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TELEFLEX CANADA LIMITED
PARTNERSHIP

INSTALLATION INSTRUCTIONS
AND OWNERS MANUAL

www.seastarsteering.com

BayStar™

Hydraulic Steering for Outboard Powered Vessels

Single Station steering for boats rated to a maximum of 150HP (Total).

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

Notice to Boat Manufacturer, Installer and End User

Throughout this publication, Warnings and Cautions (accompanied by the International Hazard Symbol ⚠) are used to alert the manufacturer, and end user 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 installation and maintenance, plus "common sense" are major accident prevention measures.

⚠ DANGER	⚠ WARNING	⚠ CAUTION	NOTICE
Immediate hazards which WILL result in severe personal injury or death.	**Hazards or unsafe practices which COULD result in severe personal injury or death.**	**Hazards or unsafe practices which COULD result in minor injury or product or property damage.**	**Information which is important to proper installation or maintenance, but is not hazard-related.**

⚠ WARNING

Cleaning fluids containing ammonia, acids or any other corrosive ingredients MUST NOT be used for cleaning any part of this Hydraulic Steering System. Failure to comply will cause serious damage to the steering system, resulting in possible loss of steering, causing property damage, personal injury and/or death.

NOTICE

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

Don't compromise performance... use genuine BayStar parts ONLY!

- **BayStar Helms**
- **BayStar Cylinders**
- **BayStar Hoses/Tubing**
- **BayStar Oil.**

Substituting non BayStar parts in any part of the BayStar hydraulic steering system, may seriously compromise system performance.

INTRODUCTION

Before proceeding with the installation, read these instructions thoroughly. Teleflex 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.

⚠ CAUTION

BayStar is ONLY applicable for single station steering.

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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BEFORE OPERATING YOUR BOAT

⚠ WARNING

Failure to comply with maintenance checks may result in loss of steering, causing property damage, personal injury or death.

Maintenance requirements will vary depending on usage. Bi-annual inspection by a qualified Marine Mechanic is required.

Refer to page 24 for Maintenance instructions.

Ensure that the following check list is carried out

1. Perform system pressure test by turning helm to hard over and then an additional 1/4 to 1/2 of a turn. This will pressurize this side of the system. Check all fittings and seals for leaks and repeat the process in the opposite direction. **Repair or replace** any leaking component prior to operating vessel.
2. Test the steering system. Complete two (2) full cycles with the engine being taken from hard over to hard over in both the fully tilted DOWN and fully tilted UP positions. During this operation inspect ALL moving components to ensure that no interference or restriction of mechanical components is present through the full range of travel including:

   NO interference between cylinder, drag link, fasteners, engine cowling, tie-bar, transom, adjustable engine lift plates, splashwell or other surfaces;

   NO stretching, crushing, or restriction of movement of hydraulic lines, kinking or chafing of lines against bulkhead/splashwell entry points or any other contact points.

- Confirm that there is no interference between the steering cylinder and the transom, splashwell or jackplate or any positional combination of these parts by performing these simple steps:
- Fully trim and tilt engine and turn steering from hard over to hard over while checking for interference at all positions. *(If interference occurs it must be eliminated prior to operating vessel.)*
- Confirm that the steering cylinder can be stroked fully in both directions as well as fill tilt and trim without stretching and/or kinking the hydraulic tube.
- Confirm that the hydraulic tubing is not subject to chaffing, kinking, pinching or stretching.
- Stretched, kinked or chafed tubing will fail over a period of time.

⚠ WARNING

Failure to comply with above instructions may result in loss of steering causing property damage, personal injury or death.

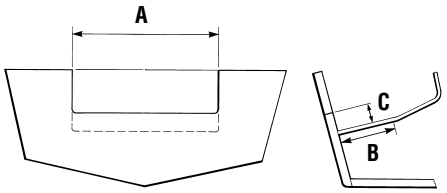
Before attempting installation, ensure that the splashwell of your boat has the following minimum dimensions.

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:

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



MOUNTING TEMPLATE

BayStar Helm
(part# HH4314 & HH4514
BayStar Plus)

Scale 1:1

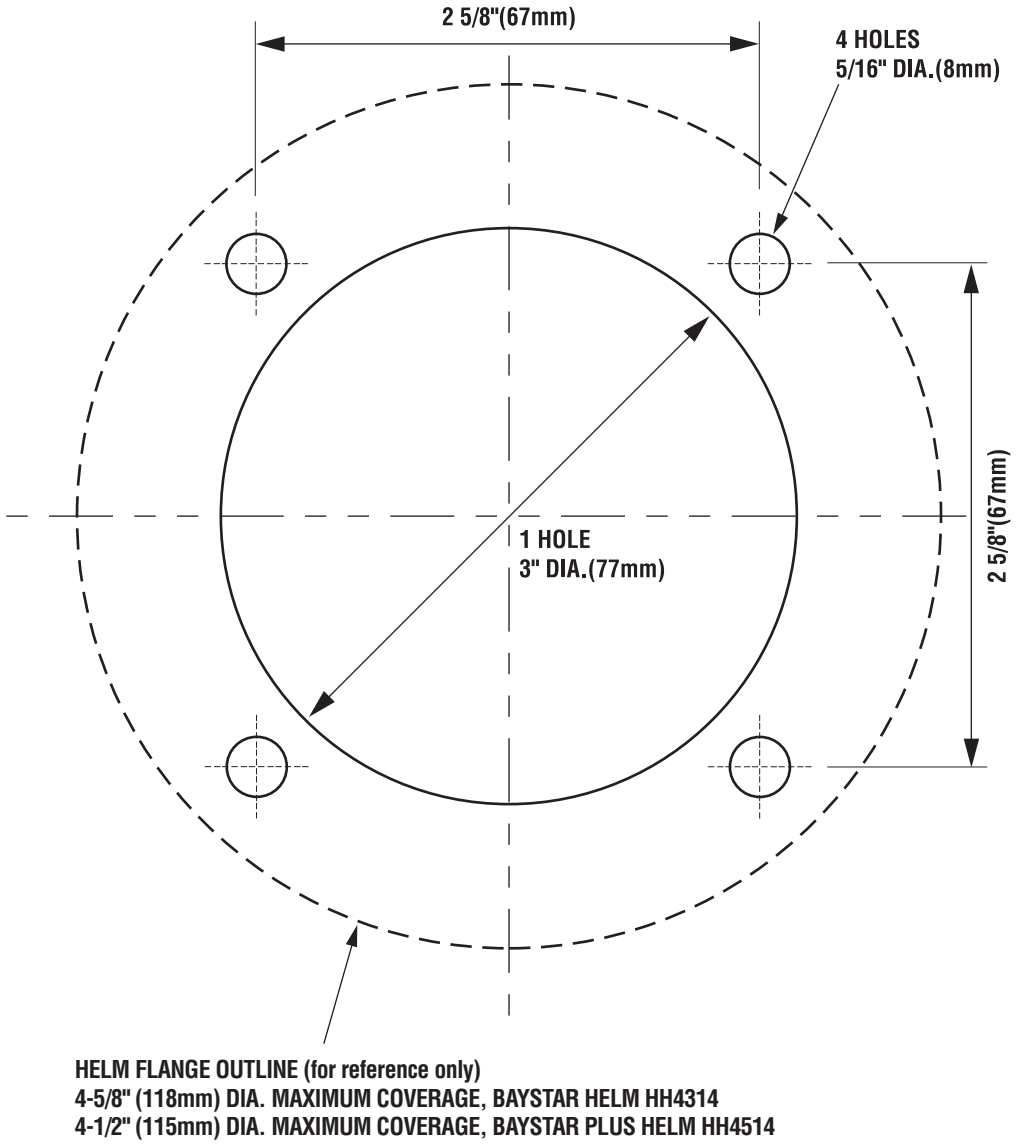


Figure 1

Note: *This page left blank intentionally.*

SYSTEM OVERVIEW

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.

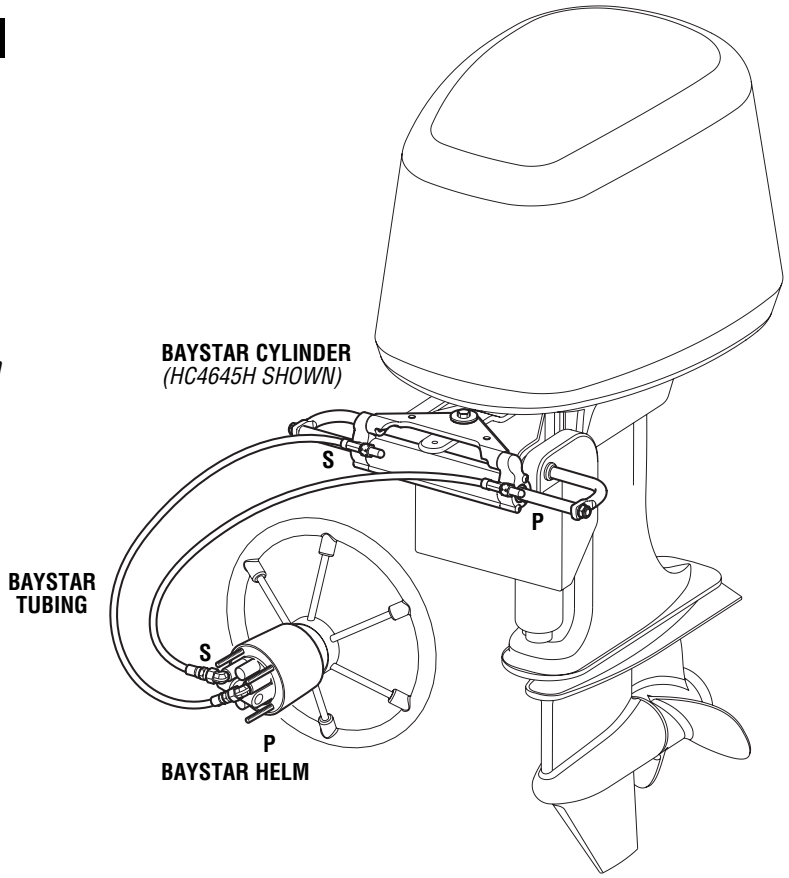
Figure 2

⚠ CAUTION

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

NOTICE

The BayStar system is a single station steering system ONLY, with the option to add an autopilot



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

⚠ WARNING

Warranty will be void if combined with any other product. Steering Failure may occur causing property damage and/or personal injury or death. MAXIMUM 150HP (Total).

BayStar Helm Pump
(part# HH4314)

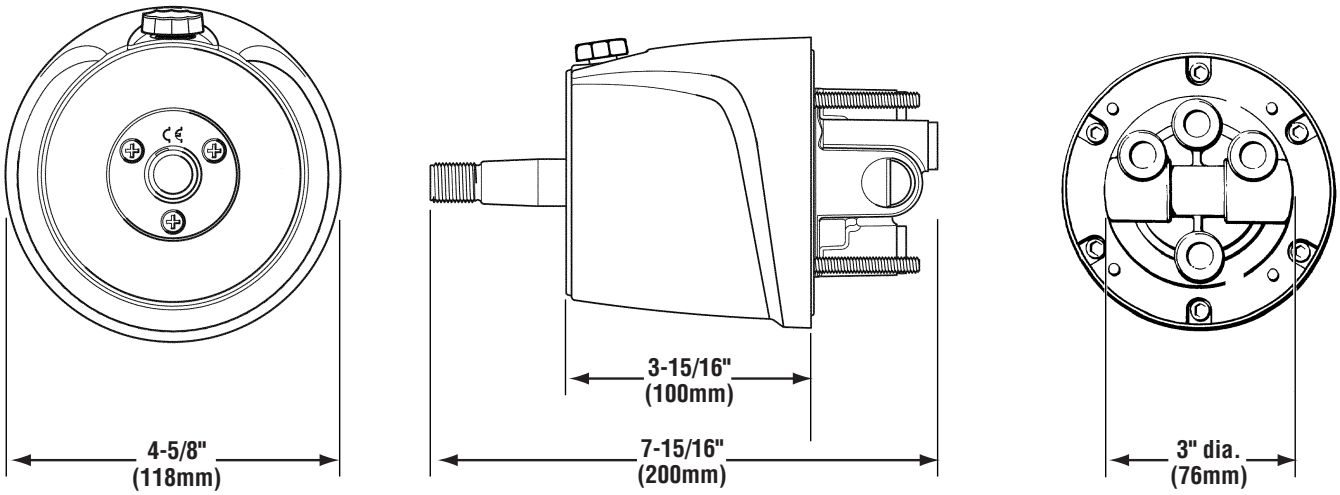


Figure 3

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

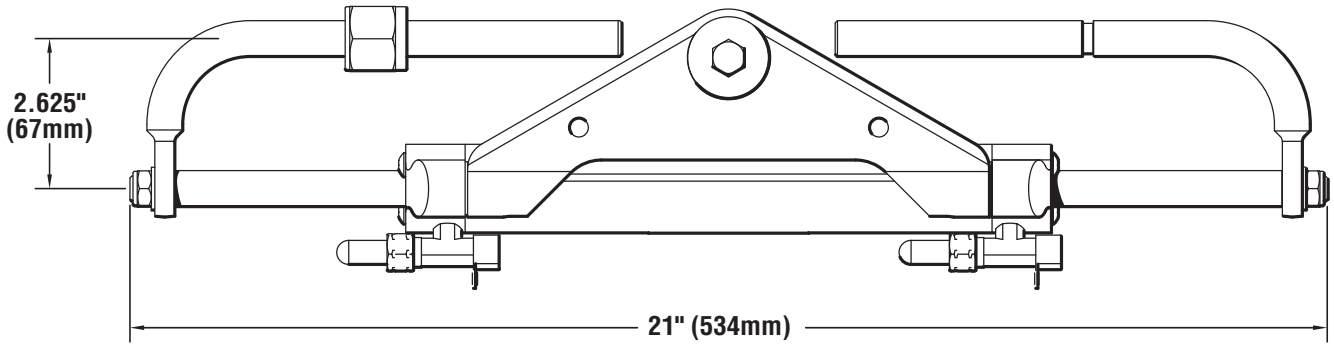


Figure 4

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).

NOTICE

Only use a pipe sealant such as Loctite P.S.T. or equivalent on ALL pipe threads.
DO NOT USE "TAPE" SEALERS.

Use a pipe sealant such as Loctite P.S.T. or equivalent on all pipe threads. **DO NOT use "tape" sealers.**

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 #1 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:

To simplify installation, we recommend that the fittings being used in the rear of the helm pump are installed prior to the helm being mounted to the dash. See Caution at the top of page 8.

Step 5:

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. Torque nuts to 15 ft. lb.

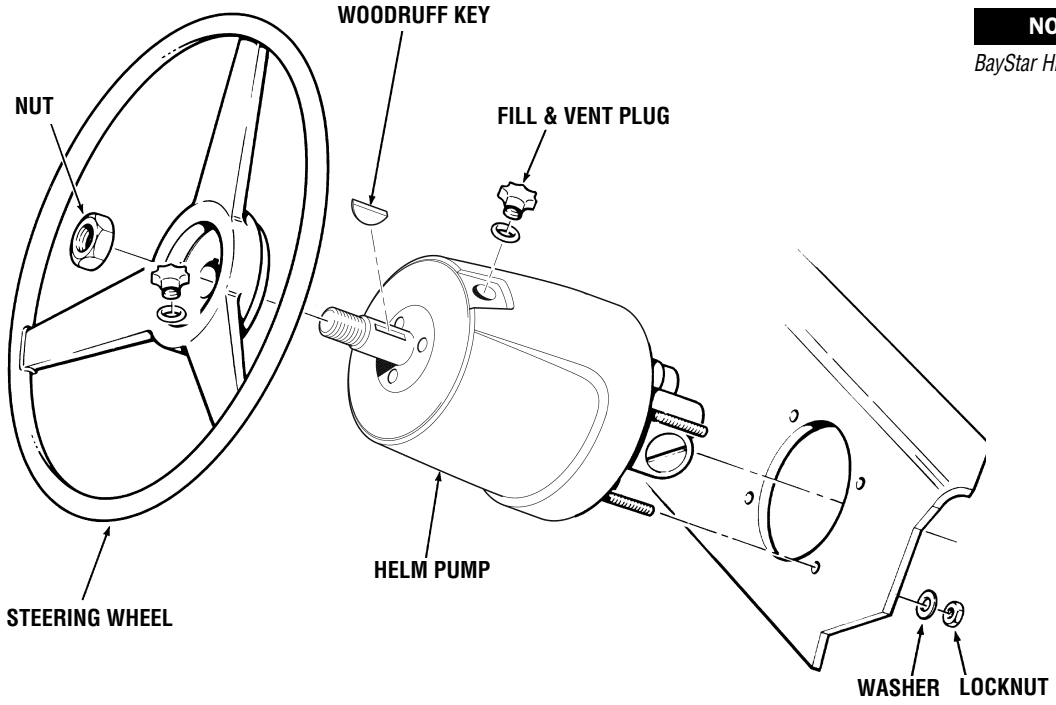
Step 6:

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

Figure 5

NOTICE

BayStar HH4314 shown



HYDRAULIC TUBING INSTALLATION

⚠ WARNING

BayStar cylinders with the letter 'H' in the part number can ONLY use BayStar tube marked with–H (BayStar STEERING TUBE–H).

DO NOT cut and/or modify in any way the swaged fitting, protective covering or the tube at the cylinder connection end of your tube kit. Only the helm end of the TUBING without the swage fitting may be cut. If using hydraulic HOSE—DO NOT CUT. Hose assemblies are NOT cut to fit. Failure to comply will cause serious damage to the steering system, resulting in possible loss of steering, causing property damage, personal injury and/or death.

⚠ WARNING

DO NOT remove protective fitting caps until connection of tube/hose fitting to helm and cylinder is made. Use shortest convenient path for routing tube.

Tube Kits

Attach the cylinder end of the BayStar tubing complete with the swage fitting and protective covering the port side of the BayStar Cylinder and route tubing with a gradual rise through the Spalshwell and along the gunwale, or, through the builder installed conduit to the starboard side of the BayStar helm pump. The end of the BayStar tubing without the swage fitting and covering may be cut to fit using a proper tube or pipe cutter **DO NOT** use a saw. Repeat for the starboard side of the system. Leave extra tubing in the Spalshwell to allow for the cylinder rotation and motion.

Hose Kits

Attach one end of the hydraulic hose to the port side of the steering cylinder and with a gradual rise through the Splashwell and along the gunwale, or, through the builder installed conduit to the starboard side of the BayStar helm pump. **DO NOT CUT** the hydraulic hoses. **DO NOT** bend hoses tighter than 4" (10cm) radius. Repeat connection with other hose from starboard side of steering cylinder to port side in the helm pump. Prevent mix up in connections by marking both ends of one tube/hose with masking or electrical tape. Provide sufficient length to allow full uninterrupted steering motion including full trim/tilt.

For **HC4645H/47H/48H/58H** pivot type cylinders ONLY, the tubing attached to the port side of the cylinder should attached to the starboard side of the helm pump. Tubing attached to the starboard side of the cylinder should attached to the port side of the helm pump.

Tube nut installation and connection for BayStar tubing to helm fitting:

Slide tube nut over tubing. Push tubing into bottom of component fittings.

Hand tighten tube nut, ensuring that tube is bottomed against the fitting while tightening tube nut.

After hand tightening tube nut, tighten nut an additional one and a half turns with a 5/8" wrench.

NOTICE

Cut BayStar tube with tube cutter or pipe cutter only. *Thread tube fitting onto appropriate fitting on rear cover of BayStar helm and tighten to 12 ft lbs (16N.m).*

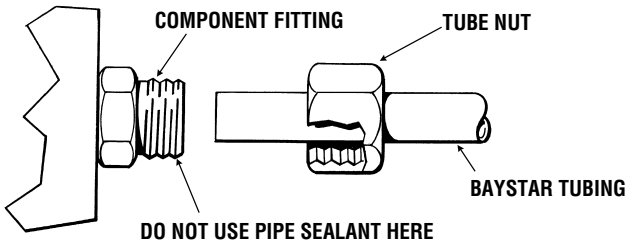


Figure 6

⚠ CAUTION

Fittings inserted into the rear of the helm should be installed until finger tight and then turned an additional 1-1/2 to 2-1/2 turns depending on desired orientation of fitting. DO NOT exceed 156in/lbs (17.6Nm)

⚠ WARNING

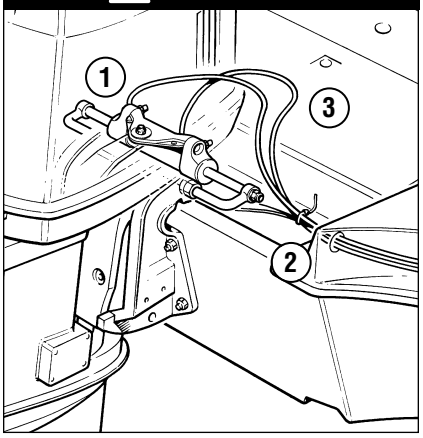


Figure 7

1 DO NOT adjust angle of fittings without first consulting manufacturer.

2 Tubing should be secured to the control cable harness as they enter the Splashwell through the boot.

3 Minimum bend radius 4" (102mm).

BayStar tube MUST be protected from changing and any possible contact or interference with assembly screws or sharp edges of any type. The BayStar tube should be secured wherever possible. Teleflex recommends the use of a rigging tube, PVC piping or conduit for the safe secure installation of the BayStar tube.

DO NOT allow the tubing to hang free in an area where they could become a safety hazard.

DO NOT install tubing in such a way that they will become exposed to high heat areas such as engine manifolds or highly corrosive areas, such as battery fumes or electrical connections.

Ensure that no stretching, crushing, kinking or restriction of movement, of the tubing occurs or chaffing or abrading of tube against bulkheads, Splashwell or gunwale entry points.

Continuos kinking, chafing, rubbing, scoring or twisting may eventually weaken BayStar tube to a point where it could rupture from normal steering pressure causing loss of steering resulting in property damage, personal injury or death.

Periodically inspect tubing and fittings for wear and/or damage.

⚠ CAUTION

Provide sufficient tube length to allow full, uninterrupted steering motion including trim and tilt.

⚠ WARNING

Ensure both elbow fittings installed in rear of helm pump, and tube nuts attaching the hydraulic tubing are installed as per the above listed instructions and are free from leaks prior to operation. Failure to comply will cause serious damage to the steering system, resulting in possible loss of steering, causing property damage, personal injury and/or death.

INSTALLATION INSTRUCTIONS

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 24 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 an approved quality marine grease (such as Johnson/Evinrude triple guard, Quicksilver anti-corrosion, Yamaha marine grease or equivalent), liberally lubricate the tilt tube and support rod (Item 5) and slide the support rods into the 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 Fig. 8 through 14 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 the mounting nut (Item 7) onto tilt tube of outboard engine.

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 8 through 14.

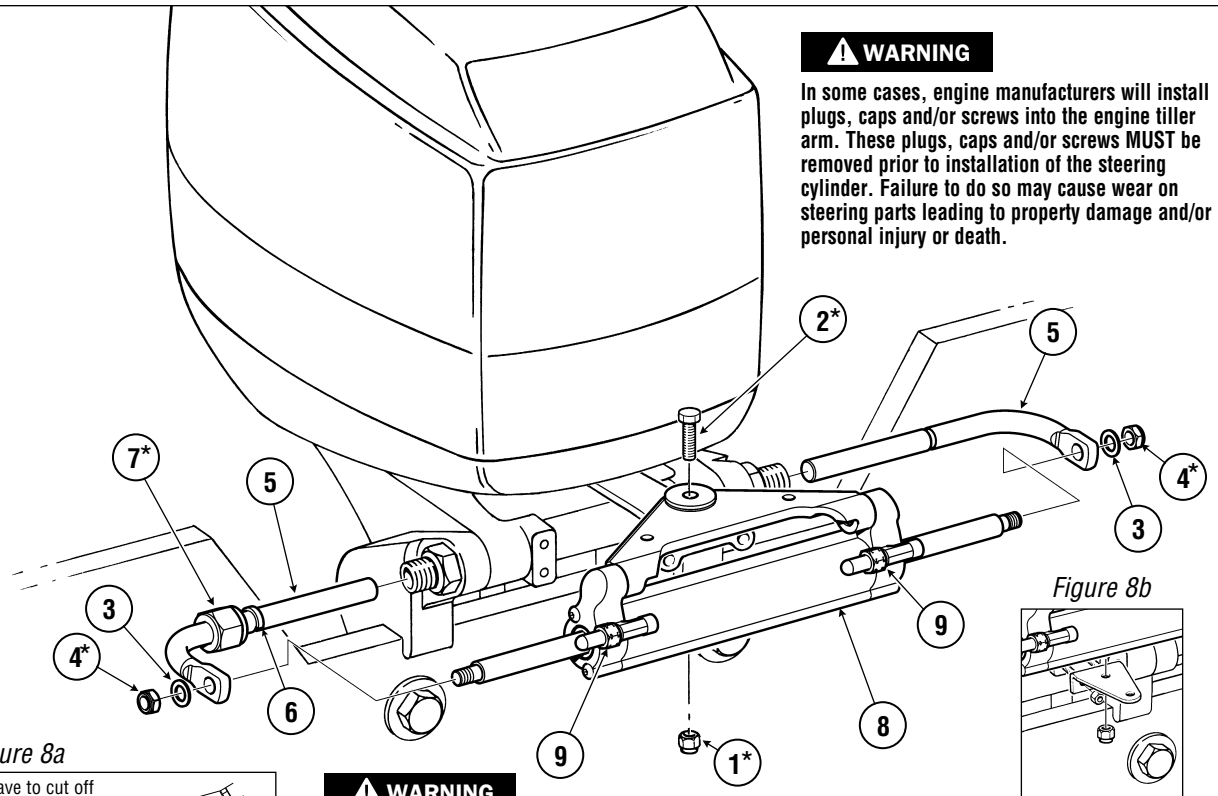
⚠ CAUTION

If installing a jack plate make sure that there isn't any 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.

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
FORCE	1985 TO 1994	90–150 HP	**HC4645H**	(See Fig. 8a)
	1995 TO DATE	90–120 HP	**HC4645H**	
HONDA	1992 TO DATE	30–50 HP	**HC4645H**	Cylinder may not be centred when mounted due to short tiller tube (See Fig. 8b)
	1996 TO DATE	75–90 HP	**HC4645H**	
	1998 TO DATE	115–130 HP	HC4647H	(See page 13)
	2003 TO DATE	135–150 HP	**HC4645H**	

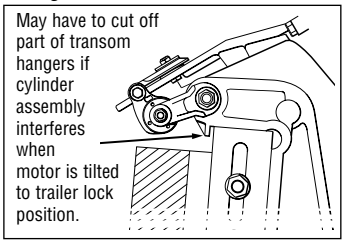
Figure 8



⚠ 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 8a



Force 90-150HP 1985 to 1994

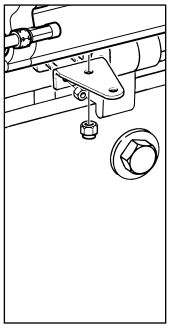
⚠ WARNING

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 19 for aligning details.

Figure 8b



Honda 1992 To Date
30–50 HP

* *Refer to page 24 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	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
HONDA	1998 TO DATE	115–130 HP	**HC4647H**	

Figure 9

⚠ WARNING

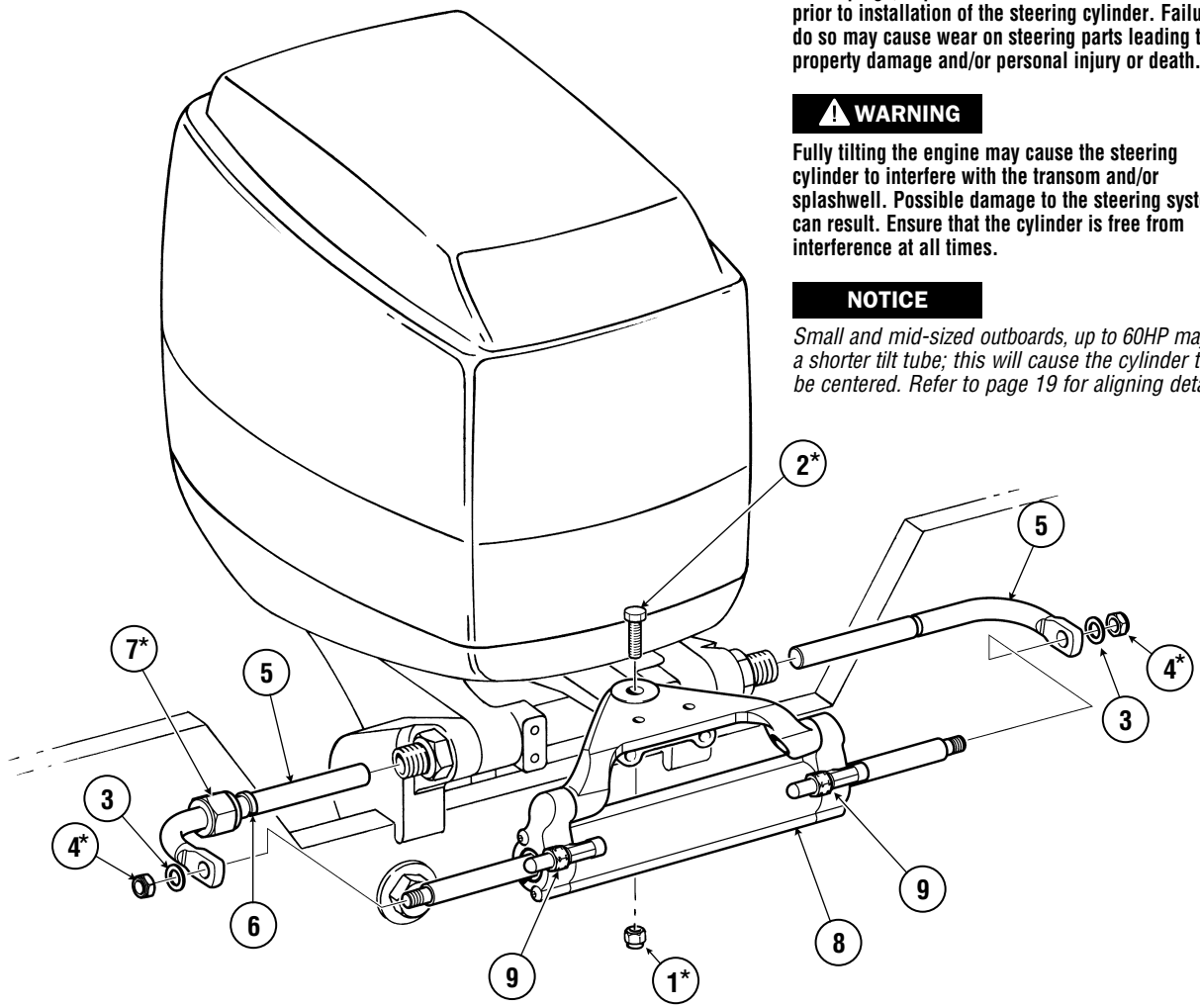
In some cases, engine manufacturers will install plugs, caps and/or screws into the engine tiller arm. These plugs, caps and/or screws MUST be removed prior to installation of the steering cylinder. Failure to do so may cause wear on steering parts leading to property damage and/or personal injury or 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 19 for aligning details.



* *Refer to page 24 for correct torque specifications.*

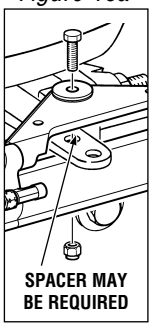
ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket
6	N/A	1	Clip, Support Bracket

ITEM	PART #	QTY	DESCRIPTION
*7	N/A	1	Mount Nut, Support Bracket
8	591000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

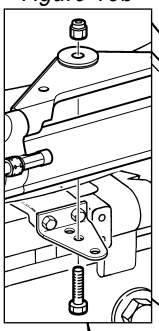
ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
MERCURY/MARINER	1984-TO 1989	75-150 HP	**HC4645H**	(See Fig. 10a)
	1990-TO DATE	75-150 HP	**HC4645H**	
	1998-TO DATE	40-60 HP	**HC4645H**	Cylinder may not be centred when mounted due to short tiller tube (See Fig. 10b)
	2002-TO DATE	90-115HP	**HC4645H**	(See Fig. 10c)
NISSAN	1990-TO DATE	120-140 HP	**HC4645H**	
TOHATSU	1990-TO DATE	120-140 HP	**HC4645H**	

Figure 10a



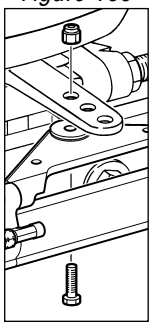
Mercury/Mariner
1984 to 1989

Figure 10b



Mercury 1998 to
Date 40 to 60HP

Figure 10c



Mercury/Mariner
2002 to Date
90 to 115HP

⚠ 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

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 19 for aligning details.

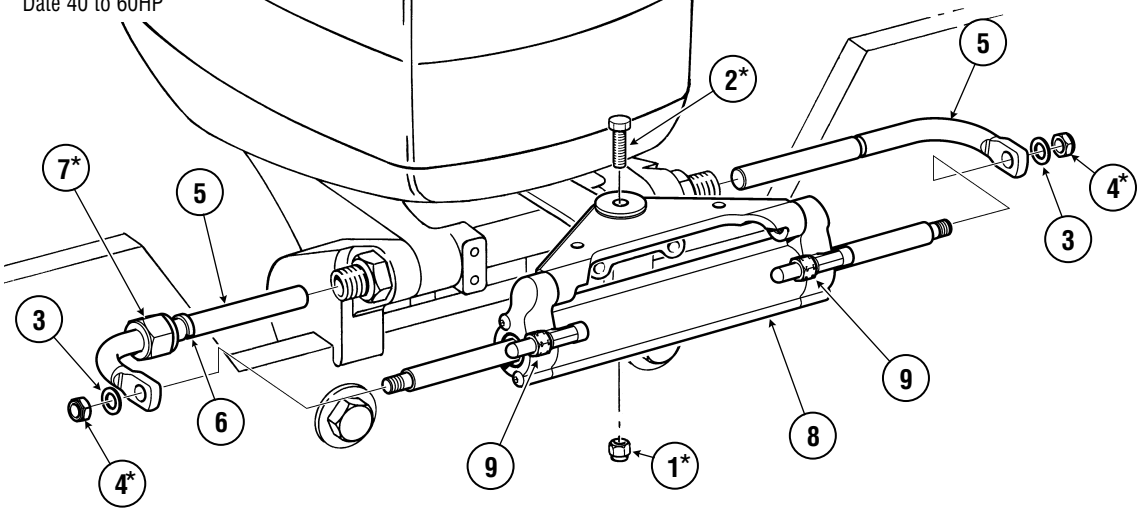


Figure 10

* *Refer to page 24 for correct torque specifications.*

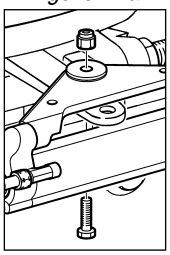
ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket
6	N/A	1	Clip, Support Bracket

ITEM	PART #	QTY	DESCRIPTION
*7	N/A	1	Mount Nut, Support Bracket
8	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

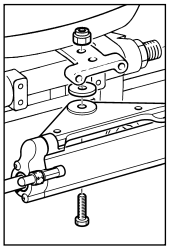
ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
JOHNSON/EVINRUDE	1977 TO 1990	65–150 HP	HC4648H	Refer to Figure 11d
	1991 TO DATE	40–150 HP	**HC4645H**	Refer to Figure 11a
	1997 TO DATE	115 HP FICHT	HC4658H	If using cylinder HC4645H please invert pivot plate (See Page 18). Refer to Figure 11c
	1997 TO DATE	75-150 HP FICHT	**HC4645H**	
	1998 TO DATE	40–140 HP 4 Stroke	HC4658H	Requires Spacer Kit H05090 (See Page 17) If using cylinder HC4645H please invert pivot plate (See Page 18). Refer to Figure 11b

Figure 11a



Johnson/Evinrude
1991 to Date
40-70HP

Figure 11b



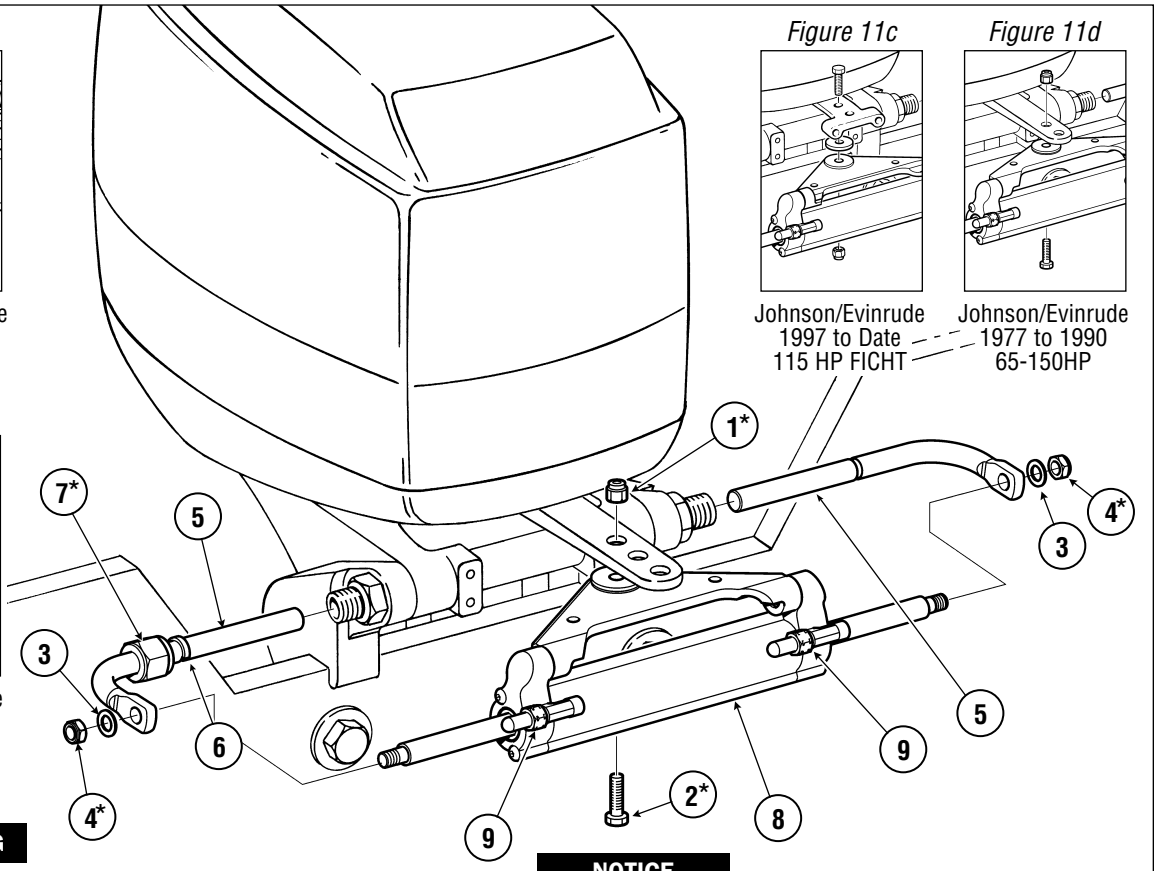
Johnson/Evinrude
1998 to Date
40–140 HP
4-Stroke

Figure 11c

Johnson/Evinrude
1997 to Date
115 HP FICHT

Figure 11d

Johnson/Evinrude
1977 to 1990
65-150HP



⚠ 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

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 19 for aligning details.

Figure 11

* *Refer to page 24 for correct torque specifications.*

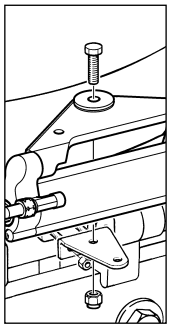
ITEM	PART #	QTY	DESCRIPTION
*1	113529	1	Nut, 3/8" NF Nylok® SS
*2	113222	1	HHCS 3/8" NF x 1-1/4" SS
3	731625	2	Washer Flat, 7/16" SS
*4	731720	2	7/16" NF Nylok® SS
5	590040	2	Support Bracket

ITEM	PART #	QTY	DESCRIPTION
6	N/A	1	Clip, Support Bracket
*7	N/A	1	Mount Nut, Support Bracket
8	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

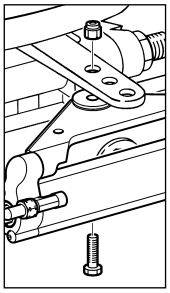
ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
YAMAHA	1998 TO DATE	40–50 HP	**HC4645H**	Engine clamp brackets must be modified (cut or ground) and the engine through bolted onto transom or interference will occur restricting engine trim and tilt. (See Fig. 12a).
	1998 TO DATE	60 HP	**HC4645H**	Steering Hook Yamaha Part no. 63D-48511-00-4D must be installed and (See Fig. 12a).
	1990 TO DATE	70–90 HP	**HC4645H**	Requires Spacer Kit HO5090 (See Page 17).
	1986 TO DATE	100–150 HP 2 Stroke	**HC4645H**	
	1997 TO DATE	75–150 HP 4 Stroke	**HC4645H**	
	2003 TO DATE	40–60 HP 4 Stroke	HC4648H	Requires Spacer Kit H05090 (See Page 17)

Figure 12a



Yamaha 1998 To Date
40–60 HP
Yamaha 1997 To Date
80–100HP, 4 Stroke

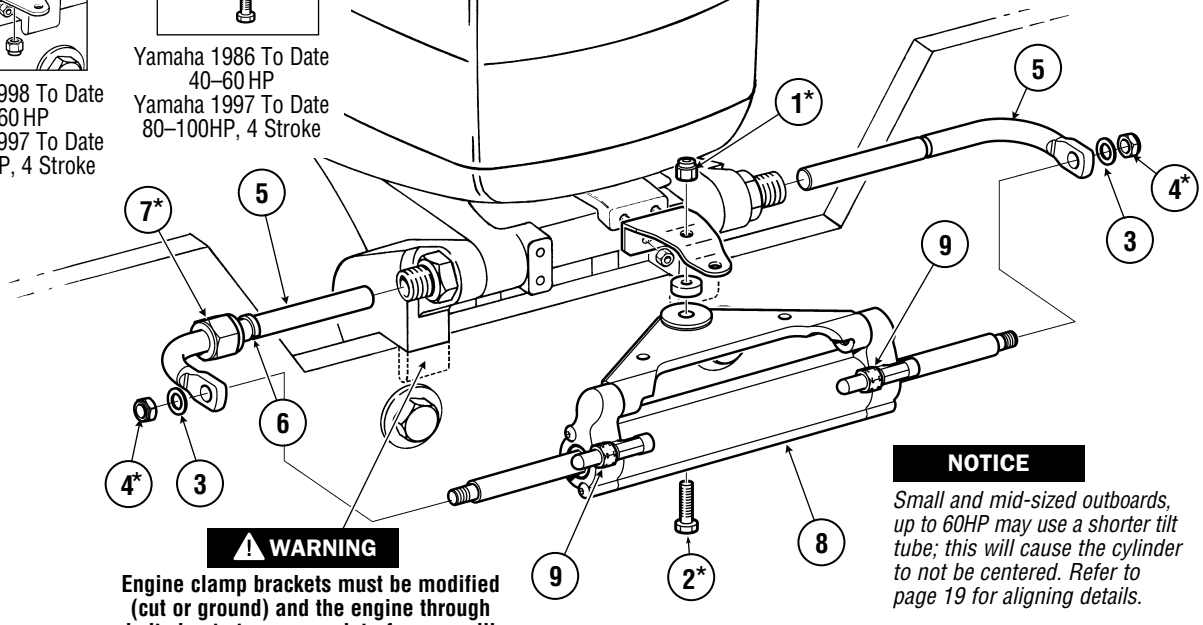
Figure 12b



Yamaha 1986 To Date
40–60 HP
Yamaha 1997 To Date
80–100HP, 4 Stroke

⚠ 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

Engine clamp brackets must be modified (cut or ground) and the engine through bolted onto transom or interference will occur restricting engine trim & tilt.

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 19 for aligning details.

Figure 12

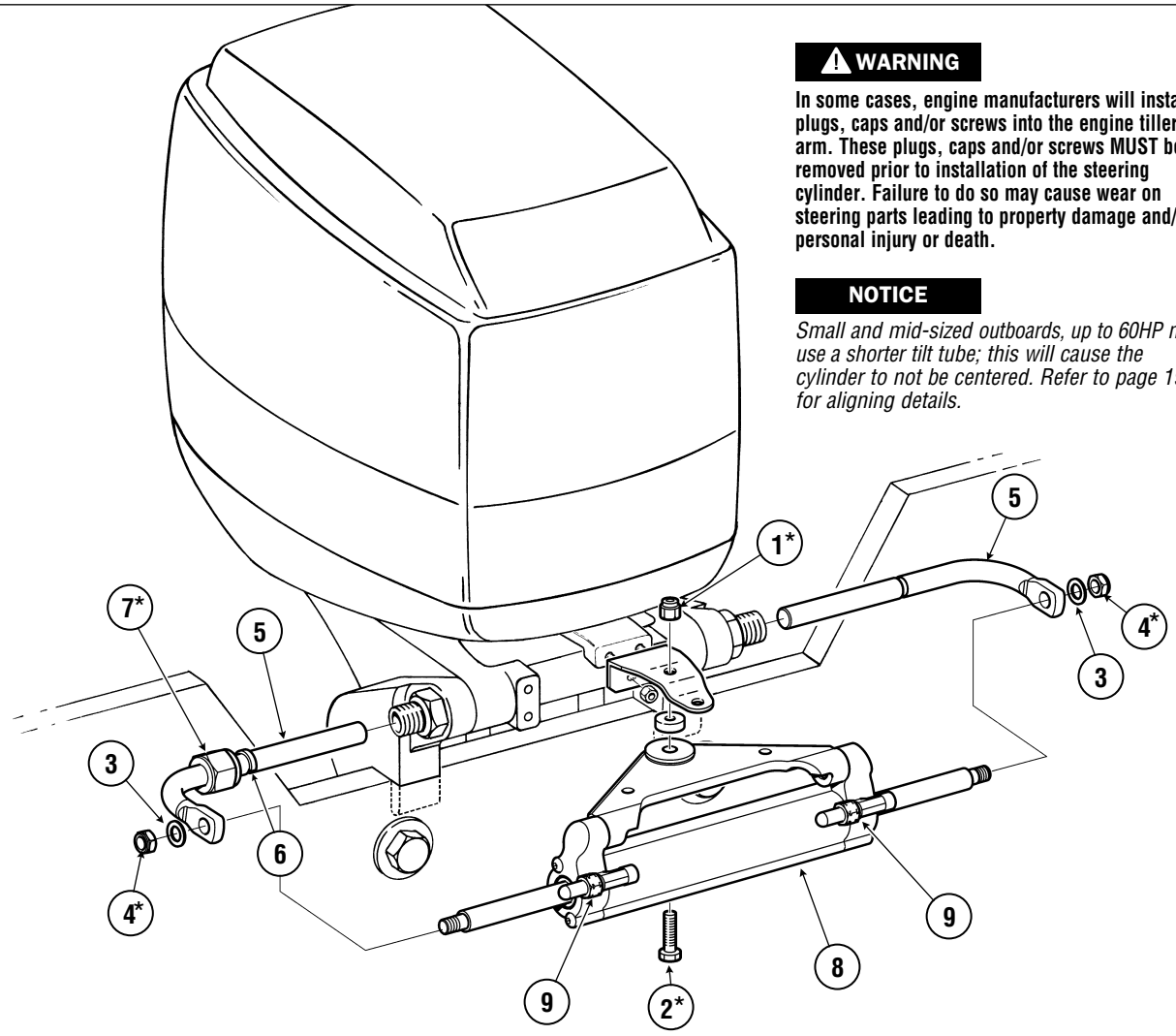
** Refer to page 24 for correct torque specifications.*

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 HO5090 used then:		
	198461	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
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	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 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 HO5090 (See Page 17).



⚠ 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

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 19 for aligning details.

Figure 13

* *Refer to page 24 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
	If spacer kit HO5090 used then:		
	198461	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
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	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

⚠ WARNING **Refer to page 24 for correct torque specifications of all installation hardware.**

ENGINE MANUFACTURER	YEAR	MODEL	CYLINDER	NOTE
SUZUKI	1986 TO DATE	150 HP	**HC4645H**	(See Fig. 14c)
	1996 ONLY	115–140 HP	See Note	Consult Factory
	1987 TO 2002	115–140 HP	**HC4645H**	Requires Spacer Kit HO5090 (See Figs. 14a & 14b)
	1990 TO 2000	90–100 HP	**HC4645H**	
	1998 TO DATE	40–70 HP 4 Stroke	**HC4645H**	Requires Spacer Kit HO5090 (See Page 17).
	2001 TO DATE	115–140 HP 4 Stroke	HC4658H	Requires Spacer Kit HO5090 (See Page 17). If using cylinder HC4645H please invert pivot plate (See Page 18). (Refer to Fig. 14d).

Figure 14

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 19 for aligning details.

† *For ALL Suzuki 40-140 HP 4 stroke use tiller bolt supplied in spacer kit HO5090.*

* *Refer to page 24 for correct torque specifications.*

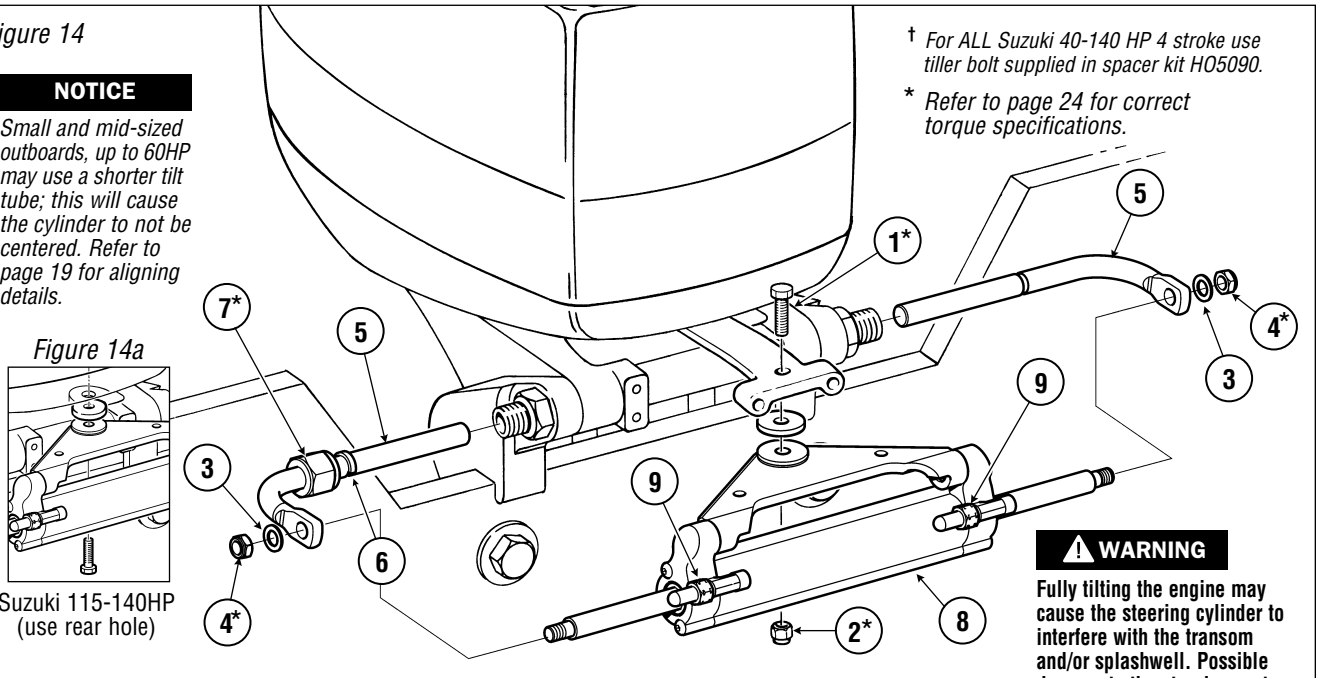


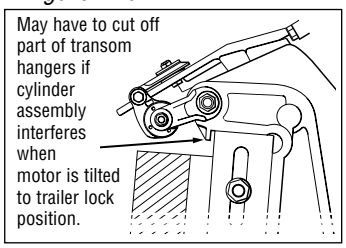
Figure 14a

Suzuki 115-140HP
(use rear hole)

⚠ WARNING

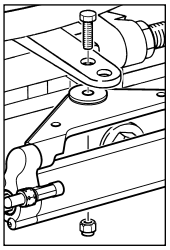
Fully tilting the engine may cause the steering cylinder to interfere with the transom and/or splashwell. Possible damage to the steering system can result. Ensure that the cylinder is free from interference at all times.

Figure 14b



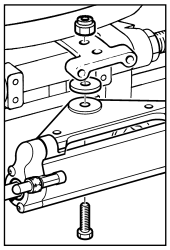
Suzuki 115/140 to 1998

Figure 14c



Suzuki 1986 to Date
150HP

Figure 14d



Suzuki 2001 to Date
115-140 HP 4 Stroke

⚠ 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 HO5090 used then:		
	198461	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	590000H	1	Cylinder Assembly
9	HF4202	1	Bleed Fitting Kit, 2 fittings per kit

HO5090 SPACER KIT

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

JOHNSON/EVINRUDE,	1998 to DATE	40–140 HP 4 Stroke	**Fig. 15**
SUZUKI	2001 to DATE	115–140 HP 4 Stroke	

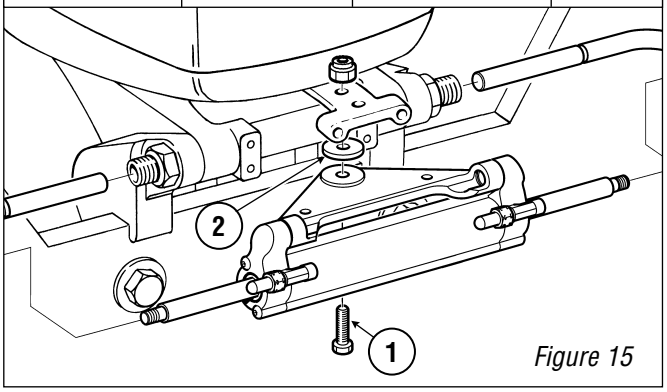


Figure 15

SUZUKI	1998 to DATE	115-140 HP	**Fig. 17**

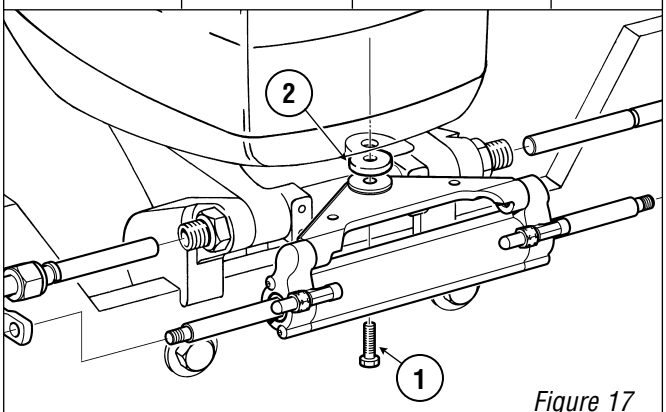


Figure 17

SUZUKI	1998 to DATE	40 & 70 HP 4 Stroke	**Fig. 16**

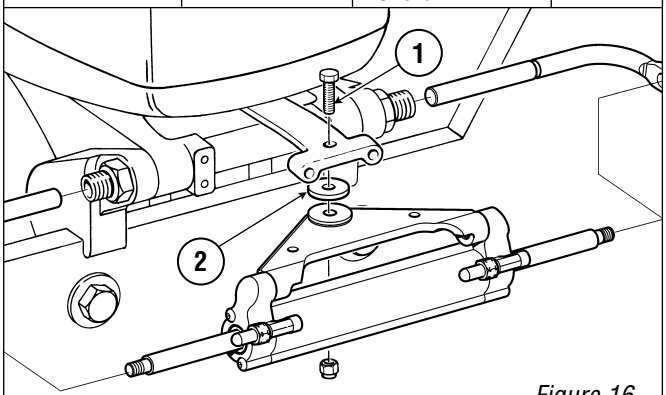


Figure 16

YAMAHA	1990 to DATE 2003 to DATE	70–90 HP 40–60 HP 4 Stroke	**Fig. 18**
YANMAR	1990 to DATE	27–36 HP	**Fig. 18**

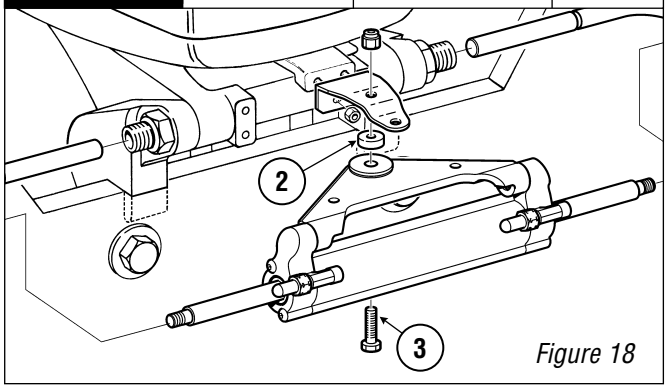


Figure 18

⚠ 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 24 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

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.

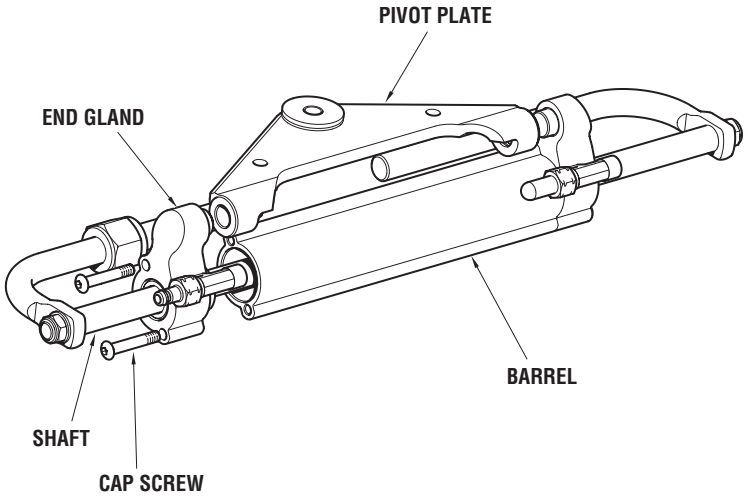
⚠ CAUTION

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 19



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 20.) 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.

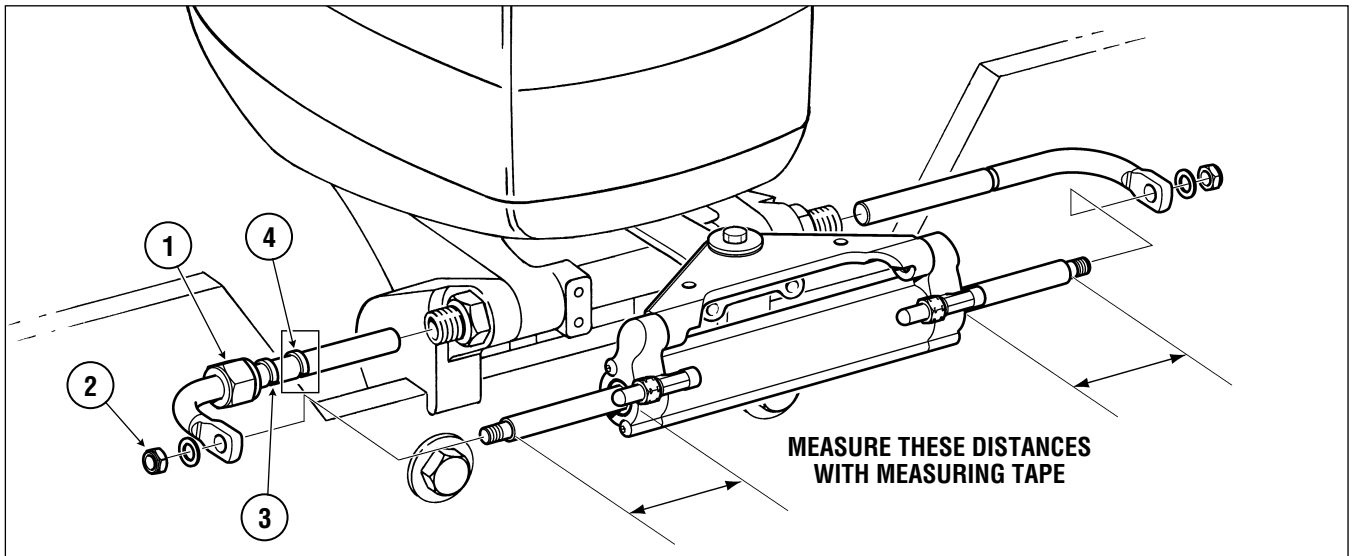


Figure 20

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.seastarsteering.com or contact Teleflex at 604-270-6899.

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

Hydraulic Fluid Requirements

Recommended oils for your BayStar Steering System are; SeaStar/BayStar Marine Steering Fluid, part# HA5430 (1 quart), HA5440 (1 Gallon.)

Texaco HO15	Chevron Aviation Fluid A
Aero Shell Fluid #41	Mobil Aero HFA
Esso Univis N15	Fluids meeting Mil H5606 specifications.

Automatic transmission fluid Dexron ll may be used in an emergency.

In case of emergency any non-toxic, non-flammable fluid may provide temporary steering. Steering system should be fully serviced after such usage. Please contact manufacturer.

⚠ WARNING

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

NOTICE

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

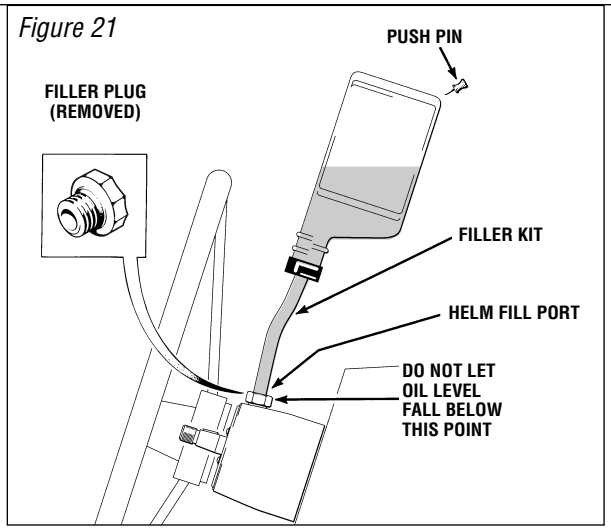
NOTICE

"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 oil can be done faster if oil is poured into the helm prior to connecting filler tube and oil bottle to the helm. Part #HA5438.

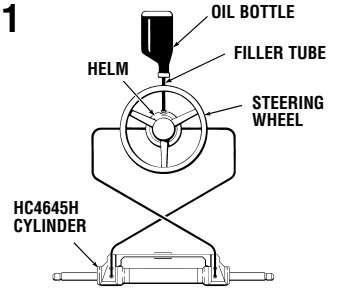
Figure 21



NOTICE

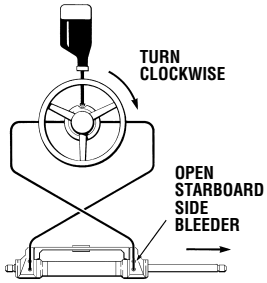
Help protect your boating environment by ensuring that all used oil is disposed of properly.

Step 1



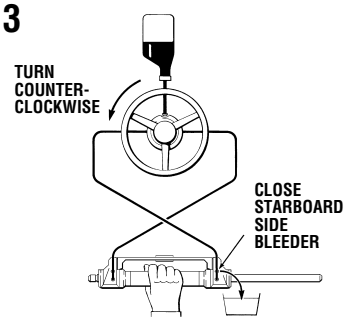
- Screw the threaded end of the filler tube into the helm filler port.
- Remove the cap from the oil bottle and holding upright screw into the filler tube bottle cap. Poke hole in the bottom of the bottle.
- Fill the helm pump with hydraulic oil so that it is visible in the filler tube. Oil should always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

Step 2



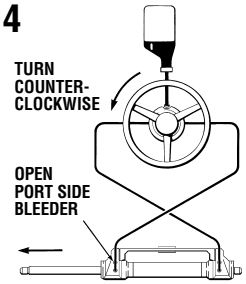
- Turn the steering wheel counter clockwise until the cylinder rod is fully extended.
- Open starboard side fitting.

Step 3



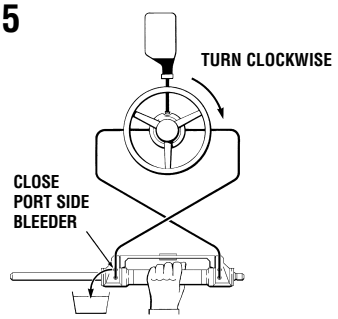
- Hold the cylinder body to prevent the rod from moving and turn the wheel counter-clockwise until a steady stream of air free oil flows from the bleeder nipple.
- While continuing to turn the wheel, close the bleeder fitting.

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 oil flows from the bleeder nipple.
- While continuing to turn the wheel, close the port side bleeder fitting.

System Air Test

⚠ WARNING

DO NOT use SeaStar Power Purge SR. with the BayStar Steering system unless pressure gauge kit# HA5443 has been installed. Failure to do so may result in damage to the steering system.

Attach the fill tube (part number HA5438 page 20) to the fill port of your BayStar Helm Pump.

Fill the HA5438 tube approximately 1/2 with Steering fluid.

Jog the steering wheel back and forth quickly approximately 1/2 turn in each direction while observing the level of fluid movement in the fill tube.

If the fluid level in the filler tube remains constant, all air has been removed from the system. If the fluid level in the tube jumps more than 2 inches, further bleeding is required.

When BayStar steering system has been properly purged/bled the steering wheel will turn approximately 4.5 times stop to stop.

OIL LEVEL AND SYSTEM CHECK

⚠ CAUTION

⚠ WARNING

DO NOT USE NON-VENTED FILL PLUG/CAP.

⚠ CAUTION

Single and twin outboard engines MUST be tested to ensure no interference occurs between the cylinder, the steerable devices, tiebars, transom, engine lift plates, splashwell or other surfaces with engine(s) at any and all combinations of hard over to hard over, highest and lowest tilt positions and engine lift plates highest and lowest adjustment. This is done by taking the system through 2 full cycles from hard over to hard over.

⚠ CAUTION

Failure to check for interference may result in cylinder, splashwell and/or engine damage.

Check oil level prior to leaving dock or turning wheel.

For helms mounted horizontally, or up to 10° from the horizontal, oil must be filled to the bottom of the fill port. DO NOT allow the oil level to drop more than 1/4" (6.3mm).

For helms mounted between 10° and 70° from the horizontal, oil should be maintained at between 1/8" (3.2mm) and 1/2" (12.5mm) from the bottom of the fill port.

Over filling may NOT allow sufficient air volume in the reservoir and may cause weeping from the vent plug.

Under filling may result in air being drawn into the lines causing poor performance and/or **loss of steering causing property damage, personal injury or death**.

At this time the steering system must be checked for proper connections of tube and fittings, possible leaks, and air removal. To do so, turn the steering wheel in one direction (port or starboard) to the engine stop position and pressurize the system by forcing the wheel beyond the engine stop position. You will not harm any component of the system by doing this. While maintaining pressure on the steering wheel, check all the fittings and tube connections for a minimum of 60 seconds for leaks. Repeat by turning the steering wheel in the opposite direction. If there is no sign of fluid loss your steering system is ready for use.

If interference occurs during engine tilt or trim between steering cylinder and splashwell or jackplate, contact your engine manufacturer for trim restrictors or a Tilt Stop Switch.

MAINTENANCE

⚠ WARNING

Failure to comply with maintenance checks may result in loss of steering, causing property damage, personal injury or death.

Maintenance requirements will vary depending on usage. Bi-annual inspection by a qualified Marine Mechanic is required.

Remove, clean and grease the support rod annually with quality marine grease.

Check the steering fluid level in the helm, it should be maintained at no less than 1/2" and no more than 1/8" below the bottom of the filler cap threads. Be careful not to overfill (Refer to Oil Level System Check on page 22).

All tubing showing signs of wear MUST be replaced. Eliminate the cause of wear or re-route tubing.

Check fittings & seal locations for leaks/damage and service as necessary.

LUBRICATING INSTRUCTIONS

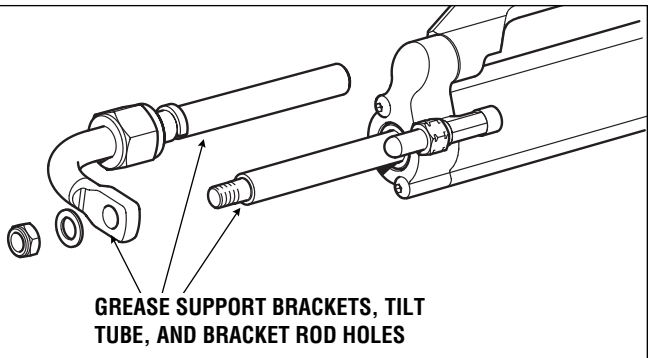


Figure 24, HC4645H/47H/48H/58H

⚠ CAUTION

Grease tilt tube, guide tube and offset link holes once a year or every 100 hours whichever comes first.

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.*

TROUBLE SHOOTING GUIDE

Maximum 150HP (Total)

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

BayStar hydraulic steering will provide years of safe reliable performance with a minimum of service if properly installed with correct cylinder.

BayStar steering systems have been designed with protection against over-pressure situations by a pressure relief valve.

Most faults occur when the installation instructions are not followed and usually show up immediately upon filling the system. Below are the most common faults, their likely cause and solution.

Sometimes when returning the wheel from a hardover position, a slight resistance may be felt and a clicking sound heard. This should not be mistaken as a fault, as it is a normal situation caused by the release of the lockspool.

⚠ 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.	Mount cylinder correctly, according to cylinder installation instructions. Ports should always be kept in uppermost position.
	Air in system.	Review filling instructions.
	Bleed fitting leaking.	Tighten bleed fitting.
	Coiled BayStar tube.	Uncoil or straighten the BayStar tube.
3. Steering is stiff and hard to turn, even when the vessel is not moving.	Restrictions in tube.	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.
	Air in oil.	See filling and purging instructions.
	Wrong Oil, like ATF has been sued to fill the system.	Drain system and fill with Baystar fluid.

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.	Dismantle check valves and remove contaminant.
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.	Adjust tab(s).
	Air pocket in system.	Check oil level, perform air test as instructed on page 22, fill and purge system as instructed on page 20.
	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.	Remove check valve plugs. These are the larger SLOTTED plugs on either side on rear of helm. Clean ball seats and balls and re-assemble. **Note:** Be prepared to lose a certain amount of oil during this procedure. Have a small can available. Refill and purge system when check valves have been re-assembled.
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 18 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 19 for details.

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.

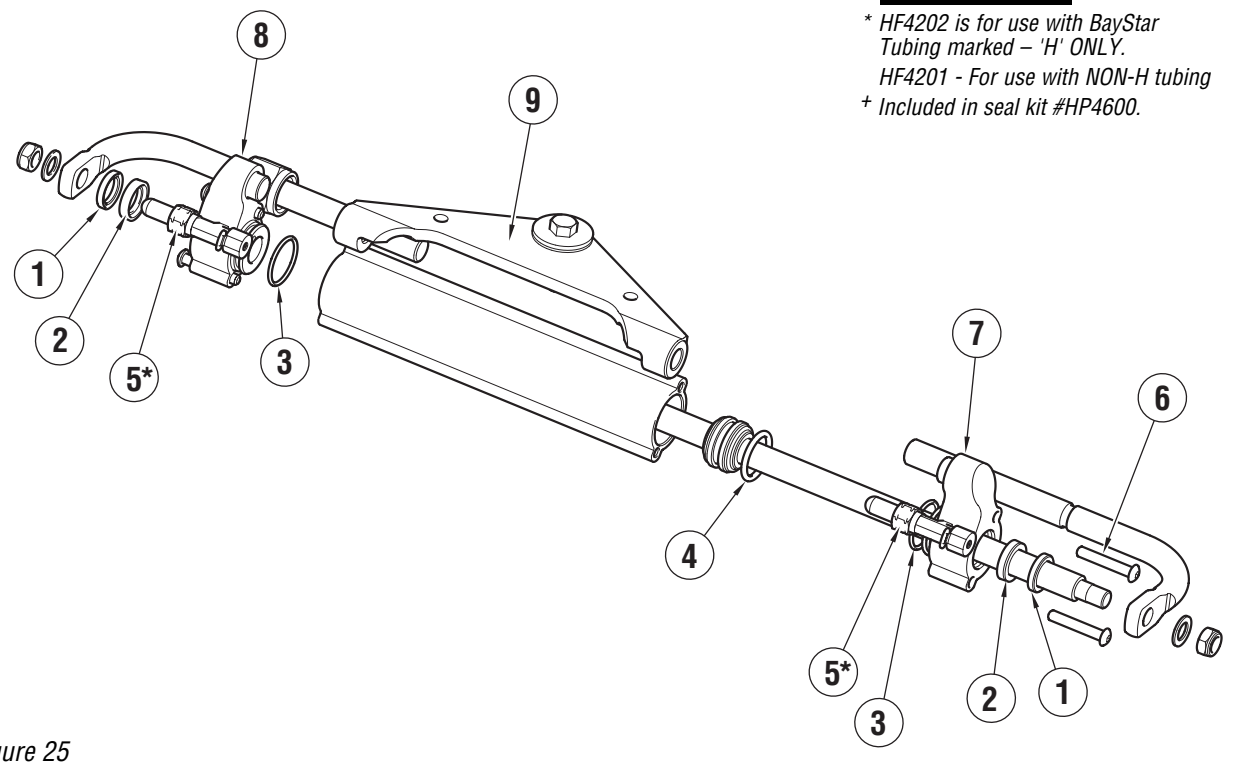


Figure 25

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 plat. See page 28 for your specific cylinder part number.

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 9 before cylinder removal.

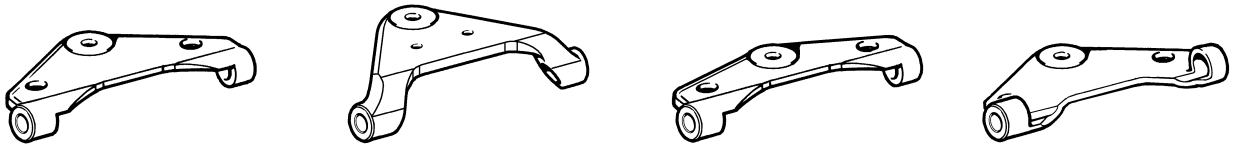
Step 1
Remove the two cap screws from one end of the steering cylinder using the 5/32" Allen head wrench, or socket.

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 26



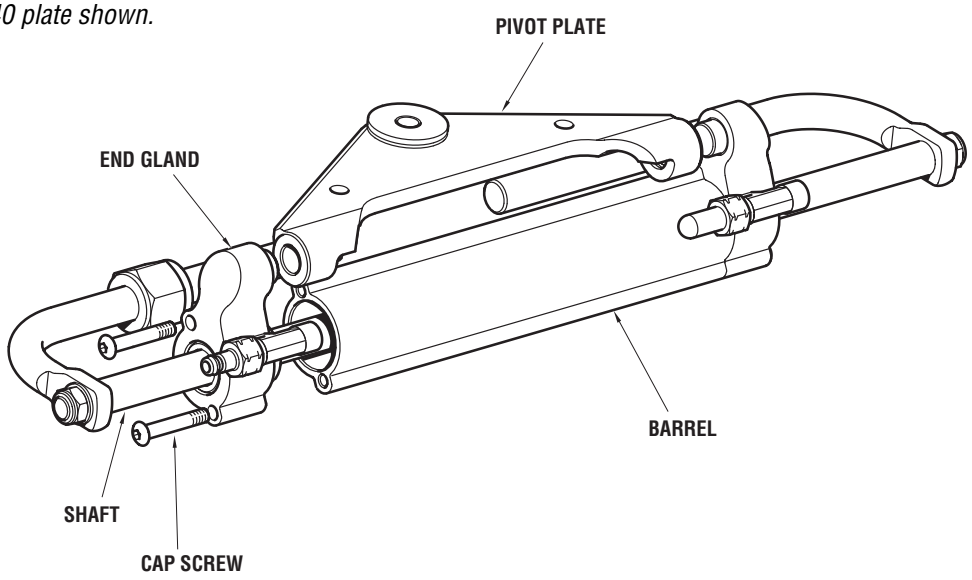
HA4640
Use with cylinder HC4645H

HA4641
Use with cylinder HC4647H

HA4642
Use with cylinder HC4648H

HA4643
Use with cylinder HC4658H

Figure 27, HA4640 plate shown.



Statement of Limited Warranty

We warrant to the original retail purchaser that **Teleflex Canada Limited Partnership** 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 **Teleflex Canada Limited Partnership** 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 **Teleflex Canada Limited Partnership** 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 **Teleflex Canada Limited Partnership** products found to be defective and covered by this warranty, will be replaced at **Teleflex's** option, and returned to the customer.

The above quoted statement is an extract from the complete **Teleflex Canada Limited Partnership** products warranty statement. A complete warranty policy is available in our **Teleflex Canada Limited Partnership** products catalogue.

NOTICE

Maximum 150HP (Total).

Return Goods Procedure

Prior to returning product to **Teleflex Canada Limited Partnership** 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 # ?
Teleflex Canada
c/o Panalpina
#8 – 14th Street
Blaine, WA 98230

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

Teleflex®
HYDRAULIC

TELEFLEX CANADA
3831 NO.6 ROAD
RICHMOND, B.C.
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