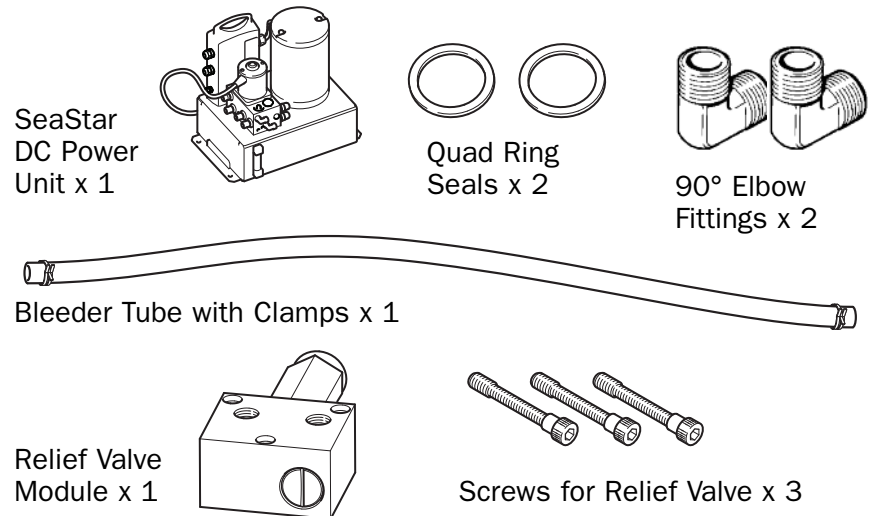


System Overview

Included with your kit



Additional items required for installation

- Power steering cylinder (See cylinder selection guide, and page 3 for DCPU compatibility).
- Hoses (See hose information on page 9).
- Liquid Teflon Sealant (DO NOT USE TEFLON TAPE).
- Helm (1.4 or 1.7 NFB models ONLY).
- Non-vent caps for helms.
- Wiring (see "Wiring Connections" section for details).
- 90A peak power supply on vessel.
- Autopilot controller (Optional).
- Fast Purge Kit (Optional).
- SeaStar Steering Fluid.
 - 1.85 gal (7L) for Power Unit tank
 - 0.13 gal (1/2L) for each steering cylinder
 - 0.26 gal (1L) for each helm station
 - Additional 1–2 gal (4–8L) depending on hose length and type
- Misc. mounting hardware.
- Misc. crimp or solder connectors for making electrical connections.
- One HF5529 fitting kit per additional helm station

STEP 1 System Installation

- Install SeaStar helm pump(s) using installation instructions provided with your helm.
- Install steering cylinder using the installation instructions provided with your cylinder.

⚠ WARNING

Install non-vent plug part # HA5432 into ALL helm pump stations on board vessel. Failure to properly install non-vent plugs can result in loss of steering causing property damage, personal injury and/or death.

- Mount DC Power Unit. Refer to page 7 for mounting details.
- Install relief module on power steering cylinder. Refer to page 8 for installation details.

NOTICE

DO NOT mount the DC Power Unit in an area where pump noise may disturb passengers.

- Install steering hoses using the figures and table shown on page 9 and page 10.

⚠ WARNING

The DC Power unit may be HOT to the touch. DO NOT mount the DC Power Unit in an area where fabrics and/or any other flammable material may come in contact with the unit.

STEP 2 Making Electrical Connections

- Refer to page 12 of this manual for electrical connections.

⚠ WARNING

Prior to making electrical connections of any type, be sure to vent installation area of any fumes. Failure to do so may result in a fire causing property damage and/or personal injury or death.

STEP 3 Filling and Purging Procedure

- Refer to page 14 of this manual for filling and purging of the steering system.

STEP 4 Autopilot Tuning

- Refer to page 17 of this manual to adjust autopilot speed.

STEP 5 System Verification & Operation Check

- Refer to page 17 of this manual to verify system operation.

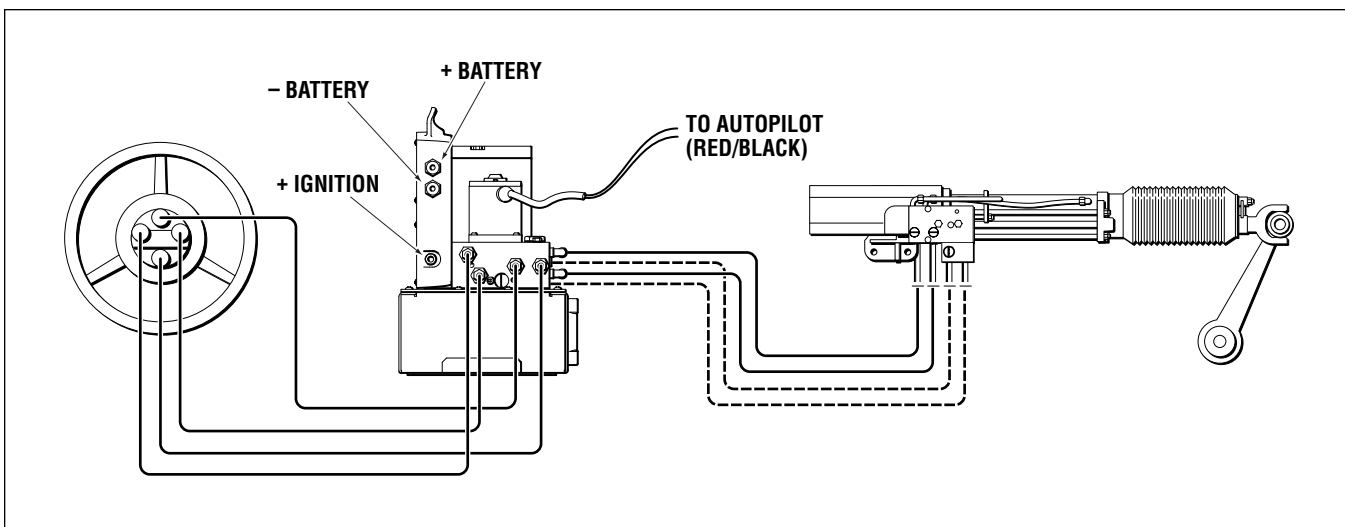


Figure 3.

SYSTEM INSTALLATION

Step 1 Mounting and Plumbing

1.1 Install Helm Pump(s)

- Install SeaStar Helm pump(s) using the instructions provided with your helm(s).

1.2 Install Steering Cylinder(s)

- Install SeaStar steering cylinder(s) using the instructions provided with your cylinder(s).

1.3 DC Power Unit Mounting

- Using the four mounting holes on the base of the unit, mount the DC Power Unit in the desired location. Confirm that there will be sufficient room for filling/purging, hose connections and future access to the unit.

CAUTION

Mount the unit in a cool location, away from any sources of excessive heat, such as engine manifolds, and also free of any water splash.

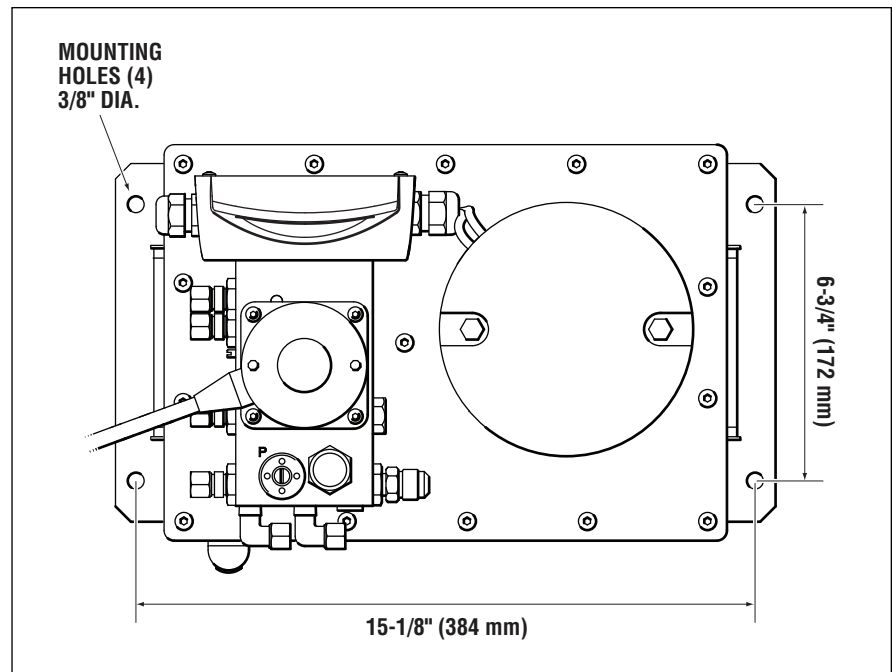


Figure 4.

NOTICE

For installations with minimal clearance behind unit, it is advised that electrical connections are made prior to mounting the Unit.

NOTICE

For installations in areas where pump noise may disturb passengers, the use of rubber isolation mounts is recommended. SeaStar Solutions part # HA2222.

1.4 Relief Module Installation

NOTICE

All cylinders manufactured during or after January 2008 will have mounting provisions for the relief module.

⚠ WARNING

Ensure that the quad rings remain seated in the relief valve module and are not pinched and/or rolled between the module block and the servo cylinder valve. Failure to do so will result in fluid leaks causing property damage, personal injury and/or death.

- Remove steering cylinder from its packaging and inspect servo valve block. The cylinder MUST have three tapped holes on the face of the servo valve block as shown in figure 5 below. If the servo valve block does NOT have these tapped holes contact SeaStar Solutions Technical Support.
- Remove fittings from the PRS and TNK ports on the steering cylinder servo block if required.
- Inspect valve block face. It MUST be free of ALL contaminants, including thread sealant, debris, burrs, gouges or large scratches. Clean as required.
- Install both quad rings (items #2) into relief valve module as shown in Figure 5.
- Insert three (3) socket head cap screws (items #1) into relief valve module (item #3) and fasten to front face of cylinder servo valve as shown in Figure 5. Torque mounting bolts to 40 in.lb.
- Clean threads and apply a Teflon based, liquid pipe sealant to the threads of the fittings that were removed in the second point above. Install fittings into the ports on the relief module. DO NOT USE TEFLON TAPE. Torque fittings to 200 in. lb.

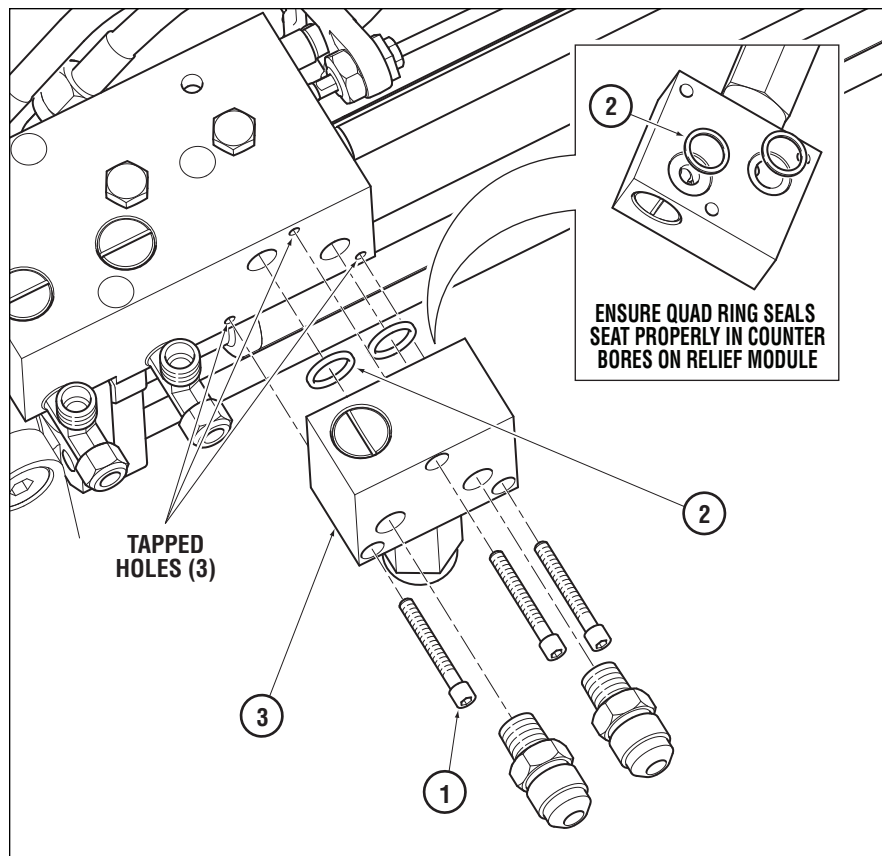


Figure 5.

1.5 Plumbing the DC Power Unit

⚠ WARNING

Install non-vent plug part # HA5432 into ALL helm pump stations on board vessel. Failure to properly install non-vent plugs can result in loss of steering causing property damage, personal injury and/or death.

⚠ CAUTION

All SeaStar hose connections and bleeders must be torqued to 15 ft-lb. SAE-8 fittings should be torqued to 40 ft-lb. Failure to correctly torque may lead to loss of steering control causing property damage and/or personal injury or death.

⚠ CAUTION

DO NOT reverse PRS/TNK lines or damage to unit may result.

⚠ CAUTION

ONLY use SeaStar or SeaStar PRO steering lines for all lines except PRS and TNK. 3/8" Copper tubing is also acceptable as a substitution for SeaStar lines, provided 4' of SeaStar hose is used to connect copper to fittings. Failure to comply may lead to loss of steering control causing property damage and/or personal injury or death.

NOTICE

For multiple helm installations, helm reservoirs must be DIRECTLY chained together by connecting the upper reservoir port of the lower helm to the lower reservoir port of the next highest helm. (Refer to Figures 6 and 7.)

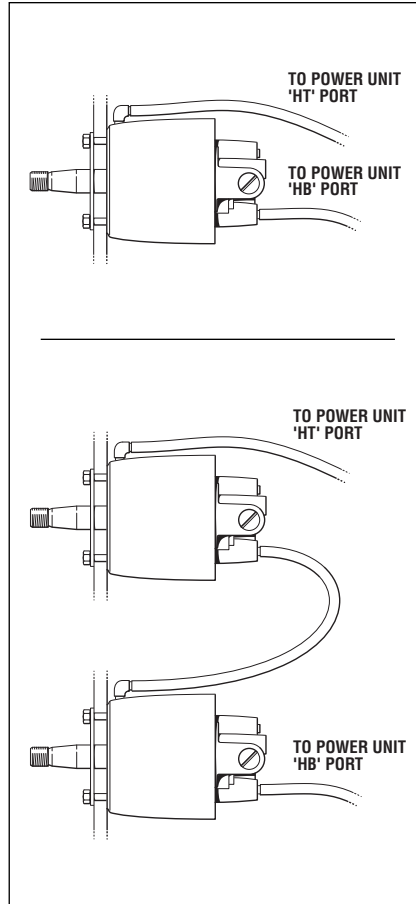


Figure 6. Rear Mount Helms.
(Recommended wherever possible.)

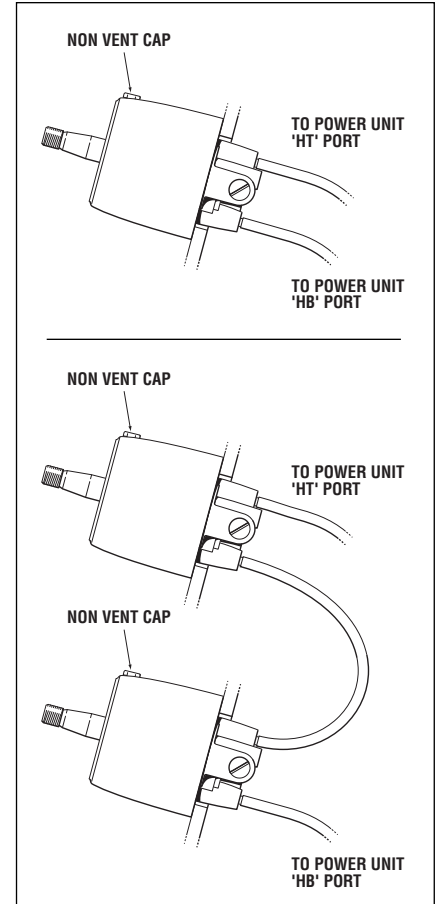


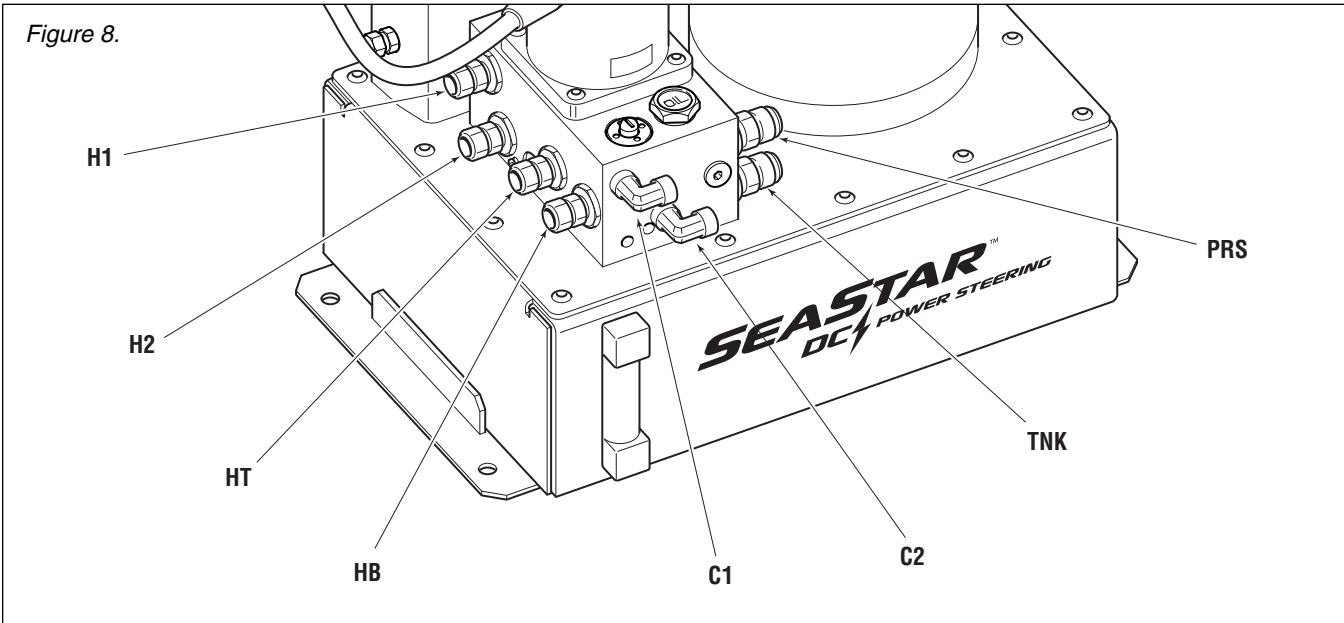
Figure 7. Standard helms. (Acceptable configuration; helms will need to be burped during purge. Refer to page 14 to page 17)

Helm pump to DC Power Unit

- Connect P and S helm pump ports to H1 and H2 as outlined in Table 1, Figure 8 and Figure 9.
- Connect hose from lower R port on the helm pump to the HB port on the DC Power Unit. (Refer to Figures 6 and 7.)
- Connect hose from upper R port (or fill port) on helm to the HT port on the DC Power Unit. (Refer to Figures 6 and 7.)

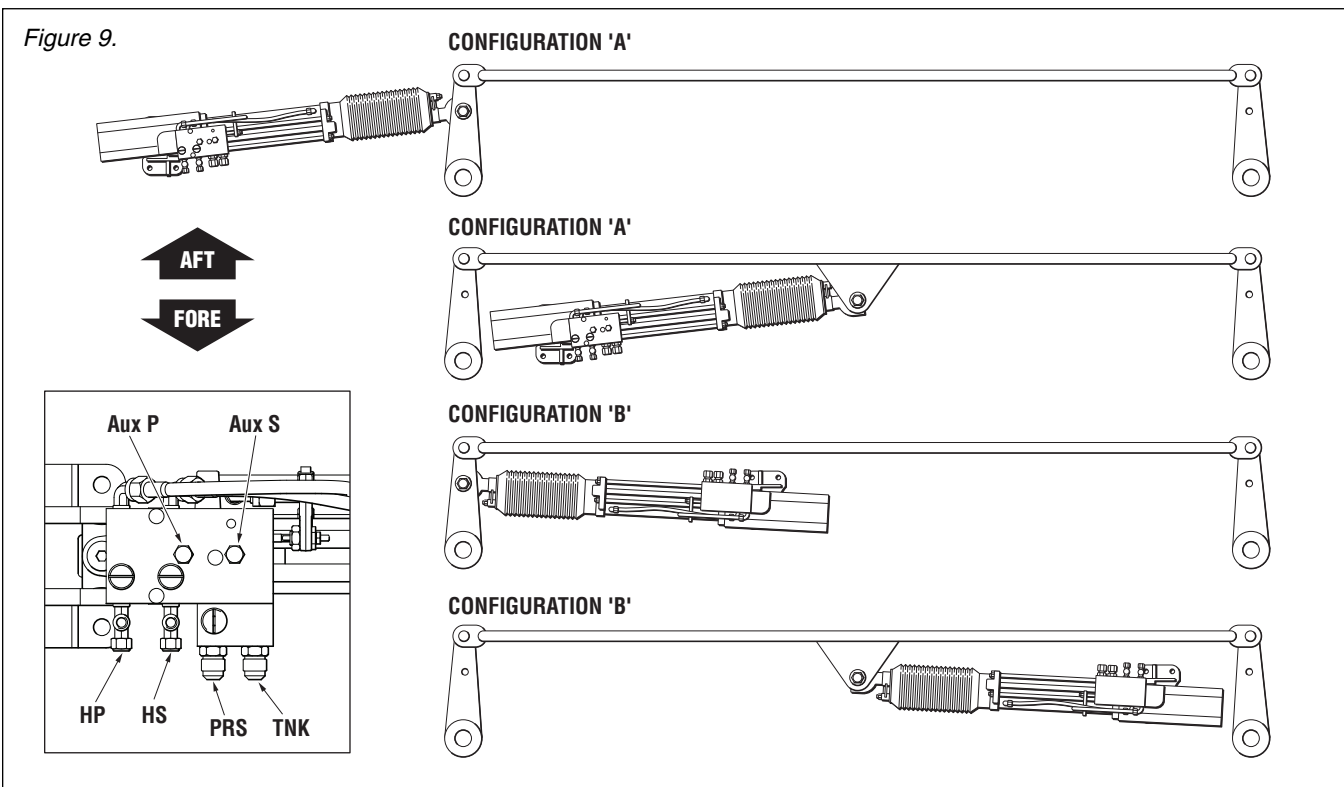
DC Power Unit to steering cylinder

- Connect 1/2" Dash 8; 2000psi SAE 100R hose from the PRS port on the DC Power Unit to the PRS port on the steering cylinder.
- Connect 1/2" Dash 8; 2000psi SAE 100R hose from the TNK port on the DC Power Unit to the TNK port on the steering cylinder.
- Connect C1 port on DC Power Unit to HS port on cylinder.
- Connect C2 port on DC Power Unit to HP port on cylinder.



Config.	Hose Connection
A	Connect 'P' on helm to 'H2' on power unit
	Connect 'S' on helm to 'H1' on power unit
B	Connect 'P' on helm to 'H1' on power unit
	Connect 'S' on helm to 'H2' on power unit

Table 1



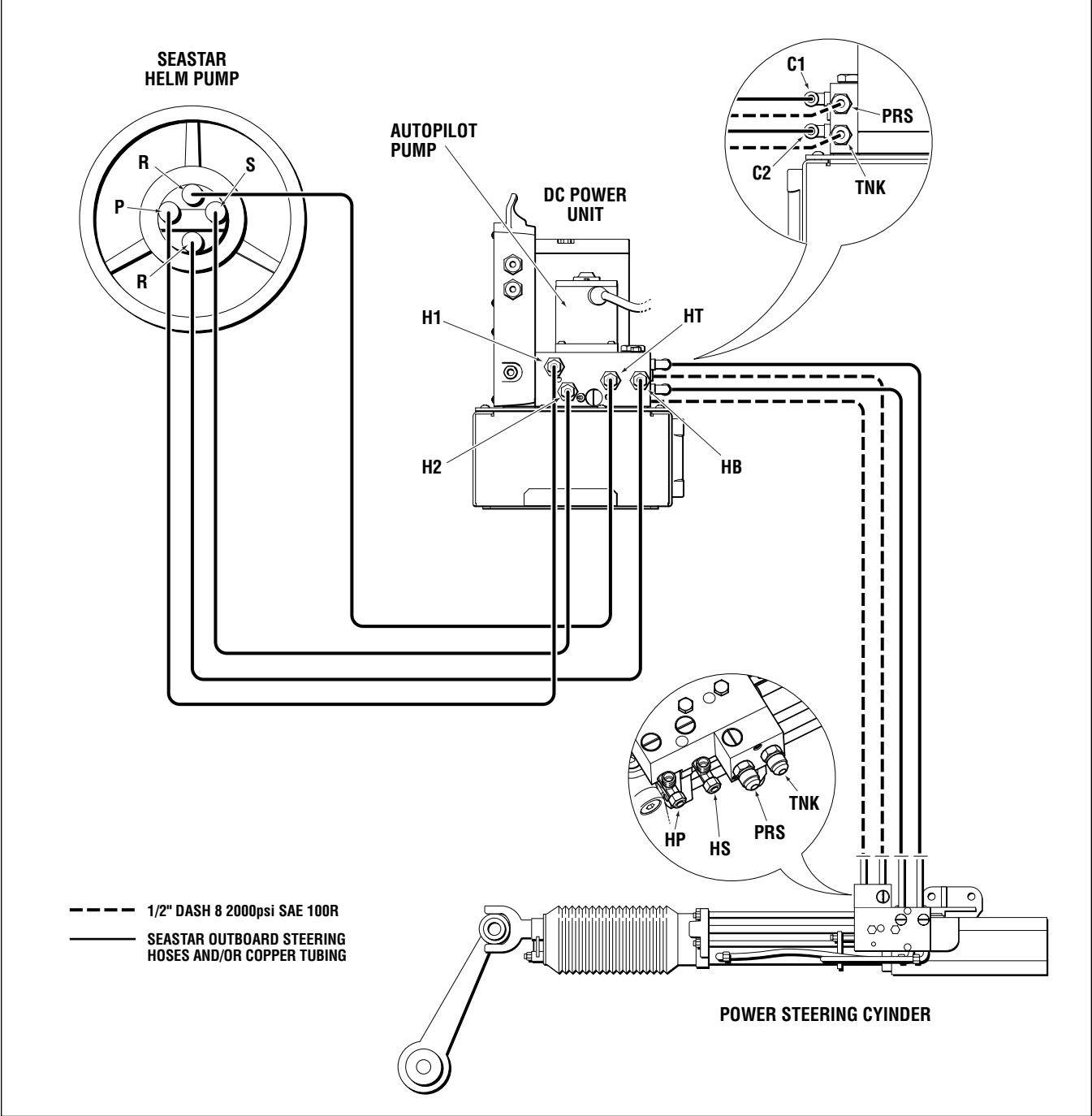


Figure 10. Typical Plumbing Schematic.

NOTICE

The drawing in figure 10 is used for visual purposes ONLY, refer to page 9 to page 10 for your specific plumbing details.

Step 2 Electrical Connections

2.1 DC Power Unit Battery Connections

NOTICE

⚠ WARNING

To avoid risk of fire, ensure that the area in which any electrical connection is being made is vented and free of any fumes that may cause fire or explosion.

⚠ WARNING

To avoid fire and/or poor steering performance, **ALL** electrical connections and cable **MUST** comply with ABYC wiring standards, be rated for 105 degrees C, and compliant with SAE J1128. Battery leads must be a **MINIMUM** of 6AWG and a **MAXIMUM** of 30ft in length, with an appropriate fuse or breaker for fire protection. If your application requires longer battery leads, please consult factory.

⚠ WARNING

DO NOT REVERSE POLARITY. The use of color coded (Red/Black) wiring is highly recommended to avoid reversing polarity. Failure to comply may result in damage to the unit.

NOTICE

Battery connections inside the electrical box should be made using ring terminals sized for a #10 stud.

NOTICE

It is recommended that the DC Power unit be connected directly to a main battery, or other on-board 24-volt power source rated for 90 amps peak using an appropriate fuse or breaker.

- 1 Remove electronics casing cover by removing the 6 Phillips head screws. (Refer to Figure 11.)
- 2 Insert positive battery lead through the upper strain relief fitting on the electronics box. (Refer to Figure 11.)
- 3 Remove the #10 Phillips head screw from the top-most terminal inside the electronics enclosure. Securely fasten the positive lead with ring connector to this terminal post, torque to 25in-lbs.
- 4 Insert negative battery lead through the lower strain relief fitting on the electronics box. (Refer to Figure 11.)
- 5 Remove the #10 Phillips head screw from the bottom-most terminal inside the electronics enclosure. Securely fasten the negative lead with ring connector to this terminal post, torque to 25in-lbs.
- 6 Using a crescent wrench, tighten the strain relief nuts until the rubber sleeves form a seal with the wires. **DO NOT OVER TIGHTEN.**
- 7 Connect the other ends of your battery leads to your breaker box, battery, or other 24V power source rated for a minimum of 90A peak current.
- 8 Leave the electronics cover off for the moment, you are not finished.

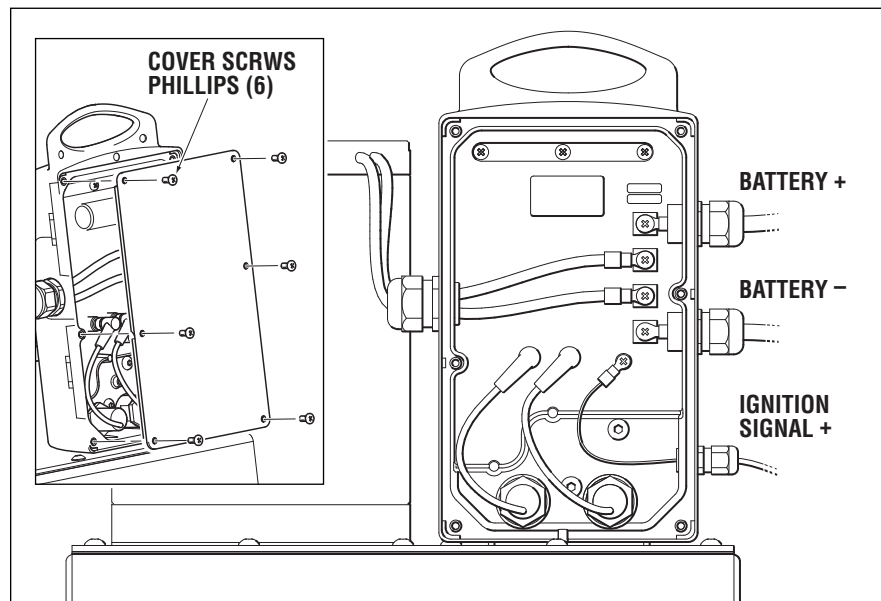


Figure 11.

It is recommended that ring-type crimp connections are used at each end of the battery harness. Use the correct ring terminal for the wire gauge, and the appropriate crimping pliers.

2.2 Ignition Connection

NOTICE

A minimum wire gauge of 16AWG is recommended for the ignition trigger wire. Length of this wire is not critical.

- 1** Insert ignition wire through the small strain relief fitting on the electrical enclosure (see figure 11).
- 2** Connect the ignition wire with a #8 ring connector to the IGN post inside the electrical box. Torque to 15in-lbs (see figure 11).
- 3** Using a crescent wrench, tighten the strain relief fitting until a seal is formed with the wire. **DO NOT OVER TIGHTEN.**
- 4** Replace the cover on the electronics box with the 6 Phillips head screws removed in step 2.1-1.

2.3 Autopilot Connections

NOTICE

When extending wire leads, marine best practices must be followed. Solder and shrink wrap are highly recommended. Appropriately sized and properly installed crimp connections with shrink wrap protection are also acceptable. A minimum of 12AWG wiring should be used for any extensions.

- 1** The Red (+) and Black (-) leads from the autopilot motor should be connected to your autopilot controller as specified in your autopilot controller documentation.

NOTE: The polarity of the autopilot connections may need to be reversed for correct operation in some installations.

NOTICE

Consult autopilot manufacturer's documentation for full operation instructions, EMC guidelines, etc.

Step 3 Filling & Purging the System

3.1 Purging Using Fast Purge Kit (HA2266)

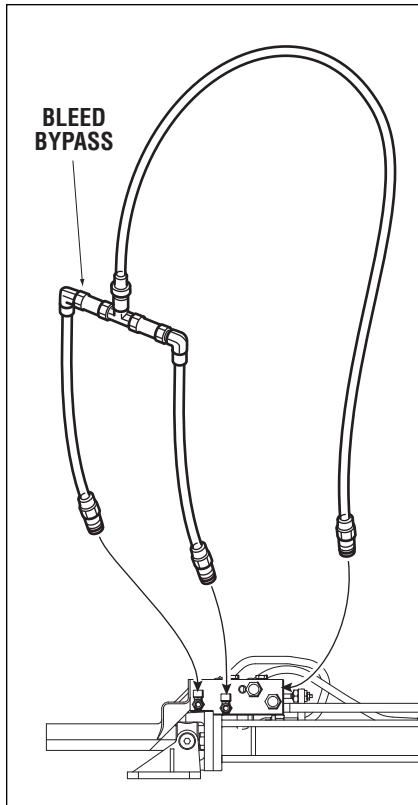


Figure 12. Fast Purge Kit HA2266.

NOTICE

The use of Fast Purge Kit (HA2266) is highly recommended and will improve speed and quality of purge.

CAUTION

Monitor tank oil level during purge. Failure to maintain MIN oil level will allow air into the system and may lead to damage to the power pump.

WARNING

- 1 Fill DC Power Unit tank with SeaStar Steering Fluid to the "FULL" line on sight glass, DO NOT OVERFILL (refer to Figure 15 for location of sight glass).
- 2 Turn ignition ON to power DC Power Unit.
- 3 Enter purge mode by holding down the purge button on the DC Power Unit for 5 seconds. The unit's main power pump will start operating, and the red purge LED will light up.
- 4 Install Fast Purge Kit on steering cylinder and open all three cylinder bleeder fittings a 1/4 turn. (Refer to Figure 12.)
- 5 Open purge valve by rotating counter-clockwise until valve seats. (Purge valve marked with the letter P on Power Unit, refer to Figure 15).
- 6 Allow the unit to run for approximately 5 minutes while monitoring and filling the oil reservoir as needed. Take this opportunity to check helms and hose connections for leaks.
- 7 Start at the highest helm station; turn the wheel to port for at least 10 wheel revolutions.
- 8 Repeat Step #7 to the starboard side.
- 9 Repeat steps #7 and #8 for each helm station, working from highest to lowest.
- 10 If equipped with an autopilot, jog the a/p controller in both directions at this time.
- 11 At this time verify oil level again and wait approximately 2 minutes while the unit purges the power circuit.
- 12 Using any steering station, stroke cylinder from hard over to hard over several times, or until an air free stream of fluid is seen through the bypass line.
If cylinder will not stroke at this time verify that the bleeders opened in Step 4 are open 1/4 turn MAX.
- 13 Close Purge Valve completely. Torque to 80 in-lb. (Purge valve marked with the letter P on Power Unit, refer to Figure 15).
- 14 Close cylinder bleeder fittings (torque to 15 ft-lb) and remove Fast Purge kit.
- 15 At this time, if using front mount helms as shown in Figure 7, 'burp' each helm station by loosening the fill cap slightly to release any trapped air. Loosen cap just enough to allow oil to start escaping (DO NOT fully remove cap.) Use a rag to catch any oil spillage.
- 16 Exit "purge mode" by either pressing the purge button once, or, by cycling the power unit ignition power.
- 17 Verify oil level and replace fill cap. With Power Unit on confirm that the bleeding is completed by counting the number of wheel turns from hard over to hard over. Use the chart on next page to determine wheel turn amount.

Ensure purge valve is fully closed and tightened to 80 in-lb before operating vessel. Failure to comply may lead to loss of steering control causing property damage and/or personal injury or death.

Number of Wheel Turns by Installation

SYSTEM	HC5801-2	HC5803-2	HC5805
SeaStar 1.4	4.3 Turns	5.3 Turns	4.3 Turns
SeaStar 1.7	3.6 Turns	4.4 Turns	3.6 Turns

Table 2

If your wheel turns are not to within at least a 1/2 turn of the ones shown above, repeat bleeding procedure.

3.2 Purging Using Supplied Bleed Tubing (No Fast Purge Kit)

- 1 Fill DC Power Unit tank with SeaStar steering fluid to the full line on sight glass; DO NOT OVERFILL. (Refer to Figure 15 for location of sight glass.)
- 2 Turn ON DC Power Unit ignition.
- 3 Enter purge mode by holding down the purge button on the DC Power Unit for 5 seconds. The unit's main power pump will start operating, and the red purge LED will light up.
- 4 Connect the bleeder tube to the HP bleeder tee and the tank bleeder fitting on the power steering cylinder (Refer to Figure 13.) Open bleed fittings 1/4 – 1/2 turn. Use supplied spring clamps to retain hose securely.
- 5 Open the purge valve by rotating counter-clockwise until the valve seats. (Purge valve marked with the letter P on Power Unit; refer to Figure 15.)
- 6 Allow the unit to run for approximately 5 minutes while monitoring and filling the oil reservoir as needed. Take this opportunity to check helms and hose connections for leaks.

! WARNING

Failure to enter purge mode prior to opening the purge valve may result in damage to system.

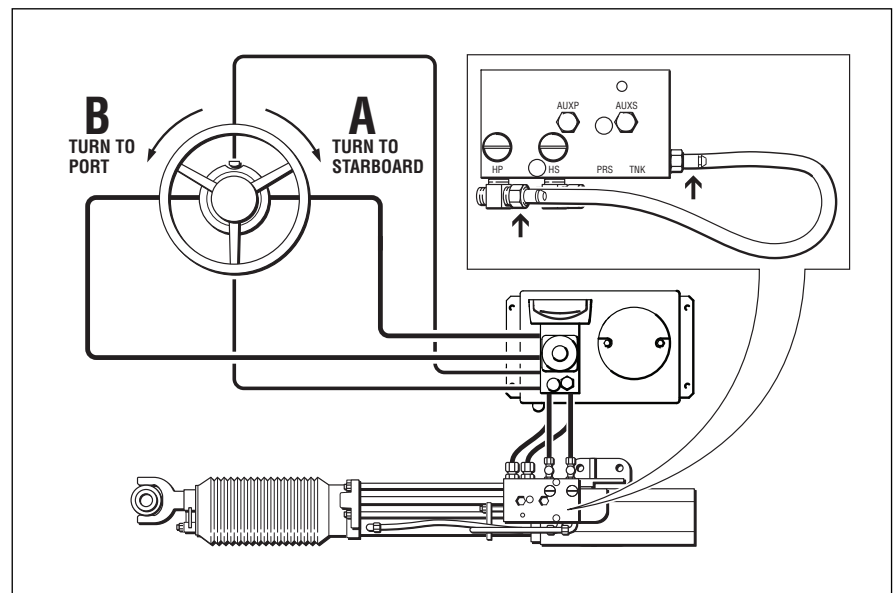


Figure 13.

- 7 Referring to Table 1 and Figure 13 and starting at your highest helm station, turn the wheel starboard (configuration A) or port (configuration B) until cylinder is fully retracted. If cylinder is already fully retracted, proceed to the next step.
- 8 Turn the wheel 10 turns in the opposite direction. The cylinder may not move at this point, this is OK. Repeat, turning in the same direction for each station from highest to lowest.
- 9 If equipped with an autopilot, jog the a/p controller in both directions at this time.

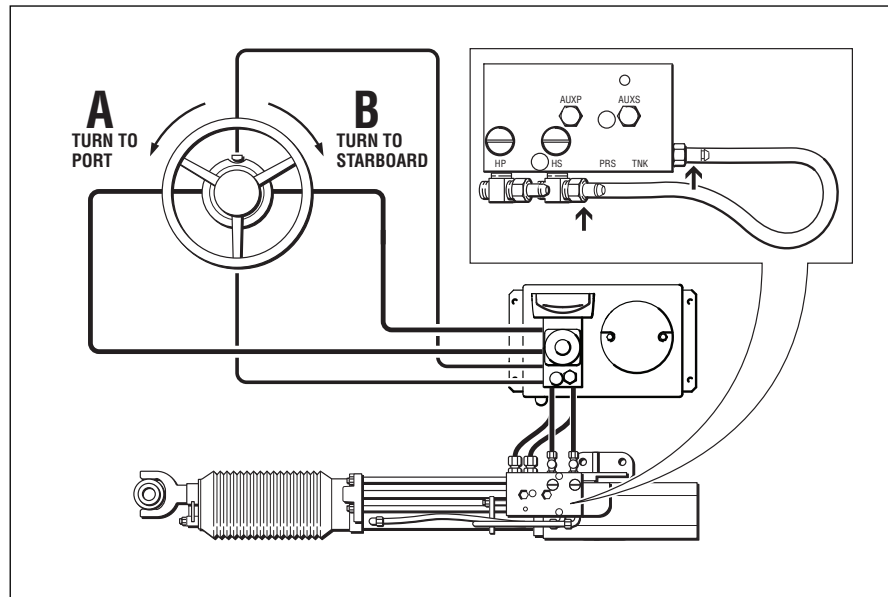


Figure 14.

- 10 Close the cylinder bleed fittings. Remove the bleeder tube from the HP bleeder tee and connect it to the HS bleeder tee on the cylinder (Refer to Figure 14). Open bleed fittings 1/4 – 1/2 turn.
- 11 Referring to Table 1 and again starting at your highest helm station, turn the wheel port (configuration A) or starboard (configuration B) until cylinder is fully extended. If cylinder is already fully extended, proceed to the next step.
- 12 Turn the wheel 10 turns in the opposite direction. The cylinder may not move at this point, this is OK. Repeat, turning in the same direction for each station from highest to lowest.
- 13 Repeat steps 7 through 11, 4 times or until no air can be seen in the bleeder tube when the cylinder is taken to full extension/retraction.
- 14 Close all the cylinder bleed fittings (torque to 15 ft-lb).
- 15 Close the purge valve completely. Torque to 80 in-lb.

! WARNING

Ensure purge valve is fully closed and tightened to 80 in-lb before operating vessel. Failure to comply may lead to loss of steering control causing property damage and/or personal injury or death.

- 16** At this time verify oil level in the reservoir and wait approximately 2 minutes while the unit purges the power circuit.
- 17** If using front mount helms as shown in Figure 7, 'burp' each helm station by loosening the fill cap just far enough to allow oil to start escaping (do not fully remove cap). Use a rag to catch oil spillage. **DO NOT REMOVE THE FITTING.** Tighten fill cap.
- 18** Exit purge mode by either pressing the purge button once, or by cycling the power unit ignition power.
- 19** Verify oil level and replace fill cap.

With Power Unit on, confirm that the bleeding is completed by counting the number of wheel turns from hard over to hard over. Use chart on page 15 to determine the correct number of turns.

Step 4 Autopilot Tuning

The DC Power Unit is supplied with the autopilot pump set to "full speed" This will give approximate 60 cu in/min of flow. To adjust the autopilot speed, locate the adjusting screw (refer to Figure 15). To reduce speed, turn adjusting screw counter-clockwise until the desired autopilot speed is achieved.

- Refer to autopilot controller documentation for complete autopilot system set-up

NOTICE

It is suggested that after an adjustment is made, the vessel be sea trialed in an open area to determine proper/safe hard over times.

NOTICE

Refer to autopilot controller documentation for complete autopilot system setup.

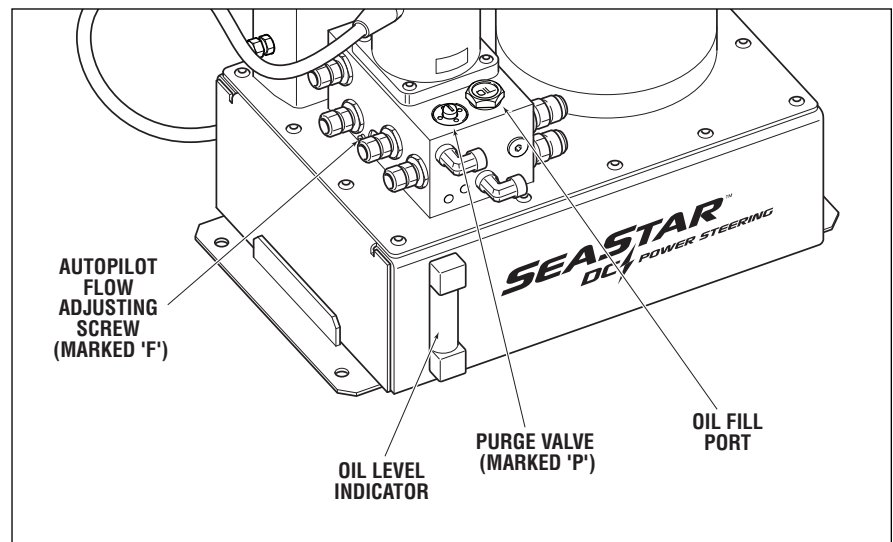


Figure 15.

Step 5 System Verification & Operation Check

At this time you have successfully installed the DC Power Unit. Verify that the system is operating properly, and verify that turning of the helm results in the correct movement of the cylinder shaft and rudder(s).

Perform a 'System Leak Test' by taking the helm pump to hard over. Once the hard over point is reached, continue to force the wheel an additional 1/2 turn to pressurize the system. Leave the wheel in this position for at least 5 minutes, then, check ALL connection points, hoses, helm, cylinder, etc. to ensure that no leak is shown. Repeat to the opposite direction. DC Power Unit may cycle on and off repeatedly while held at hard over. This should be considered normal.

WARNING

If a leak is noticed, it MUST be corrected prior to using the boat. Failure to do so may lead to loss of steering causing property damage, personal injury or death.

MAINTENANCE

NOTICE

The oil level in the Power Unit should be checked routinely. Any loss of fluid indicates a leak somewhere in the system which must be repaired immediately before operating the vessel.

Hoses should also be routinely inspected. Replace any hose(s) showing signs of wear and remove the cause or reroute the hose(s).

Check all fittings and seal locations for leaks/damage and services as necessary.

WARNING

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

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

TROUBLESHOOTING GUIDE

NOTICE

These troubleshooting notes have been gathered from several cases throughout the years. Whenever a solution calls for removal of parts, disassembly of parts etc. The work must ONLY be performed by a 'Qualified Marine Technician'.

FAULT	CAUSE	SOLUTION
1. Unit blows fuses upon connection.	Electrical connection polarity reversed. PRS/TNK reversed.	Check battery connections. Check PRS/TNK connections.
2. Turning one wheel results in the other wheel turning.	Dirt or debris in inlet checks of helm	Replace or repair helm pump.
3. Turning ON ignition does NOT turn on DC Power Unit.	Ignition wire (purple) not connected to positive ignition source. Damaged or faulty wire. Battery cables reversed.	Connect to ignition source ONLY. Check and replace faulty section as required. Confirm RED is attached to the Positive (+) terminal on battery, and BLACK (-) to the negative terminal of battery.
4. Requires too many turns from hard over to hard over.	Hoses installed in the wrong ports. Kinked or collapsed line. DC Power Unit not on.	Review the plumbing diagrams for your system noted on page 9 through page 10 confirm that your hoses are hooked up correctly. Check ALL lines for sign of a collapsed or kinked line. See item 3.
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 DC Power Unit.	Review the plumbing diagrams for your system noted on page 9 through page 10 confirm that your hoses are hooked up correctly.
6. Pump cycles ON/OFF at hard over.	NORMAL	This is not considered a fault.

7. Pump runs continuously.

Bleed fitting left open.
Purge valve open.
Contamination causing flow sensors to stick.

Unit plumbed incorrectly.

Air in system.

Close bleed fitting.
Close purge valve.
Shake wheel back and forth quickly several times. If problem persists contact SeaStar Solutions technical support.

Verify hose routing as noted on page 9 through page 10.

Repeat purge procedure.

8. Cylinder 'Hunts' or makes continuous course corrections

Autopilot incorrectly set up.

Refer to Autopilot controller documentation for correct set up.

Adjust Autopilot pump flow rate on DC Power Unit. Refer to page 17.

9. Poor steering response or drift.

Air in system.
Dirt or debris in helm check or relief valve(s).
Dirt or debris in power steering cylinder valve or damaged power steering cylinder.

Repeat purge procedure .
Replace or repair helm pump(s).

Replace or repair power steering cylinder

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 - Friday 05:00 – 15:30 PST

Web: www.seastarsolutions.com



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