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INSTALLATION INSTRUCTIONS

AND OWNER'S MANUAL

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*Helm pump
now fitted with
positionable O-ring
hose fittings*



BAYSTAR[™]

Hydraulic Steering for Outboard
Powered Vessels

Hydraulic Steering for Outboard Powered Boats
Rated to a Maximum of 150HP (Total)



*Before you do it your way,
please try it our way*

To the Installer and End User (Owner)

Thank you for choosing BayStar Steering Systems by SeaStar Solutions. This Installation and Owner's Manual contains all the information that you and others will require for the safe installation and use of your steering system and MUST remain on board the boat. Throughout this manual, information for the safe installation and operation of the steering system will be distinguished in one of the following ways;

WARNING

Hazards or unsafe practices which could result in severe personal injury or death.

Failure to adhere to a warning may lead to loss of steering control. Loss of steering control may result in unpredictable boat behavior, leading to ejection from boat causing property damage, personal injury and/or death.

CAUTION

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

NOTICE

Important information in regards to installation, use and maintenance of the steering components.

These safety alerts alone cannot eliminate all of the hazards that may be present while on the water. SeaStar Solutions recommends that all users of the steering system take an accredited 'boating safety course', follow safe boating practices and are made aware of the environment that they will be in.

NOTICE

BayStar is NOT recommended in applications with high steering effort (i.e. such as those using high performance engines or boats capable of attaining high speeds), customers should consider upgrading the system to SeaStar/SeaStar Pro steering. This will reduce the steering effort due to the fact that SeaStar steering provides more output power resulting in lower steering effort.

SAFETY INFORMATION

WARNING

The safety information provided below is intended to inform you of the dangers that may be present before, during and after the installation. It is critical that you read and understand ALL the points noted.

The safe operation of the steering system is dependant upon proper installation and maintenance, common sense, safe judgment and the knowledge/expertise of the operator. Every installer/user of the steering system should know the following requirements 'before' installing/using the steering system.

If you have any questions regarding any of these warnings, contact SeaStar Solutions.

To reduce risk of severe injury or death. Always wear a Coast Guard Approved personal flotation device (PFD) and use an engine shut-off cord (lanyard).

Before installation

1. Read and understand the Installation and Owner's Manuals provided with your steering components.
2. Ensure that all components required to complete the installation are on hand (including hoses, fittings, fluid and the proper tools required for the installation).
3. SeaStar components are highly engineered and safety tested to ensure system integrity, DO NOT substitute any component with non-SeaStar components as this may compromise system performance/reliability.

Installation

CAUTION

-3 helm pumps are fitted with positionable O-ring style hose fitting ports (referred throughout this manual as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting port. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

1. Install components as directed in all Installation Manuals (including helm pumps, hoses and fitting kits).
2. DO NOT modify or substitute any component in any way without written consent from SeaStar Solutions.
3. Comply with all system ratings/regulations (boat/engine, U.S.C.G.).
 - Cylinder MUST be compatible with engine(s) installed.
 - Cylinder MUST be rated for use on the engine(s) installed.
4. Confirm that there is no interference between the steering cylinder(s), tiebars and the transom, splashwell, outboard engine or jackplate or any combination of these parts by performing the following steps;
 - a) With engine fully tilted DOWN, turn steering wheel from hard over to hard over and confirm that no interference occurs.
 - if using a hydraulic jack plate the above must also be performed at all the positions of the jack plate.
 - b) Repeat step 4a) with engines tilted UP.
 - c) Perform step 4a) with each engine in DOWN/UP positions confirming that independent TRIM/TILT can be done without any interference.
5. Confirm that the steering cylinder can be fully stroked in both directions as well as full tilt and trim without stretching, chafing, rubbing and/or kinking of the hydraulic hoses.
6. Confirm that extruded nylon tubing has NOT been substituted for SeaStar Steering Hose.
7. DO NOT use a wire coil type trim switch with a hydraulic steering system as the wire can wind up tight around the steering wheel shaft and prevent further steering.
8. Conduct Fluid Level and System Check as outlined on page 26 of this manual.

Safety Information Continued

WARNING

The safety information provided below is intended to inform you of the dangers that may be present before, during and after the installation. It is critical that you read and understand ALL the points noted.

Prior to every use

1. Check fluid level in highest helm pump (see page 26 for proper fluid level setting).
2. Verify immediate steering response when turning steering wheel(s). (Ensure engine turns when steering wheel is turned.)
3. Visually inspect all steering hoses and fittings for wear, kinking and/or leaks.
4. Check for binding, loose, worn or leaking steering components.

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

During use

1. WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD).
2. ATTACH ENGINE SHUT-OFF CORD (LANYARD) TO YOUR PFD.
3. Never allow anyone not familiar with the operation of the steering system operate the boat at any time.
4. Know and adhere to the operator restrictions for your area including;
 - Federal Laws/Regulations,
 - State Laws/Regulations and
 - Municipal Laws/Regulations.

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

After use

1. Rinse off steering system thoroughly using 'fresh, clean water only'.
 - Cleaning fluids containing ammonia, acids or any other corrosive ingredients MUST NOT be used for cleaning any part of the hydraulic steering system.

Maintenance

1. Maintain steering system at a minimum of twice per year.
 - See Routine Maintenance, page 28 of this manual.

Keep our waters clean for all current and future users. Dispose of ALL fluids in accordance with your local regulations.

INTRODUCTION

Before proceeding with the installation, read these instructions thoroughly. SeaStar Solutions cannot accept responsibility for installations where instructions have not been followed, where substitute parts have been used, or where modifications have been made to our products.

WARNING

Do Not use BayStar on vessels that exceed a MAXIMUM horsepower rating of 150HP (Total), or on smaller HP outboard engines that use wing nut type transom mount clamping screws. Warranty will be void if combined with any other product (including SeaStar steering components). Steering failure may occur causing property damage and/or personal injury or death.

NOTICE

BayStar is NOT recommended in applications with high steering effort (i.e. such as those using high performance engines or boats capable of attaining high speeds), customers should consider upgrading the system to SeaStar/SeaStar Pro steering. This will reduce the steering effort due to the fact that SeaStar steering provides more output power resulting in lower steering effort.

NOTICE

*Due to a small amount of internal hydraulic slip, a “master spoke” or “centered” steering wheel cannot be maintained with a hydraulic steering system. For best results, use an equidistant spoke steering wheel. **Maximum steering wheel diameter = 28”(711mm)** and **Maximum steering wheel dish = 5”(127mm)**.*

WARNING

Do Not use a wire coil type trim switch with a hydraulic steering system. Wire coil can wind tightly around the steering wheel shaft and prevent further steering!

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BAYSTAR

HYDRAULIC STEERING

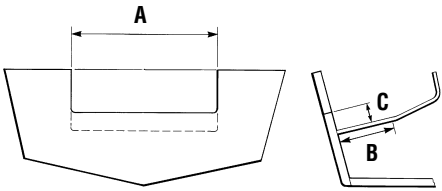
Before attempting installation, ensure that the splashwell of your boat has the following minimum dimensions.

Minimum Splashwell Dimensions

CYLINDER MODEL NUMBER	# OF ENGINES	A	B	C	MIN. ENGINE CENTER DISTANCE
HC4645/47H/48H/58H	1	21" (534mm)	6" (153mm)	5" (127mm)	N/A
	2	Twin engine applications not available at this time			

NOTES:

- Ensure there is no interference between the BayStar cylinder rod and the splashwell boot or engine controls & cables.
- Dimensional restrictions also apply to external motor mount brackets.
- Ensure dimension 'A' is maintained through full trim/tilt range.
- Maximum transom thickness 3" (76mm).
- Engines less than 70HP may require up to an additional 1" (25mm) of splashwell clearance.



CAUTION

Do Not use BayStar on smaller HP outboard engines that use wing nut type transom mount clamping screws.

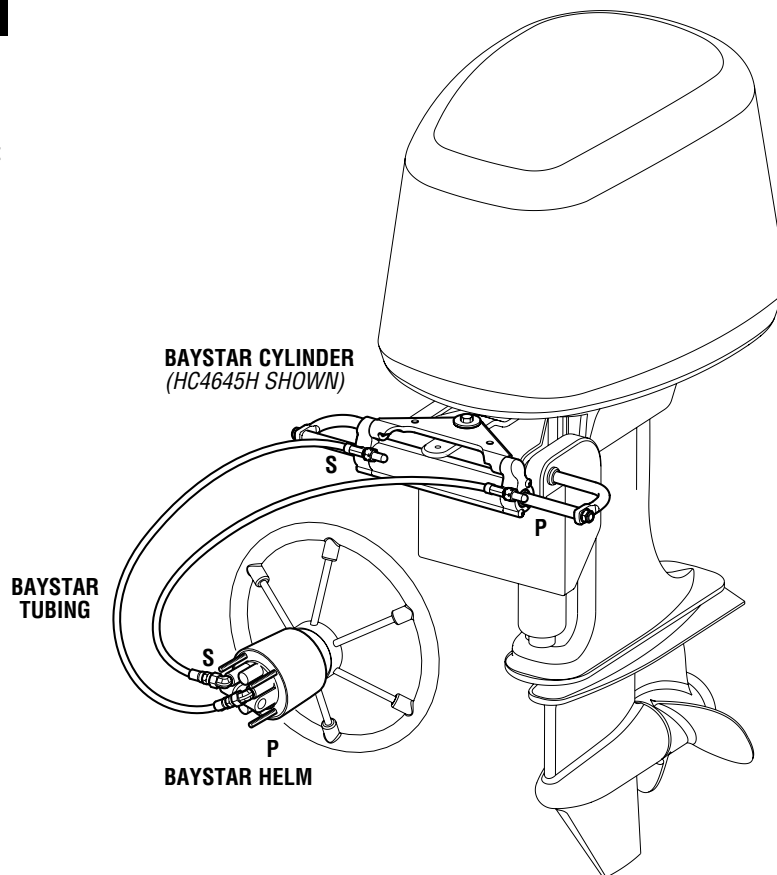


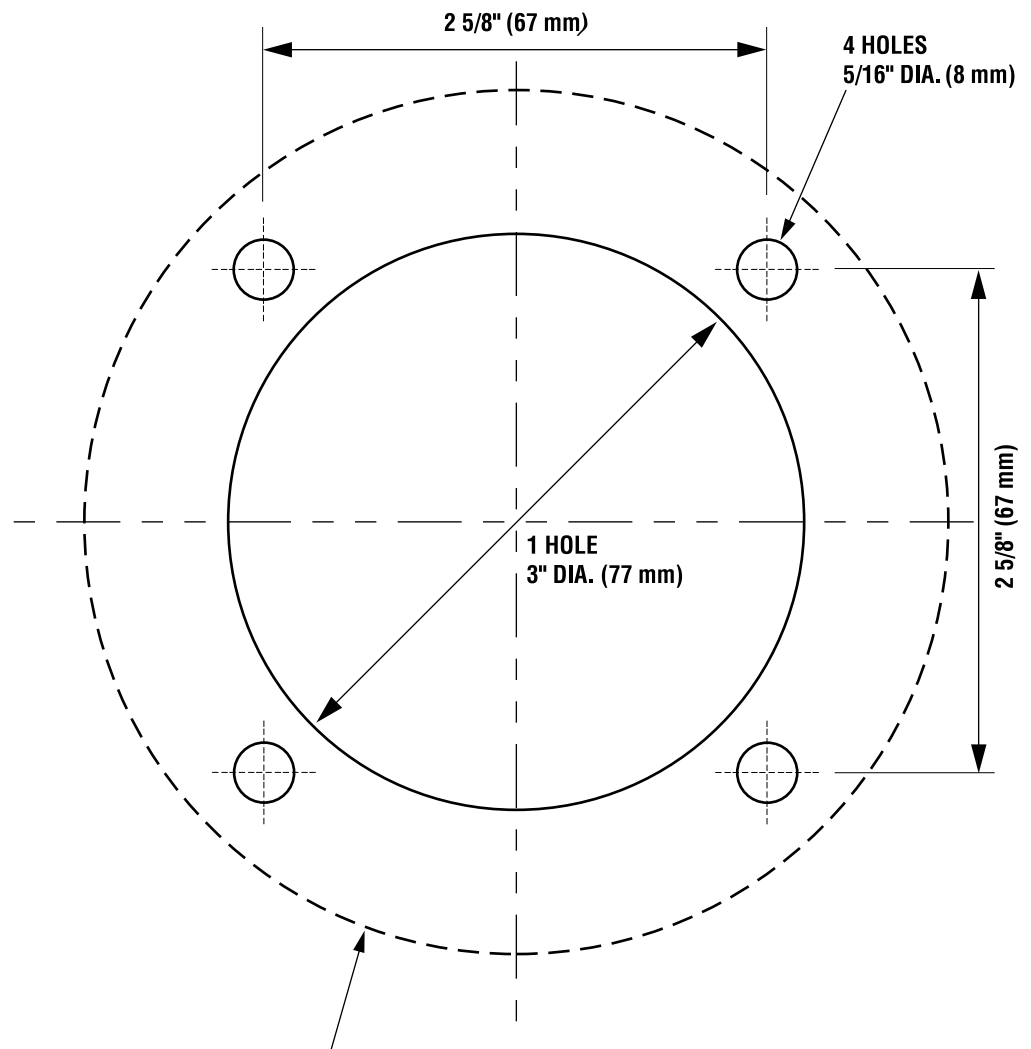
Figure 1. Typical Installation Shown.

CYLINDER	HELM PORT CONNECTION	STEERING CYLINDER CONNECTION
HC4645H/47H/48H/58H (Cylinder is stationary)	Port (P)	Starboard side of cylinder
	Starboard (S)	Port Side of cylinder

HELM MOUNTING TEMPLATE

BayStar Helm
(part# HH4311-3, HH4314-3
and HH4514-3)

Scale 1:1



HELM FLANGE OUTLINE (for reference only)
4-5/8" (118 mm) DIA. MAXIMUM COVERAGE, BAYSTAR HELM HH4314-3
4-1/2" (115 mm) DIA. MAXIMUM COVERAGE, BAYSTAR PLUS HELM HH4514-3

Figure 2.

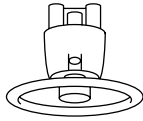
NOTICE

If you must photocopy this mounting template for use, check ALL measurements using a measuring device prior to using as a template.

Note: *This page left blank intentionally.*

SYSTEM OVERVIEW

HELM



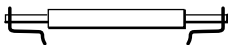
STEP 1

System Installation

- Install helm pump onto dash using the installation instructions noted on page 8 of this manual.

⚠ WARNING

CYLINDER



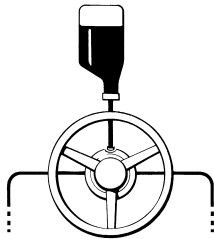
Ensure that you read and understand **ALL** cautions, notices and warnings that are noted in your helm pump installation instructions.

- Install steering cylinder as outlined on page 13 of this manual.
- Install steering hoses as outlined on page 10 of this manual.

STEP 2

Filling and Purging Procedure

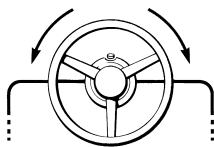
- Refer to fill and purge procedures as outlined on page 24 of this manual.



STEP 3

Fluid Level and System Check

- Refer to page 26 of this manual for setting fluid level in helm pump and performing the “system pressure test” to ensure steering system is ready for use.



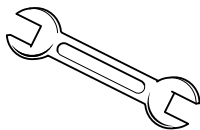
⚠ WARNING

Fluid level and System check is critical to the safe operation of your boat, failure to follow this important step may lead to loss of steering control resulting in property damage, personal injury and/or death.

STEP 4

Routine Maintenance

- Refer to page 28 of this manual to become familiar with the routine maintenance that **MUST** be carried out in the intervals noted.



BayStar Hydraulic Steering System

Maximum 150 horsepower (Total).

NOTICE

Specific installation may vary from the application depicted. Ensure the engine can be fully tilted into the splashwell and turned from port (engine stop) to starboard (engine stop) without interference occurring between the steering cylinder and engine cowling, engine hook and the splashwell or transom.

⚠ WARNING

Warranty will be void if BayStar system components are combined with any other manufacture's product. Steering failure may occur causing property damage and/or personal injury or death. **MAXIMUM 150HP (Total)**

BayStar Helm Pump (Part # HH4311-3 and HH4314-3)

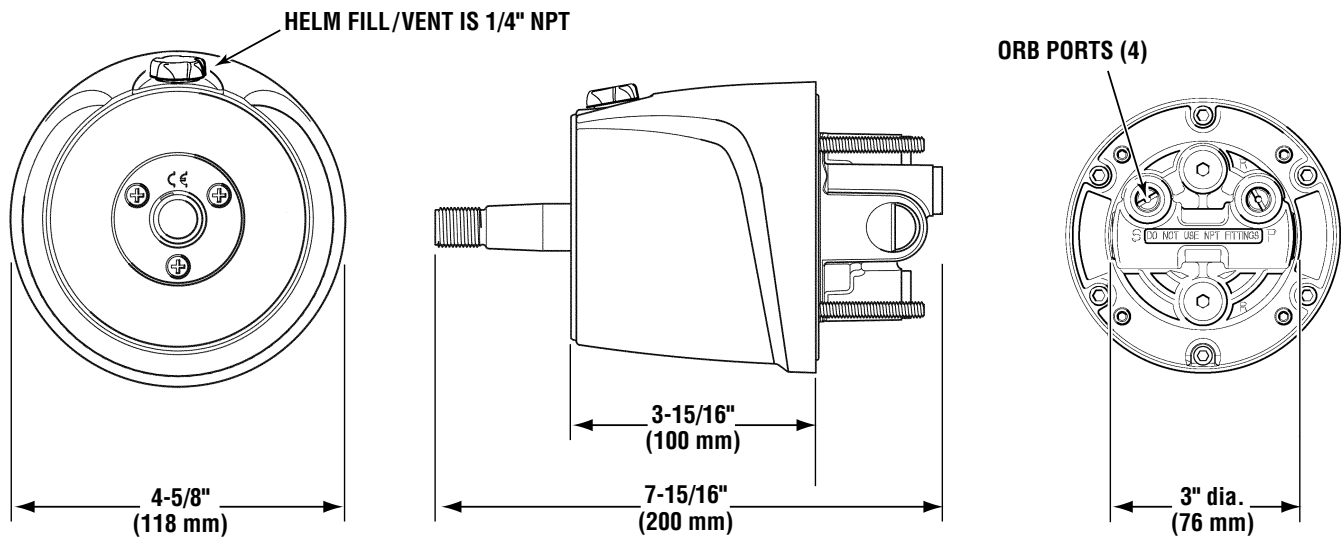


Figure 3.

BayStar Cylinder (Part # HC4645H/47H/48H/58H)

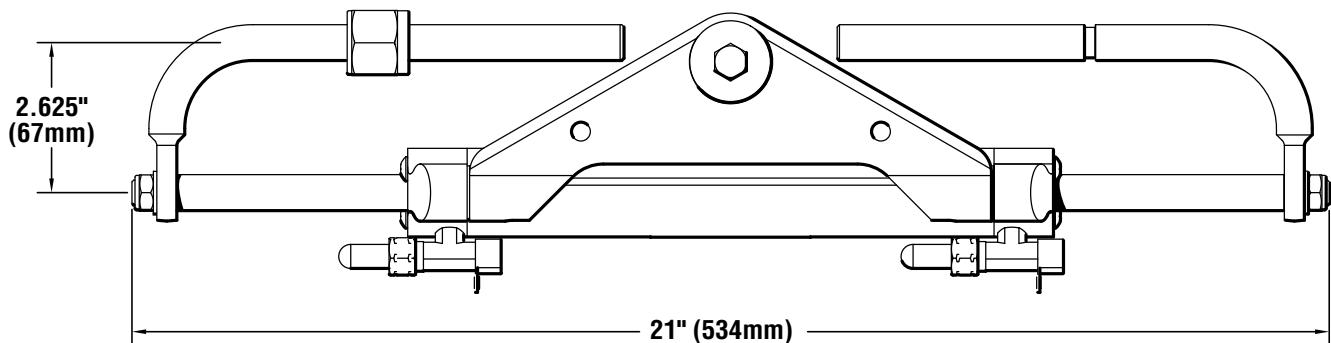


Figure 4.

Horse Power Limitations

Limited to boats rated to a MAXIMUM of 150HP (Total). Twin engine application not available at this time.

⚠ WARNING

Warranty void if total maximum 150HP (Total) is exceeded.

Tools

You will need the following tools to complete your installation.

- 3" (77mm) diameter hole saw or key hole saw
- 5/16" (9.5mm) drill bit

Wrenches for helm installation

- 1/2" (13mm) for mounting the helm
- 5/8" (16mm) for tube nuts connecting tube to helm pump

Wrenches for HC4645H/47H/48H/58H cylinder installation

- 9/16" (15mm) for tiller bolt (2 required)
- 5/8"(16mm) for shaft nuts and bleed fittings (2 required)
- 11/16" (18mm) for tubing on the cylinder
- 1-1/8" (29mm) for mounting nut

⚠ CAUTION

Lightly lubricate threaded fasteners before installing. This will prevent them from seizing.

Lubricate support rod and all moving parts with a quality marine grease such as OMC Triple Guard, Quicksilver Anti-corrosion, Yamaha Marine Grease or equivalent.

Do not remove protective caps from fittings and fitting ports until hose or tube connections are made. Contaminant's in the steering system may cause premature wear and/or steering malfunctions.

MOUNTING THE HELM

⚠ WARNING

Use only self-locking fasteners provided; substituting non-self locking fasteners can result in loosening or separation of equipment and loss of steering control.

DO NOT exceed 110 in.lbs. (12 Nm) torque on helm nuts and bolts.

⚠ CAUTION

Tighten steering wheel shaft nut before filling and purging the steering system. Tighten nut to 150 in./lbs. (17 Nm).

DO NOT exceed 200 in.lbs. (22 Nm).

Step 1:

Determine desired mounting position. Ensure that the steering wheel will not interfere with other functional equipment. Check for adequate space behind the dash for fitting and line connections.

Step 2:

Tape the mounting template (found on page 3 of this manual) to the dash and use a center punch to mark the locations of the hole.

Step 3:

Confirm that you will not be drilling into any other equipment then; drill the 3" diameter center hole and the four 5/16" diameter mounting holes as shown on the template.

Step 4:

Ensuring that the fill port is in the upper position, install the four washers and four nuts onto the mounting studs of the helm pump.

Step 5:

Lightly grease taper of the helm shaft and mount steering wheel to helm.

Step 6:

Install ORB helm fittings into rear of helm, see page 9 for ORB fitting installation.

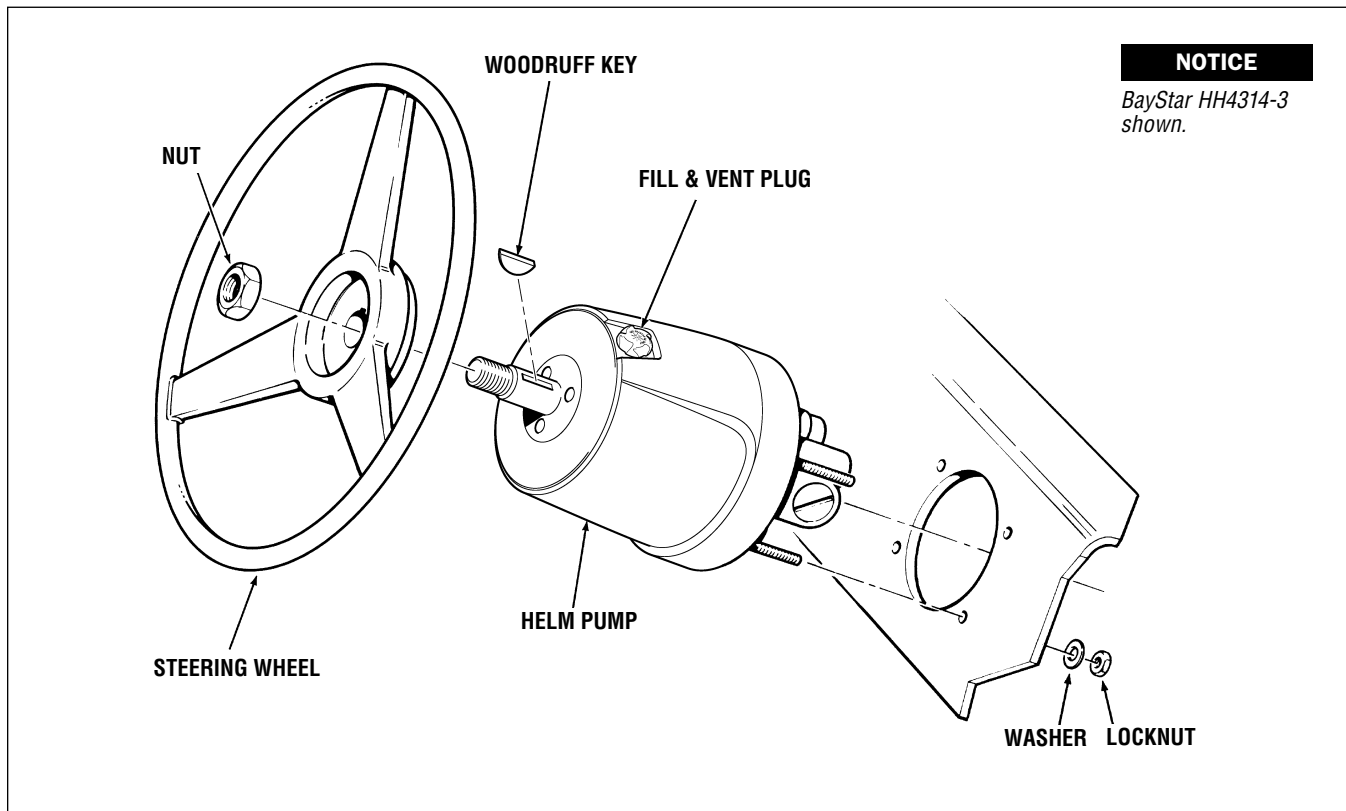


Figure 5.

Re-Positionable ORB Hose Fitting Installation

⚠ CAUTION

-3 helm pumps are fitted with positionable O-ring style hose fitting ports (referred throughout this manual as ORB). Do NOT attempt to install an NPT pipe fitting into a -3 helm hose fitting port. Doing so will lead to irreparable damage to the helm. ONLY use SeaStar Solutions O-ring style hose fittings (ORB).

Re-Positionable Pump Fitting Installation

⚠ WARNING

Failure to properly tighten the lock- nut (item 1) may lead to loss of steering control. Loss of steering control may result in unpredictable boat behavior, collision with an obstacle and/or ejection from vessel, leading to property damage, personal injury and/or death.

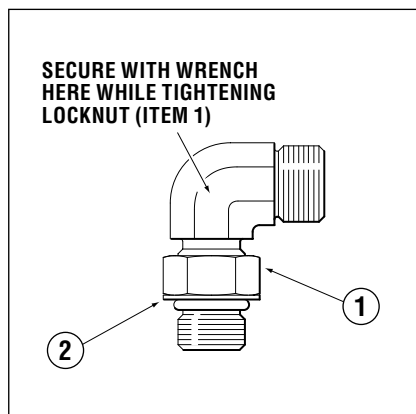


Figure 6.

NOTE: for straight ORB fittings simply torque fitting to 18 ft-lbs. Fitting re-orientation not required.

1. Back off lock nut (item 1), counter-clockwise, until it stops.

NOTE: O-ring must be fully on sealing surface and cannot contact any threads. Do not use Teflon tape or any liquid pipe sealant with ORB fittings.

2. Thread fitting into helm port until fitting washer (item 2) contacts the face of the helm port. Tighten hand tight. **DO NOT USE A WRENCH.**
3. Re-position fitting to desired orientation by turning it counter-clockwise to a MAXIMUM of 1 full turn.
4. While holding the fitting body securely with a wrench, torque the lock nut (item 1) to **18 ft-lbs.**
5. While holding the fitting body securely with a wrench, torque the hose end nut to **15 ft-lbs.**
6. Purge system per applicable instruction manual.

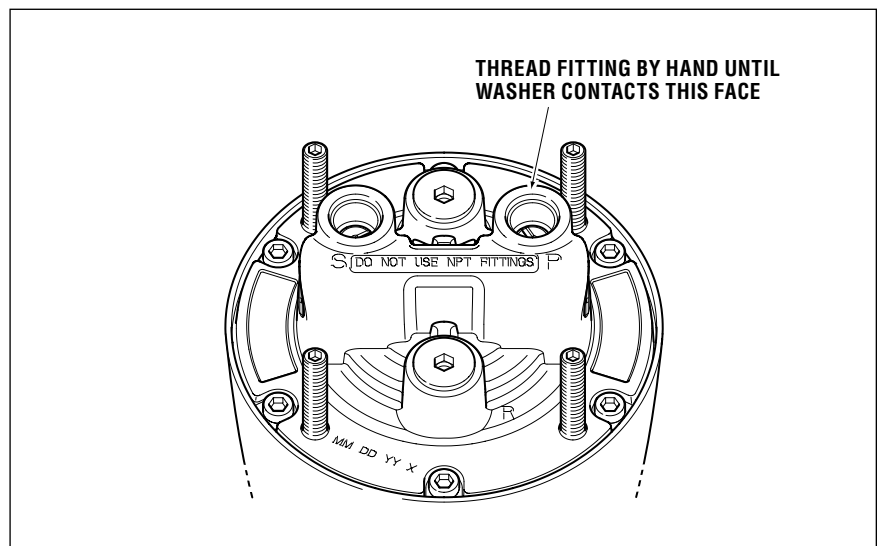


Figure 7.

⚠ WARNING

SeaStar Solutions recommends that the hose and hose fittings are checked on a regular basis to ensure the safe operation of the steering system.

HYDRAULIC HOSE/TUBE INSTALLATION

Steering hoses/tubing and how they are installed are critical to the safe operation of your steering system. SeaStar Solutions recommends the use of BayStar tubing, or, SeaStar hose ONLY. Use of any other tube/hose may drastically reduce system performance and safety.

WARNING

DO NOT cut SeaStar steering hoses, cutting these hoses will render them useless.

Before continuing on with the installation of your steering hoses, please ensure that you read and understand the important points shown below;

- DO NOT install any pipe sealant onto the hose/tube side of a fitting.
- DO NOT remove protective end covers until the hoses/tubing have been routed and are ready to be connected to the helm pump, hose/tube fitting or steering cylinder(s).
- Before, during and after installation the hoses/tubing MUST be protected from chaffing, rubbing, and contact or interference with assembly screws or sharp edges of any type.
- DO NOT install hoses/tubing in an area where they will be exposed to high heat, such as engine manifolds, engine compartments or highly corrosive areas such as battery fumes or electrical connections.
- If possible, route hoses/tubing through a protective PVC cover.
- Secure hose/tube in minimum 2' increments.
- DO NOT bend hoses/tubing tighter than a 3-1/2" (89mm) radius.
- Provide sufficient hose/tube lengths to allow for cylinder movement throughout the turning arc and UP/DOWN trim/tilt settings of the engine(s).
- DO NOT allow hoses/tubing to hang free in an area where they could become a safety hazard.
- Where possible, route hoses in an area where they can be easily inspected for wear on a regular basis.

WARNING

Continuous kinking, rubbing, chafing or twisting of a steering hose/tube may eventually weaken the hose(s) to a point where it could rupture. Rupture of a hose will lead to loss of steering control.

STEP 1

Set Up

- See Figure 10 to locate your plumbing diagram.
- Mark each end of the hose to ensure proper connection.

NOTICE

Hoses/tubing is crossed from the helm pump(s) to the steering cylinder(s). Port side helm connection will be installed onto the starboard fitting on the cylinder, and the starboard side helm connection will be installed onto the port side fitting on the cylinder.

STEP 2

Routing

Throughout the hose/tube installation, ensure the protective caps remain installed onto the end of the hoses. Doing so will prevent contamination from entering the system.

- Route steering hoses/tubing so that the hose bend restrictor will be located at the steering cylinder(s).
- Route steering hoses/tubing so that they have a gradual rise from the steering cylinder(s) to the helm pump.

- If routing hoses/tubing a blind area, ensure that the area is free and clear of any sharp edge, screw or any other object that may damage the hose.
- Secure hoses/tubing every 2'.

Substituting brass fittings into the steering cylinder may result in galvanic corrosion and irreparable damage to the cylinder as well as affect system integrity.

1. Minimum bend radius 3-1/2" (89mm).
2. DO NOT adjust angle of fittings without first consulting manufacturer.
3. Hoses should be secured to the control cable harness as they enter the splashwell through the boot.

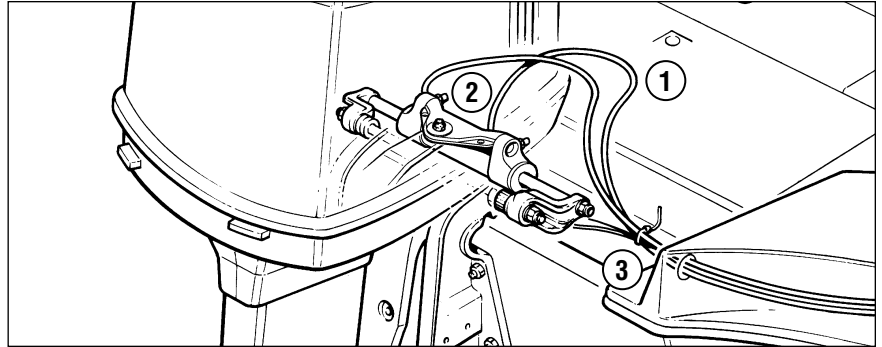


Figure 8.

STEP 3A

BayStar Tubing Installation

- Remove protective covers
- Install tube end "complete with the swage fitting and protective covering" onto the proper steering cylinder tube fitting, tighten hand-tight
- While holding fitting with a wrench, tighten to 15 ft-lb
- Route tubing to helm pump
- Remove protective cover
- Using a pipe cutter, cut off excess tubing
- Slide tube nut over tubing
- Push tubing into bottom of component fitting
- Hand tighten tube nut
- While holding fitting with a wrench, tighten tube nut to 12 ft-lb.

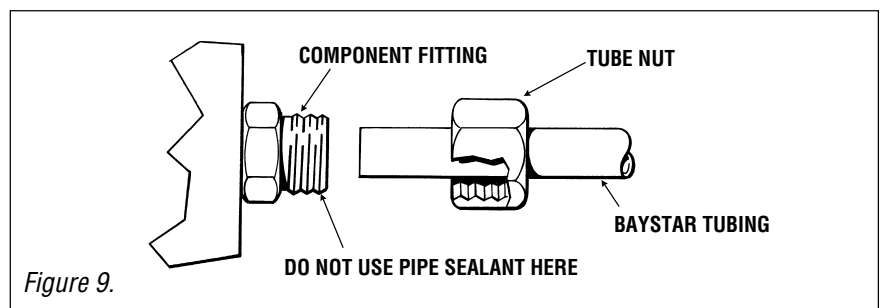


Figure 9.

STEP 3B**SeaStar hose to fitting installation**

- Remove protective covers.
- Install hose end fitting onto intended fitting, tighten hand tight.
- While holding the receiving fitting with a wrench, tighten hose fitting to 15 ft-lb.

⚠ WARNING

When installed, confirm that the hoses are not being pulled or kinked over by pushing the engine(s) back and fourth. Hoses must NOT be pulled on at any time.

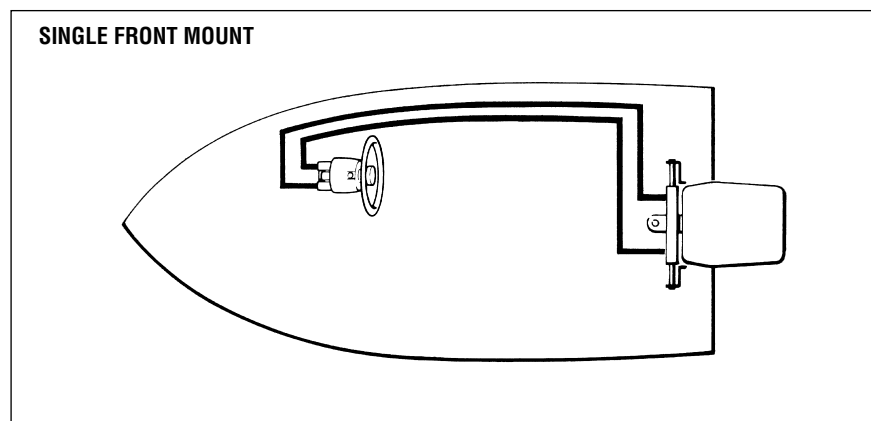


Figure 10.

Hose Inspection

DO NOT operate the vessel if ANY of the following are observed:

- Fitting slippage on hose
- Damaged, cracked, cut or abraded cover (or any reinforcement exposed)
- Hard, stiff, heat cracked, or charred hoses;
- Cracked, damaged, or badly corroded fittings;
- Leaks at fitting, or in hose;
- Kinked, crushed, flattened or twisted hose; and
- Blistered, soft, degraded, or loose cover.

CYLINDER INSTALLATION

BayStar Compact Cylinders, HC4645H, HC4647H, HC4648H and HC4658H.

On the following pages of this instruction booklet you will find the assembly drawing for your specific application.

WARNING

In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws **MUST** be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or death.

NOTICE

Before beginning installation make sure that all mounting hardware is included and that the tiller arm and the tilt tube bolt holes are clean and free from rust or burrs.

CAUTION

Engines with rigid engine mounts have been shown to cause premature wear to the pivot cylinder—therefore, please perform a complete inspection of your steering system as outlined in the Maintenance Section at the back of this manual.

Single Engines

WARNING

Refer to page 29 for the correct torque specifications for your installation. Failure to correctly install your steering cylinder and torque all screws may result in steering failure causing property damage and/or personal injury.

Step 1:

Using a good quality marine grease (such as Evinrude Triple Guard, Quicksilver anti-corrosion, Yamaha marine grease, or equivalent), liberally lubricate the tilt tube, support rods (Item 5) and mount nut (item 7) and then slide the support rods (item 5) into engine tilt tube.

Step 2:

Lightly grease the tiller bolt (Item 2) & partially screw into the appropriate hole in the tiller arm to assure a proper fit. Remove and go to Step 3.

Step 3:

Select appropriate insert diagram from Figure 11 through 15 to determine proper orientation of the cylinder assembly, the tiller bolt and the self-locking nut (Items 8, 2 and 1). Grease and install as indicated.

Step 4:

Screw lubricated mounting nut (item 7) onto tilt tube of the engine. Torque nut 20–25 ft-lb.

Step 5:

Lightly grease the ends of the cylinder shaft and holes of the support rods (item 5). Attach and secure support rods (Item 5) to the cylinder shaft. Tighten using the nuts and washers (Items 4 & 3) as illustrated in Figure 11 through 17.

CAUTION

If installing a jack plate make sure that there **is NO** interference between the jack plate and your steering cylinder. If there is interference, it may occur during full tilt and you should install lift restrictors (Tilt Stop Switch). Some engine manufacturers supply these as standard equipment.

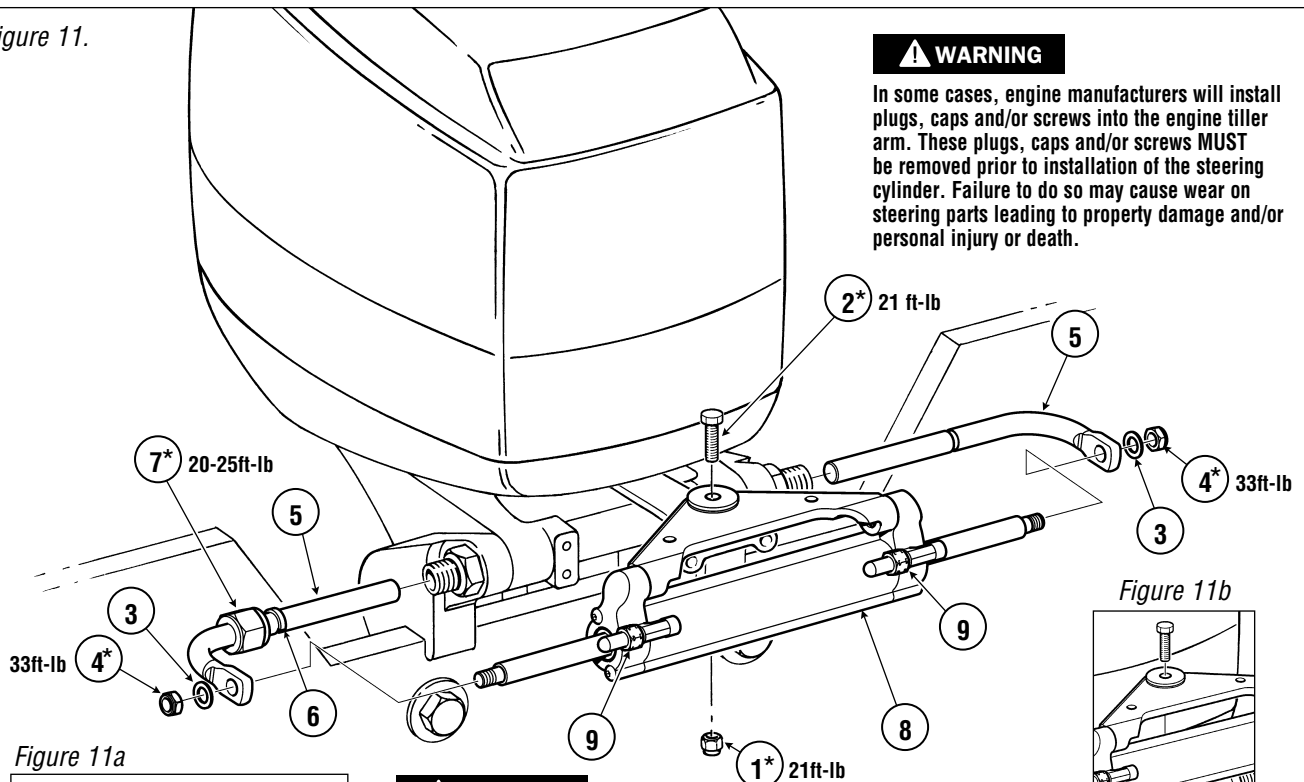
BAYSTAR

HYDRAULIC STEERING

WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
FORCE	1985 TO 1994	90–150 HP	HC4645H	(See Fig. 11a)
	1995 TO DATE	90–120 HP	HC4645H	
HONDA	1992 TO DATE	30–50 HP	HC4645H	Cylinder may not be centered when mounted due to short tiller tube (See Fig. 11b)
	1996 TO DATE	75–90 HP	HC4645H	
	1998 TO 2010	115–130 HP	HC4647H	
	2003 TO DATE	135–150 HP	HC4645H	
	2010 TO DATE	115 HP	HC4645H	

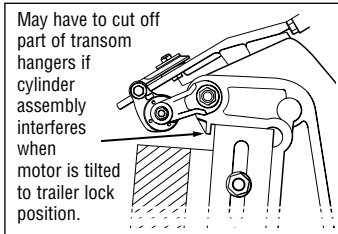
Figure 11.



WARNING

In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws **MUST** be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or death.

Figure 11a



Force 90-150HP 1985 to 1994

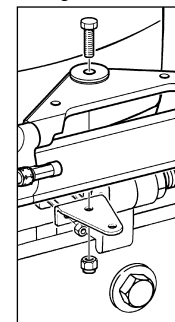
WARNING

Fully tilting the engine may cause the steering cylinder to interfere with the transom and/or splashwell. Possible damage to the steering system can result. Ensure that the cylinder is free from interference at all times.

NOTICE

Small and mid-sized outboards, up to 60HP may use a shorter tilt tube; this will cause the cylinder to not be centered. Refer to page 23 for aligning details.

Figure 11b



Honda 1992 To Date
30–50 HP

* Refer to page 29 for correct torque specifications.

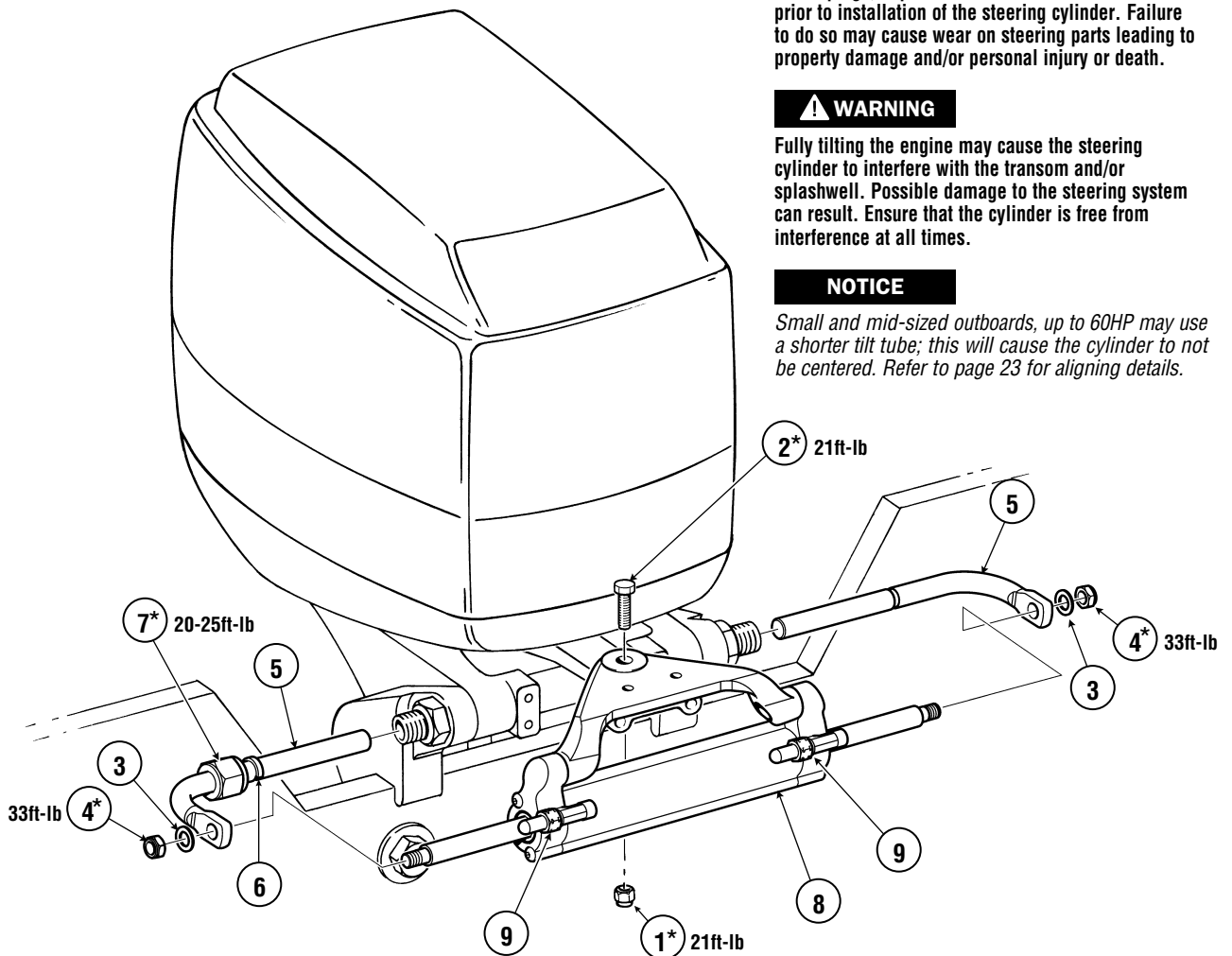
ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket

ITEM	PART #	QTY	DESCRIPTION
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
HONDA	1998 TO 2010	115-130 HP	HC4647H	

Figure 12.



WARNING

In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws **MUST** be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or death.

WARNING

Fully tilting the engine may cause the steering cylinder to interfere with the transom and/or splashwell. Possible damage to the steering system can result. Ensure that the cylinder is free from interference at all times.

NOTICE

Small and mid-sized outboards, up to 60HP may use a shorter tilt tube; this will cause the cylinder to not be centered. Refer to page 23 for aligning details.

* Refer to page 29 for correct torque specifications.

ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket
6	N/A	1	Clip, Support Bracket

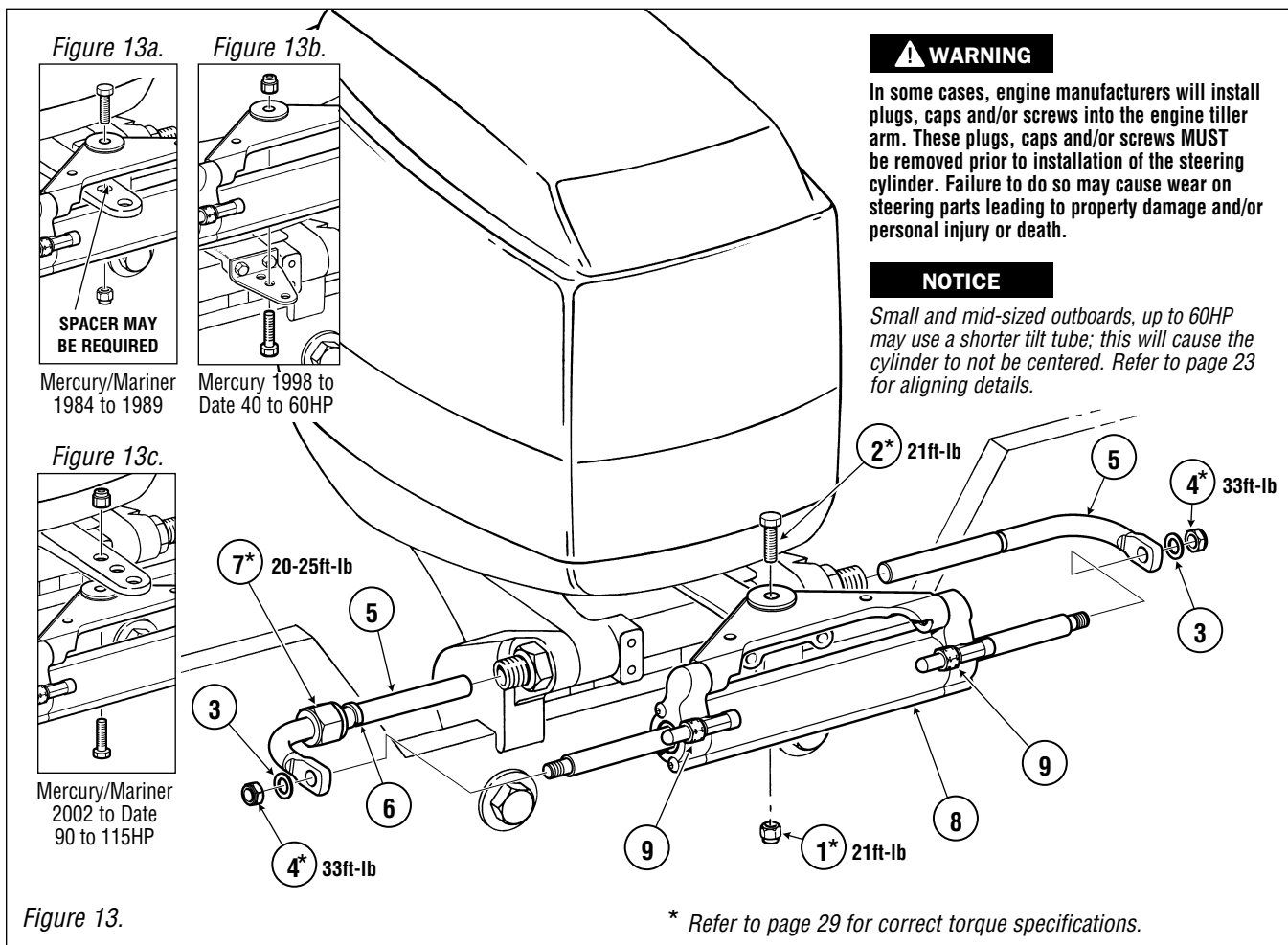
ITEM	PART #	QTY	DESCRIPTION
*7	N/A	1	Mount Nut, Support Bracket
8	HC4647H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

BAYSTAR

HYDRAULIC STEERING

WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
MERCURY/MARINER	1984-TO 1989	75-150 HP	HC4645H	(See Fig. 13a)
	1990-TO DATE	75-150 HP	HC4645H	Cylinder may not be centered when mounted due to short tiller tube (See Fig. 13b) (See Fig. 13c)
	1998-TO DATE	40-60 HP	HC4645H	
	2002-TO DATE	90-115HP	HC4645H	
NISSAN	1990-TO DATE	120-140 HP	HC4645H	
TOHATSU	1990-TO DATE	120-140 HP	HC4645H	



ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket
6	N/A	1	Clip, Support Bracket

ITEM	PART #	QTY	DESCRIPTION
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

▲ WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
JOHNSON/EVINRUDE	1977 TO 1990	65-150 HP	HC4648H	Refer to Figure 14d
	1991 TO DATE	40-150 HP	HC4645H	Refer to Figure 14a
	1997 TO DATE	115 HP FICHT	HC4658H	If using cylinder HC4645H please invert pivot plate (See page 22). Refer to Figure 14c
	1997 TO DATE	75-150 HP FICHT	HC4645H	Requires Spacer Kit H05090 (See page 21) If using cylinder HC4645H please invert pivot plate (See page 22). Refer to Figure 14b
	1998 TO DATE	40-140 HP 4 Stroke	HC4658H	

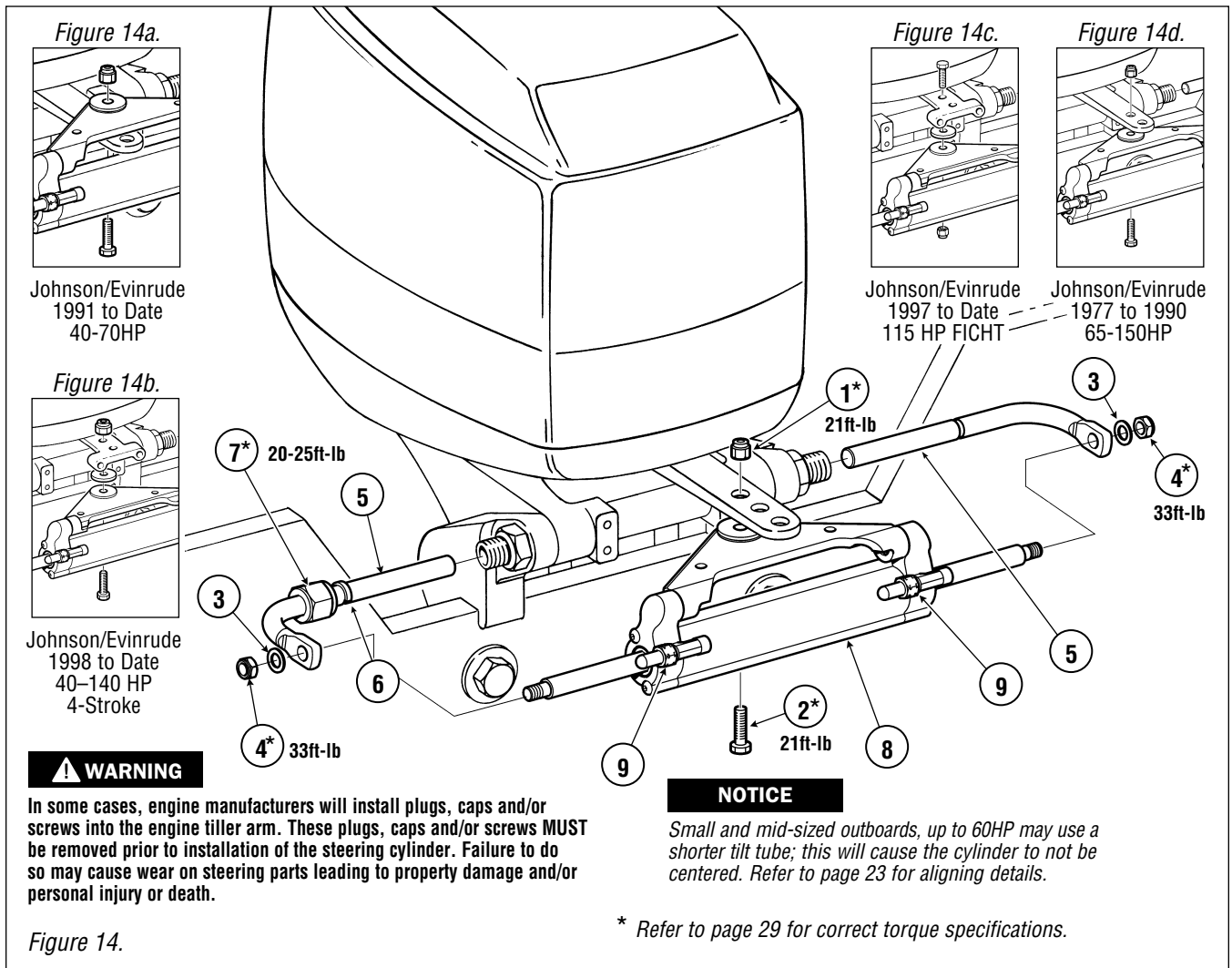


Figure 14.

ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket

ITEM	PART #	QTY	DESCRIPTION
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

BAYSTAR

HYDRAULIC STEERING

WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
YAMAHA	1986 TO DATE	100–150 HP 2 Stroke	HC4645H	(See Fig. 15b)
	1997 TO DATE	F75–F150 HP	HC4645H	(See Fig. 15b) includes F115A and B models
	2002 TO DATE	25–70 HP 4 Stroke	HC4648H	Requires Spacer Kit H05090 (See page 21).

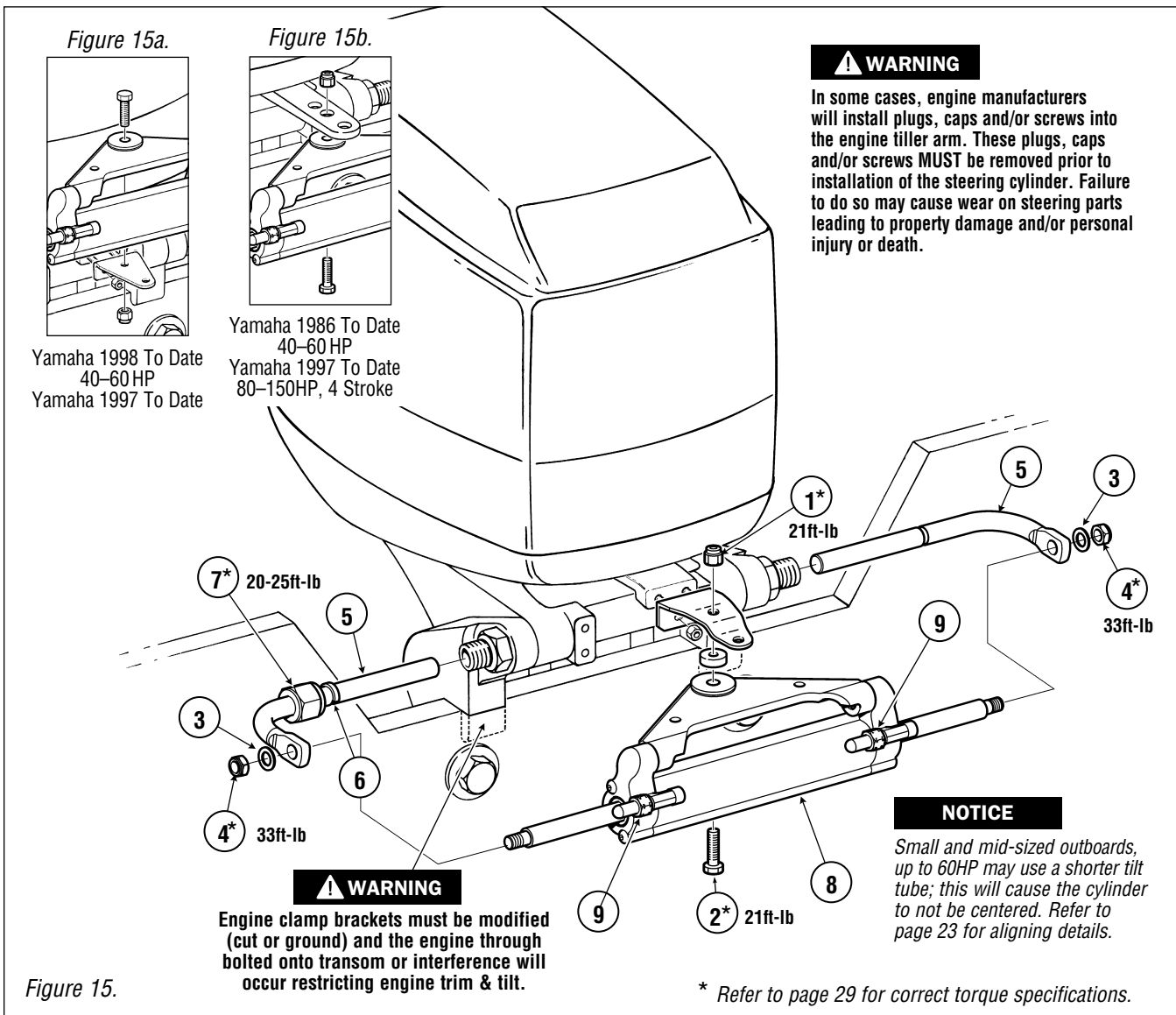


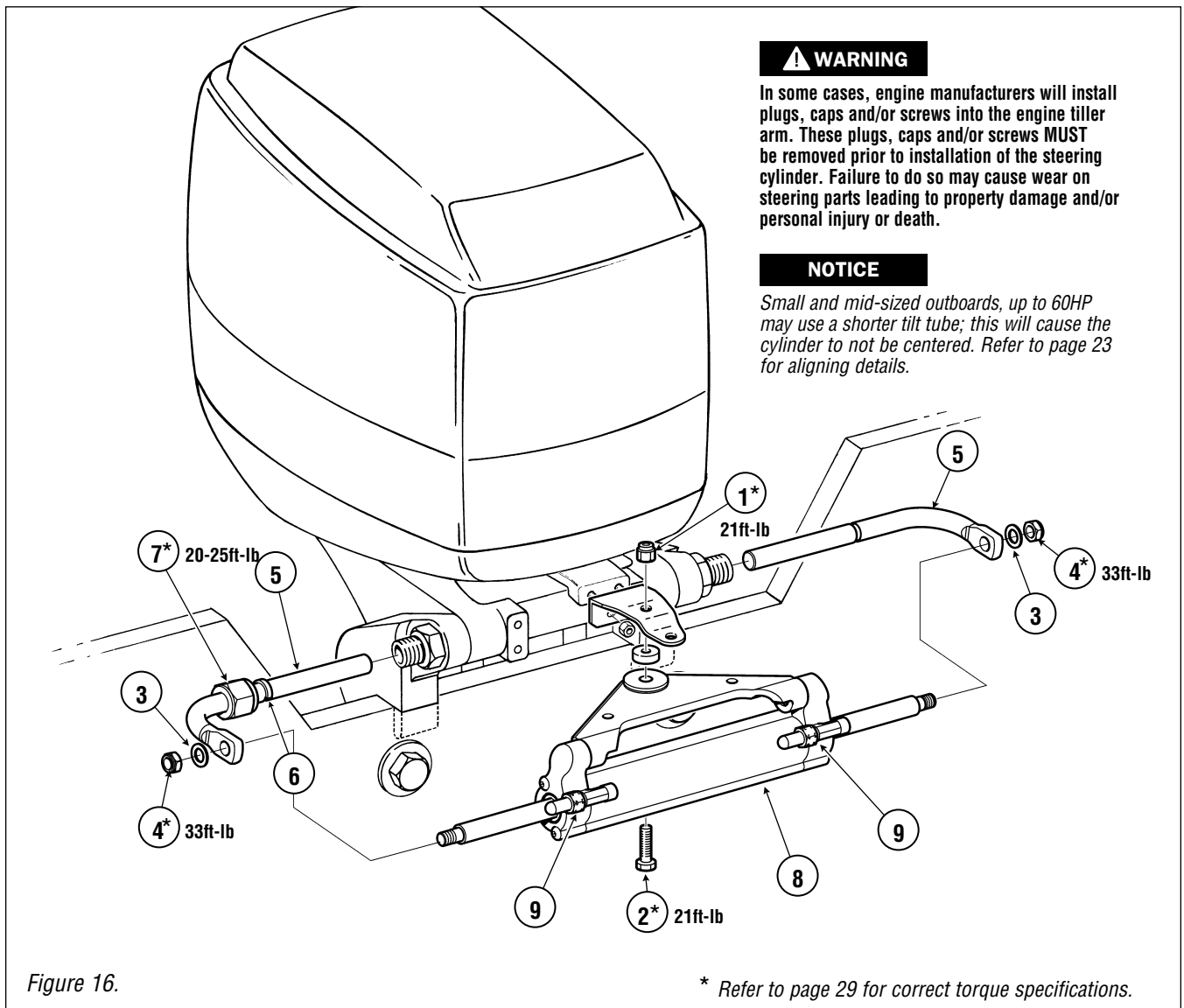
Figure 15.

ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113330	1	HHCS 3/8" NF x 1-3/8" SS
	If spacer kit H05090 used then:		
	198767	1	HHCS 3/8" NF x 1-5/8" SS (In Kit)
	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
	590040	2	Support Bracket

ITEM	PART #	QTY	DESCRIPTION
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
YANMAR	1990 TO DATE	27-36 HP	HC4645H	Requires Spacer Kit H05090 (See page 21).



ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
	<i>If spacer kit H05090 used then:</i>		
	198767	1	HHCS 3/8" NF x 1-5/8" SS (In Kit)
	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
	590040	2	Support Bracket

ITEM	PART #	QTY	DESCRIPTION
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

WARNING Refer to page 29 or correct torque specifications of all installation hardware.

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
SUZUKI	1986 TO DATE	150 HP	HC4645H	(See Fig. 17c)
	1996 ONLY	115-140 HP	See Note	Consult Factory
	1987 TO 2002	115-140 HP	HC4645H	Requires Spacer Kit H05090 (See Figs. 15a & 15b)
	1990 TO 2000	90-100 HP	HC4645H	
	1998 TO DATE	40-70 HP 4 Stroke	HC4645H	Requires Spacer Kit H05090 (See page 21).
	2001 TO DATE	115-140 HP 4 Stroke	HC4658H	Requires Spacer Kit H05090 (See page 21). If using cylinder HC4645H please invert pivot plate (See page 22). (Refer to Fig. 17d).

Figure 17.

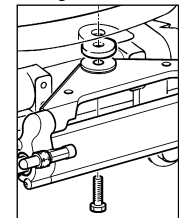
NOTICE

Small and mid-sized outboards, up to 60HP may use a shorter tilt tube; this will cause the cylinder to not be centered. Refer to page 23 for aligning details.

† For ALL Suzuki 40-140 HP 4 stroke use tiller bolt supplied in spacer kit H05090.

* Refer to page 29 for correct torque specifications.

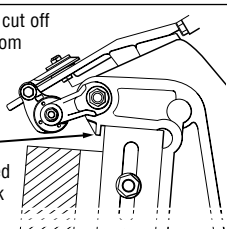
Figure 17a.



Suzuki 115-140HP (use rear hole)

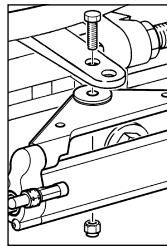
Figure 17b.

May have to cut off part of transom hangers if cylinder assembly interferes when motor is tilted to trailer lock position.



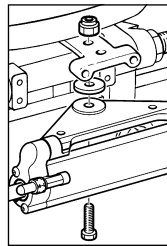
Suzuki 115/140 to 1998

Figure 17c.

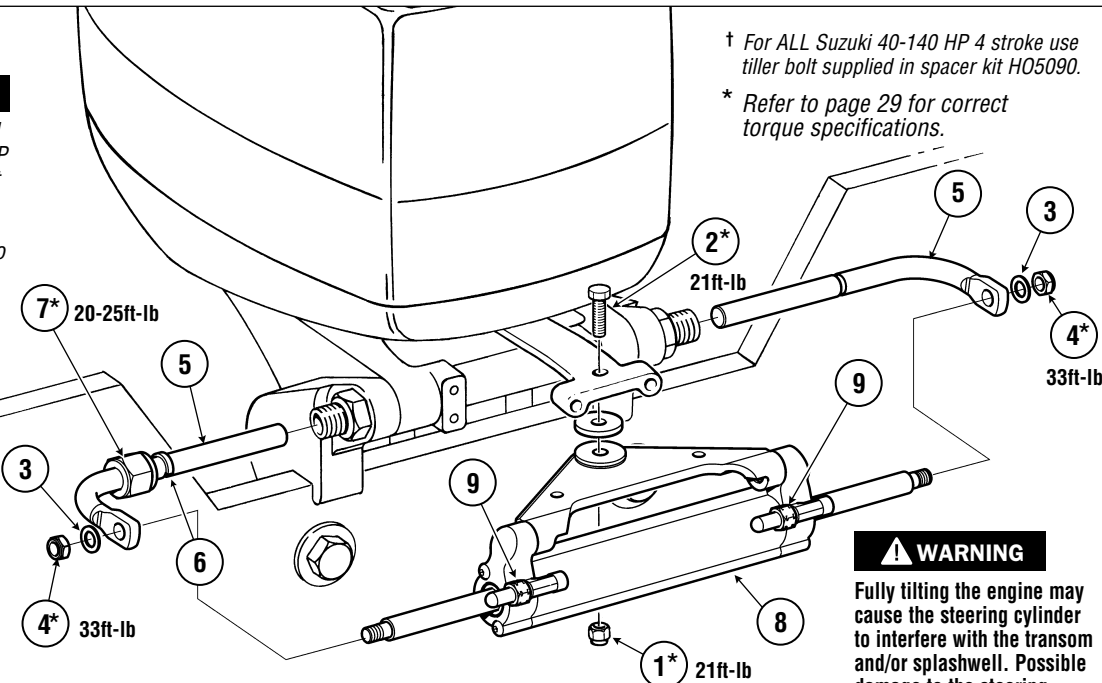


Suzuki 1986 to Date 150HP

Figure 17d.



Suzuki 2001 to Date 115-140 HP 4 Stroke



WARNING

Fully tilting the engine may cause the steering cylinder to interfere with the transom and/or splashwell. Possible damage to the steering system can result. Ensure that the cylinder is free from interference at all times.

WARNING

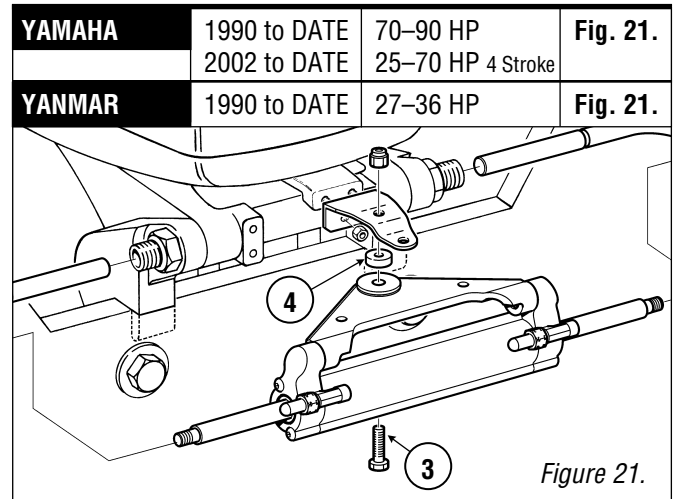
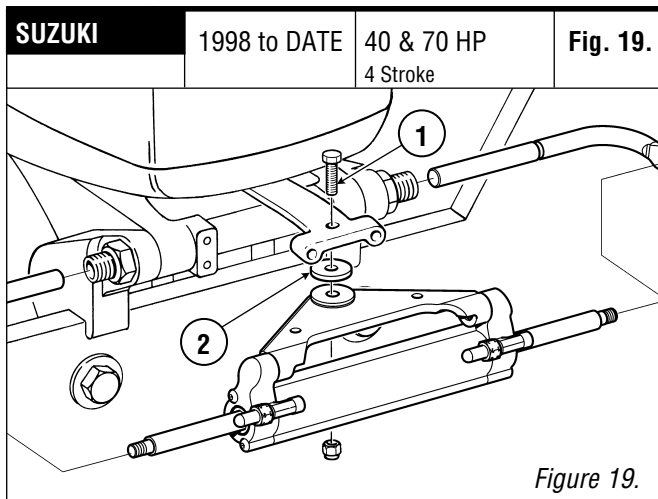
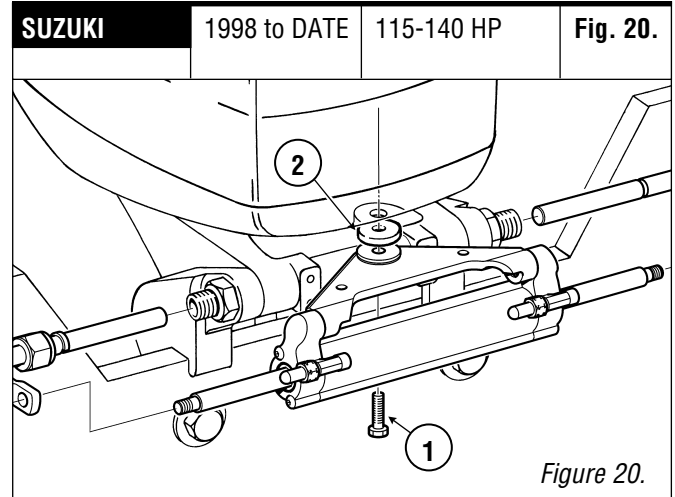
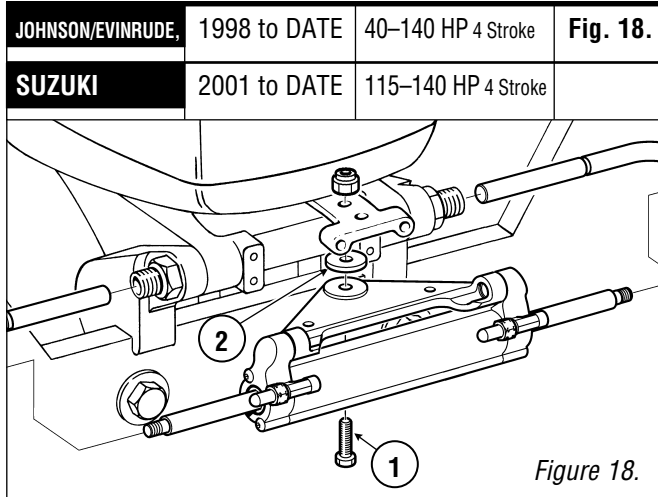
In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws **MUST** be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or death.

ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
			If spacer kit H05090 used then:
	198767	1	HHCS 3/8" NF x 1-5/8" SS (In Kit)
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS

ITEM	PART #	QTY	DESCRIPTION
5	590040	2	Support Bracket
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	HC46xxH	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

H05090 Spacer Kit

For Use with BayStar Hydraulic Steering Cylinder HC4645H, HC4647H, HC4648H and HC4658H.



▲ WARNING In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws **MUST** be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or death.

▲ WARNING Refer to page 29 for correct torque specifications of all installation hardware.

ITEM	PART #	QTY	DESCRIPTION
*1	688726	1	HHCS 3/8" NF x 2-1/4" SS (Tiller Bolt)
2	113600	1	SS Fender Washer
3	113330	1	HHCS 3/8" NF x 1-3/8" SS
4	773421	1	Aluminum Spacer, 1/2"

ITEM	PART #	QTY	DESCRIPTION

REVERSING COMPACT CYLINDER ENGINE PLATE

Recommended Tools

5/32" Allen head socket, with extension.

1. **DO NOT** attempt to reverse the pivot plate with the cylinder installed on the engine. (This may damage the steering shaft, causing irreparable damage.)
2. Remove the two cap screws from one end of the steering cylinder using the 5/32" Allen head wrench, or socket.

⚠ CAUTION

DO NOT pull the gland off the end of the shaft, doing so may damage the seals when you try to reassemble it.

3. Remove the pivot plate and flip over end for end, placing the end hole over the shaft stub on the fixed gland.

⚠ CAUTION

4. **After removing the cap screws there will be small amounts of debris on the screw. Ensure that any loose debris is removed from inside and the face of the cylinder body.**
5. Carefully slide the loose gland back into place so that the gland stub fits into the hole on the pivot plate. Some SeaStar steering fluid applied to the O-ring on the gland may ease reinsertion into the barrel.
6. Align the screw holes on the gland with the threaded holes on the barrel, ensure that the gland face is butted tightly against the end of the barrel, with no debris in between, and fasten using the cap screws removed earlier. Tighten to torque spec 60 in-lb (5 ft-lb).

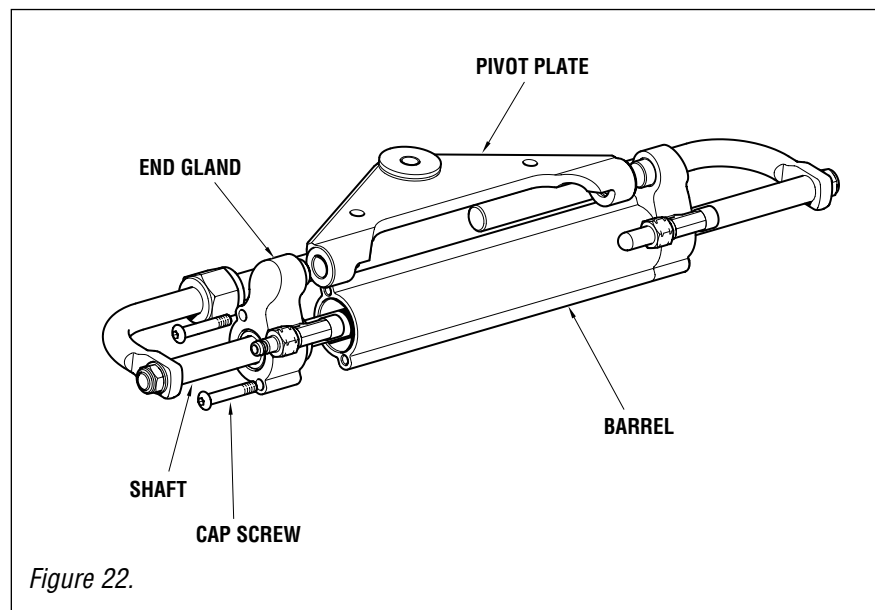


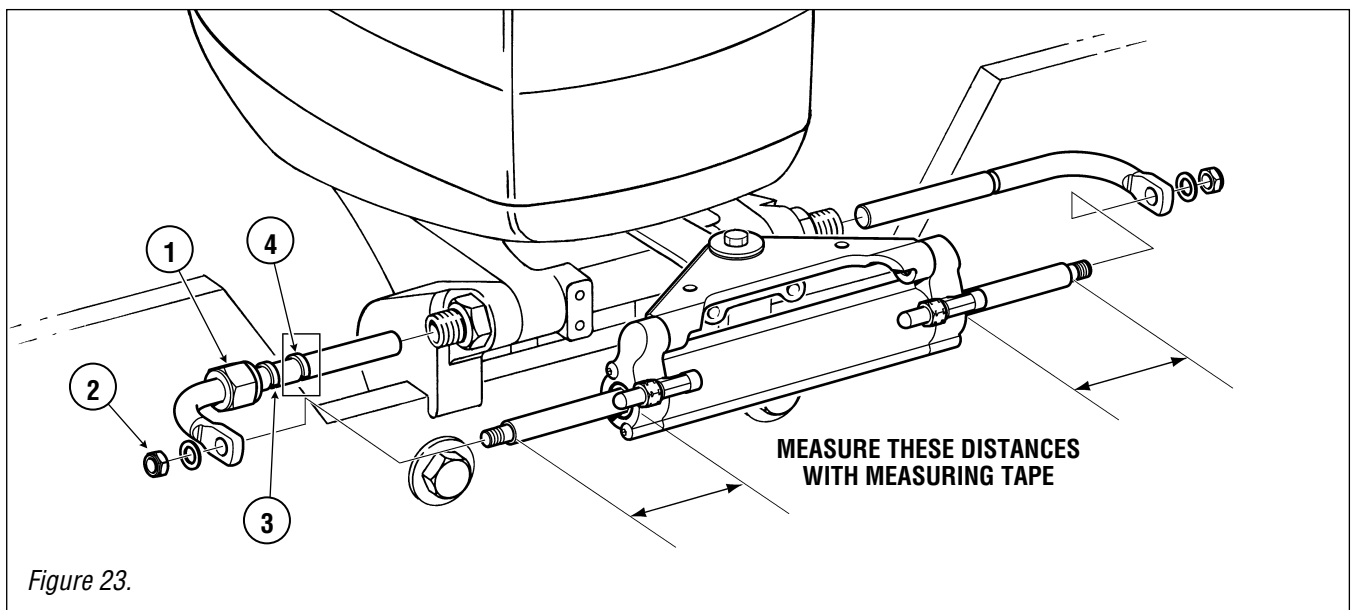
Figure 22.

MOUNTING TO OUTBOARD ENGINES UP TO 60 HP

Small and mid sized outboard engines up to 60HP may use a shorter tilt tube causing the BayStar Compact Steering Cylinder to be NOT centered with the engine in the straight ahead position. This will create reduced steering articulation in one direction. Please follow the instructions below to center the cylinder and address this issue.

Centering Instructions

1. Mount the steering cylinder as per your installation manual and position the engine in the straight ahead position.
2. Using a measuring tape, measure the amount of steering rod on both sides of the steering cylinders. (Refer to Figure 23.) If the starboard side of the rod is shorter than the port side by $11/16$ " or more, proceed to Step 3. If less than $11/16$ " your cylinder is centered, continue on with steering installation as per your installation manual.
3. Remove the support rod mounting nut (item 1), the cylinder end nut (item 2), then remove the support rod assembly.
4. Carefully remove the support rod retaining clip (item 3) using a vice, and move the clip to the inner groove (item 4).
5. Reinstall the support rod assembly and verify that the measurements taken in Step 2 are now within $11/16$ " side to side.
6. Continue with steering system installation as per the installation manual that was provided with your steering system.



FILLING AND PURGING THE SYSTEM

DEALER NOTICE

Reduce purging time to approximately 10 min per system with optional, portable Power Purge Jr. For more information reference our Website at www.seastarsolutions.com or contact your marine parts dealer.

Read First

This procedure requires two people. One person may not be able to remove all the air from the system which will result in spongy, unresponsive steering.

During the entire filling procedure, fluid **must** be visible in the filler tube. **Do not** allow the fluid level to disappear into the helm pump, as this may introduce air into the system and increase your filling time.

Hydraulic Fluid Requirements

Due to recent upgrades in our steering system components, SeaStar Solutions recommends use of SeaStar Steering Fluid **ONLY** in our hydraulic steering systems. SeaStar Steering Systems have been engineered and validated using our proprietary SeaStar Hydraulic Steering Fluid. SeaStar Steering fluid is engineered with a special additive package that contains anti-foaming and anti-rusting agents, anti-oxidants, viscosity stabilizers, corrosion inhibitors, wear additives as well as water emulsification additives. It is highly recommended that SeaStar Steering Fluid be used to ensure optimum system performance and safety.

⚠ WARNING

NEVER use brake fluid. Any non-approved fluid may cause irreparable damage, loss of steering, and cancellation of warranty.

NOTICE

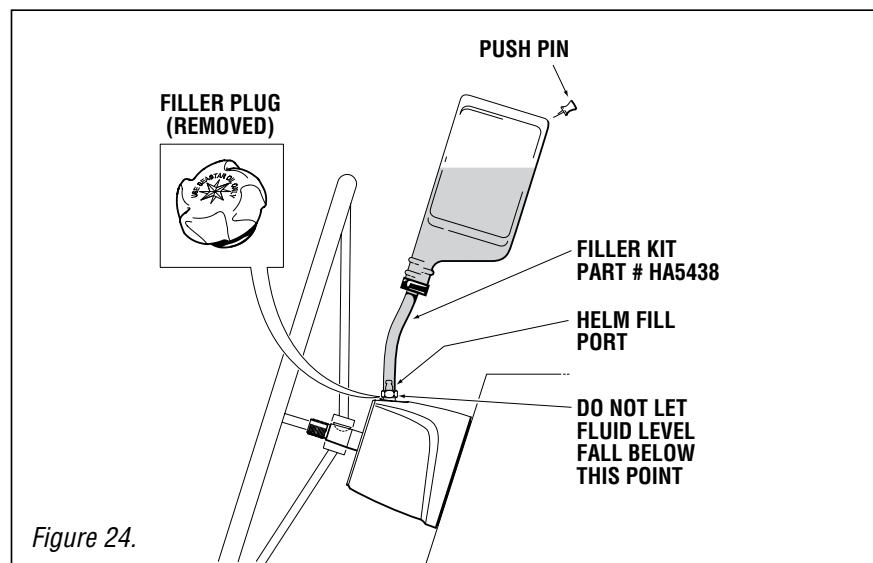
Fluid can be re-used if filtered through a fine mesh screen such as used for gasoline. If unable to filter fluid, an additional bottle of fluid is required.

NOTICE

“Bleeder” refers to cylinder fitted with bleeder tee fittings. Open bleeder by turning bleed nipple tube nut 2 revolutions counter clockwise.

NOTICE

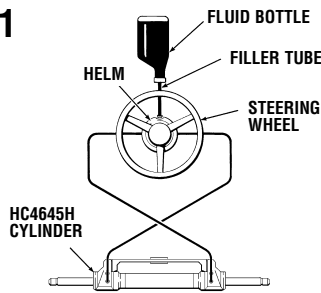
Filling the helm with fluid can be done faster if fluid is poured into the helm prior to connecting filler tube and fluid bottle to the helm.



NOTICE

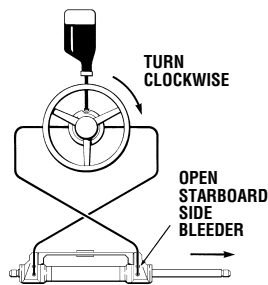
Help protect your boating environment by ensuring that all used fluid is disposed of properly.

Step 1



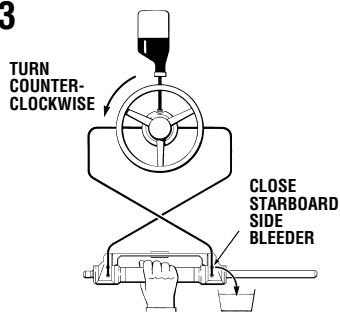
- Screw the threaded end of the filler tube into the helm filler port.
- Remove the cap from the fluid bottle and holding upright screw into the filler tube bottle cap. Poke hole in the bottom of the bottle.
- Fill the helm pump with hydraulic fluid so that it is visible in the filler tube. Fluid should always be visible in the filler tube. Use the next bottle of fluid at any time during the procedure in order to maintain the fluid level. Do not proceed with step 2 until helm is full.

Step 2



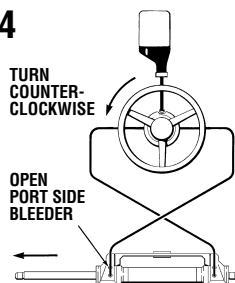
- Turn the steering wheel clockwise until the cylinder rod is fully extended.
- Open starboard side fitting.

Step 3



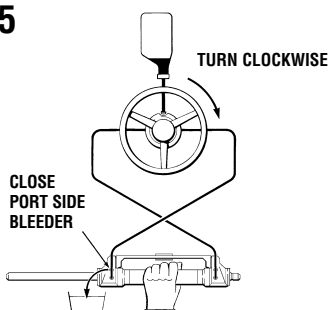
- Hold the cylinder body to prevent the rod from moving and turn the wheel counter-clockwise until a steady stream of air free fluid flows from the bleeder.
- Note:** If attached to engine, hold engine to prevent cylinder rod from moving.
- While continuing to turn the wheel, close the bleeder fitting.

Step 4



- Continue to turn the steering wheel counter-clockwise until the cylinder rod is fully extended. (Steering wheel will come to a stop.)
- Open Port side bleeder.

Step 5



- Hold the cylinder body to prevent the rod from moving a turn the wheel clockwise until a steady stream of air free fluid flows from the bleeder nipple.
- Note:** If attached to engine, hold engine to prevent cylinder rod from moving.
- While continuing to turn the wheel, close the port side bleeder fitting.

System Air Test

- Place engine in the center position.
- Manually push engine back and fourth.
- While pushing engine back and fourth, watch the steering cylinder “body” move.

If cylinder body moves more than 1/8”, this is a sign that there is still air remaining in the system and further bleeding is required.

Fluid Level and System Check

Step 1 – Fluid level Setting

⚠ WARNING The fluid level **MUST** be checked and maintained **BEFORE EACH** use to ensure safe steering operation. Failure to adhere to this warning may lead to loss of steering control resulting in persons being ejected from vessel or collision with an obstacle, leading to property damage, personal injury and/or death.

⚠ CAUTION

Side mount and Splashwell mount cylinder are unbalanced. To set the fluid level in the helm pump the cylinder rod **MUST** be fully “retracted (cylinder shaft all the way in the cylinder body). Failure to adhere to this caution **WILL** result in fluid spillage at the helm filler port and/or stiff steering operation.

- For helms mounted with the wheel shaft completely horizontal **MUST** be filled to the bottom of filler hole **AT ALL TIMES**. **DO NOT** allow fluid level to drop more than 1/4” below filler threads.
- For helms mounted on a 20 degree angle, or, with wheel shaft in the vertical position, fluid level should be within 1/2” of filler hole.

Step 2 – System Check

⚠ WARNING The system check **MUST** be completed after installation. Doing so will ensure the safe operation of your steering system and any fault/leak will show at this time. Failure to adhere to this warning/check may result in the loss of steering control leading to ejection from the vessel, or, collision with an obstacle resulting in property damage, personal injury and/or death.

- Turn steering wheel hard over to hard over to confirm unrestricted movement of the steering system and hoses. Repeat this procedure in ALL trim/tilt positions of the engine(s). If interference occurs, or, hoses are being stretched this **MUST** be removed prior to operating your boat.
- Confirm that engine(s) are deflecting to the proper direction when steering wheel is turned.
- If no interference is noticed, or, any interference is corrected, go to next step.

NOTICE This step will **NOT** harm the system and any noise made during this step should not be considered a fault in the steering system.

- Take steering wheel hard over to starboard (any helm can be used on a multi-station boat). Once the wheel reaches its stop point (cylinder is fully stroked out), continue to force the wheel one (1) full turn past stop. Leave wheel in this position while you check all connections, fittings, seals and hoses for leaks.
- If leaks are noticed they MUST be repaired prior to operating boat. After repair repeat bleeding procedures as outlined in this manual.
- Repeat to the Port direction and inspect ALL connections, fittings, seals and hoses for leaks.
- If leaks are noticed they MUST be repaired prior to operating boat. After repair repeat bleeding procedures as outlined in this manual.

⚠ WARNING

Failure to complete the above noted step or, failure to correct a problem may result in loss of steering control leading to ejection from the vessel or collision with an obstacle resulting in property damage, personal injury and/or death.

ROUTINE MAINTENANCE

⚠ WARNING

Following the routine maintenance schedules as outlined below, in the time frame noted will ensure years of service from your BayStar Steering System, as well as keep you and your passengers safe from the dangers that are present on and off the water.

1. Owner(s) (End Users)

⚠ WARNING

DO NOT operate boat if any component is not in proper working condition.

Prior to every use.

1. Check Fluid level in highest helm pump (see page 26 for proper fluid level setting).
2. Verify immediate steering response when turning steering wheel(s). (Ensure engine turns when steering wheel is turned.)
3. Visually inspect all steering hoses and fittings for wear, kinking and/or leaks.
4. Check for binding, loose, worn or leaking steering components.

2. Qualified Marine Mechanic

After first 20 hours, then every 100 hours or 6 months thereafter (which ever comes first).

1. All points noted above.
2. Check tightness of ALL fasteners/fittings throughout the steering system. Tighten to correct torque specifications as required.
3. Check for mechanical play or slop throughout steering system, correct as required.
4. Check for signs of corrosion. If corrosion is present contact your dealer or SeaStar Solutions.

After every 200 hours or 12 months (which ever comes first).

1. All points noted above.
2. Remove support rod from engine steering/tilt tube. Clean engine steering/tilt tube and re-grease using a good quality marine grease.
3. Grease support rod liberally
4. Grease all contact points shown in Figure 25. DO NOT remove tiller bolt to re-grease.
5. Remove steering wheel and re-grease wheel shaft using a good quality marine grease.
6. Inspect hydraulic fluid for cleanliness, flush if required.

⚠ WARNING

Any work being performed with the steering system MUST be completed by a qualified mechanic with the working knowledge of the system.

GREASE POINTS

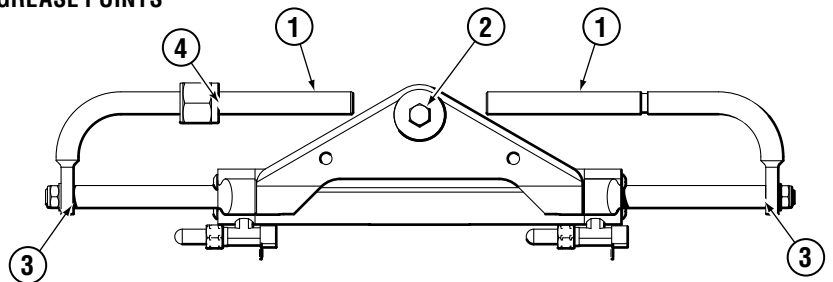


Figure 25.

1. Remove support rod completely; clean engine steering/tilt tube. and regrease with a good quality marine grease. Complete on both sides of cylinder.
NOTE: Ensure proper torque specification is met when reinstalling.

2. Remove tiller nut; clean threads, regrease using a good quality marine grease, then reinstall.
NOTE: Ensure proper torque specification is met when reinstalling.
3. Remove support rod from cylinder shaft, clean and regrease using a good quality marine grease.
NOTE: Ensure proper torque specification is met when reinstalling.

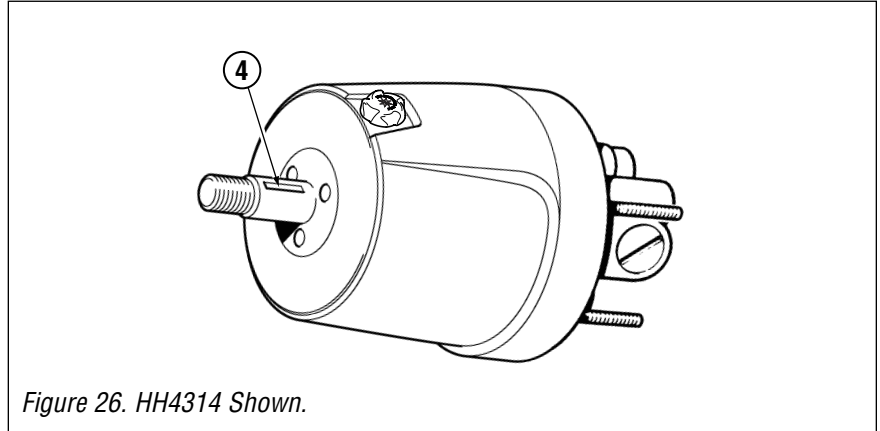


Figure 26. HH4314 Shown.

4. Remove steering wheel; clean off helm pump shaft; regrease using a good quality marine grease .
NOTE: when reinstalling steering wheel, ensure proper torque specification is met.

Bolt Torque Specifications

These are the recommended maximum torque values for reusable dry bolts. Bolts should be torqued to this value +0% -20%. For lubricated bolts, multiply the dry bolt torque values by .75.

Values are stated in: **in/lbs (N.m)**

Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass
2-56	2.5 (.282)	2.0 (.226)	6-32	9.6 (1.08)	4.9 (.554)	5/16"-18	132.0 (14.91)	107.0 (12.10)
2-64	3.0 (.338)	2.5 (.282)	6-40	12.0 (1.35)	9.9 (1.12)	5/16"-24	142.0 (16.04)	116.0 (13.11)
3-48	3.9 (.440)	3.2 (.361)	8-32	20.0 (2.25)	16.0 (1.81)	3/8"-16	236.0 (26.66)	192.0 (21.71)
3-56	4.4 (.497)	3.6 (.407)	8-36	22.0 (2.48)	18.0 (2.03)	3/8"-24	259.0 (29.20)	212.0 (23.97)
4-40	5.2 (.587)	4.3 (.486)	10-24	23.0 (2.59)	19.0 (2.14)			
4-48	6.6 (.740)	5.4 (.610)	10-32	32.0 (3.61)	26.0 (2.94)			
5-40	7.7 (.869)	6.3 (.712)	1/4"-20	75.0 (8.47)	62.0 (7.01)			
5-44	9.4 (1.06)	7.7 (.869)	1/4"-28	94.0 (10.6)	77.0 (8.70)			

Values are stated in: **ft/lbs (N.m)**

Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass	Bolt Size	18-8SS	Brass
7/16"-14	31.0 (42.00)	26.0 (35.25)	5/8"-11	93.0 (126.09)	76.0 (103.04)	1"-8	287.0 (389.12)	235.0 (318.62)
7/16"-20	33.0 (44.74)	27.0 (36.61)	5/8"-18	104.0 (141.00)	85.0 (115.24)	1"-14	259.0 (351.16)	212.0 (287.43)
1/2"-13	43.0 (58.30)	35.0 (47.45)	3/4"-10	128.0 (173.55)	104.0 (141.00)			
1/2"-20	45.0 (61.01)	37.0 (50.17)	3/4"-16	124.0 (168.12)	102.0 (138.29)			
9/16"-12	57.0 (77.28)	47.0 (63.72)	7/8"-9	194.0 (236.03)	159.0 (215.58)			
9/16"-18	63.0 (85.42)	51.0 (69.15)	7/8"-14	193.0 (261.67)	158.0 (214.22)			

NOTICE Torque values for 18-8 stainless steel and brass bolts are taken from a torque guide by ITT Harper. All results correspond well with basic bolt equations, using a bolt factor of 0.2 and a factor of 3/4 for a reusable connection.

TROUBLESHOOTING GUIDE

⚠ WARNING

Whenever in the following text a solution calls for removal from the vessel and/or dismantling of steering system components, the work must be carried out by a qualified marine hydraulic mechanic only.

SeaStar Solutions offers the following as a guide only and will not assume any responsibility for problems resulting from incorrect repairs.

Maximum 150HP (Total)

BayStar Hydraulic Steering will provide years of safe and reliable performance when installed and maintained correctly. As with all hydraulic steering systems, the BayStar helm is fitted with an internal pressure relief valve to protect the components of the system during over-pressure situations (such as hitting an object/ground during operation). This valve is set to 1000psi.

Most faults occur when installation instructions are not followed and in most cases will show up immediately upon filling the system. Below are the most common faults, their likely cause and possible solutions.

NOTICE *In some installations, when returning the wheel from a hardover position, a slight resistance and clicking sound may be heard. This should not be mistaken as a fault, this is a normal occurrence caused by the release of the lock-spool.*

⚠ WARNING

Warranty will be void if maximum 150HP (Total) exceeded or if combined with any other product (including SeaStar steering components). Steering failure may occur causing property damage and/or personal injury or death.

FAULT	CAUSE	SOLUTION
1. During filling the helm becomes completely jammed.	Blockage in the line between the helm and cylinder.	Check ALL fittings for incomplete holes, replace faulty fitting. Fittings without complete holes, however, are not common. Make certain that the BayStar tube has not collapsed during installation. If so: In a system using tubing, the collapsed section will need to be removed and re-fitted with a new piece with the aid of tube connectors. In a system using Hose, the entire hose will need to be replaced, DO NOT cut Hose.
2. System is very difficult to fill. Air keeps burping out top of helm even after system appears full.	Cylinder has been mounted upside down. This causes air to be trapped in the cylinder. Air in system. Bleed fitting leaking. Coiled BayStar tube.	Mount cylinder correctly, according to cylinder installation instructions. Ports should always be kept in uppermost position. Review filling instructions. Tighten bleed fitting. Uncoil or straighten the BayStar tube.
3. Steering is stiff and hard to turn, even when the vessel is not moving.	Restrictions in tube. Air in fluid. Wrong fluid, like ATF has been used to fill the system. Cylinder connecting nuts are over tightened. Cylinder installed into wrong hole in steering arm.	Find restriction and correct. ⚠ WARNING Kinked BayStar tube MUST be replaced. Failure to do so may result in a loss of steering causing personal injury, property damage or death. See filling and purging instructions. Drain system and fill with BayStar fluid. Ensure proper torque specification has been met. Confirm proper hole as shown on your engine application.

FAULT	CAUSE	SOLUTION
4. Helm unit in system is very bumpy and requires too many turns from hardover to hardover.	Dirt in inlet check of helm pump.	Contact repair center, or replace helm pump. ⚠ WARNING DO NOT attempt to access check valves, or dismantle the helm pump in any way, doing so may lead to loss of steering control resulting in ejection from boat, or collision with an obstacle causing property damage, personal injury and/or death.
5. Steering is easy to turn at the dock, but becomes hard to turn when vessel is underway.	Steering wheel is too small.	Fit larger steering wheel if possible, see installation instructions. If this does not correct the problem proceed with next cause and solution or consult factory. Max. wheel dia. 22"(56cm).
	Incorrect setting of trim tab(s) engine. Air pocket in system.	Adjust tab(s). Check fluid level, perform air test as instructed on page 26, fill and purge system as instructed on page 24.
	Total horsepower exceeds 150HP.	Replace BayStar steering system with SeaStar steering system.
6. Engine drifts to port or starboard while vessel is underway, even when wheel is not being turned.	Dirt in check valves.	Contact repair center, or replace helm pump. ⚠ WARNING DO NOT attempt to access check valves, or dismantle the helm pump in any way, doing so may lead to loss of steering control resulting in ejection from boat, or collision with an obstacle causing property damage, personal injury and/or death.
7. Turning wheel to starboard causes the boat to turn to port.	Incorrect tube connections.	Switch the port side BayStar tubing to the starboard cylinder fitting and the starboard BayStar tubing to the port side cylinder fitting. Refill and purge system.
8. My application requires me to flip or change the pivot plate on my cylinder.	Different engine applications.	Please refer to page 22 for complete instructions.
9. Cylinder is not centered when installed onto engine.	Small tilt tube.	Remove clip and install into second groove. Please refer to page 23 for details.

REPLACEMENT PARTS

BAYSTAR CYLINDER (PART # HC4645H, HC4647H, HC4648H, HC4658H)

⚠ WARNING

Maintenance/Repairs on BayStar steering components must be performed by a qualified marine mechanic.

NOTICE

* HF4202 is for use with BayStar Tubing marked - 'H' ONLY.
 HF4201 - For use with NON-H tubing
 + Included in seal kit #HP4600.

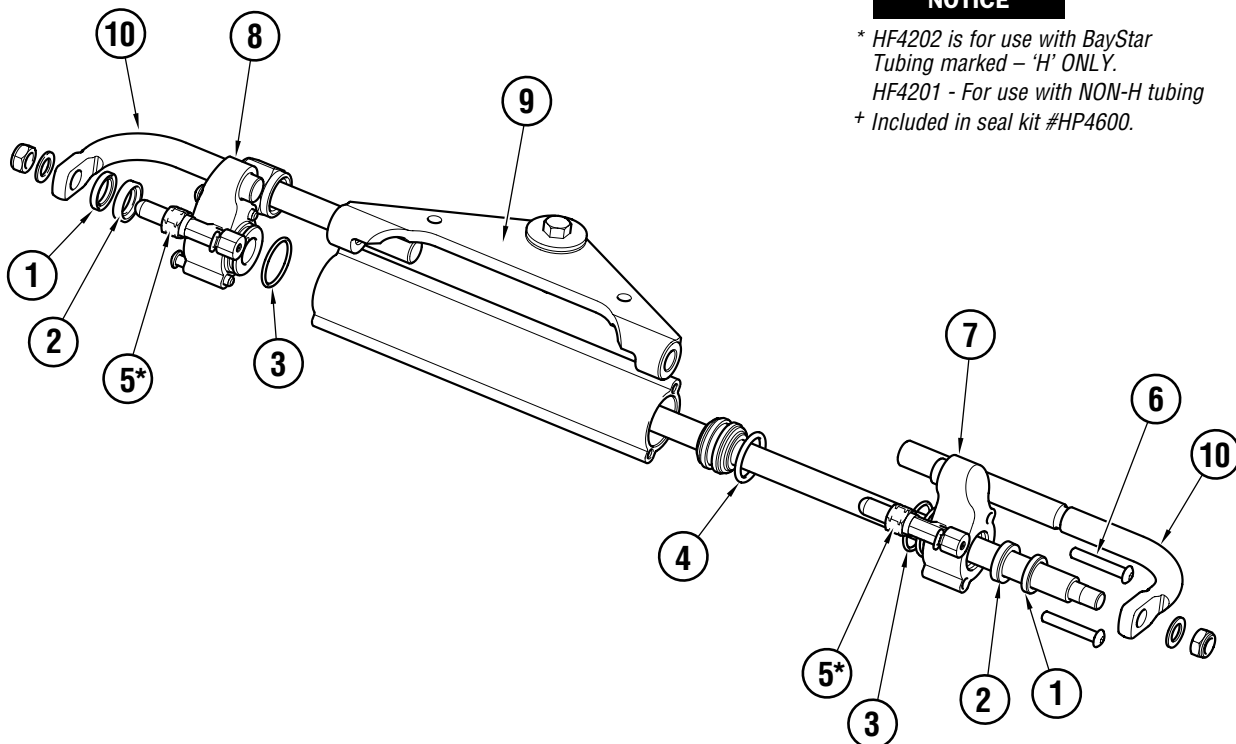


Figure 27.

ITEM	PART#	QTY	DESCRIPTION
+1	872018	1	Wiper
+2	441000	1	Shaft Seal
+3	008821	1	O-Ring
4	029620	1	O-Ring, NOT included in seal kit HP4600
*5	HF4202	1	Tee Fitting Kit, comes with two complete fittings
+6	590075	4	BHCS 1/4" NC x 1.5" SS
+7	590027	1	Gland, Port Side
+8	590025	1	Gland, Starboard Side
+9	Various	1	Pivot plate. See page 33 for your specific cylinder part number
10	590040	2	Support Rod, Bent Available in Kit # HP6050

ITEM	PART#	QTY	DESCRIPTION

REPLACEABLE PIVOT PLATE

(PART # HA4640, HA4641, HA4642 and HA4643)

⚠ CAUTION

DO NOT pull the gland off the end of the shaft, doing so may damage the seals when you try to reassemble it.

⚠ CAUTION

After removing the cap screws there will be small amounts of debris on the screw. Ensure that any loose debris is removed from inside and the face of the cylinder body.

Remove cylinder from the engine. Please refer to page 13 before cylinder removal.

Step 1

Remove the two cap screws from one end of the steering cylinder using the 5/32" Allen head wrench, or socket.

Step 2

Remove the pivot plate and install the correct plate for your engine application.

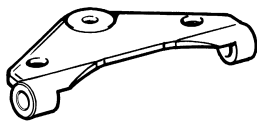
Step 3

Carefully slide the loose gland back into place so that the gland stub fits into the hole on the pivot plate. Some SeaStar steering fluid applied to the O-ring on the gland may ease reinsertion into the barrel.

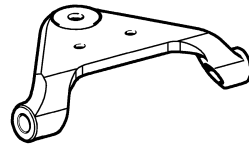
Step 4

Align the screw holes on the gland with the threaded holes on the barrel, ensure that the gland face is butted tightly against the end of the barrel, with no debris in between, and fasten using the cap screws removed earlier. Tighten to torque spec 60 in-lb (5 ft-lb).

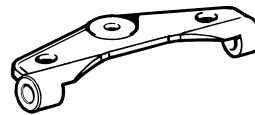
Figure 28.



HA4640
Use with cylinder HC4645H



HA4641
Use with cylinder HC4647H

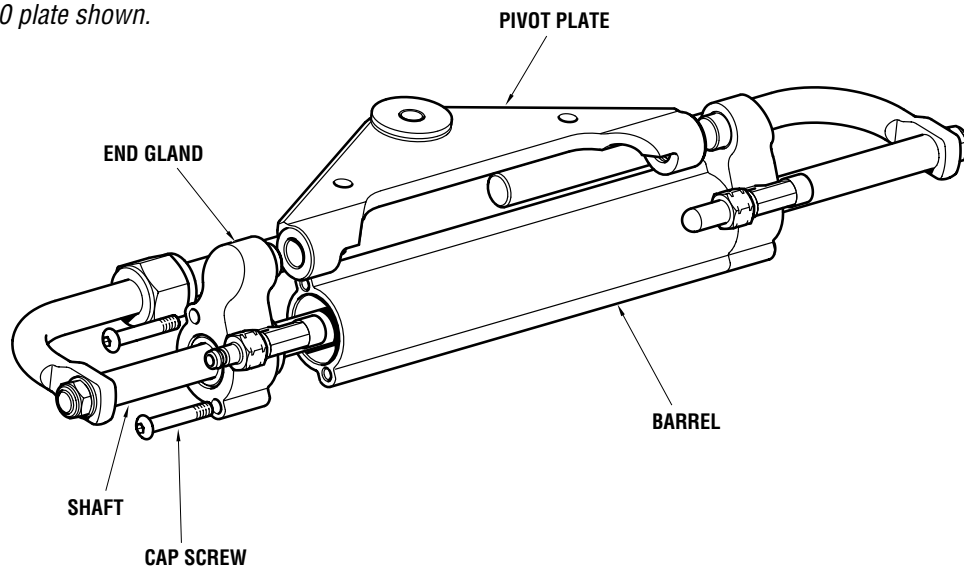


HA4642
Use with cylinder HC4648H



HA4643
Use with cylinder HC4658H

Figure 29. HA4640 plate shown.



Statement of Limited Warranty

We warrant to the original retail purchaser that **Marine Canada Acquisition Inc. DBA SeaStar Solutions** (herein forward referred to as **SeaStar Solutions**) products have been manufactured free from defects in materials and workmanship. This warranty is effective for two years from date of purchase, excepting that where **SeaStar Solutions** products are used commercially or in any rental or income producing activity, then this warranty is limited to one year from the date of purchase.

We will provide replacement product without charge, for any **SeaStar Solutions** product meeting this warranty, which is returned (freight prepaid) within the warranty period to the dealer from whom such product were purchased, or to us at the appropriate address. In such a case **SeaStar Solutions** products found to be defective and covered by this warranty, will be replaced at **SeaStar Solutions's** option, and returned to the customer.

The above quoted statement is an extract from the complete **SeaStar Solutions** products warranty statement. A complete warranty policy is available in our **SeaStar Solutions** products catalogue.

NOTICE

Maximum 150HP (Total).

Return Goods Procedure

Prior to returning product to **SeaStar Solutions** under warranty, please obtain a *Return Goods Authorization number* (claim number).

Be sure to label the goods with:

- a) the name and address of the sender, and
- b) the return goods authorization number (claim number)

Please address the returned goods as follows:

From U.S.A.

RGA # ?
SeaStar Solutions
c/o UPS-SCS
19308 70th Ave S.
Kent, WA 98032

From Canada

RGA # ?
SeaStar Solutions
3831 No. 6 Road
Richmond, B.C.
Canada V6V 1P6

Technical Support

Phone: 604-248-3858

email: seastar@seastarsolutions.com

Hours: Monday - Friday 05:00 – 15:30 PST

Web: www.seastarsolutions.com



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