



merCruiser
SERVICE
MANUAL

Number 20

Blackhawk Stern Drive Unit

NOTICE

This service manual covers the Blackhawk Stern Drive Unit only and is to be used in conjunction with the Bravo Stern Drive Unit service manual.

For transom, trim, steering and corrosion information, refer to the appropriate section in the Bravo Stern Drive Unit service manual.

NOTICE

Refer to appropriate engine service manual for engine repair.

Stern Drive Unit – Blackhawk Service Manual Outline

SECTION 1 - Important Information

A - General Information

B - Maintenance

C - Troubleshooting

SECTION 2 - Removal and Installation

A - All Models

SECTION 3 - Stern Drive Unit

A - Upper Drive Components

B - Lower Drive Components

Notice

Throughout this publication, “Dangers,” “Warnings” and “Cautions” are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. **OBSERVE THEM CAREFULLY!**

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus “common sense” operation, are major accident prevention measures.

DANGER

DANGER - Immediate hazards which **WILL** result in severe personal injury or death.

WARNING

WARNING - Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION

CAUTION - Hazards or unsafe practices which could result in minor personal injury or product or property damage.

IMPORTANT: Indicates information or instructions that are necessary for proper operation and/or maintenance.

Notice to Users of This Manual

This service manual has been written and published by the service department of Mercury Marine to aid our dealers, mechanics and company service personnel when servicing the product described herein.

It is assumed that these personnel are familiar with the servicing procedures of this product, or like or similar products manufactured and marketed by Mercury Marine, and that they have been trained in the recommended servicing procedures of these products which include the use of mechanic’s common hand tools and the special Mercury Marine or recommended tools from other suppliers.

We could not possibly know of and advise the service trade of all conceivable procedures by which a service might be performed and of all possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the product’s safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at time of publication.

As required, revisions to this manual will be sent to all dealers contracted by us to sell and/or service these products.

Replacement Parts

WARNING

Electrical, ignition and fuel system components on gasoline engines and MerCruiser Stern Drives are designed and manufactured to comply with U.S. Coast Guard Rules and Regulations to minimize risks of fire or explosion.

Use of replacement electrical, ignition or fuel system components, which do not comply to these rules and regulations, could result in a fire or explosion hazard and should be avoided.

When servicing the electrical, ignition and fuel systems, it is extremely important that all components are properly installed and tightened. If not, any electrical or ignition component opening would permit sparks to ignite fuel vapors from fuel system leaks, if they exist or develop.

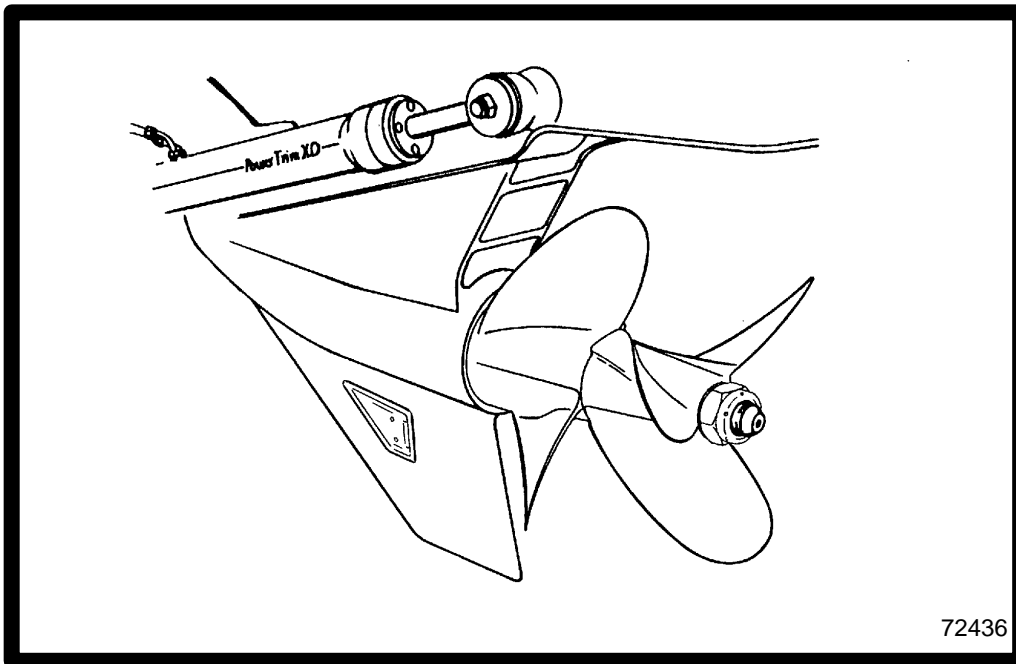
WARNING

Electrical system components on diesel engines are not external ignition protected. DO NOT STORE OR USE GASOLINE ON BOATS EQUIPPED WITH THESE ENGINES, UNLESS PROVISIONS HAVE BEEN MADE TO EXCLUDE GASOLINE VAPORS FROM ENGINE COMPARTMENT (ref: 33 CFR). Failure to comply could result in fire, explosion and/or severe personal injury.

IMPORTANT INFORMATION

1

A



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GENERAL INFORMATION

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How to Use This Manual

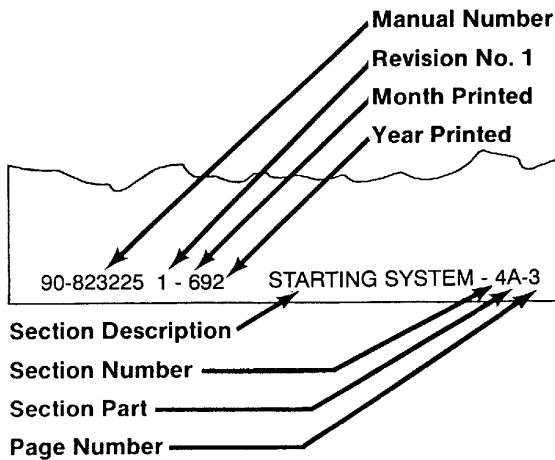
This manual is divided into sections which represent major components and systems.

Some sections are further divided into parts which more fully describe the component.

Sections and parts are listed at the front of this manual.

Page Numbering

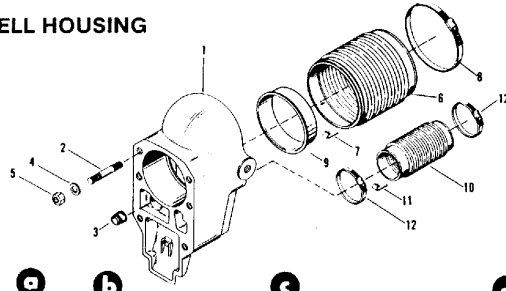
Two number groups appear at the bottom of each page. Following is an example and description.



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How to Read Parts Manual

BELL HOUSING



PART NO.	REF. NO.	DESCRIPTION	QUAN.
41646A3	1	BELL HOUSING ASSEMBLY	1
16-59579	2	STUD, bell housing to drive shaft housing	6
41674	3	INSERT, water hose	1
12-35935	4	WASHER, bell housing stud	6
11-13439-1	5	NUT, bell housing stud	6
86840A3	6	BELLOWS ASSEMBLY, universal joint	1
54-86049	7	GROUNDING CLIP, bellows	1
54-31765	8	CLAMP, universal joint bellows	1
86814	9	SLEEVE, universal joint bellows	1
78458A1	10	EXHAUST TUBE ASSEMBLY	1
54-86049	11	GROUNDING CLIP, bellows	1
54-32533	12	CLAMP, exhaust bellows	2
54-12899	13	ADAPTOR	1
54-12894	14	CLIP, tube	1
32-54850-25	15	TUBE	1
22-43711	16	CONNECTOR	1
32-89713	17	HOSE	1
22-85822	18	CONNECTOR	1
69355	19	TIE STRAP	2
54-22740	20	CLAMP	1
69205	21	*C*WASHER	1
10-60605	22	SCREW	1

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- a. **Part Number:** Part must be ordered by complete part number.
- b. **Reference Number:** Number of part on exploded parts view.
- c. **Description:** This column provides important information.
 - (1) Description of part: Reference 1 on parts list is BELL HOUSING ASSEMBLY, reference 12 is an exhaust bellows CLAMP and reference 19 is a TIE STRAP.
 - (2) What parts are included: Reference 1 on the parts list is BELL HOUSING ASSEMBLY. Parts listed under the assembly are indented, which indicates that they are included. Therefore, if Part Number 41646A3 is ordered, you will receive the bell housing assembly, including six studs and one water hose insert.
 - (3) Serial number break: If serial number is listed, check product serial number to ensure that correct part is ordered.

(4) Special information: Will often appear after the description; i.e., O-ring on DSH, O-ring on top cover, casting #1641-8293C1, etc. This information enables you to select correct parts.

d. **Quantity:** Specifies quantity which must be ordered.

**GEAR HOUSING
SEAL KIT
26-76868A1
INDICATED BY (*)**

Access Hole Plug Kit 22-88847A1
contains all necessary parts to allow
removal of swivel shaft without re-
moving gimbal housing.

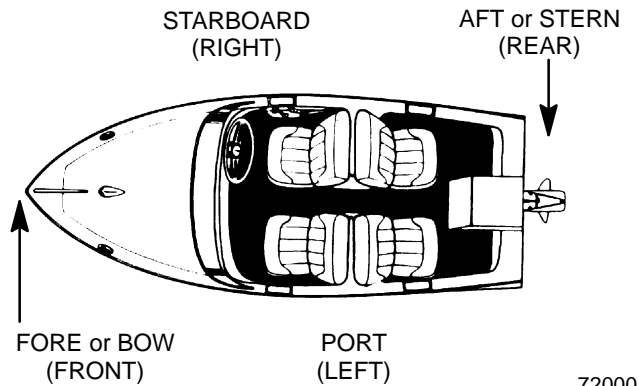
Introduction

This comprehensive overhaul and repair manual is designed as a service guide. It provides specific information, including procedures for disassembly, inspection, assembly and adjustment, to enable dealers and service mechanics to repair this product.

Before attempting repairs, it is suggested that the procedure first be read through to gain knowledge of the methods and tools used, and the cautions and warnings required for safety.

Directional References

Front of boat is bow, rear is stern. Starboard side is right side, port side is left side. In this service manual, all directional references are given as they appear when viewing boat from stern, looking toward bow.

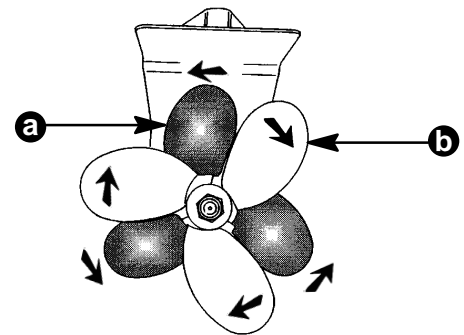


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Propeller Rotation

Propeller rotation for stern drive is as follows:

- Front Propeller - Left-Hand Rotation
- Rear Propeller - Right-Hand Rotation



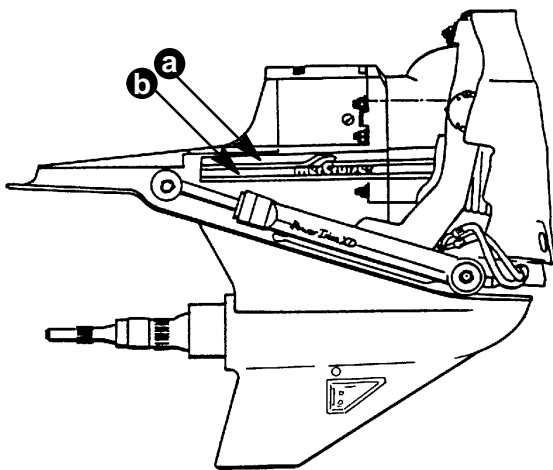
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- a - Front Propeller
- b - Rear Propeller

Stern Drive Unit 10-Hour Break-In Period (New or With Replacement Gears)

1. Avoid full throttle starts.
2. DO NOT operate at any one constant speed for extended periods of time.
3. DO NOT exceed 75% of full throttle during the first 5 hours. During the next 5 hours, operate at intermittent full throttle.
4. Drive unit should be shifted into forward gear a minimum of 10 times during break-in, with run-in time at moderate RPM after each shift.

Serial Number Location



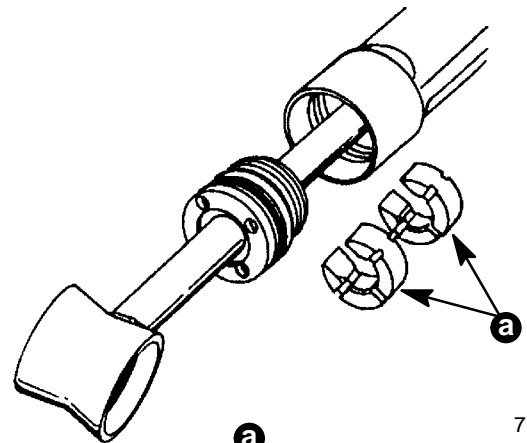
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- a - Stern Drive Unit Serial Number
- b - Stern Drive Unit Gear Ratio

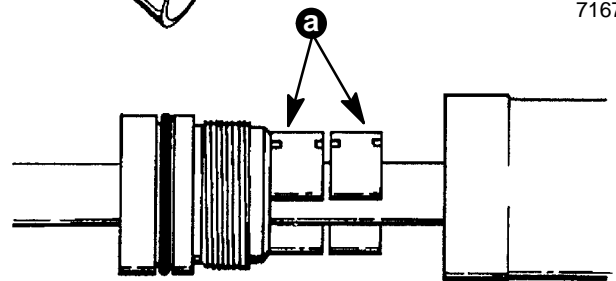
Stern Drive Unit Serial Number Location - Starboard Decal

Special Information

The Blackhawk drive unit uses the same transom assembly as the Bravo drive unit with the following exceptions:



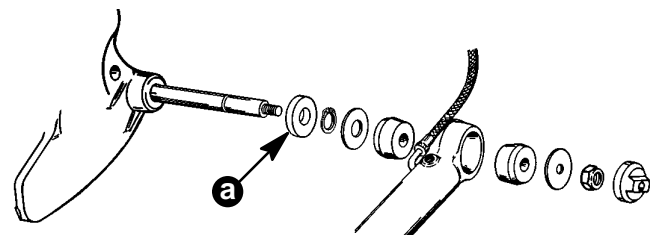
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71679

a - Spacers

Tilt Limit Spacers



71617

a - Spacer

Front Anchor Pin Spacers

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

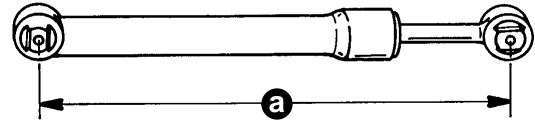
IMPORTANT: The electrical Trim Limit Switch and Trim Position Sender are not present on this transom assembly. Without a Trim Limit Switch, the drive unit can be trimmed up/out beyond the position where the drive unit has side support from the gimbal ring at any throttle setting. It is highly recommended that a mechanical (cable actuated) Trim Position Indicator be installed to provide important drive unit trim angle information to the operator and that the Trim Indicator be marked to clearly indicate the maximum up/out position where side support is still provided. The drive unit should not be trimmed to a position beyond gimbal ring side support at engine speeds above 1200 RPM.

⚠ WARNING

Avoid personal injury or damage to stern drive unit. Do not trim drive unit to an up/out position where the drive unit receives no side support from the gimbal ring at engine speeds above 1200 RPM. Refer to a properly marked mechanical Trim Position Indicator.

1. Install "WARNING DECAL" (Contained in the transom assembly box) at the operator station in a place where it will be clearly visible to the operator.
2. To mark the maximum "Trim Up/Out" position on the mechanical trim indicator, proceed as follows:
 - a. Trim drive unit(s) to the "Full Down/In" position.
 - b. Check to ensure that the mechanical trim indicator indicates "Full Down/In" position. Adjust the indicator following the manufacturers recommendations.

- c. Slowly raise the drive unit(s) until the trim limit point is reached. The trim limit point can be determined by measuring the amount of trim cylinder extension. The dimension for the Bravo and Blackhawk drive units is **21-3/4 in. (552 mm)**, which is measured from front anchor point to rear anchor point centerlines as shown following.



50464

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

- d. With the trim cylinders at this position, place a mark on the mechanical trim indicator.
- e. Raise and lower drive unit(s) several times to ensure that the trim limit point is properly marked.

Convert Bravo Transom to Hi-Performance Transom

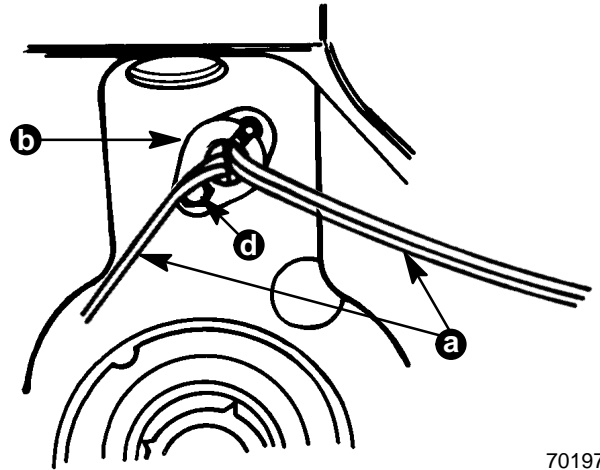
IMPORTANT: The electrical Trim Limit Switch and Trim Position Sender can no longer be used after installing this kit. Without a Trim Limit Switch, the drive unit can be trimmed up/out beyond the position where the drive unit has side support from the gimbal ring at any throttle setting. It is highly recommended that a mechanical (cable actuated) Trim Position Indicator be installed to provide important drive unit trim angle information to the operator and that the Trim Indicator be marked to clearly indicate the maximum up/out position where side support is still provided. The drive unit should not be trimmed to a position beyond gimbal ring side support at engine speeds above 1200 RPM.

⚠ WARNING

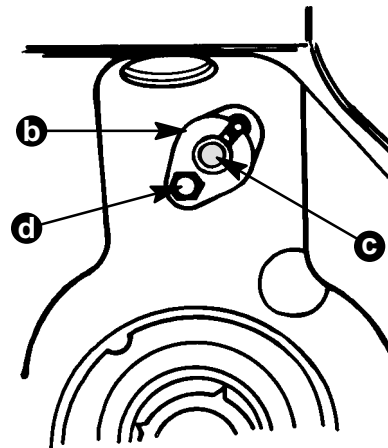
Avoid personal injury or damage to stern drive unit. Do not trim drive unit to an up/out position where the drive unit receives no side support from the gimbal ring at engine speeds above 1200 RPM. Refer to a properly marked mechanical Trim Position Indicator.

1. Install "WARNING DECAL" (Contained in this kit) at the operator station in a place where it will be clearly visible to the operator.
2. Remove stern drive unit.
3. Remove existing bell housing and gimbal ring. Refer to the stern drive service manual.

4. Remove bracket that secures the trim limit and trim position sender wires. Disconnect and remove the wires. Apply Quicksilver Perfect Seal to rubber plug from conversion kit (822374A2) and install it in the hole. Apply Perfect Seal to existing screw and secure bracket over rubber plug. Torque to 90-100 lb.in. (10.2-11.3 N·m).



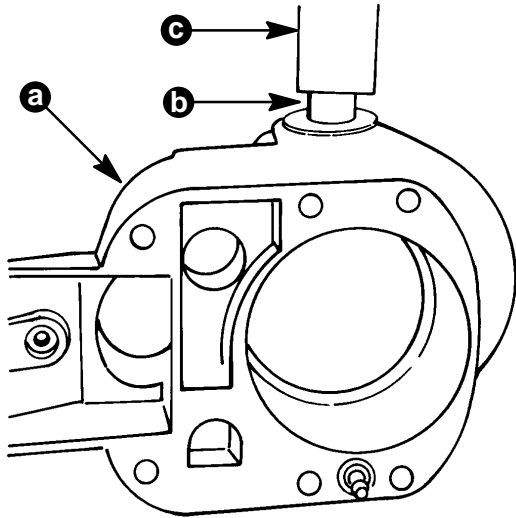
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- a - Trim Limit and Trim Position Sender Wires
- b - Bracket
- c - Rubber Plug
- d - Screw

5. Insert hinge pin bushings into the bell housing.

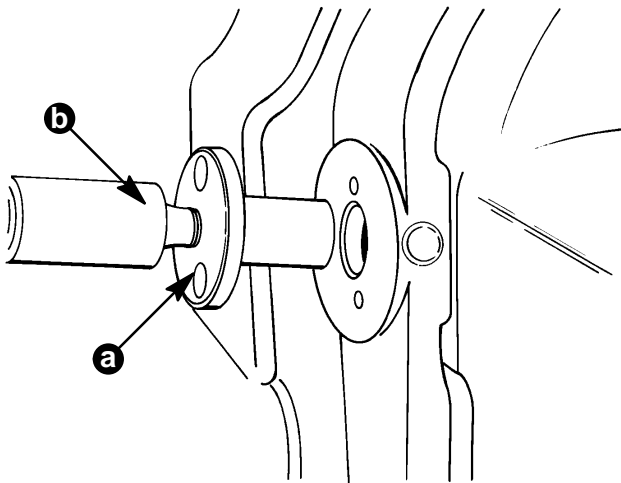


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- a - Hi-Performance Bell Housing
- b - Bushing
- c - Press

6. Install hinge pins using special tool (91-63616) and slide hammer as follows:

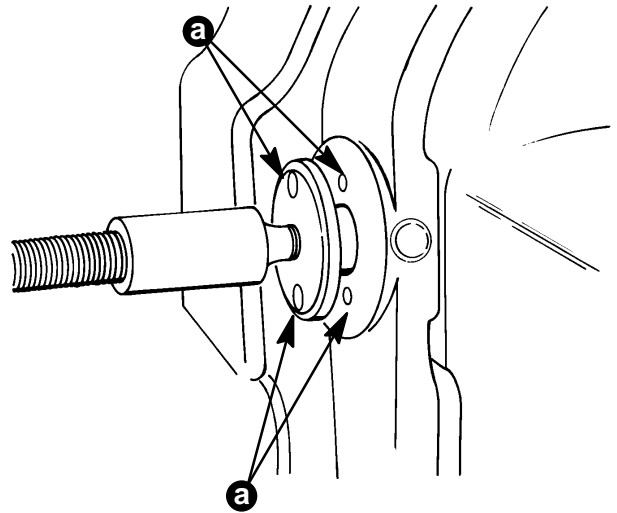
- a. Thread hinge pin onto special tool. Lubricate hinge pins with Quicksilver Special Lubricant 101.



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- a - Hinge Pin
- b - Special Tool

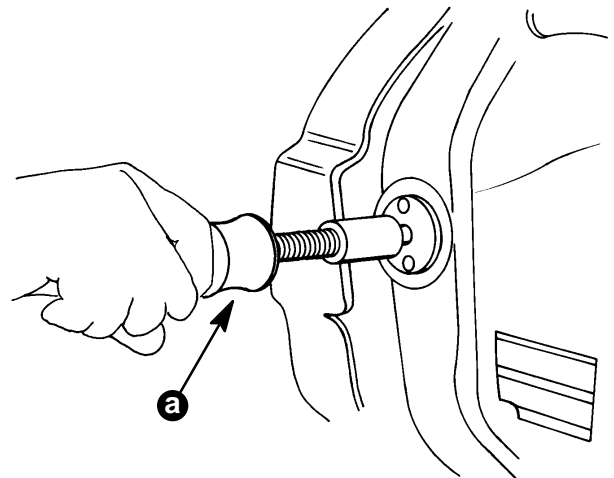
b. Slide hinge pin through gimbal ring and bell housing. Be sure to align screw holes in hinge pin with holes in gimbal ring.



71827

- a - Screw Holes

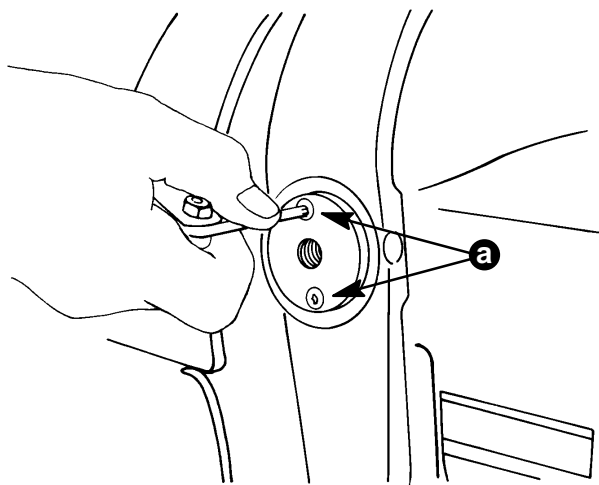
c. Lightly tap hinge pin into place using slide hammer.



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- a - Slide Hammer

- d. Apply Loctite 242 to threads of screws and install. Torque screws to 25-30 lb.in. (2.8-3.3 N.m).



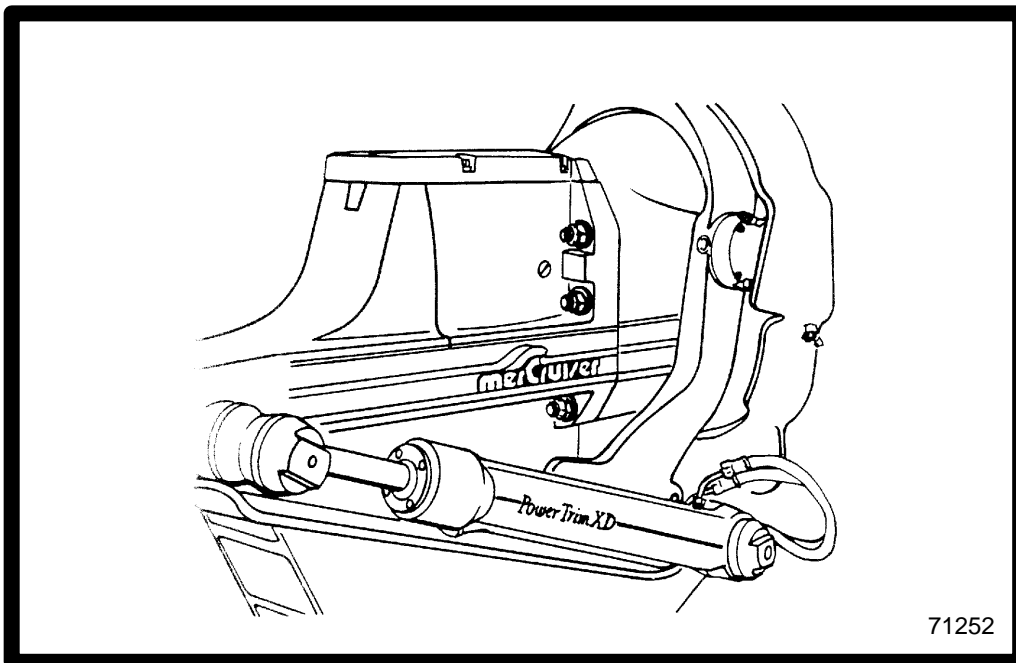
a - Screws

71825

REMOVAL AND INSTALLATION

2

A



ALL MODELS

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Specifications

Torque Specifications

DESCRIPTION	TORQUE		
	lb. in.	lb. ft.	N·m
Exhaust Pipe to Gimbal Housing Screws or Block-Off Plate		20-25	27-34
Power Trim cylinder to Anchor Pin Nut	tighten securely		
Front Propeller Nut		100	135.5
Rear Propeller Nut ¹		60	81
Shift Cable End Guide Attaching Nuts	tighten nut until it bottoms out against flat washer, then back off 1/2 Turn		
Steering Cable Coupler Nut		35	48
Steering System Pivot Bolts		25	34
Stern Drive Unit to Bell Housing Attaching Nuts		50	68
Transom Assembly Attaching Screws and Nuts		20-25	27-34
Power Steering Hose Fittings		23	31
Power Trim Hose Fittings	110		12

¹: Amount specified is MINIMUM.

Bearing Preloads

DESCRIPTION	TORQUE	
	lb. in.	N·m
U-joint Bearings (New)	6-10	0.7-1.1
U-joint Bearings (Used)*	3-6	0.4-0.7

*A bearing is considered used if spun once under load.

Special Tools

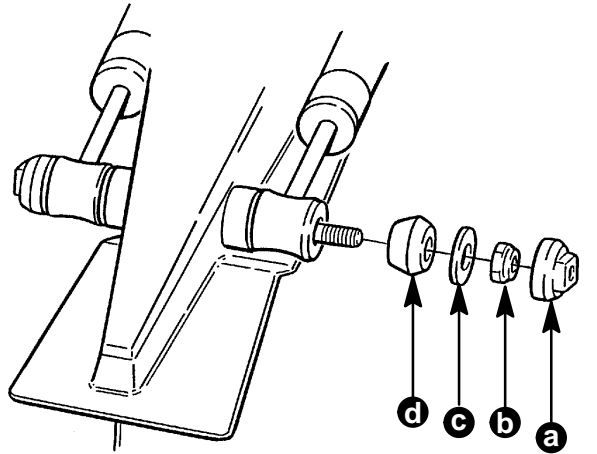
DESCRIPTION	PART NUMBER
Housing Fixture	91-805573
Torque Wrench (lb. in.)	91-66274
Slide Hammer Puller	91-34569A1
U-joint Bearing Retainer Wrench	91-17256
Clutch Assembly Stand	91-17301A1
Shift Handle Tool	91-17302
Bearing and Bushing Removal Tool	91-17273
Bearing, Bushing, and Seal Driver Assembly	91-17275A1
Driver Head	91-90773
Puller Guide	91-90774
Driver Guide	91-90243
Puller Bolt	10-90775
Bearing Driver	91-89868
U-joint Press Adaptor	91-38756
Universal Puller Plate	91-37241
Puller Jaws (Two Halves)	91-90777A1 and 91-90778

Lubricants, Sealers, and Adhesives

DESCRIPTION	PART NUMBER
Quicksilver 2-4-C Marine Lubricant	92-825407A12
3M Brand Adhesive	92-25234-1
Quicksilver Needle Bearing Assembly Lubricant	92-825265A1
Quicksilver Special Lubricant 101	92-13872A1
Quicksilver High Performance Gear Lube	92-816026A4
Loctite 8831	92-826089-1
Permalock 115	Obtain Locally

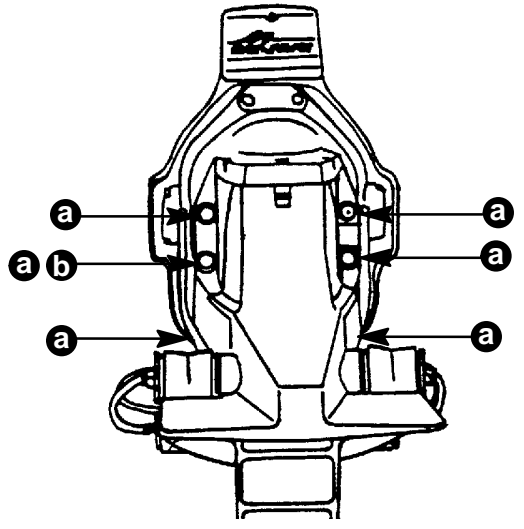
Stern Drive Unit Removal

1. Shift remote control into NEUTRAL.
2. Position drive to full DOWN position and remove power trim cylinders (aft end) from drive shaft housing.



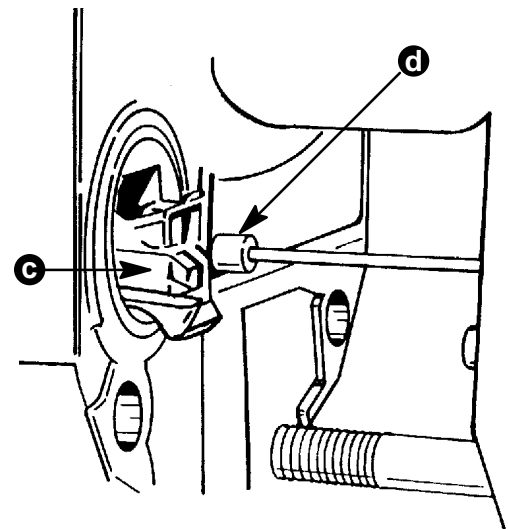
- a - Cap
- b - Nut
- c - Small I.D. Washer
- d - Trim Cylinder Cap

3. Remove stern drive unit. Check that shift linkage jaws open and release shift cable end.



- a - Locknuts and Washers
- b - Ground Plate - Washer Not Used at This Location

71244



- c - Shift Linkage Jaws - Open
- d - Shift Cable End - Released from Jaws

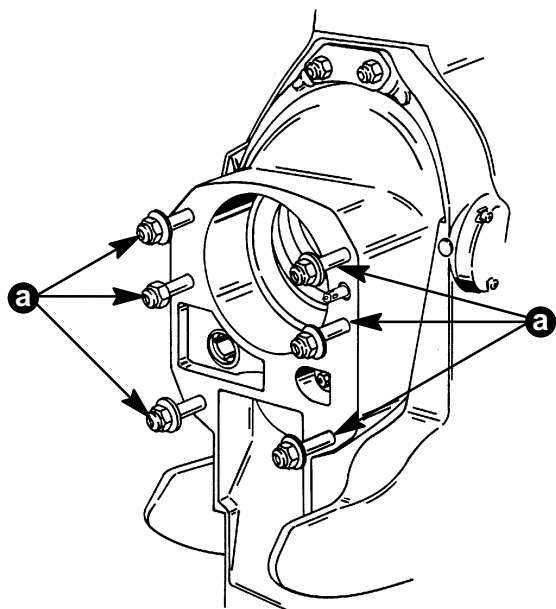
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Stern Drive Unit Installation

1. Install and align engine. (Refer to appropriate engine service manual.)

NOTE: If engine was removed and shift cable was disconnected, reinstall and adjust shift cable before proceeding. (Refer to the "Shift Cable Installation and Adjustment" instructions found in the Bravo Stern Drive Unit Service Manual.)

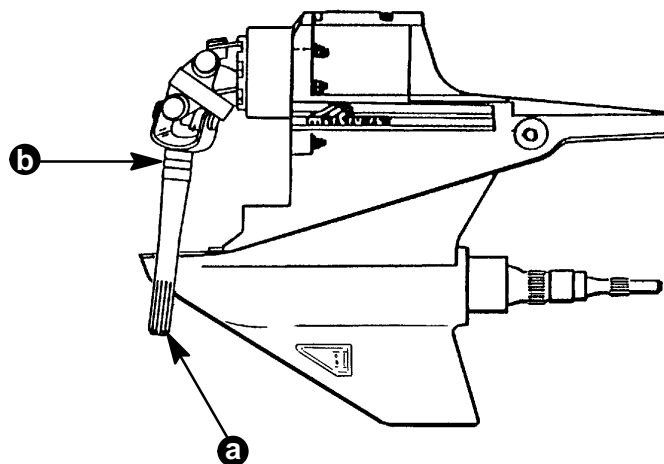
2. Place the remote control shift lever in the NEUTRAL position.
3. Lubricate bell housing studs with Quicksilver 2-4-C Marine Lubricant.



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a - Bell Housing Studs

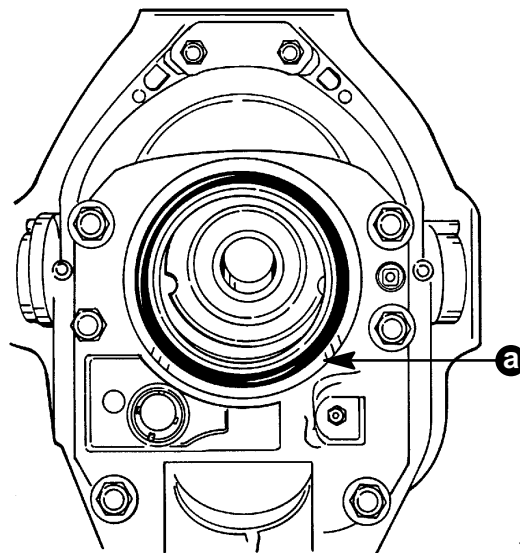
4. Lubricate U-joint shaft O-rings and U-joint shaft splines with Quicksilver Engine Coupler Spline Grease.



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a - U-Joint Shaft Splines
b - U-Joint Shaft O-Rings

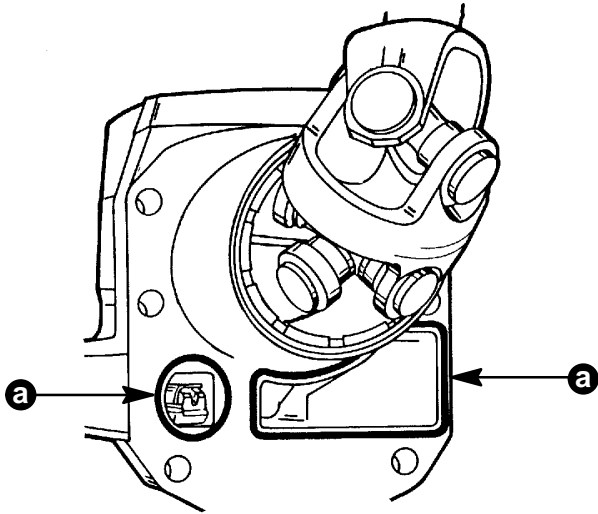
IMPORTANT: The edge of U-joint bellows acts as a seal between bell housing and drive shaft housing. Ensure surface is not damaged.



72472

a - Drive Shaft Bellows Edge

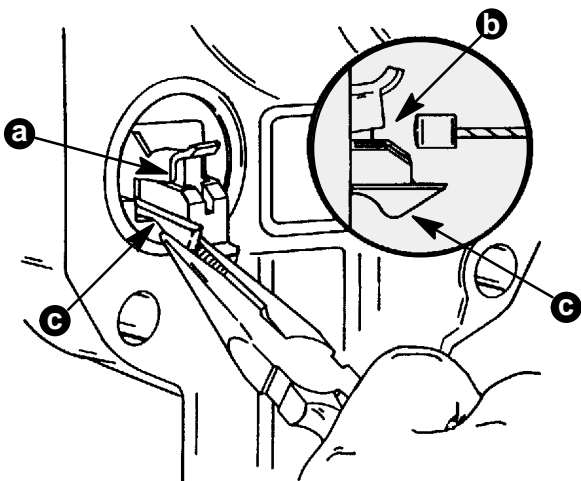
5. Inspect drive shaft bellows for cracks, nicks and cleanliness.
6. Lubricate O-ring seals on face of drive shaft housing with Quicksilver 2-4-C Marine Lubricant.



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a - O-ring Seals

7. Pull out shift linkage as far as it moves - jaws will open.

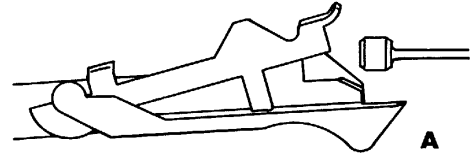


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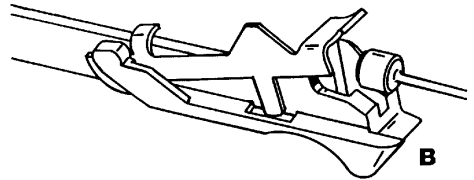
a - Shift Linkage Assembly
 b - Jaws - Open
 c - Lubricate Underside of Lower Lip of Shift Linkage Assembly as Shown with Quicksilver Special Lubricant 101

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

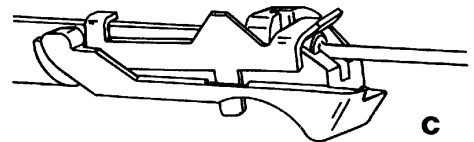
NOTE: As bell housing shift cable enters the shift linkage assembly, it pushes the assembly back into the drive shaft housing, and the jaw closes, securing the cable as shown in Figures A, B and C.



A



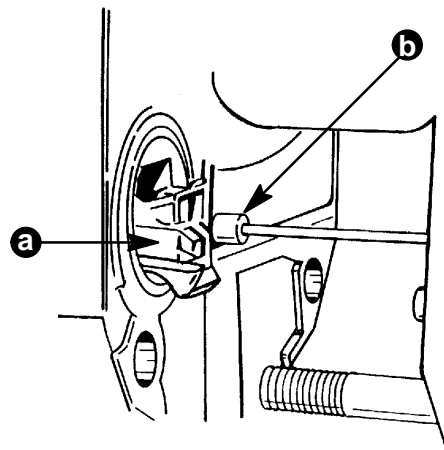
B



C

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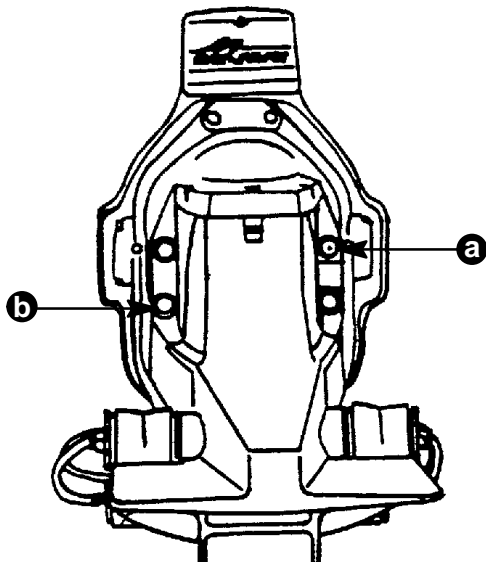
NOTE: If bell housing shift cable does not line up to properly enter jaws of shift linkage assembly, use your hand to guide cable into place while installing stern drive unit.



a - Shift Linkage Assembly “Jaws”
 b - Shift Cable

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8. Install stern drive unit.
 - a. Position trim cylinders so they point 45 degrees upward. Be careful not to scratch splash plate.
 - b. Align universal joint shaft with bell housing bore.
 - c. Guide U-joint shaft through gimbal bearing and into engine coupler. Make sure that shift linkage jaws engage with shift cable.
 - d. If necessary, rotate propeller shaft slightly to align U-joint shaft splines with engine coupler splines, then slide drive unit all the way into bell housing.
 - e. Rotate propeller shaft slightly to ensure that drive unit is still in neutral once installed.
9. Fasten stern drive unit to bell housing. Starting from center, torque nuts to 50 lb. ft. (68 N·m).



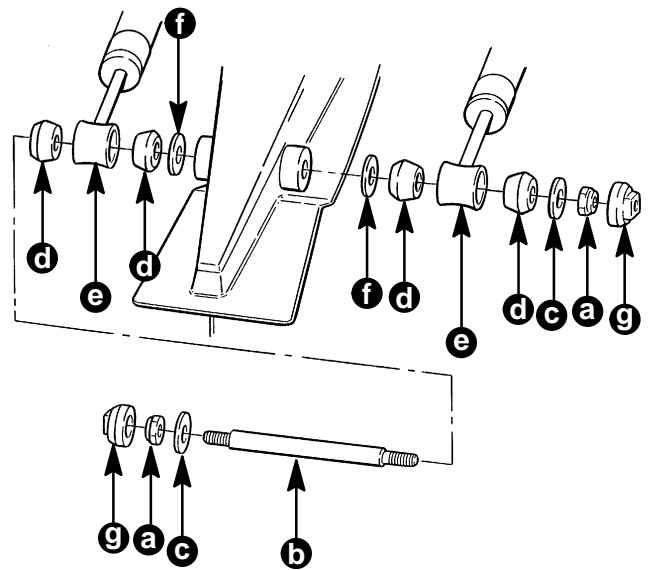
71244

- a - Locknuts (6) and Flat Washers (5)
 b - Ground Plate - Do Not Use Flat Washer

IMPORTANT: To aid in installing rubber bushings, use a water and soap solution.

10. Loosen nuts which secure trim cylinders to forward anchor pins. Be careful not to scratch splash plate.
11. Install aft anchor pin as follows:
 - a. Install rubber bushings in one aft trim cylinder pivot end. Be sure to install bushings with small diameter end facing each other.
 - b. Align cylinder bore with stern drive housing bore.

- c. Place large I.D. flat washer between rubber bushing and stern drive housing.
- d. Slide aft anchor pin through rubber bushings, large I.D. flat washer and stern drive housing bore.
- e. Place large I.D. flat washer on aft anchor pin against stern drive housing.
- f. Install rubber bushings in other aft trim cylinder pivot end. Be sure to install bushings with small diameter end facing each other.
- g. Align cylinder bore with stern drive housing bore and slide aft anchor pin through rubber bushings.
- h. Place small I.D. flat washer onto each end of anchor pin and install elastic stop nuts.



72461

- a - Locknut
 b - Anchor Pin
 c - Small I.D. Flat Washer
 d - Rubber Bushings
 e - Trim Cylinder Pivot Ends
 f - Large I.D. Washers
 g - Trim Cylinder Cap

12. Tighten forward and aft anchor pin nuts until nuts and washers bottom out against anchor pin shoulder.
13. Attach trim cylinder caps; hand tighten only. If caps will not catch threads, recheck tightness of anchor pin nuts.



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