ALPHA AND BRAVO TRANSOM ASSEMBLIES

4

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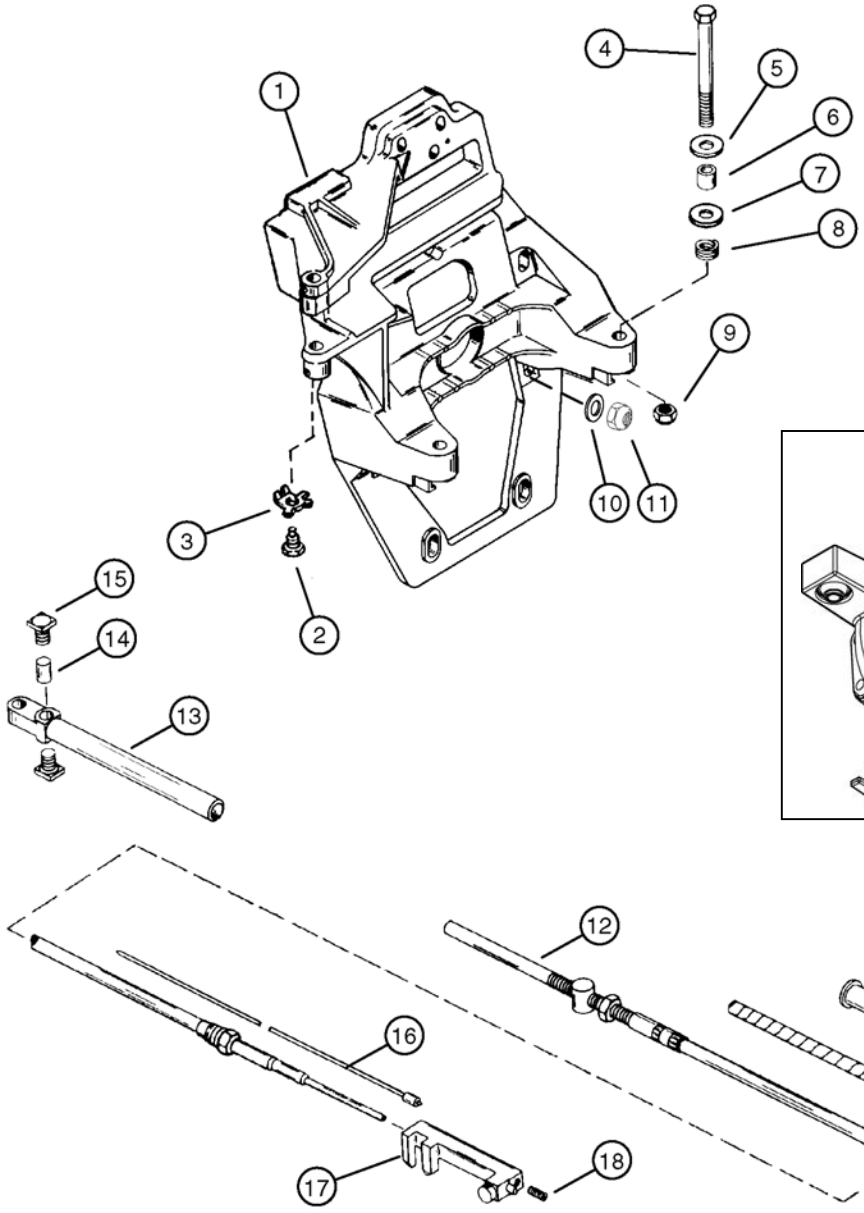
Alpha Inner Transom Plate Components

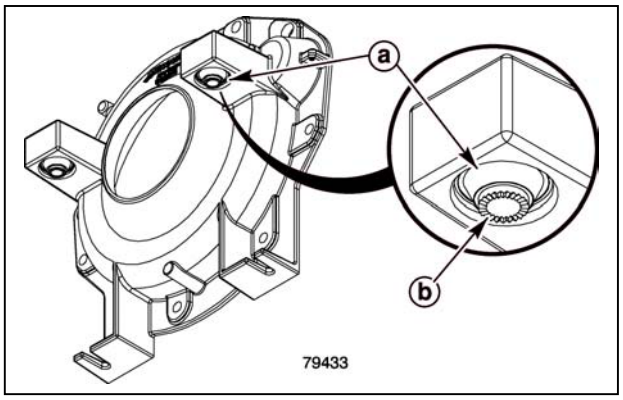
Note: *New engines use a modified rear engine mount system (a). The bottom of the rear mount now has a knurled edge (b) [older version was smooth].*

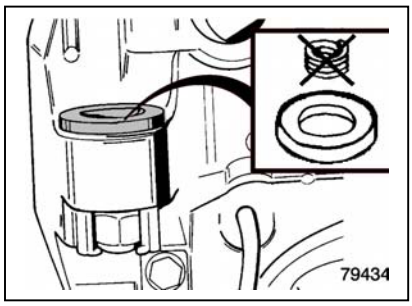
The "double-wound" lockwasher (spring) is no longer used.

The large fiber washer is still used.

Starting S/N ***0M660000****.*

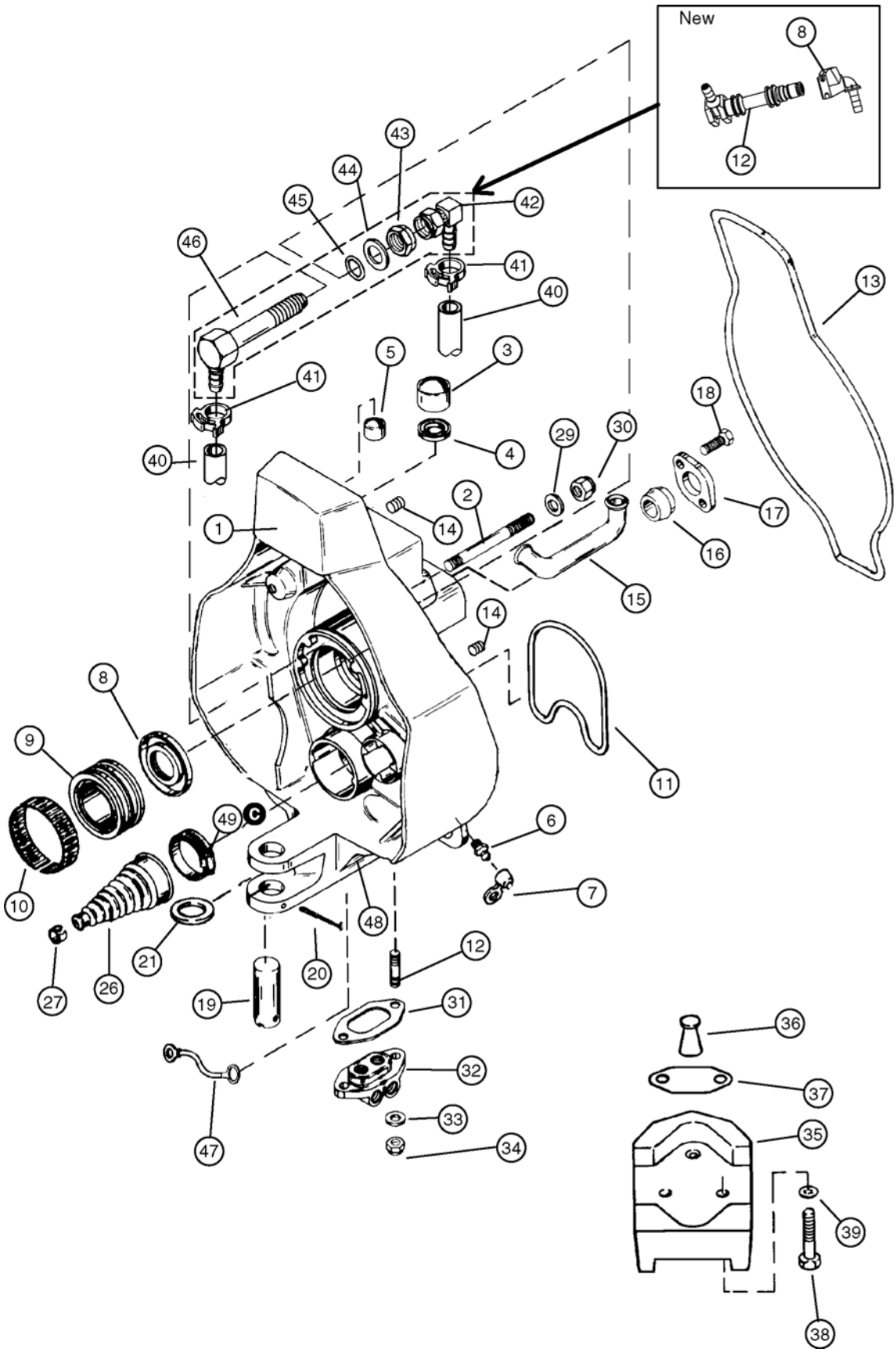






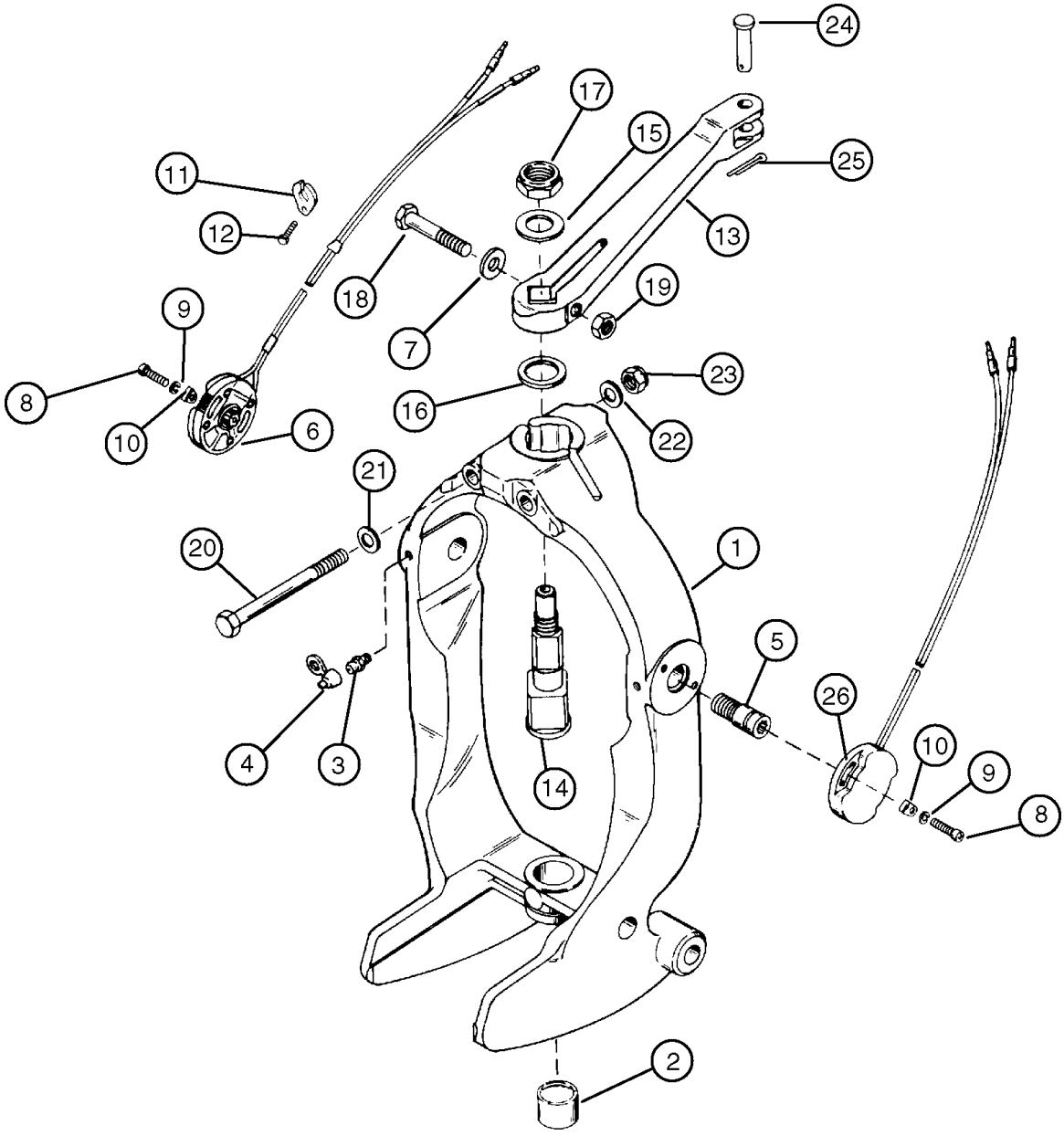
1 - Transom Plate Assembly
2 - Pivot Bolts
3 - Tab Washers
4 - Screw Engine Mounting
5 - Washer
6 - Spacer
7 - Washer - Fiber
8 - Lockwasher - Double Wound
9 - Locknut
10- Washer
11- Locknut
12- Shift Cable Outer Casing
13- End Guide
14- Core Wire Anchor
15- Anchor Screws
16- Core Wire
17- Shift Slide
18- Screw - Core Wire Cavity
19- Gimbal Housing Eyelet
20- Cable Wrapping

Alpha Gimbal Housing Components



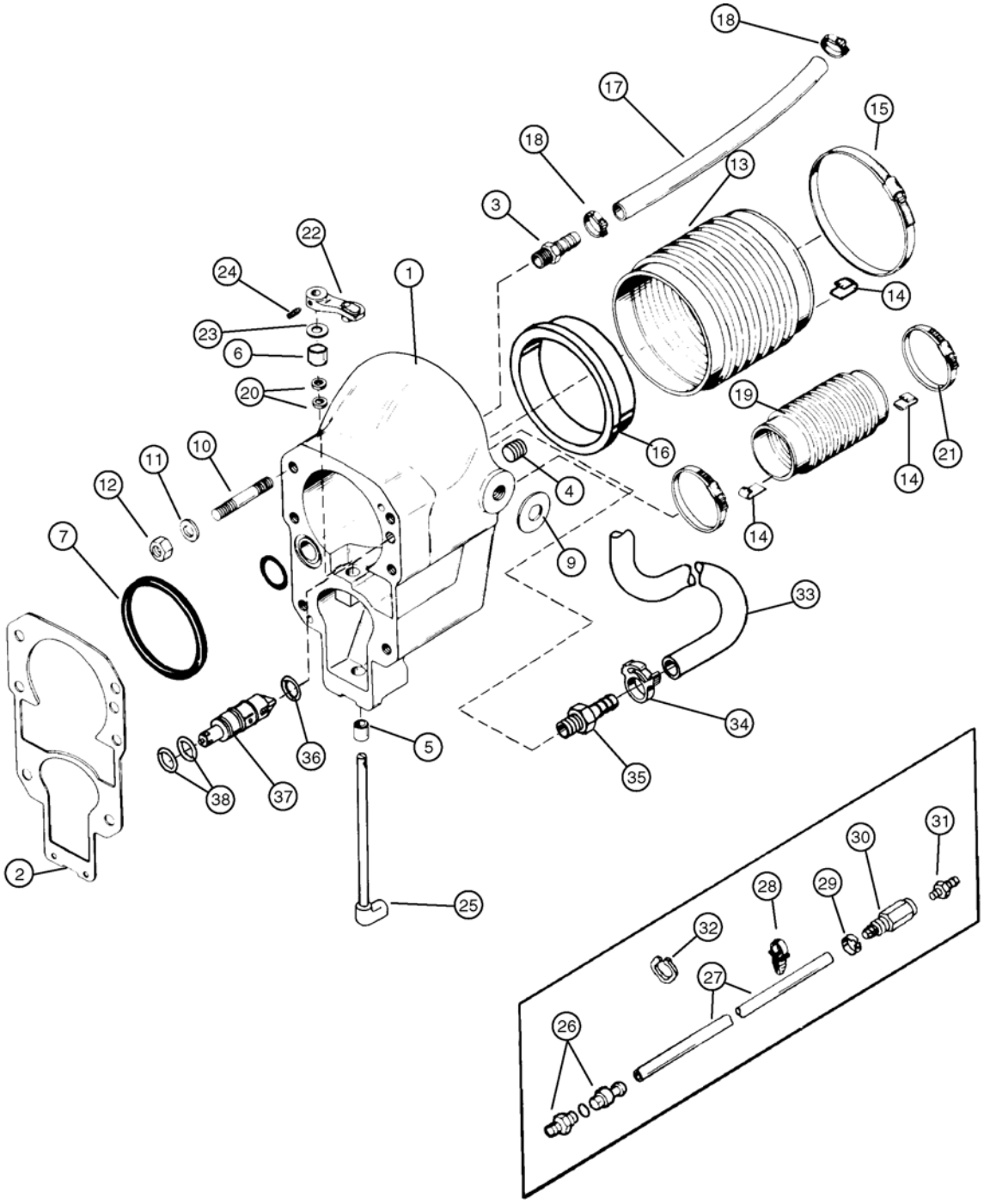
1 - Gimbal Housing
2 - Stud
3 - Lower Bushing
4 - Oil Seal
5 - Upper Bushing
6 - Grease Fitting
7 - Lubricap
8 - Grease Seal
9 - Bearing Assembly
10- Tolerance Ring
11- O-Ring
12- Stud
13- Seal
14- Pipe Plug
15- Water Tube
16- Bushing
17- Cover
18- Screw
19- Lower Swivel Pin
20- Cotter PIn
21- Washer
22- Bolt
23- Washer
24- Washer
25- Nut
26- Shift Cable Boot (Bellows)
27- Clamp
28- Clamp
29- Washer
30- Nut
31- Gasket
32- Connector
33- Lock Washer
34- Nut
35- Anodic Plate
36- Seal
37- Gasket
38- Screw
39- Lock Washer
40- Hose
41- Clamp
42- 90° Fitting
43- Nut
44- Washer
45- O-Ring
46- Connector
47- Continuity Wire
48- Continuity Wire Connection
49- Hose Clamp

Alpha Gimbal Ring and Steering Lever Components



1 - Gimbal Ring
2 - Bushing
3 - Grease Fitting
4 - Lubricap
5 - Hinge Pin
6 - Trim Limit Switch
7 - Washer
8 - Screw
9 - Lockwasher
10- Retainer
11- Trim Wire Clamp
12- Screw
13- Steering Lever
14- Swivel Shaft
15- Washer
16- Washer
17- Nut
18- Screw
19- Nut
20- Screw
21- Washer
22- Washer
23- Locknut
24- Clevis Pin
25- Cotter Pin
26- Trim Position Sender

Alpha Bell Housing Components



1 - Bell Housing Assembly
2 - Gasket
3 - Connector
4 - Pipe Plug
5 - Bushing
6 - Bushing
7 - Gasket (Rubber)
8 - O-Ring
9 - Washer (Synthane)
10- Stud
11- Washer
12- Nut
13- Universal Joint Bellows
14- Ground Clip
15- Clamp
16- Sleeve
17- Hose
18- Clamp
19- Exhaust Bellows
20- Seals
21- Clamp
22- Lever Assembly
23- Washer
24- Screw
25- Shift Shaft (Upper)
26- Coupling Assembly
27- Tubing
28- Clip
29- Clamp
30- Fitting Assembly
31- Connector
32- Clamp
33- Hose
34- Clamp
35- Connector
36- O-Ring
37- Valve Assembly
38- O-RIng

Bravo Transom Assembly – Exploded Views

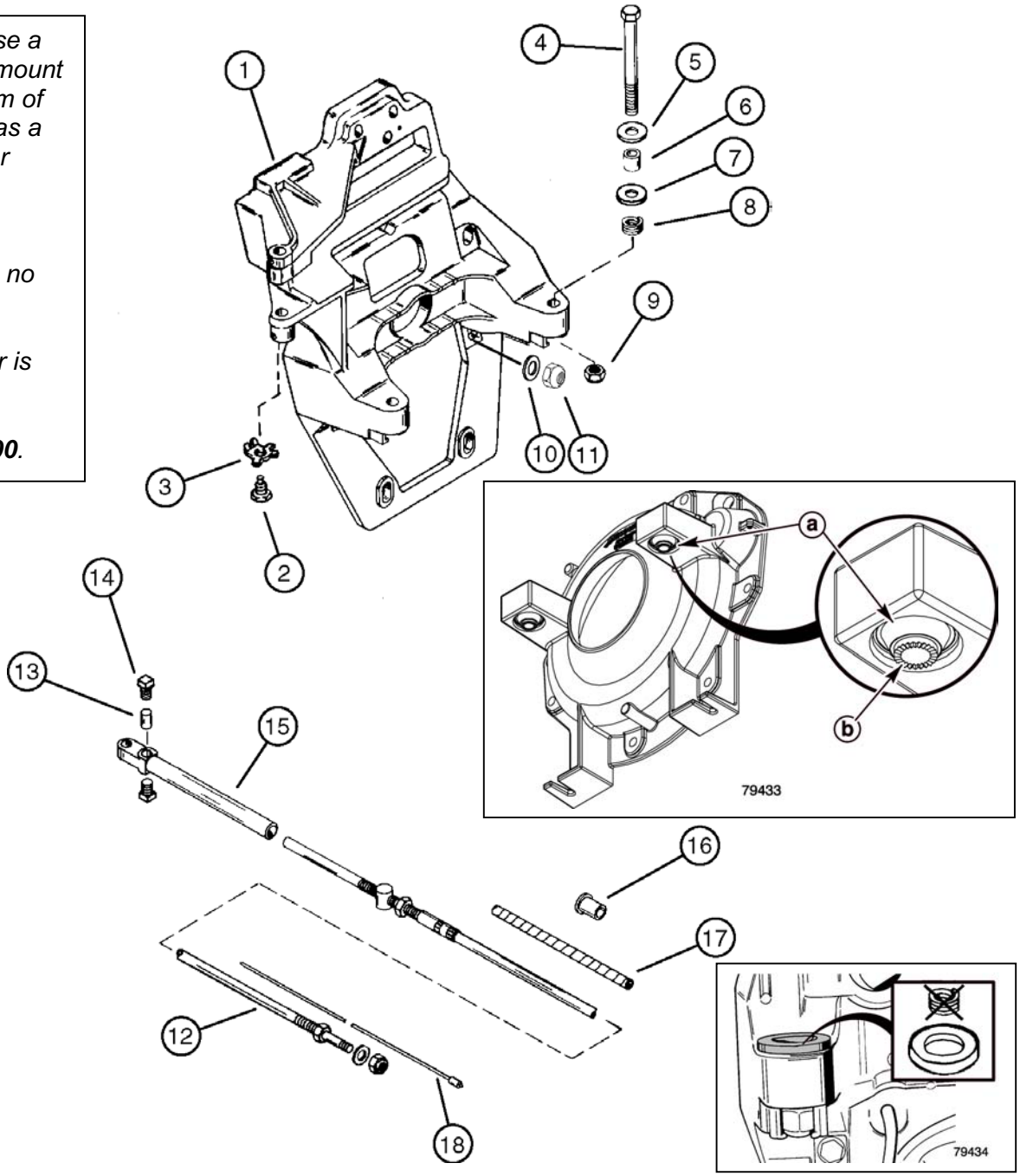
Bravo Inner Transom Plate Components

Note: *New engines use a modified rear engine mount system (a). The bottom of the rear mount now has a knurled edge (b) [older version was smooth].*

The "double-wound" lockwasher (spring) is no longer used.

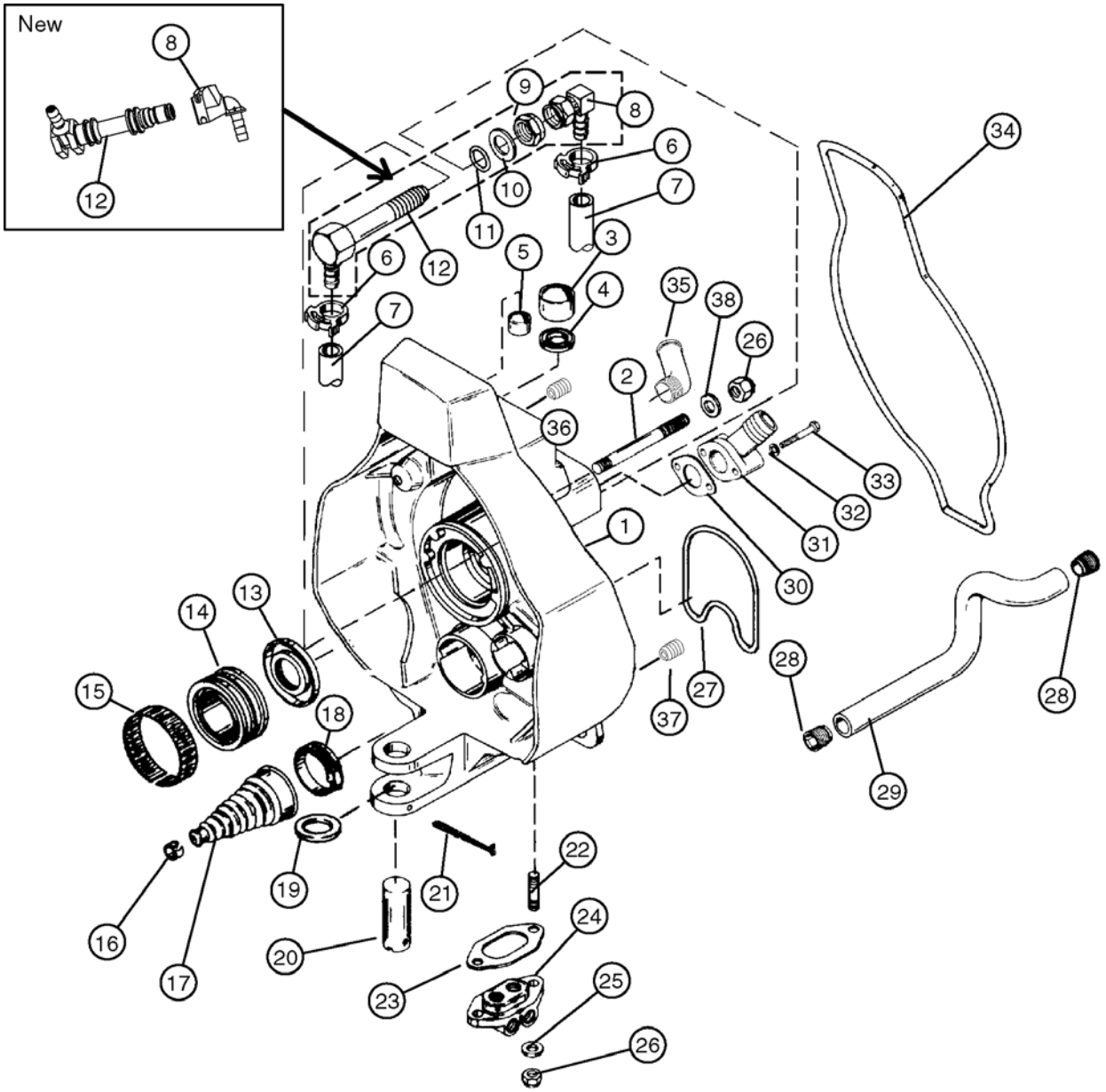
The large fiber washer is still used.

Starting S/N ***0M660000****.*



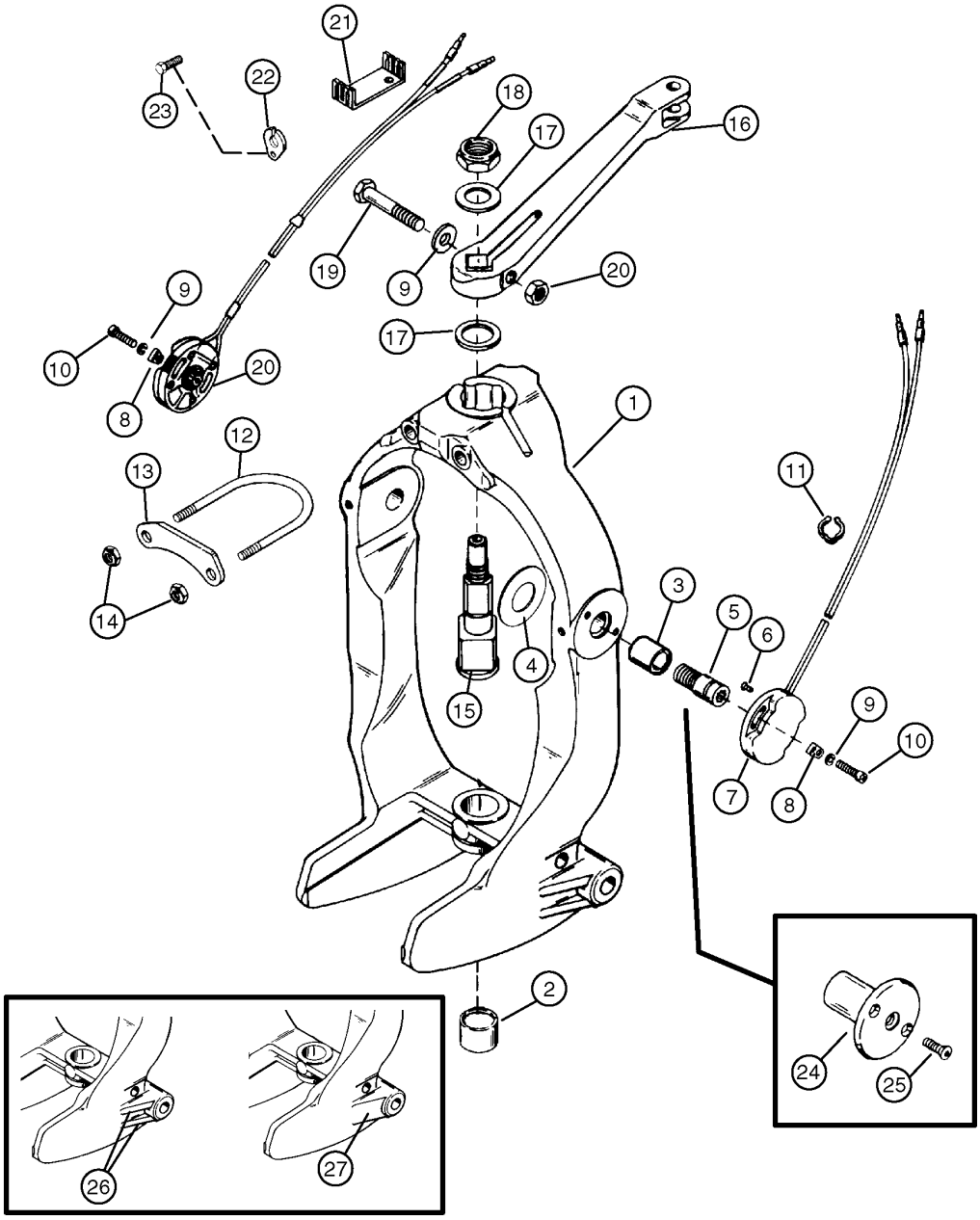
1 - Transom Plate Assembly
2 - Pivot Bolts
3 - Tab Washers
4 - Screw Engine Mounting
5 - Washer
6 - Spacer
7 - Washer - Fiber
8 - Lockwasher - Double Wound
9 - Locknut
10- Washer
11- Locknut
12- Shift Cable Casing
13- Core Wire Anchor
14- Anchor Screws (2)
15- End Guide
16- Pilot Bushing - Gimbal Housing
17- Spiral Wrap
18- Core Wire

Bravo Gimbal Housing Components



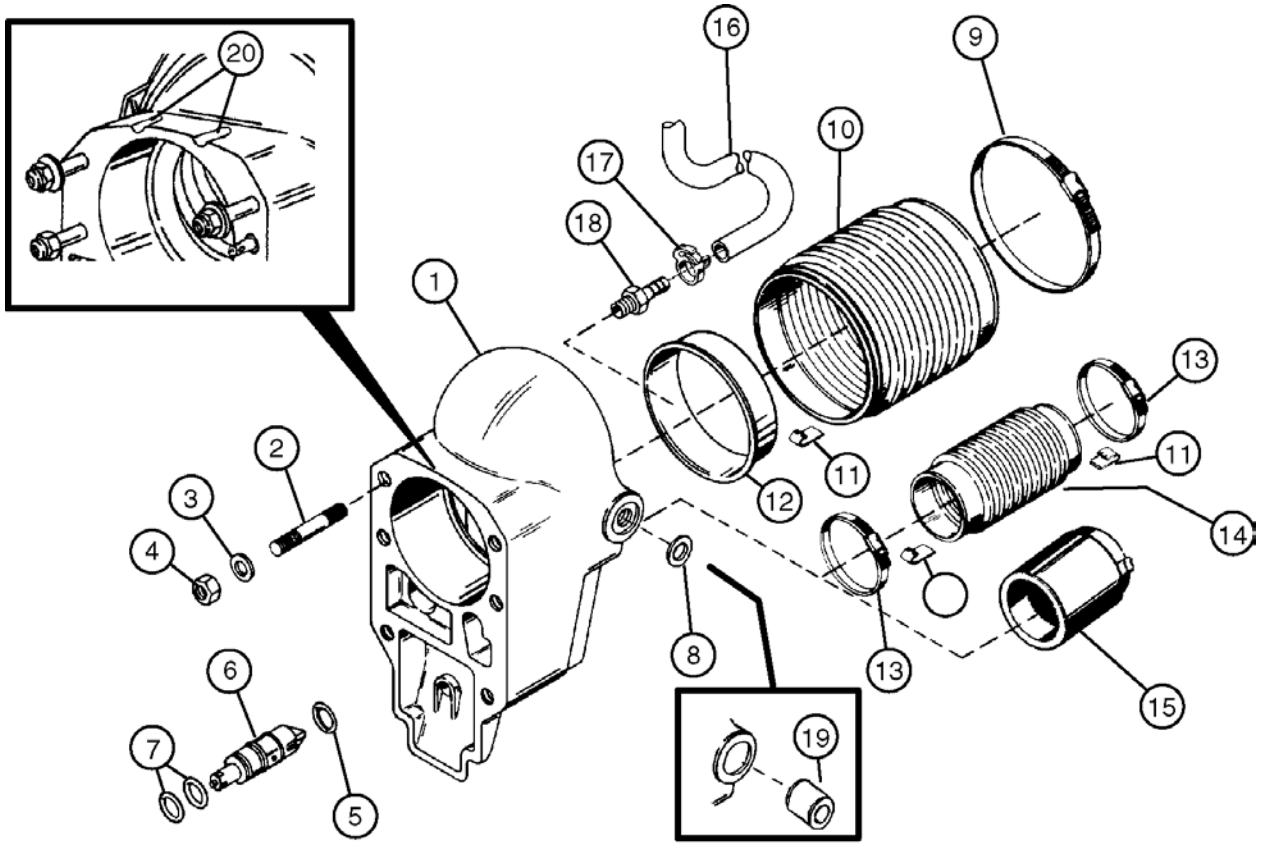
1 - Gimbal Housing
2 - Stud
3 - Lower Bushing
4 - Seal
5 - Upper Bushing
6 - Clamp
7 - Gear Lube Hose
8 - Swivel Fitting
9 - Locknut
10- Washer
11- O-ring
12- Gear Lube Fitting
13- Seal
14- Gimbal Bearing
15- Tolerance Ring
16- Crimp Clamp
17- Shift Cable Bellows
18- Bellows Clamp
19- Washer
20- Lower Swivel Pin
21- Cotter Pin
22- Stud
23- Gasket
24- Hydraulic Manifold
25- Lockwasher
26- Locknut
27- Exhaust Passage O-ring
28- Water Hose Insert
29- Water Hose
30- Water Fitting Gasket
31- Water Fitting
32- Lockwasher
33- Screw
34- Gimbal Housing Seal
35- Water Bypass Fitting (Some Diesel Models)
36- Pipe Plug (or Speedometer Fitting – Later Style)
37- Pipe Plug (or Speedometer Fitting – Earlier Style)
38- Washer

Bravo Gimbal Ring Components



1 - Gimbal Ring
2 - Bushing
3 - Bushing
4 - Washer
5 - Hinge Pin
6 - Screw
7 - Trim Position Sender
8 - Clip
9 - Washer
10- Screw
11- Clip
12- U-Bolt
13- Plate
14- Locknuts
15- Swivel Shaft
16- Steering Lever
17- Washer (Smaller I.D.)
18- Washer (Larger I.D.)
19- Clamp Screw
20- Nut
21- Wire Retainer
22- Trim Wire Clamp
23- Screw
24- Hinge Pin (High Performance Transom Only)
25- Screws (High Performance Transom Only)
26- Standard Gimbal Ring Identification. (Two Ribs)
27- Magnum and High Performance Gimbal Ring Identification. (Filled Area)

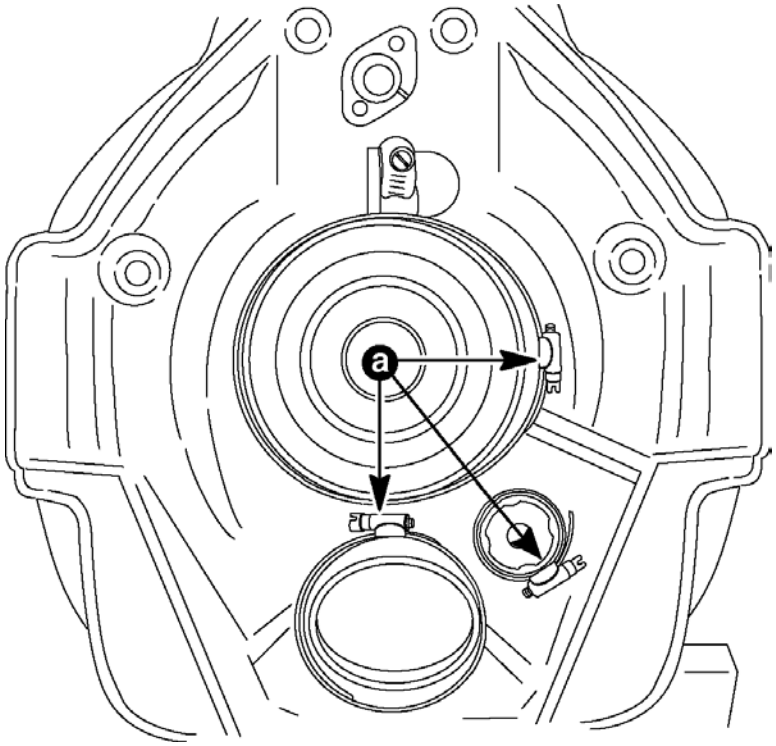
Bravo Bell Housing Components



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- Speedometer Hose
17- Hose Clamp
18- Bayonet Fitting
19- Bushing (High Performance Transom)
20- Indentations in Later Style Bell Housing (Must Be Used With Trim -In Limit Pins)

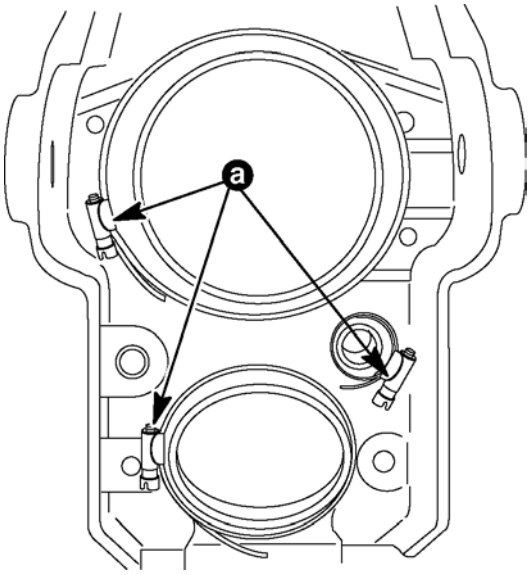
Notes:

Bellows Hose Clamp and Sleeve Installation



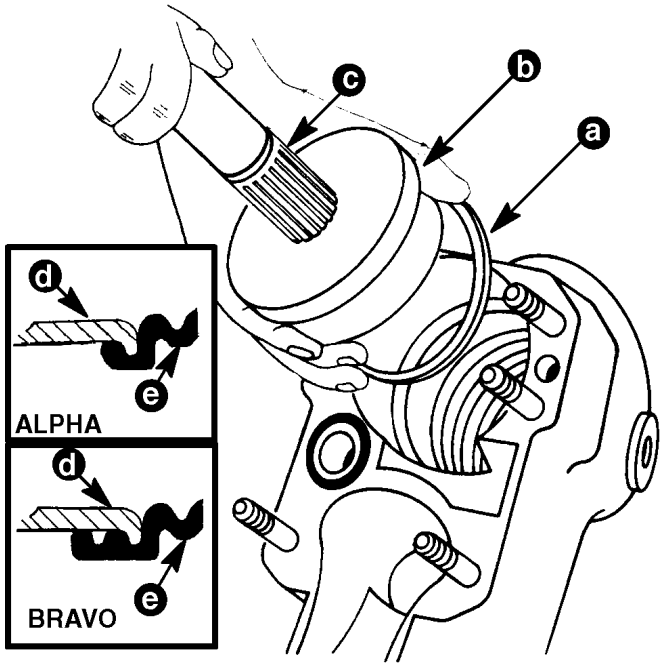
Approximate Hose Clamp Position on Gimbal Housing - MC-I/I-R/I-MR/Alpha One

a - Hose Clamp Position

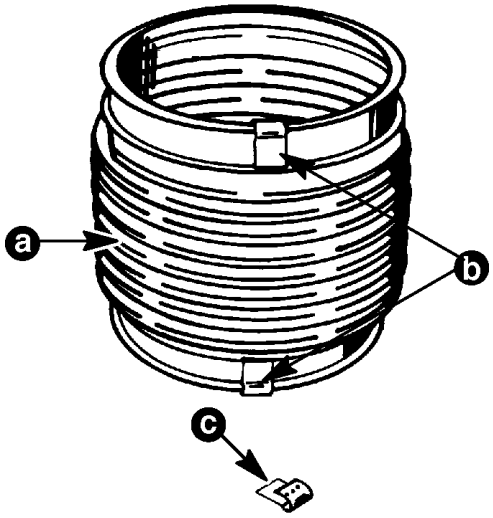


Approximate Hose Clamp Position on Bell Housing - MC-I/I-R/I-MR/Alpha One

a - Hose Clamp Position



Alpha One Generation II & Bravo U-Joint Bellows Sleeve (replaces hose clamp)
a - Sleeve
b - Sleeve Installation Tool (P/N 91-818162)
c - Suitable Driving Rod
d - Bell Housing Flange
e - Bellows



Grounding Clip Installation (Bellows clamps may corrode if grounding clips are not installed)
a - Bellows
b - Ground Clips
c - Hole Side

Notes:

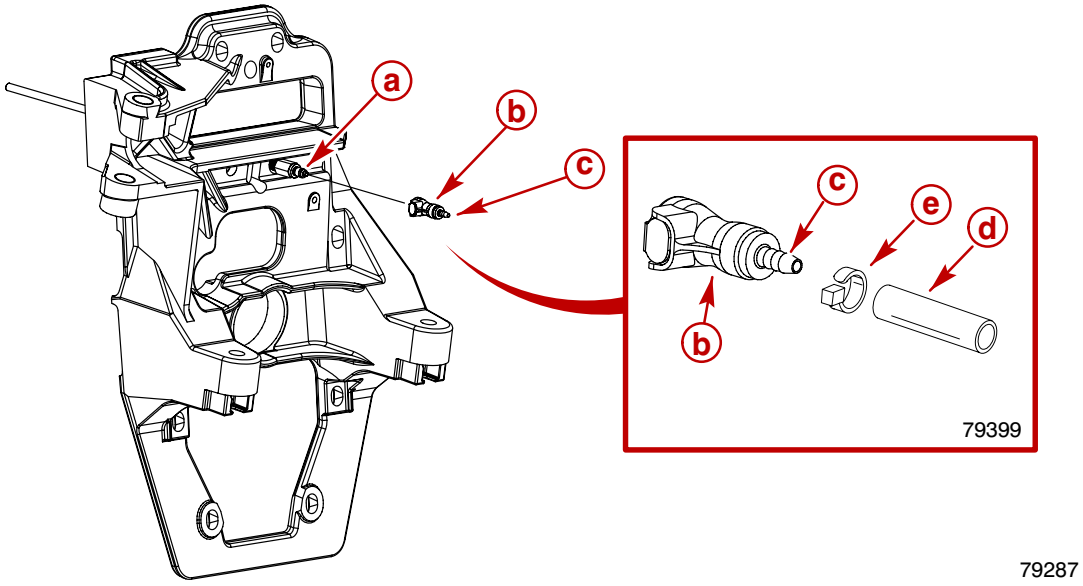
Bravo Transom Assembly - 2004

Speedometer Quick Connect

⚠ CAUTION

Excess water in bilge can damage engine or cause boat to sink. Do not remove plug from speedometer pickup tube fitting unless connection is to be utilized.

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



79287

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

⚠ CAUTION

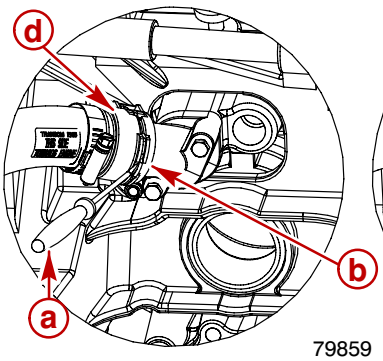
AVOID WATER LEAKING INTO BOAT. Speedometer hose is filled with water, especially during boat operation. Hose contact with moving or rotating engine parts could cause damage to the hose resulting in water leaking into boat. Do not let speedometer hose contact steering system components, engine coupler, or drive shaft.

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 Hose

REMOVAL

1. Using a screwdriver, lift the retainer clip to open position and pull seawater inlet hose assembly from transom.



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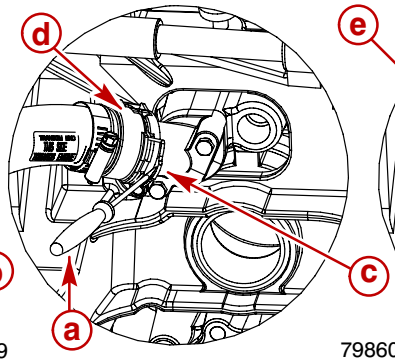

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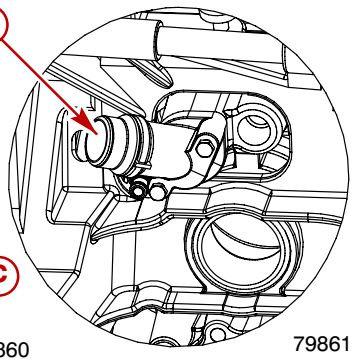
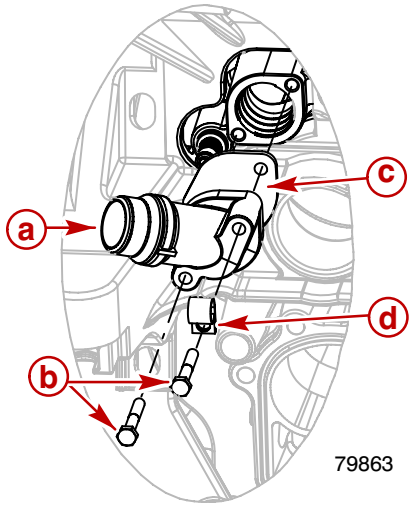


79861

a - Screwdriver
b - Retainer clip (closed)
c - Retainer clip (open)
d - Seawater inlet hose assembly
e - Seawater inlet fitting

2. Remove the screws, water inlet fitting, and the gasket from the transom.



79863

Water inlet fitting shown with gear lube hose J-clip

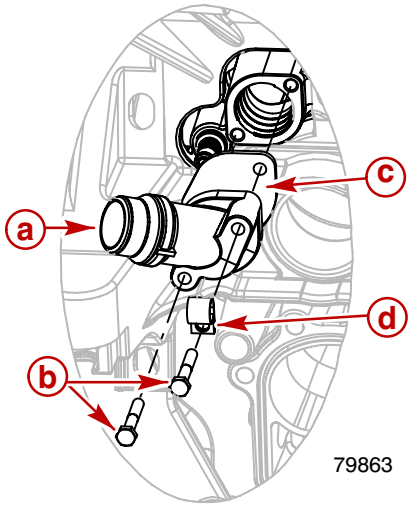
a - Seawater inlet fitting
b - Screw (2)
c - Gasket
d - J-clip

CLEANING AND INSPECTION

1. Inspect the fitting tabs for damage.
2. Inspect the fitting slots for damage.
3. Open and shut the retainer clip and check for proper operation.
4. Clean water inlet fitting with water and dry with compressed air.

REASSEMBLY

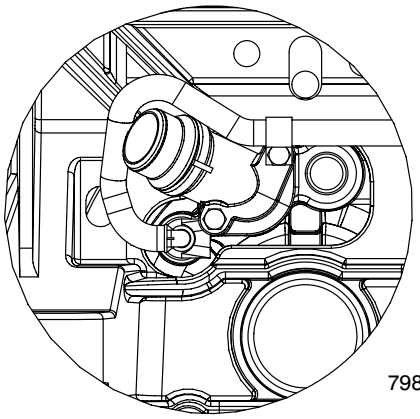
1. Install a new gasket, water inlet fitting, and screws. Torque screws.



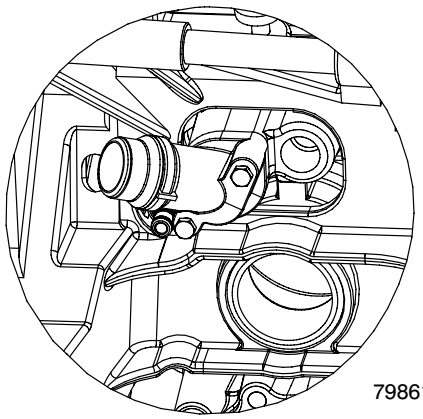
Water inlet fitting shown with gear lube hose J-clip

- **a** - Seawater inlet fitting
- **b** - Screw (2)
- **c** - Gasket
- **d** - J-clip

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



With gear lube hose and J-clip



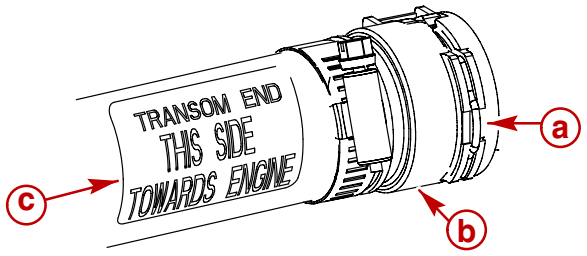
Without gear lube hose and J-clip

⚠ CAUTION

Excess water in bilge can damage engine or cause boat to sink. Ensure that the seawater inlet hose is connected properly by performing a pull test.

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

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



79867

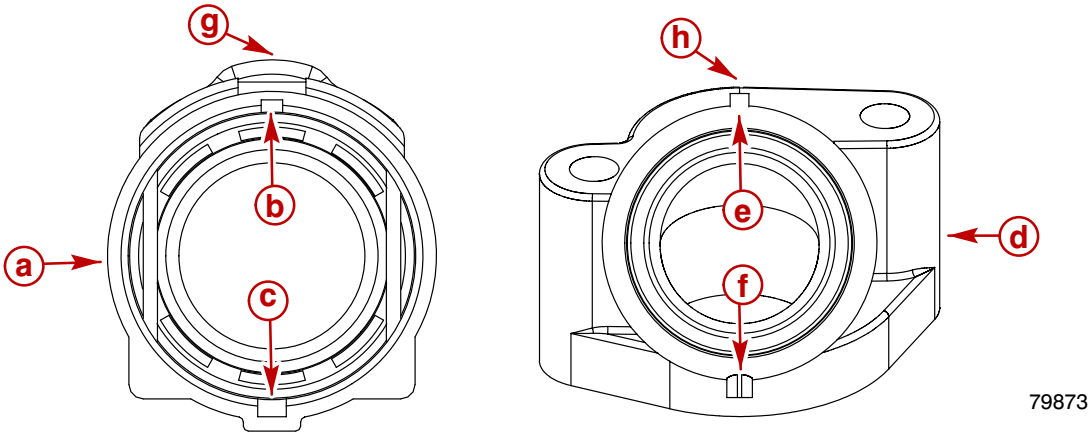
Seawater inlet hose assembly

- **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.



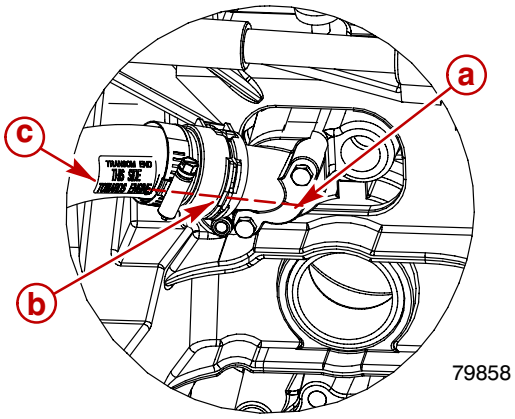
79873

- **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** - Center line 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.

3. 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.*



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

⚠ CAUTION

Excess water in bilge can damage engine or cause boat to sink. Ensure that the seawater inlet hose is connected properly by performing a pull test.

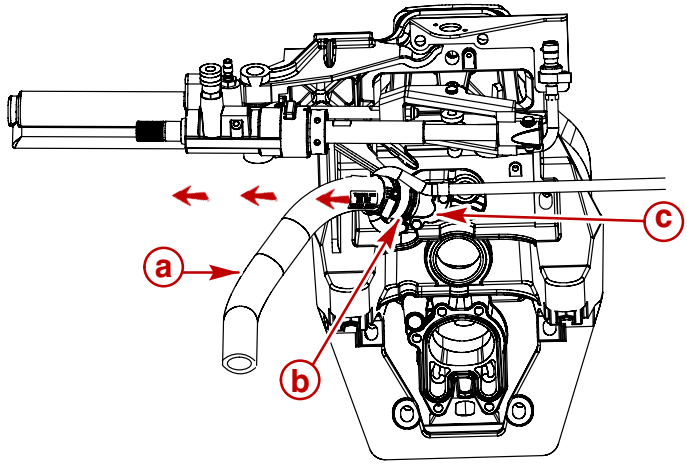
IMPORTANT: A pull test must be performed at the seawater inlet connection.

Decal – Transom End of Hose

Later versions of this seawater inlet hose assembly have the Decal moved from the hose to the Quick Connect Fitting (more durable installation).

4. 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.



79865

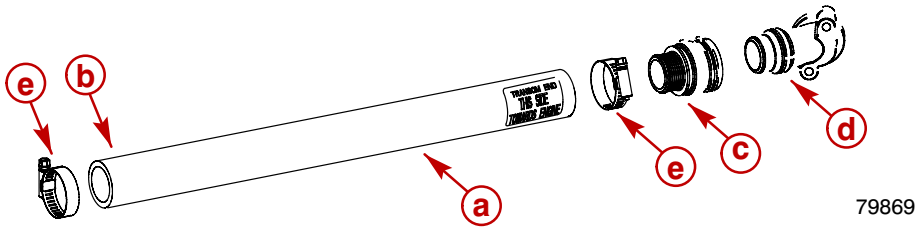
a - Seawater inlet hose
b - Quick connect fitting
c - Seawater inlet fitting
d - Pull direction

   b. If the seawater inlet hose does become separated from the seawater inlet fitting, reassemble as outlined in Step 2., 3., and the requirements in Step 4 for checking the integrity of the connection are satisfied.

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

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

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



79869

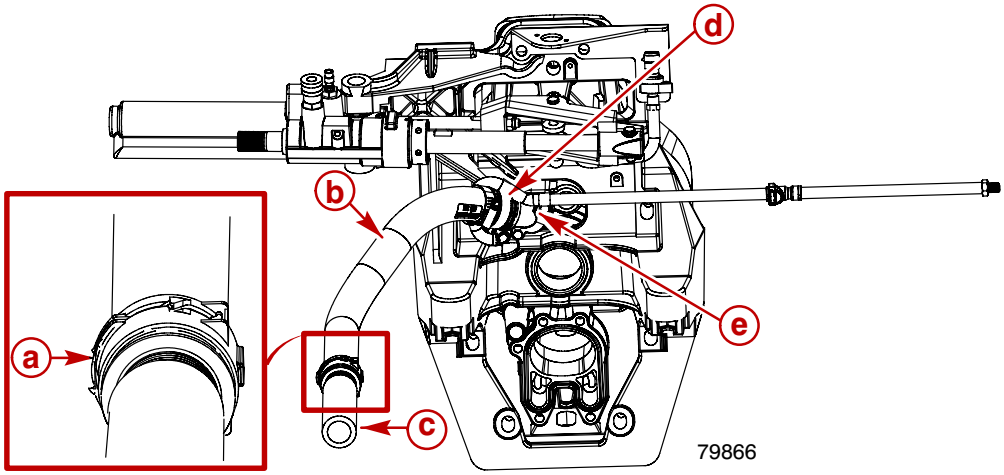
Seawater inlet hose assembly

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

6. **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.



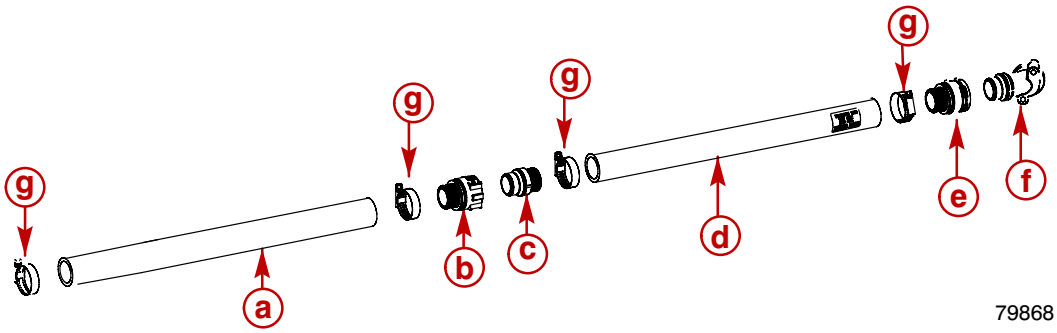
- **a** - Retainer clip position (away from engine)
- **b** - Extension hose
- **c** - Seawater inlet hose (to engine seawater pump)
- **d** - Quick connect fitting (to seawater inlet fitting)
- **e** - Seawater inlet fitting (to transom)

⚠ CAUTION

Excess water in bilge can damage engine or cause boat to sink. Ensure that the seawater inlet hose is connected properly by performing a pull test.

b. Perform a pull test and ensure that the requirements in Step 4. for checking the integrity of the connection are satisfied.

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

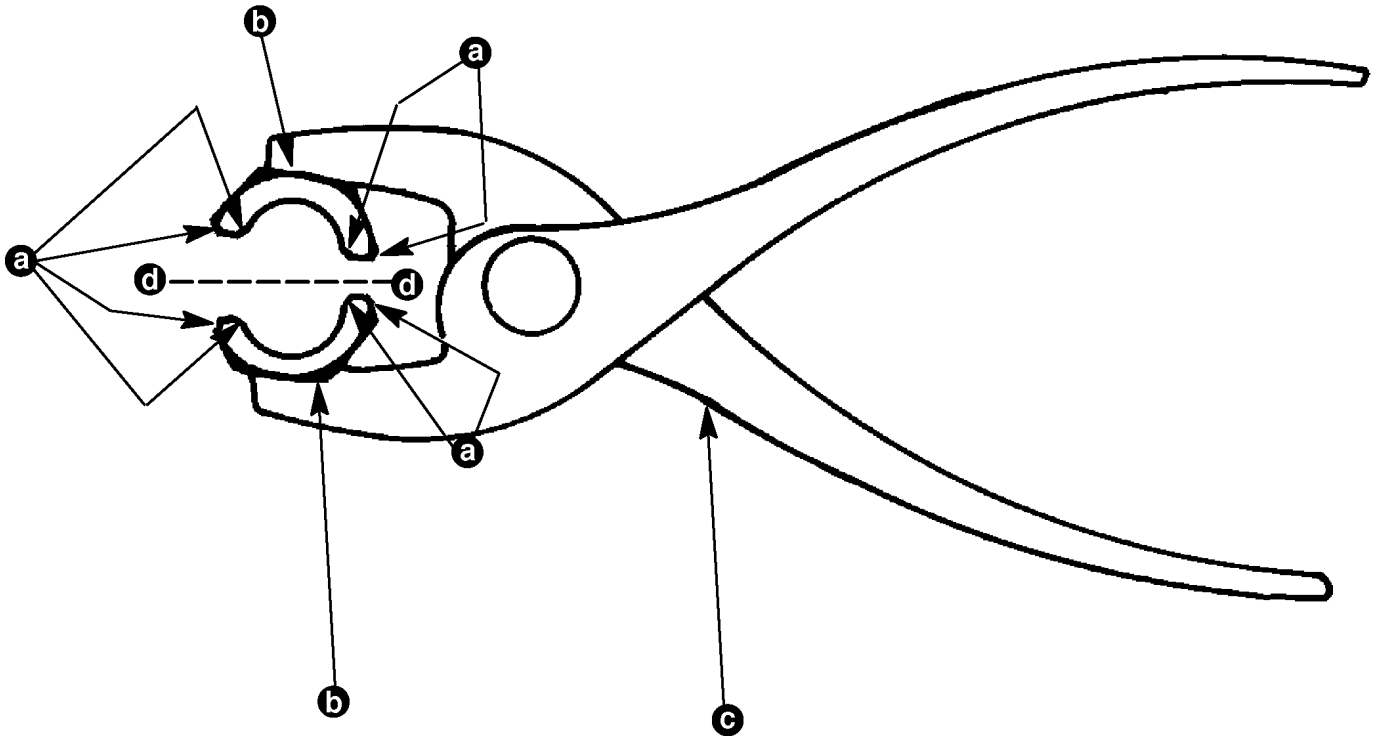
Shift Cable Bellows Crimp Clamp Pliers

1. Weld a 1/2 in. nut to the jaws of a pair of pliers (as shown).

2. Use a 1/2 in. drill bit to drill the threads out of the nut.

3. Clamp the jaws of the pliers in a vice and saw the nut in half without damaging the pliers.

4. Remove the pliers from the clamp and bevel the edges of the nut as indicated.



a - Bevel Edges
b - 3/4 in. Nut
c - Pliers
d - Saw Nut in Half

(Note: Shift Cable Bellows Clamp - P/N 54-38863.)

Gimbal Bearing Assembly

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

Inspection

1. Remove sterndrive unit.

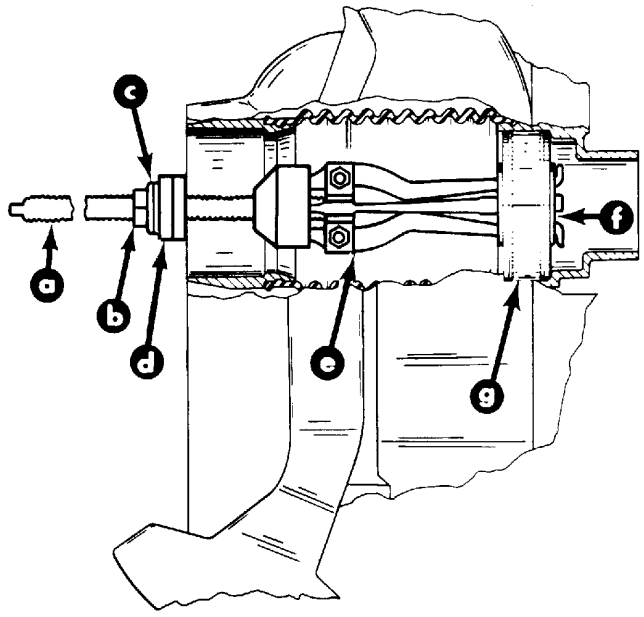
2. Reach through bell housing and rotate gimbal bearing to check for rough spots. Push and pull on inner race to check for side wear. Any excessive movement or roughness is cause for replacement.

Removal

CAUTION

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

1. Remove gimbal bearing assembly using tools as shown.

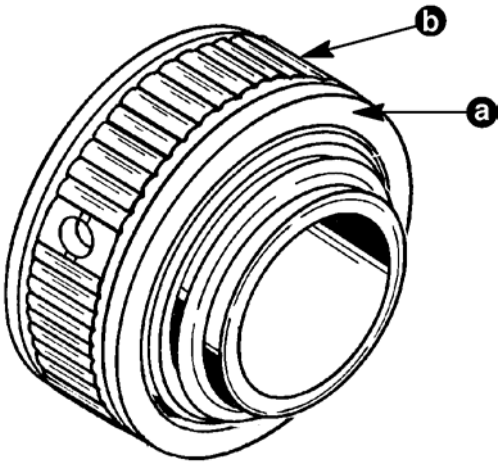


a - Puller Shaft (91-31229)*
b - Nut (11-24156)*
c - Washer (12-34961)*
d - Plates (2) (91-29310)*
e - Slide Hammer Puller
f - Gimbal Bearing Inner Race
g - Gimbal Bearing Carrier
* From Bearing Removal and Installation Tool 91-31229A5

Notes:

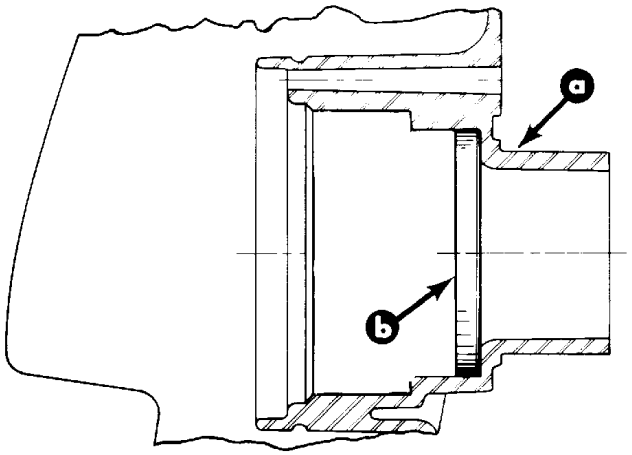
Notes:

2. Remove tolerance ring.



a - Gimbal Bearing Carrier
b - Tolerance Ring

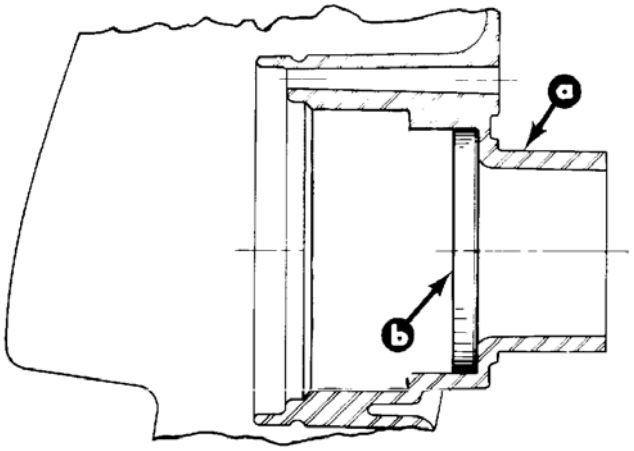
3. Remove grease seal.



a - Gimbal Housing
b - Grease Seal

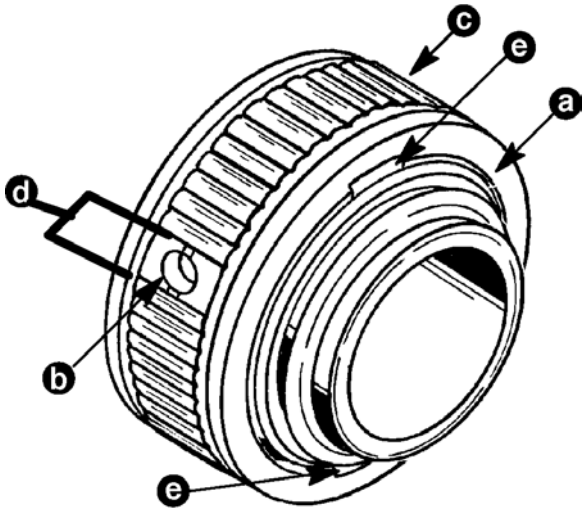
Installation

1. Install new 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

2. Install and position new tolerance ring, as shown.



NOTE: *When installing a Bravo 2000 X, XZ or XR drive on a 1999, or older, transom assembly, refer to MC Service Bulletin 2000-08 for necessary changes.*

a - Carrier
b - Carrier Grease Hole
c - Tolerance Ring
d - Align Opening in Tolerance Ring With Grease Hole in Carrier
e - Notched Edge Of Bearing Carrier

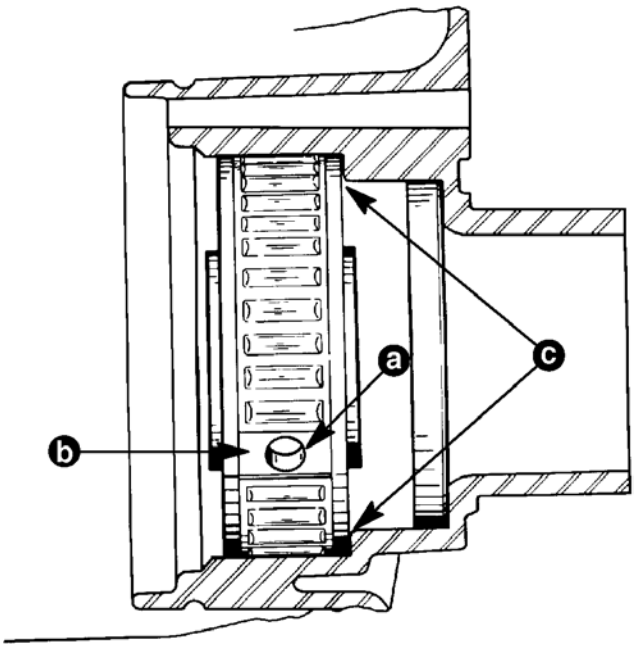
3. Ensure that notched edge of bearing carrier faces inward in bore when installing gimbal bearing.

NOTE: *All Bravo 2000 models and Alpha Transom Assys., beginning with S/N 0M535803, use a special gimbal bearing (P/N 30-862540A3) with a red dot that must face out. Non-current transom assys. continue to use gimbal bearing P/N 30-60794A4.*

Notes:

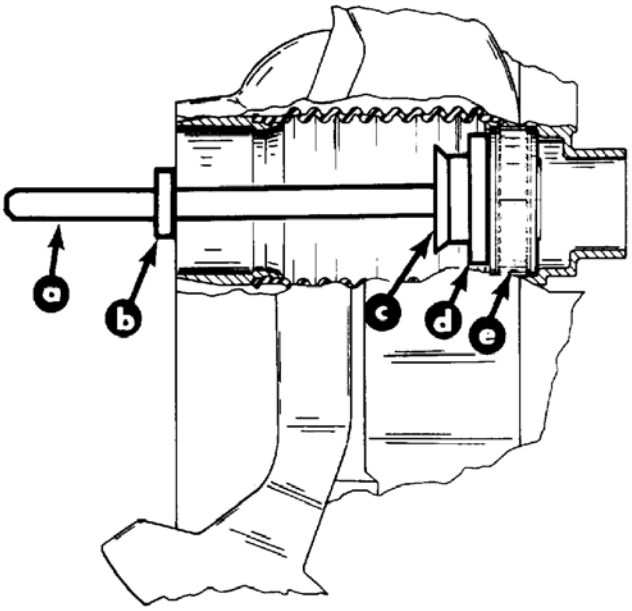
Notes:

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



a - Gimbal Bearing Carrier Grease Hole
b - Tolerance Ring Opening
c - Bearing Carrier Notch - Face Inward

5. Install gimbal bearing with tools, as shown. Tap in with a lead hammer until carrier rests on the gimbal housing. Approximately 1/8 in. of the bore will show when the bearing is bottomed out.



a - Driver Rod (91-37323)*
b - Plate (91-29310)*
c - Driver Head (91-32325)*
d - Mandrel (91-30366-1)*
e - Gimbal Bearing Assembly
* From Bearing Removal and Installation Tool 91-31229A7

Notes:

MerCruiser I Drive Unit Intermediate Shift Cable Identification

Transom Assembly serial number 6376504 and above.

IMPORTANT: This new style cable (which attaches to bell housing from aft end) can be used on models with the old style shift cable (attached on front side of bell housing). To do this, the threaded hole in bell housing must be tapped all-the-way thru, using a 1/4-18 NPSF tap. This special STRAIGHT THREAD TAP may be obtained thru Quicksilver by ordering P/N 91-95639. The following important information must be observed when performing tapping operation.

- Tapping must be done from the front (bellows side) end of bell housing to prevent cross-threading.
- Never use a TAPERED THREAD TAP as improper positioning of shift cable may result, or water may leak into bell housing.

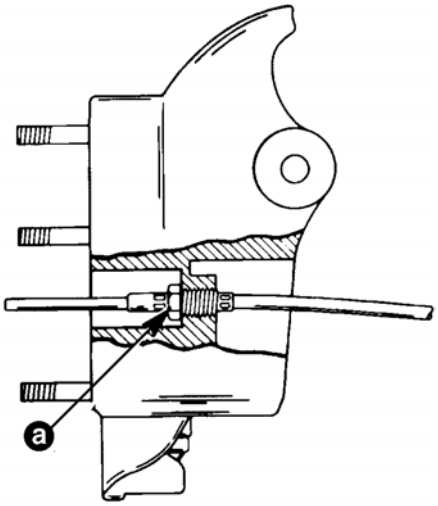


Figure 1. New Style Shift Cable
a - Shift Cable Retaining Nut

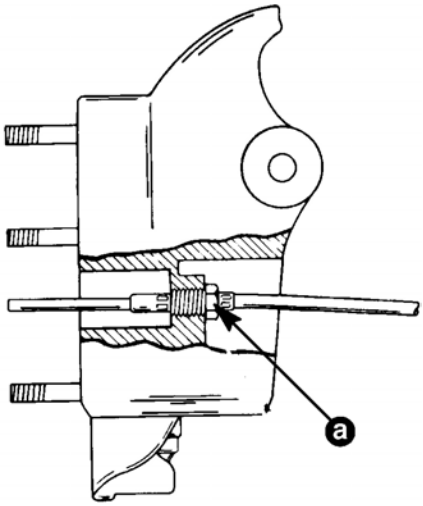


Figure 2. Old Style Shift Cable
a - Shift Cable Retaining Nut

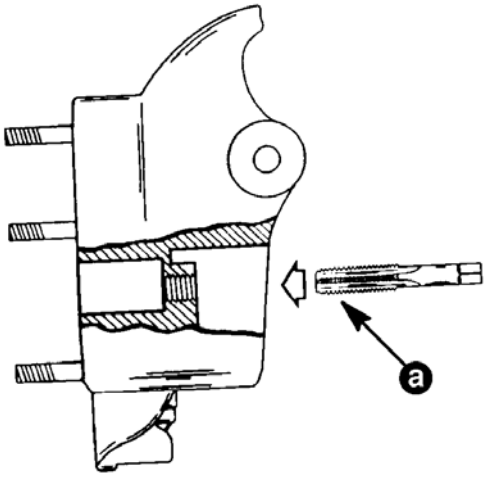
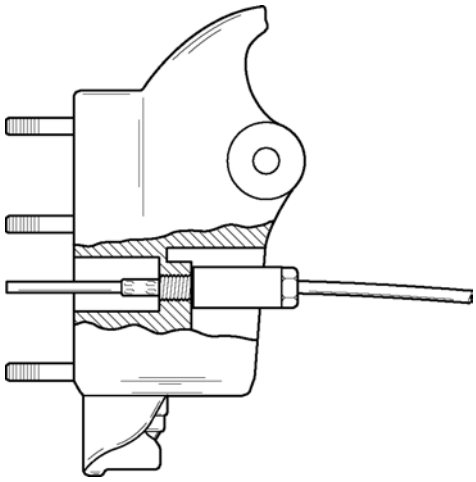


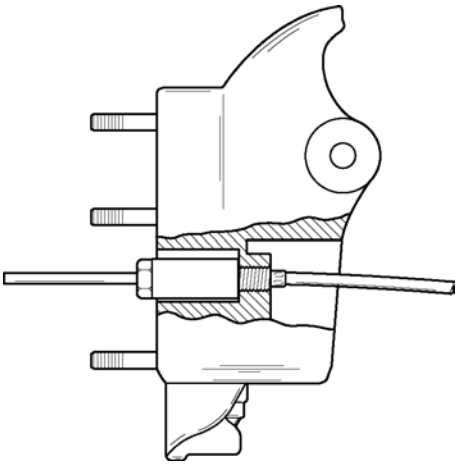
Figure 3. Threading Shift Cable Hole in Bell Housing (Older Models) to accept the new style shift cable

a - P/N 91-95639 1/4”-18 NPSF Tap

Drive Unit Shift Cable Removal and Installation Tool P/N 91-12037 Installation - Old Style Cable



Installation - New Style



Notes:

MerCruiser I/I-R/I-MR/Alpha One – New Style (Aft) Shift Cable - Conduit and Core Wire Identification

Transom assembly serial number 0C698141 and above.

A new style drive unit shift cable is being used. Following is a list of the major differences from the earlier cable.

IMPORTANT: The new style shift cable is pre-cut to proper length and should be replaced as an assembly only. DO NOT mix parts between old and new style.

1. Larger Diameter Armor Wrapped Core Wire. (Figures 1 & 2)
2. Larger Diameter Hole in Shift Cable Anchor. (Figures 3 & 4)
3. Larger Diameter Hole Inside of Shift Slide. (Figures 5 & 6)
4. Larger Diameter Shift Cable Conduit (to Accommodate Larger Diameter Core Wire). (Figures 7 & 8)

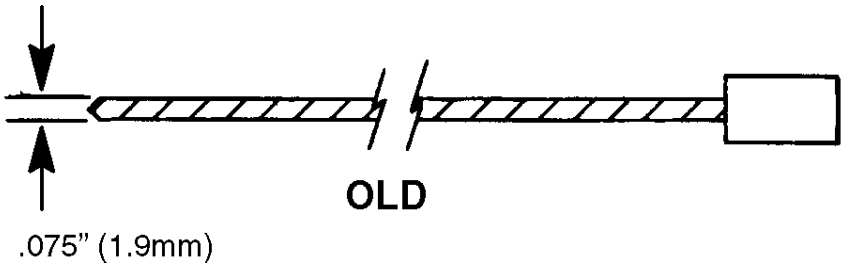
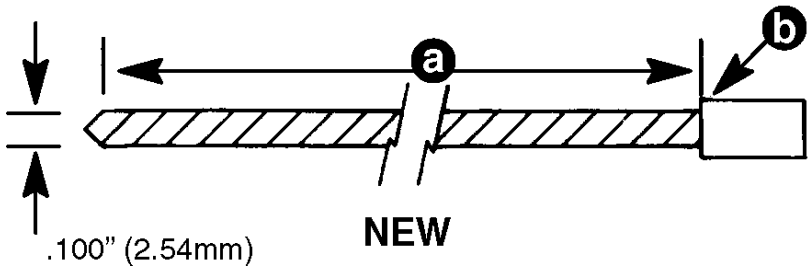


Figure 1. Core Wire



a - New Pre-Cut Core Wire Dimension 72-1/8 in. (1832mm)
b - Front Edge of Anchor

Figure 2. Core Wire

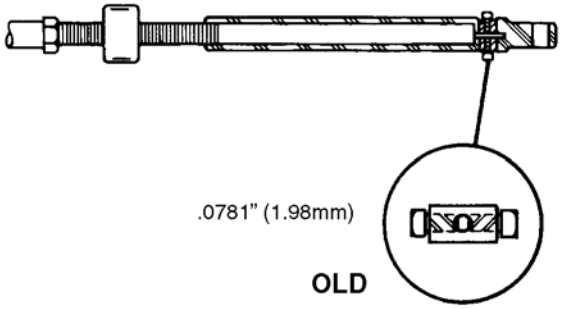


Figure 3. Cable Anchor

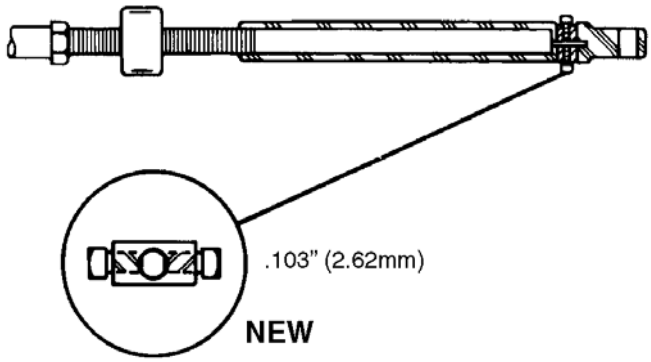


Figure 4. Cable Anchor

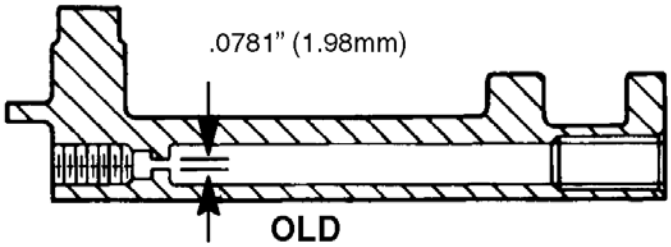


Figure 5. Shift Slide

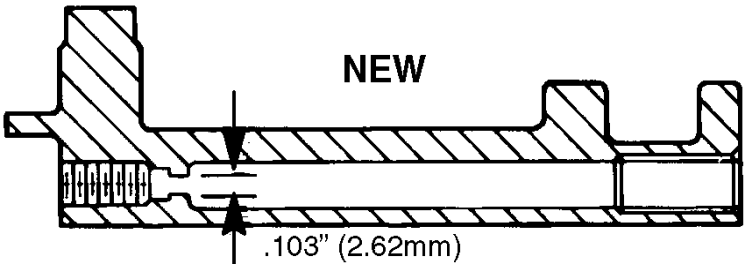


Figure 6. Shift Slide

Notes:

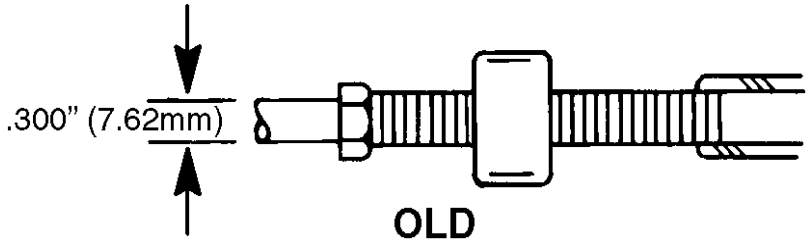


Figure 7. Shift Cable Conduit
*Inner Core wire is cut to length at installation

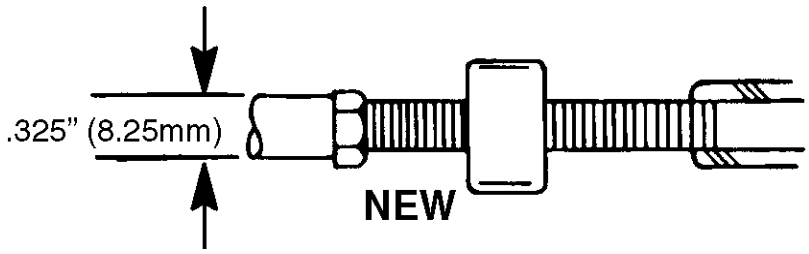
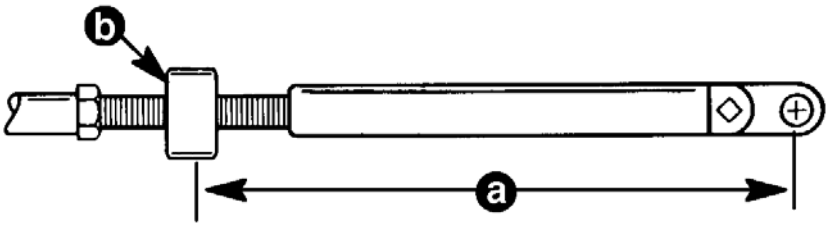


Figure 8. Shift Cable Conduit
*Inner Core wire is pre-cut by factory

NOTE: *The distance from the centerline of the cable end guide to the centerline of the brass barrel was changed in 1974.*

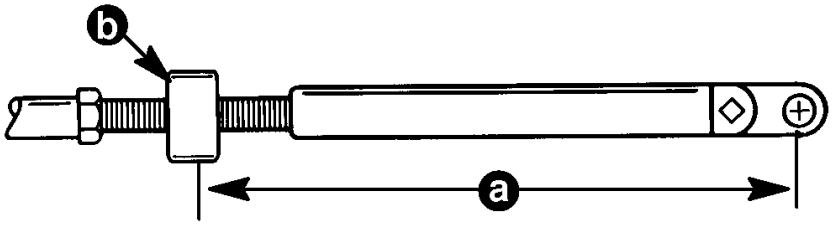
1973 and Prior

NOTE: *This cable does not supersede to the new cable. Order P/N 73723A1.*

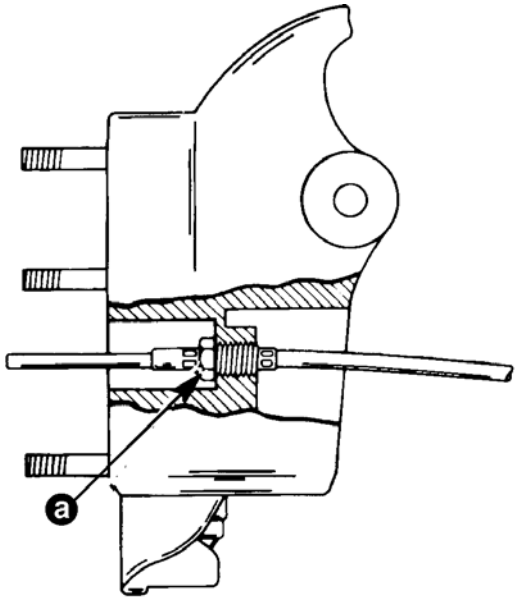


a- 5-7/8" (14.9 cm)
b- Brass Barrel

1974 and Newer



a- 6" (15.2 cm)
b- Brass Barrel



a - Shift Cable Retaining Nut

New Style Shift Cable

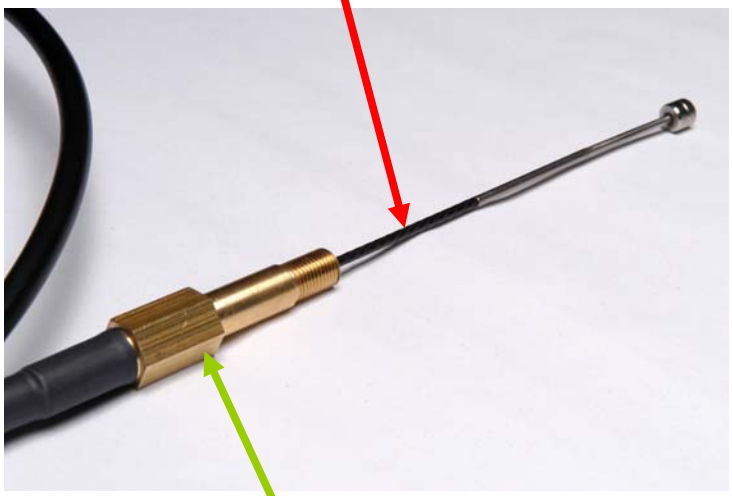
Notes:

Intermediate Shift Cable Redesign

Notes:

- Alpha and Bravo intermediate shift cable redesign to reduce friction and lost motion
- Affects Alpha and Bravo
- Reduces required bend radius
- Installs exactly as the old style cable did
- Went into production in June 2003

Black Teflon Coating



New Crimp method to prevent water leak

ALPHA Intermediate Shift Cable
(Part # 865436 A02)

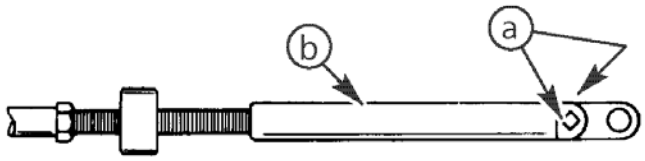
Notes:

Alpha Drive Unit Shift Cable Removal and Installation

Removal

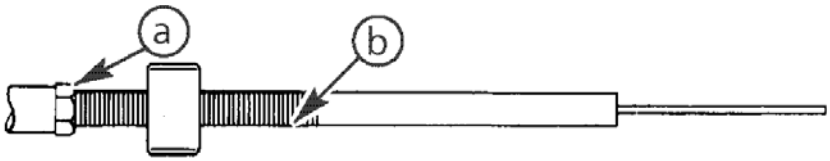
1. Remove sterndrive unit.

2. Disconnect shift cable from shift plate and remove end guide.



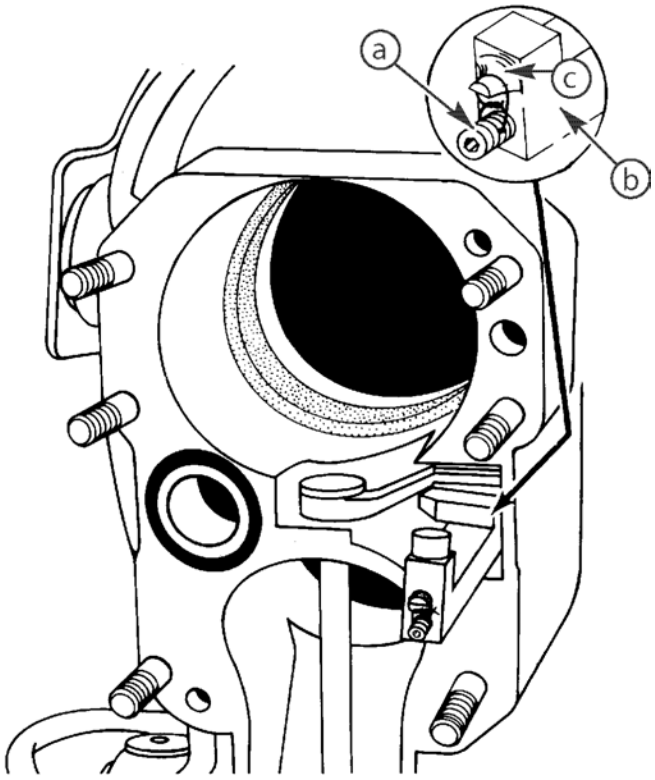
a - Anchor Screws (2)
b - End Guide

3. Remove threaded tube.



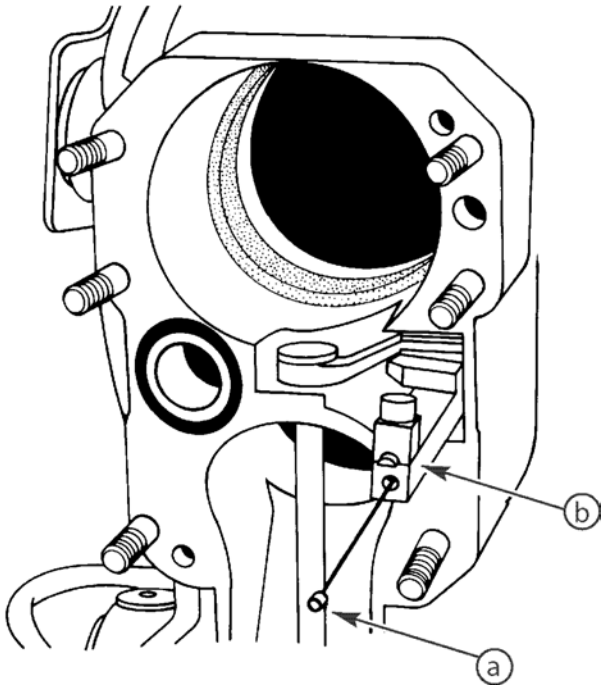
a - Jam Nut
b - Threaded Tube

4. Cut safety wire and remove set screw from shift slide.



a - Set Screw
b - Shift Slide
c - Safety Wire

5. Remove inner core wire and shift slide.

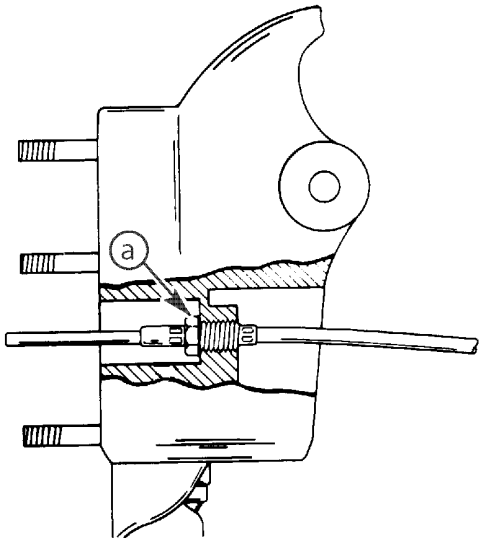


a - Inner Core Wire
b - Shift Slide

Notes:

Notes:

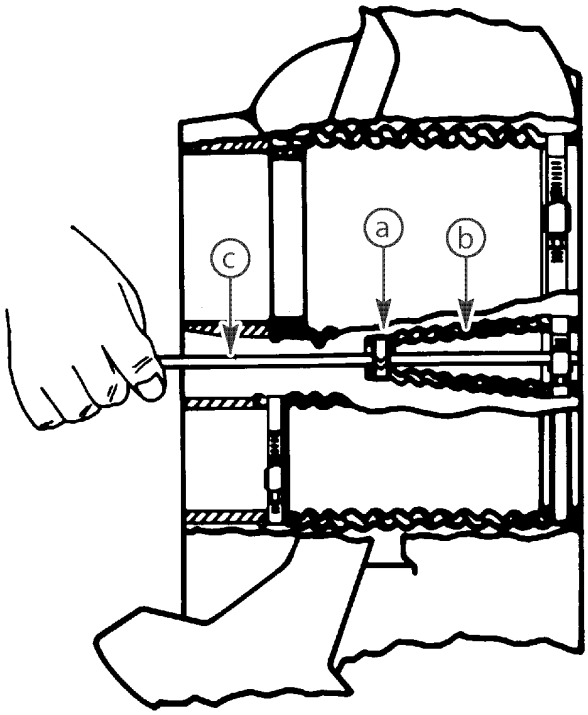
6. Using shift cable removal and installation tool (91-12037), completely loosen shift cable retaining nut.



a - Shift Cable Retaining Nut

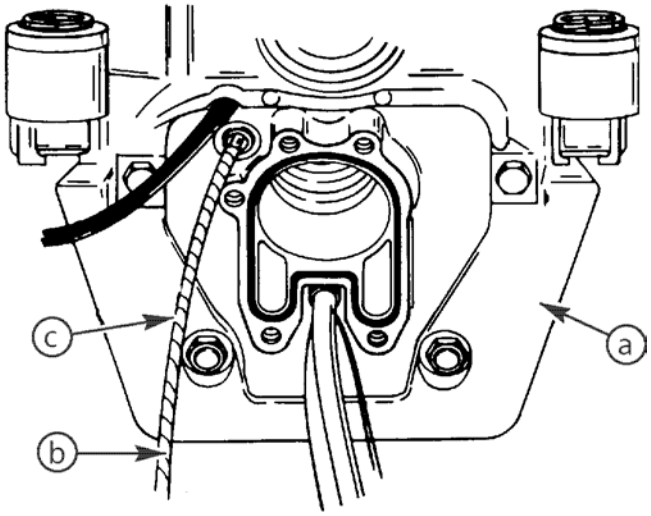
IMPORTANT: The shift cable should be replaced as an assembly only.

7. Loosen and remove shift cable bellows crimp clamp.



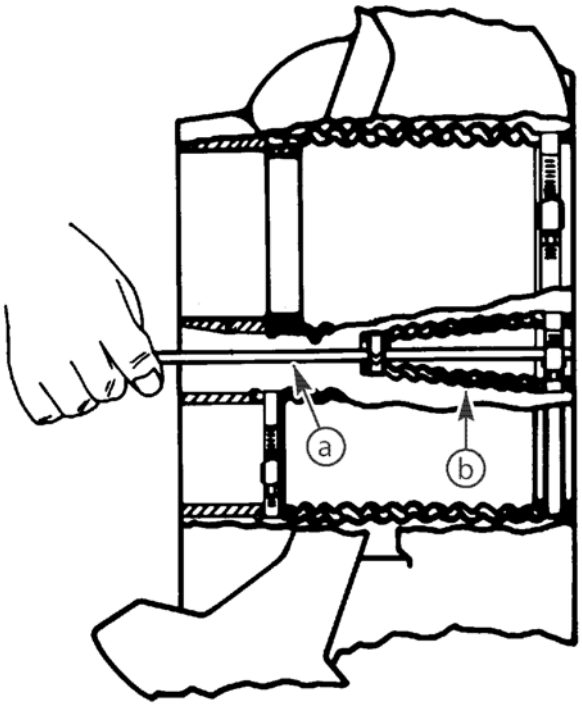
a - Crimp Clamp
b - Shift Cable Bellows
c - Shift Cable

8. Remove shift cable wrapping from shift cable on inner transom.



a - Inner Transom
b - Shift Cable
c - Wrapping

9. Pull shift cable through shift cable bellows.



a - Shift Cable
b - Shift Cable Bellows

Notes:

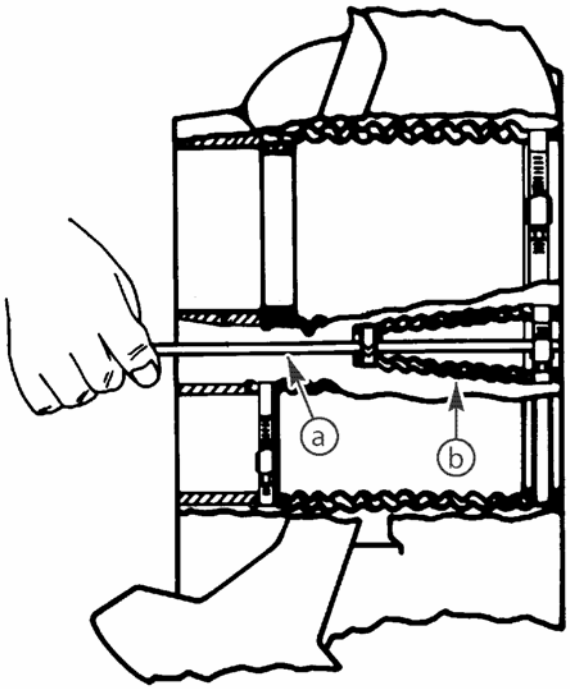
Notes:

Inspection

1. Inspect shift cable for cuts, kinks and chafing.
2. Inspect inner core wire for kinks and unraveling.
3. Inspect shift cable retainer nut threads for damage.
4. Inspect for signs of retainer nut separating from outer casing.

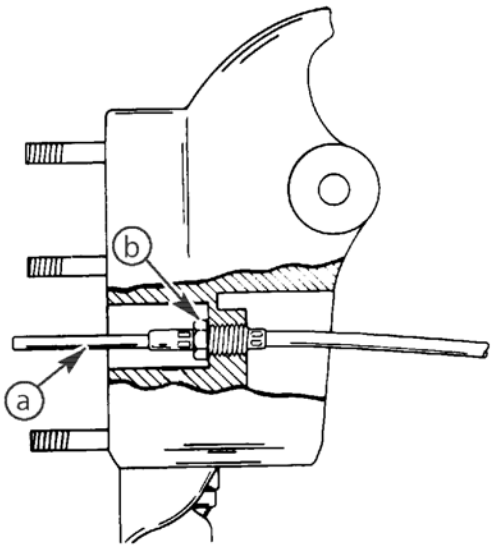
Installation

1. Insert shift cable through bell housing and shift cable bellows.



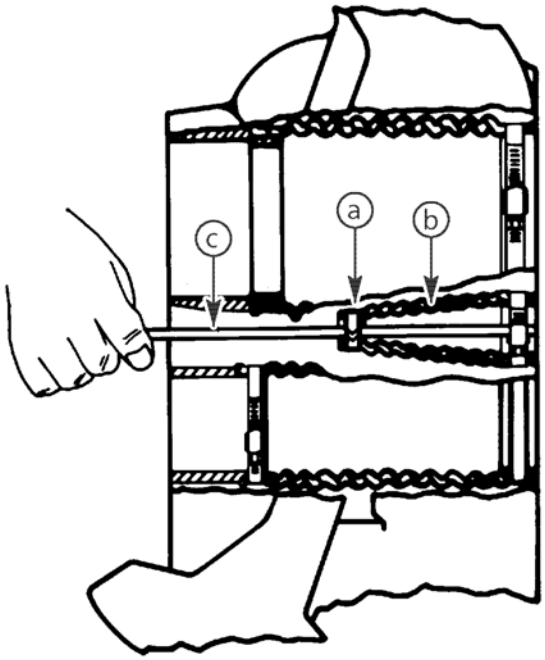
a - Shift Cable
b - Shift Cable Bellows

2. Apply Perfect Seal to shift cable retainer nut threads and secure shift cable to bell housing, using shift cable removal and installation tool (91-12037). **No more than 2 threads on retainer nut should be exposed.**



a - Shift Cable
b - Retainer Nut

3. Install and compress shift cable bellows crimp clamp. Be sure that clamp is crimped evenly so that a good seal is maintained between bellows and shift cable. (Plans for Crimp Clamp Tool are on p. 14) DO NOT allow bellows to flatten or water leak may occur.

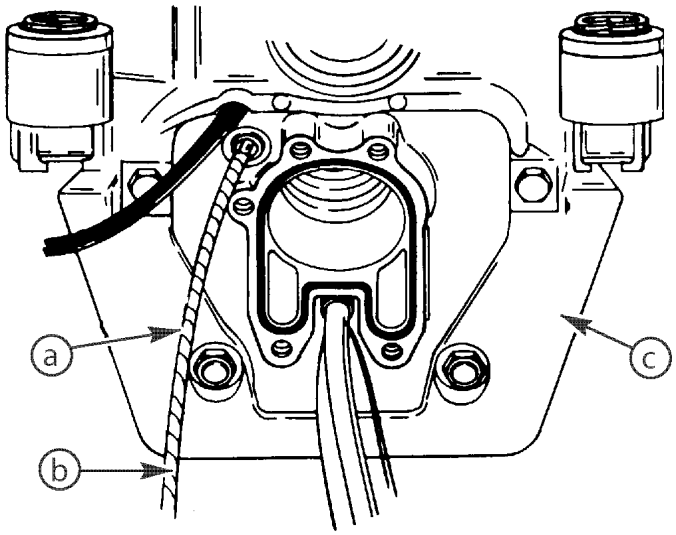


a - Crimp Clamp
b - Shift Cable Bellows
c - Shift Cable

Notes:

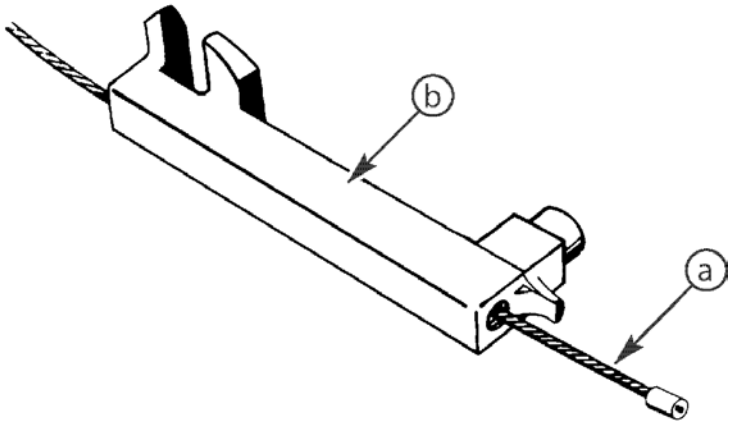
Notes:

4. Install shift cable wrapping.



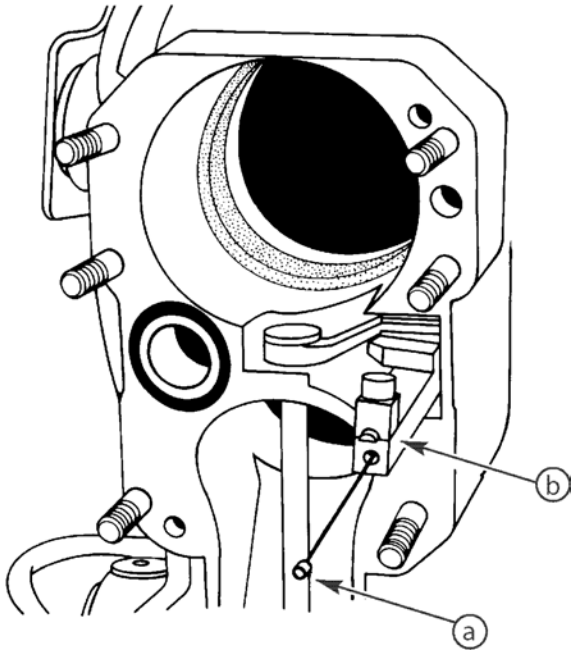
a - Shift Cable
b - Shift Cable Wrapping
c - Inner Transom Plate

5. Install inner core wire through shift slide.



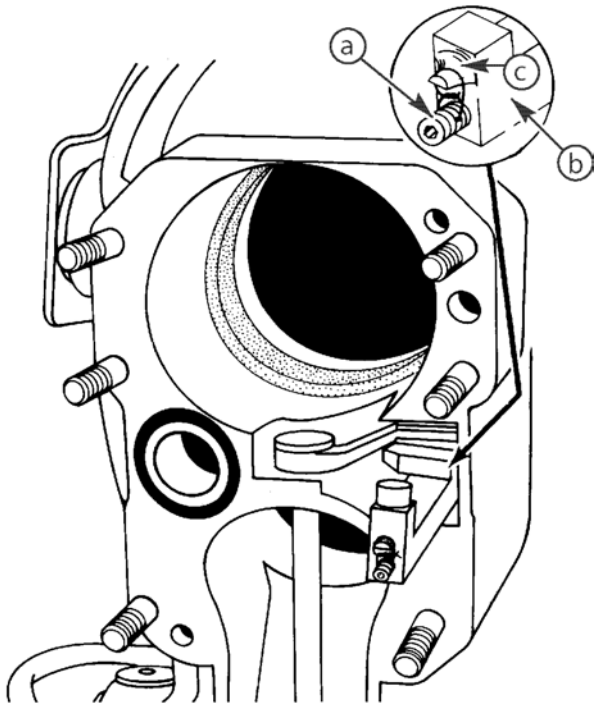
a - Core Wire
b - Shift Slide

6. Install inner core wire through shift cable.



a - Inner Core Wire
b - Shift Slide

7. Install set screw into shift slide. Tighten until it contacts core wire. Then back off a maximum of 1/8 turn. Safety wire set screw to shift slide using a “figure 8” pattern. Twist until tight and cut off excess length of safety wire.



a - Set Screw
b - Shift Slide
c - Safety Wire

NOTE: *.032" safety wire may be obtained from most aviation parts suppliers and may also be ordered from the following locations:*

www.aircraft-tool.com

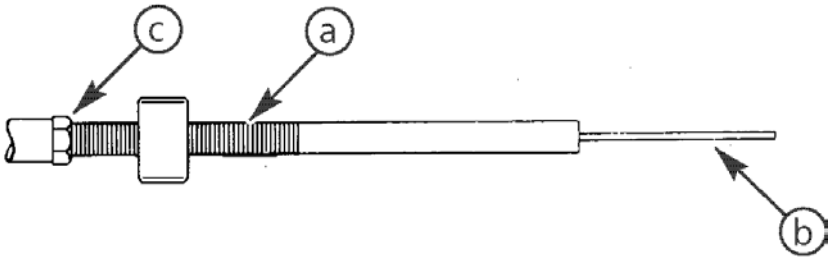
or

Precision Manufacturing and Sales, Clearwater, FL
www.precisionmfgsales.com
800-237-5947

Notes:

Notes:

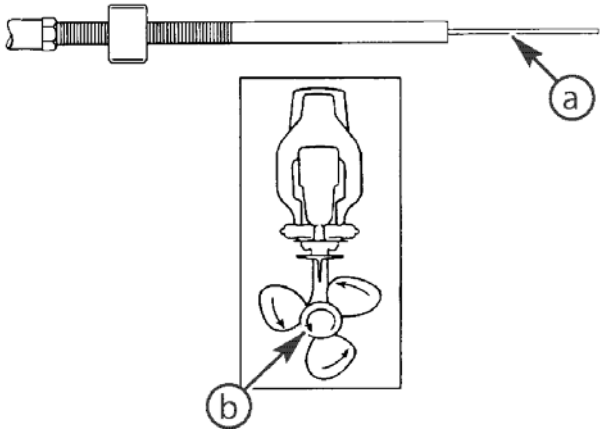
8. Install threaded tube on shift cable and tighten until it bottoms. Secure jam nut against shift cable end.



a - Threaded Tube
b - Core Wire
c - Jam Nut

9. Install sterndrive unit.

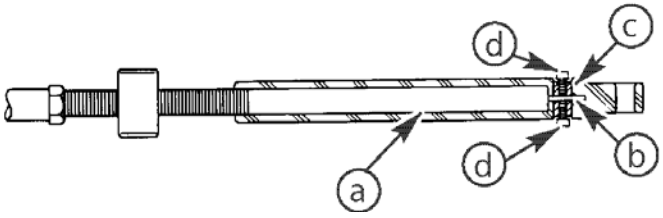
10. Push in on drive unit shift cable while simultaneously turning propeller shaft counterclockwise until shaft stops. To ensure that clutch is fully engaged, maintain pressure on propeller shaft with a suitable device (elastic strap).



a - Inner Core Wire
b - Propeller Shaft

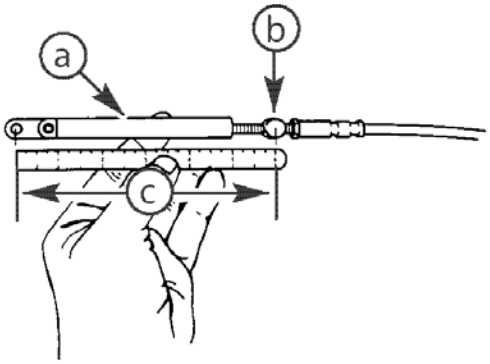
NOTE: *Clutch engagement will be in forward on right hand rotation units and reverse for left hand rotation.*

11. Install shift cable end guide over core wire and insert core wire through cable anchor. Tighten screws securely.



a - Shift Cable End Guide
b - Core Wire
c - Cable Anchor
d - Screws (2)

12. While applying light inward pressure, rotate barrel on shift cable threads until distance between center of hole in shift cable end guide and center of brass barrel measure 6 in. (153 mm).



a - End Guide
b - Brass Barrel
c - 6 in. (153 mm)

13. Adjust shift cable.

Notes:

Alpha Drive Unit Remote Control and Drive Unit Shift Cables Adjustment, Drive Unit Installed

IMPORTANT: Shift cable adjustment for a right hand (RH) rotation drive unit is different than the procedure for adjusting a left hand (LH) rotation drive unit. Be sure to refer to the appropriate procedure when performing the following steps.

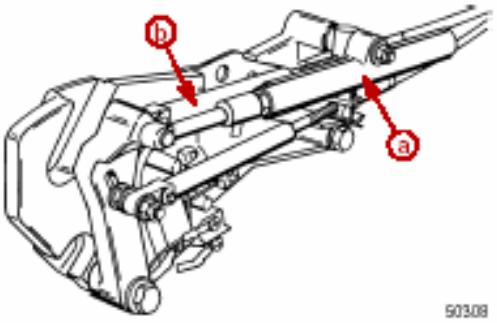
RIGHT HAND ROTATION - Install control cable in remote control so that cable end will move in direction “A” when shift handle is placed in the forward position.

LEFT HAND ROTATION - Install the control cable in remote control so that cable end will move in direction “B” when shift handle is placed in the forward position.

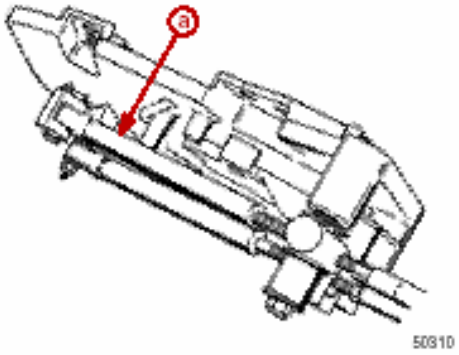
IMPORTANT: Drive unit must be installed.

IMPORTANT: DO NOT run engine.

1. Remove remote control shift cable and shift assist assembly (if installed).



With Shift Assist Assembly (Older shift plate shown)
a - Shift Assist Assembly
b - Remote Control Shift Cable

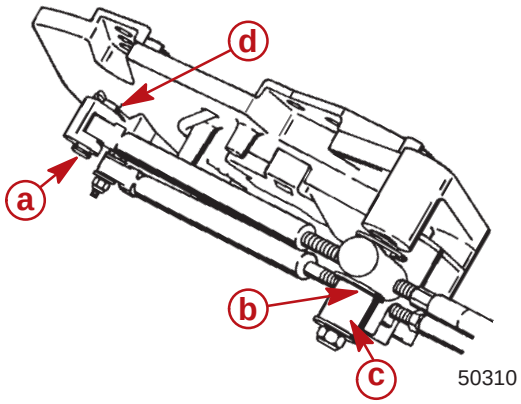


Without Shift Assist Assembly (Older shift plate shown)
a - Remote Control Shift Cable

IMPORTANT: If boat is being equipped with a REMOTE CONTROL THAT HAS SEPARATE SHIFT AND THROTTLE LEVERS, the shift assist assembly that is shipped with the engine should NOT be used. The use of the shift assist assembly with this type of remote control can cause the shift lever to move out of gear unexpectedly.

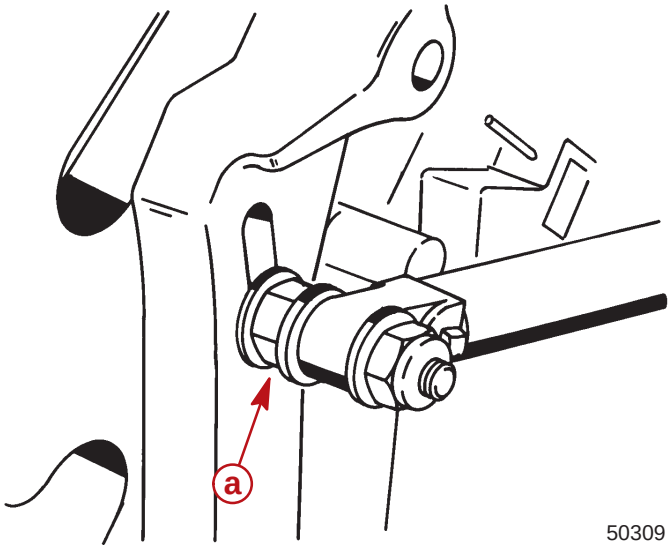
The following kit will have to be ordered to connect remote control shift cable when shift assist assembly is not used.

Spacer Kit 23-11284A1



a - Clevis Pin
b - Washer
c - Spacer
d - Cotter Pin

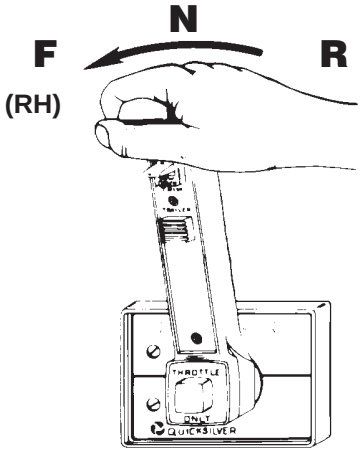
2. Ensure shift lever adjustable stud is at bottom of slot. If necessary, loosen stud and move it to bottom of slot toward pivot point and retighten stud.



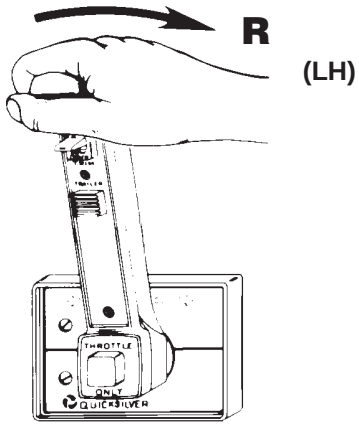
a - Adjustable Stud

3. Shift remote control as stated in “a” or “b” following:

   a. **Right Hand (RH) Rotation Drive Unit -** forward gear, past detent, into wide-open-throttle position. (Older control shown)

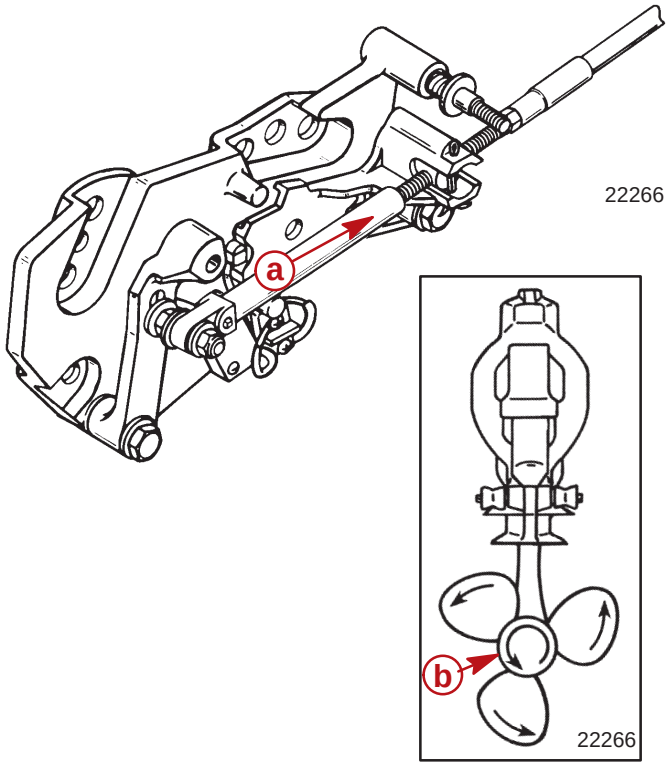


   b. **Left Hand (LH) Rotation Drive Unit -** reverse gear, past detent, into wide-open-throttle position. (Older control shown)



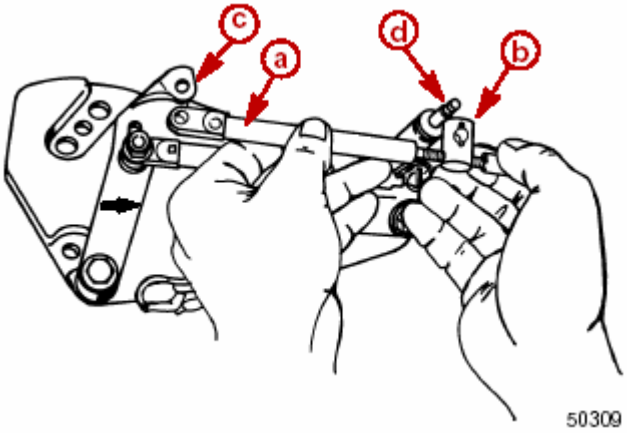
4. Place drive unit into gear by pushing in on drive unit shift cable, while simultaneously rotating propeller shaft counterclockwise until shaft stops, to ensure full clutch engagement. Maintain a light pressure on the drive unit shift cable to hold it at the end of its travel (this removes all slack from the cable).

   IMPORTANT: Do not use excessive force when holding pressure on the drive unit shift cable. Excessive force would be indicated by movement of the shift cutout switch.



a - Drive Unit Shift Cable - Push In
b - Propeller Shaft - Rotate Counterclockwise

5. Lightly pull on remote control shift cable end guide (to remove slack from remote control and cable) and adjust brass barrel as necessary to align attaching points with shift lever clevis pin hole and stud. Be sure to maintain light pressure on drive unit shift cable.



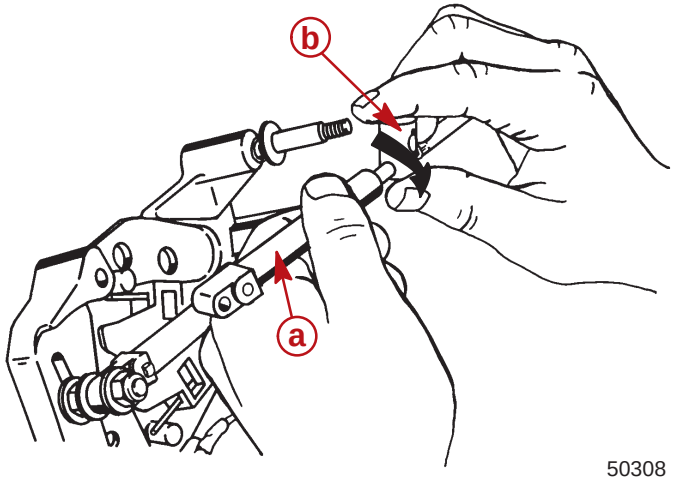
a - End Guide
b - Brass Barrel
c - Shift Lever Clevis Pin Hole
d - Stud

6. If the shift plate is equipped with a Shift Assist Assembly then skip this step and go to step 7.

   If the shift plate does not have a Shift Assist Assembly then follow these isntructions

   NOTE: *Two different size threaded ends have been used on the remote control shift cable.*

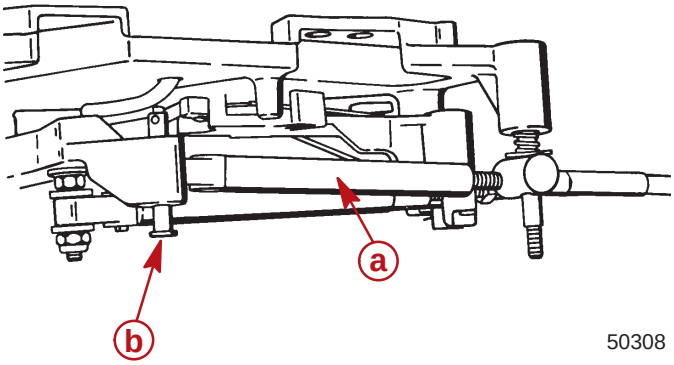
   After cable has been aligned, turn brass barrel 2 turns **away** from cable end guide on 1/4-28 threaded ends and 4 turns away from cable end guide on 1/4-40 threaded ends.



50308

a - End Guide
b - Brass Barrel

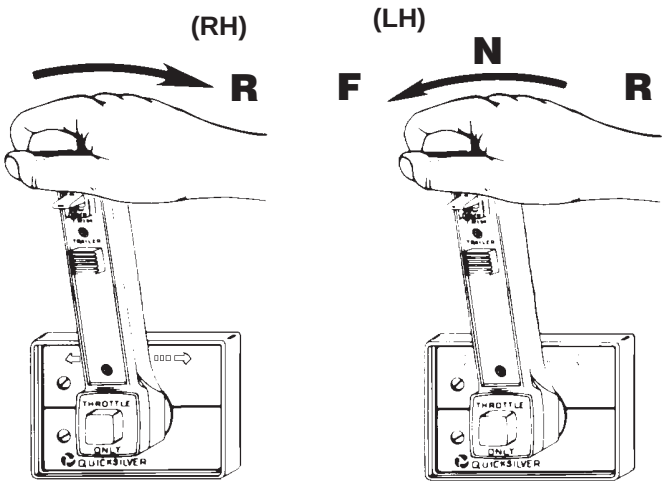
7. Temporarily install remote control shift cable on stud and install clevis pin.



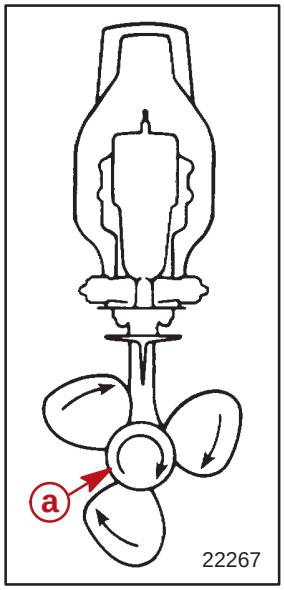
50308

a - Remote Control Shift Cable
b - Clevis Pin

8. Shift remote control as stated in “a” or “b” following: (older control shown)
   a. **Right Hand (RH) Rotation Drive Unit -** reverse gear, past detent, into wide-open-throttle position.
   b. **Left Hand (LH) Rotation Drive Unit -** forward gear, past detent, into wide-open-throttle position.



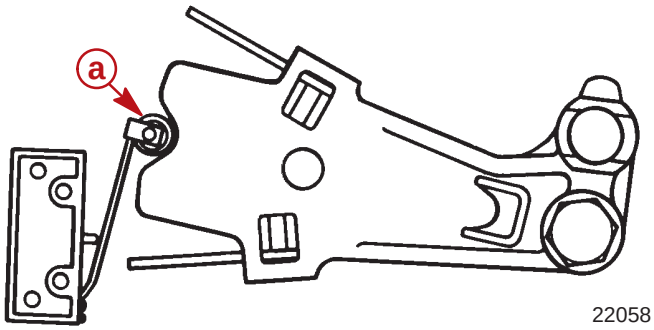
Simultaneously rotate propeller shaft clockwise until shaft stops to ensure full clutch engagement.



a - Propeller Shaft - Rotate Clockwise

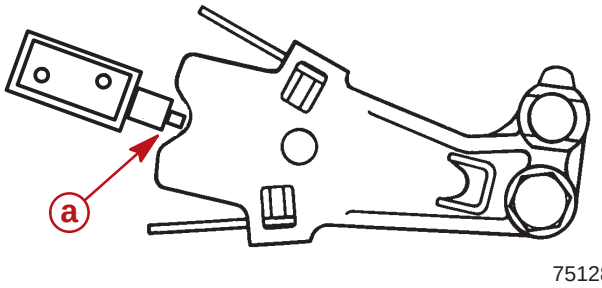
9. Perform “a” or “b” as appropriate:

   a. **On Models with Earlier Type Switch:** check shift cutout switch lever position. Roller must be centered.



a - Shift Cutout Switch Roller

   b. **On Models with Later Type Switch:** check shift cutout switch plunger position. Pin must be centered.



a - Shift Cutout Switch Plunger Pin

10. If roller or plunger pin is not centered:

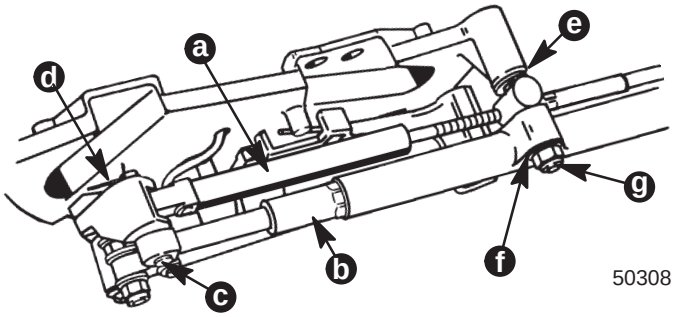
   a. Ensure adjustable stud is at bottom of slot in shift lever.

   b. Check remote control for proper shift cable output [3 in. (76mm) ± 1/8 in. (3mm)]. Refer to “Installation Requirements.”

   c. If “a” and “b” are correct, ensure drive unit shift cable is not crushed or kinked. (If drive unit shift cable is binding, the shift cutout switch roller or plunger pin will move off center when shifting “into” and “out of” forward **and** reverse).

NOTE: *If shift cable was damaged during installation, install new shift cable assembly in accordance with instructions contained in sterndrive service manual, then repeat shift cable adjustment procedure.*

11. After remote control shift cable has been properly adjusted, reinstall cable and shift assist assembly (if applicable) and secure with hardware as shown.

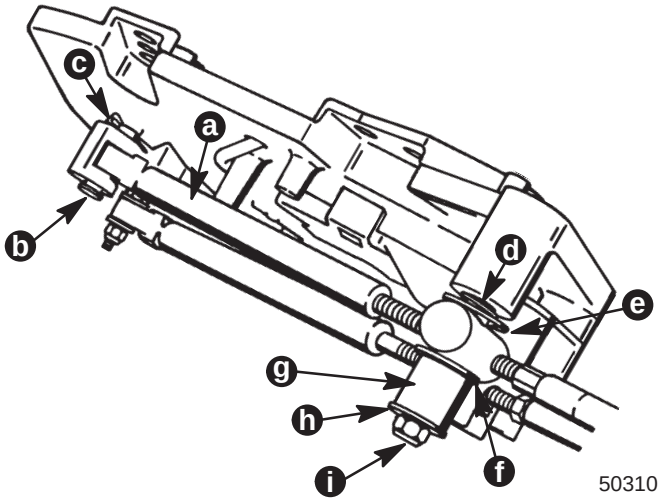


With Shift Assist Assembly (Older shift plate shown)

a - Remote Control Shift Cable
b - Shift Assist Assembly
c - Clevis Pin
d - Cotter Pin (Spread Both Prongs)
e - Large I.D. Washer
f - Small I.D. Washer
g - Locknut (Tighten Until Bottomed, Then Back Off 1/2 Turn) [New plate has cotter pins.]

There should be no pressure on either side of the shift assist assembly attaching point. Failure to adjust properly could apply excessive load to the cable and cause the throttle only portion of the control to hang up and malfunction.

If the shift assist assembly requires effort to fit over the anchor stud and clevis pin, the shift cable from the control box is adjusted incorrectly. Remove the shift cable and reposition the adjustment barrel as required to allow the shift assist assembly to be attached with no effort.



Without Shift Assist Assembly (Older shift plate shown)

a - Remote Control Shift Cable
b - Pin
c - Cotter Pin (Existing)
d - Spring (Existing)
e - Washer (Existing)
f - Washer
g - Spacer
h - Washer (Existing)
i - Locknut (Existing) - (Tighten Until Bottomed, Then Back Off 1/2 Turn) [New plate has cotter pins.]

IMPORTANT: If an extra long remote control shift cable is used, or if there are a large number of bends in remote control shift cable, or remote control has inadequate output travel, an additional adjustment may be necessary. Refer to step 12 or 13 as applicable.

12. **Remote Control with Single Lever Shift/Throttle Control:**

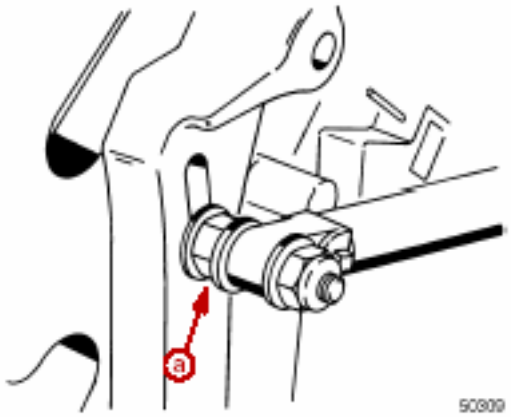
a. **RIGHT HAND (RH) propeller rotation drive unit -** Shift remote control into reverse gear, wide-open-throttle position while simultaneously rotating propeller shaft clockwise. Clutch should engage and cause propeller shaft to lock. If clutch does not engage, loosen adjustable stud on shift lever and move it upward in slot until clutch engages with reverse gear. Retighten stud. Shift remote control several times and stop in reverse to recheck shift cutout switch position. Roller, or plunger pin, must be centered.

b. **LEFT HAND (LH) propeller rotation drive unit -** Shift remote control into forward gear, wide-open-throttle position while simultaneously rotating propeller shaft clockwise. Clutch should engage and cause propeller shaft to lock. If clutch does not engage, loosen adjustable stud on shift lever and move it upward in slot until clutch engages with forward gear. Retighten stud. Shift remote control several times and stop in forward to recheck shift cutout switch position. Roller, or plunger pin, must be centered.

13. **Two Lever Remote Control with Separate Shift and Throttle Levers:**

a. **RIGHT HAND (RH) propeller rotation drive unit -** While turning propeller shaft clockwise, move remote control shift handle into full reverse position. Clutch should engage before shift lever comes to a stop. If clutch does not engage, loosen adjustable stud on shift lever and move it upward in slot until clutch engages with reverse gear. Retighten stud. Shift remote control several times and stop in reverse to recheck shift cutout switch position. Roller, or plunger pin, must be centered.

b. **LEFT HAND (LH) propeller rotation drive unit -** While turning propeller shaft clockwise, move remote control shift handle into full forward position. Clutch should engage before shift lever comes to a stop. If clutch does not engage, loosen adjustable stud on shift lever and move it upward in slot until clutch engages with forward gear. Retighten stud. Shift remote control several times and stop in forward to recheck shift cutout switch position. Roller, or plunger pin, must be centered.

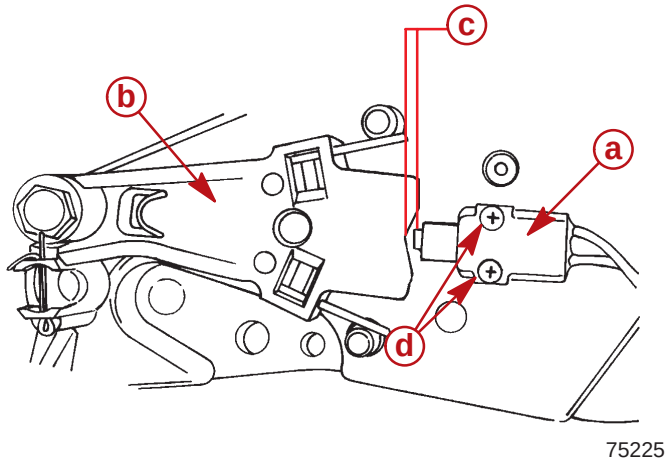


a - Adjustable Stud on shift lever

Alpha Models - Shift Cutout Switch

Checking Cutout Switch Timing (Models with Plunger Type Switch)

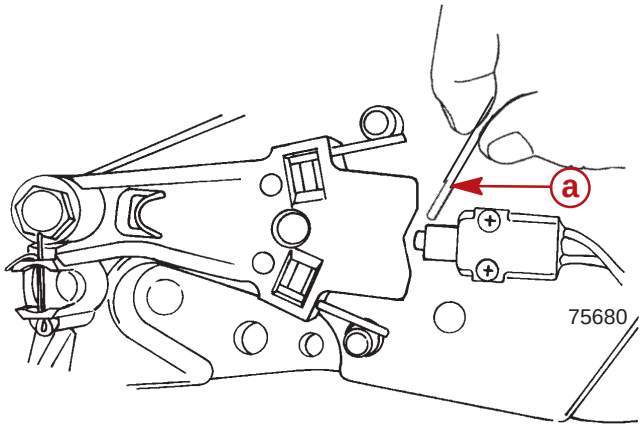
A. While holding the retainer nuts on the back of the shift plate, loosen the two phillips head screws on the shift cutout switch and slowly move the switch either forward or aft.



75225

a - Switch/Plunger Pin
b - Activating Lever Assembly
c - 1/32” Adjustment
d - Two Screws

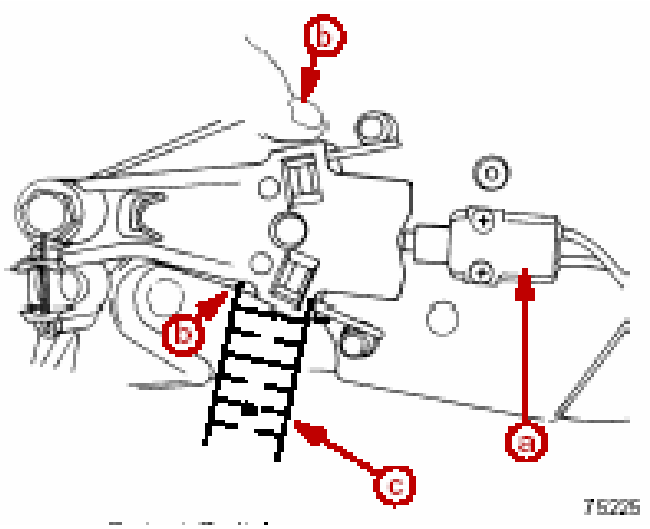
B. Adjust switch to locate plunger pin to 1/32 in. between plunger pin and activating lever assembly.



75679

a - 1/32 in. Drill Bit

C. Slowly move activating lever assembly off until cutout switch opens or closes. Circuit should open or close when the activating lever assembly is moved 3/16 in. (+ or – 1/32 in.). Measure with 6 in. steel rule.



a - Shift Interrupt Switch
b - Movement of Activating Lever Assembly
c - 6 in. Steel Rule

D. After adjustments are made and are within 3/16 in. (+ or – 1/32 in.), tighten the screws on the cutout switch. After tightening screws, recheck the plunger pin position.

Checking Operation

1. Reconnect throttle cable(s), removed earlier.

2. Place boat in water and start engine. Check the following:

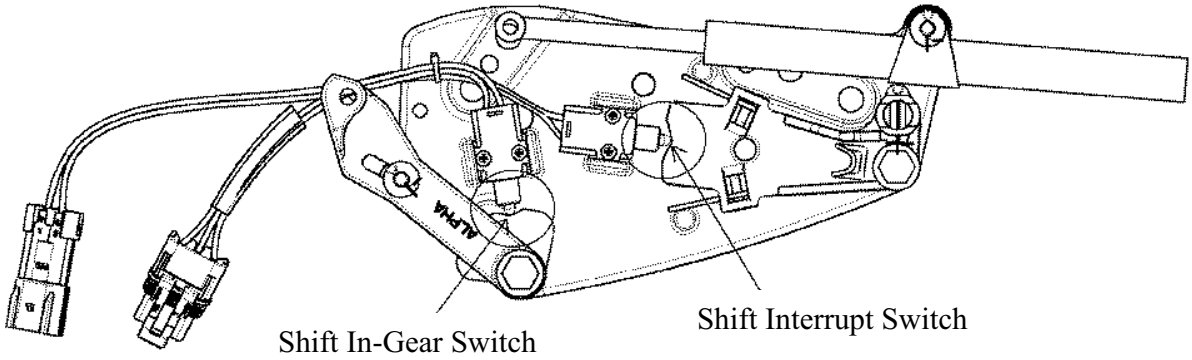
   a. Shift into forward and reverse gear, making sure that clutch engages before engine begins to accelerate.

   b. Accelerate engine in forward and reverse gear to ensure engine does not shut down.

   c. Check that shift cutout switch plunger is centered in notch of shift cutout lever, with drive unit in forward and reverse gear.

   d. Shifting from IN gear position to neutral, ensure drive unit is in neutral before remote control shift lever comes to neutral detent position.

New Style Alpha Shift Plate (Bravo similar)



Both switches are now located in slots. There is a machined rib, formed in the shift plate, at each side of the switch. These ribs form a channel that allows the switch to move towards and away from the actuator, without any side play. Switch adjustment is made easier and more accurate.

In-Gear Switch

There are two notches on the shift lever. The one used during engine operation is just behind the shift lever (parallel to lever). A second notch is provided as shown above. The shift lever is rotated counter-clockwise to bring the second notch in contact with the In-Gear Switch. This second location allows you to have direct access to the switch mounting screws. You can make a switch adjustment without having to move the shift lever out of the way. This allows for a more accurate adjustment.

This switch must be adjusted so that the switch plunger is set at “zero” clearance (plunger is just making contact with the bottom of the adjustment notch in the shift lever.

Shift Interrupt Switch

The shift interrupt switch and the actuating hardware are the same components that were used on the previous shift plate.

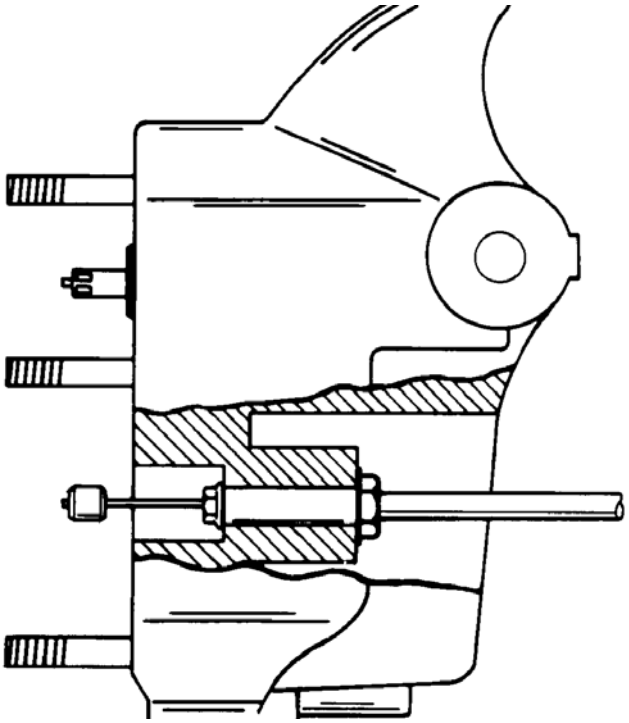
This switch must be set so that the switch plunger is 1/32 in. (.794 mm) from the bottom of the notch in the shift actuation arm.

Notes:

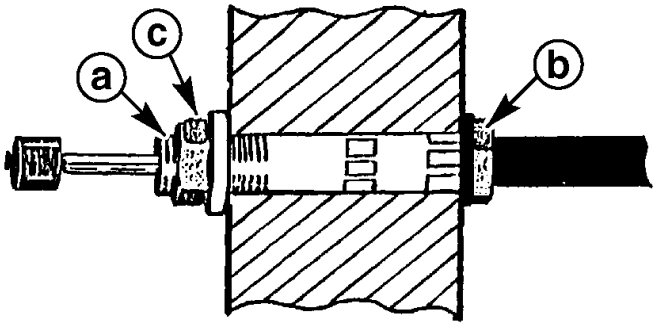
Bravo Shift Cables

Replacing Earlier Model Shift Cables with Later Model Shift Cables

Models with earlier style shift cable – identified by small nut which will not pass over cable anchor - core wire must be pulled from shift cable to remove cable assembly from bell housing.



Models with later style shift cable – identified by larger nut which fits over core wire anchor; it is unnecessary to remove core wire to remove shift cable assembly.



a) Shift Cable Retaining Nut
b) Inside Nut
c) Washer

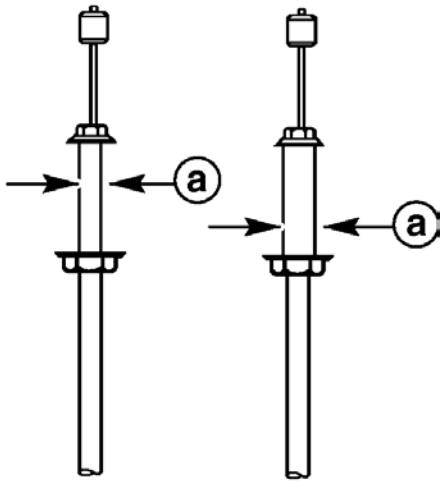
Notes:

Notes:

To install the later model shift cable on all Brave transom assemblies with serial number OD542204 and lower you must enlarge the bell housing shift cable retainer hole from 3/8 in. (9.525mm) to 7/16 in. (11.113 mm). Use the Bravo Shift Cable Replacement Kit (815471A3).

All Bravo Transom Assemblies, serial number OD542205 and above, already have the latest style shift cable.

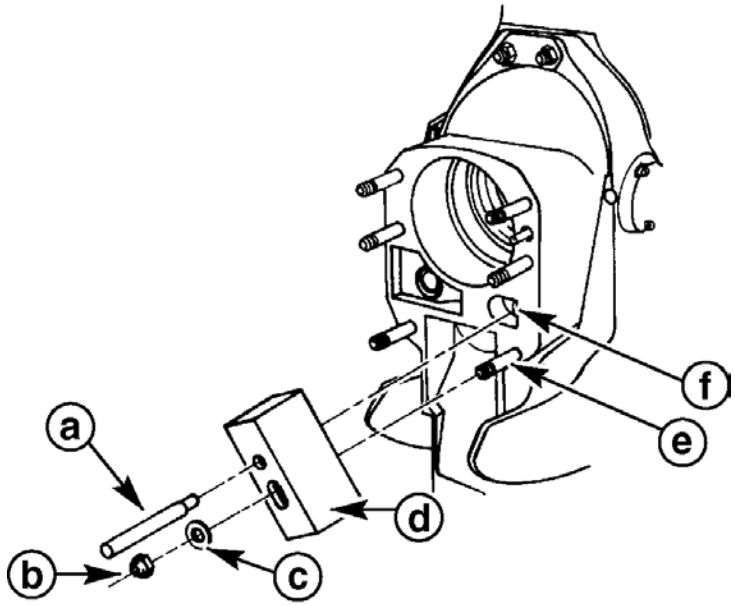
1. Remove the sterndrive unit.
2. Compare the shift cable that was removed from the unit with the replacement shift cable.
   a) If diameter “a” is equal on both the removed cable and the replacement cable, then both cables are the later model. Install the replacement cable (Bravo Drive Unit Shift Cable Installation).
   b) If diameter “a” is larger on the replacement shift cable than on the removed shift cable, proceed with the following instructions.



a) Cable Diameter

3. Slide the slotted hole of the drill bushing tool over the lowest stud closest to the bell housing shift cable bore.
4. Install the alignment rod through the round 7/16 in. hole of the bushing tool and into the bell housing shift cable bore. Make sure that it is seated fully into the bore.

5. Clamp the drill bushing tool into place using one of the nuts and washers that hold the sterndrive unit to the bell housing.



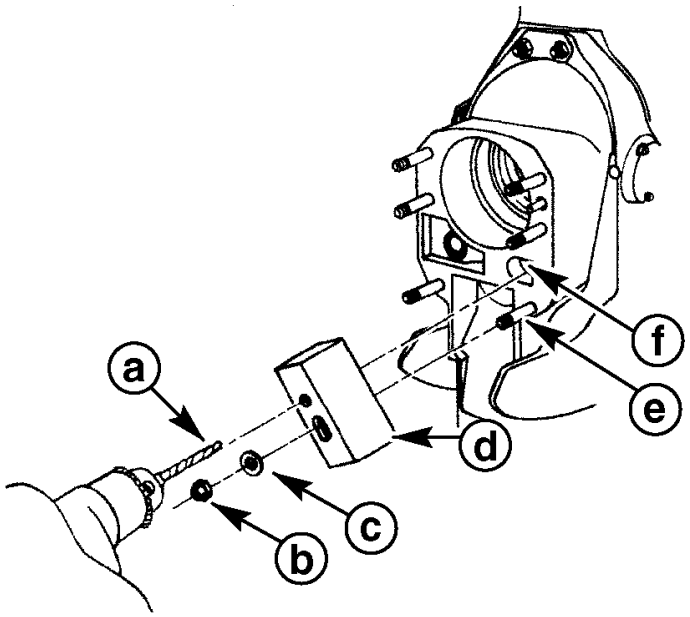
a) Alignment Rod
b) Nut
c) Washer
d) Drill Bushing Tool
e) Bell Housing Stud
f) Bell Housing Shift Cable Bore

CAUTION
Using the wrong drill may create a rough surface in the shift cable bore, allowing water leakage that could cause premature shift component failure. Use a sharp, straight drill with a 118º point and without nicks.

Notes:

Notes:

6. Drill through the 7/16 in. hole in the drill bushing tool and through the bell housing shift cable bore. Use the 7/16 in. drill provided in Service Tool Kit 91-818836A-1.



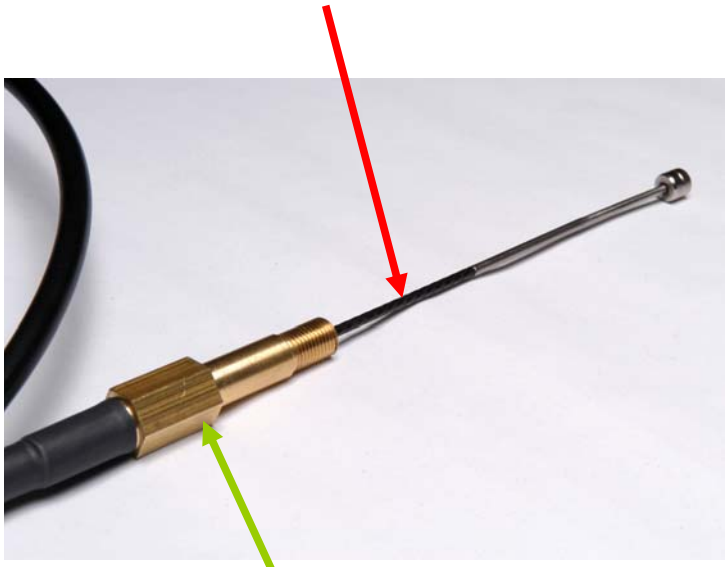
a) Alignment Rod
b) Nut
c) Washer
d) Drill Bushing Tool
e) Bell Housing Stud
f) Bell Housing Shift Cable Bore

7. Remove the drill bushing tool and clean the debris out of the bell housing. Grease the newly drilled hole with 2-4-C Marine Lubricant with Teflon.
8. Install the new shift cable.

Intermediate Shift Cable Redesign

- Alpha and Bravo intermediate shift cable redesign to reduce friction and lost motion
- Affects Alpha and Bravo
- Reduces required bend radius
- Installs exactly as the old style cable did
- Went into production in June 2003

Black Teflon Coating



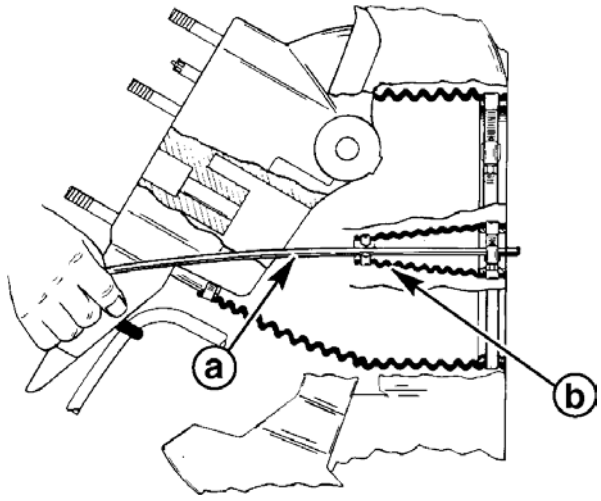
New Crimp method to prevent water leak

BRAVO Intermediate Shift Cable (Part # 865437 A02)

Notes:

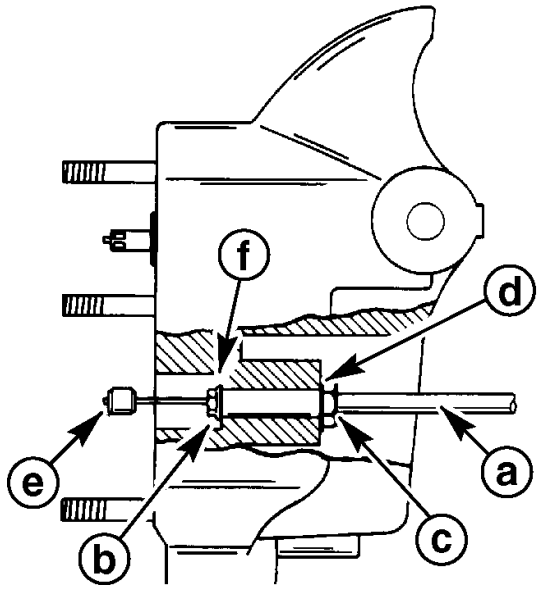
Bravo Drive Unit Shift Cable Installation

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



a) Shift Cable End
b) Shift Cable Bellows

2. Apply Perfect Seal to shift cable retaining nut threads. Secure shift cable to bell housing. Hold inner nut with wrench and torque outer retaining nut to 65 lb. in. (7 N·m).

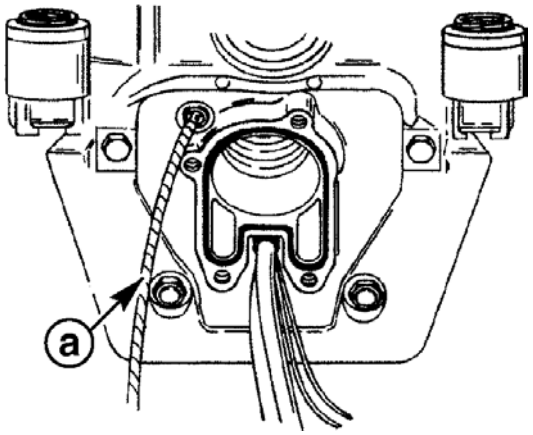


a) Shift Cable
b) Outer Retaining Nut
c) Inner Nut
d) Seal Washer (Hidden by Nut)
e) Core Wire is in Later Model Cable, only (at this step of reinstallation)
f) Later Style Cable - Washer

Notes:

Notes:

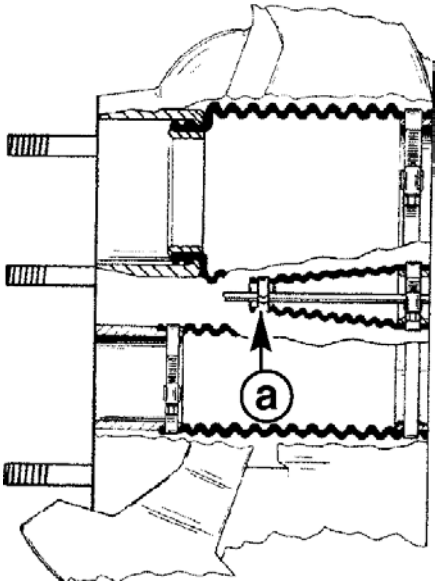
3. Install shift cable wrapping.



a) Shift Cable Wrapping

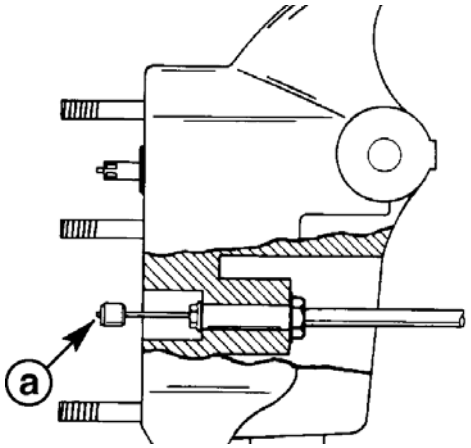
CAUTION
Check that bellows end is not flattened out when crimping in the following step. Water leakage may result if clamp is not installed properly.

4. Install and compress shift cable bellows crimp clamp, maintaining a 1/2 in. diameter **round** O.D. Be sure that clamp is crimped evenly so that a good seal is maintained between bellows and shift cable. (Do not allow bellows to flatten.)



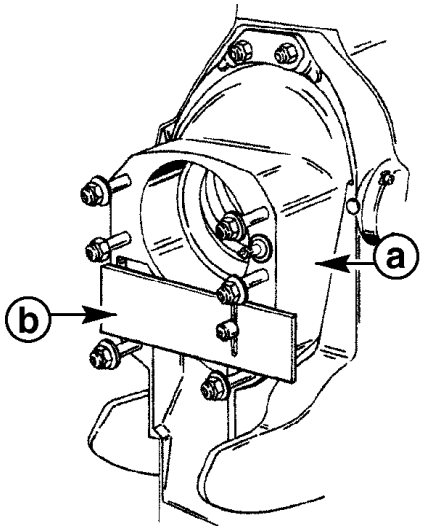
a) Crimp Clamp

5. **Models with earlier shift cable** - install inner core wire.



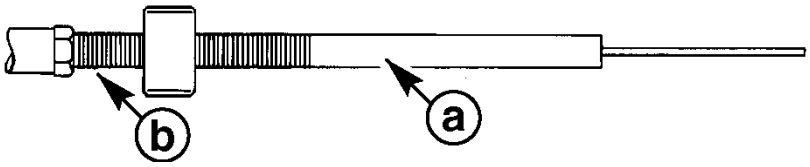
a) Inner Core Wire

6. Install core wire locating tool (P/N 91-17263) on face of bell housing.



a) Bell Housing
b) Core Wire Locating Tool (P/N 91-17263)

7. Install threaded tube until it bottoms. Tighten finger tight. Tighten jam nut securely.

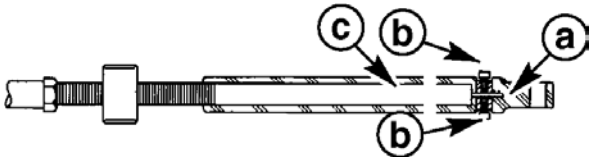


a) Threaded Tube
b) Jam Nut

Notes:

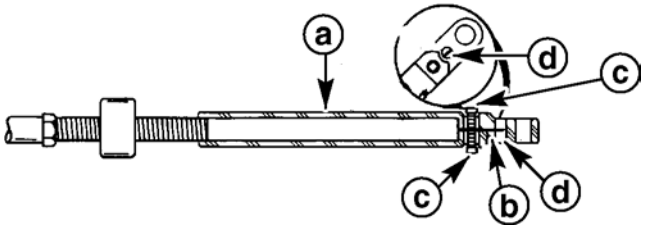
Notes:

8. **Earlier shift cables with support tubes** - discard support tube; do not reinstall.
9. Install cable end guide over core wire, and insert core wire through cable anchor. Tighten anchor screws evenly and torque to 20 lb. in. (2.3 N·m).



Earlier Models

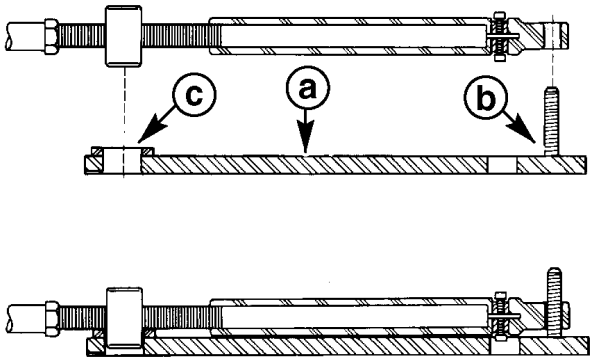
a) Core Wire
b) Anchor Screws
c) Cable End Guide



Later Models

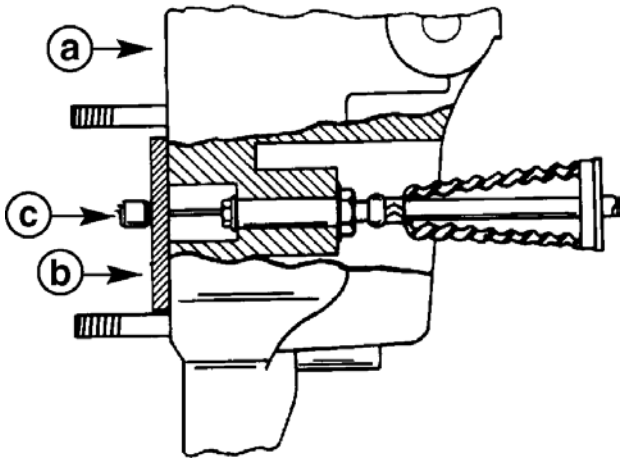
a) Cable End Guide
b) Core Wire
c) Anchor Screws
d) Sight Port - bottom-out core wire (present on all later style and some earlier style cables)

10. Place shift cable anchor adjustment tool (P/N 91-17262) on end of shift cable as shown.



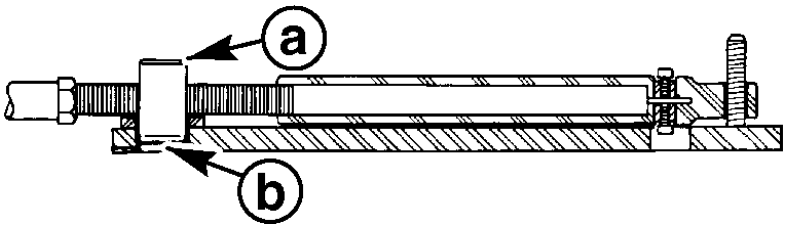
a) Shift Cable Anchor Adjustment Tool (91-17262)
b) Stud - Placed through Hole in End Guide
c) Hole - Barrel Placed Here

11. Ensure that bell housing end of core wire is positioned tight against core wire locating tool.



a) Bell Housing
b) Core Wire Locating Tool
c) Core Wire

12. Adjust cable barrel to align with hole in tool. Re-move tools and install cable on shift plate assembly, being careful not to lose adjustment.



a) Barrel
b) Hole in Tool

Notes:

Notes:

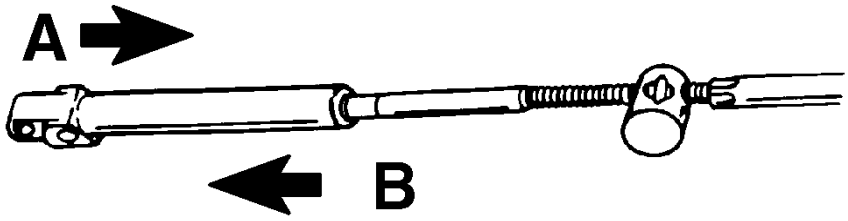
Bravo Drive Unit Remote Control and Drive Unit Shift Cables Adjustment

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

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

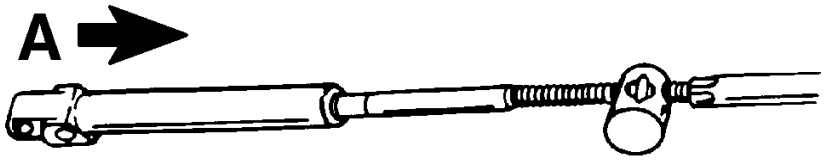
Bravo One/Two - If shift cable end guide moves in direction "A" when control lever is placed in Forward, remote control is set up for RIGHT HAND (RH) propeller rotation.

Bravo One/Two - If shift cable end guide moves in direction "B" when control lever is placed in Forward, remote control is set up for LEFT HAND (LH) propeller rotation.



Bravo One and Two

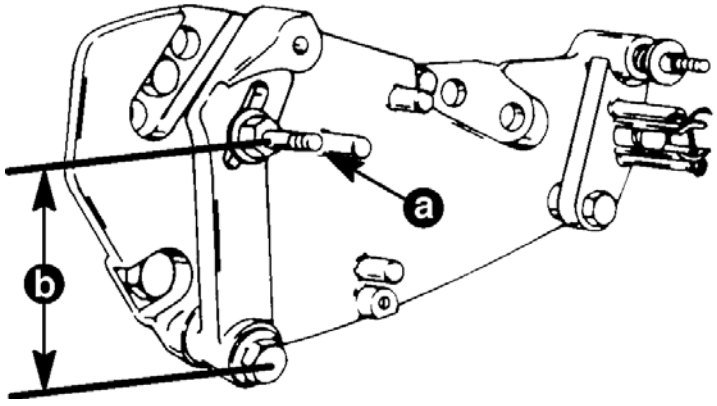
Blackhawk and Bravo Three - Front propeller on drive unit is always LH Rotation and rear propeller is always RH Rotation. Shift cable end guide must move in direction "A," when control lever is placed in Forward gear position.



Bravo Three and Blackhawk

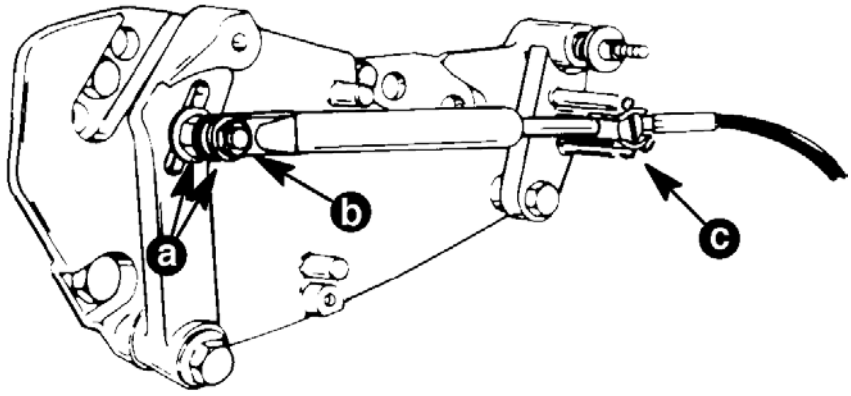
IMPORTANT: When installing shift cables, be sure that cables are routed in such a way as to avoid sharp bends and/or contact with moving parts. DO NOT fasten any items to shift cables.

1. Install shift cable into remote control. (Refer to appropriate remote control instructions.)
2. Loosen stud and move it to dimension, as shown. Retighten stud.



a) Stud
b) 3 Inches (76 mm) (Center of Pivot Bolt to Center of Stud)

3. Install drive unit shift cable.

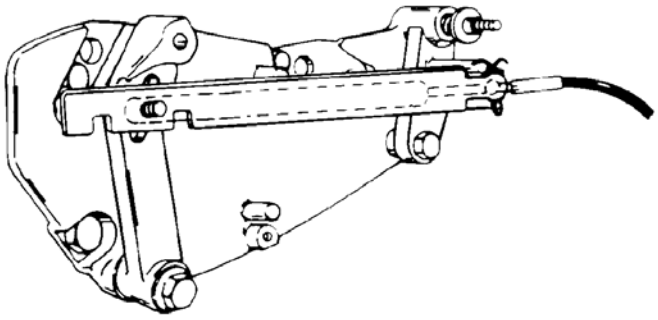


a) Washers (2)
b) Lock Nut - Tighten Until Contact. Then Back Off 1/2 Turn
c) Cotter Pin - Insert from Top and Spread Both Ends

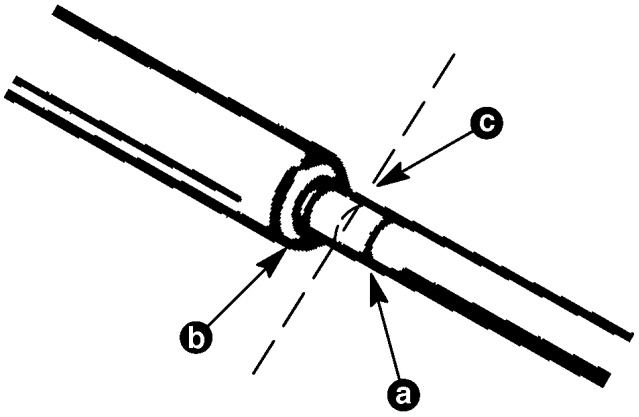
Notes:

Notes:

4. Place adjustment tool (91-12427) over drive unit shift cable, as shown. Hold tool in place, using a piece of tape over the barrel retainer.



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

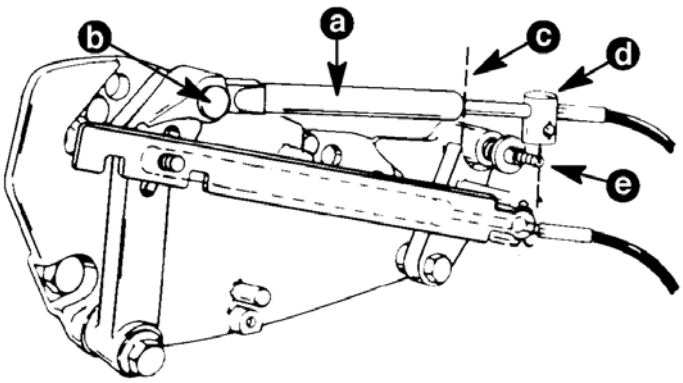


IMPORTANT: Be sure to keep center mark “c” aligned with control cable end guide edge when making the following adjustment.

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

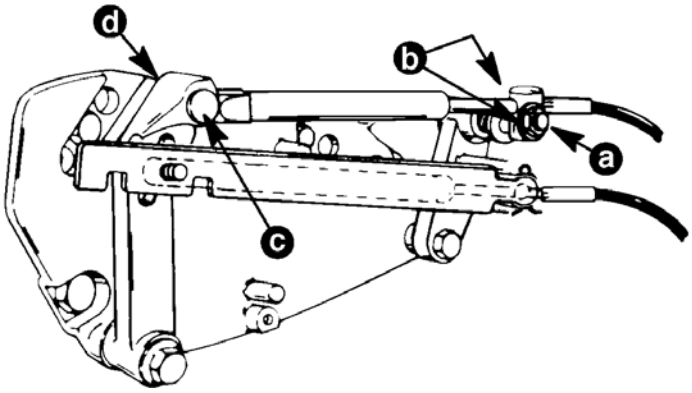
CAUTION
DO NOT attempt to install or remove control cable barrel from stud without first removing end guide anchor pin from shift lever and removing cable. Attempting to bend control cable to install or remove barrel will place undue stress on cable end guide and shift lever and damage to both could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

c. Remove control cable end guide from shift lever by removing anchor pin.



a) Control Cable End Guide
b) Anchor Pin
c) Backlash Center
d) Control Cable Barrel
e) Stud

7. Install control cable.



a) Lock Nut - Tighten Until Bottomed Out
b) Washers - Both Sides of Barrel
c) Anchor Pin
d) Cotter Pin (Not Visible) - Spread Both Ends

Notes:

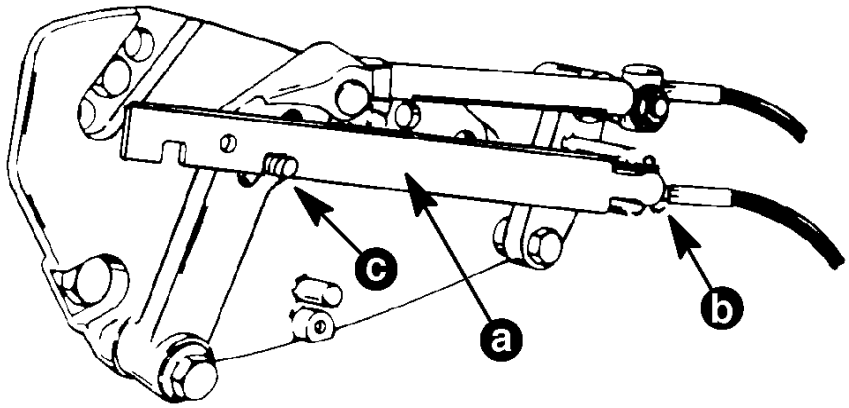
Notes:

8. Remove adjustment tool.
9. Shift remote control lever into full forward position. Place end of adjustment tool in barrel retainer.

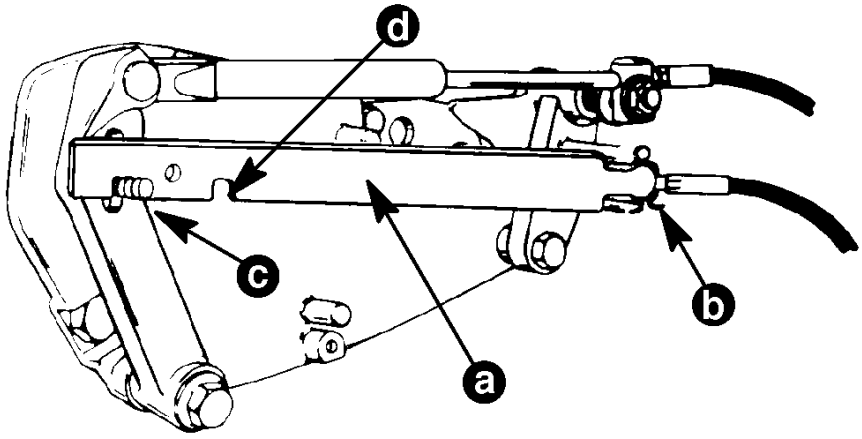
RH ROTATION BRAVO ONE, TWO, THREE AND BLACKHAWK MODEL: Rear slot in tool should fit over shift lever stud.

LH ROTATION BRAVO ONE AND TWO: Forward slot in tool should fit over shift lever stud.

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.



RH Rotation Bravo One, Two, Three, and BlackHawk



LH Rotation Bravo One and Two

a) Adjustment Tool (91-12427)
b) Barrel Retainer
c) Shift Lever Stud
d) Shift Lever Adjustment Slot

10. Remove adjustment tool.
11. Lubricate shift cable pivot points with 30W oil.

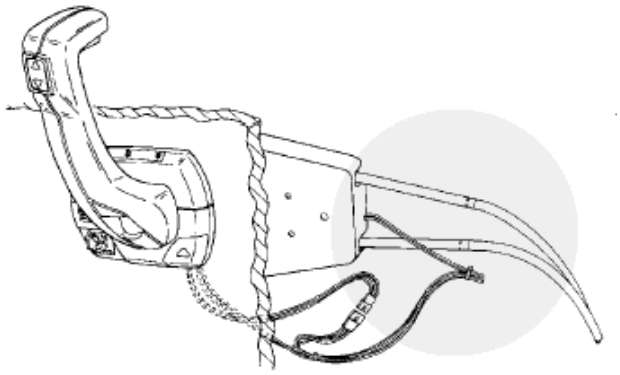
Troubleshooting Shift Problems

(Information from MC Service Bulletin 96-5, Rev. Nov. 1999)

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.*

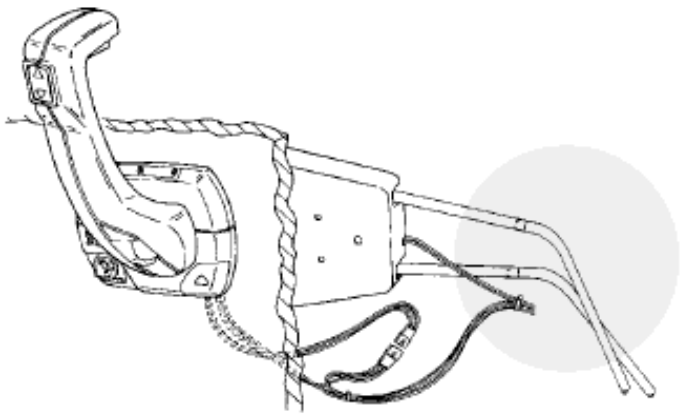
1. When installing the control box in the side panel of the boat, make sure that the cables have enough clearance to operate. This is necessary because the cables move up and down when the shift handle is moved. If the control box is mounted too far back toward any fiberglass structure, the cables will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

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



74688

Proper Cable Bend



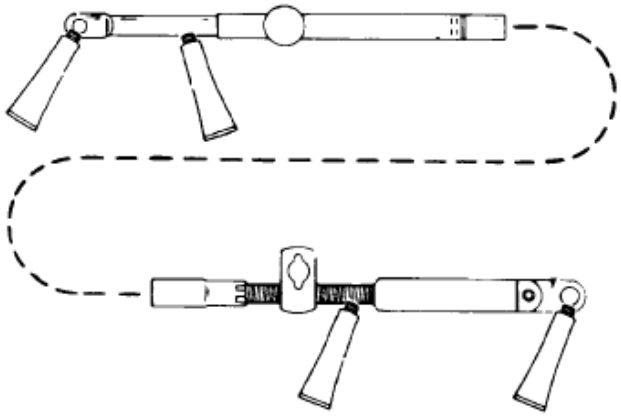
Improper Cable Bend

2. Make sure 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.

Notes:

Notes:

3. Before installing the shift cable into the control box, extend the stainless rod eye end of the cable and grease it with 2-4-C Marine Lubricant with Teflon. Move it back and forth to allow even distribution of the grease.



4. Do not strap or clamp the control cables to any other cables or rigid structure within **3 ft. (914 mm)** of the control box.
5. Be sure the cable is not permanently kinked.
6. Make sure 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 **5 ft. (1.5 m)** of the shift plate.
9. DO NOT fasten the shift cable to the transom with any type of plastic clips or fasteners within **5 ft. (1.5 m)** 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.

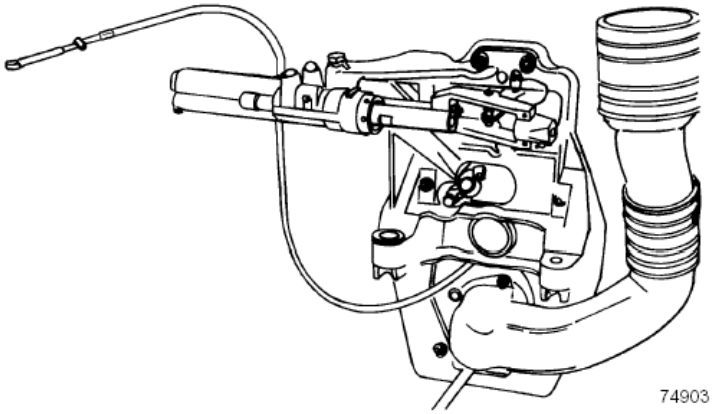
NOTE: *Lubricate attaching points with motor oil.*

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

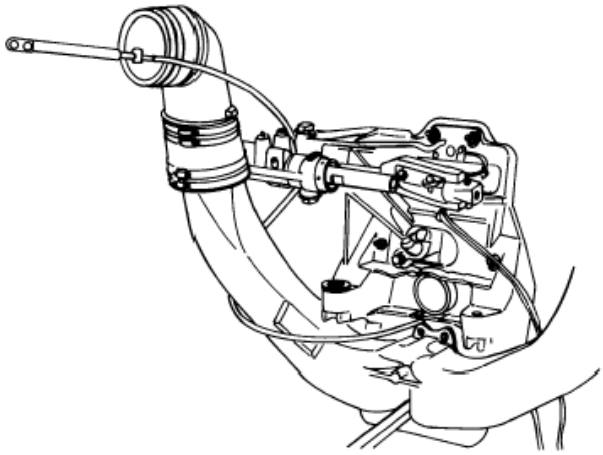
Following this routing will prevent the engine coupler from damaging the cable.

NOTE: *A final check of the adjustments should be made with the boat in the water and engine running. This should also be done as part of the pre-delivery inspection.*

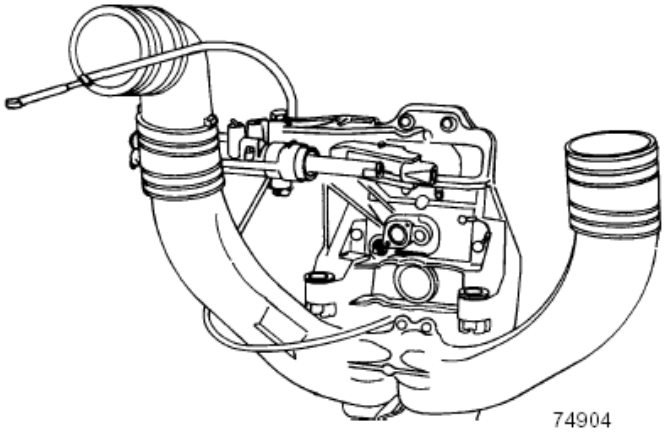
Shift Cable Routing



3.0L & 3.0LX Model Only



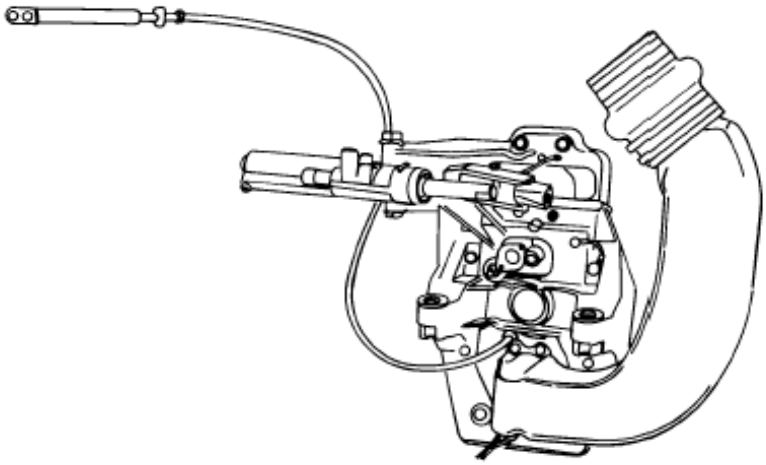
All V-6 & V-8 Alpha Models



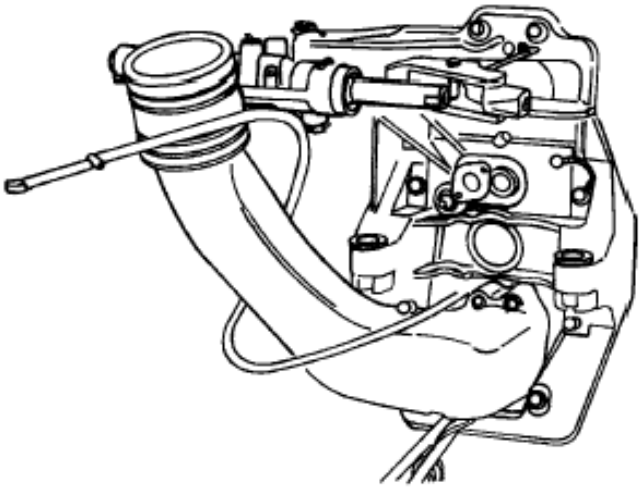
All V-6 & V-8 Bravo Models (Except 7.4L [L-29] MPI MCM)

Notes:

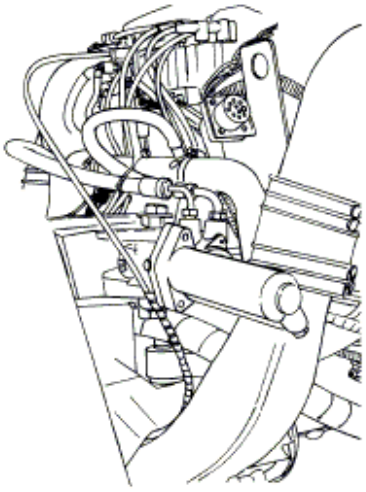
Notes:



V-8 Diesel Models



In-Line Diesel Models



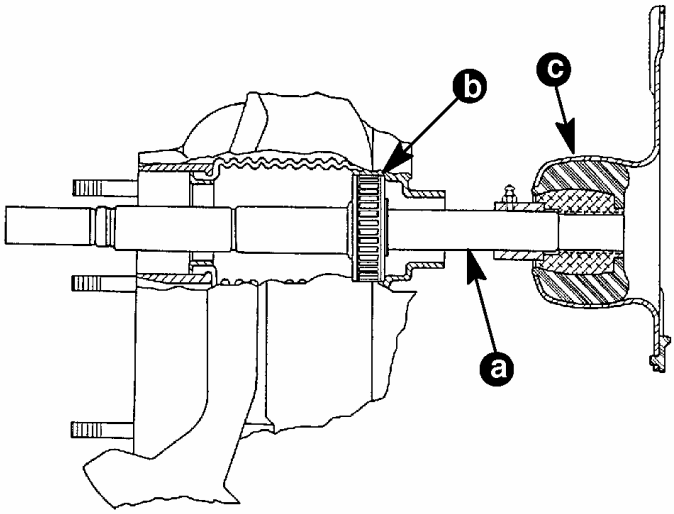
On 7.4L MPI MCM

Engine Alignment Tools and Hardware

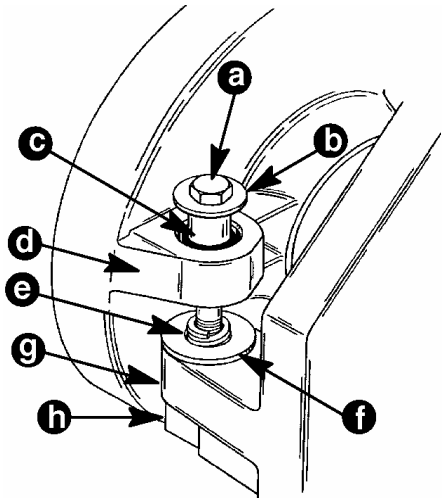
For Sterndrive Engines

IMPORTANT: Engine attaching hardware must be installed in sequence shown.

Install both rear engine mounting bolts and hardware as shown. Torque to 35-40 lb. ft. (47-54 N·m).

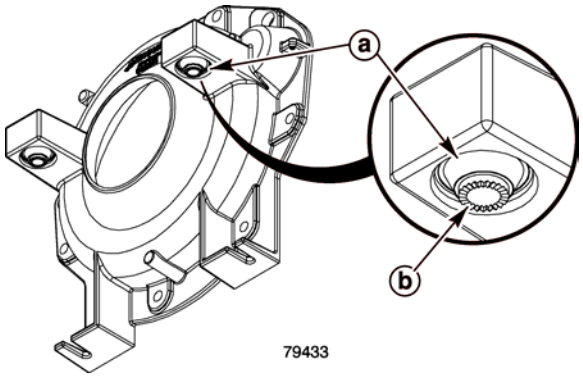


a - Alignment Tool (Use Only Quicksilver Alignment Tool 91-805475A1, or Properly Modified 91-57797A3)
b - Gimbal Bearing
c - Engine Coupler



Older Rear Engine Mount System

a - Bolt, Rear Engine Mounting
b - Washer, Large Steel
c - Spacer, Metal
d - Rear Engine Mount
e - Double Wound Lockwasher
f - Fiber Washer (Cemented in Place)
g - Inner Transom Plate Mounts
h - Locknuts (Hidden In This View)



Newer Rear Engine Mount System

New engines use a modified rear engine mount system (a). The bottom of the rear mount now has a knurled edge (b) [older version was smooth].

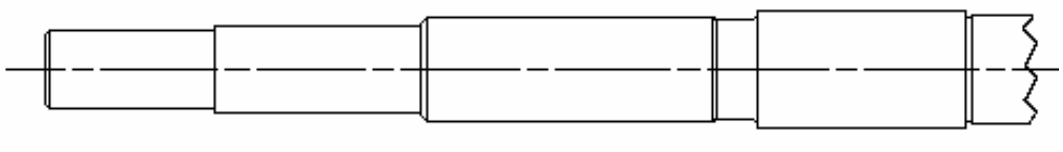
The "double-wound" lockwasher (spring) is no longer used.

The large fiber washer is still used.

CAUTION

DO NOT use an alignment tool from another manufacturer. Alignment tools other than Quicksilver Alignment Tools (91-805475A1 or a properly modified 91-57797A3) may cause improper alignment and damage to gimbal bearing and/or engine coupler.

If you have an older tool (91-57797A3), refer to Service Bulletin 92-9 for modification information.



← To Alpha or Bravo Coupling

Quicksilver Engine Alignment Tool

Engine Alignment Procedure

CAUTION
DO NOT use an alignment tool from another manufacturer. Alignment tools other than Quicksilver Alignment Tool 91-805475A1, may cause improper alignment and damage to gimbal bearing and/or engine coupler.

CAUTION
To avoid damage to gimbal bearing, engine coupler, or alignment tool: • **DO NOT attempt to force alignment tool!** • **DO NOT raise or lower engine with alignment tool inserted (or partially inserted) in gimbal bearing or engine coupler.**

1. Align engine as follows:

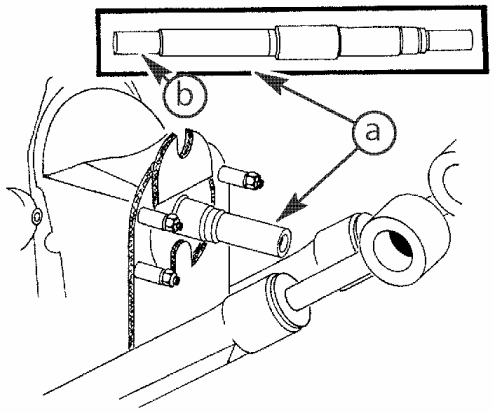
   a. Attempt to insert solid end of Quicksilver Alignment Tool through gimbal bearing and into engine coupler splines. If it will not insert easily proceed to following.

   b. If the tool does not fit, remove it and carefully raise or lower the front end of the engine (using the center alignment eye), as necessary, and attempt to insert the alignment tool.

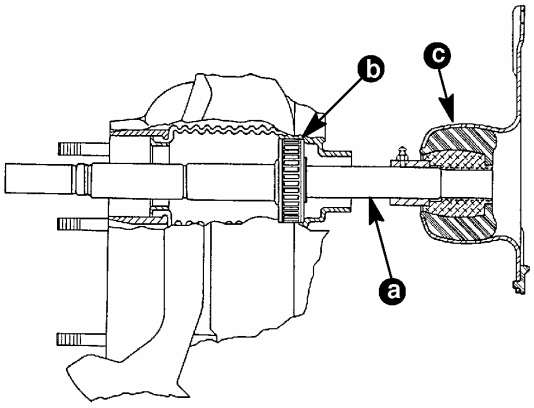
   Note: *It may be necessary to hit the alignment tool with a synthane hammer to set the gimbal bearing to the coupler.*

   c. If necessary, lightly tap the sides of the alignment tool at 90 degree increments to help align the gimbal bearing.

   d. Repeat step “b” and “c” until the alignment tool installs easily **(slides freely with 2 fingers)** all the way into and out of engine coupler splines. Do not check by turning the alignment tool.



a -Alignment Tool (Use Only Quicksilver Alignment Tool (91-805475A1)
b -Insert this end of Alignment Tool through Gimbal Housing Assembly



a -Alignment Tool
b -Gimbal Bearing
c -Engine Coupler

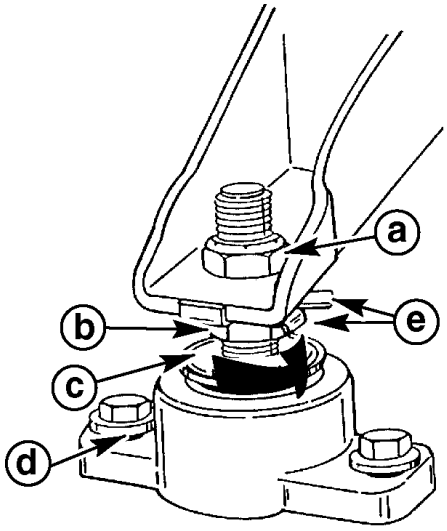
IMPORTANT: Turn both front engine mount adjustment nuts an equal amount in direction required to align engine.

e. Adjust front engine mounts until they rest on boat stringers (new engine installation).

f. Relieve hoist tension entirely and fasten both front mounts to boat stringers using appropriate hardware (lag bolts or through-bolts, etc.) [new engine installation].

g. Recheck alignment with alignment tool. Tool must enter coupler splines freely. If not, readjust front mounts.

h. When alignment is correct, tighten locknut or nut with lockwasher on each mount securely.

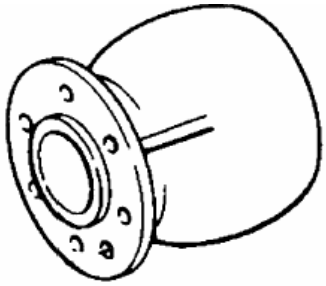


a -Locknut
b -Adjustment nut
c -Turn Adjustment Nut in this direction (Counterclockwise) to raise front of engine
d -Slotted Hole to front of engine
e -Tab Washer

i. Bend tab washer down against flat on adjusting nut.

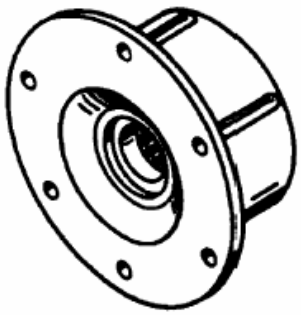
j. Remove alignment tool if not already removed.

Sterndrive Engine Coupler (Identification)



Earliest Inline GM (4 and 6 cyl.), 470/488, Ford V8 and GM V8

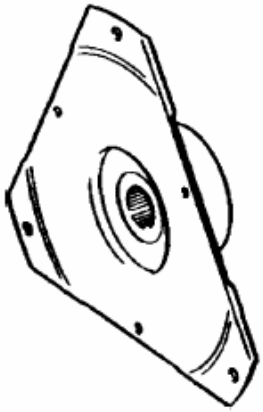
Coupler bolts to crankshaft and sandwiches flywheel between coupler and crankshaft.



Later Mercury Marine 4 Cylinder and Diesel Engines

Coupler bolts to the engine flywheel.

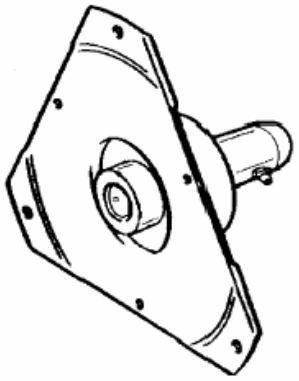
Mercury Marine 4 Cylinder Engines - 470R/488R/165 (4 Cyl.)/170/ 180/190/ 3.7L/3.7LX
MerCruiser Diesel Engines (solid coupler) - 530D-TA/ D183-TA/ 636D-TA/ D219-T/D254-TA



Later Inline GM and V6/V8 GM Engines (with one-piece rear main seal)

Earlier Flex Plate Style coupler (bolts to flywheel)

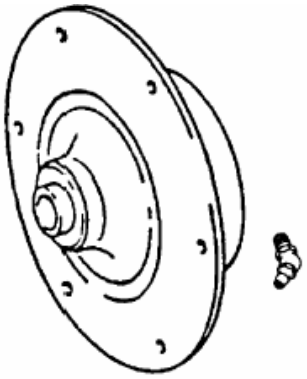
4 Cylinder engines - 120/2.5L/140/3.0L/3.0LX
V6 engines - 175/4.3L/185 (262 ci.)/4.3LX
V8 (305 C.I.) engines - 200/205/5.0L/ 230/5.0LX
V8 (350 C.I.) engines - 260/5.7L/300 TEMPEST/350 MAGNUM
V8 (454 C.I.) engines - 454 ALPHA



1993 and later Inline GM and V6/V8 GM Engines (with one-piece rear main seal)

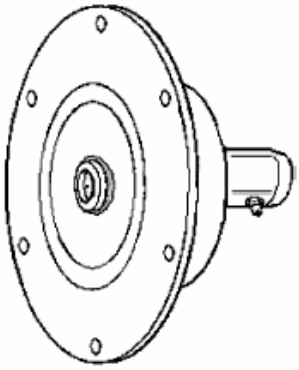
Later Flex Plate Style coupler with greaseable/sealed steel hub (bolts to flywheel). Introduced on 1993 models and shipped in replacement kits for the earlier flex plate design.

4 Cylinder engines - 120/2.5L/140/3.0L/3.0LX
V6 engines - 175/4.3L/185 (262 ci.)/4.3LX
V8 (305 C.I.) engines - 200/205/5.0L/230/5.0LX
V8 (350 C.I.) engines - 260/5.7L/300 TEMPEST/350 MAGNUM
V8 (454 C.I.) engines - 454 ALPHA



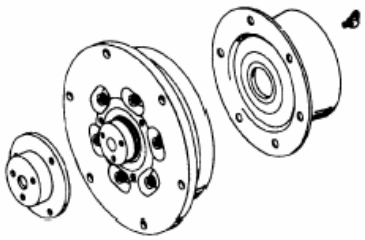
Earlier model Bravo gas engine coupler

Machined aluminum with greaseable steel hub.



Later model Bravo gas engine coupler

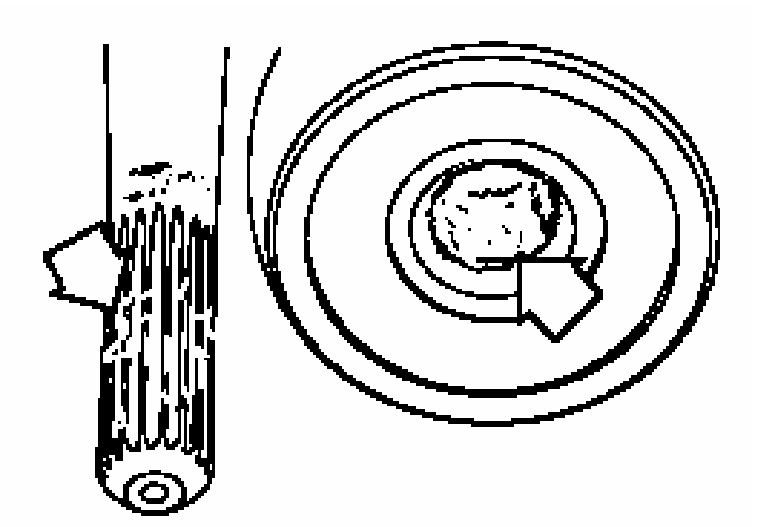
Stamped steel with greaseable/sealed steel hub (bolts to flywheel).



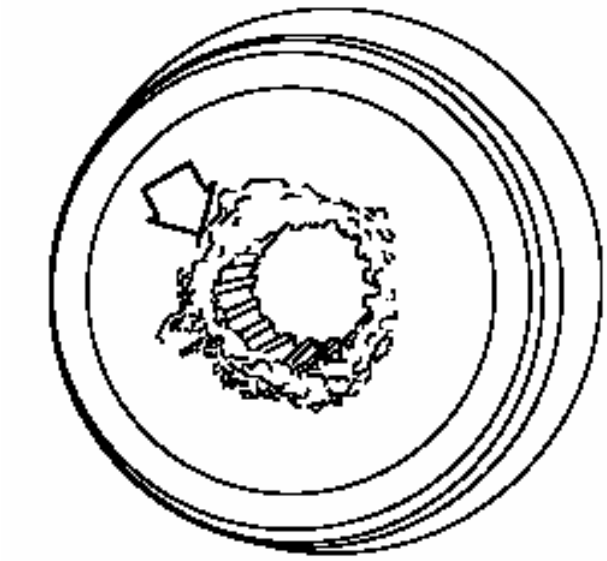
Later model Bravo diesel engine coupler

Two-stage engine coupler (typical) with greaseable steel hub (bolts to flywheel).

Coupler Failures



Coupling Spline failure caused by a lack of lubrication and or minor misalignment.



Coupling Rubber Hub failure caused by major engine misalignment