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TELEFLEX CANADA LIMITED
PARTNERSHIP

INSTALLATION INSTRUCTIONS

AND OWNERS MANUAL

www.seastarsteering.com




SeaStar[®]

POWER STEERING FOR INBOARD
POWERED VESSELS

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

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.

Don't compromise performance... use genuine SeaStar parts only!

- SeaStar helms
- SeaStar hoses
- SeaStar Cylinders
- SeaStar Oil

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

INTRODUCTION

The SeaStar open center Power Steering System has been designed to steer commercial and pleasure boats, requiring a maximum output force of 10,308 lbs_f or 45,852 Newtons, or a maximum torque of 66,130 in-lbs, or 7472 newton meters. If uncertain of your application, or you have special requirements, refer to the SeaStar Power Steering brochure or consult the factory.

All power steering system components have been designed to the highest standards possible. Please ensure that components not purchased from Teleflex are of the highest quality possible, and are compatible with Teleflex Equipment.

NOTICE

Before proceeding with installation, read these instructions thoroughly. Teleflex cannot accept responsibility for installations where instructions have not been followed, where substitute parts have been used, or where modifications have been made to our products.

Index

Introduction	1
How it Works	2
Mounting Cylinders	5
HC5801/03/05 Power Steering Cylinder.....	5
HC5802/04/06 Add-On Cylinder	8
Shaft Shield Installation	10
SeaStar Power Steering Cylinders HC5801 & HC5803	10
Power Pump Installation	11
Cooler Installation	13
Reservoir Installation	15
Filter Installation	16
Mounting the Helm	17
Tube & Hose Installation	18
Autopilot Installation	22
Filling and Purging the System	23
Single Station One Cylinder	24
Twin Station Single Cylinder	26
Purging the Power Circuit	27
Oil Level & System Check	27
Maintenance	28
Troubleshooting Guide	28
Technical Information	31
Appendix A	33
Appendix B	34
Appendix C	35
Appendix D	36
Appendix E	37
Appendix F	38
Appendix G	42
Appendix H (Bleed Fitting Kit HA5457)	44
Statement of Limited Warranty	45
Return Goods Procedure	46

HOW IT WORKS

SeaStar Power Steering Systems use a hydraulic pump driven from either the boat's motor(s) or an electric driven motor to provide the "POWER" for the Power Steering System. The SeaStar Power Steering System is comprised of three distinct circuits: a hand operated **Manual System**, which is the control element, a **Power System**, which is the working element, and a **Fluid Management System**, which provides the system with enough fluid to operate. The Manual hydraulics consist of a standard SeaStar Helm and a steering cylinder (fitted with integral servo cylinder and a power steering valve). The Manual hydraulics supplies the "control" portion of the power steering system. In case of an engine failure the **Manual System** will still provide steering to the helmsman.

The **Power System**, like that in your automobile, uses one or two hydraulic power pumps. These pumps can be belt or cam driven off the engine(s), or, electrically driven. Regardless of the source, with the engine(s) running, hydraulic oil supply is in stand-by mode, ready to be directed to the steering cylinder valve. Turning the steering wheel left or right causes the **Power System** to go from "stand-by" into "operating" mode and moves the steering cylinder as to the input from the helmsman.

The **Fluid Management System** consists of an engine room mounted reservoir, which allows easy system fill, an in-line fluid filter that helps protect the steering system from contaminants, and an in-line oil cooler. Since there is a continuous fluid flow involved in the power circuit, provisions are made to keep the fluid reasonably cool. The oil cooler requires water fed from an external source.

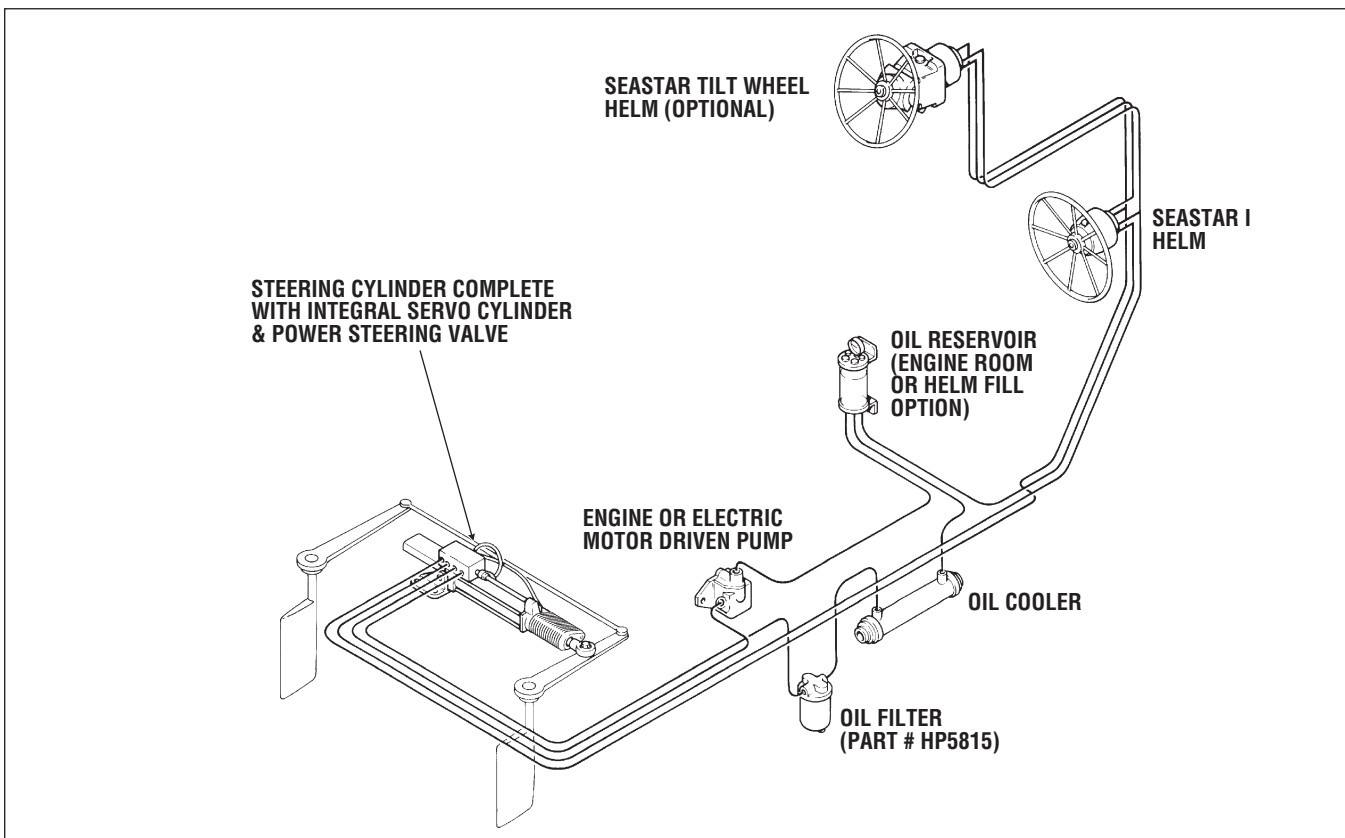


Figure 1. System Diagram.

Things You Need To Know

Not all of the steering system components may have been purchased from Teleflex, such as power steering pump, oil cooler, filter, hose, and tube fittings. SeaStar components have the following port sizes:

- SeaStar Helm Pump – fitted with 1/4" NPT ports
- Power Steering Cylinder – fitted with 1/4" NPT ports
- Reservoir, fitted with 1/4" NPT & 3/8" NPT ports
- Oil Cooler, fitted with 3/8" or 1/2" NPT ports and 1" or 2" hose ports
- Oil Filter, fitted with 3/4" NPT ports
- Power Steering Pump (Vicker's) fittings

NOTICE

Due to various mounting configurations, mounting hardware is not supplied for the power pumps, oil cooler, and filter. Make sure you have what you need to mount these items before starting.

Before Starting

WARNING

A high quality Teflon pipe sealant, such as Loctite PST, is to be used on ALL pipe threads (NPT). Never use Teflon Tape.

Study this installation manual carefully, and thoroughly to familiarize yourself with all components and their intended or required mounting location.

Ensure that there is adequate space available for installation of all components, hydraulic lines, and easy access service. It is good practice to mount all components first, before running hose. This allows port to port connection with less chance of error. If you must run hose first, a system of marking the various lines must be used. ALL tube ends should be closed with tape or similar material to prevent contamination. **Contamination is the most common cause of system failure.**

Read ALL bold printed text, notes and cautions. Reading these now will help prevent unexpected surprises during the installation.

Confirm that all components needed to complete the installation are purchased, including; steering system components, mounting hardware, hoses, fittings, pipe sealant such as Loctite PST (**NEVER use Teflon Tape**), all necessary tools, and hydraulic fluid.

It is sometimes easier to install fittings into the component's ports before mounting, if installation allows; elbows may be substituted for straight adapters, and or vice versa.

Cleanliness is extremely important. Precautions MUST be taken to prevent any dirt, chips, or other contaminants from entering the system.

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.

Tools

- 3/8" dia. Drill
- 5/8", 3/4", 15/16" Open End type Wrench/Spanner

Standard Helm Mount

- 3" (77 mm) diameter Hole Saw or Key Hole Saw and a
- 5/16" (8 mm) dia. Drill
- 7/16", 9/16", 5/8" and 3/4" Open End type Wrench/Spanner
- 15/16" Socket

Optional Helm Mount

- Square Bezel Back mount, HA5418, 4-1/2" (115 mm) Hole Saw
- Round Bezel Back mount, HA5417, 4-3/8" (112 mm) Hole Saw
- Rear mount Helm, HH5261/62, 13/16" (21 mm) Drill
- Tilt Helms 4-1/2" (115 mm) Hole Saw

20° Mount Wedge

- Key Hole or Sabre Saw
- 5/16" (8 mm) dia. Drill
- 1/2" Wrench/Spanner, Box or Open End type
- 7/16" Socket and Drive

Cylinder Selection Guide:

* All boats over 70' should have steering loads reviewed by factory.

CYLINDER PART NUMBER	DISPLACEMENT HULLS (standard)	DISPLACEMENT HULLS (heavy duty)	PLANING HULLS
SINGLE 9" x 1 CYLINDER (HC5801-2)	UP TO50' (15m)	UP TO40' (12m)	UP TO65' (20m)
TWIN 9" x 2 CYLINDER (HC5802)	UP TO75' (22m)	UP TO55' (17m)	UP TO85' (26m)
SINGLE 11" x 1 CYLINDER (HC5803-2)	UP TO60' (18m)	UP TO50' (15m)	UP TO75' (23m)
TWIN 11" x 2 CYLINDER (HC5804)	UP TO85' (26m)	UP TO60' (18m)	UP TO100' (31m)
*SINGLE 9" x 2.5 CYLINDER (HC5805)	UP TO100' (31m)	UP TO70' (22m)	UP TO110' (34m)
*TWIN 9" x 2.5 CYLINDER (HC5806)	UP TO110' (34m)	UP TO80' (25m)	UP TO120' (37m)

* Larger 2.5" cylinder bore than HC5801-2 and HC5802.

Technical Data:

CYLINDER PART NUMBER	DISPLACEMENT	BORE	STROKE	OUTPUT FORCE	MAX. TORQUE (35° from centre)
SINGLE 9" CYLINDER (HC5801-2)	21.25 in ³ (348cc)	2.0" (51mm)	9" (229mm)	2946 lbs _f (13,090 N)	18,900 in-lbs (2130 Nm)
SINGLE 11" CYLINDER (HC5803-2)	26.00 in ³ (426cc)	2.0" (51mm)	11" (280mm)	2946 lbs _f (13,090 N)	23,140 in-lbs (2610 Nm)
TWIN 9" CYLINDER (HC5802)	42.50 in ³ (697cc)	2.0" (51mm)	9" (229mm)	5892 lbs _f (26,190 N)	37,800 in-lbs (4260 Nm)
TWIN 11" CYLINDER (HC5804)	52.00 in ³ (853cc)	2.0" (51mm)	11" (280mm)	5892 lbs _f (26,190 N)	46,280 in-lbs (5220 Nm)
SINGLE 9" CYLINDER (HC5805)	37.11 in ³ (608cc)	2.5" (64mm)	9" (229mm)	5154 lbs _f (22,926 N)	33,065 in-lbs (3736 Nm)
TWIN 9" CYLINDER (HC5806)	74.33 in ³ (1216cc)	2.5" (64mm)	9" (229mm)	10,308 lbs _f (45,852 N)	66,130 in-lbs (7472 Nm)

Basic System Selection Guide:

Power Steering Cylinders	Part #
9" (228mm) Stroke, for vessels under 75' (22m)	HC5801-2
11" (279mm) Stroke, for vessels over 75' (22m)	HC5803-2
9" (228mm) Stroke, additional cylinder option	HC5802
11" (279mm) Stroke, additional cylinder option	HC5804
Steering Helms (For 3-1/2 Turn System)	
SSI Helm, Standard Mount	HH5271
SSI Helm, Rear Mount	HH5261
SSI Helm, Tilt	HH5741
SSI Helm, Rear Mount, 1" Shaft	HH5281

Power Steering Pumps	Part #
Outlet Check Power Pump	HP5820
Press Relief Twin Pump	HP5822
Belt Drive, Right Rotation (Universal)	HP5830
Belt Drive, Left Rotation (Universal)	HP5831
Direct Drive, Right Rotation (for Detroit Diesel)	HP5832
Direct Drive, Right Rotation (for Caterpillar – special order)	HP5833
Direct Drive, Right Rotation (Spline)	HP5833
Direct Drive, Right Rotation (2 GPM)	HP5834
Direct Drive, (for Twin Disk)	HP5835
Note: See appendix F for a complete list of available power pumps.	

Oil Reservoir, Cooler & Filter	Part #
Oil Reservoir	HP5810
Oil Cooler, 2.25 Kw, 1" water lines	HP5825
Oil Cooler, 6.25 Kw, 2" water lines	HP5826
Oil Filter	HP5815
Miscellaneous	
Outlet Check Valve (Power Pump)	HP5820
Auto Flow Control (Twin Pump)	HP5821
Crossover Pressure Relief	HP5822
System Pressure Gauge Kit	HA5821
Adapter Kit, Twin Disk #5050	HA5823
Adapter Kit, Twin Disk #5061	HA5824
Adapter Kit, MAN to V10 Pump	HA5827
SeaStar Oil, 1 liter	HA5430
SeaStar Oil, 4 liter	HA5440

MOUNTING CYLINDERS

HC5801/03/05 Power Steering Cylinder

⚠ CAUTION

Incorrect cylinder installation will subject the cylinder to rapid seal and bearing wear, which will cause irreparable cylinder damage.

⚠ CAUTION

Ensure HC5801/03/05 power rams are mounted such that the servo cylinder can shift.

⚠ CAUTION

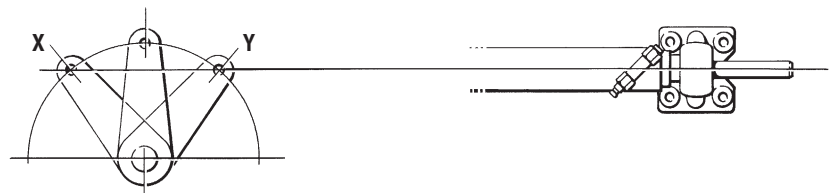
DO NOT mount the steering cylinder, or any other steering component in a position where it may be used as a support for other equipment, or to be used for step points.

Correct cylinder installation is the key to the successful operation of the Hydraulic Steering system. An incorrectly installed cylinder is subject to rapid seal and bearing wear and non-repairable damage. Minimum side loading of the cylinder rod and maximum cylinder performance can be achieved as illustrated below (figure 2).

An imaginary line drawn through the tiller arm hole at both hard-over positions will create the cylinder centerline.

With the cylinder at hard-over positions, angle X and Y should be the same.

CENTER LINE FOR CYLINDER MOUNT *Tiller Arm shown in hard-over and Midship positions.*



NOTICE

Measure from the rod-end ball to a fixed point on the steering cylinder to obtain X and Y positions.

Figure 2.

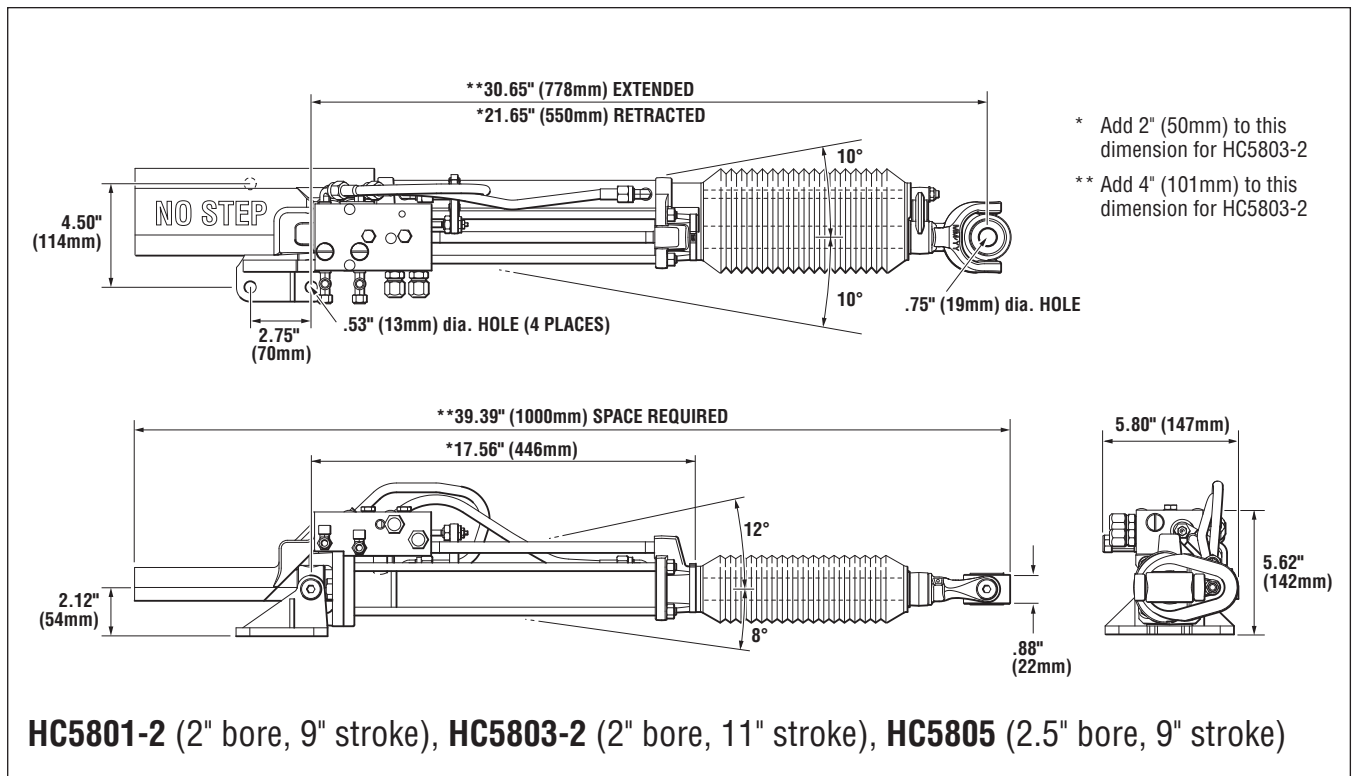


Figure 3.

Mounting Foot Configurations

Select the diagram and dimensional data that corresponds with your cylinder model.

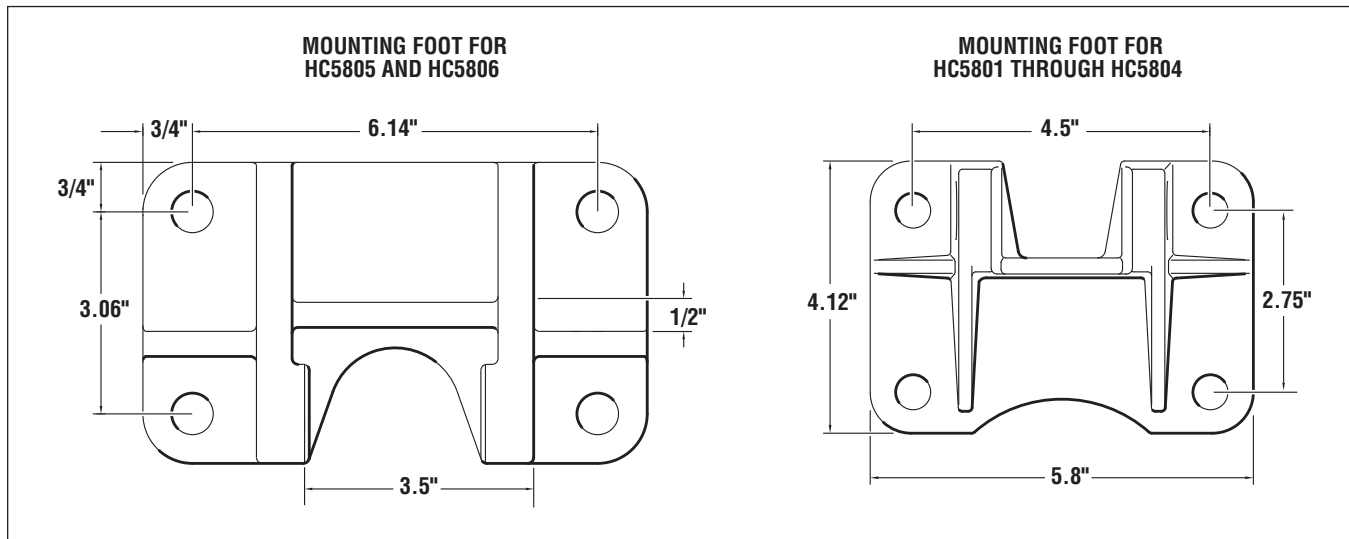


Figure 4.

⚠ WARNING

Cylinders **MUST** always be secured with through bolts, not with lag screws.

⚠ CAUTION

When installing bolts, ensure wrench and/or any other tightening device **DOES NOT** hit against the cylinder shafts. Damage to the shaft(s) may result in a leak causing loss of steering.

⚠ WARNING

Failure to ensure Cylinder Shafts are protected from gel coat, paint or any other form of debris or foreign substance will void warranty

PROTECT CYLINDER RODS FROM NICKS AND SCRATCHES, WHICH CAN CAUSE THE CYLINDER TO LEAK, AND RESULT IN LOSS OF STEERING.

Servo Cylinder rod bolt MUST always engage the Nylok® nut fully beyond the nylon ring by at least two full threads.

Shoulder pins with cotter pins are not recommended by Teleflex.

⚠ CAUTION

DO NOT mount the steering cylinder, or any other steering component in a position where it may be used as a support for other equipment, or to be used for step points.

Verify the model of your steering cylinder and select your system type by referring to configurations A through C. Use these charts to calculate rudder arm length with desired rudder arc, Make note of the appropriate locations for mounting the power steering cylinder.

With the cylinder rod attached to the rudder arm, position the rudder arm in the midships position. Now position the mounting foot along the boat's center line as shown on page 5, and on approximately the same horizontal plane as the rudder arm's bottom surface.

The mounting foot **MUST** be thru-bolted to a substantial member, since it will have to withstand forces up to 3000 lbs. for the HC5801 and HC5803, and up to 5000 lbs. for HC5805.

Mounting Configurations

While using the tables noted below be sure that your steering cylinder is at mid-stroke as per figure 5 to ensure the cylinder operates correctly.

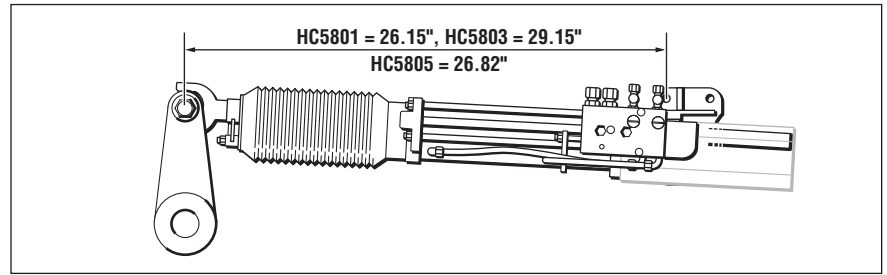


Figure 5.

Configuration A

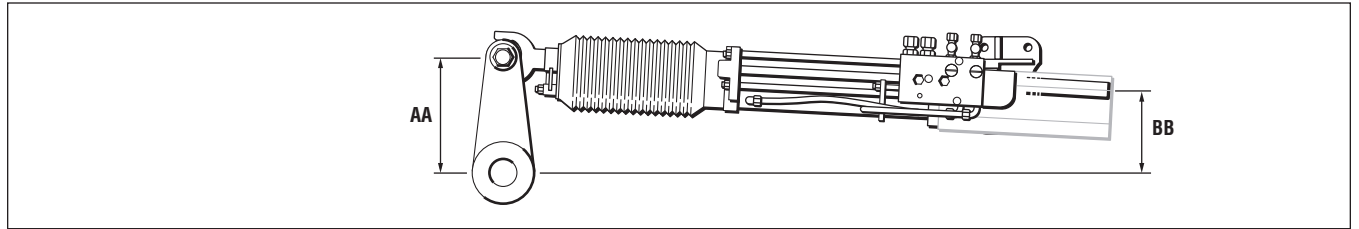


Figure 6.

	50° TOTAL		60° TOTAL		70° TOTAL		80° TOTAL	
MODEL	AA	BB	AA	BB	AA	BB	AA	BB
HC5801	10.63"	9.63"	9"	7.79"	7.88"	6.47"	7"	5.36"
HC5803	13"	11.81"	11"	9.53"	9.56"	7.82"	8.56"	6.56"
HC5805	10.63"	9.63"	9"	7.79"	7.88"	6.47"	7"	5.36"

Configuration B

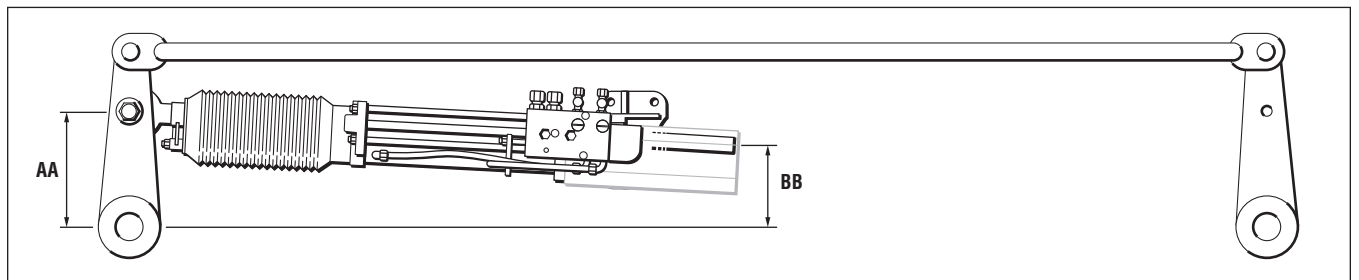


Figure 7.

	50° TOTAL		60° TOTAL		70° TOTAL		80° TOTAL	
MODEL	AA	BB	AA	BB	AA	BB	AA	BB
HC5801	10.63"	9.63"	9"	7.79"	7.88"	6.47"	7"	5.36"
HC5803	13"	11.81"	11"	9.5"	9.56"	7.19"	8.56"	6.56"
HC5805	10.63"	9.63"	9"	7.79"	7.88"	6.47"	7"	5.36"

Configuration C

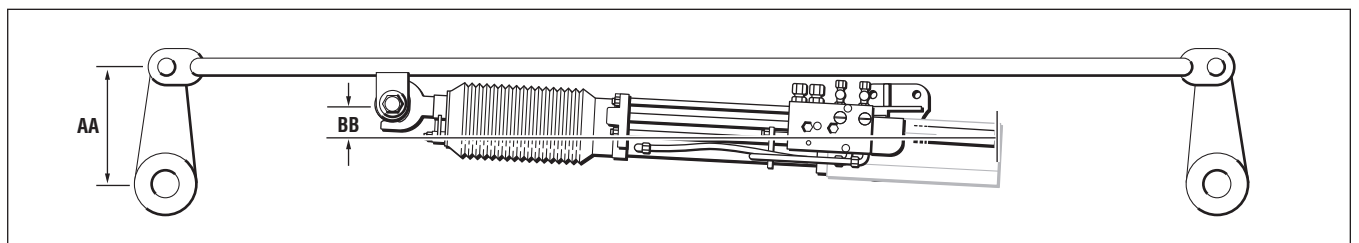


Figure 8.

	50° TOTAL		60° TOTAL		70° TOTAL		80° TOTAL	
MODEL	AA	BB	AA	BB	AA	BB	AA	BB
HC5801(-2)	10.63"	1"	9"	1.21"	7.88"	1.43"	7"	1.62"
HC5803(-2)	13"	1.22"	11"	1.47"	9.56"	1.73"	8.56"	2"
HC5805	10.63"	1"	9"	1.21"	7.88"	1.43"	7"	1.62"

HC5802/04/06 Add-On Cylinder

CAUTION

DO NOT mount the steering cylinder, or any other steering component in a position where it may be used as a support for other equipment, or to be used for step points.

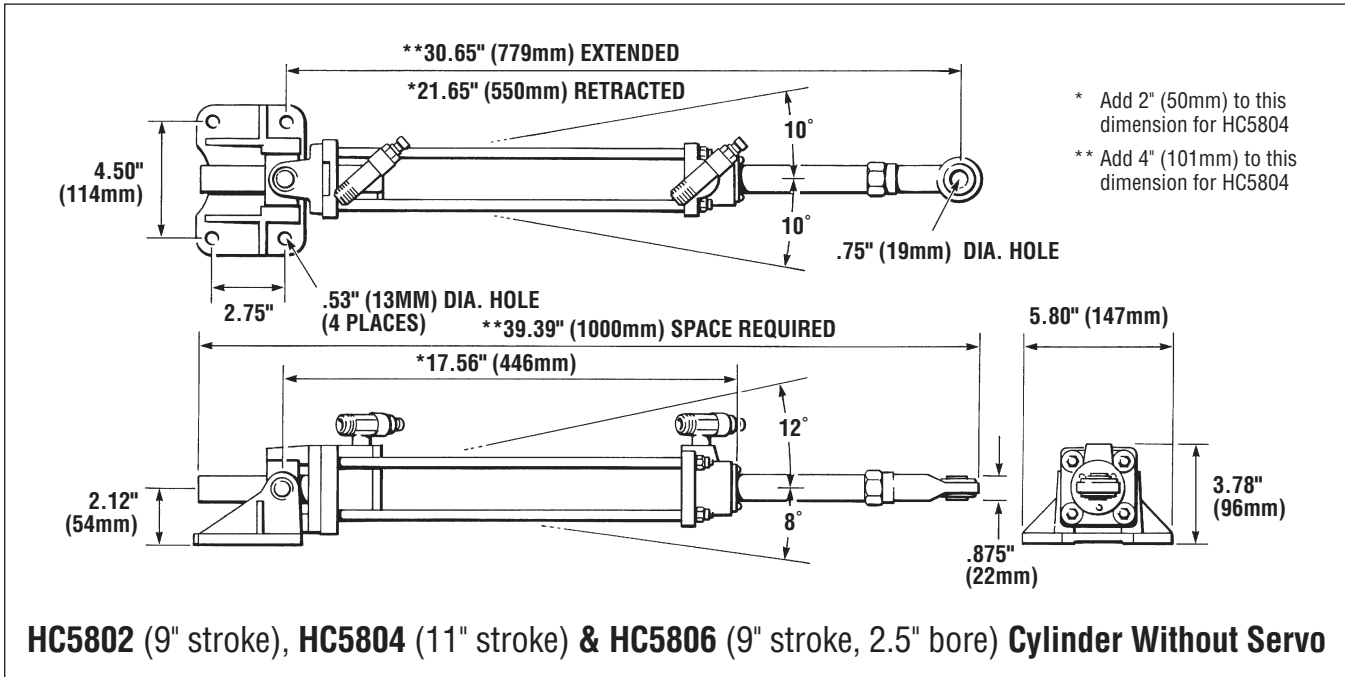


Figure 9.

Mounting Foot Configurations

Select the diagram and dimensional data that corresponds with your cylinder model.

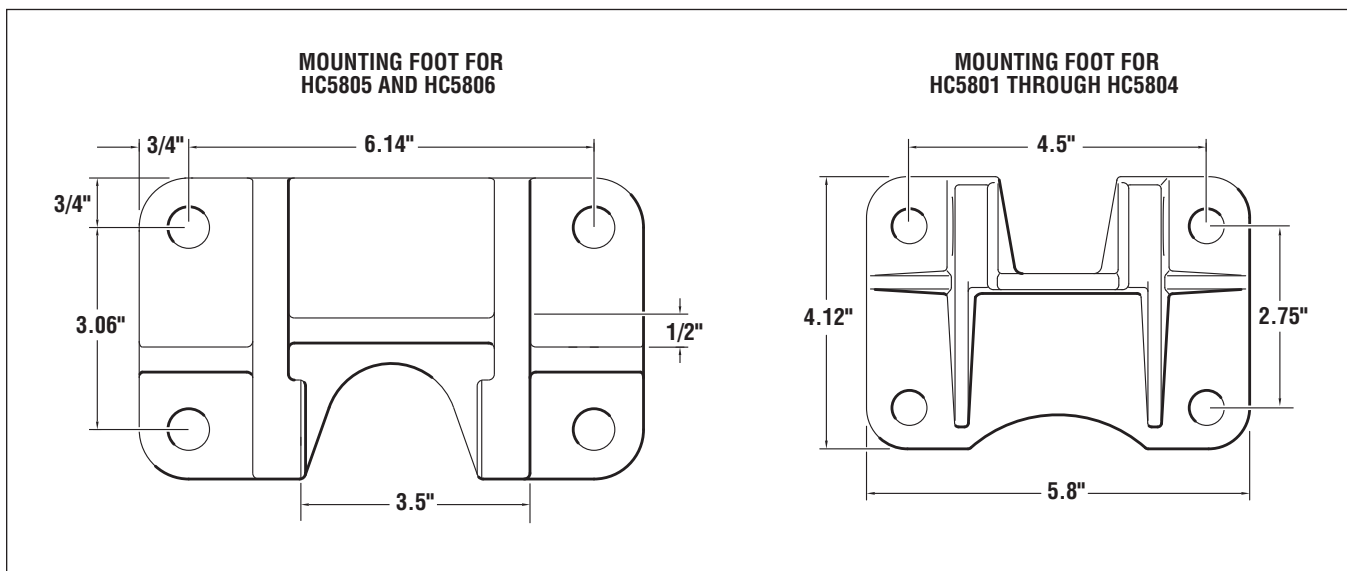
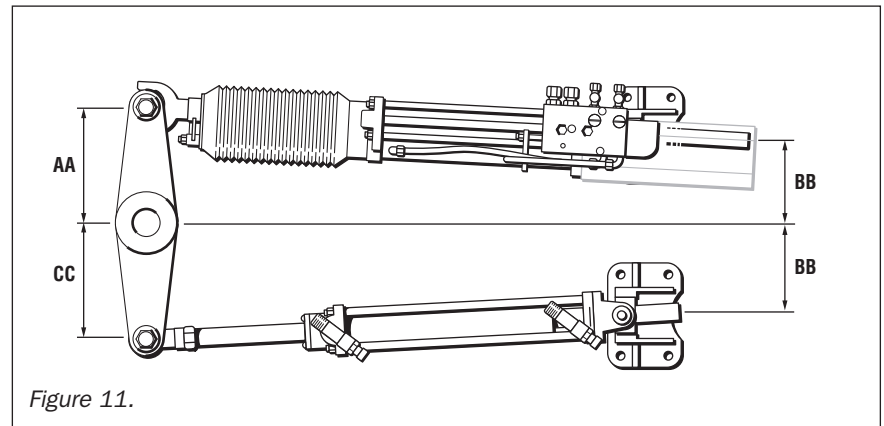


Figure 10.

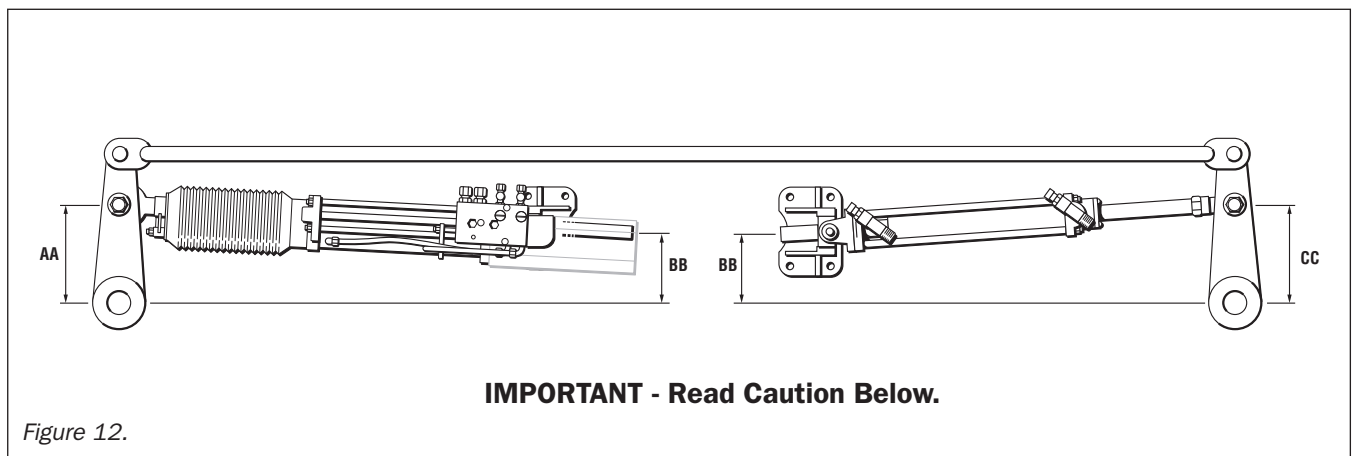
Mounting Configurations

Configuration D



MODEL	50° TOTAL			60° TOTAL			70° TOTAL			80° TOTAL		
	AA	BB	CC	AA	BB	CC	AA	BB	CC	AA	BB	CC
HC5801	10.63"	9.63"	10.43"	9"	7.81"	8.81"	8.3"	6.44"	7.88"	7"	5.38"	6.81"
HC5803	13"	11.81"	12.81"	11"	9.5"	10.81"	9.92"	7.19"	9.56"	8.56"	6.56"	8.37"
HC5805	10.63"	9.63"	10.43"	9"	7.81"	8.81"	8.3"	6.44"	7.88"	7"	5.38"	6.81"

Configuration E



MODEL	50° TOTAL			60° TOTAL			70° TOTAL			80° TOTAL		
	AA	BB	CC	AA	BB	CC	AA	BB	CC	AA	BB	CC
HC5801	10.63"	9.63"	10.43"	9"	7.81"	8.81"	8.3"	6.44"	7.88"	7"	5.38"	6.81"
HC5803	13"	11.19"	12.81"	11"	9.5"	10.81"	9.92"	7.19"	9.56"	8.56"	6.56"	8.37"
HC5805	10.63"	9.63"	10.43"	9"	7.81"	8.81"	8.3"	6.44"	7.88"	7"	5.38"	6.81"

CAUTION

Proper measurement of the CC area is critical to proper operation of the power cylinder. Failure to properly measure and use the CC dimension may cause irreparable damage to the steering system.

SHAFT SHIELD INSTALLATION

SeaStar Power Steering Cylinders HC5801 & HC5803

⚠ CAUTION

This shaft shield is to be installed on ALL SeaStar Power Steering Cylinders to prevent damage to the steering cylinder shafts.

⚠ CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

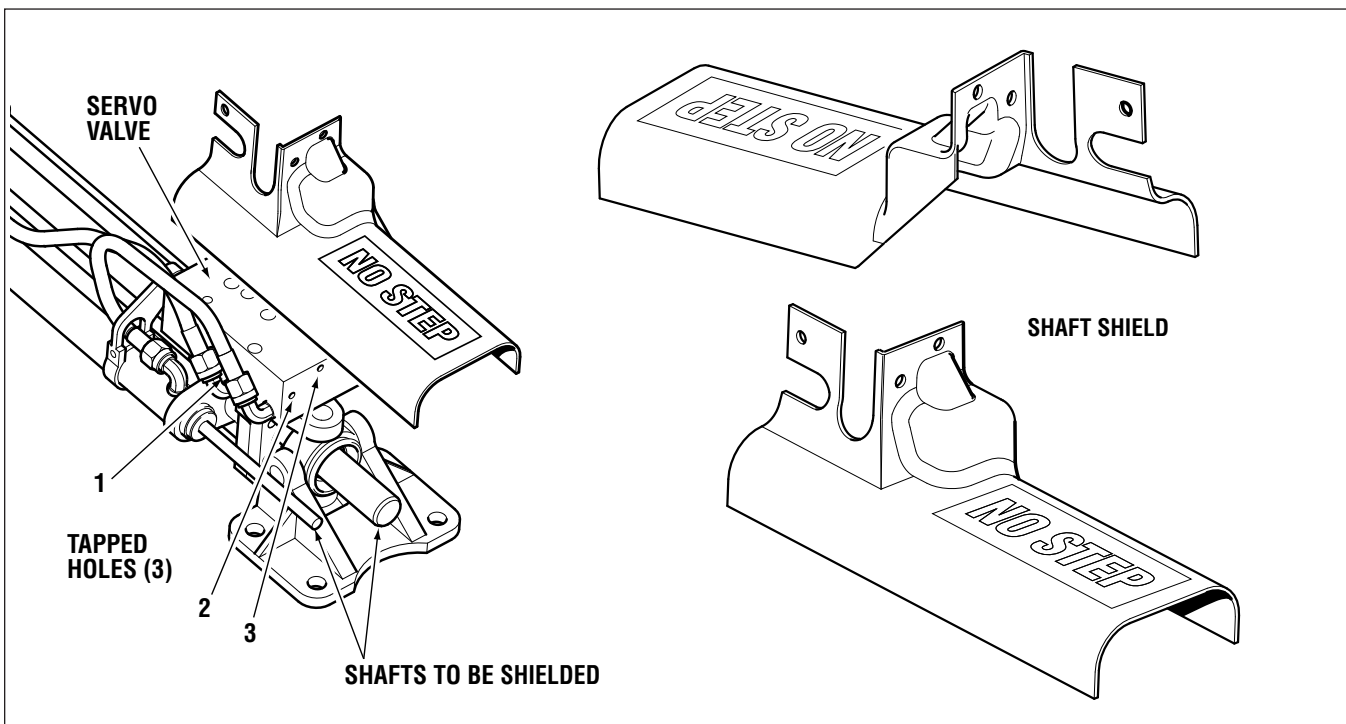


Figure 13.

⚠ CAUTION

When installing bolts, ensure wrench and/or any other tightening device DOES NOT hit against the cylinder shafts. Damage to the shaft(s) may result in a leak causing loss of steering.

- 1 Locate the three pre-tapped holes on the Power Steering Servo valve. Refer to Figure 13.
- 2 Guide the tabs of the shaft shield around the hoses on the front of the servo valve (refer to Figure 13) and line up with the pre-tapped holes. Install screws through the shaft shield into the servo valve. Be careful not to break shaft shield tabs.
- 3 Line up the other two holes with the holes on the shaft shield and place remaining screws through the shaft shield into the servo valve.
- 4 Tighten all 3 screws, torque to 75in lbs (8.67Nm).
- 5 Confirm that there is no interference between the shaft shield and cylinder shafts. If interference does occur contact Teleflex Canada for technical assistance.
- 6 Installation of shaft shield is now complete.

POWER PUMP INSTALLATION

Before Starting

Confirm that the pump you are intending on installing is that of the proper drive, rotation, and flow rate.

⚠ CAUTION

Failure to check that the pump will work with the engine and the steering system may cause irreparable damage to the engine and steering systems.

These installation instructions are made as informative yet general as possible, for specific Power Pump specifications please refer to page 37 for your pump details. These pumps develop the specified rated flow at 1200 RPM, the excess flow at higher RPM is circulated back to the tank via the integral flow control valve. Pressure reliefs are preset and integral.

⚠ CAUTION

If using two power pumps, an autoflow valve (part # HP5821) is required.

⚠ CAUTION

If using a power pump without a built in pressure relief valve, you MUST purchase part # HP5818 (Pressure Relief Valve). Failure to use a pressure relief valve in the power circuit may result in costly damage to engine components, please see Appendix F, page 38 for a system diagram with a Pressure Relief Valve installed.

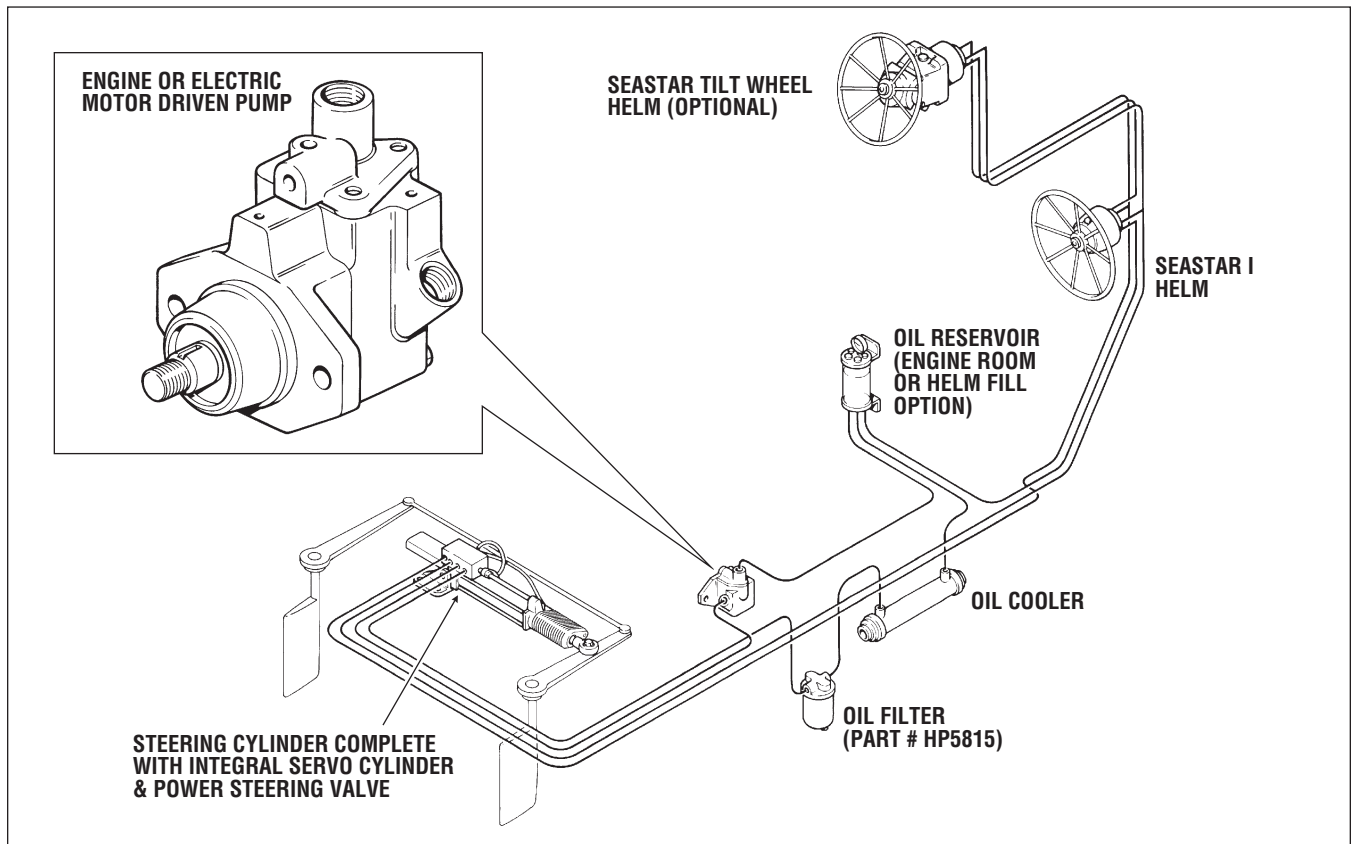


Figure 14

Please refer to Appendix F, page 38 to page 40 for power pump details and specifications.

Installation Instructions

Confirm that the area the pump is being installed in will allow enough room for mounting of the fittings and the hoses. DO NOT let hoses or fittings interfere with any other object.

CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

HP5830 (R.H. rotation, 4 GPM)

HP5831 (L.H. rotation, 4 GPM)

When selecting a pulley for the HP5830 or HP5831, make sure the ratio between the engine pulley and the pump pulley is 1 to 1 or such that the pump will operate at a MAX RPM of 2800.

$$\frac{\text{ENGINE MAX. RPM}}{\text{PUMP MAX. RPM}} \times \text{ENGINE PULLEY DIAMETER} = \text{PUMP PULLEY DIAMETER}$$

Mount the pump on a suitable bracket with provision for alignment and tensioning of the belt. Make sure the ports are not obscured when mounting the pump.

Right, Left, & Direct Drive Engine Driven Power Pump Installation

Refer to page 38 for details on your particular power pump.

These pumps are meant to run off a Power Take Off (PTO) with the correct rotation and RPM. Ensure clearance exists for the pump, fittings, and hoses.

Consult your engine Manufacturer's manual for mounting locations. If driving off an electric motor: use 3HP @ 1800 RPM, #182 Frame, "C" Face "Y" connection. Consult Teleflex for part number of pump.

CAUTION

Consult your engine's manufacturer's manual before doing any work with the power pump installation. Expensive, or irreparable damage to the engine may result with the installation of an incorrect or improper power steering pump.

NOTICE

DO NOT use a bypass line with a belt driven pump.

Installation of twin 2 GPM engine driven power pumps requires the installation of outlet checks (HP5820) at the outlet of both power pumps.

Installation of twin 4+ GPM engine driven pumps requires the use of the flow control valve HP5821.

Twin steering cylinder installations require the use of a 4+ GPM engine driven power pump. Connect the oil coolers to the return circuit in parallel. Single pump installations use Dash 8, 1/2" I.D. hose to pipe the return circuit. Dual or twin pump installations use Dash 10, 5/8" I.D. hose to pipe the return circuit.

Single steering cylinder installations require the use of the twin 2 GPM engine driven power pumps. Pipe the return circuit using Dash 8, 1/2" I.D. hose and connect the coolers in series.

Applications using Mann diesels, where the engine is driving the power pump at 1.26 times the engine speed, use 2 GPM pumps for single or twin cylinder installations.

COOLER INSTALLATION

⚠ CAUTION

To adequately cool the hydraulic fluid in the system, the heat exchanger requires a minimum water flow rate of 2.5 GPM. If you are teeing from the existing thru hull engine cooling exchange system, make sure existing thru hull and water pump will provide adequate flow to the system at ALL times. ALL oil coolers, including Teleflex coolers, must be able to withstand a minimum of 100 psi working pressure, and provide 2.25 kW of cooling for HP5825, and 6.25 kW of cooling for HP5826 and HP5827.

⚠ CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

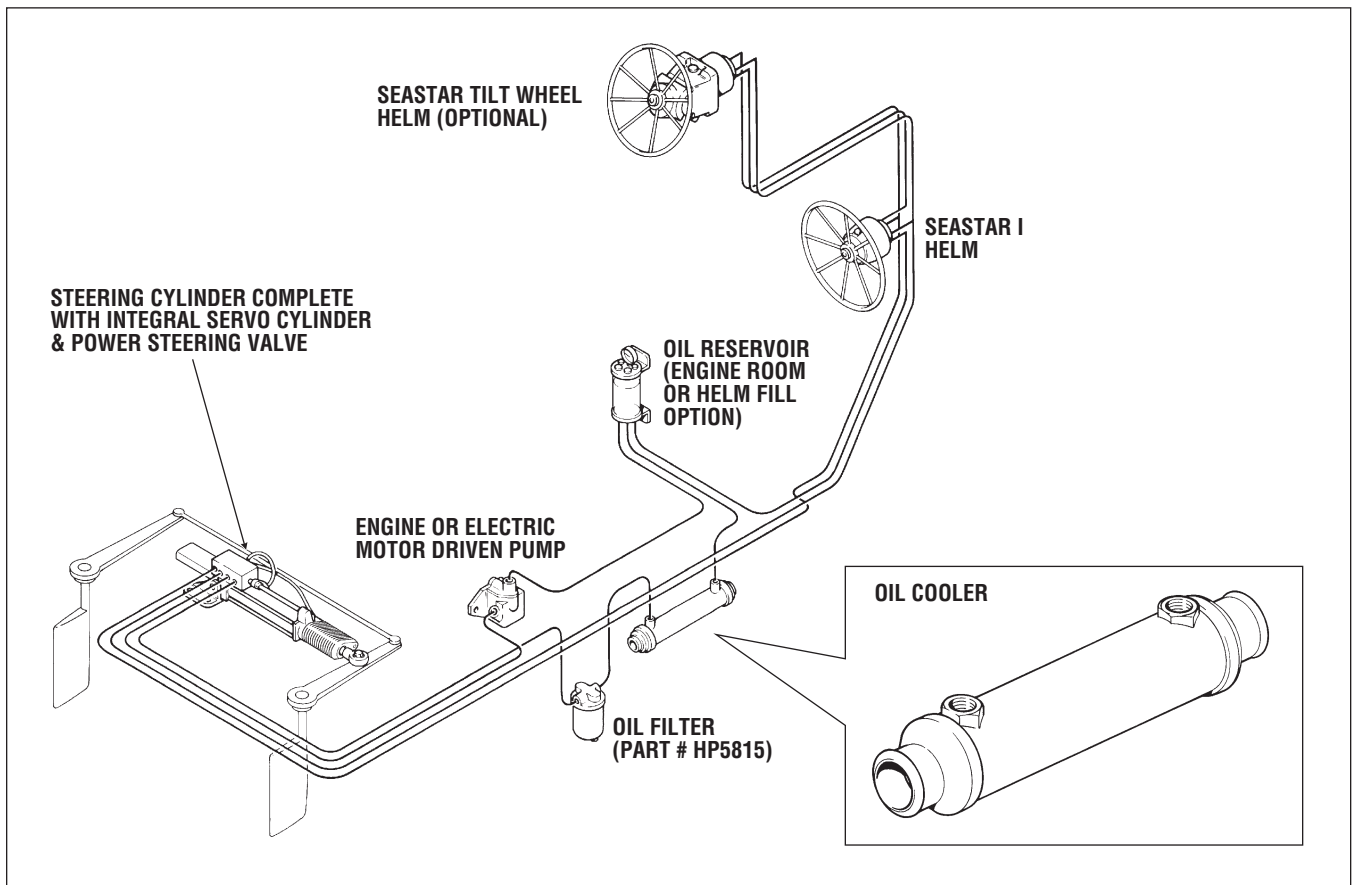


Figure 15.

Please refer to Appendix E on page 37 for cooler details.

Installation Instructions

NOTICE

Specific engine connection details by manufacturer and model can be found in your engine owners manual.

- 1 For details on your oil cooler, please refer to page 37 for complete dimensional data.
- 2 Select a suitable location for mounting the cooler which is close to the water pick-up, yet, is accessible for plumbing the hydraulic lines.
Note: Be sure that mounting the cooler will not let the hose, or fittings interfere with any other object. It is best to run a parallel circuit on the feed side of the engine to cool the hydraulic fluid most efficiently.

NOTICE

Ensure oil cooler is drained when winterizing your vessel for storage.

- 3 Before securing the cooler install the fittings for both water and hydraulic lines. Water line ports are 3/8" NPT for 1" models (HP5825), and 1/2" NPT for 2" models (HP5826 and HP5827). It is recommended that a non-collapsible hose is used if you place the cooler on the suction side of the water pump. Otherwise standard water hose may be used.
- 4 ONLY use Brass Fittings. When installing fittings use a crescent wrench to hold the nut while turning in the brass fitting.
- 5 Once ALL fittings are installed secure the cooler to a bulkhead using saddle clamps or copper straps. Be sure NOT to deform the cooler in any way.

If running the cooler in series, ensure that the cooler does not restrict your flow too much. **The HP5825 will create a 3.5 PSI pressure drop @ 35 gpm, and the HP5826/HP5827 will create 3.5 psi pressure drop @ 100 gpm.**

NOTICE

Supply water for cooler **MUST** be raw water, **DO NOT** use Re-circulated water.

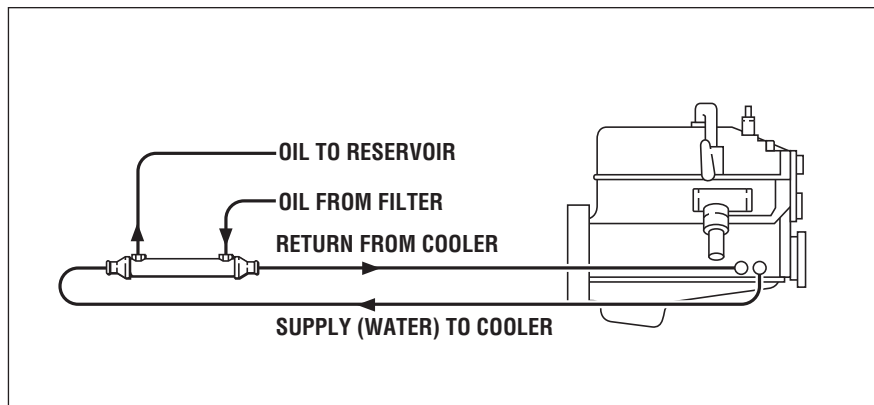


Figure 16. HP5825 Installation.

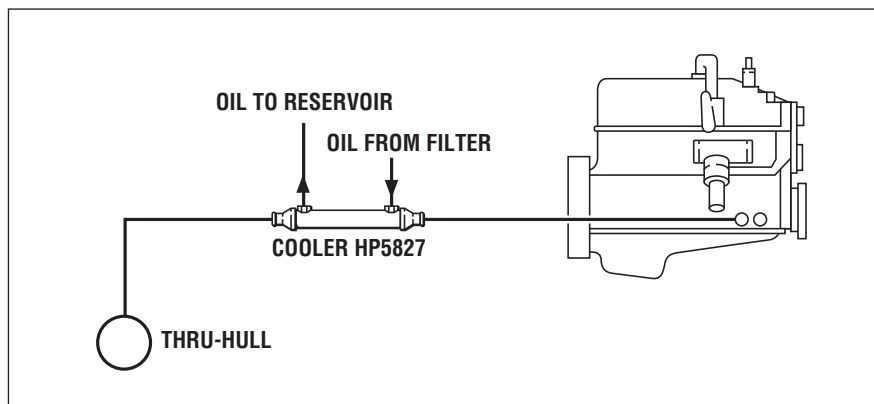


Figure 17. HP5826/27 Installation.

RESERVOIR INSTALLATION

Plan Ahead

⚠ CAUTION

DO NOT use "tape" sealers such as Teflon tape, these may cause contamination and damage to the system. Only use a Teflon based pipe sealant, such as Loctite® PST.

Install the reservoir in an area that provides unobstructed access. It is advised that the gauge be in a position where it can be easily read. Leave enough room on the top and on the bottom of the reservoir for hose connections and to fill and pressurize the system.

- 1 It is recommended that you install ALL fittings into the reservoir before mounting. Be sure that you take into account the area needed for hoses and fittings to be sure that there is an unobstructed access.
- 2 Once ALL fittings are installed, mount the reservoir to the bulkhead using four (4) 3/8" screws. Be sure that the reservoir is mounted level to prevent an inaccurate fluid level reading.

⚠ CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

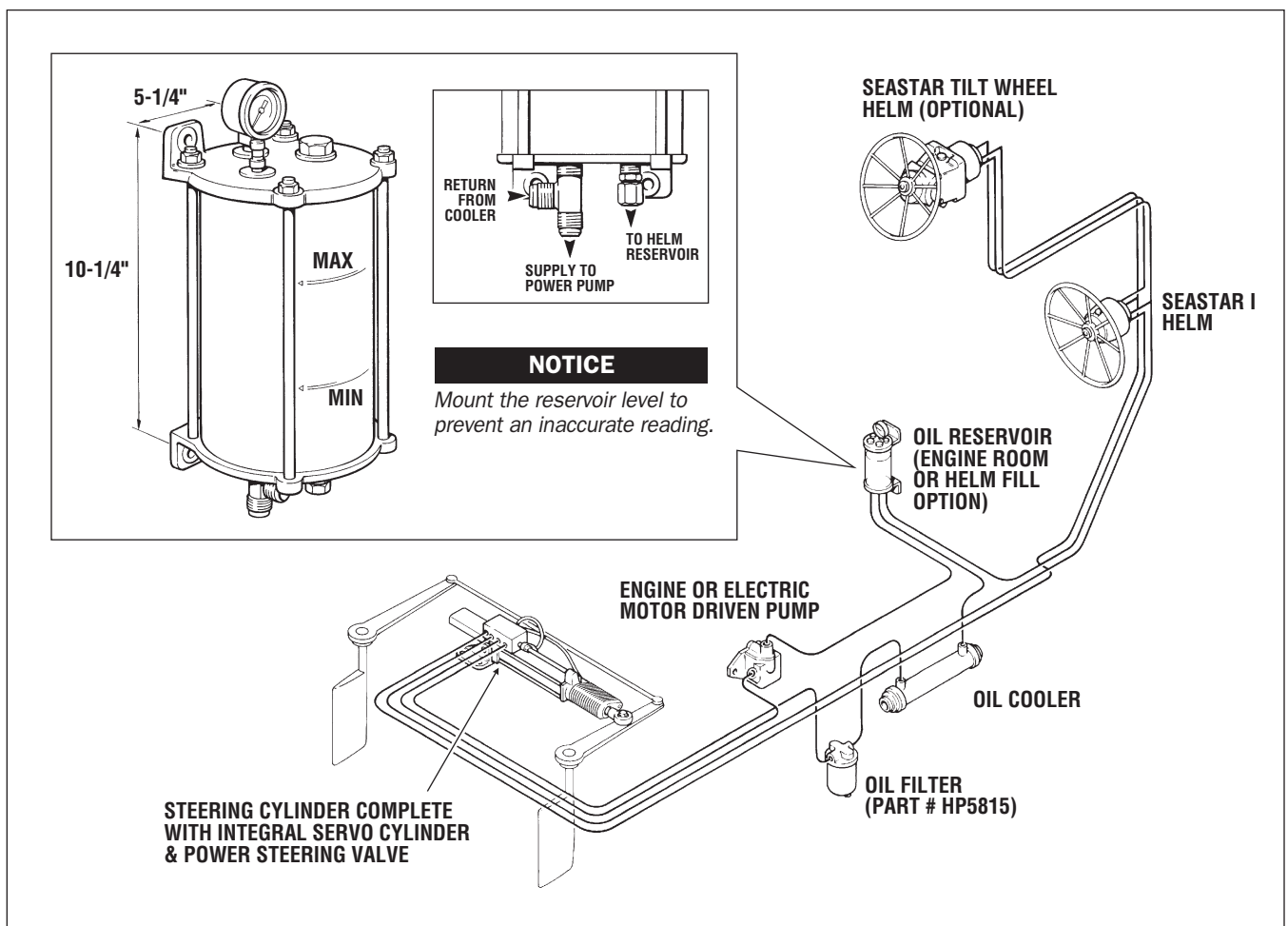


Figure 18. Oil Reservoir (HP5810).

Please refer to Appendix D on page 36 for reservoir details.

FILTER INSTALLATION

Plan Ahead

Install the oil filter in a location that gives easy, un-obstructed access.

- 1 Install fittings into the 3/4" NPT ports before mounting the filter.
- 2 Select a location that permits easy access for fluid filter replacement and allows continuous, unrestricted plumbing from the oil cooler, thru the filter, to the reservoir, taking note that the flow direction is towards the reservoir.

NOTICE

Ensure oil filter is installed properly and the filter element is threaded onto the base securely prior to purging. Failure to do so may result in the loss of steering fluid.

CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

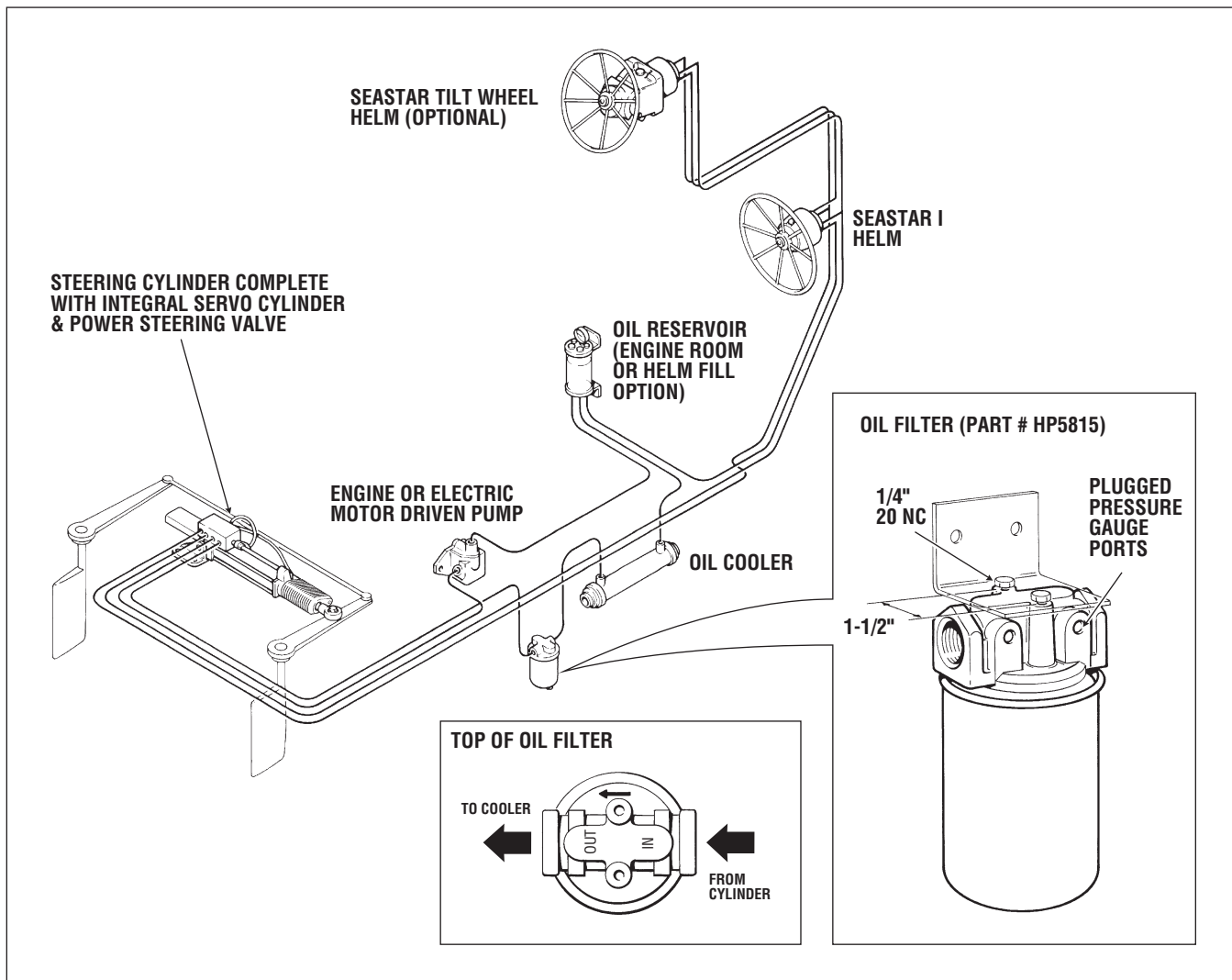


Figure 19. Oil Filter (HP5815).

Please refer to Appendix E on page 37 for oil filter details.

MOUNTING THE HELM

The SeaStar Helm pump can be mounted with the helm shaft vertical, horizontal or anywhere in between, the Fill plug MUST be in the upper most position. Ensure that the steering wheel will not interfere with other functional equipment, check for adequate space behind the dash for fittings and line connections.

⚠ CAUTION

The SeaStar Power Steering System is a pressurized system. ALL steering stations MUST have a non-vent plug part number HA5432 installed.

NOTICE

Due to the many possible differences with the SeaStar Helm Pump, please use the Installation Manual included with your helm for Mounting Templates, Fitting Installation, and general guidelines. If you do not have these instructions that are included with the helm please phone Teleflex Canada for a complete set of instructions.

NOTICE

Refer to Helm Pump Installation Instructions when mounting your helm pump.

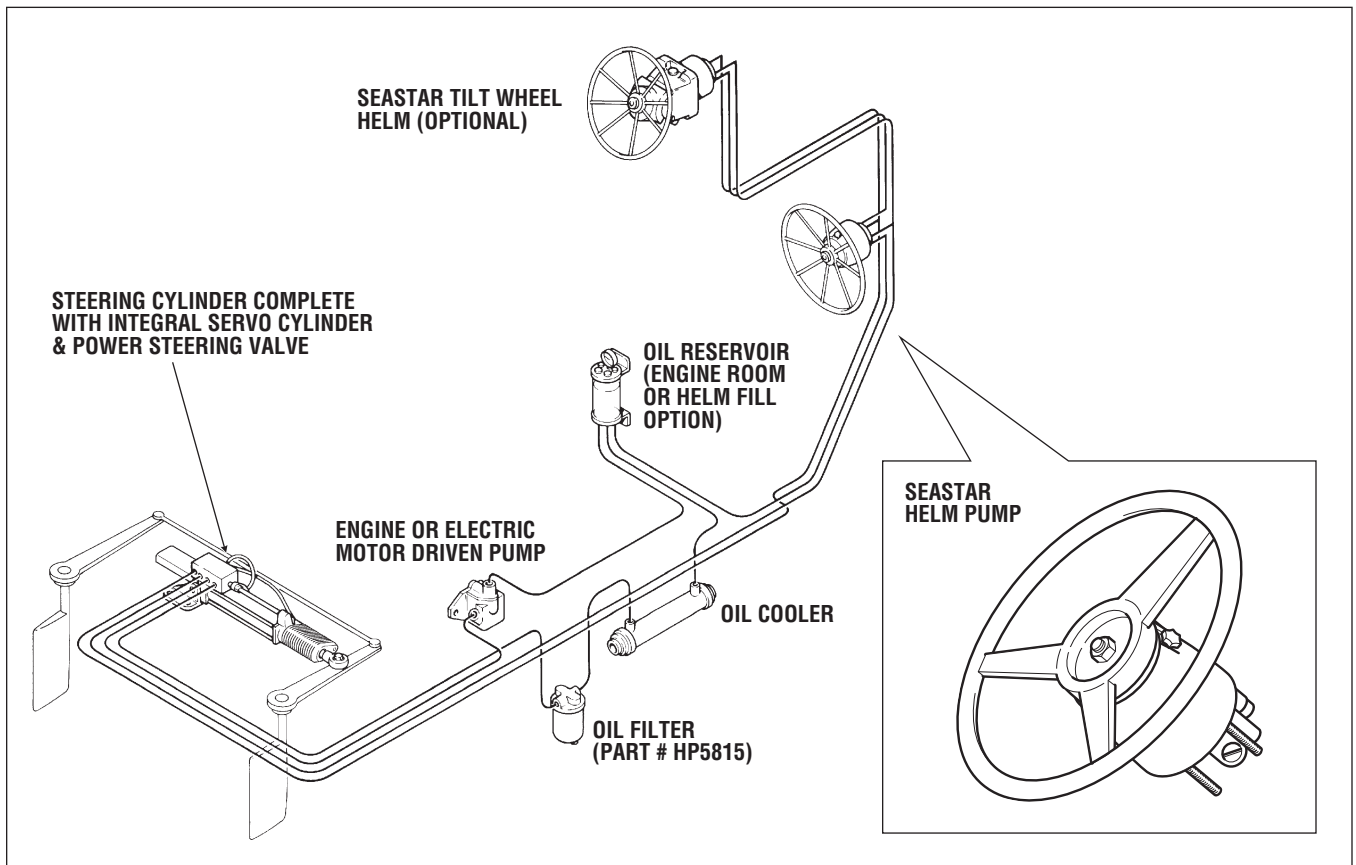


Figure 20.

TUBE & HOSE INSTALLATION

General

WARNING

Do not allow nylon tubing to contact, or come too close to hot engine. Extreme heat will lower burst pressure or melt nylon tubing. In either case instant loss of steering may occur.

Review the appropriate plumbing diagrams located on page 42 through page 43. Note sizes of recommended tubing and hoses. Any substitutions may alter the operation of your steering system. When in doubt, contact Teleflex Canada for assistance.

- **Route the hose/tube so that it will not interfere with the hatchways or any other functional equipment.**
- **DO NOT remove protective caps from hose/tube until the attachment to the helm and cylinder is ready to be made.**
- **DO NOT allow tubing to kink or collapse while routing through the vessel. Any piece of kinked or collapsed hose/tube will need to be replaced.**
- **Tie down hose/tube at regular intervals, using non-metallic type ties.**
- **DO NOT allow hose/tube to rest or chafe against a sharp or abrasive surface.**
- **DO NOT allow hose/tube to contact, or come close to a hot surface, such as the engine. Extreme heat will lower burst pressure or melt nylon tube. In either case instant loss of steering may occur.**
- **Use shortest convenient path for routing hoses.**
- **Route hose/tube with a continual rise from the steering cylinder to the helm pump.**
- **Hydraulic hose/tube MUST be protected from chaffing and any possible contact or interference with assembly screws or sharp edges of any type. The hydraulic hose/tube should be secured wherever possible. Teleflex recommends the use of a rigid tube, PVC piping, or conduit for the safe secure installation of hydraulic hose/tube.**
- **DO NOT allow hose/tube to hang free in an area where they could become a safety hazard.**
- **Continuous kinking, chafing, rubbing or twisting may eventually weaken hose/tube to a point where it could rupture from normal steering pressure causing loss of steering, resulting in property damage and/or personal injury or death. Visually inspect hose/tube and fittings for wear and/or damage.**

Manual System Circuit

Use 5/16" ID nylon tube or 5/16" ID SeaStar hose minimum. Any larger size can also be used.

NOTICE

SeaStar 3/8" OD nylon tube can be used for single station boats, with short tube runs. Pressure drop through this small tubing can make the steering feel slightly heavy in all but the shortest tube runs.

Power System Circuit

Use 3/8" ID hose or 1/2" ID hose for the power circuit.

1/2" copper tube is also acceptable, if short flexible lines are used at the power cylinder.

Suction line from power pump to reservoir should be 3/4" ID. (length not exceeding 12 feet). If length is 6' or less 1/2" ID hose may be substituted.

All hoses for power circuit should meet SAE 100R1.

NOTICE

Suction line hose used should meet SAE 100R1 or be able to withstand 200 psi vacuum without collapsing.

Cooling System Circuit

Use Heater Hose meeting SAE 30R7 specifications of the appropriate size for the water circuit.

Fittings

All necessary fittings for the manual circuit are supplied with a single steering station system. Fitting Kit, Part No. HF5502 is required for each additional steering station and or autopilot interface. Fittings for Cooler/Filter/Power Pump, customer supplied.

⚠ CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

SeaStar Fittings are available as follows:**STANDARD**

- 280327** Tube Nut, for 3/8" Nylon & Copper Tube, 1 ea. only
- 280929** Union Coupling Ftg., Tube to Tube, 1 ea. only
- 287129** Connector Ftg., Tube to 1/4" NPT Male, 1 ea. only
- 113124** Elbow Ftg., Tube to 1/4" NPT Male, 1 ea. only
- 018023** Tee Ftg., 3 x Tube, 1 ea. only
- 285020** Tee Ftg., Ends Tube & 1/4" NPT Male, Center Tube, 1 ea. only
- 280524** Connector Ftg., Tube to 3/8" NPT Male, 1 ea. only
- 284826** Tee Ftg., Ends Tube , Center 1/4" NPT Female, 1 ea. only
- 280421** Elbow Ftg., Tube to 3/8" NPT Male, 1 ea. only
- 286624** Elbow Ftg., Tube to 1/4" NPT Female, 1 ea. only
- 718725** Cap Plug Nut

45° FLARE

- 826828** Tee – 8 Flare Both Ends, 3/8" NPT Side
- 288529** Elbow – 6 Flare, 1/4" NPT
- 828427** Connector – 8 Flare, 1/4" NPT Male
- 288225** Tee – 8 Flare

Nylon or Copper Tube (Compression Fitting)

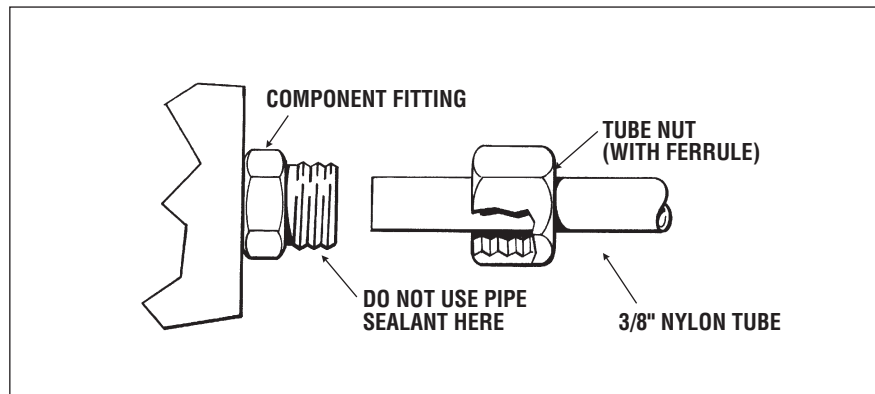


Figure 21.

- Slide tube nut over tubing.
- Push tubing into bottom of component fittings.
- Hand tighten tube nut, ensuring that tube is bottomed against fitting, while tightening tube nut.
- After hand tightening tube nut, tighten nut an additional one and a half turns with a 5/8" wrench.

Copper Tube (Flare Fitting)

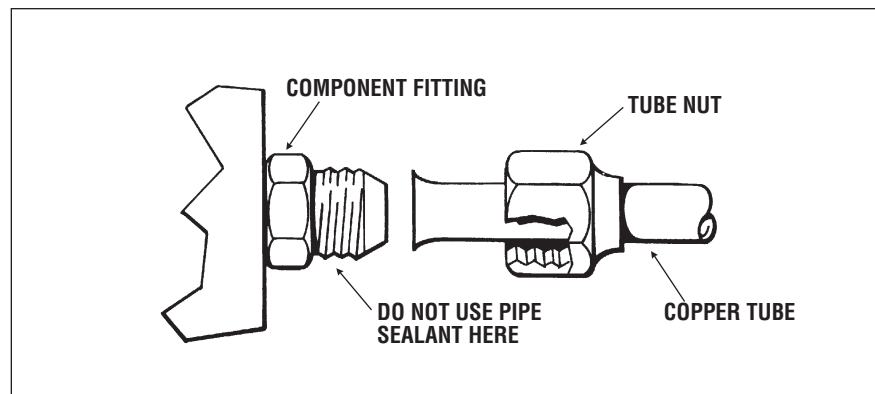


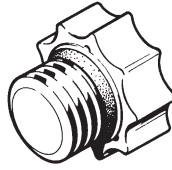
Figure 22.

- Slide tube nut over tubing.
- Flare tubing with SAE 45° flaring tool then continue as above.

Non-Vent Plug (part #HA5432)

⚠ CAUTION

If using a pressurized reservoir there must be a non-vent or pipe plug in all helm filler ports.



- THIS NON-VENT PLUG IS SUPPLIED WITH ADDITIONAL STATION FITTING KIT NO. HF5501 AND HF5502.
- ACTUAL SIZE SHOWN.
- COLOUR: BLACK

Figure 23.

Helm to Cylinder Connections

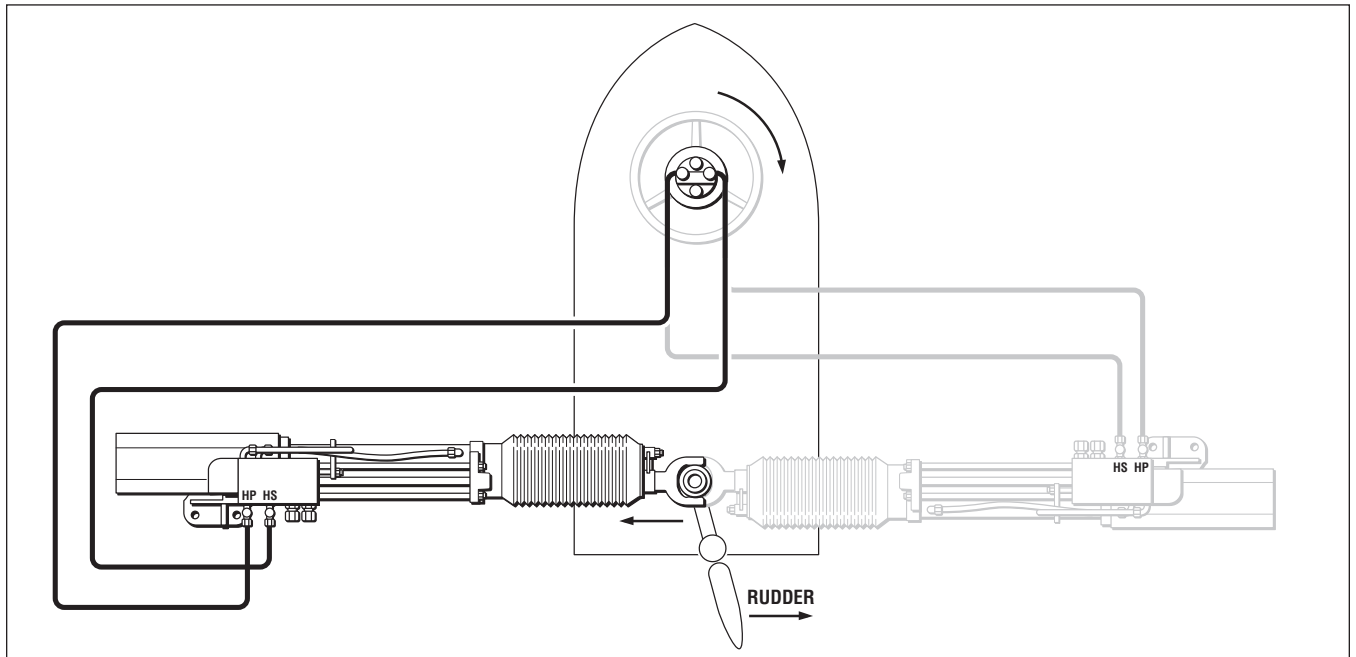


Figure 24.

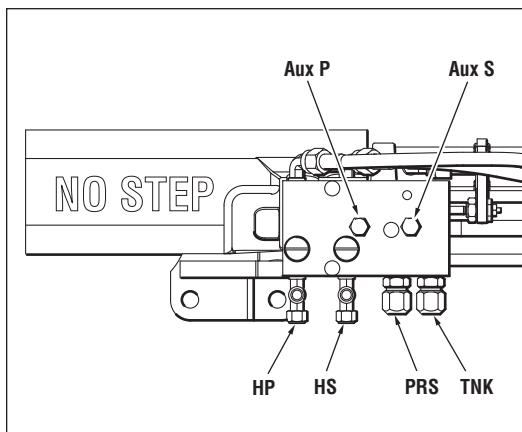


Figure 25. Cylinder with Servo: Connection Ports.

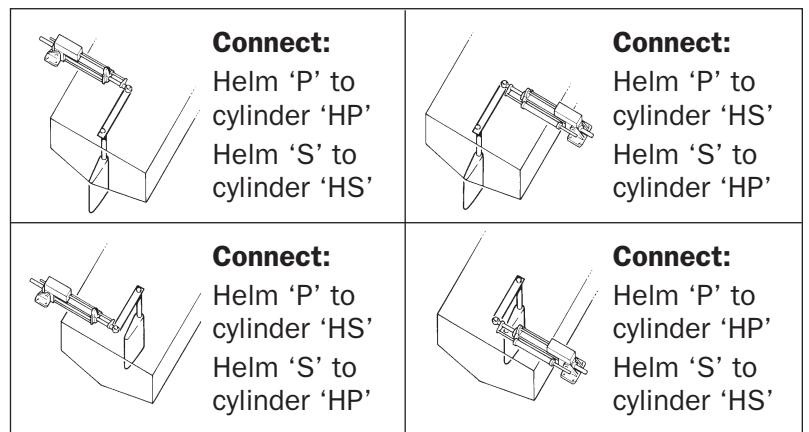


Figure 26.

AUTOPILOT INSTALLATION

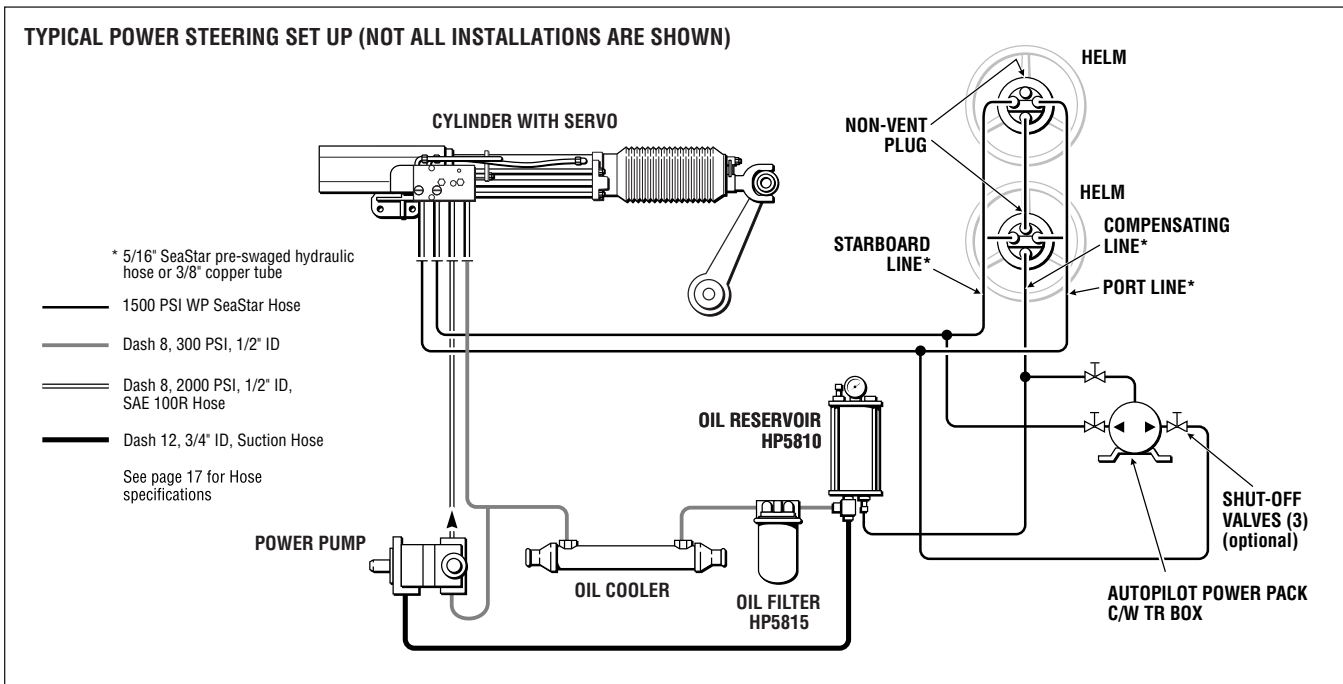


Figure 27. System Layout Including Autopilot.

An autopilot compensating line may be teed into an existing compensating line between two helms or directly into a bottom R port on a SeaStar Helm. Connector fittings for the installation of an autopilot are listed below.

NOTICE

Fitting kit part HF5502 is required for systems where 3/8" copper has been used. Fitting kit HF5501 is required for systems where SeaStar Steering hose is used, this kit also comes with a 25' roll of Nylon Tubing that is to be used for the Compensating Line **ONLY**.

CAUTION

Fitting kit numbers HF5502 and HF5501 both come with a non venting plug. This plug is to be installed in both helm pumps, including the highest helm as this Power Steering System utilizes an air pressurized reservoir. Failure to install a non venting plug will lead to fluid escaping from the fill caps on the helm pumps.

NOTICE

When sizing the power pack— size it for the volume of the servo cylinder.

HC5801.....6.07 cu. in. (99.5cc)
 HC5803.....7.42 cu. in. (121.5cc)
 HC5805.....6.07 cu. in. (99.5cc)

When choosing a power pack, consult the autopilot manufacturers literature for an appropriate power pack to give the required hard-over time.

NOTICE

When setting up your autopilot note that there is approx. 1/8" valve shift in either direction. Consult autopilot manufacturer to ensure your adjustments are correct.

NOTICE

When choosing a power pack, consult the autopilot manufacturer's literature for an appropriate power pack to give the required hard-over time.

FILLING AND PURGING THE SYSTEM

Read First

These instructions show how to fill and purge a Single Station One Cylinder System. For twin station and/or twin cylinder filling and purging instructions read instructions on page 26.

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.

Bleeding this system can be made easier with the purchase of bleed fitting kit# HA5457. Refer to page 44 for details.

During the entire filling procedure, oil **MUST** be above minimum mark on reservoir. **DO NOT** allow the oil level to fall below the minimum mark, as this may introduce air into the system and increase your filling time.

Hydraulic Oil Requirements

2 bottles HA5440 (1 US gal. each) for single station and single cylinder systems.

1 additional bottle HA5430 (1 quart) 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.

If cylinder is not fitted with bleed tee fittings, disconnect hydraulic line from the cylinder fitting. Loosening the hose or tube fitting only, may not cause sufficient oil flow to purge the system.

Hydraulic Fluid

Acceptable and recommended oils for your steering systems are:

SEASTAR 1.7, 2.0, 2.4 in³/rev. HELM PUMPS

SEASTAR HYDRAULIC FLUID,
(Part # HA5430 – 1 quart,
HA5440 – 1 US gallon.)
TEXACO H015
SHELL AERO 4

ESSO UNIVIS N15 OR J13
CHEVRON AVIATION FLUID A
MOBIL AERO HFA
FLUIDS MEETING MIL H5606C SPEC.

CAUTION

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

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

In cases of extreme emergency any non-toxic, non-flammable fluid may provide temporary steering.

Seastar hydraulic oil is not available from your local gas station. Order a spare bottle from your Teleflex/Seastar dealer.

CAPILANO 1250V and 1275V

DEXTRON II OR III AUTOMATIC TRANSMISSION FLUID OR EQUIVALENT.

Single Station One Cylinder

Step 1

- Open the hex fill plug on the top of the reservoir.
- Fill the reservoir to the top and replace the plug.
- Using a bicycle pump or similar, pressurize reservoir to 30 psi.
- Refill and pressurize until the level does not drop below the maximum level marked on the front of the reservoir.

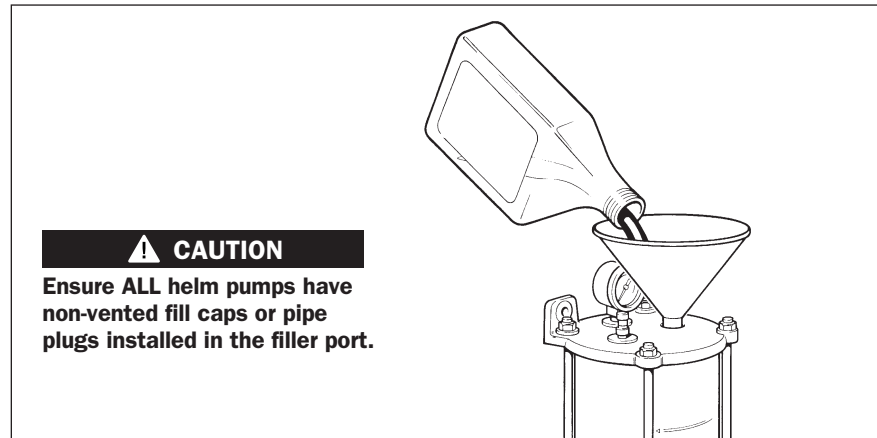


Figure 28.

Step 2

- Turn the helm station steering wheel clockwise until the cylinder shaft is fully extended or retracted (depending on installation geometry, this will vary).
- Open the left side bleeder.

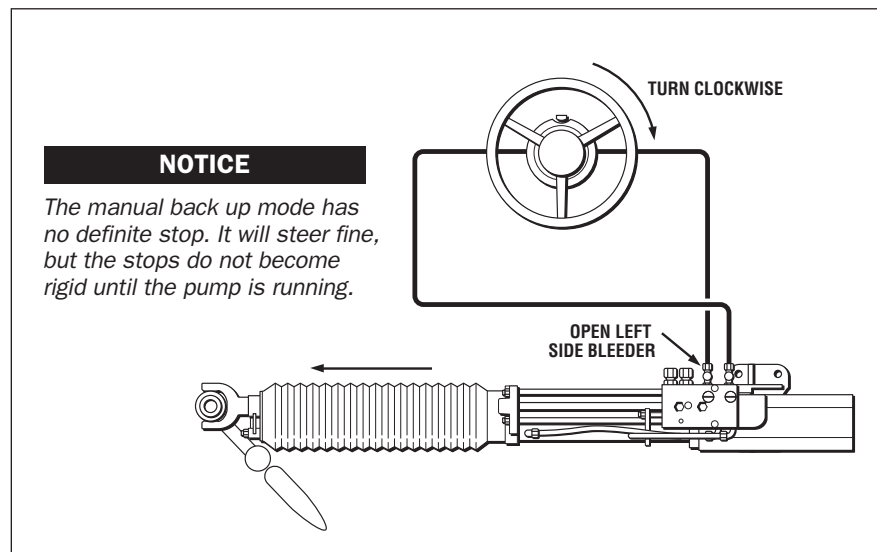


Figure 29.

Step 3

- Making sure the cylinder shaft does not retract into the cylinder, turn the steering wheel counter-clockwise until a steady stream of air free oil comes out of the bleeder.
- While continuing to slowly turn the wheel, close the left side bleeder and let go.

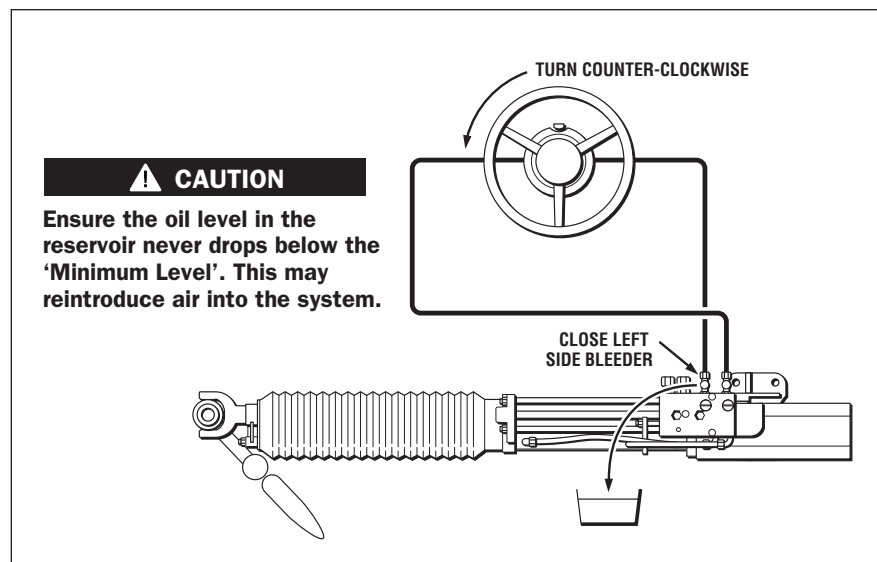


Figure 30.

Step 4

- Continue to turn the steering wheel counter-clockwise until the cylinder shaft is fully extended or retracted (depending on installation geometry, this will vary).
- Open the right bleeder.

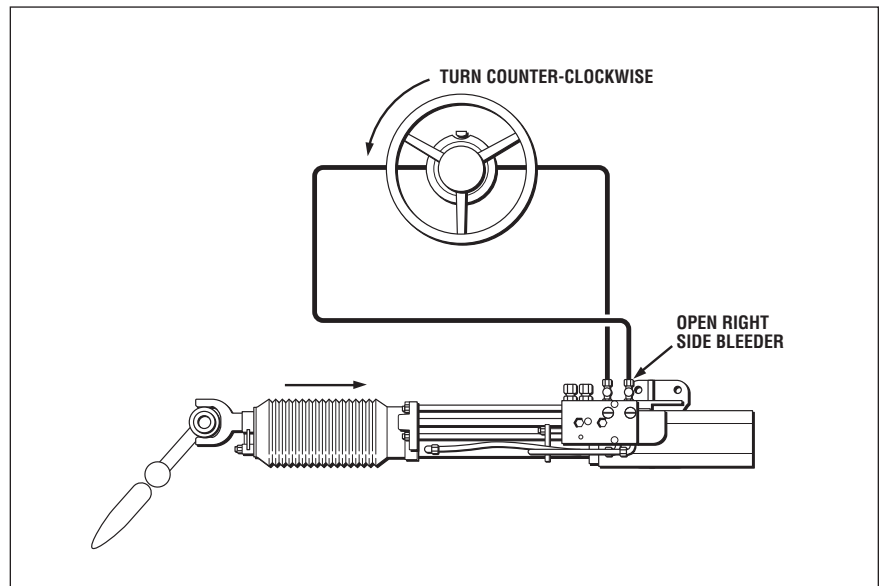


Figure 31.

Step 5

- Making sure the cylinder shaft does not retract 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.
- Check the level in your reservoir and fill to maximum level and repressurize to 30 psi.

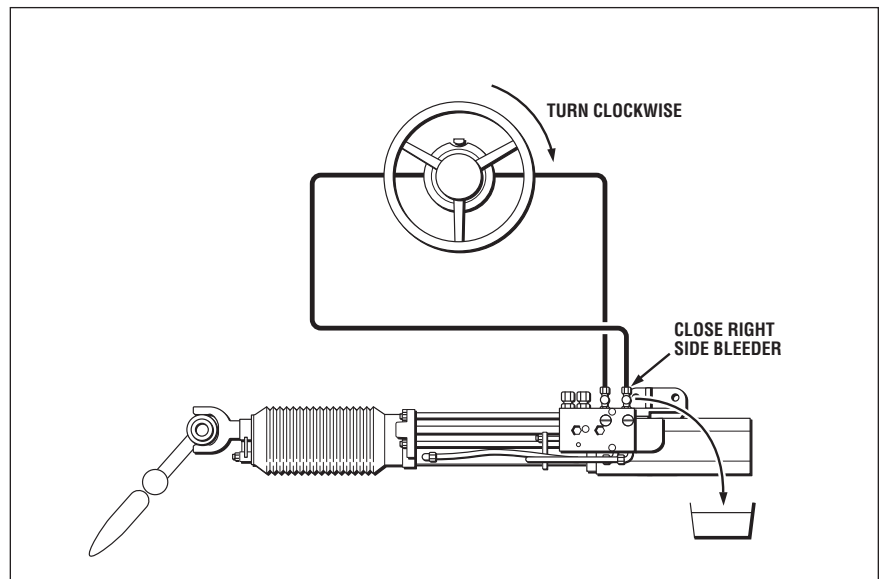


Figure 32.

NOTICE

Most of the air is now purged and you are ready to purge the power circuit.

Twin Station Single Cylinder

Repeat steps 1 through 5 on station one then 1 through 5 on station two.

NOTICE

If you have an add-on power cylinder, this will be purged in the power circuit (refer to page 27).

⚠ CAUTION

In pressurized systems, ALL steering stations require the use of a non-vent plug (part # HA5432).

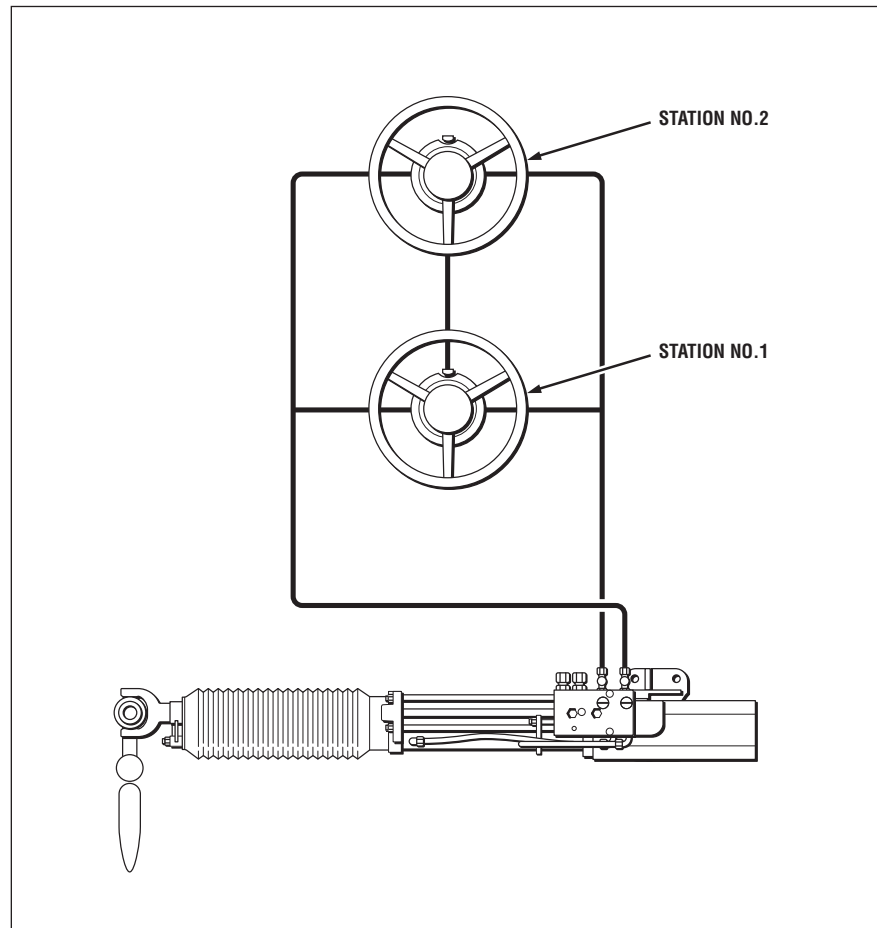


Figure 33.

NOTICE

Most of the air is now purged and you are ready to purge the power circuit.

Purging the Power Circuit

- Before starting engines or electric motor, ensure that all hoses and connections are tight and installed correctly.
- Start engines and idle at 600 to 800 RPM.
- Start turning either helm one revolution to the left then back to center and then one revolution to the right.
- Continue to do this adding one revolution each time until you are steering from hard-over to hard-over.
- Bring your engine speed to 1200 RPM and count the number of wheel turns from hard over to hard over. Consult the table below to ensure that your wheel turns are the same as noted.

SYSTEM	HC5801	HC5803	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
SeaStar 2.0	3 turns	3.7 turns	3 turns
SeaStar 2.4	2.5 turns	3.1 turns	2.5 turns
Capilano 1250V	1.75 to 3.6 turns	2.4 to 4.4 turns	1.75 to 3.6 turns
Hynautic H-21	2.2 turns	2.7 turns	2.2 turns
Hynautic H-22	3 turns	3.7 turns	3 turns
Hynautic H-41	1.1 turns	1.35 turns	1.1 turns
Hynautic H-42	1.5 turns	1.8 turns	1.5 turns

NOTICE

If using a 1250V helm, it may be necessary to open the uppermost filler plug in the top helm to allow the trapped air to escape.

- If your turns are not within 1/8 of a turn of these, stop engines.
- Turn your wheel to the right and continue to turn for 10 to 15 revolutions. You will be able to turn through hard-over because the engine is not running.
- Turn your wheel to the left for 10 to 15 turns.
- Start your engines and your turns should be correct. If not, repeat.

Oil Level & System Check

- Check to ensure the oil level in reservoir is at the maximum level. Re-pressurize to 30 psi if required.
- The maximum level allows sufficient room for thermal expansion.
- Check all fittings and components for leaks. Tighten loose fittings. If you find oil on a component, wipe it down thoroughly. If no more oil appears after a few minutes it is probably spilled oil.

MAINTENANCE

Inspection of the following items is required two times per year, by a qualified marine mechanic:

- Check the oil level in the reservoir and ensure the pressure is 25 to 35 psi.
- Change oil filter after first 50 hours of operation and every 2 years or 300 hours thereafter. See page 36 for filter details.
- Check all linkages, bolts and hose connections. Tighten if loose.
- Check for leaks.
- Check hoses and tubing for chafing/rub marks. Replace if required.
- Check the servo cylinder and ensure it shifts 1/8" minimum each way when moving the steering wheel 1/4 turn each way.
- Grease sliding joints.

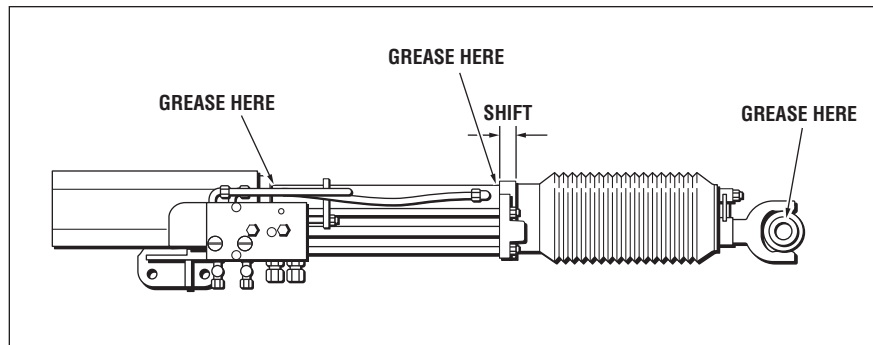


Figure 34.

TROUBLESHOOTING GUIDE

NOTICE

When the time calls for trouble shooting the steering system, and your system is equipped with an autopilot, close the shut off valves to remove the autopilot from the steering system. If no shut off valves are installed, disconnect the autopilot from the system before beginning with trouble shooting.

! WARNING

Whenever 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. Teleflex offers the following as a guide only and is not responsible for any consequences resulting from incorrect dismantling repairs.

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

Seastar Steering Systems have been designed with protection against over-pressure situations, by using 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 on the following pages, are the most common faults encountered and their likely cause and solution.

Sometimes when returning the wheel from a hard-over 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.

FAULT

1. During filling, the helm becomes completely jammed.

CAUSE

- Blockage in the line between the helm(s) and the cylinder(s).

SOLUTION

- 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.
- Ensure check valves or shut-off valves are installed correctly.

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

- Rudder post glands are too tight or rudder post is bent, causing mechanical binding. The same applies to tiller arm and linkage on outdrives.
- Restrictions in hose, copper tubing, piping or fittings.
- Air in system.
- 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).

- 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.
- 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.

3. Steering is hard to turn under way and at dock.

- Components are mechanically preventing servo valve from shifting or limiting shift.
- Helm tubing to cylinder assembly too small. This causes pressure drop making system feel heavy.
- Power pump not running.
- System hoses hooked up incorrectly.

- Move components to allow free movement of servo cylinder.
- Use 5/16" ID minimum tube size.
- Check for proper rotation of pump
- Check your installation diagram for proper plumbing of the steering system

FAULT	CAUSE	SOLUTION
<p>4. Steering is easy to turn at the dock, but becomes hard to turn when vessel is under way.</p>	<ul style="list-style-type: none"> • Incorrectly designed or adjusted rudders, causing binding on rudder post and/or tie bar at cruising speeds. • Drive belt on power pump slipping under load. 	<ul style="list-style-type: none"> • Seek professional help. Have experienced, qualified marine mechanic correct problem. • Tighten belt or replace if necessary.
<p>5. Rudder drifts to port or starboard while vessel is under way, even when wheel is not being turned.</p>	<ul style="list-style-type: none"> • Dirt in helm check valves. 	<ul style="list-style-type: none"> • If within the Teleflex warranty period, please contact your dealer or Teleflex Canada. • Remove check valves and clean the passageway in the helm pump. Reset the ball seats. This is to be done by a qualified marine technician ONLY.
<p>6. Turning one wheel causes second steering wheel to rotate.</p>	<ul style="list-style-type: none"> • See fault No. 5. 	<ul style="list-style-type: none"> • See fault No. 5.
<p>7. Worn seals.</p>	<ul style="list-style-type: none"> • If the shaft seals are leaking, have them replaced by a qualified marine mechanic. 	<ul style="list-style-type: none"> • See pages 34 to 38 for seal kit part numbers.
<p>8. Power pump is noisy.</p>	<ul style="list-style-type: none"> • Starving the inlet. • Rotation of pump incorrect 	<ul style="list-style-type: none"> • Minimize suction hose length and maximize suction hose ID. • Ensure pump is supposed to rotate in the same direction as the engine.
<p>9. Loss of pressure fluid in reservoir.</p>	<ul style="list-style-type: none"> • Leak in system. 	<ul style="list-style-type: none"> • Check all connections and seals, repair as necessary.
<p>10. No definite stops at hard-over (with engine running).</p>	<ul style="list-style-type: none"> • Air in system <u>or</u> • belt drive power pump not pumping. 	<ul style="list-style-type: none"> • Ensure compensating line to the helm is connected to the lowest port in the back of the helm. • Ensure that belt in pump is not slipping. Tighten or replace if necessary.

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 (Nm)**

BOLT SIZE	18-8SS	BRASS	BOLT SIZE	18-8SS	BRASS
2-56	2.5 (.282)	2.0 (.226)	5/16"-24	142.0 (16.04)	116.0 (13.11)
2-64	3.0 (.338)	2.5 (.282)	3/8"-16	236.0 (26.66)	192.0 (21.71)
3-48	3.9 (.440)	3.2 (.361)	3/8"-24	259.0 (29.20)	212.0 (23.97)
3-56	4.4 (.497)	3.6 (.407)	7/16"-14	31.0 (42.00)	26.0 (35.25)
4-40	5.2 (.587)	4.3 (.486)	7/16"-20	33.0 (44.74)	27.0 (36.61)
4-48	6.6 (.740)	5.4 (.610)	1/2"-13	43.0 (58.30)	35.0 (47.45)
5-40	7.7 (.869)	6.3 (.712)	1/2"-20	45.0 (61.01)	37.0 (50.17)
5-44	9.4 (1.06)	7.7 (.869)	9/16"-12	57.0 (77.28)	47.0 (63.72)
6-32	9.6 (1.08)	4.9 (.554)	9/16"-18	63.0 (85.42)	51.0 (69.15)
6-40	12.0 (1.35)	9.9 (1.12)	5/8"-11	93.0 (126.09)	76.0 (103.04)
8-32	20.0 (2.25)	16.0 (1.81)	5/8"-18	104.0 (141.00)	85.0 (115.24)
8-36	22.0 (2.48)	18.0 (2.03)	3/4"-10	128.0 (173.55)	104.0 (141.00)
10-24	23.0 (2.59)	19.0 (2.14)	3/4"-16	124.0 (168.12)	102.0 (138.29)
10-32	32.0 (3.61)	26.0 (2.94)	7/8"-9	194.0 (236.03)	159.0 (215.58)
1/4"-20	75.0 (8.47)	62.0 (7.01)	7/8"-14	193.0 (261.67)	158.0 (214.22)
1/4"-28	94.0 (10.6)	77.0 (8.70)	1"-8	287.0 (389.12)	235.0 (318.62)
5/16"-18	132.0 (14.91)	107.0 (12.10)	1"-14	259.0 (351.16)	212.0 (287.43)

NOTICE

Torque values for 18-8 stainless steel and brass bolts are taken from a torque guide by ITT Harper. All results correspond well with basic bolt equations, using a bolt factor of 0.2 and a factor of 3/4 for a reusable connection.

Helm Pump

MODEL	DISPLACEMENT	RELIEF VALVE	PORTS
SeaStar various styles	1.4 cu. in. (22.9cc)	1000 PSI (70 BAR)	1/4" NPT
SeaStar various styles	1.7 cu. in. (27.8cc)	1000 PSI (70 BAR)	1/4" NPT
SeaStar various styles	2.0 cu. in. (22.9cc)	1000 PSI (70 BAR)	1/4" NPT
Capilano 1250V	1.7 - 3.4 cu. in. (22.9cc)	1000 PSI (70 BAR)	3/8" NPT
Hynautic H-21	2.75 cu. in. (22.9cc)	N/A	1/4" NPT
Hynautic H-22	2.0 cu. in. (22.9cc)	N/A	1/4" NPT
Hynautic H-41	5.5 cu. in. (22.9cc)	N/A	1/4" NPT
Hynautic H-42	4.0 cu. in. (22.9cc)	N/A	1/4" NPT

Cylinder

	PART#	DISPLACEMENT	STROKE	OUTPUT FORCE	MAX. TORQUE (35° from centre)
Single 9" Cylinder c/w Servo	HC5801-2	21.25 cu.in (348cc)	9" (229mm)	2946 lbs _f (13,090 N)	18,900 in-lbs (2130 Nm)
Single 11" Cylinder c/w Servo	HC5803-2	26.00 cu.in (426cc)	11" (280mm)	2946 lbs _f (13,090 N)	23,140 in-lbs (2610 Nm)
Twin 9" Cylinder	HC5802	42.50 cu.in (697cc)	9" (229mm)	5892 lbs _f (26,190 N)	37,800 in-lbs (4260 Nm)
Twin 11" Cylinder	HC5804	52.00 cu.in (853cc)	11" (280mm)	5892 lbs _f (26,190 N)	46,280 in-lbs (5220 Nm)
Single 9" x 2.5" Bore c/w Servo	HC5805	37.11 cu.in (608cc)	9" (229mm)	5154 lbs _f (26,190 N)	33,065 in-lbs (3736 Nm)
Single 9" x 2.5" Bore	HC5806	74.33 cu.in (1216cc)	9" (229mm)	10,308 lbs _f (26,190 N)	66,130 in-lbs (7472 Nm)

Fittings

SeaStar cylinder and all other fittings are 3/8" compression type fittings. Threads are 9/16" x 24 extra fine. A brochure on all SeaStar fittings is available from Teleflex Canada.

SeaStar I, II Hose

- SeaStar I, II hose inside diameter – 5/16" (8mm)
- Other recommended hose is Aeroquip 2651 or equivalent. Inside diameter should not be smaller than 5/16"

APPENDIX A

POWER STEERING CYLINDERS: HC5801 (9" stroke), HC5803 (11" stroke) for date codes 01/93 through 07/02.

NOTICE

Not all spare parts can be used on every cylinder date code. Please ensure that when selecting spare parts you match them to the date code of the cylinder. See the next page for newer model cylinders.

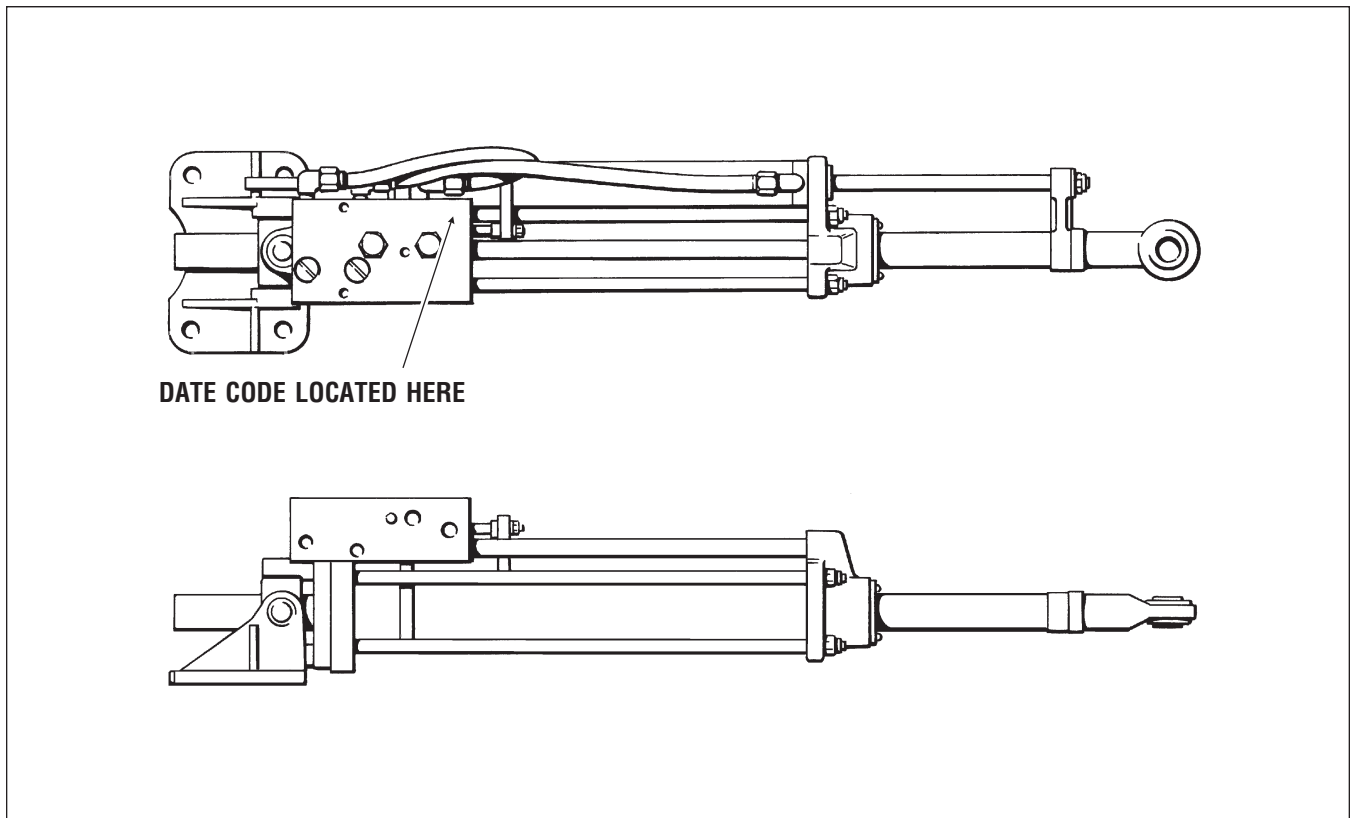


Figure 35.

NOTICE

For cylinders that fall within the dates of 01/93 and 07/02 there are no replacement parts available other than the seal kits. If parts are required for this cylinder please contact Teleflex Canada for options.

APPENDIX B

POWER STEERING CYLINDERS: HC5801-2 (9" stroke), HC5803-2 (11" stroke) and HC5805 (2.5" Bore 9" stroke) for date codes 08/02 to present.

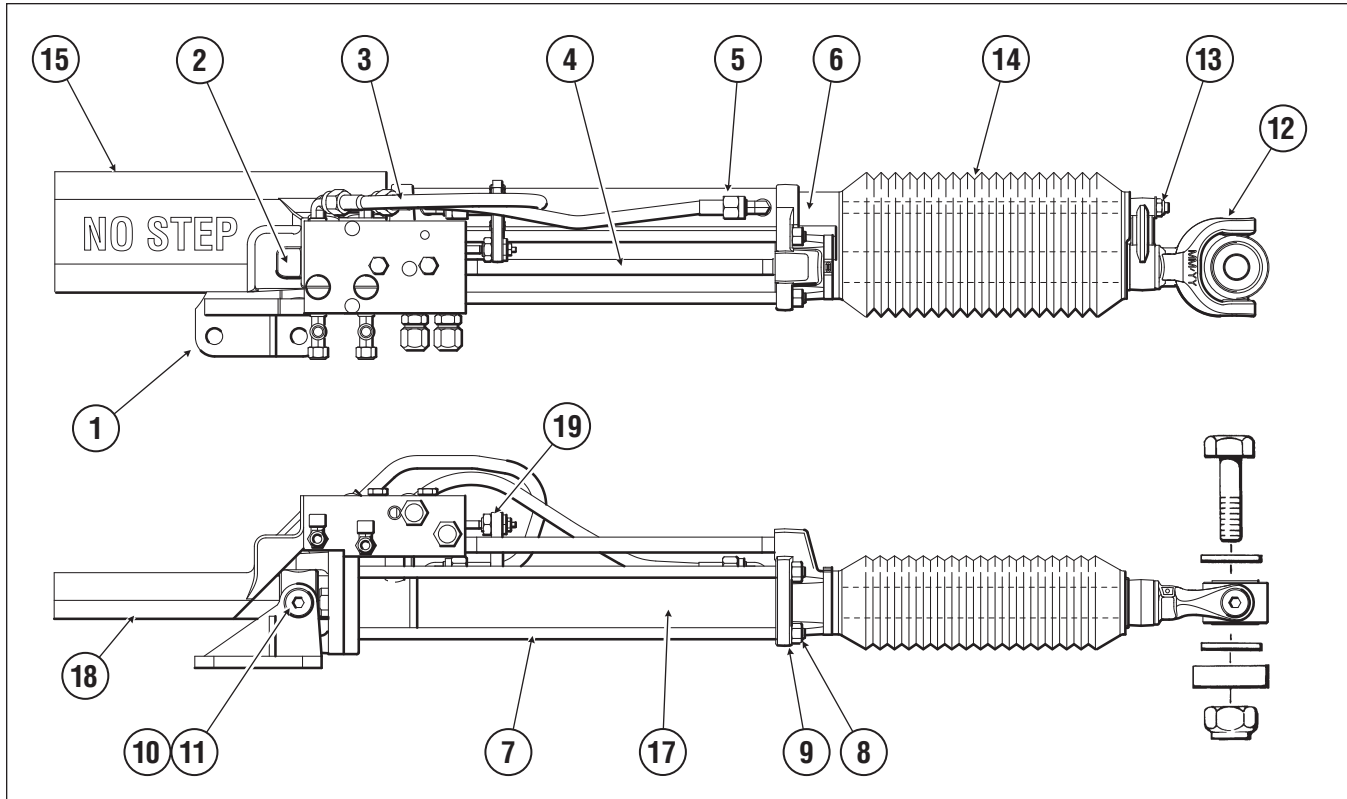


Figure 36.

ITEM	DESCRIPTION	QTY	PART NUMBER		
			HC5801-2	HC5803-2	HC5805
1	Mounting Foot	1	820228	820228	670082
2	Clevis Bracket	1	820425	820425	820425
3	Hose Assembly	2	823122	948224	823122
4	Tube Valve/Ram	1	823226	947720	823226
5	Assembly Servo Cylinder	1	821324	948328	821328
6	Gland Rod End	1	820263	820623	823001
7	Tie Rod	4	821926	947927	420108
8	Nut 3/8" NC	4	025421	025421	025421
9	Lock Washer	4	025525	025525	029327
10	Journal Stud	4	822721	822721	n/a
11	Screw	4	822827	822827	n/a
12	Rod End Ball	1	HA5817	HA5817	HA5817
13	Nut 5/16" NC Nylok®	1	113021	113021	113021
14	Boot Cover	1	823203	823203	823207
15	Shaft Shield	1	823105	823105	823115
16	Boot Clamp	1	823204	823204	823204
17	Barrel	1	822026	947823	500330
18	Steering shaft assy	1	825802	825804	825805
19	Servo bracket	1	821024	821024	821025

APPENDIX C

HC5802, HC5802-2 (9" stroke), HC5804, HC5804-2 (11" stroke) & HC5806 (9" stroke)

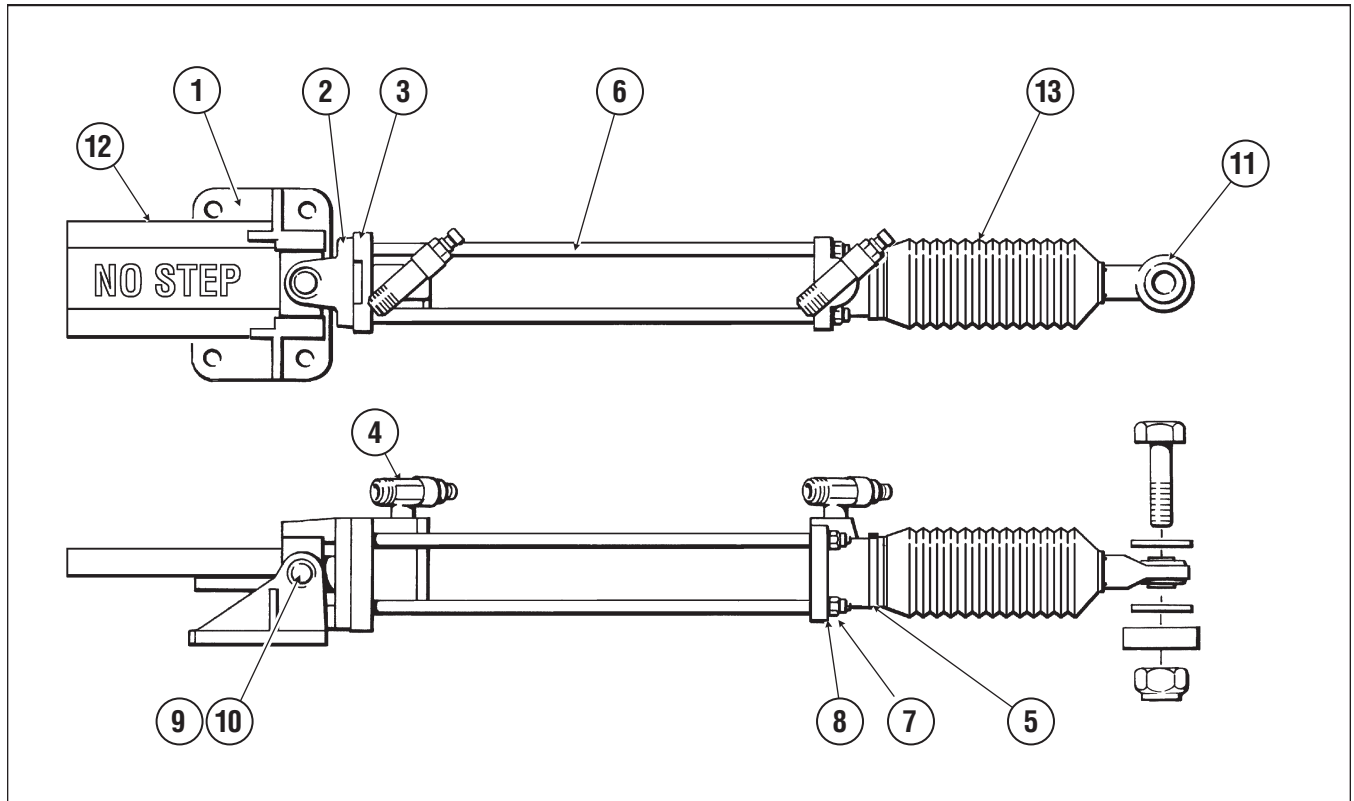
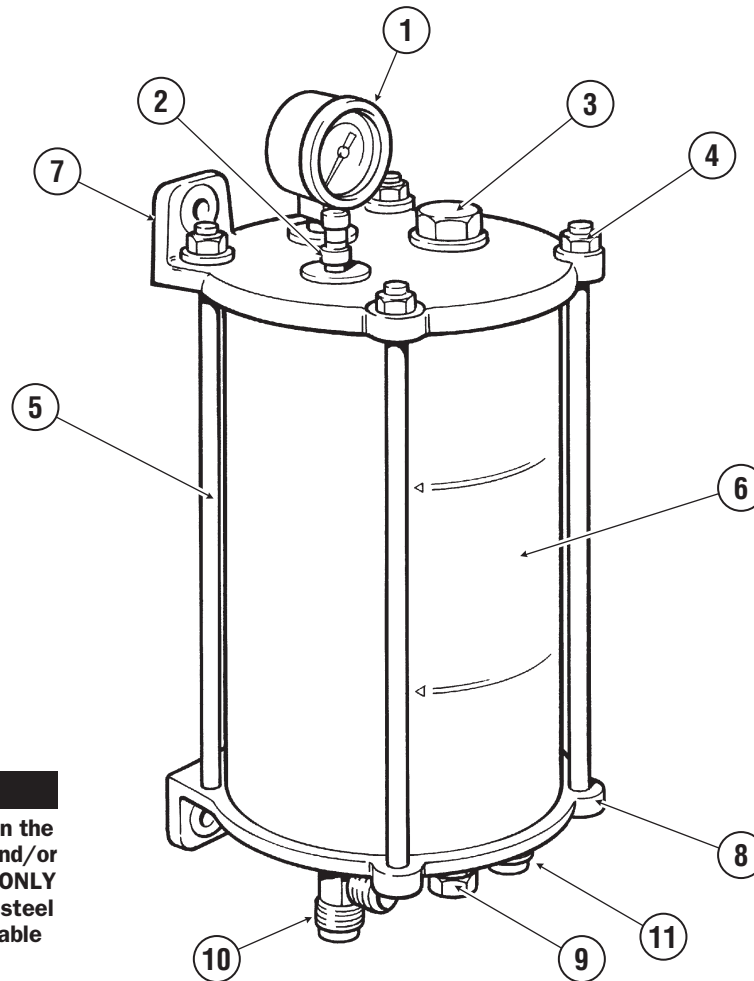


Figure 37.

ITEM	DESCRIPTION	QTY	PART NUMBER		
			HC5801-2	HC5803-2	HC5805
1	Mounting Foot	1	820228	820228	670082
2	Clevis Bracket	1	820425	820425	670073
3	Gland Rear	1	828126	828126	N/A
4	Bleed Tee Assembly	2	462922	462922	462922
5	Gland	1	827020	827020	827020
6	Tie Rod	4	821926	947427	420126
7	Nut 3/8" NC SS	4	025421	025421	270037
8	Lock Washer, 3/8" SS	4	025525	025525	025525
9	Journal Stud	4	822721	822721	822721
10	Journal Screw	4	822825	822825	822825
11	Rod End Ball	1	822156	822156	671528
12	Shield cover	1	823105	823105	823115
13	Boot cover	1	823203	823203	823207
14	Boot clamp	1	823204	823204	823204

APPENDIX D

HP5810 OIL RESERVOIR



⚠ CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), ONLY use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

Figure 38.

ITEM	PART#	QTY	DESCRIPTION
1	825128	1	Gauge 0-60
2	168625	1	Air Valve
3	330315	1	Fill Plug
4	113021	4	Nut 5/16" NC Nylok®
5	826624	4	Tie Rods SS
6	404429	1	Tank Housing
7	826328	1	Top Cap
8	826421	1	Bottom Cap
9	430122	1	Fitting 3/8" Tube
10	289820	1	Tee - 8, 45° Flare
11	600602	1	Fitting 3/8" Straight Compression

ITEM	PART#	QTY	DESCRIPTION
SEAL KIT #HS5199			
Seals only.			

APPENDIX E

HP5815 OIL FILTER, HP5825 (1") OIL COOLER, HP5826 (2") OIL COOLER & HP5827 (2-1/2") OIL COOLER

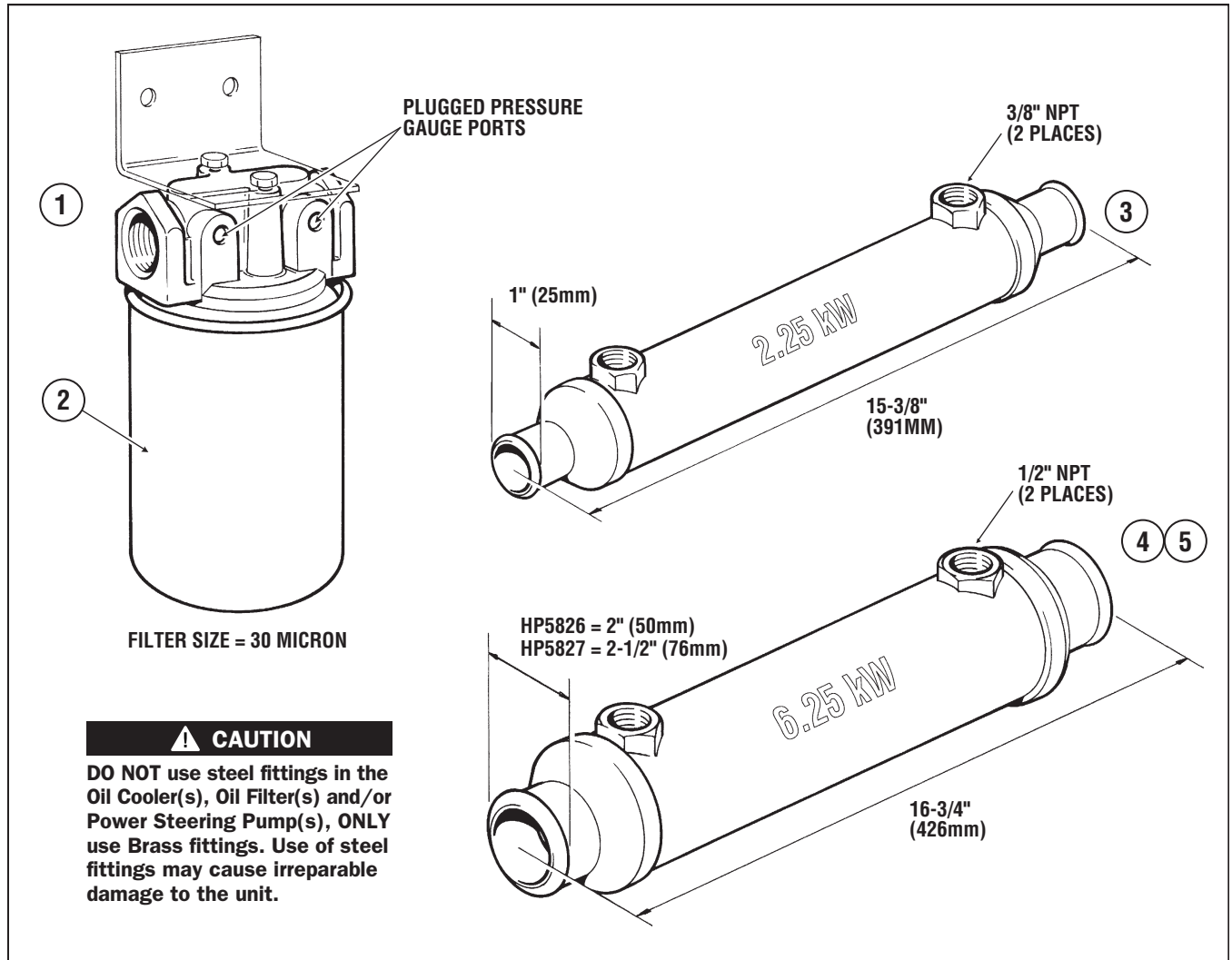


Figure 39.

ITEM	PART#	QTY	DESCRIPTION
1	HP5815	1	Oil Filter Assembly
2	821723	1	Filter Element
3	HP5825	1	1" Outlet Oil Cooler
4	HP5826	1	2" Outlet Oil Cooler
5	HP5827	1	2.5" Outlet Oil Cooler

ITEM	PART#	QTY	DESCRIPTION
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APPENDIX F

HP5830, HP5831, HP5832, HP5835, HP5836, HP5837 & HP5838 POWER STEERING PUMPS

NOTICE

Diagrams are for reference **ONLY**, not all power pumps are exactly as shown.

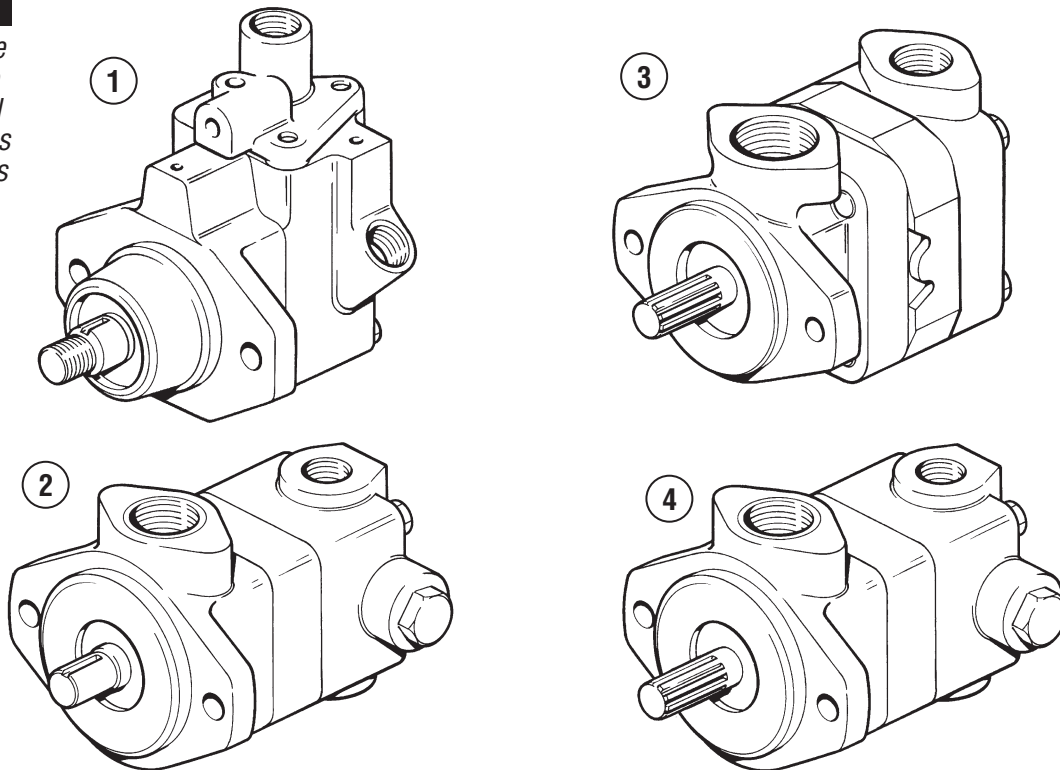


Figure 40.

ITEM	PART#	DESCRIPTION	GPM
1	HP5830	R.H. Rotation, Belt Drive	4
1	HP5831	L.H. Rotation, Belt Drive	4
2	HP5832	R.H. Rotation, Keyed Shaft, Direct Drive	4
2	HP5833	R.H. Rotation, 11 tooth splined shaft	4
2	HP5834	R.H. Rotation, Keyed shaft	2
2	HP5853	R.H. Rotation, 13 tooth splined shaft	4
3	HP5835	R.H. Rotation, Direct Drive, Heavy Duty	4
<i>(Note: pump is a 6 GPM yet is flow controlled to 4 GPM)</i>			
4	HP5837	R.H. Rotation, 9 Tooth Splined Shaft, Direct Drive	4
4	HP5838	R.H. Rotation, 11 Tooth Splined Shaft, Direct Drive	2
4	HP5836	R.H. Rotation, Direct Drive, No Flow Control	5
4	HP5839	R.H. Rotation, 9 Tooth Splined Shaft, Direct Drive	2

ITEM	PART#	DESCRIPTION	GPM
4	HP5840	L.H. Rotation, 11 Tooth Splined Shaft, Direct Drive	2
4	HP5841	L.H. Rotation, Direct Drive	4
4	HP5842	L.H. Rotation, 11 Tooth Splined Shaft, Direct Drive	4
4	HP5843	L.H. Rotation, 9 Tooth Splined Shaft, Direct Drive	4
4	HP5844	R.H. Rotation, 13 Tooth B Flange, Direct Drive	2
4	HP5845	L.H. Direct Drive, 9 tooth splined shaft	6
4	HP5846	R.H. Direct drive, 9 tooth splined shaft	6
4	HP5847	R.H. Direct Drive, 11 tooth splined shaft	6
4	HP5848	R.H. Keyed shaft	6
4	HP5849	L.H. Direct Drive, 11 tooth splined shaft	6
4	HP5850	L.H. Keyed shaft	6
4	HP5852	L.H. direct drive, 13 tooth splined shaft	6

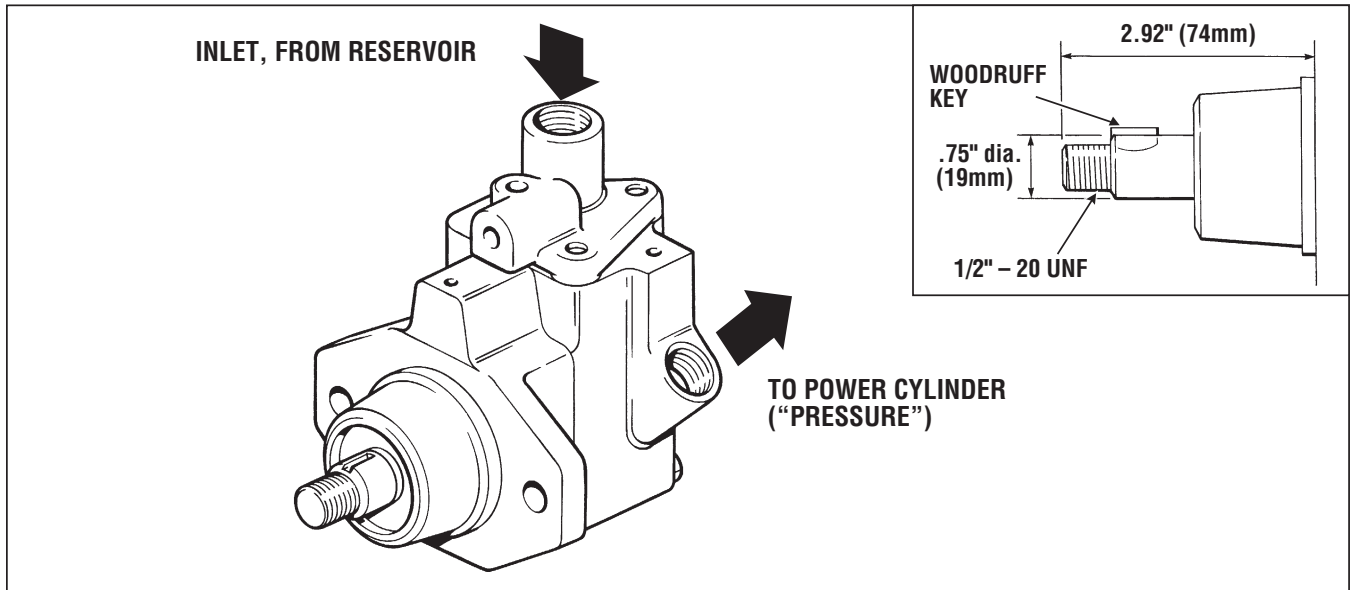


Figure 41. Pump part #HP5830, #HP5831.

<p>NOTICE</p>	<p>If using ZF drive, adapter coupling HA5828 is required. Refer to page 41 for adapter details.</p>	<p>HP5832 - STRAIGHT</p>
		<p>3/16" SQUARE KEY 1.75" (44mm) .75" dia. (19mm)</p>
<p>HP5833, HP5838 - #38, 11 TOOTH SPLINE</p>		
<p>1.25" (32mm) .75" dia. (19mm)</p>		
<p>HP5834 - DDEC</p>		
<p>.62" dia. (16mm) 1.97" (50mm)</p>		
<p>For Detroit Diesel with #6X4416 drive option, may require #5124137, #5132024 & #6X4461. Consult Detroit Diesel.</p>		
<p>HP5837, HP5839 - #38, 9 TOOTH SPLINE</p>		
<p>1.25" (32mm) 5/8" dia. (15mm)</p>		

Figure 42. Pump part #HP5832, HP5833, HP5834, HP5837, HP5838, HP5839.

Inlet Port 1" NPT, **Power Port** 3/4" – 16 O-Ring Boss Port, **Cooler Port** 1/2" NPT, **Flange** SAE 'A'

CAUTION

DO NOT use steel fittings in the Oil Cooler(s), Oil Filter(s) and/or Power Steering Pump(s), **ONLY** use Brass fittings. Use of steel fittings may cause irreparable damage to the unit.

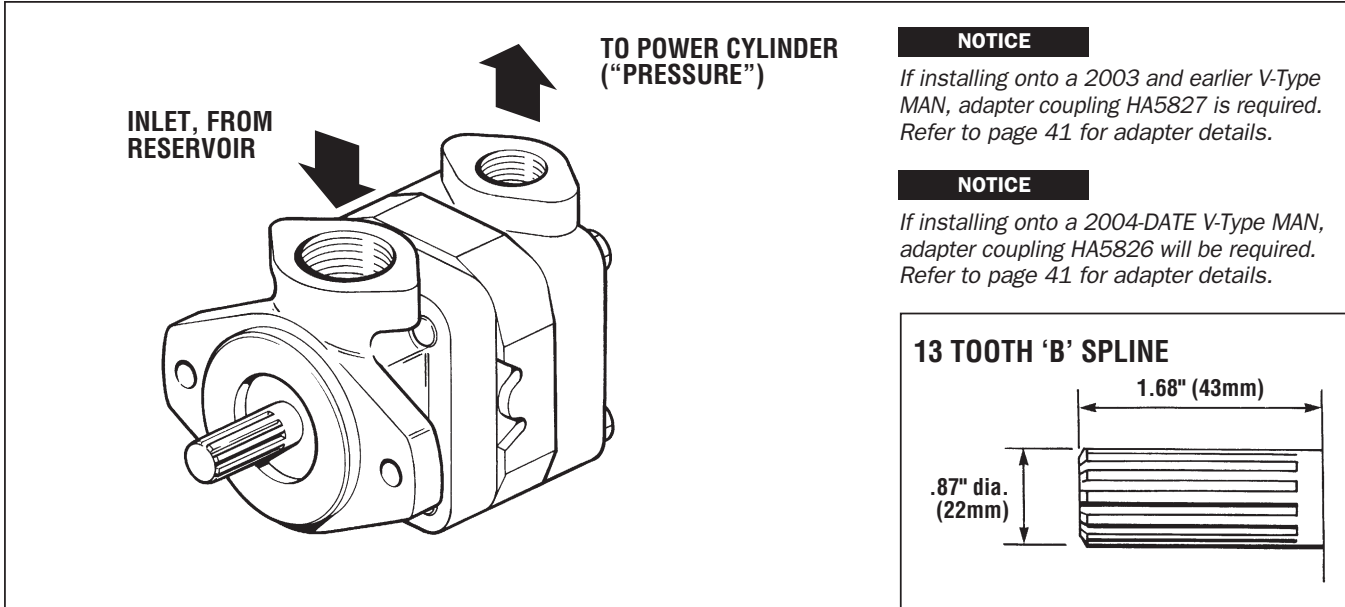


Figure 43. Pump part #HP5835.

Inlet Port 1⁵/₈" – 12 O-Ring Boss Port, **Power Port** 3/4" – 16 O-Ring Boss Port, **Flange** SAE 'B'.

HP5818 Pressure Relief Valve *Typical SeaStar system installation layout—yours may vary.*

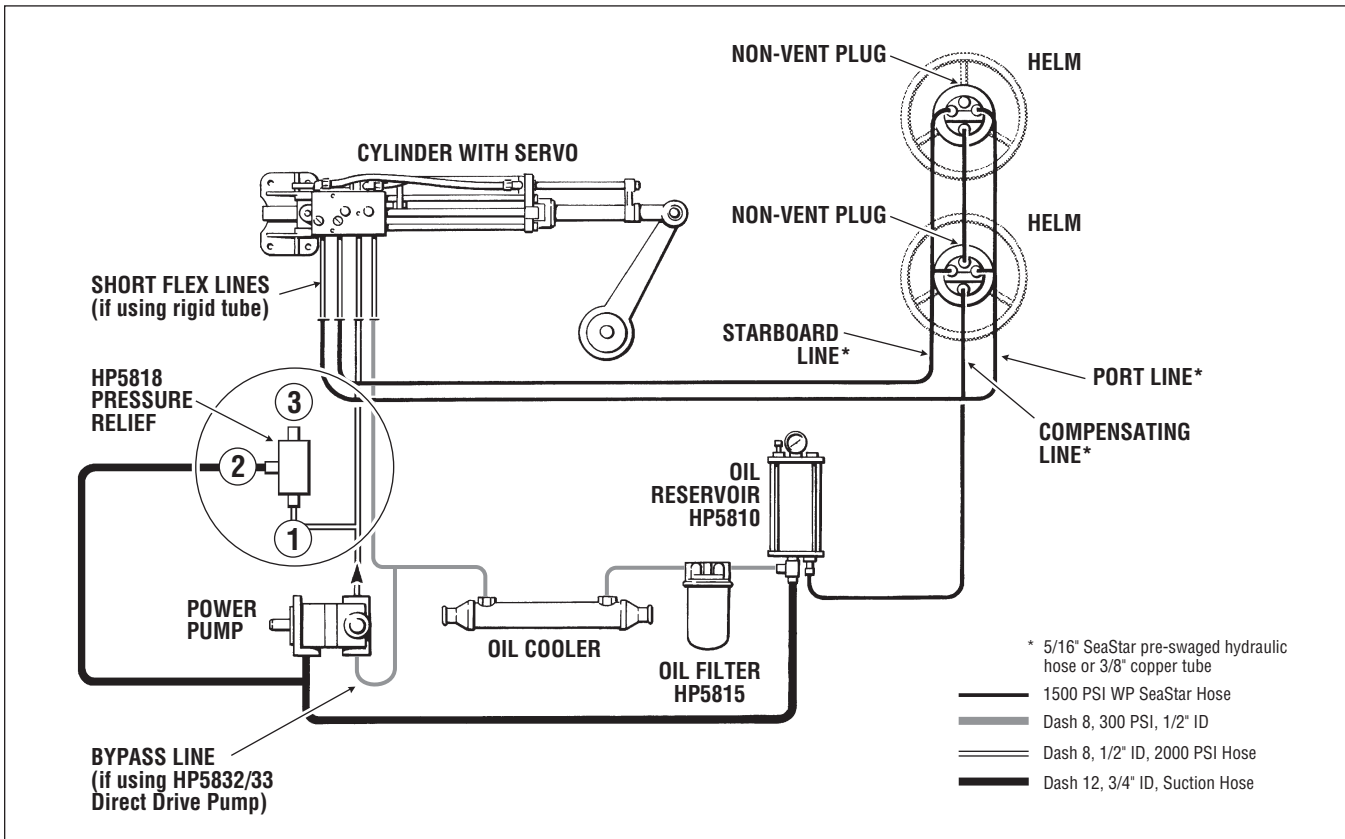


Figure 44.

HA5828 Adapter Kit

for V20 Pump to ZF Gear
(IRM 280A).

NOTICE

Install HA5828 with
HP5835 Power pump.

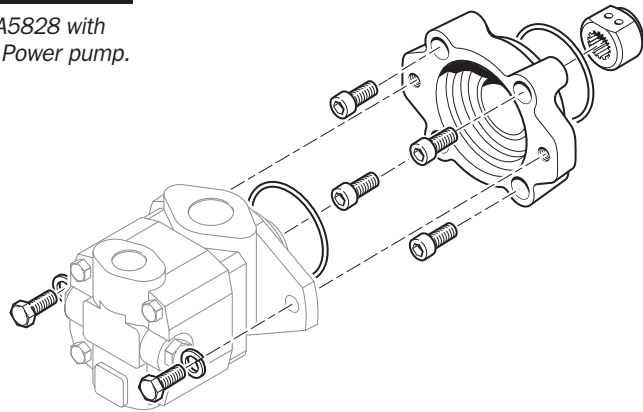


Figure 45

HA5827 Adapter Kit

for V10 to MAN V-Type Engine.

NOTICE

Install HA5827 with
HP5832 Power pump.

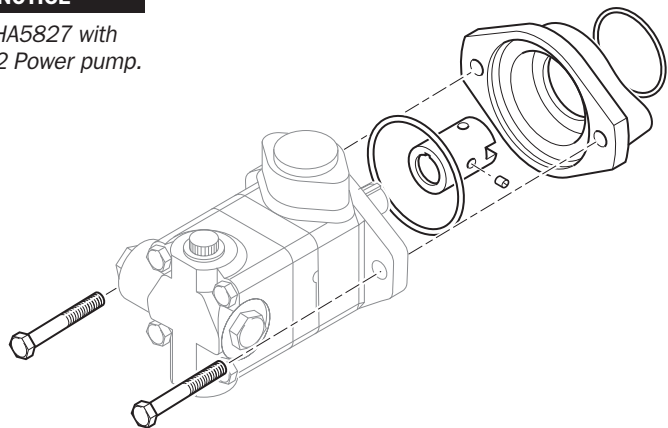


Figure 46

HA5826 Adapter Kit

for V10 MAN 2004 to DATE,
Common Rail Engine.

NOTICE

Install HA5826 with
HP5837 Power pump.

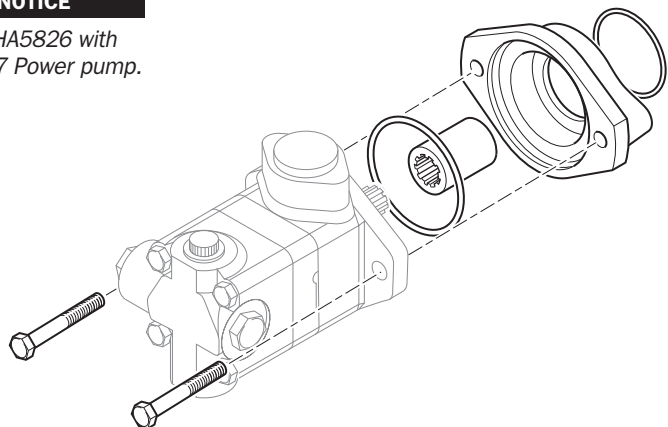


Figure 47

APPENDIX G

SeaStar System Layout: Single Cylinder Single Pump

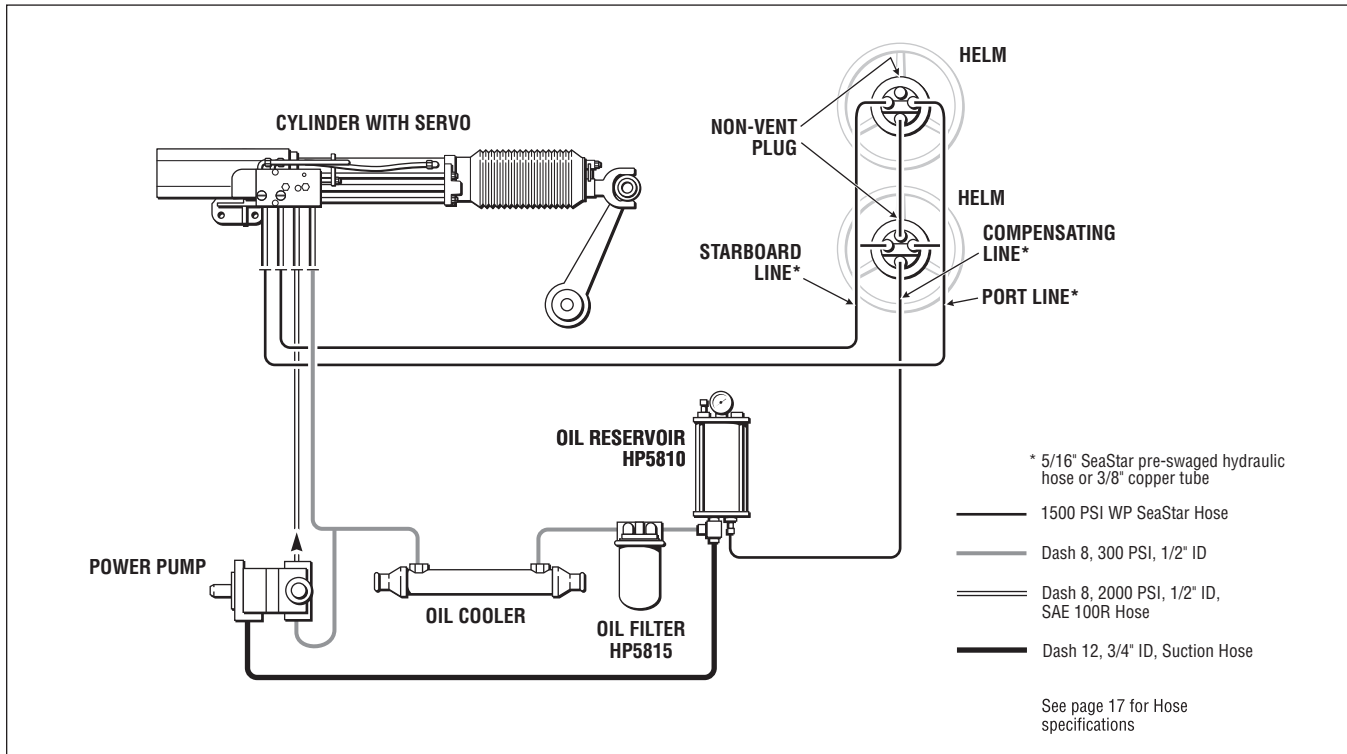


Figure 48.

SeaStar System Layout: Twin Cylinder Twin Pump

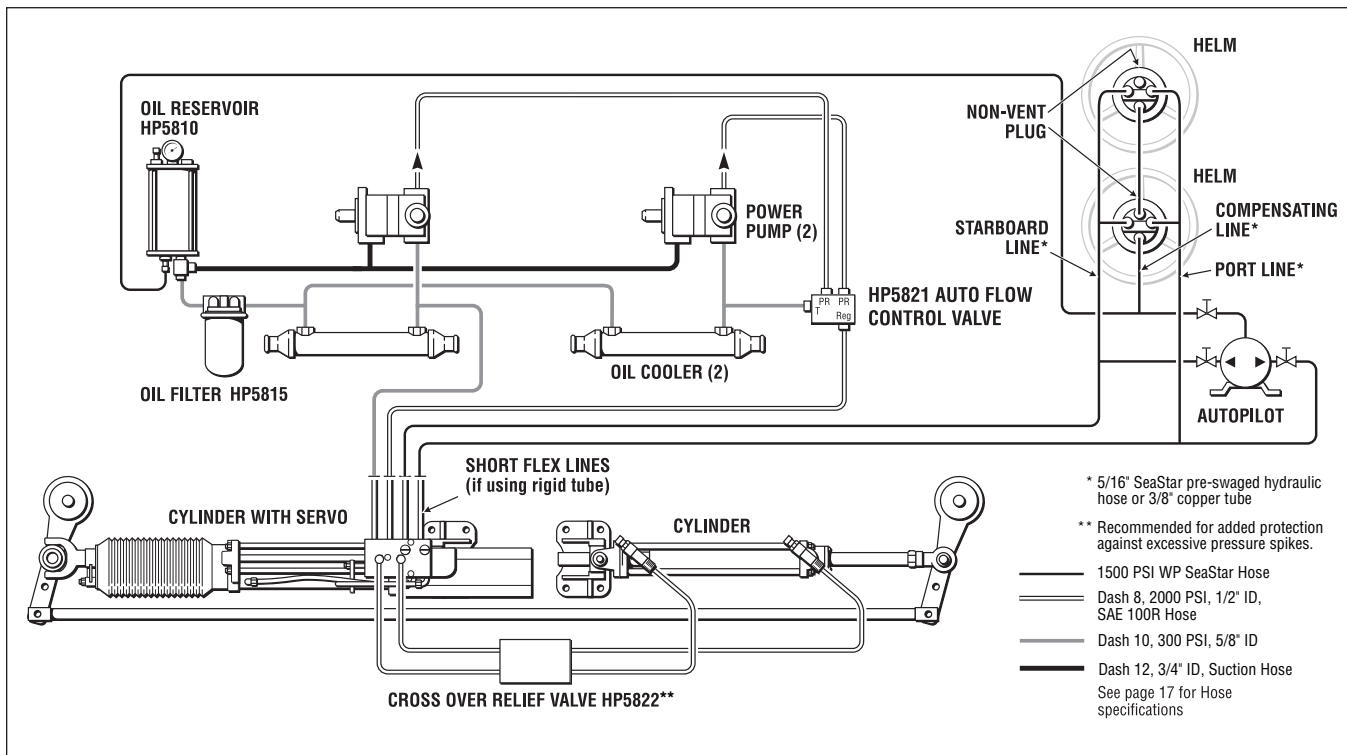


Figure 49.

SeaStar System Layout: Twin Cylinder, Reservoir and Power Pump with Autopilot

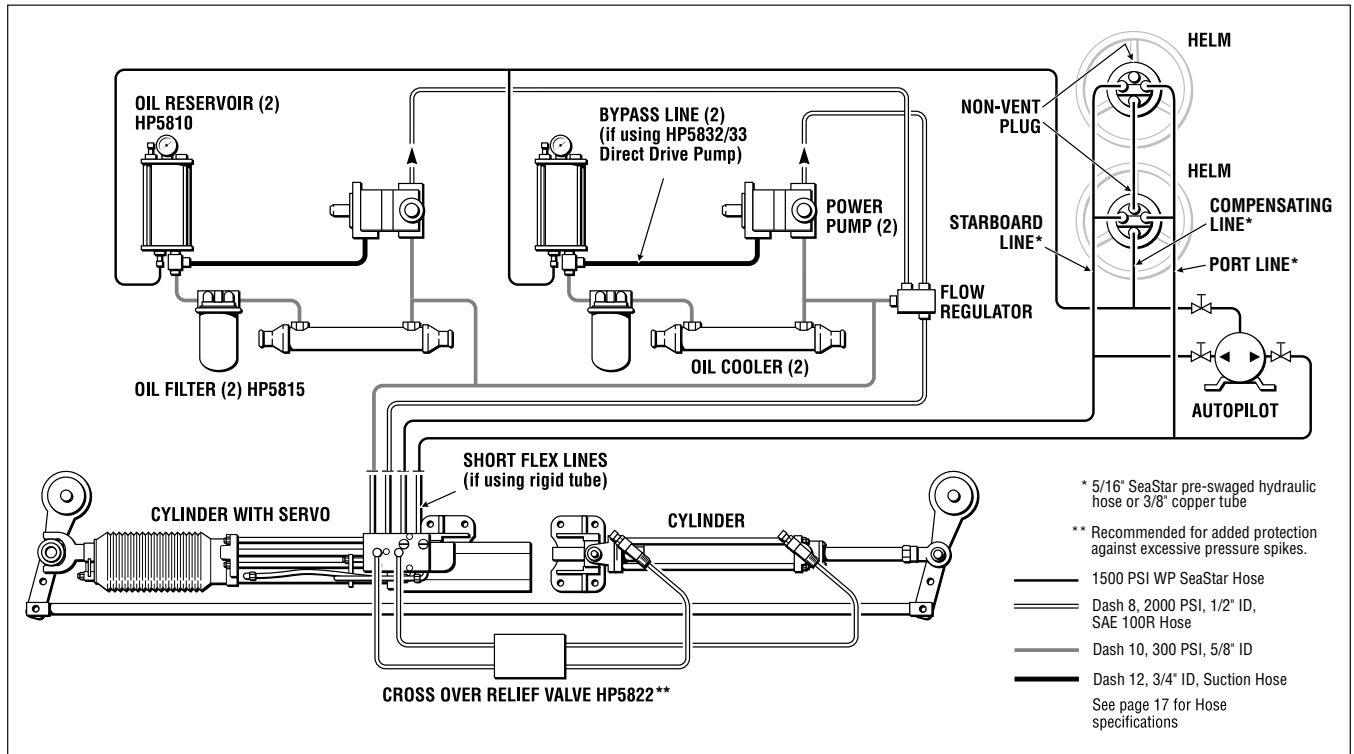


Figure 50.

SeaStar System Layout: Twin Cylinder Twin 4GPM Pumps

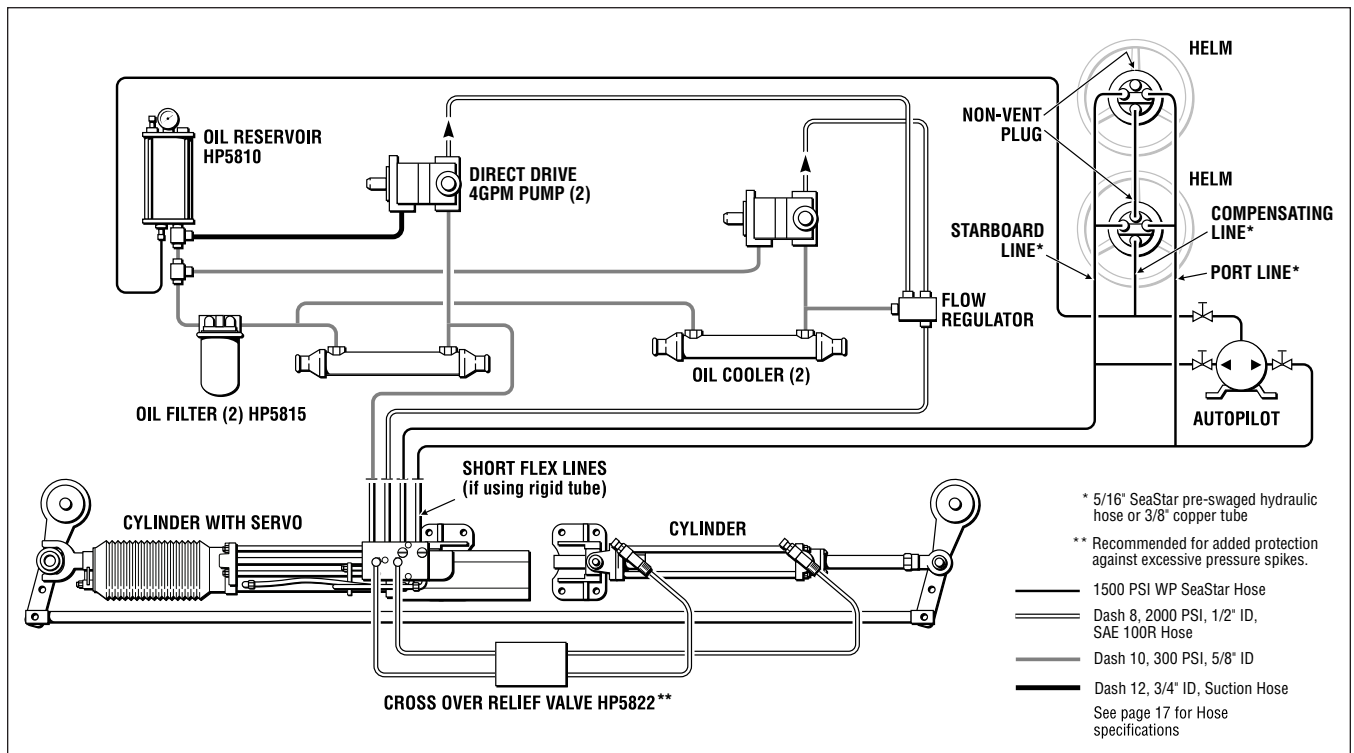


Figure 51

APPENDIX H

Bleed Fitting Kit HA5457

This kit provides an easy, cleaner way to pass fluid between the helm line, bleed fittings and the reservoir. With the bypass line installed, fluid and air from the bleeder is diverted to the reservoir. Included in this kit you will find a 1.05 foot length of 5/16" ID clear plastic tubing with quick connect fittings fitted to both ends.

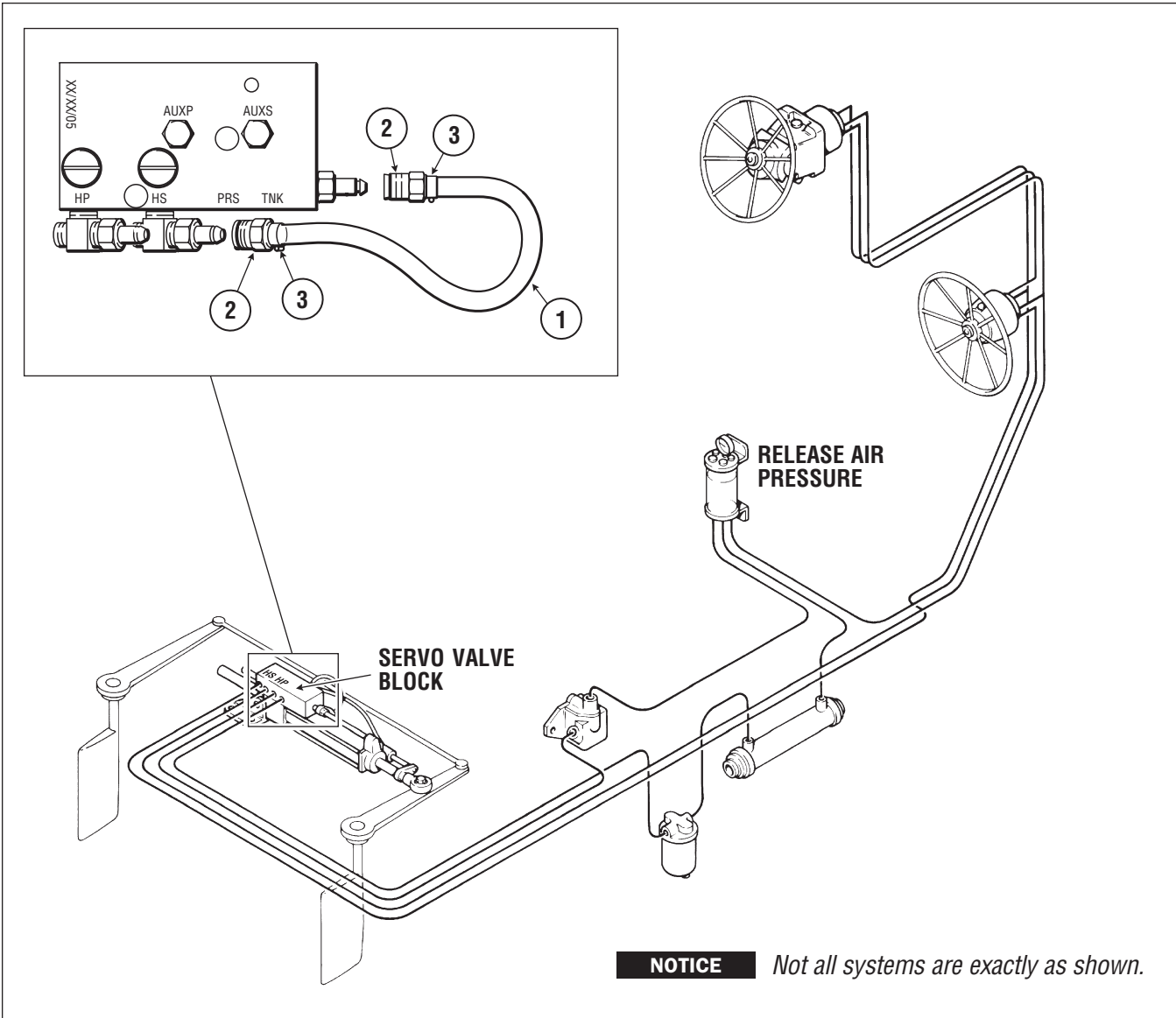


Figure 52.

ITEM	PART#	QTY	DESCRIPTION
1	291021	1.5'	5/16" ID Clear Plastic Tubing
2	800111	2	Fitting Quick Disconnect
3	800116	2	Hose Clamp

ITEM	PART#	QTY	DESCRIPTION

Statement of Limited Warranty

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

We will provide replacement product without charge, for any **Teleflex Canada Limited Partnership** product meeting this warranty, which is returned (freight prepaid) within the warranty period to the dealer from whom such product were purchased, or to us at the appropriate address. In such a case **Teleflex Canada Limited Partnership** products found to be defective and covered by this warranty, will be replaced at **Teleflex's** option, and returned to the customer.

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

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 UPS-SCS Warehouse
1927 Boblett Street
Blaine, WA 98230

From Canada

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

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