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43

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INSTALLATION INSTRUCTIONS

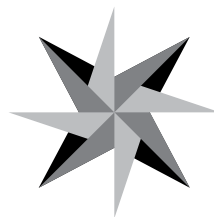
AND OWNER'S MANUAL

www.seastarsolutions.com



BAYSTAR[™]

Hydraulic Steering for Inboard
Powered Vessels



SEASTAR
SOLUTIONS[®]

*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.

Safety Information

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. Substituting non SeaStar parts are not recommended as they may compromise performance/reliability.

Installation

1. Install components as directed in all Installation Manuals (including helm pumps, hoses and fitting kits).
2. DO NOT modify 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.
 - Cylinder MUST be able to withstand rudder loads.
4. Confirm that there is no interference between the steering cylinder(s) and any other object by performing the following steps:
Stern drive applications:
 - a) With cylinder installed, turn steering wheel from hard over to hard over and confirm that no interference occurs.
 - If using external mount cylinders, confirm no interference with drive in UP/DOWN positions.
Inboard applications:
 - a) Confirm that cylinder(s) fully extend/retract prior to hitting any installed rudder stops.
5. Confirm that the steering cylinder can be fully stroked in both directions without stretching, chafing, rubbing and/or kinking of the hydraulic hoses.
6. Where required, 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 System Proof Test as outlined on page 14 of this manual.

Safety Information Continued

Prior to every use

1. Check Fluid level in highest helm pump (see page 14 for proper fluid level setting).
2. Verify immediate steering response when turning steering wheel(s). (Ensure drive(s)/rudder(s) 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.
5. Ensure operator(s) have taken an 'accredited boating course'.

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 Routine Maintenance, page 29 of this manual.

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

INTRODUCTION

Before proceeding with the installation, read THESE instructions and ALL other instructions included with the rest of your system (helm pumps, Power Assist etc). SeaStar Solutions cannot accept responsibility for installations where instructions have not been followed, where substitute parts have been used, or modifications have been made to our products. Warranty may be void if products other than SeaStar Solutions products are used within the system.

NOTICE

Due to a small amount of internal slip, a “Master Spoke” or “centered” steering wheel cannot be maintained with a hydraulic steering system. For best results, use an equal distance spoke steering wheel.

WARNING

DO NOT use a wire coil type trim switch with a hydraulic steering system. Wire coil can wind up tight around the steering wheel preventing further steering.

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The following steering cylinders are covered within this manual.
HC4460-3 and HC4461-3

Typical Inboard Steering System

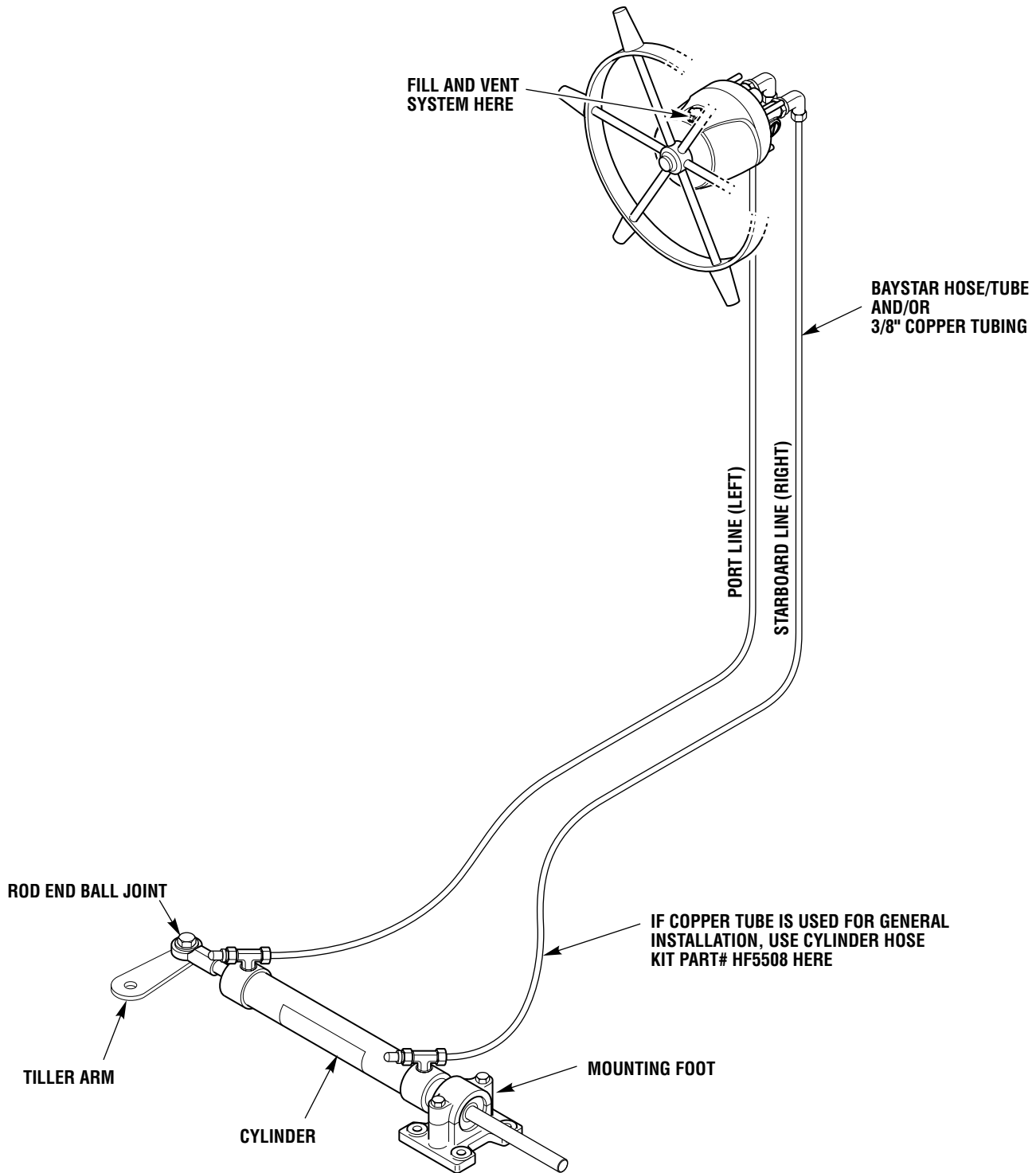


Figure 1. Overview.

TOOLS

Standard Helm Mounts

You will need the following tools to complete your installation.

- 5/16" (8mm) dia. Drill.
- 7/16", 9/16", 5/8" and 3/4" Open End type Wrench/Spanner.

Optional Helm Mounts

- Square Bezel Backmount, HA5418, 4-1/2" (115 mm) Hole Saw
- Round Bezel Backmount, HA5476, 4-3/8" (112mm) Hole Saw

CAUTION

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

NOTICE

When disposing of excess, left over, or used fluid, if the original oil bottle is unavailable, dispose of the steering fluid in an environmentally conscientious manner, adhering to local and federal environmental regulations.

Always wear safety glasses and protective clothing when working around hydraulic fluid and components.

THINGS YOU NEED TO KNOW

CAUTION

BEFORE beginning with this installation, confirm that **ALL** components have been acquired to complete the installation, including; helm pump(s), hose and tube, oil, pipe sealant and any other component required. **ORB** fittings do **NOT** require pipe sealant of any kind. **NPT** fittings require a "liquid" Teflon based pipe sealant. **DO NOT** use Teflon tape or any other tape type sealer.

CAUTION

Take **EXTREME** care not to allow any foreign material or contamination to enter the hydraulic steering system. Contamination is the main cause of a hydraulic system to wear and or fail. **Protect ALL** hose/tube ends until ready to make final connection to fitting.

WARNING

Follow the maintenance procedures outlined on page 17 of this manual as well as **ALL** other manuals included with the other components of your steering system. Following these procedures, in the time frame noted will keep you and your passengers safe from the dangers that are present on the water. Failure to adhere to **ALL** maintenance procedures included in **ALL** Installation and Owner's Manual may result in loss of steering control. Loss of steering control may lead to unpredictable boat behavior, leading to a collision with an obstacle and/or ejection from the boat, resulting in property damage personal injury and/or death.

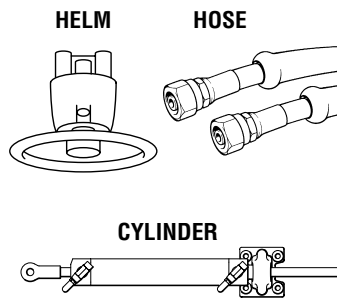
Before Starting

Study this manual and ALL other manuals provided with your BayStar Steering System carefully and thoroughly to familiarize yourself with all of the components and their intended or required mounting locations. Ensure there is adequate space available for installation of ALL components, hydraulic lines and easy access for service. It is good practice to mount all components first, before running hoses; this will allow hose/tube to fitting connections with less chance of an error. If you must run hoses first a system of marking the various lines must be used. ALL hose/tube ends **MUST** be closed off with tape or similar material to prevent contamination. Read ALL **BOLD** print text, notes, cautions and warnings; reading these now will help prevent unexpected surprises during the installation.

These instructions have been made as complete as possible, but as brief as practical. If you have any questions please phone SeaStar Solutions Technical Support @ 604.248.3858

SYSTEM INSTALLATION OVERVIEW

STEP 1



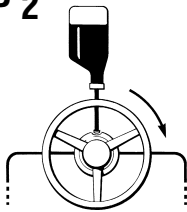
System Installation

- Install your BayStar helm pump(s) onto the dash using the installation instructions provided with your helm pump(s).
- Install steering cylinder as per the instructions on the following pages.

NOTICE Ensure that you follow the installation instructions for YOUR Steering Cylinder.

- Install hose/tube as per the plumbing diagrams shown on page 9.

STEP 2



Filling and Purging Procedures

- Manual purging: Refer to page 12 of this manual for bleeding details.
- Power Purging: Refer to Power Purge Installation Manual.

STEP 3

System Check

- **⚠ WARNING** The System Check shown on page 16 of this manual **MUST** be completed after installation. Doing so will ensure the safe operation of your steering system. Any fault (leaks or malfunction) will present itself during this check. Failure to perform this check may result in loss of steering control. Loss of steering control may lead to unpredictable boat behavior, leading to a collision with an obstacle and/or ejection from the boat, resulting in property damage personal injury and/or death.

CYLINDER MOUNTING

HC4460-3 and HC4461-3 BayStar Inboard Cylinders

General

Proper cylinder mounting is CRITICAL to the successful operation of your hydraulic steering system. An incorrectly installed cylinder WILL lead to rapid seal and bearing wear as well as non-repairable damage.

Select the diagram and dimensional data that corresponds with your cylinder model. Note, not all possible cylinder mounting configurations are shown, however, all necessary dimensions are shown regardless of mounting configurations.

⚠ CAUTION

If installing rudder stops, ensure that the cylinder(s) reach hard-over BEFORE rudder stops are engaged.

⚠ WARNING

Where applicable, cylinders should be secured with thru bolts, NOT with lag screws. Failure to adhere to this warning may result separation of steering components leading to loss of steering control, which may result in unpredictable boat behavior, leading to a collision with an obstacle and/or ejection from the boat, resulting in property damage personal injury and/or death.

⚠ CAUTION

Cylinder hose/bleeder fittings must always be installed in the uppermost position. If this is not possible the cylinder must be disconnected from mount to allow the bleeder fittings to be in the up-right position, then, once all air is removed the cylinder can be re-installed. Leaving air in the system will drastically affect performance of your steering system.

⚠ CAUTION

Protect cylinder shafts from nicks and scratches. A damaged cylinder shaft can not be repaired and a new cylinder will need to be purchased.

All parts used are corrosion resistant, however with extended operation under extremely corrosive conditions, corrosion may occur and affected parts should be replaced.

In order to avoid excess steering loads and to optimize steering performance, outdrive trim tabs must be adjusted in accordance with the engine manufacturer's instructions for specific boat/motor combinations. Failure to do so will drastically change the performance and handling characteristics of your boat.

Inboard ATM Cylinder Models:
HC4460-3 (BA1.25-6.25ATM)

1. Minimum side loading of cylinder rod and maximum cylinder performance of ATM and TM Models can be achieved as illustrated below.
 An imaginary line drawn through the tiller arm hole at both hard over positions will create the cylinder centre line. With tiller arm at hard over positions, angle X and Y should be the same.

NOTICE

To achieve MAXIMUM cylinder performance it is suggested that an imaginary line is drawn through the tiller arm hole at both hard over positions (see figure 2), this will create the "cylinder center line". With the tiller arm at hard over positions, angle X and Y should be the same.

NOTICE

In order to obtain a correct push and pull angle between the tiller arm and cylinder, or tiebar and cylinder, the cylinder should be parallel to the transom, tiebar or the keel line (depending on your mounting configuration) when cylinder rod is fully extended (out) or fully retracted (in).

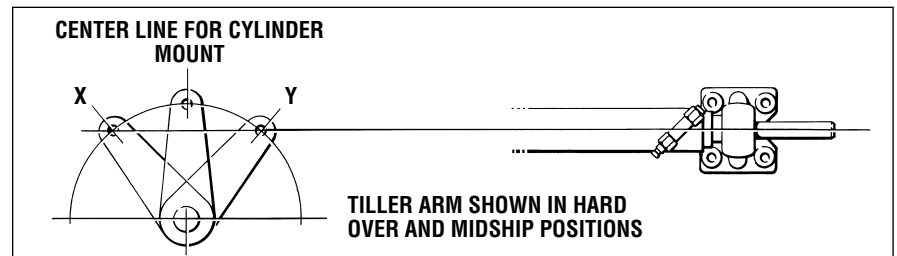


Figure 2.

2. Set rudder(s) in the fore and aft position and then attach rod end ball joint to the tiller arm or tiebar.
3. Remove caps from cylinder hose fittings.
4. Extend cylinder rod to arrive at 18.8" (477.5 mm) from center of rod end ball joint hole to the center of the mounting foot (as shown in figure 3 below).

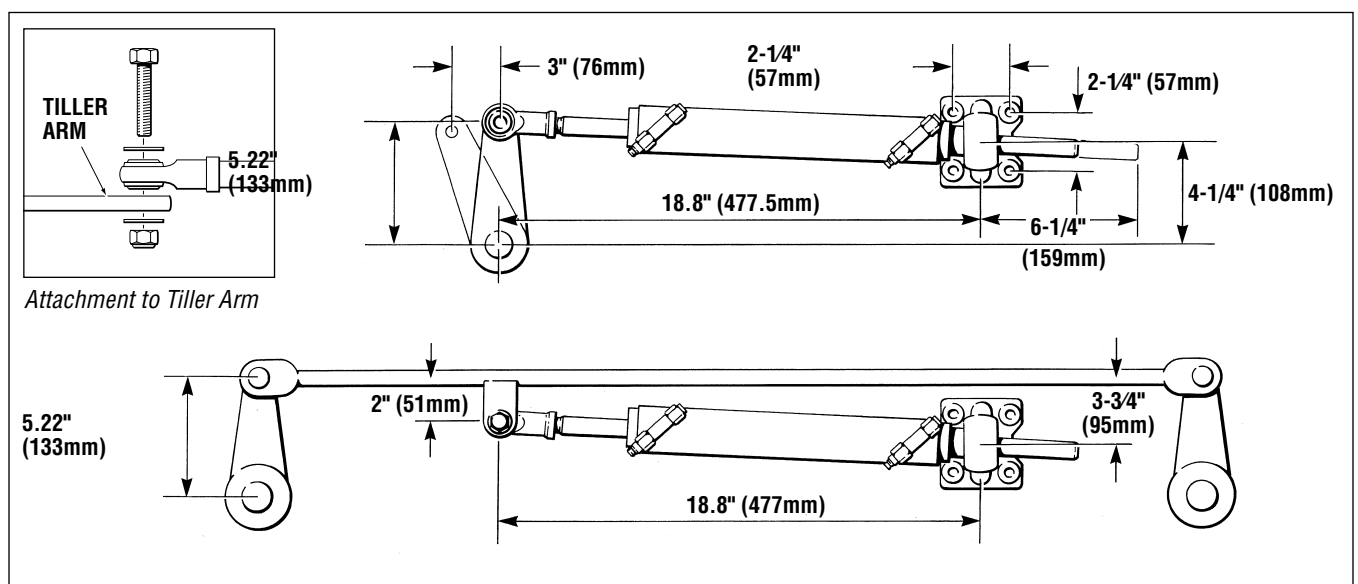


Figure 3.

HYDRAULIC STEERING

CYLINDER MOUNTING

⚠ CAUTION

There is **NO** adjustment for centering cylinder after installation. **Correct mounting is critical at this time. Total cylinder travel is 6.25" (159mm).**

NOTICE

For twin rudders, the cylinder may be mounted directly to the tiebar or to one of the tiller arms. **ENSURE** all measurements remain the same as if mounting to a rudder arm.

5. Secure mounting foot to transom or mounting bracket using four 5/16" (8mm) Grade 5 bolts (corrosion resistant) and self-locking nuts.
6. **BEFORE** final hose/tube connection, swing rudder(s) back and forth to ensure free movement of cylinder and that there is no binding of the rod end ball joint.

⚠ WARNING

Any binding and or interference MUST be corrected prior to use. Failure to do so may lead to separation of components and/or prevention of steering control. Separation of components or loss of steering control may lead to unpredictable boat behavior and/or a collision with an obstacle and/or ejection from vessel resulting in property damage, personal injury and/or death.

⚠ CAUTION

The cylinder ball mount allows up to **15 degrees of movement MAX.** Any movement beyond 15 degrees will result in premature seal and/or bearing wear.

Inboard ATM Cylinder Models:

HC4461-3 (BA100-6ATM)

1. Minimum side loading of cylinder rod and maximum cylinder performance of ATM and TM Models can be achieved as illustrated below.

An imaginary line drawn through the tiller arm hole at both hard over positions will create the cylinder centre line. With tiller arm at hard over positions, angle X and Y should be the same.

NOTICE

To achieve **MAXIMUM** cylinder performance it is suggested that an imaginary line is drawn through the tiller arm hole at both hard over positions (see figure 4), this will create the "cylinder center line". With the tiller arm at hard over positions, angle X and Y should be the same.

NOTICE

In order to obtain a correct push and pull angle between the tiller arm and cylinder, or tiebar and cylinder, the cylinder should be parallel to the transom, tiebar or the keel line (depending on your mounting configuration) when cylinder rod is fully extended (out) or fully retracted (in).

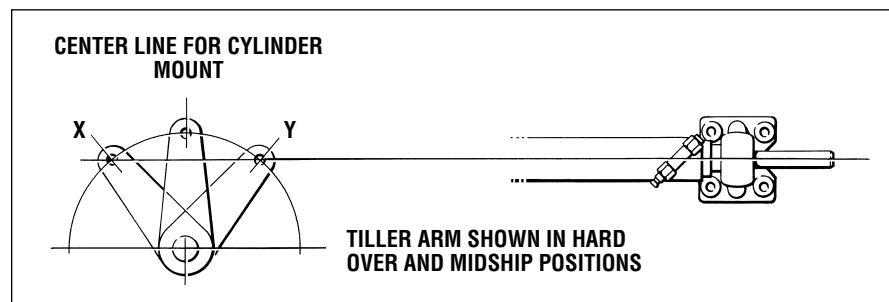


Figure 4.

2. Set rudder(s) in the fore and aft position and then attach rod end ball joint to the tiller arm or tiebar.
3. Remove caps from cylinder hose fittings.
4. Extend cylinder rod to arrive at 17.3" (439 mm) from center of rod end ball joint hole to the center of the mounting foot (as shown in figure 5 below).

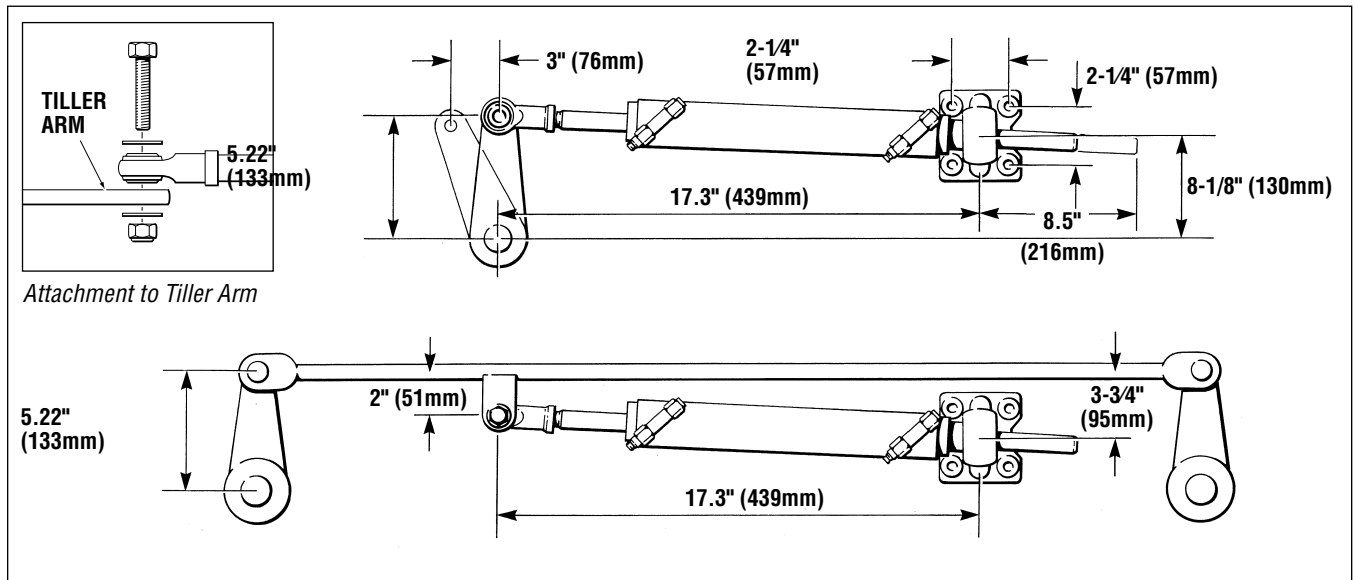


Figure 5

⚠ CAUTION

There is NO adjustment for centering cylinder after installation. Correct mounting is critical at this time. Total cylinder travel is 6" (152mm).

NOTICE

For twin rudders, the cylinder may be mounted directly to the tiebar or to one of the tiller arms. ENSURE all measurements remain the same as if mounting to a rudder arm.

5. Secure mounting foot to transom or mounting bracket using four 5/16" (8mm) Grade 5 bolts (corrosion resistant) and self-locking nuts.
6. BEFORE final hose/tube connection, swing rudder(s) back and forth to ensure free movement of cylinder and that there is no binding of the rod end ball joint.

⚠ WARNING

Any binding and or interference MUST be corrected prior to use. Failure to do so may lead to separation of components and/or prevention of steering control. Separation of components or loss of steering control may lead to unpredictable boat behavior and/or a collision with an obstacle and/or ejection from vessel resulting in property damage, personal injury and/or death.

⚠ CAUTION

The cylinder ball mount allows up to 15 degrees of movement MAX. Any movement beyond 15 degrees will result in premature seal and/or bearing wear.

HOSE AND TUBING INSTALLATIONS

General

Proper steering hose/tube is required for the best performance and safe operation of your steering system. Use of a hose/tube other than that recommended by SeaStar Solutions may drastically effect performance and the safe operation of your system. SeaStar Solutions cannot be responsible for ANY consequences resulting from the use of a substitute tube or hose.

WARNING

Use of a substitute hose and/or tube may lead to hose breakage or rupture resulting in loss of steering control. Loss of steering control may lead to unpredictable boat behavior and/or a collision with an obstacle and/or ejection from boat, resulting in property damage, personal injury and/or death.

The following considerations **MUST** be taken into account when planning and routing steering hose/tubes.

- a) Cut nylon/copper tubing using an appropriate tube cutter. A straight and level cut is required for proper sealing.
- b) DO NOT allow hose/tube to come into contact or come to close to any source of extreme heat. Extreme heat WILL lower burst pressure and/or melt hose/tubing resulting in the immediate loss of steering control. Loss of steering control may lead to a collision with an obstacle and/or ejection from boat resulting in property damage, personal injury and/or death.
- c) Hose/Tube must be routed so that it will not interfere with any other functional equipment; (such as, hatches, doorways or in a walking path where it may become a tripping hazard).
- d) Hose/Tube **MUST** be installed with a gradual rise from the steering cylinder to the helm pump(s). If hose/tube is not installed with a gradual rise, air removal from system will be difficult.
- e) Hose/tube should be secured at regular intervals using non-metallic type ties.
- f) Do not allow tubing to rest or chafe against any abrasive material.

CAUTION

DO NOT CUT SeaStar Outboard, flexible, hoses. Cutting these will render them useless and a new hose will need to be ordered.

NOTICE

*Fiberglass although soft to the touch can be extremely abrasive. Care **MUST** be taken when securing hose/tubing.*

- g) Ensure that hose/tube ends are covered prior to passing through bulkheads, cable tubes and any other blind area. Failure to do so may allow contamination to enter the steering system.

WARNING

If hose/tubing is kinked during and/or after installation it **MUST be replaced prior to operation. SeaStar Outboard hose cannot be cut and must be replaced with a new hose completely. SeaStar extruded nylon tubing can have the damaged section removed and a union fitting put into place. Failure to replace any damaged hose/tube may result in loss of steering control. Loss of steering control may lead to unpredictable boat behavior and/or a collision with an obstacle and/or ejection from vessel, resulting in property damage, person injury and/or death.**

Positional O-Ring Horizontal and Vertical Tee Fitting Installation/Realignment (if required)

1. Back off lock nut (item 1, figure 6), counter-clockwise, until it stops.
2. Thread fitting into cylinder body until fitting washer (item 2, figure 6) 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 6) and torque to 40–43 ft-lb.
5. Purge system as per your cylinder instruction manual.

⚠ WARNING

Failure to properly tighten the locknut (item 1, figure 6) 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.

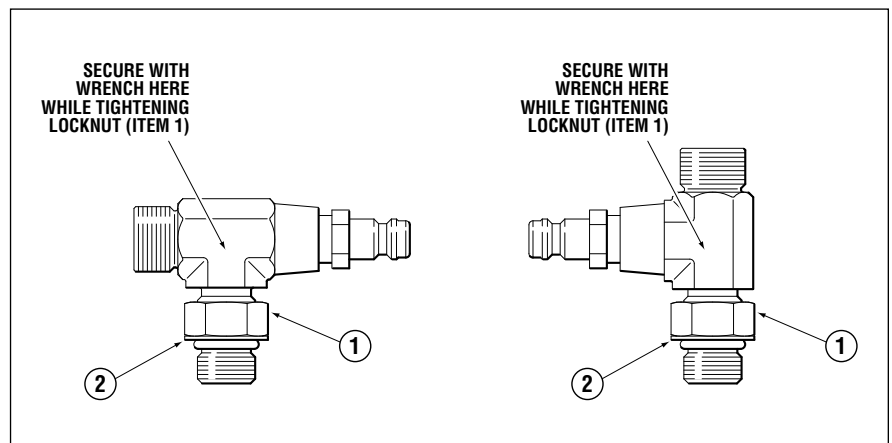


Figure 6

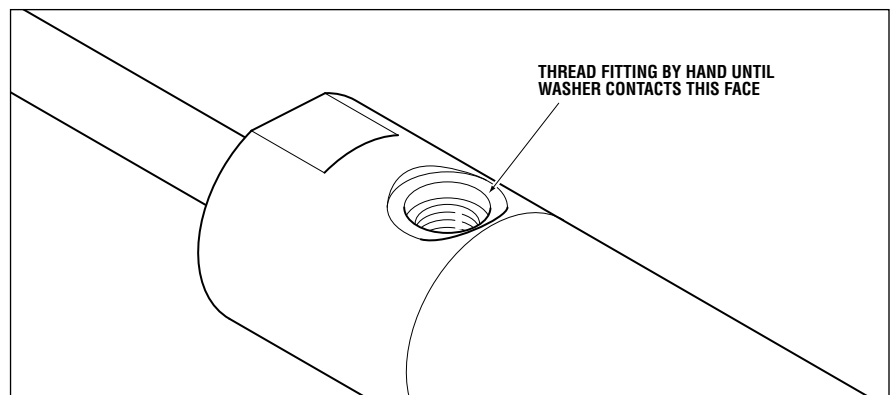


Figure 7.

HYDRAULIC STEERING

HOSE & TUBE INSTALLATION

System Connection

1. Refer to figure 10 on this page for hose/tube to fitting connection.
2. If not already completed, install fittings into helm as per specific instructions supplied with your helm pump.

⚠ CAUTION

There is **NO** requirement for pipe sealant of any kind when using an ORB fittings. A "LIQUID" Teflon based pipe sealant **IS** required when using NPT type fittings. **DO NOT** use Teflon Tape or any other tape type sealers.

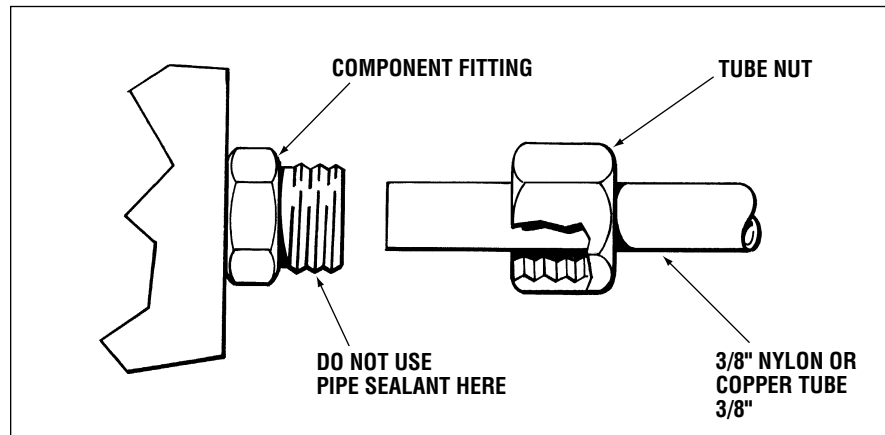


Figure 8. Connection to Helm Pump shown.

⚠ CAUTION

Ensure that the tubing is pushed **ALL** the way in.

3. Helm Pump Connection

- a) SeaStar Outboard Hose – While holding the fitting body securely with a wrench, torque the hose end nut to 15 ft-lbs.
- b) BayStar Nylon Tubing.
 - Slide tube nut over tubing.
 - Push tubing into bottom of component fittings.
 - Hand tighten tube nut, ensuring that the tube is bottomed out against the fitting while tightening.
 - After hand-tight, turn an additional 1-1/2 turn with a 5/8" wrench.

MANUAL FILLING AND PURGING

NOTICE

Power Purge Users. Please refer to the instructions included with your power purge unit.

Read First

These instructions show how to fill and purge a Single Station Cylinder System.

NOTICE

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

SeaStar Solutions recommends the use of **SeaStar Steering Fluid ONLY**. SeaStar Steering Systems have been engineered and validated using our proprietary SeaStar Hydraulic Fluid.

⚠ WARNING

Any non-approved fluid may cause serious damage to the steering system resulting in possible loss of steering, causing property damage, personal injury and/or death.

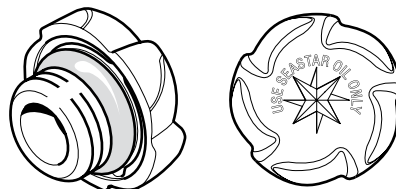
Emergency Use Fluids

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.

Vent Plug Part # HP6126 (5 per kit)



- Must be used with helm pump on all single steering station systems.
- Must be used on upper-most helm pump only on multi-steering station systems.
- Vent hole: actual size as shown.
- Colour: thread – silver / cap – black.

Figure 9.

HYDRAULIC STEERING

FILLING AND PURGING

Hydraulic Oil Requirements

2 bottles (2 quarts or litres) for single station and single cylinder systems.

1 additional bottle for each additional helm, cylinder, or auto pilot.

NOTICE

These instructions will result in hydraulic oil flushed in and out of the system. 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 cylinders fitted with bleed tee fittings. If fitted with bleed tee fitting, open bleeder by unscrewing bleed nipple nut two turns.

⚠ CAUTION

Unbalanced Cylinders.

The oil level in the helm must be set with the cylinder rod fully retracted. Failing to observe this caution will result in an oil spill at the helm.

NOTICE

Filling the helm full of oil can be done faster if oil is poured into the helm prior to connecting filler tube and oil bottle to the helm.

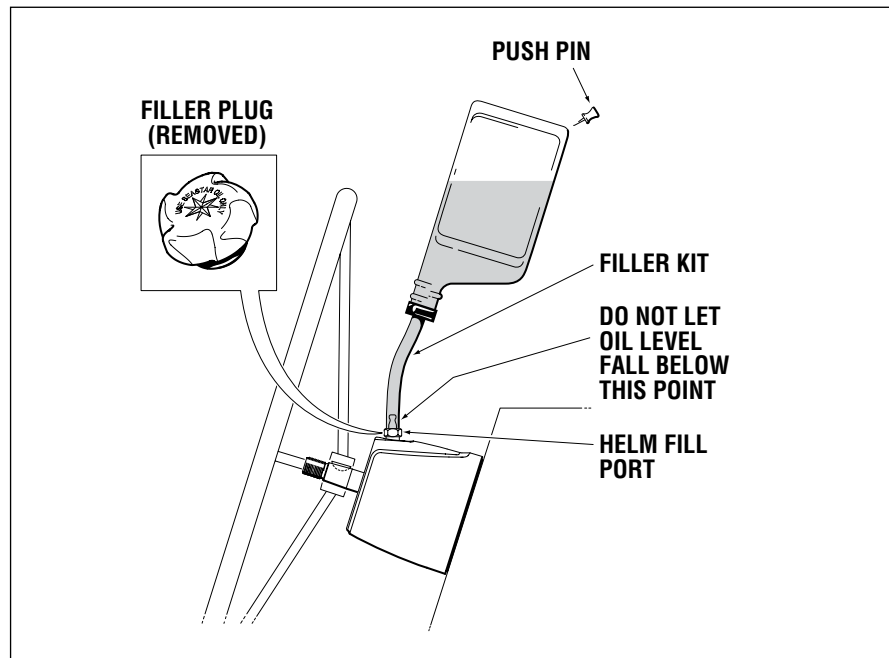


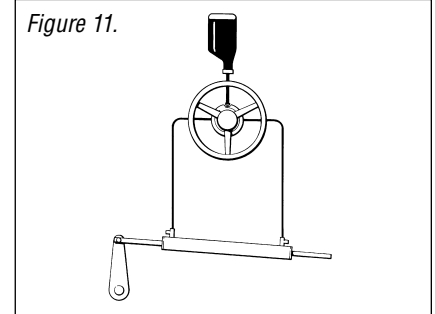
Figure 10.

Single Station One Cylinder

Step 1

- Screw the threaded end of the filler tube into the helm filler hole.
- 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 full of oil (Oil should always be visible in the filler tube). Use the next bottle at any time throughout the procedure when the oil level drops in the filler tube. Do not proceed with step two until helm is full of oil.

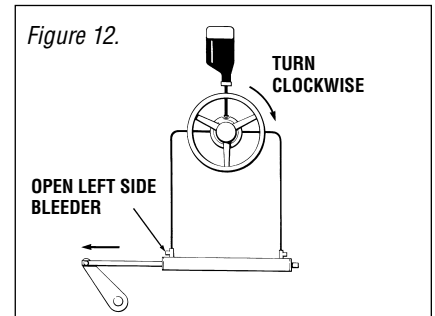
Figure 11.



Step 2

- Turn the steering wheel clockwise until the cylinder rod is fully extended on the left side of the cylinder.
- Open left side bleeder.

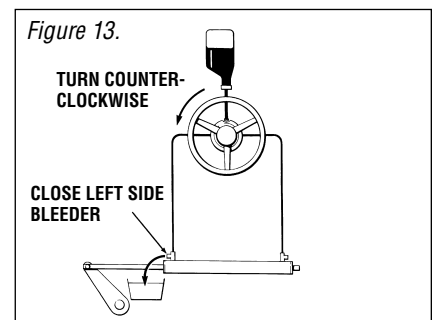
Figure 12.



Step 3

- Holding the cylinder rod (to prevent it from moving back into the cylinder) turn the steering wheel counter-clockwise until a steady stream of air free oil comes out of the bleeder. (Drain out approx. 1/2 bottle of oil or as required.)
- While continuing to turn the wheel, close the left side bleeder and let go of the cylinder rod.

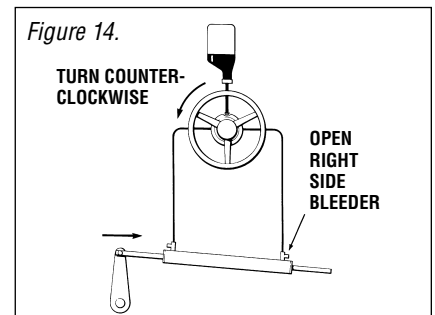
Figure 13.



Step 4

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

Figure 14.



HYDRAULIC STEERING

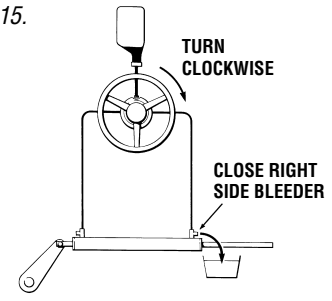
FILLING AND PURGING

Step 5

- Holding the cylinder rod (to prevent it from moving back into the cylinder) turn the steering wheel clockwise until a steady stream of air free oil comes out of bleeder.
- While continuing to turn the wheel, close the right side bleeder and let go of the cylinder rod.

Fill and purge is now complete.

Figure 15.



Oil Level Set

- Proper oil level set can be obtained by opening right bleeder and turning steering wheel to the right until fluid level reaches top of plastic filler fitting and then turning wheel one more full turn.

⚠ CAUTION

For unbalanced cylinders the oil level in the helm must be set with the cylinder rod fully retracted. Failing to observe this caution will result in an oil spill at the helm.

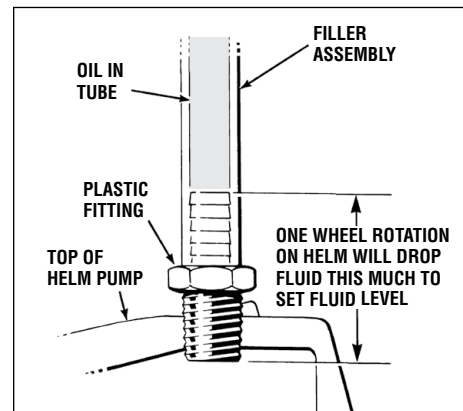


Figure 16.

OIL LEVEL & SYSTEM CHECK

STEP 1

WARNING

CAUTION

When setting fluid level in a system fitted with an un-balanced cylinder, the cylinder shaft **MUST** be fully retracted (IN). Failure to have cylinder shaft retracted (IN) will lead to very stiff steering and/or oil spillage at the helm pump.

Oil Level Setting

The oil level **MUST** be checked and maintained **BEFORE** each use to ensure the safe operation of your steering system. Failure to adhere to this warning 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.

- For helms mounted with the wheel shaft completely horizontal **MUST** be filled to the bottom of the filler hole **AT ALL TIMES**. **DO NOT** allow oil level to drop more than 1/4" below the filler port threads.
- For helms mounted on a 20° angle, or, with wheel shaft in the vertical position the oil level must be no lower than 1/2" below filler port threads and no higher than 1/8" below filler port threads.

STEP 2

WARNING

NOTICE

WARNING

System Check

The System Check **MUST** be completed after installation. Doing so will ensure the safe operation of your steering system. Any fault (leaks or malfunction) will present itself during this check. Failure to adhere to this check may result in loss of steering control. Loss of steering control may lead to unpredictable boat behavior, leading to a collision with an obstacle and/or ejection from the boat, resulting in property damage personal injury and/or death.

- Turn steering wheel hard over to hard over to confirm unrestricted movement of steering components.

If equipped with a tilting helm, repeat this step in "EVERY" tilt position.

- Confirm that rudder(s) and outdrive(s) are turning to the proper direction.
- If no interference is noticed and rudder(s) and/or outdrive(s) are turning to the proper direction, go to next point
- Take steering wheel hard over to starboard. Once the wheel reaches its stop point, force the wheel another 1/4 – 1/2 turn past stop. Leave wheel in this position while you inspect ALL fittings, helms and hose/tubes for any signs of a leak.
- Repeat above step to the starboard side of each steering station
- Repeat above steps to the port side of each steering station.
- If ANY leaks are noticed they **MUST** be repaired **BEFORE** operating your boat.

Failure to correct **ANY** problem that becomes present during the "System Check" may lead to loss of steering control. Loss of steering control can lead to unpredictable boat behavior and/or collision with obstacle and/or ejection from vessel resulting in property and/or personal injury or death.

ROUTINE MAINTENANCE

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

NOTICE

Maintenance requirements will vary depending on usage and climate. Bi-Annual inspection by a qualified marine mechanic is required.

1. Every Trip, prior to engine start up or launch

- Check Fluid level in uppermost helm pump .
- Hose/Tube. Ensure hose/tubing are in good condition and free of wear, kinks or any other signs of fatigue or damage.
*REPLACE IF DEEMED FAULTY.
- Turn steering wheel hard over to hard over to ensure rudder(s) and/or outdrive(s) are responding to input at the wheel.
Repeat on ALL steering stations on board (including autopilots).

2. Every 100 hours or 3 months (whichever comes first)

- All points noted in 1.
- Check torque value on ALL fasteners throughout the steering system. Tighten as required. See page 20 for torque specifications.

3. Every 6 months

- All points noted in Steps 1 and 2.
- Grease rod end ball joints (inboard ATM and TM cylinders).
- Remove and clean support/cable tube (Sterndrive models).
- Remove steering wheel and re-grease wheel shaft.

WARNING

Failure to adhere to the “Routine Maintenance” procedures noted above may lead to loss of steering control. Loss of steering control may lead to unpredictable boat behavior and/or a collision with an obstacle and/or ejection from boat resulting in property damage, personal injury and/or death.

TROUBLESHOOTING GUIDE

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, to minimize the possibility of total loss of steering.

Most faults occur when the installation instructions are not followed and usually show up immediately upon filling the system. Provided below, are the most common faults encountered and their likely cause and solution. The term “Rudder” also applies to stern drives, when applicable.

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

WARNING

Whenever in the following text, a solution calls for removal from vessel and/or dismantling of steering system components, such work must only be carried out by a qualified marine hydraulic mechanic. SeaStar Solutions offers the following as a guide only and is not responsible for any consequences resulting from incorrect dismantling repairs.

FAULT	CAUSE	SOLUTION
1. During Filling, the helm becomes completely jammed.	<ul style="list-style-type: none">• Blockage in the line between the helm(s) and the cylinder(s).	<ul style="list-style-type: none">• Make certain that tubing has not collapsed during installation. If so, the collapsed section must be removed and re-fitted with a new piece with the aid of tube connectors. Check fittings for incomplete holes. Fittings with incomplete holes, however, are not common.
2. System is very difficult to fill. Air keeps burping out top of helm even after system appears full.	<ul style="list-style-type: none">• Cylinder(s) has been mounted upside down. This causes air to be trapped in the cylinder(s).• Air in system.	<ul style="list-style-type: none">• Mount cylinder(s) correctly, according to cylinder installation instruction. Ports should always be kept in uppermost position.• Review filling instructions.
3. Steering is stiff and hard to turn, even when the vessel is not moving.	<ul style="list-style-type: none">• Rudder post glands are too tight or rudder post is bent, causing mechanical binding. The same applies to tiller arm and linkage on outdrives.	<ul style="list-style-type: none">• To test, disconnect cylinder(s) from the tiller arm and turn the steering wheel. If it turns easily, correct above mentioned problems. Please note that excessively loose connections to tiller arm or tie-bar can also cause mechanical binding.

HYDRAULIC STEERING

TROUBLESHOOTING

FAULT

CAUSE

SOLUTION

3. Continued

Steering is stiff and hard to turn, even when the vessel is not moving.

- Restrictions in hose, copper tubing, piping or fittings.
- Air in oil.
- Wrong oil has been used to fill steering system, like A.T.F. (automatic transmission fluid, or any other oil with a high viscosity factor).

- Find restriction and correct. **Note:** Collapsing of copper tubing during bending is enough to cause restrictions.
- See filling instructions supplied with helm units.
- Drain system and fill with recommended oils.

4. Helm unit in system is very bumpy and requires too many turns from hardover to hardover.

- Dirt in inlet check of helm pump.

- Contact Authorized repair center and/or replace helm pump.

5. Steering is easy to turn at the dock, but becomes hard to turn when vessel is underway.

- Steering wheel is too small.
- cylinder(s) too small.
- incorrect setting of trim tab(s) on stern drive.
- incorrectly designed or adjusted rudders, causing binding on rudder post and/or tie bar at cruising speeds.

- Fit larger wheel if possible, see installation instructions. If the problem cannot be rectified by the above mentioned solution, proceed with next cause and solution or consult factory.
- replace with larger cylinder(s).
- adjust tab(s).
- seek professional help. Have competent, qualified marine mechanic correct problem.

6. Rudder drifts to port or starboard while vessel is underway, even when wheel is not being turned.

- Dirt in check valves.

- Contact authorized repair center and/or replace helm pump.

7. Consistent wearing of rod end ball and or mounting foot.

- Excess vibration at rudder.

- Consult with boat builder and/or Naval architect for vibration cure.

TECHNICAL INFORMATION

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.

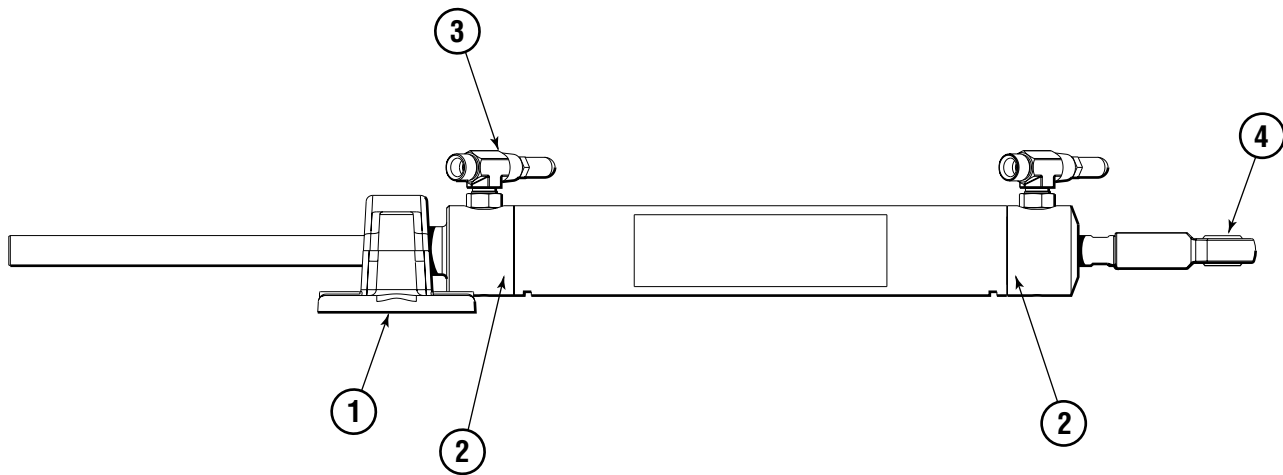
Values are stated in: **in/lbs (N.m)**

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)			

PARTS LIST



NOTICE

SeaStar Solutions does not sell internal parts. Contact Authorized repair center for repair and/or replace cylinder.

⚠ WARNING

When replacing any seals, make sure shaft is clear of any abrasions.

Figure 17.

ITEM	PART #	QTY	DESCRIPTION
1	HP5611	1	Aluminum Mounting Foot
2	HP6026	1	End Gland Seal Kit
3	HF6001	1	Bleeder/Tee Assembly (2 per kit)
4	HP6029	1	Rod End Ball

ITEM	PART #	QTY	DESCRIPTION
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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.

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-Supply Chain Solutions Inc.
Door A37
1201 C Street NW, Auburn, WA,
98001

From Canada

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

Technical Support

Phone: 604-248-3858

email: seastar@seastarsolutions.com

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

Web: www.seastarsolutions.com



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