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INSTALLATION INSTRUCTIONS

AND OWNER'S MANUAL

www.seastarsolutions.com



SEASTAR™

Hydraulic Steering for Outboard
Powered Vessels

Front Mount Tournament Cylinder HC6845



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

To the Installer and End User (Owner)

Thank you for choosing SeaStar 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.

NOTICE

Marine Canada Acquisition Inc. DBA SEASTAR SOLUTIONS is referred to as SeaStar Solutions throughout this publication.

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.

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1.0 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, oil 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

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 Oil Level and System Check as outlined on page 32 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 use. 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 32 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 PDF.
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 Maintenance, page 33 of this manual.

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

Safety Information Continued

⚠ WARNING

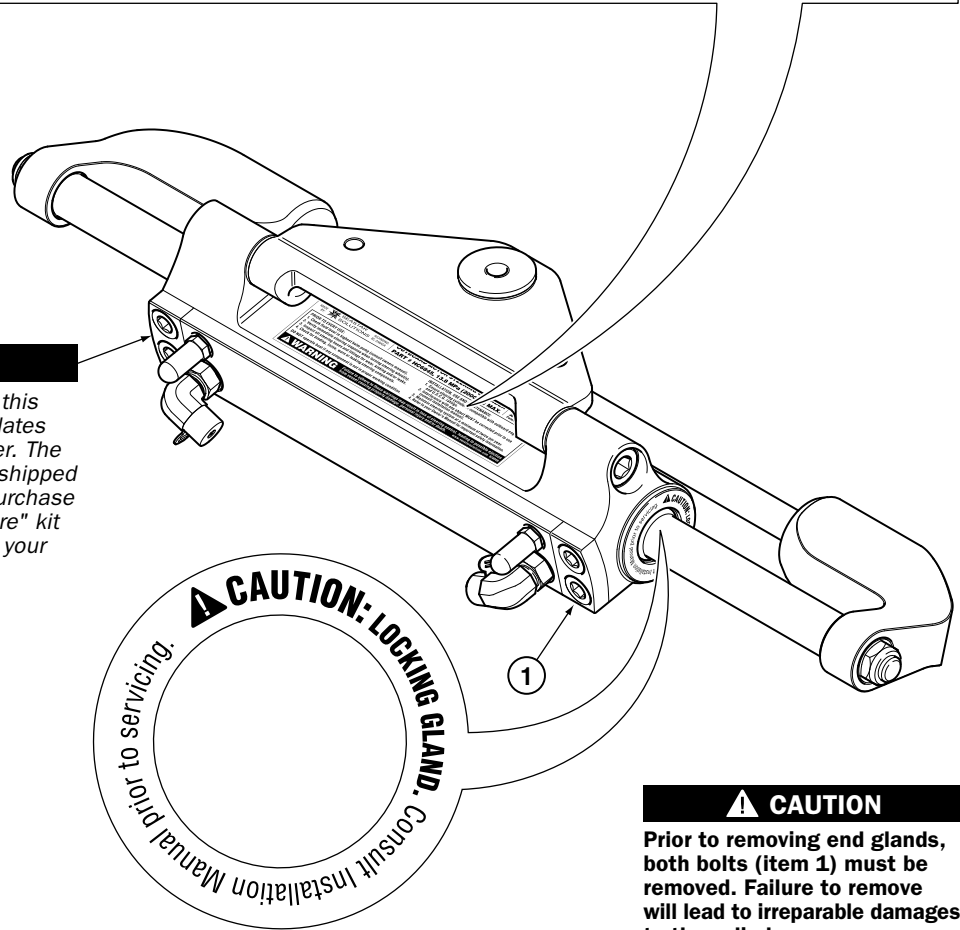
The safety information provided below is intended to inform you of the warning information on your products. Contact SeaStar Solutions if labels are missing.

Important Labels

<p>MADE BY: SEASTAR SOLUTIONS</p>	<p>RICHMOND, BC, CANADA</p>	<p>OUTBOARD MOTOR STEERING CYLINDER PART # HC6845, 13.8 MPa (2000psi) MAX.</p>	<p>ISO10592 ABYC Patent No. 8430702</p>
<p>PRIOR TO EVERY USE:</p> <ol style="list-style-type: none"> 1. Check fluid level in highest helm pump (consult owners manual). 2. Verify immediate steering response when turning steering wheel(s). 3. Inspect all steering hoses and fittings for wear, kinking and/or leaks. 4. Check for binding, loose, worn or leaking steering components. <p>DO NOT operate boat if any component is not in proper working condition.</p>		<p>INSTALLATION, USE AND MAINTENANCE:</p> <ol style="list-style-type: none"> 1. Ensure steering cylinder is compatible with outboard engine and U.S.C.G. ratings. 2. Interference with any object MUST be corrected prior to use (consult installation manual). 3. Maintain steering system at a minimum of twice per year. 4. Refer to your Owner's Manual for important safety information. 	
<p>⚠ WARNING Failure to adhere to these warnings may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal injury and/or death. www.seastarsolutions.com 828066</p>			

NOTICE

Many figures throughout this manual show blanking plates installed onto the cylinder. The steering cylinder is NOT shipped with these plates. The purchase of an additional "hardware" kit is required regardless of your application.



⚠ CAUTION

Prior to removing end glands, both bolts (item 1) must be removed. Failure to remove will lead to irreparable damages to the cylinder.

Figure 1.

2.0 INTRODUCTION

2.1 Important Information/Technical Support Contact

To assist with the installation and maintenance of this steering system, SeaStar Solutions recommends that;

- You read and understand ALL installation manuals before you start the installation process (cylinders, helms, power assist, etc.). Knowing the correct order of installation and location of components will drastically reduce installation time as well as inform you of common installation errors.
- Read and understand ALL Safety Information that is noted in this manual and ALL other Installation Manuals.

If you run into any problems before, during or after the installation of the steering system, please contact Technical Support for assistance.

Technical Support

Web: www.seastarsolutions.com

Email: seastar@seastarsolutions.com

Phone: 604.248.3858

Fax: 604.279.2202

2.2 Parts List

Before proceeding, confirm that you have all the necessary components required to complete the installation of the steering system.

- Helm Pump(s).
- Power Assist and Autopilot Pumps (if applicable).
- Steering Hoses.
- Steering Cylinder(s).
- Tiebar(s).
- Hardware Kits.
- Appropriate Fittings.

- Fluid.

NOTE: SeaStar Solutions recommends the use of SeaStar Steering Fluid ONLY.

- Steering Wheel(s).

2.3 Tools Required

The following tools are required to complete this installation. Having tools on site and ready will decrease installation time drastically.

NOTICE

These tools are 'in addition' to the tools required to mount your helm pump and steering hoses.

- 9/16", 1/2", 5/8" and 3/4" Open end or box type wrench
- Torque wrench
- 5/32", 5/16", 3/8", 3/16", 7/16" Allen Key/Wrench
- 5/8", 3/4" Socket
- 9/16" Long Socket and socket extension
- Good quality marine grease

2.4 Tournament Series Application Guide, all engine makes – 200+ HP

CONFIGURATION	CYLINDER		HARDWARE KIT		TIEBAR				NOTES
	PART#	QTY	PART#	QTY	ENGINE CENTER DISTANCE (IN)	ENGINE CENTER DISTANCE (mm)	PART#	QTY	
SINGLE ENGINE – SINGLE CYLINDER	HC6845	1	HA6801	1	N/A	N/A	N/A	N/A	1
TWIN ENGINE – SINGLE CYLINDER (Starboard)	HC6845	1	HA6802	1	25.0" – 25.6" 25.7" – 30.6" 30.7" – 39.4" 39.5" - 54.0"	635 mm – 650 mm 653 mm – 777 mm 780 mm – 1001 mm 1003 mm – 1372 mm	H06821 H06822 H06823 H06824	1 1 1 1	1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5
TWIN ENGINE – DUAL CYLINDER	HC6845	2	HA6804	1	25.0" – 26.5" 26.6" – 29.3" 29.4" – 34.2" 34.3" – 43.0" 43.5" – 58.0"	635 mm – 673 mm 676 mm – 744 mm 747 mm – 869 mm 871 mm – 1092 mm 1105 mm – 1473 mm	H06820 H06821 H06822 H06823 H06824	1 1 1 1 1	1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5 1, 3, 4, 5
TRIPLE ENGINE – DUAL CYLINDER	HC6845	2	HA6806	1	25.0" – 27.9" 28.0" – 36.0" 36.0" – 51.0"	635 mm – 709 mm 711 mm – 914 mm 914 mm – 1295 mm	H06822 H06823 H06824	2 2 2	1, 2, 3, 4, 5, 6 1, 2, 3, 4, 5, 6 1, 2, 3, 4, 5, 6
QUAD ENGINE – DUAL CYLINDER	HC6845	2	HA6811	1	Consult SeaStar Solutions Technical Service				1, 2, 3, 4, 5
QUINTUPLER ENGINE (Plus)	Consult SeaStar Solutions Technical Service								1, 2, 3, 4, 5

NOTES

1. Installation may vary according to the following factors: engine mounting height, transom thickness, use of transom savers, tiller bolt location, engine tilt range, and engine size.
2. For center engine drops greater than 3 inches (76mm), please consult SeaStar Solutions Technical Service.
3. Tiebar length may vary depending on toe in/toe out setup. To allow for toe, add or subtract from your nominal engine center to center distance.
4. Based on recommended engine manufacturer minimum center to center distances. Deviating from these recommendations may require stroke limiting cylinders and/or engine tilt limiting, please consult SeaStar Solutions Technical Service.
5. Cylinder's must be plumbed in parallel only, no series connections. Only exception is if cylinders are utilizing a liquid tie bar.
6. Maximum drop: ≤ 3 inches (76mm).

Single Engine – Single Cylinder

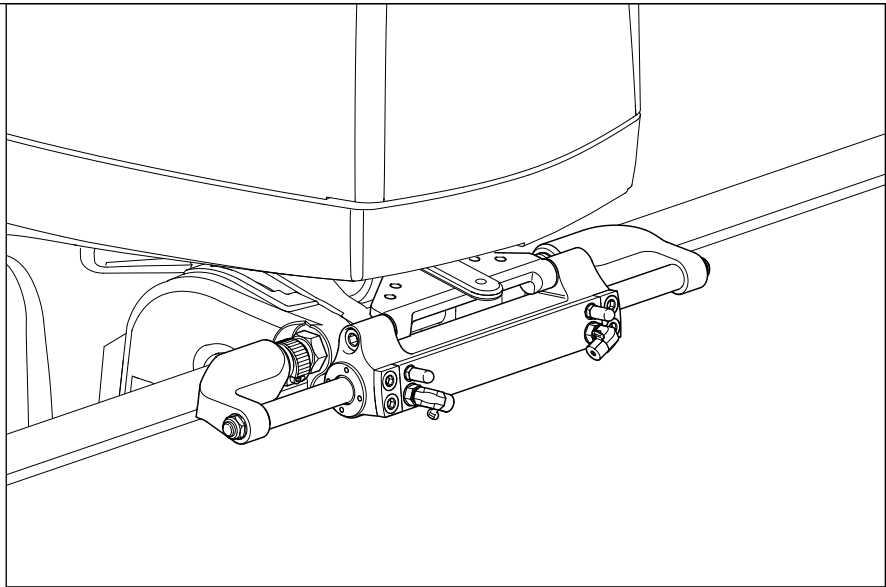
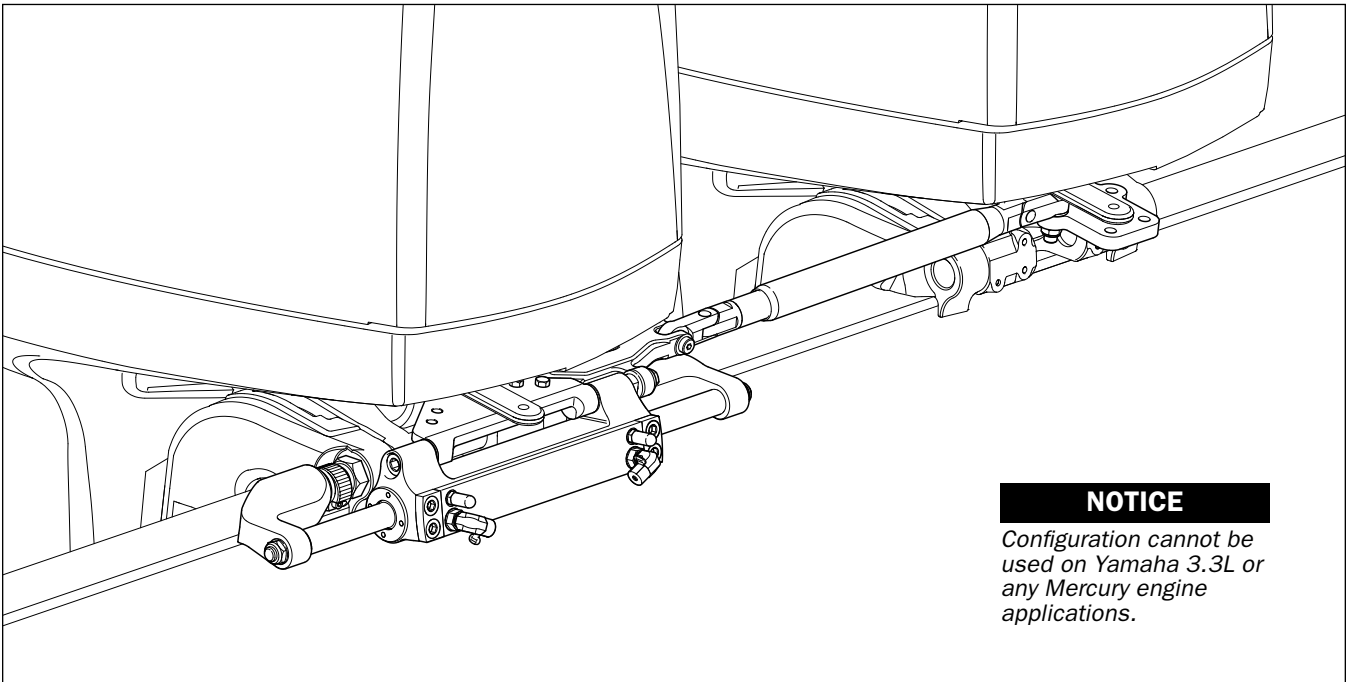


Figure 2.

Twin Engine – Single Cylinder (Starboard)

NOTICE

This application requires installation of the drive bracket "BEFORE" installing the steering cylinder onto the engine. (Refer to page 9.)



NOTICE

Configuration cannot be used on Yamaha 3.3L or any Mercury engine applications.

Figure 3.

Twin Engine – Dual Cylinder

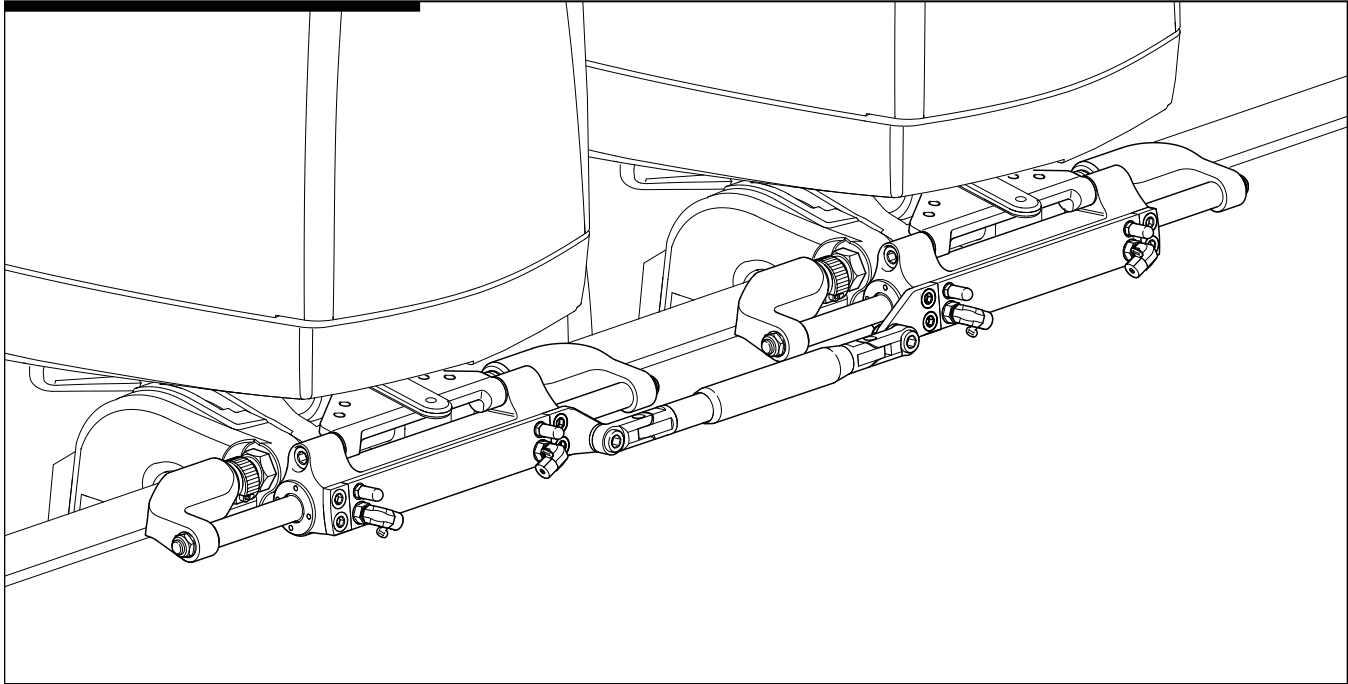


Figure 4.

Triple Engine – Dual Cylinder

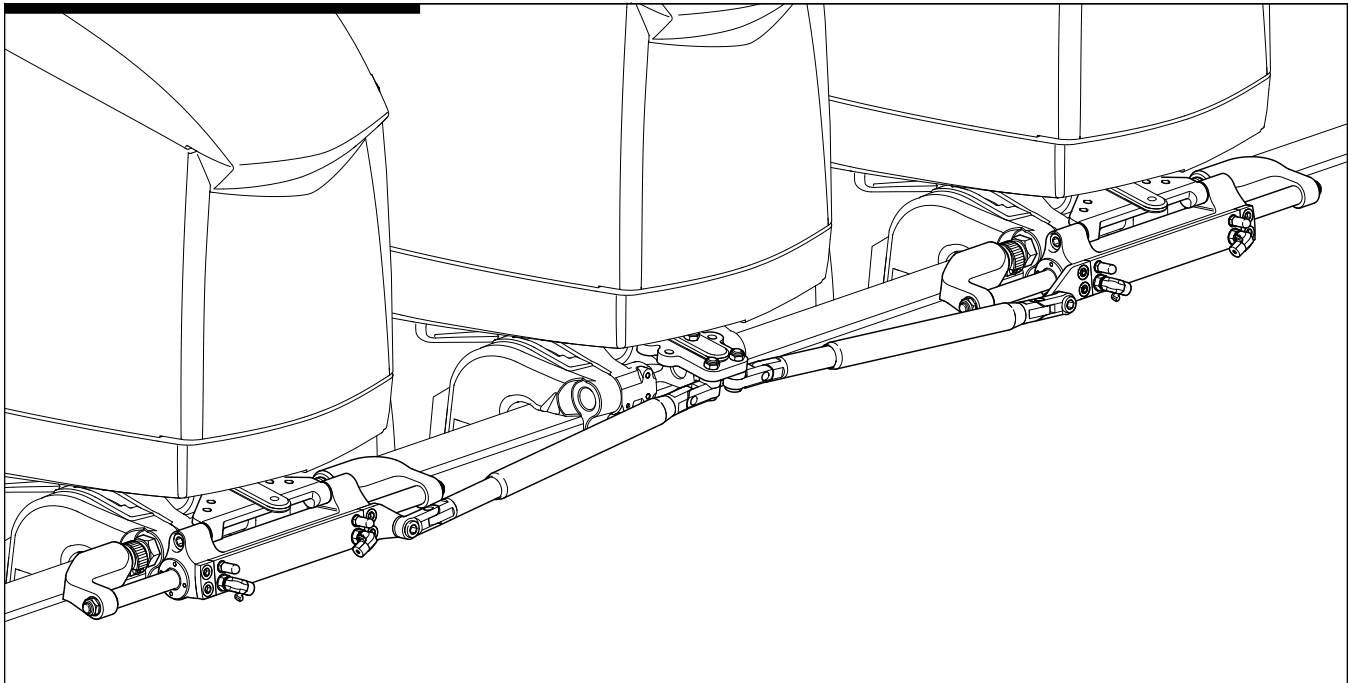
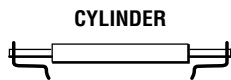


Figure 5.

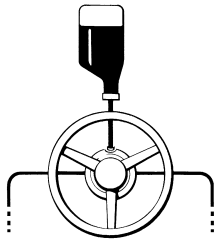
3.0 INSTALLATION

3.1 System Installation Overview



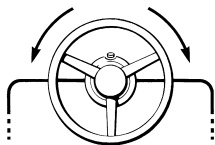
Step 1 – Component Installation

1. If you are running a Twin Engine – Single cylinder, install drive bracket (see page 6) onto steering cylinder (see section 3.2 on page 9 for more information).
2. Install steering cylinder(s) onto engine as per Section 3.3, page 10 of this manual.
3. Install "Bracket(s)" as per Section 3.4, page 14 of this manual.
4. Install "Tiebar(s)" as per Section 3.5, page 18 of this manual.
5. Install Helm pump(s), Power Assist Pumps and/or Autopilot pumps.
6. Install steering hoses as per Section 3.6, page 21 of this manual.



Step 2 – Filling and Purging

1. Refer to page 26 for general filling and oil requirements.
2. Power Purge users refer to Section 3.9.2, page 26 of this manual.
3. Manual purging users refer to Section 3.9.3, page 27 of this manual.



Step 3 – Final System Check/Inspections

1. Refer to Section 3.10, page 32 of this manual for setting oil level in helm pump and performing the 'system pressure test' to ensure steering system is ready for use.
2. Conduct interference inspections as per Section 3.11, page 32 of this manual.

3.2 Drive Bracket Installation

NOTICE

Used only in a Twin Engine – Single Cylinder installation. Cylinder is to be installed onto the starboard engine only. Except with kit # HA6807.

NOTICE

Requires kit # HA6802.

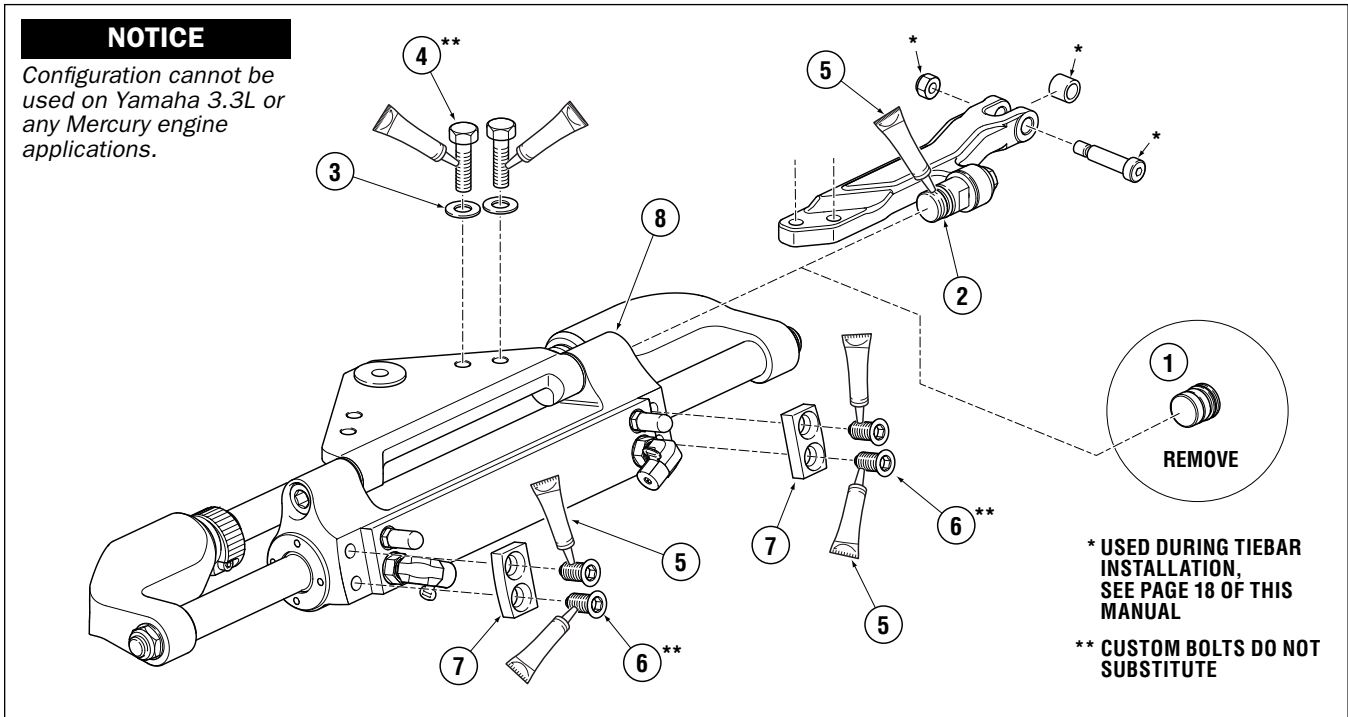


Figure 6. Twin Engine - Single Cylinder.

ITEM	QTY	DESCRIPTION	NOTES
1	1	Cylinder Cap Plug	<i>Ships installed in cylinder</i>
2	1	Drive Bracket Assembly	
3	2	SS Washer	
4	2	Mounting Bolt	<i>Custom bolts, DO NOT substitute</i>
5	1	Loctite® 263	
6	4	Mounting Bolts	<i>Custom bolts, DO NOT substitute</i>
7	2	Blanking Plates	
8	1	Steering Cylinder	

⚠ WARNING

Blanking plates (item 7) **MUST** be installed prior to use.

⚠ WARNING

Thread locker **MUST** be installed onto all four bolts (item 7). Failure to do so may lead to separation of components.

1. Using a 3/8" Allen Socket, remove cap plug (item 1) from cylinder.
2. Apply thread locker to threads of drive bracket assembly (Item 2).
NOTE: Thread locker (item 5) is included with the hardware kit.
3. Thread drive bracket assembly onto cylinder and torque to 30ft-lb.
4. Apply thread locker to the threads of item 4. Install washer and bolts torque to 20ft-lb.
5. Apply thread locker (item 5) to the threads of item 6.
6. Mount blanking pates (item 7) to both sides of the steering cylinder (item 8) as shown in figure 6.
7. Torque bolts (item 6) to 50 ft-lb.

3.3 Cylinder Installation

NOTICE

Refer to page 12 – page 13 for your specific engine.

NOTICE

If used in a saltwater application, install end of ground strap to midsection steering bracket hole (see Figure 7, page 11).

Step 1

Using a good quality marine grease with anti-corrosion additives, liberally lubricate the engine steering/tilt tube and support rod(s) (item 9). Slide lubricated support rod(s) into engine steering/tilt tube.

⚠ WARNING

If engine manufacturer has installed caps, plugs, and/or screws into the tiller arm, these caps, plugs and/or screws MUST be removed prior to installation of the steering cylinder.

Step 2

Lightly grease the tiller bolt (item 2) and thread into the appropriate engine tiller arm hole. Ensure tiller bolt threads completely through the tiller arm hole. Remove bolt.

Step 3

NOTE: Locate the correct orientation of your steering cylinder(s) and tiller nut/bolt as shown in Figures 8 through 9.

1. Lightly grease tiller bolt.
2. Install steering cylinder onto the correct side of the tiller arm.
3. Thread tiller bolt fully into tiller arm and torque to 21ft-lb.
4. While holding tiller bolt with a wrench to prevent loosening, install and torque tiller nut (item 1) to 21ft-lb.

⚠ WARNING

The tiller bolt (item 2) is a custom, high strength tiller bolt. DO NOT substitute with any other bolt. Ensure tiller bolt is properly torqued and does NOT loosen when installing nut (item 1).

Step 4

1. Thread adjusting nut (item 10) **completely** onto steering/tilt tube.
2. Install stainless steel washers (item 11) onto both sides of the support rod (item 9).
3. Install plastic spacers (items 7 and 8) as per your engine details.
4. To assist with the installation grease and install keys (item 14) into support rod (item 9).
5. Grease and secure support brackets (item 12) to the support rod and the cylinder rod.
6. Install washers (items 3 and 4)
7. If using a ground strap, complete install of strap as shown in Figure 7, page 11.
8. Install nuts (item 5 and 6) torque to 50ft-lb.

Step 5

Eliminate free play in the support rod by rotating the adjusting nut "counter-clockwise" until all the slack is removed from support rod hardware. Lock the adjusting nut in place by tightening the hexagon set screw.

Ground Strap Installation

SeaStar Solutions strongly recommends use of a ground strap on any outboard hydraulic steering cylinder with an exposed shaft (such as SeaStar tournament steering cylinders), especially where the vessel will be used in salt water. This ground strap will provide added protection against corrosion caused by stray current.

⚠ CAUTION

Ensure ground strap is routed 'under' the tilt tube. Installation of the strap 'above' the tilt tube may lead to a hang up, or restriction.

1. Attach end terminal to the starboard side lower midsection steering bracket hole (wire facing downwards) using correct fasteners. Torque to 94 in-lb.
2. Route ground strap UNDER the tilt tube. Install ground strap large end terminal to cylinder as per Figure 7.
3. Install cylinder shaft nut and torque to 50ft.lb.
4. Attach small middle terminal to unused hole in rear of cylinder support bracket. Orient terminal as shown in Figure 7. Torque to 45 in-lb.
5. Ensure there is enough slack in the strap to allow the engine to pivot freely in ALL trim/tilt positions and throughout the entire steering range of the engine.

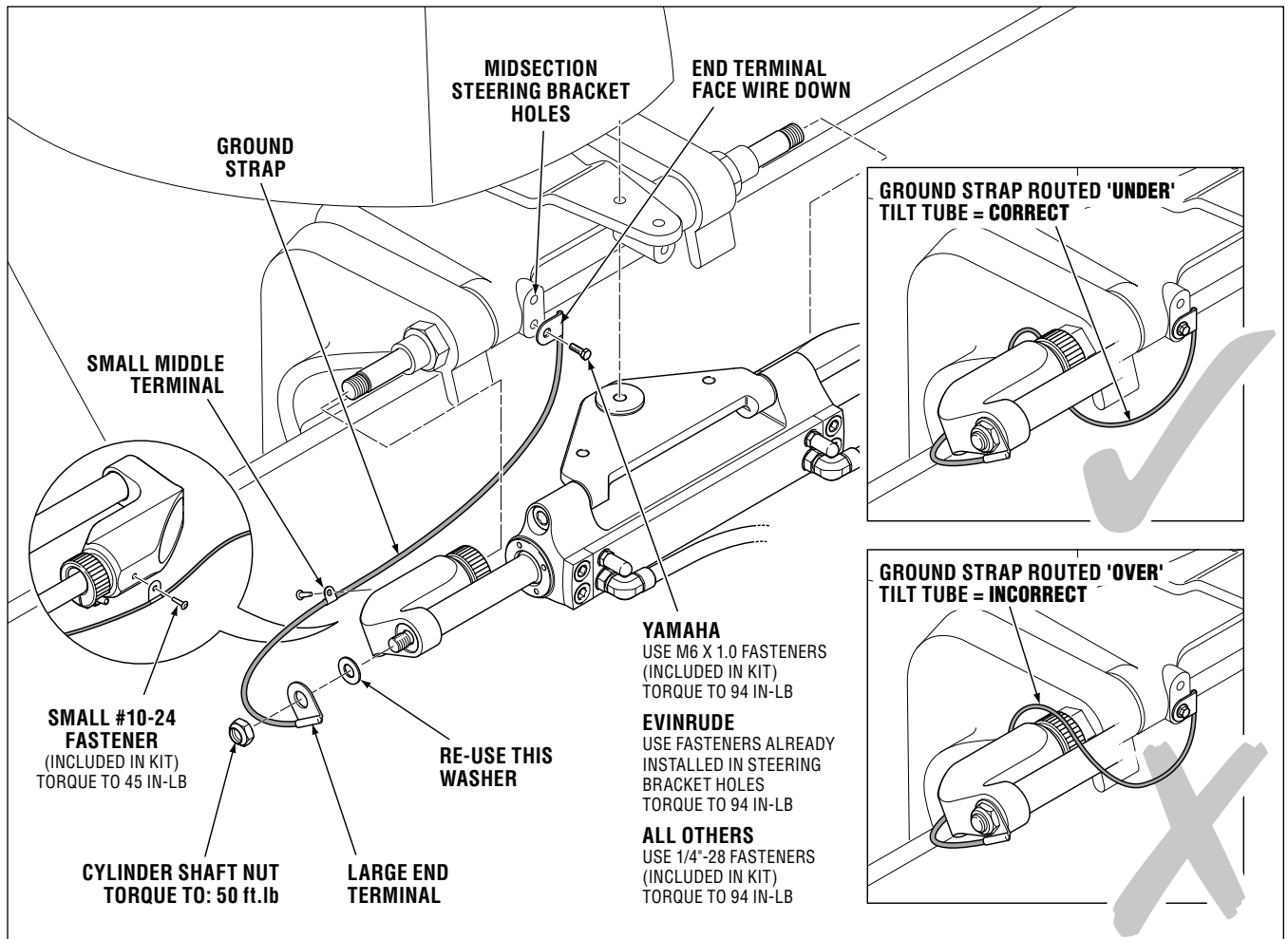
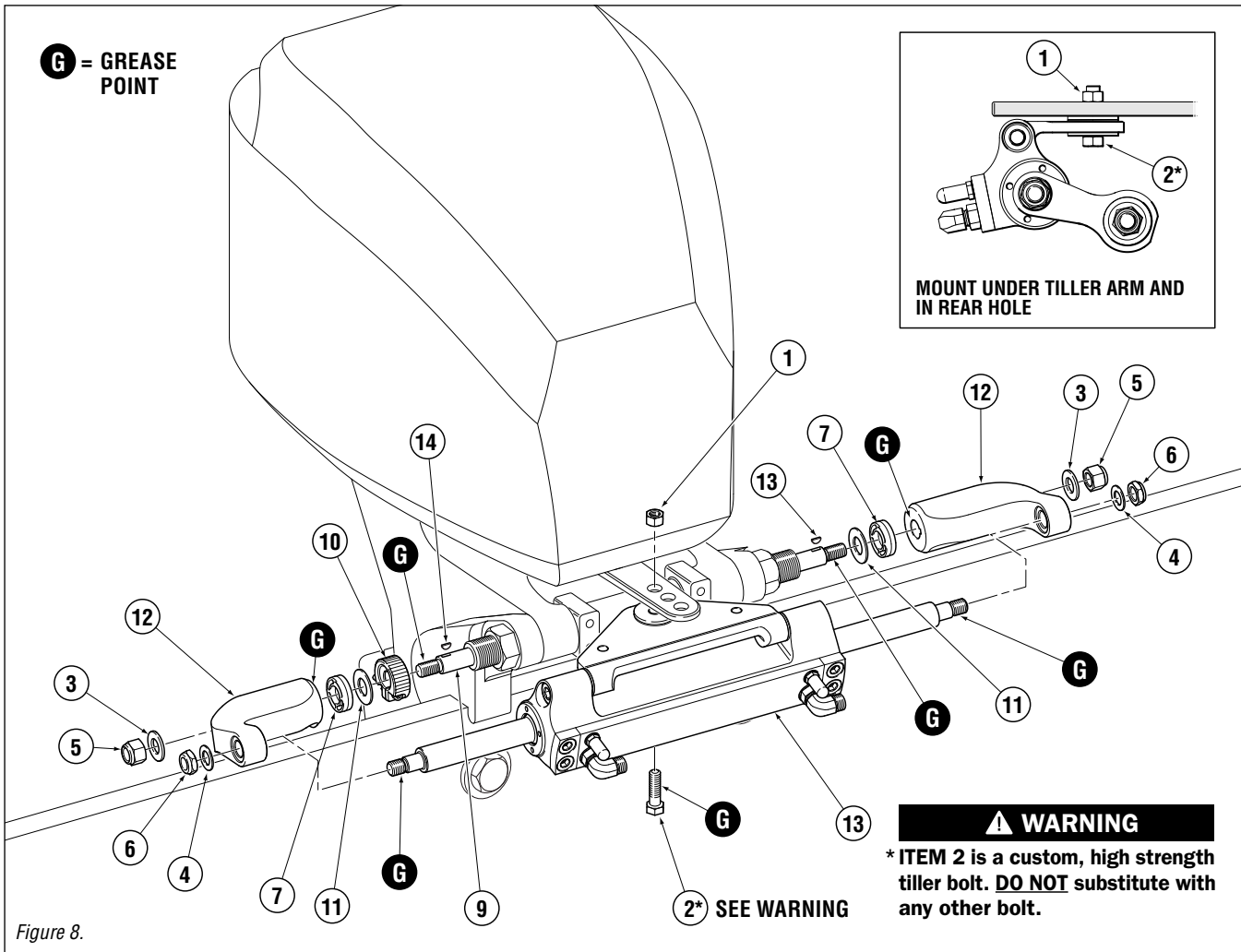


Figure 7. Ground Strap Installation.

HYDRAULIC STEERING

TOURNAMENT CYLINDERS

ENGINE MFG.	YEAR	MODEL	CYLINDER	NOTES
EVINRUDE	2007 TO DATE	3.3L, V6, 200-250HP 3.4L, V6, 250-300HP	HC6845 HC6845	
SUZUKI	1986 TO DATE	3.6/4.0L, V6, 200-300HP	HC6845	



ITEM	QTY	DESCRIPTION
1	1	Nut, 3/8" NF Nyloc®, SS
*2	1	3/8" UNJF x 1.35 HS (High Strength)
3	2	1/2" Washer, Flat, SS, Thick
4	2	1/2" Washer, Flat, SS, Thin
5	2	1/2" NF Nut, Thick
6	2	1/2" NF Nut, Thin
7	2	Plastic Spacer, Thick

ITEM	QTY	DESCRIPTION
8	0	Plastic Spacer, Thin (<i>Not Used</i>)
9	1	Support Rod
10	1	Adjusting Nut
11	2	5/8" Washer, Flat, SS
12	2	Support Bracket
13	1	Steering Cylinder
14	2	Key

HYDRAULIC STEERING TOURNAMENT CYLINDERS

ENGINE MFG.	YEAR	MODEL	CYLINDER	NOTES
YAMAHA	2007 TO DATE	F200-250HP, V6 3.3L F225-300HP, 4-Stroke, V6 4.2L F300-350HP, 4-Stroke, V8, 5.3L	HC6845 HC6845 HC6845	Req. ONE cylinder on ALL engines Offshore
MERUCRY	2002 TO DATE	OPTIMAX V6, 3.0/3.2L, 200-300HP 200-250HP, PRO XS	HC6845 HC6845	Req. ONE cylinder on ALL engines Req. ONE cylinder on ALL engines
HONDA	2000 TO DATE	V6, 3.5L, 200-250HP	HC6850	

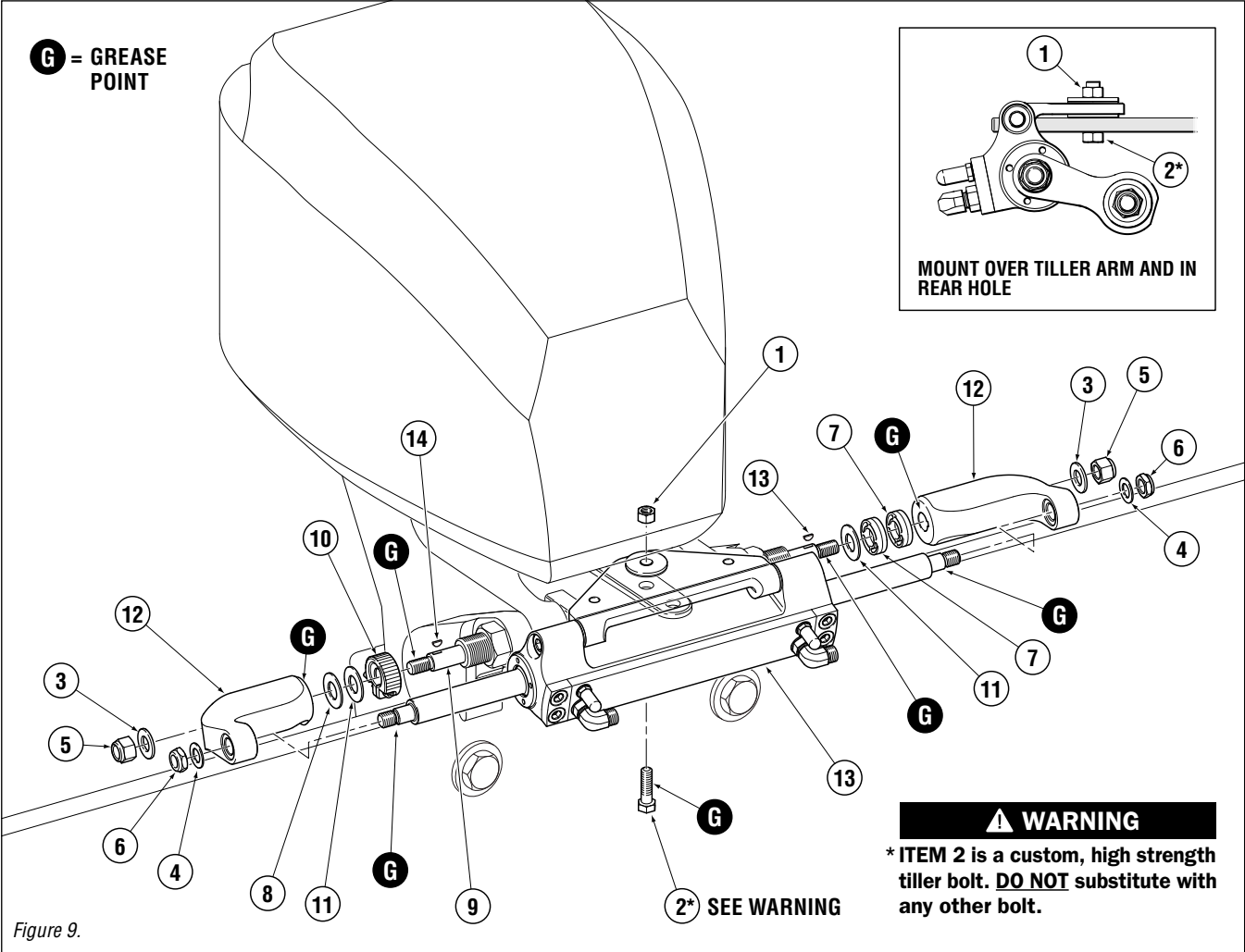


Figure 9.

ITEM	QTY	DESCRIPTION
1	1	Nut, 3/8" NF Nyloc®, SS
*2	1	3/8" UNJF x 1.35 HS (High Strength)
3	2	1/2" Washer, Flat, SS, Thick
4	2	1/2" Washer, Flat, SS, Thin
5	2	1/2" NF Nut, Thick
6	2	1/2" NF Nut, Thin
7	2	Plastic Spacer, Thick

ITEM	QTY	DESCRIPTION
8	1	Plastic Spacer, Thin
9	1	Support Rod
10	1	Adjusting Nut
11	2	5/8" Washer, Flat, SS
12	2	Support Bracket
13	1	Steering Cylinder
14	2	Key

3.4 Bracket Installation

Single Engine – Single Cylinder

NOTICE

Requires Kit # HA6801.

⚠ WARNING

Blanking plates MUST be installed prior to use.

1. Apply thread locker (item 2) to the threads of item 1. **NOTE:** Thread locker (item 2) is included with the hardware kit.

⚠ WARNING

Thread locker MUST be installed onto all four bolts (item 1). Failure to do so may lead to separation of components.

2. Mount blanking plates (item 3) to both sides of steering cylinder (item 4) as shown in Figure 10.

3. Torque bolts to 50ft-lb.

NOTICE

Depending on engine, the cylinder may be mounted different than shown here.

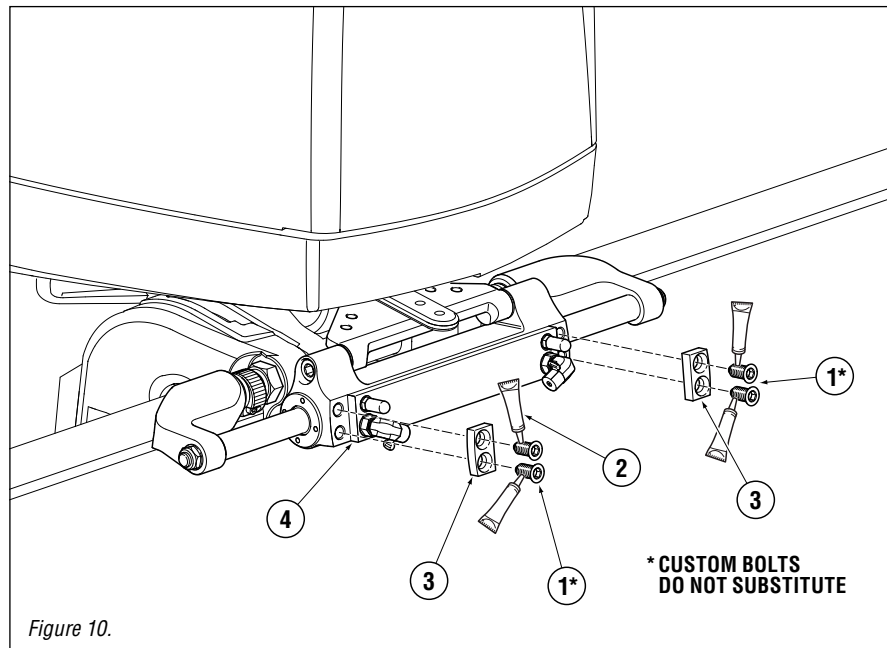


Figure 10.

ITEM	QTY	DESCRIPTION	NOTES
*1	4	Mounting Bolt	Custom bolts, DO NOT substitute
2	1	Thread Locker	Must be applied
3	2	Blanking Plate	Must be installed
4	1	Steering Cylinder	

Twin Engine – Single Cylinder

NOTICE

This application requires installation of the drive bracket "BEFORE" installing the steering cylinder onto the engine. (Refer to page 9.)

NOTICE

Requires Kit # HA6802.

Blanking Plate Installation (items 1–3)

1. Apply thread locker (item 2) to the threads of item 1.
NOTE: Thread locker (item 2) is included with the hardware kit.

⚠ WARNING

Thread locker MUST be installed onto all four bolts (item 1). Failure to do so may lead to separation of components.

2. Mount blanking plates (item 3) to both sides of steering cylinder (item 4) as shown in Figure 11.
3. Torque bolts to 50ft-lb.

⚠ WARNING

Item 6a & 6b are custom, high strength tiller bolts. DO NOT substitute with any other bolt.

Engine Bracket Installation (items 5–7)

1. Mount engine bracket (item 5) to the port engine tiller arm (see inset).
2. Lightly grease item 6 (a and b). Thread 6a into far aft hole and 6b into forward hole in engine tiller arm and torque to 21ft-lb.
3. While holding the head of the bolt (items 6a and 6b) with a wrench, tighten and torque nuts (items 7) to 21ft-lb.

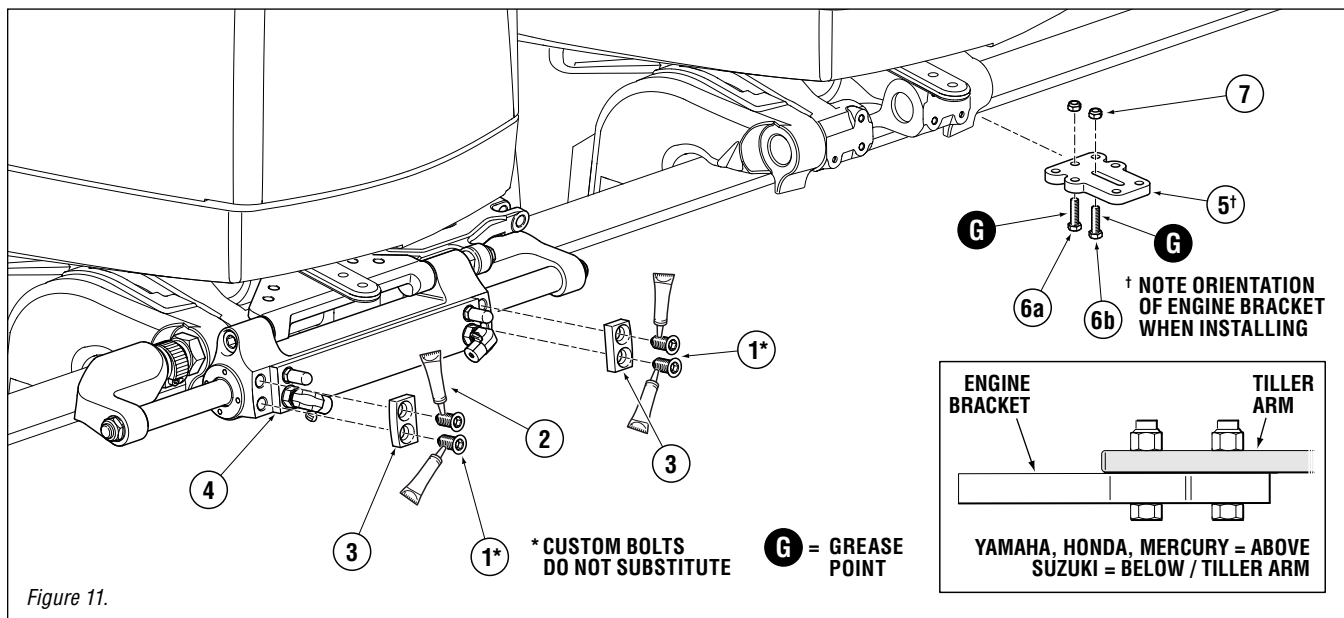


Figure 11.

NOTICE

Depending on engine, the cylinder may be mounted different than that shown here.

ITEM	QTY	DESCRIPTION	NOTES
*1	4	Mounting Bolt	<i>Custom bolts, DO NOT substitute</i>
2	1	Thread Locker	<i>Must be applied</i>
3	2	Blanking Plate	<i>Must be installed</i>
4	1	Steering Cylinder	
5	1	Engine Bracket	
6	2	Bracket Tiller Bolt	
7	2	3/8" Locking Nut	

Twin Engine – Dual Cylinder

NOTICE

Requires Kit # HA6804.

1. Apply thread locker (item 2) to the threads of item 1.
NOTE: Thread locker (item 2) is included with the hardware kit.

⚠ WARNING

Thread locker MUST be installed onto all eight bolts (item 1). Failure to do so may lead to separation of components.

2. Mount tiebar and blanking plates (item 3 and 4) to both sides of steering cylinder (item 5) as shown in Figure 12.
3. Torque bolts to 50ft-lb

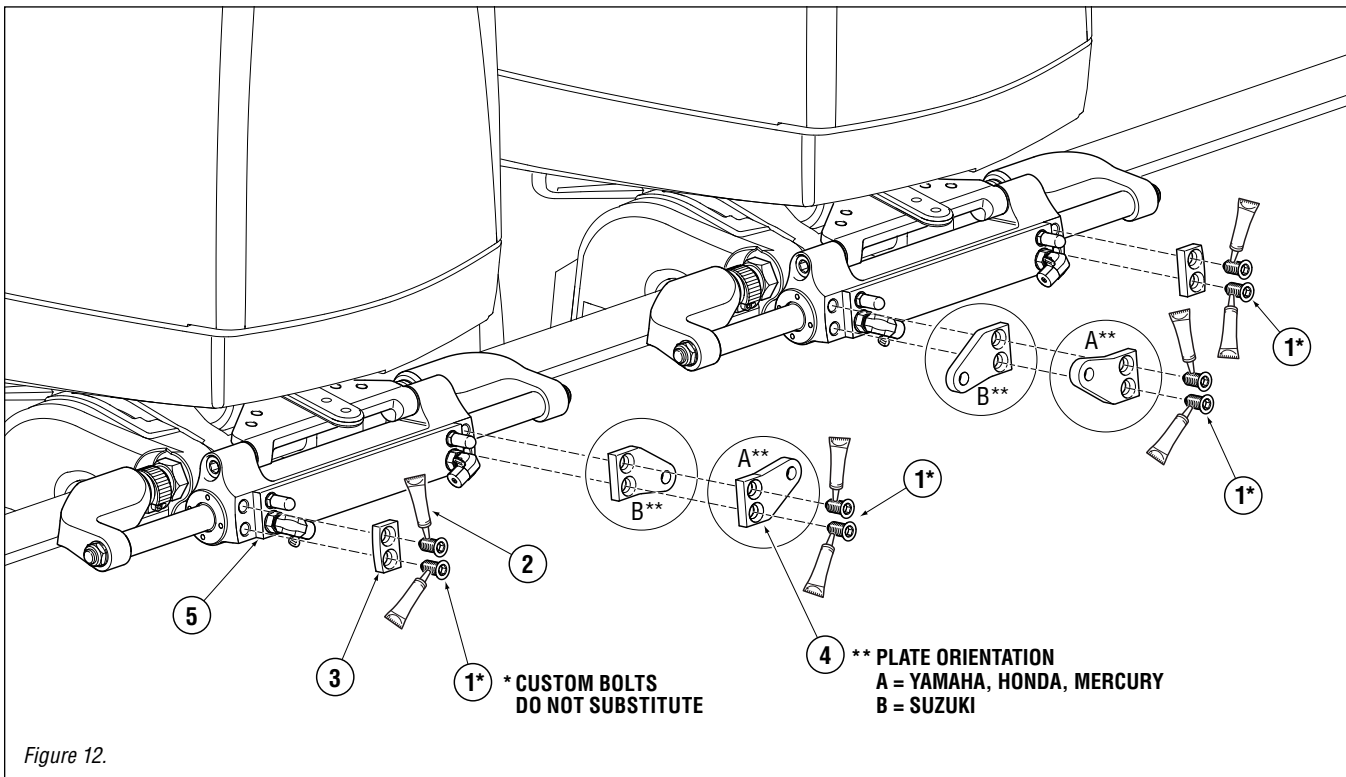


Figure 12.

NOTICE

Depending on engine, the cylinder may be mounted different than that shown here.

ITEM	QTY	DESCRIPTION	NOTES
*1	8	Mounting Bolt	Custom bolts, DO NOT substitute
2	1	Thread Locker	Must be applied
3	2	Blanking Plates	Must be installed
4	2	Port/Starboard Plate	
5	2	Steering Cylinder	

Triple Engine – Dual Cylinder

NOTICE

Requires Kit # HA6806.

Tiebar Bracket Installation (items 1–4)

1. Apply thread locker (item 2) to the threads of item 1.
NOTE: Thread locker (item 2) is included with the hardware kit.

⚠ WARNING

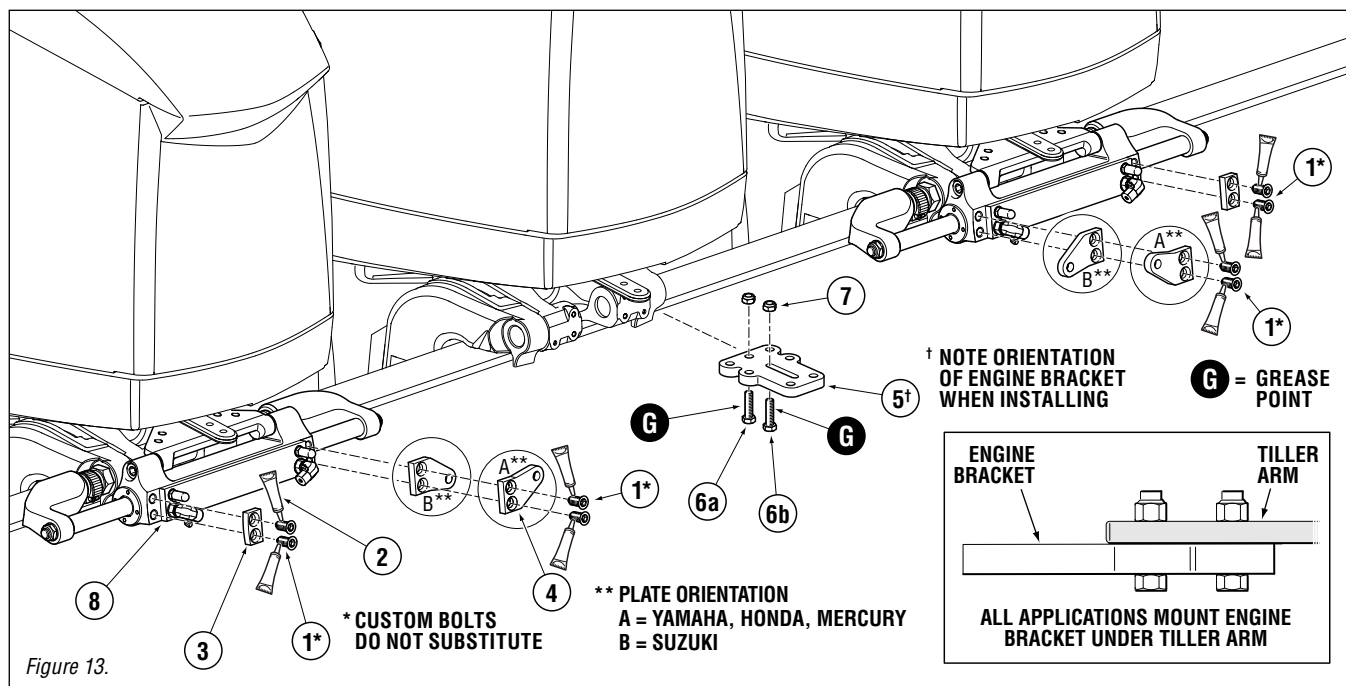
- Thread locker MUST be installed onto all eight bolts (item 1). Failure to do so may lead to separation of components.**
2. Mount tiebar and blanking plates (item 3 and 4) to both sides of steering cylinder (item 8) as shown in Figure 13.
 3. Torque bolts to 50ft-lb.

⚠ WARNING

Item 6a & 6b are custom, high strength tiller bolts. DO NOT substitute with any other bolt.

Engine Bracket Installation (items 5–7)

1. Mount engine bracket (item 5) to the center engine tiller arm.
2. Lightly grease item 6 (a and b). Thread 6a into far aft hole and 6b into forward hole in engine tiller arm and torque to 21ft-lb.
3. While holding the head of the bolt (items 6a and 6b) with a wrench, tighten and torque nuts (items 7) to 21ft-lb.



NOTICE

Depending on engine, the cylinder may be mounted different than that shown here.

ITEM	QTY	DESCRIPTION	NOTES
1	8	Mounting Bolt	Custom bolts, DO NOT substitute
2	1	Thread Locker	Must be applied
3	2	Blanking Plate	Must be installed
4	2	Port/Starboard Plate	
5	1	Engine Bracket	
6	2	Bracket Tiller Bolt	
7	2	3/8" Locking Nut	
8	2	Steering Cylinder	

3.5 Tiebar Adjustment and Installation

3.5.1 Tiebar Adjustment

1. Determine engine center distance. **Note:** Ensure that any toe IN/OUT is taken into account.
2. Adjust tiebar to correct distance by rotating as shown in Figure 14.

⚠ WARNING

If a RED O'ring appears during the tiebar adjustment you **MUST** order a longer tiebar to complete the installation. **DO NOT** install tiebar if the RED O'ring appears.

3. Install adjusted tiebar onto steering cylinder/bracket as per 3.5.2/3.5.3.

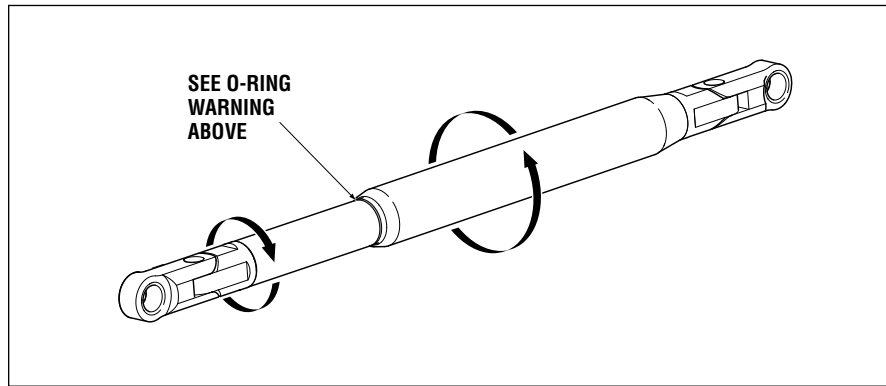


Figure 14.

3.5.2 Tiebar to Drive Bracket Installation

Twin Engine – Single Cylinder

1. Install bushing into tiebar joint.
2. Slide tiebar (with bushing installed) into drive bracket.
3. Install shoulder bolt and nut, torque to 11ft-lb.

NOTICE

* Parts included with hardware kit.

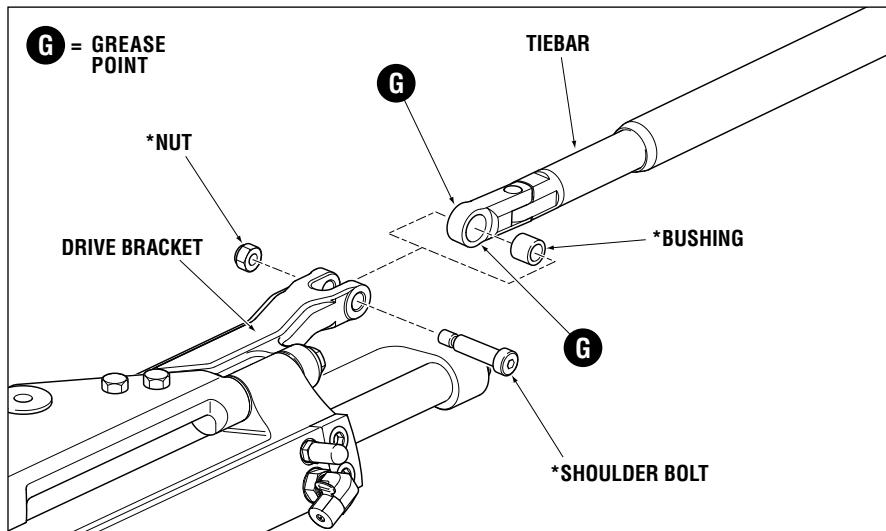


Figure 15.

3.5.3 Tiebar to Cylinder Installation

YAMAHA, HONDA, MERCURY

1. Position tiebar in place.
2. Apply thread locker to shoulder bolt SHORT and install. Torque to 70ft-lb.
3. While holding shoulder bolt SHORT with your key/wrench, install and tighten nut to 50ft-lb.

NOTICE
* Parts included with hardware kit.

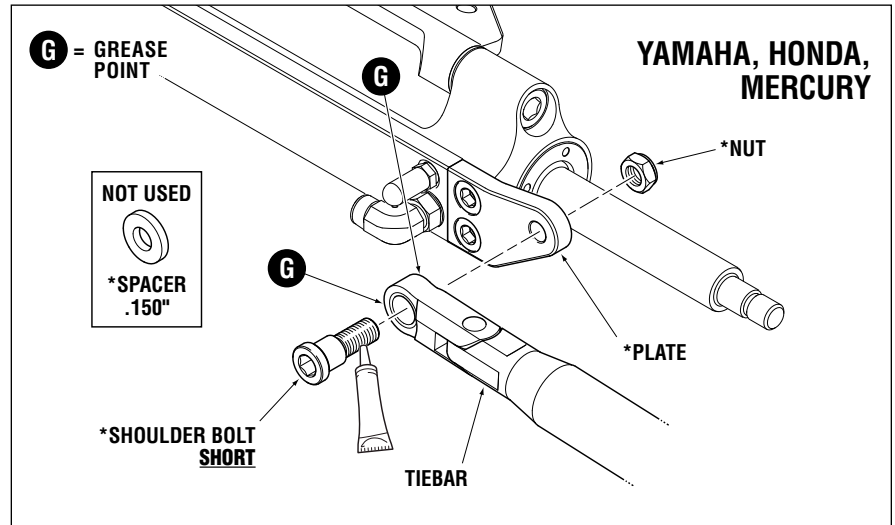


Figure 16. Yamaha, Honda, Mercury Tiebar to Cylinder Installation.

EVINRUDE

1. Position tiebar in place.
2. Install .150" spacer for Evinrude.
3. Apply thread locker to shoulder bolt SHORT and install. Torque to 70ft-lb.
4. While holding shoulder bolt SHORT with your key/wrench, install and tighten nut to 50ft-lb.

NOTICE
* Parts included with hardware kit.

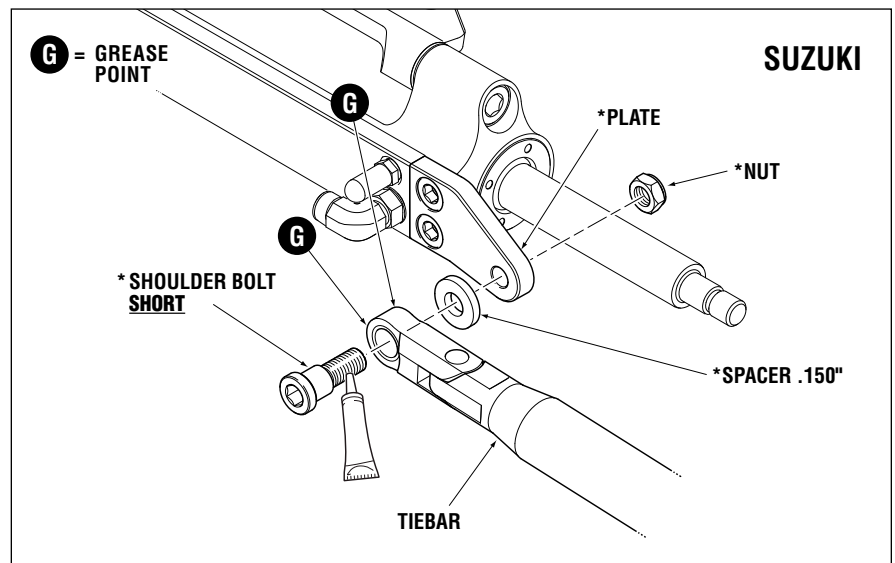


Figure 17. Suzuki Tiebar to Cylinder Installation.

3.5.4 Tiebar to Engine Bracket Installation

Twin Engine – Single Cylinder

1. **Note** installation hole as per your engine make (A or B) see figure 18.
2. Install .100" spacer.
3. Position tiebar into appropriate hole.
4. Apply thread locker to shoulder bolt LONG and install. Torque to 70ft-lb.
5. While holding shoulder bolt LONG with your key/wrench, install and tighten nut to 50ft-lb.

NOTICE

* Parts included with hardware kit.

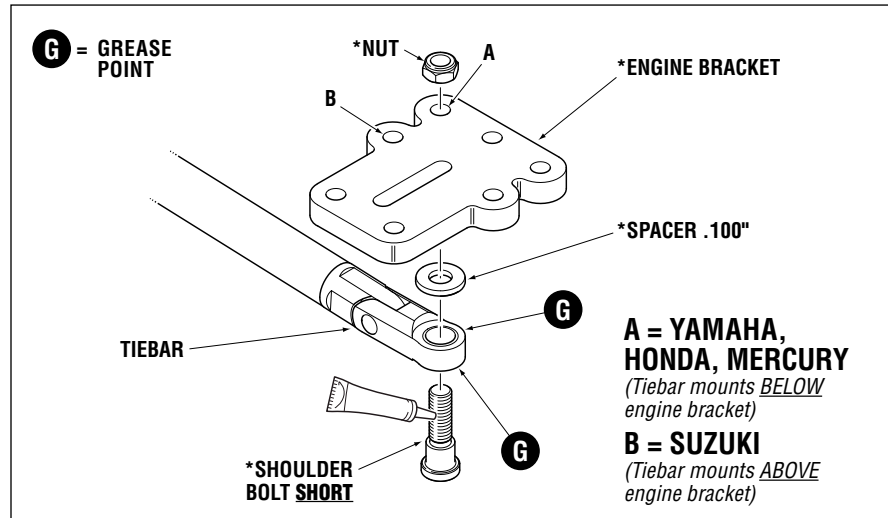


Figure 18.

Triple Engine – Dual Cylinder

1. Note installation hole as per your engine make (A, B, or C).
2. Install .350" spacer.
3. Position tiebar into appropriate hole.
4. Apply thread locker to shoulder bolt LONG and install. Torque to 70ft-lb.
5. While holding shoulder bolts LONG with your key/wrench, install and tighten nut to 50ft-lb.

NOTICE

* Parts included with hardware kit.

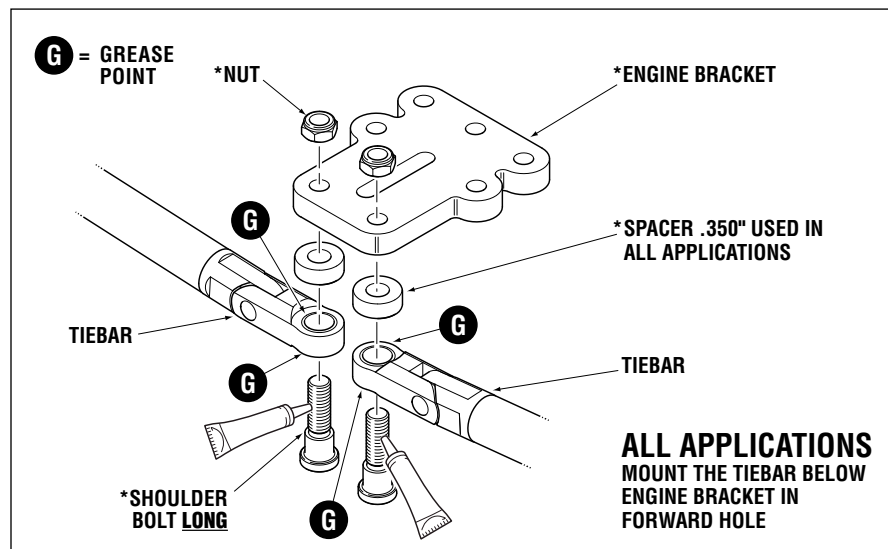


Figure 19.

3.6 Hose Installation

Steering hoses and how they are installed are critical to the safe operation of your steering system. SeaStar Solutions recommends the use of SeaStar Steering hoses ONLY. Use of any other 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" side of a fitting.
- DO NOT remove protective end covers until the hoses have been routed and are ready to be connected to the helm pump, hose fitting or steering cylinder(s).
- Before, during and after installation the hoses MUST be protected from chaffing, rubbing, and contact or interference with assembly screws or sharp edges of any type.
- DO NOT install hoses 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 through a protective PVC cover.
- Secure hoses in minimum 2' increments.
- DO NOT bend hoses tighter than a 3-1/2" (89mm) radius.
- Provide sufficient hose lengths to allow for cylinder movement throughout the turning arc and UP/DOWN trim/tilt settings of the engine(s).
- DO NOT allow hoses to hang free in an area where they could become a safety hazard.
- DO NOT use extruded nylon tubing for plumbing an outboard system. Extruded nylon tubing can only be used for return/compensating lines between power assist and/or autopilot pumps and the helm pump.
- 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 may eventually weaken the hose(s) to a point where it could rupture. Rupture of a hose will lead to loss of steering control.

NOTICE

Your SeaStar helm and steering cylinder(s) are shipped with the appropriate hose fittings and are for use with SeaStar Steering hoses only. All SeaStar Steering 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.

Hose Installation Continued

Step 1 – Set Up

1. See figures 22 through 25 on the following pages to locate your plumbing diagrams.
2. Mark each end of the hose to ensure proper connection.

NOTICE

Hoses are 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

⚠ CAUTION

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

1. Route steering hoses so that the hose bend restrictor will be located at the steering cylinder(s).
2. Route steering hoses so that they have a gradual rise from the steering cylinder(s) to the helm pump.
3. If routing hoses through 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.
4. Secure hoses every 2'.

NOTICE

When securing hoses, ensure that the securing device being used does NOT crimp down too tight on the steering hoses. This may lead to a restriction in the system.

⚠ CAUTION

The hose fitting port on the steering cylinder is that of an ORB and NOT an NPT. Installing an NPT fitting into an ORB port will result in irreparable damage to the steering cylinder.

If you wish to re-orientate the hose fitting, please refer to page 23 of this manual for the re-orientation steps.

⚠ WARNING

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

Step 3 – Hose to fitting installation

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

3.7 ORB Hose Fitting Reorientation

If required

1. Back off lock nut (item 1, Figure 20), counter-clockwise, until it stops.
2. Thread fitting into cylinder body until fitting washer (item 2, Figure 20) contacts the face of the cylinder port. Tighten hand tight, **DO NOT TORQUE FITTING INTO GLAND.**
3. Position fitting to desired orientation by turning it counter-clockwise to a **MAXIMUM** of 1 full turn.
4. While holding fitting with a wrench, tighten the locknut (item 1, Figure 20) and torque to 40–43ft-lb.

⚠ WARNING

Failure to properly tighten the locknut (item 1, Figure 20) 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.

⚠ 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.

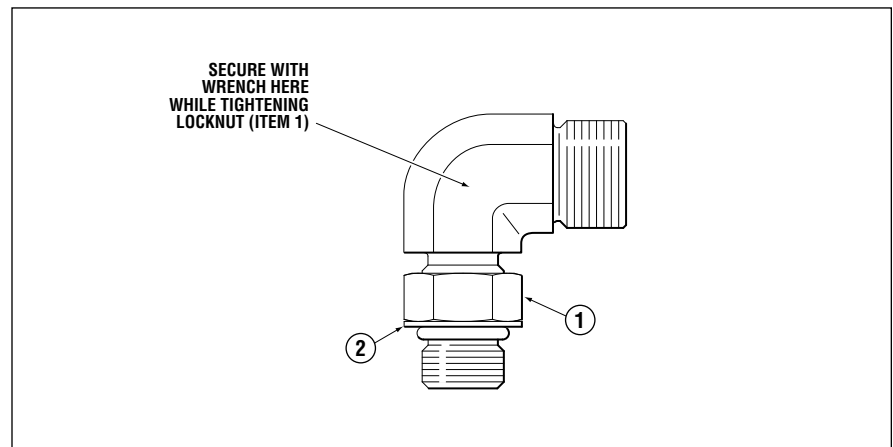


Figure 20.

NOTICE

Complete removal of hose fitting requires the cylinder bleed nipple to be removed.

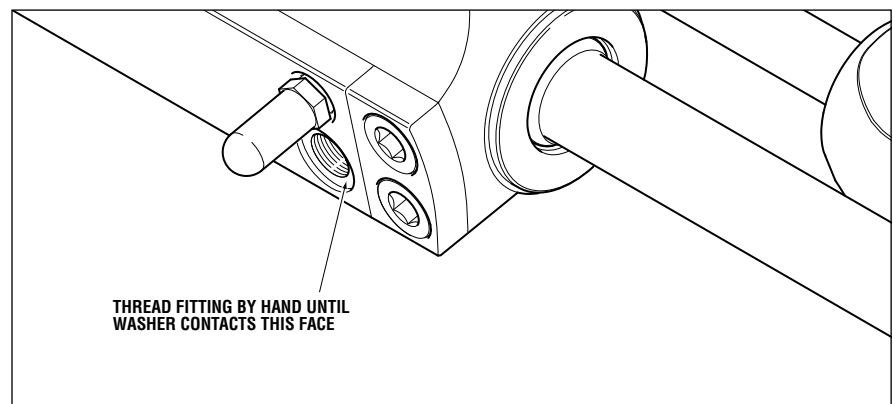


Figure 21.

3.8 Hose Installation Plumbing Diagrams

The plumbing diagrams shown in the following pages outline typical ways to plumb a SeaStar Steering system fitted with autopilot and power assist pumps. Wheel turns are counted with the Power Assist Pump turned OFF.

Single Cylinder Applications (including Twin Engine – Single Cylinder)

**SINGLE CYLINDER
MANUAL SYSTEM**

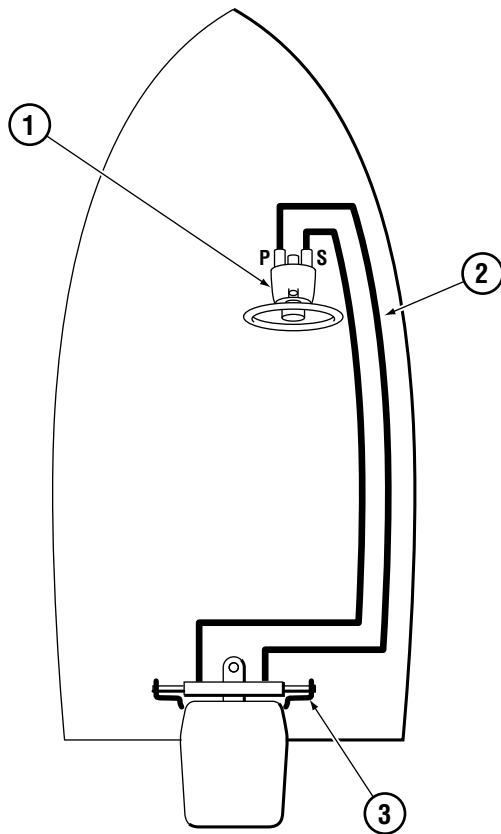


Figure 22.

**SINGLE CYLINDER
POWER ASSIST WITH AUTOPILOT**

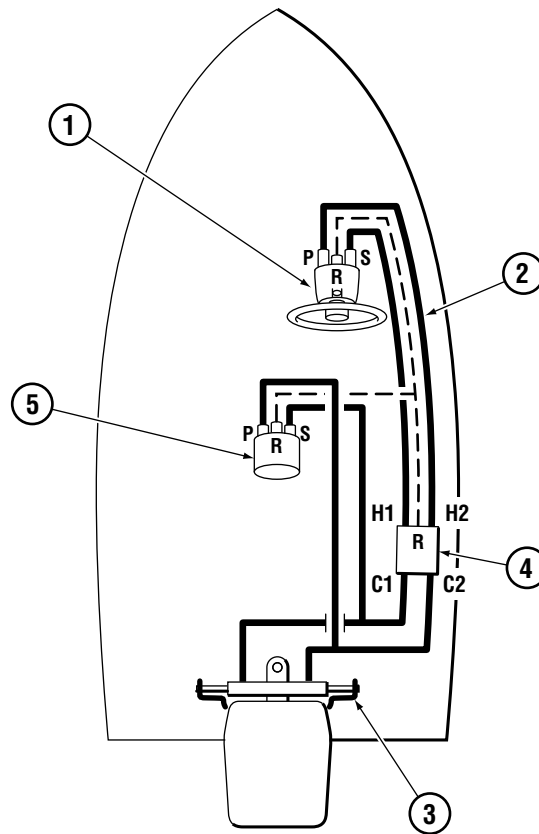


Figure 23.

ITEM	QTY	DESCRIPTION
1	As Req.	Helm Pump, various styles and displacements
2	As Req.	SeaStar Steering Lines
3	As Req.	Steering Cylinder*
4	As Req.	SeaStar Power Assist Pump
5	N/A	Autopilot Pump

HELM PUMP MODEL & DISPLACEMENT	WHEEL TURNS REQUIRED
1.7 cu.in. per revolution	5
2.0 cu.in. per revolution	4
2.4 cu.in. per revolution	3.5

Dual Cylinder Applications (Including Triple/Quad Engines – Dual Cylinder)

**DUAL CYLINDER
MANUAL, PLUMBED IN PARALLEL**

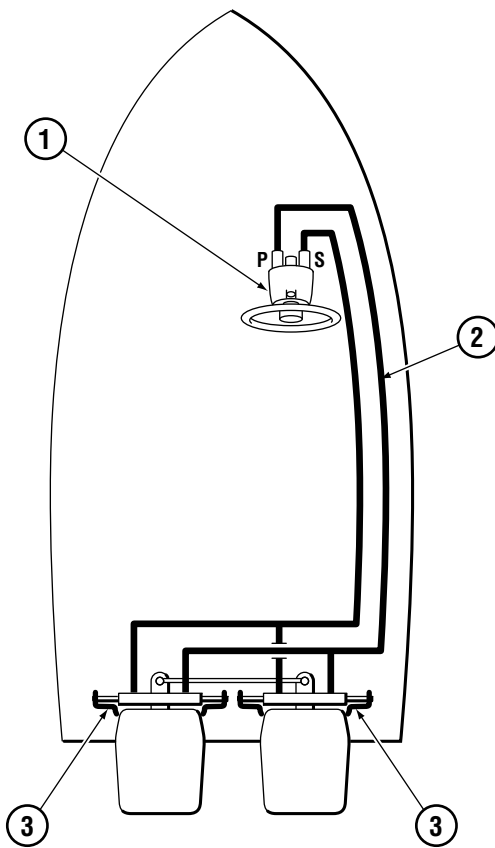


Figure 24.

**DUAL CYLINDER
POWER ASSIST WITH AUTOPILOT,
PLUMBED IN PARALLEL**

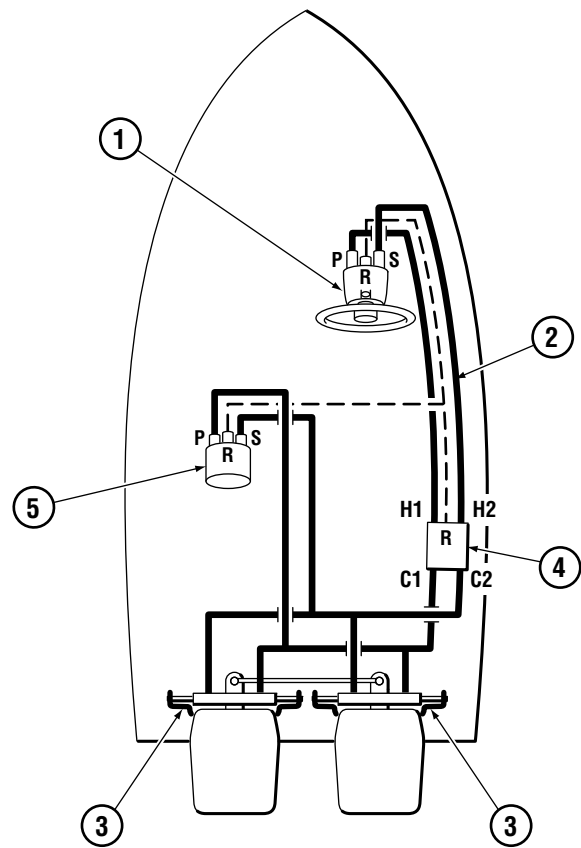


Figure 25.

ITEM	QTY	DESCRIPTION
1	As Req.	Helm Pump, various styles and displacements
2	As Req.	SeaStar Steering Lines
3	As Req.	Steering Cylinder*
4	As Req	Power Assist Pump
5	N/A	Autopilot Pump

HELM PUMP MODEL & DISPLACEMENT	WHEEL TURNS REQUIRED
1.7 cu.in. per revolution	10
2.0 cu.in. per revolution	8
2.4 cu.in. per revolution	7

HYDRAULIC STEERING

TOURNAMENT CYLINDERS

3.9 Filling and Purging

3.9.1 Hydraulic Oil Requirements

2 bottles (2 quarts or liters) for single station and single cylinder systems. One additional bottle for each cylinder, helm, power assist and/or autopilot pump added to the system.

NOTICE

Longer hose runs will require more fluid than that shown above.

NOTICE

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

NOTICE

"Bleeder" refers to cylinder or P/A unit fitted with bleed fittings. Bleed fittings can be opened by unscrewing bleed nipple nut two turns.

NOTICE

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

Recommended oils for your steering system are:

SeaStar Solutions only recommends the use of SeaStar Steering Fluid. In an emergency, SeaStar EPS Fluid, any MD-3/4 rated ATF or MIL-PRF-5606H equivalent fluid that is filtered through a fine mesh screen can be used. The system MUST be thoroughly flushed as soon as possible with genuine SeaStar Steering Fluid after using an emergency fluid.

In an EXTREME emergency, any non-toxic, non-flammable fluid that is filtered through a fine mesh screen may provide temporary steering.

⚠ WARNING

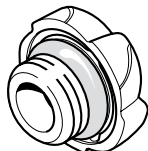
Never fill or mix brake fluids, triglycerides or polyalkylene glycols within a hydraulic steering system.

⚠ WARNING

Use of non-standard fluids will require an immediate and complete system flush using approved fluids, by an approved steering technician.

VENT PLUG – Part No. HA5431

- SUPPLIED WITH SEASTAR HELM
- MUST BE USED WITH HELM PUMP ON ALL SINGLE STEERING STATION SYSTEMS.
- MUST BE USED ON UPPERMOST HELM PUMP ON MULTI STEERING STATION SYSTEMS.



NON-VENT PLUG – Part No. HA5432

- MUST BE USED ON ALL HELM PUMPS OTHER THAN UPPERMOST HELM PUMP ON MULTI STEERING STATION SYSTEMS.
- THIS NON-VENT PLUG IS SUPPLIED WITH ADDITIONAL STATION FITTING KIT NO. HF6007 AND HF6010.

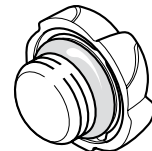


Figure 26.

3.9.2 Power Purge Users

Step 1 – Removing Air from Return Line

NOTICE

If the application is NOT fitted with a SeaStar Power Assist, start at Step 2, point 2.

⚠ CAUTION

Refer to your Power Purge installation manual for important Warnings and Notices while using the Power Purge Units.

- Install the helm adapter into the helm pump and attach the helm hose from the power purge unit.
- Connect one of the fluid return hoses (cylinder lines) from the Power Purge unit to the Reservoir bleed fitting on the P/A unit. (see Figure 27 on page 28 for bleed fitting location).
- Using a 1/2" wrench open reservoir bleed fitting 1-turn.

NOTICE**DO NOT OPEN MANUAL BLEED VALVE WHEN USING A POWER PURGER**

- Turn ON the Power Purge unit and continue to run until NO air is visible leaving the P/A unit.
- Turn OFF Power Purge unit.
- Close reservoir bleed fitting and continue on with the following steps.

Step 2 – Remove Air from the Rest of the System

- Ensure the reservoir bleed fitting is closed then remove the hose from the reservoir bleed fitting and connect to the steering cylinder bleeder fittings. Ensure the quick connect is locked onto the fitting.

NOTICE

If using Dual Cylinder Purge Kit (part # HA5461), connect cylinder bleed hoses to every bleeder fitting, then, open fitting 1-turn using a 1/2" wrench.

NOTICE

If using a single cylinder Purge Kit, begin with the starboard bleeder fitting to each bleeder on the steering cylinder(s), open bleeder fitting 1-turn using a 1/2" wrench. Repeat on the port side bleeder fitting.

- Turn Power Purge unit ON.
- Oil should flow into and out of the helm pump. Wait twenty seconds for the helm to fill with oil.
- Turn the steering wheel clockwise until the cylinder rod is fully extended (you may have to manually push the cylinder rod). SLOWLY continue to turn the wheel to hold the cylinder in this position for approximately 30 seconds. Ensure there are NO air bubbles escaping through the cylinder hoses.
- Turn the steering wheel counter-clockwise until the cylinder rod is fully extended (you may have to manually push the cylinder rod). SLOWLY continue to turn the wheel to hold the cylinder in this position for approximately 30 seconds. Ensure there are NO air bubbles escaping through the cylinder hoses.
- Turn OFF Power Purge unit.
- Tighten ALL bleed fittings on the steering cylinder(s).
- Repeat above steps with the Power Assist unit ON.

Step 3

Continue on with Oil Level and System Check on page 32.

3.9.3 Manual Filling and Purging

These instructions show how to fill and purge a SeaStar Steering System with the P/A unit installed. The same steps apply to ALL cylinders with the exception of which bleed fitting to open and close and the direction the cylinder rod moves. These variations are shown in inset diagrams at each step. For multiple steering stations, start with the lowest station while going through Steps 1 – 7, repeat at each higher station until complete.

HYDRAULIC STEERING

TOURNAMENT CYLINDERS

⚠ CAUTION

DO NOT turn ON P/A unit until manual portion is completed. 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 oil level to disappear into the helm pump, as this may introduce air into the system and increase your filling time.

3.9.4 Single Station One Cylinder

NOTICE

BEFORE bleeding the main steering system (helm, hoses and cylinders), the RETURN line will need to be purged.

Step 1 – Removing Air from Return Line

1. Install the fill tube and fluid fill bottle into the helm pump.

NOTICE

Filling the helm full of fluid prior to connecting the filler tube and oil bottle will decrease purge time.

2. Open the manual bleed valve and reservoir bleed fitting (see Figure 27) on the power assist unit. The manual bleed valve should be opened two full turns.
3. Fill helm with fluid, then, turn steering wheel to the starboard side until a steady stream of "air-free" oil comes out of the reservoir bleed fitting on the Power Assist Unit.
4. Close reservoir bleed fitting.
5. Continue to turn the wheel to starboard another 15 turns after closing the reservoir bleed fitting and prior to closing the manual bleed valve.
6. Close manual bleed valve and continue with Steps 2 – 5.

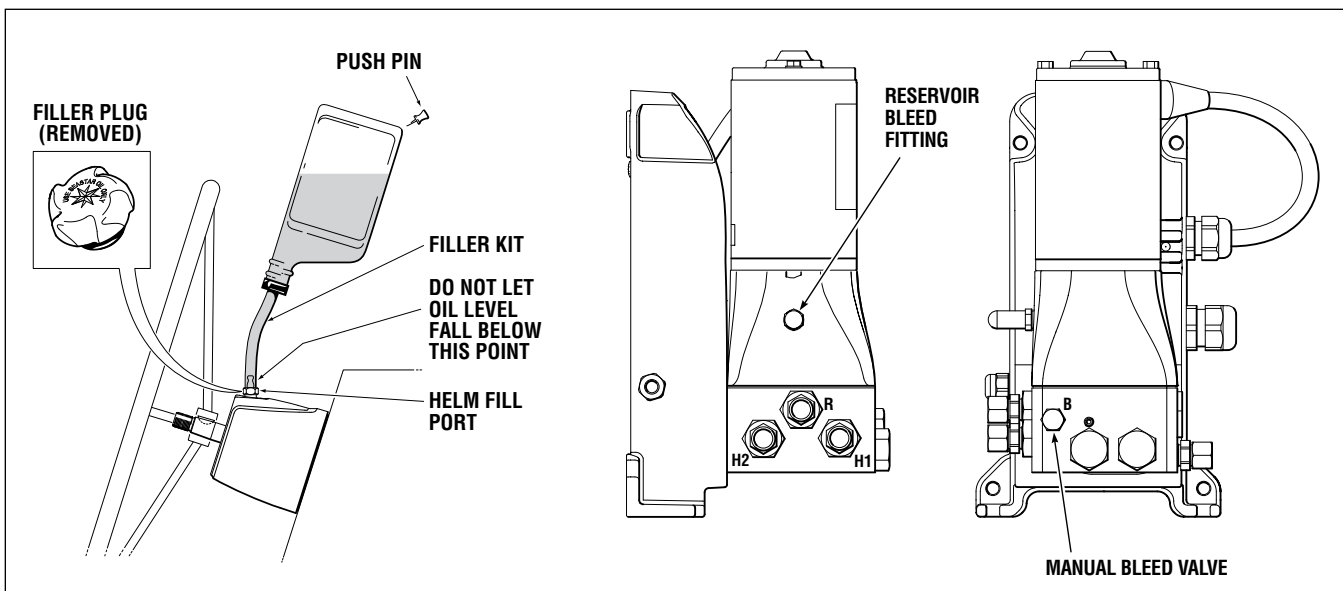


Figure 27.

Step 2

1. Turn the steering wheel clockwise until the cylinder rod is fully extended on the right side of the cylinder.
2. Open bleed fitting as per your installation.

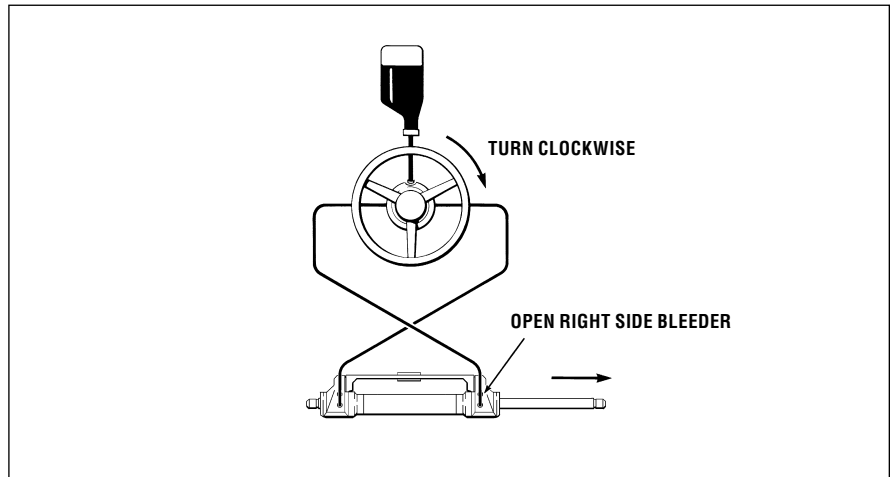


Figure 28. Tournament, Front Mount Cylinder.

Step 3

1. Holding the cylinder body to prevent the body from moving, turn the steering wheel counter-clockwise until a steady stream of air free oil comes out of the bleeder. (Drain approx. 1/2 bottle of oil or as required).

⚠ CAUTION

Do not use anything other than your hands to restrain the cylinder body.

2. While continuing to turn the wheel close the bleed fitting for your application and let go of the cylinder body.

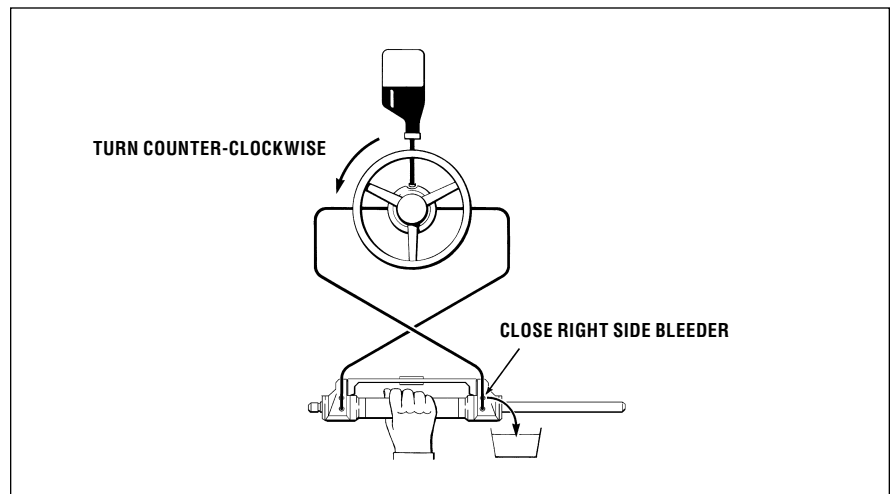


Figure 29. Tournament, Front Mount Cylinder.

Step 4

1. Continue turning the steering wheel counter-clockwise until the cylinder rod is fully extended to the left. (Steering wheel will come to a stop).
2. Open bleed fitting as per your installation.

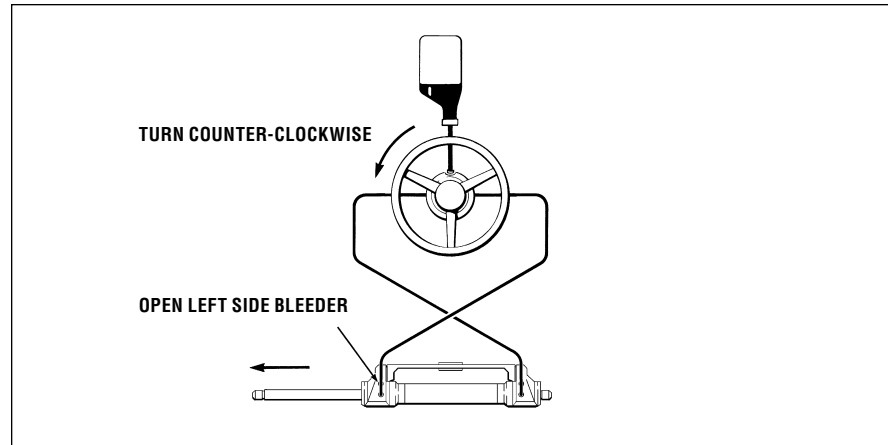


Figure 30. Tournament, Front Mount Cylinder.

STEP 5

Step 5

1. Holding the cylinder body to prevent the body from moving, turn the steering wheel clockwise until a steady stream of air free oil comes out of the bleeder.
2. While continuing to turn the wheel close the bleed fitting for your application and let go of the cylinder body.

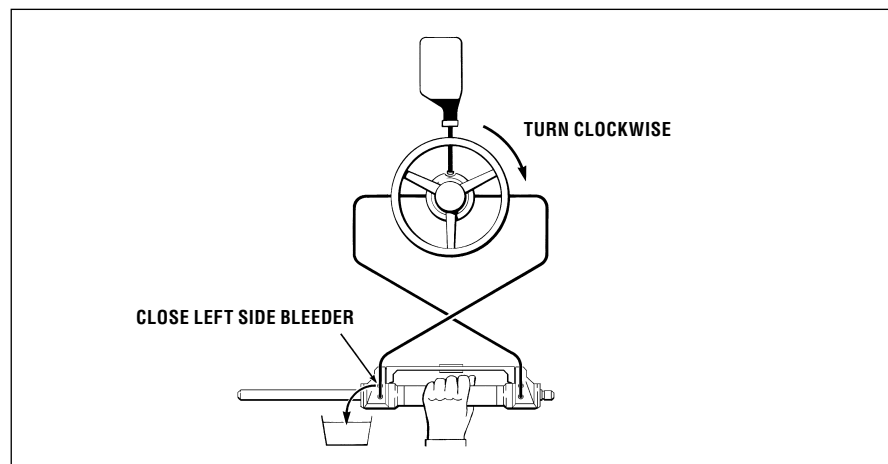


Figure 31. Tournament, Front Mount Cylinder.

NOTICE

Be sure to remove ALL air from the autopilot reservoir line.

If the system has an autopilot installed, ensure that the autopilot pump is run for at least 10 seconds in both directions during Step 3 & Step 5.

CAUTION

Prior to operating system, perform Oil Level System Check, refer to page 32.

STEP 6

Step 6

1. Complete electrical connections as outlined in your Installation Owner's Manual.
2. Repeat Steps 2 – 5 of purging instructions with the P/A unit "ON".

3.9.5 Twin Station Single Cylinder

Perform Steps 1 – 6 at station no. 1. Then repeat Steps 2 – 5 at station no. 2.

Note: Refer to Oil Level & System Check on page 32.

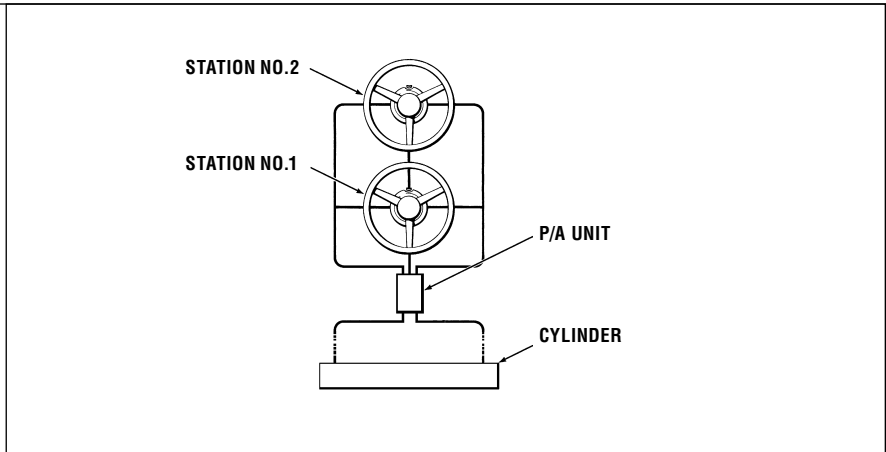


Figure 32.

3.9.6 Single Station Dual Cylinder

When performing Steps 2 – 5, perform instructions in each step first on cylinder no. 1 and then on cylinder no. 2, before proceeding to the next step. ie: Perform instructions referring to right side of cylinder first on cylinder no. 1 and then on cylinder no. 2.

Note: Refer to Oil Level & System Check on page 32.

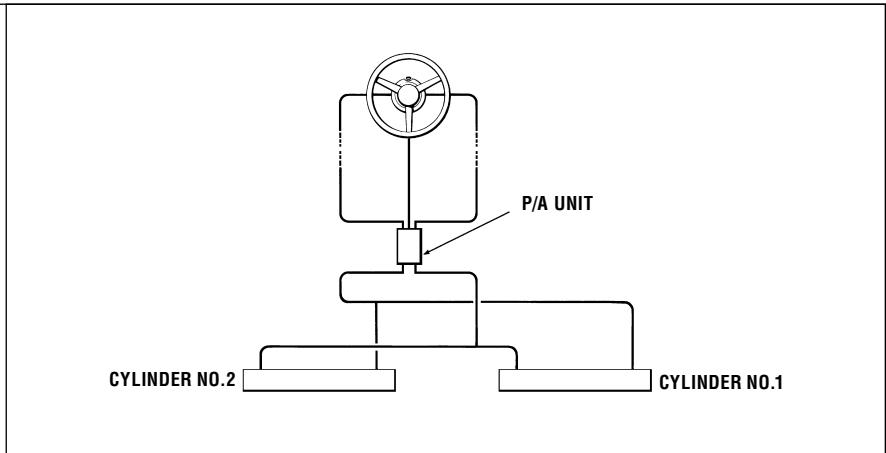


Figure 33.

3.9.7 Twin Station Dual Cylinder

Follow same procedure as instructed for single station-twin cylinders, beginning at station no. 1, and repeat entire procedure at station no. 2.

Note: Refer to Oil Level & System Check on page 32.

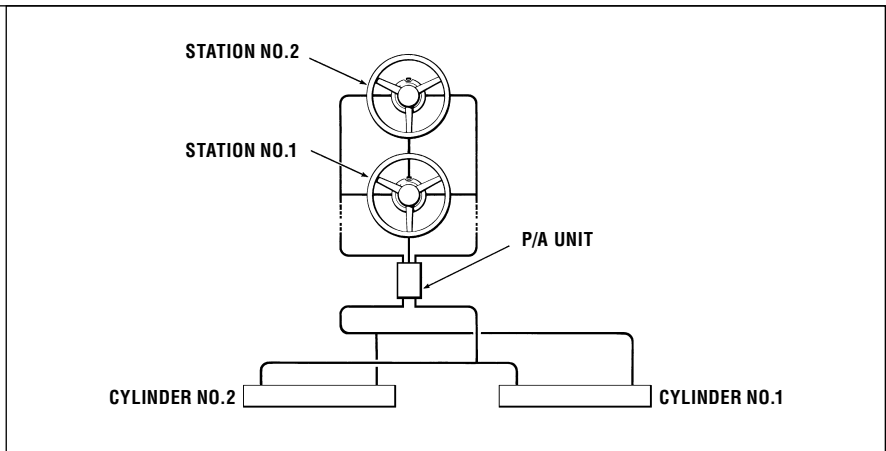


Figure 34.

3.10 Oil Level and System Check

NOTICE

Refer to your helm pump installation manual for proper fluid level setting.

At this time the steering system must be checked for proper connections hose and fittings, possible leaks, and air removal. Please complete the following steps with the P/A Unit OFF.

1. Turn steering wheel to hard over, then force the wheel another one quarter to one half turn past the stop point. Check all connections including the following areas for evidence of a leak.
 - Helm fitting connections.
 - P/A fitting connections
 - Cylinder fitting connections
2. Repeat above steps to the other steering direction.
3. Any sign of a leak **MUST** be repaired prior to operating the boat.
4. While turning steering wheel observe fluid level in the helm pump. If fluid level drops and rises as the wheel is being turned there is still air in the system. Complete bleeding instructions again until no obvious fluid level change is noticed.

3.11 Interference Inspections

⚠ WARNING

The following steps **MUST be completed with an assistant **BEFORE** operating the boat. Failure to conduct this important step may lead to damage or separation of components. ANY fault and/or interference with any other object **MUST** be corrected prior to use.**

1. 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 1a) with engines tilted UP.
 - c) Perform step 1a) with each engine in DOWN/UP positions confirming that independent TRIM/TILT can be done without any interference.
2. Confirm that the steering cylinder(s) 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.
3. Confirm that the steering wheel can rotate freely from hard over to hard over.
If using tilt type helms, this step must be performed in all tilt positions.

4.0 MAINTENANCE

⚠ WARNING

Following the routine maintenance schedules as outlined below, in the time frame noted will ensure years of service from your SeaStar 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)

Prior to every use.

1. Check Fluid level in highest helm pump (see page 32 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.

⚠ WARNING

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

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.

⚠ WARNING

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

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 the cylinder and tiebar installations 'G'. 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 oil for cleanliness, flush if required.

5.0 TROUBLESHOOTING

If properly installed and maintained, your SeaStar Steering System will provide years of safe and reliable performance. Our systems have been designed with protection against over-pressure situations by a pressure relief valve. Most faults occur when installation instructions have not been followed and in most cases will present themselves immediately upon filling the system. Below are the most common faults and their likely cause and solution. Extreme caution must be exercised when diagnosing and correcting a fault. These troubleshooting guides may seem simple in text, however these **MUST** be completed by a qualified marine mechanic that has working knowledge of the steering system.

⚠ WARNING

SeaStar Solutions does NOT recommend disassembly of a helm pump, or, removing a steering cylinder rod/shaft at any time. Doing so may cause more damage, leading to irreparable damage and costly replacements.

FAULT	CAUSE	SOLUTION
<p>1. During filling, helm becomes completely locked up.</p>	<ul style="list-style-type: none"> • Mechanical interference with other components. • Blockage in the steering lines. • Tilting mechanism not installed properly. • Engine(s) are restricted. • Power Assist H1, or H2 line crossed with R line. 	<ul style="list-style-type: none"> • Check ALL areas for interference, correct as required. • Remove all steering lines. Blow air through lines. Any line not allowing good air flow may should be replaced. • Confirm tilt mechanism is installed correctly. • Confirm that engines are able to be moved freely with cylinder not connected. • Confirm system is plumbed correctly.
<p>2. System is very difficult to fill, air keeps burping out top of helm, even after system appears full.</p>	<ul style="list-style-type: none"> • Air remaining in system. • Bleed fitting leaking. • Coiled hose. • Reservoir/compensating lines not purged free of air. 	<ul style="list-style-type: none"> • Bleed steering system again. • Tighten bleeder, replace if leak continues. • DO NOT cut hoses. Lessen coil, or, replace with shorter lines. • Bleed air from reservoir/compensating lines.
<p>3. Steering is hard to turn even when boat is not moving and engines are OFF.</p>	<ul style="list-style-type: none"> • Adjusting nut on support rod is overtightened. • Restrictions on hoses (see Fault 1). • Mechanical interference with other components (see Fault 1). 	<ul style="list-style-type: none"> • Nut should be hand-tight. • See fault 1. • See fault 1.

FAULT

CAUSE

SOLUTION

3. Continued.

Steering is hard to turn even when boat is not moving and engines are OFF.

- Air in system (yes, air will lead to heavy steering).
 - Incorrect fluid has been used to fill system.
 - Damaged steering cylinder body.
 - Too small of a steering hoses being used.
 - Steering wheel is too small.
 - Tilt bellows interference.
 - Cylinder installation procedure not followed correctly.
 - Cylinder mounting plate is too tight.
 - Support rod/bracket key not seated correctly.
- Bleed Steering System.
 - Drain and flush, fill and bleed with SeaStar fluid.
 - Replace steering cylinder(s) completely.
 - Remove and re-plumb system using SeaStar outboard hoses.
 - Wheel should be 15" & larger (MAX 26").
 - Confirm no interference with rubber tilt bellows on steering wheel hub.
 - Remove cylinder, re-install as per the steps noted.
 - With cylinder not connected, the plate must move UP/DOWN freely. Replace if hard to move.
 - Disassemble steering cylinder, ensure key is seated correctly.

4. One helm in system is very bumpy and requires too many turns.

- Air in system.
 - Dirt/debris in system.
 - Dirt/debris in autopilot (if fitted).
- Bleed system.
 - Replace helm pump, flush system (DO NOT attempt repair of helm).
 - Replace autopilot pump.

6.0 REPLACEMENT PARTS

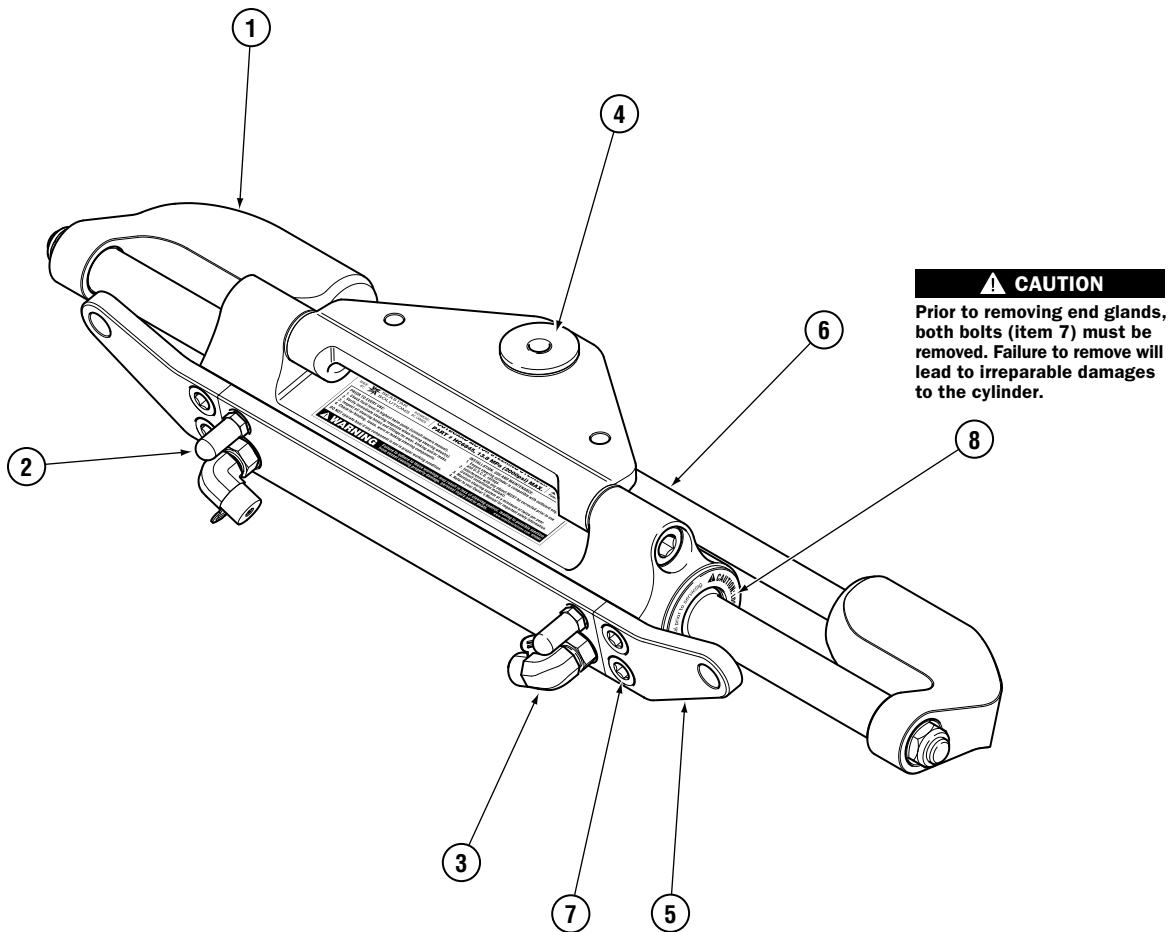


Figure 35.

ITEM	PART #	QTY PER KIT	DESCRIPTION
1	HP6162	2	Support Bracket (Includes mounting hardware)
2	HF5548	2	Bleeder Nipple
3	HF6004	2	Hose Fitting (ORB fitting.)
4	HA5820	1	Tiller Bushing Kit (c/w High strength tiller bolt.)
5	Various	N/A	Hardware Kits (Refer to Application Chart, page 5 for details.)

ITEM	PART #	QTY PER KIT	DESCRIPTION
6	HP6161	1	Support Rod (c/w mounting hardware and keys)
7	HP6063	4	Tiebar Plate Bolts
8	HP6160	2	End Gland Seal Kit

7.0 WARRANTY

7.1 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'** 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.

7.2 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



**SEASTAR
SOLUTIONS®**

SEASTAR SOLUTIONS
3831 NO. 6 ROAD
RICHMOND, B.C.
CANADA V6V 1P6

FAX 604-270-7172

www.seastarsolutions.com

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