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 **Teleflex**[®]
Teleflex Canada

OPERATING INSTRUCTIONS

AND OWNERS MANUAL

www.seastarsteering.com



SeaStar **PSA**TM

HYDRAULIC POWER ASSIST FOR SEASTAR
STEERING SYSTEMS (PA1200)

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




Dedicated to our friend and mentor Jack Hoster.

*Through the years you have always helped to steer us
in the right direction, you are a true friend and mentor,
you will be missed, but not forgotten.*

December 2003




your friends from Sea Star

Notice to Boat Manufacturer or Installer

Throughout this publication, Warnings and Cautions (accompanied by the International Hazard Symbol ) are used to alert the manufacturer or installer to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly.

Observe Them Carefully!

These “safety alerts” alone, cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the installation and maintenance plus “common sense” operation are major accident prevention measures.

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

WARNING

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

NOTICE

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

INTRODUCTION

Before proceeding with the installation, read these instructions thoroughly. Teleflex cannot accept responsibility for installations where instructions have not been followed, where substitute parts have been used, or modifications have been made to our products. Warranty may be void if products other than Teleflex products are used with this system.

NOTICE

Due to a small amount of internal hydraulic slip, a "master spoke: or "centered" steering wheel cannot be maintained with a Hydraulic Steering System. For best results, use an equal distance spoke steering wheel. Consult Teleflex Canada before using the P/A system with a SeaStar Pro Helm pump.

⚠ 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 shaft and prevent further steering!

Pro Trim offers fingertip trim or jackplate control with a column-mounted switch, enabling you to keep both hands on the steering wheel and concentrate on your driving. Pro Trim PT1000 controls trim or jackplate only. Pro Trim Dual PT2000 controls both functions.

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BEFORE OPERATING YOUR BOAT

Ensure that the following check list is carried out

- 1 With the P/A unit "OFF" (ignition off) perform a system pressure test by turning the helm all the way to hard over and then forcing the helm another one quarter to one half turn past the stop point.

Inspect the following areas for leaks.

- Inspect helm fittings
- Inspect P/A fittings
- Inspect cylinder fittings

Look for evidence of a leak. This test is to be done in BOTH directions. Any leak that is noticed will need to be repaired before operating the boat.

- 2 **Confirm that extruded nylon tubing has NOT been substituted for SeaStar Hydraulic Steering Hose.**
- 3 Confirm that there is no interference between the steering cylinder and the transom, splashwell or jackplate or any combination of these parts by performing these simple steps:
 - If installed on an outboard engine, with the engine fully titled, turn steering from hard over to hard over and confirm that NO interference occurs. If you are using a hydraulic jack plate this also must be performed at the top and bottom position of the jack plate. *(If interference is present, it MUST be eliminated with trim limiting switches and/or jack plate restrictors. Contact Jack plate manufacturer for advice if required.)*
 - Confirm that the steering cylinder can be stroked fully in both directions as well as full tilt and trim without stretching and/or kinking the hydraulic hoses.
 - Confirm that the hydraulic hoses are not subjected to chafing or rubbing.

WARNING

Failure to comply with above may result in loss of steering, causing property damage and/or personal injury

WARNING

Stretched, kinked or chafed hose will fail over a period of time.

CAUTION

The SeaStar P/A has a 40 amp fuse and a thermal breaker to protect the electronics from overheating and/or fire. If either of these devices are triggered, the steering will revert back to manual steering, requiring substantially more force to turn the wheel.

WARNING

When working in an area where fumes from fuel are present, allow the fumes to disperse completely **BEFORE doing any electrical connection to the battery. Failure to do so may result in an explosion and or fire.**

SeaStar P/A Compatibility Chart

NOTICE

DO NOT use Nylon tube to plumb this system. Use ONLY SeaStar hydraulic outboard hoses.

The P/A is designed to work best with SeaStar 1.7 and 2.0 helm pumps. The P/A unit is NOT recommended for use with 2.4 helm pumps.

NOTICE

Use ONLY Teleflex products with the P/A unit as with ALL Teleflex systems. Failure to do so may void your warranty.

Tools

You will need the following tools to complete your installation.

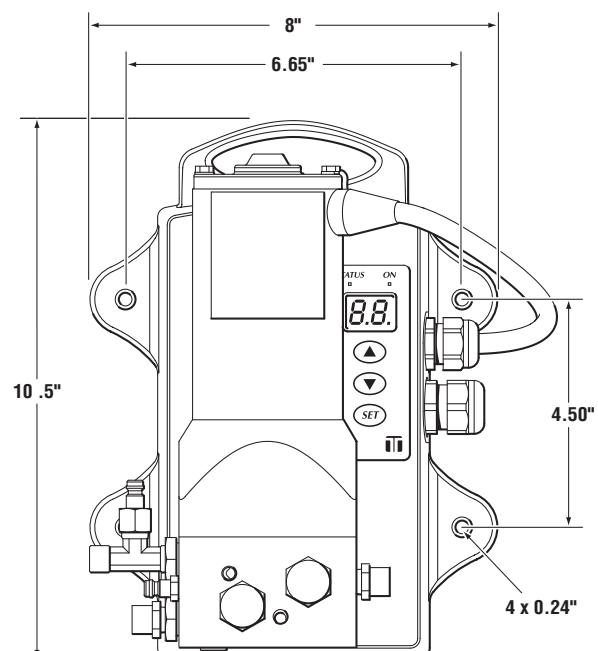
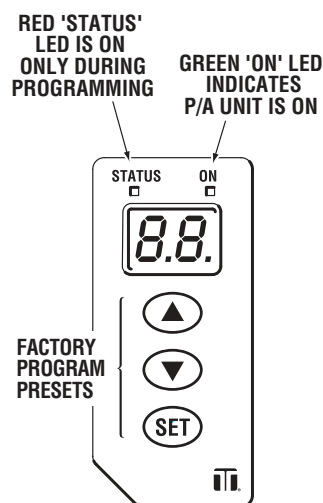
- 1/2", 5/8", and 3/4" open end wrench
- Electrical cut and crimp pliers.
- All other tools noted with your Helm Pump and Steering Cylinder Installation Instructions.

P/A PA1200 Specifications

- 12 Volts (24 volts to be offered late 2004)
- 1000 psi MAX pressure (500 psi working)
- Max Current Draw (at 1000 psi) 55 amps
- Typical current draw:
 - Single outboard ~ 3amps.
 - Twin Rudder Inboard ~ 8amps.

⚠ CAUTION

Display buttons UP, DOWN and SET are preset at the factory. DO NOT attempt to adjust the setting of the P/A unit. Accidental attempts to adjust the factory settings will not result in any change to the operation of the P/A unit.



HOW THE SYSTEM WORKS

SeaStar P/A (Power Assist) steering uses an electronically controlled hydraulic pump to provide "Power" for your SeaStar Hydraulic Steering system.

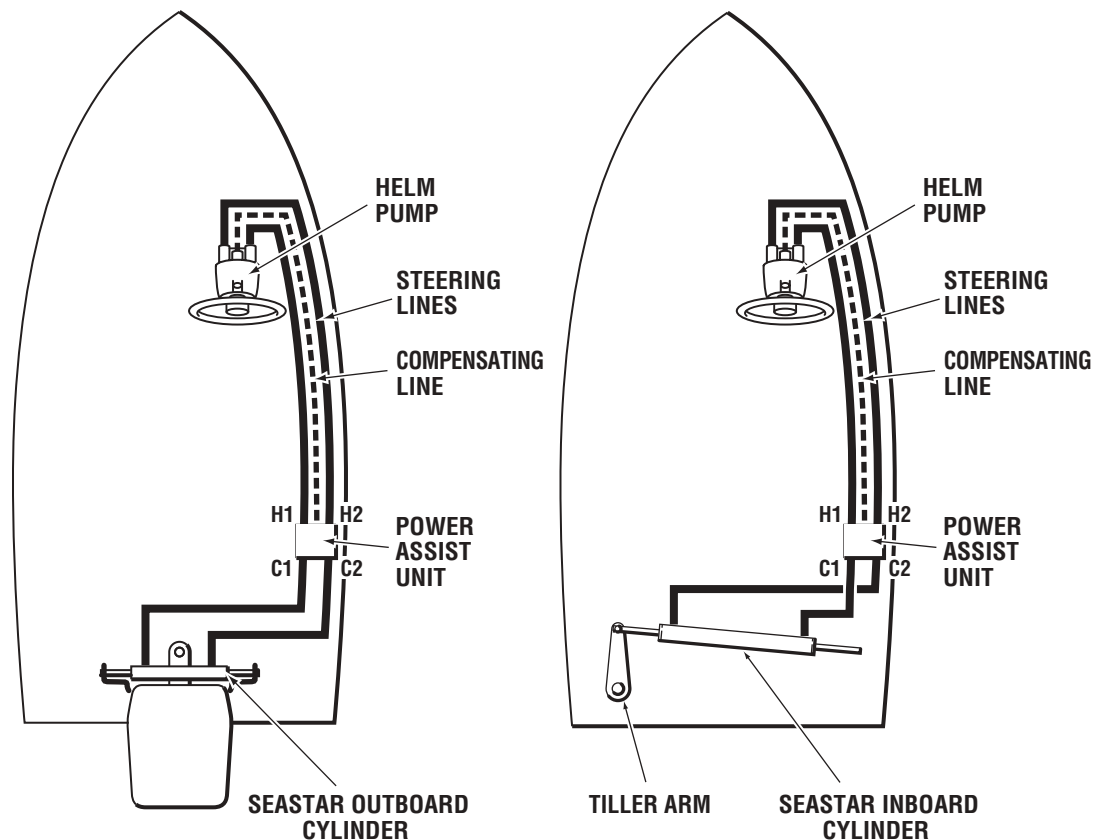
The SeaStar P/A system is comprised of two distinct circuits: a hand operated manual system, which is the control element, and a hydraulic power pump, which is the working element.

The manual system consists of a helm pump with internal relief and check valves, as well as a built in reservoir. Two steering lines, which provide a routing for fluid to transmit through the system, and a steering cylinder which moves the steering device on the boat from side to side.

The power system, is an electronically controlled hydraulic pump that boosts the fluid being sent from the helm pump to the steering cylinder (this will result in much easier effort at the wheel—even when under heavy loads). A compensating line connects the P/A unit to the helm pump, allowing the P/A unit to share fluid with the helm reservoir.

The SeaStar P/A is compatible with multiple steering stations, and with the use of an autopilot. In the event of a P/A power loss or failure the hydraulic system will automatically revert to a manual hydraulic system.

Typical installations shown (please refer to your cylinder installation manual for proper hose installation diagrams).



THINGS YOU NEED TO KNOW

WARNING

SeaStar Steering hose **CANNOT** be cut. Cutting the hoses will render them useless. Failing to comply, may result in possible loss of steering, causing property damage, personal injury and/or death.

CAUTION

DO NOT use SeaStar Nylon tube with the P/A unit. Use of SeaStar, or SeaStar Pro steering hose is the **ONLY** hose recommended for use with the P/A unit.

NOTICE

Due to various mounting configurations, mounting hardware is not supplied with the SeaStar P/A, make sure you collect the appropriate mounting screws before getting started (refer to Specifications on page 2 for mounting hole size).

CAUTION

Confirm that all components needed to complete the installation are purchased, including: helm pump, steering cylinder, hoses, fluid, fittings and pipe sealant such as Loctite PST, NEVER USE TEFLON TAPE.

CAUTION

Take EXTREME care not to allow any foreign material or contamination to enter the hydraulic system. Contamination is the main cause for a hydraulic system to wear and or fail.

WARNING

If it is necessary to replace the fuse for the P/A unit, the P/A unit MUST have the power turned OFF.

BEFORE STARTING

Study this manual and the other manuals provided with your SeaStar 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 allows port to port connection with less chance of an error. If you must run hoses first, a system of marking the various lines must be used. ALL hose ends must be closed with tape or similar material to prevent contamination.

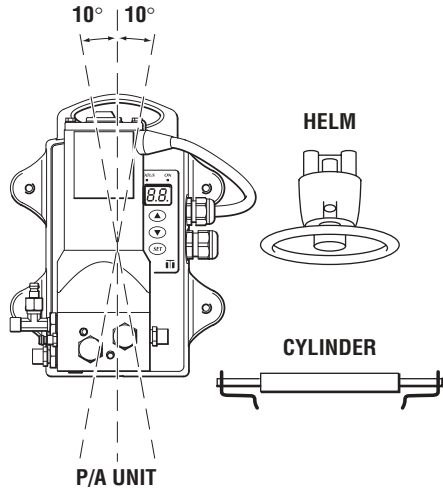
Contamination is the most common cause of system failure.

Read ALL bold print text, notes and cautions. Reading them 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, contact your Distributor or Teleflex Canada.

SYSTEM INSTALLATION OVERVIEW

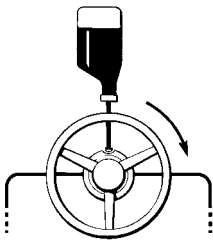
STEP 1 System Installation



- Install SeaStar Helm pump onto the dash using installation instructions provided with your helm pump.
- Install Steering Cylinder into boat using the installation instructions provided with your steering cylinder.
- The P/A unit will make a noise similar to that of an autopilot, we recommend installing the P/A unit in a vertical position (see diagram) as close to the steering cylinder as possible. **DO NOT mount the P/A unit in a horizontal position.**
- Install steering hoses using diagrams noted on page 6 through page 8, using your specific application.

NOTICE Due to the different cylinders options available with SeaStar Steering, be sure that you choose the correct installation diagram noted in this book.

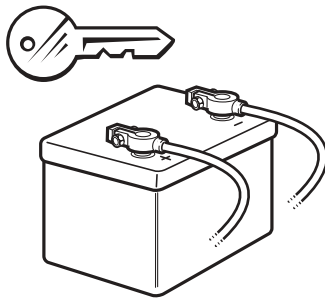
STEP 2 Filling and Purging



- Purge the SeaStar Steering System using the filling and purging instructions, steps 1 through 5, located on page 11 of this manual.

CAUTION DO NOT run the P/A unit until the SeaStar Steering System has been bled of air. Failure to do so may result in non-repairable damage to the P/A unit.

STEP 3 Electrical Installation



CAUTION

Reduce fire risks by only using wires of good quality. **ANY wire showing ANY sign of damage MUST be replaced.**

NOTICE The SeaStar P/A electrical connection is recommended to be made using a two position toggle switch that can be turned off, tying into the ignition system if the boat. Use a fuse-protected ignition ONLY.

- Refer to wiring diagram on page 10.
- Connect the RED (+ positive) wire to the Positive (+) terminal of your battery.
- Connect the Black wire (- Negative) to the Negative (-) terminal of your battery.
- Connect purple wire (power) to the ignition of the boat. Use of a two-position toggle switch recommended. Refer to page 10 for details.

CAUTION DO NOT lengthen any of the wires provided without first consulting Teleflex Canada, or your Distributor.

STEP 4 Final Purge and System Check

- Turn ignition ON and continue with the filling and purging instructions step 6 on page 15 of this manual

SeaStar Outboard Front Mount Cylinders and I/O Cylinder

Outboard Front Mount Cylinders:

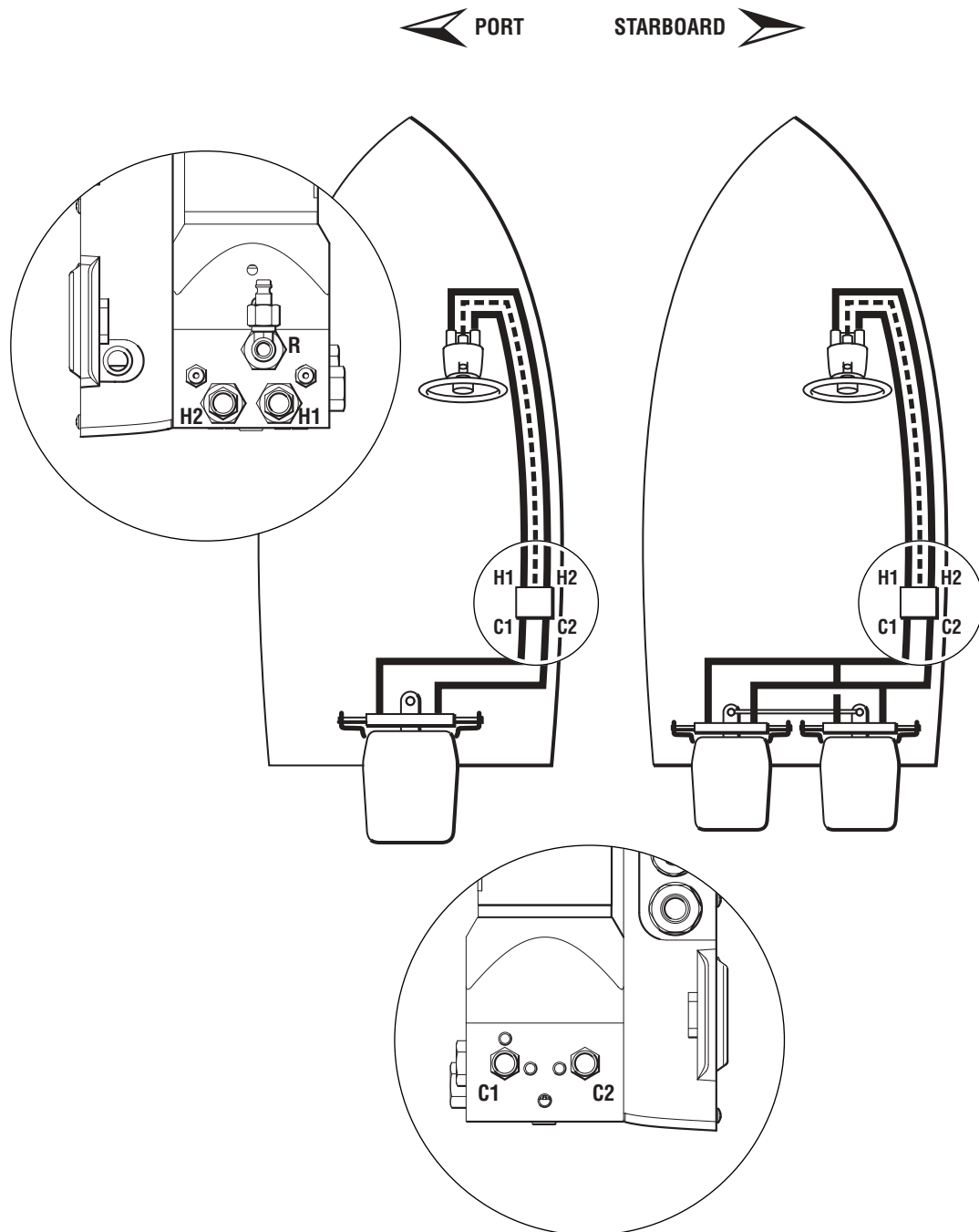
HC5345
HC5347
HC5345
HC5348
HC5358

Hose connection is as follows.

- Helm to P/A = S to H1, P to H2, R to bottom R port on helm pump.
- P/A to cylinder = C2 to starboard side. C1 to port side.

I/O Cylinder:

HC5332



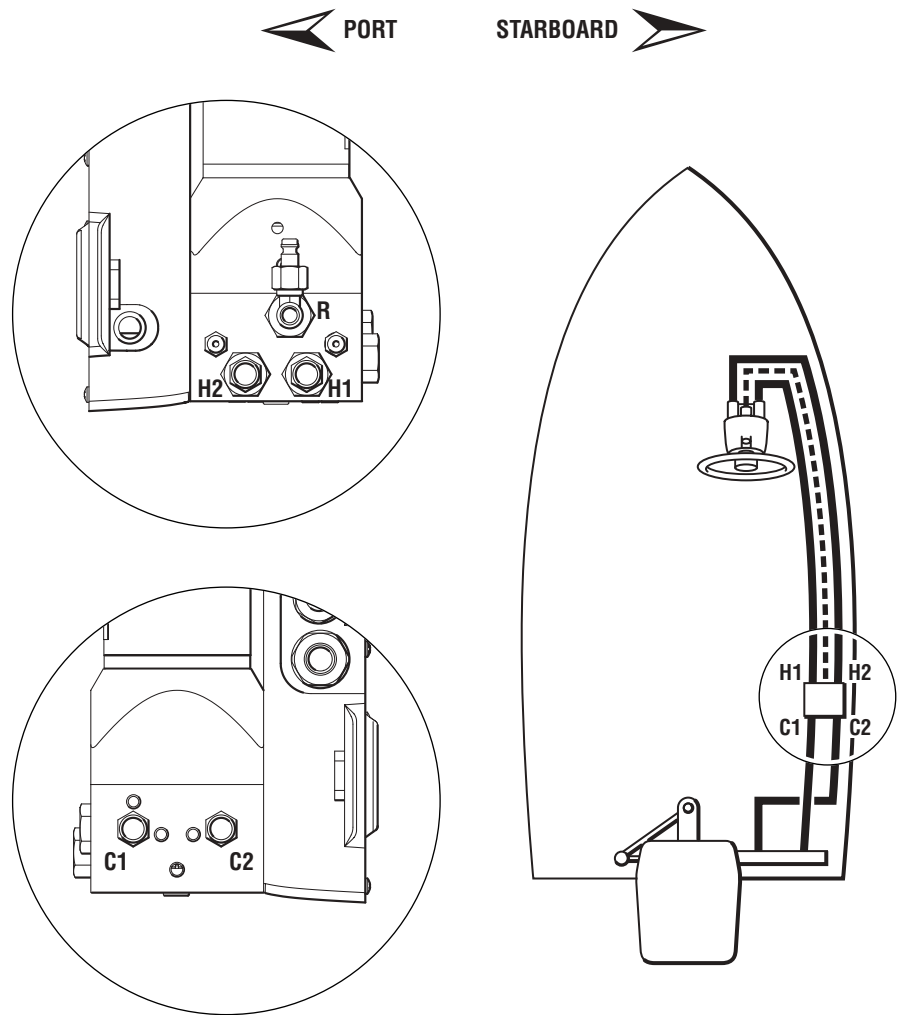
SeaStar Outboard Side Mount and Splashwell Mount Cylinders

Side Mount Cylinder:
HC5370

Splashwell Cylinder:
HC5380

Hose connection is as follows.

- Helm to P/A = S to H1, P to H2 R to bottom R port on helm pump.
- P/A to cylinder = C1 to starboard side. C2 to port side.

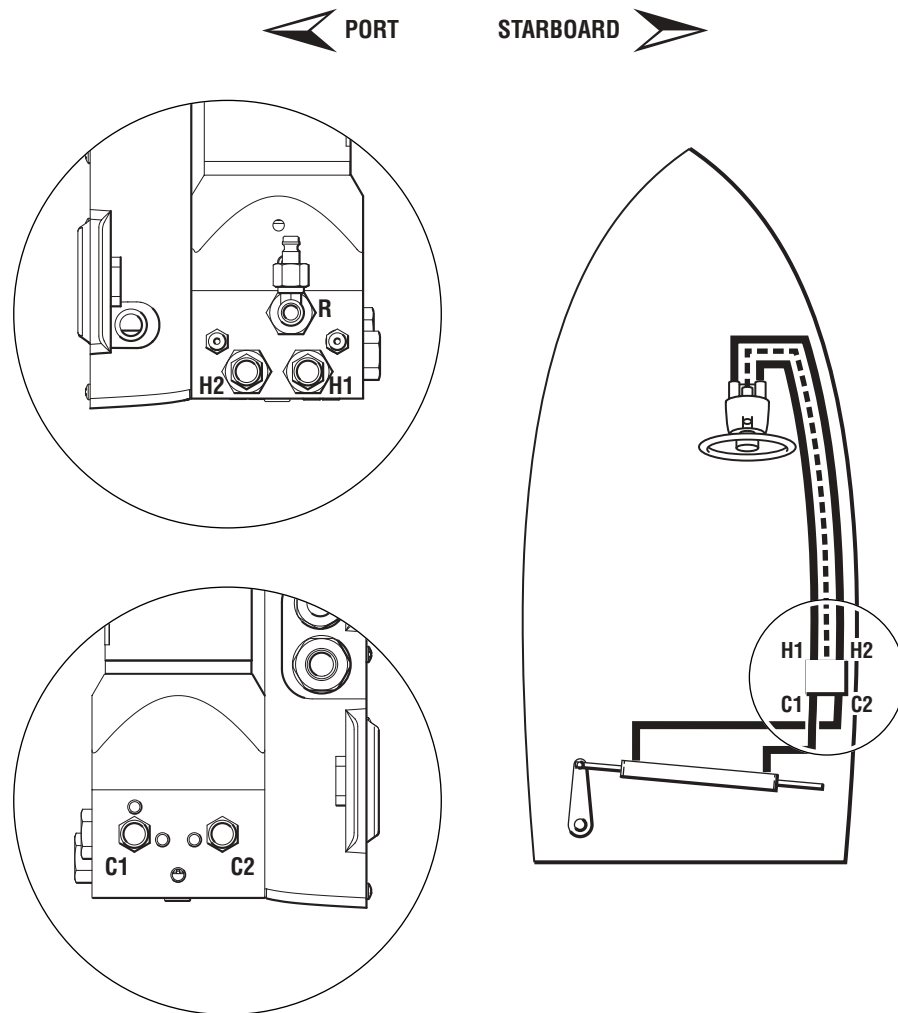


SeaStar Inboard and Sterndrive Cylinders ALL

All Inboard & Sterndrive Except: HC5332

Hose connection is as follows.

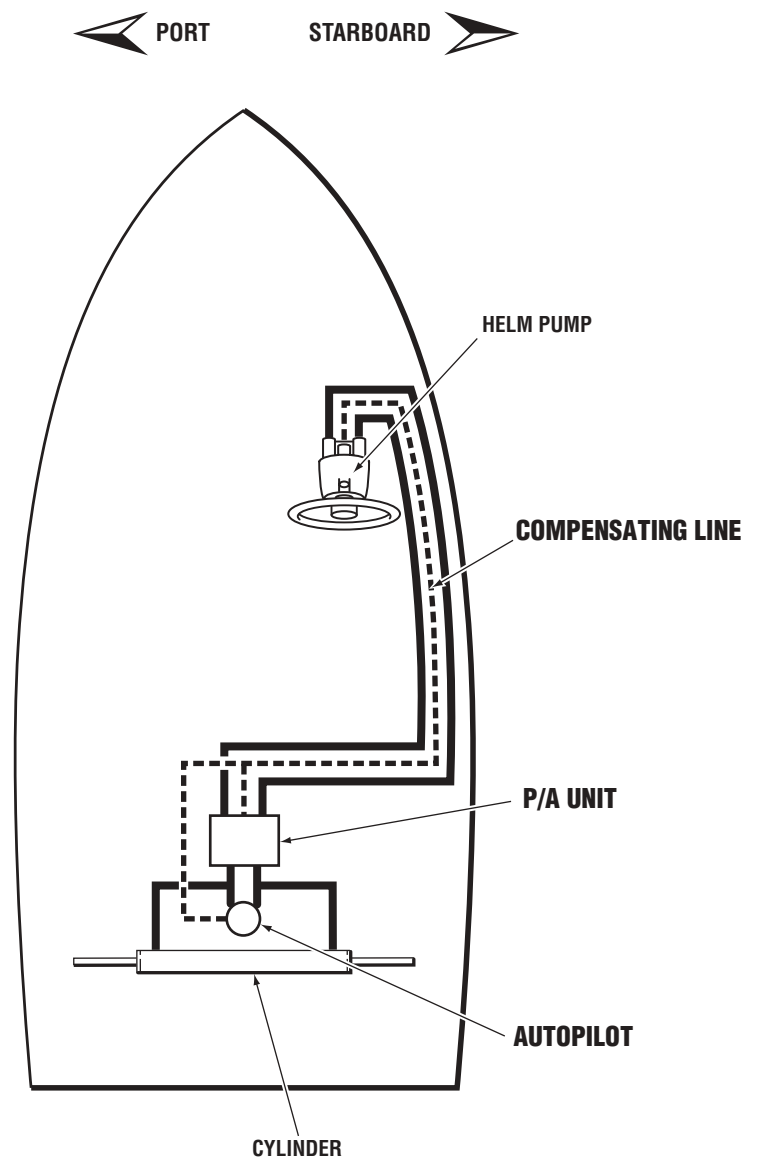
- Helm pump to P/A = S to H1, P to H2, R to bottom R port on Helm pump.
- P/A to cylinder = C1 to starboard side, C2 to port side.



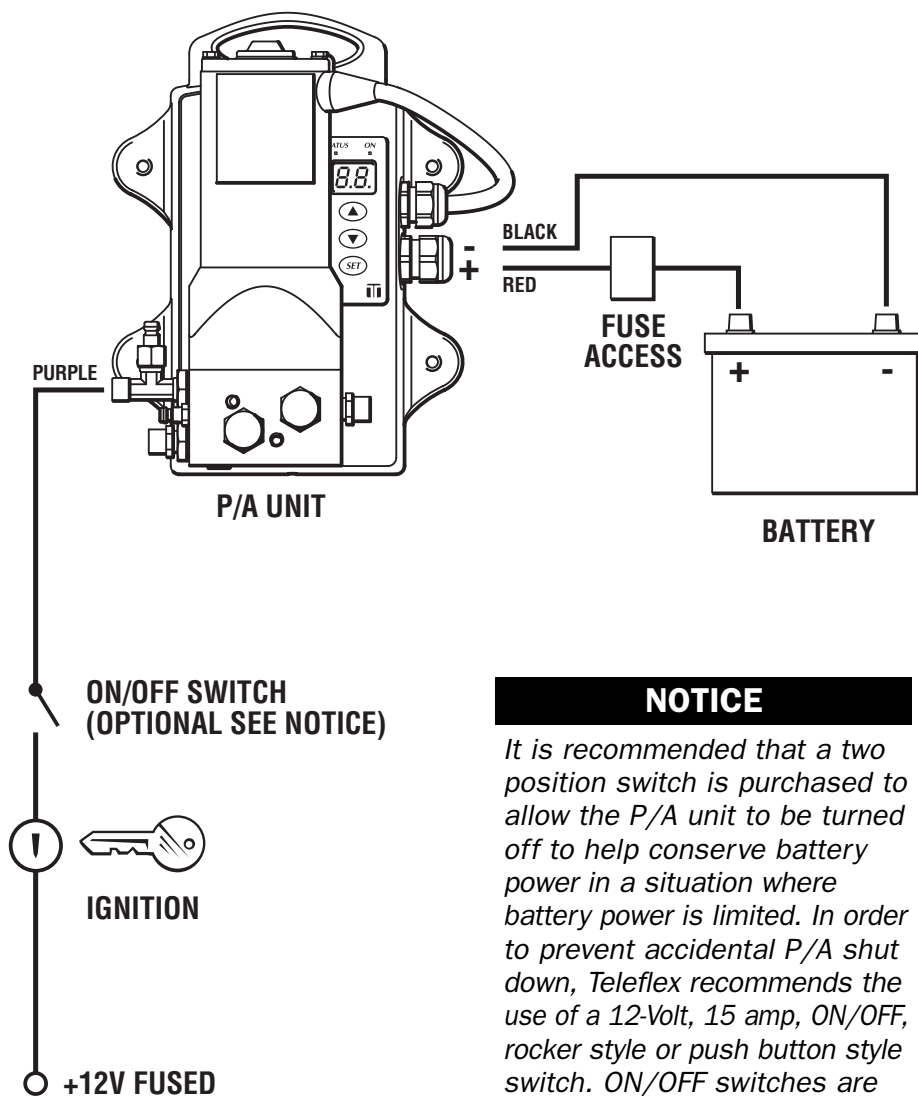
Autopilot Connection Detail

Hose connection is as follows.

- **Autopilot pump MUST be connected to the steering lines AFTER the P/A (see diagram below). The return R line MUST be tee'd into the system in front of the P/A unit (see diagram below).**
- Refer to page 6 through page 8 for you cylinder application.
- Be sure to run the autopilot in both directions during the purge procedure, refer to page 14 for details.



Wiring Diagram



NOTICE

It is recommended that a two position switch is purchased to allow the P/A unit to be turned off to help conserve battery power in a situation where battery power is limited. In order to prevent accidental P/A shut down, Teleflex recommends the use of a 12-Volt, 15 amp, ON/OFF, rocker style or push button style switch. ON/OFF switches are not available from Teleflex.

! WARNING

DO NOT run wires or hoses in areas where they may come in contact with excessive heat, i.e. engine exhaust, manifolds, or any other area that may damage the wires or hoses.

FILLING AND PURGING THE SYSTEM

Read First

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 through #7, repeat at each higher station until complete.

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.

Hydraulic Oil Requirements

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

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.

Single Station One Cylinder

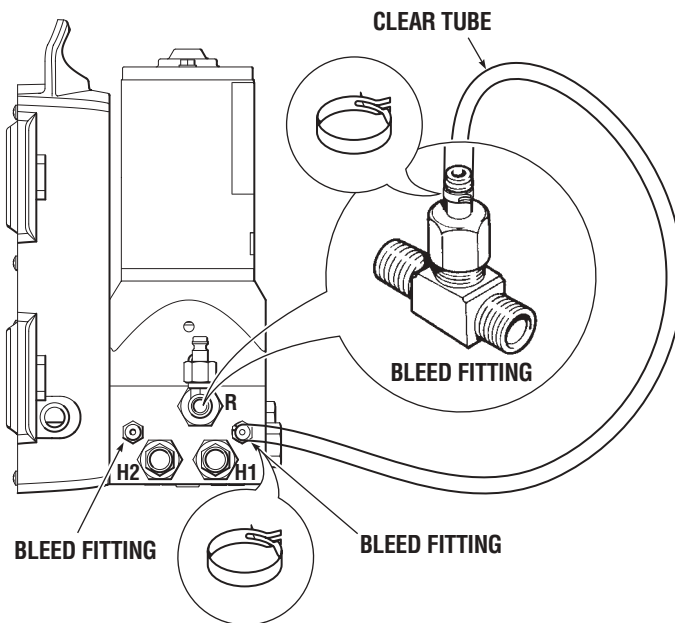
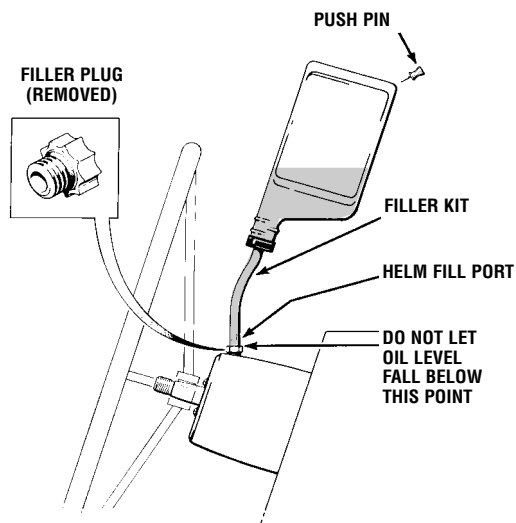
NOTICE

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

Step 1

NOTICE

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



Bleeding with SeaStar Power Purge units.

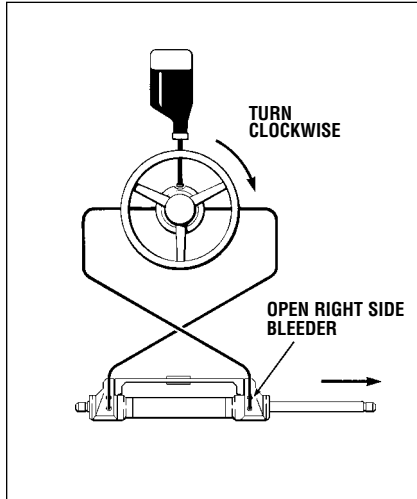
- Install the helm adapter into the helm pump and attach the helm hose from the power purge unit.
- Connect one of the two fluid return hoses (cylinder purge hoses) from the Power Purge unit to the R bleed fitting on the P/A unit.
- Open R Port bleed fitting.
- Turn ON Power Purge unit and let run until no air is visible leaving the P/A unit.
- Close the R port Bleed fitting and continue on with purging the system.

For manually bleeding the system

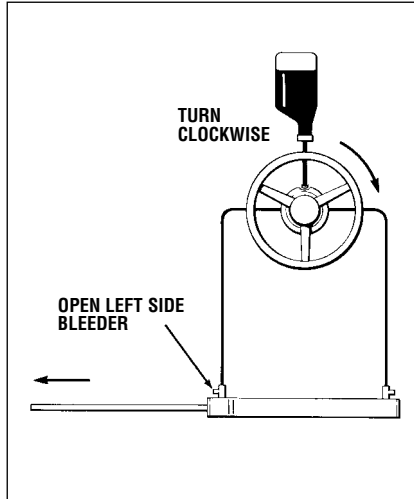
- Using the clear tube and spring clamps provided, connect one end of the tube to the H1 bleed fitting, and the other end to the bleed fitting in the R port (refer to figure below).
- Open both the H1 and the R bleed fittings (refer to figure below).
- Install the fill tube and full fluid bottle into the helm pump.
- Fill helm with fluid, then turn steering wheel to the starboard (clockwise direction) 40 revolutions.
- Close H1 bleed fitting and continue on with steps 2 through 5

Step 2

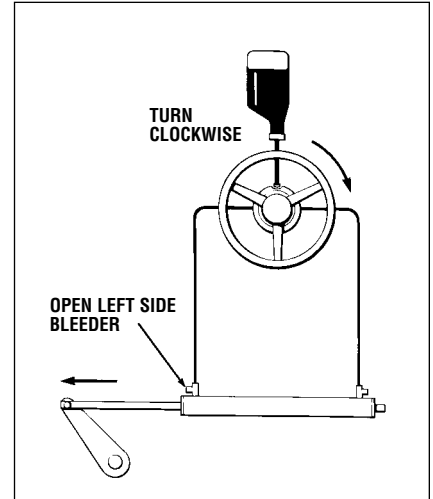
- Turn the steering wheel clockwise until the cylinder rod is fully extended on the right side of the cylinder.
- Open bleed fitting as per your installation.



Outboard Front Mount & HC5332 Cylinder



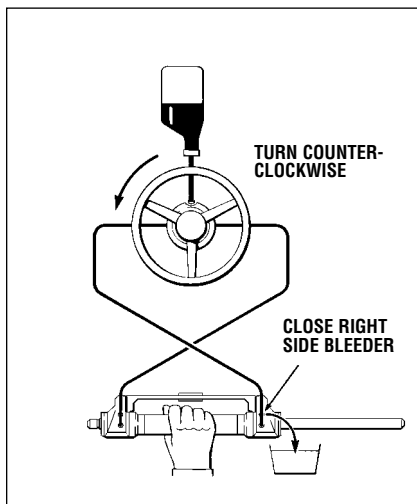
Side Mount / Splashwell Mount Cylinder



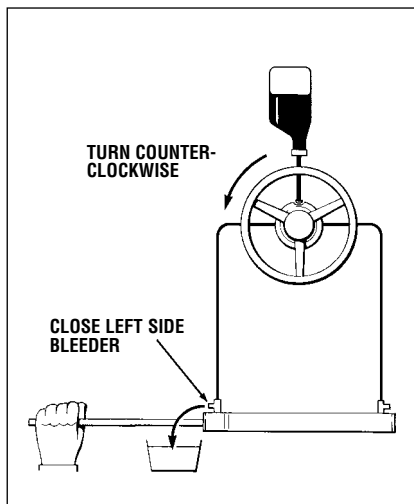
All Balanced Cylinder. Inboard & Stern Drive Cylinders

Step 3

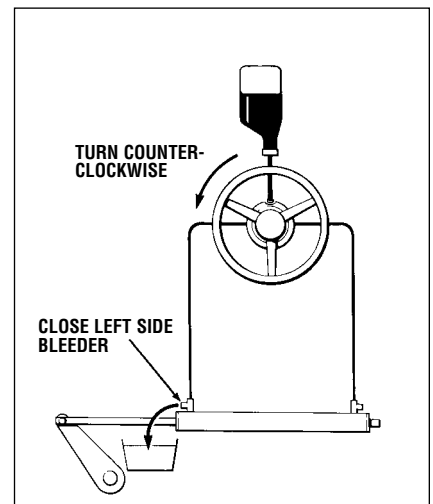
- Holding the cylinder body (Front Mount cylinder) or rod (Side Mount cylinder) to prevent the body/rod from moving, turn the steering wheel counter-clockwise until a steady stream of air free oil comes out of the bleeder. (Drain approx. 1/2 bottle of oil or as required).
Do not use anything other than your hands to restrain the cylinder body/rod.
- While continuing to turn the wheel read close the bleed fitting for your application and let go of the cylinder body/rod.



Outboard Front Mount & HC5332 Cylinder



Side Mount / Splashwell Mount Cylinder



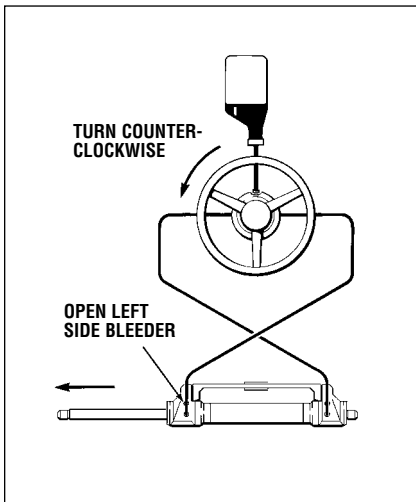
All Balanced Cylinder. Inboard & Stern Drive Cylinders

SEASTAR POWER ASSIST

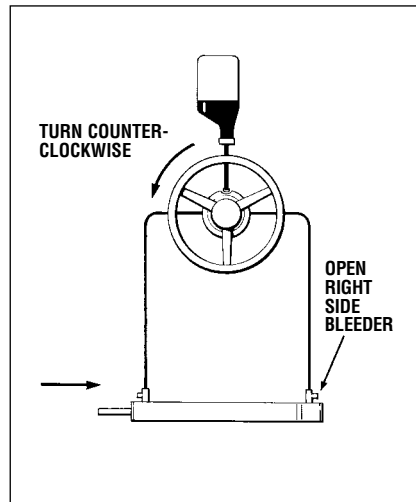
FILLING AND PURGING

Step 4

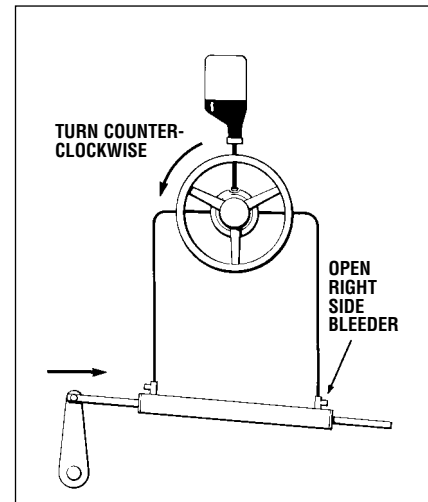
- Continue turning the steering wheel counter-clockwise until the cylinder rod is fully extended to the left. (Steering wheel will come to a stop).
- Open bleed fitting as per your installation.



Outboard Front Mount & HC5332 Cylinder



Side Mount / Splashwell Mount Cylinder



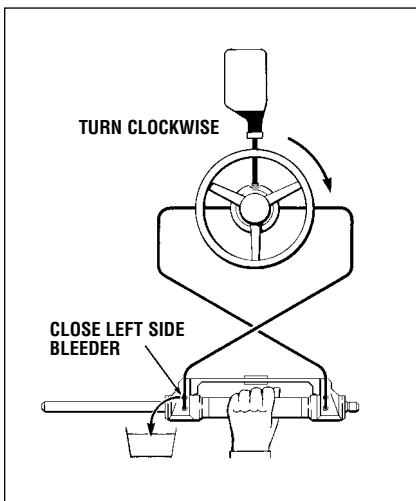
All Balanced Cylinder. Inboard & Stern Drive Cylinders

Step 5

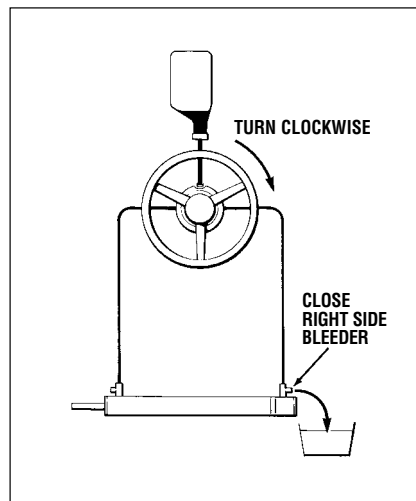
- Holding the cylinder body (Front Mount cylinder) or rod (Side Mount cylinder) to prevent the body/rod from moving, turn the steering wheel clockwise until a steady stream of air free oil comes out of the bleeder.
- While continuing to turn the wheel read close the bleed fitting for your application and let go of the cylinder body/rod.

⚠ CAUTION

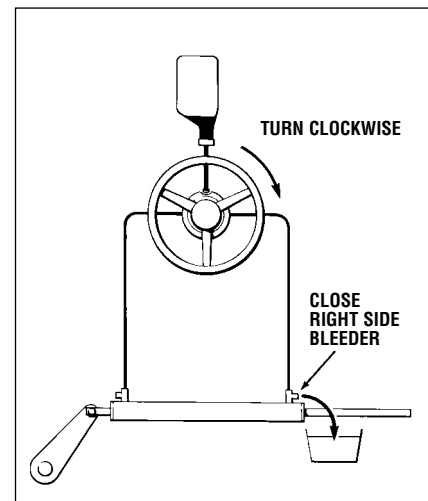
Prior to operating system, perform Oil Level System Check, refer to page 17.



Outboard Front Mount & HC5332 Cylinder



Side Mount / Splashwell Mount Cylinder



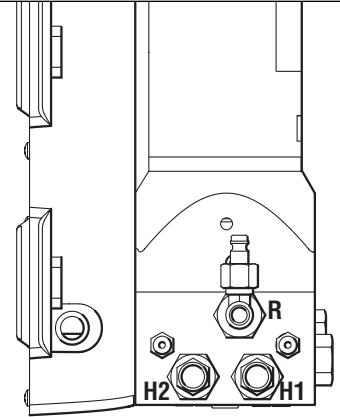
All Balanced Cylinder. Inboard & Stern Drive Cylinders

Step 6

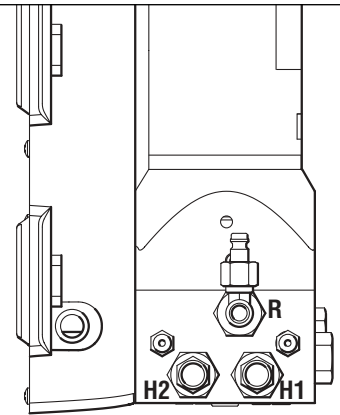
- Complete electrical connection and installation as per Step 3 on page 5 of this manual.
- Repeat steps 2 – 5 of purging instructions with P/A unit "ON".
- Continue with Steps 7 and 8.

Step 7

- Turn wheel counter-clockwise until cylinder rod is fully extended.
- Open P/A H2 bleed fitting.
- Continue turning counter-clockwise until steady stream of fluid comes from the P/A unit.
- Close P/A H2 Bleed fitting.
- **Note** – Only a few air bubbles (if any) will come out of the fitting.

**Step 8**

- Turn wheel clockwise until cylinder rod is fully extended.
- Open P/A H1 bleed fitting.
- Continue to turn clockwise until a steady stream of fluid comes from the P/A unit.
- Close P/A H1 Bleed fitting.
- **Note** – Only a few air bubbles (if any) will come out of the fitting.

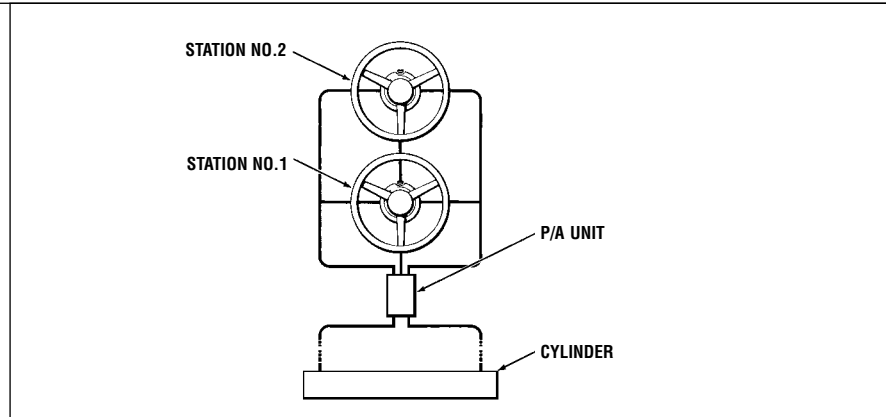
**NOTICE**

Autopilot. If you have an autopilot installed, ensure autopilot pump is run for 10 seconds in both directions during Step 3 and Step 5.

Twin Station Single Cylinder

Perform steps 1 through 8 at station no. 1. Then repeat steps 1–8 at station no. 2.

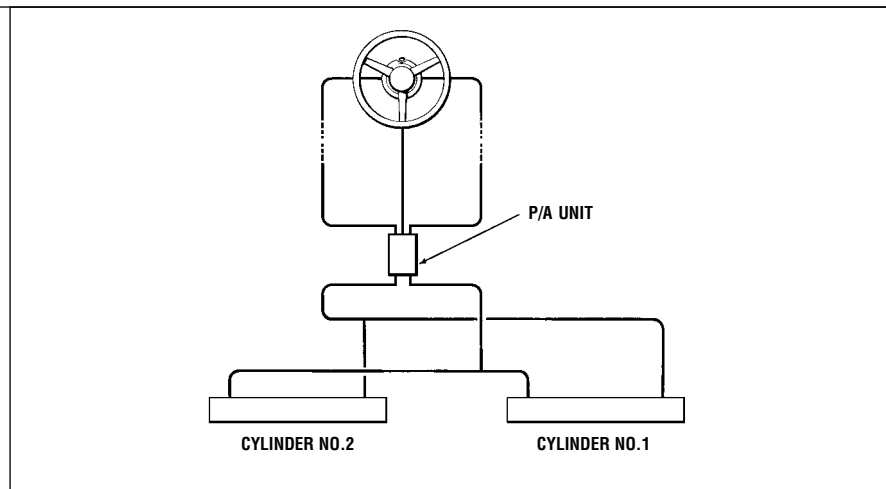
Note: Refer to Oil Level & System Check on page 17.



Single Station Twin Cylinder

When performing steps 2 through 8, 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.

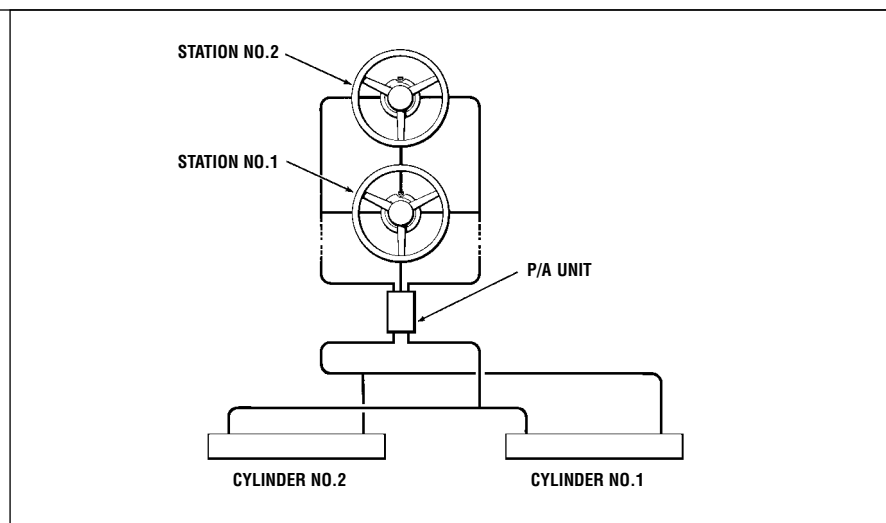
Note: Refer to Oil Level & System Check on page 17.



Twin Station Twin 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 17.



Oil Level and System Check

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.

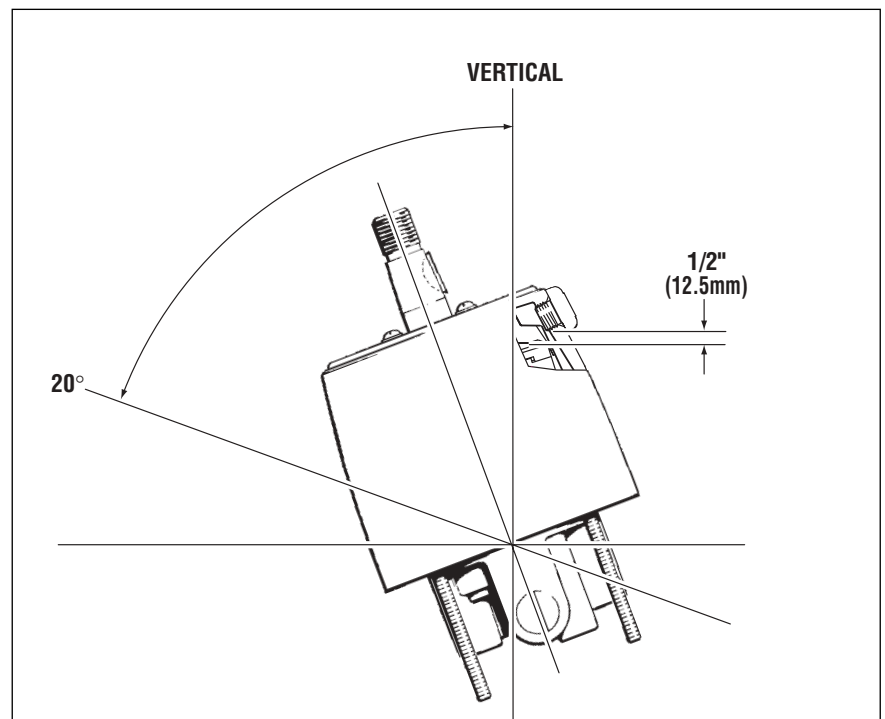
- Turn steering wheel to hard over, then force the wheel another one quarter to one half turn past the stop point. Check the following areas for evidence of a leak.
 - Helm fitting connections.
 - P/A fitting connections
 - Cylinder fitting connections
- Repeat above steps to the other steering direction.
- Any sign of a leak MUST be repaired prior to operating the boat.
- 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.

NOTICE

Helms mounted with the wheel shaft completely horizontal must be filled to the bottom of the filler hole at all times. DO NOT allow the fluid level to drop more than one-quarter inch below the filler hole.

NOTICE

Helms mounted on a 20 degree angle or with the wheel shaft vertical MUST have the fluid level within 1/2" of the filler hole, refer to diagram below.



TROUBLE SHOOTING GUIDE

FAULT	CAUSE	SOLUTION
1. P/A unit does not turn on.	Blown Fuse (A green light will come on but the P/A unit will not provide power assist.) Wrong electrical connections	Replace with 40amp ATO automatic fuse. ⚠ WARNING If it is necessary to replace the fuse for the P/A unit, the P/A unit MUST have the power turned OFF. Refer to wiring diagram and location of fuse on page 10.
2. Turns the wrong way	Lines reversed	Review the plumbing diagrams for your system noted on page 6 through page 8, confirm that your hoses are hooked up correctly.
3. Wheel is bumpy	Air in system	Re-Bleed. Concentrate on remaining air in the P/A unit. Autopilot has not been bled as per instructions.
4. Helm locks up in both directions	Hoses installed in the wrong ports Kinked or collapsed line	Review the plumbing diagrams for your system noted on page 6 through page 8, confirm that your hoses are hooked up correctly. Check ALL lines for sign of a collapsed or kinked line.
5. Helm only turns in one direction and free wheels in the other	Port or Starboard line is connected to the reservoir R port on the P/A unit.	Review the plumbing diagrams for your system noted on page 6 through page 8, confirm that your hoses are hooked up correctly.
6. Steering is very hard (stiff)	P/A unit is not turned on. Partially kinked or collapsed line H1, H2 or R port screen filters are plugged with contamination.	See fault #1 Check ALL lines for a sign of a collapsed or kinked line Remove H1, H2 and R hose and fittings. Clean screens located in the adapter fittings.

⚠ WARNING

Whenever a solution calls for the removal from vessel and/or dismantling of steering system components, such work must ONLY be carried out by a qualified marine hydraulic mechanic. Teleflex offers this information as a guide ONLY and is not responsible for any consequences resulting from incorrect repairs. When in doubt, contact your parts distributor or Teleflex for assistance.

Statement of Limited Warranty

We warrant to the original retail purchaser that **Teleflex Canada Limited Partnership** products have been manufactured free from defects in materials and workmanship. This warranty is effective for two years from date of purchase, excepting that where **Teleflex Canada Limited Partnership** products are used commercially or in any rental or income producing activity, then this warranty is limited to one year from the date of purchase.

We will provide replacement product without charge, for any **Teleflex Canada Limited Partnership** product not meeting this warranty, which is returned (freight prepaid) within the warranty period to the dealer from whom such product were purchased, or to us at the appropriate address. In such a case **Teleflex Canada Limited Partnership** products found to be defective and covered by this warranty, will be replaced at **Teleflex's** option, and returned to the customer.

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

Return Goods Procedure

Prior to returning product to **Teleflex Canada Limited Partnership** under warranty, please obtain a *Return Goods Authorization number* (claim number).

Be sure to label the goods with:

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

Please address the returned goods as follows:

From U.S.A.

RGA # ?
Teleflex Canada
c/o Panalpina
#8 – 14th Street
Blaine, WA 98230

From Canada

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



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

FAX 604-270-7172

www.seastarsteering.com

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