

280CX



280 Crossover OWNER ASSISTANCE MANUAL

Revised 2014



Dear EdgeWater 280 CX owner:

Congratulations on purchasing one of the finest small boats ever built. It has been constructed with care from the finest available materials. At EdgeWater we take great pride in the quality and craftsmanship that goes into each boat, large or small. We believe you'll have many years of enjoyment from your new EdgeWater and thank you for entrusting your leisure time to one of our fine products.

This manual has been assembled to help you learn more about your new boat and increase your enjoyment of it. Your EdgeWater has been built for a "Lifetime on the Water".

Boat safe and boat smart, we wish you many years of boating pleasure.

Sincerely,

A handwritten signature in black ink, appearing to read "P. Truslow". The signature is stylized with a large, looped "P" and a trailing flourish.

Peter Truslow
President
EdgeWater Powerboats



Service Information

Customer Name_____

Address_____

City_____State_____Zip_____

Phone_____Cell_____Business_____

E-mail Address_____

Dealer Name_____

Address_____

City_____State_____Zip_____

Phone_____Fax_____

Purchase Date_____Delivery Date_____

Engine Make/Model_____Engine Serial #_____

Engine Make/Model_____Engine Serial #_____

Engine Make/Model_____Engine Serial #_____

Hull Number_____DMA_____Ignition Key #_____

EdgeWater Power Boats LLC reserves the right to make alterations in the standard and optional equipment without incurring obligation to those boats already having been built. Every effort has been made to ensure that the information in this manual accurately describes vessels being built at the date of printing.

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1/General Information

1.1 General

The EdgeWater 280CX has been designed to be powered by twin outboard engines.

Each outboard manufacturer provides manuals that carefully detail operation and maintenance of their products. Please read and observe the instructions set forth in your outboard manual.

1.2 Owner / Operator Responsibilities

Registration

Registering your boat is important to you. Federal Law requires that all powered, undocumented vessels be registered in their state of principal use. Contact the appropriate agency in your local state to obtain specific registration information.

Reporting Boating Accidents

All boating accidents must be reported to the proper authorities in the state which the accident occurred. If someone dies or disappears as a result of the recreational boating accident, it must be reported immediately, with a formal report being made within 48 hours. If there is damage of more than \$500, or if the boat is completely lost, a formal report must be made within 10 days.

Questions regarding accidents may be directed to the Boating Safety Hotline, 800-368-5647.

Education

Whether or not you are an experienced boater, attending a Boating Education Course can be beneficial. If you are inexperienced, it is the best and safest way to begin your life on the water. If you are an experienced boater, it's always good to sharpen your skills.

Required Equipment

The U.S. Coast Guard requires certain equipment on each boat. In addition, they also set minimum equipment and safety standards. For more detailed requirement information, obtain "Federal Requirements And Safety Tips For Recreational Boats", by contacting the Boating Safety Hotline, 800-368-5647.



Some states and local agencies require equipment that is not required by the U.S. Coast Guard. Your local agency or dealer can provide specific information regarding these non-standard requirements.

2/Helm Control Systems

2.1 General

The helm station is the control center for the boat. The main control systems are the engine throttle and shift controls, the steering system, and the trim tab controls. These provide the operator the ability to control speed, direction, boat trim, and attitude. Each manufacturer provides manuals on the operation and use of their systems.

2.2 Steering System

General

The manual which comes with your steering system provides specific information on your steering system.

The SeaStar® helm pump is an axial piston pump. It has a built-in lock valve to prevent the steering load of the engines from feeding back to the boat operator. When the steering wheel is turned clockwise, hydraulic fluid is pumped out of the helm unit, into the starboard hydraulic line and then into the cylinder. As the fluid is pumped into one side of the steering cylinder, an equal volume of fluid is displaced from the opposite side, moving the steering cylinder body to port. The cylinder body is connected directly to the engine's stern arm, which moves the front of the engine to port and puts the boat into a starboard turn. The fluid displaced from the cylinder returns to the helm pump. Please see diagram in the manual's appendix for a visual representation of this system. In the event of a power assist failure, the steering system will still function normally but in a manual mode, which requires greater steering effort by the operator.

*NOTE: Depending on engine manufacturer, some steering systems are furnished with power assist pumps. Please refer to the engine owner's manual for complete instructions on their brand.

While running at slow speeds, most boats tend to wander slightly back and forth. Keeping the wheel in the center without overcompensating for the slight wandering will prevent over steering and reduce the tendency to wander.

Steering System Maintenance

Routine system inspection should occur regularly. Cables, hoses, linkage and helm assemblies should be inspected for wear, corrosion, cracking, or deterioration. Cleaning and light grease should be applied to all exposed metal parts and other damaged or deteriorated parts should be replaced as soon as possible. Cleaning fluids containing ammonia, acids or any other corrosive ingredients **MUST NOT** be used for cleaning any part of the steering system. Failure to comply will cause serious damage to the system, which could result in an accident or injury.

2.3 Engine Throttle and Shift Controls

Refer to the engine manual supplied with your engine for specific information on your controls. The ones depicted are those supplied by Yamaha.

Your EdgeWater 280CX comes with twin engines only. The engines may be controlled mechanically or electronically depending on the type of engine. Mechanical controls operate using a push/pull cable system connected directly to the engine shift linkage and throttle assemblies. Electronic controls have no mechanical attachment and instead control solenoids on the engines for throttle and shifting. When moving the handles forward and back, the operator controls the amount of fuel and air being used and the gear selector for forward, neutral and reverse. Careful use of the controls provides smooth, responsive and safe operation.



Allow time for the engine RPM to come down to idle before shifting to reverse or severe gearbox damage could occur. PLEASE REFER TO YOUR ENGINE OWNER'S MANUAL FOR FURTHER OPERATIONAL PROCEDURES FOR YOUR OUTBOARD.

Engine Stop Switch

This device is designed to disable the engine(s) in the event the vessel operator is thrown from the control station. The engine stop switch lanyard should always be worn by the operator, while the boat is in motion. Pulling the lanyard from the control will stop the engine(s). If the engine will crank properly, but not start, the lanyard may not be properly attached to the engine stop switch.



Do not use the engine stop switch to stop the boat unless it is an emergency as it may impair your ability to quickly re-start the engine.

****NOTE** Each ignition key has a 3 digit number stamped on it. Please record this number for future reference on the service information page in the front of this manual.**

3/Propulsion System

3.1 General

Your new EdgeWater 280CX is designed to be powered by twin outboard motors. Most 2-cycle outboards currently use an automatic system to mix the oil with the gasoline before the engine uses it. If equipped with a 2-cycle engine, there will be oil tanks in the aft bilge locker. Make sure these tanks always have a sufficient amount of the recommended 2-cycle oil for your cruise, plus some reserve. All 4-cycle engines require oil be maintained in the crankcase. Always check the crankcase oil level before each day's run.

***NOTE:** All Yamaha engines installed by EdgeWater Power Boats will be 4-cycle.



Always follow the manufacturer's recommendations and use only the recommended oil types.



Don't attempt to service your outboard or any of its components unless you are thoroughly familiar with its operation and dangers. Many of the moving parts are exposed and can pose an extreme danger to anyone unfamiliar with their operation. Always leave the servicing to a qualified technician.

Each manufacturer provides manuals designed to assist you in the proper operation and maintenance of your new engine. If the boat is to be kept in saltwater for an extended period, electrolysis and marine growth can become a problem. When leaving your boat in salt water overnight or for an extended period, tilt the engine as high out of the water as possible. This will decrease the possibility of marine growth on the outside of the engine, as well as reduce the potential of marine growth compromising the cooling water inlets in the lower unit, which can cause overheating.



Do not paint your outboard's lower unit with paints designed for boat hulls. Some can cause severe damage to your engine. Check with your engine manufacturer to get their recommendation.

Do not attempt control adjustments unless you are very familiar with their function, operation and adjustment. Failure to properly adjust the system components can adversely affect your boat's performance and safety and may also result in severe engine damage.



Please return all warranty cards for boat, engine and other related items. This will assist you in the event you have a warranty problem.

3.2 Engine Cooling System

All outboard engines are cooled by water taken in through ports in the lower part of the drive section. Make sure these ports are free of debris or other items that might cause the flow to be restricted. Maintain a routine vigilance to see that the visual inspection streams have a steady flow of water. If they do not, shut down the engine to see if they are clogged or if there is a more serious problem. Be especially watchful if you have gone through an area of vegetation or shallow water as the intake ports can become clogged with weeds, dirt or other debris.

Do not run your outboard without water coming into the lower unit. The water pump impeller can be damaged in only seconds of this type of operation.

3.3 Propellers

A turning propeller moves the boat through the water, forward or backward. They should always be clean and free from nicks or dings, which can adversely affect performance. The propeller selection is based on the horsepower of the engine and its relationship to the size and weight of the boat.

Propeller sizes are determined by two numbers, which appear on different propellers at various locations. They are listed in sequence, for example 13 x 17. The first number is the diameter of the propeller and the second is the pitch. Pitch is the theoretical distance the propeller moves through the water with each complete revolution. The larger the number, the greater the theoretical movement. It also follows that the larger the number the greater horsepower is required to turn it. With a load which is "normal", or usual for your boating activities, the engine should be able to reach its maximum operating RPM range at wide open throttle (WOT) and full trim. With a light load on smooth water, the engine should reach its manufacturer's rated maximum operating RPM at wide open throttle (WOT) and moderate trim. If it does not, you may have a propeller which has too much pitch. If it goes beyond the maximum recommended RPM range, you may have too little pitch. Neither condition is good for the engine. You will get shorter engine life and poorer performance than your boat and motor were designed to provide.



If your boat came from the factory with propellers selected by EdgeWater and Yamaha Engineering, it should already be optimized for the performance of your boat. Before changing the pitch or diameter of your propeller, always check with your dealer to determine how the changes will affect your boat and engine performance. Certain modifications such as bottom paint or options that affect weight balance and/or wind resistance may lower peak rpm. Always check with your dealer first if optimum rpm cannot be attained.

Very heavy loads will affect the ability of your boat to reach maximum RPM.

3.4 Engine Power Tilt and Trim

The power tilt and trim system on your outboard provides the ability to optimize the running angle of your EdgeWater 280CX to allow for load and sea conditions. Moving the outboard lower unit toward the transom is generally referred to as trimming “in”, while moving the outboard lower unit away from the transom is referred to trimming “out”. It is generally best to have the engine trimmed in for acceleration from displacement to planning mode. This brings the bow down and requires less fuel and effort on the engine’s part to plane off the hull. Once on plane, the engine should be trimmed “out” to optimize performance and minimize fuel consumption.

The first 20° of movement aft of the transom are referred to as trim and is the area generally used to operate the boat while on plane. The area beyond the first 20° is referred to as tilt and is usually reserved for operating in shallow water or at idle speeds only.

While running under normal conditions, the bow should be in a 3° to 5° up angle to maximize the hull’s ride and performance. When sea conditions are rougher than normal, bringing the bow slightly down may improve the ride and will also allow the boat to remain on plane at a lower speed.



Your boat will only achieve maximum RPM when the engines are properly trimmed out.

3.5 Engine Instrumentation

The following is presented to familiarize you with the instruments, which may be on your boat. Every boat is not equipped with the same instrumentation.



All factory installed Yamaha engines include Yamaha’s digital multifunction Command Link Plus display. Refer to your engine operator’s manual for use details.

Tachometer

The tachometer displays the number of revolutions per minute (RPM) the engine is turning. There is a designed operation RPM range for the engine. Become familiar with the operating range of your engine and its operating characteristics. The tachometers designed to aid the boater to assure the engine performs within that designed range. The tachometer can be used to better understand the performance of your engine and your EdgeWater 280CX. By monitoring your tachometer as you operate your EdgeWater, you will find RPM ranges that work better in certain sea and load conditions. Be alert the tachometer operation may provide an early indication of difficulty, before it becomes irreversible.

Speedometer

The speedometer indicates the boat speed in miles per hour. Some types work using a spinning wheel to determine the boat speed. Their accuracy can vary from the actual over the bottom speed due to many factors. Other boat speedometers calculate the speed by amount of pressure the moving water forces into a “pitot” tube. And some other speedometers use a GPS sensor. These gauges should only be used as indicators of approximate speed and not used as absolute speed indicators. NOTE: All Yamaha engines up to and including F250 utilize a pitot tube. In the event that erroneous speed readings appear, it is likely caused by debris clogging the pitot tube. Consult with your dealer on methods to clean the tube and restore normal operation.

Temperature Gauge

This is designed to monitor the operating temperature of your engine’s cooling system. A sudden rise from the normal should be investigated to determine if there is an obstruction in the cooling system.

Water Pressure Gauge

This gauge measures pressure in the engine cooling system. If the pressure changes from the norm it could indicate a complete or partial blockage in the system or a water pump problem. If this does not return to normal, your dealer should check it to make sure the cooling system is operating properly. Low water pressure may also be caused by engines mounted excessively high.

Fuel Gauge

This gauge indicates the amount of fuel in the fuel tank. It is always prudent to follow the “rule of thirds”, one-third of the tank to get the destination, one-third to return, and one-third in reserve.



This gauge is a measure of relative fuel supply and is not a calibrated instrument! The shape of the fuel tank will affect the amount of fuel for each level. For example, your 280CX tanks have a “V” shape so there is more capacity in the top half of the tank than the bottom half. Because of this, it will take longer to use the first half of the tank the last half. If equipped, always reset for “fuel used” function with each fill up. This will provide an accurate measure of how much fuel is remaining.

Voltmeter

This meter displays the voltage for the battery and charging system. The voltmeter should read at least 12.1 volts when the engines are off and 13.4 volts when the engines are running. For Yamaha engines, a voltage reading can be observed with the speedometer.

Hour Meter

The hour meter keeps a record of operating time and is very useful for scheduling maintenance. This is incorporated into the tachometer for Yamaha powered boats.

Engine Alarms

All outboards are equipped with several audible engine alarms and in some cases, RPM reduction to reduce the risk of engine damage. Your engine owner's manual will familiarize you with these and their sometimes-distinctive sounds.



Warning: If an engine alarm sounds, shut down the engine until the source of the problem is determined.

Compass

The compass assists in determining your location by indicating your position relative to magnetic north. For accuracy, your compass may need to be adjusted to take into account specifics of your boat and geographic location. Please refer to the material provided with your compass for magnetic deviation.

Instrument Maintenance

Your instrument faces should be periodically cleaned to keep them free of salt and atmospheric debris. The ignition switches should be periodically sprayed with a contact cleaner/lubricant to keep them free of corrosion and dirt. Cleaners with abrasives or harsh chemicals should not be used on your instruments.

4/ Fuel System

4.1 General

Your boat's fuel system has been designed to meet or exceed the requirements of the U.S. Coast Guard, the National Marine Manufacturers Association (NMMA), and the American Boat and Yacht Council (ABYC), which were in effect at the date of manufacture. All fuel system components on your EdgeWater 280 CX have been tested at the factory for function and leaks, regular inspection and maintenance are the responsibility of the owner. Make periodic inspections to determine the system is still safe and free of leaks. Special care should be taken when inspecting joints and connections to ensure they have not loosened due to vibration.



If any odor of gasoline is detected, immediately shut off all engines and electrical devices until the source and condition of the odor has been determined and eliminated. Have a fire extinguisher at the ready until the condition has been resolved.

4.2 Fuel Fill

The fuel fill caps are located on the port side and labeled "GAS". Tighten the cap until it is snug, not so tight it cannot be removed at the next fuel stop, or so tight that the rubber o-ring is damaged, allowing water to enter the system. The forward cap fills the starboard tank and the aft cap fills the port tank. Each fuel tank holds 100 gallons when full.

4.3 Fuel Vent

This vent is incorporated into the fuel fill cap. The vent allows air to escape from the tank as fuel is being added. Make sure the fill and vent area is kept free from debris. The vent also allows for expansion and contraction of the fuel in the tanks. **DO NOT SMOKE OR INTRODUCE AN OPEN FLAME NEAR THE FUEL CAPS!**

4.4 Fueling

Your EdgeWater 280 CX is equipped with two, 100 gallon fuel tanks. Before fueling, you should follow these procedures.

- Make sure the boat is securely moored and engines are turned off.
- Make sure all switches are off and all cigarettes and open flames are extinguished.
- Know the location of all fire extinguishers.
- Remove the fuel fill cap.
- Place the nozzle firm against the side of the opening to prevent static discharge
- Begin fueling.
- DO NOT OVERFILL.
- Re-install the fuel cap.
- Check the bilge area for fuel odors.



Warning: If fuel odors are detected, do not start the engine! Check to make certain there are no leaks or system problems before starting the engine.



Warning: Do not fill the fuel tank while the engine is running. Do not allow smoking or open flames within 50 ft. of the fueling area. Fuel is very flammable. To prevent damage to the engine, use only fuels without harsh additives or alcohol. Refer to your engine owner's manual for specific fuel requirements.

4.5 Fuel System Maintenance

Regularly inspect the fuel system components. All lines, fittings, and bulbs should be flexible and not corroded. If fittings or other components are found to be cracked, they should be replaced at once. If you use your boat infrequently or do not use it for an extended period of time, a fuel conditioner should be added to a full tank of fuel to prevent fuel deterioration and damage to the fuel system.

4.6 Fuel Filters

A fuel filter for each engine is installed in the bilge locker of your EdgeWater 280CX. This is a 10-micron fuel/water separator type of filter and is designed to prevent water from entering your engine. The fuel filter element is a spin-off type element. At a minimum, this element should be replaced at the beginning of every boating season. Always carry a filter wrench and spare pair filters of the type supplied on your boat.

5/Electrical Systems

5.1 General

Your EdgeWater 280CX operates on a 12 volt DC system, similar to your automobile. The battery or batteries are typically lead acid type and require similar maintenance to your car's battery. An electrical schematic is included in the Appendix for troubleshooting if a problem should arise.

5.2 Switch Panels & Battery Isolator

Your EdgeWater 280CX is equipped with panel mounted breakers located at the helm as well as main and 24hr breakers located next to the transom door. Switches are provided at the helm for navigation lights, deck lights, spreader lights, helm lights, underwater lights, horn, wipers forward bilge pump, aft bilge pump, livewell, raw water pump, fresh pump, fishbox pumpout, two accessories and battery parallel. The aft main battery switch panel contains circuit breakers for helm main, power steering, windlass, electronics, cabin lights, refrigerator, air conditioner, head, waste pump, bilge pump float switches, and a switch for the bilge work light. A wiring diagram is included with this manual to assist you in troubleshooting the boats' electrical system. Please note that the accessory circuits are protected by circuit breakers with various amperage ratings. Check that the requirement of any device you install does not exceed the rating of the circuit breaker being used.

The battery switch panel is equipped with heavy duty ON/OFF battery switches for each engine and the house battery bank that connect to a three bank battery isolator system with a manual parallel feature. The isolator is located below the battery switch panel in the aft bilge locker. When either engine is running, the isolator senses the charge current from the alternator(s) and connects all three battery bank together for charging. With the engines off, the battery banks are isolated from each other to protect the start batteries from being drained by house loads.

*NOTE: The bilge pumps have automatic float switches wired directly to the house battery circuit so they can pump water out of the bilge even when the battery switch is in the "OFF" position.



When leaving the boat unattended, always switch all battery switches to the OFF position to prevent unintended battery discharge.

5.3 Electrical System Maintenance

At the beginning and end of each season the exposed electrical components of the switch panel should be sprayed with a non-conductive rust/corrosion inhibiting spray. Inspect all wiring for breaks, loose terminals and sound insulation. Replace worn or deteriorated components. Check the electrolyte level in the batteries regularly and fill with distilled water, as necessary. **DO NOT OVERFILL.** Batteries under charge emit explosive hydrogen gas. DO NOT remove fill caps for inspection in the presence of sparks or an open flame. Factory installed Yamaha engines are supplied with "WET" type lead/acid batteries. Other engine installations may use "AGM" sealed batteries that require only visual inspections.

6/Raw Water & Freshwater Systems

6.1 General

Your boat is equipped with a standard freshwater system consisting of a holding tank, distribution lines, 12 volt pump with integral strainer, transom sink with pull out spray head and cabin sink with pull out spray head. The standard raw water system consists of a high speed pick-up, located on the transom, 12 volt pump with integral strainer and one or more livewells and washdowns.

6.2 Livewell Operation

The livewell is filled by a low maintenance, cartridge style, centrifugal pump installed in the bilge on a ball valve. This valve must be open (handle pointing forward) for the pump to operate. The cartridge style pump may be cleared of debris by closing the ball valve and removing the motor assembly from the pump housing by depressing two tabs at the base of the motor and rotating counter clockwise. The pump is controlled by the livewell switch on the control panel. To operate properly, the valve inside the livewell must be adjusted to provide an even flow in and out of the livewell. Too much and it will be more than the drain can handle, too little and the water will not get the proper circulation. The valve should be turned counterclockwise to open and clockwise to close. The livewell drains through a hose connected to a thru hull fitting on the port side of the boat. To completely drain the livewell, remove the bottom plug and allow the water to drain overboard.

6.3 Raw Water Washdown

The washdown system is comprised of a pump mounted on the hull inside the starboard side transom locker and a washdown fitting to attach a hose. The pump is controlled by the washdown switch on the control panel. The diaphragm pump is fed through the same thru hull and high speed pickup as the livewell pump. The washdown hose outlet is located forward under the starboard gunwale board. With an attached hose, this system can be used to wash debris from the boat. The washdown switch should be turned on immediately prior to use and turned off when not in use. When activated, the pump's pressure switch will automatically control the pump. It is normal for the pump to cycle on and off in response to flow rates and water demand.



Always turn off the high pressure washdown pump switch when leaving the boat unattended.

6.4 Freshwater System

The freshwater system is comprised of a pump mounted on the hull inside the starboard side transom locker and a shower head assembly. The pump is controlled by the freshwater switch on the control panel. The diaphragm pump is fed by a 30 gallon freshwater tank located in the transom bilge area. The shower head assembly is located on the starboard side of the transom area. The freshwater switch should be turned on immediately prior to use and turned off when not in use. When activated, the pump's pressure switch will automatically control the pump. It is normal for the pump to cycle on and off in response to flow rates and water demand. The freshwater tank has a drain fitting located in the front of the bilge locker for flushing the tank.



Always turn off the freshwater pump switch when leaving the boat unattended.

Operating instructions for the freshwater system

1. Fill holding tank with drinkable water, using water fill located on the port side gunwale.
2. Turn on freshwater pump switch, located on the dash switch panel.
3. Turn on both the transom and cabin faucets to clear air from the lines.
4. If the system has not been used for a while please allow a few minutes for the pump to prime up.

Troubleshooting tips

1. You can hear the pump running, but no water is coming out of the spray head.
 - a. The holding tank is empty, fill with water.
 - b. The pump has not yet primed, hold hand over nozzle while squeezing the trigger. This will help to prime the pump.
2. The pump will not run at all.
 - a. Check the breaker on the dash switch panel.
 - b. Make sure the battery switches are in the "ON" position.
 - c. Check the connections at the switch and at the pump itself.

6.5 Raw Water System Maintenance

The following checks should be made periodically to assure your system operates properly:

- Periodically spray pumps with a protective silicone solvent to reduce corrosion.
- Periodically check the strainer on the pump inlet to remove any collected debris.
- Fishboxes and livewells should be drained and cleaned after each use.
- Periodically check hoses and connections for signs of deterioration.

7/Drainage System

7.1 General

All non-bilge water drains from your EdgeWater 280CX by gravity. Your boat is self-bailing at rest. It is important to check drains frequently to make sure they are clear and free flowing. Review the schematic in the Appendix and become familiar with the location of each thru-hull drain.

7.2 Drain System Maintenance

Essential tasks must be done periodically to maintain your boat's ability to drain in adverse conditions.

- Clean cockpit drains to remove debris or other foreign objects which could prevent boat from draining properly.
- Check bilge area for debris and foreign material, which can cause automatic switches to malfunction.
- Flush drains to keep free flowing and clean.

7.3 Cockpit Drains

Your EdgeWater 280CX deck drains thru four cockpit drains located in the transom area. The deck is designed to take water and drain it overboard. These drains should be checked periodically to make sure they are clear running and free from debris. When washing the boat down after use, use a hose nozzle with a high pressure stream to make sure they are free running.

7.4 Transom Bilge

Your EdgeWater 280CX has a hull bilge where the raw water pump and automatic bilge pump are located. The bilge pump is designed with an internal float so that it automatically turns on if the water in the sump rises, or it may also be activated by a momentary switch on the panel. This pump should be periodically checked to make sure it is working properly and that the drain screen is clear. To check the pump, squeeze the pump sides and lift it from the base, which is fastened to the hull. The screen will be easily seen and if there is debris, it may be cleaned and replaced. Replace the pump assembly and check its operation by turning on the momentary switch on the helm switch panel.

When the boat is out of the water it may be drained by a thru hull drain located at the bottom of the transom. This drain has a stainless steel plug with an o-ring that may be removed. This plug should be periodically checked for tightness.



Note: The bilge sump area should be checked for oil before operating the bilge pump. The discharge of oil from a bilge area is illegal and is subject to a fine. The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States or the waters of the contiguous zone if such discharge causes a film or sheen upon, or a discoloration of the surface of the water, or causes a sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of \$10,000.

7.5 Locker Drains

On the 280CX, the large in-floor fishbox locker is drained through a diaphragm pump in the aft bilge cavity. This pumps switch is labeled “pumpout” and is located on the pump switch panel below the steering wheel. Check this locker for any collected water each time you use the boat. All other lockers on the vessel drain directly overboard, not into the bilge area.

8/Safety Equipment

8.1 Required Safety Equipment

Contact the U.S. Coast Guard Boating Safety Hotline at 1-800-368-5647 to obtain a pamphlet on the latest required and suggested safety equipment. The Coast Guard Auxiliary also offers “Courtesy Examinations” to help ensure your boat is properly equipped.

The following is a list of required safety equipment to be aboard your boat. This may be modified from time to time and it is suggested that you contact the U.S. Coast Guard Boating Safety Hotline at 800-368-5647 or pick up a copy of the latest “Federal Requirements and Safety Tips of Recreational Boats” pamphlet.

- **Personal Floatation Devices (PFD's)**

These must bear a tag that they have been approved by the U.S. Coast Guard and must be in serviceable condition. They must also be of the appropriate size for the wearer, i.e. for children there must be children's life vests on board. Many states now require children to wear PFD's at all times. You should check with your state to determine the proper requirements. You should maintain at least one Type I, II, or III PFD for each person on board, plus one throwable device, a ring or boat cushion, Type IV.

- **Visual Distress Signals**

These are now required in virtually all waters of the United States. If in doubt, please check with the U.S. Coast Guard Boating Safety Hotline at 1-800-368-5647 for a specific answer.

- **Pyrotechnic Visual Distress Signals**

These must be U.S. Coast Guard approved, be in a serviceable condition, and be readily accessible. They each have a service life date and are not counted beyond this date. These types include both hand held flares and aerial flares.

- **Sound Signaling Device**

You must have an efficient means of making a proper sound signal in the event of distress or poor visibility. This may be a horn, whistle, or bell.

- **Navigation Lights**

These come with your EdgeWater 280CX and meet U.S. Coast Guard requirements. It is important that you periodically check to make sure they are in working order. It is very important these be checked prior to any cruise which will keep you on the water after dark.

- **Fire Extinguisher**

A fire extinguisher is standard on all EdgeWater boats. These require regular inspection to make certain they are ready for use. Questions may be directed to the U.S. Coast Guard Boating Safety Hotline at 1-800-368-5647, or 1-202-267-1070. You should, as part of routine boat maintenance; check to make sure your extinguisher is still operable.



Never discharge your fire extinguisher to see if it still works. This will cause it to lose pressure. If it is accidentally discharged or if it is used on a fire, replace it immediately.

8.2 Suggested Safety Equipment - Inshore

Suggested safety equipment, over and above the required equipment is:

- First aid kit and manual
- Boat hook
- Tool kit
- Spare fuel/water separator and filter removal tool
- Extra quart of engine oil
- An adequate number and size of line should be on the boat. Bowlines should be at least 1/3 longer than the boat's length and stern lines at least as long as the boat. When operating in areas with unusually high tidal range, this should be lengthened. The minimum size line for a small boat is 3/8" diameter 3-strand nylon. Refer to one of the listed references in the Appendix for a complete discussion on line size relative to boat length.

- Waterproof flashlight, with good batteries
- Spare batteries
- Binoculars
- Tow line. This should be a minimum of 50' long with at least one size increase over the boat's mooring lines.
- Day/Night visual distress signals
- Local charts and compass
- Properly sized anchor and line
- Fenders of the proper size



Always carry water, even for a 10-minute cruise.

8.3 Suggested Safety Equipment – Offshore

In addition to the required equipment, and the suggested inshore equipment, there is additional equipment that is prudent to have when venturing offshore. No matter what the conditions at the start of the trip, the situation can change rapidly and all your equipment and skill can be required to safely bring your crew home to safety.

- VHF radio
- A supplemental, portable VHF is also a good backup
- Sunscreen
- Spare propeller and the knowledge of how to properly change it, if required
- Extra clothing for changeable weather conditions
- Spare anchor with sufficient line for the water depth
- Mirror
- Charts

9/Safe Operation

9.1 Pre-Cruise Check List

- Check provisions. Make sure you have plenty of water in the event you have a problem and are delayed.
- Check the weather forecast. Avoid sea conditions that are beyond the experience of yourself and your crew.
- Do you have the correct safety gear aboard and is it in good working order?
- Make sure all fire extinguishers are in good working order.
- It is advisable to carry jackets or foul weather gear in the event of adverse weather conditions.

Your EdgeWater 280CX is equipped with a maximum capacity rating plate permanently affixed to the helm area of your boat. It will provide information regarding the maximum number of people you can safely have aboard, the maximum amount of weight the boat can safely carry, and the maximum horsepower your boat was designed to handle.



**Do Not Overload your boat.
Before Starting the Engine**

- Determine if the trip can be safely made by checking the weather.

- Are all the proper boat and personal documents on board?
- Check operational equipment, such as running lights and horns to make sure they are on board, and operable.
- Make sure there are enough provisions for the cruise.
- Leave a float plan with someone who can notify authorities in the event you do not return in the allotted time.
- Double check the fuel and engine oil levels.
- Set the battery switches to “ON”.
- Check the emergency stop lanyard to see if it is properly attached, and that the shift lever is in the neutral position.



Remember the rule of thirds: 1/3 out, 1/3 back, and 1/3 in reserve.

After Starting the Engine

Upon initial start-up, make sure to follow the manufacturer's recommendations for engine break-in:

- Check to be sure there is a telltale water stream exiting the engine.
- Check the gauges to determine if everything is nominal.
- Check to make sure everything is secured and properly stowed away; remember the boat's movement is dynamic and anything that is loose will become a hazard at the worst possible time.



Remember that the captain is responsible for the safety of the crew and passengers and for his/her boat's wake damage.



Never operate the boat while under the influence of alcohol!

Make sure someone else on-board knows how to operate the boat in the event you are injured and unable to operate the boat.



If you are operating the boat for the first time, make sure you follow the engine manufacturer's break-in recommendations. This will assure proper break-in and reduce the possibility of engine problems.

9.2 Basic Rules of the Road

The following is not intended to be a comprehensive course in seamanship and rules of the road, but instead an introduction. It is strongly recommended that a boating safety course be taken from your local Coast Guard Auxiliary or local Department of Natural Resources. There are also many good reference books in your local library as well as numerous sites on the internet.



Remember, paddle boats, sailboats and other vessels (such as barges) which are unable to maneuver, always have the right of way over powerboats. Sail boats, when under power, are considered motor boats. However, always boat defensively.

Aids to Navigation

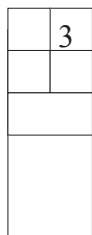
Along the coast lines and in navigable inland waters, aids to navigation have been placed by the U.S. Coast Guard. These have been placed for the boating public's safety. Please become familiar with them and learn to use them to make your boating safer and more fun.

Federal Waterways Marking System Aids

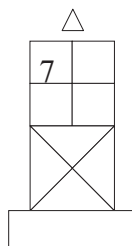
Lateral Aids as seen from Seaward (**portside green**)



Daymark

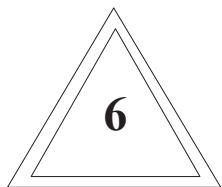


Can Buoy

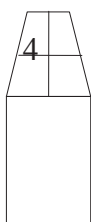


Lighted Buoy
(**green** light)

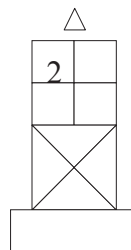
Lateral Aids as seen from Seaward (**starboardside red**)



Daymark



Nun Buoy



Lighted Buoy
(**red** light)

9.3 Safe Operation

Getting Underway

After clearing the dock, make sure the power trim (if so equipped) is trimmed down. (This will bring the boat up on plane more quickly and easily.) Give the engine sufficient throttle to bring it to plane briskly, then back down to the cruising speed of your choice, based on the sea conditions and your planned activity.

- After coming on plane, raise the trim to a point where the engine is level with or slightly above the plane of the water. This is usually with the bow at about 3° to 5° above level. This will provide the smoothest, most economical operation.
- Keep a constant vigil for other boats and watercraft and be prepared to give way, or slow down, if necessary. (We suggest you enroll in a boating safety course offered by the U.S. Power Squadron or the Coast Guard Auxiliary.)
- When coming off plane, allow the engine to come back to an idle speed until the boat slows down.
- Shift to the neutral position.



Never allow anyone to sit on the gunwale while the boat is moving!

While underway keep a constant vigil for other craft that may be approaching, the gauges on your boat, location of passengers and the general sound and feel of your craft. Often, a change in the way the engine sounds or the boat feels will presage a problem. Your early attention may prevent a more serious problem.



If you should strike an underwater object, bring the throttle to neutral and stop the engine. Inspect the lower unit for damage. If none is apparent, proceed as before but heighten your awareness of the engine and its operation to make sure a problem has not gone undetected. Check the propeller whereas a bent prop may cause unusual vibration, cavitation and reduced performance.

9.4 Towing or Being Towed

Sooner or later you will have the misfortune of having to be towed in or needing to tow someone back to a safe landing. It is important that this be done properly so that a difficult situation does not become worse. This comes under a longstanding, unwritten law of the sea that one boater will aid another in time of distress. The 1971 Boating Safety Act grants protection to those assisting others at sea as "Good Samaritans" and absolves them of civil liability rising from the aid being provided.

When being towed, it is best to have a line passed from the tow boat to the one being towed, assuming the towing boat has a line of adequate size and length. The towboat should also tow the disabled vessel from as close to amidships as possible. This reduces the tendency to yaw. If possible, the towing boat should use a bridle attached to the two stern ski tow eyes. The vessel being towed should attach the towline to the bow eye that holds the boat onto the trailer. This provides an optimal tow position and a strong tow point. Have the occupants of the boat being towed sit aft of amidships, but not all in the stern. Attention should be given so the boat remains balanced and on an even keel. Some boats tow better with the engine tilted out of the water, others need the engine to act as a rudder to be able to maintain a straight line. Start with the engine tilted. If that does not work well lower the engine until it is about perpendicular.



You should never attempt to plane off the boat being towed.

9.5 Stopping the Boat

Gradually bring the controls back to the low forward position and allow the boat to gradually slow down. After the boat has dropped into the displacement mode, shift to the neutral position. If you have been running the boat hard for some time, allow the engine to idle for several minutes to gradually cool down. After docking and securing the boat, raise the trim tabs to the fully upright position and turn off the ignition.

9.6 Docking

Safe docking keeps your boat from being damaged and is an indicator of a capable and knowledgeable captain. There are many docking maneuvers, which will be done while boating; only the basics will be discussed here. Several constants to always use as guides while docking:

Perform docking at idle or no wake speeds. Always try to come into wind or current, whichever is stronger. This allows you to use the natural forces on your boat to act as a natural brake. The skipper is free to use the boat's power to control speed and direction.

The approach to the dock should be at roughly a 45° angle, when possible. This approach angle allows the captain to bring the bow close to the dock, and then to use reverse, while turning the wheel toward the dock, to bring the boat to a safe, controlled stop.

Never approach a dock on plane. Even after reducing engine speed, the wake will push the boat uncontrollably into the dock.

9.7 After Operation

Refill the fuel tank and engine oil if it is a two-cycle engine. A full fuel tank is less subject to condensation and therefore, less fuel problems. If you will be leaving the boat for an extended period, use a good fuel stabilizer. Each engine manufacturer makes their own and proper use will avoid many fuel related and lay-up problems. Remember; always follow the manufacturer's recommendation.

If the boat is to be left in the water, make sure it is secure and free to properly accommodate any tide.

Turn off all electronics and leave the battery switches in the off position. Remember, the bilge pump will operate properly even with the battery switches turned off. On a comforting note, your EdgeWater 280CX is fully self-bailing and unsinkable. Proper precautions, however, are always prudent.

Check to make sure that the through hull drains are not obstructed by coolers or other equipment, or clogged with debris such as bottle caps and trash.

9.8 Trailering Your Boat



Note: If you have doubts or questions about your tow vehicle or towing, contact your dealer.



Before going on the highway, make sure your tow vehicle and trailer meet the local regulations for trailers and towing in your state.



Before leaving the driveway, make sure the lights on the trailer are operating properly. If necessary, get a second person to make sure of the operation.

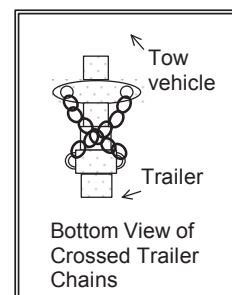


At least once a season, check and repair/replace the trailer wheel bearings.

The trailer should be adequately sized for your boat. Allow about 10% above the maximum boat weight for trailer capacity.

Make sure your vehicle is properly equipped to handle the load. This includes engine, hitch, frame, brakes, transmission cooler, and vehicle capacity.

Securely attached the boat trailer to the vehicle hitch, hook the safety chains and cross them under the hitch and check the lights to ensure they are



hooked up and working.

If you are new to trailering your boat, it is best to practice before actually getting in a situation where you are not sure of your ability. If possible use a trailer without a boat to practice with as you can see the trailer's movement without the boat. Also, your vision will not be impaired by the boat's presence.

Keep in mind that the trailer will turn sharper than your tow vehicle which means if you operate your tow vehicle normally, your trailer will be running off the road, over curbs or impacting rigid objects. Therefore, make your turns slightly wider than normal and glance at the position of your trailer through your mirrors to avoid damage and injury.

When backing, remember, the bottom of the steering wheel will move in the direction the trailer will ultimately go. Backing consists of two parts, breaking the trailer by turning the vehicle's backward motion in the opposite direction from the ultimate trailer direction, then following the trailer toward the correct direction with the tow vehicle. It is prudent to go to a large paved area with little traffic to practice these maneuvers before attempting them on the boat ramp.



Remember to check to see if the tow ball is the same size as the trailer coupler. Never use a different size.

9.9 Launching Your Boat

When you arrive at the ramp, prepare your boat before getting in the ramp line.

- Make sure the hull plug is in place.
- Place a line on the bow and stern cleats to be at the dock ready.
- Have fenders out and on the proper side.
- Raise the engine so it will not be damaged during launching.
- Make sure the battery switch is in one of the "on" positions, and the boat key is in the ignition.
- Remove any tie-down straps.
- If someone is with you, hand them the free end of the bow line and have them follow the trailer as you enter the ramp.
- Back the boat into the water until it barely floats.
- Lower the engine, pump the fuel bulb until firm and crank the engine.
- Let it idle for a few minutes to warm up before getting under way.
- Remove the winch line and back off the trailer.

9.10 Retrieving Your Boat

There are several ways to retrieve your boat. The method described herein requires two persons.

Drop someone off to back the trailer into the water, or do it yourself. If doing it yourself, makes sure you make it easy and safe to exit the boat after it is loaded onto the trailer.

Back the trailer into the water until the bunks are completely submerged, or until the middle roller is just touching the water. (This depth should provide enough to float the boat until the last minute and yet provide enough resistance from the trailer to stop the boat short of the winch stand.)

Drive the boat onto the middle of the trailer. This is assuming it is a trailer designed for drive on. Speed should not be over one or two knots. Fast enough to maintain steerage but slow enough to be easily controlled.

Once the boat has touched the trailer, a little forward throttle should secure the boat on the trailer and allow you to put the engine in neutral and have the winch line attached to the bow eye. The boat should now be easily winched onto the last several feet of the trailer.



When properly done, this method is easy, safe and will not harm boat ramps by powering away the soil from the base of the ramp.

10/Routine Maintenance

10.1 Exterior Hull and Deck

Fiberglass

When you remove the boat from the water, clean it as soon as possible. Dirt, debris and grime will come off easier while it is still wet. Use a brush and biodegradable boat cleanser. Stubborn areas may be cleaned with a non-abrasive cleaner. Harsh abrasives and chemical cleaners are not recommended as they can damage the gelcoat, shorten its life, and make it more susceptible to stains. When used in saltwater, the boat should be washed after each use. NOTE** Do not use any cleaners containing ammonia or with extremely high or low PH levels as this will affect the condition of gelcoat.

The hull should be waxed periodically, at least once a year, with a high quality wax. This will keep it shiny looking and help prevent chalking and aging. The wax will also make it easier to keep clean by closing the pores that trap the grime.



If the boat is to be kept in freshwater or saltwater for an extended period, a proper barrier coat and bottom paint must be applied to prevent possible Gel Coat blistering.



Do not wax non-skid areas. It could make them slippery and increase the possibility of injury.

Stainless Steel Hardware

The stainless steel hardware of your boat should be cleaned and washed after each boat use, especially in salt or polluted water. While it is “stainless” it is not “stain-proof”. If it is not cleaned, it can develop surface rust stains. It can be protected with a high quality automotive or boat wax. It can also be protected with a commercial metal cleaner and protectant such as Flitz®.

Anodized Aluminum

The aluminum can be maintained with a regular washing with soap and water and wiped with a rag containing a petroleum-based lubricant such as WD-40®. Otherwise it can develop a surface corrosion, which can penetrate the anodizing and attack the aluminum underneath. If badly scratched, it can be repaired with an aluminum or silver paint.

Chrome Hardware

Use a good metal polish and protect with wax. This should be done every couple of months or as soon as you notice any finish deterioration. Dupont® No.7 Chrome Polish works well.

Plexiglas®

Do not use products with ammonia on your Plexiglas® windscreen. It can mar the surface and reduce its transparency. A mild soap and water or non-ammonia cleaner will work well. In addition to ammonia, cleaners should not be used which contain solvents, acetone, or alcohol. Plexus® is recommended for proper treatment and protection of Plexiglas®.

Upholstery

Soap and water should be periodically used to clean the vinyl. Vinyl protector products can make the seats slippery, which may not be desirable. When cleaning the vinyl, be gentle. Do not use cleaners that contain ammonia, acetone, strong solvents, or powdered abrasive cleaners. They can damage and shorten the vinyl's life.

Sump Area

Your EdgeWater has a bilge area in the after part of the boat. This can be maintained well by periodically using a boat bilge cleaner. Follow the directions carefully.

Powder Coated Parts

Powder coating can be a very effective option to minimize corrosion to aluminum or stainless steel parts. Keep in mind however that powder coating requires waxing, applicants of water dispersant aerosols on fasteners and touchups to maintain its luster and protective qualities.

10.2 Engine

If you have a new engine with a built-in flushing device, the engine may be flushed without cranking. If the engine does not have a built-in flush device, one may be purchased to fit.

To flush the engine, after connecting a water hose to the proper connection, turn on the water. Put the engine control in the idle position and crank the engine. Only let it run a couple of minutes. The gear case is water-cooled and is not designed to run out of the water for extended periods.



Do not crank the engine without water running. Water acts as a coolant and also a lubricant for the water pump.



Do not rev the engine when flushing; idle speed is sufficient!

The exterior of the engines will respond well to a good quality wax. This should be re-applied every several months as the marine environment is a very harsh one and the constant sun exposure will deteriorate your motor's finish. Consult the engine manufacturer's owner's manual for specific instructions. In areas where there is a conflict between this manual and the engine manufacturer's manual, the engine owner's manual will take precedence.

11/ Exterior Equipment

11.1 Anchor Locker

The anchor roller on your new EdgeWater 280CX has been designed for a Danforth, plough, or claw-style anchor. Before using the anchor for an extended period or overnight, make sure the free end of the anchor line is attached to the boat's anchor tie-off cleat, which is located inside of the locker.



Remember, your anchor line should be a minimum of 7 times the depth in which you routinely operate.



Your EdgeWater 280CX should have a minimum of 150 to 200 feet of ½" three strand nylon line. If you routinely venture offshore, remember the 7 times depth rule. This may sound like a lot but if your engine fails in 100 feet of water, maintaining your position will be very important to being recovered.

11.2 Swim Ladder

Your EdgeWater 280CX is equipped with a fold down ladder as standard equipment and there are several important things to remember for safe use and operation of this useful option.

- Always shut down the engine if persons will be using the ladder. Do not just settle for the engine being in neutral.
- Make sure the folding ladder portion has been properly stowed before getting underway.

11.3 Trim Tabs

The trim tabs on your EdgeWater 280CX can assist the captain in maintaining trim and level running attitude. When used in conjunction with the engine trim, a great deal of flexibility is available to the operator. On the EdgeWater hull, the tabs are most useful to affect lateral trim. The best results for lateral trim are usually achieved by using only one tab. For example, if the boat is loaded heavier to the port side, lowering the port trim tab will elevate that side and assist the boat in running trim and level. This is important for seaworthiness and fuel consumption. A hull is usually more efficient when running level and with the bow 3° to 5° above level. Tabs can also be useful when running into a heavy wind that is blowing from the side. If the boat tends to turn into the side blowing wind, elevating the tab on the windward side will elevate that side and assist the boat in running level.

12/Seasonal Maintenance

12.1 Engine

Refer to your engine manual for any specific information pertaining to your engine. For the fuel system, add a fuel stabilizer to a full fuel tank as per the stabilizer's instructions. Run the engine for a minimum of 10 minutes to allow the fuel stabilizer to reach the engine.

- Remove the engine cowl and spray the engine's powerhead with a non-conductive lubricant spray. Do not spray directly on joints that are lubricated with grease as some lubricant sprays may dissolve grease.
- Grease all external zert fittings on the engine and steering system. Use grease that is consistent with engine manufacturer's recommendations.
- Change the engine lower unit lubricant. This will remove contaminants that may have built up throughout the boating season. This is also a good time to check for lower unit seal problems. If there is a leak, have it repaired by your dealer.
- Remove the propeller and grease the propeller shaft. Inspect the shaft and propeller for unusual wear or signs of deterioration.
- Remove the hull plug so the sump area can breathe.

12.2 Hull

Wax the entire boat. The hull will maintain its factory delivered luster much longer if waxed at least once a season. The inside of the boat, which is subject to the sun's direct rays, will also respond well to a good coat of marine wax.



DO NOT wax the non-skid surfaces.

12.3 Storage

It is best to store the boat inside, however if inside storage is not available, use the following guidelines in order of preference

Under awning with no boat cover

Outside under cover: Boat cover should allow ample ventilation and be removed periodically to allow moisture to dissipate avoiding mildew growth and staining.

12.4 Trailer

Check the wheel bearings for water. Clean and re-pack or replace as necessary.

Check the tires for proper inflation.

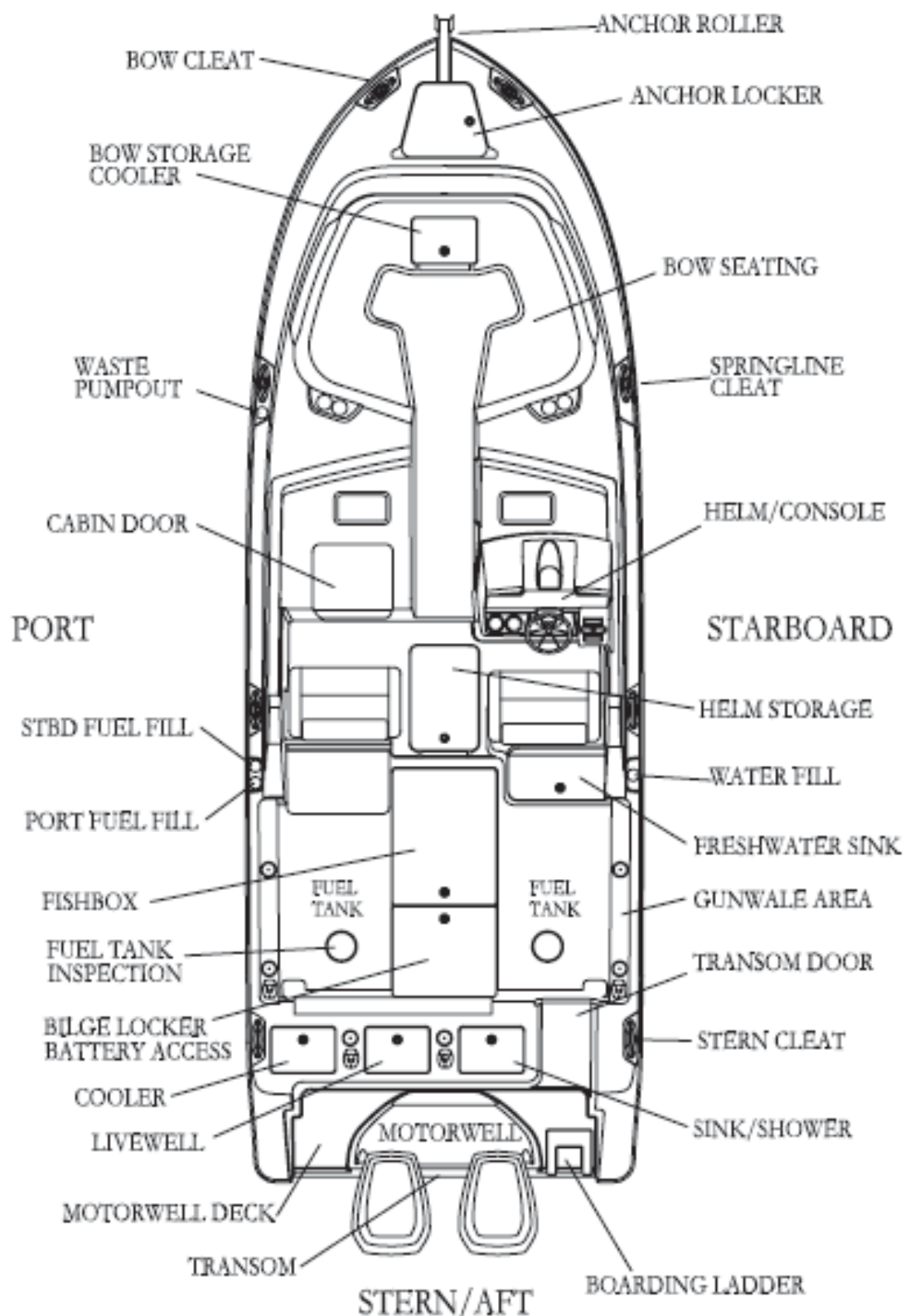
Try to store the boat and trailer with the bow slightly elevated so it will drain.

If possible, cover the boat so that the sun will not deteriorate and tree sap and other environmental hazards will not damage the deck or upholstery. If covered, make sure to let air circulate so mildew will not build up. If in a high snow or rain area, make sure to properly support the cover to sustain and shed the load.

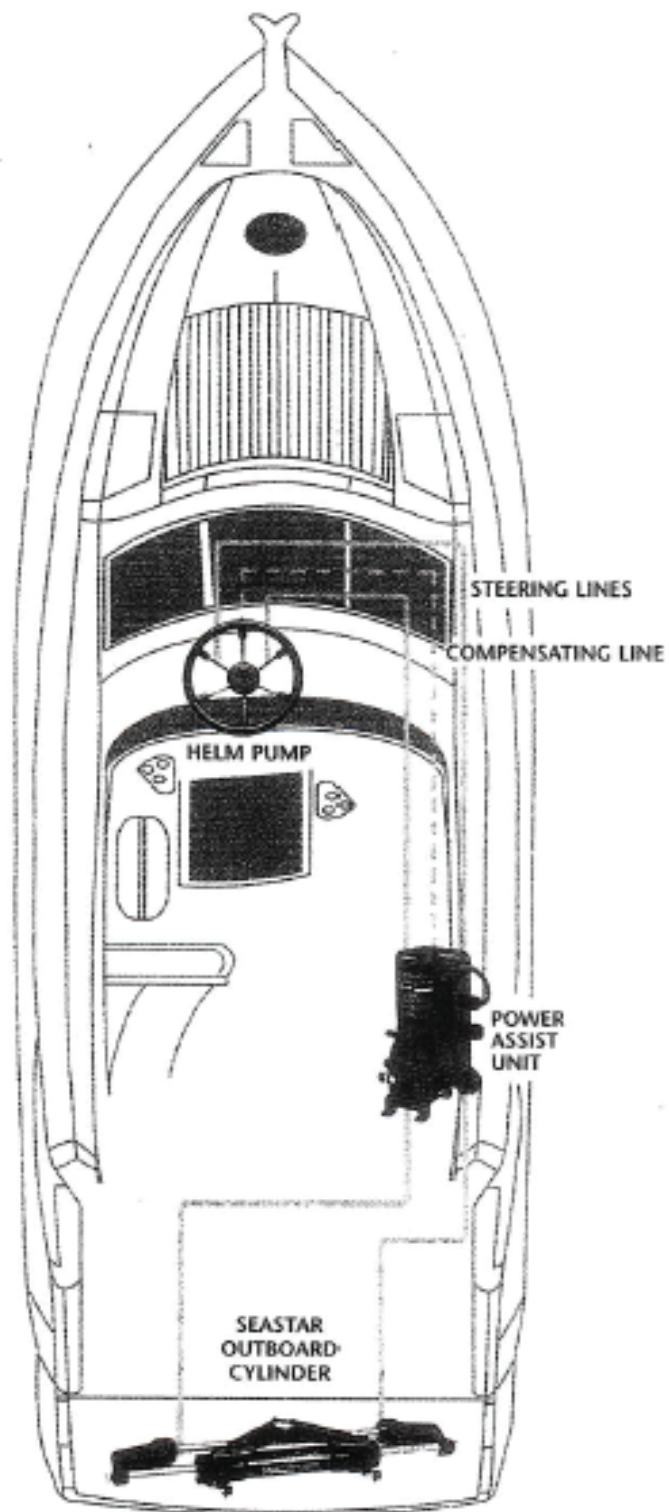
Appendix 280CX

280CX CHART OF BOAT TERMS

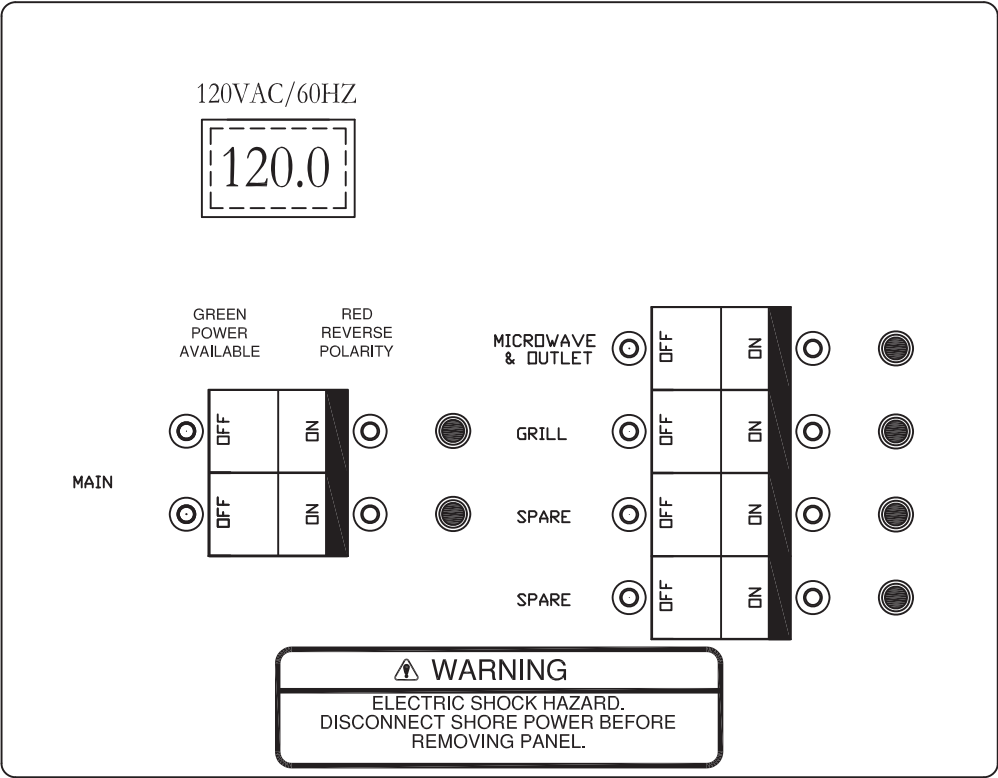
BOW/FWD



**TYPICAL POWER ASSIST APPLICATION
IN AN OUTBOARD BOAT**



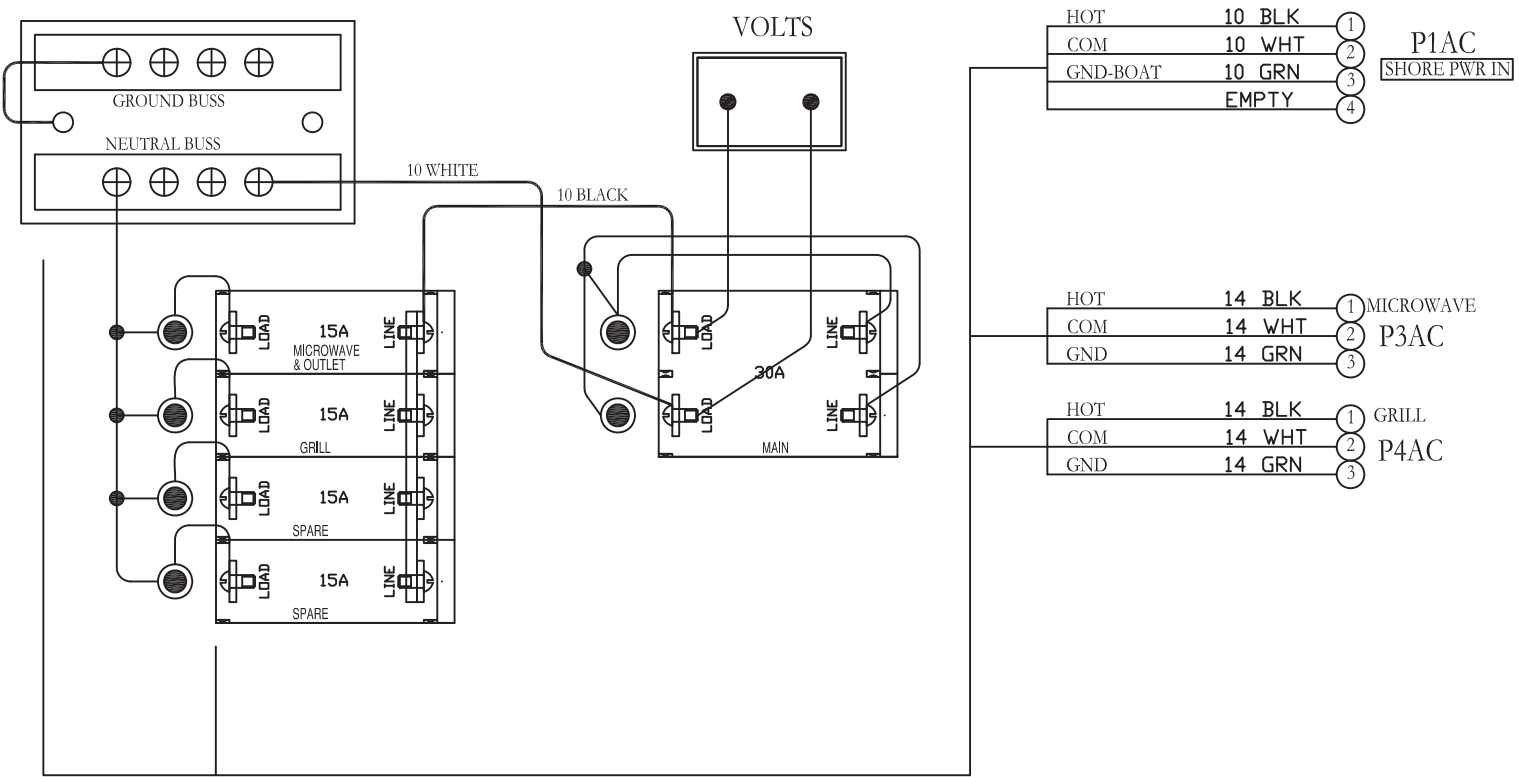
OPTIONAL AC PANEL



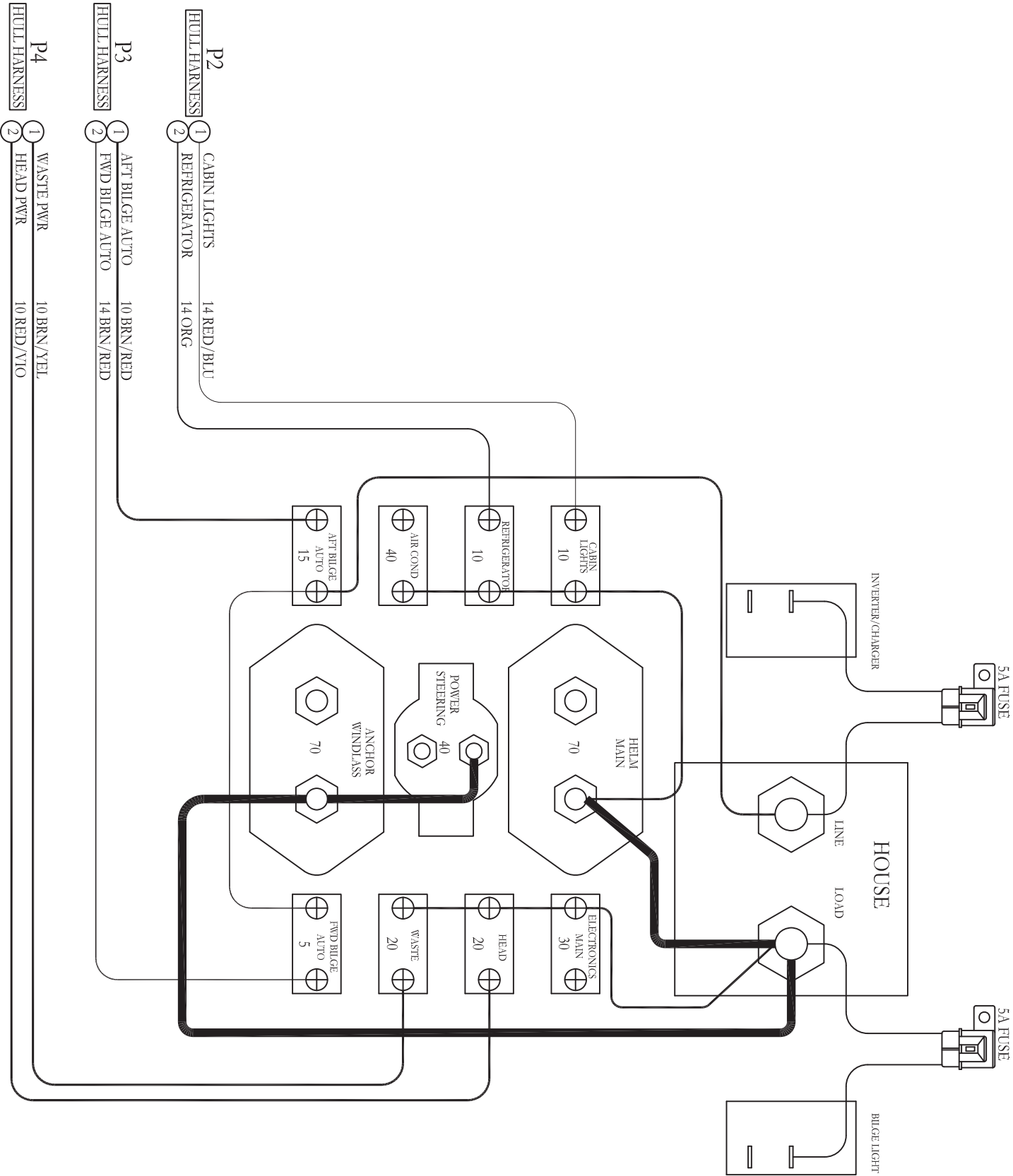
MAIN

⚠ WARNING

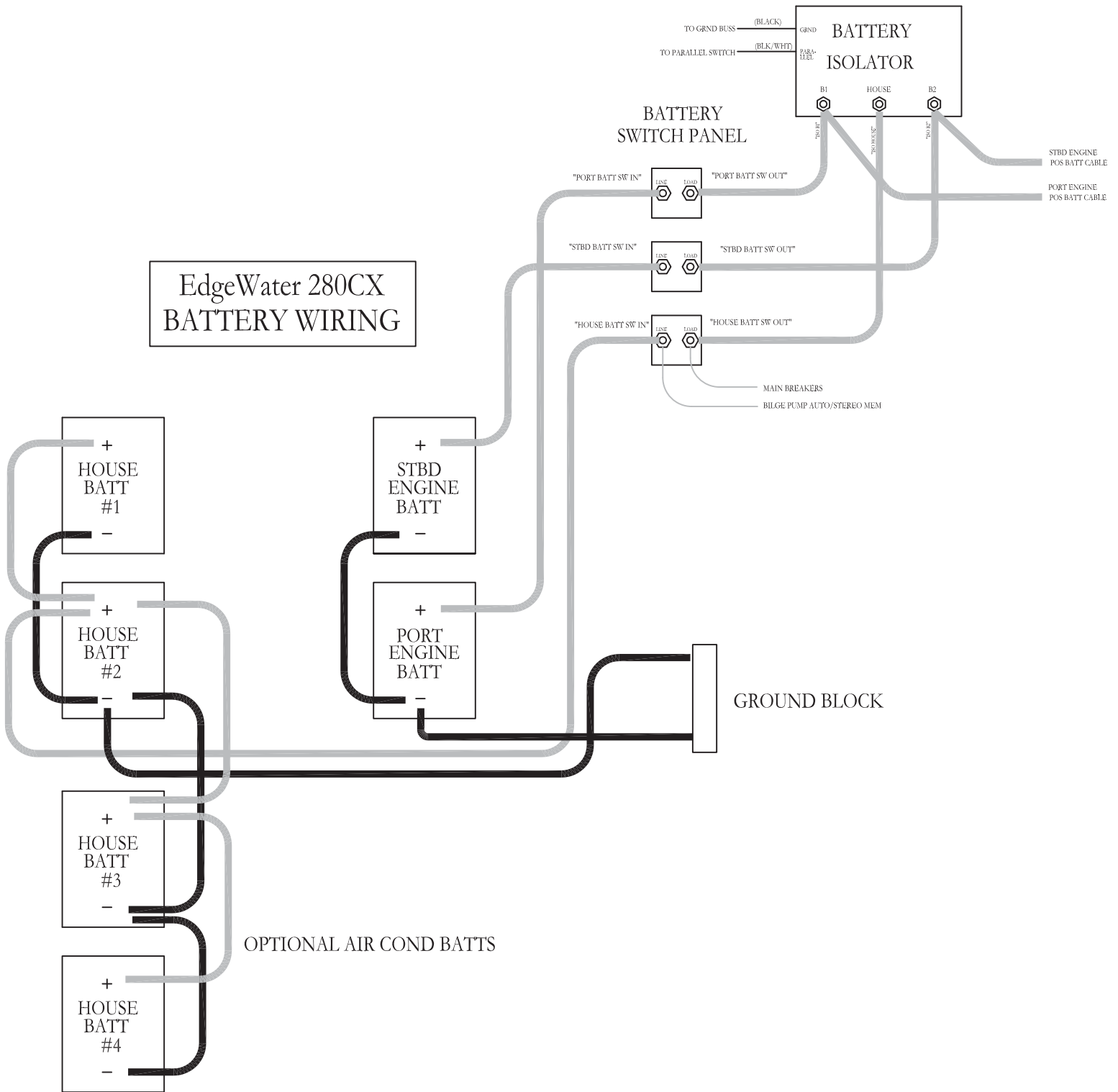
ELECTRIC SHOCK HAZARD.
DISCONNECT SHORE POWER BEFORE
REMOVING PANEL.



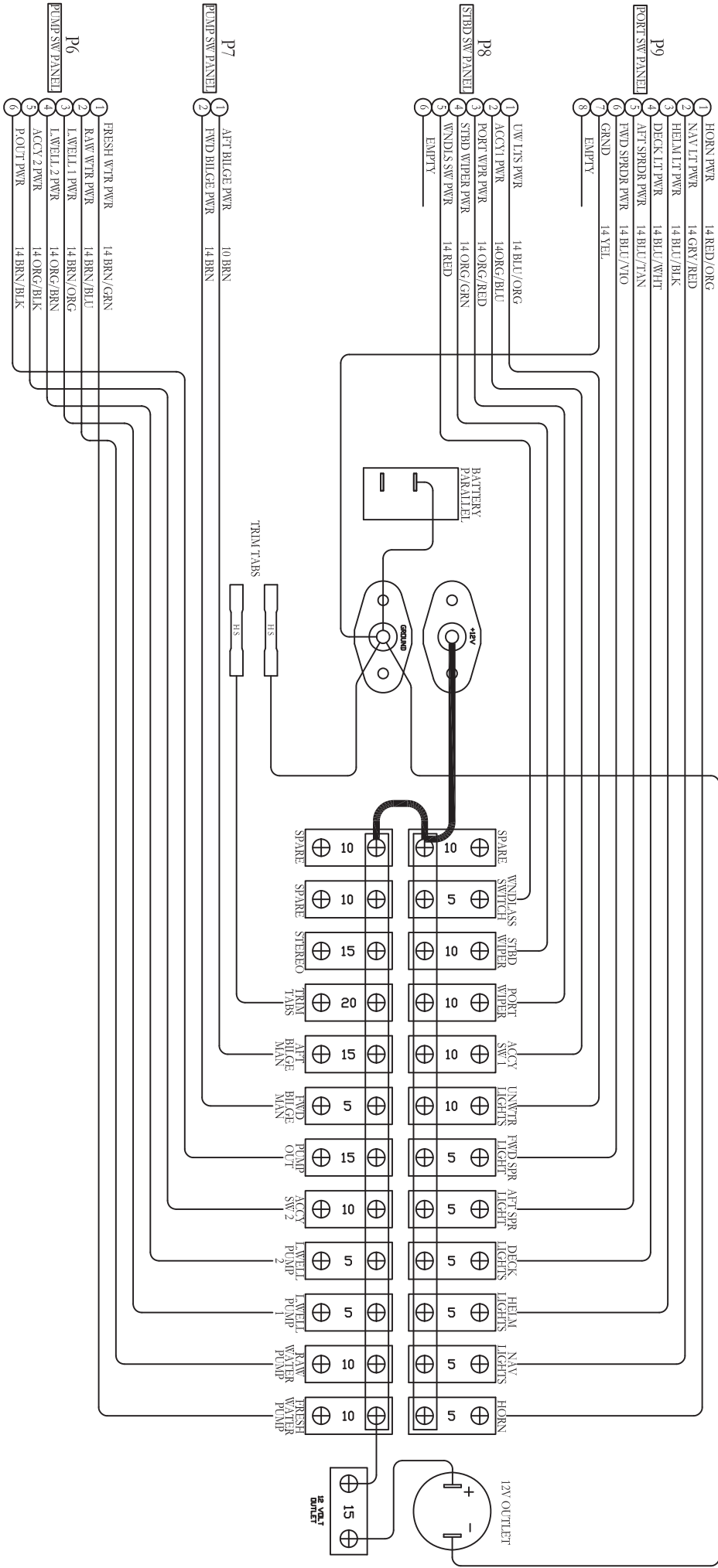
BATTERY SWITCH MAIN PANEL



EdgeWater 280CX
BATTERY WIRING



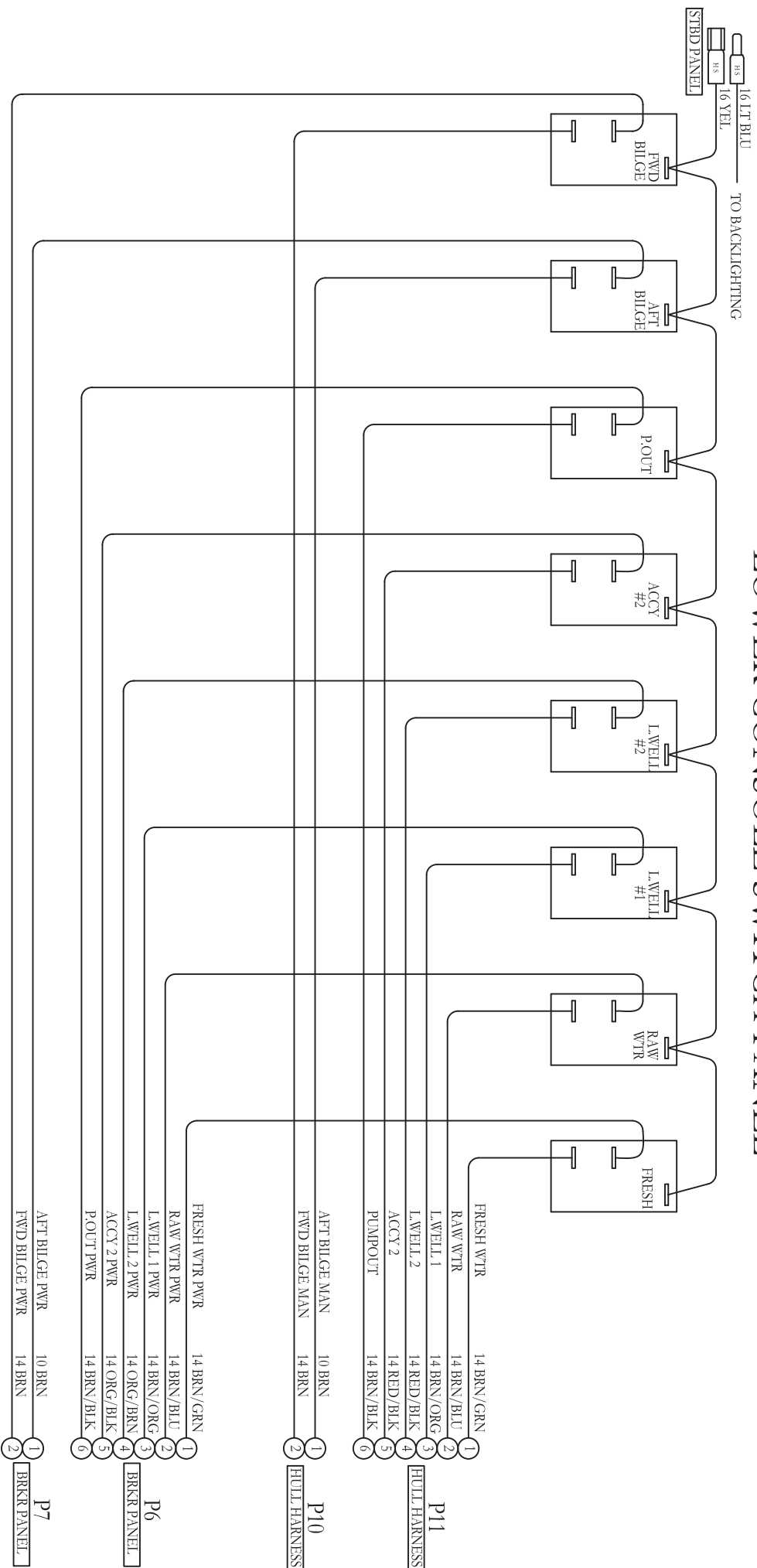
CONSOLE BREAKER PANEL



TAB CONT	DRG
	TRIM TAB RETRACT
PED/WHT	

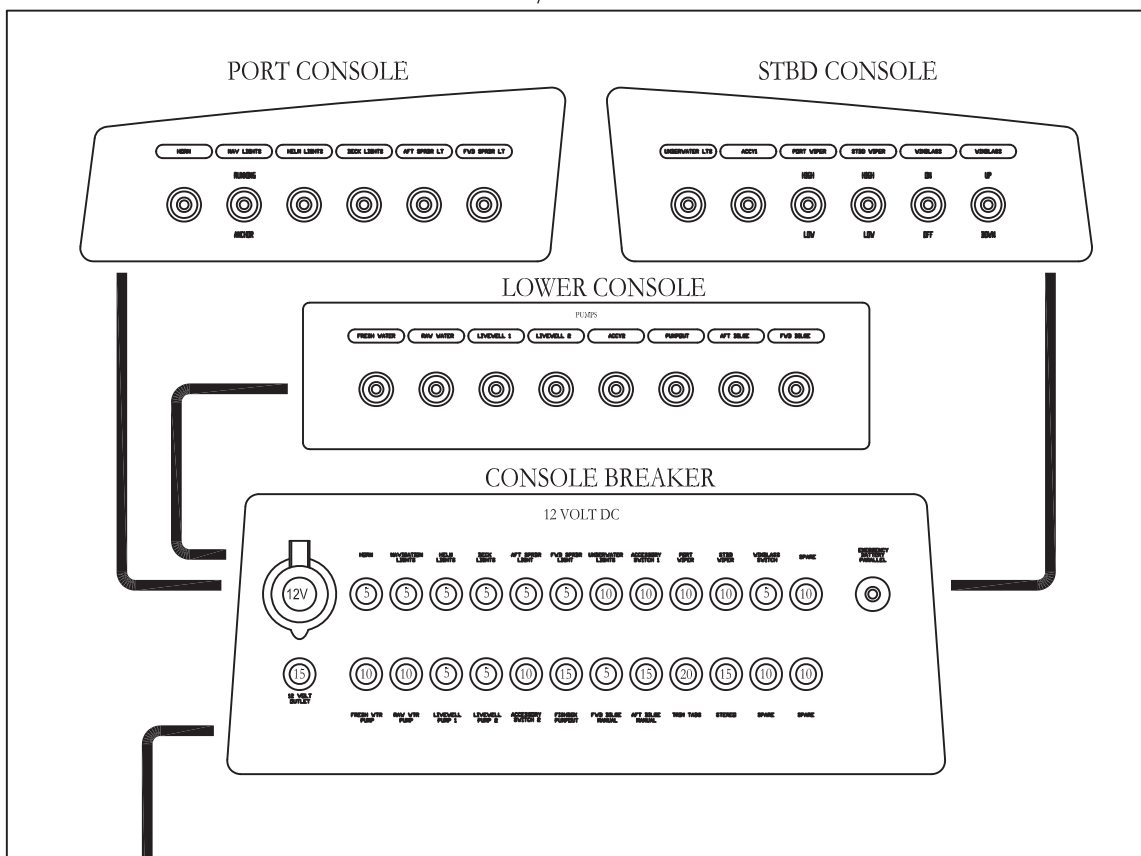


LOWER CONSOLE SWITCH PANEL

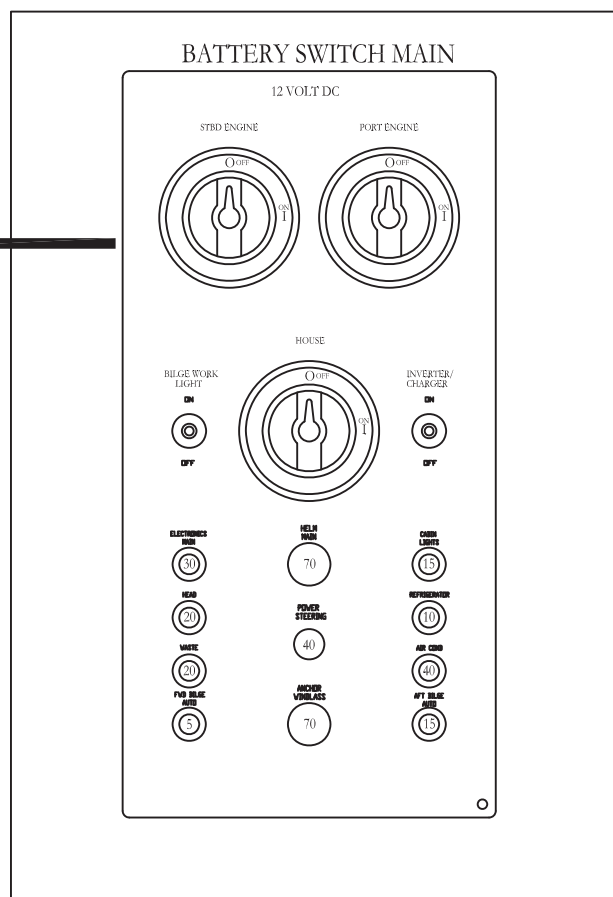


12 VOLT DC PANEL LAYOUT

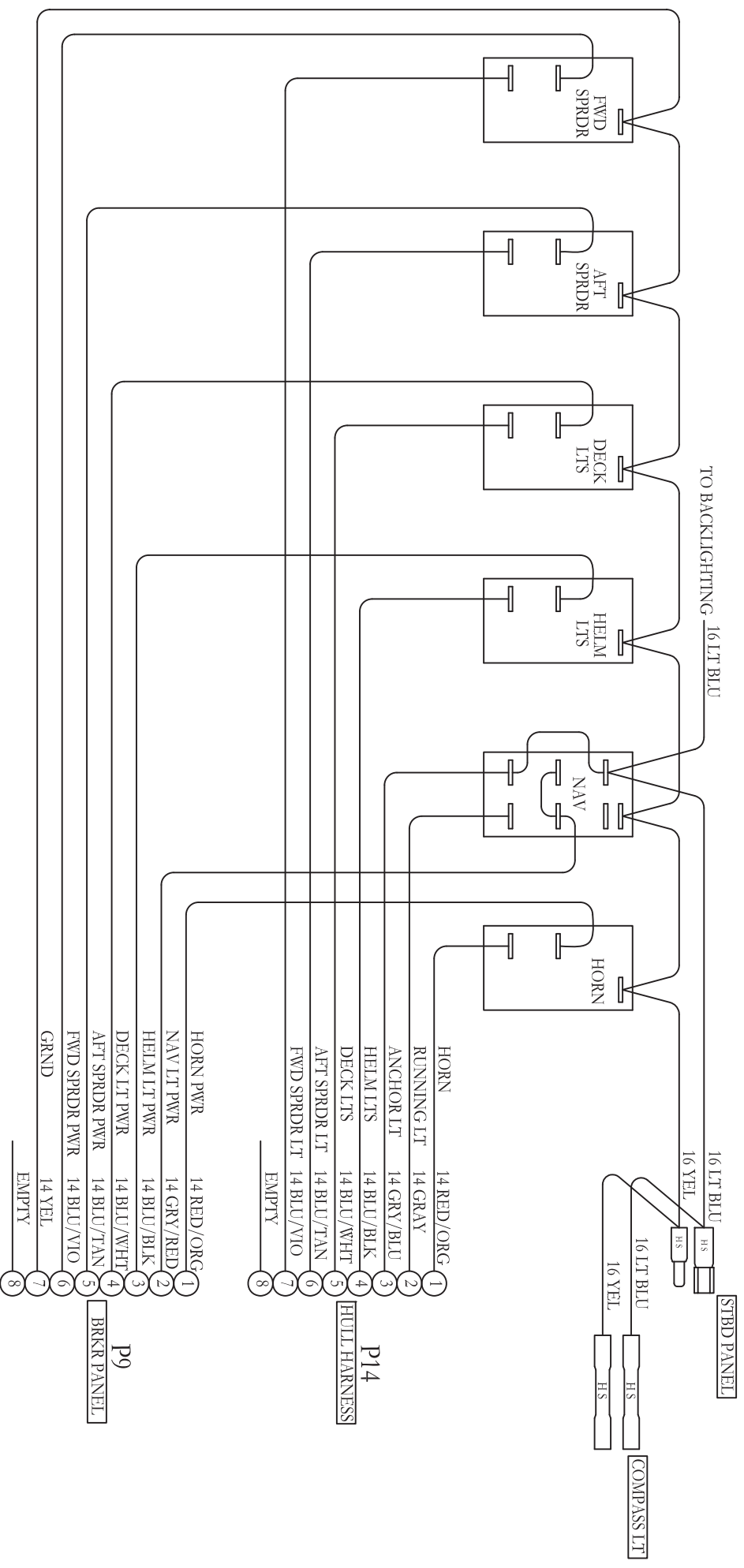
HELM/CONSOLE



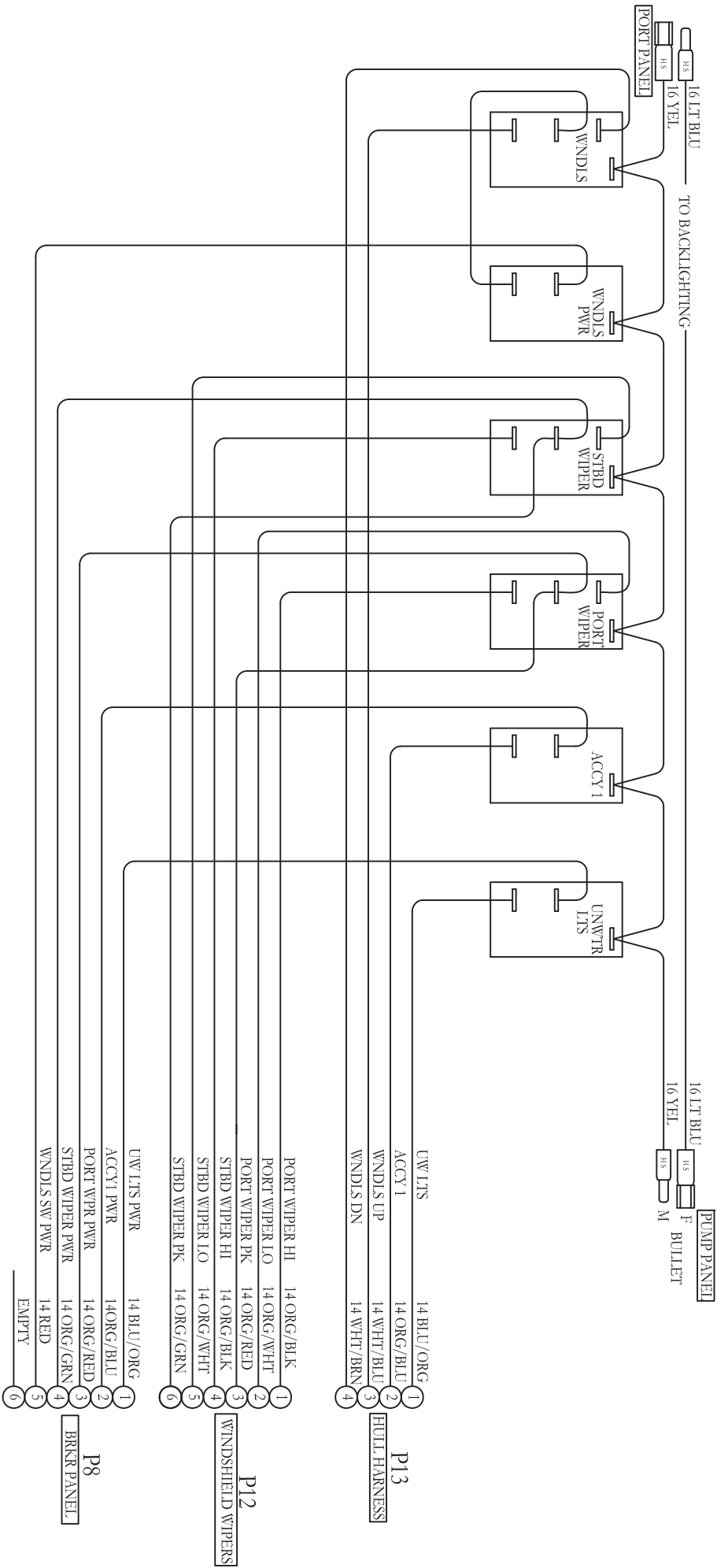
TRANSOM DOOR



PORT CONSOLE SWITCH PANEL



STARBOARD CONSOLE SWITCH PANEL



HYDRAULIC STEERING SELECTION GUIDE 2008



Boating safety is everyone's responsibility.

As a boater, you are responsible for having all required safety equipment, for operating your boat safely and for ensuring the safety of those on board your vessel as well as those sharing the waterways. Boaters exercising courtesy and common sense will not create a hazard, threat, stress or an irritant to themselves, to others, to the environment, or to wildlife.

1. Wear an approved Personal Flotation Device (PFD)
2. **Read your owner's manual.**
3. Attach engine stop switch securely to your body or PFD.
4. Respect the speed limits and other boating restrictions.
5. Be cautious and courteous.
6. Navigate with care.
7. Understand the behaviour characteristics of your vessel that might result from unexpected manoeuvres, such as sudden deceleration, high-speed obstacle avoidance, and other speed related issues.
8. It is good boating practice to rinse down your boat and exposed steering equipment with clean, fresh water after each use.
DO NOT use corrosive materials on SeaStar products.

Become informed and stay informed!

"Take an accredited boating safety course"

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.

NOTICE

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

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BayStar and SeaStar Hydraulic Steering Systems

The BayStar Hydraulic Steering System is designed to add safety, reliability and comfort to single station outboard powered boats to a maximum 150HP (Total). The SeaStar Hydraulic Steering System is designed to provide that extra margin of muscle when needed. The SeaStar system easily handles Outboards, Sterndrive and Inboard boats.

System selection, installation and service is substantially simplified with just three major components — helm, cylinder and tube or hose. SeaStar has a comprehensive range of available cylinders to handle the variety of Outboard, Sterndrive and Inboard steering applications. These are suitable for both pleasure and commercial applications. Extra steering stations and/or autopilots are easily added.

SeaStar hydraulic steering is a total commitment to quality, performance and simplicity.

BayStar & SeaStar, the hydraulic steering systems that are;

Easy to install...

- Only three components: helm, cylinder & tube or hose
- Compact and attractive helm design
- Variety of helm mounting configurations
- Simple tube/hose fitting connections
- Clear, complete installation instructions

Easy to fill and purge...

- Engineered bleed fittings on the cylinders
- A helm and lock valve design that enhances air removal
- A no-mess filler device
- A filling and purging time of normally less than 30 minutes
- Easy to check for proper installation
- Easy purging check via filler device
- No searching for difficult-to-find air leaks

Easy to turn...

- Anti-friction piston points

Designed to provide many years of service...

- Precision built
- Heavy-duty bearings instead of bushings
- No corrosive materials exposed to marine environment
- Field replaceable helm and cylinder shaft seals
- A no-hassle warranty — 2 years for pleasure use
— 1 year for commercial use (SeaStar)

BayStar and SeaStar! Simply the best!

Teleflex Hydraulic Steering

Our manual hydraulic steering systems are simple and efficient. The basic system consists of three main components;

1) the helm pump, 2) the cylinder, and 3) the hose or tubing required to connect the cylinder to the helm pump.

These basic components are necessary in all applications. However as the system variables increase (ie: multiple engines, rudders, steering stations and autopilots), additional components may be required.

1. The Helm Unit.

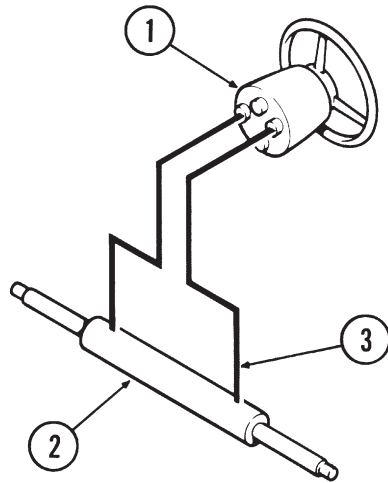
The helm pump is an axial piston pump specifically designed for manual steering. It has a built-in lock valve to prevent the steering load from feeding back to the driver. The lock valve will not allow the rudder or drive unit to move until you move it with the steering wheel. The lock valve section of the helm also includes a relief valve. This relief valve provides over-pressure protection for mechanical components and hydraulic hoses and fittings.

2. The Cylinder.

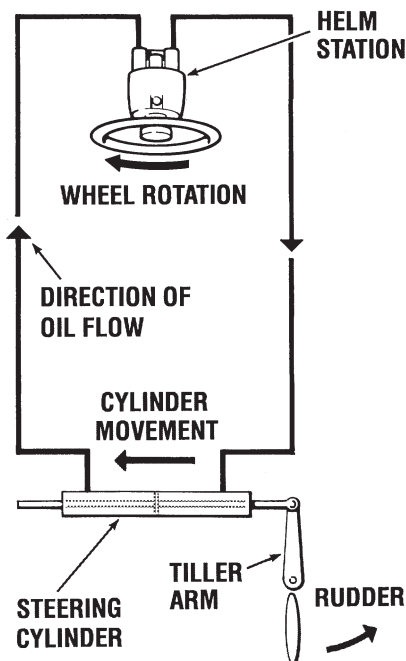
The most important differences between the variety of steering systems available is the cylinder selection. Both BayStar and SeaStar systems have a cylinder for most steering applications.

3. Hoses and Tubes.

Required to provide a path for the fluid to flow under pressure from the helm pump to the cylinder.



The System: How it works



The system is a two-line system. This makes operation very simple.

- 1) The steering wheel, which is attached to the helm pump, is rotated in the desired direction (ie: a turn to starboard or clockwise rotation).
- 2) Oil is pumped out the corresponding port from the rear of the helm into the starboard line and then into the cylinder.
- 3) This causes the cylinder rod, which is attached to the vessels rudder or drive unit, to move (ie: rod moves to port) thus causing the vessel to alter course.
- 4) Oil displaced from the opposite end (ie: the port end) of the cylinder flows (ie: into the port line) back to the helm pump.
- 5) For steering in the opposite direction, simply turn the helm the other way.
- 6) When no course corrections are required, the integral lock valve holds the rudder or drive unit stationary.

Selecting the System

The objective is to match the steering system to the requirements of the vessel. This depends on four things;

- 1) hull type (ie: planing or displacement),
- 2) type of propulsion system in the vessel (ie: inboard, outboard, sterndrive, etc.),
- 3) the number of engines or rudders,
- 4) the total power of the engines (ie: Horsepower).

Once the system and cylinder has been selected, the size of the helm pump is pre-determined. SeaStar systems also allow the following options to be specified;

- 1) the number of steering stations,
- 2) helm configuration (ie: standard or tilt helm),
- 3) additional features such as autopilots.

Notes on Steering Response versus Steering effort

Steering wheel effort is directly proportional to the number of wheel turns lock to lock.

The number of wheel turns lock to lock is dependent on three things;

- 1) the volume of the cylinder,
- 2) the displacement of the helm pump,
- 3) the allowable movement of the rudder or drive unit.

Less wheel turns lock to lock results in more steering effort. More wheel turns lock to lock results in less steering effort. However, additional factors that can influence steering effort are;

- 1) vessel speed,
- 2) rudder size,
- 3) unusual propeller selections,
- 4) hull type (ie: displacement, planing, etc.), and
- 5) improperly aligned counter balance skeg.

System Selection Worksheet

How can we help?

We have provided the following check list to assist you in choosing your Hydraulic Steering System. We invite you to make notes on this page as required.

☒ as appropriate.

- ☐ **OUTBOARD—Single up to 150HP UNDER 55mph**
 - ☐ Most economical system to meet my steering needsPage 1-1
 - ☐ Economical to meet my needs, PLUS less effort at the steering wheel than above.....Page 3-1, 3-9
 - ☐ Power Assist – 'Automotive' Style, Feel and ComfortPage 2-1, 3-1, 3-9
- ☐ **OUTBOARD—Multiple up to 150HP combined total**
 - ☐ Most economical system to meet my steering needsPage 1-1
 - ☐ Economical to meet my needs, PLUS less effort at the steering wheel than above.....Page 3-1, 3-9
 - ☐ Power Assist – 'Automotive' Style, Feel and ComfortPage 2-1, 3-1, 3-9
- ☐ **OUTBOARD—Single 150HP – 350HP UNDER 65mph**
 - ☐ Most economical system to meet my steering needsPage 3-1, 3-2
 - ☐ Power Assist – 'Automotive' Style, Feel and ComfortPage 2-1, 3-1, 3-2
- ☐ **OUTBOARD—Single 150HP – 350HP OVER 65mph**
 - ☐ Most economical system to meet basic steering needsPage 3-1, 3-9
 - ☐ Recommended for Steering Comfort and 'Automotive' Style and Feel.....Page 2-1, 3-1, 3-9
- ☐ **OUTBOARD—Multiple over 150HP
(including Catamaran and Liquid Tiebars)**
 - ☐ Most economical system to meet basic steering needsPage 3-1, 3-2
 - ☐ Recommended for Steering Comfort and 'Automotive' Style and Feel.....Page 2-1, 3-1, 3-2
- ☐ **STERNDRIVE—Single and Twin**
 - ☐ Most economical system to meet my steering needsPage 4-1
 - ☐ Power Assist – 'Automotive' Style, Feel and ComfortPage 2-1, 4-1
- ☐ **INBOARD—Single and Twin**
 - ☐ Most economical system to meet my steering needsPage 5-1
 - ☐ Power Assist – 'Automotive' Style, Feel and ComfortPage 2-1, 5-1
 - ☐ Power Steering SystemPage 7-1

My Steering Components

Helm Model #..... Cylinder Model #.....
Hose/Tube Other
Autopilot Equipped ☐ Yes ☐ No Date Purchased.....
Boat: Make..... Model Length
Engine: Make..... H.P. Quantity

OUTBOARD STEERING

BayStar™ hydraulic steering is brought to you by the manufacturers of SeaStar®, the most trusted name in pleasure boat steering. BayStar allows you to install all of the safety, reliability and comfort of hydraulic steering onto your boats rated up to **MAX. 150HP (Total)**. Combine this with the superior Teleflex Canada Limited Partnership design team, rigid ISO quality control and teamed with the finest materials and precision manufacturing—BayStar continues the tradition bringing comfort and safety to boating.

The BayStar steering system consists of a super low friction helm for smooth comfortable steering, a balanced cylinder—featuring a compact design that fits most splashwells. For your convenience two lengths of 20' cut to fit tubing are supplied (2 x 20' length), two bottles of hydraulic steering fluid, and one fill tube for easy fill and purge.

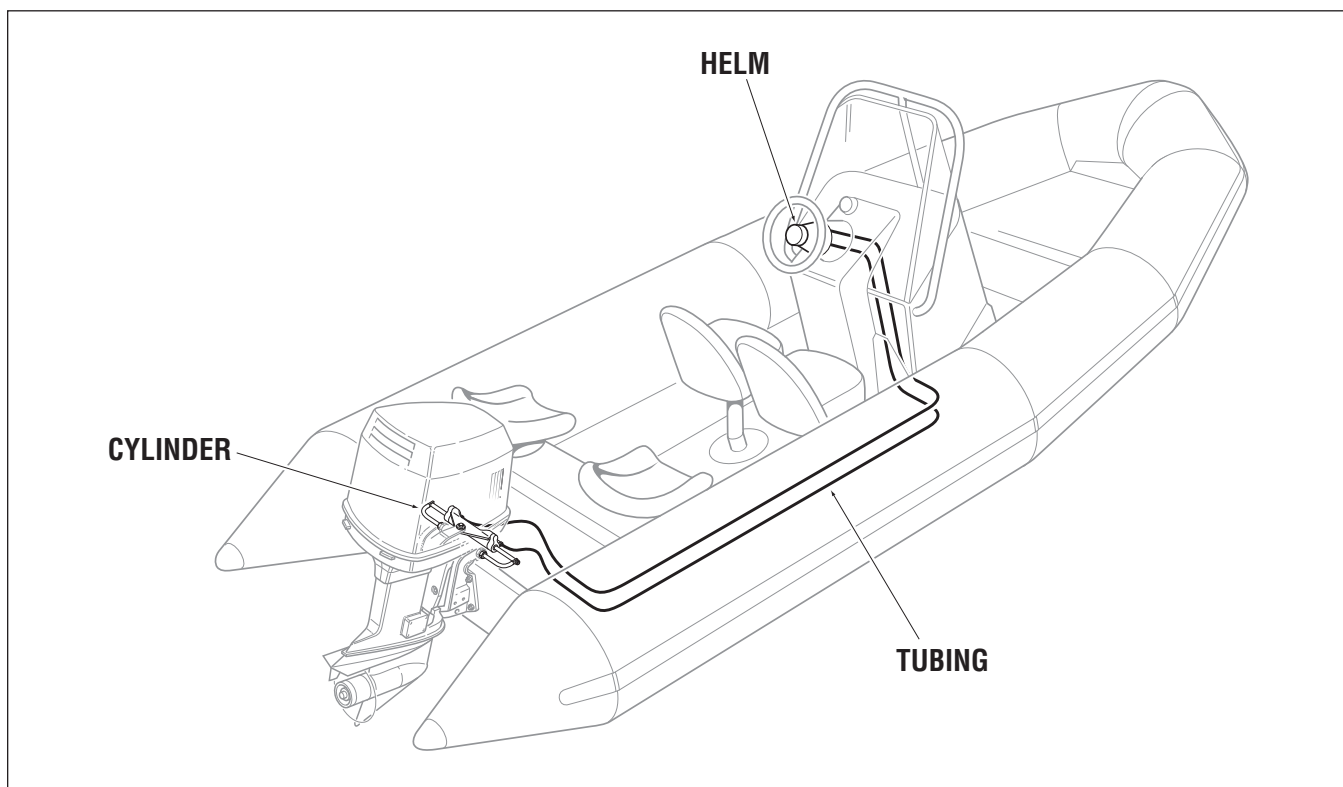
⚠ CAUTION

BayStar is ONLY applicable for single station steering.

DO NOT use BayStar on smaller HP outboard engines that use wing nut type transom mount clamping screws.

NOTICE

Tilt Helm HH4315 is available separately. Currently not available in kit form.

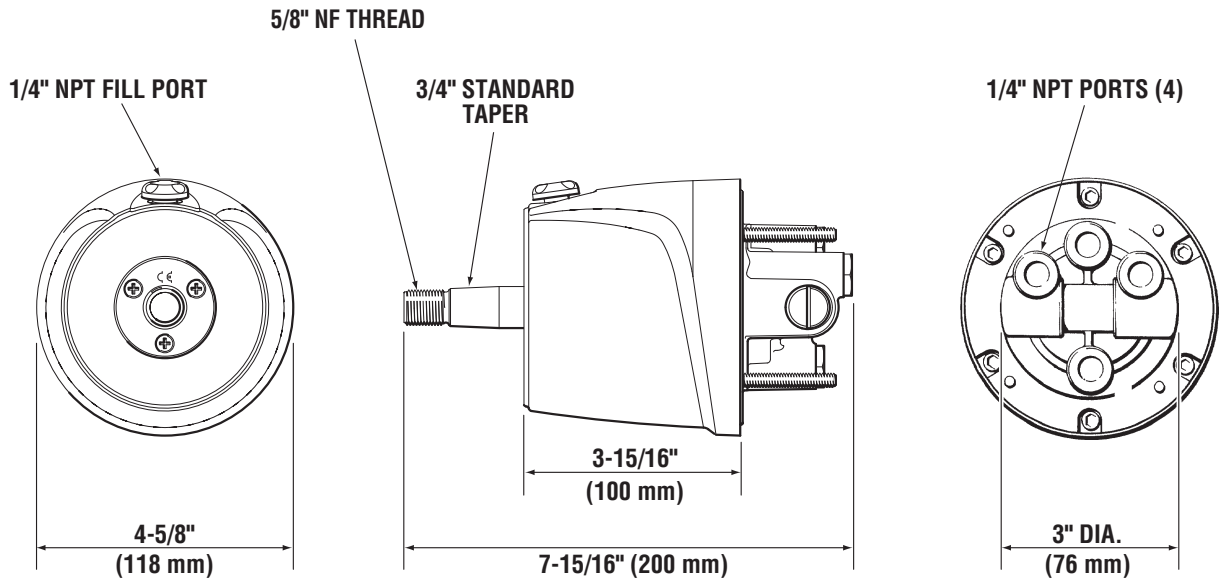


Typical BayStar Installation

Three easy steps to select your BayStar System:

- 1) Check helm dimension. Both the Standard and Tilt helms require a 3" (76mm) cut-out hole in the dash.

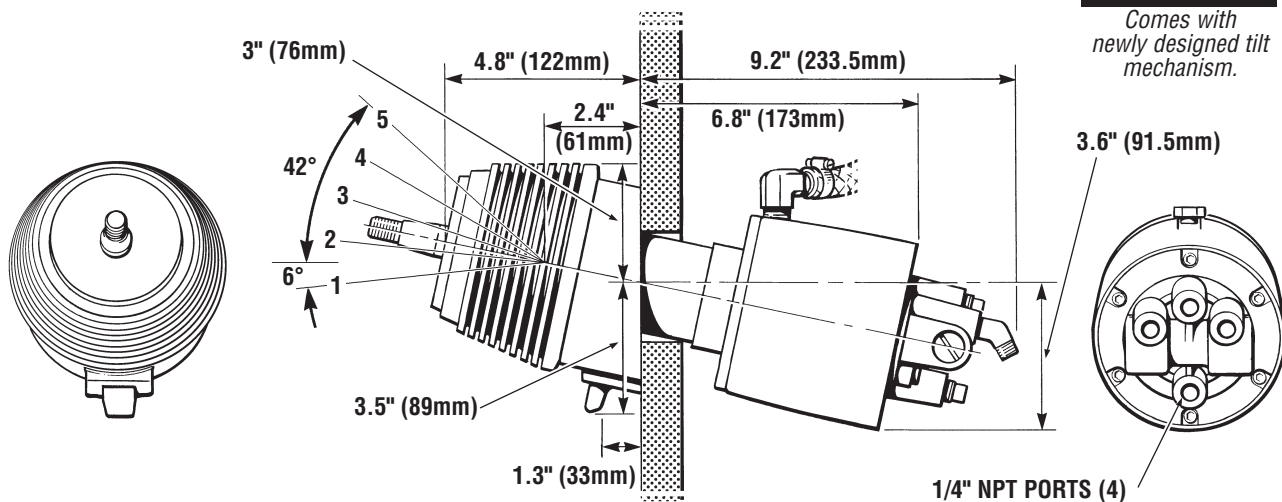
STANDARD HELM PART# HH4314



TILT HELM PART# HH4315

NOTICE

Comes with newly designed tilt mechanism.

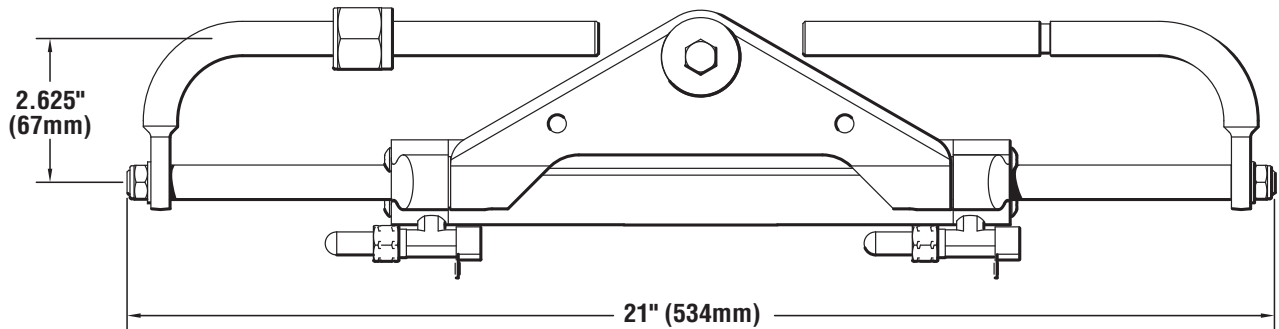


- 2) Check the BayStar cylinder dimensions through the full trim/tilt range of the engine.

IS THE SPLASHWELL WIDE ENOUGH?

The HC4645H/47H/48H /58H require a 21" (534mm) Splashwell width.

BAYSTAR CYLINDER PART# HC4645H/47H/48/H58H



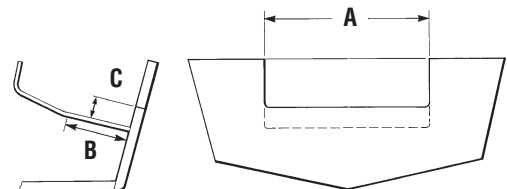
- 3) Is there enough room in the splashwell for full engine tilt? Find the dimensions (A, B & C) of your splashwell. Check them against the minimum splashwell dimensions for full engine tilt for your engine and cylinder.

MOTOR WELL DIMENSIONS required for BayStar front mount outboard steering systems

CYLINDER MODEL NO.	# OF ENGINES	A	B	C	MIN. ENGINE CENTER DISTANCE
HC4645H/47H/48H/58H	1	21" (534mm)	6" (153mm)	5" (127mm)	N/A
	2	Twin engine applications not available at this time			

NOTES:

- i) Ensure there is no interference between the BayStar cylinder rod and the splashwell boot or engine controls & cables.
- ii) Dimensional restrictions also apply to external motor mount brackets.
- iii) Ensure dimension 'A' maintained through full trim/tilt range.
- iv) Maximum transom thickness 3" (76mm).
- v) **Engines less than 70HP may require up to an additional 1" (25mm) of splashwell clearance.**



BayStar Steering Kits PID# HK4200A, HK4230A



NOTICE

HC4645H compact cylinder is included in both BayStar Steering Kits. If your engine requires the use of a cylinder other than HC4645H or HC4658H (refer to application guide on page 1-5) then purchase of a replacement Pivot Plate (noted on page 1-5) will be required.

BayStar Steering kits come complete with everything needed for an install, (some engines require spacer kits and/or cylinder plate change, see application chart on *page 1-5*) the compact cylinder does not require the engine manufacturer drag link for connection. For your convenience two lengths of 20' cut to fit tubing are supplied with the HK4200A and two lengths of 30' cut to fit tubing are supplied with the HK4230A kit.

BayStar Steering Kit (HK4200A)

Includes:

- 1 x BayStar helm pump (HH4314)
- 1 x BayStar Cylinder (HC4645H)
- 1 x BayStar Tubing kit (HT4420H, comes with two 20' hoses)
- 2 x Hydraulic Steering Fluid (HA5430)
- 1 x Filler Kit (HA5438)

BayStar Steering Kit (HK4230A)

includes:

- 1 x BayStar helm pump (HH4314)
- 1 x BayStar Cylinder (HC4645H)
- 1 x BayStar Tubing kit (HT4430H, comes with two 30' hoses)
- 2 x Hydraulic Steering Fluid (HA5430)
- 1 x Filler Kit (HA5438)

NOTICE

HC4600 and HC4600H are no longer being made by Teleflex Canada, all seal kits and spare parts will be made available. If purchase of a new HC4600 or HC4600H is required, please purchase BayStar Compact Cylinder part# HC4645H/47H/48H/58H as per the application chart on page 1-5. If the cylinder that you are replacing does not include the letter H after the part number, you will need to reuse the fittings out of your old cylinder and/or purchase fitting kit # HF4201 (includes 2 of the old style bleed fittings).

BayStar Outboard Compact Application Guide

(BayStar Compact Cylinders HC4645/47/48/58)

BayStar™

OUTBOARD—FRONT MOUNT

MFG	YEAR	MODEL	CYLINDER	NOTES
FORCE	1985–DATE	90–150 HP	HC4645H	
HONDA	1992–DATE	30–90 HP	HC4645H	
	1998–DATE	115–130 HP	HC4647H	
	2001–DATE	150 HP	HC4645H	
	2003–DATE	BF135 HP	HC4645H	
JOHNSON/ EVINRUDE	1977–1989	65–150 HP	HC4648H	
	1991–DATE	40–150 HP	HC4645H	
NOTICE Johnson 115 HP 2-stroke engines, required the pivot plate to be flipped. See note #4 below	1997–DATE	115 HP FICHT	HC4658H	4
	1997–DATE	75–150 HP FICHT	HC4645H	
	1998–DATE	40–140 HP 4-Stroke	HC4658H	1, 4
MERCURY/ MARINER	1984–DATE	75–150 HP	HC4645H	
NISSAN	1990–DATE	120–140 HP	HC4645H	
SUZUKI	1986–DATE	150 HP	HC4645H	
	1996 ONLY	115–140 HP	N/A	
	1987–2002	115–140 HP	HC4645H	1
	1990–2000	90–100 HP	HC4645H	
	1998–DATE	40–70 4-Stroke	HC4645H	1
	2001–DATE	115–140 HP 4-Stroke	HC4658H	1, 4
TOHATSU	1990–DATE	140–140 HP	HC4645H	
YAMAHA	1998–DATE	40–50 HP	HC4645H	2
	1998–DATE	60 HP	HC4645H	3
	1986–DATE	70–90 HP	HC4645H	1
	1997–DATE	80–150 HP 4-Stroke	HC4645H	
	2000–DATE	25–60 HP 4-Stroke	HC4648H	1
YANMAR	1990–DATE	27–36 HP	HC4645H	

1. Requires Spacer kit part # HO5090

2. Engine clamp brackets must be cut or ground, and the engine through bolted onto the transom, or interference will occur, restricting engine trim and tilt.

3. Steering hook Yamaha Part # 63D-48511-00-4D must be installed

4. Cylinder HC4645 may be used in these applications. The pivot plate will need to be flipped before installation. Instructions provided with Owner's Manual.

The above engine applications are current through the revision date shown. For up-to-date engine applications go to: www.seastarsteering.com

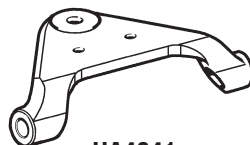
REVISION DATE: MAR. 10TH 2006

NOTICE

HC4645H compact cylinder is included in the BayStar Steering kits. If your engine requires the use of a cylinder other than HC4645H or HC4658H then please refer to the figure below for additional replacement pivot plate.



HA4640
Use with cylinder HC4645H



HA4641
Use with cylinder HC4647H



HA4642
Use with cylinder HC4648H



HA4643
Use with cylinder HC4658H

SeaStar^{PA}TM

POWER ASSIST



SeaStar Power Assist Pilot shown, available Summer, 2008.

The Marine Industry is continually introducing heavier outboard engines, higher horse power engines, more aggressive propellers, bigger/faster boats...

Boat operators are asking for increased comfort and lighter steering loads... These were the driving forces behind the design of SeaStar and SeaStar PRO Power Assist.

This new and innovative product is highly recommended on any 200HP and above outboard application to give your boat the same, easy steering you are accustomed to in your car. Power Assist is also recommended for the following;

- Twin and Triple engine applications
- Bass Boats
- Power Catamarans
- Inboard powered cruisers without engine driven power assist.

How the System Works

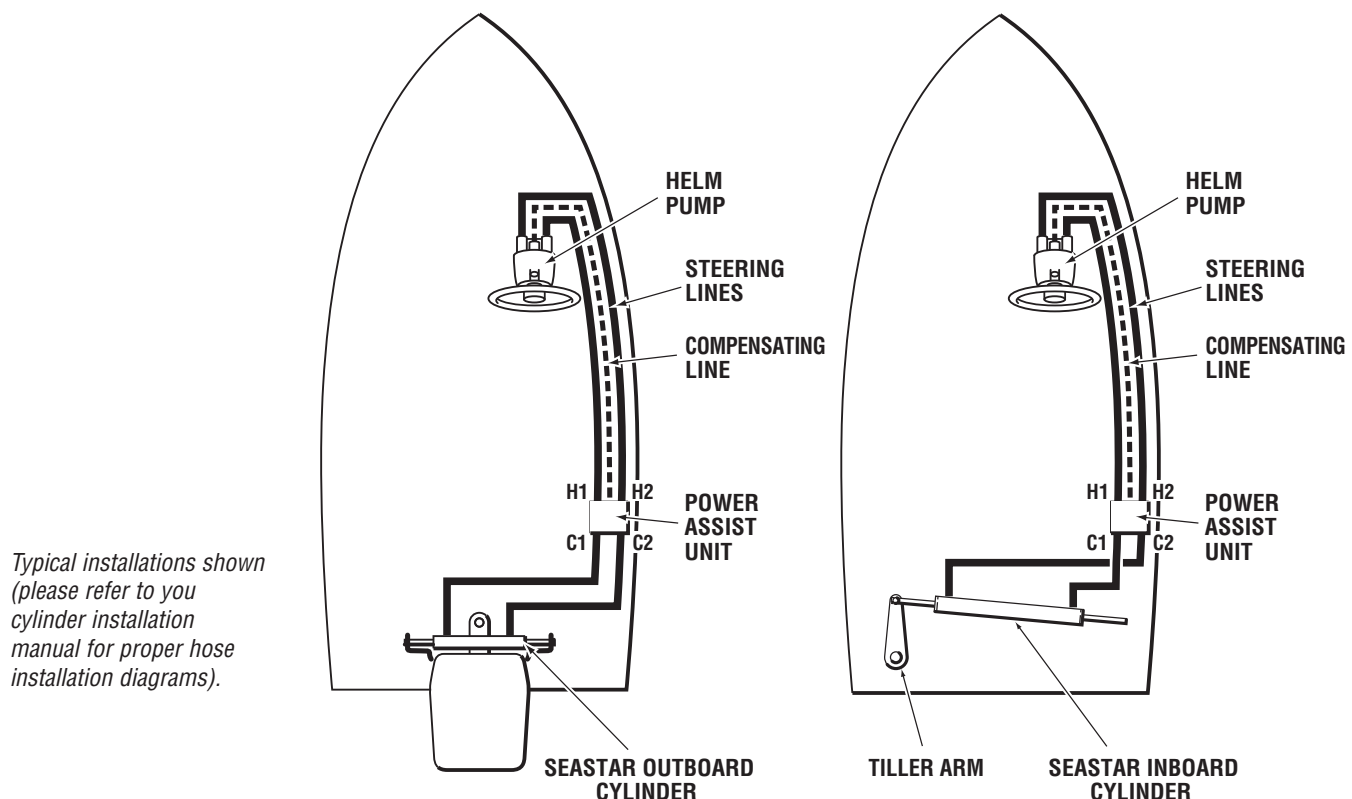
SeaStar P/A (Power Assist) steering uses an electronically controlled hydraulic pump to provide "Power" for your SeaStar Hydraulic Steering system.

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

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

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

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



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

SeaStar P/A Compatibility Chart

The P/A is designed for use in recreational marine applications in conjunction with SeaStar Hydraulic Steering. Optimal performance will be obtained when used with SeaStar 1.4, 1.7 and 2.0 cu in (1000psi) helm pumps, or, 2.0 cu in (1500 psi) SeaStar P/A PRO Hydraulic Steering.

NOTICE

SeaStar nylon tube may ONLY be used for the compensating line. DO NOT use SeaStar Nylon tube to plumb any other portion of the steering system.

NOTICE

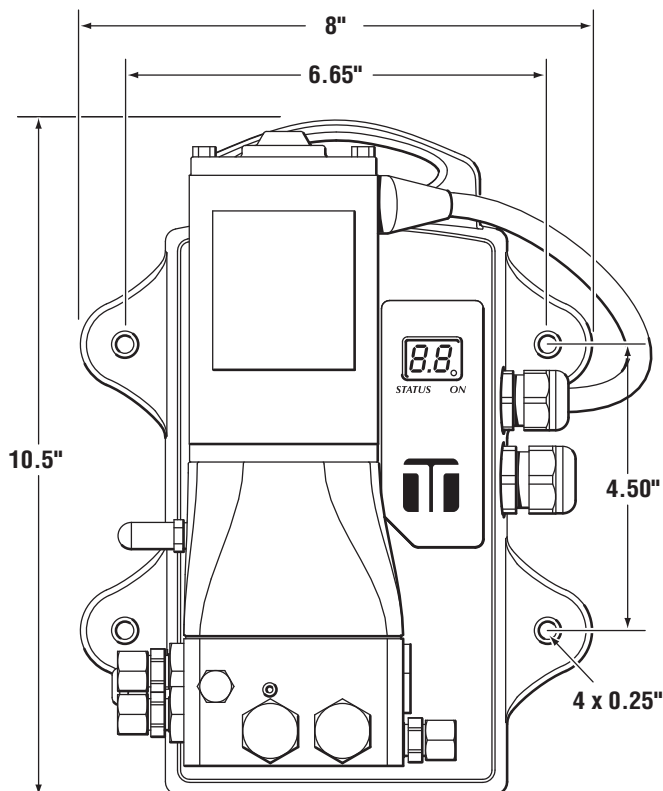
Plan ahead. There MUST be at least 4' (feet) of hose between the helm pump and power assist, or the power assist and the steering cylinder.

NOTICE

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

SeaStar P/A PRO is NOT to be used with SeaStar Hydraulic Steering, performance will be compromised. ONLY use P/A PRO with a SeaStar PRO Hydraulic steering system and ensure that SeaStar PRO (1500 psi) hose is used to plumb the entire system. (Nylon tubing may be used for the compensating/return line ONLY.

Specifications



SEASTAR P/A 12VOLT, SEASTAR PRO P/A, 12 VOLT

- 12 Volts
- 1000 psi MAX System peak pressure (500 psi working load) SeaStar Standard
- 1500 psi MAX System peak pressure (500 psi working load) SeaStar Pro
- MAX Current Draw (at 1000psi) 55 amps
- Purple ignition wire MAX. current draw = 1 amp
- Typical current draw:
Single outboard ~ 3 amps, average
Twin Rudder inboard ~ 8 amps, average

SEASTAR P/A 24 VOLT. (SEASTAR PRO P/A IS NOT AVAILABLE IN 24 VOLT POWER).

- 24 Volts
- 1000 psi MAX., System peak pressure (500psi working load)
- MAX Current Draw (at 1000psi) 25 amps
- Purple ignition wire MAX. current draw = 1 amp
- Typical current draw:
Single outboard ~ 1.5 amps, average
Twin Rudder inboard ~ 4 amps, average

WARNING

DO NOT exceed peak operating pressure.
1000psi – Standard,
1500psi – Pro.

OUTBOARD STEERING

SeaStar Outboard Hydraulic Steering offers three models of steering cylinders to suit most applications. The standard and most commonly used model is the Front Mount Steering Cylinder HC5345/47/48/58. The Side Mount Cylinder HC5370 and the Splashwell Mount Cylinder HC5380. Before ordering it is necessary to determine the best possible application for your boat, taking into account the hull design, speed and usage of the boat. Keep in mind that engines today have become larger, more powerful and heavier than in the past. Teleflex encourages you to use the tables noted below and select your system accordingly.

Selecting the outboard steering system best suited for your boat:

- 1) Using the table below, select your design of boat as per speed, hull design and horsepower.
- 2) Using the Application chart on page 3-5 choose the proper cylinder and tiebar equipment as per your outboard engine. If your engine is not noted, contact Teleflex or your Distributor for details.
- 3) Proceed to page 10-1 for details on fitting kits and particular equipment that will be needed to add a second station and/or and autopilot.

TYPICAL BOAT DESIGNS

- 1 INFLATABLE:** Boats manufacture from waterproofed fabric which are inflated with air in order to achieve their shape. The bottom of the hull may be made of fabric and/or fiberglass. They typically have narrow transoms. Boats may be single and/or dual engine, and is generally slower than 40 mp/h
- 2 CRUISER:** Cuddy/express/bridge cruiser primarily designed for cruising. It has overnight accommodations. Typically rigged with two steering stations. Boats may be single and/or dual engine, and is generally slower than 45 mp/h
- 3 RUNABOUT:** Intended for day boating. Typically a single engine, but, can be a dual engine boat. This includes tournament Ski boats and performance outboards. Boat speeds are generally slower than 60 mp/h
- 4 FISH "N" SKI:** Single engine boat designed for day fishing or skiing in protected waters. Boats speeds are generally slower than 40 mp/h
- 5 FISH BOAT:** Boat primarily designed and equipped for offshore fishing. May be rigged with a second station and may have single and/or dual outboards. Speeds are generally slower than 50 mp/h
- 6 CENTER CONSOLE:** Boats with the control station located on the center line of the boat. Designed specifically for fishing, may be single and/or dual engine(s). Boat speeds are generally slower than 65 mp/h.
- 7 BASS BOAT:** Single engine designed specifically for fishing in protected waters and has a flat bottomed hull. Generally performance orientated and speeds in excess of 60 mp/h.
- 8 PONTOON:** Twin or triple hull boats. Single and dual engine capable. Generally speeds to not exceed 60 mp/h. Note: High steering loads when equipped with engines over 115 HP.
- 9 CATAMARAN:** Twin hull vessels. Typically twin engine boats where the use of a mechanical tiebar is not possible. Speeds to not exceed 60 mp/h
- 10 COMMERCIAL/WORK/RESCUE/RACE/:** Any of the above noted boats but used in a more severe environment. Take special care when selecting a system for these boats to ensure that you have both comfortable and safe steering.

SEASTAR FRONT MOUNT OUTBOARD STEERING SYSTEM

Part# HC5345, HC5347, HC5348, HC5358

Features

- Independent engine tilt for twin engine installations.
- Easy steering.
- 5 turns lock to lock steering response.

Applications

- General purpose system.
- Single and multiple engine capability.
- Total power to 700 HP.
- Typical applications include center console fishboats and cruisers.

How to select a front mount outboard steering system

- 1) From the order guide on page 3-3 select the system configuration based on:
 - a) the number of engines, and
 - b) the total power of engine(s) to be installed.
- 2) From the application guides on page 3-5 to page 3-7, confirm that the Front Mount cylinder will fit your specific make, model and year of engine. Select the adapter kit for single engines or the tie bar kit for dual engines.”
- 3) From the order guide select the appropriate helms and accessory hardware for each steering station.
- 4) From the order guide select the fitting and hose kits required for the installation.
- 5) Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.

CAUTION

Not recommended for use in installations where;

- a) chopper, cleaver or surface piercing propellers are used,
- b) the engine is highly elevated on the transom,
- c) engine trim tabs have been removed,
- d) the boat speed exceeds 75 mph (120 km/h), or
- e) the power exceeds the maximum Coast Guard or M.O.T. recommendations for the boat.

HC5345



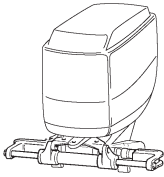
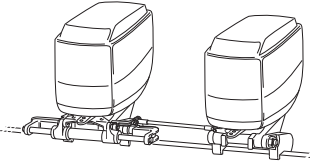
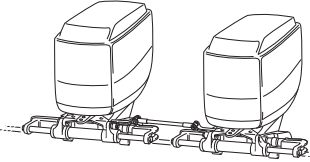
Order Guide

SeaStar®

OUTBOARD-FRONT MOUNT

NOTICE

Front Mount Cylinder part# HC5345 is included in the SeaStar Outboard Steering Kits HK6400/63XX and HK7400/73XX. If your engine requires the use of a cylinder other than the HC5345 (see application guides on pages 3-5 through 3-6) you will need to purchase the individual components (helm, cylinder, hoses, etc.) separately.

ENGINE/ CYLINDER CONFIGURATION	DESCRIPTION	QTY REQ	MODEL	PART NUMBER	REF. PAGE #
SINGLE ENGINE (SINGLE CYLINDER) APPLICATIONS UP TO 350 HP MAX NUMBER OF TURNS 5 	CYLINDER	1	FRONT MOUNT	† HC5345	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATION ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
	† Refer to Application Guides on page 3-5 to page 3-7 for correct cylinder ‡ Refer to on page 10-2 for measuring hose distance				
DUAL ENGINE (SINGLE CYLINDER) NON-COUNTER ROTATING APPLICATIONS UP TO 450 HP MAX COUNTER ROTATING ENGINE APPLICATIONS UP TO 600 HP MAX NUMBER OF TURNS 5 	CYLINDER	1	FRONT MOUNT	† HC5345	
	TIE BAR KIT	1		HO60__	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATION ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
	† Refer to Application Guides on page 3-5 to page 3-7 for correct cylinder ‡ Refer to on page 10-2 for measuring hose distance				
DUAL ENGINE (DUAL CYLINDERS) NON-COUNTER ROTATING APPLICATIONS UP TO 600 HP MAX ALL COUNTER ROTATING ENGINE APPLICATIONS UP TO 700 HP MAX NUMBER OF TURNS 6.5 	CYLINDER	2	FRONT MOUNT	† HC5345	
	TIE BAR KIT	1		HO60__	
	HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	FITTING KIT	1	TEE FITTINGS	HF5530	10-1
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATION ADD:				
	HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	‡ HO51__	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
	† Refer to Application Guides on page 3-5 to page 3-7 for correct cylinder ‡ Refer to on page 10-2 for measuring hose distance				
OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	9-3
	20 DEGREE WEDGE		(FOR STANDARD HELMS)	HA5419	9-3
	AUTOPILOT FITTING KIT		(FOR ALL HELMS)	HF5501	10-10
	* TILT HELM- SEASTAR I			HH5741	9-7
	REAR MOUNT HELM- SEASTAR I			HH5261	9-7
	** TILT HELM- SEASTAR II			HH5742	9-7
	REAR MOUNT HELM- SEASTAR II			HH5262	9-7
	POWER ASSIST STEERING			PA1200	2-1

300HP + Outboard Installation Recommendations

With the introduction of heavier, higher horsepower engines producing more torque, Teleflex Marine has updated its recommendations across various applications (single and multiple engines, different hull types, etc.) Please read carefully to ensure that your current steering system provides the best comfort versus performance available.

ENGINE	SEASTAR FRONT MOUNT (Normal Use)	SEASTAR FRONT MOUNT (Aggressive Use - See Note 1)	HYNAUTIC K-6 (Normal Use ONLY)
SINGLE ENGINE	SINGLE CYLINDER 350 HP Max 75 MPH Max HC53xx Cylinder (See Note 2)	SINGLE CYLINDER 350 HP Max HC63xx Pro Cylinder (See Notes 2 & 3)	SINGLE CYLINDER 300 HP Max 55 MPH Max
DUAL ENGINE NON COUNTER ROTATING	SINGLE CYLINDER 450 HP Max 55 MPH Max HC53xx Cylinder HO60xx Tie Bar	SINGLE CYLINDER Not Recommended	SINGLE CYLINDER 400 HP Max 55 MPH Max
	DUAL CYLINDER 600 HP Max 55 MPH Max HC53xx Cylinders HO60xx Tie Bar	DUAL CYLINDER 700 HP Max HC67xx Cylinders (See Notes 2 & 4) HO67xx Tie Bar	DUAL CYLINDER 500 HP Max 55 MPH Max
DUAL ENGINE COUNTER ROTATING	SINGLE CYLINDER 600 HP Max 55 MPH Max HC53xx Cylinder HO60xx Tie Bar	SINGLE CYLINDER Not Recommended	SINGLE CYLINDER 500 HP Max 55 MPH Max
	DUAL CYLINDER 600 HP Max 55 MPH Max HC53xx Cylinders HO60XX Tie Bar	DUAL CYLINDER 700 HP Max HC67xx Cylinders (See Notes 2 & 4) HO67xx Tie Bar	DUAL CYLINDER 500 HP Max 55 MPH Max
TRIPLE ENGINE ONE WITH COUNTER ROTATING	DUAL CYLINDER 900 HP Max 55 MPH Max HC53xx Cylinders HO60xx Tie Bar	DUAL CYLINDER 1050 HP Max HC67xx Cylinders (See Notes 2 & 4) HO67xx Tie Bars HA67xx Center Engine (See Note 2) Bracket Kit	NOT RECOMMENDED
	TRIPLE CYLINDER 900 HP Max 55 MPH Max HC53xx Cylinders HO60xx Tie Bar	TRIPLE CYLINDER 1050 HP Max HC67xx Cylinders (See Notes 2 & 4) HO67xx Tie Bars	NOT RECOMMENDED
1 Teleflex has specific steering equipment for boats that are driven aggressively, used in severe conditions or with more than 300 HP per engine. 2 ALL ENGINES over 300 HP and all boats that are driven aggressively must use a high strength tiller bolt, kit part # HA5822. All front mount cylinders built after June 15, 2007 will have this high strength bolt included in the box. High strength tiller bolts can be identified by the marking "TFX -ARP" on the head of the bolt (refer to NOTICE page 3-5). 3 HC63xx PRO Cylinders are designed for all those critical high speed, single outboard engine boats, such as Bass, Flats combo Race/Ski and other performance orientated boats capable of speeds in excess of 65 mph. For optimal performance, the use of SeaStar PRO Kevlar Steering Hoses is recommended. 4 HC67xx Tournament cylinders are designed for use with high powered fishing/sport boats. If your application calls for dual or triple outboard engines, is capable of speeds exceeding 55 mp/h and runs in open water, Tournament Cylinders should be used.			

Single Engine Application Guide

SeaStar®

OUTBOARD—FRONT MOUNT

Prior to selecting a cylinder from this application guide, please refer to page 3-4 to ensure that you are selecting the correct cylinder for your engine/boat.

NOTICE

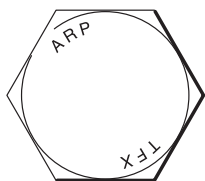
Is your Splashwell wide enough? Check page 3-11 for space requirements.

NOTICE

Front Mount Cylinder part# HC5345 is included in the SeaStar Outboard Steering Kits HK6400/63XX and HK7400/73XX. If your engine requires the use of a cylinder other than the HC5345 (see application guides on this page through 3-6) you will need to purchase the individual components (helm, cylinder, hoses, etc.) separately.

NOTICE

High Strength Tiller bolt, part# HA5822. ALL cylinders shipped after June 15th, 2007 will have this bolt included in the cylinder package.



CAUTION

SeaStar PRO Helms require the use of SeaStar PRO (1500 psi) Kevlar steering hoses.

MFG	YEAR	MODEL	CYL	NOTES
FORCE	1985-DATE	90-150 HP	HC5345	
HONDA	1996-DATE	75-90HP	HC5345	See Note 1
	1998-DATE	115-130HP	HC5347	
	1998-DATE	30-50HP	HC5345	
	2001-DATE	135-225HP 4-Stroke	HC5345	
	2003-DATE	BF135HP	HC5345	
JOHNSON/ EVINRUDE	1977-1990	65-300HP	HC5348	Inc. ETech See Note 1 See Note 1
	1988-1997	250-300HP V8	HC5342	
	1991-DATE	40-250HP	HC5345	
	1996-DATE	75-250HP Ficht	HC5345	
	1998-DATE	40-140HP 4-Stroke	HC5358	
	2000-DATE	115HP Ficht	HC5358	
	2002-DATE	200-225HP 4-Stroke	HC5345	
	2005-DATE	E250 DPX Vindicator	HC5348	
MERCURY	1984-1994	2.4/2.5HP EFI	HC5345	See Note 2 See Note 1 See Note 3
	1989-DATE	75-300HP	HC5345	
	1996-DATE	75-225HP 4-Stroke	HC5345	
	1998-DATE	30-60HP	HC5345	
	2003-DATE	250-300HP XS	HC6345	
NISSAN	1990-DATE	90-140HP	HC5345	
SUZUKI	1986-DATE	100HP	HC5345	NOT 1996 See Note 1 See Note 1
	1986-2002	115-140HP	HC5345	
	1986-DATE	150-300HP 2 & 4-Stroke	HC5345	
	1996 ONLY	115-140HP	HC5348	
	1998-DATE	40-140HP 4-Stroke	HC5358	
	2003-DATE	90HP 4-Stroke	HC5358	
US MARINE	1996-DATE	90-120HP	HC5345	
YAMAHA	1990-2003	40-90HP	HC5345	See Note 5 See Note 5 See Note 1 See Note 4
	1986-DATE	100-250HP 2-Stroke	HC5345	
	1997-DATE	80-225HP 4-Stroke	HC5345	
	2000-DATE	150-250 HPDI	HC5345	
	2002-DATE	300 HPDI	HC5358	
	2003-DATE	25-60 HP 4-Stroke	HC5348	
	2007-DATE	350 HP	HC5345	
YANMAR	1994-DATE	90-120HP	HC5345	

1. Requires Spacer Kit# HO5090.
2. May Require Extensive Cowling Modifications.
3. **MUST** use High Strength Tiller bolt, part # HA5822. Refer to the NOTICE on this page identifying the high strength bolt.

4. Optional cylinder part # HC5358. Slight interference may occur when using the HC5358, with the engine in the full tilt position.
5. Cylinder part # HC5358 may also be used in these single engine applications.

The above engine applications are current through the revision date shown. For up-to-date engine applications go to: www.seastarsteering.com

REVISION DATE: MAR. 24th 2008

Twin Engine Application Guide

Prior to selecting a cylinder from this application guide, please refer to page 3-4 to ensure that you are selecting the correct cylinder for your engine/boat.

NOTICE

Is your Splashwell wide enough? Check page 3-11 for space requirements.

MFG	YEAR	MODEL	CYL	TIE BAR KITS		NOTES
				TWIN x 1	TWIN x 2	
FORCE	1985-DATE	90-150 HP	HC5345	HO5008A	HO5008A	
HONDA	1996-DATE	75-90HP	HC5345	HO6001	HO6002	See Note 3
	1998-DATE	115-130HP	HC5347	HO5063	HO5064	See Note 5
	1998-DATE	30-50HP	HC5345	HO6001	HO6002	See Note 2
	2001-DATE	150HP 4-Stroke	HC5345	N/A	HO6002	See Note 7
	2001-DATE	225HP 4-Stroke	HC5345	HO6001	HO6002	
	2003-DATE	BF135HP	HC5345	HO6003	HO6002	
JOHNSON/ EVINRUDE	1977-1990	65-300HP	HC5348	HO6003	HO6002	
	1988-1997	250-300HP V8	HC5342	HO5001A	HO5030	See Note 5
	1991-DATE	40-250HP	HC5345	HO6003	HO6002	<i>Inc. ETech Engines.</i>
	1996-DATE	75-250HP Ficht	HC5345	HO6003	HO6002	
	1998-DATE	40-140HP 4-Stroke	HC5358	HO6003	HO6002	See Note 2
	2000-DATE	115HP FICHT	HC5358	HO6003	HO6002	See Note 2
	2002-DATE	200-225HP 4-Stroke	HC5345	HO6003	HO6002	
	2005-DATE	E250 DPX Vindicator	HC5348	HO6003	HO6002	
MERCURY	1984-1994	2.4/2.5HP EFI	HC5345	HO6001	HO6002	See Note 4
	1989-DATE	75-300HP	HC5345	HO6001	HO6002	See Note 3
	1996-DATE	75-200HP 2 & 4-Stroke	HC5345	HO6001	HO6002	
	1998-DATE	30-60HP	HC5345	HO6001	HO6002	See Note 2
	2002-DATE	225HP 4-Stroke	HC5358	HO6001	HO6002	See Note 1
	2003-DATE	250-300HP XS	HC5345	N/A	HO6002	See Note 6
NISSAN	1990-DATE	90-140HP	HC5345	HO6001	HO6002	
SUZUKI	1986-DATE	100HP	HC5345	HO6003	HO6002	
	1986-2002	115-140HP	HC5345	HO6001	HO6002	NOT 1996
	1986-DATE	150-300HP 2 & 4-Stroke	HC5345	HO6003	HO6002	
	1996 ONLY	115-140HP	HC5348	HO6001	HO6002	
	1998-DATE	40-140HP 4-Stroke	HC5358	HO6003	HO6002	See Note 2
	2003-DATE	90HP 4-Stroke	HC5358	HO6003	HO6002	See Note 2
US MARINE	1996-DATE	90-120HP	HC5345	HO6001	HO6002	
YAMAHA	1990-DATE	40-90HP	HC5345	HO6003	HO6002	
	1986-DATE	100-250HP 2-Stroke	HC5345	HO6001	HO6002	
	1997-DATE	80-225HP 4-Stroke	HC5358	HO6001	HO6002	See Note 1
	2000-DATE	150-250 HPDI	HC5358	HO6001	HO6002	See Note 1
	2002-DATE	300 HPDI	HC5358	HO6001	HO6002	
	2003-DATE	25-60HP 4-Stroke	HC5348	HO6003	HO6002	See Note 2
	2006-DATE	350HP	<i>MUST Use Tournament Cylinders. Refer to Page 3-8</i>			
YANMAR	1994-DATE	90-120HP	HC5345	HO6001	HO6002	

1. HC5345 is optional for **SINGLE ENGINE ONLY** applications. **DO NOT** use HC5345 for twin engine applications as operational interference may occur.

2. Requires Kit HO5090

3. Minimum Engine Center = 27"

4. May Require Extensive Cowling Modifications

5. HO5030 and HO5064 comes without Tie Bar

6. One cylinder per engine. Must use Mercury supplied tiller bolt for installation.

7. Interference will occur when using a single HC5345 cylinder and HO6003 tiebar when installed in the aft hole on the steering arm. Options include, a) install tiebar into most forward hole (this will limit steering articulation), b) purchase K-6 Cylinder, and tiebar kit part # HO5009. There will be no interference when using twin HC5345 cylinders.

The above engine applications are current through the revision date shown. For up-to-date engine applications go to: www.seastarsteering.com

REVISION DATE: NOV. 23rd 2007

Triple Engine Application Guide

SeaStar

OUTBOARD-FRONT MOUNT

Prior to selecting a cylinder from this application guide, please refer to page 3-4 to ensure that you are selecting the correct cylinder for your engine/boat.

⚠ WARNING

Use of incorrect components on a high speed/performance boat, may lead to bending and breaking of components resulting in steering failure causing property damage and/or personal injury.

NOTICE

Tournament Tiebar Cylinder should be used on ALL Tournament/High Speed (60 Mph and above) multi-engine boats. Please refer to page 3-8.

MFG	YEAR	MODEL	CYL	PORT TO DRIVE CYL	STARBOARD TO DRIVE CYL	NOTES
FORCE	1995-DATE	90-120HP	HC5345	HO6001	HO6002	See Note 4
HONDA	1996-DATE	75-90HP	HC5345	HO6001	HO6002	See Note 2, 4
	2001-DATE	135-225HP 4-Stroke	HC5345	HO6003	HO6002	See Note 4
MERCURY	1989-DATE	75-275HP	HC5345	HO5081		See Note 4
	2003-DATE	250-300HP XS	HC5345	HO6002	HO6002	See Note 3, 4
JOHNSON/ EVINRUDE	1991-DATE	90-175HP	HC5345	HO5080		See Note 4
	1991-DATE	250-300HP	HC5345	HO6001	HO6002	See Note 4
	1991-DATE	200-225HP	HC5345	HO6003	HO6002	See Note 4
	1991-DATE	90-225HP Ficht	HC5345	HO5080		See Note 2, 4
	1998-DATE	65-70HP 4-Stroke	HC5345	HO6003	HO6002	See Note 1, 4
	2005-DATE	E250 DPX Vindicator	HC5348	HO6003	HO6002	See Note 4
SUZUKI	1986-DATE	150-200HP 2 & 4-Stroke	HC5345	HO6003	HO6002	See Note 4
	1986-DATE	115-140HP	HC5345	HO6003	HO6002	See Note 4
	1998-DATE	65-70HP 4-Stroke	HC5345	HO6001	HO6002	See Note 1, 4
	2001-DATE	250-300HP	HC5345	HO6001	HO6002	See Note 4
YAMAHA	1990-DATE	100-200HP	HC5345	HO6001	HO6002	See Note 4
	1990-DATE	225-250HP 4-Stroke	HC5358	HO5080		See Note 4
	1998-DATE	80-100HP 4-Stroke	HC5358	HO6001	HO6002	See Note 4
	2001-DATE	150-300HP HPDI	HC5358	HO6001	HO6002	See Note 4
	2006-DATE	350HP	<i>MUST Use Tournament Cylinders. Refer to Page 3-8</i>			See Note 3

1. Requires Kit HO5090

2. Minimum Engine Center = 29"

3. One cylinder required per engine. MUST use high strength tiller bolt part # HA5822.

4. For high performance/speed applications, please refer to the Caution noted at the bottom of this page.

The above engine applications are current through the revision date shown. For up-to-date engine applications go to: www.seastarsteerng.com

REVISION DATE: SEPT. 4th 2007

NOTICE

A minimum of two cylinders will be required to operate a triple engine installation with the exception of Mercury XS engines which MUST use one cylinder per engine.

NOTICE

Is your Splashwell wide enough? Check page 3-11 for space requirements.

Tournament Series Tiebar Cylinders

NOTICE

Maximum engine centers for:
Single cylinder = 41"
Twin cylinders = 32-1/8"

With the power and speed increasing for performance orientated fishing boats, Teleflex Marine felt it prudent to set up a dedicated application for these types of boats. If your application calls for a dual or triple Outboard Engine configuration, is capable of speeds exceeding 55mph and runs in open water, please refer to the Tournament Tiebar Cylinders to achieve performance, durability and safety.



MAKE	YEAR	TWIN ENGINE CYLINDERS	TRIPLE ENGINE CYLINDERS *Note
HONDA All models	200–250HP	HC6750 (s) x 1 HC6751 (p) x 1 Tiebar HO6700 x 1	HC6750 (s) x 1 HC6751 (p) x 1 HC6752 (c) x 1 2 x HO6700 tiebar kits required for triples.
EVINRUDE Salt/Fresh/DI engines	200–300HP	HC6753 (s) x 1 HC6754 (p) x 1 Tiebar HO6700 x 1	HC6753 (s) x 1 HC6754 (p) x 1 HC6755 (c) x 1 2 x HO6700 tiebar kits required for triples.
MERCURY Verado N/A	200–300HP	HC6750 (s) x 1 HC6751 (p) x 1 Tiebar HO6700 x 1	HC6750 (s) x 1 HC6751 (p) x 1 HC6752 (c) x 1 2 x HO6700 tie bar kits required for triples.
	250–300HP XS (One cylinder per engine required.)	HC6750 (s) x 1 HC6751 (p) x 1 Tiebar HO6700 x 1	HC6750 (s) x 1 HC6751 (p) x 1 HC6752 (c) x 1 2 x HO6700 tiebar kits required for triples.
SUZUKI All models	200–300HP 2 and 4 stroke	HC6750 (s) x 1 HC6751 (p) x 1 Tiebar HO6700 x 1	HC6750 (s) x 1 HC6751 (p) x 1 HC6752 (c) x 1 2 x HO6700 tiebar kits required for triples.
YAMAHA All models	200–300HP	HC6753 (s) x 1 HC6754 (p) x 1 Tiebar HO6700 x 1	HC6753 (s) x 1 HC6754 (p) x 1 HC6755 (c) x 1 2 x HO6700 tiebar kits required for triples.
	350HP	HC6750 (s) x 1 HC6751 (p) x 1 Tiebar HO6700 x 1	HC6750 (s) x 1 HC6751 (p) x 1 HC6752 (c) x 1 2 x HO6700 tiebar kits required for triples.

REVISION DATE: NOV. 22nd 2007

NOTICE

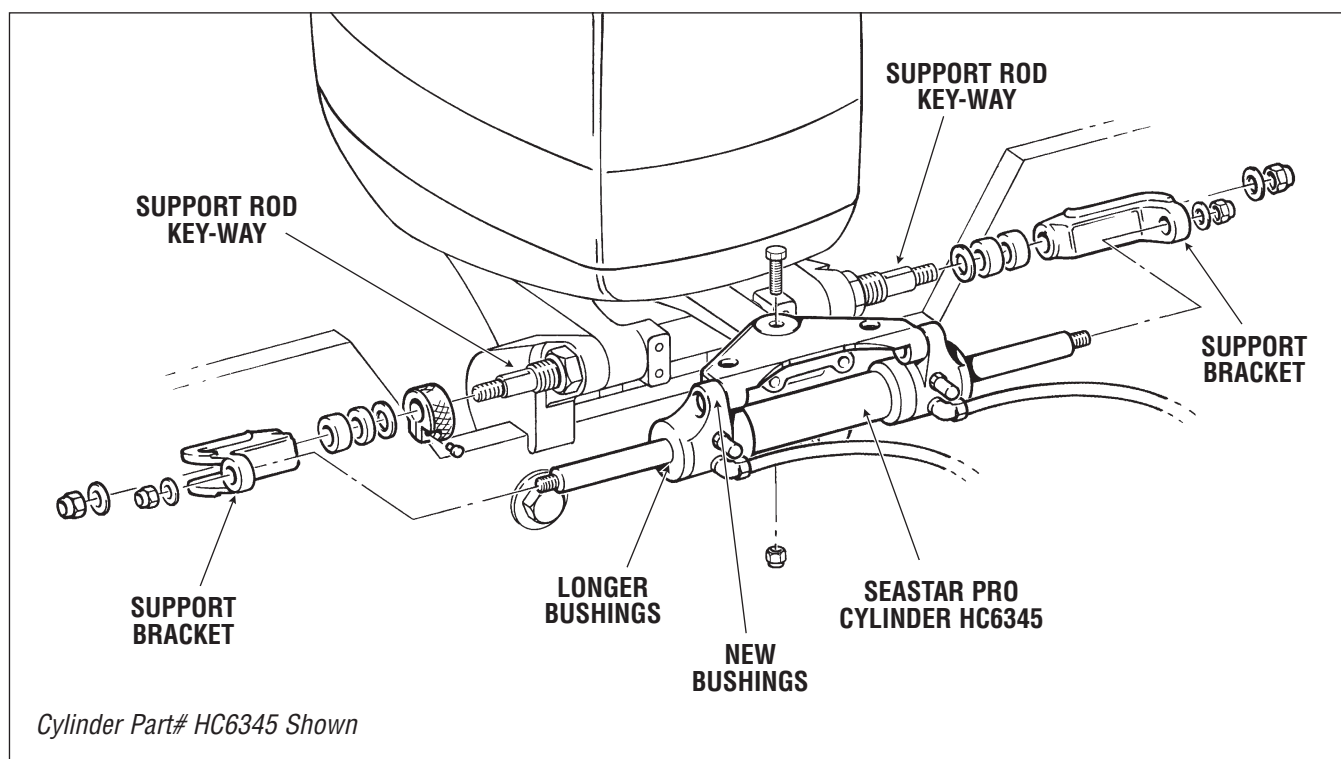
* All triple engine applications, excluding the Mercury XS line, may use a twin cylinder set up with the additional purchase of a "center engine bracket kit, part # HA6701.

SeaStar Pro Steering Systems

SeaStar®

OUTBOARD-FRONT MOUNT

SeaStar PRO Outboard Steering systems are suited for all those critical high speed, single powered outboard boats, like Bass, Flats, combo Race/Ski and other performance orientated boats capable of speeds in excess of 65mph. Before ordering it is necessary to determine the proper cylinder and helm pump for your application. Using the table on page 3-10, choose the correct cylinder as per your outboard engine. All SeaStar PRO systems require the use of a SeaStar PRO helm and SeaStar PRO (1500psi) reinforced Kevlar hoses ONLY!



⚠ WARNING

SeaStar PRO Helm systems require the use of SeaStar PRO (1500 psi) reinforced Kevlar Hoses ONLY.

Helm Pumps

SeaStar PRO Steering systems have the option to install a standard front mounting helm, both traditional and sport tilt as well as rear mount helm pumps. Please refer to page 9-1 for style and page 9-5 for PRO Helm part numbers.

⚠ CAUTION

SeaStar PRO Helms require the use of SeaStar PRO (1500 psi) Kevlar steering hoses

SeaStar Pro Application Guide

NOTICE

Is your Splashwell wide enough? Check page 3-11 for space requirements.

MFG	YEAR	MODEL	CYL	NOTES
FORCE	1985-DATE	90-150HP	HC6345	
HONDA	1996-DATE	150-300HP	HC6345	
JOHNSON/ EVINRUDE	1977-1990 2002-DATE 2003-DATE 2005-DATE	150-300HP 150-250HP 4-Stroke 150-300HP ETech E250HP Vindicator	N/A HC6345 HC6345 N/A	Contact Teleflex Contact Teleflex
MERCURY	1989-DATE	150-300 2-Stroke, 4-Stroke and XS Engines	HC6345	XS engine requires mercury supplied tiller bolt on install
SUZUKI	1986-DATE	150-250 HP 2 and 4-Stroke	HC6345	
YAMAHA	1986-DATE 2002-DATE	150-250HP 2 and 4-Stroke 300 HPDI	HC6345 HC6358	

REVISION DATE: FEB. 10TH 2006

NOTICE

SeaStar PRO Steering Systems can not be used with an unbalanced steering cylinder.

Cylinder Installation and General Dimensions

⚠ WARNING

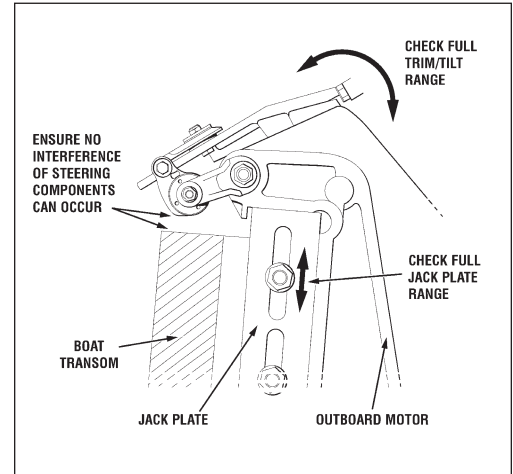
Operational interference of the steering cylinder/cylinder fittings and jackplates/transom/splashwell can occur under certain conditions. Check installation thoroughly throughout the full range of Motor Tilt, Jack Height and Trim before making final installation.

If interference does occur, contact:

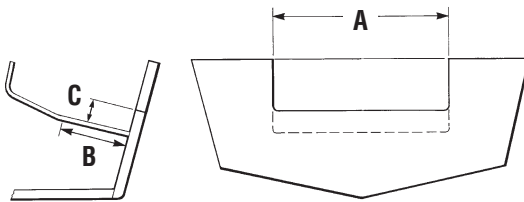
Teleflex Canada Limited Partnership for additional information/options.

Telephone: **604-270-6899** Fax: **604-279-2202**

If interference is not eliminated total steering loss can occur, causing property damage and/or personal injury.



Motor Well dimensions required for front mount outboard steering systems

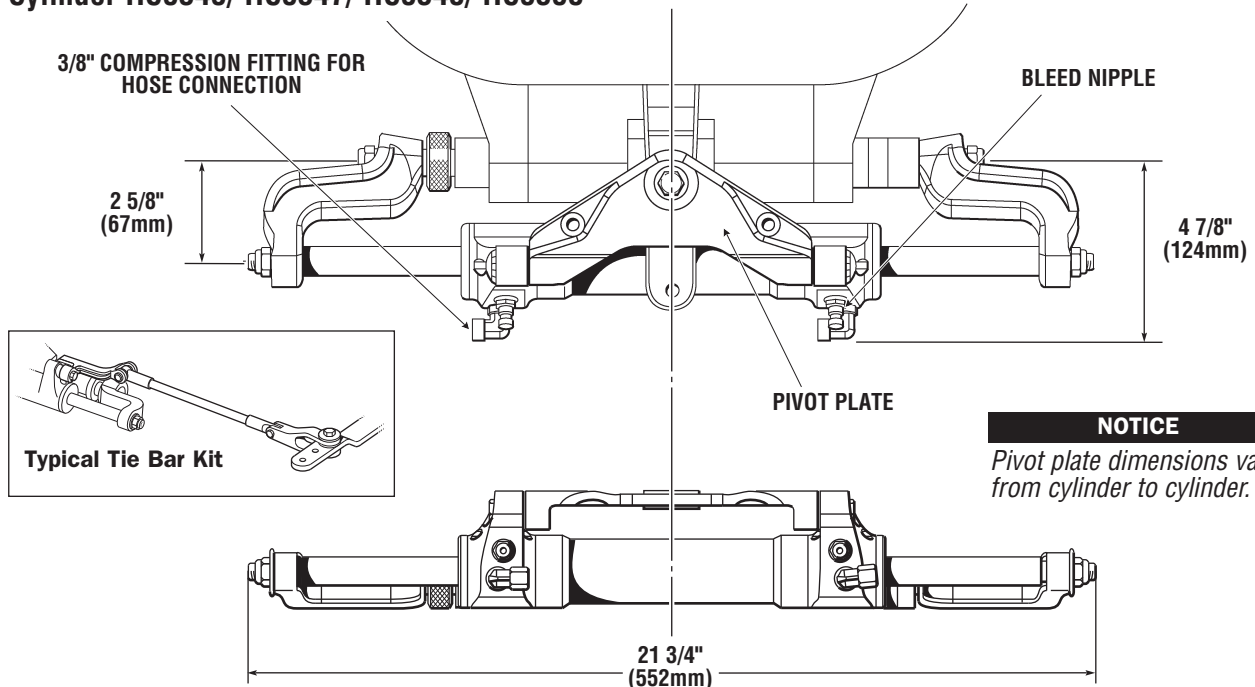


# OF ENGINES	A	B	C	MIN. ENGINE CENTER DISTANCE
1	22" (559mm)	6" (152mm)	5" (127mm)	N/A
2	49" (1244mm)	6" (152mm)	5" (127mm)	26" (660mm)

NOTES

- Dimensional restrictions also apply to external motor mount brackets.
- Maximum engine center distance for twin engine applications is 36" (914mm) using the standard tiebar. Dimension 'A' would have to be increased proportional to the tiebar length.
- Minimum engine center distance is 26" unless engine manufacturer recommendation is greater.

Cylinder HC5345/ HC5347/ HC5348/ HC5358



NOTICE

Pivot plate dimensions vary from cylinder to cylinder.

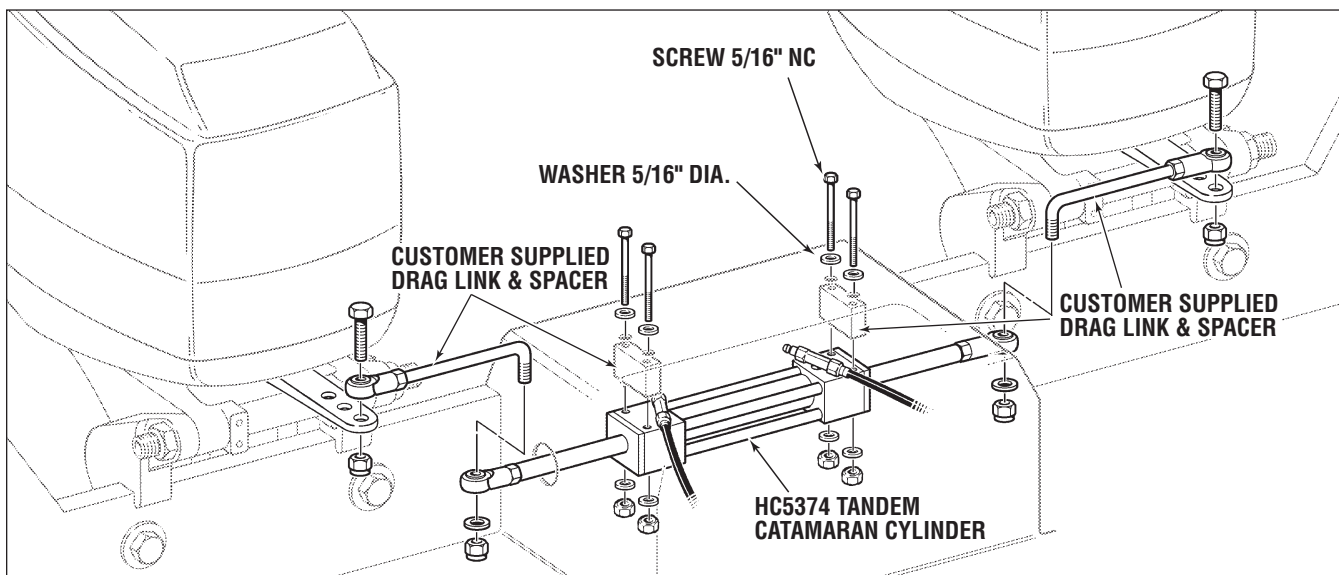
Outboard-Catamaran

Horsepower Limitations

ENGINE CONFIGURATIONS	MAXIMUM HORSEPOWER	CYLINDER	RECOMMENDED HELM PUMP	NO. OF STEERING WHEEL TURNS
NON COUNTER-ROTATING	UP TO 450HP	HC5343 HC5374	HH5271 HH5272	5 5.5
COUNTER-ROTATING	UP TO 600HP	HC5343 HC5374	HH5271 HH5272	5 5.5

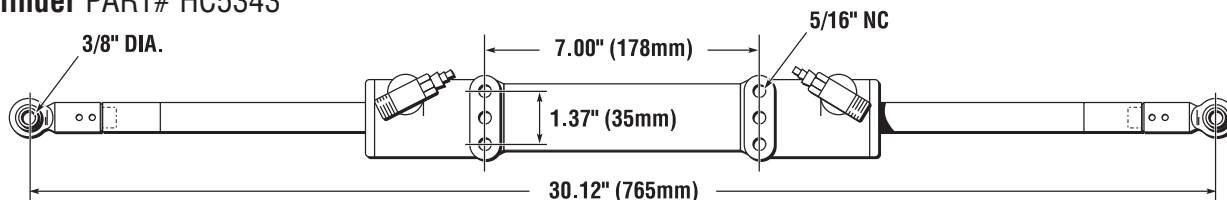
To establish whether or not this cylinder is suitable for your application, the following points should be considered:

1. Fore and aft alignment of cylinder. If not mounted in line, motors will have a different turning radius.
2. Distance between motors.
3. Distance of travel in tilt arc.
4. Horizontal alignment of cylinder.

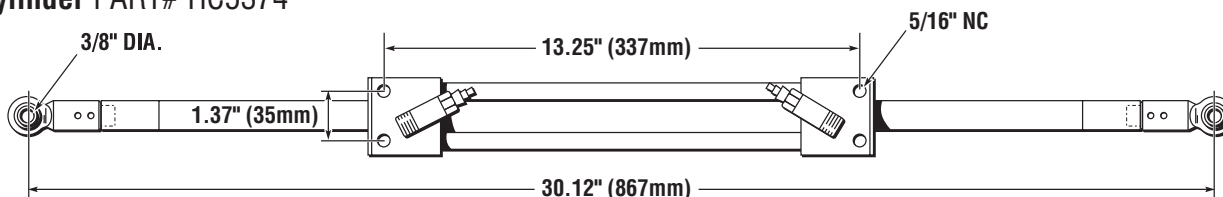


Cylinder Part# HC5374 Shown

Cylinder PART# HC5343



Cylinder PART# HC5374



SEASTAR SIDE MOUNT OUTBOARD STEERING SYSTEM

Part# HC5370

Features

- Ease of installation.
- Alternative to Front Mount Cylinder.
- Unbalanced cylinder with 4.8/5.7 turns lock to lock.
- Suitable for installation in shallow splashwells.
- Suitable for use on engines fitted with power steering.

Applications

- All engines with threaded tilt (steering) tubes complying with ABYC P17/ABYC P21/NMEA/BIA standards for mechanical steering.
- Cylinder attaches to the engine tilt tube as per ABYC/NMEA/BIA standard.
- Single and multiple outboard engine installations.
- Total power to 600 HP in counter rotating application. (see order guide)
- Typical applications include center console fishboats and cruisers.

How to select a side mount outboard steering system

WARNING

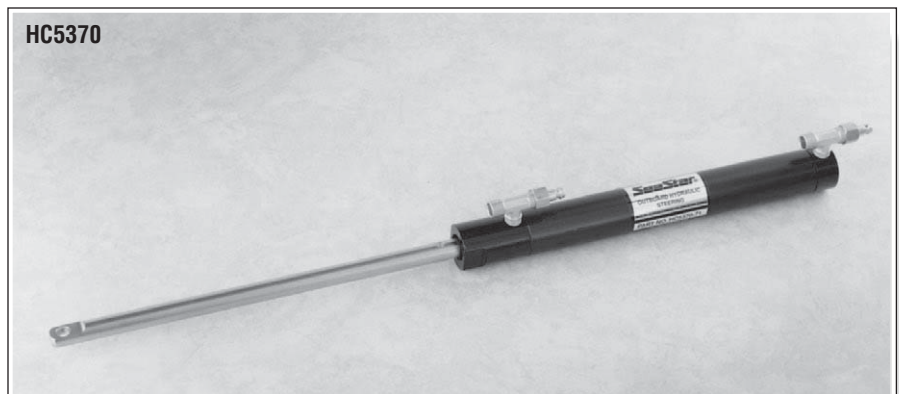
**Not for use with SeaStar-Pro
Helm Pumps.**

- 1) From the order guide on page 3-14 select the system configuration based on;
 - a) the number of engines, and
 - b) the total power of engine(s) to be installed.
- 2) From the order guide select the cylinder(s) and tie bar kits required.
- 3) From the order guide select the appropriate helms and accessory hardware for each steering station.
- 4) From the order guide select the fitting and hose kits required for the installation.
- 5) Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.

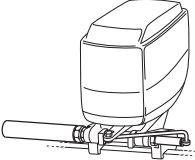
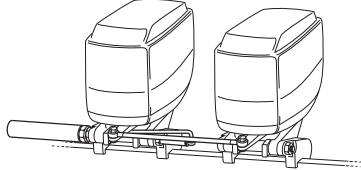
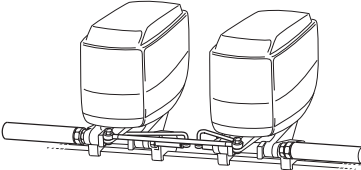
NOTICE

*Not recommended for use in
installations where;*

- a) chopper, cleaver, or surfacing
piercing propellers are used,*
- b) the engine is highly elevated
on the transom,*
- c) engine trim tabs have been
removed,*
- d) the boat speed exceeds
75 mph (120 km/h), or*
- e) the power exceeds maximum
Coast Guard or M.O.T.
recommendations for the boat.*



Order Guide

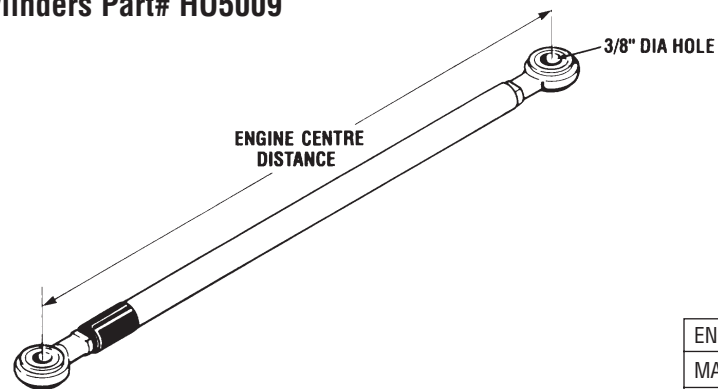
ENGINE/ CYLINDER CONFIGURATION	DESCRIPTION	QTY REQ	MODEL	PART NUMBER	REF. PAGE #
SINGLE ENGINE (SINGLE CYLINDER) APPLICATIONS UP TO 300 HP MAX NUMBER OF TURNS 4.8/5.7 	CYLINDER	1	SIDE MOUNT	HC5370	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
DUAL ENGINE (SINGLE CYLINDER) NON-COUNTER ROTATING APPLICATIONS UP TO 300 HP MAX COUNTER ROTATING ENGINE APPLICATIONS UP TO 600 HP MAX NUMBER OF TURNS 4.8/5.7 	CYLINDER	1	SIDE MOUNT	HC5370	
	TIE BAR KIT	1	TIE BAR ONLY	HO5009	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
DUAL ENGINE (DUAL CYLINDERS) NON-COUNTER ROTATING APPLICATIONS UP TO 600 HP MAX ALL COUNTER ROTATING ENGINE APPLICATIONS NUMBER OF TURNS 7.5 	CYLINDER	2	SIDE MOUNT	HC5370	
	TIE BAR KIT	1	TIE BAR ONLY	HO5009	
	HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	HOSE KIT	1	OUTBOARD HOSE	HO51__	10-2
	FITTING KIT	1	TEE FITTINGS	HF5530	10-1
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	9-3
	20 DEGREE WEDGE		(FOR STANDARD HELMS)	HA5419	9-3
	AUTOPILOT FITTING KIT		(FOR ALL HELMS)	HF5501	10-10
	* TILT HELM- SEASTAR I			HH5741	9-7
	REAR MOUNT HELM- SEASTAR I			HH5261	9-7
	** TILT HELM- SEASTAR II			HH5742	9-7
	REAR MOUNT HELM- SEASTAR II			HH5262	9-7
	POWER ASSIST STEERING			PA1200	2-1

General Dimensions

SeaStar

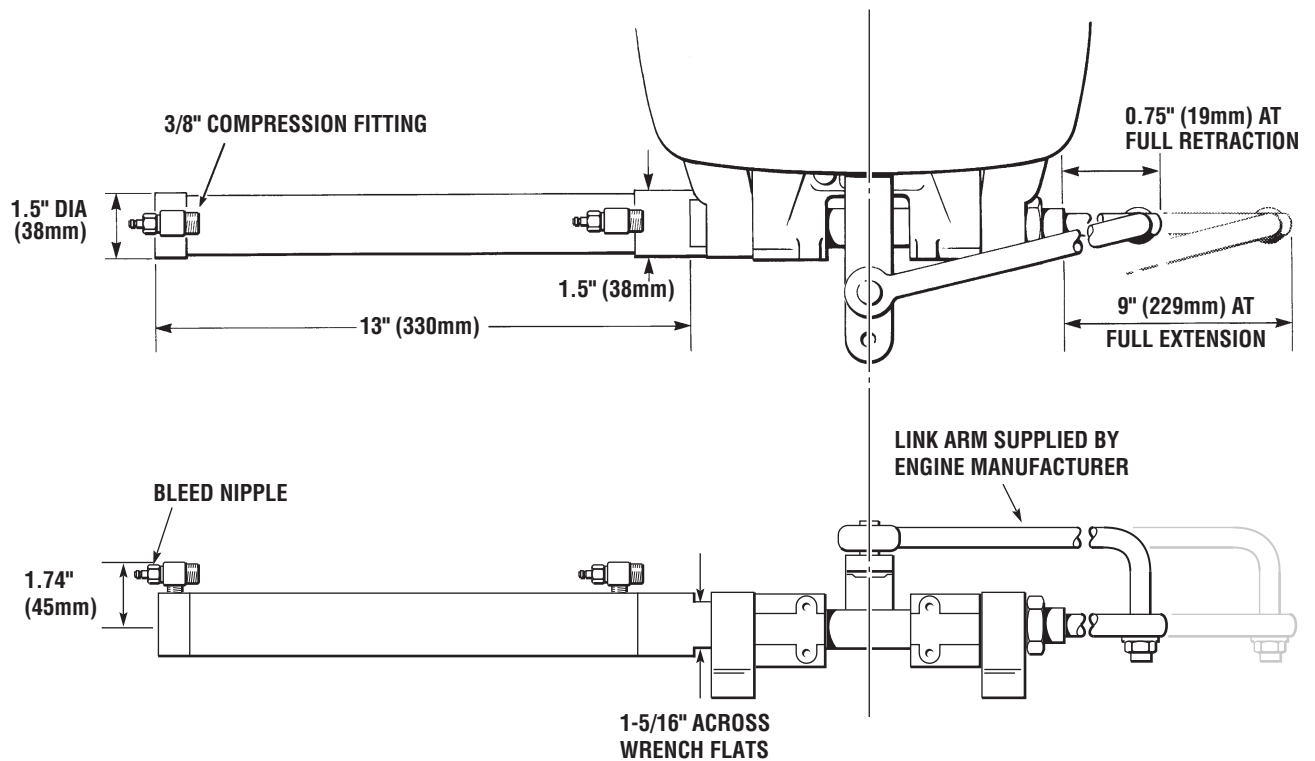
OUTBOARD-SIDE MOUNT

Tie Bar for Side Mount Cylinders Part# H05009



ENGINE CENTRE DISTANCE	
MAXIMUM:	36" (914mm)
MINIMUM:	26" (660mm)

PART# HC5370



SEASTAR SPLASHWELL MOUNT OUTBOARD STEERING SYSTEM

Part# HC5380

NOTICE

Not for use with SeaStar Pro Helms.

Features

- Light duty alternative to front & side mount cylinders.
- Unbalanced cylinder with 5.5/6.5 turns lock to lock.
- Fits engines with/without support (steering) tube.

Applications

- Single & multiple engine capability.
- Total power to 600 HP in counter rotating application. (see order guide)
- Transom or hull mounted cylinder.
- Speeds to 60mph maximum (97km/h).

How to select a splashwell mount outboard steering system

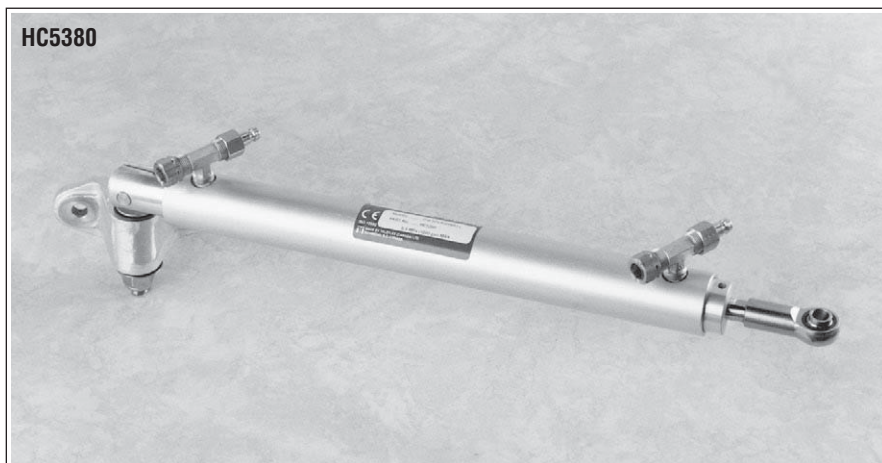
- 1) From the order guide on page 3-17 select the system configuration based on;
 - a) the number of engines, and
 - b) the total power of engine(s) to be installed.
- 2) Select the cylinder and tie bar kit required.
- 3) From the order guide select the appropriate helms and accessory hardware for each steering station.
- 4) From the order guide select the fitting and hose kits required. You will have to determine the configuration, length, number of hose and fitting kits required for the installation (refer to page 10-2).
- 5) Confirm that there is sufficient space available in the splashwell and dash areas for the steering components.

NOTICE

Not recommended for use in installations where;

- a) chopper, cleaver or surfacing piercing propellers are used,
- b) the engine is highly elevated on the transom,
- c) engine trim tabs have been removed,
- d) the boat speed exceeds 60mph (97km/h), or
- e) the power exceeds maximum Coast Guard or M.O.T. recommendations for the boat.

HC5380

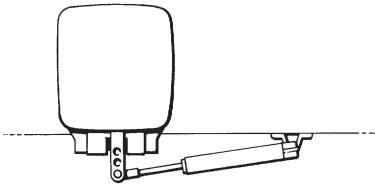
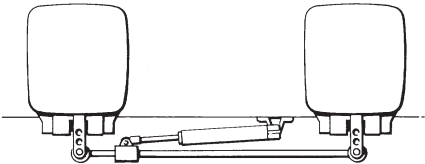


Order Guide

SeaStar

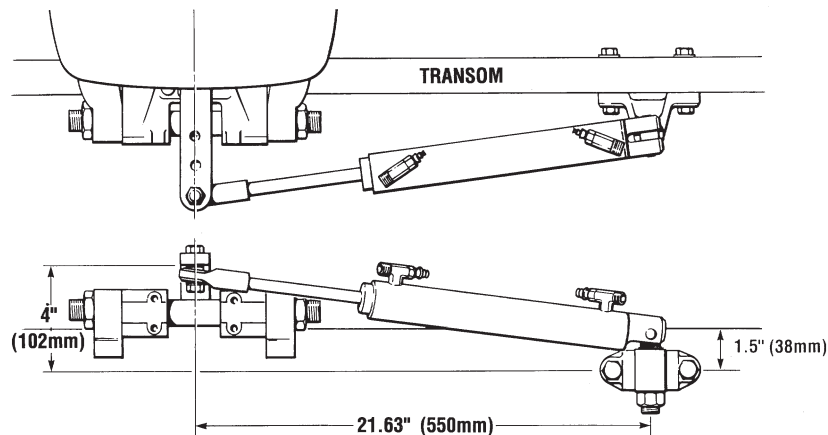
OUTBOARD-SPLASHWELL MOUNT

The splashwell mount cylinder (part no. HC5380) can be used on all engines complying with ABYC P17/NMEA/BIA standards provided they have a threaded attachment hole (3/8" – 24 UNF thread) in the steering arm. Not suitable for use on engines fitted with factory power steering.

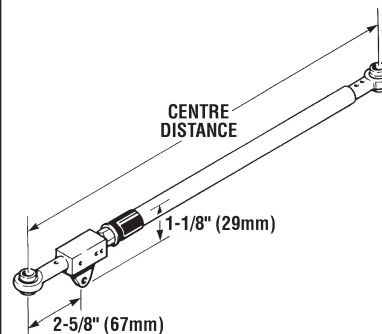
ENGINE/ CYLINDER CONFIGURATION	DESCRIPTION	QTY REQ	MODEL	PART NUMBER	REF. PAGE #
SINGLE ENGINE (SINGLE CYLINDER) APPLICATIONS UP TO 300 HP MAX NUMBER OF TURNS 5.5/6.5 	CYLINDER	1	SPLASHWELL	HC5380	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	H051_ _	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	H051_ _	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
DUAL ENGINE (SINGLE CYLINDER) NON-COUNTER ROTATING APPLICATIONS UP TO 300 HP MAX COUNTER ROTATING ENGINE APPLICATIONS UP TO 600 HP MAX NUMBER OF TURNS 5.6/6.5 	CYLINDER	1	SPLASHWELL	HC5380	
	TIE BAR KIT	1	SPLASHWELL		
				MOUNT TIE BAR H05010	
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	HOSE KIT	1	OUTBOARD HOSE	H051_ _	10-2
	OIL	3	SEASTAR OIL	HA5430	11-1
	FOR EXTRA STEERING STATIONS ADD:				
	HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
	FITTING KIT	1	ADD A STATION	HF5501	10-10
	HOSE KIT	1	OUTBOARD HOSE	H051_ _	10-2
	OIL	1	SEASTAR OIL	HA5430	11-1
OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	9-3
	20 DEGREE WEDGE		(FOR STANDARD HELMS)	HA5419	9-3
	AUTOPILOT FITTING KIT		(FOR ALL HELMS)	HF5501	10-10
	* TILT HELM- SEASTAR I			HH5741	9-7
	REAR MOUNT HELM- SEASTAR I			HH5261	9-7
	POWER ASSIST STEERING			PA1200	2-1

General Dimensions

Mounting Configuration



Tie Bar Kit# H05010

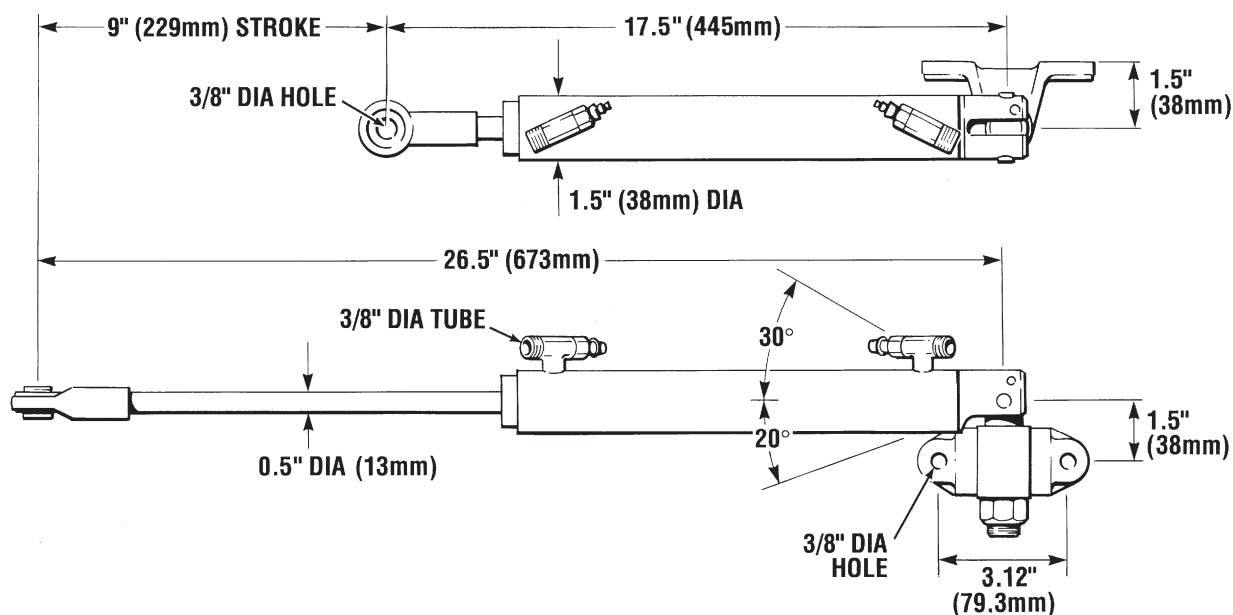


36" (914mm)	MAXIMUM ENGINE CENTRE DISTANCE
26" (660mm)	MINIMUM ENGINE CENTRE DISTANCE

PART# HC5380

NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.



Features

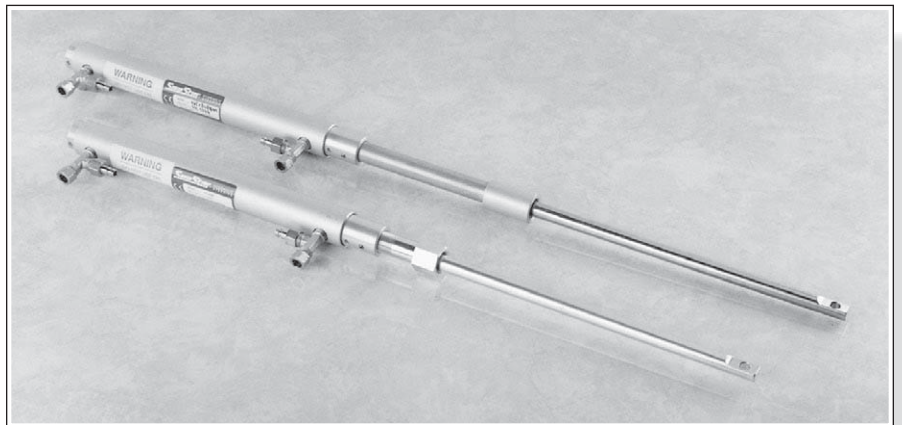
- Easy installation.
- Simple autopilot interface.
- Simple multiple steering station connection.

Applications

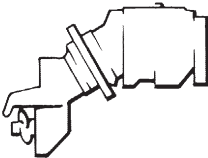
- Fits most power and non-power assist sterndrives.
- Single and multiple drives.

How to select a steering system for a stern drive

- 1) From the order guide on page 4-2 select the drive configuration based on the number of drives.
- 2) From the application guide on page 4-3 confirm that a cylinder is available for your specific make, model and year of drive unit. Select the cylinder that is appropriate for the drive.
- 3) From the order guide select the appropriate helm and accessory hardware. Note that two helm pumps of different displacements are available for power steered sterndrives. The displacement of the helm affects the number of turns lock to lock. Select the helm displacement on the basis of the desired steering response.
- 4) Select the appropriate tube or hose and fitting kits.
- 5) Confirm that sufficient space is available in the dash and engine compartments for the equipment.



Order Guide

SYSTEM CONFIGURATION	COMPONENT DESCRIPTION	QTY REQ	MODEL	PART #	PAGE REF #
SINGLE & DUAL STERNDRIVE (For dual sterndrive applications use engine manufactures supplied tie bar.) 	CYLINDER	1	SEE APPLICATION GUIDE		
	HELM	1	* SEASTAR I STANDARD (SEE NOTE 1) ** SEASTAR II-STANDARD (SEE NOTE 2)	HH5271 HH5272	9-6 9-6
	OIL	3	SEASTAR OIL	HA5430	11-1
	TUBE/HOSE		SEE NOTE 3		10-6
	FOR EXTRA STEERING STATION ADD:				
	HELM	1	* SEASTAR I STANDARD (SEE NOTE 1) ** SEASTAR II-STANDARD (SEE NOTE 2)	HH5271 HH5272	9-6 9-6
	FITTING KIT	1	ADD A STATION - FOR SEASTAR I HELMS - FOR SEASTAR II HELMS	HF5502 HF5501	10-11 10-10
	OIL	1	SEASTAR OIL		11-1
	EXTRA TUBE/HOSE		SEE NOTE 3		10-6
OPTIONAL EQUIPMENT	BACK PLATE KIT		(FOR STANDARD HELMS)	HA5418	9-3
	20 DEGREE WEDGE KIT		(FOR STANDARD HELMS)	HA5419	9-3
	AUTOPILOT FITTING KIT		(FOR ALL HELMS)	HF5502	10-11
	* TILT HELM-SEASTAR I			HH5741	9-7
	REAR MOUNT HELM-SEASTAR I			HH5261	9-7
	** TILT HELM-SEASTAR II			HH5742	9-7
	REAR MOUNT HELM-SEASTAR I			HH5262	9-7
	POWER ASSIST STEERING			PA1200	2-1

1. Seastar I helms are the standard recommendation for both non-power and power steered applications.
2. Seastar II helms can be specified for power steered applications where faster steering response is desired. Review the application chart on page 4-3 for recommendations.
3. * **For Seastar I systems:** use 3/8" dia nylon tubing ref part No. HT5_ _ (Refer to page 10-6)

- * **For Seastar II systems:** Use the following option **A** or **B**
- A)** Outboard hose:
Hoses must be ordered in standard lengths. They cannot be cut to length. (Refer to page 10-2)
- B)** Copper tube:
3/8" diameter copper tube and hose kit part No. HF5508 (Refer to page 10-6)
4. For dual stern drives – use the tie bar supplied by the engine manufacturer.

NOTICE

These recommendations apply to factory stock stern drives only. Modified installations may require a higher capacity steering system. If in doubt, contact our technical service for assistance.

Application Guide

SeaStar

STERNDRIVE STEERING

ENGINE MANUFACTURER	STEERING CONFIGURATION	ENGINE/DRIVE DESCRIPTION	YEAR	CYLINDER DESCRIPTION		NUMBER TURNS LOCK TO LOCK		NOTES
				MODEL No.	PART No.	SEASTAR I HELM	SEASTAR II HELM	
BMW	NON POWER ASSIST	ALL	TO DATE	BA125-8EMV	HC5330	4.9	N/A	1
	POWER ASSIST	ALL	TO DATE	125-8EM	HC5328	4.9/5.8	3.4/4.1	2
MERCRUISER	NON POWER ASSIST	MERCRUISER I ALPHA I BRAVO I BRAVO II BRAVO III	1983 & PRIOR 1984 TO DATE 1984 TO DATE 1984 TO DATE 1984 TO DATE	BA125-8EMV BA135-7EM BA135-7EM BA135-7EM BA135-7EM	HC5330 HC5332 HC5332 HC5332 HC5332	4.9 5.0 5.0 5.0 5.0	N/A 3.5 3.5 3.5 3.5	1,7 1,5,6,7 1,5,6,7 1,5,6,7 1,5,6,7
	POWER ASSIST	MERCRUISER I ALPHA I BRAVO I BRAVO II BRAVO III	1983 & PRIOR 1984 TO DATE 1984 TO DATE 1984 TO DATE 1984 TO DATE	125-8EM 125-8EM 125-8EM 125-8EM 125-8EM	HC5328 HC5328 HC5328 HC5328 HC5328	4.9/5.8 4.9/5.8 4.9/5.8 4.9/5.8 4.9/5.8	3.4/4.1 3.4/4.1 3.4/4.1 3.4/4.1 3.4/4.1	2 2 2 2 2,8
OMC	NON POWER ASSIST	400/800 SERIES COBRA KING COBRA	1985 & PRIOR 1986 TO DATE 1986 TO DATE	N/A BA150-7EM BA150-7EM	N/A HC5326 HC5326	N/A 6.0 6.0	N/A N/A N/A	1,4 1,4
	POWER ASSIST	400/800 SERIES COBRA KING COBRA	1985 & PRIOR 1986 TO DATE 1986 TO DATE	N/A 125-8EM 125-8EM	N/A HC5328 HC5328	N/A 4.9/5.8 4.9/5.8	N/A 3.4/4.1 3.4/4.1	2 2
VOLVO	NON POWER ASSIST	275 280 290 DIESEL	TO DATE TO DATE TO DATE TO DATE	BA150-7ATM BA135-7EM BA135-7EM BA135-7EM	HC5314 HC5332 HC5332 HC5332	6.0 5.0 5.0 5.0	N/A 3.5 3.5 3.5	1,7 1,5,6,7 1,5,6,7 1,5,6,7
	POWER ASSIST	275 280 290 DIESEL 32, DIESEL 41-42, DIESEL DPS & SX	TO DATE TO DATE TO DATE TO DATE 1997 TO DATE 1992 TO DATE 1996 TO DATE	N/A 125-8EM 125-8EM 125-8VEM 92-VPS 92-VPS 92-VPS	N/A HC5328 HC5328 HC5329 HC5331 HC5331 HC5331	N/A 4.8/5.8 4.8/5.8 4.9/5.8 4.8/5.5 4.8/5.8 4.8/5.5	N/A 3.4/4.1 3.4/4.1 3.4/4.1 3.4/4.1 3.4/4.1 3.4/4.1	2 2 2 2 2 2 2
YAMAHA	NON POWER ASSIST	ALL	1989 TO DATE	N/A	N/A	N/A	N/A	
	POWER ASSIST	ALL	1989 TO 1992	125-8EM	HC5328	4.9/5.8	3.4/4.1	2

1. Balanced system – ie: the number of turns lock to lock is equal port to starboard or vice-versa.
2. Unbalanced system – ie: the number of turns lock to lock is not equal port to starboard or vice-versa.
3. Requires additional clevis supplied by engine manufacturer. Reference Quicksilver part No. B98735A1. Refer to diagram on page 4-4.

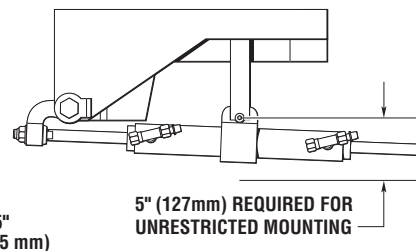
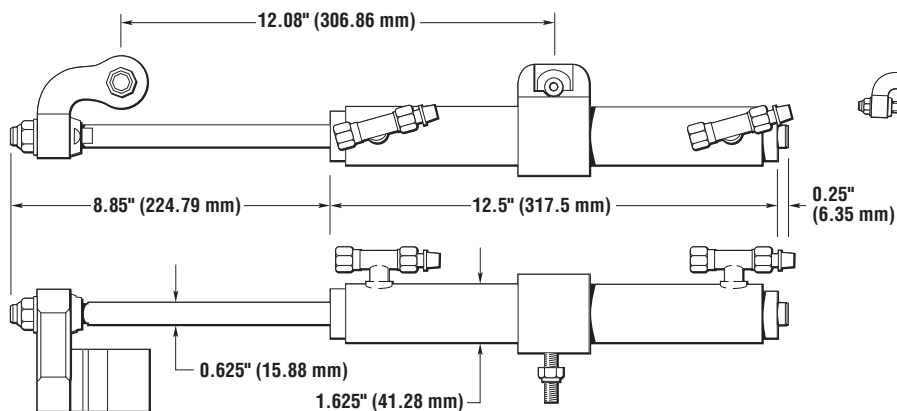
4. Requires cylinder rod end adapter HA5424 supplied by Teleflex Canada Limited Partnership. Refer to diagram on page 4-4.
5. **HC5332 replaces HC5326 as of January 2000.** If installing HC5326 additional clevis supplied by engine manufacturer required (part number B98735A1).

6. **The installation of the HC5332 sterndrive cylinder requires the use of SeaStar Outboard hose only. DO NOT use 3/8" copper or nylon tube.**
7. If engine outdrive is NOT equipped with a torque tab on the underside of the lower leg one must be installed to reduce prop torque.
8. Yanmar Engines using the Bravo III drives require the use of cylinder HC5326.

REVISION DATE: JANUARY 12TH 2004

General Dimensions

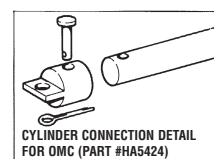
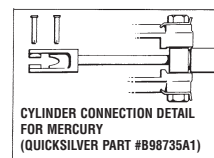
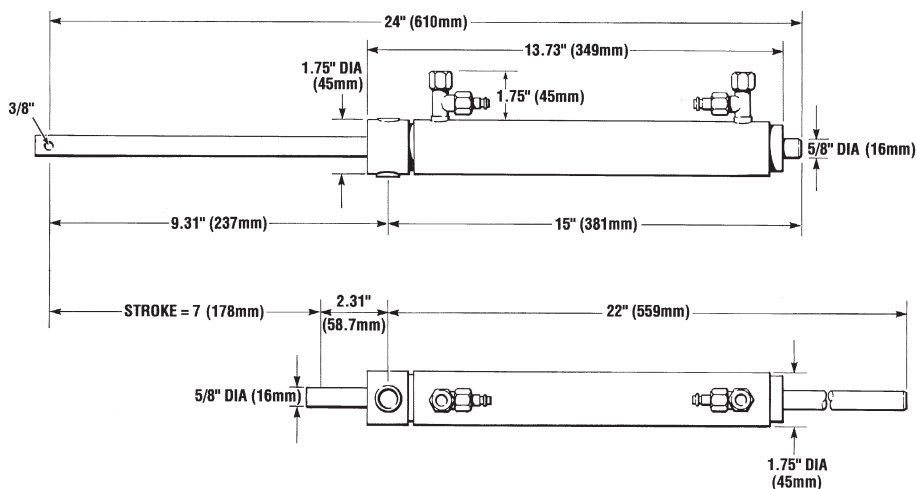
HC5332 135-7EM



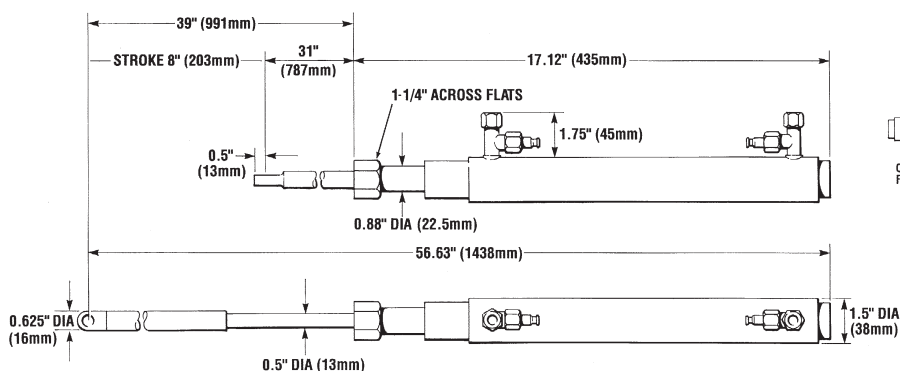
NOTICE

If engine outdrive is NOT equipped with a torque tab on the underside of the lower leg, one must be installed to reduce prop torque.

HC5326 BA150-7EM

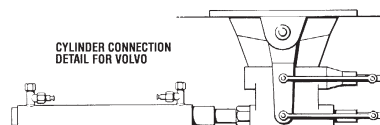
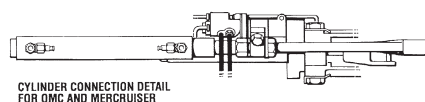


HC5328 125-8EM



NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.

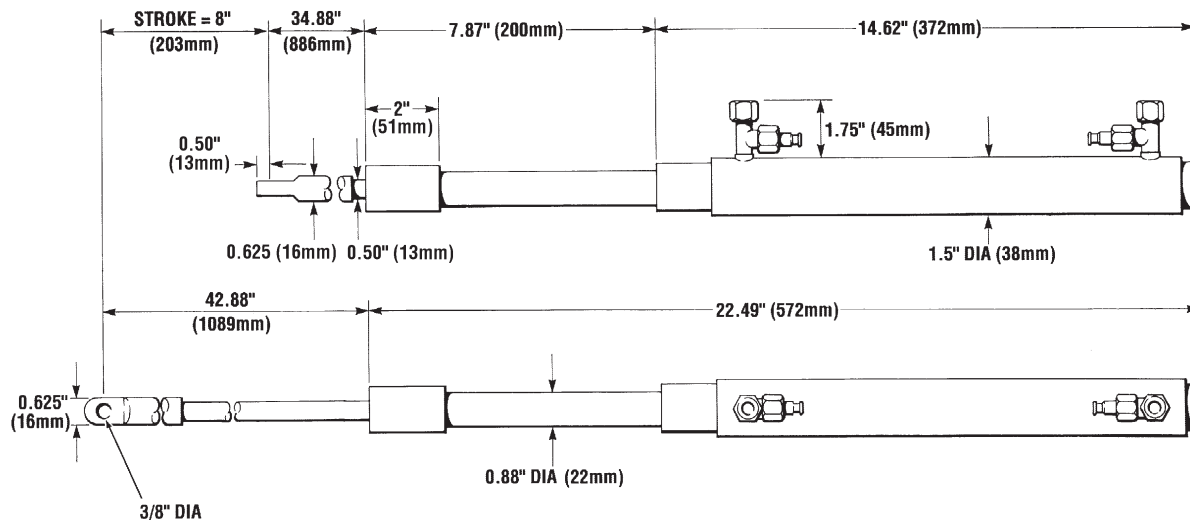


General Dimensions

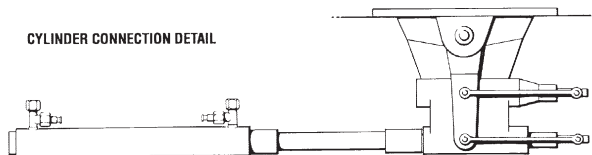
SeaStar®

STERNDRIIVE STEERING

HC5329 125-8VEM



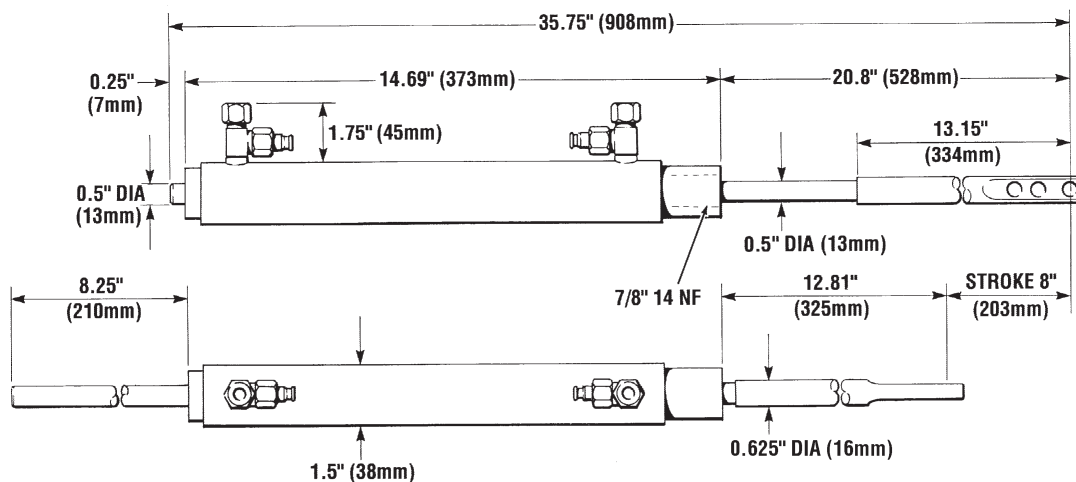
CYLINDER CONNECTION DETAIL



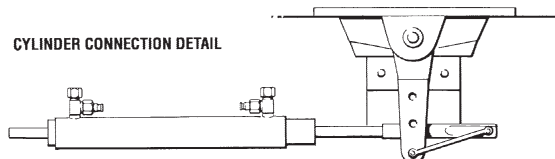
NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.

HC5330 BA125-8EMV

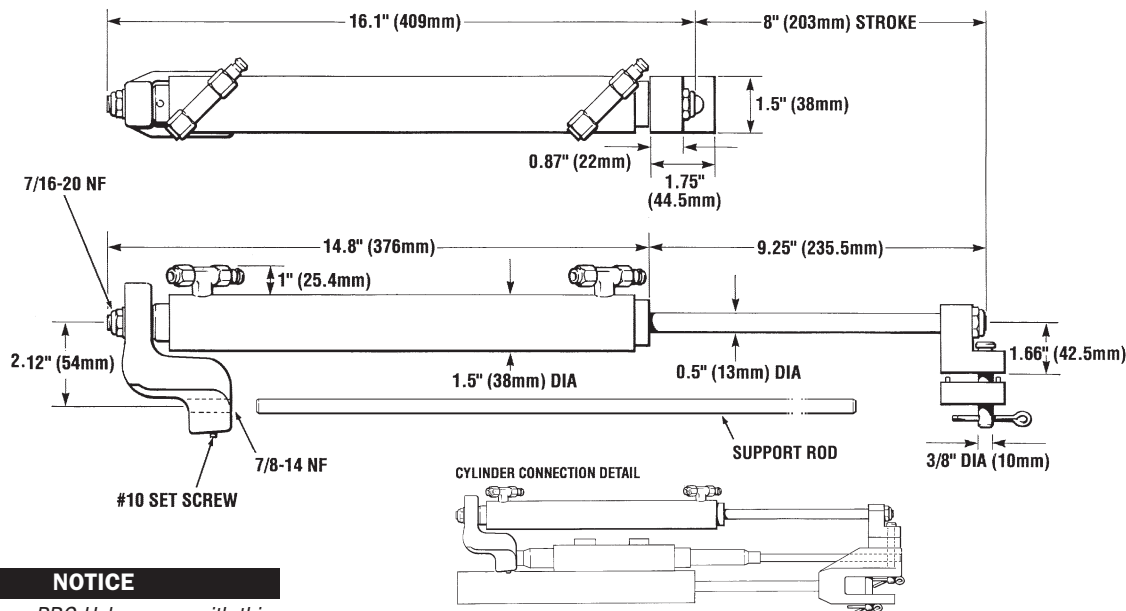


CYLINDER CONNECTION DETAIL



General Dimensions

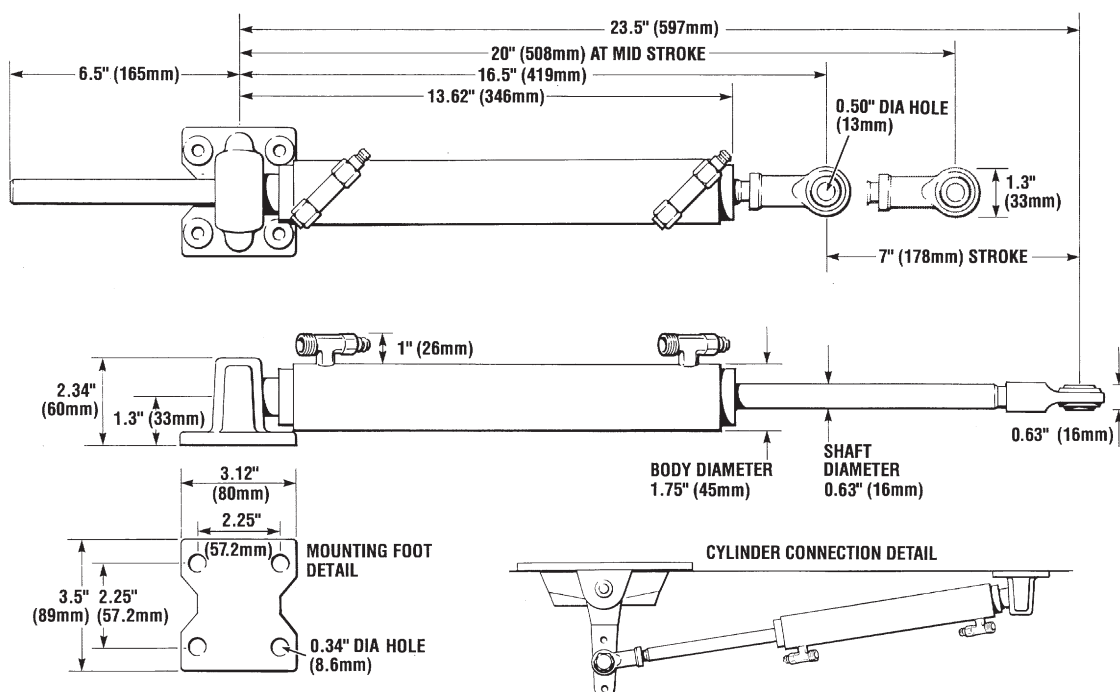
HC5331 92-VPS



NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.

HC5314 BA150-7ATM



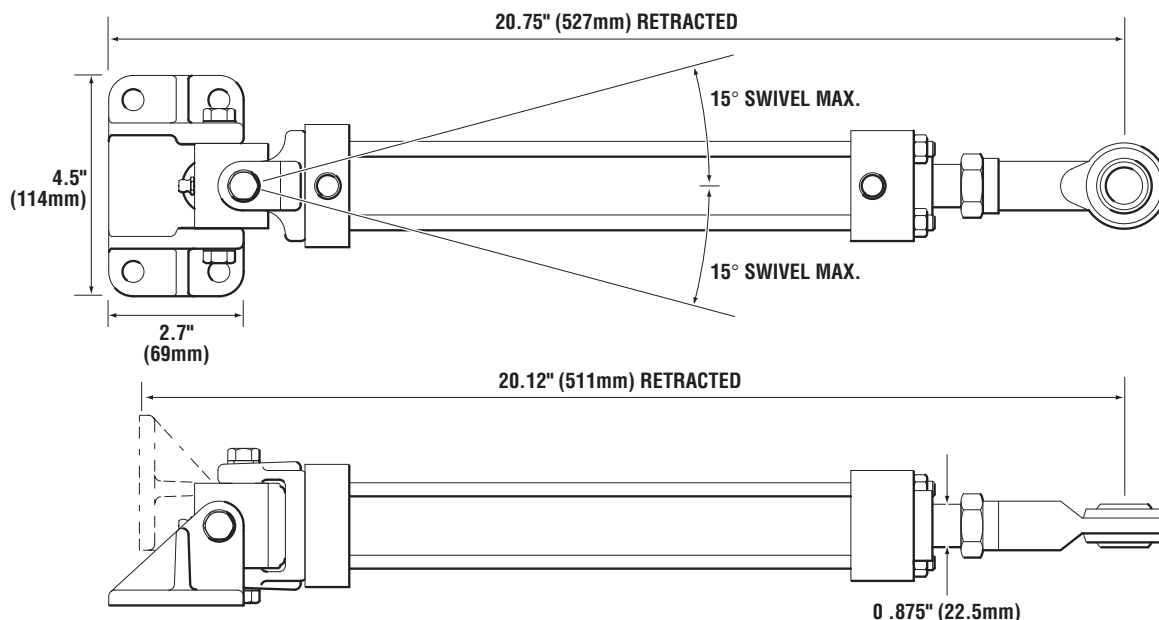
Performance I/O and Outboard Cylinders

The K-5-B cylinder was designed for inboard/outboard boats requiring external cylinders of substantial size and strength. The K-5 cylinders are nickel plated for aesthetics and protection against the elements. This cylinder does not include the wing plates or hardware required for mounting to the outdrive. Porting is through two through-transom 1/4" NPT ports located at the mounting end of the cylinder.

NOTICE

Due to the large volume of the K-5-B Cylinders, it is suggested that only Capilano and/or Hynautic H-40 series helms be used to retain a comfortable yet reasonable amount of wheel turns from hard over to hard over.

K-5-B



BORE	STROKE	DISP EXT.	DISP RET.
1.5" (38mm)	9" (229mm)	15.9cu in	10.5cu in

NOTICE

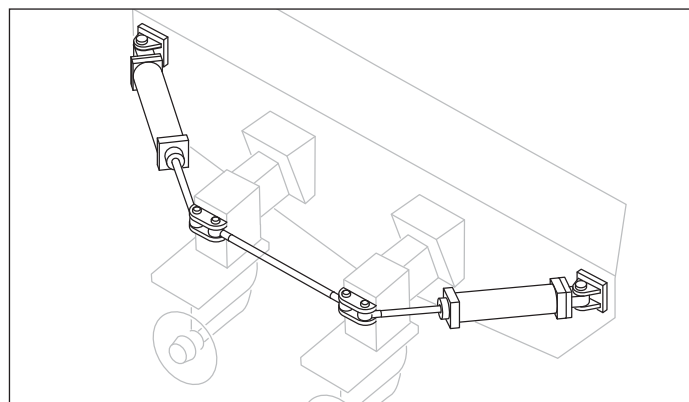
K-5 Cylinders are UN-balanced Cylinders, unequal amount of fluid on either side of the piston.

NOTICE

DO NOT use a PRO Helm pump with this, or any other unbalanced steering cylinder.

NOTICE

Teleflex does NOT make connecting hardware to attach this cylinder to the out drive.

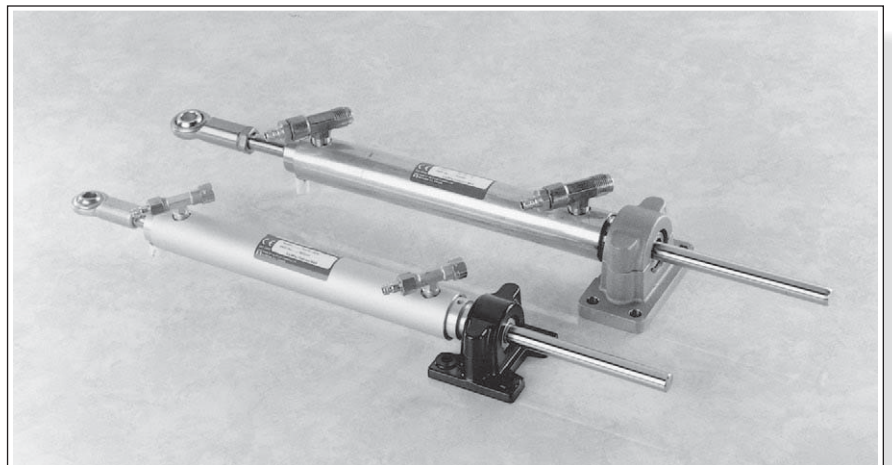


Features

- Regular duty aluminum cylinders.
- Heavy duty brass cylinders.
- Easy installation for single and dual rudder vessels.
- Cylinders supplied with bleeder fittings.
- Two axis articulation.
- Easy autopilot interface.

Four steps to select a steering system for an inboard powered boat

- 1) From the Application Guide on page 5-2 select the System Number appropriate for the vessel based on;
 - a) hull type - displacement or planing,
 - b) length of vessel,
 - c) number of rudders, and
 - d) usage of vessel.
- 2) From the Order Guide on page 5-2 select the appropriate helms and accessory hardware for each steering station.
- 3) From the Order Guide select the fitting and hose kits required for the installation.
- 4) Confirm that you have sufficient space available in;
 - a) the area the cylinder is to be mounted, and
 - b) the dash area for the steering components.



Application Guide

NOTICE

Want automotive type steering? Refer to page 2-1 for Power Assist Details.

BOAT LENGTH UP TO	PLANING HULL				DISPLACEMENT HULL				SAIL	
	SINGLE ENGINE		TWIN ENGINE		SINGLE ENGINE		TWIN ENGINE		SINGLE ENGINE	
	PLEASURE	WORK	PLEASURE	WORK	PLEASURE	WORK	PLEASURE	WORK	PLEASURE	WORK
26FT (8m)	1	4	1	4	2	4	2	4	4	4
32FT (10m)	2	4	1	4	3	4	3	4	4	4
38FT (11.5m)	3	5	2	5	5	5	3	5	4	5
44FT (13.5m)	5	-	3	5	-	-	5	-	5	-
50FT (15m)	-	-	5	-	-	-	-	-	-	-

a) Displacement Hull - maximum hull speed does not normally exceed 18 knots.
b) Planing Hull - maximum hull speed normally exceeds 18 knots.

ORDER GUIDE

COMPONENT DESCRIPTION	QTY REQ	MODEL	PART #	PAGE REF
1 4 TURNS LOCK TO LOCK				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
CYLINDER	1	BA125 - 7ATM	HC5312-2	
OIL	3	SEASTAR OIL	HA5430	11-1
TUBE	1	3/8" DIA NYLON (NOTE 1 & 3)	HT5_ _	10-6
FOR EXTRA STEERING STATION ADD:				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
FITTING KIT	1	ADD A STATION	HF5502	10-11
OIL	1	SEASTAR	HA5430	11-1
EXTRA TUBE		3/8" DIA NYLON (NOTE 1 & 3)		10-6

COMPONENT DESCRIPTION	QTY REQ	MODEL	PART #	PAGE REF
4 4-1/4 TURNS LOCK TO LOCK				
HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
CYLINDER	1	BA150 - 7TM	HC5318	
OIL	3	SEASTAR OIL	HA5430	11-1
HOSE KIT	1	HOSE KIT	HF5508	10-12
COPPER TUBE		3/8" DIA.(NOTE 2 & 3)		10-6
FOR EXTRA STEERING STATION ADD:				
HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
FITTING KIT	1	ADD A STATION	HF5502	10-11
OIL	1	SEASTAR	HA5430	11-1
EXTRA TUBE		AS ABOVE (NOTE 2 & 3)		10-6

2 5 TURNS LOCK TO LOCK				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
CYLINDER	1	BA135 - 7ATM	HC5313	
OIL	3	SEASTAR OIL	HA5430	11-1
TUBE	1	3/8" DIA NYLON (NOTE 1 & 3)	HT5_ _	10-6
FOR EXTRA STEERING STATION ADD:				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
FITTING KIT	1	ADD A STATION	HF5502	10-11
OIL	1	SEASTAR	HA5430	11-1
EXTRA TUBE		3/8" DIA NYLON (NOTE 1 & 3)		10-6

5 5-1/2 TURNS LOCK TO LOCK				
HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
CYLINDER	1	BA175 - 7TM	HC5319	
OIL	3	SEASTAR OIL	HA5430	11-1
HOSE KIT	1	HOSE KIT	HF5508	10-12
COPPER TUBE		3/8" DIA.(NOTE 2 & 3)		10-6
FOR EXTRA STEERING STATION ADD:				
HELM	1	** SEASTAR II- STANDARD	HH5272	9-6
10-11 OIL	1	SEASTAR	HA5430	11-1
EXTRA TUBE		AS ABOVE (NOTE 2 & 3)		10-6

3 6 TURNS LOCK TO LOCK				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
CYLINDER	1	BA150 - 7ATM	HC5314	
OIL	3	SEASTAR OIL	HA5430	11-1
TUBE	1	3/8" DIA NYLON (NOTE 1 & 3)	HT5_ _	10-6
FOR EXTRA STEERING STATION ADD:				
HELM	1	* SEASTAR I- STANDARD	HH5271	9-6
FITTING KIT	1	ADD A STATION	HF5502	10-11
OIL	1	SEASTAR	HA5430	11-1
EXTRA TUBE		3/8" DIA NYLON (NOTE 1 & 3)		10-6

OPTIONAL EQUIPMENT			
BACK PLATE KIT (FOR STANDARD HELMS)	HA5418	9-3	
20 DEGREE WEDGE KIT (FOR STANDARD HELMS)	HA5419	9-3	
AUTOPILOT FITTING KIT (FOR ALL HELMS)	HF5502	10-11	
* TILT HELM-SEASTAR I	HH5741	9-7	
REAR MOUNT HELM-SEASTAR I	HH5261	9-7	
** TILT HELM-SEASTAR I	HH5742	9-7	
REAR MOUNT HELM-SEASTAR I	HH5262	9-7	
POWER ASSIST STEERING	PA1200	2-1	

1. For systems 1, 2 & 3 - nylon tubing (3/8" dia.) is the standard requirement for plumbing the system. Copper tubing (3/8" dia.) can be substituted but Fitting Kit HF5507 is required. (Refer to page 10-12).

2. For systems 4 & 5 - copper tubing (3/8" dia.) is the standard requirement for plumbing the system. Fitting Kit HF5508 is required. (Refer to page 10-12).

3. For systems 1, 2, 3, 4, & 5 Seastar outboard hose can be substituted for nylon or copper tube. These hoses must be ordered in standard lengths. They cannot be cut to length. (Refer to page 10-2).

NOTICE

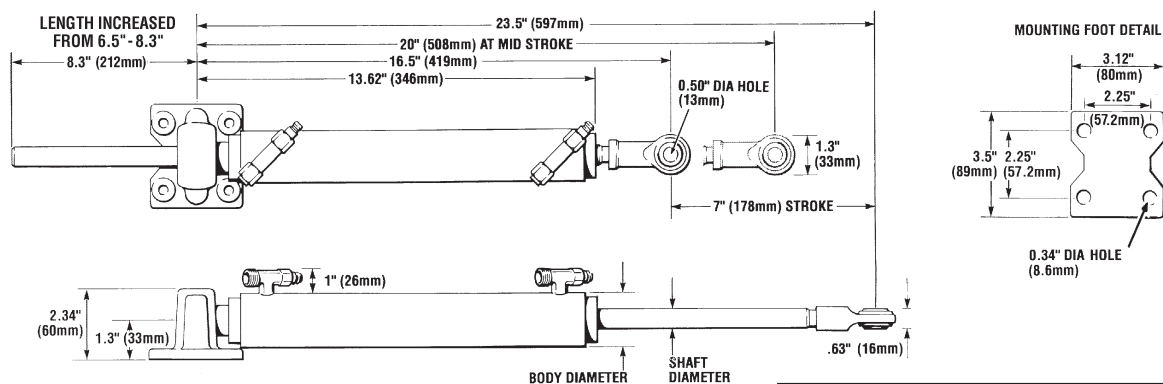
If your vessel is beyond system 1 to 5, please go to page 7-1 for SeaStar Power Steering Systems.

General Dimensions–SeaStar

SeaStar®

INBOARD STEERING

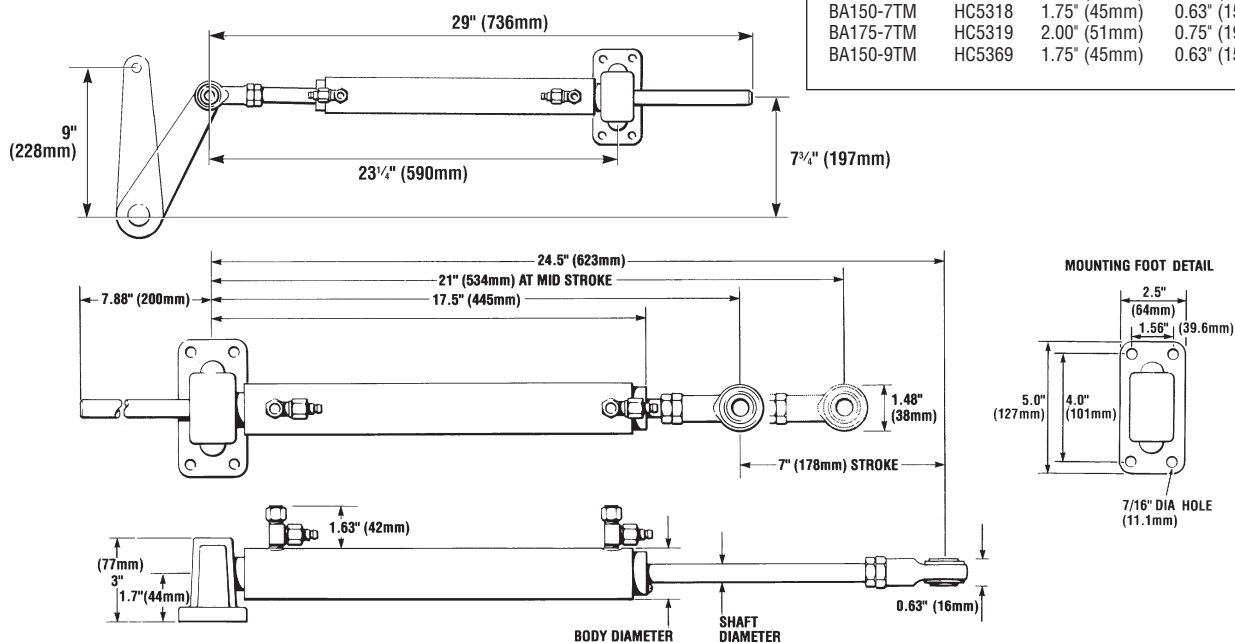
ATM CYLINDERS (ALUMINUM): HC5312-2/ HC5313/ HC5314



CYLINDER DIMENSIONS SPECIFIC TO MODEL

CYLINDER MODEL	PART #	BODY DIAMETER	SHAFT DIAMETER
BA125-7ATM	HC5312	1.38" (35mm)	0.50" (12.7mm)
BA135-7ATM	HC5313	1.50" (38mm)	0.63" (15.9mm)
BA150-7ATM	HC5314	1.75" (45mm)	0.63" (15.9mm)
BA150-7TM	HC5318	1.75" (45mm)	0.63" (15.9mm)
BA175-7TM	HC5319	2.00" (51mm)	0.75" (19.1mm)
BA150-9TM	HC5369	1.75" (45mm)	0.63" (15.9mm)

TM CYLINDERS (BRASS): HC5318/ HC5319/HC5369

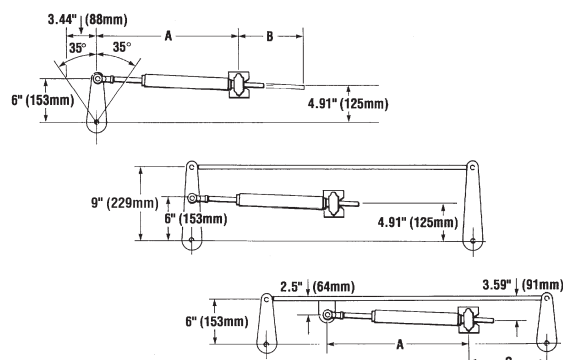


CYLINDER MOUNTING CONFIGURATIONS

MOUNTING CONFIGURATION DIMENSIONS

CYLINDER MODEL	PART #	A	B	C
BA125-7ATM	HC5312	20" (508)	6.5" (165)	8.5" (216)
BA135-7ATM	HC5313	20" (508)	6.5" (165)	8.5" (216)
BA150-7ATM	HC5314	20" (508)	6.5" (165)	8.5" (216)
BA150-7TM	HC5318	21" (534)	8" (204)	10" (254)
BA175-7TM	HC5319	21" (534)	8" (204)	10" (254)
BA150-9TM	HC5369	21" (534)	8" (204)	10" (254)

Figures in parenthesis are in millimetres

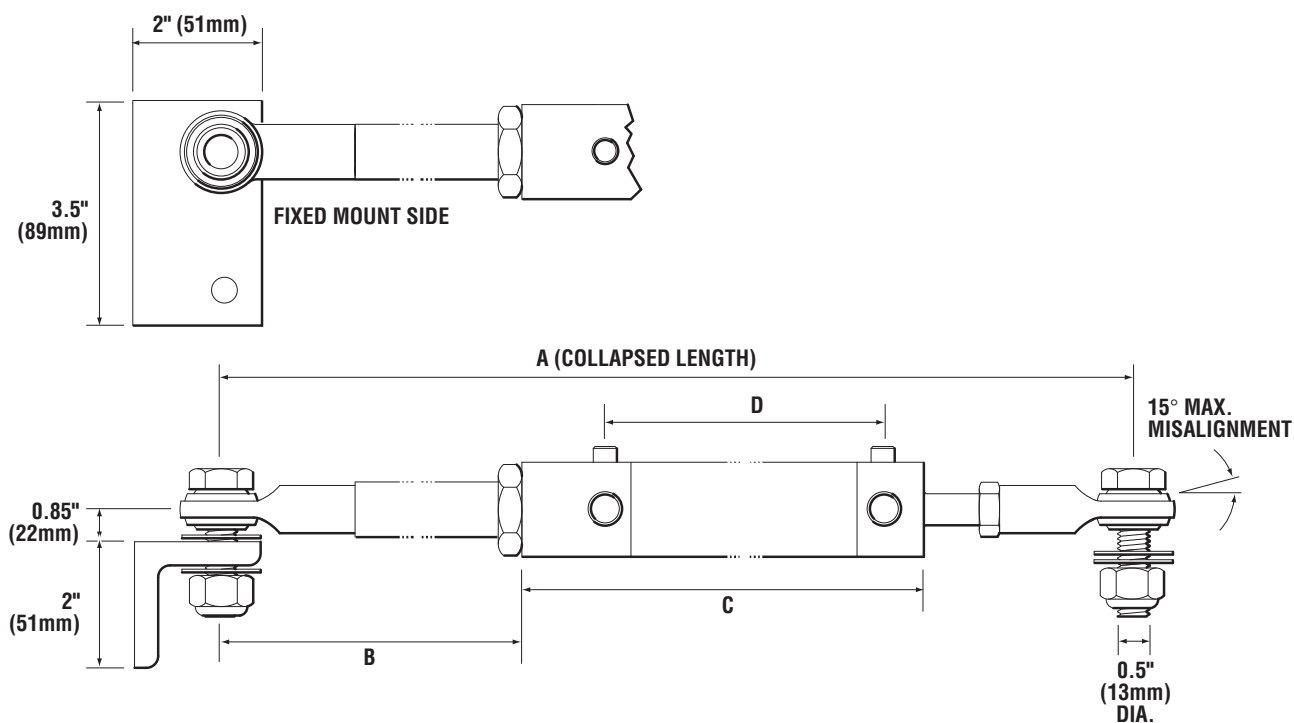


General Dimensions–Hynautic

Universal Mount Cylinders K-18/K-19

The K-18 and K-19 balanced cylinders are double rod ended, each end held in place with internal wire ties. Every cylinder is equipped with a swivel joint at each end. One provides for a fixed mount attachment point at the end of the housing to protect the moving rod. The other swivel joint, located at the rod end, allows for free movement of the cylinder without binding when attached to the rudder arm.

K-18 & K-19



CYL MODEL	A	B	C	DIMENSIONS D	BORE	STROKE	DISP
K-18	24.5" (662mm)	9.31" (237mm)	11.75" (299mm)	9.875" (251mm)	1.25" (32mm)	7" (178mm)	7cu in
K-19	28.5" (724mm)	11.31" (287mm)	13.75" (350mm)	11.875" (302mm)	1.25" (32mm)	9" (229mm)	9cu in

Above cylinders can be used on the following boats:

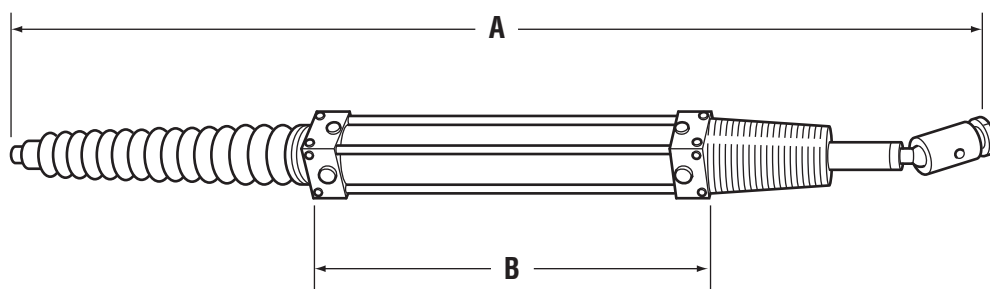
K-18 = ALL System #1 as noted on page 5-2.

K-19 = ALL Systems #1 through #3 as noted on page 5-2.

Fixed Mount and Pivot Mount models: K-22, K-27 and K-31

These Brass cylinders are for larger boats up to approximately 70 ft. Tubes, ends, and external rods are brass: cylinder rods are 17-4 stainless steel: mounts are manganese bronze. There are two different types of mounting packages for Brass cylinders: fixed mount and pivot mount.

K-22 & K-27

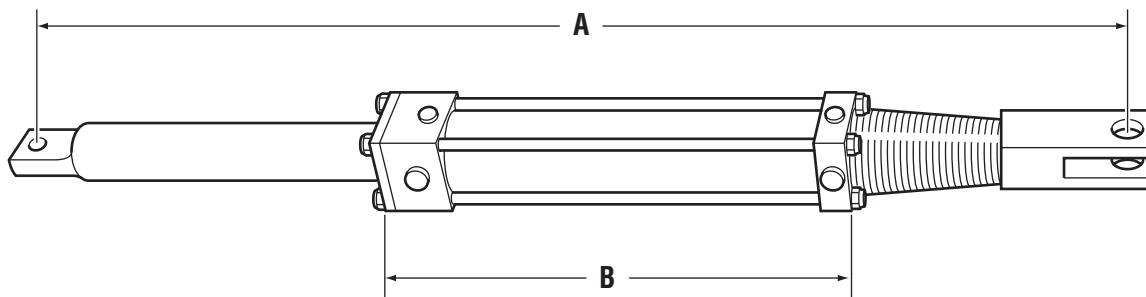


CYL MODEL	DIMENSIONS		BORE	STROKE	DISP
	A	B			
K-22	*34.12" (867mm)	13.25" (337mm)	1.5" (38mm)	10" (254mm)	13.20cu in
K-27	*36.75" (934mm)	13.25" (337mm)	1.5" (38mm)	10" (254mm)	13.20cu in

**Dimensions are with the cylinder rod centered.*

For use in Systems #3 through #4 as noted on page 5-2.

K-31



CYL MODEL	DIMENSIONS		BORE	STROKE	DISP
	A	B			
K-31	*38.37" (975mm)	14.12" (359mm)	2.0" (51mm)	10" (254mm)	25.5cu in

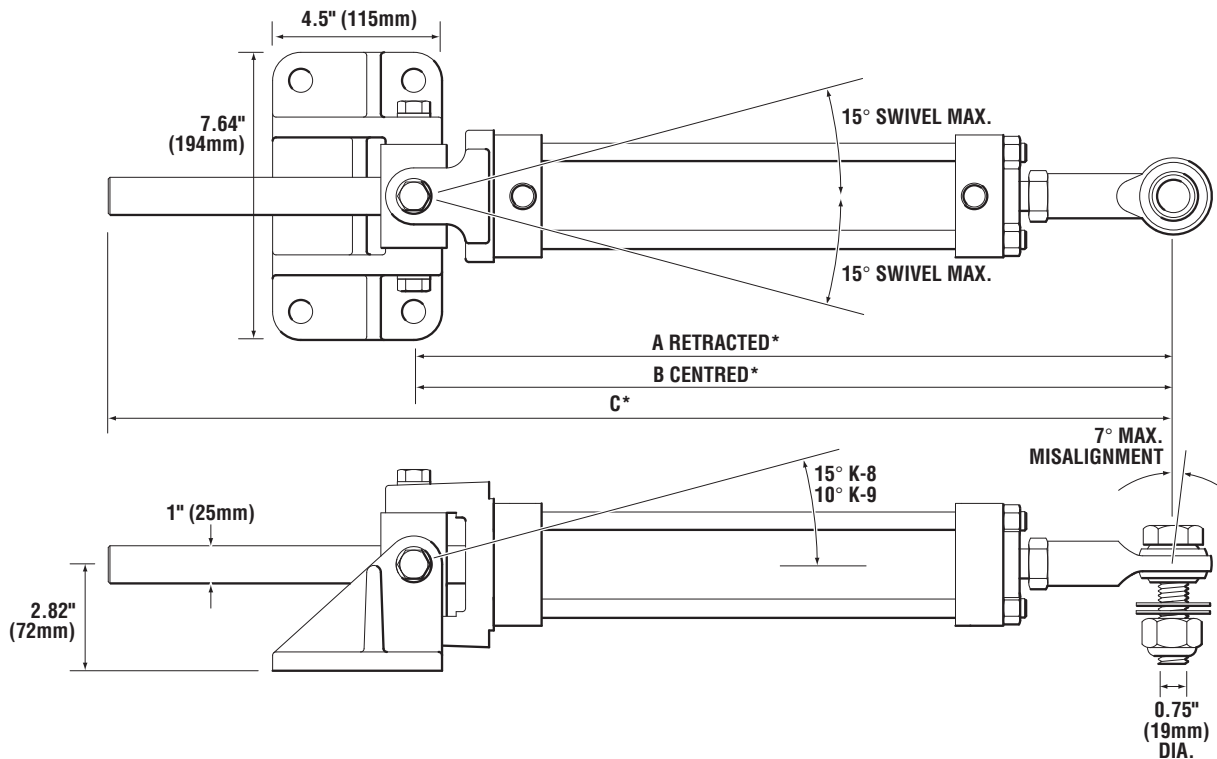
**Dimensions are with the cylinder rod centered.*

For use in System #5 as noted on page 5-2.

Large I/B Cylinders K-8/K-9

The K-8 and K-9 cylinders are double rod end, tie rod constructed hydraulic cylinders. Each has a universal mount, which allows two planes of pivot freedom. Each cylinder is equipped with a stainless steel ball joint. Porting is through two 1/4" NPT ports at each end of the cylinder.

K-8 & K-9



CYL MODEL	A*	B*	DIMENSIONS C*	BORE	STROKE	DISP
K-8	19.74" (502mm)	24.47" (622mm)	27.92" (710mm)	2.5" (64mm)	9.5" (242mm)	39.2cu in
K-9	24.74" (629mm)	31.99" 813(mm)	37.92" (962mm)	2.5" (64mm)	14.5" (369mm)	59.8cu in

* Clevis option increases length by 0.44" (12mm)



HYNAUTIC 3-LINE INBOARD STEERING

Introduction

SeaStar offers rugged 3-line Hynautic Heavy Duty steering systems for most work and pleasure vessels up to 70 feet.

Heavy Duty helms combine one or two bi-directional axial piston pumps with pilot check and make-up check valving. The result is a unit which prevents rudder feedback, is very efficient (even at low RPM), and is immediately adaptable to multi-station use.

A wide choice of helm displacements and cylinder configurations make it easy to spec a system which can handle a variety of large boat performance requirements and accommodate most user preferences.

Features

- Low friction heavy duty hydraulic steering.
- Helm/cylinder combinations for most inboards. Marine grade materials.
- Heavy duty helms available in three displacements, to accommodate most applications and user preferences.
- Helms available with 1" straight shaft or 3/4" tapered. Mount facing any direction.
- Quick air purge relief valve.
- Fluid fill at remote reservoir.
- Heavy duty brass cylinders. Two-axis articulation. Easy installation for single or dual rudder vessels.
- Meets or exceeds applicable standards.
- Accepts most steering wheels.

How to Spec a System

- 1 From the application guide select components appropriate for the vessel based on:
 - a) hull type—displacement or planing
 - b) length of vessel, and
 - d) number of steering wheel turns desired
- 2 Select the fitting and hose kits required, based on type of plumbing (1/2" or 5/8" tubing or hose) and based on number of steering stations.
- 3 Confirm that there is sufficient space available in the dash and engine compartment(s) for the steering components. Refer to helm and cylinder dimensions on page 9-8 and page 5-4.

Components

H-21	Hynautic 2.75 cu. in. helm (1" straight shaft) or
H-25	Hynautic 2.75 cu. in. helm (3/4" tapered shaft) or
H-42	Hynautic 4.0 cu. in. helm (1" straight shaft) or
H-42-02	Hynautic 4.0 cu. in. helm (3/4" tapered shaft) or
H-41	Hynautic 5.5 cu. in. helm (1" straight shaft) or
H-41-02	Hynautic 5.5 cu. in. helm (3/4" tapered shaft) or (See application guide page 6-3.)
HF-10	H-20 Fittings Kit for Main Station
HF-21	H-40 Fittings Kit for Main Station
HC53__ or K-__	Inboard Cylinder (See application guide page 6-3. 1 or 2 required.)
R06	Reservoir - Standard (2 quart)
MSV-21	Relief Valve (950 PSI)
MSVF-07	Relief Fittings (1150 & 1175-21-1)
MSVF-13	Relief Fittings (1175-42-1 & up)
1/2" or 5/8" OD Copper Tubing	(See application guide page 6-3.)
HF5590	Fitting Kit (for 1/2" Copper Tubing) or
HF5592	Fitting Kit (for 5/8" Copper Tubing) (See application guide page 6-3. These fitting kits are for one steering station, purchase add-a-station kit for 2nd station.)
HA5731	Hose Kit for Copper Tubing (2 hoses) Contains two 18" (.45m) hoses for single-cylinder installations.
HA5440	SeaStar Oil (1 Gallon) (Other fittings may be required. Contact Teleflex Canada.)

Options

K-31	Pivot Mount Inboard Cylinder (K-31 can be used in place of HC5378 or HC5379, see application chart page 6-3 for details.)
HA5732	Dual Cylinder Hose 2' (.6m)
HA5733	Dual Cylinder Hose 3' (.9m)
HA5734	Dual Cylinder Hose 4' (1.2m)
HA5735	Dual Cylinder Hose 5' (1.5m)
HA5736	Dual Cylinder Hose 6' (1.8m) These hoses are sold individually (four are required for dual cylinder installations).
R07	Reservoir (2 quart, with hand pump)
R11	Reservoir (1 quart, with hand pump)
R12	Reservoir (2 quart)
MSV-19	Relief Valve (500 PSI)
RV-55	Reservelvalve (500 PSI, top read, 3/8)
RV-55P	Reservelvalve (500 PSI, top read, 3/8, w/pump)
RV-57	Reservelvalve (500 PSI, top read, 5/16, w/pump)
RV-60	Reservelvalve (950 PSI, top read, 5/16)
RV-67	Reservelvalve (950 PSI, frt.read, 5/16, w/pump)
HF-11	H-20 Fittings Kit for Second Station
HF-22	H-40 Fittings Kit for Second Station

Hynautic 3-Line Inboard Steering Application Guide

VESSEL SIZE	HELM PUMP	WHEEL TURNS	CYLINDER MODEL	TUBING DIAMETER		MAX HP or AREA
				CYL. TO FARTHEST HELM		
				<40'	>40'	
Planing Hulls:						
35–50' (11–15m)	H-21 or H-25	5.0	HC5350 or HC5356	1/2"	5/8"	450 HP
40–50' (12–15m)	H-21 or H-25	6.8	HC5351 or HC5357	1/2"	5/8"	750 HP
40–50' (12–15m)	H-42	4.7	HC5351 or HC5357	1/2"	5/8"	750 HP
45–60' (14–18m)	H-42	7.4	HC5378 or HC5379	1/2"	5/8"	950 HP
45–60' (14–18m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	950 HP
55–65' (17–20m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	1200 HP
To 70' (To 21m)	H-41	10.8	2 x HC5378 or HC5379	1/2"	5/8"	1500 HP
To 70' (To 21m)	H-41	14.2	2 x K-8	1/2"	5/8"	1500 HP
Displacement Hulls—Tug Boats, Net Haulers:						
To 30' (To 9m)	H-21 or H-25	5.0	HC5350 or HC5356	1/2"	5/8"	200 HP
30–35' (9–11m)	H-21 or H-25	6.8	HC5351 or HC5357	1/2"	5/8"	250 HP
30–35' (9–11m)	H-42	4.7	HC5351 or HC5357	1/2"	5/8"	250 HP
26–40' (8–12m)	H-42	7.4	HC5378 or HC5379	1/2"	5/8"	400 HP
26–40' (8–12m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	400 HP
30–45' (9–14m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	150 HP
To 50' (To 15m)	H-41	10.8	2 x HC5378 or HC5379	1/2"	5/8"	500 HP
To 50' (To 15m)	H-41	14.2	2 x K-8	1/2"	5/8"	500 HP
To 50' (To 15m)	H-41	20.0	2 x K-9	1/2"	5/8"	500 HP
Displacement Hulls—Work and Pleasure Boats:						
To 40' (To 12m)	H-21 or H-25	5.0	HC5350 or HC5356	1/2"	5/8"	300 HP
40–45' (12–14m)	H-21 or H-25	6.8	HC5351 or HC5357	1/2"	5/8"	350 HP
40–45' (12–14m)	H-42	4.7	HC5351 or HC5357	1/2"	5/8"	350 HP
40–55' (12–17m)	H-42	7.4	HC5378 or HC5379	1/2"	5/8"	500 HP
40–55' (12–17m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	500 HP
45–65' (14–20m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	650 HP
To 75' (To 32m)	H-41	10.8	2 x HC5378 or HC5379	1/2"	5/8"	750 HP
To 75' (To 32m)	H-41	14.2	2 x K-8	1/2"	5/8"	750 HP
Sail Boats—Skeg Rudder:						
To 40' (To 12m)	H-21 or H-25	5.0	HC5350 or HC5356	1/2"	5/8"	9' (.9m)
40–45' (12–14m)	H-21 or H-25	6.8	HC5351 or HC5357	1/2"	5/8"	10' (1m)
40–45' (12–14m)	H-42	4.7	HC5351 or HC5357	1/2"	5/8"	10' (1m)
40–52' (12–16m)	H-42	7.4	HC5378 or HC5379	1/2"	5/8"	17' (1.6m)
40–52' (12–16m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	17' (1.6m)
50–60' (15–18m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	18' (1.7m)
To 65' (To 20m)	H-41	10.8	2 x HC5378 or HC5379	1/2"	5/8"	20' (1.9m)
To 65' (To 20m)	H-41	14.2	2 x K-8	1/2"	5/8"	20' (1.9m)
Sail Boats—Spade Rudder:						
To 40' (To 12m)	H-21 or H-25	5.0	HC5350 or HC5356	1/2"	5/8"	7' (.6m)
40–45' (12–14m)	H-21 or H-25	6.8	HC5351 or HC5357	1/2"	5/8"	8' (.7m)
40–45' (12–14m)	H-42	4.7	HC5351 or HC5357	1/2"	5/8"	8' (.7m)
35–46' (11–14m)	H-42	7.4	HC5378 or HC5379	1/2"	5/8"	15' (1.4m)
35–46' (11–14m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	15' (1.4m)
40–50' (12–15m)	H-41	5.4	HC5378 or HC5379	1/2"	5/8"	15.5' (1.4m)
To 60' (To 18m)	H-41	10.8	2 x HC5378 or HC5379	1/2"	5/8"	16.5' (1.5m)
To 60' (To 18m)	H-41	14.2	2 x K-8	1/2"	5/8"	16.5' (1.5m)

Helm Options

Four helms are offered in 3 displacements, as noted in the chart at right. The H-21 helm has a 1" straight wheel shaft; H-25 has a 3/4" tapered shaft. The H-42 and H-41 helms both have a 1" straight wheel shaft.

HELM PART#	DISPLACEMENT RANGE	RELIEF VALVE SETTING
H-21	2.75 cu.in.	950 psi (66Bar)
H-25	2.75 cu.in.	950 psi (66Bar)
H-42	4.00 cu.in.	950 psi (66Bar)
H-41	5.50 cu.in.	950 psi (66Bar)

Tubing/Hose Options

Use soft refrigeration type copper tubing for optimum performance. For tube-to-cylinder flex hoses, select a hydraulic hose rated for 1000 PSI (70 bar) working pressure, and with a very low volumetric expansion rating.

HELM TYPE	DISTANCE—CYLINDER TO FURTHEST HELM	
	40 FEET OR LESS	MORE THAN 40 FEET
All	1/2" O.D. Copper Tubing	5/8" O.D. Copper Tubing

Cylinder Options

Cylinders are made from brass & stainless steel. Available with stainless rod & ball joint (TMB models) or stainless rod & bronze clevis (TMC models.) Cylinders with ball joints have 2-axis articulation.

The K-31 is an optional pivot mount cylinder which can be used in the systems numbered "8a" and "8b" on the opposite page. With this cylinder, the number of wheel turns becomes 6.4 (using the H-42 helm) or 4.6 (H-41 helm).

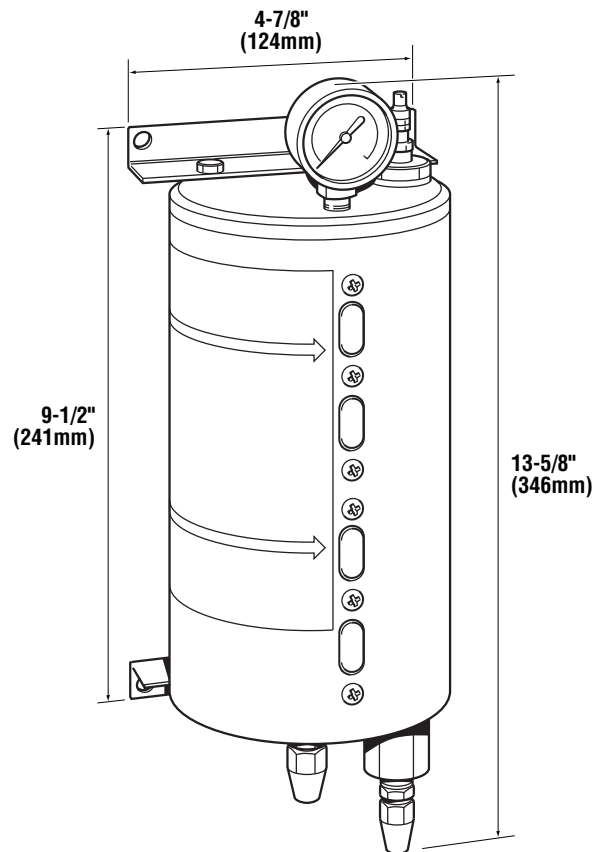
MODEL	PART#	DESCRIPTION / MODEL / ROD END CONFIG
7" Stroke:	HC5350	Cylinder BA175-7TMB (Rod End Ball Joint)
	HC5356	Cylinder BA175-7TMC (Rod End Clevis)
	HC5351	Cylinder BA200-7TMB (Rod End Ball Joint)
	HC5357	Cylinder BA200-7TMC (Rod End Clevis)
9.5" Stroke:	K-8	Hynautic Cylinder, 2.5" (Rod End Ball Joint)
11" Stroke:	HC5378	Cylinder BA200-11TMB (Rod End Ball Joint)
	HC5379	Cylinder BA200-11TMC (Rod End Ball Clevis)

NOTICE

The application guide on page 6-3 should be used with discretion. The chart is only a guide to selecting a steering system. A steering system manufacturer cannot anticipate all the variables in boat-rudder design that affect the steering loads. It is the final responsibility of the boat builder/designer to specify maximum expected steering loads. If the required information is not available, please see the Displacement and Planning Hull data sheets on page 10-21 and page 10-22. These sheets after being completely filled out can be faxed to Teleflex Technical Support at 604-279-2202.

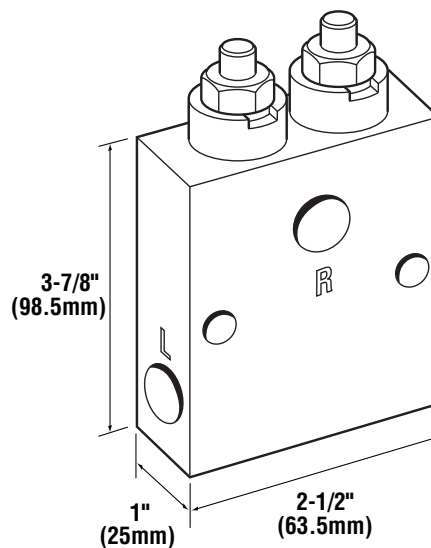
Reservoir Part# R-06

Capacity = 2 quarts.



Relief Valve Part# MSV-21

Relief Pressure factory set to 950psi.



Hynautic Seal Kits

Helms

SEAL KIT#	DESCRIPTION
HS-01	H-20 Series Helms, 1978 and earlier
HS-02	H-20 and H-30 Series Helms, 1979 and later
HS-03	H-40 Series Helms, 1978 and earlier
HS-04	H-40 Series Helms, 1979 and later
HS-05	H-50 Series Helms
HS-06	H-60 Series Helms
HS-08	H-80 Series Helms, before date code 8000
HS-09	H-80 Series Helms, after date code 8000
HS-10	H-100 and H-200 Series Helm Pumps

Cylinders

SEAL KIT#	DESCRIPTION
KS-01	K-11 thru K-17
KS-02	K-18 thru K-20
KS-03	K-02, H1010 (old style)
KS-04	K-21 thru K-29 (prior to Aug. 1983)
KS-05	K-31 thru K-33
KS-06	K-21 thru K-29 (after Aug. 1983)
KS-07	K-10
KS-08	K-07
KS-09	K-08, K-09 (prior to April 15, 1994)
KS-11	K-01, PSK-10
KS-12	K-02
KS-13	K-03, K-04, PSK-11, PSK-12 (prior to April 15, 1994)
KS-14	K-51
KS-15	K-05
KS-17	K-03, K-04, PSK-11, PSK-12 (after April 15, 1994)
KS-18	K-08, K-09 (after April 15, 1994)
KS-19	K-06 Models

Reservoirs

SEAL KIT#	DESCRIPTION
RS-01	R-04, R-10, R-13, R-14

Crossover Hynautic to SeaStar Steering

To review Advisory Notices, please view on line at www.seastarsteering.com or contact Teleflex Canada Limited Partnership directly at 604-270-6899.

Cylinders	HYNAUTIC CYLINDER	REPLACED WITH SEASTAR PART#	ADVISORY NOTICE#
	K-51	HC5314HY	764626
	K-1-B/C	HC5369HY/HYC	764624
	K-2-B/C	HC5373HY/HYC	764625
	K-3-B/C	HC5802HY/HYC	764615
	K-4-B/C	HC5378HY/HYC	764616
	K-10	HC5345HY	764612
	K-11, K-11S, K-12	HC5380HY	764613
	K-13, K-14	HC5370HY	764614

Helm Cross Over H-800 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	H-816	HH5271	764622
	H-820	HH5273	764622
	H-824	HH5272	764622

BH-800 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	BH-816	HH5779	764617 Hose MUST be replaced
	BH-820	HH5770	764617 Hose MUST be replaced
	BH-824	HH5772	764617 Hose MUST be replaced

H-100 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	H-116	HH5260	764618
	H-120	HH5261	764618
	H-124	HH5262	764618

H-200 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	BH-216	HH5741	764619
	BH-220	HH5743	764619
	BH-224	HH5742	764619

H-300 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	H-316	HH5271	764621
	H-320	HH5273	764621
	H-324	HH5272	764621

H-50 Series	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	BH-50	HH5273	764623
	BH-51	HH5272	764623
	BH-52	HH5271	764623

Hydraulic Kits	HYNAUTIC#	SEASTAR#	ADVISORY NOTICE#
	KF-100	H05035 Single H05038A Single	764633
	All Hynautic Hose/Tube	H051XX Hose HT5XXX Tube	764632
	All Hynautic Steering Kits	Misc. SeaStar Items	764631
	All Hynautic Hose/Tube	SeaStar Power Steering System	764630

Syten Hydraulic Steering
(Obsolete).

NOTICE

The Syten components were produced up until late 1984 when they were replaced by the SeaStar Steering systems. Teleflex Canada Limited Partnership no longer stocks any replacement parts, fittings or seal kits for this steering system or any component of this system.

NOTICE

Replacing or upgrading from a Syten inboard steering system to SeaStar Components.

Helms: The Syten helm pump should be replaced with the current model SeaStar Helm Pump HH5271 and Back mount kit HA5418. This should be done at each helm station.

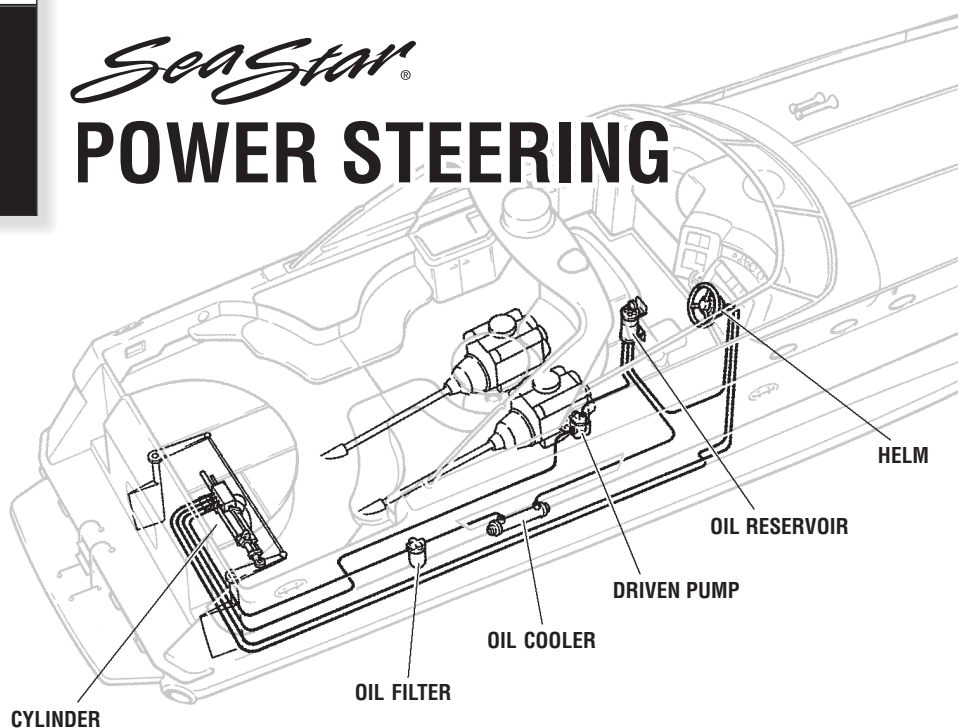
Tube: The 5/16 nylon tube and fittings are obsolete and must be replaced with SeaStar 3/8" nylon extruded tube for all inboard applications.

Uniflow Valve: U-10 or Model 50: Obsolete, no replacement parts are available.

Cylinder: Adapter HA5425 is required for the conversion from a Syten steering cylinder to a current SeaStar Steering cylinder.

Recommendations made in this publication are guidelines based on average acceptance of steering effort.

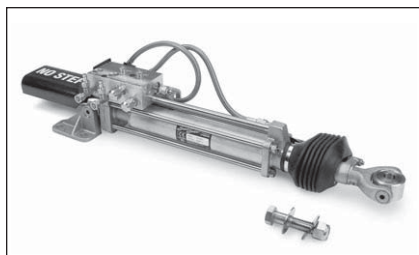
SeaStar® POWER STEERING



Features:

- Effortless steering from docking to top speed
- Responsive steering 3-1/2, turns lock to lock (or to suit)
- Automatic manual back up steering
- Simplified installation
- Multiple steering stations
- Easy autopilot interface

How it works:



SeaStar hydraulic power steering uses the ship's engine(s) to provide the "power" for the steering system, via an engine or electric motor driven hydraulic pump.

A manual hydraulic steering system, consisting of a standard SeaStar helm and a hydraulic steering cylinder, (fitted with an integral servo cylinder and a power steering valve) supplies the "control" portion of the steering system.

Under normal conditions, with engines running, a hydraulic oil supply is in a stand-by mode, ready to be directed to the steering cylinder as dictated by the steering wheel, servo cylinder and power steering valve. Turning the steering wheel left or right makes the system go from stand-by into operating mode and move the steering cylinder accordingly.

In the event of a power source failure, hydraulic oil, from the steering helm, is automatically diverted directly into the servo and steering cylinder, providing the helmsman with manual back-up steering.

An engine room mounted oil reservoir allows easy system fill and assists the in-line oil cooler in cooling the hydraulic oil. An in-line oil filter helps to protect the steering system components against contaminants.

Hose, Tube and Hydraulic Fluid:

Recommend 100R1 for power circuit, 5/16"ID hose or tube for manual circuit.
*If using 1/4"ID tube, runs should be short and SeaStar oil must be used.

System designed to use SeaStar oil (Mil spec H5606) or Dexron II (ATF) if using 1250V or 1275V helms.

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 lbf _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 lbf _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 lbf _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 lbf _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 lbf _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 lbf _f (45,852 N)	66,130 in-lbs (7472 Nm)

Basic System Selection Guide:

Power Steering Cylinders

Part #

9" (228mm) strokeHC5801-2

See table above for correct cylinder selection

11" (279mm) strokeHC5803-2

See table above for correct cylinder selection

9" (228mm) strokeHC5805

See table above for correct cylinder selection

Add-On Cylinders

9" (228mm) strokeHC5802

See table above for correct cylinder selection

11" (279mm) strokeHC5804

See table above for correct cylinder selection

9" (228mm) strokeHC5806

See table above for correct cylinder selection

Steering Helms (For 3-1/2 Turn System)

Part #

SSI Helm, Standard Mount.....HH5271

SSI Helm, Rear MountHH5261

SSI Helm, TiltHH5741

SSI Helm, Rear Mount, 1" ShaftHH5281

Power Steering Pumps

Outlet Check Power Pump.....HP5820

Press Relief Twin Pump.....HP5822

R.H. Rotation, Belt Drive.....HP5830

L.H. Rotation, Belt Drive.....HP5831

R.H. Rotation, Keyed Shaft, Direct DriveHP5832

R.H. Rotation, Keyed Shaft, Direct DriveHP5833

R.H. Rotation, Direct Drive, Heavy Duty.....HP5835

R.H. Rotation, 9 Tooth

Splined Shaft, Direct DriveHP5837

R.H. Rotation, 11 Tooth

Splined Shaft, Direct DriveHP5838

R.H. Rotation, Direct Drive,

No Flow Control.....HP5836

R.H. Rotation, 9 Tooth

Splined Shaft, Direct DriveHP5839

L.H. Rotation, 11 Tooth

Splined Shaft, Direct DriveHP5840

L.H. Rotation, Direct Drive.....HP5841

L.H. Rotation, 11 Tooth

Splined Shaft, Direct DriveHP5842

L.H. Rotation, 9 Tooth

Splined Shaft, Direct DriveHP5843

R.H. Rotation, 6 Tooth

B Flange, Direct DriveHP5844

L.H. Direct Drive, 9 Tooth

Splined ShaftHP5845

R.H. Direct Drive, 9 Tooth

Splined ShaftHP5846

R.H. Direct Drive, 11 Tooth

Splined ShaftHP5847

R.H. Keyed ShaftHP5848

L.H. Direct Drive, 11 Tooth

Splined ShaftHP5849

L.H. Keyed Shaft.....HP5850

L.H. direct drive, 13 Tooth

Splined ShaftHP5852

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 FilterHP5815

Miscellaneous

Outlet Check Valve (Power Pump).....HP5820

Auto Flow Control (Twin Pump)HP5821

Crossover Pressure ReliefHP5822

System Pressure Gauge KitHA5821

Adapter Kit, Twin Disk #5050HA5823

Adapter Kit, Twin Disk #5061HA5824

Adapter Kit, MAN to V10 PumpHA5827

SeaStar Oil, 1 liter.....HA5430

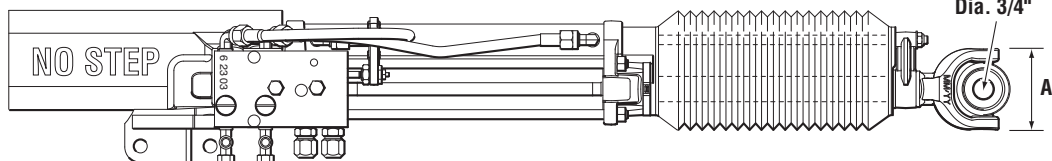
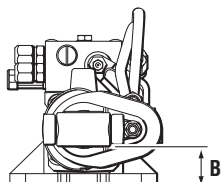
SeaStar Oil, 4 liter.....HA5440

Pressure Relief Valve, (1250psi setting).....*HP5818

* Required in a system where the Power pump does NOT

have a built in pressure relief valve. ALL SeaStar Power

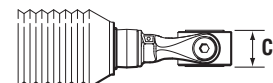
Pumps have built in Pressure Relief Valves.



A = 3.20"

B = 1.43"

C = 1.41"



HYNAUTIC TRIM TABS

Introduction

The effort required to keep large pleasure yachts and commercial boats trim and level is usually too great for most fiberglass nylon trim cylinders, even when used in multiple combinations. This is especially true when backing down hard.

Based on an understanding of these forces, Hynautic offers a heavy duty brass trim cylinder powerful enough to move and maintain the position of even the largest trim planes.

And, this patented product is more durable because it resists corrosion by eliminating all external hoses, isolating dissimilar metals, and protecting vital seals.

Coupled with a Hynautic 12 volt or 24 volt pump the cylinder will extend quickly enough to make an immediate difference in the trim of your yacht or work boat.

Applications

The Hynautic cruiser trim system is designed for yachts and commercial vessels. One brass trim cylinder provides a force equal to approximately 2.5 times that of the typical nylon cylinders.

Therefore, a Hynautic TCS-1-02 trim system, which includes separate port and starboard cylinder/pump assemblies is effective for most yachts to 65 feet using properly reinforced stainless planes. When more hydraulic muscle is needed, two cylinders per tab may be pressurized from a single pump as in the TCS-2-01 system.

Similarly, Hynautic can supply a system as complex as four cylinders moving a single trim plane from a single power pump source.

Because of the diversity of tab shapes and materials, the design is left to the builder and not included in the basic system.

Features

Double acting brass cylinder with a patented porting design:

All plumbing is left inside the transom. No external plumbing fittings to be damaged or corroded. The patented, double wall cylinders are pressurized in each direction which means they work equally as well at either holding the plane down against a force from below or preventing it from being pushed down from a force from above.

Simple, effective marine power pumps:

Available in 12 or 24 volt, and easy to install and purge. The use of marine rated relays and switches adds to the product's durability.

A design mechanics can appreciate:

The cylinder is designed to be disassembled from outside the boat without removing the complete assembly from the transom. Where dissimilar metals might come in contact, they are separated by a neutral material to reduce the effects of electrolytic corrosion.

Designed to be filled with Dextron III Automatic Transmission Fluid or equivalent.

Order Guide

NOTICE

Pressure and plate dimensional requirements are to be calculated by your Naval Architect.

TCS-1-01 TAB CYLINDER SYS, 24 VOLT:

Control switch	1 ea	TC-03
Tab cyl. - cruiser	2 ea	TK-01
Power pump	2 ea	TP-01
Manual	1 ea	182037
Hose - 2ft.	4 ea	207402

TCS-1-02 TAB CYLINDER SYS, 12 VOLT:

Control switch	1 ea	TC-03
Tab cyl. - cruiser	2 ea	TK-01
Power pump	2 ea	TP-02
Manual	1 ea	182038
Hose - 2ft.	4 ea	207402

TCS-2-02 TAB CYLINDER SYS, 12 VOLT:

Control switch	1 ea	TC-03
Tab cyl. - cruiser	4 ea	TK-01
Power pump	2 ea	TP-02
Manual	1 ea	182038
Hose - 2ft.	4 ea	207402

OPTIONAL PUMP:

Pump 24V DC (110cu. in./minute)	TP-03
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Cylinder Specification

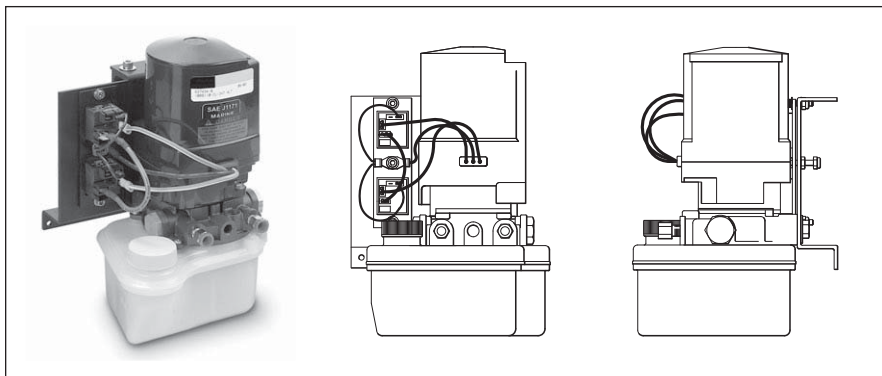
Stroke = 4"

Displacement = 5.94 cu in.

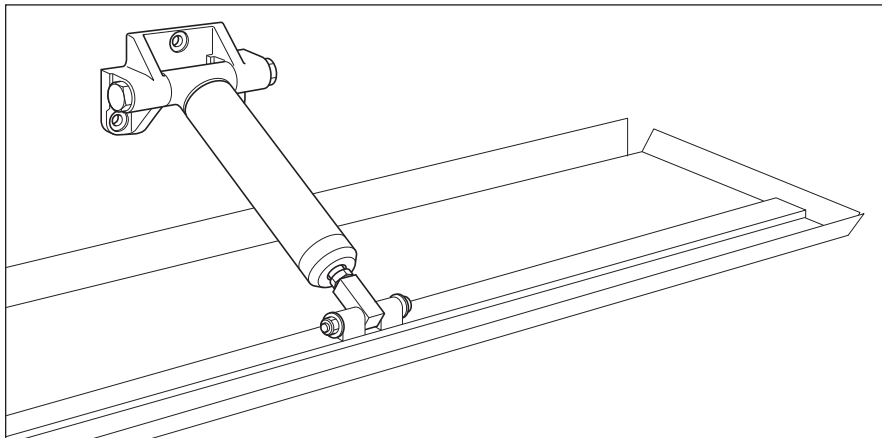
Force = 2230 ft lb @ rated pressure

Model	Displacement (in. 3/min)	Motor
TP-02	57	12V
TP-01	80	24V
TP-03	110	24V

Optional Pump Part# TP-03

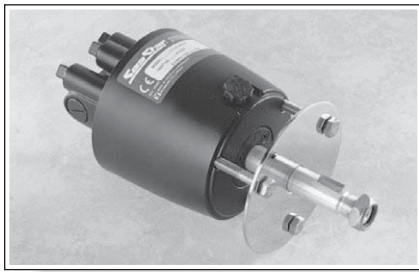
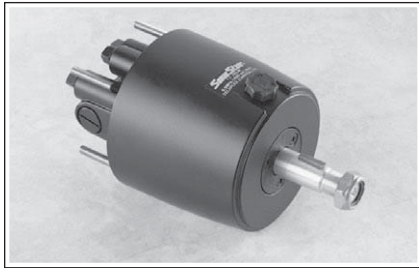


Tab Cylinder Part# TK-01



SeaStar® HELMS

The SeaStar helm pump is the heart of the hydraulic steering system. SeaStar helm pumps are the product of many years of research and experience by the world's foremost builder of manual hydraulic steering systems. Our efforts have resulted in a design which represents the ultimate in efficiency, safety and reliability, yet is easy to install and maintain. Superior design, teamed with the finest materials, precision manufacturing and rigid quality control all add up to an outstanding product which is certain to set industry standards for years to come.



Standard helm features

- Compact, stylish design.
- Available in 1.7, 2.0 and 2.4 cubic inch displacements.
- Convenient front of dash fill.
- Small 3.0" hole cutout on dash.
- Can be retrofitted into old SeaStar 4.5" hole cutout.
- Complete with elbow fittings.

Rear mount helm features (CONTACT YOUR LOCAL DISTRIBUTOR FOR AVAILABILITY)

- Behind dash mounting configuration.
- Available in 1.4, 1.7 and 2.4 cubic inch displacements.
- Top of dash fill point.
- Complete with elbow fittings.

Sport Tilt helm features

- 5 wheel positions allow adjustment to most comfortable steering position.
- 48 degree tilt range (12 down - 36 up).
- Available in 1.7, 2.0 and 2.4 cubic inch displacements.
- Remote fill point.
- Complete with elbow fittings.
- Comes with newly designed tilt mechanism.

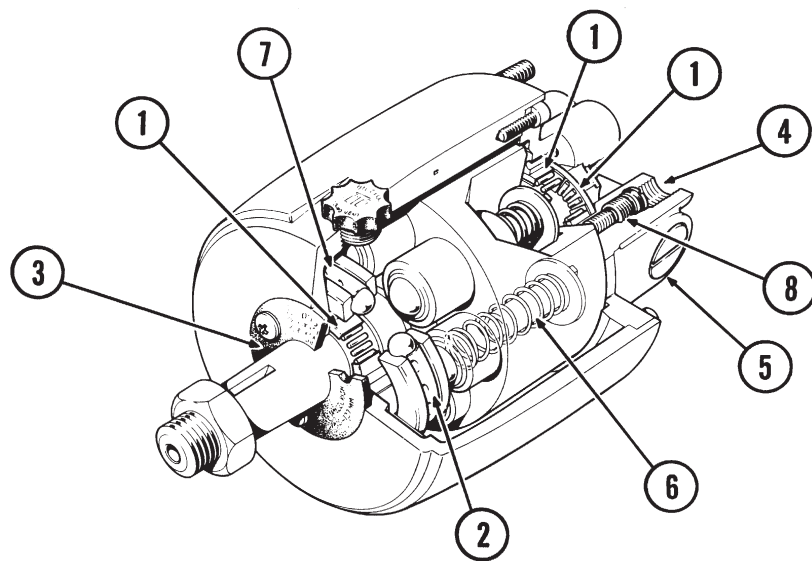
Traditional Tilt helm features

- 5 wheel positions allow adjustment to most comfortable steering position.
- 48 degree tilt range (18 down - 30 up).
- Available in 1.7, 2.0 and 2.4 cubic inch displacements.
- Convenient front of dash fill.
- Complete with elbow fittings.

Features of SeaStar Helm Pumps

Features

- 1 Helm rotor supported by three roller bearings.
- 2 Ball bearing piston race.
- 3 Field replaceable shaft seal.
- 4 1/4" NPT ports.
- 5 Built-in lock valve for positive rudder lock.
- 6 Patented bleed tubes.
- 7 Internal air pocket eliminates oil expansion overflow.
- 8 Integral relief valve.

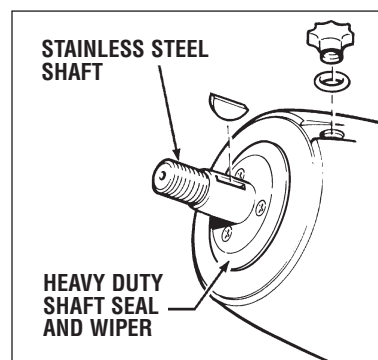


Commercial Helms

Part# HH5217, HH5224

NOTICE

For Commercial Use ONLY.



Specifically designed to be used on smaller fishing vessels involved in the Lobster and Crabbing Industries. The Commercial Helm Pumps are designed with a stainless steel shaft and heavy duty shaft seal and wiper. This new shaft and seal help protect the Helm Pump from the abrasive effects of sediment that is brought on board by the operator handling Traps or Pots.

Accessories

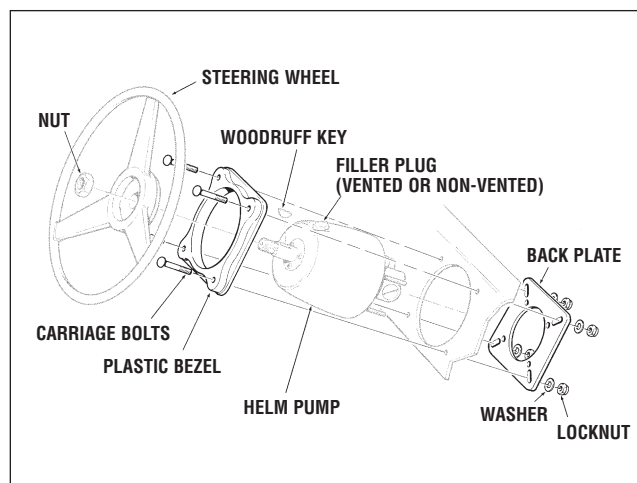
SeaStar®

HELMS

Backplate Kit (part # HA5418)

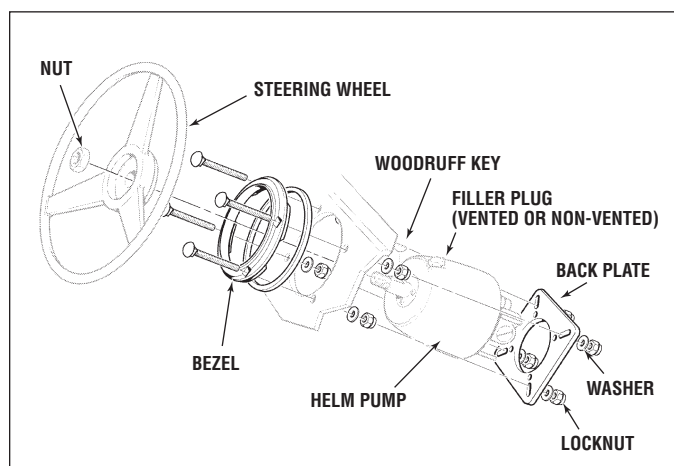
- a) Used to retrofit a new SeaStar standard helm in the old 4.5" (115mm) diameter hole, or
- b) reduce the helm protrusion from the dash by the thickness of the dash, or
- c) retrofit new SEASTAR standard helm into hole cutouts for mechanical and hydraulic steering as per chart.

STEERING MANUFACTURER	HELM MODEL TYPE	SYSTEM	BACKPLATE KIT REQ
TELEFLEX	SAFE-T	MECHANICAL	YES
	BIG-T	MECHANICAL	YES
	ROTARY	MECHANICAL	NO
	RACK AND PINION	MECHANICAL	NO
	SYTEN	HYDRAULIC	YES
MORSE	ROTARY	MECHANICAL	NO
	RACK AND PINION	MECHANICAL	NO
HYNAUTIC	H-50 SERIES	HYDRAULIC	YES
	H-60 SERIES	HYDRAULIC	YES
	H-80 SERIES	HYDRAULIC	YES
	H-300 SERIES	HYDRAULIC	YES



Round Bezel (part # HA5417)

Reduces the distance the helm protrudes from the front of the dash to 3.75" (93mm).

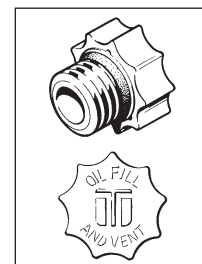


Vent Plug (part # HA5431)

Supplied with SeaStar Helm Pump

Must Be used with Helm Pump on all single steering station systems.

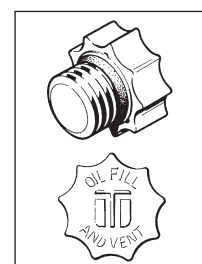
Must be used on uppermost Helm Pump on multi steering station systems.



Non-Vent Plug (part # HA5432)

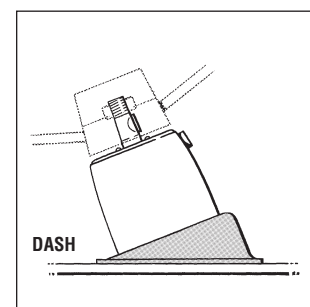
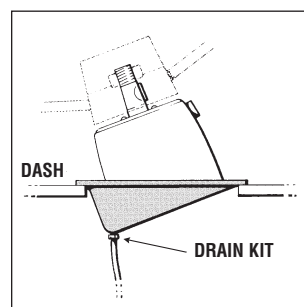
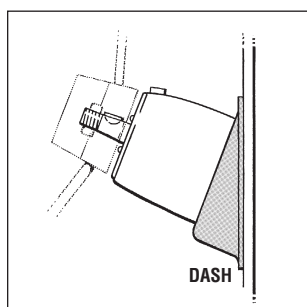
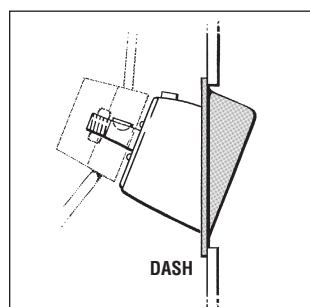
Must be used on all Helm Pumps other than uppermost Helm Pump on multi steering station systems.

This Non-Vent Plug is supplied with additional Fitting Kit No. HF5501 & HF5502



20° Wedge (part # HA5419 & HA5408 c/w Drain kit)

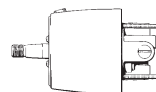
This kit is designed to mount the helm at a 20° angle to the mounting surface. 4 possible mounting configurations are available.



▲ For this configuration use **HA5408**

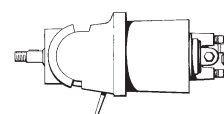
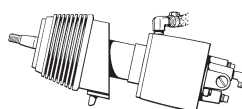
SeaStar Helm – Order Guide

SeaStar Standard Mount



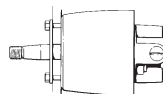
PART NUMBER	HELM DESCRIPTION	DISPLACEMENT CU. IN./REV (CC/REV)		RELIEF VALVE SETTING PSI (BAR)		NOTES
HH5269	STANDARD MOUNT	1.4	(23.0)	1000	(70)	
HH5271	STANDARD MOUNT	1.7	(27.8)	1000	(70)	
HH5761	STANDARD MOUNT FULL FEEDBACK	1.7	(27.8)	1000	(70)	2
HH5217	STD. MOUNT, COMMERCIAL	1.7	(27.8)	1000	(70)	3
HH5273	STANDARD MOUNT	2.0	(33.0)	1000	(70)	
HH5760	STANDARD MOUNT FULL FEEDBACK	2.0	(33.0)	1000	(70)	2
HH5272	STANDARD MOUNT	2.4	(39.3)	1000	(70)	
HH5762	STANDARD MOUNT FULL FEEDBACK	2.4	(39.3)	1000	(70)	2
HH5224	STD. MOUNT, COMMERCIAL	2.4	(39.3)	1000	(70)	3

SeaStar Tilt Mount



HH5744	TRADITIONAL TILT	1.4	(23.0)	1000	(70)	
HH6193	SPORT TILT	1.4	(23.0)	1000	(70)	
HH5741	TRADITIONAL TILT	1.7	(27.8)	1000	(70)	
HH6191	SPORT TILT	1.7	(27.8)	1000	(70)	
HH6291	SPORT TILT (Spline Shaft)	1.7	(27.8)	1000	(70)	
HH5743	TRADITIONAL TILT	2.0	(33.0)	1000	(70)	
HH6145	SPORT TILT	2.0	(33.0)	1000	(70)	
HH5742	TRADITIONAL TILT	2.4	(39.3)	1000	(70)	
HH6192	SPORT TILT	2.4	(39.3)	1000	(70)	
HH6292	SPORT TILT (Spline Shaft)	2.4	(39.3)	1000	(70)	

SeaStar Rear Mount



HH5260	REAR MOUNT	1.4	(23.0)	1000	(70)	
HH5279	REAR MOUNT 1" STRAIGHT SHAFT	1.4	(23.0)	1000	(70)	
HH5280	REAR MOUNT 1" TAPERED SHAFT	1.4	(23.0)	1000	(70)	
HH5231	REAR MOUNT FULL FEEDBACK	1.4	(23.0)	1000	(70)	
HH5261	REAR MOUNT	1.7	(27.8)	1000	(70)	
HH5281	REAR MOUNT 1" TAPERED SHAFT	1.7	(27.8)	1000	(70)	
HH5262	REAR MOUNT	2.4	(39.3)	1000	(70)	
HH5282	REAR MOUNT 1" TAPERED SHAFT	2.4	(39.3)	1000	(70)	

NOTES

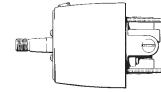
1. SeaStar PRO helms cannot be used with an unbalanced cylinder. SeaStar reinforced Kevlar Outboard style hoses MUST be used with ALL SeaStar PRO helms.
2. No "Check Valves" are installed into these helm pumps. These are intended for use in a single steering station application ONLY. Not for use in multiple steering stations and/or in conjunction with autopilot.
3. Commercial helms use a stainless steel shaft and a better sealing top plate for use in extreme conditions and or commercial type applications.

SeaStar PRO Helm – Order Guide

SeaStar

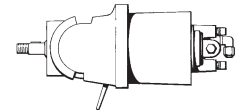
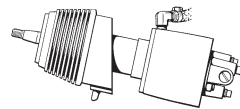
HELMS

SeaStar PRO Standard Mount



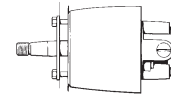
PART NUMBER	HELM DESCRIPTION	DISPLACEMENT CU. IN./REV (CC/REV)		RELIEF VALVE SETTING PSI (BAR)		NOTES
HH5779	STANDARD MOUNT	1.7	(27.8)	1500	(103)	1
HH5218	STD. MOUNT, COMMERCIAL	1.7	(27.8)	1500	(103)	1, 3
HH5770	STANDARD MOUNT	2.0	(33.0)	1500	(103)	1
HH5772	STANDARD MOUNT	2.4	(39.3)	1500	(103)	1

SeaStar PRO Traditional and Sport Tilt Mount



HH5775	TRADITIONAL TILT	1.4	(23.0)	1500	(103)	1
HH5773	TRADITIONAL TILT	1.7	(27.8)	1500	(103)	1
HH6189	SPORT TILT	1.7	(27.8)	1500	(103)	1
HH5774	TRADITIONAL TILT	2.0	(33.0)	1500	(103)	1
HH6190	SPORT TILT	2.0	(33.0)	1500	(103)	1
HH6188	SPORT TILT	2.4	(39.3)	1500	(103)	1

SeaStar PRO Rear Mount



HH5778	REAR MOUNT	1.7	(27.8)	1500	(103)	1
HH5771	REAR MOUNT	2.0	(33.0)	1500	(103)	1

NOTES

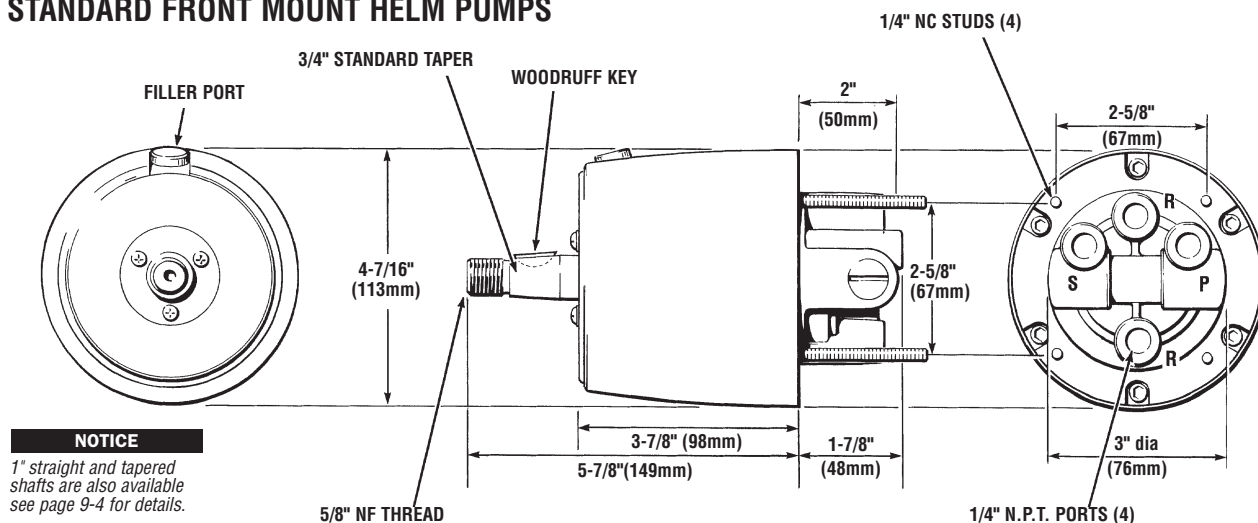
1. SeaStar PRO helms cannot be used with an unbalanced cylinder. SeaStar reinforced Kevlar Outboard style hoses MUST be used with ALL SeaStar PRO helms.
2. No "Check Valves" are installed into these helm pumps. These are intended for use in a single steering station application ONLY. Not for use in multiple steering stations and/or in conjunction with autopilot.
3. Commercial helms use a stainless steel shaft and a better sealing top plate for use in extreme conditions and or commercial type applications.

Standard/Rear Mount Helm Dimensions

NOTICE

ALL SeaStar helm pumps can be mounted horizontally to vertically and anywhere in between. In ALL cases the filler port must be in the uppermost position.

STANDARD FRONT MOUNT HELM PUMPS



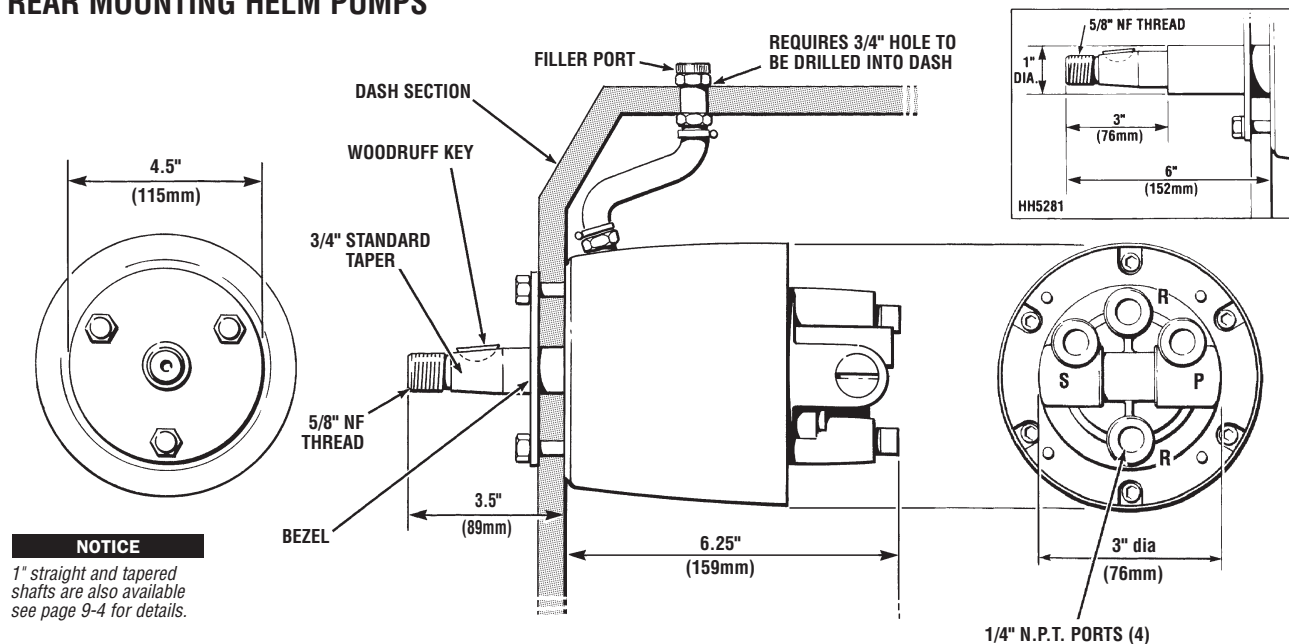
NOTICE

1" straight and tapered shafts are also available see page 9-4 for details.

NOTICE

Max. steering wheel diameter 28" (711mm).

REAR MOUNTING HELM PUMPS



NOTICE

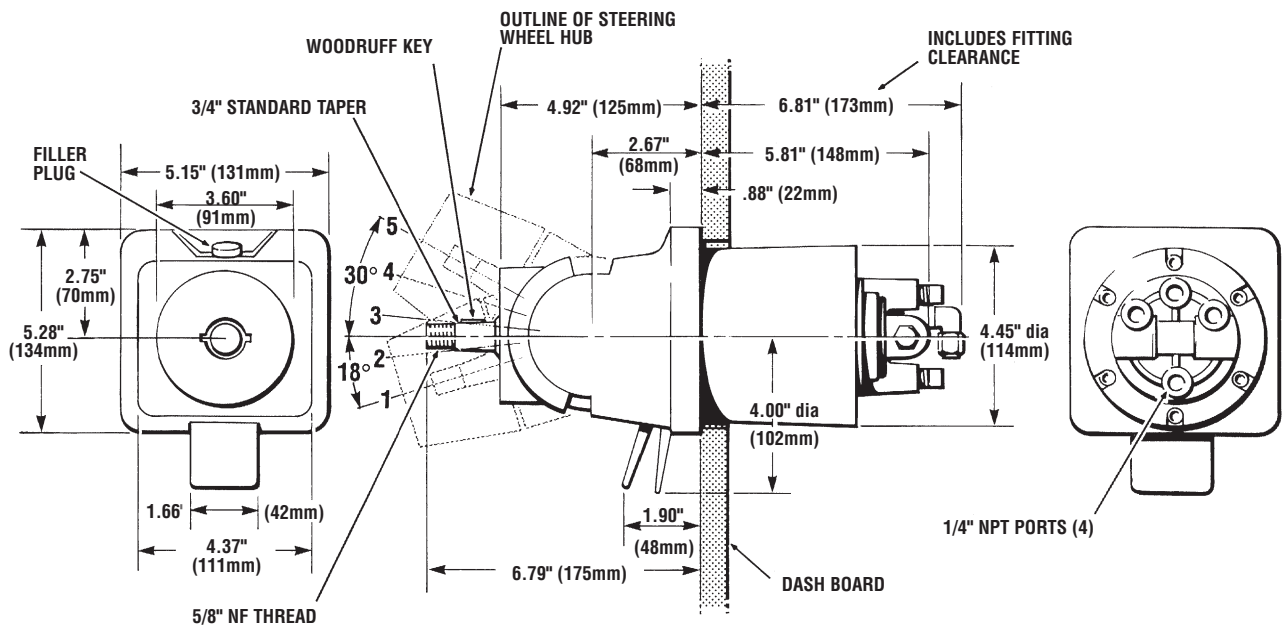
1" straight and tapered shafts are also available see page 9-4 for details.

NOTICE

Max. steering wheel diameter 28" (711mm). Min. dash thickness 1" (25.5mm), Max. dash thickness 1.5" (38mm).

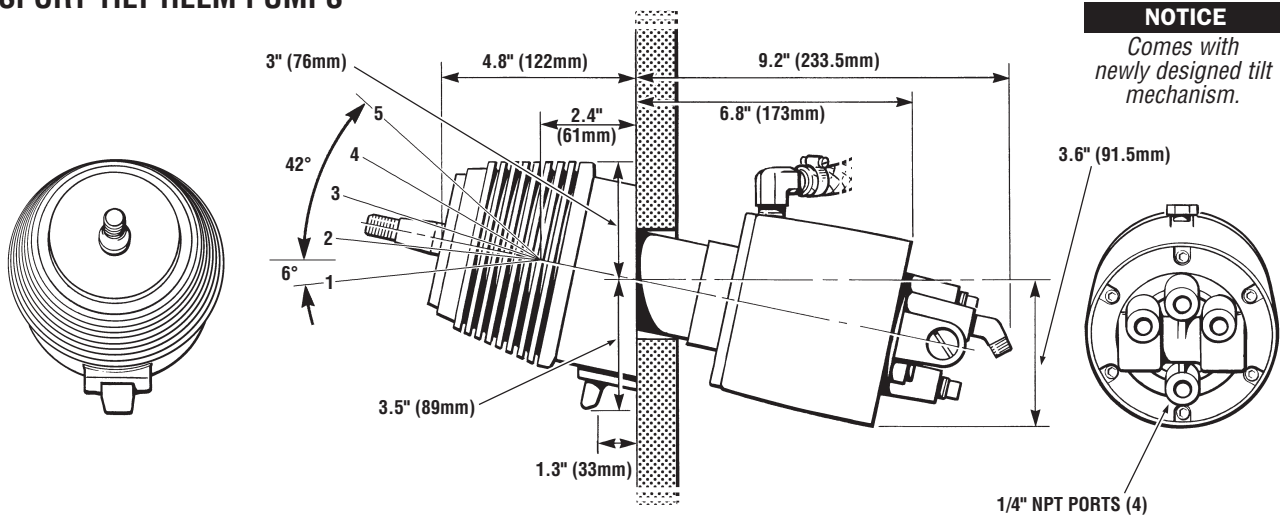
Tilt/Sport Tilt Helm Dimensions

TRADITIONAL STYLE TILT HELM PUMPS



NOTICE Max. steering wheel diameter 20" (508mm)

SPORT TILT HELM PUMPS



NOTICE

Comes with newly designed tilt mechanism.

NOTICE Max. steering wheel diameter 20" (508mm)

NOTICE

Remote fill and vent kit (included with helm pump) requires a 3/4" hole to be drilled into the dash board and above the helm pump. Please refer to page 10-19, HA5450 for details.

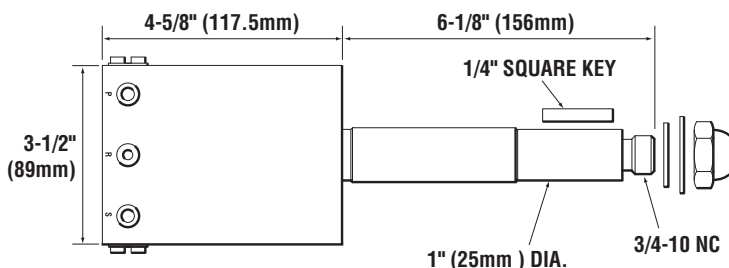
Hynautic Helm Pumps

Heavy Duty Helm Pump H-20 Series

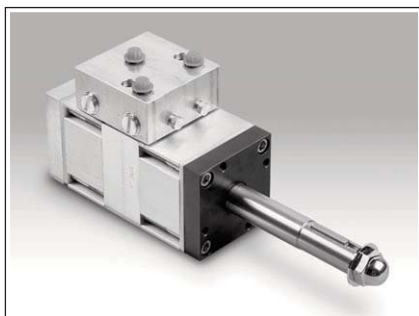


HELM		DISPL	SHAFT STYLE DIA. & TYPE	KEYWAY	INTEGRAL VALVING
20 Series	H-21	2.75cu in	1 Straight	1/4" Square	Yes
	H-25	2.75cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes
	H-26	2.00cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes

H-21

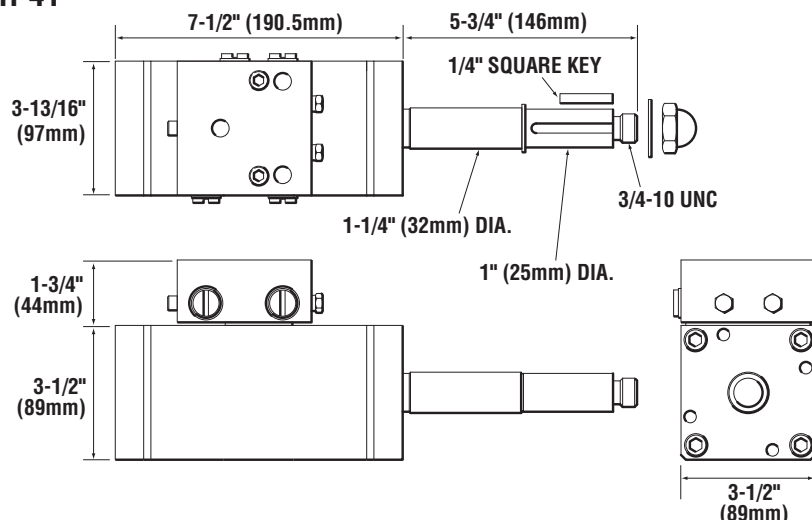


Heavy Duty Helm Pump H-40 Series



HELM		DISPL	SHAFT STYLE DIA. & TYPE	KEYWAY	INTEGRAL VALVING
40 Series	H-41	5.50cu in	1 Straight	1/4" Square	Yes
	H-41-2	5.50cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes
	H-42	4.00cu in	1 Straight	1/4" Square	Yes
	H-42-02	4.00cu in	3/4", 1"/ft Tapered	#9 Woodruff	Yes

H-41



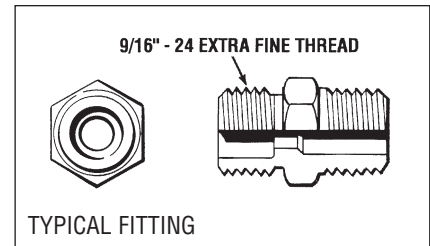
NOTICE

If using a Hynautic H-20 or H-40 series helm pump, use of a Hynautic Reservoir and Relief Valve, see page 6-4 for details. Fitting kits sold separately for both H-20 and H-40 series, please see page 6-2 for which fitting kit is to be used."

HOSE, TUBING, FITTINGS, ACCESSORIES AND TOOLS

Fittings

All SeaStar Manual Hydraulic steering systems utilize the same style of fittings for all applications. These are 3/8" compression fittings which utilize a 9/16"-24 extra fine thread.



Tubing/Hose

The tubing or hose requirements depend on the type of steering system being considered. Please double check the application in which you are using as in some cases Nylon or copper tube is not to be used.

⚠ WARNING
DO NOT CUT OUTBOARD
HYDRAULIC HOSE.

APPLICATION	TUBING/HOSE REQUIREMENTS	PAGE #
OUTBOARDS, INBOARDS, SEASTAR POWER ASSIST, or STERNDRIVE CYLINDER# HC5332	OUTBOARD HOSE	10-2– 10-4
STERNDRIVES, SEADRIVES, INBOARDS, SSI	3/8" DIA. NYLON or COPPER TUBE	10-6– 10-8
CAUTION: DO NOT USE NYLON TUBING IN OUTBOARD AND/OR POWER ASSIST STEERING APPLICATIONS.		

General Considerations

⚠ WARNING
DO NOT use extruded nylon tubing with SeaStar Outboard cylinder, HC5332 stern drive cylinders and/or SeaStar Power Assist Applications.

In most hydraulic steering installations the cylinder body moves as the motor, outdrive or tiller arm is articulated. Provide sufficient hose length to allow full-uninterrupted steering motion including trim and tilt. If your splashwell is rated for a dual engine application or you are mounting the engines on a gill bracket you must provide enough steering hose to rig either twin or single engines. Inboard or Sterndrive steering installations that use 3/8" copper or extruded nylon tube must have a swaged hydraulic hose kit (HF5508) between the steering cylinder and the rigid tube to provide a flexible connection.

SEASTAR OUTBOARD HOSE

WARNING

SeaStar PRO Helm systems require the use of SeaStar PRO (1500 psi) reinforced Kevlar Hoses ONLY.

SeaStar Outboard hoses are available in kit's (includes two hoses) ranging in length from 2' – 30'. Hydraulic Hose must be protected from chaffing and any possible contact or interference with assembly screws or sharp edges of any type.

The Hydraulic hoses should be secured along the routing path wherever possible and should not be allowed to hang free in any area where they could become a safety hazard. Teleflex Canada Limited Partnership recommends the use of a rigging tube, PVC piping or conduit for the safe secure installation of hydraulic hoses. Do not install hoses in such a way that they may become exposed to high heat areas such as engine components (i.e.; manifold or exhaust components) or highly corrosive areas such as battery fumes or electrical connections.

Continuous kinking, chaffing, rubbing or twisting may eventually weaken hose(s) to a point where it could rupture from normal steering pressure causing loss of steering, resulting in personal or property damage. Visually inspect all hoses and fittings for wear and or damage as part of your regular annual maintenance. Replace any hose or components suspect of excessive wear.

Measuring Hose Lengths

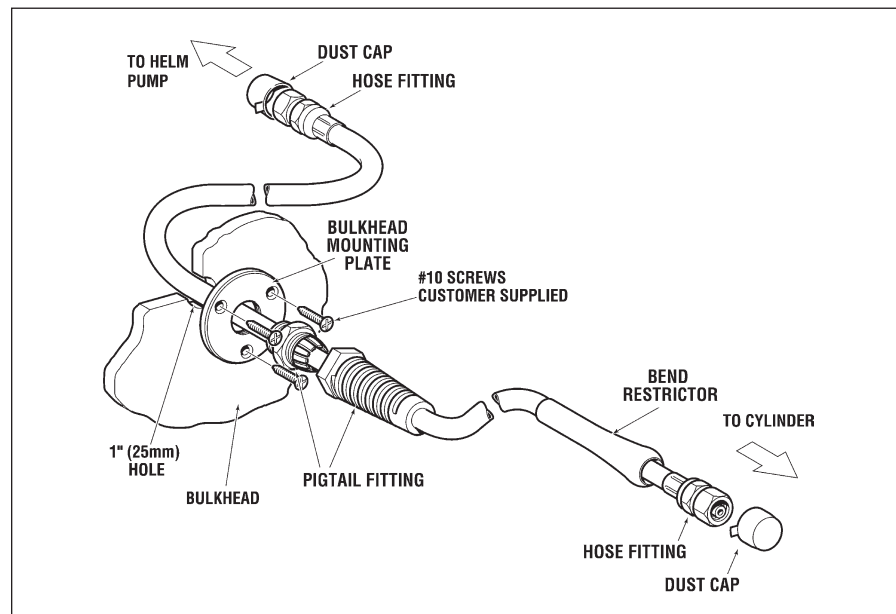
NOTICE

Correct hose length is crucial to the operation of your SeaStar steering system, please be sure that you take all the following measurements correctly to avoid damage to the steering hose.

- 1 Measure from the center of the steering wheel to the Starboard side wall.
- 2 Measure from the Starboard side wall to the transom.
- 3 Measure from the transom into the center of the engines (if this is a twin engine twin cylinder application please measure to the center of the Port side engine.)
- 4 Add up the above three measurements, round up to the nearest even number, then add two feet. This is the length of hose required for your application.

Bulkhead Hose Kit

For the cleanest Installation.



Available SeaStar Hose Kits: How to order

NOTICE

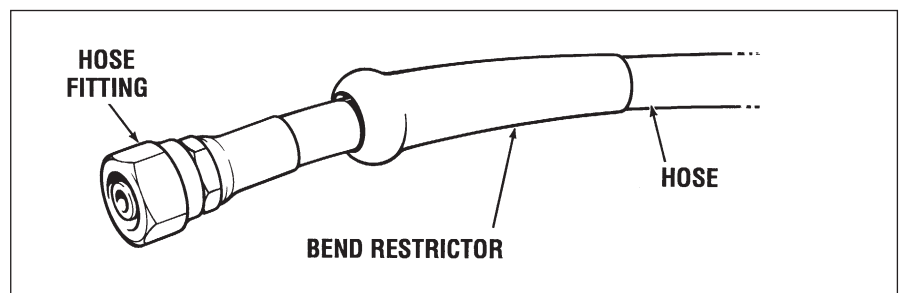
Outboard hoses are supplied with pre-attached hose fittings on both ends.

In order to prevent hose kinking, bend restrictors are supplied on one end of each hose in the kit. The end of the hose with the bend restrictor is to be attached to the cylinder.

Each part number contains two hoses of equal length.

PART NUMBER	KIT DESCRIPTION
* H051XX	SeaStar Standard Outboard Hose Kit (2 hoses)
* H057XX	SeaStar Pro Hose Kit (2 hoses)
** H081XX	SeaStar Bulkhead Hose Kit, Standard (2 hoses)
** H082XX	SeaStar Bulkhead Hose Kit, Pro(2 hoses)

- * SeaStar Standard and Pro Hose Kits are available in lengths from 2' – 30'. 40' Hose Kits are available by special order only.
- ** SeaStar Standard and Pro Bulkhead Hose Kits are available in lengths from 12' – 30'. 40' Hose Kits are available by special order only.



Standard Hose Kit

To determine the required hose lengths for outboard steering installations.

From the illustrations on the following pages (figures A through I), select the situation which best suits your application and note the:

- a) cylinder location,
- b) number of cylinders,
- c) type of cylinders,
- d) number of steering stations, and
- e) the number of hose and fitting kits required.

Single Station System

- 1) From the illustration that suits your application note the number of hose and fitting kits required.
- 2) Measure along the intended path of the hose routing for each of the required hose kits.
- 3) Round up the measurement to the next even digit and add 2 feet (0.6m). This is the length of hose kit required.
- 4) Order hose kit(s) part no. H051_ _ . The last two digits correspond to the length of hose kit.

NOTICE

- a) Measure from center of the cylinder(s) and helm(s)
- b) Some installations require more than 1 hose kit and additional fitting kits (see parts list for each figure).
- c) Minimum bend radius for outboard hose is 2-1/2" (6 cm).
- d) Outboard cylinders move. They are subject to engine trim & tilt. Enough slack must be left in the hoses to prevent kinking.

⚠ CAUTION

DO NOT cut the hose. This will destroy the hose. Once cut there is no means to field swage fittings to the ends of the hose.

Single Station

Figure A: HC5345
Single Front Mount Cylinder
Note: cylinder body moves

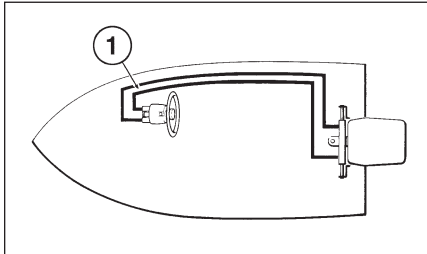


Figure B: HC5370
Single Side Mount Cylinder
Note: cylinder body stationary

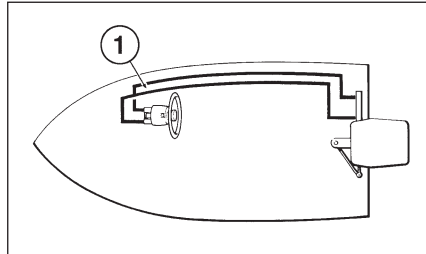


Figure C: HC5380
Single Splashwell Mount Cylinder
Note: cylinder body stationary

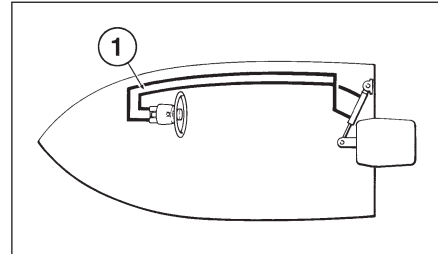


Figure D: HC5345
Dual Front Mount Cylinders
Note: cylinder body moves

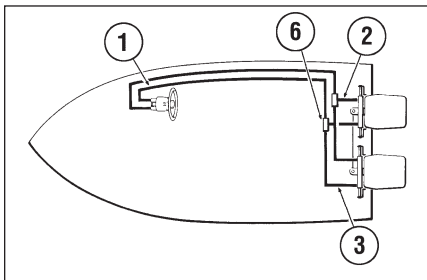


Figure E: HC5370
Dual Side Mount Cylinders
Note: cylinder body stationary

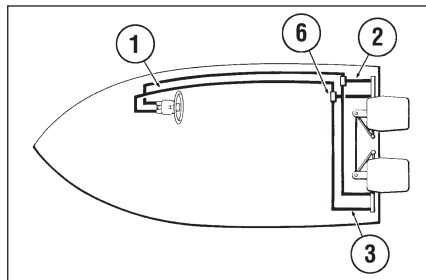


Figure F: HC535
Single Front Mount Cylinder
c/w bulkhead fittings
Note: cylinder body moves

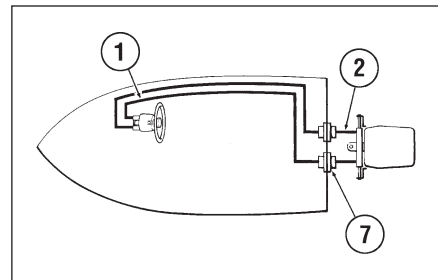


Figure G: HC5370
Single Side Mount Cylinder
c/w bulkhead fittings
Note: cylinder body stationary

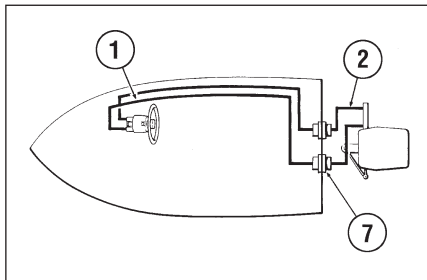


Figure H: HC5345
Dual Front Mount Cylinders
c/w bulkhead fittings

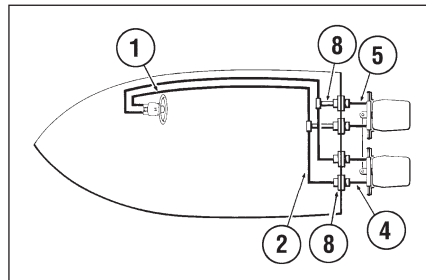
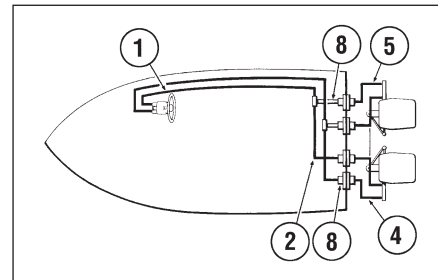


Figure I: HC5370
Dual Side Mount Cylinders
c/w bulkhead fittings



ITEM	PART #	QTY	DESCRIPTION
1	H051__	1	Hose Kit
2	H051__	1	Hose Kit
3	H051__	1	Hose Kit
4	H051__	2	Hose Kit
5	H051__	2	Hose Kit
6	HF5530	1	Tee Fitting (3 per Kit)

ITEM	PART #	QTY	DESCRIPTION
7			Bulkhead Fitting Kit (2 fittings per Kit)
	HF5512	1	3/4" Thick Bulkhead
	HF5513	1	3" Thick Bulkhead
8			Bulkhead Fitting Kit (4 fittings per Kit)
	HF5514	1	3/4" Thick Bulkhead
	HF5515	1	3" Thick Bulkhead

Additional Stations or Autopilot Integration

Additional Steering Station or Autopilot Power pack

- 1) Determine the location of the 2nd station or power pack.
- 2) Measure along the intended path of the hose routing from the upper helm pump to the 2nd station or autopilot power pack.
- 3) Round up the measurement to the next even digit. This is the length of hose kit required.
- 4) Order hose kit(s) part number H051_ _ the last two digits correspond to the length of hose.

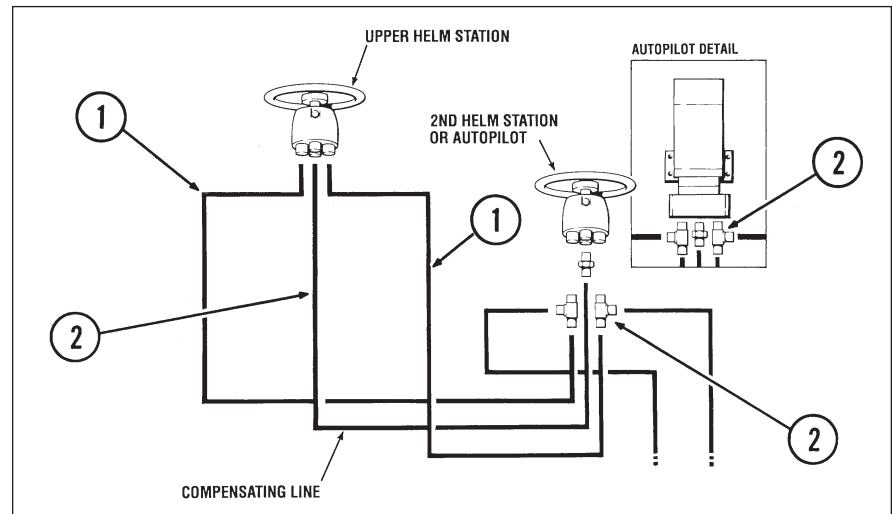
Note:

- a) **All hoses should be routed with a gradual rise so that air will not be trapped in the lower station.**
- b) Some installations require more than 1 hose kit and additional fitting kits.
- c) Minimum bend radius for outboard hose is 2-1/2" (6 cm).
- d) A compensating line is required between helm stations or the helm and autopilot power pack.

Figure J

2nd Steering Station or
Autopilot Power Pack
Installation

⚠ WARNING
DO NOT CUT HYDRAULIC HOSE.



Parts list

For Figure J

ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED	REF PAGE #
1	HOSE KIT	H051_ _	1	
2	FITTING KIT*	HF5501	1	10-10

* Includes 25' of 3/8" dia. Nylon tubing to be used for the compensating line ONLY.

SEASTAR INBOARD/STERNDRIVE TUBING

Two types of tubing materials are available for plumbing Inboards and Sterndrives.

- 1) SeaStar 3/8" outside diameter nylon tubing
- 2) 3/8" outside diameter copper refrigeration tubing

Nylon Tubing

NOTICE

SeaStar 3/8" extruded nylon is NOT recommended for use in systems with SeaStar 2.4 or SeaStar PRO helm pumps. It is also not to be used in systems where total tubing runs exceed 100', in these cases SeaStar Outboard hoses and/or 3/8" copper tubing must be used.

SeaStar 3/8" outside diameter nylon tubing is recommended for;

- a) Inboard,
- b) Sterndrive, and
- c) Seadrive steering systems with SeaStar I (1.7 cubic inch/rev displacement) helms only.

SeaStar 3/8" outside diameter nylon tubing is available in the following lengths:

LENGTH FEET	(METERS)	TUBING PART #'S
25'	(7.6m)	HT5092
50'	(15.2m)	HT5095
75'	(22.8m)	HT5097
100'	(30.5m)	HT5100
1000'	(305.0m)	HT5101

⚠ WARNING

SeaStar PRO Helm systems require the use of SeaStar PRO (1500 psi) reinforced Kevlar Hoses ONLY.

Copper Tubing

3/8" outside diameter copper tubing is recommended for;

- a) inboard,
- b) sterndrive, and
- c) seadrive steering systems with SeaStar II (2.4 cubic inch/rev displacement) helms only, or where the length of tubing run exceeds 100 feet (30.5m).

Additional SeaStar hose kit part number HF5508 is required to connect the tubing to the cylinder.

3/8" copper tubing should be obtained through a local vendor based on the following tubing specifications.

Specification for copper tubing:

Soft annealed copper tubing, Type 'L' produced under ASTM D-280.

To determine the required length of tubing for single and dual configurations:

From the illustrations (figures A through E), select the situation which best suits your application and note;

- a) the type of drive system, and
- b) the number of steering stations.

Single Station

SeaStar®

TUBING

- 1) From the illustration which best suits your application note the number of lengths of tubing and fitting kits required.
- 2) Measure along the intended path of tube routing for each of the tubing runs.
- 3) Determine if 3/8" nylon tube can be used or if copper tubing is required based on lengths of tubing runs required.
- 4) Total up the entire length of tubing required and round up to the next available tube kit length.

Figure A

Single Inboard Cylinder

- fittings required supplied with helm and cylinder

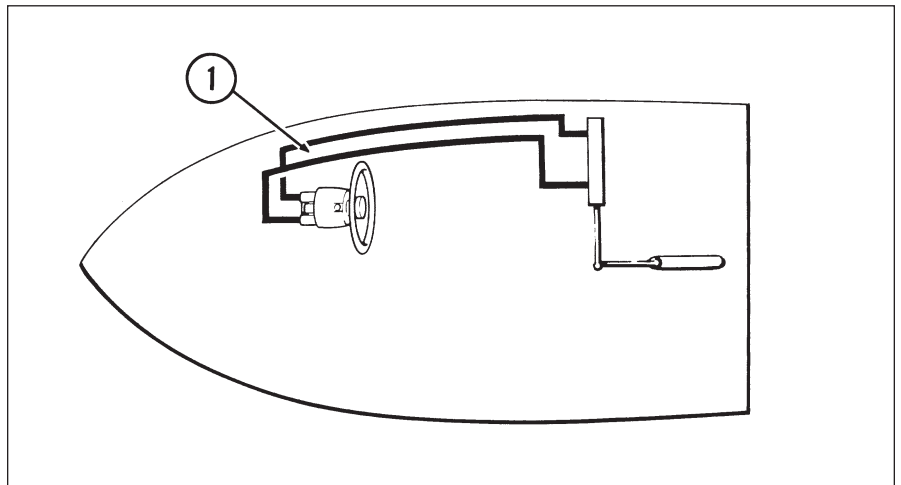
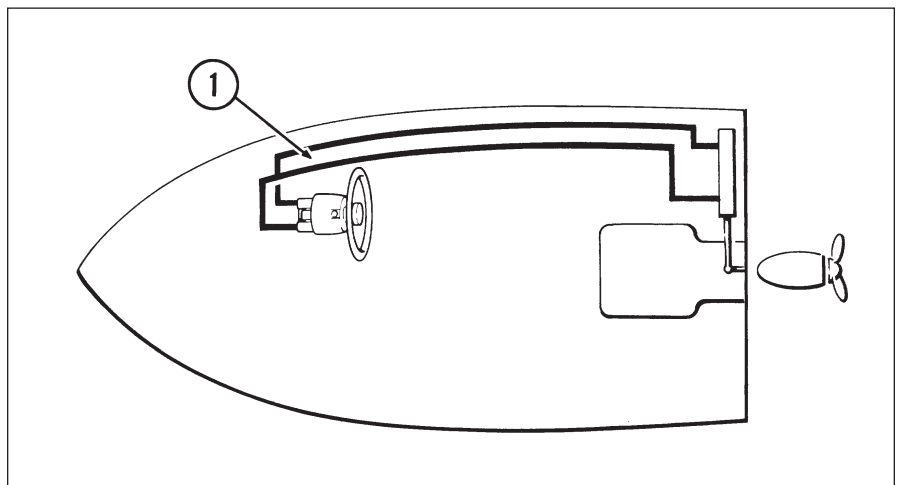


Figure B

Single Sterndrive Cylinder

- fittings required supplied with helm and cylinder



Parts list

For Figures A, B

ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED
1	3/8" DIA NYLON OR COPPER TUBE		AS MEASURED

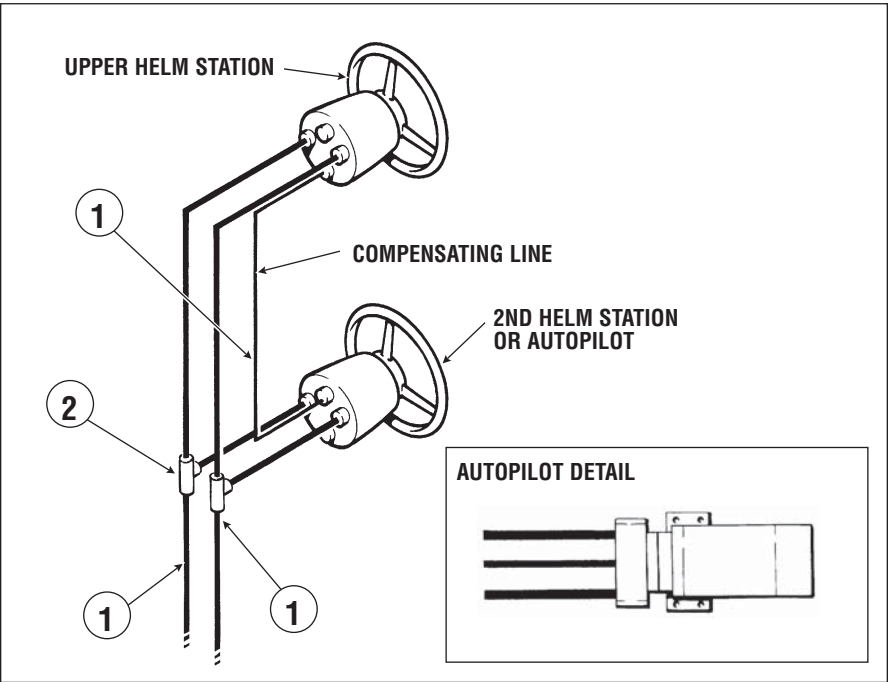
ADDITIONAL SEASTAR STEERING STATION OR AUTOPILOT KIT

- 1) Refer to illustration Figure E.
- 2) Determine the location of the second station or autopilot power pack.
- 3) Measure along the path of the tube routing from the upper helm pump to the second station or autopilot power pack. Multiply this length by three for the amount of tubing required.
- 4) Select the tubing kit based on the total system tubing requirement.

Figure E
2nd Steering Station or Autopilot

NOTICE

- a) A compensating line is required between helm stations or the helm and autopilot power pack.
- b) All hoses should be routed with a gradual rise (particularly the compensating line) so that air will not be trapped in the lower helm station.
- c) The second helm station or autopilot power pack may be connected at any location between the upper helm station and the cylinder. For existing single station installations the nylon or copper tubing may be cut and the tee fittings installed at any convenient location.



ITEM #	DESCRIPTION	PART NUMBER	QUANTITY REQUIRED	REF PAGE #
1	3/8" DIA NYLON OR COPPER TUBE	HT5_ _ _	AS MEASURED	10-11
2	FITTING KIT	HF5502	1	

Required details for the addition of an autopilot.

- 1) Most SeaStar Helm pumps have a built in check valve. Full feedback helm pumps do not have a built in check valve and one will be required for the installation of an autopilot, refer to page 9-4 of this guide to determine whether your helm pump has check valves built in.
- 2) Autopilot mfg. requires the volume of your steering cylinder(s) to provide an adequate autopilot pump, refer to page 12-2 for volumes of your cylinder.requirement.

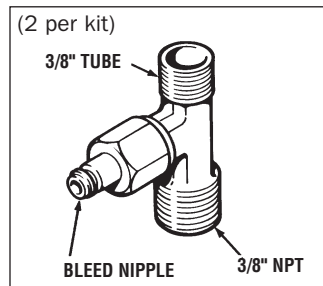
FITTINGS

SeaStar®

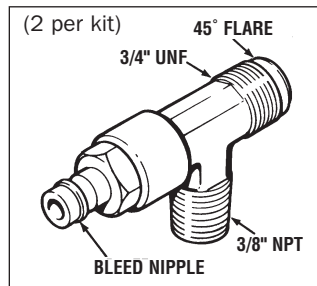
FITTINGS

All SeaStar Manual Hydraulic steering systems utilize the same style of fittings for all applications. These are 3/8" compression fittings which utilize a 9/16"-24 extra fine thread. Refer to page 10-1.

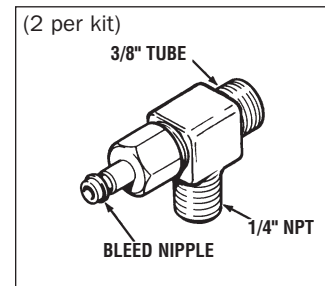
HF5518 Vertical Bleeder Tee



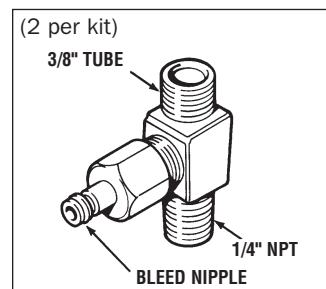
HF5519 Bleed Tee (TM Cylinders)



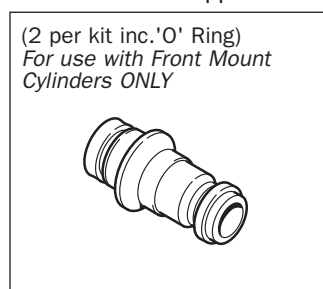
HF5520 Horiz. Bleeder Tee



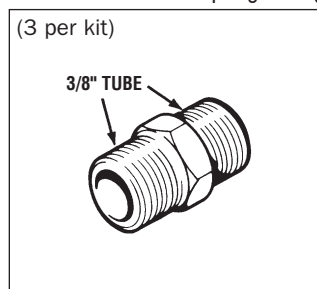
HF5521 Vertical Bleeder Tee



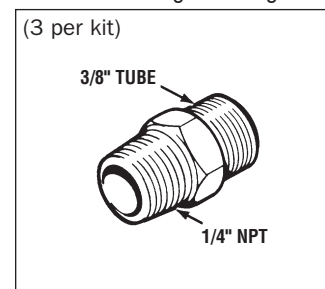
HF5548 Bleed Nipple



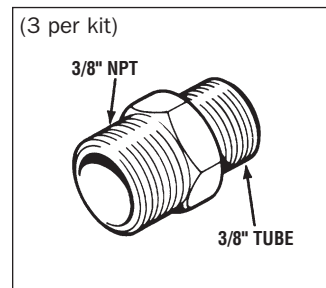
HF5527 Union Coupling Fitting



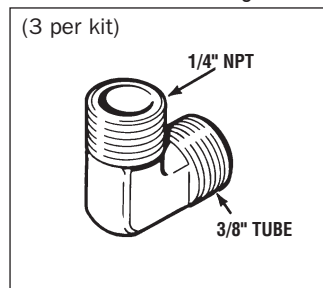
HF5528 Straight Fitting



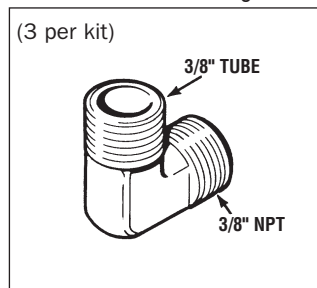
HF5532 Connector Fitting



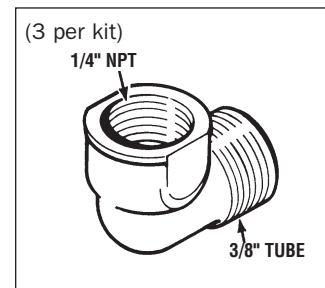
HF5529 Elbow Fitting



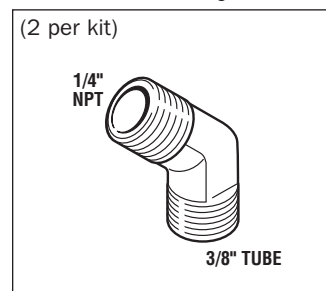
HF5534 Elbow Fitting



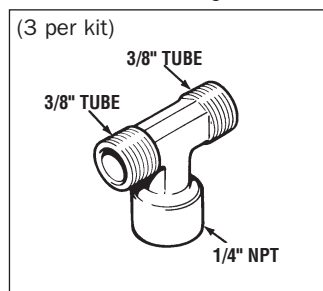
HF5538 Street Elbow



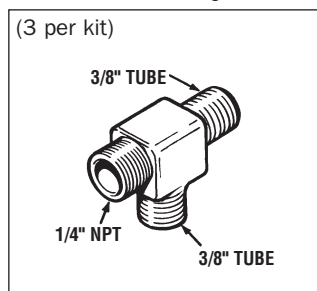
HF5540 45° Fitting



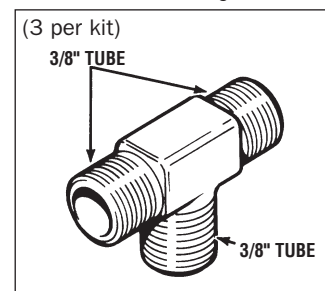
HF5533 Tee Fitting



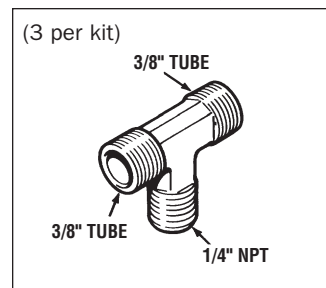
HF5531 Tee Fitting



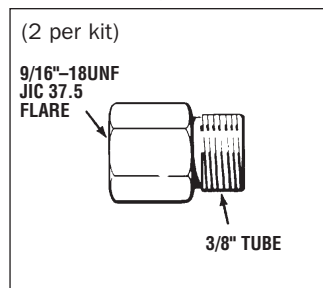
HF5530 Tee Fitting



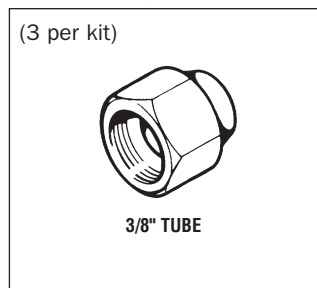
HF5536 Tee Fitting



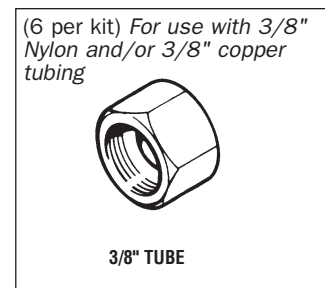
HF5566 Adapter Fitting



HF5524 Cap Plug Nut



HF5526 Tube Nut



HF5501

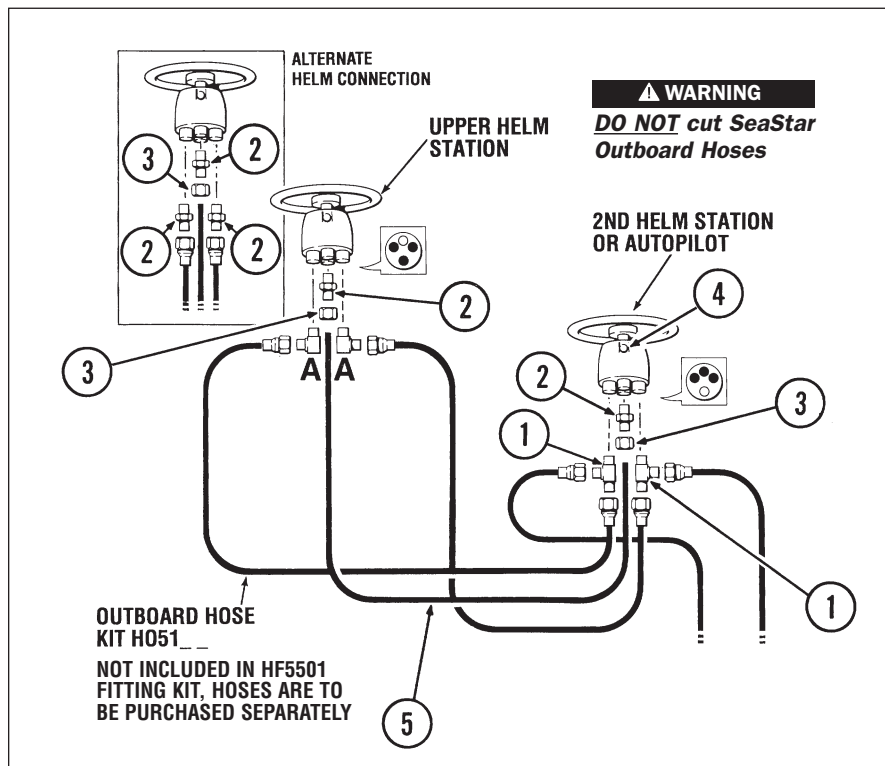
Application

Fitting kit to add a 2nd station or autopilot to an outboard system.

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tee Fitting 1 End – 3/8" NPT (M) 1 End – 1/4" NPT (M) Center – 3/8" Tube (M)	2	600603
2	Connector Fitting 3/8" Tube (M) – 1/4" NPT (M)	4	600602
3	Tube Nut – 3/8" Dia.	4	280327
4	Non-Vented Filler Plug	1	HA5432
5	SeaStar Nylon Tube 3/8" Dia.	25ft	HT5092
A*	Elbow 3/8" Tube (M) – 1/4" NPT (M)	2	

* SUPPLIED WITH HELM PUMP.

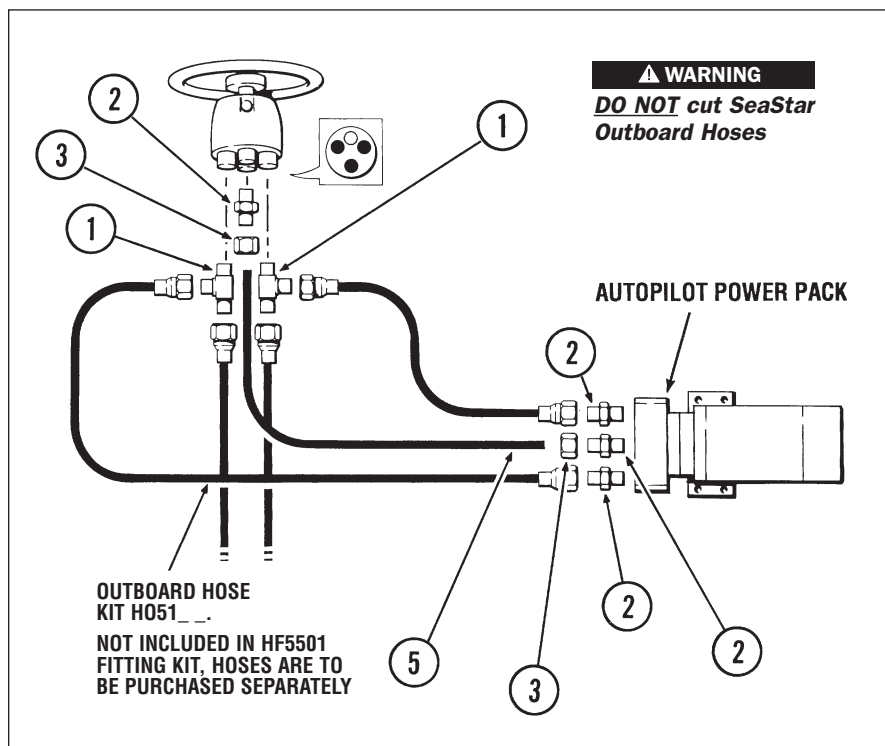
NOTE: HF5501 FITTING KIT IS TO BE USED WHEN THE SYSTEM HAS BEEN PLUMBED WITH SEASTAR OUTBOARD STEERING HOSE ONLY.



Autopilot powerpack connection

CAUTION

DO NOT cut SeaStar Outboard Steering hose. Once cut there is no means to field swage fittings to the ends of the hoses.



HF5502

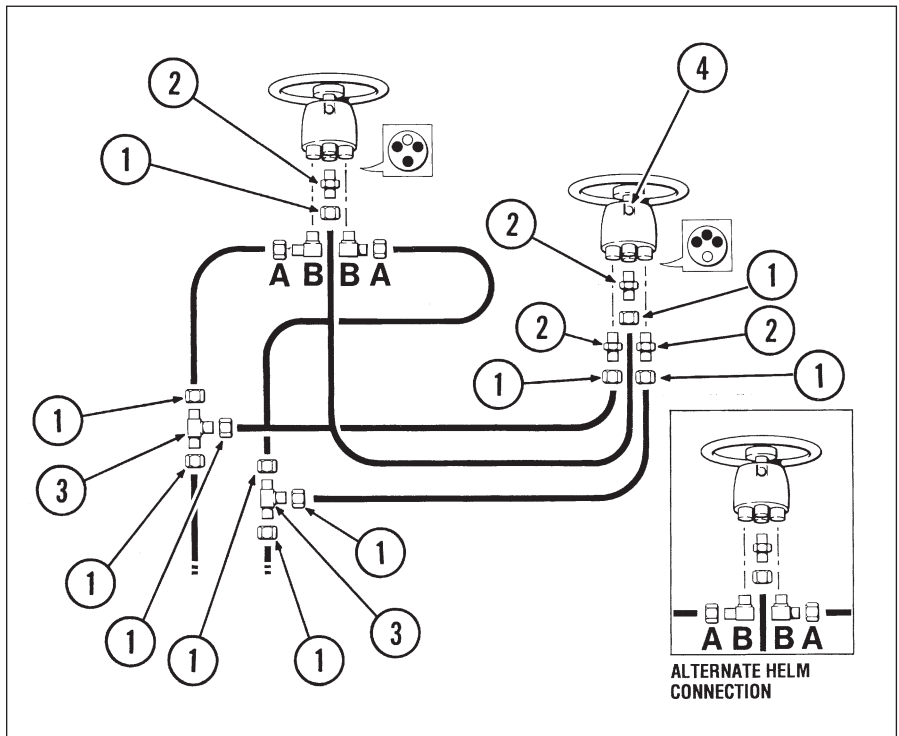
Application

Fitting kit to add a 2nd station or autopilot to an inboard or sterndrive system

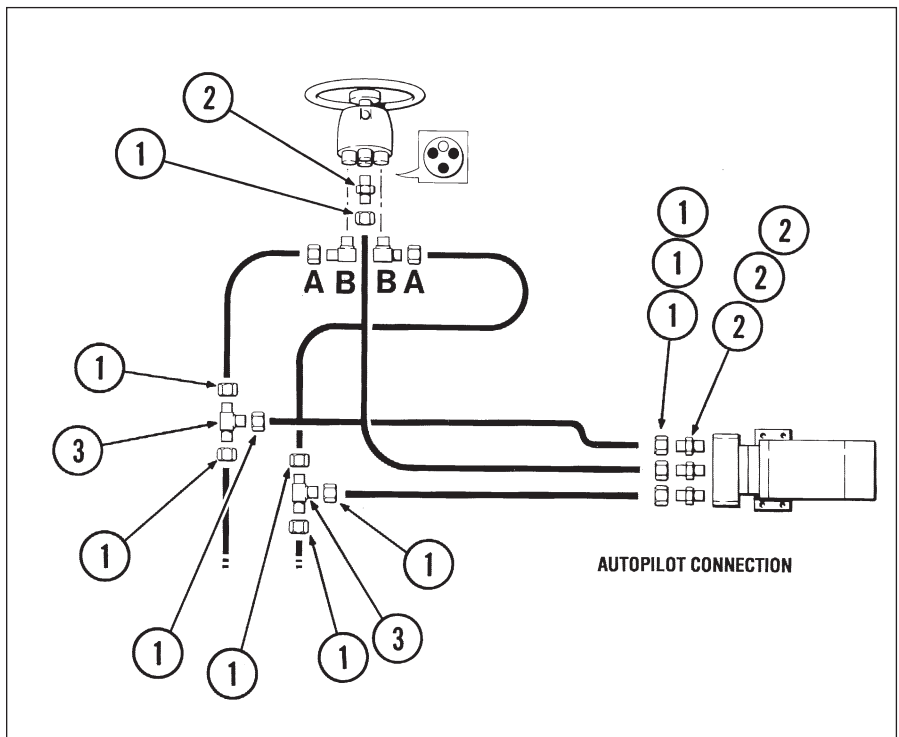
ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	10	280327
2	Connector Fitting 3/8" Tube (M) – 1/4" NPT (M)	4	600602
3	Tee Fitting 3 Ends – 3/8" Tube	2	600605
4	Non-Vented Filler Plug	1	HA5432
A*	Tube Nut – 3/8" +Dia.	2	
B*	3/8" Elbow 1/4" NPT (M)	2	

* SUPPLIED WITH HELM

NOTE: USED IN SYSTEMS PLUMBED WITH 3/8" DIAMETER NYLON OR COPPER TUBE



Autopilot powerpack connection



HF5507

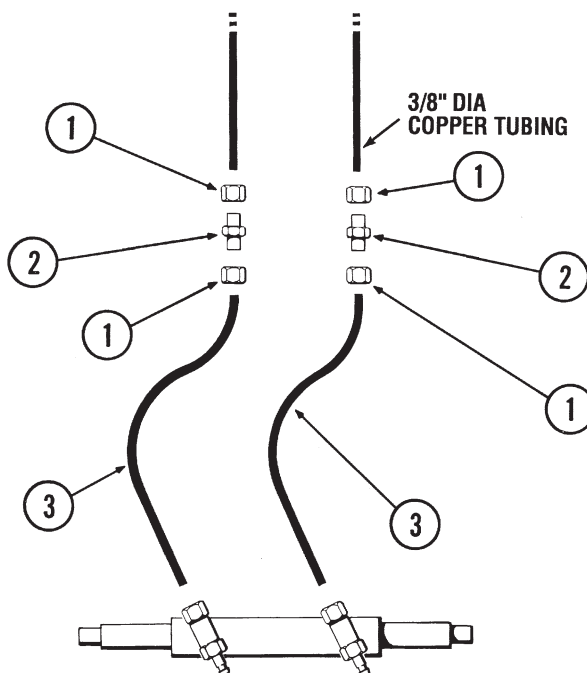
Application

Kit to connect 3/8" diameter copper tubing to SeaStar cylinders (using 3/8" diameter nylon tubing)

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	4	280327
2	Connector Fitting 3/8" Tube (M) – 3/8" Tube (M)	2	280929
3	Nylon Tubing 3/8" Dia.	6ft	795628

NOTICE

DO NOT use with SeaStar Outboard Cylinders and/or SeaStar Sterndrive cylinder # HC5332.



HF5508

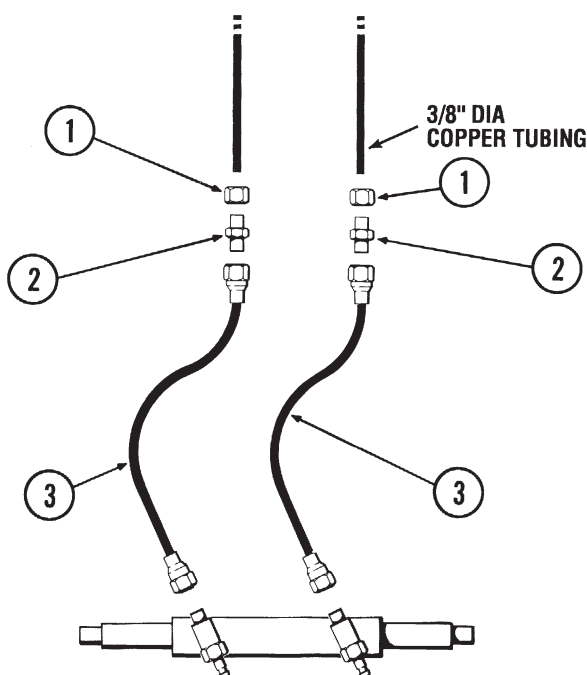
Application

Kit to connect 3/8" diameter copper tubing to SeaStar cylinders (using SeaStar outboard hose)

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut – 3/8" Dia.	2	280327
2	Connector Fitting 3/8" Tube (M) – 3/8" Tube (M)	2	280929
3	18" Hose c/w Fittings	2	338621

CAUTION

DO NOT cut SeaStar Outboard Steering hose. Once cut there is no means to field swage fittings to the ends of the hoses.



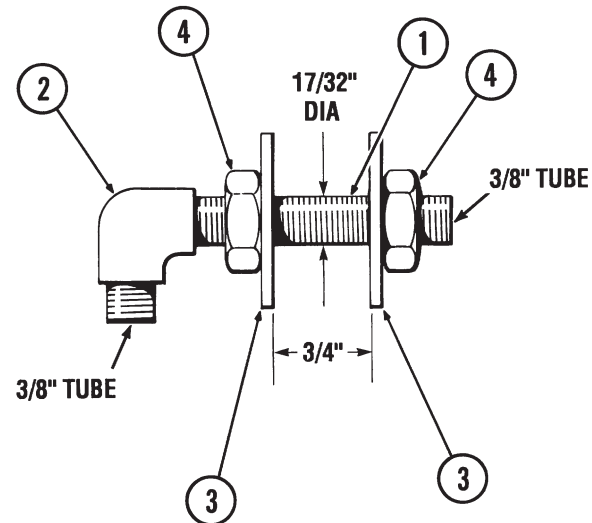
HF5512

3/4" bulkhead fitting kit

Application: Single cylinder installations

2 Assemblies per kit

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Connector Fitting	2	286323
2	Street Elbow 3/8" Tube (M) – 1/4" NPT(F)	2	600606
3	Washer	4	202224
4	Nut	4	191621



2 OF EACH ILLUSTRATED INCLUDED IN KIT

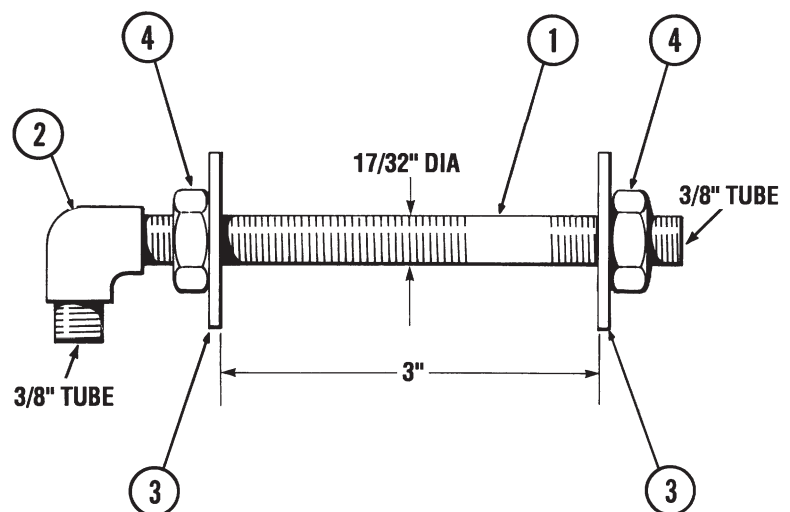
HF5513

3" bulkhead fitting kit

Application: Single cylinder installations

2 Assemblies per kit

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Connector Fitting	2	600608
2	Street Elbow 3/8" Tube (M) – 1/4" NPT(F)	2	600606
3	Washer	4	202224
4	Nut	4	191621



2 OF EACH ILLUSTRATED INCLUDED IN KIT

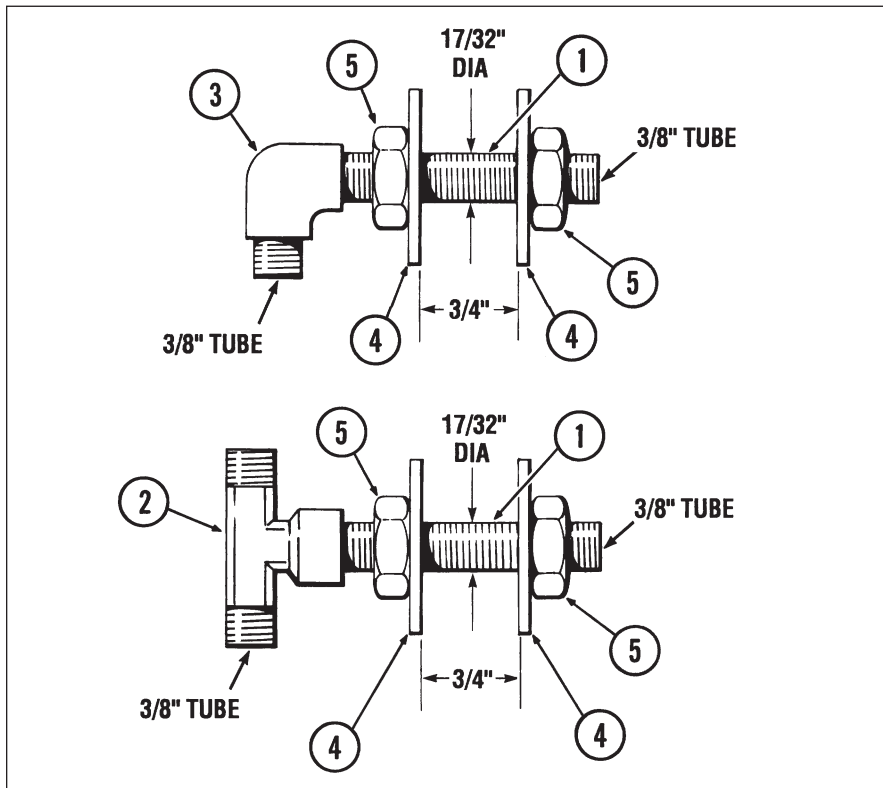
HF5514

3/4" bulkhead fitting kit

Application: Dual cylinder installations

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Connector Fitting	4	286323
2	Tee Fitting 2 Ends – 3/8" Tube (M) Center – 1/4" NPT (F)	2	284826
3	Street Elbow 3/8" Tube (M) – 1/4" NPT (F)	2	600606
4	Washer	8	202224
5	Nut	4	191621

2 OF EACH ILLUSTRATED INCLUDED IN KIT



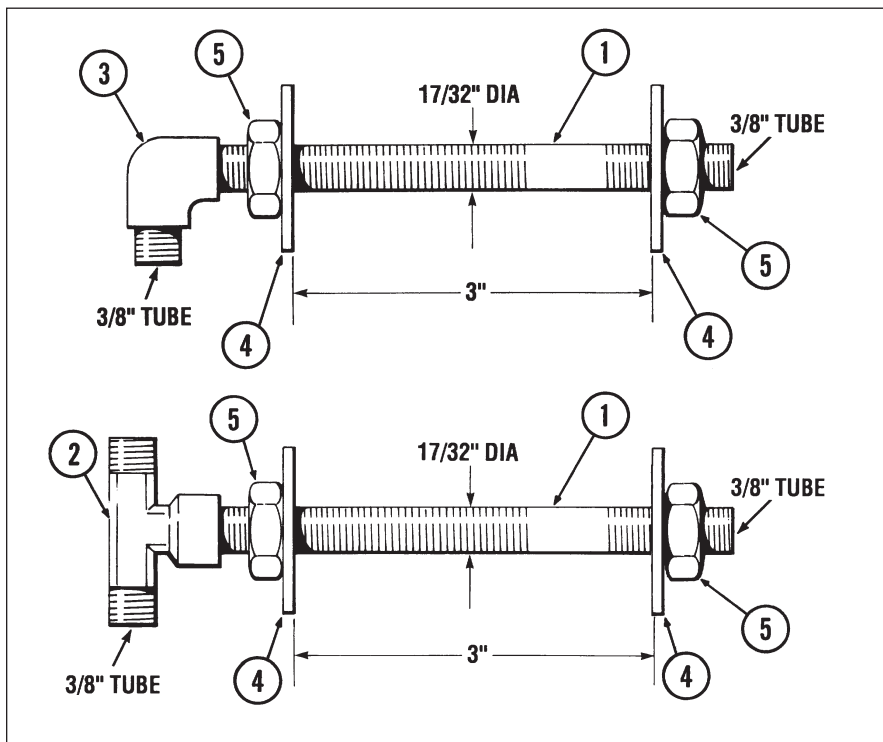
HF5515

3" bulkhead fitting kit

Application: Dual cylinder installations

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Connector Fitting	4	286323
2	Tee Fitting 2 Ends – 3/8" Tube (M) Center – 1/4" NPT (F)	2	284826
3	Street Elbow 3/8" Tube (M) – 1/4" NPT (F)	2	600606
4	Washer	8	202224
5	Nut	4	191621

2 OF EACH ILLUSTRATED INCLUDED IN KIT

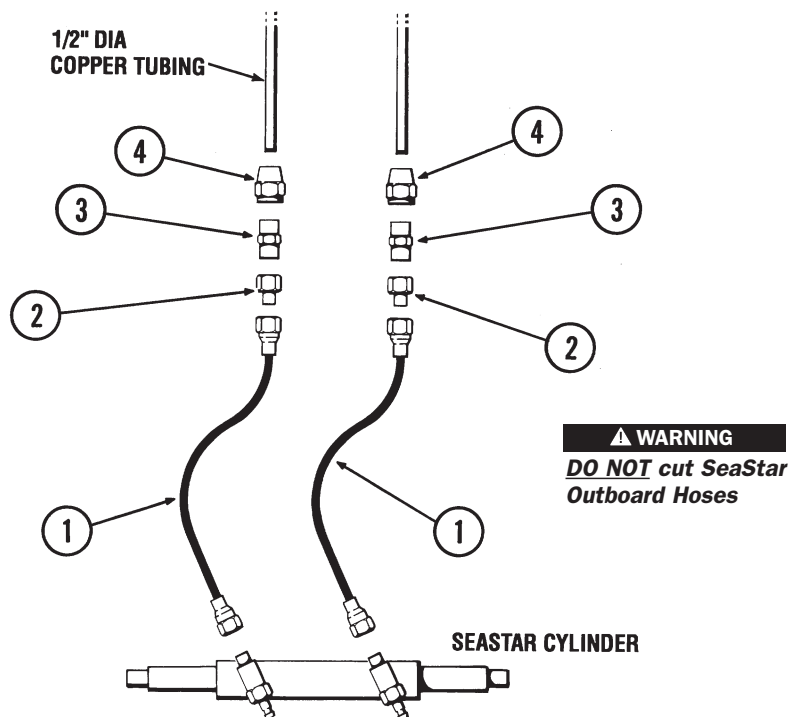


HF5568

Application

Kit to connect 1/2" diameter copper tubing to SeaStar cylinders

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	18" Hose Kit	2	338621
2	Connector Fitting 3/8" NPT(F) – 3/8" Tube (M)	2	653624
3	Connector Fitting 1 End – 3/8" NPT(M) 1 End – 1/2" Dia. 45° Flare	2	555421
4	Tube Nut 1/2" Dia. Flare	2	555027

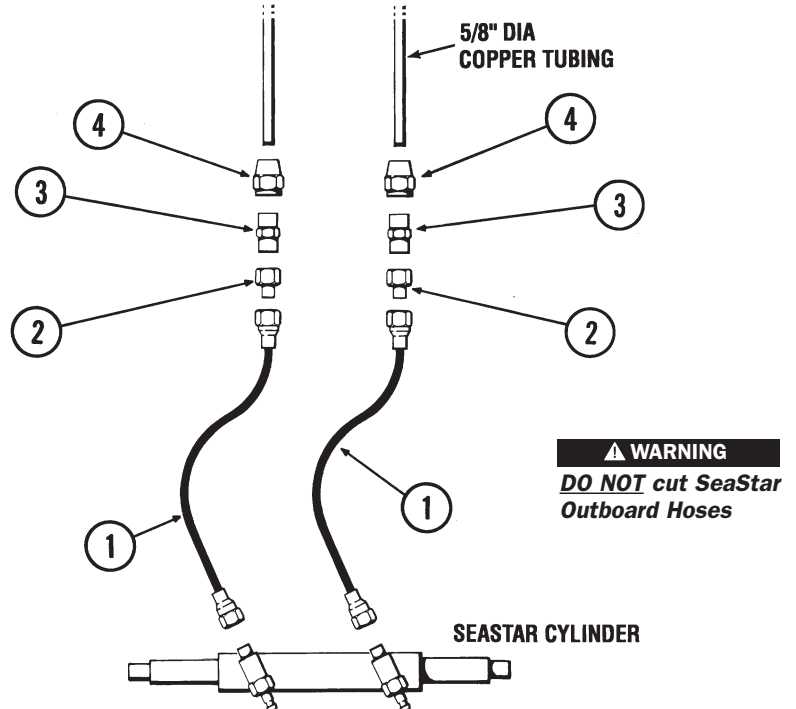


HF5569

Application

Kit to connect 5/8" diameter copper tubing to SeaStar cylinders

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	18" Hose Kit	2	338621
2	Connector Fitting 3/8" NPT(F) – 3/8" Tube (M)	2	653624
3	Connector Fitting 1 End – 3/8" NPT(M) 1 End – 5/8" Dia. 45° Flare	2	288028
4	Tube Nut 5/8" Dia. Flare	2	555121



⚠ CAUTION

DO NOT cut SeaStar Outboard Steering hose. Once cut there is no means to field swage fittings to the ends of the hoses.

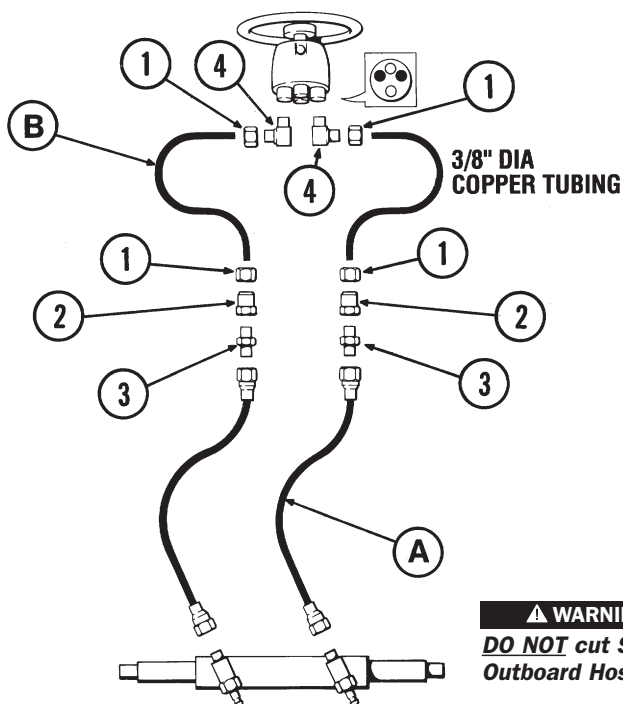
HF5581

Application

45° flare fitting connection kit
for SeaStar systems

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut 3/8" Dia. 45° Flare	4	653022
2	Connector Fitting 1 End – 3/8" Dia. 45° Flare (M) 1 End – 3/8" NPT (F)	2	653126
3	Connector Fitting 3/8" Tube (M) – 3/8" NPT (F)	2	600602
4	Elbow 1 End – 1/4" NPT (M) 1 End – 3/8" Dia. 45° Flare (M)	2	288526
A*	Outboard Hose Kit		H051__
B*	Copper Tube 3/8" Dia.		

* NOT SUPPLIED WITH FITTING KIT



⚠ WARNING
DO NOT cut SeaStar
Outboard Hoses

HF5582

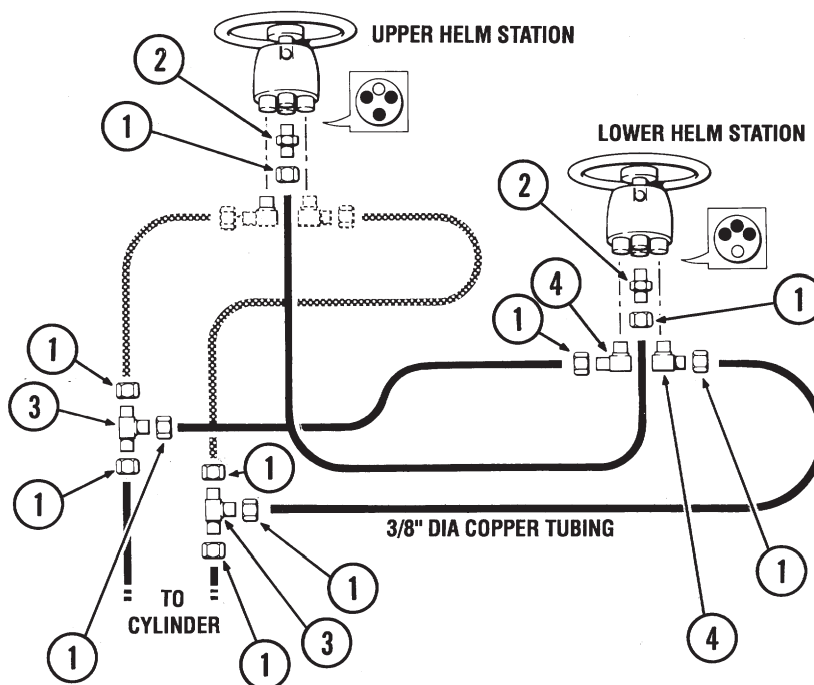
Application

Add a station or autopilot kit
using 3/8" 45° flare fittings

ITEM NO.	DESCRIPTION	QUANTITY PER KIT	PART NO.
1	Tube Nut 3/8" Dia. 45° Flare	10	653022
2	Connector Fitting 1 End – 3/8" Dia. 45° Flare (M) 1 End – 1/4" NPT (M)	2	653323
3	Tee Fitting Both Ends – 3/8" Dia. 45° Flare (M)	2	653220
4	Elbow 1 End – 1/4" NPT (M) 1 End – 3/8" Dia. 45° Flare (M)	2	288526

NOTICE

Fittings for port and starboard lines
in upper station not included.



SEASTAR LIQUID TIE BAR ALIGNMENT VALVE Part# HA5471-2

NOTICE

If a mechanical tiebar can be used, it is advisable that one is fitted. There is no substitute for a mechanical tiebar

CAUTION

Side Mount or Unbalanced Cylinders, such as SeaStar cylinder HC5370 can only be used with the valve by re-orienting the port engine tilt tube, to allow for mounting cylinder on the port (left) side of the port engine. Cylinder rods must face each other.

WARNING

The use of a standard helm at high speed (55 mph +) or a high load, eg: full throttle forward/reverse, may cause a vacuum in the liquid tie bar and cause engine/rudders to misalign, resulting in momentary loss of steering control. This will not occur if a SeaStar Pro Helm Pump (part # HH5770) is used.

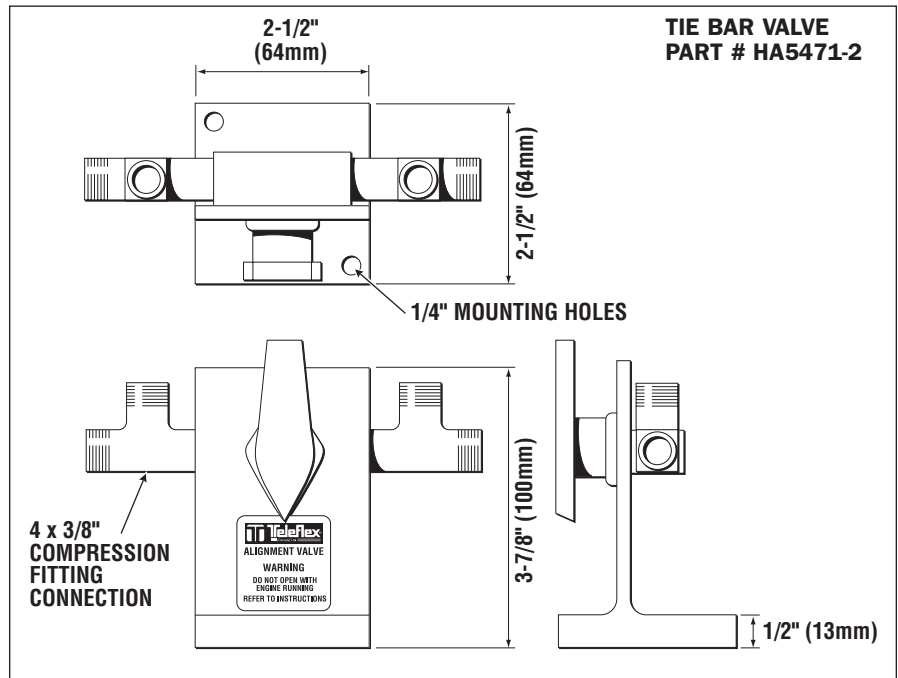
CAUTION

DO NOT allow cylinder body to move (HC5345), or shaft to move back into cylinder (HC5370).
DO NOT use a wrench to hold cylinder.

The Cylinder Alignment Valve (part # HA5471-2) will allow for the periodic required realignment of two outboard motors or rudders that are linked together with a Hydraulic Tie Bar as opposed to a solid link or a Mechanical Tie Bar.

Boats exceeding 55 mph must use the SeaStar Pro Helm Pump (part# HH5770) and SeaStar Pro Kevlar Hoses.

Due to the potential for leakage across the piston seals, it is possible for the engines to get out of synchronization. We are unable to predict, due to circumstances beyond our control, the frequency that misalignment may occur, therefore Engine alignment should be checked and corrected as required before leaving the dock.



Cylinder Alignment Valve Bleeding Instructions

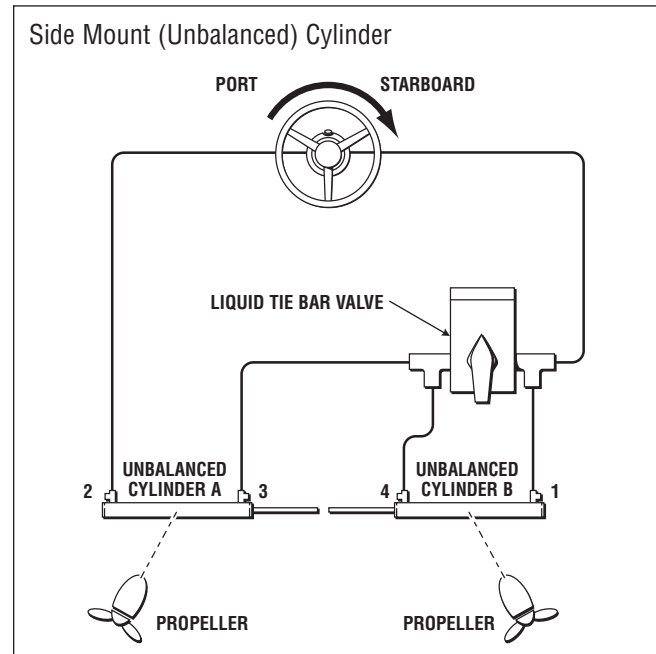
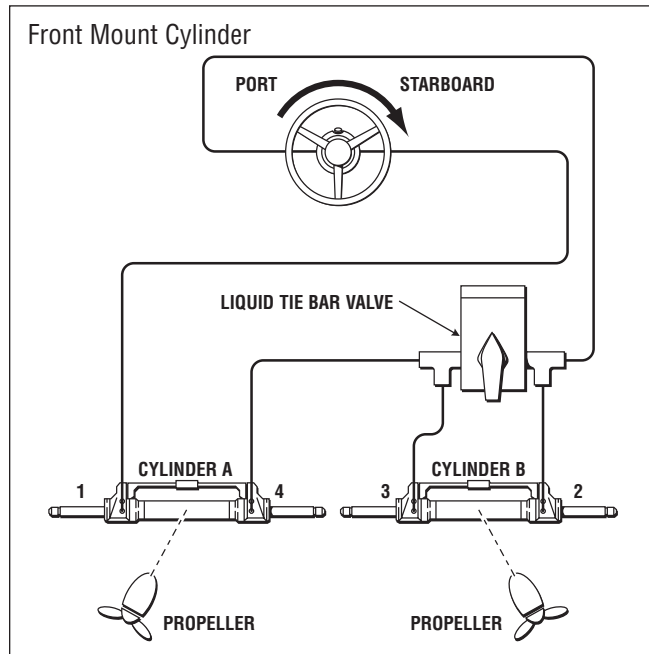
Referencing the cylinder alignment valve installation schematic.

- Fill helm with oil and attach filler device / container to helm
- Open valve
- Open bleed fitting no. 1 and pull cylinder shaft all the way out on fitting no. 1 side of cylinder
- Turn steering wheel clockwise until an air free stream of oil comes forth from bleed fitting no. 1
- Close bleed fitting no. 1
- Open bleed fitting no. 2 and pull cylinder shaft all the way out on fitting no. 2 side of cylinder
- Turn steering wheel counter-clockwise until an air free stream of oil comes forth from bleed fitting no. 2, then close bleed fitting no. 2
- Open bleed fitting no. 3 and pull cylinder shaft all the way out on fitting no. 3 side of cylinder
- Turn steering wheel counter-clockwise until an air free stream of oil comes forth from bleed fitting no. 3, then close bleed fitting no. 3
- Open bleed fitting no. 4 and pull cylinder shaft all the way out on fitting no. 4 side of cylinder
- Turn steering wheel counter-clockwise until an air free stream of oil comes forth from bleed fitting no. 4, then close bleed fitting no. 4
- Turn steering wheel back and forth from hardover to hardover a couple of times. Align cylinders by pulling cylinder rod all the way out on the same side of each cylinder and close valve

Realignment Instructions

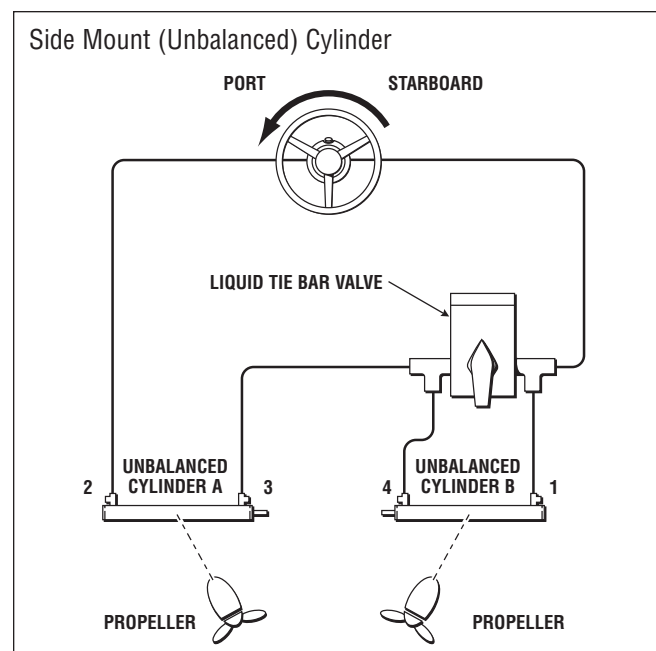
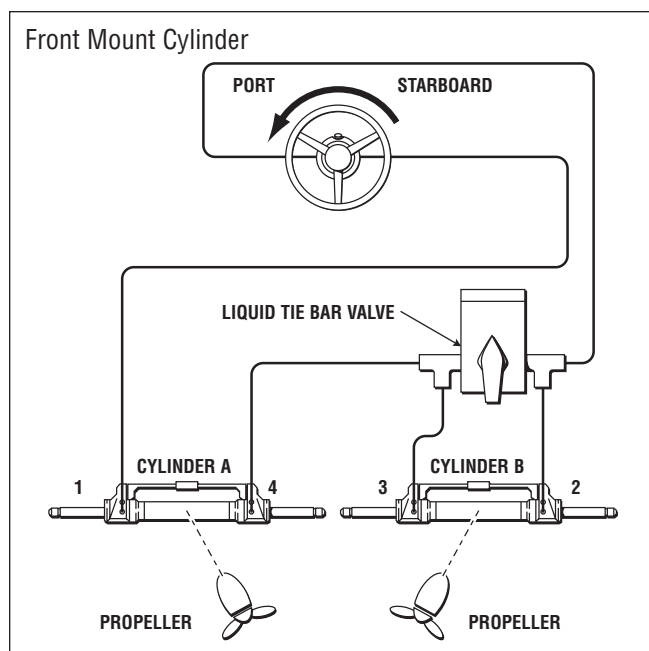
Engines Toe'd Outwards; Props too far apart

- 1 Turn the wheel hard over to Starboard. (Both cylinders move; cylinder B reaches hard over first)
- 2 Open the valve
- 3 Continue to turn the wheel hard over to Starboard. (Only cylinder A moves and reaches hard over)
- 4 Close the valve



Engines Toe'd Inwards; Props too close together

- 1 Turn the wheel hard over to Port. (Both cylinders move; cylinder B reaches hard over first)
- 2 Open the valve
- 3 Continue to turn the wheel hard over to Port. (Only cylinder A moves and reaches hard over)
- 4 Close the valve



TOOLS AND TORQUE DATA SHEETS

SeaStar Power Purge JR.

Part# HA5445-2



SeaStar®/BayStar™ Power Purge Jr. is the quickest way to bleed a SeaStar®/BayStar™ system in the field and assure a rock-solid steering feel every time!

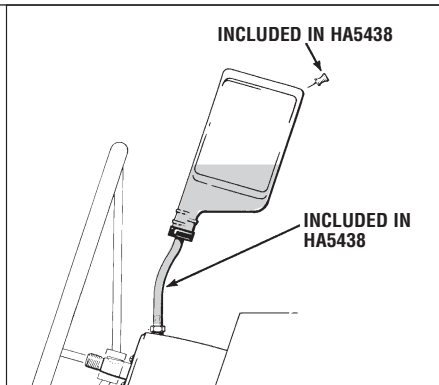
The Power Purge Jr. reduces installation and warranty costs while enhancing the quality of the boat to the end user. A typical manual fill and purge takes the average experienced installer or service technician about 30 minutes per boat — by using the Power Purge Jr. this can be reduced to 10 minutes or less.

Advantages:

- Steering feel is solid every time
- Complete Fill & Purge in 10 minutes or less
- Fast and efficient
- Easy to operate
- Screens contaminants from oil
- Quick connect fittings
- Convenient portable size
- Convenient electrical hook-up utilizing 12 volt boat battery
- Optional Dual Cylinder Purging Kit HA5461 available
- Optional 50' Hose Extension Kit HA5462, for those longer runs

SeaStar Bleed Hose

Part# HA5438



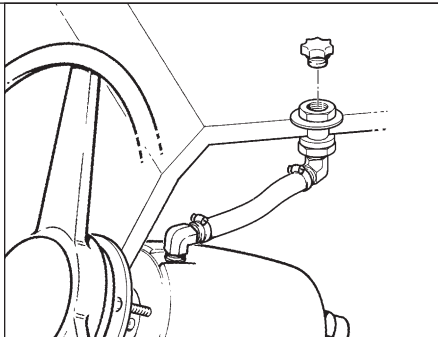
- This kit is needed to properly bleed the SeaStar Outboard steering kit
- Screws onto the SeaStar and equivalent fluid to bleed the SeaStar system
- Makes for a clean bleed when used properly

SeaStar Remote Fill

Part# HA6450

NOTICE

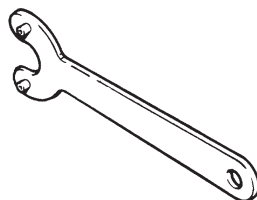
requires 3/4" hole to be drilled onto dash above helm pump.



- Can be used with ALL SeaStar Helm pumps
- Relocate your fill plug to a more convenient or hidden place

SeaStar Front Mount Gland Removal Tool

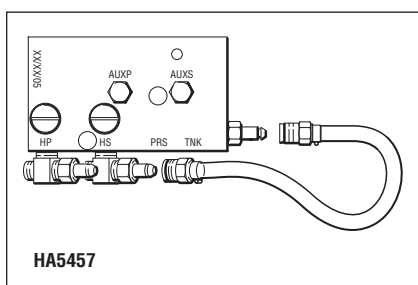
Part# 745225



- Makes changing the end glands on the front mount cylinder easy.
- Avoid damage to the gland by using the proper tool.
- Lightweight and durable.

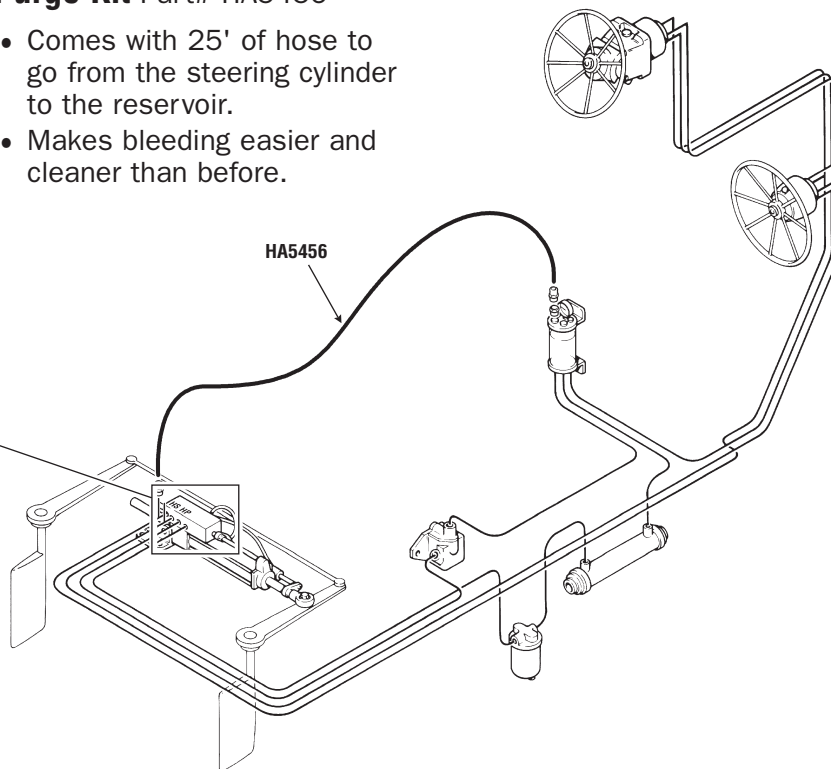
SeaStar Power Steering Purge Kit Part# HA5457

- Makes bleeding even easier than before.
- Central bleeding location—no need to run hoses to reservoir.
- Can only be used with Power Steering Cylinders made after October 2005.



SeaStar Power Steering Purge Kit Part# HA5456

- Comes with 25' of hose to go from the steering cylinder to the reservoir.
- Makes bleeding easier and cleaner than before.



SeaStar Helm Pump Drill Jigs

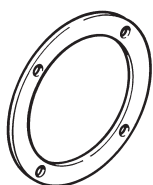
HA5405 Mounting washer for SeaStar helm studs for applications where the dashboard hole is 3-1/4 inches in diameter.

HA5465 Pilot Drill Jig for enlarging a 2 inch diameter dashboard hole to a 3 inch diameter hole. As required for all standard SeaStar and SeaStar Pro helms when using a standard 3 inch diameter hole saw.

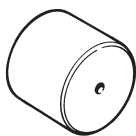
HA5466 Drill Jig for drilling mounting holes for standard SeaStar and SeaStar Pro helms. A 3 inch dashboard hole is required.

HA5467 Drill Jig for drilling mounting holes for standard SeaStar and SeaStar Pro helms where dashboard has a 3-1/4 inch hole from a previously mounted mechanical helm.

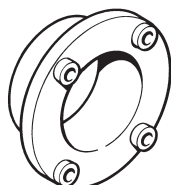
HA5468 Drill Jig for drilling mounting holes for SeaStar and SeaStar Pro traditional tilt helms (HH5741, HH5742, HH5743). Also back Mount Kit (HA5418). A 4-1/2 inch dashboard hole is required.



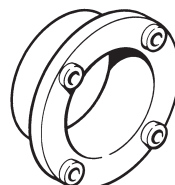
HA5405



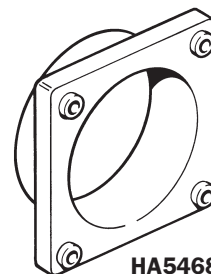
HA5465



HA5466



HA5467



HA5468

Steering Torque Data Sheet

SeaStar®

TORQUE DATA SHEETS

DISPLACEMENT HULLS ONLY

NAME: _____

CONTACT: _____

HULL DATA

HULL DIMENSIONS:

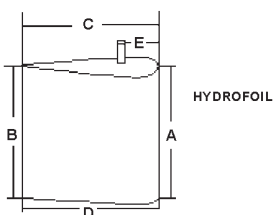
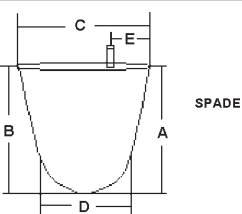
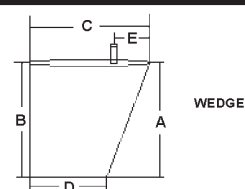
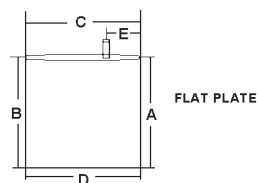
LOA _____ SAIL _____
 BEAM _____ OTHER _____
 DISPLACEMENT _____ TOP SPEED _____ Knots
 DRAFT _____ USE: _____
 NO. STEERING STATIONS _____

POWER DATA

EACH SHAFT HORSEPOWER _____
 PROP DIAMETER: _____
 SINGLE ENGINE ☐
 TWIN ENGINE ☐

RUDDER DATA

(CIRCLE TYPE OF RUDDER)



RUDDER ARC (Midship to Hardover): _____ Degrees

RUDDER AREA: _____ Square Ft.

NO. RUDDERS ☐ One ☐ Two

RUDDER DIMENSIONS:

(A) Height _____ In.
 (B) Height _____ In.
 (C) Width _____ In.
 (D) Width _____ In.
 (E) Counter-balance _____ In.

NOTICE

Please include a detailed drawing of your rudder to assist with rudder load calculations.

Rudder Torque Data Sheet

To: _____

Phone Number: _____

Fax Number: _____

From: _____

Date: _____

PLANING HULLS ONLY

NAME: _____
ADDRESS: _____

BUILDER: _____
DESIGNER: _____
BOAT NAME: _____
NO. STEERING STATIONS: _____

HULL DATA

HULL DIMENSIONS:

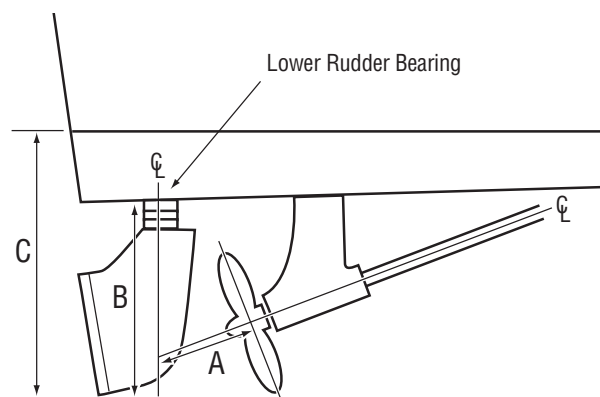
LOA _____ SAIL _____
BEAM _____ OTHER _____
DISPLACEMENT _____ TOP SPEED _____ Knots
DRAFT _____ USE: _____

POWER DATA

EACH SHAFT HORSEPOWER _____
PROP DIAMETER: _____
SINGLE ENGINE ☐
TWIN ENGINE ☐

DATA

FORMULA

Projected area of rudder = $(H+W) - (C+B)$


A = Perpendicular distance from the rudder shaft to the propeller.

B = Distance parallel to rudder shaft from rudder base to center of lower rudder bearing.

C = Perpendicular distance from waterline to rudder base.

Note: Formula presumes 23-27% counterbalance

Boat speed: _____ knots
Number of rudders: _____
Rudder area (projected area): _____ square feet
Propeller diameter: _____ feet
Perpendicular distance from the rudder shaft to the propeller: _____ feet
Distance measured parallel to the rudder shaft from the base of the rudder to the center of the lower bearings: _____ feet
Average rudder chord length: _____ feet
Perpendicular distance from the waterline to the rudder base: _____ feet
Rudder shaft diameter: _____ inches
Shaft power: _____ horsepower

NOTICE

Please include a detailed drawing of your rudder to assist with rudder load calculations.

**PLEASE TAKE A MOMENT TO COMPLETE
THIS FORM AND
RETURN IT VIA FAX TO: 604-279-2202**

BayStar™ SeaStar® Hynautic HYDRAULIC FLUID

SeaStar hydraulic steering systems require the use of a special high quality hydraulic fluid meeting MIL SPEC H-5606 G. This fluid is available in 1 liter (33.8 US fluid ounce) bottles as:

SeaStar Hydraulic Fluid: **Part Number HA5430 - 1 Litre**
HA5440 - 4 Litres

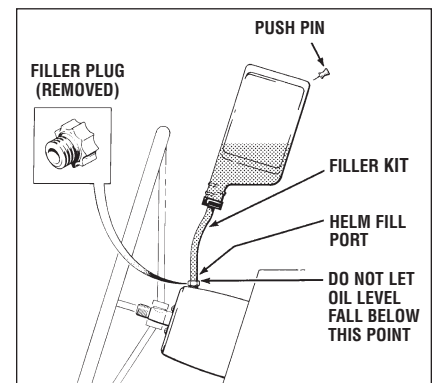


Alternate recommended hydraulic fluids for SeaStar steering systems.

Oil Manuf.	Brand Name
SeaStar	SeaStar oil part# HA5430
Shell	Aero Shell Fluid #41
Esso	Univis N15 or J13
Texaco	H015
Chevron	Aviation Hydraulic Fluid A
Mobil	Aero HFA
Petro Canada	Harmony HV115 (In Canada Only)

Optional Filler Kit

Part# HA5438



CAUTION

Substitution of non-recommended fluids may result in heavier steering and/or irreparable damage to your steering system.

NOTICE

SeaStar Hydraulic Steering Fluid can be used in Hynautic, BayStar and BayStar Plus steering systems.

NOTICE

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

SeaStar[®] Hynautic[®]

VOLUMES & CAPACITIES

NOTICE

Contact your nearest dealer or distributor to order replacement parts.

SeaStar Helm Pump Shaft Details:

Taper: 3/4" Standard Taper (1" PER FOOT), **WHEEL SHAFT Threads:** 5/8" - 18 UNF,
Key: #606 Woodruff Key (3/16"), **PORT SIZES:** 1/4" NPT (F)

Table A: SeaStar/Hynautic Helm Pumps

HELM DESCRIPTION	PART NUMBER	DISPLACEMENT CU. IN./REV (cc)	RELIEF VALVE SETTING PSI (BAR)	MAXIMUM WHEEL DIA. INCHES (mm)	SEAL KIT	SHAFT SEAL
SEASTAR 1.4 – STANDARD MOUNT	HH5269	1.4 (23.0)	1000 (70)	26 (660)	HS5176	225226
SEASTAR 1.4 – REAR MOUNT	HH5260	1.4 (22.9)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR 1.4 – REAR MOUNT FULL FEEDBACK	HH5231	1.4 (23.0)	1000 (70)	26 (660)	HS5176	225226
SEASTAR 1.4 – REAR MOUNT 1" STRAIGHT SHAFT	HH5279	1.4 (23.0)	1000 (70)	26 (660)	HS5151	225320
SEASTAR 1.4 – REAR MOUNT 1" TAPERED SHAFT	HH5280	1.4 (23.0)	1000 (70)	26 (660)	HS5151	225320
SEASTAR 1.4 – TILT	HH5744	1.4 (23.0)	1000 (70)		HS5176	225226
SEASTAR 1.7 – STANDARD FRONT MOUNT	HH5271	1.7 (27.8)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR 1.7 – STANDARD MOUNT FULL FEEDBACK	HH5761	1.7 (27.8)	1000 (70)	26 (660)	HS5176	225226
SEASTAR 1.7 – REAR MOUNT	HH5261	1.7 (27.8)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR 1.7 – REAR MOUNT 1" TAPERED SHAFT	HH5281	1.7 (27.8)	1000 (70)	26 (660)	HS5151	225320
SEASTAR 1.7 – TRADITIONAL TILT	HH5741	1.7 (27.8)	1000 (70)	20 (508)	HS5176*	225226*
SEASTAR 1.7 – SPORT TILT	HH5291	1.7 (27.8)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR PRO 1.7 – STANDARD MOUNT	HH5779	1.7 (27.8)	1500 (103)	26 (660)	HS5176	225226
SEASTAR PRO 1.7 – REAR MOUNT	HH5778	1.7 (27.8)	1500 (103)	26 (660)	HS5176	225226
SEASTAR PRO 1.7 – TILT	HH5773	1.7 (27.8)	1500 (103)		HS5176	225226
SEASTAR – 2.0 STANDARD FRONT MOUNT	HH5273	2.0 (33.0)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR – 2.0 STANDARD MOUNT FULL FEEDBACK	HH5760	2.0 (33.0)	1000 (70)	26 (660)	HS5176	225226
SEASTAR PRO 2.0 – STANDARD FRONT MOUNT	HH5770	2.0 (33.0)	1500 (103)	26 (660)	HS5176*	225226*
SEASTAR PRO 2.0 – REAR MOUNT	HH5771	2.0 (33.0)	1500 (103)	26 (660)	HS5176	225226
SEASTAR PRO 2.0 – TRADITIONAL TILT	HH5774	2.0 (33.0)	1500 (103)	20 (508)	HS5176*	225226*
SEASTAR PRO 2.0 – SPORT TILT	HH5290	2.0 (33.0)	1500 (103)	20 (508)	HS5176*	225226*
SEASTAR 2.4 – STANDARD FRONT MOUNT	HH5272	2.4 (39.3)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR 2.4 – STANDARD MOUNT FULL FEEDBACK	HH5762	2.4 (39.3)	100 (70)	26 (660)	HS5176	225226
SEASTAR 2.4 – REAR MOUNT	HH5262	2.4 (39.3)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR 2.4 – REAR MOUNT 1" TAPERED SHAFT	HH5282	2.4 (39.3)	1000 (70)	26 (660)	HS5151	225320
SEASTAR 2.4 – TRADITIONAL TILT	HH5742	2.4 (39.3)	1000 (70)	20 (508)	HS5176*	225226*
SEASTAR 2.4 – SPORT TILT	HH5292	2.4 (39.3)	1000 (70)	26 (660)	HS5176*	225226*
SEASTAR PRO 2.4 – STANDARD MOUNT	HH5772	2.4 (39.3)	1500 (103)	26 (660)	HS5176*	225226*

* SeaStar Helm Pumps manufactured from 1984 through 1990 require Seal Kit #HS5151 or individual Shaft Seal #225320

HELM DESCRIPTION	PART NUMBER	DISPLACEMENT CU. IN./REV (cc)	SHAFT STYLE	KEY WAY	SEAL KIT
HYNAUTIC	H-21	2.75 (45.1)	1" STRAIGHT	1/4" SQUARE	HS-02
HYNAUTIC	H-25	2.75 (45.1)	3/4" TAPERED	#9 WOODRUFF	HS-02
HYNAUTIC	H-26	2.00 (32.8)	3/4" TAPERED	#9 WOODRUFF	HS-02
HYNAUTIC	H-41	5.50 (90.1)	1" STRAIGHT	1/4" SQUARE	HS-04
HYNAUTIC	H-42	4.00 (65.5)	1" STRAIGHT	1/4" SQUARE	HS-04
HYNAUTIC	H-42-2	4.00 (65.5)	3/4" TAPERED	#9 WOODRUFF	HS-04

NOTICE

Theoretical torque about pivot point at 35 degrees articulation with 1000 psi (70 bar) system pressure.

Table B: SeaStar/Hynautic Cylinders

CYLINDER MODEL	PART NUMBER	BORE DIAMETER IN (mm)	NOMINAL SHAFT DIA IN (mm)	STROKE IN (mm)	SEAL KIT	VOLUME CUBIC IN (cc)	TORQUE (See Notice) IN-LB (KG-M)
BAYSTAR COMPACT	HC4645H	1.25 (31.7)	0.63 (16.0)	8 (203)	N/A	7.24 (118.6)	N/A
BAYSTAR COMPACT	HC4658H	1.25 (31.7)	0.63 (16.0)	8 (203)	N/A	7.24 (118.6)	N/A
BAYSTAR COMPACT	HC4647H	1.25 (31.7)	0.63 (16.0)	8 (203)	N/A	7.24 (118.6)	N/A
BAYSTAR COMPACT	HC4648H	1.25 (31.7)	0.63 (16.0)	8 (203)	N/A	7.24 (118.6)	N/A
BA125-3ATM	HC5303	1.25 (31.7)	0.63 (16.0)	3 (76)	HS5154	2.72 (44.5)	N/A
BA125-6.25ATM	HC5311	1.25 (31.7)	0.63 (16.0)	6.25 (159)	N/A	5.66 (92.7)	N/A
BA135-7	HC5332	1.37 (34.9)	0.625 (15.9)	7 (178)	HS5155	8.3 (135.2)	5741 (66.1)
BA125-7ATM	HC5312	1.25 (31.7)	0.50 (12.7)	7 (178)	HS5154	7.2 (118.2)	5025 (57.9)
BA135-7ATM	HC5313	1.375 (34.9)	0.625 (15.9)	7 (178)	HS5155	8.3 (135.2)	5741 (66.1)
BA135-8EM	HC5327	1.35 (34.2)	0.63 (16.0)	8 (203)	HS5155	9.5 (155.4)	6557 (75.5)
BA150-7ATM	HC5314	1.50 (38.1)	0.625 (15.9)	7 (178)	HS5156	10.2 (167.5)	7117 (82.0)
BA150-7TM	HC5318	1.50 (38.1)	0.625 (15.9)	7 (178)	HS5182	10.2 (167.5)	7117 (82.0)
BA175-7TM	HC5319	1.75 (44.4)	0.75 (19.0)	7 (178)	HS5183	13.7 (225.4)	9569 (110.2)
BA135-7EM	HC5332	1.375 (34.9)	0.625 (15.9)	7 (178)	HS5155	8.3 (135.2)	5741 (66.1)
BA150-7EM	HC5326	1.50 (38.1)	0.625 (15.9)	7 (178)	HS5156	10.2 (167.5)	8853 (102.0)
BA150-9TM	HC5369	1.50 (38.1)	0.625 (15.9)	9 (229)	HS5182	13.1 (214.7)	9375 (107.7)
BA175-9TM	HC5373	1.75 (44.4)	0.75 (19.0)	9 (229)	HS5183	17.7 (290.0)	12600 (145.5)
BA200-11TM	HC5378	2.00 (50.8)	0.75 (19.0)	11 (279)	HS5185	26.0 (426)	23140 (267.2)
BA200-11TMC	HC5379	2.00 (50.8)	0.75 (19.0)	11 (279)	HS5185	26.0 (426)	23140 (267.2)
BA200-9	HC5802	2.00 (50.8)	0.75 (19.0)	9 (229)	HS5198	21.25 (348.2)	18900 (218.3)
BA200-11	HC5804	2.00 (50.8)	0.75 (19.0)	11 (279)	HS5198	26.0 (426)	23140 (267.2)
125-8EM	HC5328	1.25 (31.7)	0.50 (12.7)	8 (203)	HS5154	8.3 (135.2)	7142 (82.3)
92VPS	HC5331	1.25 (31.7)	0.50 (12.7)	8 (203)	HS5153	8.3 (135.2)	N/A
BA125-8EMV	HC5330	1.25 (31.7)	0.50 (12.7)	8 (203)	HS5154	8.3 (135.2)	7142 (82.3)
PIVOT MOUNT	HC5345	1.375 (35)	0.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	N/A
PIVOT MOUNT	HC5347	1.375 (35)	0.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	N/A
PIVOT MOUNT	HC5348	1.375 (35)	0.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	N/A
PIVOT MOUNT	HC5358	1.375 (35)	0.75 (19.0)	8 (203)	HS5157	8.34 (136.6)	N/A
FRONT MOUNT	HC5342	1.262 (32.56)	0.75 (19.0)	10 (254)	HS5157	8.13 (133.2)	N/A
SIDE MOUNT	HC5370	1.25 (31.7)	0.50 (12.7)	8 (203)	HS5153	8.3 (135.2)	N/A
SPLASHWELL MOUNT	HC5380	1.25 (31.7)	0.50 (12.7)	9 (228)	HS5155	9.3 (152.1)	N/A
CATAMARAN O/B	HC5343	1.262 (32.0)	0.75 (19.0)	10 (254)	HS5157	8.13 (133.2)	N/A
CATAMARAN O/B	HC5374	1.50 (38.1)	0.75 (19.0)	10 (254)	KS-06	13.3 (217.95)	8990 (103.8)
HYNAUTIC	K-5	1.50 (38.1)	0.875 (22.2)	9.0 (229)	KS-15	15.9 (260.5)	10790 (124.6)
HYNAUTIC	K-8	2.50 (63.5)	1.000 (25.4)	9.5 (241)	KS-18	39.2 (642.4)	26575 (306.9)
HYNAUTIC	K-9	2.50 (63.5)	1.000 (25.4)	14.5 (368)	KS-18	55.0 (901.3)	39850 (460.2)
HYNAUTIC	K-18	1.25 (31.7)	0.625 (15.9)	7.0 (178)	KS-02	7.0 (114.7)	5972 (68.8)
HYNAUTIC	K-19	1.25 (31.7)	0.625 (15.9)	9.0 (229)	KS-02	9.0 (147.5)	7685 (88.54)
HYNAUTIC	K-22	1.50 (38.1)	0.750 (19.0)	10.0 (254)	KS-04	13.3 (217.9)	8990 (103.8)
HYNAUTIC	K-27	1.50 (38.1)	0.750 (19.0)	10.0 (254)	KS-04	13.3 (217.9)	8990 (103.8)
HYNAUTIC	K-31	2.00 (50.8)	0.875 (22.2)	10.0 (254)	KS-05	25.5 (417.9)	17320 (200.0)
TOURNAMENT SERIES	HC6750	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A
TOURNAMENT SERIES	HC6751	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A
TOURNAMENT SERIES	HC6752	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A
TOURNAMENT SERIES	HC6753	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A
TOURNAMENT SERIES	HC6754	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A
TOURNAMENT SERIES	HC6755	1.375	0.75 (19.0)	8 (203)	HS5157	8.3 (135.2)	N/A

NOTICE

Theoretical torque about pivot point at 35 degrees articulation with 1000 psi (70 bar) system pressure.

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Toll Free: 1-800-661-5353

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www.paynesmarine.com

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e-mail: sales@westernmarine.com
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99603
USA

Tel: (907) 235-8617 Fax: (907) 235-2605

Toll Free: 800-478-8612
e-mail: reddeninc@worldnet.att.net
www.reddenmarine.com

VIP Distributors (Wholesale)
1220 East 68th Avenue, Unit 101
Anchorage
Alaska
99518
USA

Tel: (907) 349-8924 Fax: (907) 349-2628

Toll Free: 800-770-8924
e-mail: vipdist@alaska.net

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Marine Wholesale
2335 East Jones Ave.
Phoenix
Arizona
85040
USA

Tel: 800-501-8333 Fax: 602-243-5998

Toll Free: 800-501-8333

ARKANSAS

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6900 Alcoa Road
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Arkansas
72015
USA

Tel: (501) 778-2002 Fax: (501) 778-3438

Toll Free: 800-643-9762
www.benrock.com

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31500 Grape Street 3-208
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California
92532
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Tel: 213-200-0369 Fax: 909-678-6358

www.boatech.com

Coast Distribution System (Wholesale)
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USA

Tel: 800-495-5858

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California
90021
USA

Tel: (213) 624-5595 Fax: (213) 689-0986

Diversified Marine Products
4105 South Market
Sacramento
California
95834
USA

Tel: 916-929-2696 Fax: 916-929-7192

Englund Marine Supply (Retail)
2 Commercial Street
Eureka
California
95501
USA

Tel: 707-444-9266 Fax: 707-444-9268

Toll Free: 800-228-7051
e-mail: englund@pacifier.com
www.englundmarine.com

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Crescent City
California
95531
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Toll Free: 800-228-7051
e-mail: englund@pacifier.com
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Long Beach
California
90813
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Tel: 562-983-6500

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Anaheim
California
92806
USA

Tel: 714-777-5505 Fax: 714-777-5736

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92806
USA

Tel: (714) 777-5505 Fax: (714) 630-3188

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Tel: (831) 728-4417 Fax: (408) 728-3014

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www.boatownerswarehouse.com

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www.brungerexport.com

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203A Kelsey Lane
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33619
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33126
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Toll Free: 800-226-4562
www.donovanmarine.com

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3636 B North L Street
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www.donovanmarine.com

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Toll Free: 1-800-226-4562
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USA

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www.glenmarmarine.com

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Florida
33315
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Tel: 800-432-2231
Toll Free: 1-800-432-2231

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Toll Free: 800-432-7652
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Toll Free: 800-327-3792
e-mail: lms@lewismarine.com
www.lewismarine.com

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1795 Continental Way
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3105 Sweetwater Road
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Coast Distribution (Wholesale)
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46514
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www.charmant.com

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Kansas
66111-3483
USA
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www.medarmarine.com

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Kenner
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e-mail: sales@beaconsupply.com
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Toll Free: 800-959-5904

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USA
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USA
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USA
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Mississippi
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www.medartmarine.com

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Missouri
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63010-4727
USA
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www.medartmarine.com

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Missouri
65802
USA
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New Jersey
8701
USA
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New Jersey
8086
USA
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P.O. Box 2103
Greenport
New York
11944
USA
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Morgan Recreational Supply
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Farmington
New York
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Toll Free: 800-836-5300
e-mail: tima@morganrec.com
www.morganrec.com

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Wilmington
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www.paxtonco.com

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Cleveland
Ohio
44113
USA
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304 Buckeye Blvd., P.O. 727
Port Clinton
Ohio
43452
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Oklahoma
74116
USA
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Toll Free: 800-643-9762
www.benrock.com

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7914 S.E. 82nd Street
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Oregon
97266
USA
Tel: (503) 777-3991 Fax: (503) 775-4989

Englund Marine Supply (Retail)
Foot of 15th Street, Box 296
Astoria
Oregon
97103
USA
Tel: (503) 325-4341 Fax: (503) 325-6421
Toll Free: 800-228-7051
e-mail: englund@pacifier.com
www.englundmarine.com

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880 SE Bay Blvd
Newport
Oregon
97365
USA
Tel: 541-265-9275 Fax: 541-265-3515
Toll Free: 800-228-7051
e-mail: englund@pacifier.com
www.englundmarine.com

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5080 Cape Arago Highway
Charleston
Oregon
97420
USA
Tel: 541-888-6623 Fax: 541-888-9332
Toll Free: 800-228-7051
e-mail: englund@pacifier.com
www.englundmarine.com

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901 N. Columbia Blvd
Portland
Oregon
97217
USA
Tel: 503-283-8310 Fax: 503-285-9461

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7911 N.E. 33rd Drive, Unit 140
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Oregon
97211
USA
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Toll Free: 800-621-3454

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Blackburn Marine Distributing, Inc.
1200 Lake Shore Road
Friedens
Pennsylvania
115541
USA
Tel: 814-267-3075 Fax: 814-267-3670
Toll Free: 800-726-3075
e-mail: blackburn@wpia.net

Coast Distribution (Wholesale)
175 Greenfield Road
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17601
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Keller Marine Service Routes 11 & 15
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17864
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Toll Free: 800-865-5299
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Toll Free: 1-800-788-2231

Lewis Marine Supply of Charleston
624 Marina Dr.
Charleston
South Carolina
29492
USA
Fax: 800-823-0311

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29556
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77003
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Tel: (713) 236-8190 Fax: (713) 236-0831

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76118
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Tel: (817) 284-1125 Fax: (817) 284-1219

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USA
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Westport
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Toll Free: 800-228-7051
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Toll Free: 800-426-6930
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Washington
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98225
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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 the date of original retail purchase, excepting that where Teleflex Canada Limited Partnership products are used commercially or in any rental or other income producing activity, then this warranty is limited to 1 year from the date of original 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 products were purchased, or to us at the appropriate address. In any such case Teleflex Canada Limited Partnership products found to be defective and covered by this warranty, will be replaced or repaired at Teleflex Canada Limited Partnership's option, and returned to the customer.

Teleflex Canada Limited Partnership's sole responsibility under this warranty is limited to the repair or replacement of product which is, in Teleflex Canada Limited Partnership's opinion, defective. Teleflex Canada Limited Partnership is not responsible for charges connected with the removal of such product or re-installation of replacement or repaired parts.

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- which has been used in an installation other than as recommended in our installation or operation instructions or specifications.
- Which has failed or has been damaged due to an accident or abnormal operation including racing, misuse or alterations outside our factory.
- Which has been repaired or modified by other than Teleflex Canada Limited Partnership.
- Which has been used on an engine/boat combination where the engine horsepower exceeds the boat horsepower rating established by the boat manufacturer.
- Which has been used with other products which, in Teleflex Canada Limited Partnership's opinion, are incompatible with the Teleflex Canada Limited Partnership product.

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If Teleflex Canada Limited Partnership products are to be returned to Teleflex Canada Limited Partnership under warranty, you must obtain a Return Goods authorization number (claim number) prior to shipping. Be sure to label the goods with:

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- b) the return goods authorization number (claim number).

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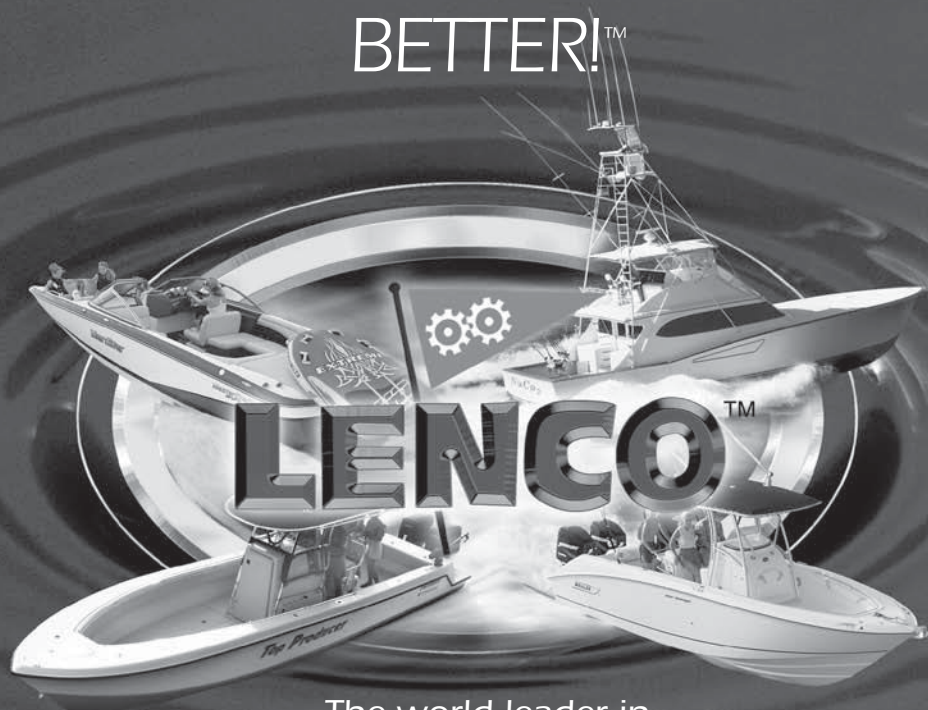


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Part Number: SL6001 Rev. 13_r04

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BETTER!™



The world leader in
trim tab, trolling motor and hatch lift innovation.



OWNER'S MANUAL

Featuring NEW waterproof Deutsch connectors!

Lenco power explained...

The entire Lenco Actuator is fully submersible, maintenance-free and sealed for life

Corrosion proof, water tight Vandar top cap and mounts stand up to severe loads

Buna-N SBR O-ring ensures absolute water-tight seal

Tough, high-torque motor easily transfers 750 lbs (340.18 kg)
Available in 12- or 24-volt motor.

Precision molded, powdered metal, high alloy gears provide high accuracy, high wear resistance, and high strength for long life

Buna-N SBR O-ring ensures absolute water-tight seal

Ballscrew rotates freely on 12 ball bearings at both ends of its stroke so there's no need for complicated limit switches and clutches

Dual Nitrile Buna SBR O-ring sealed for maximum protection

Stainless steel ram will not flex, even under extreme loads

Corrosion proof Vandar mounts always look great

6 foot leads with Deutsch connectors

Top cap gland seal sheaths the actuator cable outer jacket as well as both internal conductors for maximum waterproofing

High-impact, ultraviolet resistant Nylon 66, 50% glass fiber reinforced thermoplastic housing

Self-locking stainless steel ball screw locks into position and will not drift

CE All Lenco products are CE certified

Electro-polished solid 316 stainless steel billet end for Extreme Duty, Heavy Duty, and High Performance applications



CONGRATULATIONS!

You have just purchased the finest, performance trim tab system in the world! Welcome to the future.

Lenco Trim Tabs make the single most important difference in the way your boat rides and performs. Lenco Trim Tabs make your boat ride smoother, drier, faster, and safer with increased fuel efficiency whether on a small skiff or a mega-yacht. Lenco's ball screw design is more reliable, twice as powerful and features an instant response, making them very user friendly compared to typical hydraulic trim tabs. Lenco Trim Tabs are oil free and are environmentally friendly. Our goal is to manufacture products that simply make boating more enjoyable.



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Trim Tab Operation

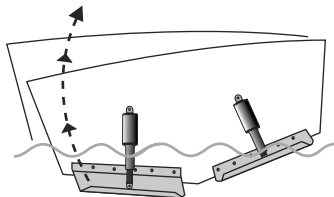
The Lenco Tactile Switch is based on the position of the bow.



Without Trim Tabs



With Trim Tabs



When the tabs are lowered, the water flow is redirected creating an upward force at the stern of the boat.

Lenco Trim Tab kits include two stainless steel planes, two electromechanical actuators and all mounting hardware for installation. (See available switch options on page 16.) The trim tabs operate independently of one another to provide optimal performance by redirecting water flow at the transom of the boat. Lenco Trim Tabs have been designed to improve the overall attitude of a boat. If used properly, Lenco Trim Tabs improve the ride, reduce drag, increase speed and improve the fuel efficiency of your boat.

The operation of Lenco Trim Tabs is basic. The two stainless steel planes are mounted with the actuators on the transom of the boat. When the tabs are lowered, the water flow is redirected creating an upward force at the stern of the boat. When the stern rises, the bow will lower.

Since Lenco actuators are electromechanical, they provide an immediate response at the touch of the switch. The Lenco switch is based on the position of the bow. The left side of the switch controls the starboard tab. The right side of the switch controls the port tab. The system is set up this way to minimize the guesswork while underway. To lower the starboard bow, press the right (starboard) switch where it reads DOWN. To lower the port bow, press the left (port) switch where it reads DOWN.

Since all boats are different in weight, length, speed and performance, it takes practice to understand how your boat reacts with trim tabs installed. Lenco Trim Tabs allow your boat to get on plane faster and continue planing at lower speeds. This improves visibility and the overall safety of your boat. When making adjustments with the trim tabs, use short momentary taps of the switch.

To become knowledgeable on how your boat performs with Lenco Trim Tabs, remember, practice makes perfect.

Lenco electromechanical actuators provide an instant response. When making adjustments, use short momentary taps of the switch.

SPECIAL CONDITIONS

HEAD SEA

Head Sea — Lower both tabs slightly by pressing BOW DOWN on both sides. This brings bow down while maintaining speed. This adjustment allows the hull of the boat to absorb the impact of the waves, resulting in a more efficient and smoother ride.

FOLLOWING SEA

Following Sea — Make sure the tabs are fully retracted by pressing BOW UP on both sides. This brings both tabs to a fully retracted position decreasing lift in the stern, allowing the bow to rise. If tabs are deployed, the bow may dig.

WINDY CHOP

Windy Chop — To raise the windward side of the boat press BOW UP on that side. If this is not sufficient, press BOW DOWN on the leeward side of the boat. Do not over trim when attempting this. This allows the windward side of the boat to rise and minimizes spray.

SHALLOW WATER HOLE SHOT

Shallow Water/Hole Shot — Lower both tabs completely down by pressing BOW DOWN on both sides. This provides lift in the stern of the boat and keeps the bow down. As you throttle up and speed increases, raise tabs by pressing BOW UP on both sides.

UNEVEN LOAD

Uneven Load — If one side of the boat is higher than the other while running, press BOW DOWN on the switch on that side. This lowers the tab on the listing side (low side) to bring the boat level.

PORPOISING

Porpoising — To stop porpoising, press BOW DOWN on both sides of the switch. The tabs need only to be deployed slightly to correct this adverse situation.

SAFETY

While the boat is underway, do not move one tab up or down significantly; this may cause listing.

While at higher speeds, do not over trim. This causes the bow to lower quickly, resulting in a reduction of speed and may cause the boat to veer.

When in following seas or when running an inlet, the tabs should be fully retracted. This allows for optimal performance.

While operating trim tabs, use caution. Improper use of trim tabs may cause accidents and/or injury.



Trim Tab System Parts & Troubleshooting

1	Stainless steel blade with hinge	#20141-001 (B-9x12 dimensions of tab)
2	Electromechanical Actuator	#101, #101 XD, #101 XDS, #102 XD
3	Upper mounting bracket	#15085-001 (116)
4	Space saver upper mounting bracket (optional)	#50225-001 (117)
5	Lower mounting bracket	#50014-001 (119)
6	RetroFit Kit bracket	#15085-001 (116)
7	(Qty. 2) 5/16 #18 X 1-3/4" large hex head bolt and 5/16	#10250-001
8	#123 L.E.D. Indicator Switch w/Retractor (optional)	#15070-001 (123SC)
9	124SSR Standard solid state Tactile Switch w/ Retractor (optional)	#15069-001 (124SSR)
10	#123 DR Dual Actuator L.E.D. Indicator Switch w/Retractor (optional)	#15071-001 (123DRSC)
11	Shim kit (optional)	#50015-002 (118S)
12	(Qty. 26) 1-1/4" (3.17 cm) stainless steel sheet metal screw kit	#10002-001 (Kit #1)
13	(Qty. 6) 20 X 7/8" (2.22 x .63 cm) stainless steel screws, (Qty 6) flat washers and (Qty. 6) 1/4" (.63 cm) lock nuts	Kit #4

Troubleshooting Guide for Trim Tabs

Trim tabs do not work together, independently or intermittently.

Solution Sequence:

- 1) Inspect fuse at fuse panel.
Replace if necessary.
- 2) Verify that all connections at switch control box are tight and in place.
- 3) Make sure that switch assembly has a solid ground.
- 4) If the actuator cables were spliced inside the transom, inspect joint for positive connection.
- 5) If, after following steps stated above, the actuators still do not operate properly — STOP and call the factory for further assistance at 772-288-2662.

Additional Information

- Check electrical connections behind switch and make sure ground wire is in place.
- The addition of a zinc anode will deter electrolysis. It is important that the zinc is in contact with the trim tab blade.
- To discourage any marine growth on tab or actuator, antifouling paint can be applied. When applying paint to the actuator, make sure it is fully retracted. Do not paint the stainless ram above the area that is exposed when retracted.
- If tabs malfunction or tabs become stuck in the down position while underway, remove pin or bolt at the lower mounting bracket.
- To reposition the actuator turn stainless steel ram clockwise and reattach.

Trim Tab Installation Instructions

Trim Tab Installation Instructions

Warning: The following instructions contain important safety information and should be followed carefully. Failure to do so may result in injury and will void warranty.

Please read through the instructions in their entirety prior to beginning installation!

TOOLS AND MATERIALS LIST

- Electric drill
 - Wire crimper/cutter
 - Tape measure
 - 3/16" & 3/8" drill bits
(.48 & .95 cm)
 - 7/16" (1.11 cm) wrench
 - Small hammer
 - 4' (1.22 m) level
 - Straight edge
 - 3M 5200 adhesive caulking
 - 2" (5.08 cm) hole saw
 - #2 & #3 Phillips screwdrivers
 - 3M 5200 adhesive caulking
1. To begin, determine where the Lenco Trim Tab Kit will be installed.
Note: When laying out the desired tab location, hold the tab against the transom with the bottom of the hinge knuckle 3/8" (.95 cm) from the bottom of the transom, approximately 1" to 4" (2.54 to 10.56 cm) in from the chine, and in line with the hull. When mounting the hinge to the hull make sure that the inside corner of the hinge knuckle is no closer than 2" (5.08 cm) to the left or right of any strake edge. The hinge may overlap a strake edge as long as any corner of the hinge knuckle is no closer than 2" (5.08 cm) to the left or right of the strake edge. (see Fig.1). Transfer (trace) the screw hole pattern onto the transom for drilling, see step 2.
 2. Using the 3/16" (.48 cm) drill bit, drill the previously marked hole locations to a depth of 1-1/4" (3.17 cm).

Note: When drilling out the screw hole pattern for the trim tab hinge you may drill through the transom, however the screws when installed with 3M 5200 adhesive caulking will seal the holes. All supplied screws and fasteners are stainless steel. Do not use any other type of alloy.

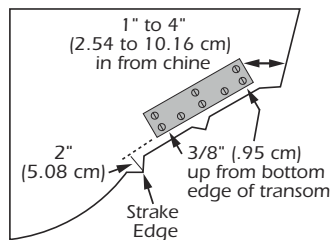
Mount the trim tab hinge to the transom using provided #14 x 1-1/4" (3.17 cm) stainless steel metal screws. We recommend using 3M 5200 adhesive caulking to bed the hinge and screws. **DO NOT OVERTIGHTEN.**

3. Attach the lower mounting bracket to the tab with the bolts, washers, and nylon lock nuts provided., Attach the upper bracket to the actuator using the 5/16-18 X 1-3/4" (4.45 cm) large hex head bolt and 5/16-18 hex nut provided. Attach the actuator to the lower bracket using the 5/16-18 X 1-3/4" (4.45 cm) large hex head bolt and 5/16-18 hex (.79) nut provided.

In order to properly position the upper bracket against the transom, you must lift the trim tab so that the trailing edge is approximately

Note: Performance tabs should be mounted with the tapered end facing toward the center of the boat.

Fig. 1



Trim Tab Installation Instructions

5/8" (1.59 cm) (for a 9" trim tab) and 3/4" (1.9) (for a 12" trim tab) above the straight edge when held to the hull (see Fig. 2). When the trim tab is at the appropriate level, transfer (trace) the outer shape of the upper bracket onto the transom. The upper bracket should be marked where it lays naturally against the transom to prevent binding during travel. (Do not adjust the upper bracket to the right or left, as this will cause binding, instead just allow the bracket to come to rest in it's natural position).

Remove the actuator from the lower bracket. Remove the upper bracket from the actuator and align to the previously marked location to mark the upper screw hole locations and cable hole location. Using the 3/16" (.48 cm) drill bit, drill the previously marked screw hole locations to a depth of 1-1/4" (3.17 cm).

Note: When drilling out the screw hole pattern for the trim tab hinge you may drill through the transom, however the screws when installed with 3M 5200 adhesive caulking will seal the holes when installed. All supplied screws and fasteners are stainless steel. Do not use any other type of alloy.

4. Warning: With some installations, fuel, water tanks and/or other systems may prevent the actuator cable from entering the hull through the upper mounting bracket. Be sure to check inside the hull before drilling the 3/8" (.95 cm) cable hole.

If all is clear, Using the 3/8" (.95 cm) drill bit., drill the previously marked cable hole completely through the transom. Insert the actuator cable through the appropriate hole in the upper bracket until it reaches the actuator. Insert the actuator cable through the gland seal until it

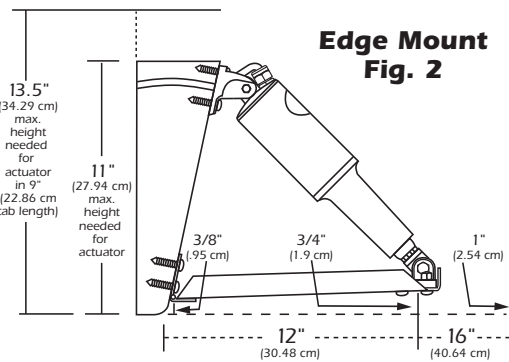
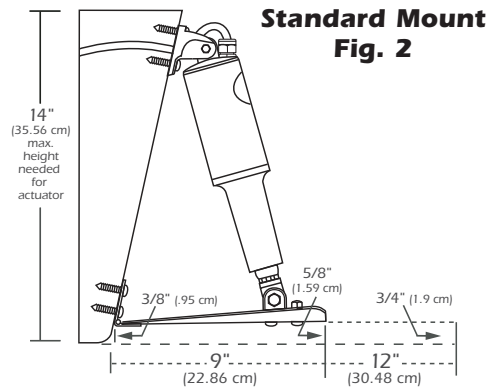
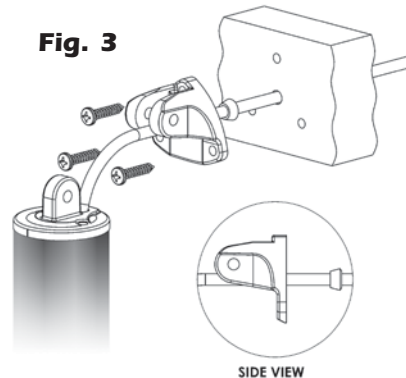


Fig. 3



reaches the upper bracket.

Note: For appropriate orientation of upper bracket and gland seal, (see Fig 3).

Continued on page 10.

Trim Tab Installation Instructions

Installation Instructions continued from page 9.

Insert the actuator cable through the transom. With the actuator loosely supported, start the provided #14 x 1-1/4" (3.17 cm) stainless steel metal screws through the upper bracket and into the transom. **MAKING SURE TO LEAVE THE SCREWS ONLY PARTIALLY INSTALLED.**

Insert the actuator clevis (mounting ear) into the top bracket and hold in the approximate installed location. Pass the actuator cable through the transom removing slack on the cable until it is snug. Remove the actuator from the upper bracket and finish installing the previously started #14 x 1-1/4" (3.17 cm) stainless steel metal screws through the upper bracket and into the transom. We recommend using 3M 5200 adhesive caulking to bed the upper bracket and screws. **DO NOT OVERTIGHTEN.**

Attach the actuator to the upper bracket using the 5/16-18 X 1 3/4" (4.45 cm) large hex head bolt and 5/16-18 (.79 cm) hex nut provided. If, however, you are prevented from drilling a hole through the transom at the bracket location, using the 3/8" (.95 cm) drill bit, simply drill a 3/8" (.95 cm) hole 4" to 5" (10.16 to 12.7 cm) above the waterline and insert the cable. Cover the hole and cable with a clamshell vent sealed with 3M 5200 for a waterproof and finished effect.

Assemble actuator connector ends as instructed in Actuator Deutsch Connector Instructions insert card provided.

5. At the helm, determine where the tactile switch will be installed, locate the template on page 27 and secure to helm, cut a circular opening using a 2" (5.08 cm) hole saw. Before cutting, make sure the area inside

the helm is clear of wires and other equipment that could be damaged. Using the template on page 35, drill four 3/16" (.48 cm) holes through the helm.

Secure the switch with the nylon nuts provided. When mounting the black control box, keep in mind that there is a 30" (76.2cm) lead that attaches to the back of the tactile switch. Make sure control box is mounted on a vertical surface with wires facing down toward the deck.

6. Following the trim tab switch wiring diagram, connect the actuators or the actuator extension cables to the switch control box. Be very careful of sharp edges that may damage the cable. Remember the left switch controls the right starboard tab and the right switch controls the left port tab.

Please follow the instructions and drawings carefully.

Call the Lenco Service Department at 772-288-2662 for technical assistance.





Lenco Trim Tabs, Switches and Bennett RetroFit Kits carry a 3-year limited warranty from the date of original purchase.

When possible, please refer to our troubleshooting guide on our website, <http://www.lencomarine.com> prior to processing your claim with the Lenco factory.

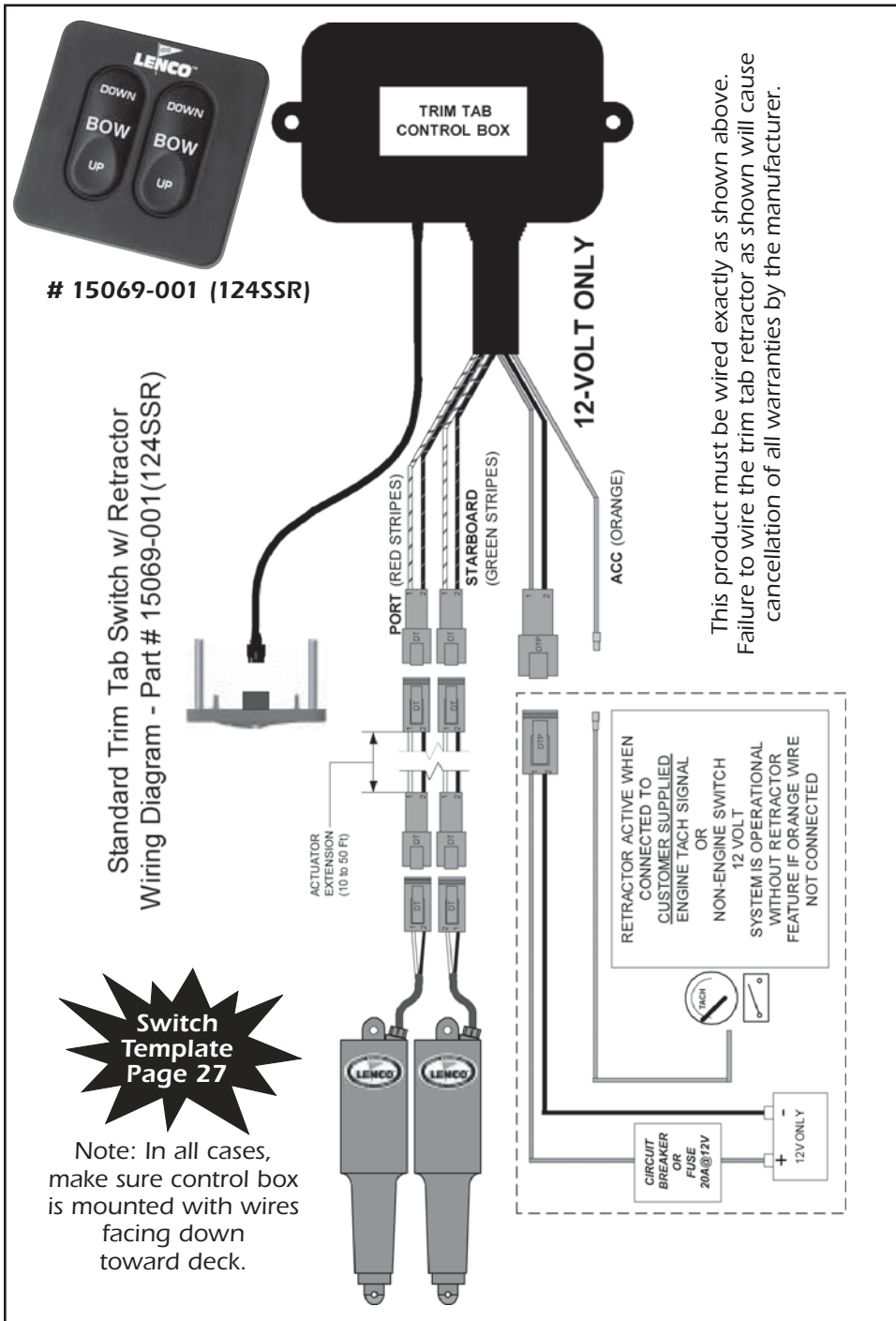
1. Call Lenco Marine at 772-288-2662, and ask for customer service. Give the technician a brief description of the product and the problem. Once the tech determines that the product is eligible for repair or replacement, they will issue you an RMA number (Return Merchandise Authorization). **Claims will not be processed without an RMA number.**
2. Return product and paperwork to Lenco Marine with the following information: name, telephone number, description of problem, proof of purchase to verify warranty. Proof of purchase and warranty info can consist of the following:
 - A. Bill of sale from place of purchase
 - B. Retail boat purchase bill of sale
3. Mark the outside of the package with the RMA number and return it to Lenco Marine Customer Service Department at 4700 SE Municipal Court, Stuart, FL 34997 for processing. Once received, our Customer Service Department will make every effort to process your return quickly. Should time restraints prohibit you from sending in the merchandise first, or you need an immediate

replacement, you will be required to secure the replacement part with a credit card prior to shipment (Visa, MasterCard, American Express, Discover). Lenco Marine ships all warranty items UPS ground. Costs for upgrades in shipping are the responsibility of the customer. Lenco Marine warranties all trim tabs, switches or Bennett RetroFit Kits for a period of 3 years from the date of original purchase. If any part of a Lenco Trim Tab, switch or Bennett RetroFit Kit fails due to manufacturing defects or workmanship within a period of 3 years from the date of original purchase, Lenco Marine will repair or replace the part(s) without charge at our discretion. No haul out, labor or miscellaneous charges are covered under this warranty. Warranty is not transferable.

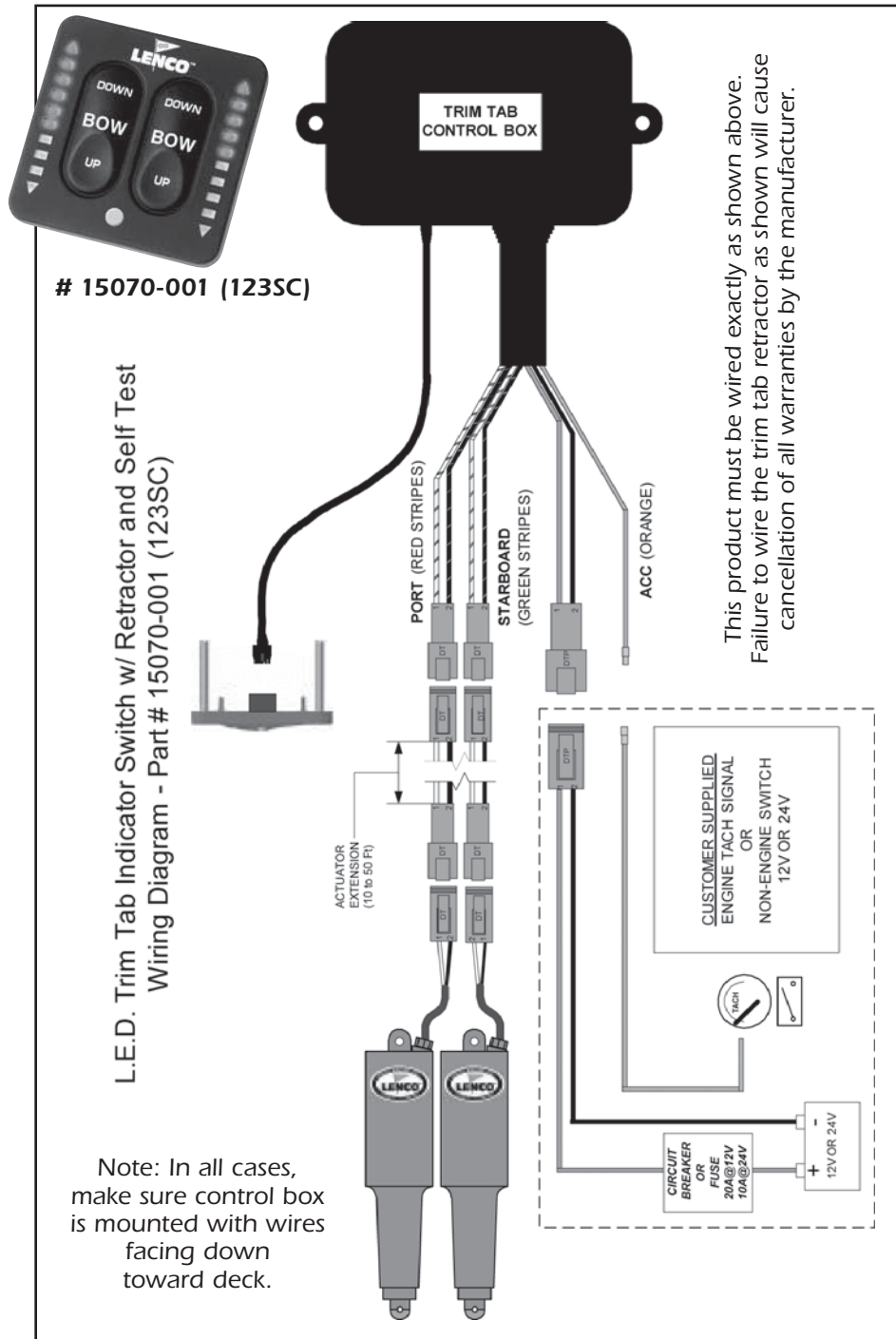
The foregoing is in lieu of any and all other warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose. There are no other warranties which extend beyond that set forth above. Lenco Marine reserves the right to void any warranty claim if the part is opened or repair was attempted, without prior authorization from Lenco Marine.

Lenco Marine, Inc.
Phone: 772-288-2662
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www.lencomarine.com
4700 SE Municipal Court
Stuart, FL 34997

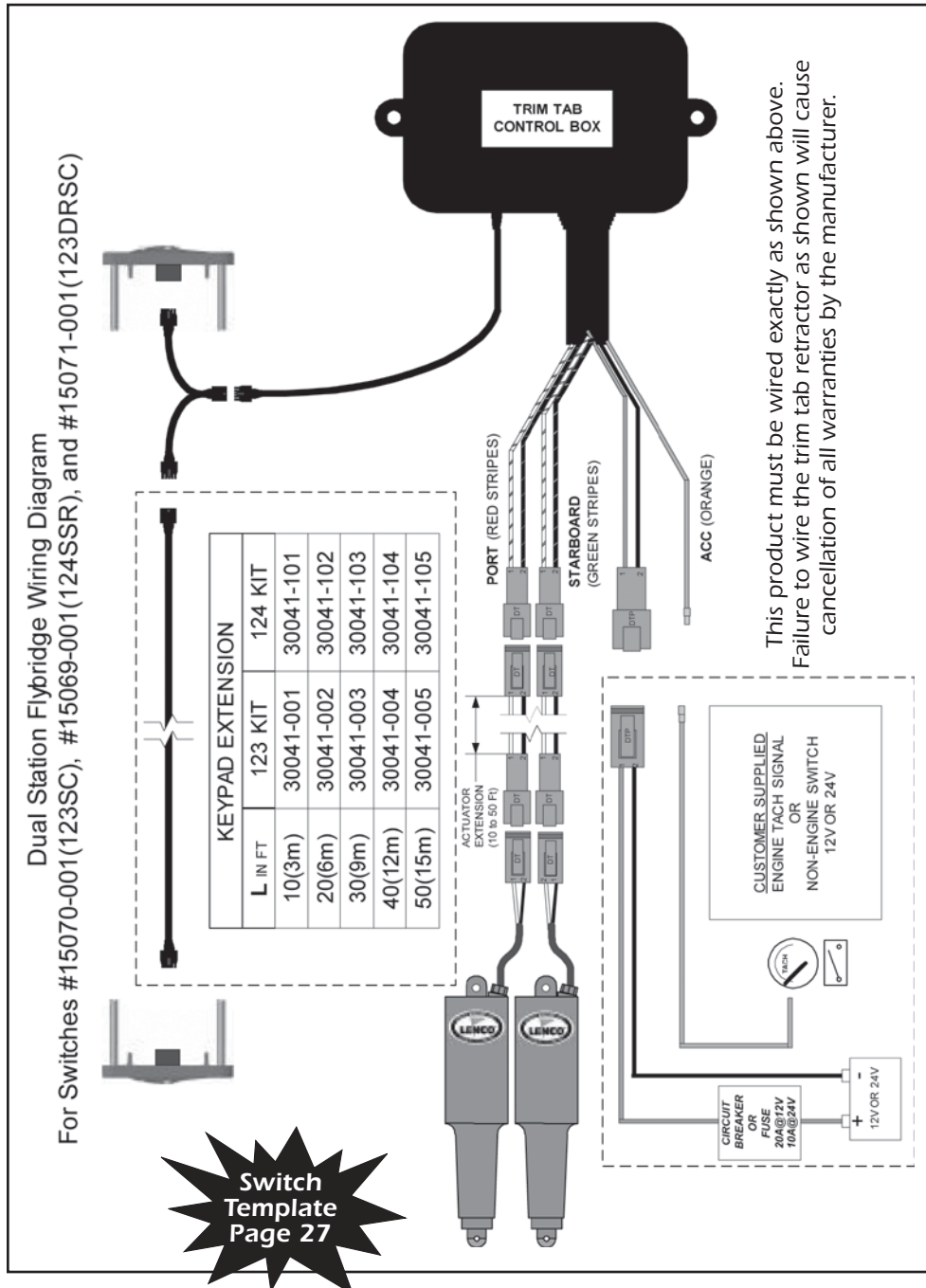
Switch Wiring #15069-001 (124SSR)



Switch Wiring #15070-001 (123SC)



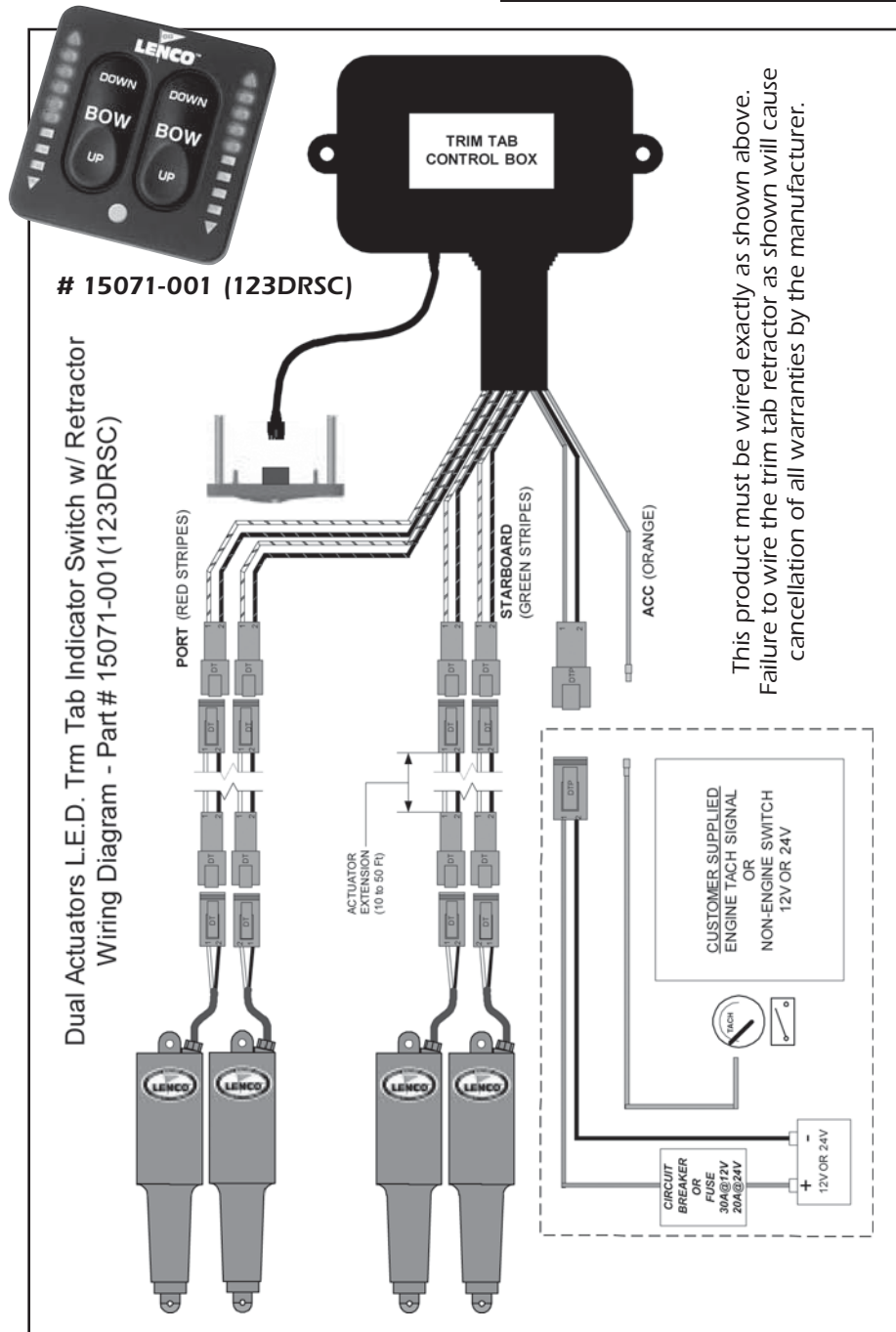
Dual Station Switch Wiring



Note: In all cases, make sure control box is mounted with wires facing down toward deck.



Dual Actuator Switch Wiring



Note: In all cases, make
sure control box is
mounted with wires facing
down toward deck.

Optional Switches

Complete your trim tab system with the latest switch technology — totally waterproof, maintenance-free, easy-to-install tactile switches.

Lenco Switch Options

#15069-001 (124SSR) – Standard Tactile Switch w/Retractor for all single actuator 12-volt trim tab systems

#15070-001 (123SC) - L.E.D. Indicator Tactile Switch w/Retractor and Self-Check for all single actuator 12- or 24-volt trim tab systems

#15071-001 (123 DRSC) - Dual Actuators L.E.D. Indicator Tactile Switch w/ Retractor and Self-Check

#10225-001 (125) - For Air Boats and Hatch Lifts.

Lenco switches feature:	124 SSR	123 SC	123 DRSC
1) Self-Check feature at power-up			
2) Self-contained, sealed keypad			
3) Self-contained, sealed control box			
4) Fade/smudge-proof, laser engraved graphics			
5) Plug & play switch wiring harness connectors			
6) Built-in Retract feature returns tabs to a fully retracted position when power or tach signal is removed			
7) 2 high-intensity L.E.D. indicator displays show the exact position of your trim tabs at all times			
8) Photo eye reads ambient light and adjusts the L.E.D. indicator display intensity for optimum viewing in all light conditions			
9) Backlit keypad graphics for optimum night viewing			
10) 24-volt compatibility			



NEW! Waterproof
Plug & Play
Deutsch Connections



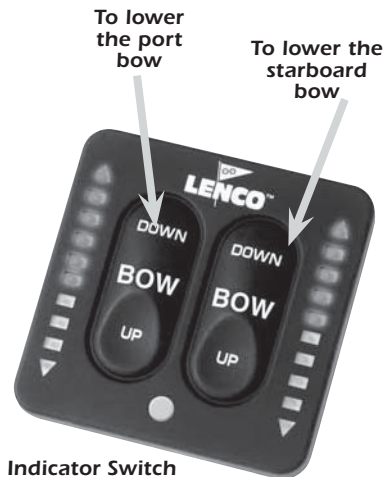
Lenco Marine

SWITCH OPERATION

The operation of the indicator switch is based on the position of the bow. To lower the starboard bow, press the right (starboard) side of the switch where it reads Down. This lowers the port tab. To lower the port bow, press the left (port) side of the switch where it reads Down. This lowers the starboard tab. The L.E.D. displays on the sides of the display show how far that tab has moved.

When the on/off switch is turned on at the helm or the engine's tachometer circuit becomes active, the L.E.D. displays on the indicator switch light from top to bottom and immediately extinguish from

bottom to top to indicate self test at power up. If there is a problem with an actuator connection the L.E.D. displays shows every other light red "ON" at the side that has the problem. After self test is complete (1 to 2 seconds) the L.E.D. displays show one up arrow on each side of the switch. This shows that both tabs are fully retracted. While functioning the tabs, the L.E.D. displays indicate the position of the tabs by lighting up the further they are pressed down. As the switch is pressed up, the lights go out. When power is removed from the switch or the engine stops (if accessory wired to tach), the tabs retract from any position before powering down.



Indicator Switch
with Retractor
#15070-001 (123SC)



Standard Switch
#15069-001
(124SSR)



Electric RetroFit Kit for Bennett Trim Tabs Installation Instructions

Lenco Marine's RetroFit Kit is designed as a direct replacement for the Bennett 4-ring standard trim tab actuator.

Note: Bennett Joystick Control can not be retrofitted to the Lenco Actuators.

These instructions should be followed completely. If you experience any problems not covered, please call the Lenco Marine customer service line at 772-288-2662.

- 1) Disconnect the Bennett hydraulic pump unit (HPU) and drain as much of the hydraulic fluid as possible into a container for proper disposal later. Remember that automatic transmission fluid (ATF) is to be disposed of only at an approved collection site in your area; do not discard in the regular trash.
- 2) Remove the Bennett trim tab cylinder from the boat transom and remove the hydraulic line at the connection. It helps to have several rags handy to soak up the oil. Remove and discard old hydraulic lines.
- 3) Disconnect the Bennett cylinder from the trim tab plane by tapping out the small black pin at the base of the cylinder where it attaches to the plane. You will first have to remove one screw from the lower bracket as this holds the pin in place. Do not remove the lower bracket, as you will need it later.
- 4) Insert the actuator cable through the appropriate hole in the upper bracket until it reaches the actuator. Insert the actuator cable through the gland seal until it reaches the upper bracket.

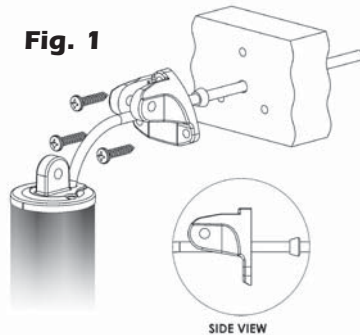
Note: For appropriate orientation of upper bracket and gland seal, (see Fig 1).

You will need to clean mounting surfaces on the transom with a cleaning solvent such as mineral spirits or alcohol to remove all oils and dirt before final mounting.

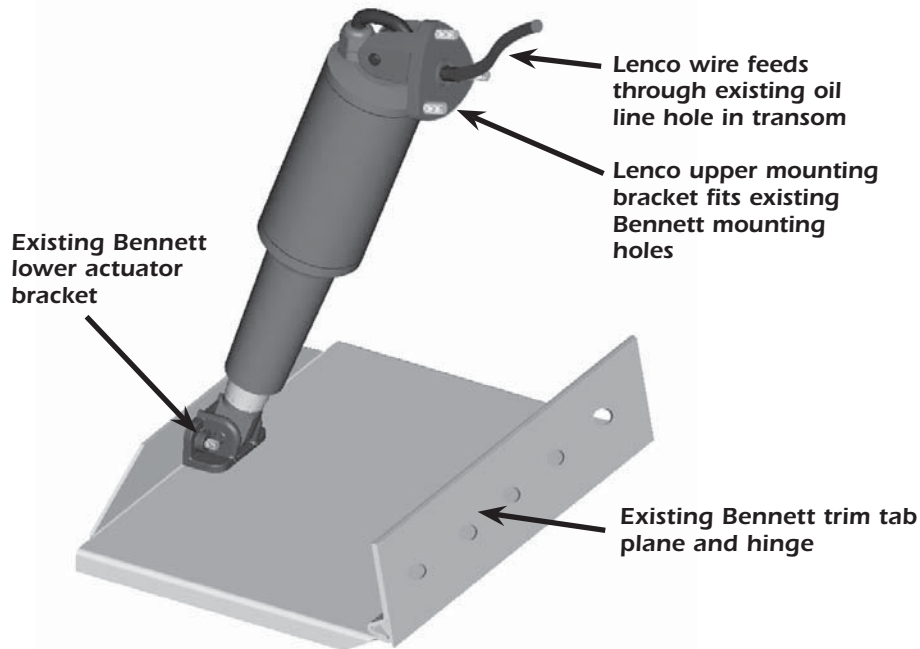
Insert the actuator cable through the transom. With the actuator loosely supported, bed the upper bracket and screws with 3M 5200 adhesive caulking. Start the provided #14 x 1-1/4" (3.17 cm) stainless steel metal screws through the upper bracket and into the transom. **MAKE SURE TO LEAVE THE SCREWS ONLY PARTIALLY INSTALLED.**

Insert the actuator clevis (mounting ear) into the top bracket and hold in the approximate installed location. Pass the actuator cable through the transom removing slack on the cable until it is snug. Remove the actuator from the upper bracket and finish installing the previously started #14 x 1-1/4" (3.17 cm) stainless steel metal screws through the upper bracket and into the transom. We

Fig. 1



RetroFit Kit for Bennett Trim Tabs Installation Instructions



recommend using 3M 5200 adhesive caulking to bed the upper bracket and screws.
DO NOT OVERTIGHTEN.

Attach the actuator to the upper bracket using the 5/16-18 X 1-3/4" (4.45 cm) large hex head bolt and 5/16-18 (.79 cm) hex nut provided.

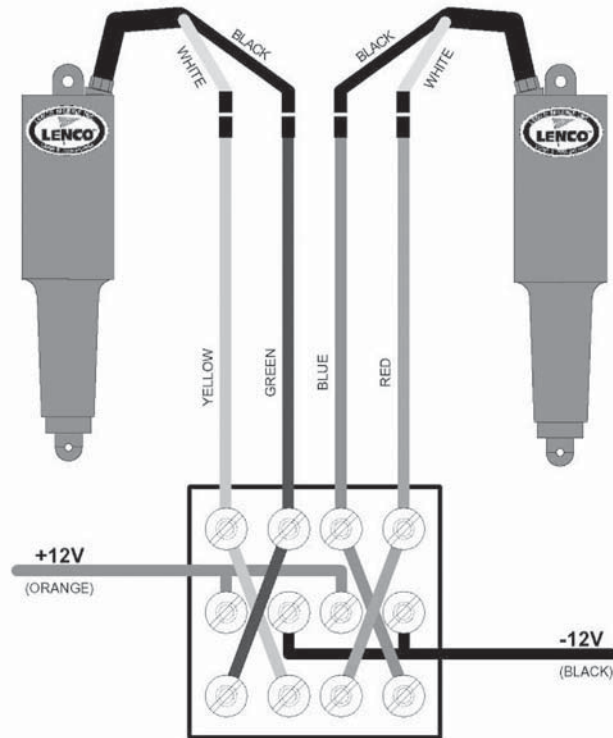
- 6) You are now ready to attach the Lenco Actuator to the blade. First insert the pin part way through the hole in the Bennett lower bracket and insert through one of the four black washers provided in the kit. Place the actuator into the bracket and tap the pin through. Continue through the second washer and other side of the bracket. Replace the bracket screw removed in step 3. This will lock the pin in place and prevent it from falling out.

- 7) Now you will need to hook up the Lenco Actuator wires inside the bilge/rigging area. First cut the wire connector from the Bennett wire harness where the pump used to be. Strip the four harness wires and connect to the four Lenco wires using the heat shrink butt splices provided in the kit. Make sure to use the proper crimping tool and then heat all connections for a tight waterproof seal. Tie-wrap or secure in some fashion to a dry location to help prevent the connectors from getting too wet. For further wiring information, see wiring instructions and diagram on next page.

Please follow the instructions and drawings carefully. Call the Lenco Service Department at 772-288-2662 for technical assistance.

RetroFit Kit for Bennett Trim Tabs Wiring Instructions

Wiring Instructions for Electric RetroFit Kit for Bennett Trim Tabs



- 1) Remove all wires and all jumpers (brass strips) on Bennett factory switch and discard.
- 2) Now find the 12-volt negative at the helm/console. Connect the black wire from the switch to this source. The Lenco system requires that a negative (-) wire be attached at the switch as per the wiring diagram. The 12-volt positive (+) should already be at the switch from the previous system. Simply reconnect it as per the wiring diagram.
- 3) Test the trim tabs for proper operation. Remember that the right switch controls the left trim tab and the left controls the right.

BOW DOWN should extend the tabs while BOW UP should retract them. If for some reason this does not work as described in the above text, recheck all the wiring for a misplaced wire. If still not fully operational, refer to the trim tab troubleshooting guide on page 7 for further instructions.

Use caution when using Lenco Trim Tabs for the first time. The response time is faster than the Bennett system.

Try small taps of the switch until you become accustomed to the new trim tabs.



Upgrading and Retrofitting

Standard Tab to Troll'n Tab

A 9x12 trim tab can be upgraded to 9x12 Troll'n Tab.

Standard Tab Blade Upgrade

For a larger trim tab blade a 9x12 blade can be retrofitted with a 12x12 blade.

Edge Mount Kit Upgrade

Since the placement of the upper bracket is lower then a standard mount, an edge mount can be retrofitted only with another edge mount trim tab.

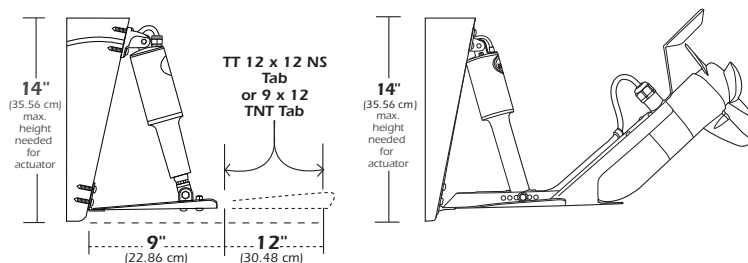
Edge Mount Tab to Troll'n Tab

A 12x12E trim tab can be upgraded to a 12x12 Troll'n Tab.

Note: In order to utilize the same mounting holes when upgrading from trim tabs to Troll'n Tabs, the trim tabs have to have been mounted with the hinges at least 3/8" (.95 cm) from transom bottom as recommended in Lenco installation instructions.

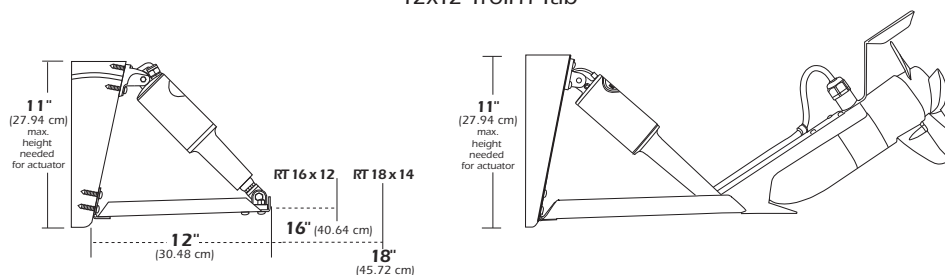
Standard Mount Kit # 15001-101 (TT 9x12 NS)

Can be upgraded to a 12" tab or a 9x12 Troll'n Tab

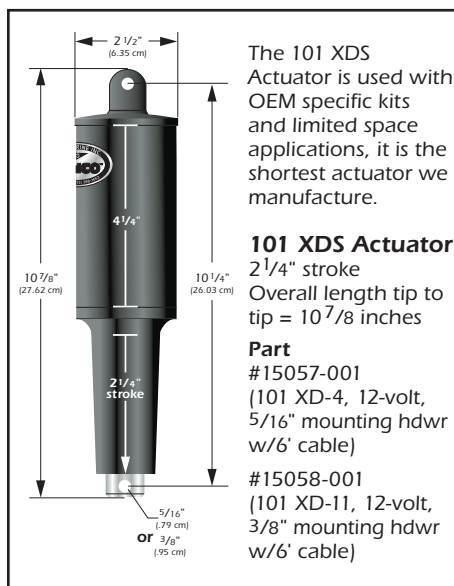
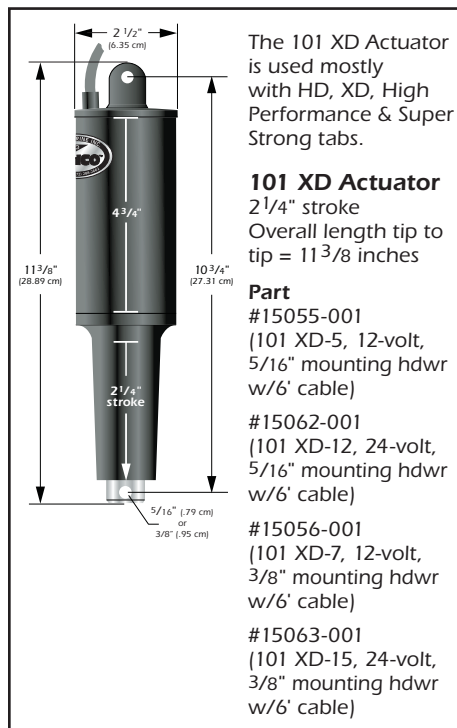
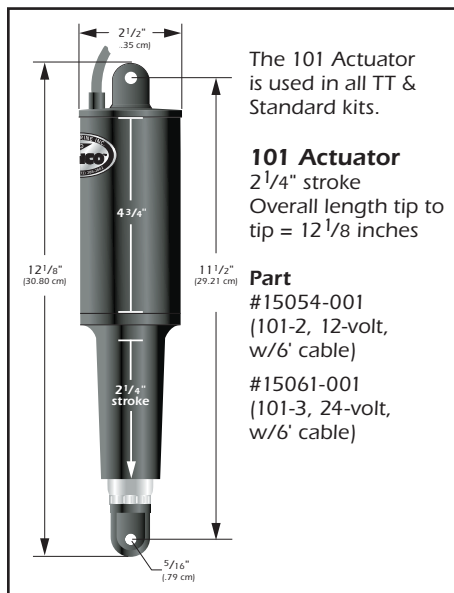


Edge Mount Kit #15016-101 (TT 12x12 ENS)

Can be upgraded to a 16" or 18" tab or a 12x12 Troll'n Tab



Actuators



The entire Lenco Actuator is fully submersible, maintenance-free and sealed for life.





Lenco Hatch Lifts carry a 2-year limited warranty from the date of original purchase.

When possible, please refer to our troubleshooting guide on our website, <http://www.lencomarine.com> prior to processing your claim with the Lenco factory.

1. Call Lenco Marine at 772-288-2662, and ask for customer service. Give the technician a brief description of the product and the problem. Once the tech determines that the product is eligible for repair or replacement, they will issue you an RMA number (Return Merchandise Authorization).

Claims will not be processed without an RMA number.

2. Return product and paperwork to Lenco Marine with the following information: name, telephone number, description of problem, proof of purchase to verify warranty. Proof of purchase and warranty info can consist of the following:
 - A. Bill of sale from place of purchase
 - B. Retail boat purchase bill of sale
3. Mark the outside of the package with the RMA number and return it to Lenco Marine Customer Service Department at 4700 SE Municipal Court, Stuart, FL 34997 for processing. Once received, our Customer Service Department will make every effort to process your return quickly. Should time restraints prohibit you from sending in the merchandise first, or you need

an immediate replacement, you will be required to secure the replacement part with a credit card prior to shipment (Visa, MasterCard, American Express, Discover). Lenco Marine ships all warranty items UPS ground. Costs for upgrades in shipping are the responsibility of the customer.

Lenco Marine warrants all Hatch Lifts for a period of 2 years from the date of original purchase. If any part of a Lenco Hatch Lift fails due to manufacturing defects or workmanship within a period of 2 years from the date of original purchase, Lenco Marine will repair or replace the part(s) without charge at our discretion. No haul out, labor or miscellaneous charges are covered under this warranty. Warranty is not transferable.

Trim Tab customers please see separate warranty policy. The foregoing is in lieu of any and all other warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose. There are no other warranties which extend beyond that set forth above. Lenco Marine reserves the right to void any warranty claim if the part is opened or repair was attempted without prior authorization from Lenco Marine.

Lenco Marine Inc.
Phone: 772-288-2662
Fax: 772-288-2566
www.lencomarine.com
4700 SE Municipal Court
Stuart, FL 34997

Lenco Hatch Lift Installation/Operation

Due to the many different variables involved with the numerous applications for Lenco hatch lifts, installation is never the same. Here are some general guidelines that can be of assistance:

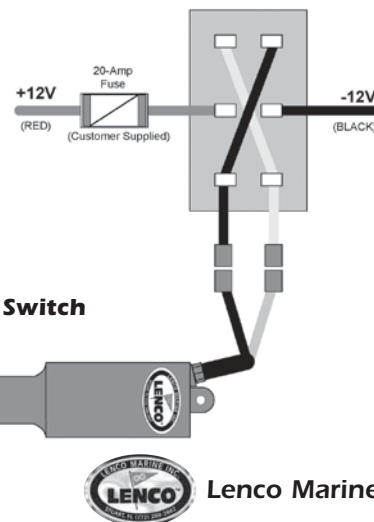
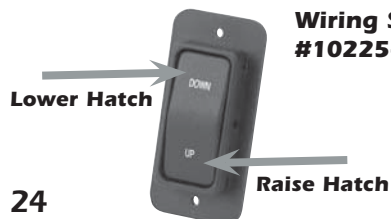
- The actuator is most powerful when it is installed vertically at 90 degrees.
- Lifting capabilities decrease the closer the upper or lower mount is located to the hinge.
- The further from a vertical position the less lifting capability. When retracted, **Do Not position hatch lift at an angle less than 45 degrees.**
- Dual actuator systems are recommended for hatches over 500 pounds (226.79 kg) of force.
- Lenco hatch lifts are designed around a ball screw that spins freely when hatch is fully open or closed.
- For installation, it is important that the hatch lift is able to disengage itself at the fully retracted position.
- The ram must be allowed to free spin at both ends of its stroke or it will continue to push or pull against any resistance potentially damaging the hatch lift or the hatch itself.
- Failure to make accurate measure could cause damage to hatch lift or the hatch itself.
- Lenco hatch lifts are fully submersible and will not drift.
- Lenco hatch lifts are offered in both 12 and 24 volts.

OPERATION

The function of the Lenco Hatch Lift system is simple. Since the hatch lift is based around a ball screw it is able to push a heavy load and remain at a constant position. To raise a load, extend the hatch lift by pressing on the upper part of the switch. To lower a load, retract the hatch lift by pressing the lower part of the switch. In case of power failure, Lenco hatch lifts are supplied with two clevis pins at the mounting brackets. To pull this pin out while the hatch is closed, you must rig it to a point outside of the hatch.

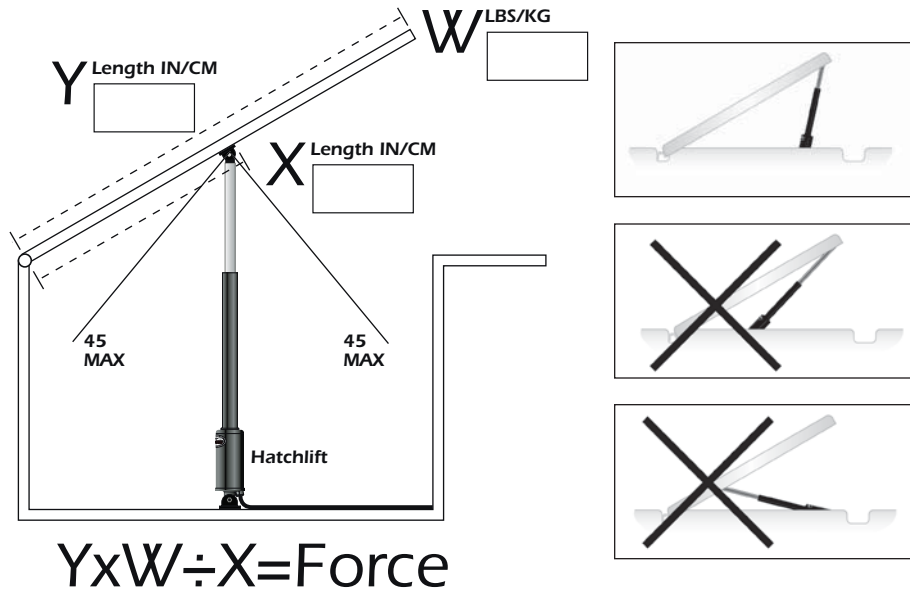
S = Short. All part numbers ending in S have the same stroke but in a 4" (10.16 cm) shorter length.

Part Number	L. O. A. Retracted	Approx. Stroke	L. O. A. Extended
HL-400	15"	4"	19"
HL-800S	21"	8"	29"
HL-800	25"	8"	33"
HL-1200S	25"	12"	37"
HL-1200	29"	12"	41"
HL-1600S	29"	16"	45"
HL-1600	33"	16"	49"
HL-2000S	33"	20"	53"
HL-2000	37"	20"	57"
HL-2400S	37"	24"	61"
HL-2400	41"	24"	65"



Lenco Marine

Lenco Hatch Lift Mounting



- Follow the chart above to figure out load on the hatch lift. Maximum load is 500 lbs. (226.79 kg)

Y = Total length of hatch

X = Length from the hinge to the hatch lift mounting point

W = Weight of the hatch to be lifted

- Determine the angle of the hatch lift mount. Do not exceed 45 degrees from center.
- Mount the hatch lift on the desired location as per the above instructions.

Important: It may be necessary to shim the upper or lower mounting bracket up or down so the hatch does

not bind when fully closed. The hatch lift does not stop pulling until it has reached its fully closed position. If the hatch fully closes before the hatch lift is fully retracted, it will cause damage to the lift or the mounting hardware. Shim the hatch lift with stainless washers for small amounts of length. Use Lenco part #118S for lengths greater than 1/8" (3 mm).

- Wire to switch according to the hatch lift wiring diagram in the owners manual supplied with the hatch lift.

SYSTEM PARTS

1	Hatch Lift (electromechanical actuator)	#s HL-400, HL-800, HL-800s, HL-1200, HL-1200S, HL-1600, HL-1600S, HL-2000, HL-2000S, HL-2400, HL-2400S
2	Mounting brackets	#50014-001 (119), #50015-001 (118)
3	Clevis pins	#60101-001 (121SS)
4	Single rocker switch	#10225-101 (125) (optional)
5	Slide bracket	#70381-001 (HLSB) (optional)

Product Summary

Standard Trim Tab Kits

- Standard trim tab kits include: two #101 actuators with extension harnesses and Deutsch connectors, two stainless steel blades, and all mounting hardware. See switch selections on page 16 for available options
- Available in standard mount and edge mount (space saver mount)
- Sizes range from 9" x 9" to 12" x 40". Measurements taken L x W



Performance Tab Kits

Standard Performance

- Standard performance tab kit includes: two #101 actuators with extension harnesses and Deutsch connectors, two 12-gauge electro-polished stainless steel blades and all mounting hardware
- Available in sizes: RT 9x9 NS, RT 9x12 NS, RT 12x9 NS, RT 12x12 NS, RT 14x12 NS, RT 16x12 NS and RT 18x14 NS

Heavy Duty Performance

- Heavy duty performance tab kit includes: two #101 XD actuators with extension harnesses and Deutsch connectors, two 12-gauge electro-polished stainless steel blades w/transom back plates and heavy duty hinge with 1/4" (.64 cm) hinge pin
- Available in sizes: RT 12x12 HDNS, RT 16x12 HDNS, RT 18x14 HDNS
- Customer supplied mounting hardware

Extreme Duty Performance

- Extreme duty performance tab kit includes: two #101 XD actuators (RT 17x12 XDNS), four #101 XD actuators (RT 19x14 XDNS & RT 24 x 14 XDNS) on two 10-gauge electro-polished stainless steel blades w/transom back plates and super duty hinge with 3/8" (.95 cm) hinge pin
- Actuator extension harnesses sold separately in choice of 5 lengths
- Customer supplied mounting hardware
- Available in sizes: RT 17x12 XDNS, RT 19x14 XDNS, and RT 24x14 XDNS

Switches: See selections on page 16 for available options



Product Summary/Switch Template

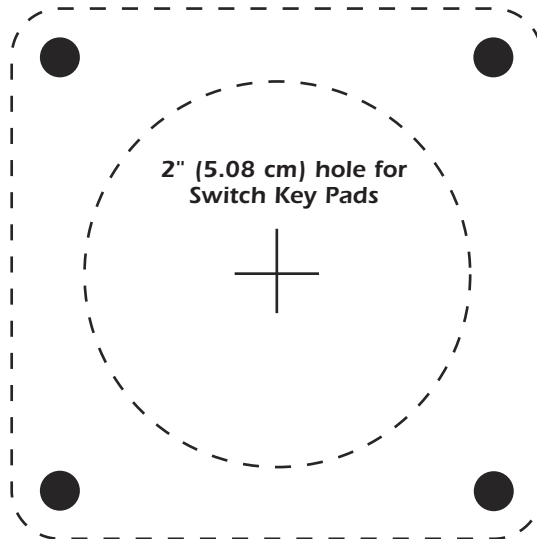
High Performance Tabs - Single & Dual Actuator

- High performance tab kit includes: two 12-volt Extreme Duty Actuators with 316 SS billet ram with 3/8" (.95 cm) SS bolts, two 7-gauge flat-304 electro-polished stainless blades.
- Full transom back plate with adjustable C-channel, 3/8" (.95 cm) bolts and super duty hinge with 3/8" (.95 cm) hinge pin
- Actuator extension harnesses sold separately in choice of 5 lengths
- Customer supplied mounting hardware
- Available in sizes: Single Actuator System: #15048-101 (14" x 12"), #15049-101 (18" x 12")
Dual Actuator System : #15050-101 (21" x 14"), #15051-101 (25" x 14")

High Performance Tabs - Single & Dual Actuator

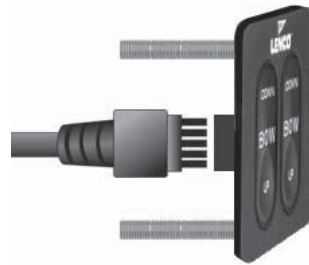


Switches sold separately. See available options on page 16



Tactile Switch Connection

Mount control box within 30" (76.2) of keypad.
Control box wire harness is 30" (76.2) length



Switch Template

Remove the template from the owner's manual by cutting around the dashed rectangular perimeter line.

Align the 3/16" (.48 cm) drill bit with each of the four black circles and drill straight down through the helm, providing

clearance for the mounting hardware provided with the switch.

Align the centering bit of a 2" (5.08 cm) hole saw with the cross hairs in the center of the 2" (5.08 cm) dashed circular perimeter and drill straight down through the helm, providing additional clearance for switch and electrical connection.

Owner's Manual

DON'T WORRY...



we've got your back.



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QUIET - FLUSH ELECTRIC TOILET

Model 37045-Series

FEATURES

- Very quiet flush cycle - like a household toilet
- Single button flush actuator - with dual function water level control switch
- Can be plumbed to any pressurized water system that can provide a 3-1/2 GPM (13.5 LPM) flow rate
- Water control solenoid valve with anti-siphon breaker to prevent contamination of potable water supply
- White vitreous china bowl available in compact or comfortable household size
- Baked enamel seat & cover
- High capacity waste macerator and bowl discharge pump



SPECIFICATIONS

PORTS

Inlet 3/4" Hose Barb
Outlet 1" Hose Barb

MOTOR

& SWITCH

Met U.S.C.G. Regulation
183.410 and ISO 8846 MARINE
for Ignition Protection.

WATER

CONSUMPTION 1-2 Quarts (Litres) per Flush

VARIATIONS AVAILABLE

MODEL NO.	DESCRIPTION
37045-0092*	Compact Size Bowl, 12 Volt EMC
37045-0094*	Compact Size Bowl, 24 Volt EMC
37045-1092*	Regular Size Bowl, 12 Volt EMC
37045-1094*	Household Size Bowl, 24 Volt EMC

*This model is **CE** Marked and complies with EN50081-1 for suppression of electro-magnetic interference.

OPERATION

The Quiet-Flush toilet provides both quiet operation and user control of water levels in the toilet bowl. A single large push button switch provides a simple flush mode by activating both the rinse water supply and the macerator discharge pump simultaneously. An additional rocker switch offers independent control of the rinse water supply and discharge pump separately so the bowl water level can be easily raised or lowered by the user. This provides a method of minimizing water use, when desired, as well as a means of raising the water level in the bowl when appropriate for user comfort. It also allows for complete evacuation of the bowl water while underway in rough sea conditions.

INSTALLATION

PLUMBING

The toilet can be plumbed to any pressurized water system that can provide a minimum of 3-1/2 GPM (13.5 LPM). This may be a fresh water system including the vessel's potable water system or a washdown system utilizing either fresh or salt water. However, it must be connected to a pressurized system that normally remains on at all times while the vessel is in use.

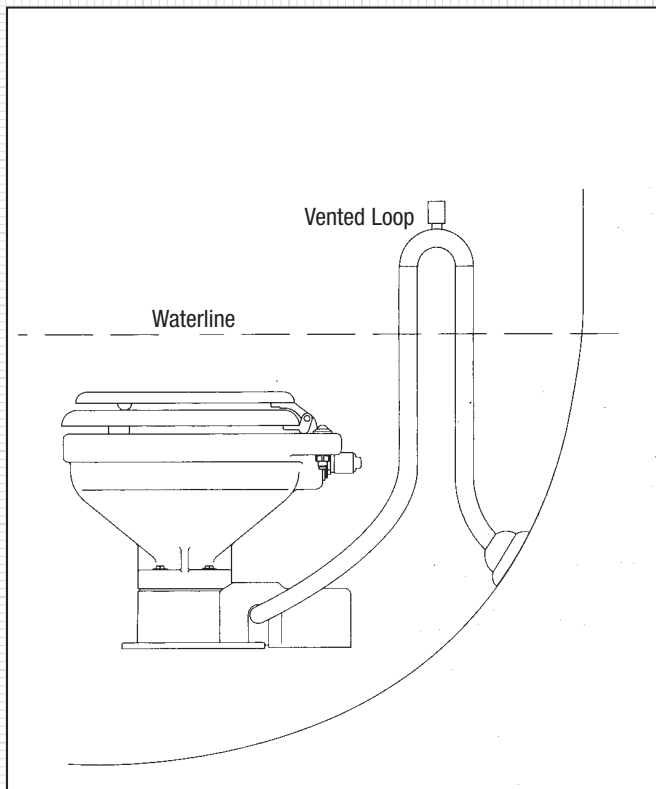
To make the water connection, shut off the water system pump and open one of the systems faucets or fixtures to drain the pressure from the system. Select an appropriate tee type fitting that can be installed in the existing pressurized water system and will provide a 1/2" (13mm) hose barb to feed water to the toilet. Install the tee fitting at a location on the pressurized water system that provides convenient connection to the toilet's solenoid valve/ siphon breaker assembly. If the toilet is being connected to the vessel's fresh water system and the vessel may be connected to an unregulated city water supply, it is recommended that a valve be installed in the toilet water supply line ahead of the solenoid valve/ siphon breaker to regulate the flow rate of incoming pressurized city water.

PLUMBING

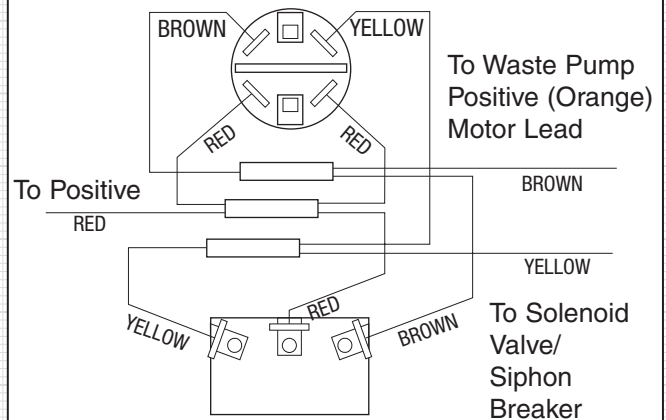
The solenoid valve/siphon breaker should be positioned a minimum of six inches above the hose connection at the back of the toilet bowl (at all angles of heel and trim) and located as close to the toilet as possible.

It should be located where an occasional drop or two of water from the siphon breaker will not adversely affect nearby equipment or supplies. It must be installed in a vertical position with the hose barb connections pointing down. The solenoid valve/siphon breaker bracket should be secured to a solid mounting surface with four screws. If the valve assembly is attached to a wood surface, 3/8" (10mm) long screws are generally adequate to support the weight of the valve assembly. If desired, the valve assembly may be installed inside a cabinet or locker to conceal it from view of the vessel's occupants. To provide a clean sanitary appearance inside the head area, a six foot section of smooth white hose is provided with the toilet to connect the toilet bowl spud fitting to the siphon breaker outlet hose barb.

The solenoid valve inlet hose barb is then connected with 1/2" (13mm) reinforced vinyl hose suitable for pressurized water to the tee fitting installed in the water system line. All pressurized water system connections should be secured with stainless steel band type hose clamps.



WIRING DIAGRAM



ELECTRICAL SPECIFICATIONS

Voltage	Amp Draw	Fuse Size	Wire Size Per Feet Of Run*				
			0'-10'	10'-15'	15'-25'	25'-40'	40'-60'
12 Vdc	10	25	#16	#14	#12	#10	#8
24 Vdc	5	15	#16	#16	#16	#14	#12

* Length of run is total distance from power source to product and back to ground.

The 3/4" hose connecting the siphon breaker to the bowl should be secured with a band clamp at the siphon breaker to prevent it from being accidentally dislodged but generally does not need a hose clamp to secure it to the bowl spud fitting unless desired for added security.

The discharge port includes a 1" (25mm) hose barb and should be plumbed with 1" (25mm) hose to an on board holding tank or, if appropriate, to an overboard discharge through hull. A 1" (25mm) to 1-1/2" (38mm) barbed hose adapter is provided to adapt a 1" (25mm) discharge hose to 1-1/2" (38mm) hose, if desired. The discharge plumbing should be kept as short as possible and bends in the discharge hose should be kept to a minimum.

If the toilet is below the water line and is plumbed to an overboard discharge through hull, the discharge plumbing must include a vented loop positioned so it remains above the water line at all angles of heel and trim. Total discharge head should not exceed 4 feet (1.2m). To retain water in the bowl, the discharge hose should be looped upward about eight to ten inches above the base of the toilet and as near to the toilet as can be practically accomplished without creating an unsightly plumbing situation.

WARNING



Flood hazard. If toilet is installed below the waterline, it must be installed with a properly positioned vented loop in the discharge hose. Failure to do so can result in flooding which can cause loss of property and life.

ELECTRICAL

The electrical wiring should be independent of all other accessories. It should be made with marine grade copper stranded wire of the gauge specified in the electrical specifications chart. Make all wire connections with mechanical locking type connectors (crimp type butt connectors and terminals). Ensure the circuit is protected by a proper sized fuse or circuit breaker determined from the electrical specifications chart. Secure all wires to a solid surface approximately every eighteen inches (1/2m) along their entire length of run. Wire the switch panel to the solenoid valve/siphon breaker and toilet pump assembly as per the following wiring diagram. Select a location for the switch panel that is convenient to the toilet user and will also allow access to run the wires from the switch panel to both the toilet's motor and the solenoid valve/siphon breaker as well as from the electrical power source to the switch panel. The red lead from the panel should be connected to an over-current protected positive power source. Connect the brown lead from the panel to the waste pump positive (orange) motor lead. Connect the black waste pump motor lead to battery negative. Connect the yellow lead from the panel to a solenoid valve terminal. Connect the remaining solenoid valve terminal to battery negative. The solenoid valve is not polarity sensitive.

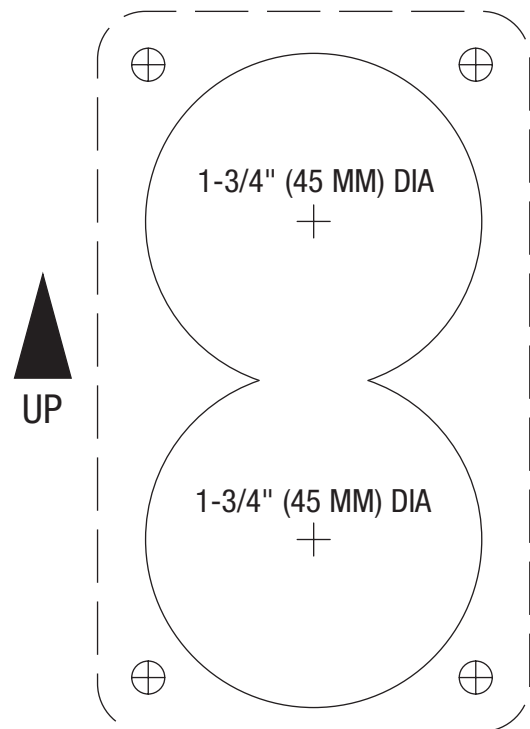
To install the switch panel, drill two 1-3/4" (45mm) diameter holes (slightly over-lapping) through the selected switch mounting surface per the attached template. Ensure the template is oriented correctly because it is not symmetrical. Also, drill four appropriate sized holes for the fasteners selected to secure the switch panel to its mounting surface.

SERVICE

The Jabsco Quiet-Flush Toilet does not require routine maintenance other than occasional cleaning to maintain a hygienic sanitary condition. Clean toilet with mild nonabrasive cleaners without strong aromatics. Cleaners having high concentrations of aromatics such as pine scented concentrated cleaners and strongly scented degreaser concentrates can cause the pump's seal to swell and may contribute to a premature seal leak.

The toilet has no wearing parts that need periodic replacement other than the shaft seal which, under normal conditions, should provide several years of service before needing replacement. The seal only requires replacement if signs of leakage are noticed under the seal housing positioned between the motor and toilet base assembly.

TEMPLATE



WARNING


Flood hazard. If toilet is plumbed to an overboard discharge, close the discharge seacock prior to disassembling toilet. Failure to do so can result in flooding which can cause loss of property and life.

Notice: Before performing any service, disconnect the power supply to the toilet and take precaution to ensure it is not reconnected until the service is complete. Also, pump all water from the toilet bowl and if connected to an overboard discharge, close the discharge seacock.

To replace the shaft seal, snap off the white motor cover and remove the pump assembly by removing the four screws with lock washers that secure it to the toilet base. Carefully slide the pump assembly from the base ensuring the macerator housing also slides out of the base with the pump.

The pump chopper will engage the macerator housing and it may be necessary to gently tap the chopper against the macerator housing to free it from the base.

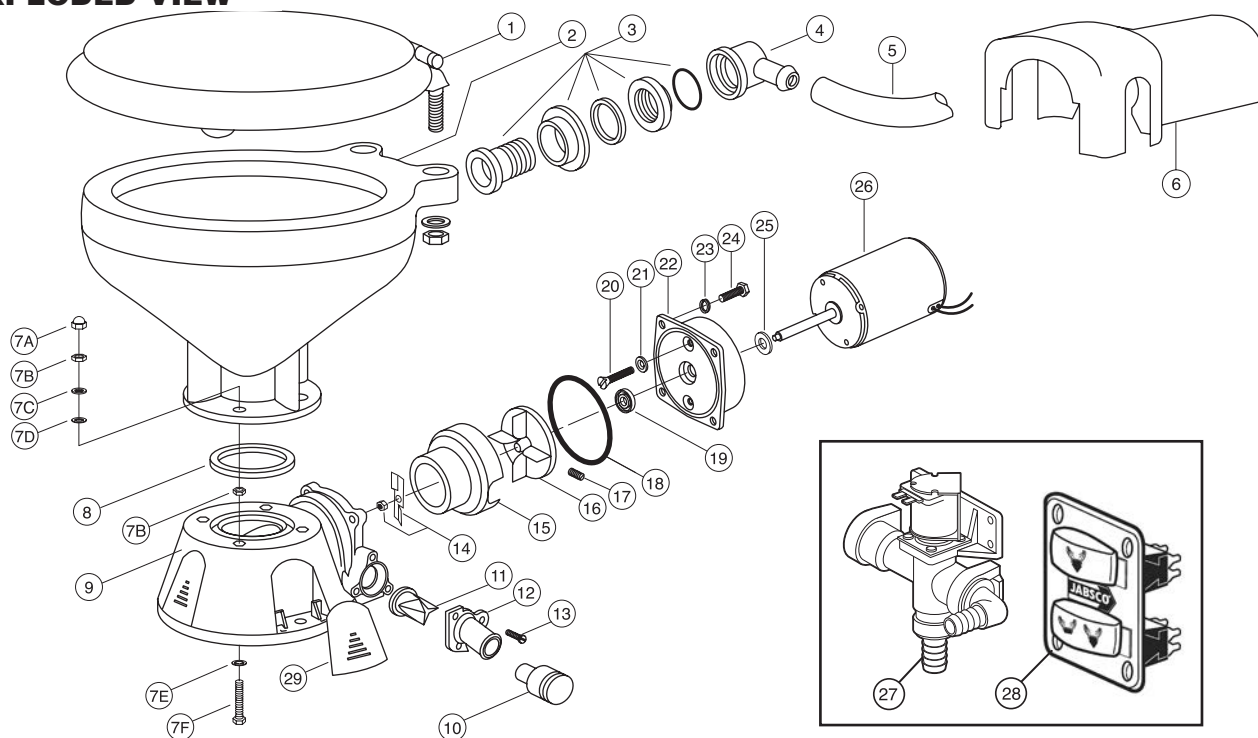
Prevent the motor shaft from turning by inserting a screwdriver in the shaft slot at the rear of the motor and unscrew the nut retaining the chopper blade. Remove the chopper and macerator housing from the motor shaft. Remove the O-ring from the O-ring groove around the outer diameter of the seal housing. With an allen wrench, loosen the centrifugal impeller set screw and slide the impeller off the shaft. Remove the two screws that secure the seal housing to the motor and slide the housing off the motor shaft. Remove the two seal washers from under the head of each of the two seal housing retainer screws. With a pair of needle nose pliers grasp the shaft seal and pull it from the seal housing. Clean all parts and inspect for damage.

Lubricate the OD of the new seal with a small amount of water and press it into the seal bore with the seal's lip facing the threaded end of the shaft. Do not use the stainless steel star retaining washer supplied with the seal. Lubricate the ID of the seal and the motor shaft with a small amount of water resistant grease.

Ensure the slinger is properly positioned on the motor shaft next to the motor and slide the seal housing onto the motor shaft until it is against the motor end bell. Position a new plastic seal washer under the head of each of the flat head seal housing retainer screws and secure the seal housing to the motor. Slide the centrifugal impeller on the motor shaft positioning it about 1/32" (1mm) from the seal housing and secure it to the shaft with the set screw. Rotate the impeller to ensure it does not rub on the seal housing.

Slide the macerator housing over the motor shaft, place the lock washer on the end of the shaft and screw the chopper onto the shaft. Tighten the chopper while holding the motor shaft at the rear of the motor. Position a new O-ring in the seal housing O-ring groove (it may be retained in the groove with a small amount of grease). Slide the pump assembly into the toilet base ensuring the macerator housing is properly positioned within the base. The cut-out in the side of the macerator housing must align with the discharge port in the base (the macerator housing is keyed so it will only go in when properly positioned). Ensuring the O-ring is still properly positioned in the O-ring groove in the seal housing, place the pump assembly against the base and secure it in place with the four screws and lock washers. Replace the white motor cover by snapping it down over the pump motor. Slide the pump assembly into the toilet base ensuring the macerator housing is properly positioned within the base.

The cut-out in the side of the macerator housing must align with the discharge port in the base (the macerator housing is keyed so it will only go in when properly positioned). Ensuring the O-ring is still properly positioned in the O-ring groove in the seal housing, place the pump assembly against the base and secure it in place with the four screws and lock washers. Replace the white motor cover by snapping it down over the pump motor.

EXPLODED VIEW

PARTS LIST

Key	Description	Qty.	Req.	Part Number
1	Seat and Cover, Compact Size	1		29097-1000
	Seat and Cover, Regular Size	1		29127-1000
1A	Hinge Only, Compact Size	1		29098-1000
	Hinge Only, Regular Size	1		29098-2000
2	Bowl, Compact Size	1		29096-0000
	Bowl, Regular Size	1		29126-0000
3 & 4	Bowl Spud & Intake Elbow & O-ring	1		29048-0000
5	Hose, 6 feet	1		29035-1031
6	Motor Cover †	1		37042-1000
7	Bowl Installation Hardware	1		18753-0637
7A	Nut Cap**	4		
7B	Hex Nut** (Two places)	8		
7C	Washer, Stainless Steel**	4		
7D	Washer, Plastic**	4		
7E	Washer, Starlock**	4		
7F	Phillips Head Screw**	4		
8	Bowl O-Ring Seal	1		44101-1000
9	Base Assembly**	1		37004-1000
10	1-1/2" Adapter, Discharge Port	1		98023-0080
11	Joker Valve* **	1		44106-1000
12	1" Discharge Port**	1		44107-1000
13	Screw** 3			96050-0568
14	Chopper Plate with Lock Nut †	1		37056-1000
15	Macerator Housing †	1		37014-0000
16	Centrifugal Impeller †	1		37006-0000

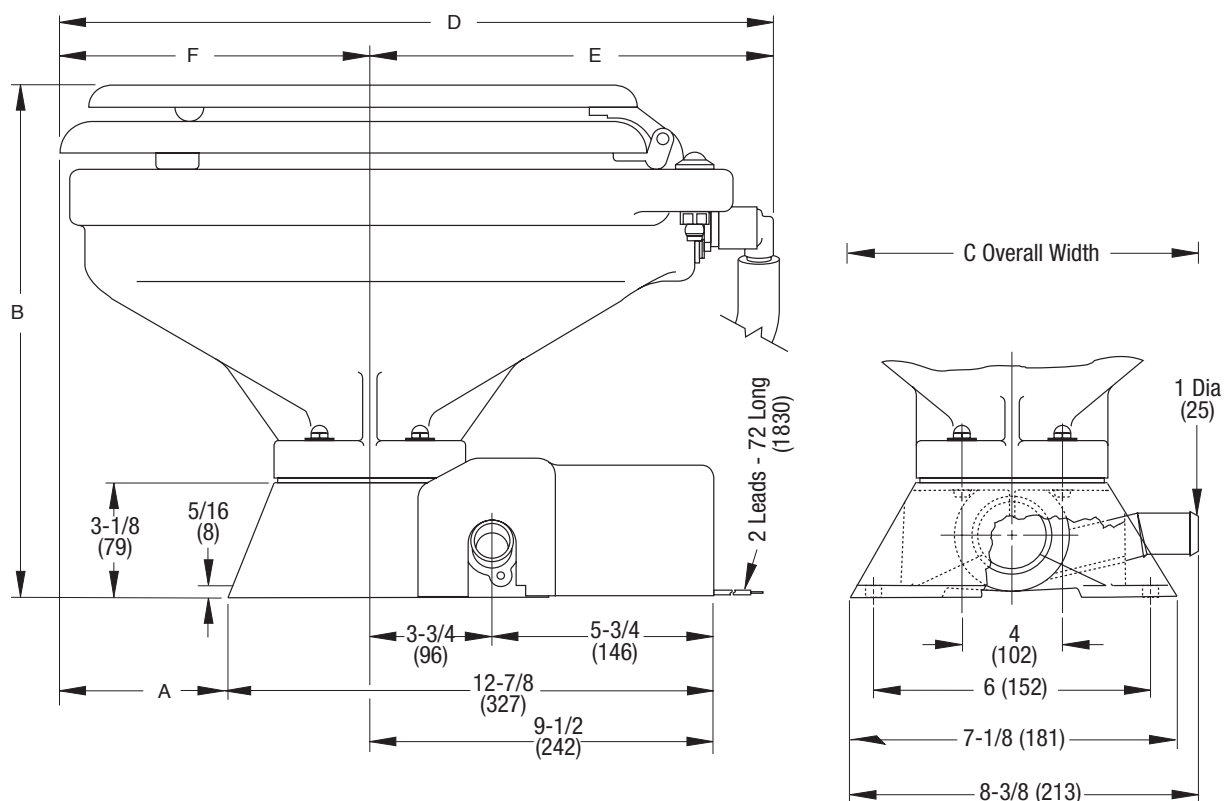
Key	Description	Qty.	Req.	Part Number
17	Set Screw †	1		91084-0320
18	O-ring* †	1		43990-0066
19	Seal* †	1		1040-0000
20	Screw †	2		91010-0144
21	Washer, Plastic* †	2		35445-0000
22	Seal Housing †	1		37043-1000
23	Lock Washer #10, Stainless Steel †	4		
24	Screw †	4		91027-0011
25	Slinger †	1		6342-0000
26	Motors:			
	Motor - 12 Volt †	1		18753-0554
	Motor - 24 Volt †	1		18753-0555
27	Solenoid Valve & Siphon Breaker 12 Volt	1		37038-1012
	Solenoid Valve & Siphon Breaker 24 Volt	1		37038-1024
28	Switch Panel	1		37047-2000
29	Screw Covers (3/kit)	1		37003-1000
	Service Kit			90197-0000
	Motor & Pump Assembly			
	12 Volt EMC			37072-0092
	24 Volt EMC			37072-0094

* Parts Supplied with Service Kit.

** Parts included with base 37004-1000.

† Parts included in Motor & Pump Assembly.

DIMENSIONAL DRAWING **Inches (Millimetres)**



	A	B	C	D	E	F
Compact Size Bowl	2-7/8 (74)	13-7/8 (350)	13-1/8 (333)	16-1/2 (419)	10 (254)	6-1/2 (165)
Household Size Bowl	4-3/8 (112)	14-1/8 (359)	14-3/4 (375)	19-3/4 (502)	10-3/4 (273)	9 (229)

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