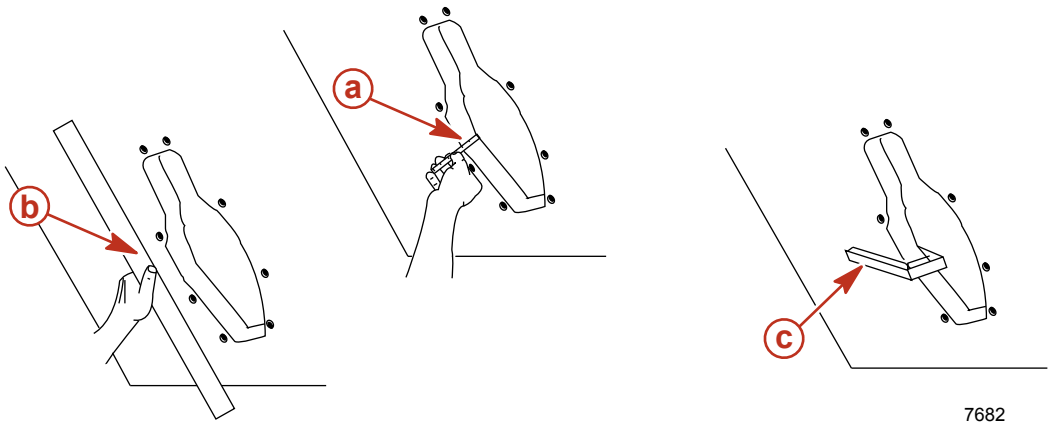
Transom specifications	
Thickness	Between 51 - 57 mm (2 - 2-1/4 in.)
Parallelism	Inner and outer surfaces must be parallel within 3 mm (1/8 in.)
Flatness	Transom surfaces in area where transom assembly will be mounted (includes vertical as well as horizontal dimensions) :Inner Surface - Flat within 3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





a - Transom thickness
b - Inner surface
c - Outer surface

d - Transom plate coverage
e - Transom angle



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

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 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 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 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

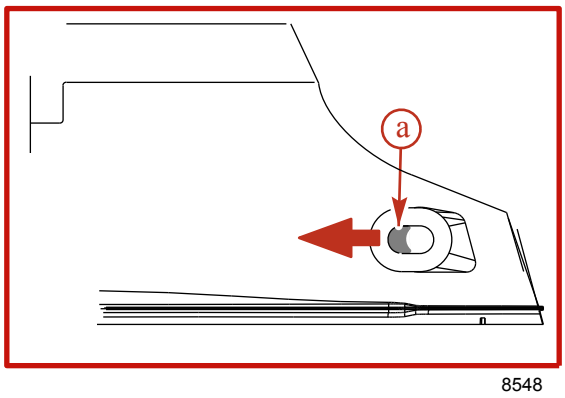
On some boats, increased trim-in range can cause handling problems at high speeds, resulting in personal injury or death. We recommend that only qualified personnel adjust the trim-in limit inserts and test the boat for handling problems.

All Models

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

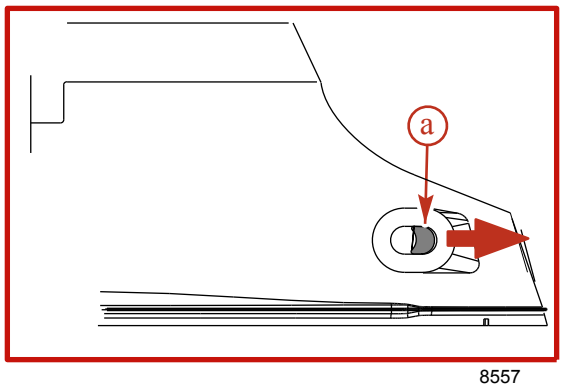
NOTE: *When removing the sterndrive, note the position of the insert for reference when reinstalling the sterndrive.*

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



Bravo One and Two (positioned forward)

a - Trim-in limit insert



Bravo Three (positioned aft)

a - Trim-in limit insert

IMPORTANT: The position of the trim-in limit insert on the Bravo Three sterndrive 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.

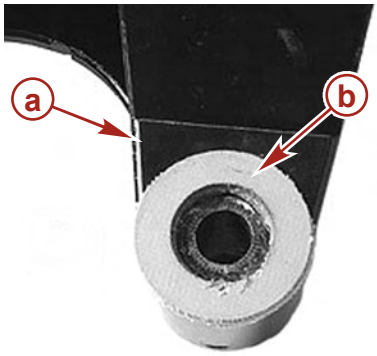
Engine Height Adjustment

To gain engine adjustment for alignment, raise the engine using the specified stainless steel washer.

IMPORTANT: The fiber washer must be used.

NOTE: *Engine alignment is usually obtained using only the rear engine mount and the fiber washer.*

1. Ensure that the fiber washer is in place.



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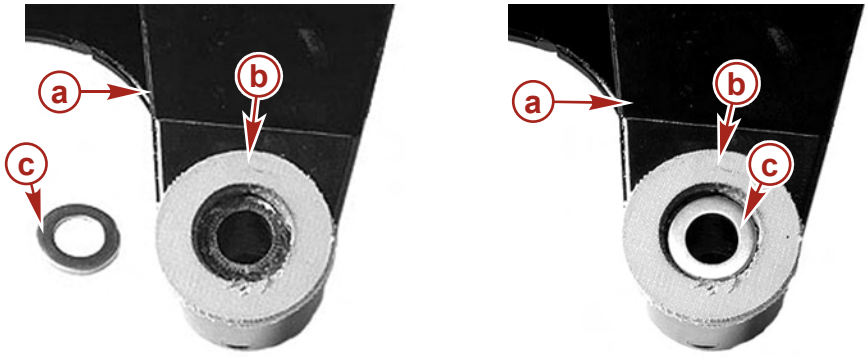
a - Transom plate

b - Fiber washer

2. Place the stainless steel washer on top of the transom plate mount.



16583

a - Transom plate

b - Stainless steel washer

c - Stainless steel washer position to raise engine

Drive Shaft Extension Models

If the power package is equipped with a drive shaft extension, refer to the **Drive Shaft Extension Installation Instructions** included with the engine package.

Extensions for the gear lube monitor and MerCathode quick connects are used with drive shaft extention installations. Refer to your parts catalog for replacement part numbers.

Bravo Models Exhaust Preparation

IMPORTANT: When installing through the transom exhaust, it is recommended that the exhaust bellows on the transom assembly be removed. This is necessary to avoid creating a vacuum at the exhaust outlet in the propeller at higher boat speeds. This vacuum could degrade propeller performance on some boats.

1. If required, remove and discard clamps and bellows from gimbal housing.

IMPORTANT: When installing through the propeller exhaust:

- With Bravo One and Bravo Two Sterndrives, an exhaust tube MAY BE INSTALLED for a slight increase in performance.
- With most Bravo Three Sterndrive Models, an exhaust tube MAY BE INSTALLED for a slight increase in performance.
- With a Silent Choice Exhaust System, the exhaust bellows must be removed and an exhaust tube MUST BE INSTALLED.
- With any application, installation of an exhaust tube will increase exhaust noise.

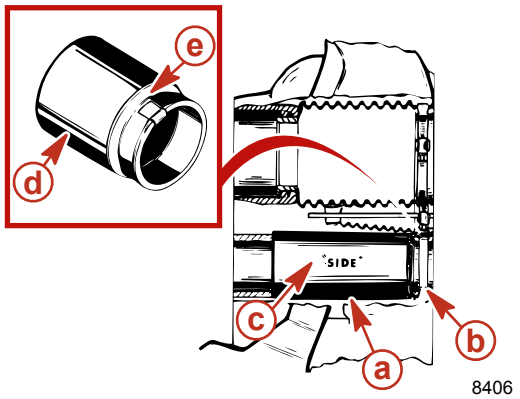
2. If required, install exhaust tube on gimbal housing as follows:
   a. Remove and discard clamps and exhaust bellows.

IMPORTANT: Failure to install the grounding clip can damage the exhaust tube due to corrosion. Always install the grounding clip.

   b. Install grounding clip on tube.
   c. Apply adhesive to exhaust bellows/tube mounting surface.

Tube Ref No.	Description	Where Used	Part No.
27	Bellows Adhesive	Exhaust bellows mounting surface	92-86166Q1

   d. Allow bellows adhesive to dry until no longer tacky (approximately 10 minutes).
   e. Position tube so that "SIDE" markings on tube are facing toward the right and left sides.
   f. Install and torque the clamp.



a - Exhaust tube
b - Clamp
c - "SIDE" marking
d - Exhaust tube
e - Grounding clip

Description	Nm	lb. in.	lb. ft.
Exhaust tube clamp	4	35	

Transom Assembly Installation

Installing Inner Bravo Transom Plate

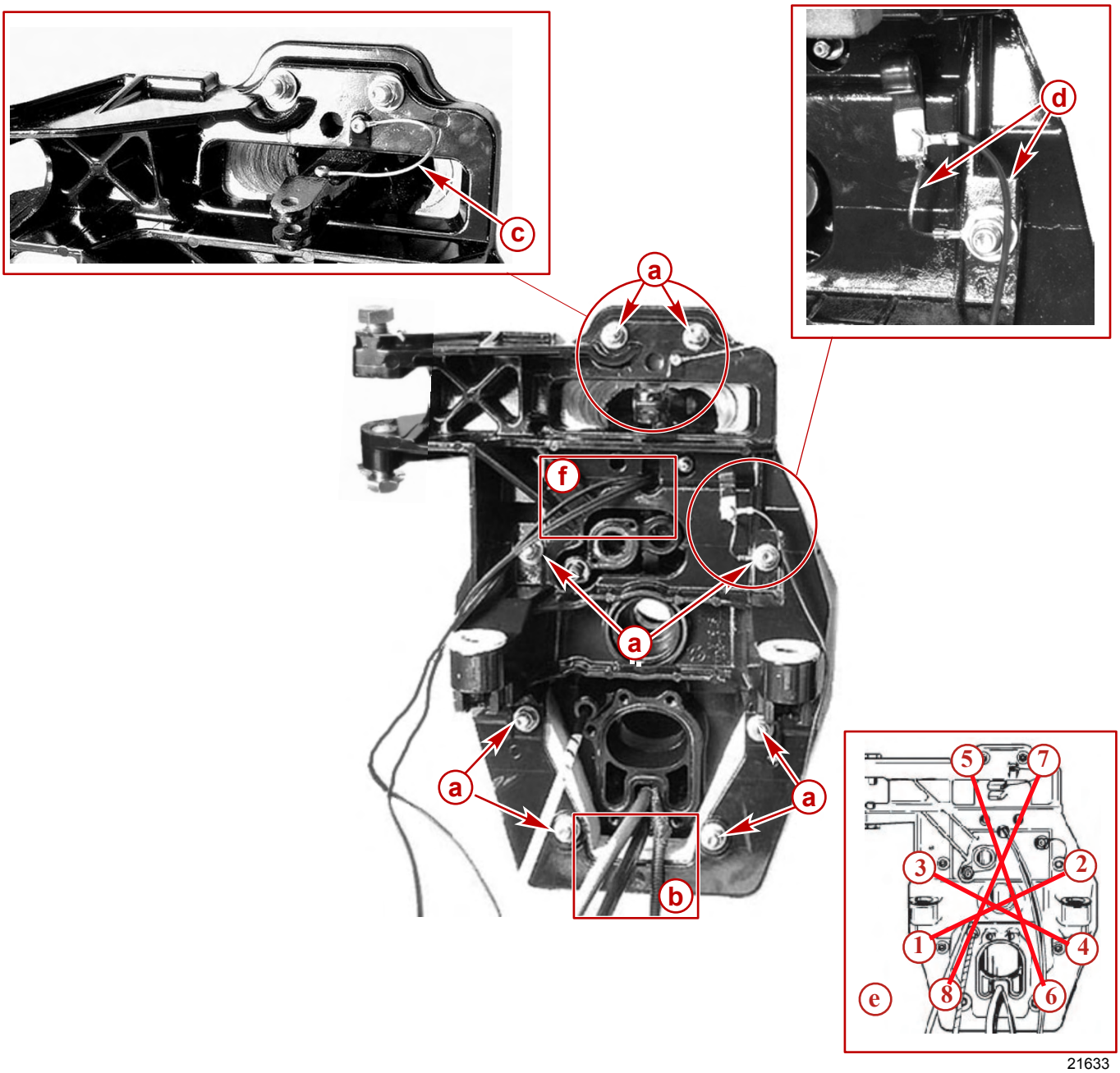
1. Insert wires, hoses, and shift cable through appropriate openings in inner transom plate.
2. Position gimbal housing on transom and hold in place.

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 fasteners. Torque the fasteners.

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

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



21633

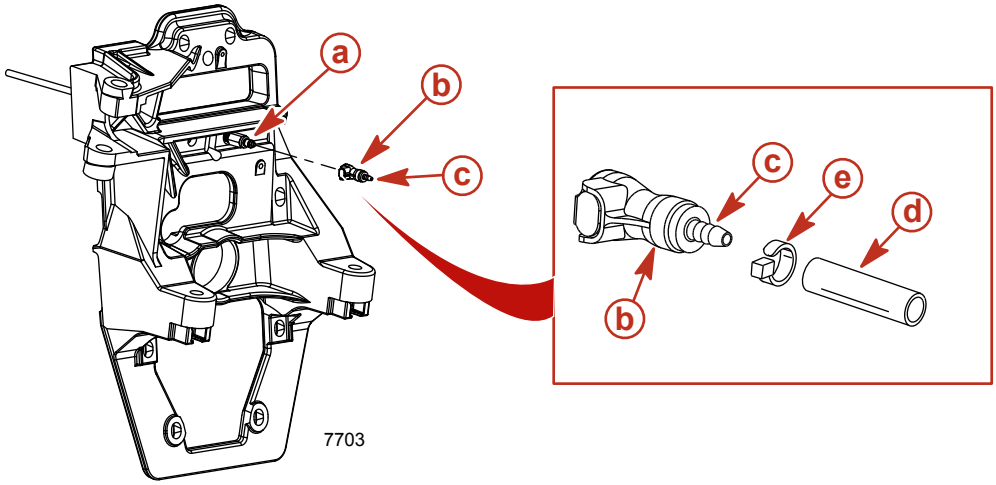
a - Locknuts and flat washers (8)
b - Hydraulic hoses and MerCathode wire
c - Steering lever continuity wires
d - Transom plate continuity wires
e - Torque sequence
f - Trim sender and trim limit wires

Connecting Speedometer Pickup

NOTICE

Removing the plug from the speedometer pickup fitting can introduce water into the bilge. Do not remove the the plug unless you intend to make a connection to a speedometer pickup.

1. Remove the protective cap from the male quick connect.
2. Connect a 4 mm (5/32 in.) speedometer hose (not provided) from speedometer to barb fitting. Secure hose with tie strap.



Typical

a - Male quick connect
b - Female quick connect
c - Barbed fitting
d - Hose
e - Tie strap

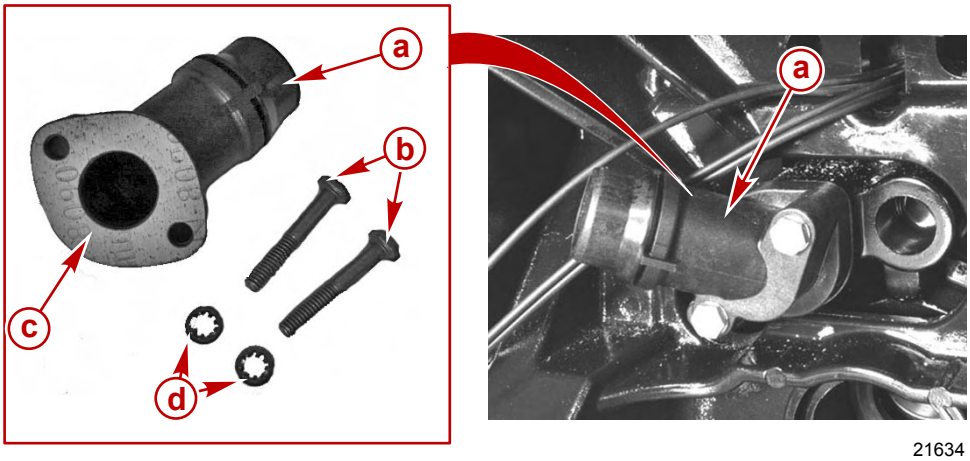
⚠ CAUTION

A ruptured speedometer hose can introduce water into the bilge, causing boat damage or possible sinking. Position or install the speedometer hose away from moving parts or pinch points, such as steering system components, engine coupler, or driveshaft, which could damage the hose.

3. Secure the hose to the transom with the hose clip and screw that are provided in the parts bag. Ensure that the hose does not contact the steering system components or the engine coupler and drive shaft.

Seawater Inlet Fitting Installation (Bravo)

Install a new gasket, seawater inlet fitting, and screws. Torque screws.



21634

Seawater inlet fitting shown with gear lube hose J-clip

a - Seawater inlet fitting
b - Screw (2)
c - Gasket
d - Star washers

Description	Nm	lb. in.	lb. ft.
Seawater inlet fitting screws	5	45	

Water Inlet Block-Off Plate Installation

ALTERNATIVE WATER PICKUPS

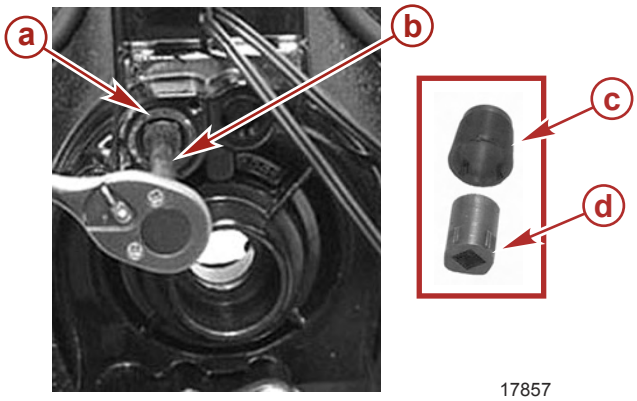
A water inlet block-off kit must be used if the sterndrive unit water pickup will not be used to supply water to the engine. When installing the block-off plate, it is necessary to cut the water hose that is located between the bell housing and the gimbal housing. This allows water to continue to circulate through the sterndrive unit for cooling.

NOTICE

Obstructions in the water passages will keep cooling water from circulating through the sterndrive resulting in damage to the sterndrive. When using a block-off plate ensure that the water hose between the bell housing and gimble housing is cut and removed.

BRAVO MODELS

1. Remove the tapered insert in the gimbal housing using the tapered insert tool. Discard the insert.

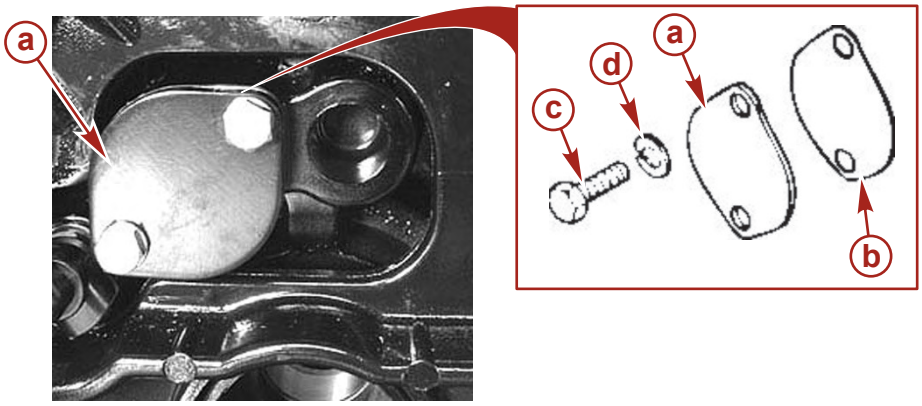


17857

a - Tapered insert location in the gimbal housing
b - Rachet and extension
c - Tapered insert
d - Tapered insert tool

Tapered insert tool	91-43579

2. Install the block-off plate with new gasket. Secure with screws and lockwashers. Torque the screws.

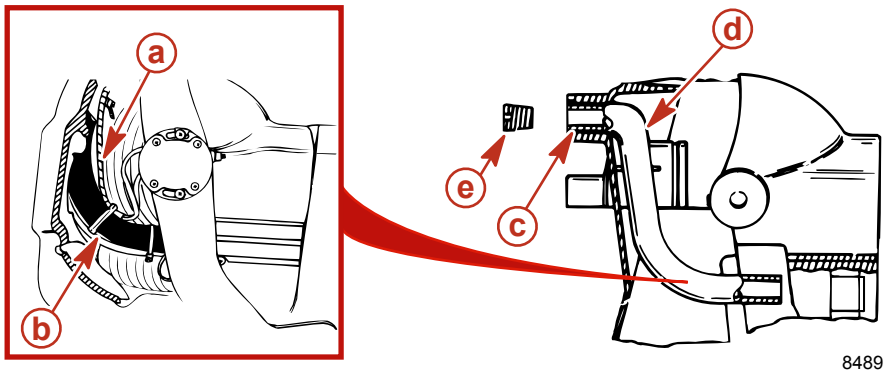


21683

a - Block-off plate
b - Gasket
c - Screw
d - Lockwasher

Description	Nm	lb. in.	lb. ft.
Water inlet block off screw	5	45	

3. Move the trim limit switch wires and speedometer hose aside. Reach between the gimbal housing and the bell housing and detach the water hose from the gimbal housing where the tapered insert was removed in Step 2.



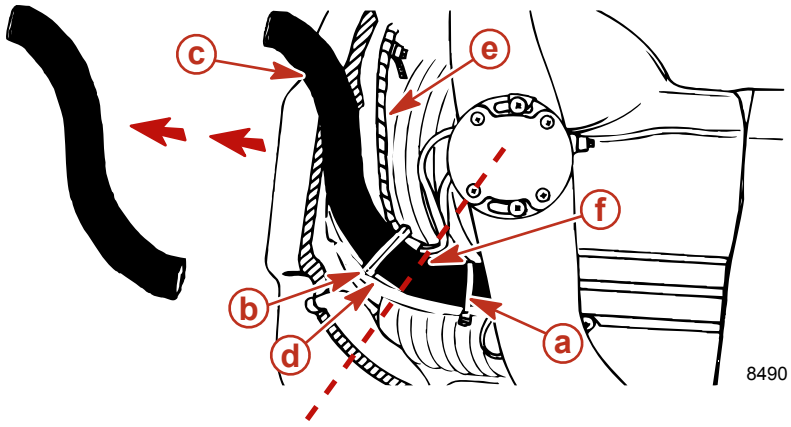
a - Trim limit switch wires
b - Speedometer hose
c - Gimbal housing
d - Water hose
e - Tapered insert

⚠ WARNING

Improper reassembly of the U-joint and pinion gear assembly can damage the sterndrive or sink the boat. The U-joint bellows must provide a watertight seal to prevent water from entering the boat. Assemble and install the U-joint and pinion gear as specified.

NOTE: *Move the trim limit switch wires and speedometer hose to avoid damaging them when cutting the water hose. The existing tie strap and clip can be reused if they are moved and repositioned after the hose is cut.*

4. Cut completely through the water hose 127 mm (5 in.) in front of the aft end of the hose where it is fitted into the bell housing in the area shown. Do not damage the U-joint bellows.
5. Discard loose hose piece.
6. Secure the trim limit switch wires and speedometer hose to the remaining section of water hose using existing tie strap and clip.



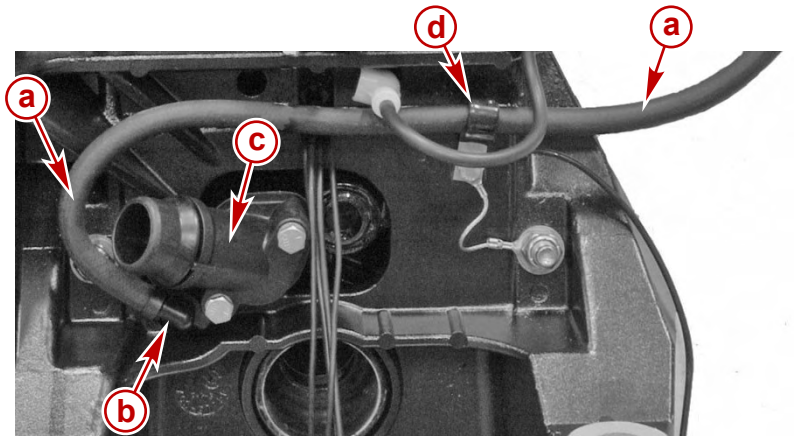
a - Tie strap
b - Clip
c - Water inlet hose
d - Speedometer hose
e - Trim limit wire harness
f - Cutting area

7. Install a through the hull or through the transom seawater pickup, seawater strainer, and seacock.

8. Connect the seawater inlet hose between seawater pump and seawater strainer.
9. Secure all hoses with hose clamps.

Gear Lube Monitor Connection At Gimbal Housing

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



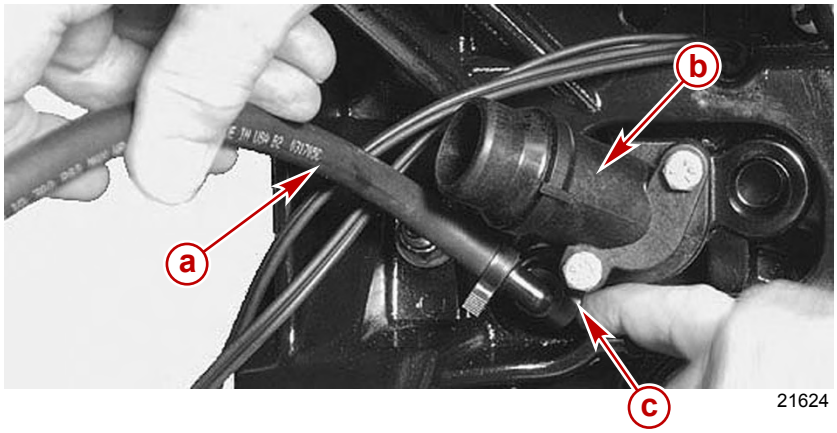
21623

Model with block-off plate

a - Hose
b - Quick release 90 degree fitting
c - Seawater inlet fitting
d - J-clip

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.*

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



21624

Model with Quick connect seawater inlet fitting

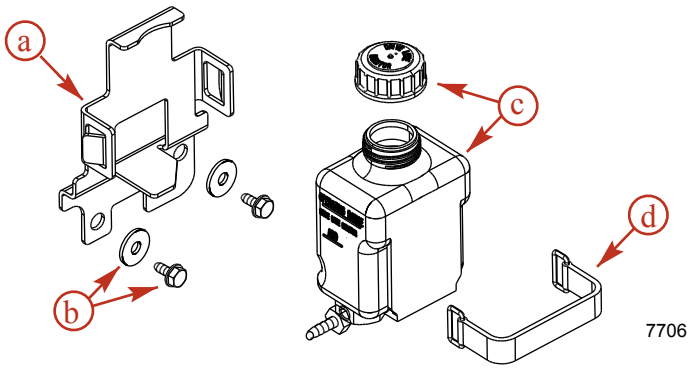
a - Gear lube monitor hose
b - Seawater inlet fitting
c - Quick release button

NOTE: *The hose must not come into contact with the steering system components or the engine coupler and drive shaft.*

Alternative Mounting Of Gear Lube Monitor On Transom

IMPORTANT: The mounting location specified must be above the steering lever on the transom assembly. Hose must be positioned to avoid moving parts (steering system, engine coupler).

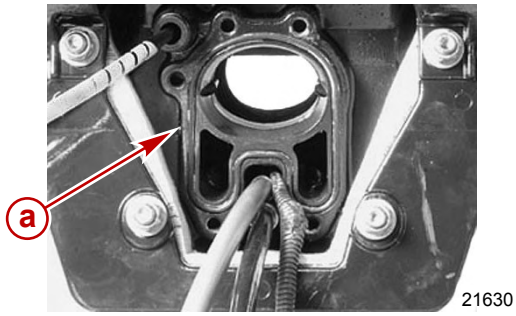
1. Install the gear lube monitor bracket in the specified location and secure with lag screws and flat washers.
2. Install the gear lube monitor in the bracket. Secure the monitor with the retaining strap.



a - Bracket
b - Lag screw and flat washer
c - Gear lube monitor and cap
d - Retaining strap

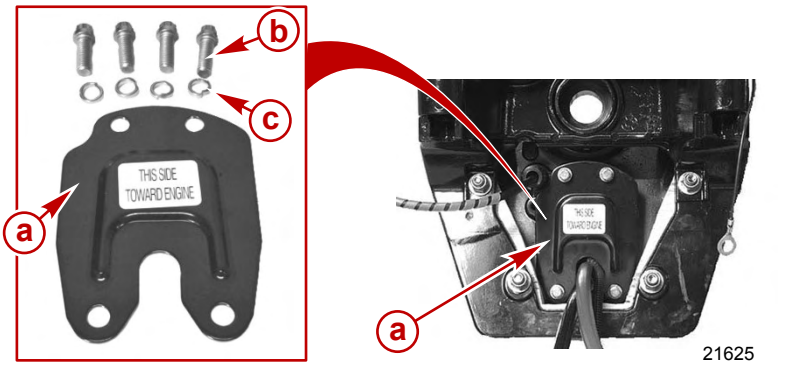
Transom Exhaust Connections

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.



a - Seal

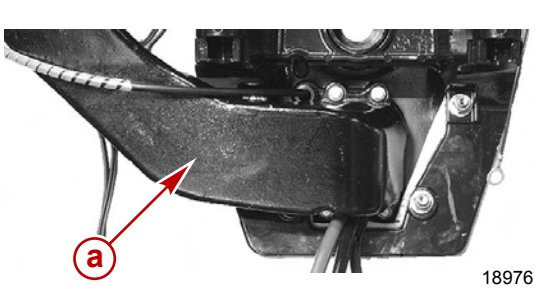
1. **Through The Transom Exhaust Models:** Install block-off plate using 4 bolts and lockwashers. Torque bolts.

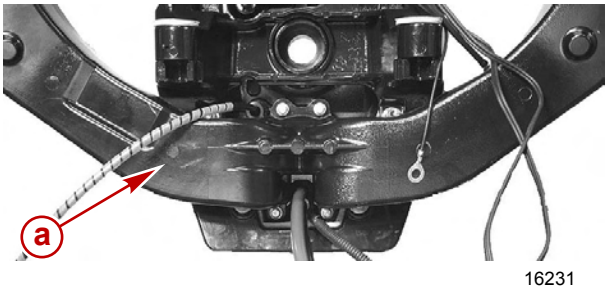


a - Block-off plate
b - Bolts
c - Lockwashers

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

2. **Through The Propeller Exhaust Models:** Install exhaust pipe. Torque bolts.





a - Engine exhaust pipe

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

Power Trim Pump Installation

Power Trim Pump

1. Select an appropriate mounting location (floor or transom) for the trim pump that:
   - Is within length limits of BLACK and GRAY hydraulic hoses coming from gimbal housing assembly.
   - Is close to the battery so that trim pump battery leads can be connected.
   - Allows easy access to trim pump oil fill and vent locations.
   - Is in an area where pump will not be exposed to water.
   - Prevents the power steering booster cylinder from coming in contact with the trim pump when the steering wheel is turned in either direction (right or left).

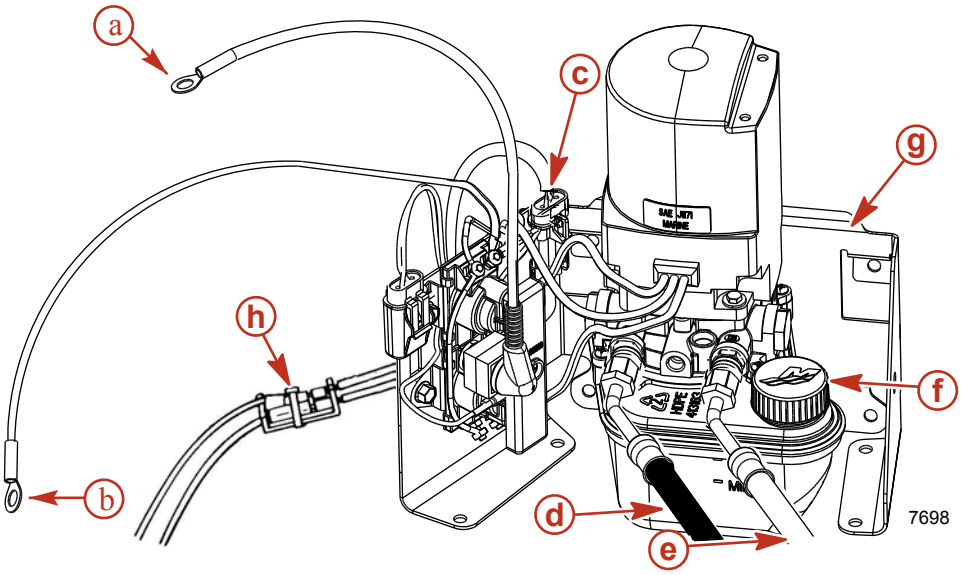
NOTE: *Template 90-863152 provides mounting hole location for floor or transom mounting.*

2. Mount the pump in the desired location.

Power Trim Pump Connections and Filling

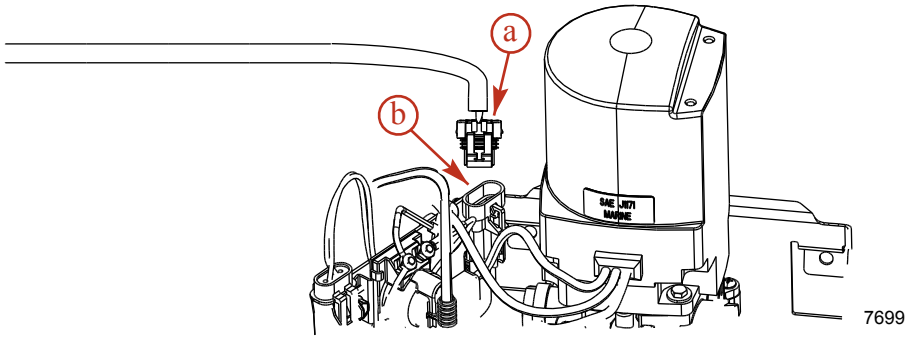
IMPORTANT: Make hydraulic connections as quickly as possible to prevent oil from leaking from the system.

1. Connect hydraulic hoses to the trim pump. Ensure that the quick- connect fittings completely seat when connecting the hoses.



a - Positive battery lead
b - Negative battery lead
c - Harness connector
d - BLACK hydraulic hose (UP hose)
e - GRAY hydraulic hose (DOWN hose)
f - Fill/vent cap
g - Dual mount trim pump bracket
h - Trim limit switch connected and secured

2. Connect power trim pump control harness to trim pump.

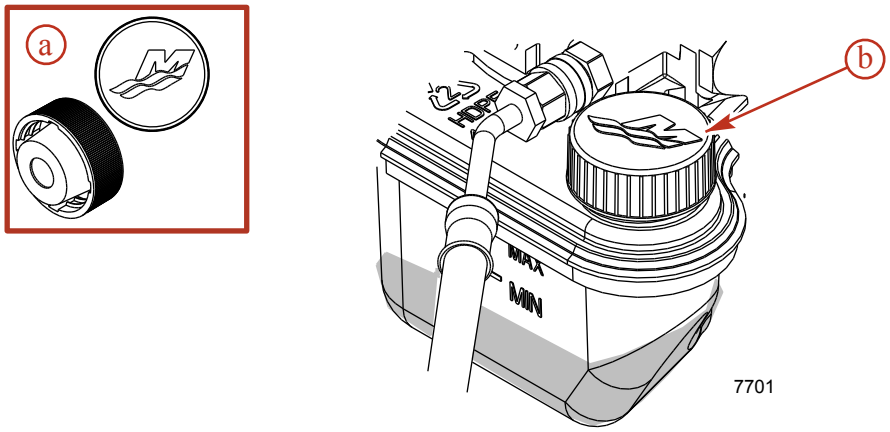


a - Control harness
b - Trim pump connector

FILLING

1. If the oil level is below the "MIN" line specified fluid must be added.
2. Remove the fill cap from the reservoir.

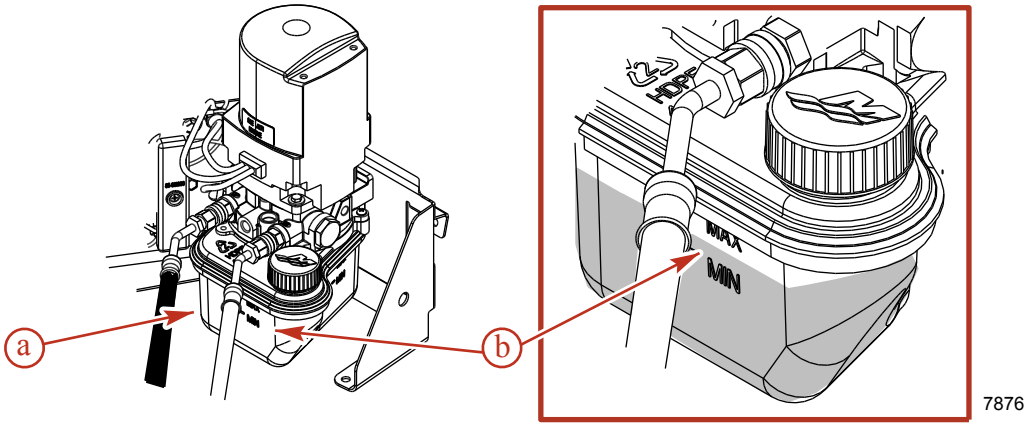
NOTE: *Fill cap is vented.*



Power tim pump reservoir showes the oil level is below "MIN" line

a - Fill cap assembly **b -** Fill cap installed

3. Add lubricant to bring level to the within the "MIN" and "MAX" lines on the reservoir.



a - Reservoir **b -** "MIN" and "MAX" lines

Tube Ref No.	Description	Where Used	Part No.
114	Power Trim and Steering Fluid	Power trim pump	92-858074K01

4. Install the fill cap.

Steering System Installation

Hydraulic (Helm) Steering

If your power package is equipped with Compact Hydraulic Steering, refer to the *Compact Hydraulic (Helm) Steering Installation Instructions* .

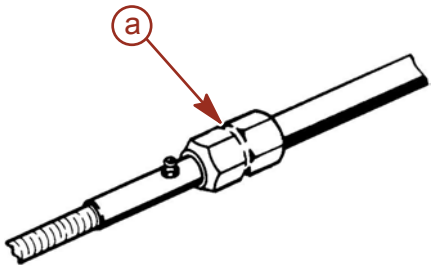
Steering Helm and Cable

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 can cause serious injury or death due to loss of boat control. Use a locking device, such as a self-locking coupler or external locking device when installing steering controls.

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.)*



7255

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.

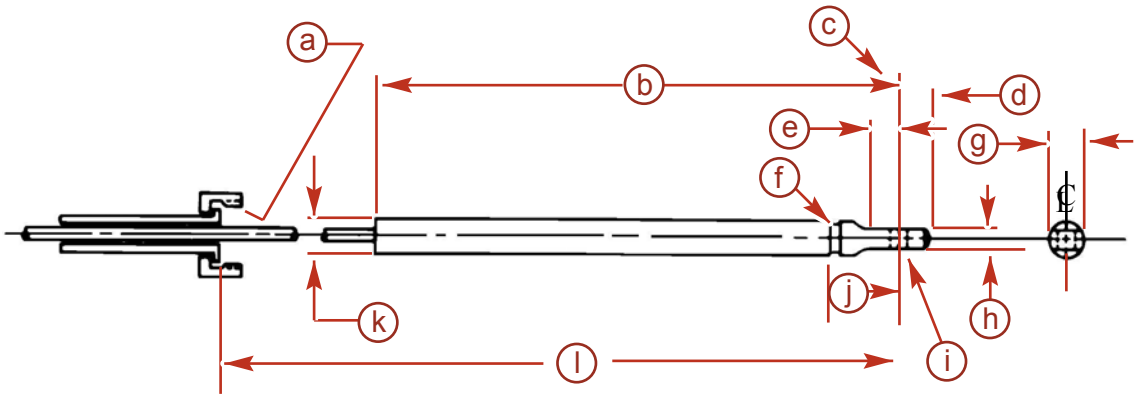
⚠ WARNING

Failure to use the correct cables or other steering system components can cause serious injury or death due to loss of boat control. Use only approved or required components when installing steering systems.

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 specified.

Steering Cable Specifications

IMPORTANT: Power-assisted 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.

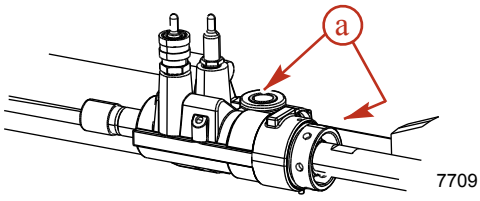


7254

- **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

Installing Steering System

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

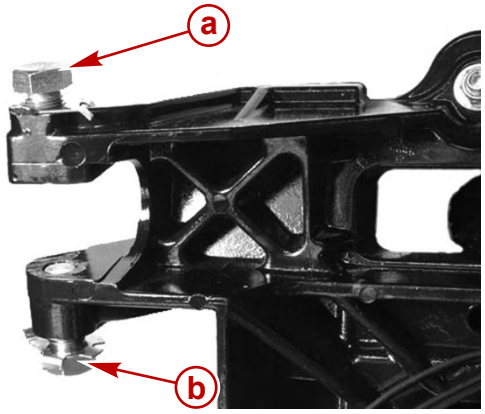
1. Remove the protective shipping caps.
2. Inspect the bushings for debris. Lubricate the power steering bushings.
3. 

7709

- **a -** Bushings

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Power steering bushings	92-802865Q02

4. Remove the upper and lower pivot bolts and ensure that the threads are well lubricated.

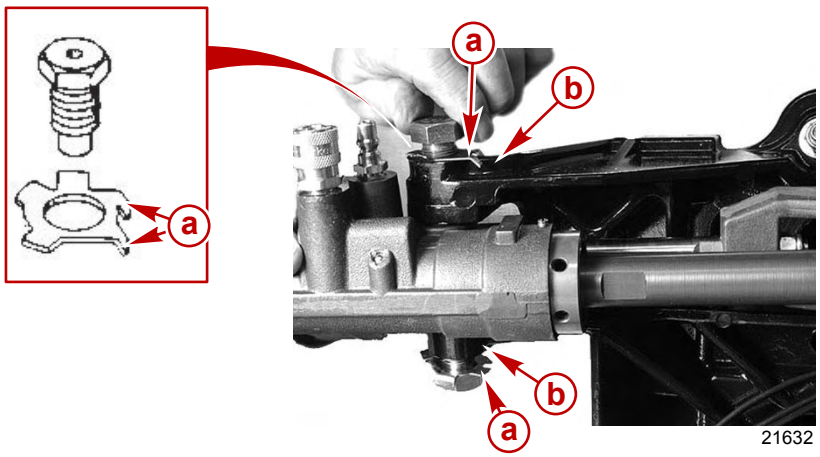


21631

a - Upper pivot bolt **b -** Lower pivot bolt

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Upper and lower pivot bolts	92-802865Q02

5. Position the steering assembly so that the pivot bolts will enter the bushings in the power-assisted steering control valve.
6. Install the upper and lower pivot bolts along with tab washers. Ensure that the tab washer tangs straddle the ridge on the inner transom plate.



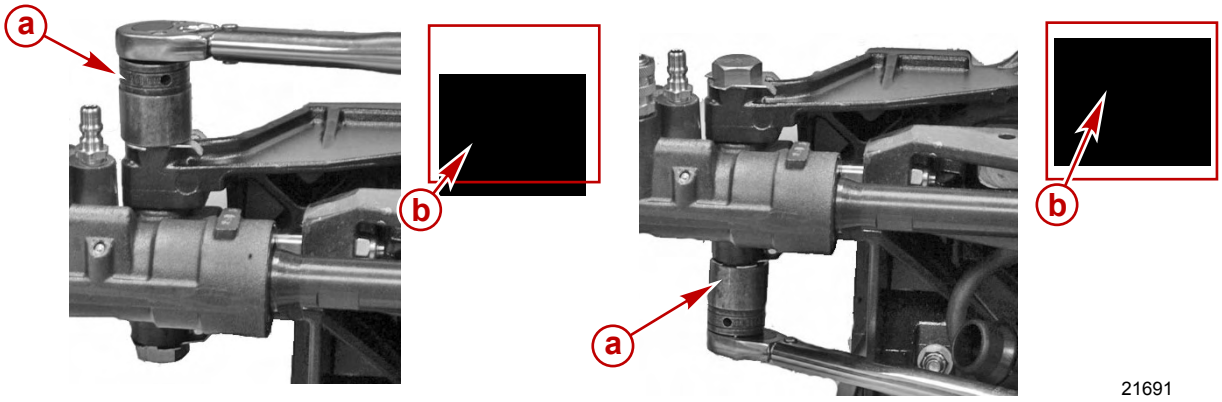
21632

Upper Pivot Bolt And Tab Washer Shown (Lower Similar)

a - Tab washer tang **b -** Ridge

7. Turn the pivot bolts all the way in, **by hand**, to ensure proper steering assembly alignment.
8. Ensure that the steering assembly pivots freely.
9. Torque the pivot bolts. **Bend the tab washer tabs against the corresponding flats on the bolt heads.**

NOTE: *It may be necessary to tighten the pivot bolts further to align the flats on bolt head with the tabs on the washer.*



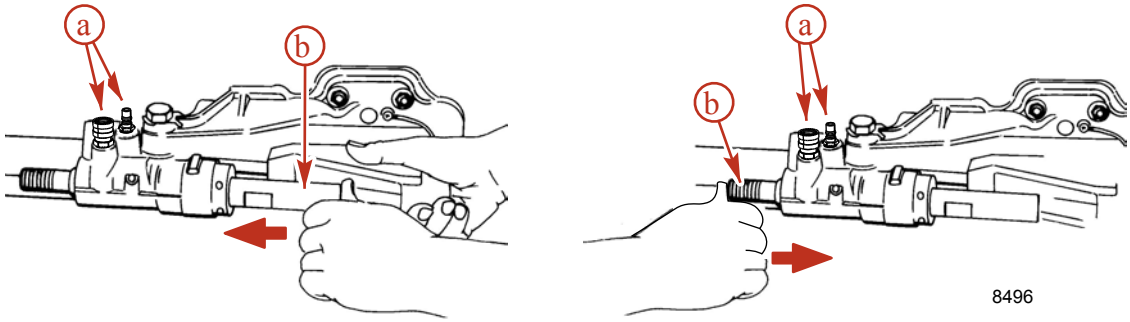
a - Pivot bolt **b -** Bent tab

Description	Nm	lb. in.	lb. ft.
Upper and lower pivot bolt	34		25

⚠ CAUTION

Contents under pressure. Moving the control valve cable guide tube with the hoses disconnected expels fluid from the ports. Wear eye protection while servicing the system.

10. While wearing eye protection to avoid expelled fluid, move the control valve cable guide tube as shown, so that it will be less difficult to pull it out or push it in during connection.

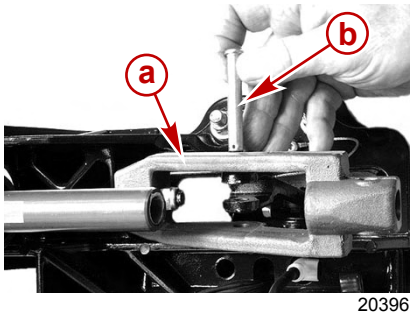


a - Port **b -** Control valve cable guide tube

11. Connect the clevis to the steering lever.
    a. Lubricate the clevis pin.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Clevis pin	92-802865Q02

b. Insert the clevis pin.

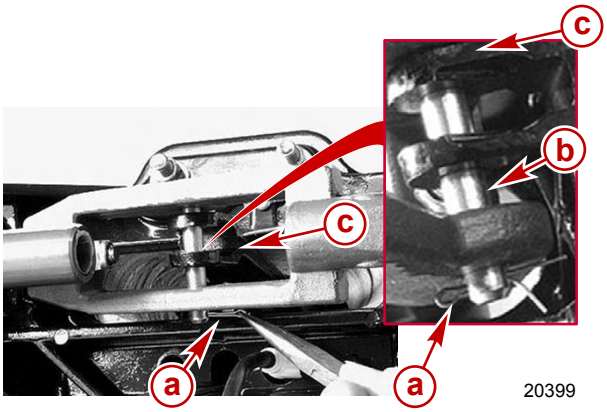


20396

a - Clevis **b -** Clevis pin

c. Insert the cotter pin.

d. Spread both ends of the cotter pin.

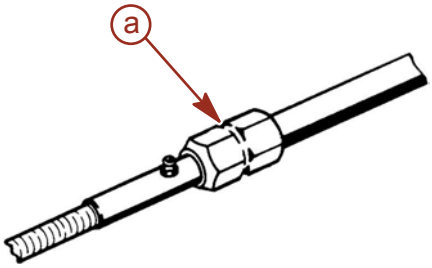


20399

a - Cotter pin **c -** Steering lever

b - Clevis pin

IMPORTANT: Quicksilver RideGuide steering cable has a self-locking coupler nut and does not require an external locking sleeve or locking plate.

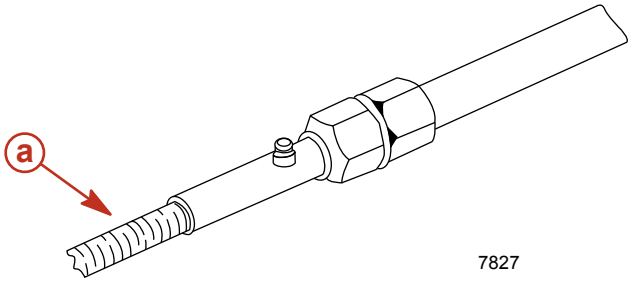


7255

a - Self-locking coupler nut

NOTICE

Fastening any items to the steering cables or outer casings prevents normal operation. The steering cable and outer casing must be free to move back and forth. Do not fasten any items to the steering cable and outer casing.



a - Steering cable and outer casing

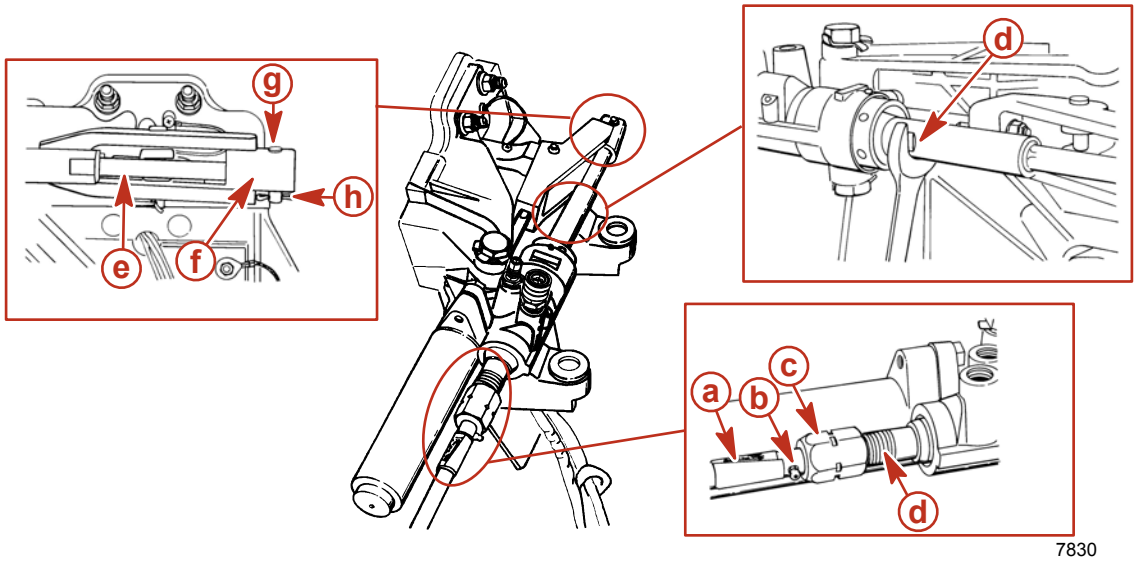
12. Connect the steering cable as follows:
    a. Coat the steering cable end with a liberal amount of lubricant.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Steering cable end	92-802865Q02

    b. Install the steering cable and secure with hardware as shown.

IMPORTANT: Cable guide tube flat surfaces must be positioned vertically or slight feedback in the steering system could be encountered.

    c. Using a suitable wrench hold the flat surfaces on the cable guide tube in the vertical position. Torque the coupler nut. Ensure that the flat surfaces are still aligned vertically after torque is applied to the coupler nut.



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

Shift Cable Routing

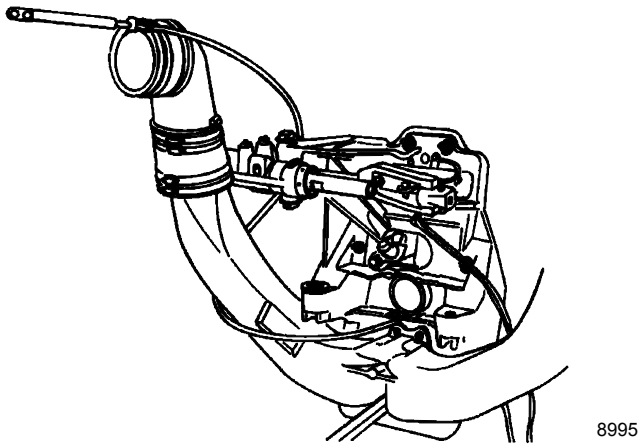
1. Route the intermediate shift cable from the transom assembly to the shift actuator as follows:

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-assisted steering valve and loop over to the shift actuator on the engine.

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



Refer to **Section 8 - Remote Control**.

Engine Installation

Refer to the appropriate Mercury MerCruiser Sterndrive Models installation Manual.

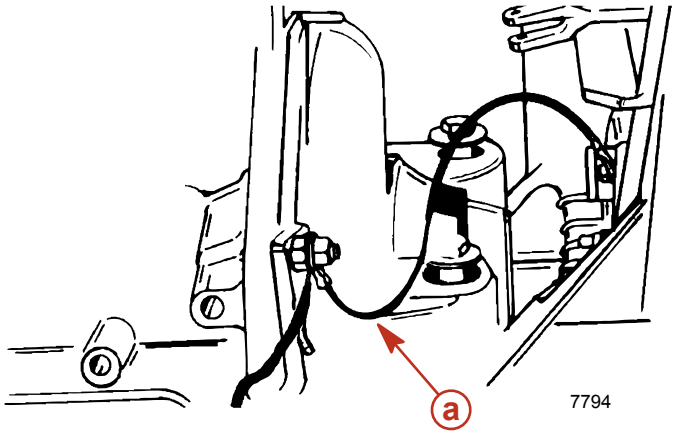
1. Install the engine.

Transom Connections

Continuity Wire Connection

1. Connect continuity circuit wire from engine to transom assembly.

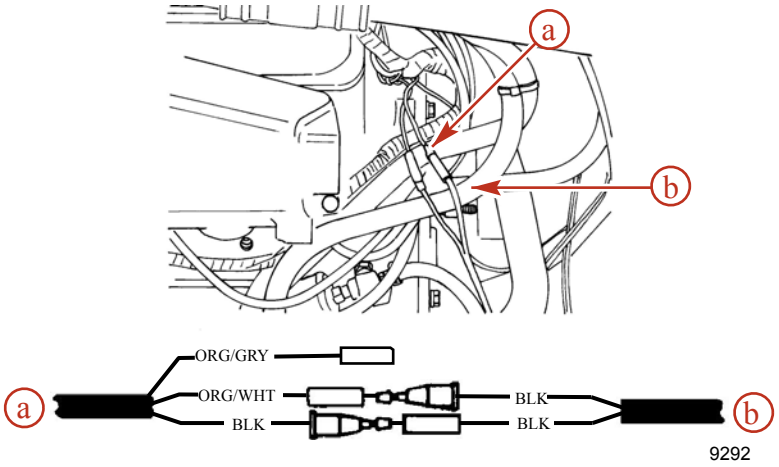
IMPORTANT: Do not attach any accessory ground (-) wires to transom plate ground point. Accessory ground wires can only be attached to ground stud on engine.



a - Continuity wire

Trim Position Sender Connections

1. Connect trim position sender wires (from transom assembly) to engine harness. Use the ORG/GRY wire for analog gauges and the ORG/WHT wire for digital gauges.

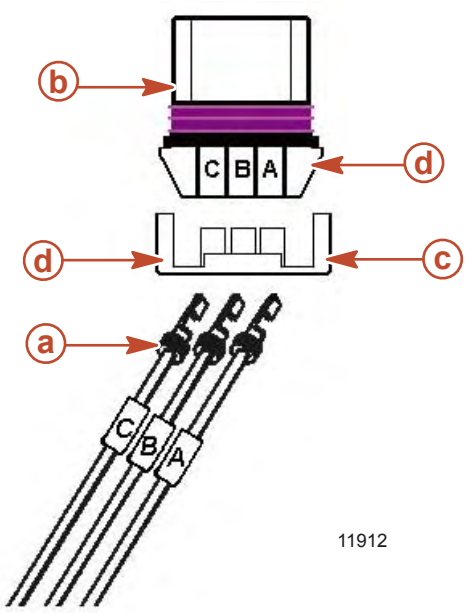


a - Engine harness bullet connector **b -** Transom assembly bullet connector

Trim Limit / Sender Harness

1. Install the harness terminal leads into the trim limit/sender harness terminal connector block as follows:
   a. Insert the terminal lead "A" into the terminal marked "A" on the terminal connector Push the terminal lead into the terminal block until the terminal lead clicks into place and cannot be pulled out.
   b. Repeat Step a. for terminals "B" and "C" ensure that all 3 terminals are securely locked in place.
   c. Place the terminal lead retaining clip over the leads at the rear of the terminal connector block.
   d. Push the the retaining clip onto the terminal connector block until it snaps into place over the locking tabs located on ether side of the terminal connector block.

e. Connect the trim limit/sender connector to the transom harness connector at the engine.



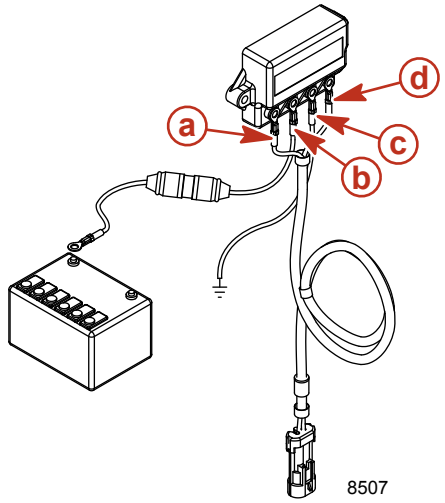
a - Trim limit/sender harness terminal lead
b - Terminal connector block
c - Retaining clip
d - Locking tab

MerCathode Connections (If Equipped)

The MerCathode controller assembly is located on the back of the front lifting eye.

1. Connect wires to MerCathode controller assembly and MerCathode quick connect. Apply a thin coat of sealant to all connections.

IMPORTANT: Opposite end of RED/PURPLE wire must be connected directly to battery positive (+) terminal. Do not connect it to a switched positive (+) circuit. MerCathode system must function continuously for proper corrosion protection.

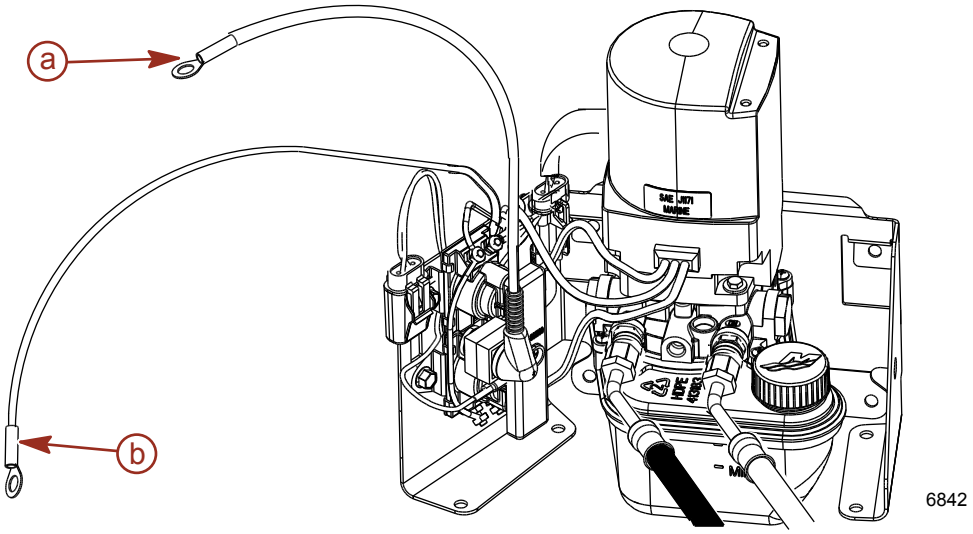


a - ORANGE lead - from anode on transom assembly (part of quick connect)
b - RED/PURPLE wire - to positive (+) battery terminal
c - BLACK wire - from engine harness
d - BROWN wire - from electrode on transom assembly(part of quick connect)

Tube Ref No.	Description	Where Used	Part No.
25	Liquid Neoprene	MerCathode connections	92- 25711 3

Power Trim Pump Connections

1. Connect power trim pump BLACK (-) battery cable to negative (-) battery terminal and pump RED (+) battery cable to positive (+) battery terminal.



a - Positive battery lead **b -** Negative battery lead

Tube Ref No.	Description	Where Used	Part No.
25	Liquid Neoprene	Battery Terminals	92- 25711 3

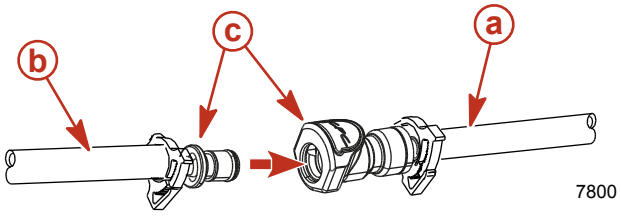
Gear Lube Monitor Connection

IMPORTANT: Route hoses to determine the minimum length of hose needed and trim off the excess to avoid low spots in the system. Avoid kinks and route in a straight path to avoid low spots (traps) in the system.

1. Locate the gear lube monitor quick connect at the rear of the engine.
2. Locate the gear lube monitor quick connect at transom.

IMPORTANT: Hose must not come in contact with steering system components, engine coupler, U-joint shaft, or drive shaft.

3. Fasten the quick connect.

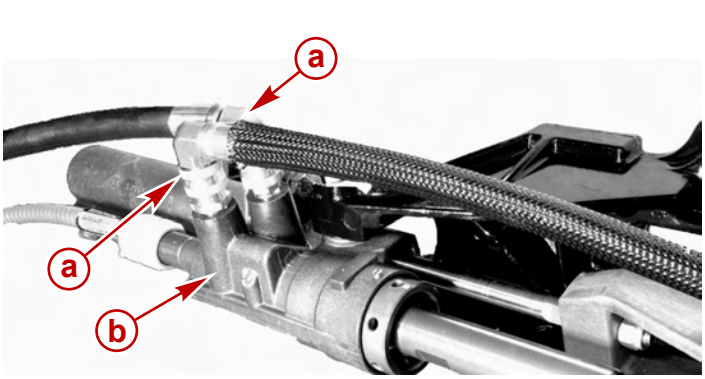


a - Gear lube monitor hose assembly from transom
b - Gear lube monitor hose assembly from gear lube monitor
c - Quick connect fitting

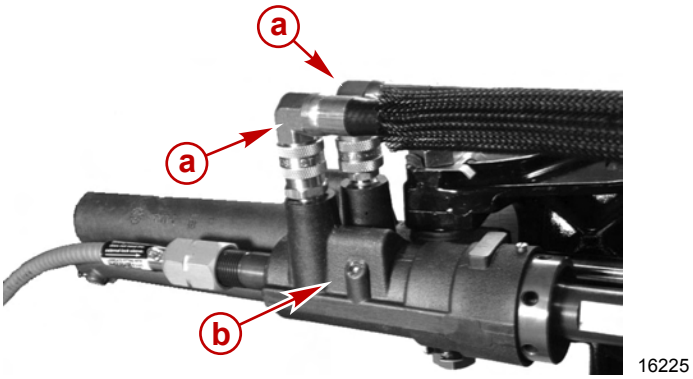
Power-Assisted Steering Hoses

IMPORTANT: Make hydraulic connections as quickly as possible to prevent fluid leaks.

1. Disconnect the quick connect fittings on the power-assisted steering hoses.
2. Connect the power-assisted steering hoses to the control valve. Ensure that the quick connects snap into place.
3. Route hoses as appropriate to avoid contact with the steering system components.
4. Use extra hose clips to secure hose to transom.



a - Hydraulic lines



b - Power-assisted steering control valve

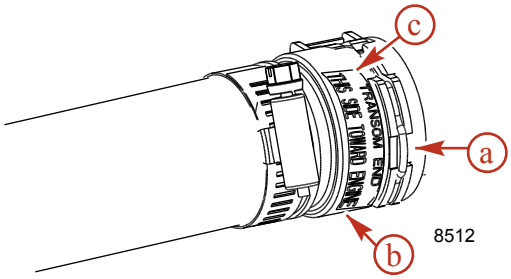
NOTE: *Steering Fluid can be added at this time if desired.*

Seawater Inlet Fitting Connection

IMPORTANT: Perform a pull test at the seawater inlet connection to ensure the seawater inlet hose is connected properly.

NOTE: *The retainer clip must be in the closed position prior to installation.*

1. Install the seawater inlet hose assembly to the water inlet fitting.
   a. Position the retainer clip in the closed position.



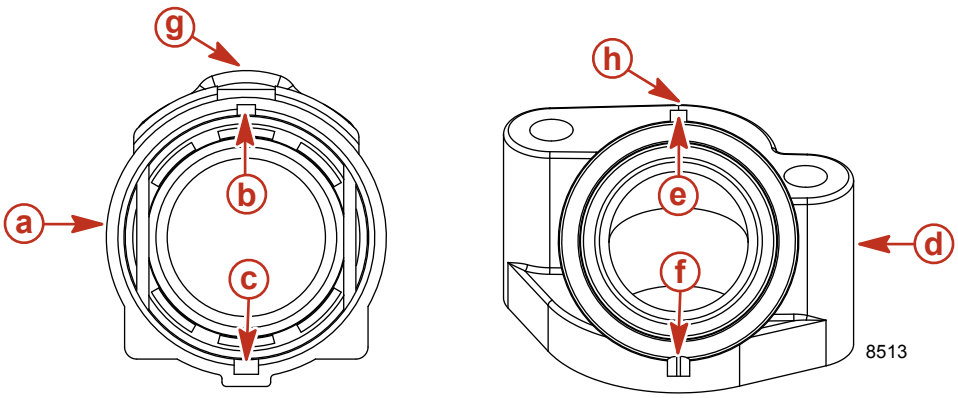
Seawater inlet hose assembly

a - Retainer clip closed
b - Quick connect fitting
c - Hose decal

   b. Position the seawater inlet hose assembly with the center of the retainer clip and the hose decal toward the engine.

IMPORTANT: Tabs and slots are sized to only mate at the correct orientation. Mate the small tab with the small slot.

c. Align the slots of the quick connect fitting to the tabs of the water inlet fitting.

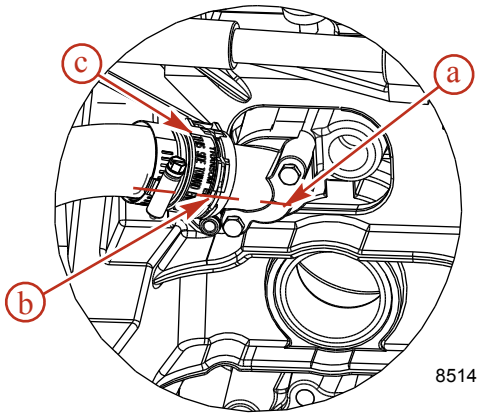


a - Quick connect fitting
b - Small slot
c - Large slot
d - Seawater inlet fitting
e - Small tab
f - Large tab
g - Center of retainer clip (toward engine)
h - Centerline of water inlet fitting (toward engine)

d. Ensure that the center line of the water inlet fitting and the center of the retainer clip are positioned toward the engine.

2. Push the seawater inlet hose assembly onto the water inlet fitting until connected.

NOTE: *The retainer clip snaps into place and resumes the closed position when properly connected.*



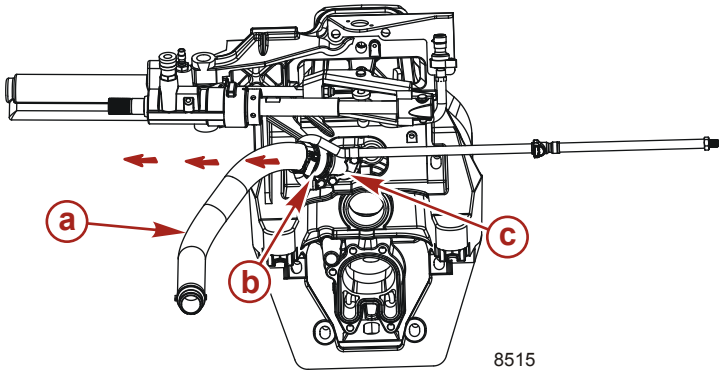
Shown with engine removed for visual clarity

a - Centerline of water inlet fitting
b - Retainer clip in closed position
c - Hose decal

IMPORTANT: Perform a pull test at the seawater inlet connection to ensure the seawater inlet hose is connected properly.

3. Perform a pull test on the water hose quick connection.

a. Pull on the seawater inlet hose near the connection point with an approximate force of 111 N (25 lbf). If the seawater inlet hose does not become separated from the seawater inlet fitting when force is applied, the seawater inlet hose is connected and sealed properly.



Shown with engine removed for visual clarity

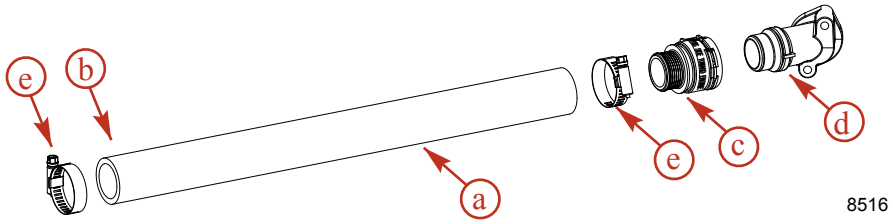
a - Seawater inlet hose
b - Quick connect fitting
c - Seawater inlet fitting

b. If the seawater inlet hose does become separated from the seawater inlet fitting, reinstall as specified.

c. When all steps have been completed, check for any leaks at this connection.

4. Connect the seawater inlet hose to the engine seawater pump.

NOTE: *The seawater inlet hose connects to the engine and the transom.*



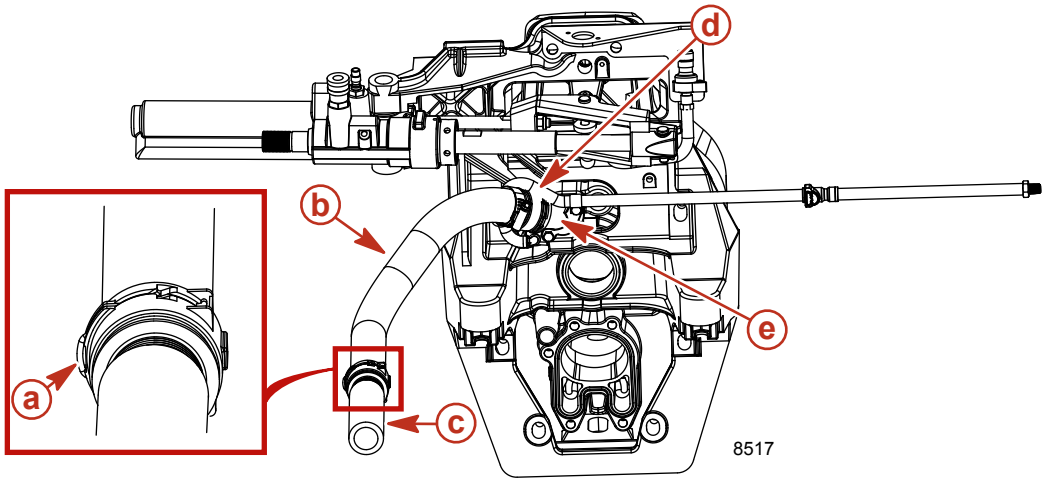
Seawater inlet hose assembly

a - Seawater inlet hose
b - To engine
c - Quick connect fitting
d - Seawater inlet fitting
e - Hose clamps

5. Models Using The Seawater Extension Hose Assembly:

NOTE: *The seawater inlet hose connects to the engine and the transom, the seawater extension hose assembly connects to the transom and the seawater inlet hose.*

a. When connecting the seawater extension hose assembly to the seawater inlet hose assembly, position the center of the retainer clip away from the engine.



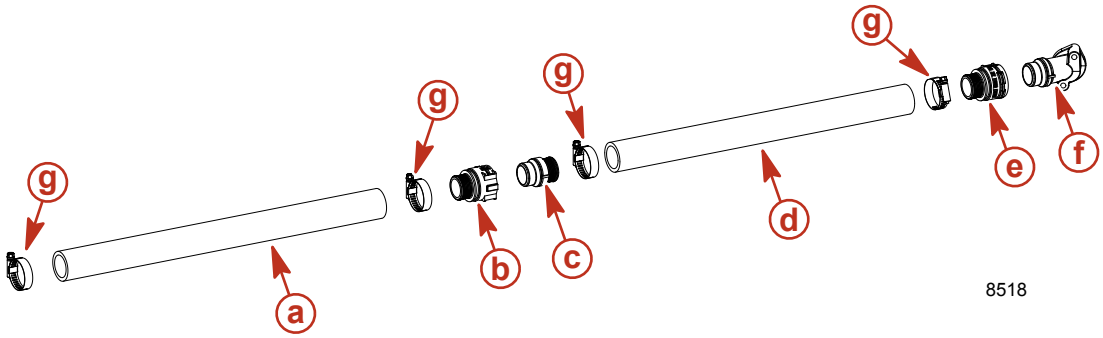
Shown with engine removed for visual clarity

- **a -** Retainer clip position (away from engine)
- **b -** Seawater extension hose
- **c -** Seawater inlet hose (to engine seawater pump)
- **d -** Quick connect fitting (to seawater inlet fitting)
- **e -** Seawater inlet fitting (to transom)

IMPORTANT: Perform a pull test at the seawater inlet connection to ensure the seawater inlet hose is connected properly.

b. Perform a pull test and ensure that the requirements for checking the integrity of the connection are met.

NOTE: *The seawater extension hose assembly connects to the transom and the seawater inlet hose.*



- **a -** Seawater inlet hose
- **b -** Quick connect fitting to extension hose
- **c -** Quick connect male fitting
- **d -** Extension hose
- **e -** Quick connect fitting to seawater inlet fitting
- **f -** Seawater inlet fitting
- **g -** Hose clamp

Shift Cable Installation and Adjustment

Bravo Models Shift Cable Installation

NOTE: *Bravo Models Only: Using shift cable adjustment tool (91-12427), shift cables can be adjusted with or without the sterndrive installed, using the following procedure.*

Shift Cable Adjustment Tool	91-12427

IMPORTANT: Sterndrive 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.

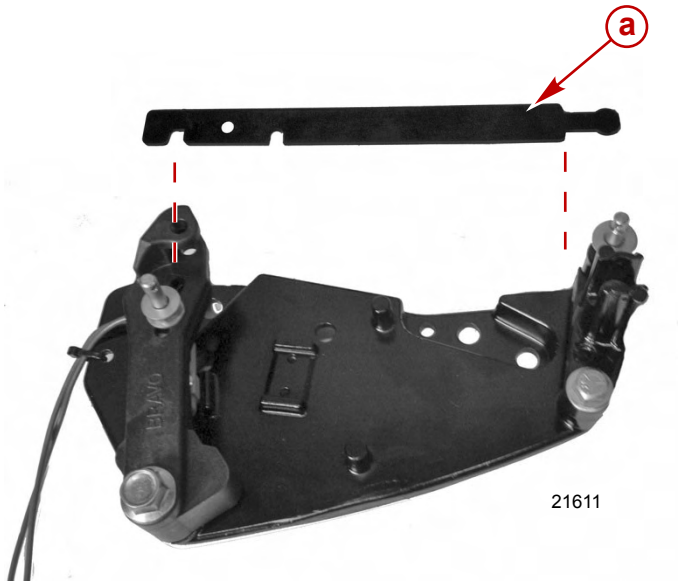
Arrow indicates direction of motion

- Bravo Three - Front propeller on sterndrive 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.

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.

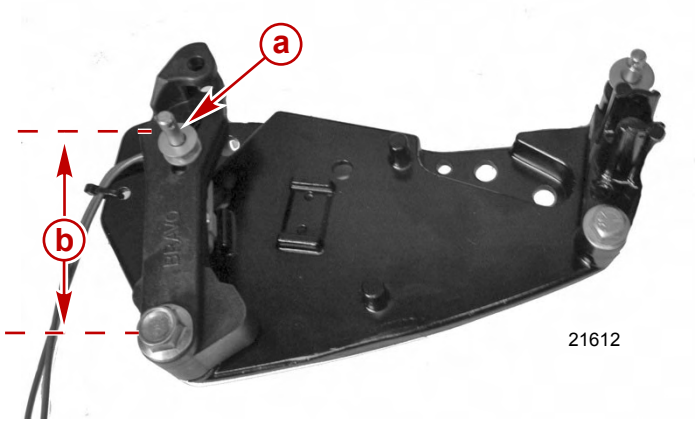
Bravo Models Shift Cable Adjustment

1. Remove the adjustment tool.



a - Adjustment tool

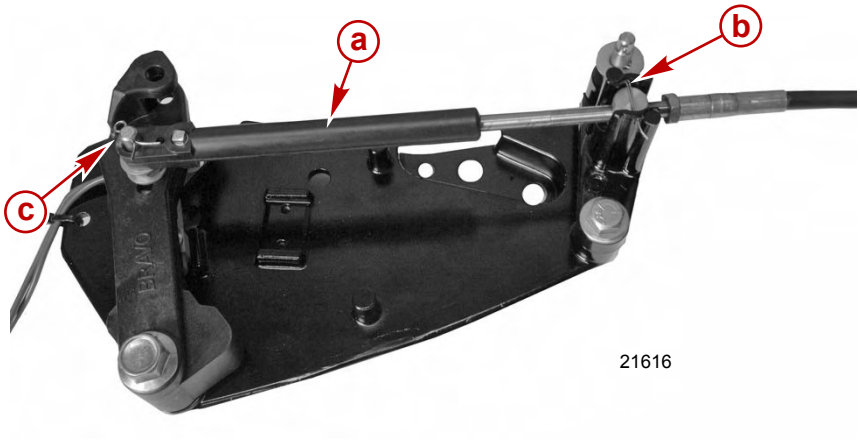
2. Loosen the adjustable stud and move it to dimension, as shown. Retighten stud.



a - Adjustable stud

b - 76 mm (3 in.) (center of pivot bolt to center of stud)

3. Install sterndrive shift cable.
4. Install cotter pin.
5. Insert cotter pin from top and spread ends fully.

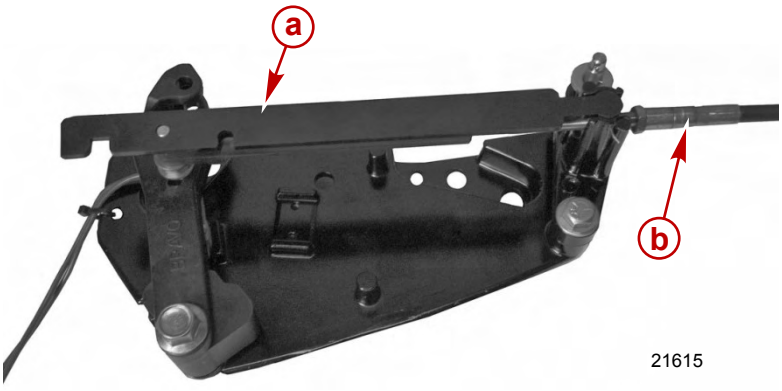


a - Sterndrive shift cable

b - Long cotter pin

c - Short cotter pin

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



a - Adjustment tool

b - Sterndrive shift cable

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

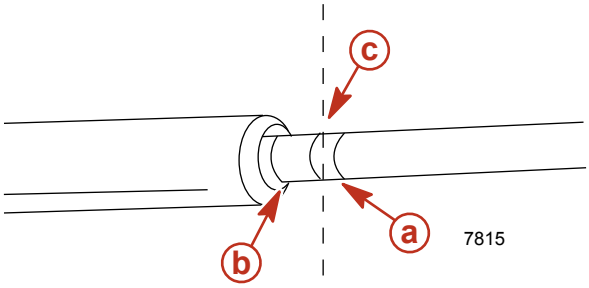
IMPORTANT: Keep center mark "C" aligned with control cable end guide edge when making the following adjustment.

a. Shift remote control to NEUTRAL.

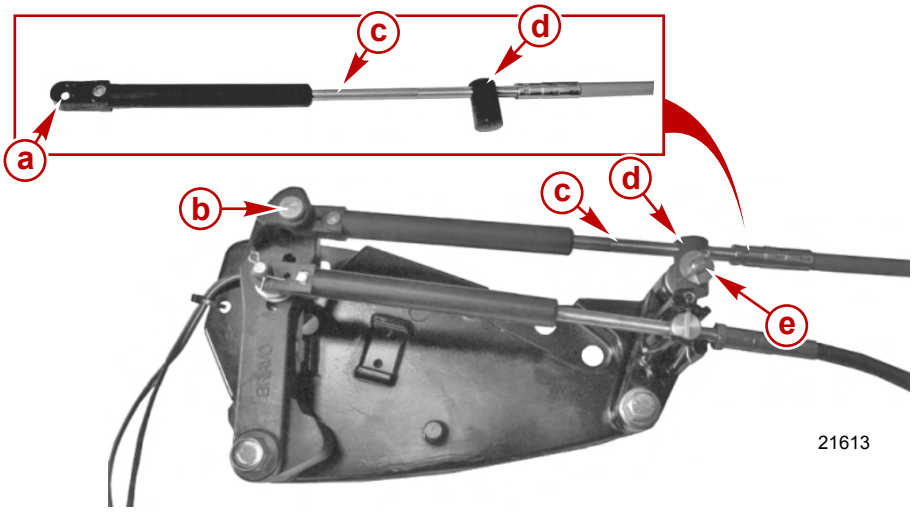
b. Push in on control cable end with enough pressure to remove play and mark position "a" on tube.

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."



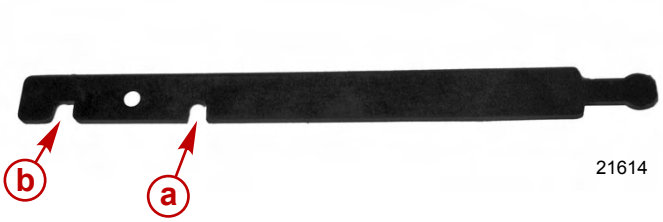
8. Temporarily install control cable end guide into shift lever and insert anchor pin.
9. Adjust control cable barrel so that hole in barrel centers with vertical center line of stud. Ensure that backlash center mark is aligned with edge of control cable end guide.
10. Remove control cable end guide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



a - Control cable end guide
b - Clevis pin
c - Backlash center
d - Control cable barrel
e - Stud, washer and cotter pin

11. Install the control cable.
12. Install the washer and cotter pin to secure the barrel.
13. Install the clevis pin.
14. Install the cotter pin into the clevis pin from the top and spread the ends.
15. Remove the adjustment tool.
16. 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.

17. Lift the adjustment tool so that the slot is above the stud.
18. Shift the remote control into REVERSE and repeat the adjustment process.



a - RH rotation Bravo One, Two, Three FORWARD, LH rotation Bravo One and Two REVERSE slot

b - LH rotation Bravo One and Two FORWARD, RH rotation Bravo One, Two and Three REVERSE slot

19. Remove adjustment tool.
20. Ensure that all cotter pins are secure and that the ends of the cotter pins are spread to 180 degrees.
21. Lubricate shift cable pivot points.

Tube Ref No.	Description	Where Used	Part No.
80	SAE Engine Oil 30W	Shift cable pivot points	Obtain Locally

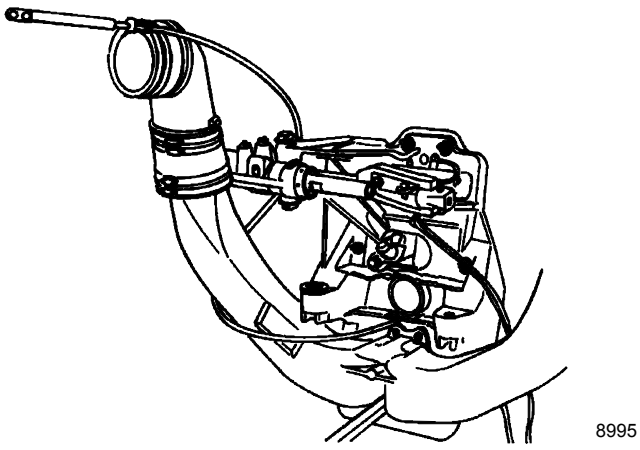
Shift Cable Installation For DTS System

IMPORTANT: Do not move the shift cable stud on the shift arm.

IMPORTANT: The shift cable barrel is preset and CANNOT be adjusted.

1. Route the intermediate shift cable from the transom assembly to the shift actuator 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-assisted steering valve and loop over to the shift actuator on the engine.

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

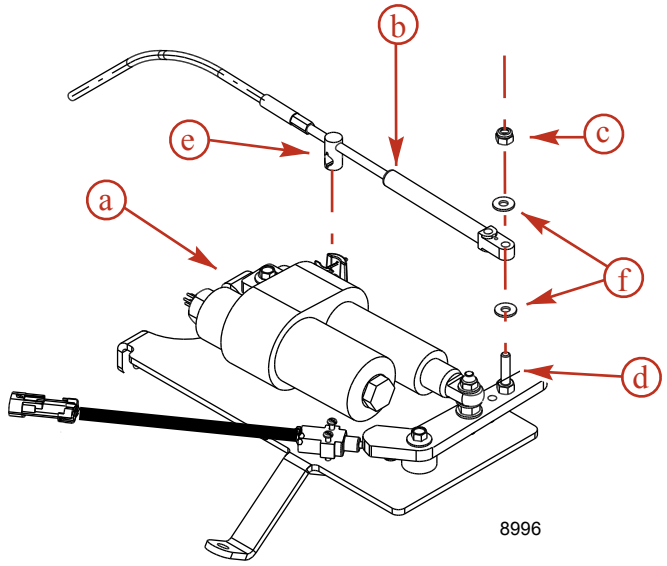


NOTE: *A final check of the adjustments should be made with the boat in the water and engine running. If this cannot be done or is not done at your manufacturing facility, arrangement should be made with the dealer to do this as part of the pre-delivery inspection.*

2. **SeaCore Models:** Apply lubricant to the threads of the shift cable stud.

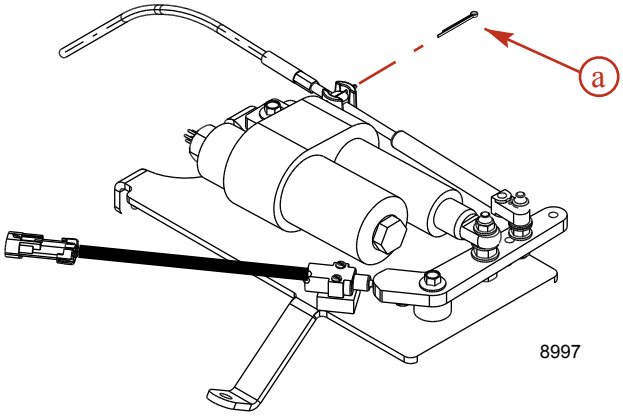
Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Shift cable stud	92-802865Q02

3. Install the intermediate shift cable to the shift actuator on the engine.
4. Tighten locknut until it contacts and then loosen 1/2 turn.



a - Shift actuator
b - Shift cable
c - Locknut
d - Shift cable stud
e - Shift cable barrel
f - Washers

5. Insert cotter pin from top and spread ends.



a - Cotter pin

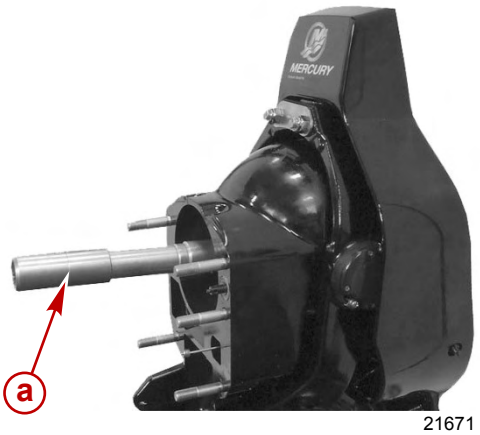
Bravo Installation

Engine Alignment Check

The engine alignment tool must slide in and out of the engine coupler and the gimbal bearing with little or no friction.

IMPORTANT: Alignment tools from other manufacturers may cause improper alignment and damage to the gimbal bearing or engine coupler. Use only the Quicksilver Alignment Tool.

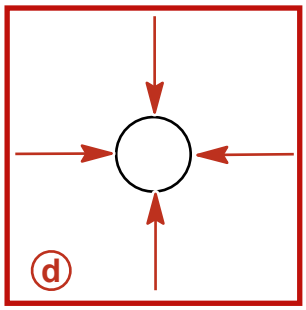
1. Check the engine alignment as follows.
   a. Insert the solid end of the alignment tool through the gimbal bearing and into the engine coupler splines.

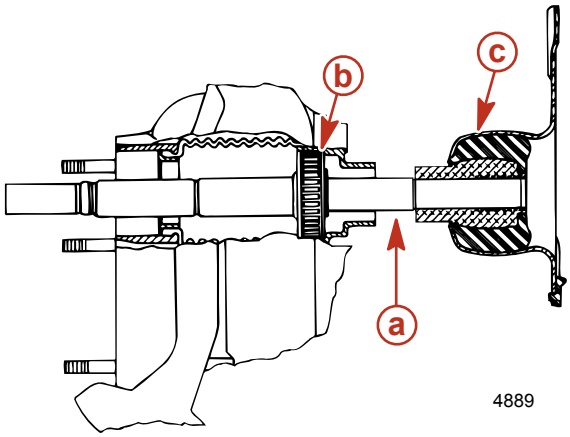


a - Alignment tool

Alignment Tool Assembly	91-805475A 1

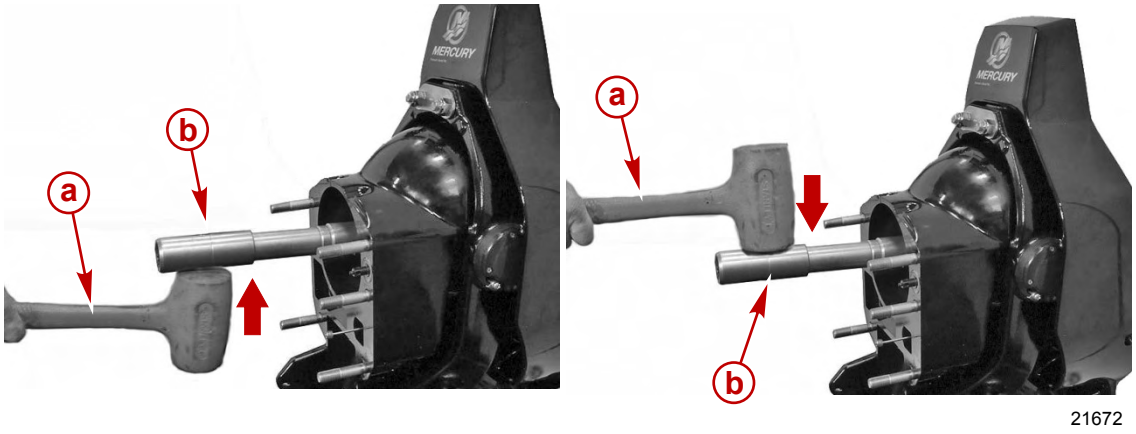
   b. Hit the sides of the alignment tool with a synthane hammer at 90 degree increments to help align the gimbal bearing to the coupler as shown in the following steps:





a - Alignment tool
b - Gimbal bearing
c - Engine coupler
d - 90 degree increments

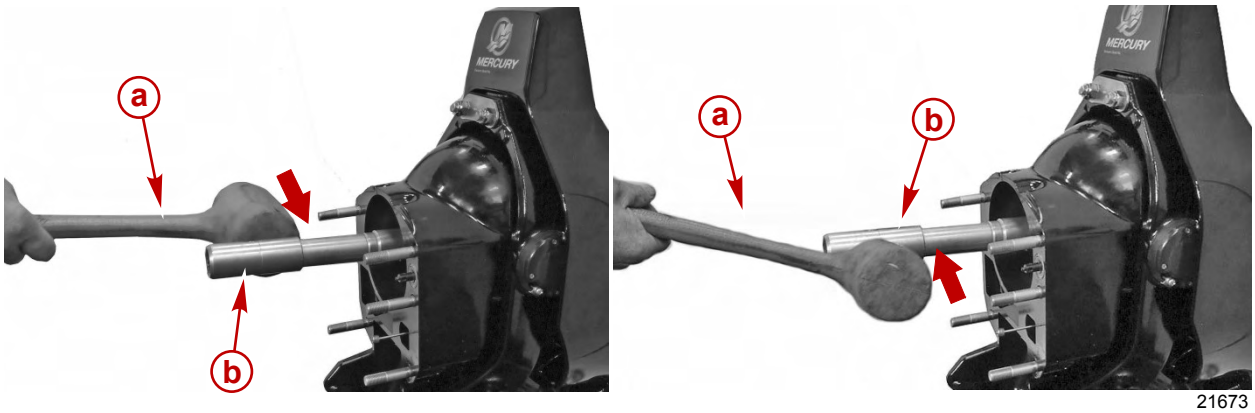
c. Hit the alignment tool upward and downward.



21672

a - Synthane hammer **b -** Alignment tool

d. Hit the alignment tool on the port side and on the starboard side.



21673

a - Synthane hammer **b -** Alignment tool

e. Pull the tool out and insert it through the gimbal bearing and into the engine coupler splines.

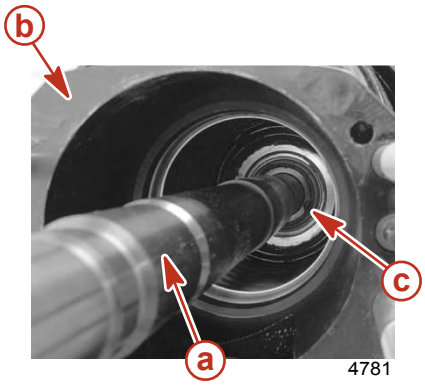
f. If the alignment tool does not fit, or is very tight, remove the tool.

NOTE: *Apply grease to the alignment tool before checking alignment. When the tool is removed the tool is wiped clean on the tight side. This can help determine where the engine adjustment is needed.*

- Adjust the engine mounts as necessary: Refer to the appropriate **Mercury MerCruiser Engine Service Manual**.
- Perform the **Engine Alignment Check**.

g. The engine alignment is good when the alignment tool can slide in and out of the engine coupler and the gimbal bearing with little or no friction.

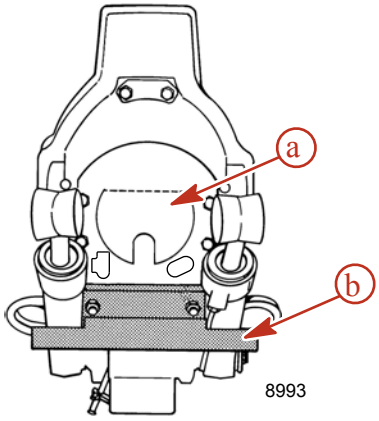
IMPORTANT: Engine alignment tool must slide in and out of the engine coupler and the gimbal bearing with little or no friction.



a - Alignment tool
b - Gimbal housing
c - Gimbal bearing

Bravo Sterndrive Installation

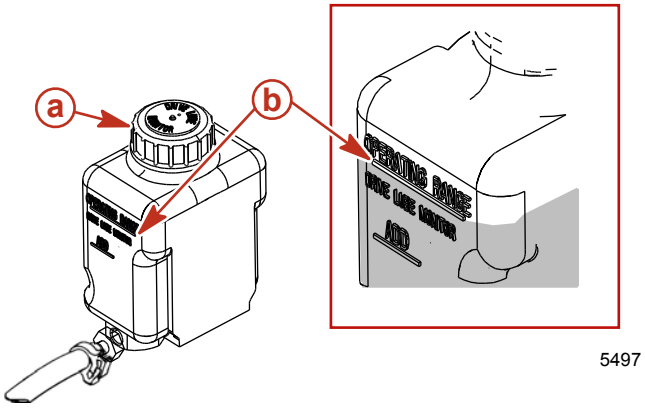
1. If applicable, remove trim cylinder support and dust cover from bell housing studs. (Retain elastic stop nuts and flat washers.)



Typical

a - Dust cover
b - Trim cylinder support

2. Remove gear lube monitor cap. Fill the gear lube monitor to the "OPERATING RANGE".

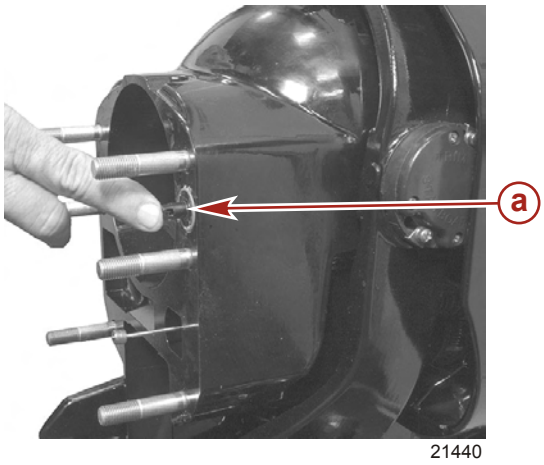


Gear lube monitor

a - Gear lube monitor cap **b -** "OPERATING RANGE" line

Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Gear Lube Monitor	92-858064K01

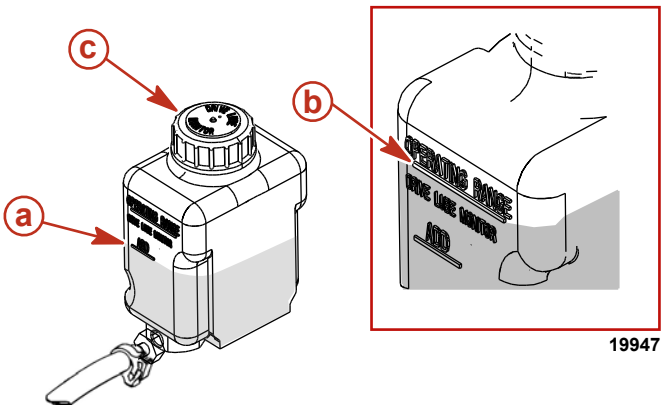
3. To purge air from the system, push in on the dribble valve stem until the new gear lube appears.



a - Dribble Valve

4. Release the dribble valve.

5. If the gear lube monitor is below the (full) line: Fill the gear lube monitor to the "OPERATING RANGE" (full) line with specified fluid. Do not overfill.

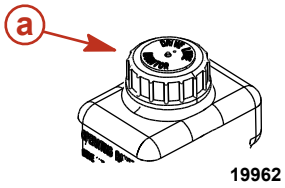


Gear lube monitor

a - Gear lube level at the "ADD" mark **c -** Cap
b - Gear lube level at the "OPERATING RANGE"

Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Gear Lube Monitor	92-858064K01

6. Install the gear lube monitor cap. Ensure that the rubber gasket is inside the monitor cap. Do not overtighten the cap.

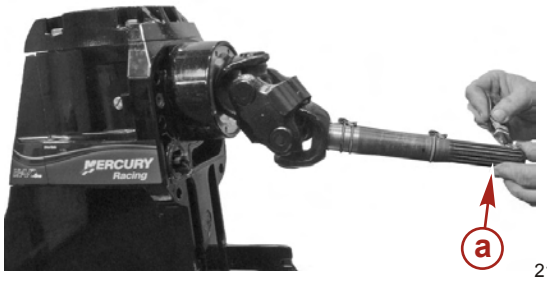


a - Gear lube monitor cap

7. Coat the O-rings on the sterndrive U-joint with lubricant

a - O-rings

8. Coat the splines on the sterndrive U-joint with lubricant.

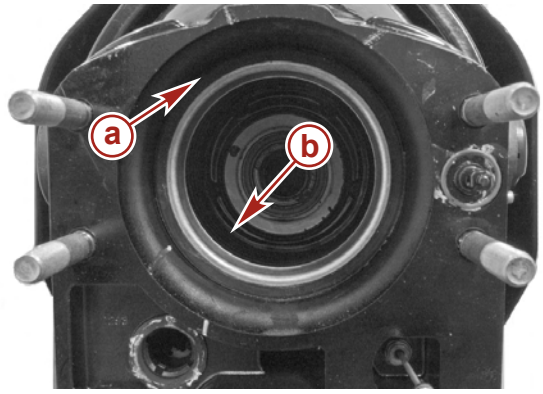


21442

a - Splines

Tube Ref No.	Description	Where Used	Part No.
91	Engine Coupler Spline Grease	U-joint O-rings	92-802869A 1
91	Engine Coupler Spline Grease	Driveshaft splines	92-802869A 1

9. Ensure that the U-joint bellows are clean and free of debris.

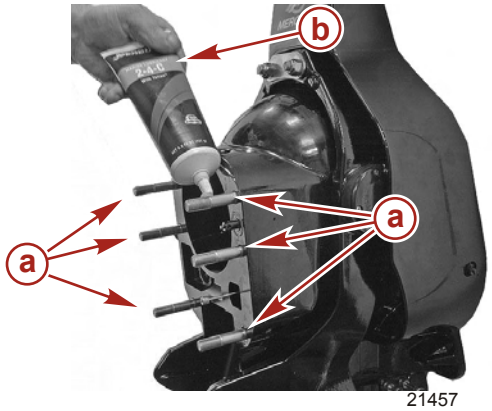


21456

Bell housing of the transom assembly

a - U-joint bellows edge **b -** U-joint bellows

10. Lubricate the bell housing studs.



21457

a - Bell Housing Studs (6) **b -** Tube of lubricant

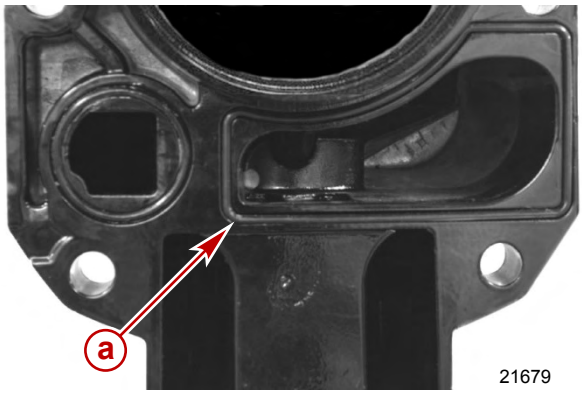
Tube Ref No.	Description	Where Used	Part No.
95	2-4-C Marine Lubricant with Teflon	Bell housing studs	92-802859A 1

11. Lubricate the shift linkage O-ring.

a - Shift linkage O-ring

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C with Teflon	O-ring	92-802859A 1

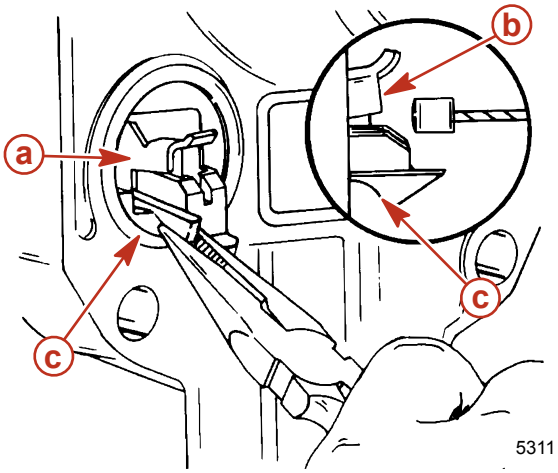
12. Lubricate the water passage seal.

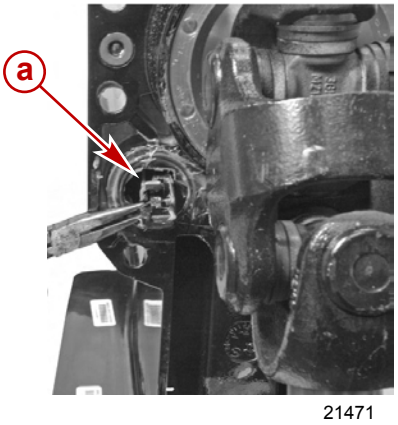


a - Water passage seal

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C Marine Lubricant with Teflon	Water passage seals	92-802859A 1

13. Pull out the shift linkage as far as it moves. Jaws will open.



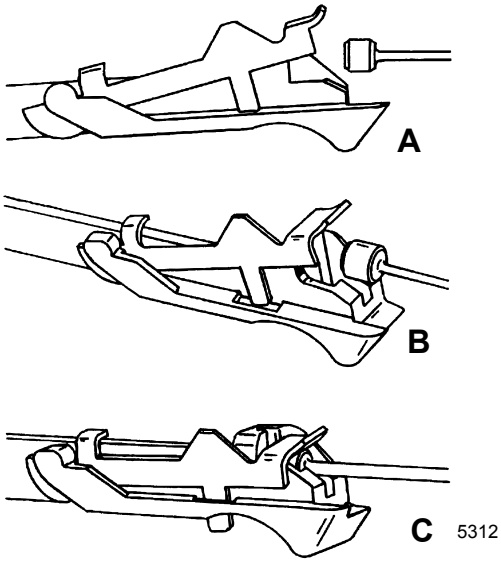


a - Shift linkage assembly
b - Jaws open
c - Underside of lower lip

IMPORTANT: As the sterndrive is inserted into the entry of the bell housing, the shift cable must be closely checked to ensure that it enters the jaws of the shift linkage assembly of the sterndrive.

14. Place remote control in NEUTRAL position.

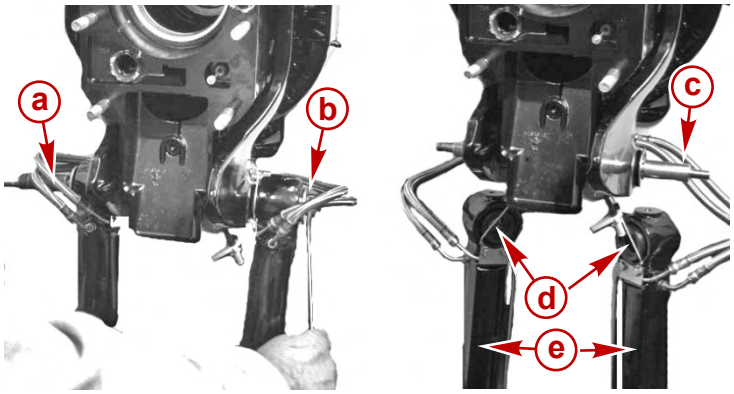
NOTE: *As bell housing shift cable enters the shift linkage assembly, it pushes the assembly back into the sterndrive housing, and the jaw closes, securing the cable, as shown in steps "A", "B" and "C."*



IMPORTANT: If bell housing shift cable does not line up to properly enter jaws of shift linkage assembly, use your hand to guide the cable into place while installing the sterndrive.

15. Place driveshaft housing in position on bell housing and install sterndrive, as follows:

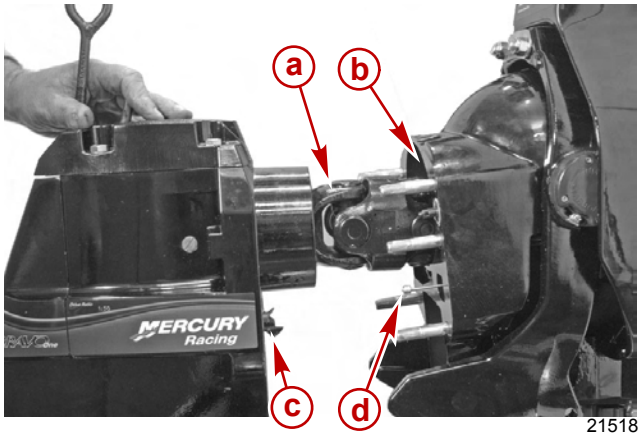
a. Remove the nuts from the trim cylinders.



21521

a - Socket
b - Wrench
c - Anchor pin
d - Ground wires
e - Trim cylinders

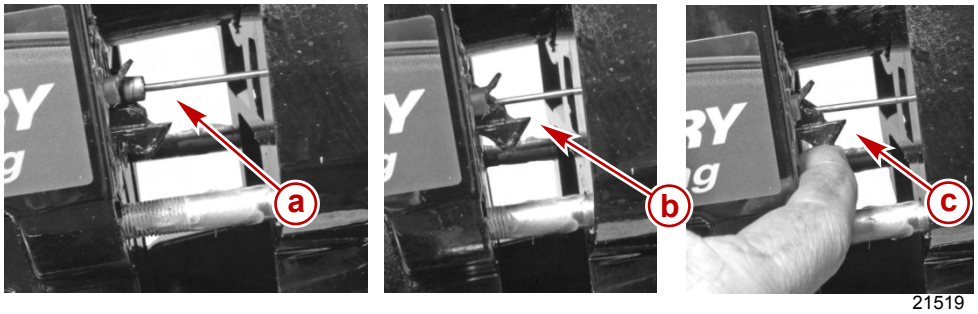
b. Position the sterndrive so that the universal joint shaft aligns with the bell housing bore.



21518

a - Universal joint
b - Bell housing
c - Shift linkage
d - Shift cable

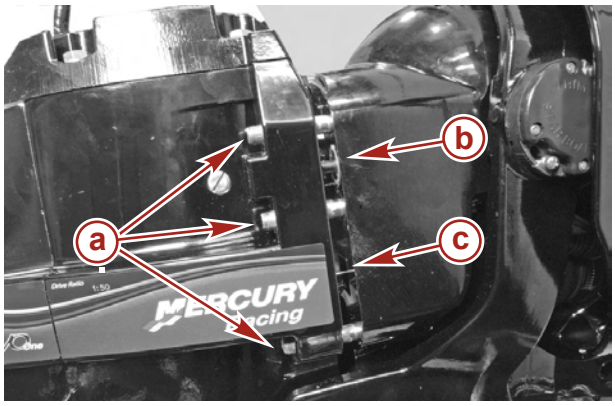
c. Guide the U-joint shaft through the bearing in gimbal housing and into the engine coupler. Ensure that shift linkage jaws engage the bell housing shift cable assembly.



21519

a - Shift cable
b - Shift linkage jaws open
c - Shift linkage jaws engage the shift cable

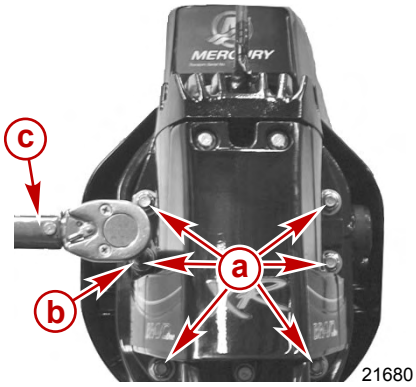
d. If necessary, rotate the propeller shaft COUNTERCLOCKWISE slightly (using a propeller) to align U-joint shaft splines with splines in engine coupling, then slide sterndrive all the way into bell housing.



21520

a - Bell housing studs
b - Dribble valve
c - Shift cable

16. Secure sterndrive to bell housing with 5 flat washers and 6 locknuts. Start from the center and torque the nuts.



21680

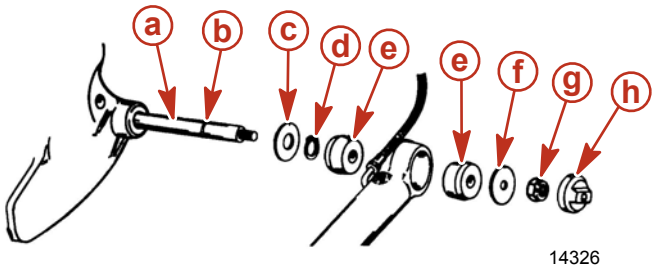
a - Locknut (6) flat washers (5)
b - Ground plate (washer not used here)
c - Torque wrench

Description	Nm	lb. in.	lb. ft.
Sterndrive fasteners	68		50

TRIM CYLINDER INSTALLATION

1. Install the mounting hardware of the trim cylinder forward as shown
2. Lubricate anchor pin threads to prevent threads from galling.

3. Hand thread locknuts onto the pin. Do not tighten at this time.



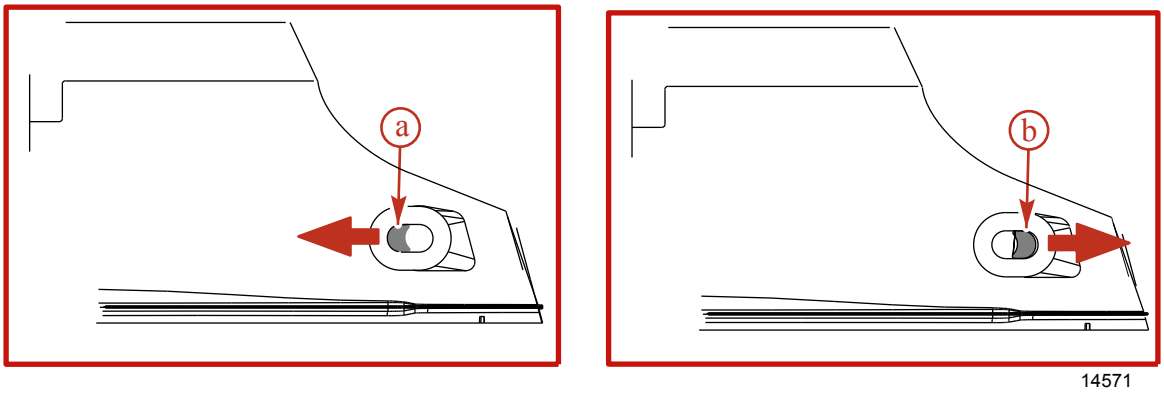
Front

a - Anchor pin
b - Retainer clip groove
c - Flat washer (large I.D.)
d - Retainer clip
e - Bushing
f - Flat washer (small I.D.)
g - Locknut
h - Plastic cap

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C Marine Lubricant with Teflon	Anchor pin threads	92-802859A 1

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.

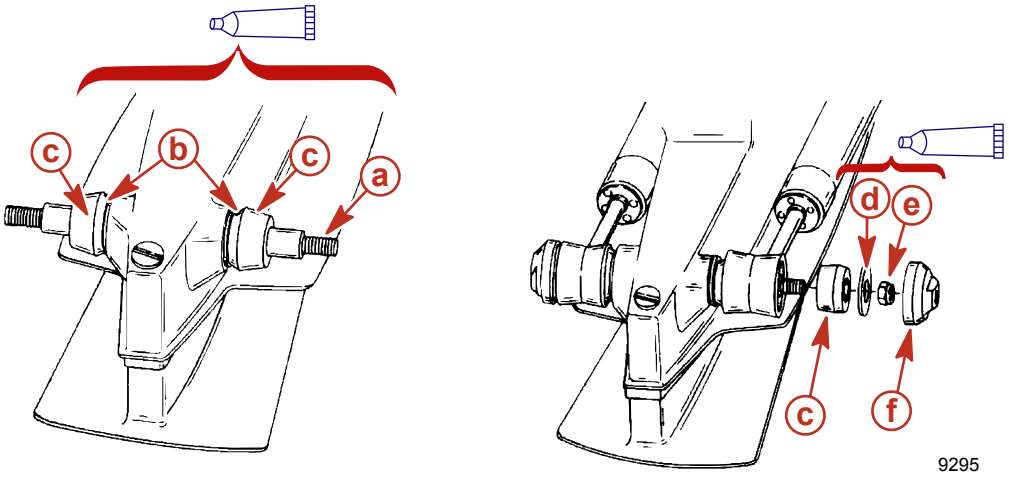
NOTE: *Ensure that the trim-in limit insert is reinstalled in the same position as before removal of the sterndrive. If you are not sure of the original position, contact the boat manufacturer for their recommendation. Refer to Special Information at the front of this section before reinstalling the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



a - Trim-in limit insert Bravo One and Two (positioned forward)
b - Trim-in limit insert Bravo Three (positioned aft)

4. Install the mounting hardware of the trim cylinder aft as shown.
5. Lubricate anchor pin threads to prevent the threads from galling.
6. Hand-thread locknuts onto the anchor pin.

IMPORTANT: The position of the trim-in limit insert on the Bravo Three sterndrive 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.

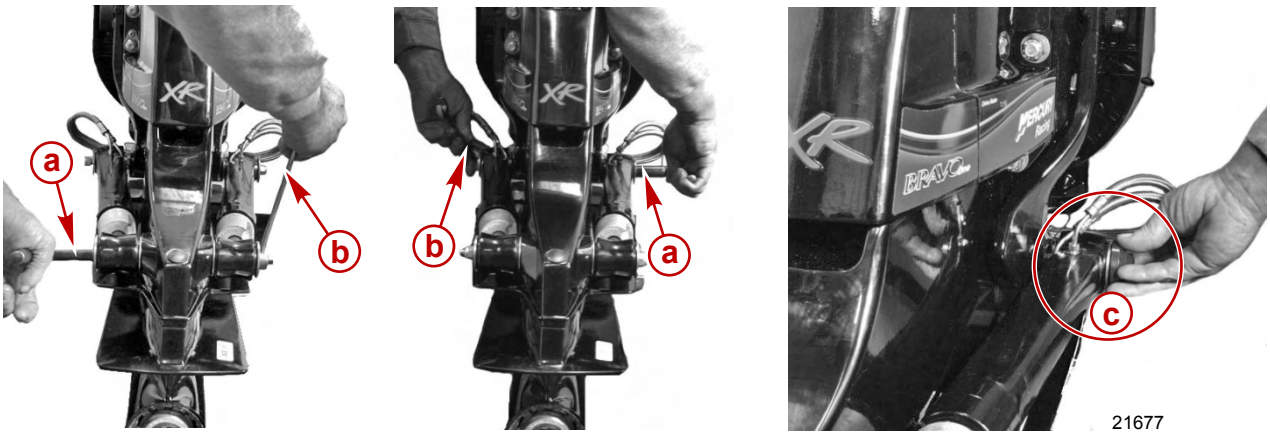


a - Aft anchor pin
b - Larger flat washers (2)
c - Bushings (4)
d - Small ID flat washers (2)
e - Locknuts (2)
f - Plastic caps (2)

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C Marine Lubricant with Teflon	Trim cylinder hardware	92-802859A 1

7. Tighten the locknuts until the washer and locknut contact the shoulder on the anchor pin.
8. Install plastic caps and tighten hand-tight only.

NOTE: *Upon installation of hardware apply lubricant to all components except plastic caps.*

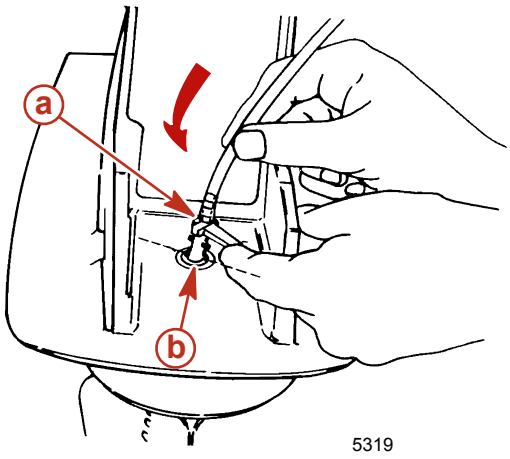


a - Socket and tool
b - Wrench tool
c - Plastic cap (4)

Speedometer Connections - Bravo Models

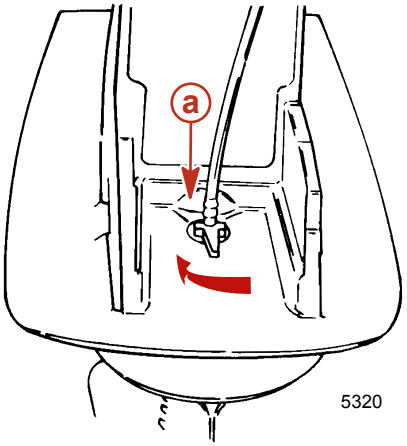
1. Raise sterndrive to gain access to area between gimbal housing and sterndrive, immediately atop the transom end of the anti-ventilation plate.

2. Insert speedometer tube fitting into opening on topside of anti-ventilation plate, in position shown.



a - Tube fitting **b -** Opening

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



a - Fitting installed (handle pointing forward)

Bravo Sterndrive Shift Check (Engine Running)

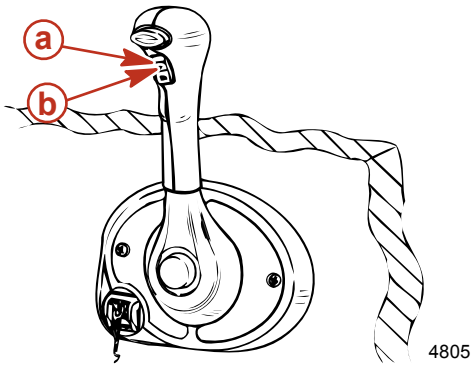
⚠ WARNING

Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the propeller blade and the anti-ventilation plate.

This test requires sufficient water supply to your engine and sterndrive.

1. Check sterndrive for proper gear shift with boat out of water.

2. Use the sterndrive tilt switch on the remote control handle to lower the sterndrive to DOWN/IN position. Do not allow the sterndrive skeg to contact the ground.



Typical single handle remote control shown

a - Drive trim switch **b -** Drive trailer button

3. Connect a garden water hose between flushing attachment and water source.

Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1

Flushing Device	91-44357Q 2

Flushing Kit	91-849996T 1

4. Partially open water source until water continuously leaks out around the flushing device.

NOTICE

Without sufficient cooling water, the engine, the water pump, and other components will overheat and suffer damage. Provide a sufficient supply of water to the water inlets during operation.

IMPORTANT: Engines with the sterndrive water inlet blocked off at the gimbal housing and using a through the hull water inlet need a supply of cooling water available to both the sterndrive and to the engine during operation.

5. Place remote control handle in NEUTRAL, idle speed position and start engine.

NOTE: *The sterndrive is shifting properly when the sterndrive shifts with minimal effort in and out of each gear FORWARD, NEUTRAL, and REVERSE, at idle speed position.*

NOTE: *The operator at the remote control handle should feel a slight detent before and after each gear. FORWARD-detent-NEUTRAL-detent-REVERSE*

IMPORTANT: The sterndrive is not shifting properly if the sterndrive shifts after the engine throttle is engaged. Consult your authorized Mercury MerCruiser dealer/representative for proper adjustment.

6. Move the remote control handle to FORWARD, idle speed position.
7. Check that the sterndrive propeller shaft is turning in the FORWARD direction.
8. Shift the remote control handle to NEUTRAL, idle speed position.
9. Check that the sterndrive propeller shaft is not turning.
10. Shift the remote control handle to REVERSE, idle speed position.
11. Check that the sterndrive propeller shaft is turning in the REVERSE direction.
12. **If the sterndrive will not shift:**
    a. Remove the sterndrive and check for proper shift hook ups.

b. Check that the shift cables are connected

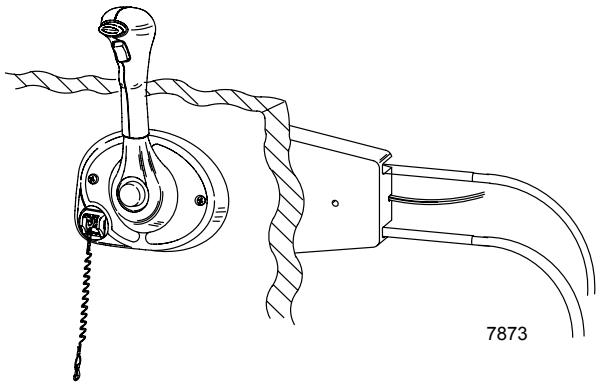
IMPORTANT: Be sure that the shift cables are routed in such a way as to avoid sharp bends and/or contact with moving parts. DO NOT fasten any items to shift cables.

Troubleshooting Shift Problems

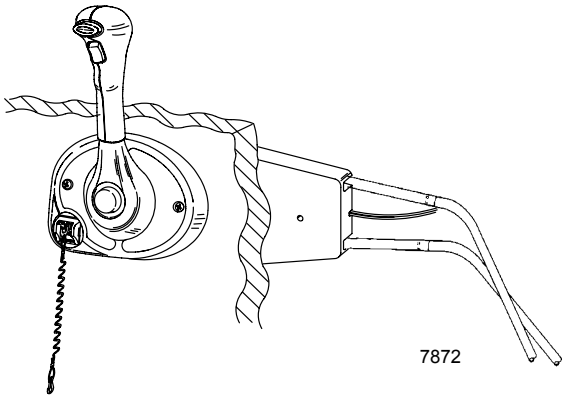
NOTE: *The following information is provided to assist an installer in troubleshooting if hard shifting or chucking/racheting is encountered when shifting into FORWARD gear.*

1. When installing the control box in the side panel of the boat, 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.*



Proper cable bend



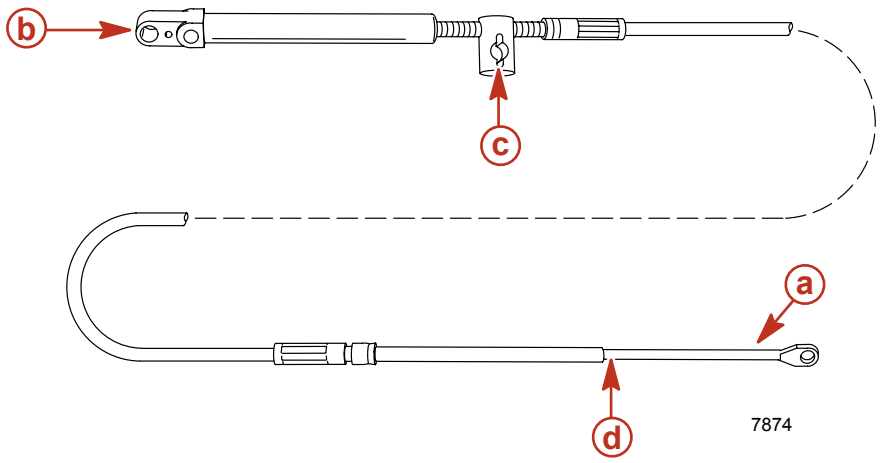
Improper cable bend

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.

IMPORTANT: Remote control cables MUST BE THE CORRECT LENGTH; sharp bends on too-short cables result in kinks and too-long cables require unnecessary bends or loops. Both conditions place extra stress on the cables.

IMPORTANT: Shift cable/throttle cable lubrication points use 2-4-C with Teflon.

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



a - Remote control end
b - Engine end
c - Adjusting barrel
d - Lubricating point

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C Marine Lubricant with Teflon	Shift cable end	92-802859A 1

NOTE: *Allow for clearance of cables directly behind panel mount remote control. The 4000 GEN II Series Panel Mount Remote Control mounting surface must not exceed 25 mm (1 in.) thickness. Cable radius at any one point must not be less than 305 mm (12 in.).*

4000 GEN II Series Panel Mount Remote Control	
Description	**Specification**
Mounting surface maximum thickness	25 mm (1 in.)
Minimum cable bend radius at any point	305 mm (12 in.)

4. Do not strap or clamp the control cables to any other cables or rigid structure within 91.4 cm (3 ft) of the control box.
5. Ensure that the cable is not permanently kinked.
6. 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.
7. 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.
8. Do not fasten the shift cable with straps or clamps to any other cable within 1.5 m (5 ft) of the shift plate.
9. 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.
10. Do not overtighten the throttle or shift cable attaching nuts at the engine end. Barrel and cable end must be free to rotate on the mounting stud.

NOTE: *Lubricate attaching points with engine oil.*

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

11. Check the intermediate shift cable routing from the transom assembly to the shift plate as follows:

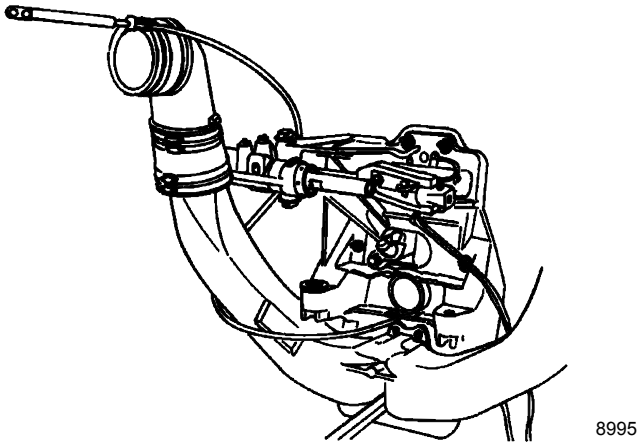
NOTE: *Cable route is the same for through transom and through prop exhaust.*

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.



Through prop exhaust shown

NOTE: *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 pre-delivery inspection*

12. Shift effort tools will be available for new installations using certain Quicksilver Gen II Controls. Refer to 90-865523 Instruction Sheet for more information.

Bravo Trim Limit Switch Adjustment - Analog Gauges

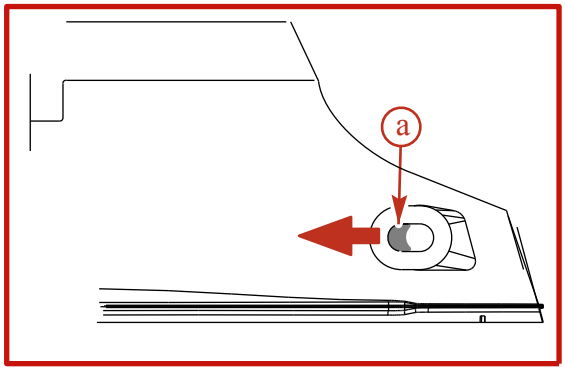
⚠ CAUTION

Trimming the sterndrive creates pinch points, which can cause personal injury. Stay clear from the sterndrive when trimming or tilting.

IMPORTANT: Follow these procedures exactly as outlined below. Incorrect switch adjustment can cause the drive unit to move beyond the gimbal ring support flanges, causing product damage.

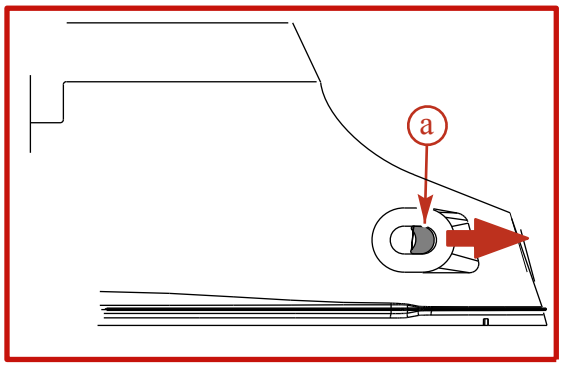
IMPORTANT: All Bravo models must have the trim-in-limit insert positioned properly before performing the trim position sender adjustment.

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



8548

Bravo One and Two (positioned forward)

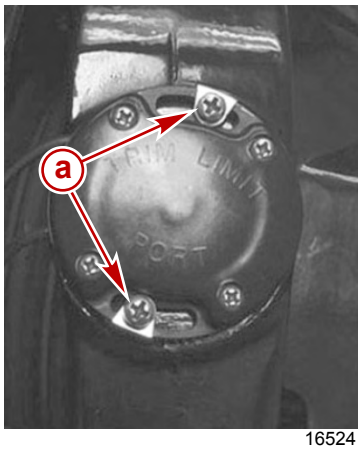


8557

Bravo Three (positioned aft)

a - Trim-in-limit insert

2. **Bravo sterndrive**, adjust trim limit switch as follows:
   a. Loosen screws and turn trim limit switch clockwise to end of slots.



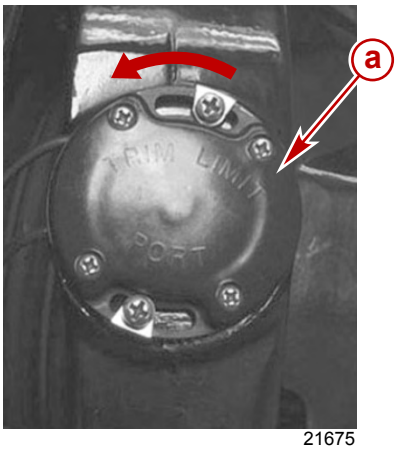
16524

Trim limit switch

a - Screws

   b. Ensure drive unit is in the full DOWN/IN position.
   c. Using the Trim button on the remote control, trim drive unit UP/OUT. DO NOT USE TRAILER BUTTON.

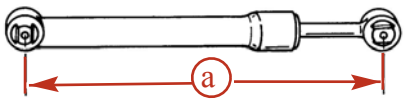
d. Slowly turn trim limit switch counterclockwise until trim cylinders extend to dimension shown.



21675

Trim limit switch

a - Rotate Counterclockwise To Adjust



8558

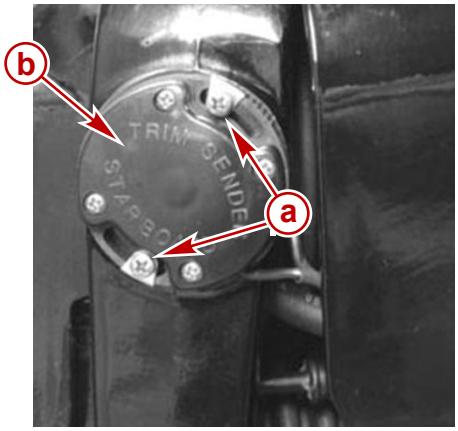
Bravo trim cylinder extended

a - Trim Limit Dimension 21-3/4 in. (552 mm)

e. Retighten screws when adjustment is correct.

Trim Position Sender Adjustment - Analog Gauges

1. Loosen both trim position sender retaining screws.



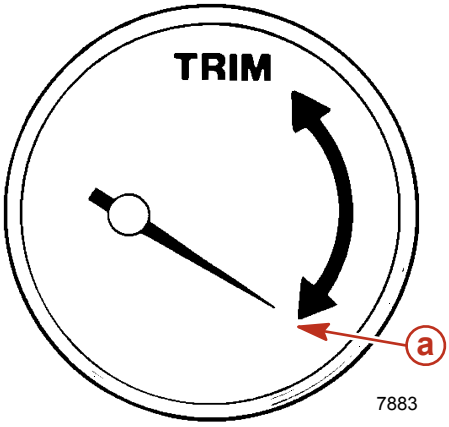
21676

a - Retaining screws **b -** Trim position sender

IMPORTANT: Do not start the engine during this procedure.

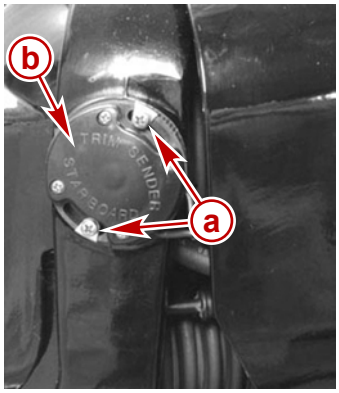
2. Turn ignition key to RUN position.
3. Trim sterndrive unit to the full DOWN/IN position.

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



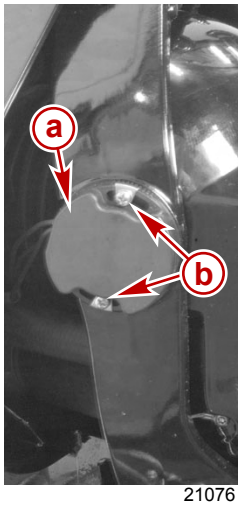
a - Trim gauge needle

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



a - Retaining screws **b -** Trim position sender

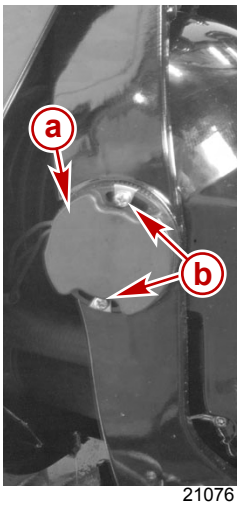
Trim Position Sender Adjustment - SmartCraft Gauges Scan Tool Method



a - Trim position sender **b -** Retaining screws

1. Trim the sterndrive unit to the full DOWN/IN position.
2. Remove the weather cap from the Diagnostic Link connector and connect the DDT Scan Tool.
3. Turn ignition key switch to the RUN position.
4. Set the scan tool to display TRIM POS counts and note the value displayed.
5. TRIM POS counts must be between 20 and 24 counts.
6. If TRIM POS counts are within specified range, proceed to step 6. Otherwise:
   a. Loosen both trim position sender retaining screws.
   b. Rotate the trim position sender until TRIM POS counts are within the specified range, preferably near the middle of the range.
   c. Tighten the trim position sender retaining screws.
   d. Verify TRIM POS counts are still within the specified range. Repeat steps "a" through "c" if necessary.
7. Turn the ignition key switch to the OFF position, disconnect the scan tool from the Diagnostic Link connector, and install the weather cap in the Diagnostic Link connector.

Trim Position Sender Adjustment - SmartCraft Gauges Multimeter Method



21076

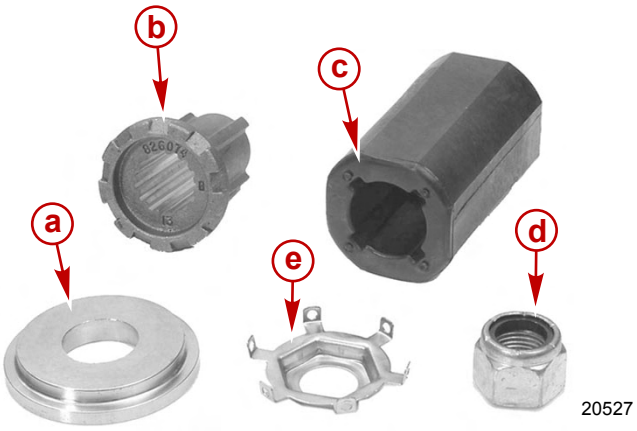
a - Trim position sender **b -** Retaining screws

1. Trim the sterndrive unit to the full DOWN/IN position.
2. Disconnect trim position sender wires from engine wiring harness connections.
3. Connect Multimeter leads to trim position sender wires and set Multimeter to display resistance (Ohms).
4. Note resistance reading. Resistance must be between 16 and 20 Ohms.
5. If resistance reading is within specified range, proceed to step 6. Otherwise:
   a. Loosen both trim position sender retaining screws.
   b. Rotate the trim position sender until resistance reading is within the specified range, preferably near the middle of the range.
   c. Tighten the trim position sender retaining screws.
   d. Verify resistance reading is still within the specified range. Repeat steps "a" through "c" if necessary.

6. Disconnect the trim position sender wires from the multimeter leads and reconnect trim position sender wires to engine wiring harness connections.
7. Refer to Mercury SmartCraft Operator's Manual for final Trim Calibration procedure.

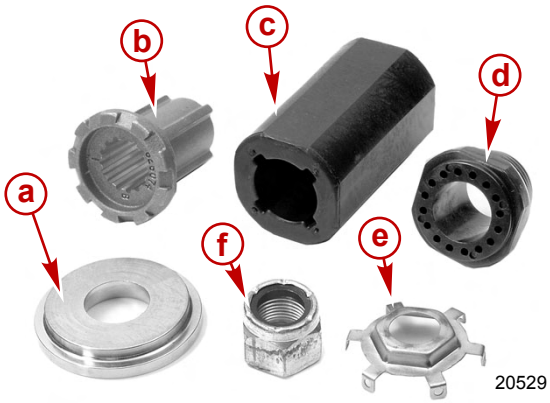
Bravo One Propeller Hub General Information

Bravo One Propeller Hubs Rated for Under 400 HP



Flo-Torq II Hub

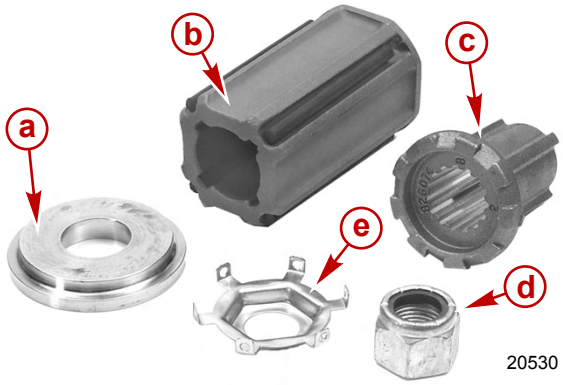
a - Forward thrust washer
b - Aft adaptor
c - Plastic drive sleeve
d - Prop nut
e - Tab washer



Flo-Torq II Hub with bushing

a - Forward thrust washer
b - Aft adaptor
c - Plastic drive sleeve
d - Bushing
e - Tab washer
f - Prop nut

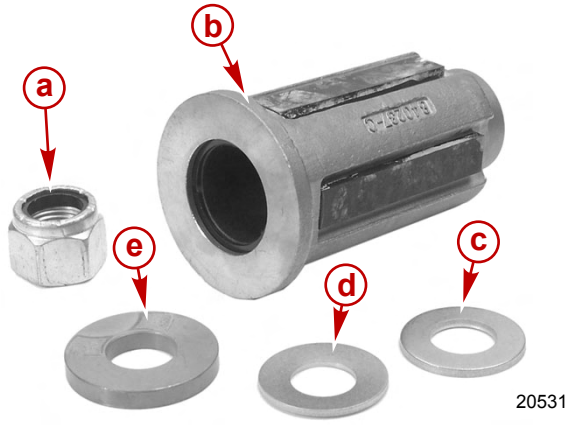
Bravo One Propeller Hub Rated for 400 HP and Over



Flo-Torq II Solid Hub

a - Forward thrust washer
b - Steel drive sleeve
c - Aft adaptor
d - Prop nut
e - Tab washer

Bravo One XR Propeller Hub



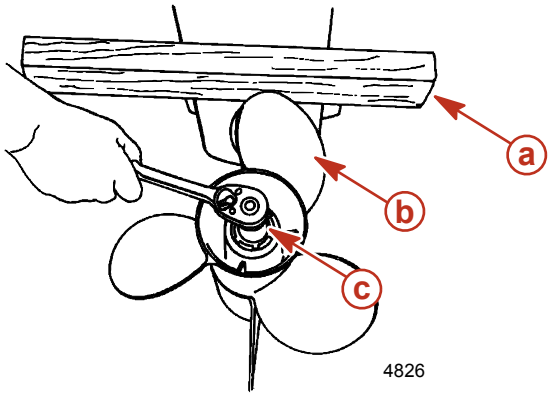
Flo-Torq II HD (heavy duty) Solid Hub

a - Prop nut
b - Steel drive sleeve with snubber stripes
c - Washer
d - Washer
e - Thick washer

Bravo Sterndrive Propeller Installation

⚠ WARNING

Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the propeller blade and the anti-ventilation plate.



a - Wood block
b - Propeller
c - Propeller nut under socket

Bravo One Models

IMPORTANT: Use the correct rotation propeller. The propeller rotation must match the direction of rotation of the propeller shaft.

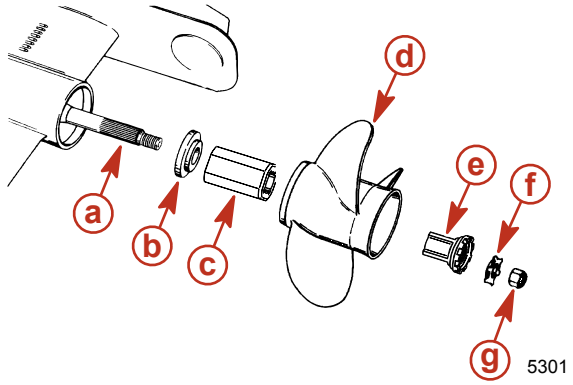
1. Coat the propeller shaft spline with one of the following Quicksilver lubricants.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Propeller shaft splines	92-802865Q02
95	2-4-C Marine Lubricant with Teflon	Propeller shaft splines	92-802859A 1
94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1

NOTE: *Anti-corrosion grease is for salt water applications only.*

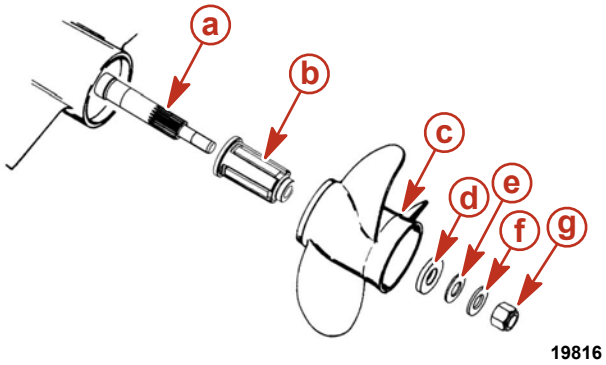
2. Install the propeller with the attaching hardware as shown.

3. Torque the propeller nut.



Typical Bravo One models

a - Propeller shaft splines
b - Forward thrust hub
c - Flo-Torque II drive hub
d - Propeller
e - Drive sleeve adapter
f - Tab washer
g - Propeller nut



Bravo One XR models

a - Propeller shaft
b - Propeller hub insert with snubbers
c - Propeller
d - Thick washer
e - Washer
f - Washer
g - Propeller nut

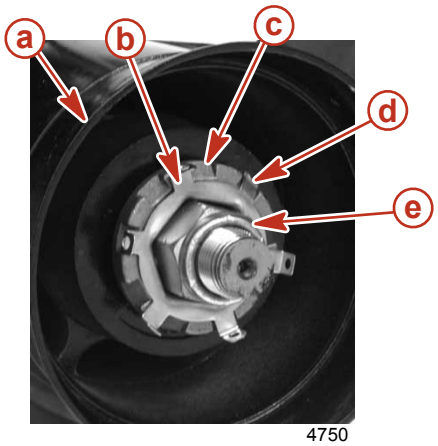
NOTE: *The propeller torque stated is a minimum torque value.*

Description	Nm	lb. in.	lb. ft.
Bravo One propeller nut	75	–	55

NOTE: *Bravo One XR models do not use the tab washer.*

4. Models equipped with the tab washer: Continue to tighten the propeller nut until the three tabs on the tab washer align with the grooves on the spline washer.

5. Bend the three tabs down into the grooves.



a - Prop
b - Tab washer
c - Drive sleeve adapter
d - Tab bent down
e - Propeller nut

Bravo Two Models

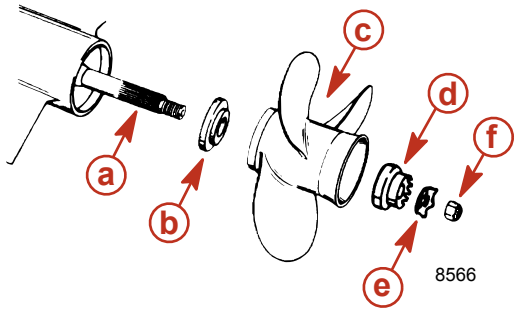
IMPORTANT: Use the correct rotation propeller. The propeller rotation must match the direction of rotation of the propeller shaft.

1. Coat the propeller shaft spline with one of the following Quicksilver lubricants.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Propeller shaft splines	92-802865Q02
95	2-4-C Marine Lubricant with Teflon	Propeller shaft splines	92-802859A 1
94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1

NOTE: *Anti-corrosion grease is for salt water applications only.*

2. Install the propeller with the attaching hardware as shown.
3. Torque the propeller nut.



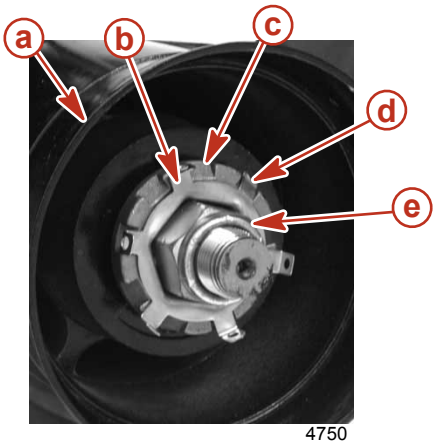
Bravo Two

a - Propeller shaft splines
b - Forward thrust hub
c - Propeller
d - Spline washer
e - Tab washer
f - Propeller nut

NOTE: *The propeller torque stated is a minimum torque value.*

Description	Nm	lb. in.	lb. ft.
Bravo Two propeller nut	81	–	60

4. Continue to tighten the propeller nut until the three tabs on the tab washer align with the grooves on the spline washer.
5. Bend the three tabs down into the grooves.



a - Prop
b - Tab washer
c - Drive sleeve adapter
d - Tab bent down
e - Propeller nut

Bravo Three

1. Coat the propeller shaft spline with one of the following Quicksilver lubricants.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Propeller shaft splines	92-802865Q02
95	2-4-C Marine Lubricant with Teflon	Propeller shaft splines	92-802859A 1
95	2-4-C Marine Lubricant with Teflon	Propeller shaft splines	92-802859A 1

NOTE: *Anti-corrosion grease is for salt water applications only.*

2. Slide forward thrust hub onto propeller shaft, with tapered side toward propeller hub.
3. Align splines and place front propeller on propeller shaft.
4. Install front propeller locknut and torque using the Propeller Nut tool.

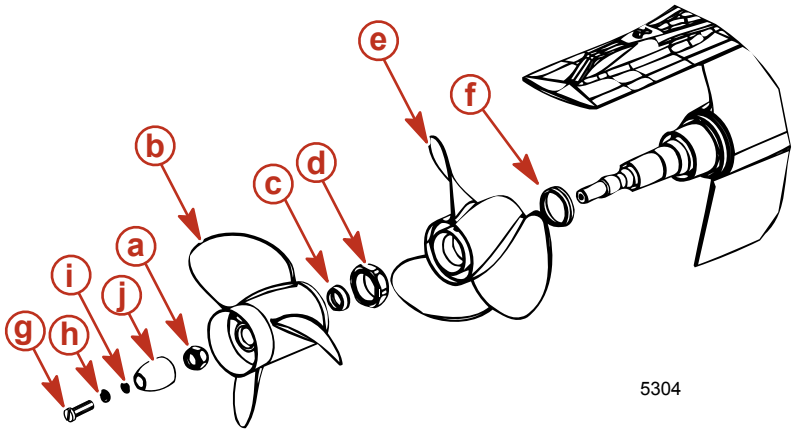
Propeller Nut Tool	91-805457T 1

Description	Nm	lb. in.	lb. ft.
Bravo Three front propeller nut	136	–	100

5. Slide aft thrust hub onto propeller shaft with tapered side toward propeller hub
6. Align splines and install aft propeller.
7. Install propeller nut and torque.

Description	Nm	lb. in.	lb. ft.
Bravo Three rear propeller nut	81	–	60

8. Install propeller shaft anode and screw and torque.



Bravo Three

a - Rear propeller nut
b - Rear propeller
c - Rear propeller thrust hub
d - Front propeller nut
e - Front propeller
f - Front propeller thrust hub
g - Propeller shaft anode screw
h - Flat washer
i - Star washer
j - Propeller shaft anode

Description	Nm	lb. in.	lb. ft.
Propeller shaft anode screw	19	168	–

Notes: