POWER TRIM

Section 5B - Trim Cylinders

Table of Contents

5 B

Torque Specifications

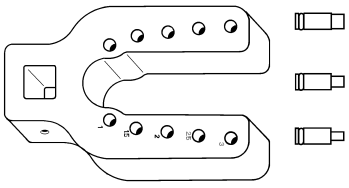
Description	Nm	lb-in.	lb-ft
Piston rod bolt	23		17
End cap	61		45
Trim cylinder hoses	11	100	

Lubricants / Sealants / Adhesives

NOTE: *Prior to reassembly of trim cylinders, lubricate all internal parts with Power Trim and Steering Fluid or, if not available, 10W-30 or 10W-40 motor oil.*

Description	Where Used	Part Number
Loctite 271 Threadlocker	Threads of piston rod bolt	92-809819
Power Trim and Steering Fluid	All internal parts	92-802880A1
2-4-C with Teflon	End cap threads	92-802859A1
	Anchor pin threads	

Special Tools

Spanner Wrench		
 71233	Removes trim cylinder end cap on all Mercury MerCruiser trim cylinders. Uses interchangeable pin sets: 91-811907 Large pin set: 0.235 in.(5.97 mm) 91-811908 Medium pin set: 0.180 in. (4.57 mm) 91-811909 Small pin set: 0.150 in.(3.81 mm)	91-821709T

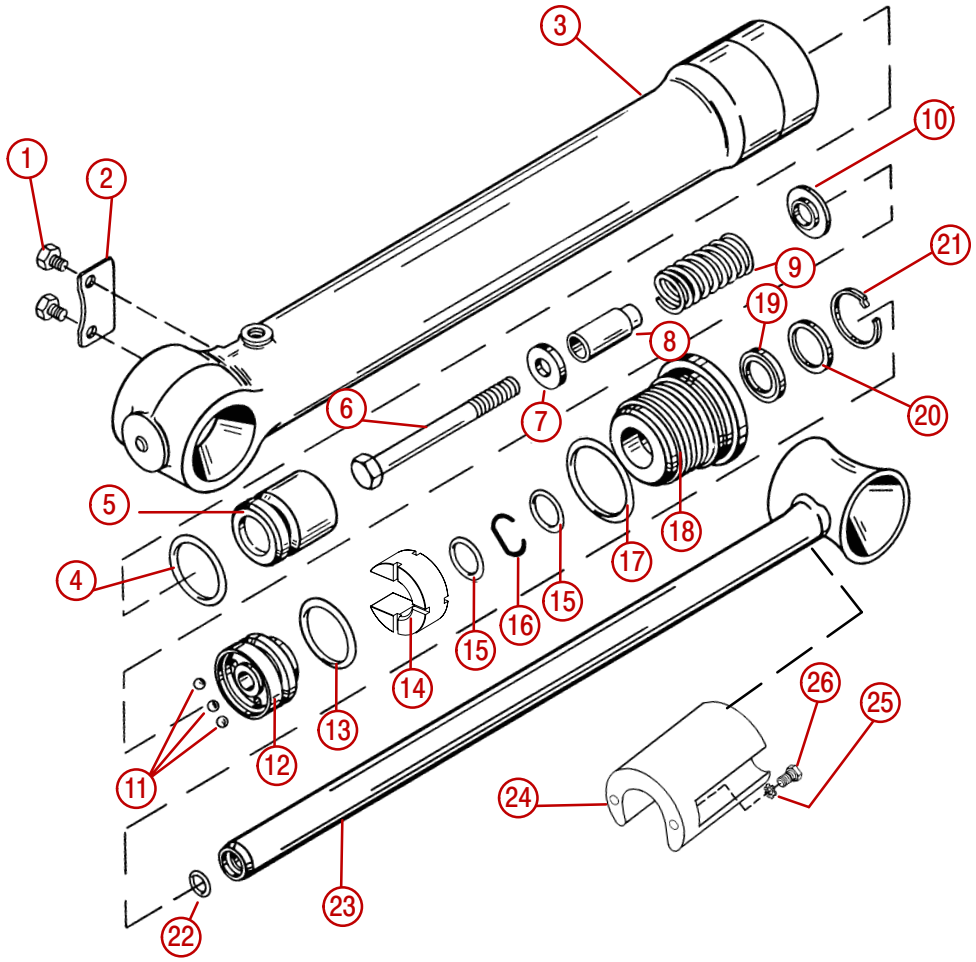
Tools

Description	Part Number
Inverted Flare Plug	22-38609

Exploded Views

Bravo Trim Cylinders

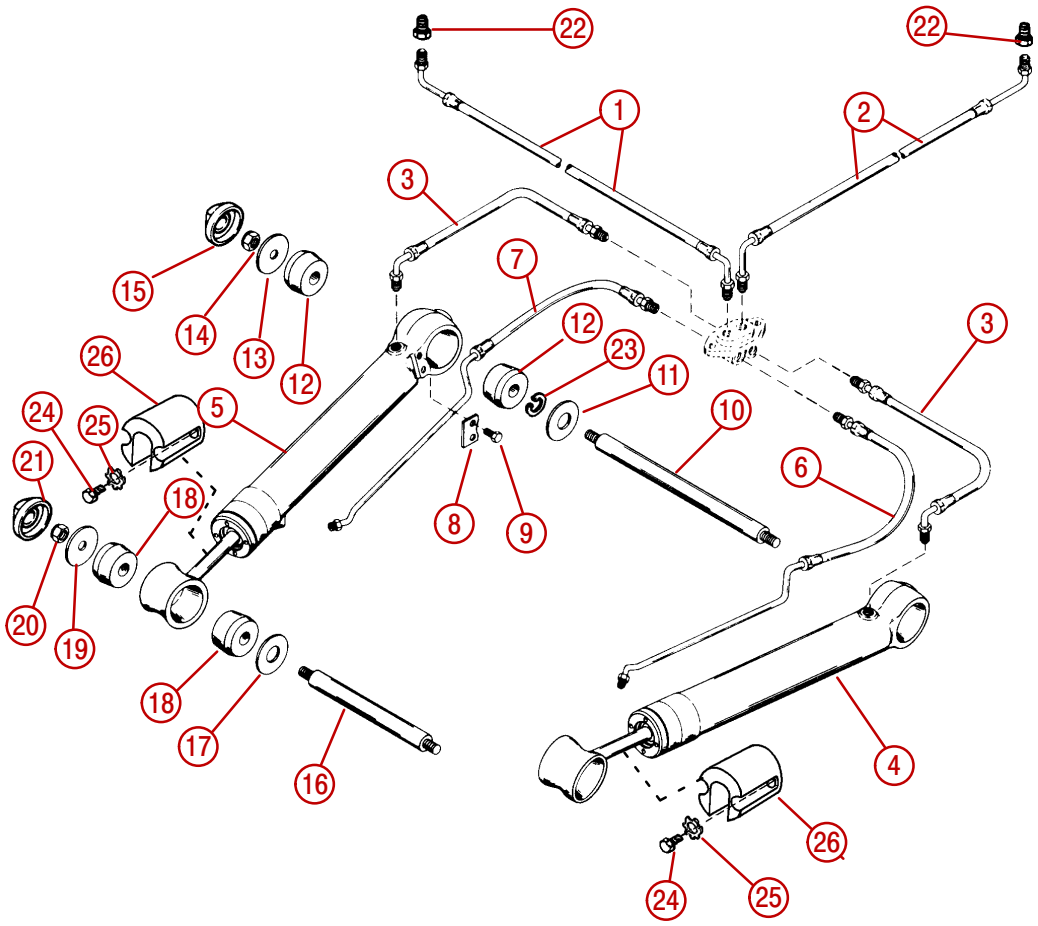
NOTE: *Prior to reassembly of trim cylinders, lubricate all internal parts with Power Trim and Steering Fluid or, if not available, 10W-30 or 10W-40 motor oil.*



76676

1 - Screws
2 - Clamping plate
3 - Trim cylinder
4 - O-ring
5 - Floating piston
6 - Bolt
7 - Washer
8 - Spring guide
9 - Spring
10 - Spring guide washer
11 - Check balls
12 - Shock piston
13 - O-ring
14 - Tilt limit spacer
15 - Small O-ring
16 - Continuity spring
17 - Large O-ring
18 - End cap
19 - Rod scraper
20 - Washer
21 - Retaining ring
22 - Small O-ring
23 - Piston rod
24 - Anode
25 - Star washer
26 - Screw

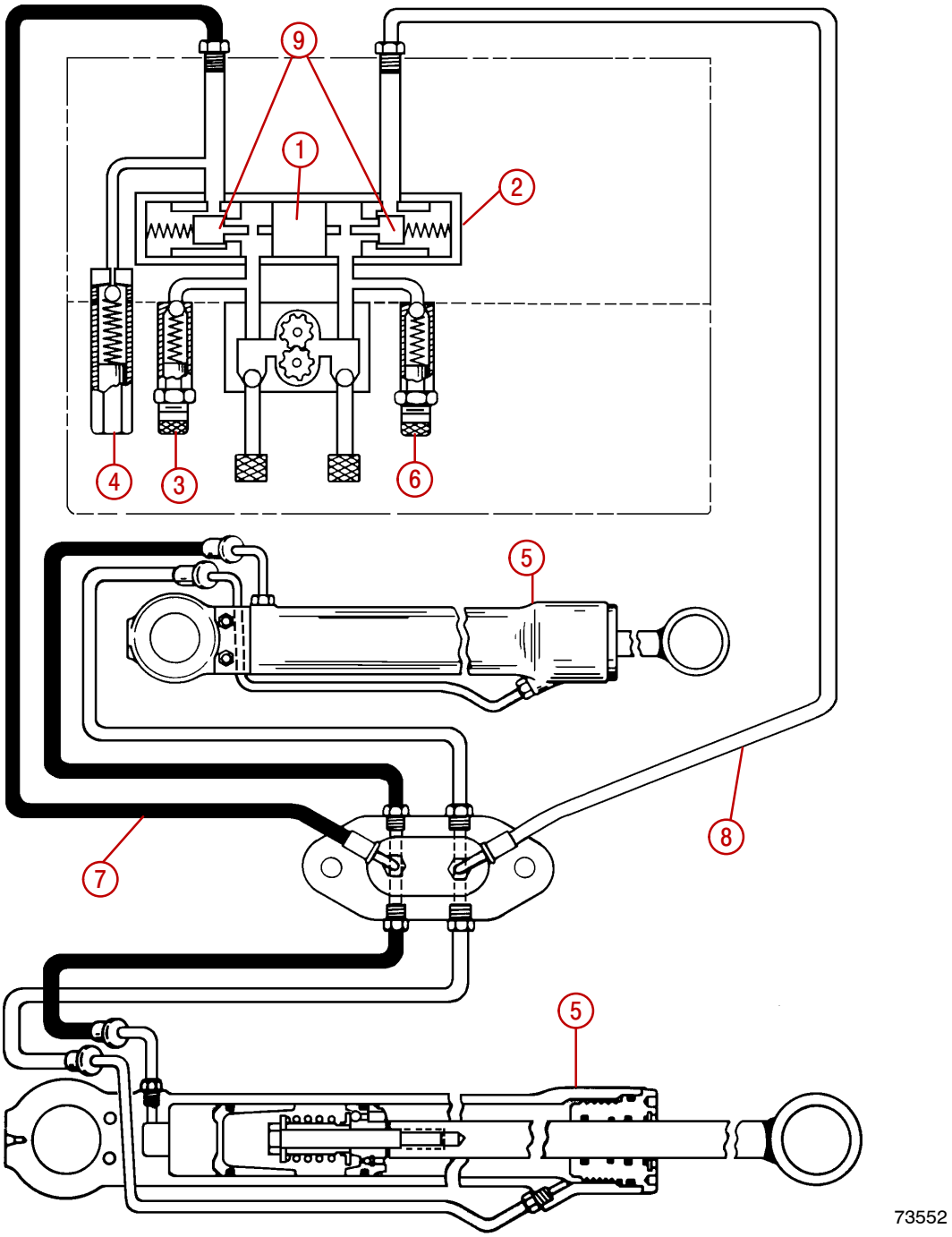
Bravo Trim System Components



73554

1 - IN/DOWN hose to trim pump (gray)
2 - OUT/UPhose to trim pump (black)
3 - OUT/UP hose to trim cylinder
4 - Starboard trim cylinder
5 - Port trim cylinder
6 - IN/DOWN starboard trim cylinder hose
7 - IN/DOWN port trim cylinder hose
8 - Plate
9 - Screw
10 - Front pin
11 - Washer
12 - Bushing
13 - Washer
14 - Nut
15 - Cap
16 - Rear pin
17 - Washer
18 - Bushing
19 - Washer
20 - Nut
21 - Cap
22 - Connector (trim pump)
23 - Retainer
24 - Screw
25 - Continuity washer
26 - Trim cylinder anode

Power Trim Hydraulic Schematic



1 - Shuttle
2 - Pump adaptor
3 - OUT/UP pressure relief valve
4 - Thermal relief valve
5 - Trim cylinder
6 - IN/DOWN pressure relief valve
7 - OUT/UP hose
8 - IN/DOWN hose
9 - Poppet valves

Special Information

Bravo Three Notice: Trim-In Limit Insert

Some boats, predominantly deep-Vee heavy boats, will roll up on their side under certain specific operating conditions. The roll can be either to port or starboard and may be experienced while moving straight ahead or while making a turn. The roll occurs most frequently at or near maximum speed, with the sterndrive unit trimmed at or near full 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. Stern lift can be created by excessive sterndrive unit trim In. Under these extreme stern lift/bow down conditions, instability can be created which may cause the boat to roll. Weight distribution to the stern can reduce stern lift and, in some circumstances, eliminate the condition. Weight distribution in the bow, port or starboard, may worsen the condition.

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

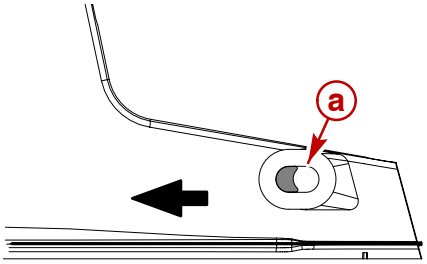
⚠ WARNING

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

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.

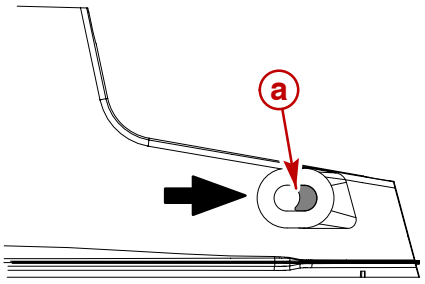
NOTE: *When removing the sterndrive unit, make a note of the position of the insert for reference when reinstalling the sterndrive unit.*

1. If equipped, ensure that the Trim-In Limit Insert is positioned as shown for the appropriate Bravo model.



75157

Bravo One and Two (positioned forward)



75158

Bravo Three (positioned aft)

a - Trim-in limit insert

IMPORTANT: The position of the Trim-In Limit Insert on the Bravo Three sterndrive unit should only be changed after the boat has been properly tested. Contact the boat manufacturer if you are not sure of the original position for a particular boat application.

Trim Cylinder Internal Leak Test

Refer to **Section 5A - Power Trim Pump**.

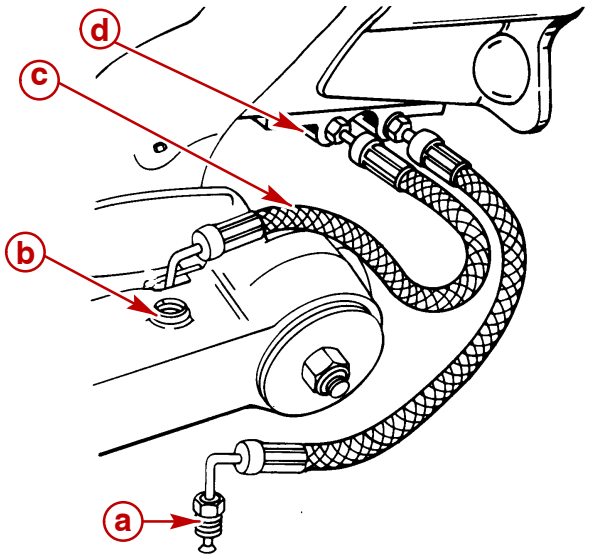
Trim Cylinder Shock Piston Test

Refer to **Section 5A - Power Trim Pump**.

Trim Cylinder Repair

Removal

1. Disconnect OUT/UP trim hose from front hole on trim cylinder.
2. Disconnect IN/DOWN trim hose from hydraulic connector on gimbal housing.
3. Plug holes with inverted flare or suitable plug.
4. Cap hoses.

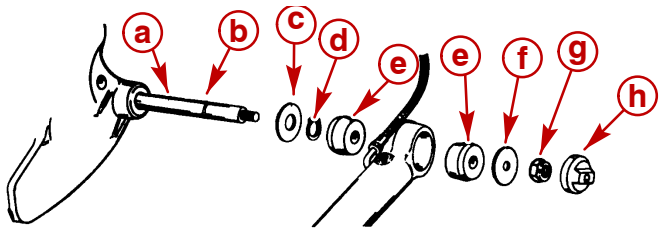


50389

a - OUT/UP hose
b - Front hole on trim cylinder
c - IN/DOWN hose
d - Hydraulic connector

Description	Part Number
Inverted Flare Plug	22-38609

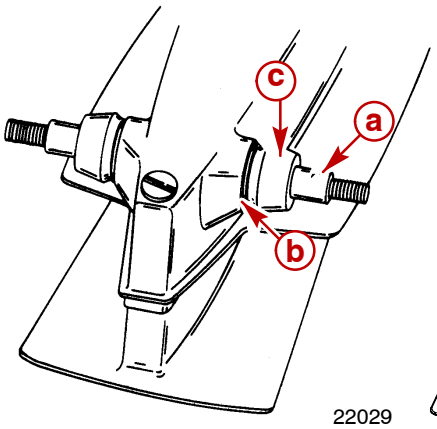
5. Remove front and rear power trim cylinder mounting hardware.



71489

Front

- **a** - Anchor pin (1)
- **b** - Slots (2)
- **c** - Flat washer (large ID) (2)
- **d** - Snap rings (2)
- **e** - Bushings (4)
- **f** - Flat washer (small ID) (2)
- **g** - Locknut (2)
- **h** - Plastic cap (2)



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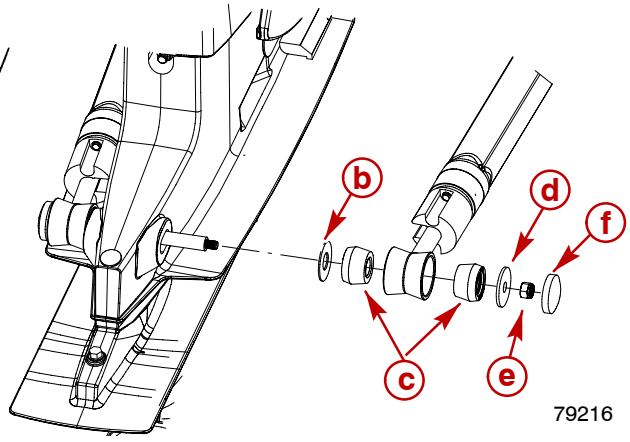


79216

Rear

- **a** - Rear anchor pin
- **b** - Large ID washers (port and starboard)
- **c** - Bushings (2) (port and starboard)
- **d** - Small ID washers (port and starboard)
- **e** - Locknuts (port and starboard)
- **f** - Plastic caps (port and starboard)

Disassembly

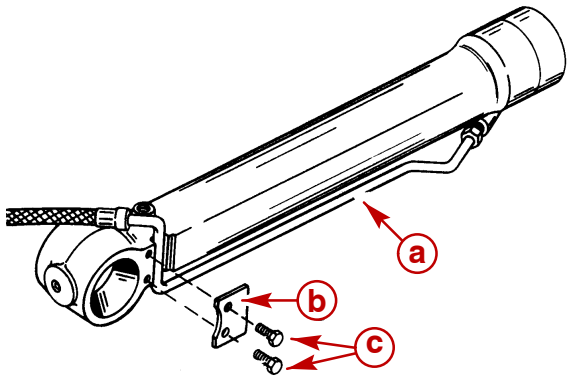
⚠ CAUTION

Ensure work area is clean before disassembling power trim cylinders. Cylinder parts can be damaged by dirt entering into power trim system.

⚠ CAUTION

Do not clamp center section of power trim cylinder during assembly or disassembly. Clamp cylinder on front mounting flange.

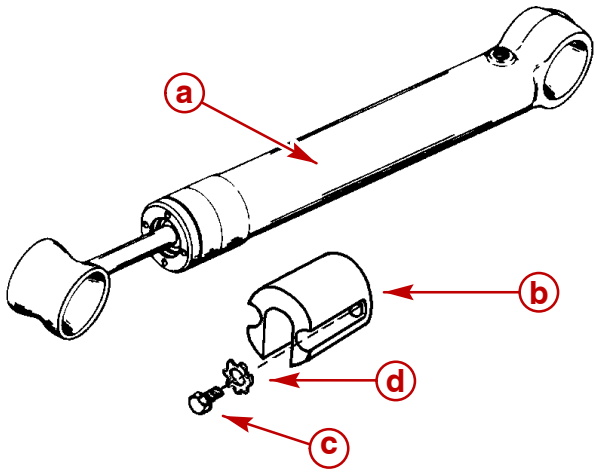
1. Remove IN/DOWN trim hose from cylinder.



22134

a - IN/DOWN trim hose
b - Clamping plate
c - Screws

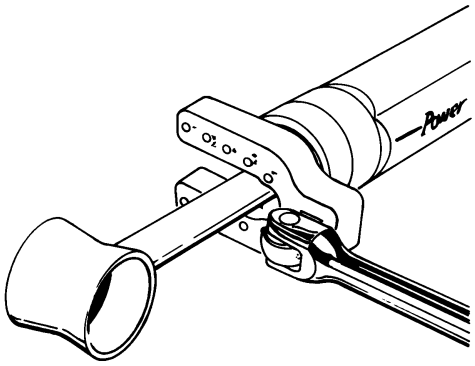
2. Remove trim cylinder anodes.



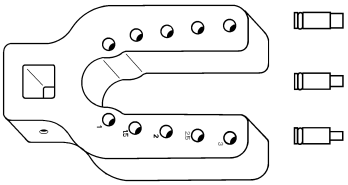
76902

a - Trim cylinder
b - Trim cylinder anode
c - Screw (2)
d - Washer (2)

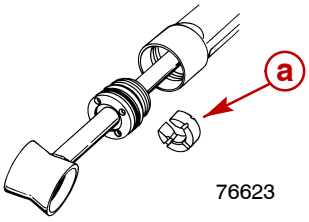
3. Use Spanner Wrench to remove trim cylinder end caps.



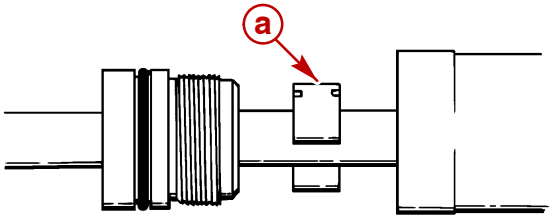
71677

Spanner Wrench		
 71233	Removes trim cylinder end cap on all Mercury MerCruiser trim cylinders. Uses interchangeable pin sets: 91-811907 Large pin set: 0.235 in.(5.97 mm) 91-811908 Medium pin set: 0.180 in. (4.57 mm) 91-811909 Small pin set: 0.150 in.(3.81 mm)	91-821709T

4. Remove tilt limit insert.



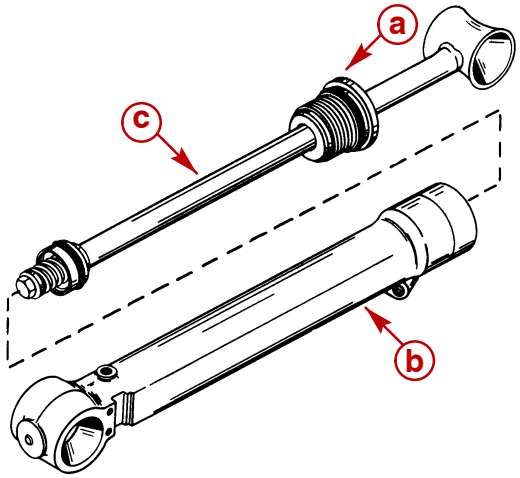
76623



76624

a - Tilt limit insert

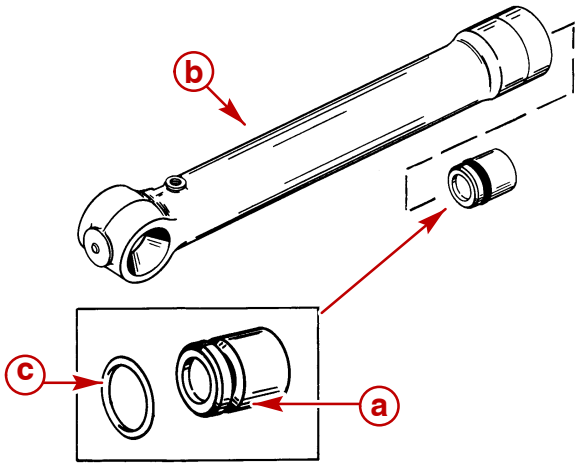
5. Remove piston rod assembly from cylinder.



22133

a - End cap
b - Cylinder
c - Piston rod assembly

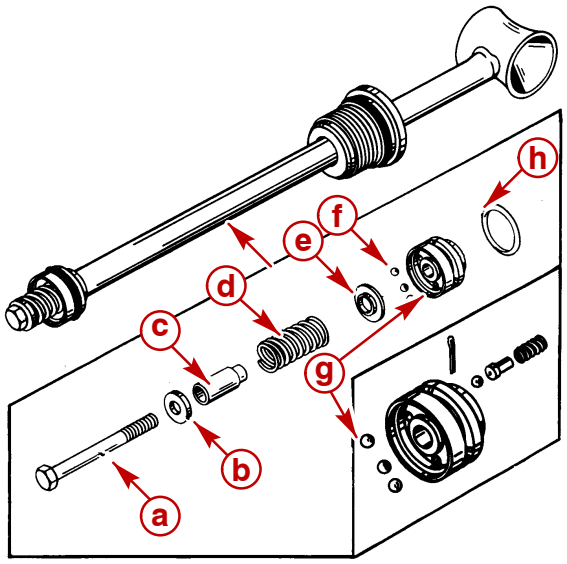
6. Remove floating piston from cylinder and remove O-ring by tapping cylinder on block of wood.



22131

a - Floating piston
b - Trim cylinder
c - O-ring

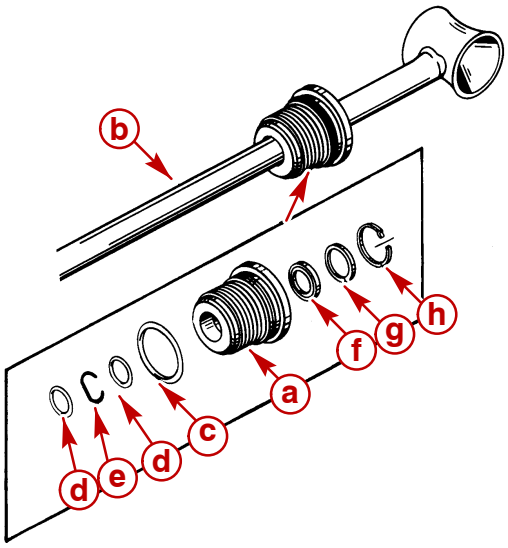
7. Disassemble shock piston assembly. Ensure that check balls are not lost.



22132

a - Bolt
b - Flat washer
c - Spring guide
d - Spring
e - Spring guide washer
f - Check balls (3)
g - Shock piston assembly
h - O-ring

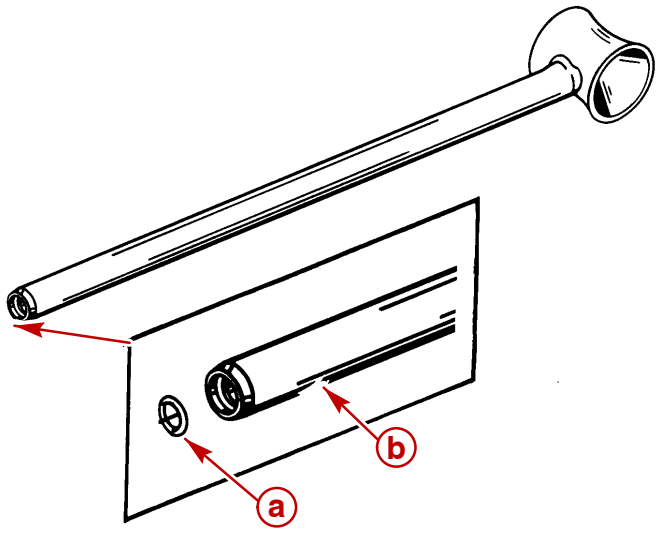
8. Remove and disassemble end cap.



22133

a - End cap
b - Piston rod
c - Large O-ring
d - Small O-ring (2)
e - Continuity spring
f - Rod scraper
g - Plain washer
h - Retaining ring

9. Remove small O-ring from end of piston rod.



22132

a - Small O-ring
b - Piston rod

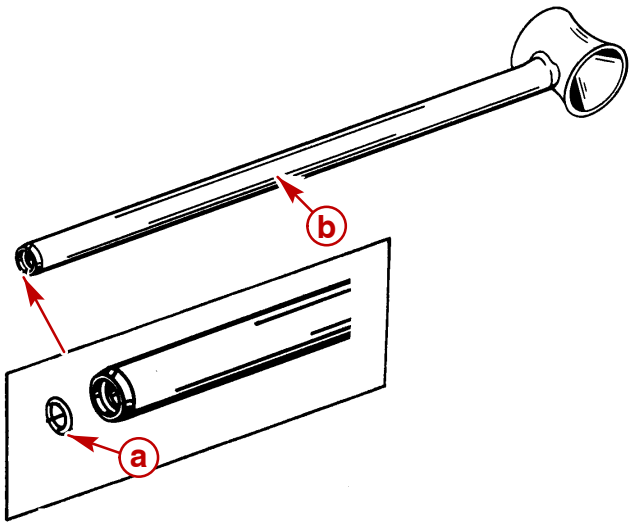
10. Clean all parts in solvent. Ensure all parts are dry before reassembly.

Reassembly

⚠ CAUTION

Ensure that work area and all components are clean before reassembling trim cylinders. Power trim components can become damaged if dirt gets into system.

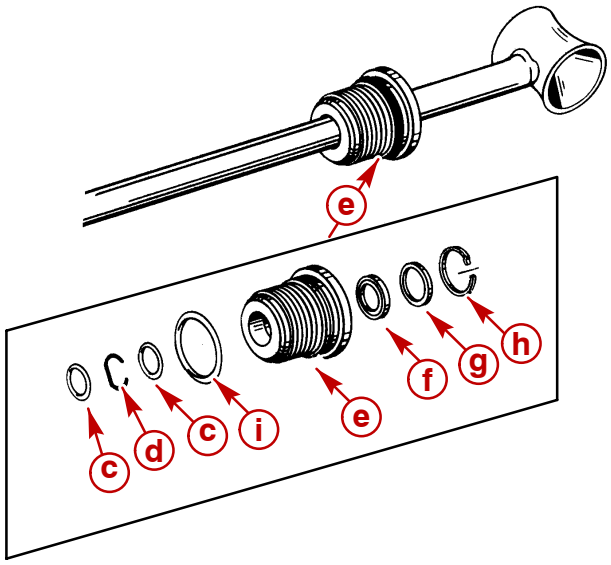
1. Install small O-ring into end of piston rod.



22132

a - Small O-ring
b - End of piston rod

2. Install small O-rings and continuity spring into end cap.
3. Install rod scraper, plain washer, and retaining ring into end cap.
4. Install large O-ring onto outside diameter of end cap.
5. Install end cap onto piston rod.

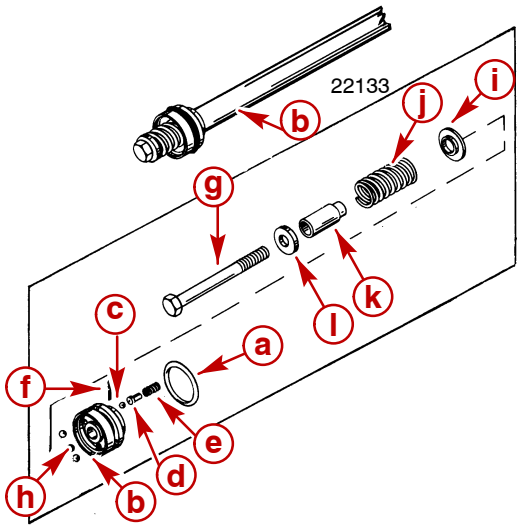


22133

22132

a - Small O-rings
b - Continuity spring
c - End cap
d - Rod scraper
e - Plain washer
f - Retaining ring
g - Large O-ring

6. Install large O-ring on shock piston.
7. Install shock piston, three check balls, check ball eyelet, spring guide washer, spring, spring guide, spring guide washer and bolt onto piston rod.
8. Apply sealant to threads of piston rod bolt and torque.



22132

a - Large O-ring
b - Shock piston
c - Check ball
d - Check ball eyelet
e - Spring
f - Spring pin
g - Bolt
h - Check balls
i - Spring guide washer
j - Spring
k - Spring guide
l - Spring guide washer

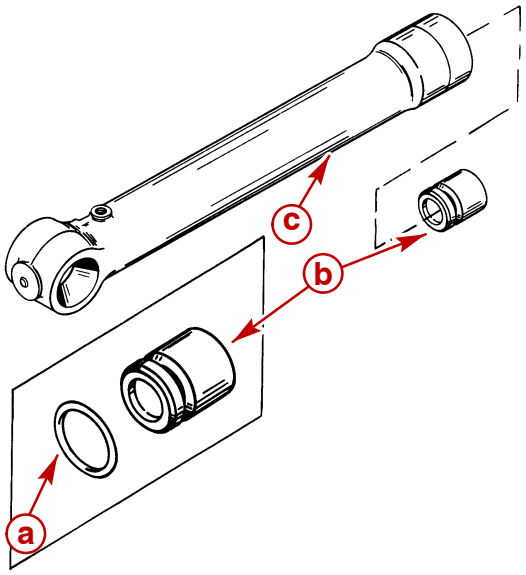
Description	Where Used	Part Number
Loctite 271 Threadlocker	Threads of piston rod bolt	92-809819

Description	Nm	lb-in.	lb-ft
Piston rod bolt	23		17

NOTE: *Before reassembly, lubricate all internal parts with Power Trim and Steering Fluid or SAE 10W-30 or 10W-40 motor oil.*

9. Apply lubricant to parts.

10. Install O-ring onto floating piston and insert floating piston into cylinder.



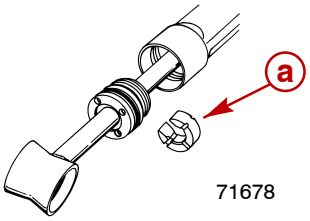
22132

a - O-ring
b - Floating piston
c - Cylinder

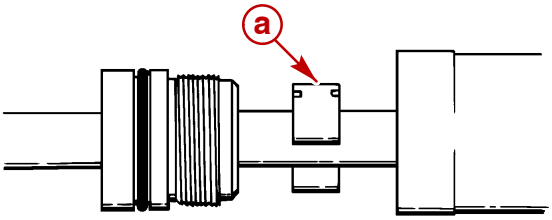
Description	Where Used	Part Number
Power Trim and Steering Fluid	All internal parts	92-802880A1

IMPORTANT: Some boat configurations may require tilt-limit inserts to limit the total upward travel of the sterndrive unit. Be sure to install the same number of inserts that were originally removed. There must be an equal number in each cylinder.

11. If required, install tilt-limit inserts.



71678



71679

a - Tilt-limit inserts

⚠ CAUTION

Ensure that work area and all components are clean before reassembling trim cylinders. Power trim components can become damaged if dirt gets into system.

⚠ CAUTION

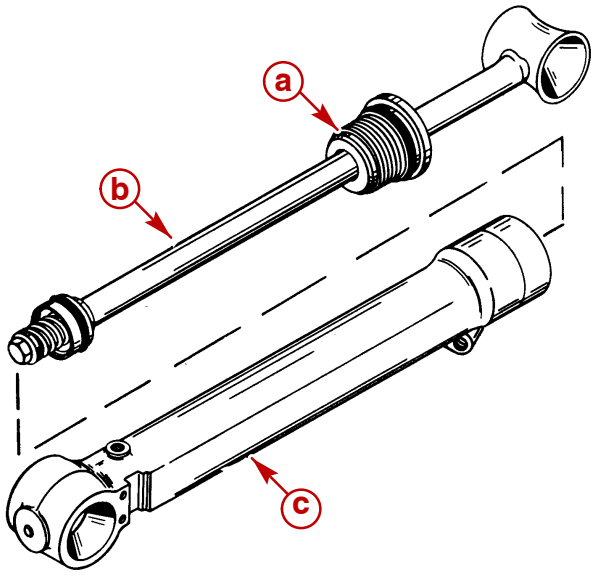
Do not clamp center section of trim cylinder during reassembly. If clamping of cylinder is necessary, clamp cylinder on front mounting flange.

⚠ CAUTION

Use only 2-4-C with Teflon on end cap threads. Other substances may act as an insulator and cause poor electrical continuity between cap and cylinder which could cause a corrosion problem.

NOTE: *Before reassembly, lubricate all internal parts with Power Trim and Steering Fluid or SAE 10W-30 or 10W-40 motor oil.*

12. Apply lubricant to end cap threads and install piston rod assembly into cylinder.

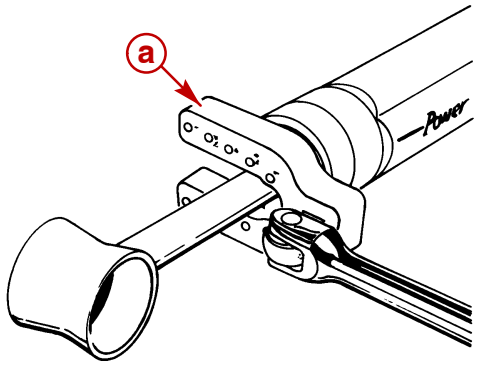


22133

a - End cap
b - Piston rod
c - Cylinder

Description	Where Used	Part Number
2-4-C with Teflon	End cap threads	92-802859A1

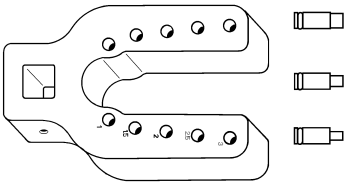
13. Using Spanner Wrench, torque end cap.



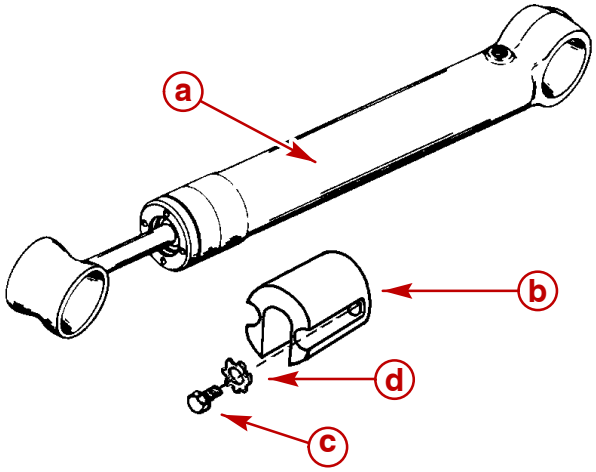
71677

a - Spanner Wrench

Description	Nm	lb-in.	lb-ft
End cap	61		45

Spanner Wrench		
 71233	Removes trim cylinder end cap on all Mercury MerCruiser trim cylinders. Uses interchangeable pin sets: 91-811907 Large pin set: 0.235 in.(5.97 mm) 91-811908 Medium pin set: 0.180 in. (4.57 mm) 91-811909 Small pin set: 0.150 in.(3.81 mm)	91-821709T

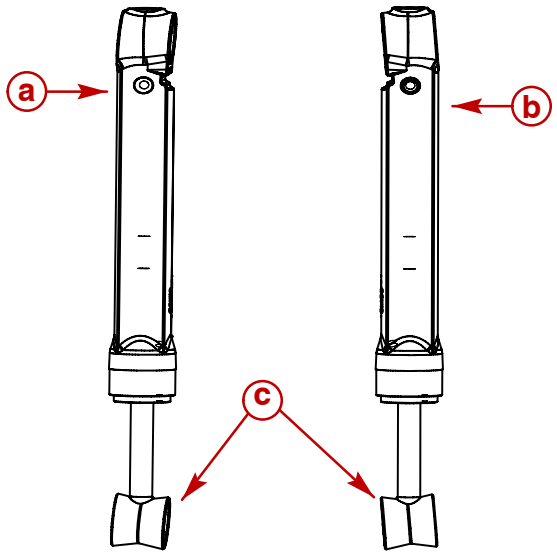
14. Install trim cylinder anodes.



76902

a - Trim cylinder
b - Trim cylinder anode
c - Screw (2)
d - Washer (2)

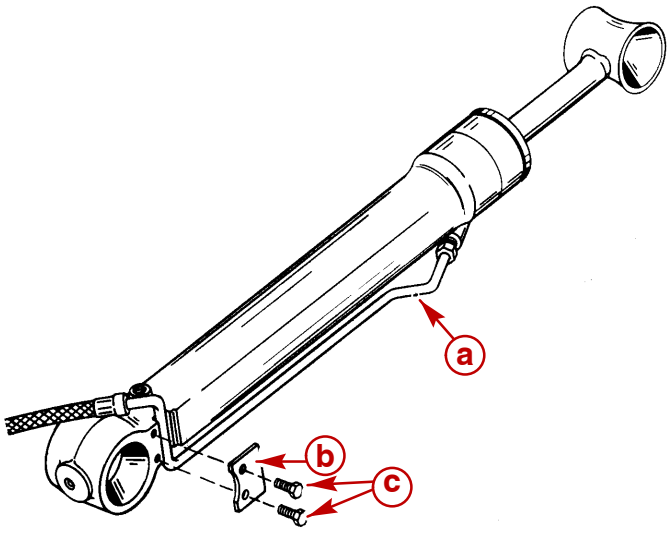
15. Position trim cylinder rear connecting ends as shown.



78880

a - Port trim cylinder
b - Starboard trim cylinder
c - Connecting ends (angled as shown)

16. Install IN/DOWN trim hose and torque.



22130

a - Down trim hose
b - Clamping plate
c - Screws

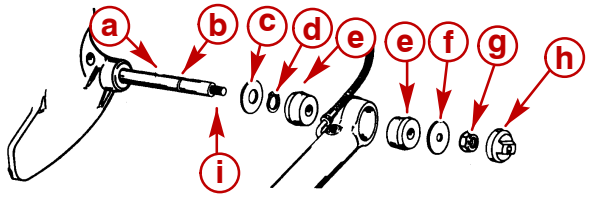
Description	Nm	lb-in.	lb-ft
Trim cylinder hoses	11	100	

17. Check painted areas of trim cylinders for scratches that expose metal and paint if necessary.

Installation

NOTE: *Refer to Special Information at the front of this section before reinstalling trim cylinders.*

1. Install trim cylinder forward mounting hardware as shown.
2. Lubricate anchor pin threads to prevent threads from galling.
3. Hand thread locknuts onto pin. Do not tighten at this time.



71489

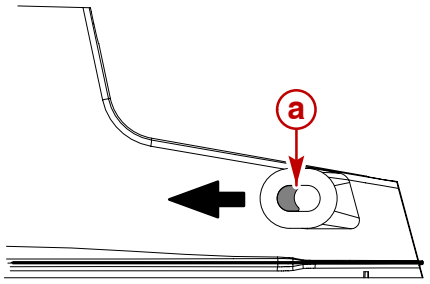
a - Anchor pin (1)
b - Slots (2)
c - Flat washer (large ID) (2)
d - Snap rings (2)
e - Bushings (4)
f - Washers (small ID) (2)
g - ocknut (2)
h - Plastic cap (2)
i - Anchor pin threads

Description	Where Used	Part Number
2-4-C with Teflon	Anchor pin threads	92-802859A1

IMPORTANT: <u>On Bravo One, Two, and Three Models</u> the Trim-In Limit Insert , must be properly positioned before installing the trim cylinder anchor pin in the following steps.

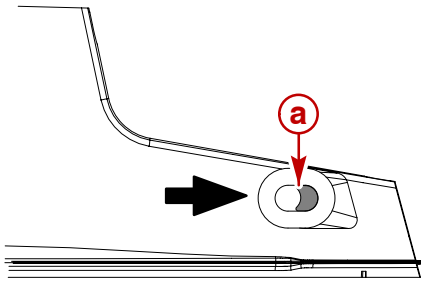
NOTE: *Ensure that the Trim-In Limit Insert is reinstalled in the same position that it was in prior to removal of the sterndrive unit. If you are not sure of the original position, contact the boat manufacturer for their recommendation. Refer to Special Information at the front of this section before reinstalling the Trim-In Limit Insert.*

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



75157

Bravo One and Two (positioned forward)



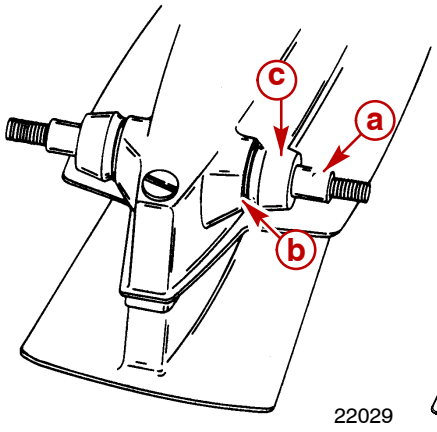
75158

Bravo Three (positioned aft)

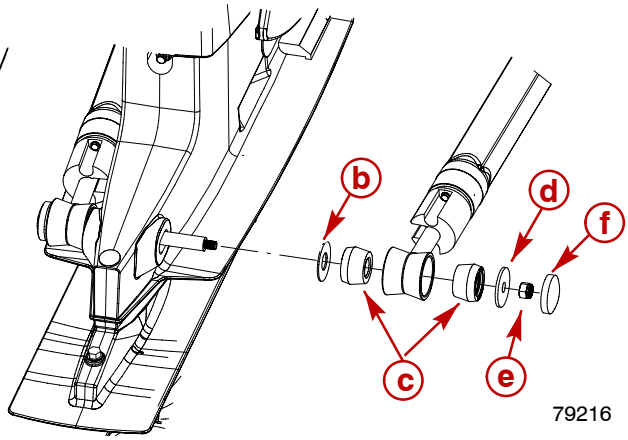
a - Trim-in limit insert

IMPORTANT: The position of the Trim-In Limit Insert on the Bravo Three sterndrive unit should only be changed after the boat has been properly tested. Contact the boat manufacturer if you are not sure of the original position for a particular boat application.

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



22029



79216

a - Rear anchor pin
b - Large ID washers (port and starboard)
c - Bushings (2) (port and starboard)
d - Small ID washers (port and starboard)
e - Locknuts (port and starboard)
f - Plastic caps (port and starboard)

Description	Where Used	Part Number
2-4-C with Teflon	Anchor pin threads	92-802859A1

⚠ CAUTION

All 4 anchor pin locknuts must be tightened as described following or damage to sterndrive unit may result from sterndrive unit moving too far inward.

8. Tighten the anchor pin locknuts until nuts and washers contact anchor pin shoulder.
9. Install plastic caps.
10. Reconnect OUT/UP trim hose to the trim cylinder and torque.

Description	Nm	lb-in.	lb-ft
Trim cylinder hoses	11	100	

11. Reconnect trim hoses to the connector after air bleeding power trim cylinders and hoses following procedures outlined in **Section 5A**.

Description	Nm	lb-in.	lb-ft
Trim cylinder hoses	11	100	