

TRANSOM ASSEMBLY

Section 4A - Service Procedures Requiring Minor Disassembly

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Bravo Transom Assembly Specifications

Torque Specifications

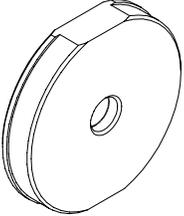
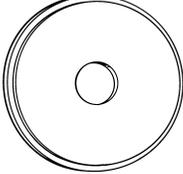
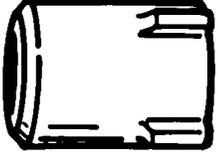
NOTE: Securely tighten all fasteners not listed below.

Description	Nm	lb-in.	lb-ft
Shift cable core wire anchor screws	2.3	20	
Exhaust bellows hose clamps	4	35	
Hinge pins	203		150
Flanged nut	7	65	
Trim wire retainer screw	11	95	

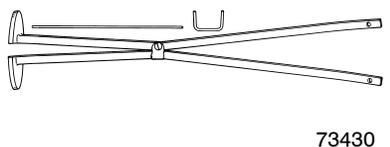
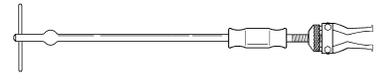
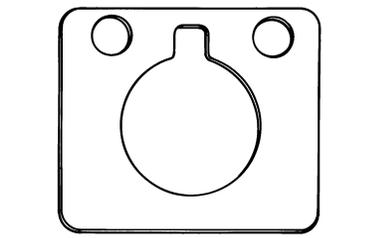
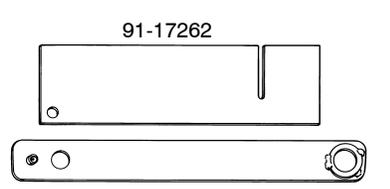
Lubricants / Sealants / Adhesives

Description	Where Used	Part Number
Bellows Adhesive	U-joint bellows	92-86166Q1
	Exhaust bellows	
	Bell housing side gear lube valve O-ring	
	Shift cable bellows	
	Mounting surfaces on inside of bellows	
2-4-C with Teflon	Threads of tapered insert	92-802859A1
	Gimbal ring clamp screw	
Perfect Seal	Flanged nut threads	92-34227-1
	Bayonet fitting	
	Water bypass plug	
Loctite 271 Threadlocker	Bell housing threads	92-809819
	Studs	
	Swivel shaft seal	
	Hinge pin washer inner surface	
High Performance Gear Lube	Gear lube valve O-rings	92-802854A1
Sealer Kit, Two Part Epoxy	Bushings	92-65150-1
U-Joint and Gimbal Bearing Grease	Gimbal bearing	92-802870A1
Super Glue	Gimbal housing seal	Obtain locally
	Exhaust passage seal	
Soapy water or engine cleaner	Sleeve outside diameter	Obtain locally
Special Lubricant 101	Hinge pin	92-802865Q 1
Loctite 242 Threadlocker	Threads Of Screw	Obtain locally
Lacquer Thinner	Exhaust Mounting Bellows	Obtain locally

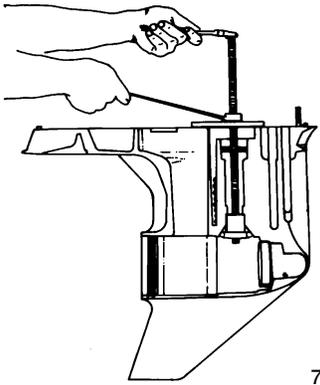
Special Tools

Retention Sleeve Removal Tool		
 <p>78063</p>	<p>Use to remove the U-joint bellows retention sleeve on all the Bravo 2000 transom assemblies.</p> <p>Used also to remove the aluminum sleeve from the U-joint bellows of all Bravo sterndrive units, Serial Number 0L99999 and below.</p>	<p>91-862546</p>
Hinge Pin Tool		
 <p>73443</p>	<p>Installs and removes the hinge pins from most all Mercury MerCruiser Transom units.</p>	<p>91-78310</p>
Sleeve Installation Tool		
 <p>73485</p>	<p>Installs the aluminum sleeve in the U-joint bellows of all the Bravo sterndrive units.</p>	<p>91-818162</p>
Tapered Insert Tool		
 <p>73456</p>	<p>Installs and removes the tapered insert retainer into the water inlet hose on all the Bravo transom units.</p>	<p>91-43579</p>

Special Tools (continued)

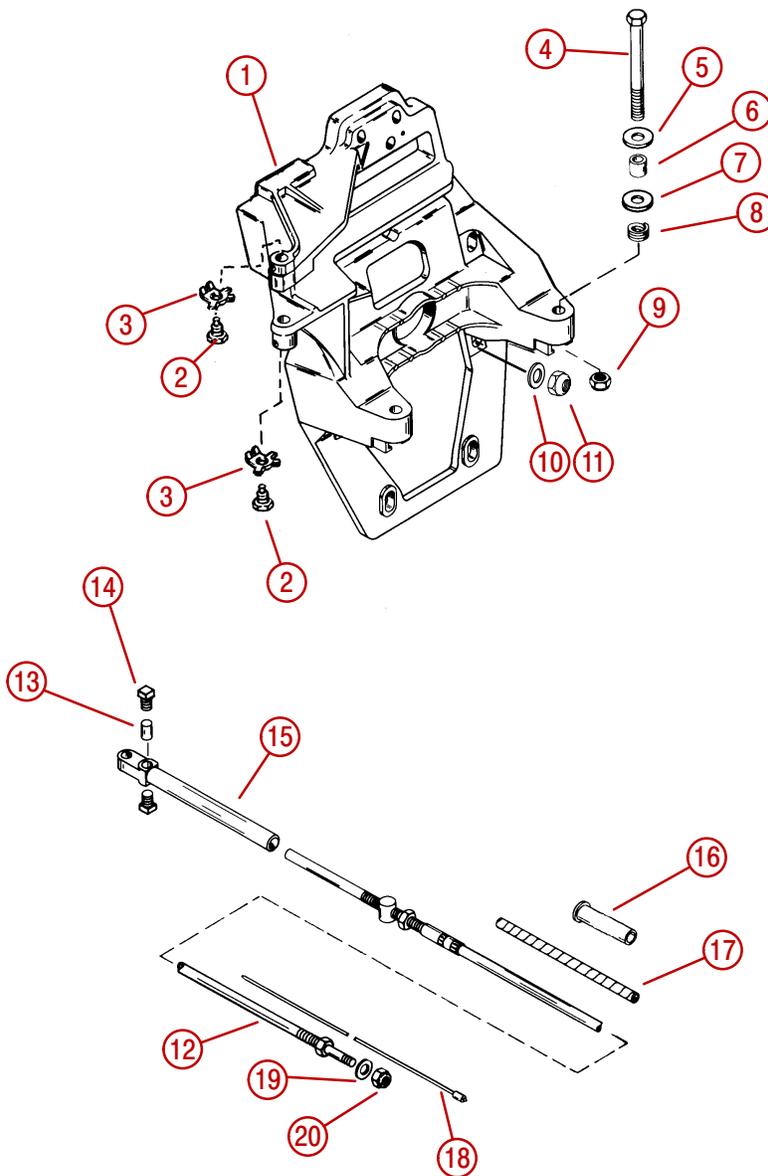
Bellows Expander Tool		
 <p>73430</p>	Installs the exhaust bellows on the Bravo One, Bravo Two, and Bravo Three Transom units.	91-45497A1
Slide Hammer Puller		
 <p>73655</p>	Removes the bearings and bearing cups. 91-34570 Replacement Jaw	91-34569A1
Clamp Plate		
 <p>73433</p>	Holds a preload while checking the backlash and bearing preload on all Mercury MerCruiser Bravo sterndrive units.	91-43559T
Shift Cable Anchor Adjustment Tool		
 <p>91-17262 91-17263 73478</p>	Used when installing a new Shift Cable Core wire in all Bravo Transoms. 91-17263 Core Wire Locating Tool 91-17262 Shift Cable Anchor Adjustment Tool	91-17262A1

Special Tools (continued)

Bearing Removal and Installation Tool Assembly		
 <p>70615</p>	<p>Installs and removes the bearings on all Alpha and Bravo sterndrive gear cases. 91-31229A7 tool assembly includes the following components:</p> <ul style="list-style-type: none"> 11-24156 Hex Nut 91-15755T Bearing Carrier 91-29310 Plate 91-29610 Pilot Plate 91-30366T1 Mandrel 91-31229 Puller Shaft 91-32325T Driver Head 91-32336 Driver Needle Bearing 12-34961 Washer 91-36379 Puller / Head Gear 91-36569T Driver Head 91-36571T Pilot Washer 91-37292 Roller Bearing 91-37311 Driver Head 91-37312 Driver Head 91-37323 Driver Head Rod 91-37324 Pilot Washer 91-38628T Puller / Driver Head 91-52393 Driver Needle Bearing 91-52394 Head Pull Rod 	<p>91-31229A7</p>

Bravo Transom Assembly Exploded Views

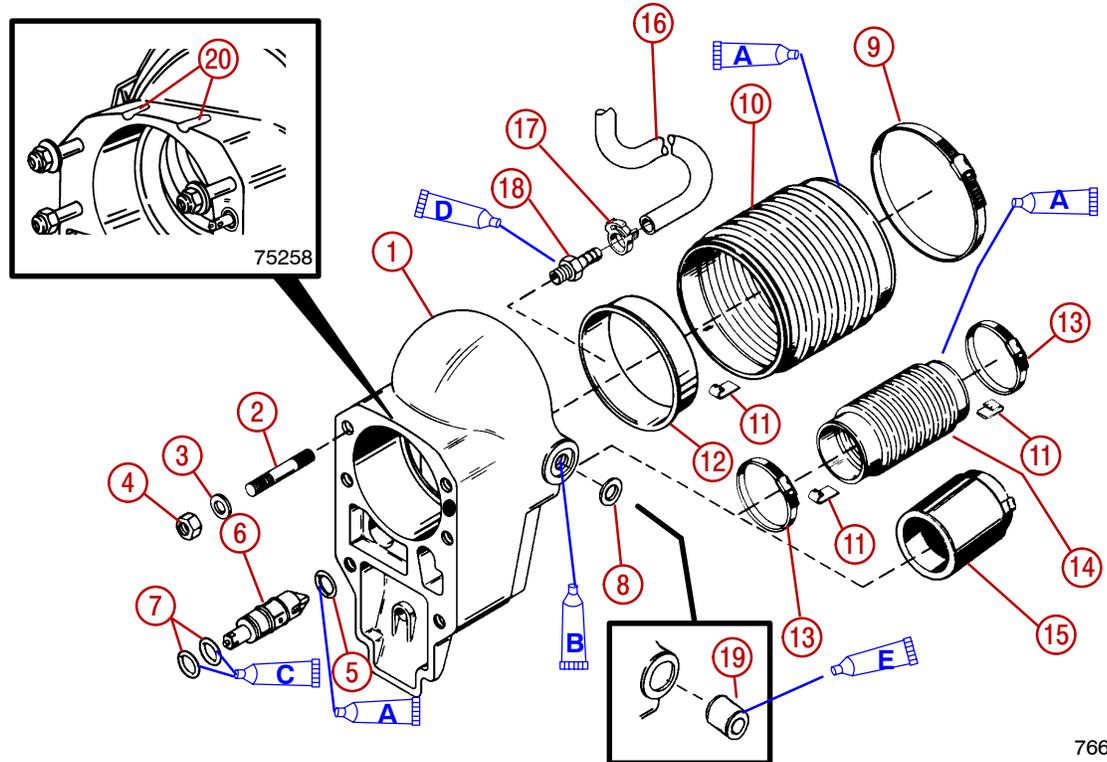
Inner Transom Plate Components



76857

- | | |
|--------------------------------------|--------------------------------|
| 1 - Transom plate assembly | 11 - Locknut |
| 2 - Pivot bolts | 12 - Shift cable casing |
| 3 - Tab washers | 13 - Core wire anchor |
| 4 - Rear engine mounting bolt | 14 - Set screws (2) |
| 5 - Washer | 15 - End guide |
| 6 - Spacer | 16 - Nylon tube |
| 7 - Washer - fiber | 17 - Nylon wrapping |
| 8 - Lockwasher - double wound | 18 - Core wire |
| 9 - Locknut | 19 - Sealing washer |
| 10 - Washer | 20 - Nut |

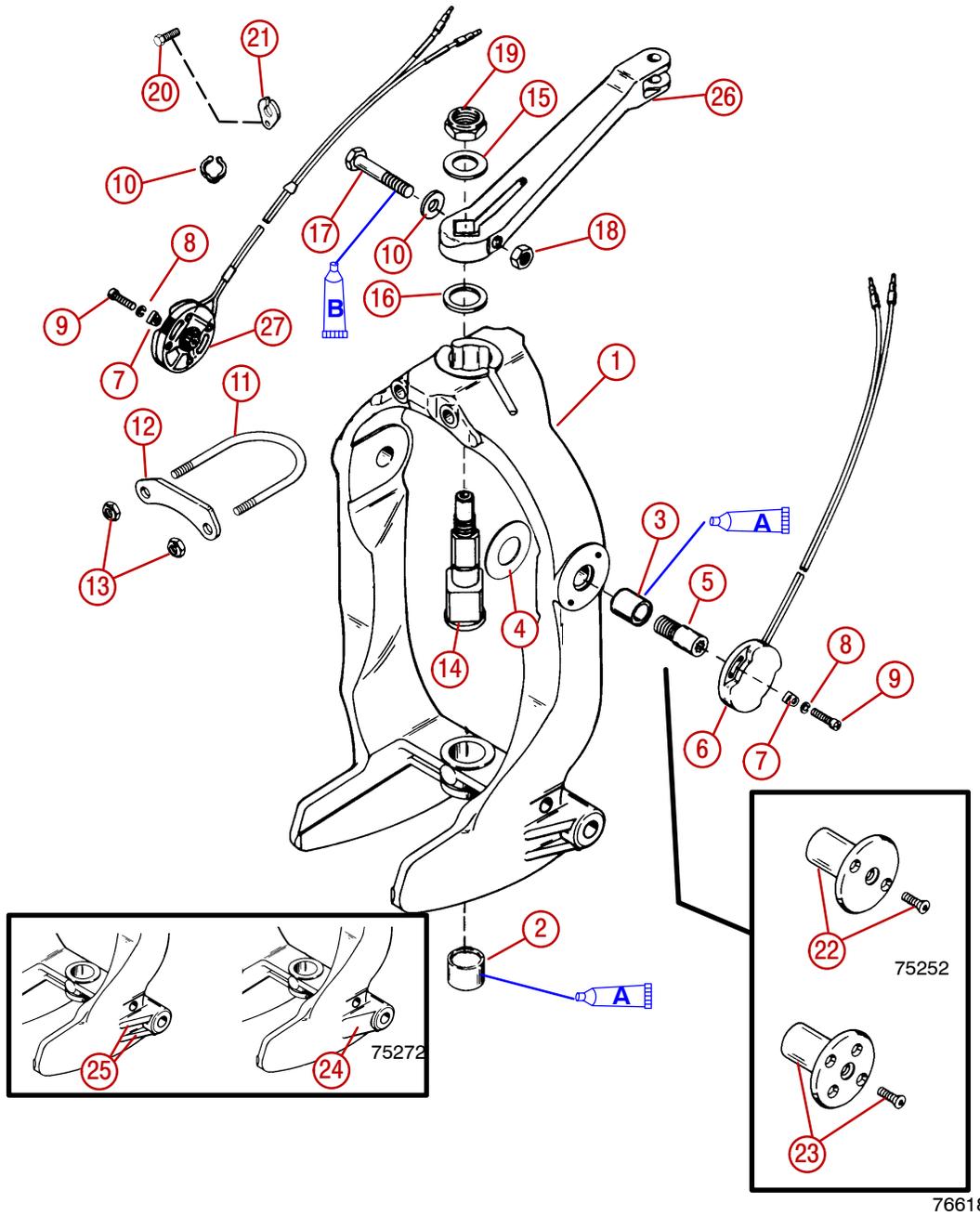
Bell Housing Components



- 1 - Bell housing
- 2 - Stud
- 3 - Washer
- 4 - Locknut
- 5 - O-ring
- 6 - Gear lube valve
- 7 - O-rings
- 8 - Hinge pin washer
- 9 - Bellows clamp
- 10 - U-joint bellows
- 11 - Grounding clip
- 12 - Sleeve
- 13 - Bellows clamp
- 14 - Exhaust bellows
- 15 - Exhaust tube (some models)
- 16 - Lube monitor hose
- 17 - Hose clamp
- 18 - Bayonet fitting
- 19 - Bushing (High Performance transom)
- 20 - Indentations in bell housing

Description	Where Used	Part Number
A Bellows Adhesive	U-joint bellows	92-86166Q1
	Exhaust bellows	
	Bell housing side gear lube valve O-ring	
B Loctite 271 Threadlocker	Hing pin washer inner surface	92-809819
C High Performance Gear Lube	Gear lube valve O-rings	92-802854A1
D Perfect Seal	Bayonet fitting	92-34227-1
E Sealer Kit, Two Part Epoxy	Bushing	92-65150-1

Gimbal Ring Components

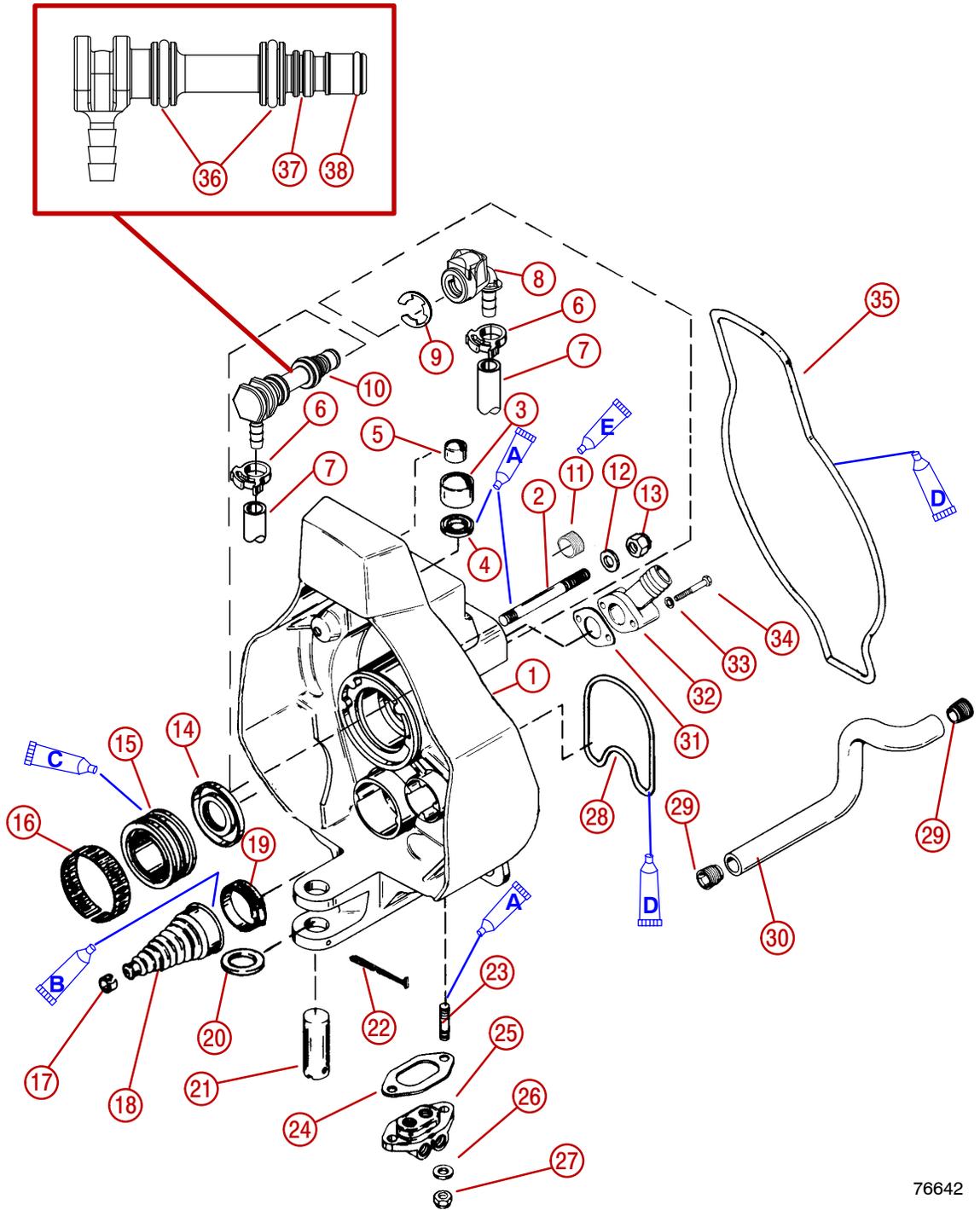


Gimbal Ring Components (continued)

- 1** - Gimbal ring
- 2** - Bushing
- 3** - Bushing
- 4** - Flat washer
- 5** - Hinge pin
- 6** - Trim position sender
- 7** - Flat washer
- 8** - Lockwasher
- 9** - Screw
- 10** - Clip
- 11** - U-Bolt
- 12** - Plate
- 13** - Locknuts
- 14** - Swivel shaft
- 15** - Flat washer (smaller ID)
- 16** - Flat washer (larger ID)
- 17** - Clamp screw
- 18** - Locknut
- 19** - Nut
- 20** - Screw
- 21** - Clamp plate
- 22** - High Performance hinge pin assembly (early style) (2 screws)
- 23** - High Performance hinge pin assembly (later style) (4 screws)
- 24** - Magnum and High Performance gimbal ring identification (filled area)
- 25** - Standard gimbal ring identification (2 ribs)
- 26** - Steering lever
- 27** - Trim limit switch

Description		Where Used	Part Number
A	Sealer Kit, Two Part Epoxy	Bushings	92-65150-1
B	2-4-C with Teflon	Gimbal ring clamp screw	92-802859A1

Gimbal Housing Components



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Gimbal Housing Components (continued)

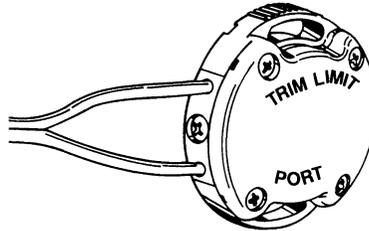
- | | |
|---|----------------------------------|
| 1 - Gimbal housing | 20 - Washer |
| 2 - Stud | 21 - Lower swivel pin |
| 3 - Swivel shaft bushing (lower) | 22 - Cotter pin |
| 4 - Swivel shaft seal | 23 - Stud |
| 5 - Swivel shaft bushing (upper) | 24 - Gasket |
| 6 - Clamp | 25 - Hydraulic manifold |
| 7 - Lube monitor hose | 26 - Washer |
| 8 - Quick disconnect fitting | 27 - Locknut |
| 9 - E-Clip | 28 - Exhaust passage seal |
| 10 - Gear lube fitting | 29 - Water hose insert |
| 11 - Water bypass plug | 30 - Water hose |
| 12 - Flat washer | 31 - Water fitting gasket |
| 13 - Locknut | 32 - Water fitting |
| 14 - Seal | 33 - Lockwasher |
| 15 - Gimbal bearing | 34 - Screw |
| 16 - Tolerance ring | 35 - Gimbal housing seal |
| 17 - Crimp clamp | 36 - Large O-rings |
| 18 - Shift cable bellows | 37 - Snap ring groove |
| 19 - Bellows clamp | 38 - Small O-ring |

Description		Where Used	Part Number
A	Loctite 271 Threadlocker	Studs	92-809819
		Swivel shaft seal	
B	Bellows Adhesive	Shift cable bellows	92-86166Q1
C	U-joint and Gimbal Bearing Grease	Gimbal bearing	92-802870A1
D	Super Glue	Gimbal housing seal	Obtain locally
		Exhaust passage seal	
E	Perfect Seal	Water bypass plug	92-34227-1

Special Information

Trim Limit Switch

The trim limit switch has a sealing system for improved water resistance and durability. The trim limit switch leads are connected internally to help ensure good electrical integrity.

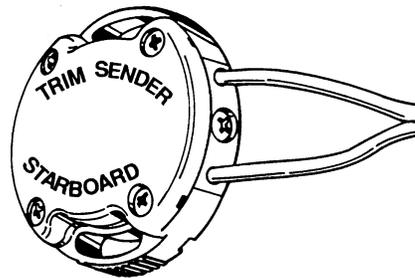


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Trim limit switch - port

Trim Position Sender

The trim position sender has a sealing system for improved water resistance and durability. The trim limit leads are connected internally to help ensure good electrical integrity.



71414

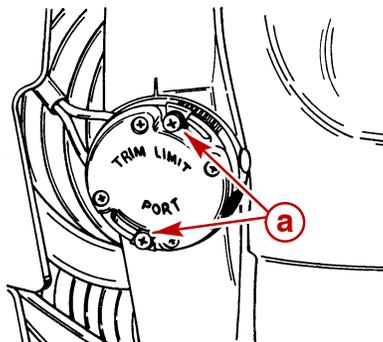
Trim position sender - starboard

Removal

⚠ WARNING

Disconnect both battery cables before installing new trim limit switch or trim sender.

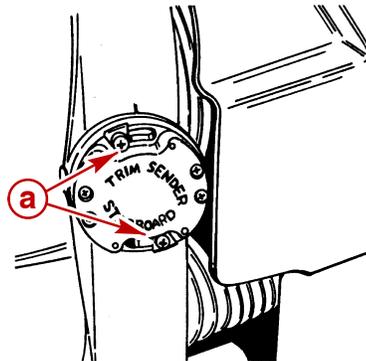
1. Remove sterndrive unit. Refer to **Section 2A**.
2. Remove trim limit switch.



71221

a - Attaching hardware

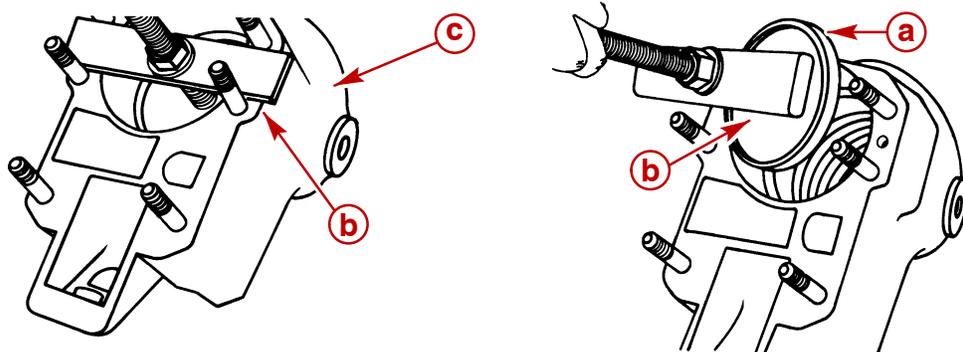
3. Remove trim position sender.



71220

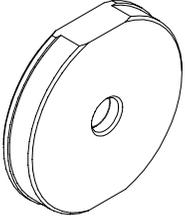
a - Attaching hardware

4. Spray engine cleaner around edge of bellows sleeve and remove with Retention Sleeve Removal Tool.

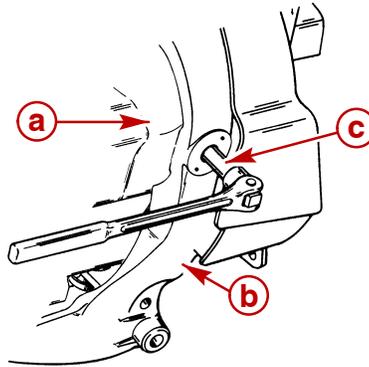


71527

a - Sleeve
b - Retention Sleeve Removal Tool
c - Bell housing

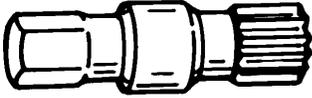
Retention Sleeve Removal Tool		
 <p>78063</p>	<p>Use to remove the U-joint bellows retention sleeve on all the Bravo 2000 transom assemblies.</p> <p>Used also to remove the aluminum sleeve from the U-joint bellows of all Bravo sterndrive units, Serial Number 0L99999 and below.</p>	<p>91-862546</p>

5. Remove starboard and port hinge pins.
 - a. Using the Hinge Pin Tool, loosen and remove hinge pin.



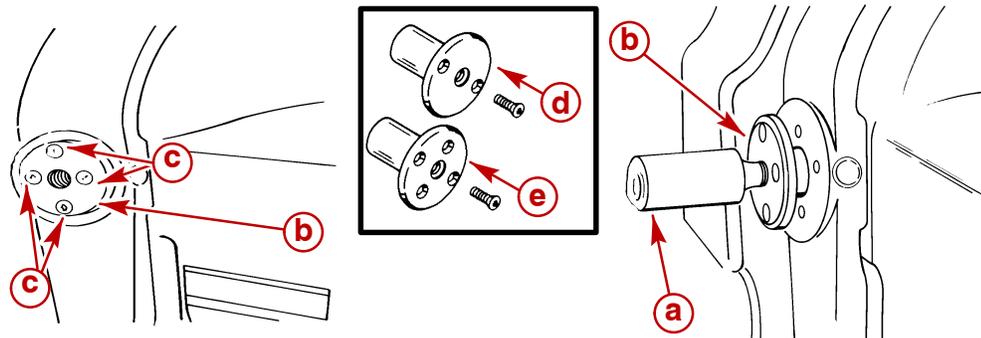
22113

- a** - Bell housing
- b** - Gimbal ring
- c** - Hinge Pin Tool

Hinge Pin Tool		
 <p>73443</p>	<p>Installs and removes the hinge pins from Mercury MerCruiser gimbal ring and bell housing assemblies.</p>	<p>91-78310</p>

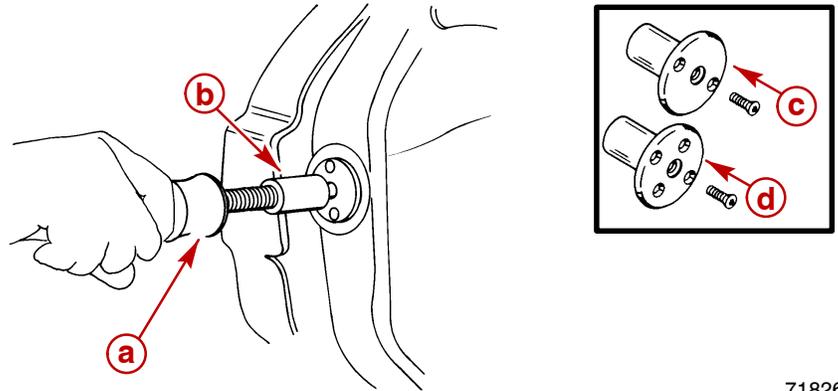
6. **High Performance Transom Assembly:** Remove hinge pins using Puller Head and Slide Hammer.

- a. Remove torx screws and thread Puller Head into the hinge pin.



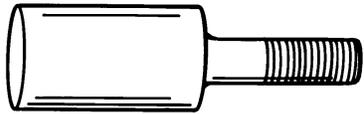
- a** - Puller Head
- b** - Hinge pin
- c** - Screw holes
- d** - High performance hinge pin early style (2 screws)
- e** - High performance hinge pin later style (4 screws)

b. Remove hinge pin by using the Slide Hammer Puller.

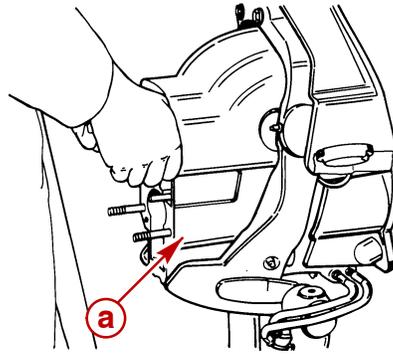


71826

- a** - Slide Hammer Puller
- b** - Puller Head
- c** - High Performance hinge pin early style (2 screws)
- d** - High Performance hinge pin later style (4 screws)

Puller Head		
 73428	Removes hinge pin from the Bravo One, Bravo Two and Bravo Three High Performance sterndrive units.	91-63616T
Slide Hammer Puller		
 73655	Removes the bearings and bearing cups. 91-34570 Replacement jaw	91-34569A1

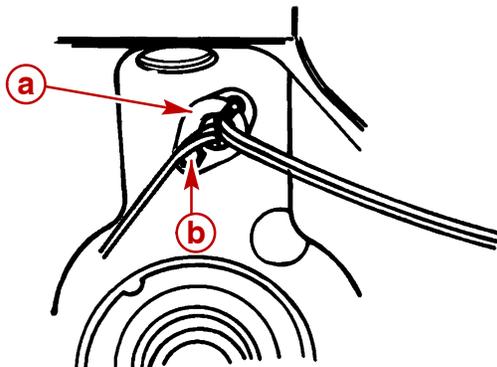
7. Pull back on bell housing and rotate it 90 degrees to gain access to the trim wire clamp plate screw.



23363

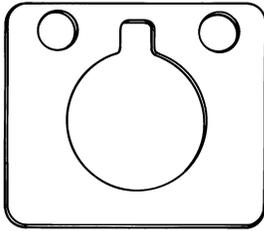
a - Bell housing

8. Remove trim wire clamp plate.



70197

a - Clamp Plate
b - Screw

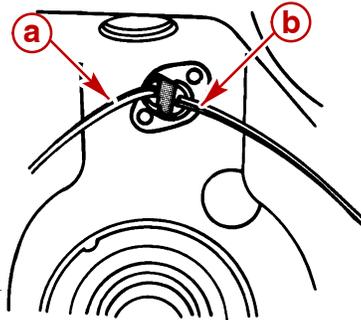
Clamp Plate		
 <p>73433</p>	<p>Holds a preload while checking the backlash and bearing preload on all Mercury MerCruiser Bravo sterndrive units.</p>	<p>91-43559T</p>

9. Unplug trim position sender wires from engine harness.
10. Unplug trim limit switch wires from trim pump.

Installation

NOTE: Old harness may be used to pilot new harnesses through hole in gimbal housing.

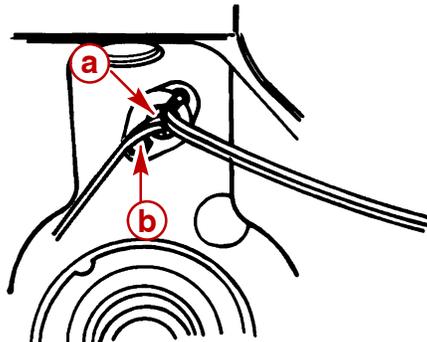
1. Route new sender wires through hole.
2. Bring together the two grommet halves and ensure that they are seated lightly in the hole with the flat mating edges vertically aligned.
3. Maintain light tension on the wires from inside the boat to hold the grommets in the hole.



70198

- a** - Trim limit switch wires
- b** - Trim position sender wires

4. Reinstall retainer and torque screw.

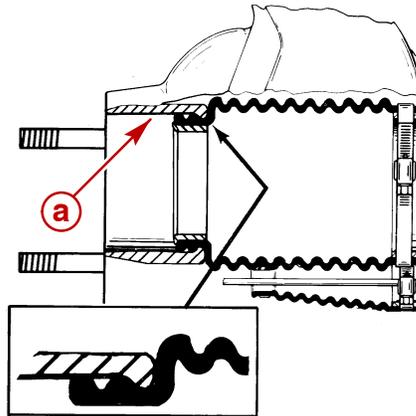


70197

- a** - Clamp
- b** - Screw

Description	Nm	lb-in.	lb-ft
Shift cable core wire retainer screw	11	95	

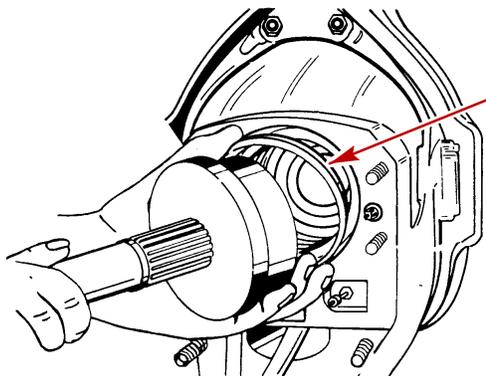
5. Install U-joint bellows on bell housing as follows:
 - a. Position U-joint bellows on bell housing. Ensure that the bell housing flange rests in the second groove from the end of the bellows.



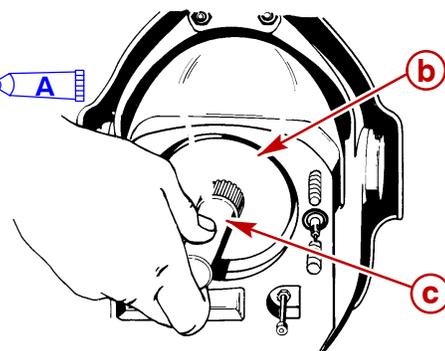
22116

a - Bell housing flange

- b. Lubricate sleeve outside diameter. Install sleeve with Sleeve Installation Tool and a suitable driving rod.



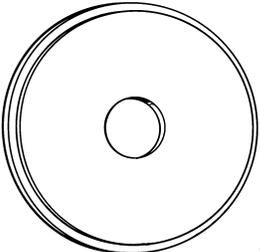
76670



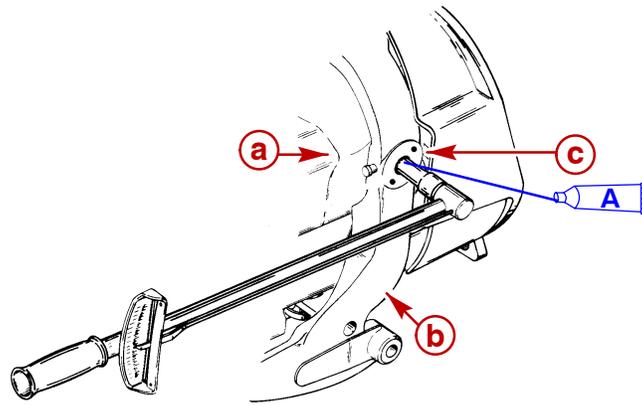
76671

- a** - Sleeve
- b** - Sleeve Installation Tool
- c** - Suitable driving rod

Description	Where Used	Part Number
A Soapy water or engine cleaner	Sleeve outside diameter	Obtain locally

Sleeve Installation Tool		
 73485	Installs the aluminum sleeve in the U-joint bellows of all the Bravo transom units.	91-818162

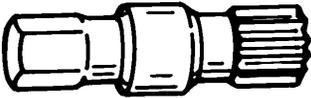
6. Apply sealant to bell housing threads and install port and starboard hinge pins.
7. Torque hinge pins.



76619

- a** - Bell housing
- b** - Gimbal ring
- c** - Hinge Pin Tool

Description	Where Used	Part Number
A Loctite 271 Threadlocker	Bell housing threads	92-809819

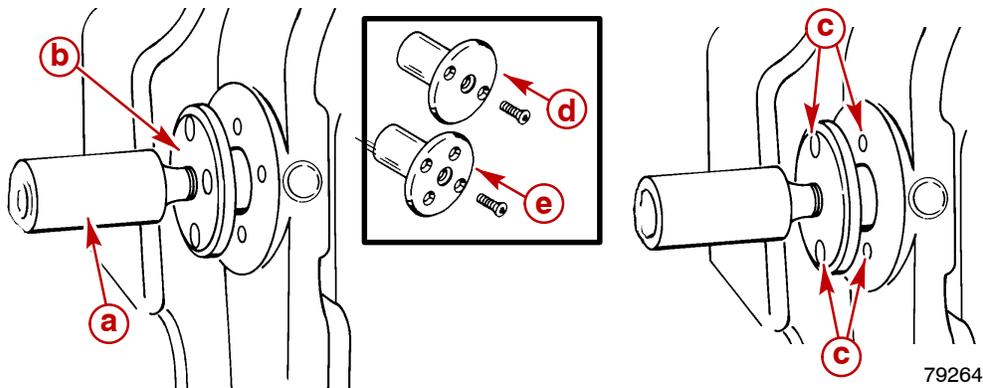
Hinge Pin Tool		
 73443	Installs and removes the hinge pins from Mercury MerCruiser gimbal ring and bell housing assemblies.	91-78310

Description	Nm	lb-in.	lb-ft
Hinge pins	203		150

8. **High Performance Models:** Install port and starboard hinge pins using Puller Head and Slide Hammer.
 - a. Thread Puller Head into hinge pin.
 - b. Lubricate hinge pin.

Description	Where Used	Part Number
Special Lubricant 101	Hinge pin	92-802865Q 1

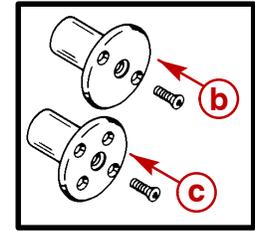
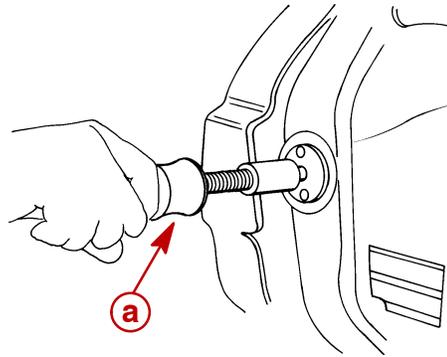
- c. Slide hinge pin through gimbal ring and bell housing.
- d. Align the screw holes in hinge pin with the screw holes in gimbal ring.



- a** - Puller Head
- b** - Hinge pin
- c** - Screw holes
- d** - High Performance hinge pin early style (2 screws)
- e** - High Performance hinge pin later style (4 screws)

Puller Head		
<p>73428</p>	Removes hinge pin from the Bravo One, Bravo Two and Bravo Three High Performance sterndrive units.	91-63616T

9. Lightly tap hinge pin into place using Slide Hammer.



71826

- a** - Slide Hammer
- b** - High Performance hinge pin early style (2 screws)
- c** - High Performance hinge pin later style (4 screws)

Slide Hammer Puller		
<p>73655</p>	Removes the bearings and bearing cups. 91-34570 Replacement Jaw	91-34569A1

10. Apply sealant to threads of screws.

11. Install and torque.

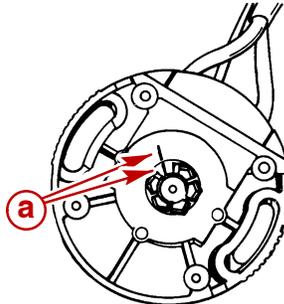
Description	Where Used	Part Number
Loctite 242 Threadlocker	Threads Of Screw	Obtain locally

Description	Nm	lb-in.	lb-ft
High performance hinge pin screws (2) early style	203		150
High performance hinge pin screws (4) later style	3	27	

Trim Position Sender and Switch Installation

NOTE: 496 cid (8.1 liter) models require a different procedure for adjustment. This procedure is not available at time of publication.

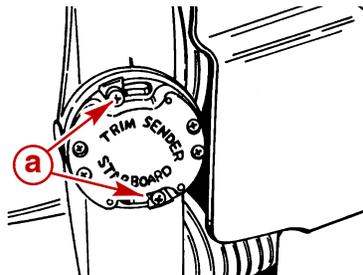
1. Place sterndrive unit in the full DOWN/IN position.
2. Turn center rotor of trim limit switch to align index mark with index mark on sender body.



71218

a - Index marks

3. Install trim position sender and secure with attaching hardware.

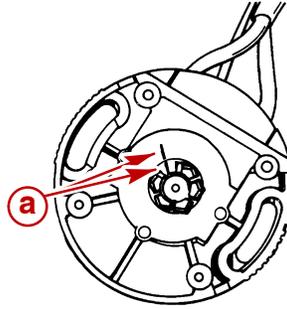


71220

a - Attaching hardware

4. Place sterndrive unit in full DOWN/IN position.

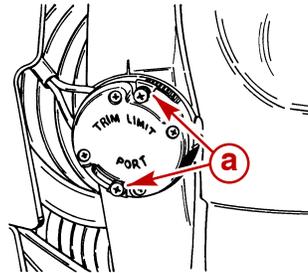
5. Turn center rotor of trim position sender to align index mark with index mark on sender body.



71218

a - Index marks

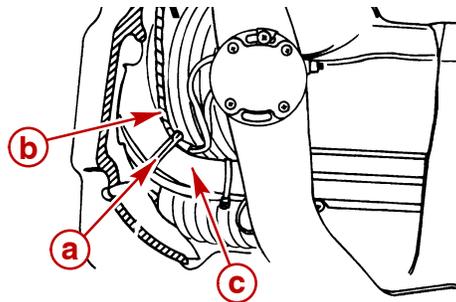
6. Install trim limit switch and secure with attaching hardware.



71221

a - Attaching hardware

7. Secure the trim limit switch harness to the water hose with the plastic clip.



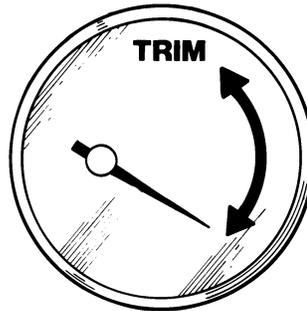
71184

a - Plastic clip
b - Trim limit switch harness
c - Water hose

8. Reconnect trim position sender wires to engine harness and the trim limit leads to trim pump harness.
9. Reinstall battery cables.

TRIM POSITION SENDER ADJUSTMENT

1. Turn ignition key to the RUN position. Do not start engine.
2. Rotate trim position sender until needle is at bottom of arc on gauge.



22175

3. Tighten trim position sender retaining screws and recheck gauge.

TRIM LIMIT SWITCH ADJUSTMENT

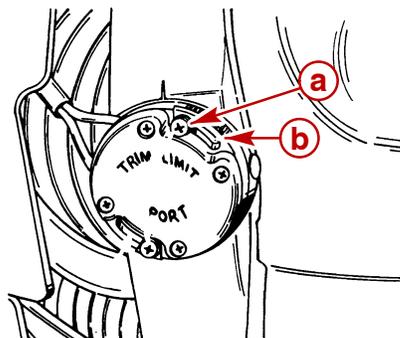
⚠ WARNING

When adjusting trim limit switch, use extreme care that engine is not started and keep clear of area near propeller. Use care to prevent placing hands in an area where injury could occur because of sterndrive unit movement.

⚠ CAUTION

Trim limit switch must be adjusted exactly as outlined. If switch is adjusted incorrectly, sterndrive unit could move out beyond the gimbal ring support flanges and cause damage to sterndrive unit.

1. Loosen screws and turn trim limit switch CLOCKWISE to end of slots.

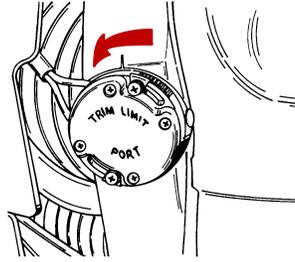


71221

- a** - Screws
- b** - Slots

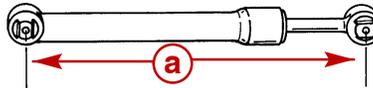
2. Ensure that sterndrive unit is in the full DOWN/IN position.
3. Trim sterndrive unit UP/OUT. Do not use trailer switch.

4. Slowly turn trim limit switch COUNTERCLOCKWISE until trim cylinders extend to correct dimension.



71221

5. Retighten screws when adjustment is correct.



50464

a - Trim limit dimension

Description	
Trim limit dimension	552 mm (21-3/4 in.)

High Performance Transom Assembly - Without Electrical Trim Sender and Trim Limit Switch

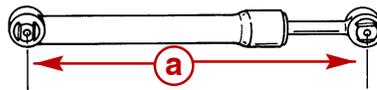
IMPORTANT: The electrical trim limit switch and trim position sender are not present on this transom assembly. Without a trim limit switch, the sterndrive unit can be trimmed UP/OUT beyond the position where the sterndrive unit has side support from the gimbal ring at any throttle setting. It is highly recommended that a mechanical (cable actuated) trim position indicator be installed to provide important sterndrive unit trim angle information to the operator and that the trim indicator be marked to clearly indicate the maximum UP/OUT position where side support is still provided. The sterndrive unit should not be trimmed to a position beyond gimbal ring side support at engine speeds above 1200 rpm.

⚠ WARNING

Avoid personal injury or damage to sterndrive unit. Do not trim sterndrive unit to an UP/OUT position where the sterndrive unit receives no side support from the gimbal ring at engine speeds above 1200 rpm. Refer to a properly marked mechanical trim position indicator.

1. Install WARNING DECAL (contained in the transom assembly box) at the operator station in a place where it will be clearly visible to the operator.
2. To mark the maximum trim UP/OUT position on the mechanical trim indicator, proceed as follows:
 - a. Trim sterndrive units to the FULL DOWN/IN position.
 - b. Ensure that the mechanical trim indicator indicates FULL DOWN/IN position. Adjust the indicator following the manufacturers recommendations.

- c. Slowly raise the sterndrive units until the trim limit point is reached. The trim limit point can be determined by measuring the amount of trim cylinder extension. The dimension for the Bravo sterndrive units is measured from front anchor point to rear anchor point centerlines as shown following.



50464

a - Trim limit dimension

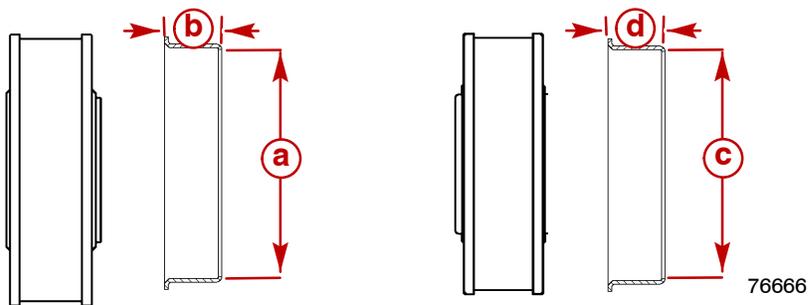
Description	
Trim limit dimension	552 mm (21-3/4 in.)

- 3. With the trim cylinders at this position, place a mark on the mechanical trim indicator in console.
 - a. Raise and lower sterndrive units several times to ensure that the trim limit point is properly marked.

Gimbal Bearing

IMPORTANT: Gimbal bearing and carrier are a matched set and must be replaced as an assembly. Tolerance ring must be replaced any time gimbal bearing is removed.

NOTE: The gimbal bearing inner race thickness has changed to accommodate the larger U-joint used in the X, XZ, and XR Bravo sterndrive units. If an X, XZ, or XR sterndrive unit is installed on a transom with the thicker gimbal bearing, interference will occur between the U-joint and the bearing. Either one or both components will fail. The new gimbal bearing can be identified by a red dot.

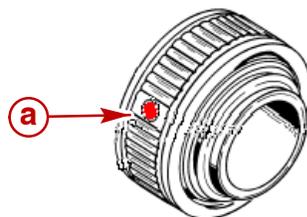


New

76666

Old

- a** - 9.47 cm (3.73 in.)
- b** - 2.05 cm (0.81 in.)
- c** - 9.37 cm (3.69 in.)
- d** - 2.54 cm (1.00 in.)



79222

a - Red dot

Inspection

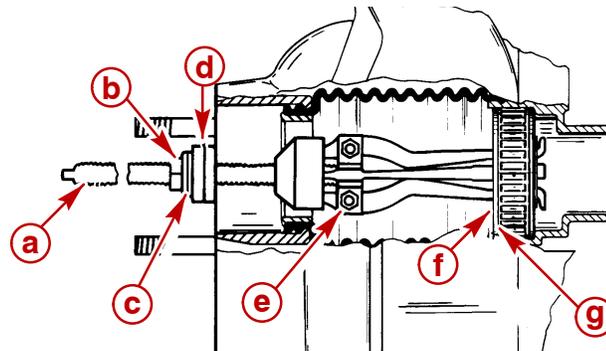
1. Remove sterndrive unit.
2. Reach through bell housing. Rotate gimbal bearing and check for rough spots. Pull and push on inner race to check for side wear. Any excessive movement or roughness is cause for replacement.

Removal

CAUTION

Do not remove gimbal bearing unless replacement is necessary, as damage to bearing may result during removal.

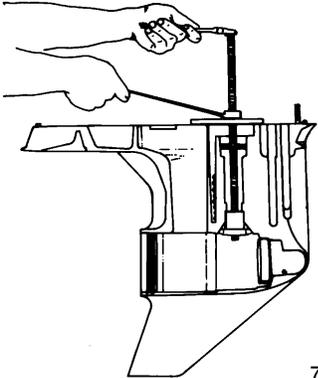
1. Remove gimbal bearing assembly.

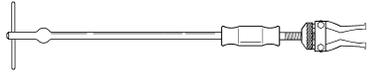


- a - Puller shaft
- b - Nut
- c - Washer
- d - Plates (3)
- e - Slide Hammer Puller
- f - Gimbal bearing inner race
- g - Gimbal bearing carrier

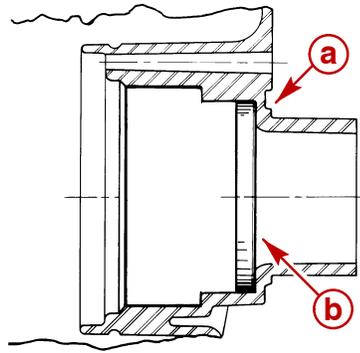
76658

NOTE: Plate Puller included in Bearing Removal and Installation Tool Assembly part number 91-31339A7.

Bearing Removal and Installation Tool Assembly		
 <p>70615</p>	<p>Installs and removes the bearings on all Alpha and Bravo sterndrive gear cases.</p> <p>91-31229A7 tool assembly includes the following components:</p> <ul style="list-style-type: none"> 11-24156 Hex Nut 91-15755T Bearing Carrier 91-29310 Plate 91-29610 Pilot Plate 91-30366T1 Mandrel 91-31229 Puller Shaft 91-32325T Driver Head 91-32336 Driver Needle Bearing 12-34961 Washer 91-36379 Puller / Head Gear 91-36569T Driver Head 91-36571T Pilot Washer 91-37292 Roller Bearing 91-37311 Driver Head 91-37312 Driver Head 91-37323 Driver Head Rod 91-37324 Pilot Washer 91-38628T Puller / Driver Head 91-52393 Driver Needle Bearing 91-52394 Head Pull Rod 	<p>91-31229A7</p>

Slide Hammer Puller		
 <p>73655</p>	<p>Removes the bearings and bearing cups.</p> <ul style="list-style-type: none"> 91-34570 Replacement Jaw 	<p>91-34569A1</p>

- Remove grease seal using a Slide Hammer Puller.



- a** - Gimbal housing
- b** - Grease seal

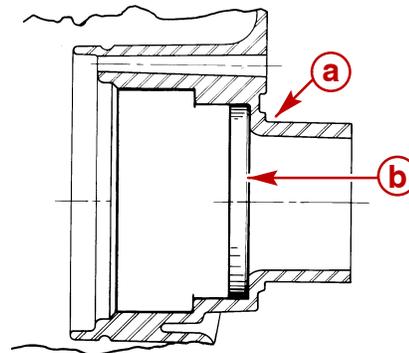
22171

Slide Hammer Puller		
 <p>73655</p>	<p>Removes the bearings and bearing cups.</p> <p>91-34570 Replacement Jaw</p>	<p>91-34569A1</p>

Installation

- Install grease seal using a suitable mandrel.

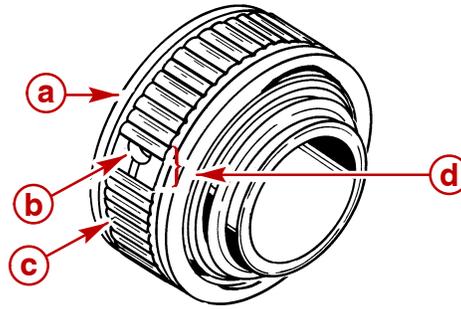
NOTE: The seal should be installed with the open face of the seal towards the gimbal bearing.



- a** - Gimbal housing
- b** - Grease seal

22171

2. Install and position new tolerance ring.



22159

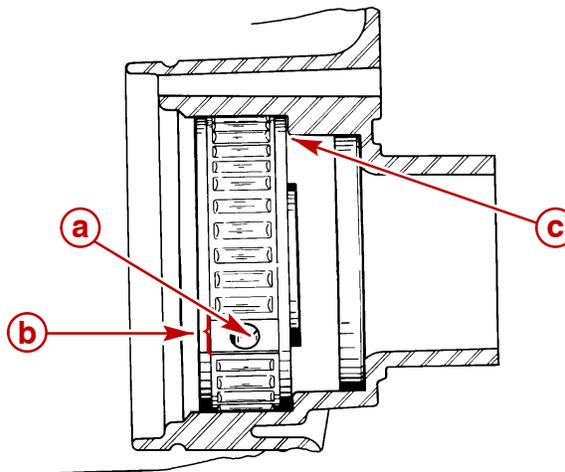
- a** - Carrier
- b** - Carrier grease hole
- c** - Tolerance ring
- d** - Opening in tolerance ring

3. Align opening in tolerance ring with grease hole in gimbal bearing cartridge.

IMPORTANT: Red dot on gimbal bearing must be positioned at 10 o'clock portside.

IMPORTANT: Ensure that notched edge of bearing carrier faces inward in bore.

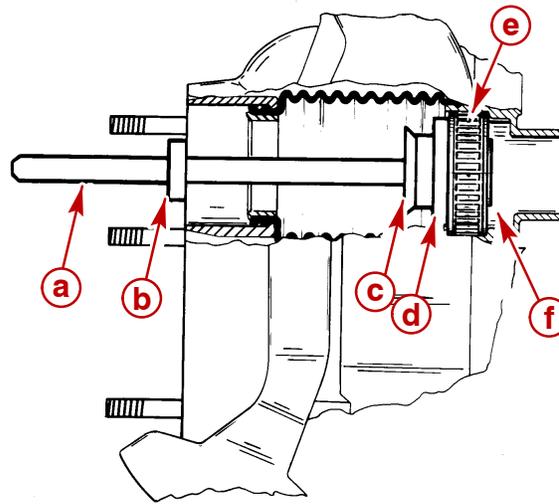
4. Align gimbal bearing carrier grease hole and tolerance ring opening with grease cavity hole in gimbal housing.



76559

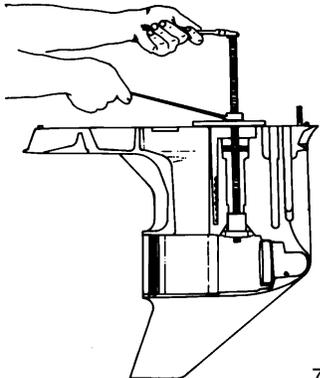
- a** - Gimbal bearing carrier grease hole
- b** - Tolerance ring opening
- c** - Bearing carrier notch

5. Install gimbal bearing with the red dot facing out toward the drive end using a brass hammer and tools shown. Ensure that the gimbal bearing carrier contacts gimbal housing.



22118

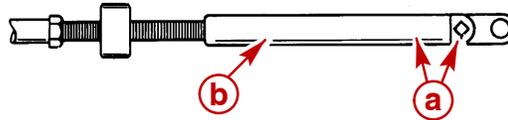
- a** - Drive Rod
- b** - Plate
- c** - Puller / Driver Head
- d** - Mandrel
- e** - Gimbal bearing assembly (red dot facing out)
- f** - Chamfer

Bearing Removal and Installation Tool Assembly		
 <p style="text-align: right; margin-right: 10px;">70615</p>	<p>Installs and removes the bearings on all Alpha and Bravo sterndrive gear cases.</p> <p>91-31229A7 tool assembly includes the following components:</p> <ul style="list-style-type: none"> 11-24156 Hex Nut 91-15755T Bearing Carrier 91-29310 Plate 91-29610 Pilot Plate 91-30366T1 Mandrel 91-31229 Puller Shaft 91-32325T Driver Head 91-32336 Driver Needle Bearing 12-34961 Washer 91-36379 Puller / Head Gear 91-36569T Driver Head 91-36571T Pilot Washer 91-37292 Roller Bearing 91-37311 Driver Head 91-37312 Driver Head 91-37323 Driver Head Rod 91-37324 Pilot Washer 91-38628T Puller / Driver Head 91-52393 Driver Needle Bearing 91-52394 Head Pull Rod 	<p>91-31229A7</p>

Shift Cable

Removal

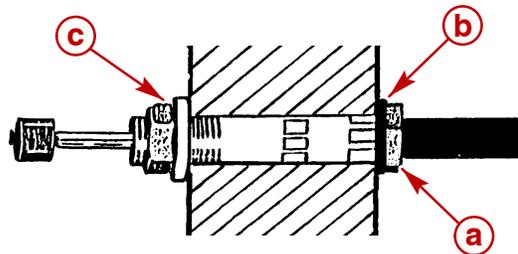
1. Remove sterndrive unit. Refer to **Section 2A**.
2. Disconnect shift cable from shift plate and remove end guide.



22183

- a** - Anchor screws (2) - loosen
- b** - End guide

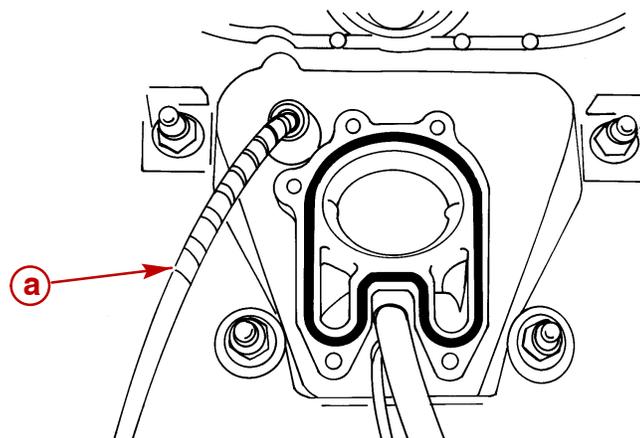
3. Hold shift cable retaining nut with wrench.
4. Remove flanged nut.



76673

- a** - Shift cable retaining nut
- b** - Seal washer
- c** - Flanged nut

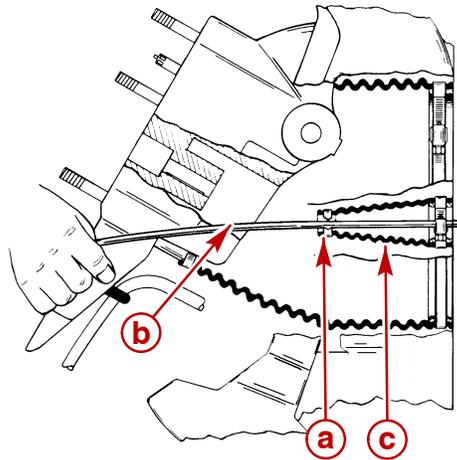
5. Remove shift cable wrapping.



76639

- a** - Shift cable wrapping

- Loosen shift cable bellows crimp clamp.



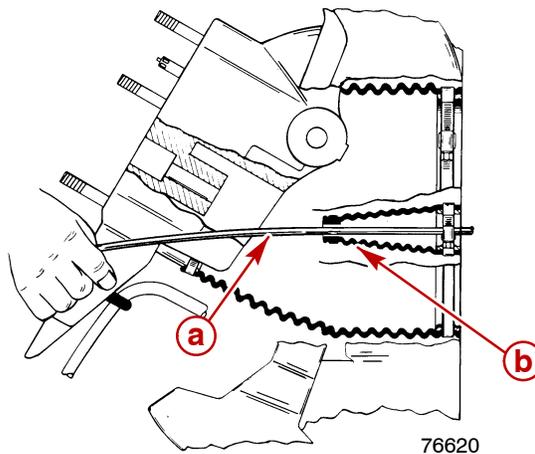
50458

- a** - Crimp clamp
- b** - Shift cable
- c** - Shift cable bellows

- Pull shift cable through shift cable bellows.

Shift Cable Installation

- Insert shift cable end into and through shift cable bellows.



76620

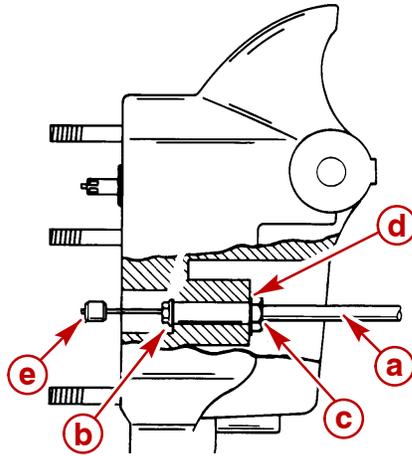
- a** - Shift cable end
- b** - Shift cable bellows

- Apply sealant to flanged nut.

Description	Where Used	Part Number
Perfect Seal	Flanged nut threads	92-34227-1

- Secure shift cable to bell housing.

4. Hold shift cable retaining nut with wrench and torque flanged nut.

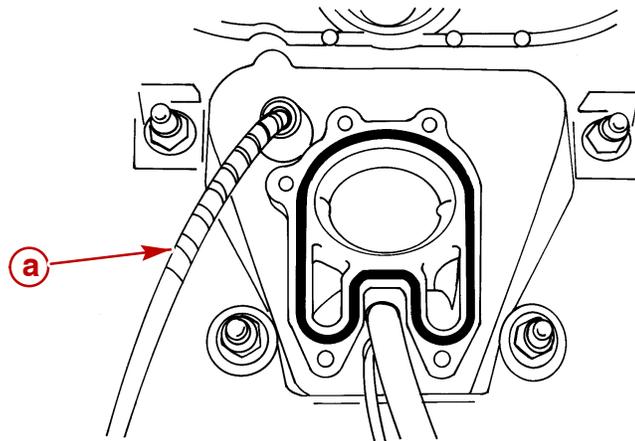


50327

- a** - Shift cable
- b** - Flanged nut
- c** - Shift cable retaining nut
- d** - Seal washer (hidden by nut)
- e** - Core wire

Description	Nm	lb-in.	lb-ft
Flanged nut	7	65	

5. Install shift cable wrapping approximately 51 mm (2 in.) from gimbal housing.



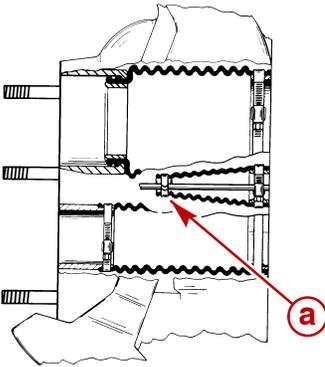
76639

- a** - Shift cable wrapping

⚠ CAUTION

Water leakage may result if clamp is not installed properly. Ensure that bellows end is not flattened out when crimping in the following step.

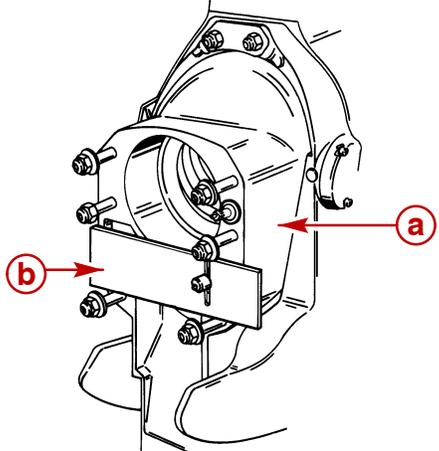
- 6. Install and compress shift cable bellows crimp clamp, maintaining a 13 mm (1/2 in.) diameter round OD. Ensure that clamp is crimped evenly to maintain a good seal between bellows and shift cable. Refer to Crimp Clamp Tool. Do not allow bellows to flatten.



22117

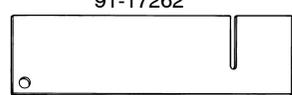
a - Crimp clamp

- 7. Install Core Wire Locating Tool on face of bell housing.

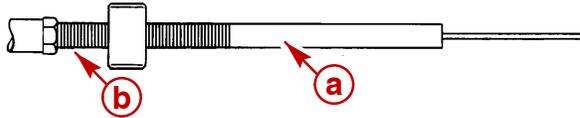


50327

a - Bell housing
b - Core Wire Locating Tool

Shift Cable Anchor Adjustment Tool		
 <p>91-17262</p>	Installs and removes shift shaft bushings on all the Bravo transom units. 91-17263 Core Wire Locating Tool 91-17262 Shift Cable Anchor Adjustment Tool	91-17262A1
 <p>91-17263 73478</p>		

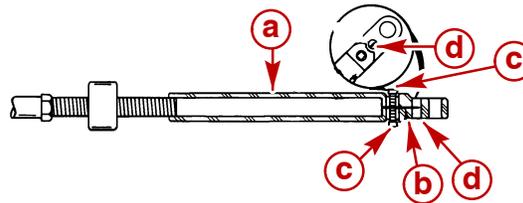
8. Install threaded tube until it contacts.
9. Tighten finger-tight.
10. Tighten jam nut securely.



22183

- a** - Threaded tube
- b** - Jam nut

11. Install cable end guide over core wire and insert core wire through cable anchor.
12. Ensure that core wire is visible in sight port. Tighten anchor screws evenly and torque.

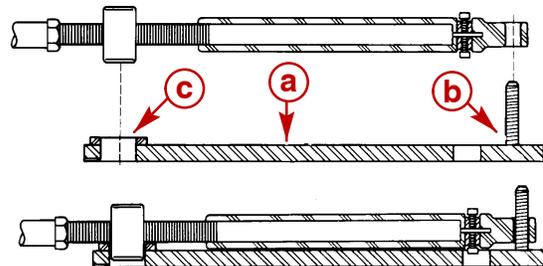


79263

- a** - Cable end guide
- b** - Core wire
- c** - Anchor screws
- d** - Sight port

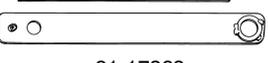
Description	Nm	lb-in.	lb-ft
Steering cable anchor screws	2.3	20	

13. Place Shift Cable Anchor Adjustment Tool on the end of the shift cable.

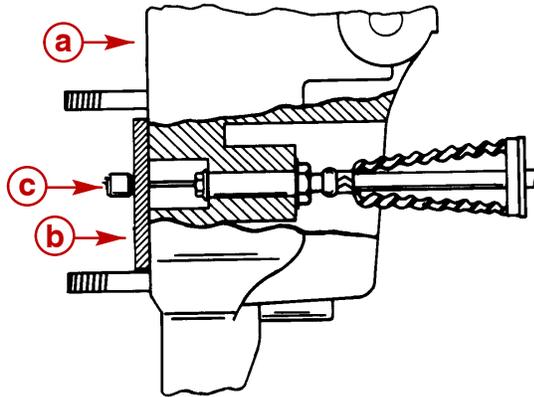


22120

- a** - Shift Cable Anchor Adjustment Tool
- b** - Stud
- c** - Hole barrel placed here

Shift Cable Anchor Adjustment Tool		
 <p>91-17262</p>  <p>91-17263 73478</p>	Installs and removes shift shaft bushings on all the Bravo transom units. 91-17262 Shift Cable Anchor Adjustment Tool	91-17262A1

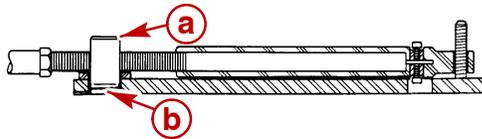
14. Ensure that bell housing end of core wire is positioned tight against Core Wire Locating Tool.



22121

- a** - Bell housing
- b** - Core Wire Locating Tool
- c** - Core wire

15. Adjust cable barrel to align with hole in tool.
16. Remove tools and install cable on shift plate assembly, being careful not to move the adjustment.



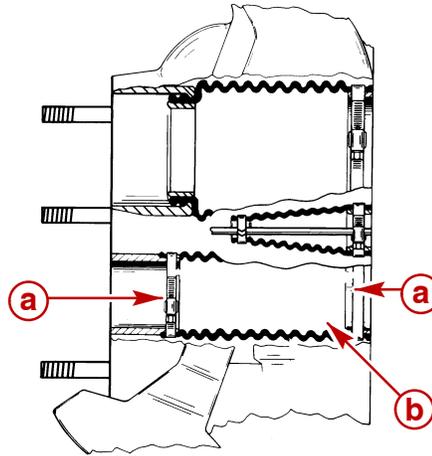
22120

- a** - Barrel
- b** - Hole in tool

Exhaust Bellows (If Equipped)

Removal

1. Remove sterndrive unit. Refer to **Section 2A**.
2. Loosen clamps and remove bellows.



- a** - Clamps
- b** - Bellows

22116

Cleaning and Inspection

1. Inspect exhaust bellows for internal charring, cracks, cuts, or hardening.
2. Clean old adhesive from bellows mounting flange on gimbal housing and on bell housing with lacquer thinner.

Description	Where Used	Part Number
Lacquer Thinner	Bellows mounting flange	Obtain Locally

3. Clean old adhesive from mounting surface of exhaust bellows if using old bellows.
4. Roughen exhaust bellows mating surfaces with sandpaper and wipe clean with lacquer thinner.

Description	Where Used	Part Number
Lacquer Thinner	Bellows mounting flange	Obtain Locally

Installation

IMPORTANT: All replacement bellows should be part number 18654A1. Do not use earlier model bellows.

⚠ WARNING

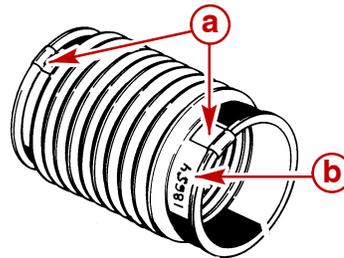
Be sure to follow label directions when using Bellows Adhesive.

1. Apply adhesive to mounting surfaces on inside of bellows. Allow adhesive to dry until no longer tacky (approximately 10 minutes).

⚠ CAUTION

Bellows clamps may corrode if grounding clips are not installed.

2. Position grounding clips on bellows.

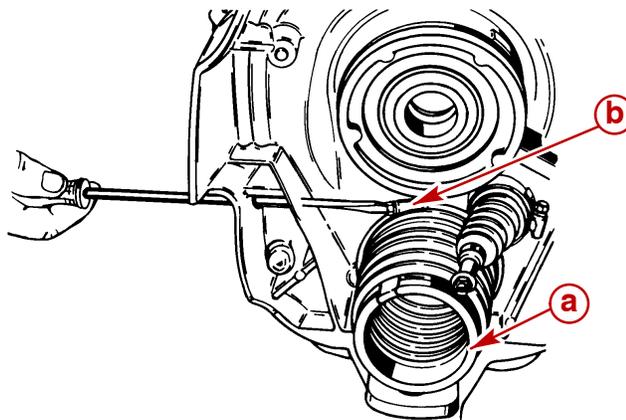


22079

- a** - Grounding clips
- b** - Part number

Description	Where Used	Part Number
Bellows Adhesive	Mounting surfaces on inside of bellows	92-86166Q1

3. Install exhaust bellows on gimbal housing and torque clamp.

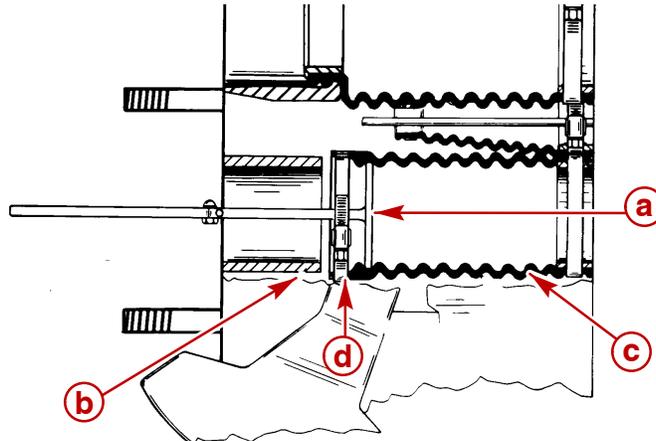


76660

- a** - Exhaust bellows
- b** - Hose clamp

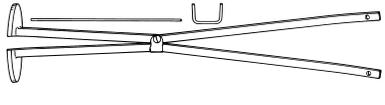
Description	Nm	lb-in.	lb-ft
Exhaust bellows hose clamp	4	35	

4. Place hose clamp over bellows end.
5. Place Bellows Expander Tool into first bellows convolution.
6. Pull tool until tool touches the flange on bell housing (bellows starts to slip onto flange) and then release tool.

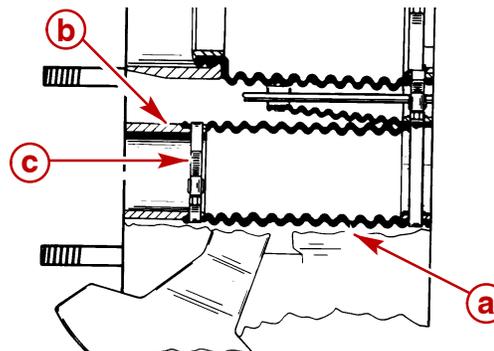


22116

- a** - Bellows Expander Tool
- b** - Bell housing flange
- c** - Exhaust bellows
- d** - Hose clamp

Bellows Expander Tool		
 <p>73430</p>	Installs the exhaust bellows on the Bravo One, and Bravo Two sterndrive units.	91-45497A1

7. Reposition tool into the third bellows convolution.
8. Pull bellows onto bell housing flange.
9. Torque hose clamp.



22116

- a** - Exhaust bellows
- b** - Bell housing flange
- c** - Hose clamp

Description	Nm	lb-in.	lb-ft
Exhaust bellows hose clamp	4	35	

Exhaust Tube (If Equipped)

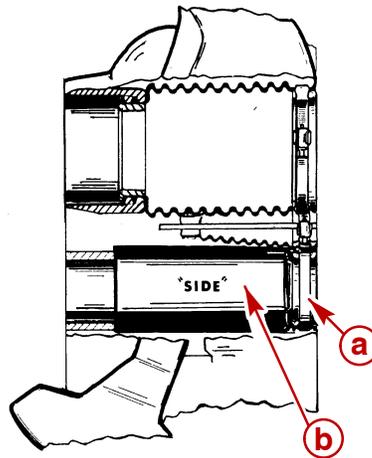
Removal

NOTE: It is not necessary to remove sterndrive unit when replacing exhaust tube.

⚠ CAUTION

Support aft end of sterndrive unit when working between bell housing and gimbal housing.

1. Raise sterndrive unit to the full UP/OUT position.
2. Loosen hose clamp and remove exhaust tube.



22184

- a** - Hose clamp
- b** - Exhaust tube

Cleaning and Inspection

1. Inspect exhaust tube for charring, cracks, cuts, and hardening.
2. Roughen exhaust tube mating surfaces with sandpaper and wipe clean with lacquer thinner.

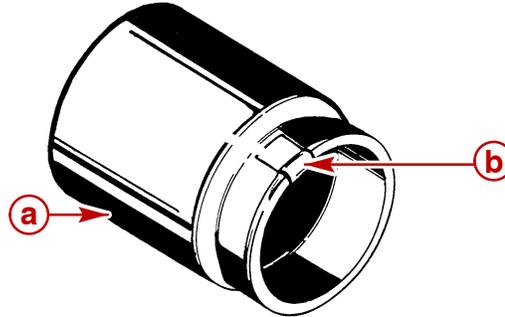
Description	Where Used	Part Number
Lacquer Thinner	Bellows mounting flange	Obtain Locally

Installation

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

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

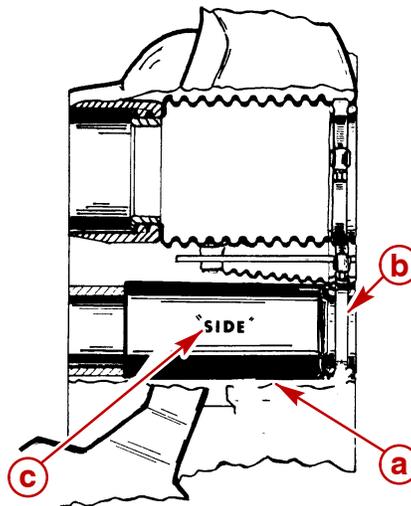
1. Position grounding clip on exhaust tube.



22184

- a** - Exhaust tube
- b** - Grounding clip

2. Position tube so that side markings on tube are facing toward the right and left sides.
3. Position clamp so that screw will align with screwdriver access hole in port (left) side of gimbal housing.
4. Tighten and torque hose clamp.



22184

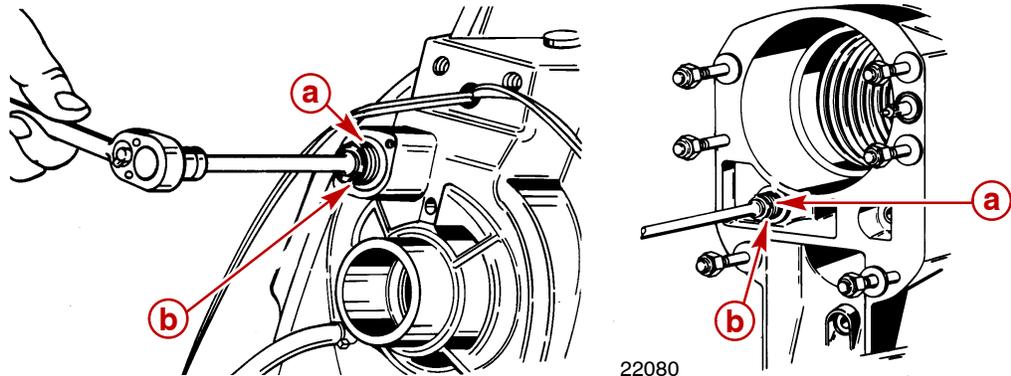
- a** - Exhaust tube
- b** - Hose clamp
- c** - Side marking

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

Water Hose and Water Fitting

Removal

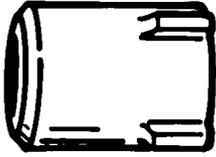
1. Remove tapered inserts.



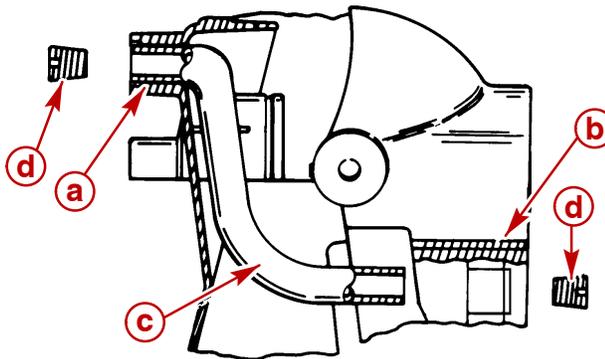
22080

50322

- a** - Tapered inserts
- b** - Tapered Insert Tool

Tapered Insert Tool		
 <p>73456</p>	<p>Installs and removes the tapered insert retainer into the water inlet hose on all the Bravo sterndrive units.</p>	<p>91-43579</p>

2. Remove water hose.



22101

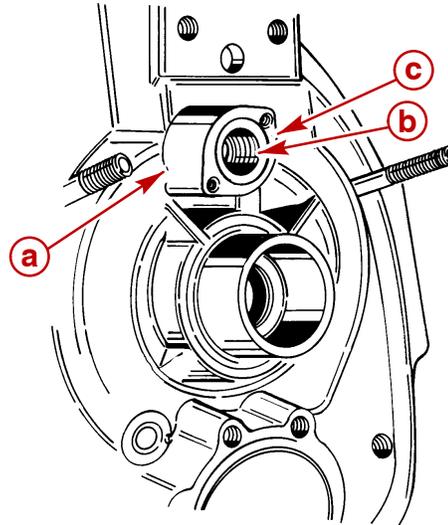
- a** - Gimbal housing
- b** - Bell housing
- c** - Water hose
- d** - Tapered inserts

Installation

⚠ CAUTION

The water hose in the following step is a preformed hose and must be installed with the short end of the molded hose going into the gimbal housing. The hose must be held in place while installing the tapered inserts. Failure to hold hose in place can result in an overheat condition.

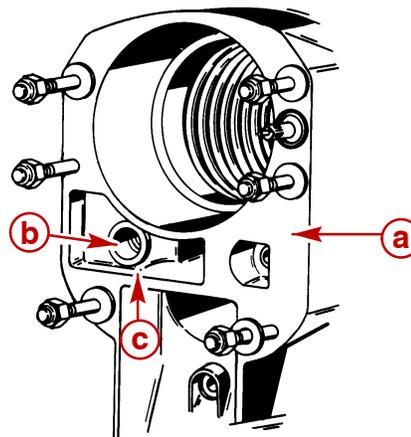
1. Position water hose as follows:
 - a. Gimbal Housing - hose edge must be flush with mounting surface.



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- a** - Gimbal housing
- b** - Water hose
- c** - Mounting surface

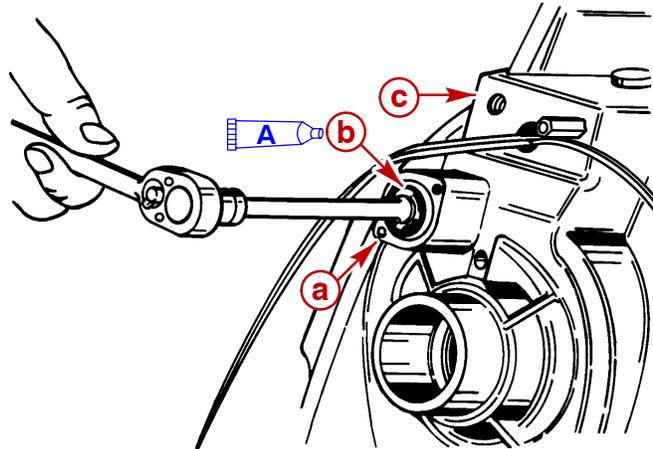
- b. Bell Housing - hose edge should protrude approximately 3 mm (1/8 in.) from edge of hole.



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- a** - Bell housing
- b** - Water hose
- c** - Hole

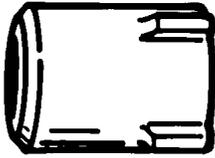
2. Lubricate threads of tapered inserts.
3. Install tapered inserts with Tapered Insert Tool.



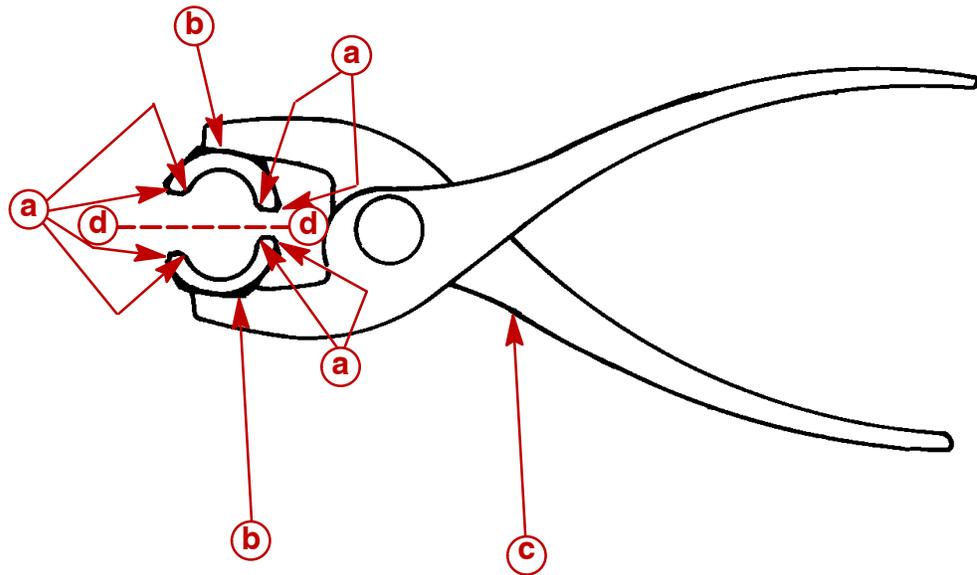
75962

- a** - Tapered insert
- b** - Tapered Insert Tool
- c** - Gimbal housing

Description		Where Used	Part Number
A	2-4-C with Teflon	Threads of tapered insert	92-802859A1

Tapered Insert Tool		
 73456	Installs and removes the tapered insert retainer into the water inlet hose on all the Bravo sterndrive units.	91-43579

Crimp Clamp Tool



74148

- a** - Bevel edges
- b** - 3/4 in. nut
- c** - Pliers
- d** - Nut (cut in half)

1. Weld a 3/4 in. nut to the jaws of a pair of pliers.
2. Saw the nut in half without damaging the pliers.
3. Clamp the jaws of the pliers in a vice so that the 2 halves of the nut are pressed firmly together.
4. Use a 1/2 in. drill bit to drill out the threads of the nut.
5. Remove the pliers from the clamp and bevel the edges of the nut.

NOTES: