



merCruiser
SERVICE
MANUAL

Number 6

Sterndrive Units
R-MR-Alpha One-
Alpha One SS

**MerCruiser #6 Sterndrive Units
R MR Alpha One Alpha One SS**

90-12934--2

**MerCruiser #6 Sterndrive Units
R MR Alpha One Alpha One SS**

90-12934--2

Models Covered in This Manual

Transom Assemblies

Model	Serial Number
MC 120R/140B/185R/488R/898R/228R/260R	6216687 – 6849289
MC 120MR/140MR/170MR/185MR/190MR/200MR/230MR/260MR/300 Tempest MR	6849290 – 0A471374
MC Alpha One/Alpha One SS	0A471375 and Above

Sterndrive Units

MC 120R-260R		
Original Ratio	Ratio If Serviced With 13:21 Gears	Serial Number
1.98:1	1.94:1	6237861-6854392
1.84:1	1.81:1	6225577-6862701
1.65:1	1.62:1	6268065-6810537
1.50:1	1.47:1	6229158-6847029
1.32:1	1.29:1	6231571-6663947

MC 120 MR - 300 TEMPEST MR		
Original Ratio	Ratio If Serviced With 13:28 Gears	Serial Number
1.98:1	1.94:1	6854393-0A476746
1.84:1	1.81:1	6862702-0A470164
1.65:1	1.62:1	6810538-0A475786
1.50:1	1.47:1	6847030-0A479506

MC ALPHA ONE / ALPHA ONE SS			
Original Ratio	Ratio If Serviced With 13:28 Gears	R.H. Serial Number	L.H. Serial Number
1.98:1	1.98:1	0A476747 and Above	0C881740 and Above
1.84:1	1.84:1	0A470165 and Above	0C884040 and Above
1.65:1	1.65:1	0A475787 and Above	0C881790 and Above
1.50:1	1.50:1	0A479507 and Above	0C852908 and Above
1.32:1	1.32:1	0A613927 and Above	
Alpha One SS 1.50:1/1.32:1	1.50/1.32:1	0A545004 and Above	


Sea Ray Sterndrive Units and Transom Assembly (Oyster White)

Original Ratio	Ratio If Serviced With 13:21 Gears	Serial Number
1.98:1		0B803866-0C348031
1.84:1		0B800854-0C343526
1.50:1		0B796473-0C340666
1.32:1		0B804807-0C340030
Transom Assembly		0B815811-0C340333

When making repairs to Sea Ray (Oyster White) sterndrives, follow procedures as outlined for corresponding MerCruiser models as shown in the cross-reference chart below.

Sea Ray	MerCruiser
3.0L	3.0L Alpha One
4.3L2	4.3L Alpha One
4.3L4	4.3LX Alpha One
5.7L	5.7L Alpha One
SRX 5.7L	350 Magnum Alpha One
SRX 7.4L	454 Magnum Alpha One

Notice

Throughout this publication, “Warnings” and “Cautions” (accompanied by the International HAZARD symbol ) 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 the manufacturer 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. That they have been trained in the recommended servicing procedures of these products which includes the use of mechanics’ common hand 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 result of each method. We have not

undertaken any such wise 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 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 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 electrical systems, it is extremely important that all components are properly installed and tightened. If not, any electrical 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 UTILIZE 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.

Service Manual Outline

Section 1 - Important Information

- A - Important Information
- B - Maintenance
- C - Troubleshooting

Section 2 - Removal, Installation and Adjustments

- A - All Models

Section 3 - Sterndrive Unit

- A - Drive Shaft Housing
- B - Gear Housing - MR/Alpha One/Alpha One SS
- C - Gear Housing - I-R
- D - Gear Housing - Alpha One Counter Rotation

Section 4 - Transom Assembly

- A - Service Procedures Requiring Minor Disassembly
- B - Service Procedures Requiring Major Disassembly

Section 5 - Power Trim

- A - Oildyne Power Trim Pump (Plastic Reservoir)
- B - Oildyne Power Trim Pump (Aluminum Reservoir)
- C - Prestolite Power Trim Pump
- D - Trim Cylinders
- E - Dual Power Trim Control
- F - Auto Trim II

Section 6 - Steering Systems

- A - Power Steering
- B - Manual Steering

Section 7 - Corrosion Protection

- A - All Models

Important
Information

1

Removal, Installation
and Adjustments

2

Sterndrive Unit

3

Transom Assembly

4

Power Trim

5

Steering Systems

6

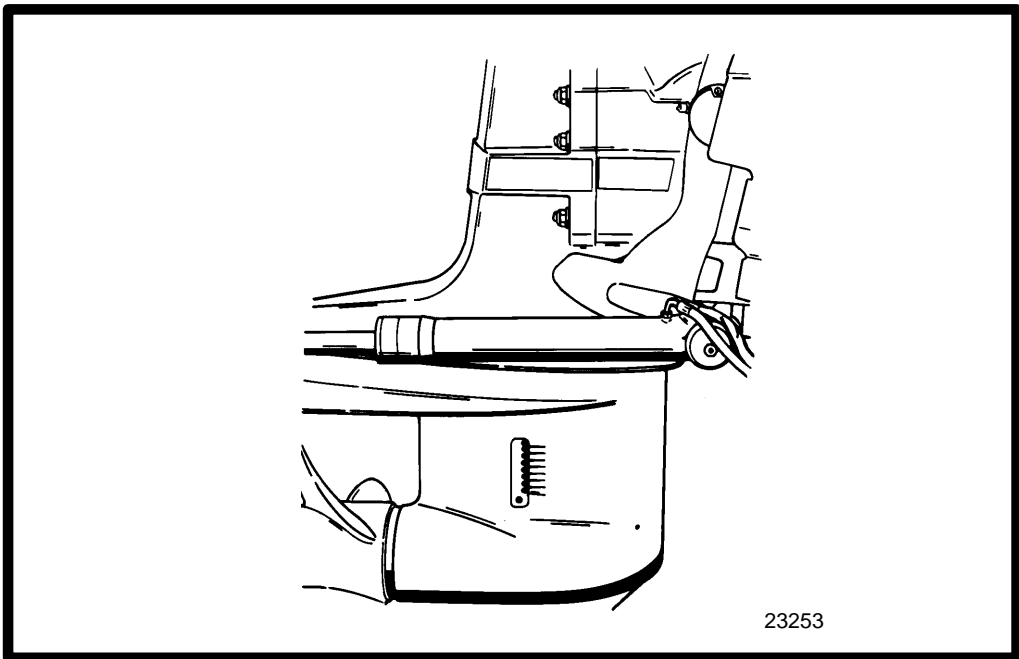
Corrosion Protection

7

GENERAL INFORMATION

1

A



IMPORTANT INFORMATION

Table of Contents

	Page
How To Use This Manual	1A-1
Page Numbering	1A-1
Introduction	1A-1
Special Product Information	1A-1
Directional References	1A-1
Propeller Rotation	1A-1
Serial Number Locations	1A-2
Hi-Performance Boating	1A-2
Sterndrive Unit 10-Hour Break-In Period	1A-2
Decal Application	1A-2
Decal Removal	1A-2
Temperature	1A-2
Surface Preparation	1A-2
Decal Application	1A-2
Painting Procedures	1A-3
Cleaning & Painting Aluminum Propellers & Gear Housings	1A-3
Propellers	1A-3
Gear Housings	1A-3

How To Use This Manual

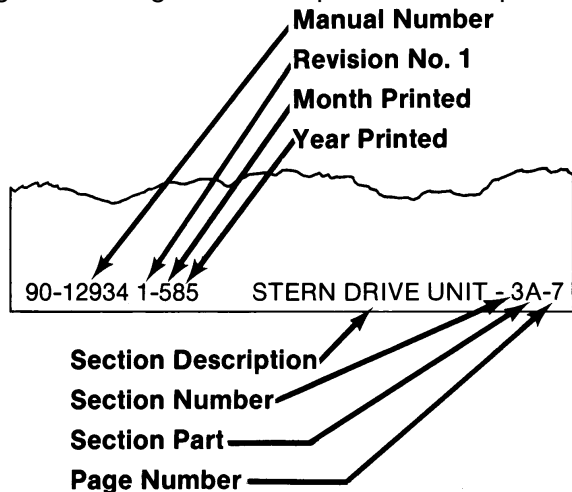
This Manual is divided into sections which represent major components and systems.

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

Sections and parts are listed on page.

Page Numbering

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



Introduction

This comprehensive overhaul and repair manual is designed as a service guide for the MerCruiser models previously listed. It provides specific information, including procedures for disassembly, inspection, assembly and adjustment, to enable dealers and service mechanics to repair these products.

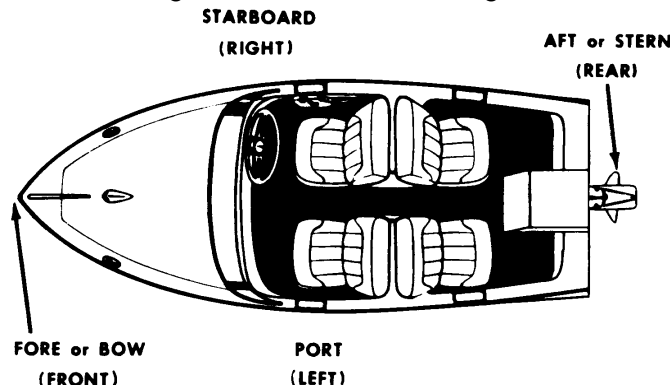
Before attempting repairs, it is suggested that procedure first be read through to gain knowledge of the methods and tools used and the cautions and warnings required for safety.

Special Product Information

During production of these models, special product improvements and changes have been made to increase product reliability and performance. Such changes to a sterndrive assembly component(s) are covered in the "Special Information" portion of the appropriate sterndrive assembly section. (Refer to the section "Index".) Serial number breaks are provided, where applicable, for ease of identification.

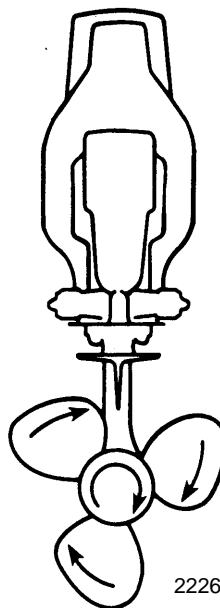
Directional References

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.

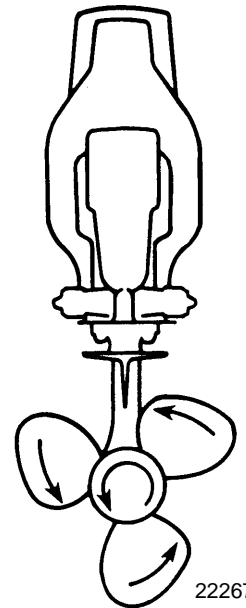


Propeller Rotation

Propeller rotation for sterndrive can be right hand or left hand rotation as viewed from the aft end of the propeller.

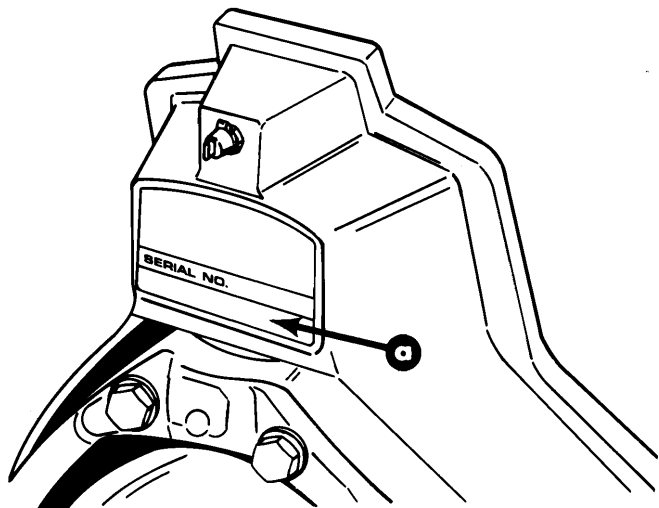


Right Hand Rotation



Left Hand Rotation

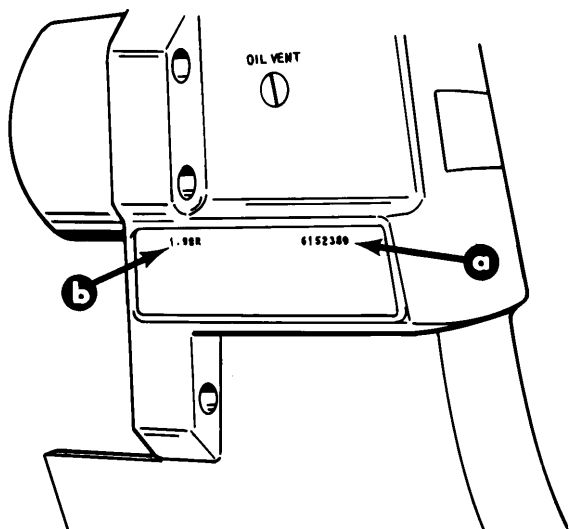
Serial Number Locations



23254

Transom Assembly Serial Number Location

a - Transom Assembly Serial Number



23254

Sterndrive Unit Serial Number Location – Port Decal

a - Sterndrive Unit Serial Number

b - Sterndrive Unit Gear Ratio

Hi-Performance Boating

Written by marine engineers, order Part No. 90-86168, entitled "Hi-Performance Boat Operation."

Sterndrive 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.

Decal Application

Decal Removal

1. Mark decal location before removal to assure proper alignment of new decal.
2. Carefully soften decal and decal adhesive with a heat gun or heat blower while removing old decal.
3. Clean decal contact area with a 1:1 mixture of isopropyl alcohol and water.
4. Thoroughly dry decal contact area and check for a completely cleaned surface.

TEMPERATURE

IMPORTANT: Installation of vinyl decals should not be attempted while in direct sunlight. Air and surface temperature should be between 60°F (15°C) and 100°F (38°C) for best application.

SURFACE PREPARATION

IMPORTANT: Do not use a soap or any petroleum based solvents to clean application surface.

Decal Application

NOTE: Ensure area where decal will be applied is clean.

1. Remove backing from decal.
2. Apply to drive unit.
3. Carefully smooth decal on surface.

Painting Procedures

Cleaning & Painting Aluminum Propellers & Gear Housings

WARNING

Avoid serious injury from flying debris. Avoid serious injury from airborne particles. Use eye and breathing protection with proper ventilation.

PROPELLERS

1. Sand the entire area to be painted with 3M 120 Regalite Polycut or coarse Scotch-Brite, disc or belts.
2. Feather edges of all broken paint edges. Try not to sand through the primer.
3. Clean the surface to be painted using PPG Industries DX330 Wax and Grease Remover or equivalent (Xylene or M.E.K.).
4. If bare metal has been exposed, use Quicksilver's Light Gray Primer.
5. Allow a minimum of 1 hour dry time and no more than 1 week before applying the finish coat.
6. Apply the finish coat using Quicksilver's EDP Propeller Black.

GEAR HOUSINGS

The following procedures should be used in refinishing gear housings. This procedure will provide the most durable paint system available in the field. The materials recommended are of high quality and approximate marine requirements. The following procedure will provide a repaint job that compares with a properly applied factory paint finish. It is recommended that the listed materials be purchased from a local Ditzler Automotive Finish Supply Outlet. The minimum package quantity of each material shown following is sufficient to refinish several gear housings.

Procedure:

1. Wash gear housing with a muriatic acid base cleaner to remove any type of marine growth and rinse with water, if necessary.
2. Wash gear housing with soap and water, then rinse.

3. Sand blistered area with 3M 180 grit sandpaper or P180 Gold Film Disc to remove paint blisters only. Feather edge all broken paint edges.
4. Clean gear housing thoroughly with (DX-330) wax and grease remover.
5. Spot repair surfaces where bare metal is exposed with (DX-503) alodine treatment.

IMPORTANT: Do not use any type of aerosol spray paints as the paint will not properly adhere to the surface nor will the coating be sufficiently thick to resist future paint blistering.

6. Mix epoxy chromate primer (DP-40) with equal part catalyst (DP-401) per manufacturer's instructions, allowing proper induction period for permeation of the epoxy primer and catalyst.
7. Allow a minimum of one hour drying time and no more than one week before top coating assemblies.
8. Use Ditzler Urethane DU9000 for Mercury Black and DU33414M for Sea Ray White. Catalyze all three colors with Ditzler DU5 catalyst mixed 1:1 ratio. Reduce with solvents per Ditzler label.

CAUTION

Be sure to comply with instructions on the label for ventilation and respirators. Using a spray gun, apply one half to one mil even film thickness. Let dry, flash off for five minutes and apply another even coat of one half to one mil film thickness. This urethane paint will dry to the touch in a matter of hours, but will remain sensitive to scratches and abrasions for a few days.

9. The type of spray gun used will determine the proper reduction ratio of the paint.

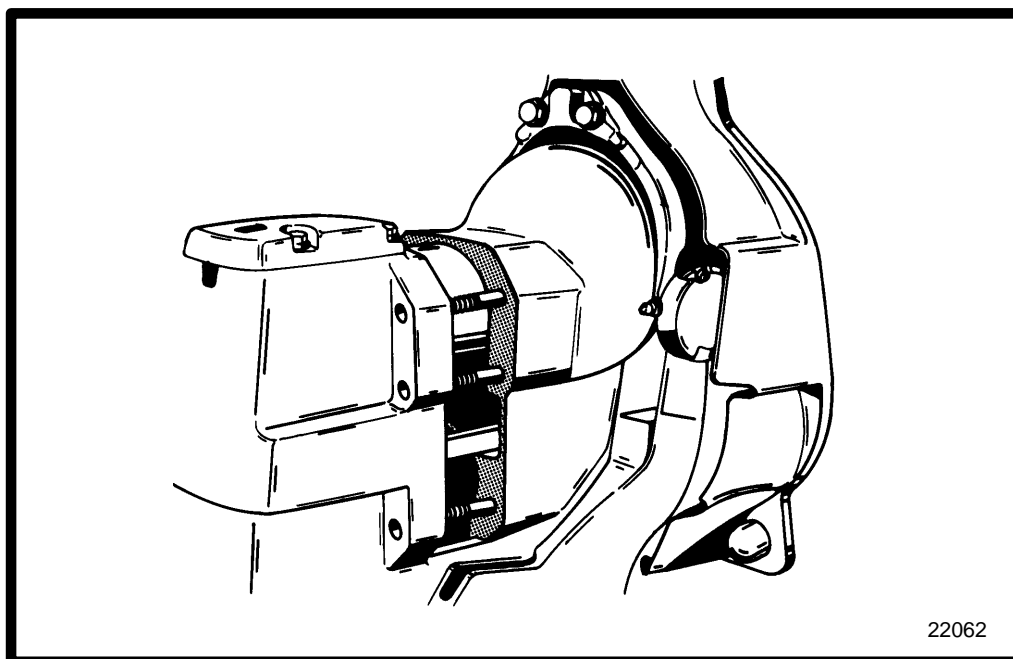
IMPORTANT: Do not paint sacrificial trim tab or anode.

10. Cut out a cardboard "plug" for trim tab pocket to keep paint off of mating surface to maintain good continuity circuitry between trim tab and gear housing.

REMOVAL, INSTALLATION AND ADJUSTMENTS

2

A



ALL MODELS

Table of Contents

	Page
Specifications	2A-1
Torque Specifications	2A-1
Lubricants/Sealers/Adhesives	2A-1
Special Installation Tools	2A-1
Special Information	2A-1
Transom Specifications	2A-1
Checking Transom Thickness	2A-2
Sterndrive Unit Removal	2A-2
Transom Assembly Removal	2A-3
Transom Assembly Installation	2A-7
Sterndrive Unit Installation	2A-15
Shift Cable Adjustment	2A-18
Installing Shift Cables	2A-19
Propeller Installation	2A-24

Specifications

Torque Specifications

NOTE: Listed below are the torque specifications for those fasteners which have a specific torque value. Tighten all other fasteners (not listed) securely.

DESCRIPTION	TORQUE		
	lb. in.	lb. ft.	N-m
Exhaust Pipe To Gimbal Housing Screws		20-25	27-34
Power Trim Cylinder To Anchor Pin Nut	Tighten Until Nut Just Bottoms Out		
Propeller		55 (Min.)	75 (Min.)
Shift Cable End Guide Attaching Nuts	Tighten Until Nut Bottoms And Then Loosen 1/2 Turn		
Steering Cable Coupler Nut		35	48
Steering Cable Coupler Nut Locking Plate Screw	60-72		7-8
Steering System Pivot Bolts		25	34
Sterndrive Unit To Bell Housing Attaching Nuts		50	68
Transom Assembly Attaching Screws and Nuts		20-25	27-34
Power Steering Hydraulic Hose Fitting - Large		20-25	27-34
Power Steering Hydraulic Hose Fitting - Small	96-108		11-12

Lubricants/Sealers/Adhesives

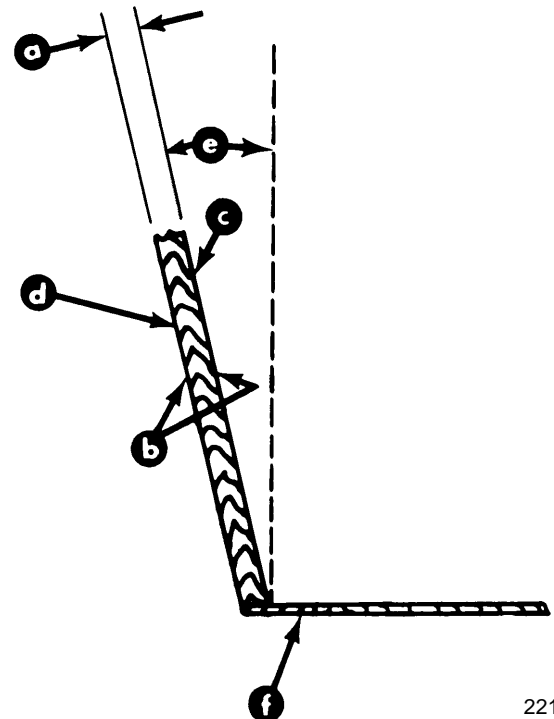
Description	Part No.
Quicksilver 2-4-C Marine Lubricant With Teflon	92-825407A3
Quicksilver Special Lubricant 101	92-13872A1
Liquid Neoprene	92-25711-2
Perfect Seal	92-34227--1
Engine Coupler Spline Grease	92-816391A4

Special Installation Tools

Description	Part No.
Alignment Tool Assembly	91-805475A1
Engine Alignment Tool	91-57797A3

Special Information

Transom Specifications

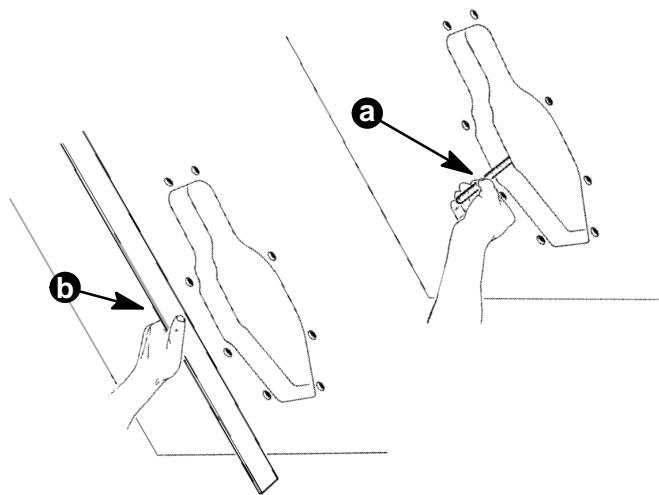


22170

- a - Transom Thickness-to Be 2 In. (51 mm) Minimum To 2-1/4 in. (57 mm) Maximum
- b - Transom Surfaces-MUST BE Parallel Within 1/8 in. (3.2 mm) Measured At Top And Bottom Of Cutout Hole
- c - Area Covered By Inner Transom Plate-MUST BE Flat Within 1/8 in. (3.2 mm)
- d - Area Covered By Gimbal Housing Assembly-MUST BE Flat Within 1/16 in. (1.6 mm)
- e - Transom Angle-10° to 16°
- f - Keel (If Equipped)-Remove 4 Ft. (1.2m) Forward To Transom

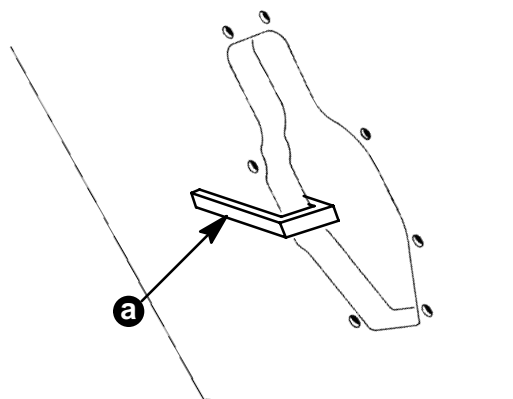
Checking Transom Thickness

Ensure transom surface thickness and flatness conform to minimums specified in "Installation Requirements" listed previously.



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a - Measuring Thickness
b - Measuring Flatness



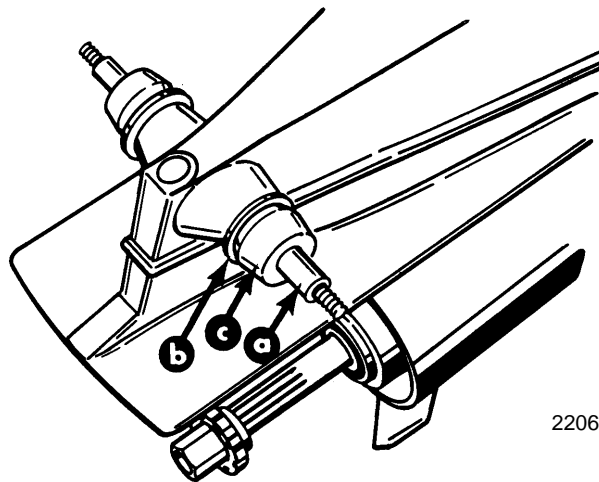
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a - Suitable Mandrel To Check For Uniform Transom Thickness

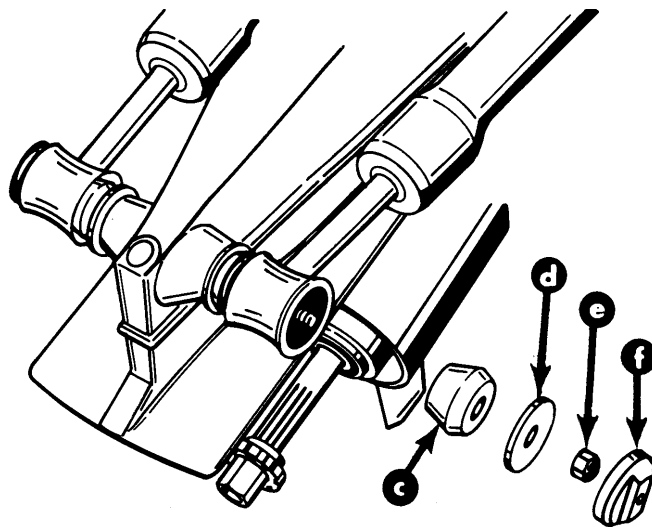
NOTE: Transom must be between 2" (51 mm) and 2-1/4" (57 mm) a distance of 8" (203 mm) to either side of the vertical centerline.

Sterndrive Unit Removal

1. Move remote control shift lever into the forward gear position.
2. Remove power trim cylinders (aft end) from drive shaft housing.



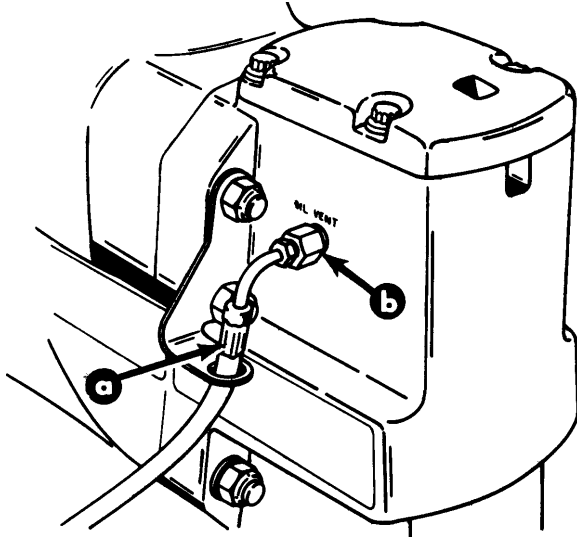
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22441

- a - Anchor Pin
- b - Washers (2)-Large I.D.
- c - Rubber Bushings (4)
- d - Washer (2)-Small I.D.
- e - Locknuts (2)
- f - Plastic Caps (2)

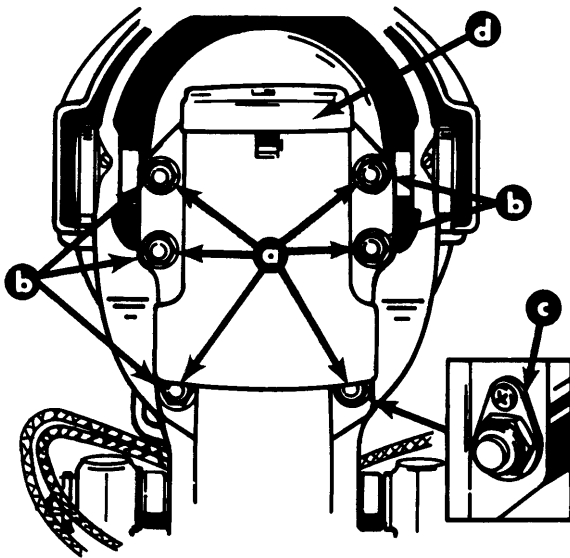
- If installed, remove and cap remote oil reservoir hose. Remove adaptor fitting and plug drive unit vent hole.



23253

- a - Oil Reservoir Hose
- b - Adaptor Fitting

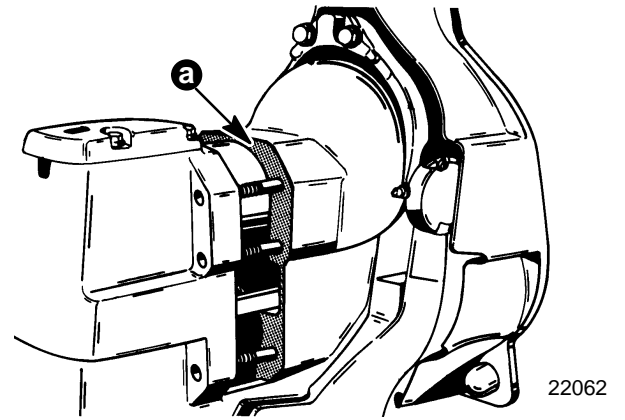
- Remove locknuts and washers holding drive unit to bell housing. Keep ground plate secured to drive shaft housing. Pull drive unit straight away from bell housing.



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- a - Locknuts (6)-Remove
- b - Washers (5)-Remove
- c - Ground Plate
- d - Sterndrive Unit

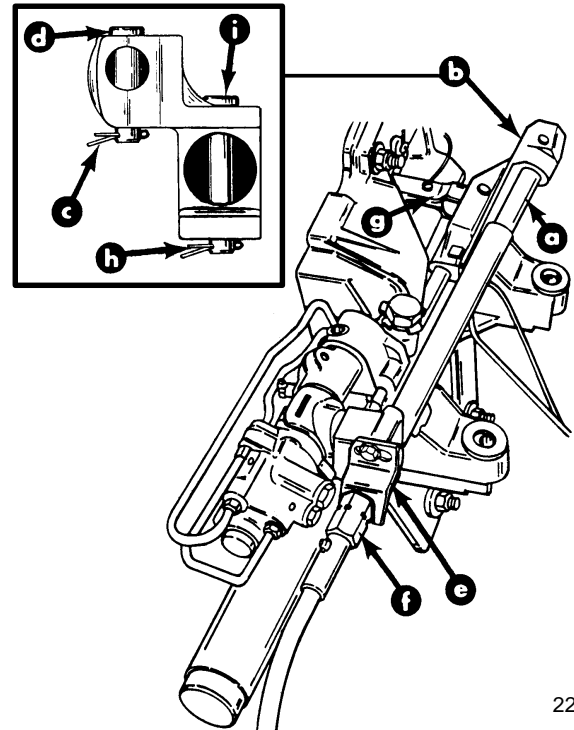
- Remove bell housing gasket.



- a - Bell Housing Gasket

Transom Assembly Removal

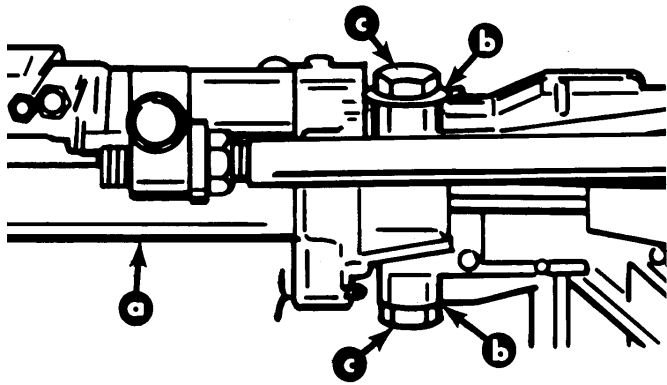
- If equipped, remove power steering assembly as follows:
 - Remove cotter pin and clevis pin from clevis. Loosen the cable retaining nut. Disconnect clevis from steering lever.
 - Remove cotter pin and clevis pin from the steering lever. Disconnect steering cable from clevis.



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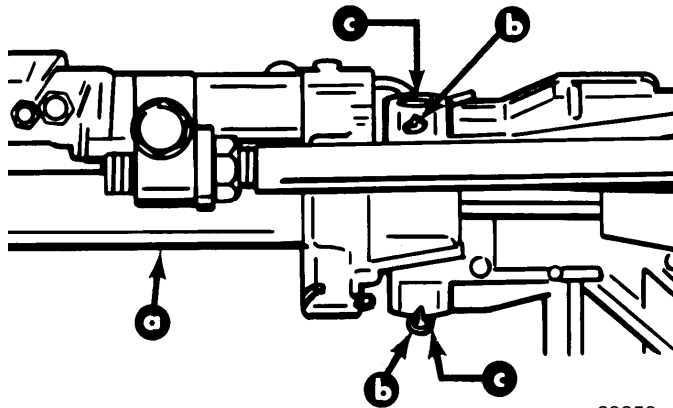
- a - Cable End
- b - Clevis
- c - Cotter Pin
- d - Clevis Pin
- e - Locking Plate
- f - Cable Retaining Nut
- g - Steering Lever
- h - Cotter Pin
- i - Clevis Pin

- c. Bend tab on tab washer down. Loosen pivot bolts or remove pivot pins. Use a screw to remove pivot pins. Remove power steering unit.



23256

Power Steering Units Secured With Pivot Bolts



23256

Power Steering Units Secured With Pivot Pins

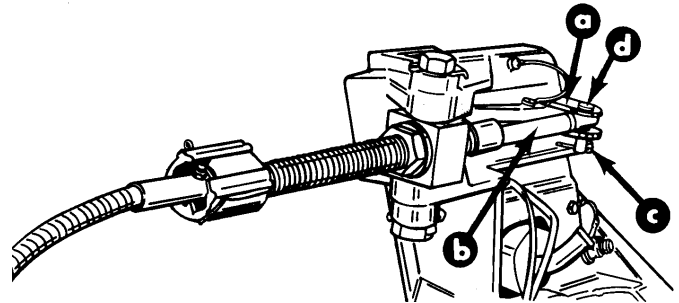
- a - Power Steering Unit
- b - Tab Washer
- c - Pivot Bolt
- a - Power Steering Unit
- b - Cotter Pins
- c - Pivot Pins

2. If equipped, disconnect manual steering as follows:

- a. Remove cotter pin and clevis pin from clevis. Loosen the cable retaining nut. Disconnect clevis from steering lever.

or

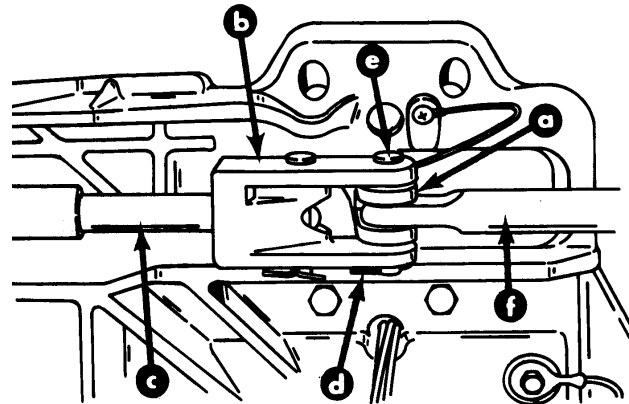
- b. Remove cotter pin and clevis pin from the steering lever. Disconnect steering cable from clevis.



22055

Single Installation Models

- a - Steering Lever
- b - Steering Cable
- c - Cotter Pin
- d - Clevis Pin

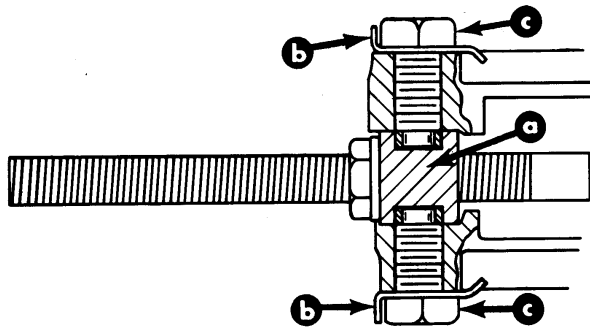


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Dual Installation Models

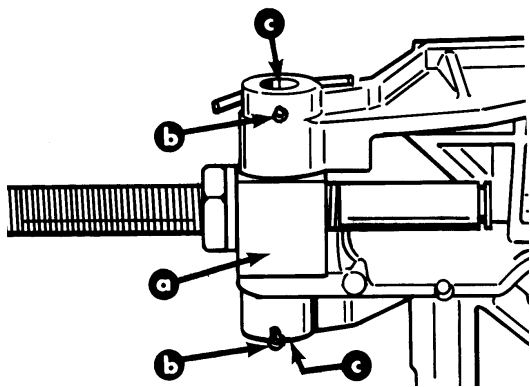
- a - Steering Lever
- b - Clevis Assembly
- c - Steering Cable
- d - Cotter Pin
- e - Clevis Pin
- f - Tie Bar

- c. Bend tab on tab washer down. Loosen pivot bolts or remove pivot pins. Use a screw to remove pivot pins. Remove manual steering ring.



22945

Manual Steering Units Secured With Pivot Bolts



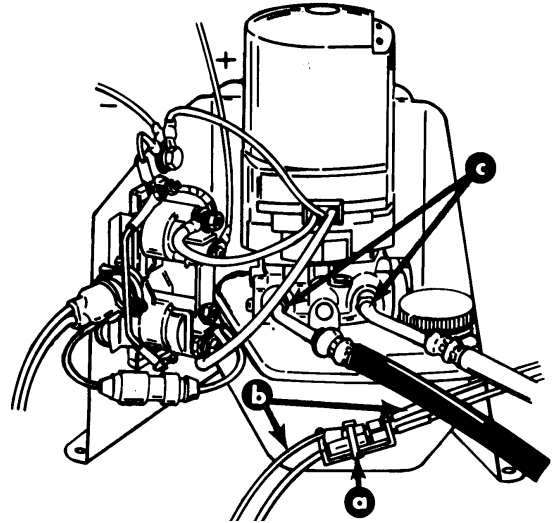
23256

Manual Steering Units Secured With Pivot Pins

- a - Swivel Ring
- b - Tab Washer-Bend tab
- c - Pivot Bolt
- a - Swivel Ring
- b - Cotter Pins-Remove
- c - Pivot Pins

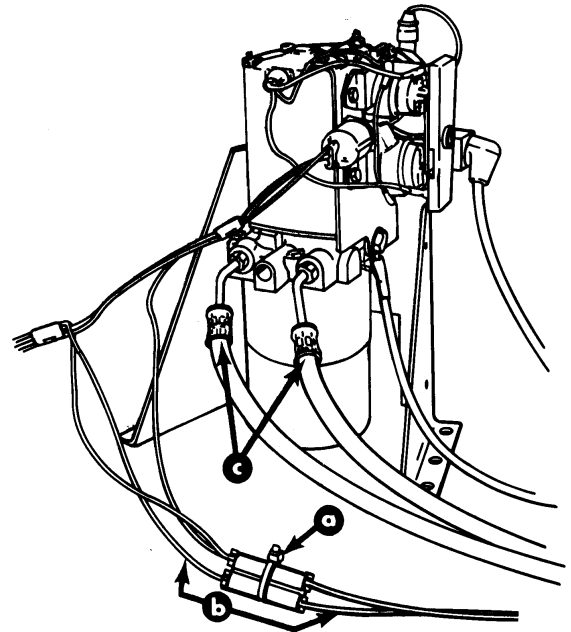
3. Remove engine (Refer to appropriate Engine Service Manual).
4. Disconnect trim limit switch wires and trim position sender wires.

5. Remove power trim pump hydraulic hoses. Cap hoses and plug pump fitting holes.
6. Remove sta-strap and disconnect trim limit switch wires.



22031

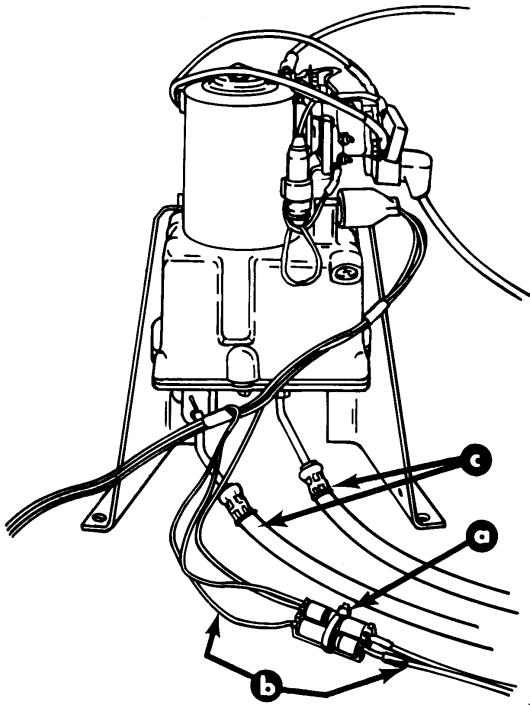
Oildyne Power Trim Pump (Plastic Reservoir)



50483

Oildyne Power Trim Pump (Metal Reservoir)

- a - Sta-Strap
- b - Trim Limit Switch Wires
- c - Hydraulic Hoses

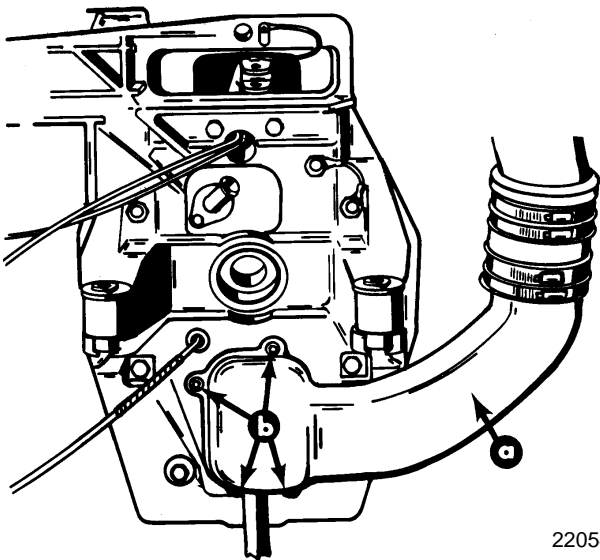


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Prestolite Power Trim Pump

- a - Sta-Strap
- b - Trim Limit Switch Wires
- c - Hydraulic Hoses

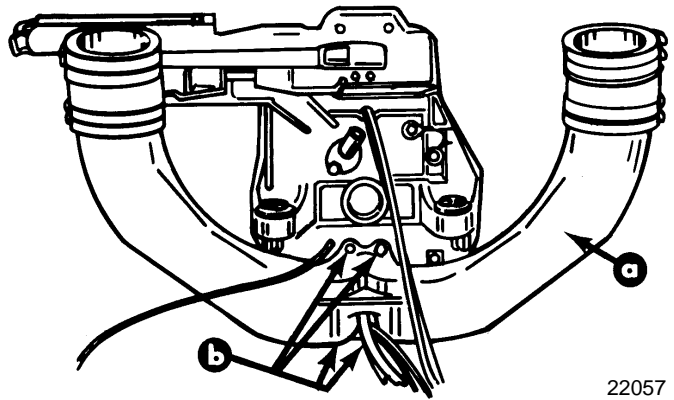
7. If installed, remove exhaust pipe.



22054

In-line 4 Cylinder Models

- a - Exhaust Pipe
- b - Screws

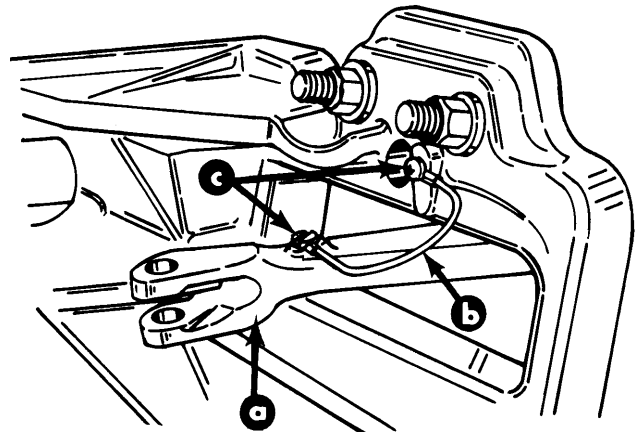


22057

V6/V8 Models

- a - Exhaust Pipe
- b - Screws

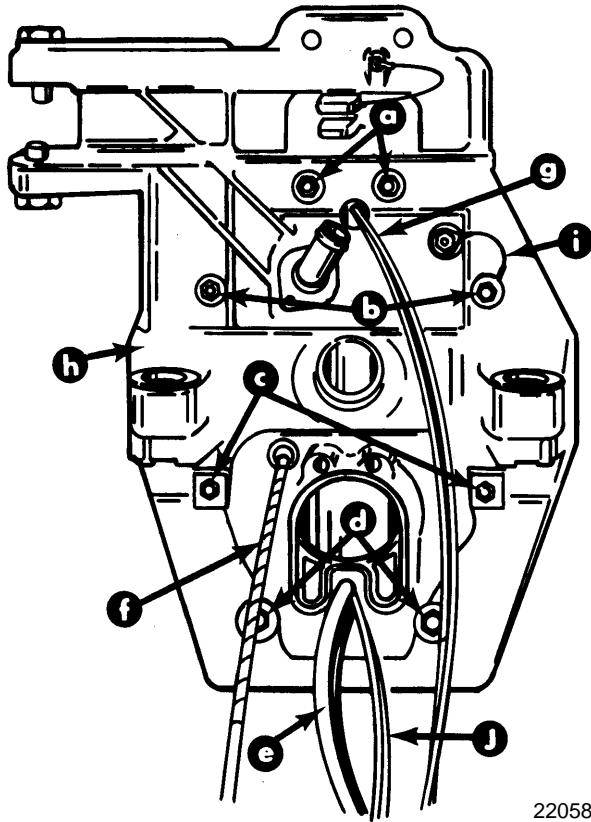
8. Remove ground wire from steering lever.



22028

- a - Steering Lever
- b - Ground Wire
- c - Screws

9. Separate inner transom plate from transom gimbal housing assembly.

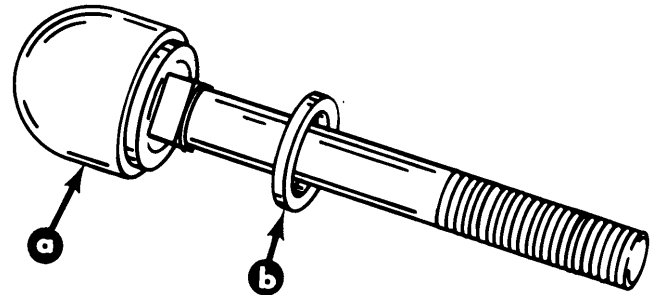


- a - Short Screws With Lock Washers
- b - Flat Washers And Locknuts
- c - Long Screws, Lock Washers And Square Flat Washers
- d - Flat Washers And Locknuts (Securing Anode Head Bolts)
- e - Hydraulic Hoses
- f - Drive Unit Shift Cable
- g - Trim Limit And Trim Position Sender Wires
- h - Inner Transom Plate
- i - Ground Wire (Continuity Circuit)
- j - Mercathode Wires (If Equipped)

Transom Assembly Installation

CAUTION

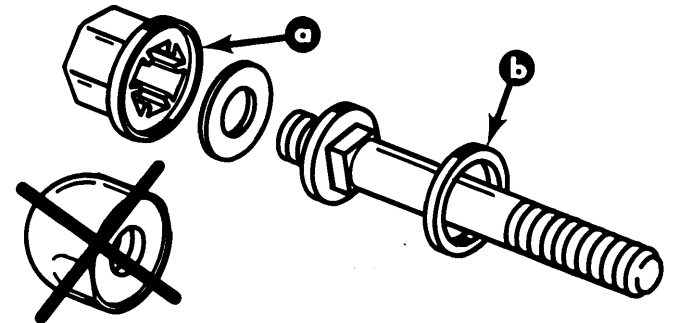
Rubber seal **MUST BE** installed on anode head bolts, or water will leak into boat.



22028

Non MerCathode Models

- a - Anode Head
- b - Rubber Seal



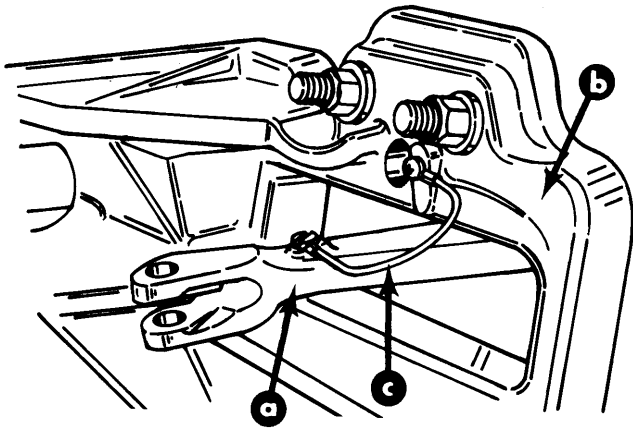
50094

MerCathode Models

- a - Plastic Cap
- b - Rubber Seal

CAUTION

Steering lever ground wire **MUST BE** positioned as shown or wire may fatigue.



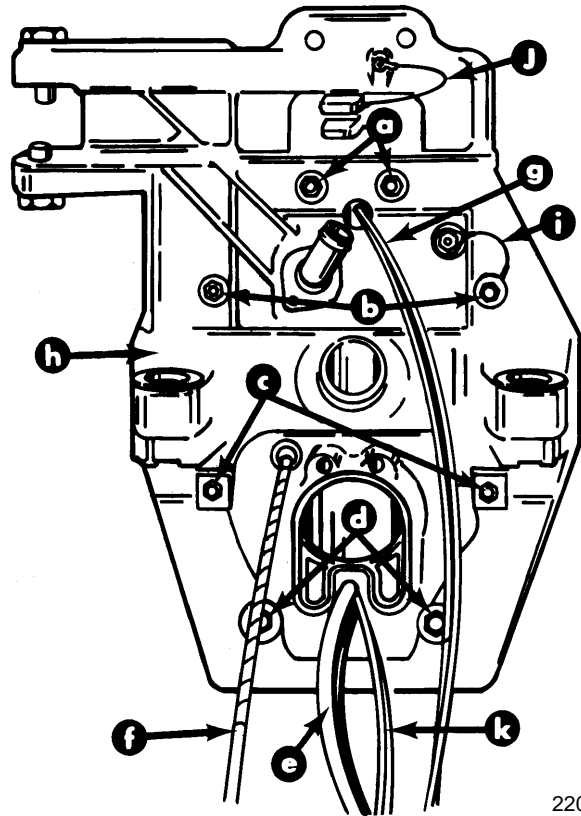
22028

- a - Steering Lever
- b - Inner Transom Plate
- c - Ground Wire

IMPORTANT: Torque bolts and nuts evenly (starting from center and working out) to 20-25 lb. ft. (27-34 N·m).

IMPORTANT: Be sure to pull all wires and cables completely through inner transom plate and ensure wires are not pinched.

1. Install transom assembly. Tighten attaching bolts and nuts evenly (starting from center and working out). Torque to 20-25 lb. ft. (27-34 N·m).



22058

- a - Short Screws And Lock Washers
- b - Flat Washers And Locknuts
- c - Long Screws, Lock Washers And Square Flat Washers
- d - Flat Washers And Locknuts (Securing Anode Head Bolts)
- e - Hydraulic Hoses
- f - Drive Unit Shift Cable
- g - Trim Limit Switch And Trim Position Sender Wires
- h - Inner Transom Plate
- i - Gimbal Housing To Inner Transom Plate Ground Wire
- j - Steering Lever Ground Wire
- k - Mercathode Wires (If Equipped)



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