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OPTIMUS EPS BY SEASTAR

BAYSTAR™

SEASTAR™

OPERATION INSTRUCTIONS

AND USER'S MANUAL

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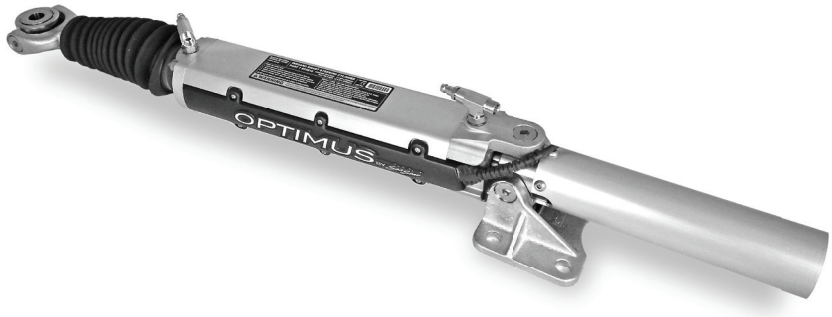

OPTIMUS EPS BY SEASTAR

Electronic Power Steering for Large Inboard Powered Vessels

SEASTAR SOLUTIONS®

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

All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Moreover, because of our continuous product improvement policy, we may modify information, illustrations and/or specifications to explain and/or exemplify a product, service or maintenance improvement. We reserve the right to make any change at any time without notice.

California
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive ham.

Wash hands after handling.

Thank you for choosing an Optimus™ Electronic Power Steering System by SeaStar Solutions. You have chosen a state of the art steering system that will provide years of effortless and trouble free steering performance.

About this Book

This User's manual contains the information you need to safely operate and maintain your steering system. It must remain on the boat.

Notice to the Operator

Throughout this publication, Dangers, Warnings and Cautions (accompanied by the International Hazard Symbol ⚠) are used to alert the user to special instructions concerning a particular service or operation that may be hazardous if ignored or performed incorrectly or carelessly. **Observe them carefully!**

These safety alerts alone cannot eliminate the hazards that they signal. Strict compliance with these special instructions during installation, operation, and maintenance, plus common sense operation, are important measures to prevent accidents.

Failure to adhere to these notices may result in the loss of steering control, leading to possible ejection from the vessel, causing property damage, injury and/or death.

⚠ DANGER — **IMMEDIATE HAZARDS WHICH, IF NOT ACTED UPON, WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.**

⚠ WARNING — **HAZARDS OR UNSAFE PRACTICES WHICH, IF NOT ACTED UPON, COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.**

⚠ CAUTION — **Hazards or unsafe practices which could result in minor injury or product or property damage.**

NOTICE — *Information which is important to proper use or maintenance, but is not hazard-related.*

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INDEX

ABBREVIATIONS

The following abbreviations are used in this manual:

ABYC	American Boat & Yacht Council
AP	Autopilot
CAN	Controller Area Network
EPS	Electronic Power Steering
GPS	Global Positioning System
INFO	Information
HI	High
LO	Low
MPH	Miles Per Hour
NMEA	National Marine Electronics Association
NMEA 2000®	A protocol for digital communication on a CAN Bus
PCM	Pump Control Module
RFU	Rudder Feedback Unit
RPM	Revolutions Per Minute
STBD	Starboard (right)

Note: Some abbreviations not listed here may be found in their respective sections.

1.0 SAFETY INFORMATION

⚠ WARNING

THE SAFETY INFORMATION PROVIDED BELOW IS INTENDED TO INFORM YOU OF THE DANGERS THAT MAY BE PRESENT BEFORE, DURING AND AFTER USE. IT IS CRITICAL THAT YOU READ AND UNDERSTAND ALL THE POINTS NOTED.

⚠ WARNING

THE OPTIMUS EPS SYSTEM MUST ONLY BE INSTALLED BY AN AUTHORIZED DEALER OR OEM.

Safe operation of the steering system depends upon proper installation and maintenance of the system, and the common sense, safe judgment, knowledge, and expertise of the operator. Every installer and operator of the steering system should know the following requirements before installing or operating the steering system.

If you have any questions regarding any of these warnings, contact SeaStar Solutions.

To reduce the risk of severe injury or death:

1. Always wear a Coast Guard Approved personal flotation device (PFD) and use an engine shut-off cord (lanyard) if you have one.
2. Read and understand this User's manual and the Quick Reference Card provided with your vessel control components.
3. SeaStar and Optimus components are highly engineered and safety tested to ensure system integrity. DO NOT substitute any component. Substitution with non-SeaStar or non-Optimus components may compromise system safety, performance, and reliability.

Prior to every use

Perform a system inspection as outlined below. Refer to Section 3.3 for further details.

1. Check steering fluid level in all steering pumps.
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
4. Check for binding, loose, worn or leaking steering or shift/throttle control components.
5. Verify proper shift and throttle response for all control levers.
6. Verify that no alarms or warnings are shown on the CANtrak display.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

1.0 Safety information (continued)

During use

1. WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD).
2. Attach engine shut-off cord (if you have one) to your pfd.
3. Never allow anyone not familiar with the operation of the vessel control system to operate the boat at ANY time.
4. Know and adhere to all applicable federal, state, and municipal laws and regulations that govern boating in your area.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

⚠ WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY.

After use

DO NOT use acetone, or cleaners containing ammonia, acids, or any other corrosive ingredients on any Optimus components.

Maintenance

Maintain your Optimus Steering as directed in Section 7 of this manual.

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

1.1 Safety Labels

⚠ WARNING

NOTE: THE LABELS BELOW SHOULD CALL ATTENTION TO THE POSSIBLE HAZARDS ASSOCIATED WITH THE EQUIPMENT SHOWN LATER IN THIS MANUAL (SEE SECTION 3.1)

Hydraulic Pump Labels

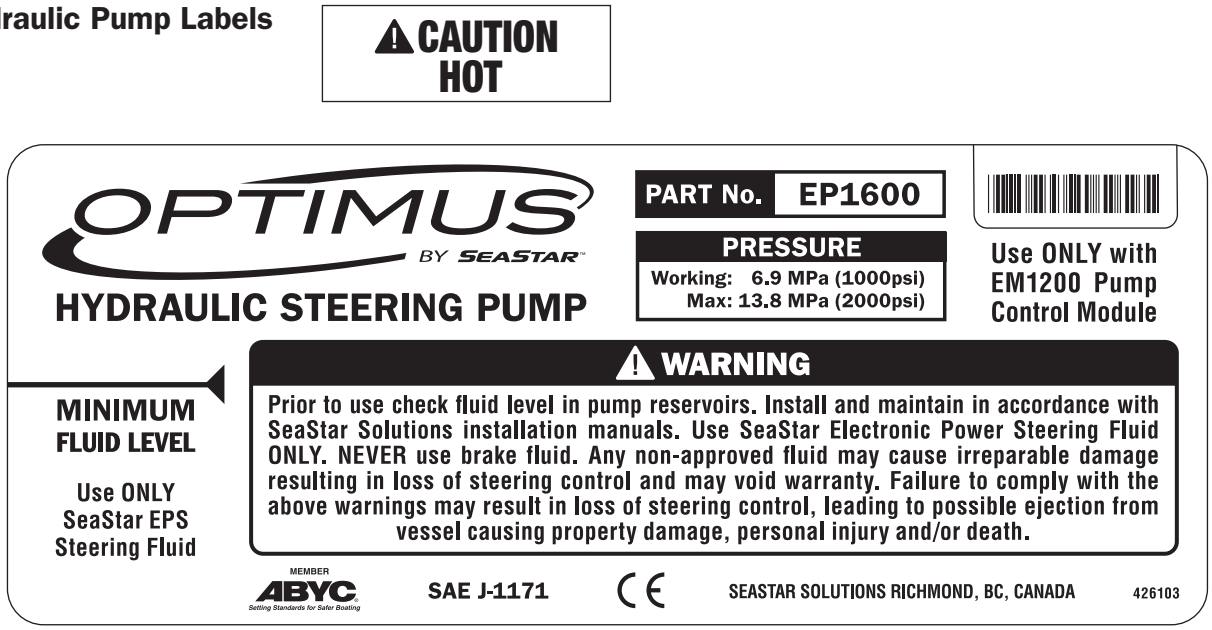


Figure 1-1. Hydraulic steering pump labels.

Pump Control Module (PCM) Labels

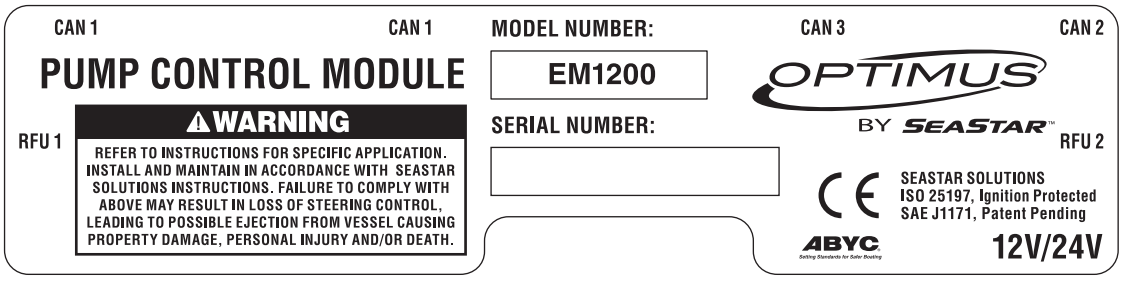


Figure 1-2. PCM labels.

SmartCylinder Label

SEASTAR SOLUTIONS
RICHMOND, BC, CANADA
PATENTS PENDING

INBOARD SMART STEERING CYLINDER
PART # EC5810 WORKING PRESSURE: 6.9 MPa (1000psi)
MAX PRESSURE: 13.8 MPa (2000psi)

ISO10592 CE ABYC

PRIOR TO EVERY USE:
1. Check fluid level in pump reservoirs (consult User's Manual).
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings & cables for wear, kinking and/or leaks.
4. Check for binding, loose, worn or leaking steering components.

DO NOT operate boat if any component is not in proper working condition.

INSTALLATION, USE AND MAINTENANCE:
1. Ensure steering cylinder is compatible with tiller and U.S.C.G. ratings.
2. Interference with any object MUST be corrected prior to use.
3. Maintain steering system at a minimum of twice per year.
4. Refer to Installation and User's Manuals for important safety information.
5. Ensure all electrical connections are properly secured and free from corrosion.
6. Keep magnets away from steering cylinders.

⚠ WARNING Failure to adhere to these warnings may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal injury and/or death. www.seastarsolutions.com 426788

Figure 1-3. SmartCylinder labels.

Steering Service Valve Labels

To be installed close to the service valve.

STEERING SERVICE VALVE

Refer to User's Manual for use of valve.

OPERATION:

- TURN OFF ENGINES
- FULLY TURN KNOB COUNTER-CLOCKWISE TO OPEN
- MANUALLY REPOSITION ENGINE(S), OUTDRIVE(S), OR RUDDER(S)
- FULLY TURN KNOB CLOCKWISE TO CLOSE

682151

⚠ WARNING

DO NOT OPEN VALVE WITH ENGINE(S) RUNNING

Failure to comply with this warning may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal Injury and/or death.

Figure 1-4. Steering service valve label.

Ignition Connection Label

⚠ WARNING
Avoid loss of control:
Ensure proper connection per instructions.

682300

⚠ WARNING
Avoid loss of control:
Ensure proper connection per instructions.

Figure 1-5. Ignition warning decal, PID# 682300.

2.0 INTRODUCTION

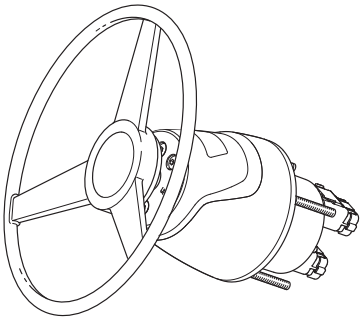
2.1 Welcome

Welcome to the world of electronic power steering. Please take a few minutes to familiarize yourself with the System Overview and the First Time Operation sections. An understanding of the system will assure your safety and help you get the most enjoyment from your Optimus EPS steering system.

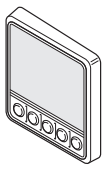
2.2 Optimus EPS System Overview

Optimus EPS is a steer-by-wire system that replaces a traditional hydraulic helm with electronic components that communicate over a serial data network. This state-of-the-art system incorporates many advanced features to make it safe and reliable. These features include redundant sensors, fault-tolerant communications, extensive self-monitoring, and fault communications to notify and advise the operator in case of a system fault.

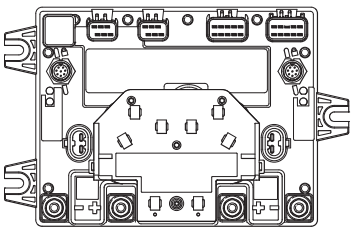
The Optimus EPS system consists of several major components, listed below. Refer to figure 2-1 and figure 2-2 to see these components in a schematic system diagram.



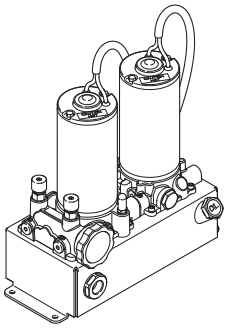
Electronic helm
The helm converts steering wheel movement into digital messages that are sent over the network to the pump control module (PCM). A system of friction plates in the helm allow the steering effort to be adjusted according to a setpoint received from the PCM. (A steering wheel is not included with the Optimus EPS system.)



CANtrak display
The CANtrak display is a small color LCD that displays system status and fault information to the operator. It can also be used to make changes to user-adjustable steering settings, such as helm effort and number of turns, when enabled by the boat builder or dealer.

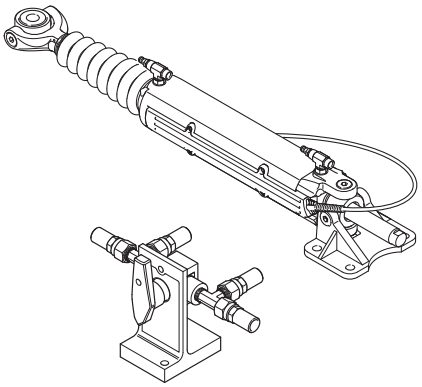


Pump control module (PCM)
The PCM receives wheel movement messages from the helm(s) and operates the hydraulic steering pumps to steer the vessel as required. The PCM uses position feedback from the SmartCylinders for precise steering control and fault detection. The PCM can also respond to inputs from a certified autopilot system.



Power steering pump
The power steering pump supplies pressurized fluid to the SmartCylinder in order to steer the boat. The PCM controls a pair of DC motors that drive small gear pumps. The pump assembly has an integral fluid reservoir and pressure relief valves.

The steering pump has an integral service valve that can be opened to bypass the pump and allow the engines to be manually repositioned. They are used for service or in the case of an emergency.



SmartCylinders
The SmartCylinder is a hydraulic steering cylinder fitted with a magnet and a position sensor (RFU). Each SmartCylinder can steer up to two rudders connected with a tie-bar.

Remote-mounted steering service valves (optional)
When the service valves on the power steering pumps are not easily accessible these optional remote-mounted valves can be installed in a convenient location.

2.3 System Diagrams

The figures on the following pages illustrate the Optimus EPS system schematically. Not every possible system configuration can be represented here, but these figures will illustrate the key components and connections.

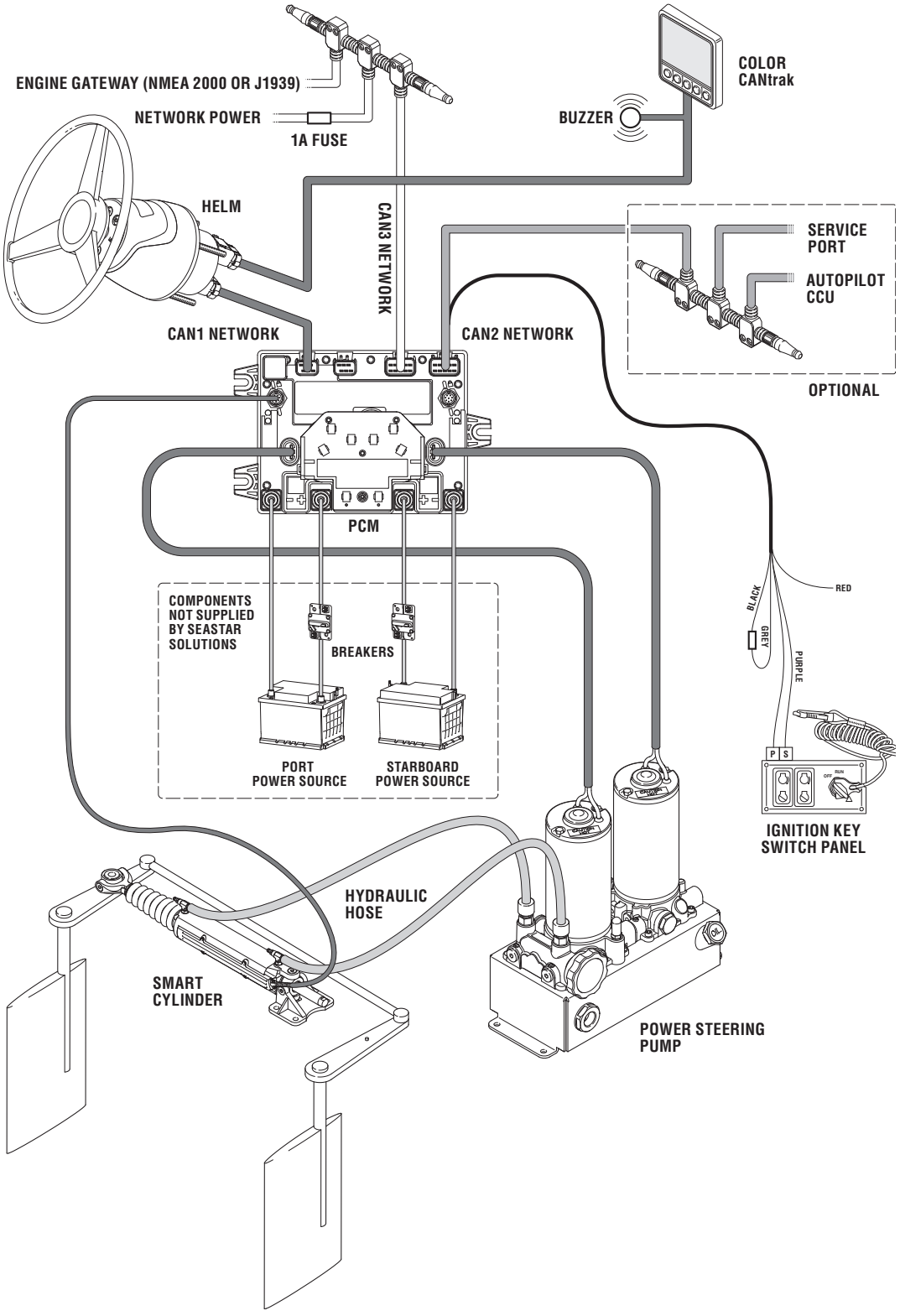


Figure 2-1. Optimus EPS system diagram, single station.

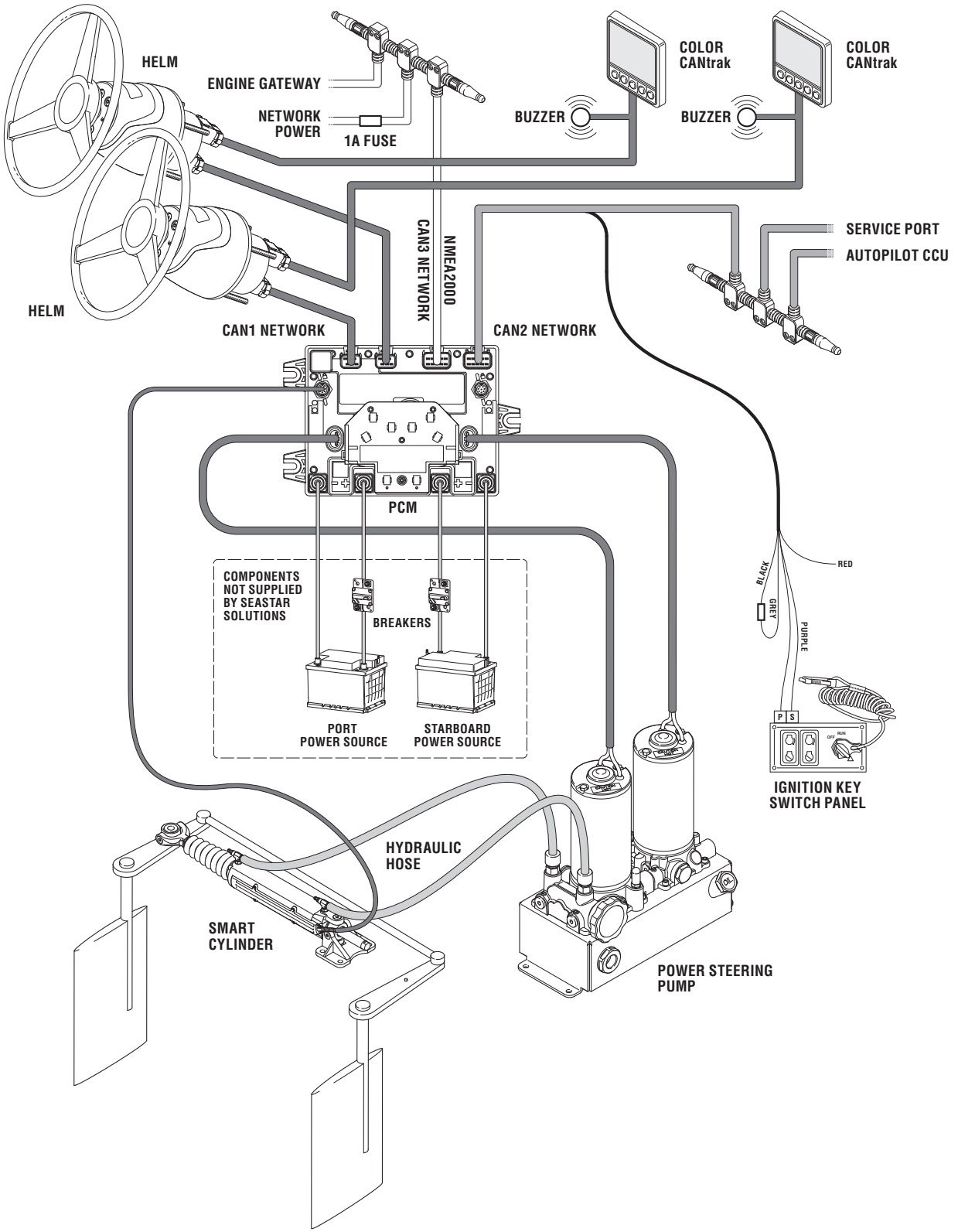


Figure 2-2. Optimus EPS system diagram, dual station.

3.0 FIRST TIME OPERATION

Before operating your boat for the first time after the installation of the Optimus EPS system, take the time to:

- Familiarize yourself with the location and function of the steering system components (section 3.1).
- Perform a system inspection (section 3.2).
- Check the SmartCylinder installation for interference and proper cable routing (section 3.3).

Once you've taken these steps and are comfortable with the function of the steering system, do a sea trial to get familiar with the steering response (section 3.4).

3.1 Locate the Following Steering System Components

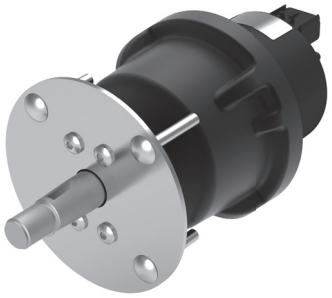
3.1.1 Electronic Helm(s)

The steering wheel is attached to this unit, which may be located immediately under the wheel or just behind the dash. The images below show the available helm styles.

⚠ CAUTION

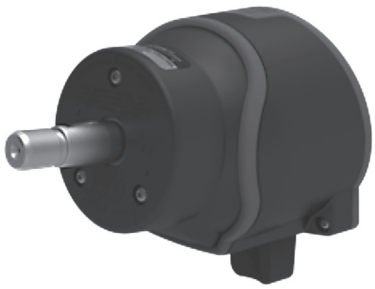
Keep magnets away from the helm. They may interfere with proper helm operation.

EPS Front Mount Helm



EPS Rear Mount Helm

EPS Classic Tilt Helm



EPS Sport Plus Tilt Helm

Figure 3-1. EPS Helm configurations.

3.1.2 Circuit Breakers for Optimus EPS System

These are supplied by the installer and may be mounted in a variety of locations. Check near the batteries, in the circuit breaker box, or near the PCM or hydraulic pumps. There should be a breaker for each PCM power feed.

3.1.3 Pump Control Module (PCM)

The PCM is located in a dry area and can usually be found in the engine room or in the lazarette near the rudder tillers. The PCM is always located close to the steering pumps.

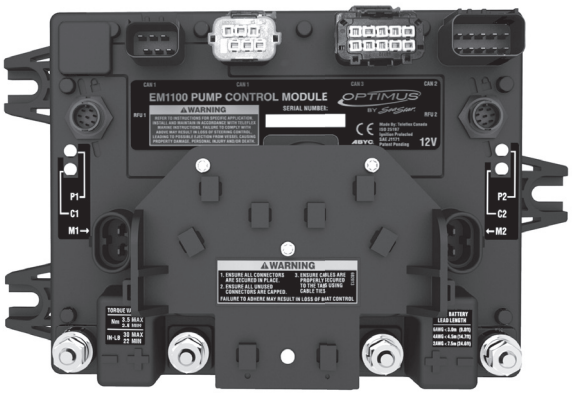


Figure 3-2. Pump control module.

3.1.4 Hydraulic Steering Pump

The hydraulic steering pump supplies pressurized fluid to the SmartCylinder to steer the rudders. It will always be located near the PCM, usually in the engine room or the aft lazarette that houses the rudder tillers.

The pump contains an integral steering service valve and a fluid reservoir; it is here that you will check the fluid level and add steering fluid as necessary.

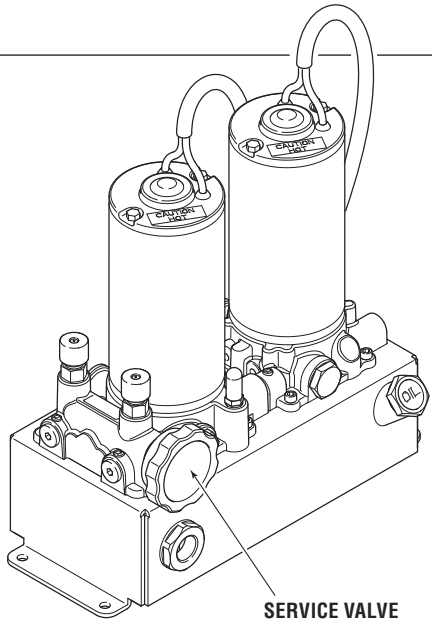


Figure 3-3. Hydraulic pump and reservoir.

3.1.5 SmartCylinders

The SmartCylinder acts on the rudder tiller or tiller tie-bar. It's usually in a lazarette aft of the engine room.

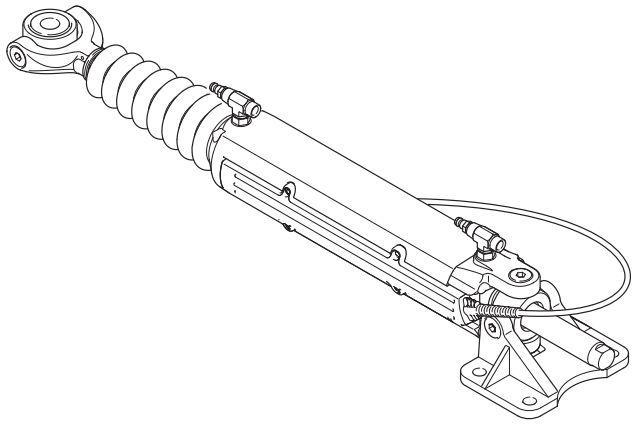


Figure 3-4. Outboard SmartCylinder with sensor.

3.1.6 Steering Service Valves

⚠ WARNING

WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD) WHEN MANUALLY REALIGNING ENGINES.

The steering service valve permits the bypass of the EPS system and allows the steering gear to be manually positioned. It should only be used in the event of an EPS system failure, in which case instructions will be given on the CANtrak.

The service valve is integrated into the power steering pump. To open the valve, turn the knob fully counter-clockwise until it stops (about three turns). Turn the knob fully clockwise to close it. Turn just until you feel the valve contact the stop – do not use tools or over-tighten.

Some vessels may be fitted with remote service valves as shown in figure 3-5.

Figure 3-5 Remote steering service valve.

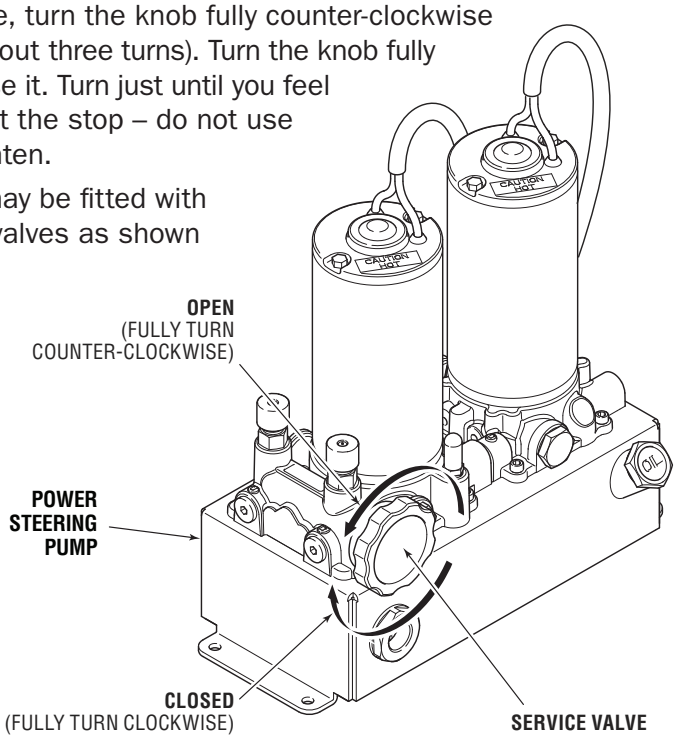


Figure 3-6. Service valve location.

3.1.7 CANtrak Display

A color display at the main helm station shows system status and fault notifications. When enabled by the dealer or builder it can also be used to make adjustments to steering parameters. A CANtrak display may also be installed at additional helm stations.

The CANtrak display is supplied with a plastic cover to protect it from the weathering effects of sunlight. Remove and stow the cover before using the boat, and replace it when finished.

Figure 3-7. CANtrak Display.

⚠ WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY.

3.2 Perform System Inspection

⚠ WARNING

FAILURE TO ADHERE TO THESE WARNINGS MAY RESULT IN LOSS OF BOAT CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL, CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

⚠ WARNING

ON MULTIPLE HELM STATION BOATS ALL STEERING HELMS ARE ACTIVE WHEN THE OPTIMUS EPS IS TURNED ON. THIS IS THE SAME AS YOU WOULD FIND ON A CONVENTIONAL HYDRAULIC STEERING SYSTEM.

A system inspection should be performed before every use. For your convenience the inspection steps are summarized on the laminated Quick Reference Guide, which should remain on the vessel at all times. (Contact your dealer immediately if you do not have your QR Guide.)

To perform a system inspection, first start up the system by turning on the ignition switch. The steering will become active at all helms and the CANtrak display will turn on. When the CANtrak is powered up it will display a Warning screen that prompts you to conduct the system inspection. Press the button labeled **Info** to enter a sequence of screens that will prompt you through the same system inspection procedure listed below and on your QR Guide.

3.2.1 System Inspection Procedure

⚠ WARNING

FAILURE TO ADHERE TO THESE WARNINGS MAY RESULT IN LOSS OF BOAT CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL, CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

1. **Check steering fluid level in the steering pump.**

   Ensure the fluid level is between the MIN mark and the top of the sight glass lens on the reservoir as shown in figure 3-8. Use only SeaStar EPS steering fluid (HA5482) in the Optimus EPS System.

2. **Verify immediate steering response when turning steering wheel(s).**

   Turn the steering wheel slowly to port and to starboard and make sure the rudders follow the commands. Watch that the hoses and cables move freely without any snags or hang-ups.

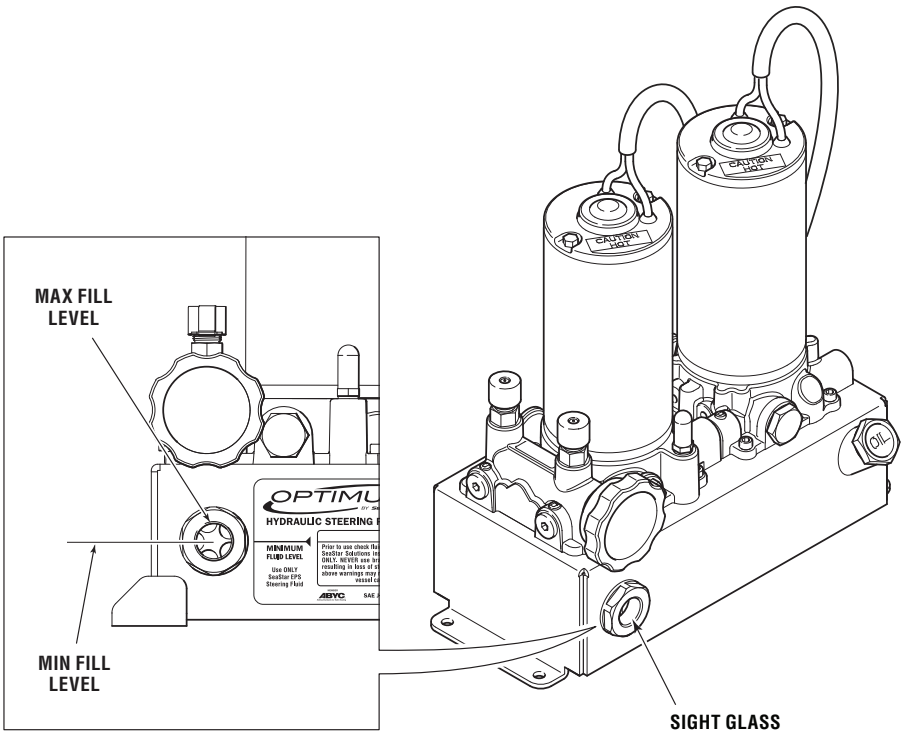


Figure 3-8. Location of fluid level marks.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.

Check all steering hoses and fittings between the pump, service valves and cylinders for any signs of leakage, kinking, wear or chafing. Check all electrical and mechanical cabling for abrasion, wear, rubbing or chafing. Check that all connections are tight and free of corrosion.

⚠ WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY.

4. Check for binding, loose, worn or leaking steering or shift/throttle control components.

Check all shift and throttle cables for signs of wear, damage or chafing. Check that all linkages and cables move freely and are not binding or corroded.

5. Verify proper shift and throttle response for all control levers.

Check that all shift and throttle levers operate freely and cause the engines to shift accordingly. Put the engines in neutral idle mode and confirm that the throttle responds correctly and returns to idle.

6. Verify that no alarms or warnings are shown on the CANtrak display.

If any warnings are found, follow the instructions on the CANtrak screen or refer to Section 6 before proceeding.

Read the System Inspection steps on the CANtrak display and acknowledge them by pressing the button labeled OK.

⚠ CAUTION

It is recommended the full system inspection procedure be reviewed on a regular basis to retain familiarity.

3.3 Installation Checks

To verify correct installation of the Optimus SmartCylinder, perform the following installation checks when the boat is delivered and after each boat servicing. You will need someone to assist you.

⚠ WARNING

FAILURE TO PERFORM THESE CHECKS MAY RESULT IN DAMAGE TO THE SMART-CYLINDER SENSOR AND AFFECT THE SAFE OPERATION OF THE BOAT'S STEERING.

1. **Interference Checks** – Confirm that the steering cylinder moves through the entire steering range with no interference or binding, and that the sensor does not come close to any magnetic material or electric motors such as a bilge pump. Check that hoses and harnesses move freely with no rubbing or binding.
2. **Sensor cable** – Confirm that the SmartCylinder Sensor Cable is tied securely to the hoses with gradual bends as shown figure 3-9.

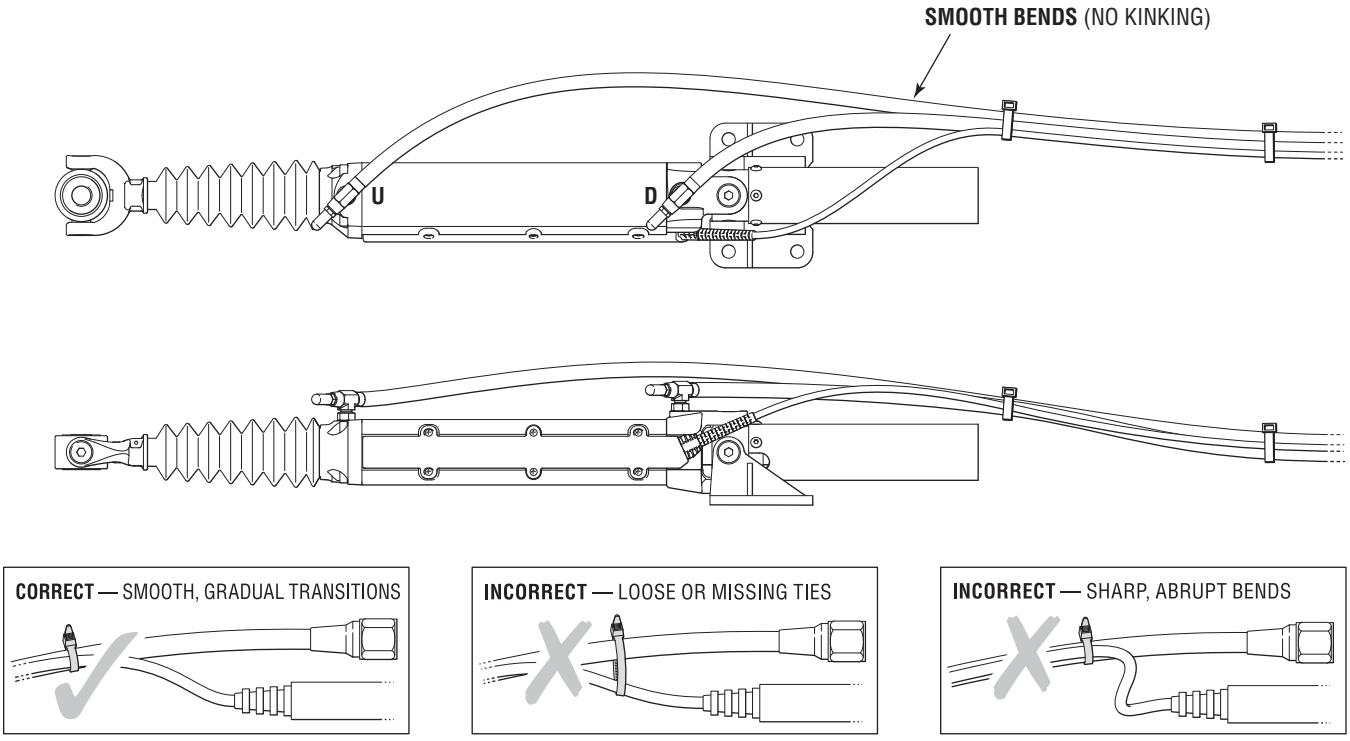


Figure 3-9. Sensor cable and hose routing checks. (Cylinder may not be exactly as shown.)

⚠ WARNING

IF ANY ISSUES ARE FOUND DURING THE INSTALLATION CHECKS, IMMEDIATELY RETURN THE BOAT TO THE SERVICE DEALER FOR THOSE ISSUES TO BE REMEDIED.

3.4 Initial Sea Trial

Carefully proceed to a section of deep, open water at a slow to moderate speed. Use the trip to get a feel for the steering response. When in open water that is deep enough to assure you will not run aground, try various maneuvers with the boat at various speeds until you are comfortable operating the boat. Be sure to spend some time backing up at a slow speed. Once familiar with the operation run the boat in a safe, normal fashion and enjoy your electronic power steering.

If adjustments to the system are required, see Section 5.0 for steering adjustments or contact your dealer.

⚠ CAUTION

Keep magnets away from the helm. They may interfere with proper helm operation.

4.0 SYSTEM USE

If this is the first-time use, or for more details, see Section 3 of this manual.

4.1 Before Each Use

Prior to every use perform a system inspection as outlined here. See section 3.2 for further details.

1. Check steering fluid level in all steering pumps.
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
4. Check for binding, loose, worn or leaking steering or shift/throttle control components.
5. Verify proper shift and throttle response for all control levers.
6. Verify that no alarms or warnings are shown on the CANtrak display.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

⚠ WARNING

DO NOT OPERATE THE VESSEL WITHOUT A FUNCTIONING CANTRAK DISPLAY.

4.2 Multiple Station Boats

⚠ WARNING

NEVER ATTEMPT TO MOVE FROM ONE HELM STATION TO ANOTHER WHILE THE VESSEL IS UNDER WAY. ALWAYS PLACE ENGINES IN NEUTRAL AND ENSURE THE BOAT IS STATIONARY BEFORE MOVING TO ANOTHER STATION.

⚠ CAUTION

On multiple helm station boats all helms are active when the Optimus EPS is turned on.

The Optimus EPS system is designed to operate much like a conventional hydraulic steering system. The boat can be steered from any helm without requiring additional steps to transfer control.

Like a conventional hydraulic system, steering input from each helm is added cumulatively, which means it is possible that steering inputs from a second or third helm can cancel out or exaggerate the operator's inputs. It is important that all passengers, and especially children, are instructed not to touch the helms unless specifically requested to take control.

4.3 Autopilot Operation

⚠ WARNING

ALWAYS READ AND UNDERSTAND THE AUTOPILOT OPERATION INSTRUCTIONS COMPLETELY BEFORE ENGAGING THE AUTOPILOT MODE. NEVER LEAVE THE HELM STATION UNATTENDED WHEN THE AUTOPILOT IS ENGAGED.

The Optimus EPS steering system is designed to interface with many autopilot controllers. See your Autopilot's documentation for specific model compatibility.

The steering effort may be noticeably higher when the autopilot is engaged. This resistance may be user adjustable; see Section 5.1.4 of this manual.

When any wheel is turned with the autopilot engaged, the helm will take control of the system and manually override the autopilot. The steering resistance will return to normal until the autopilot re-engages. See your autopilot user's manuals for specific system behavior.

When autopilot is engaged on systems equipped with a CANtrak display the run screen will display a notification as shown in figure 4-1.

The Title Bar will display "Autopilot Mode" when the autopilot is engaged.

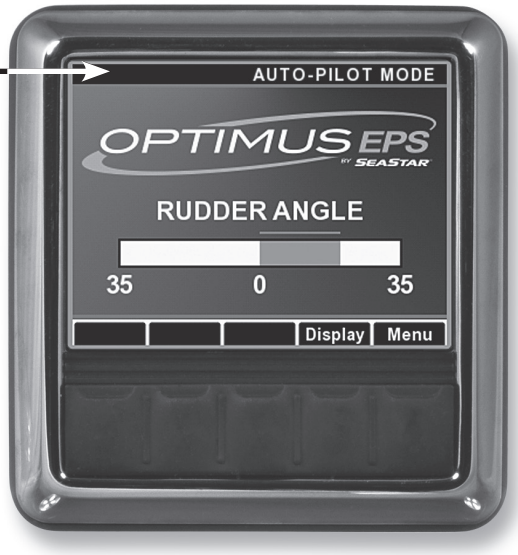


Figure 4-1. Autopilot mode screen.

4.4 High Speed Rudder Limit

The boat builder or dealer may have set a high speed rudder limit in order to keep the vessel in a comfortable operating envelope and prevent aggressive maneuvers at high speed. If this is the case you will find that your steering angle is progressively limited as boat speed increases. See section 5.1.5 for more information on speed sensitive steering and how it works.

5.0 OPERATOR INTERFACE

5.1 CANtrak Display

The Optimus CANtrak display has an easy to navigate menu system, adjustable backlighting for night use and includes a cover to protect it from the sun when not in use.

Figure 5-1. CANtrak display, All Helms Active screen.

The CANtrak display serves these purposes:

1. Displays the current system operating conditions.

2. Handles system faults:

a) Displays system warnings in case of a system fault.

b) Sounds an audible alarm in case of a system fault.

c) Instructs the operator what to do in case of a system fault.

3. Permits changes to the basic system settings.

4. Provides system and diagnostic information

5.1.1 CANtrak Display Navigation

The five buttons at the bottom of the unit are used to select various actions. The five boxes at the bottom of the display screen indicate the legend for each button. These legends vary based on what is on the screen.

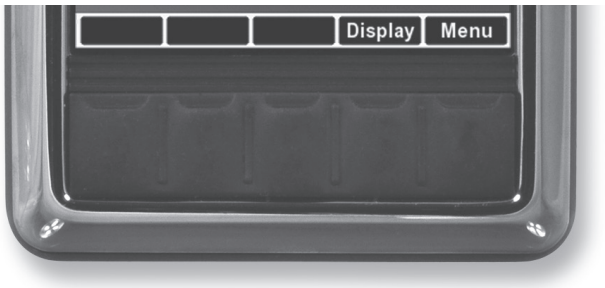
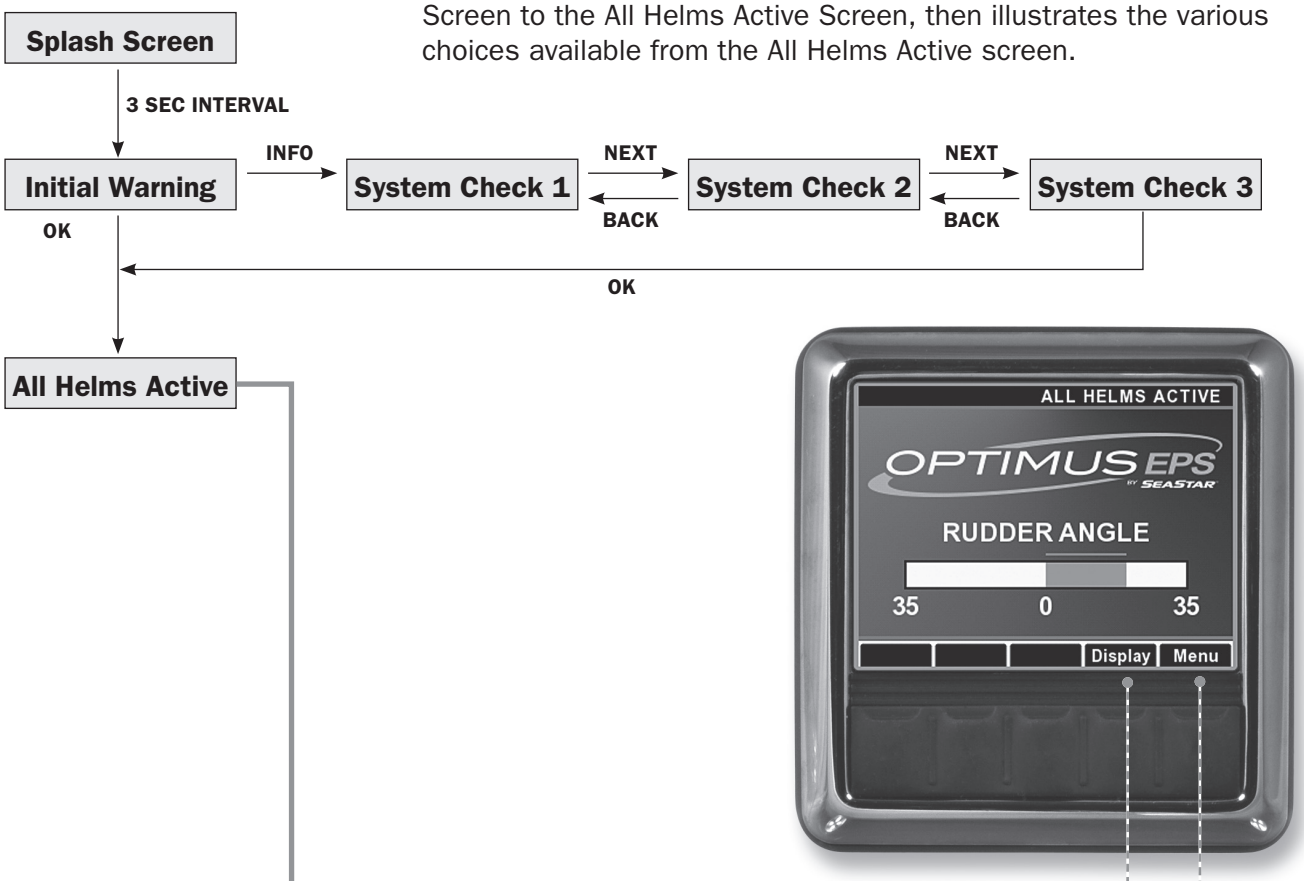


Figure 5-2. Navigation buttons and legend.

WORD OR SYMBOL	IDENTIFIES A FUNCTION OR SETTING
^	Moves the cursor up the screen to the next item.
v	Moves the cursor down the screen to the next item.
>	Enters the sub-menu at the cursor location.
–	Reduces the setting of the selected item.
+	Increases the setting of the selected item.
OK	Accepts a given statement or condition and advances to the next screen.
↺	Returns to previous menu.
Save	Saves change and returns to previous menu.

5.1.2 CANtrak Display Map – All Helms Active (Normal Steering Mode)

The following diagram shows the progression from the Splash Screen to the All Helms Active Screen, then illustrates the various choices available from the All Helms Active screen.



DISPLAY

Adjust display brightness

MENU

Settings* – Set steering parameters such as number of turns and steering effort.

Faults – View active faults.

System Health – View the status of all devices on the network.
✔ Good ⚠ Warning, but operational ✖ Failed ? Not found

Device List – Access product information, such as part number and serial number, for each device on the network.

** Menu may be deactivated. Contact your dealer.*

Figure 5-3. CANtrak display map.

5.1.3 All Helms Active Screen

The All Helms Active screen (also called the Run screen) will be displayed under normal operating conditions after the startup warning has been acknowledged. The screen shows rudder angle, and legends for the Display and Menu buttons.

Figure 5-4. All Helms Active screen.

Rudder Angle Display

The rudder angle display has two components:

- The current rudder angle is displayed using a color-coded slider bar. The slider is green when steering to starboard and red when steering to port.
- Above the slider bar is a thin line that shows the commanded rudder angle. When steering quickly you may find that the actual rudder position lags behind the commanded position. This is normal; the effect is more pronounced when helm sensitivity is increased (fewer turns lock-to-lock) or when steering loads are high.

The maximum steering angle is shown at the ends of the slider bar. If you have hit hard over at the helm and the slider is not at the maximum steering angle, it likely means that the system has been configured with a high speed rudder limit that restricts steering angle as speed increases. See section 5.1.5 for more information.

5.1.4 Settings Screen [Steering]*

If the boat builder (or dealer) has enabled this menu option, the Steering Settings screen allows adjustment of steering effort and helm turns. To get to the screen, select Settings from the Menu, then select Steering. You will be prompted to save changes when you exit.

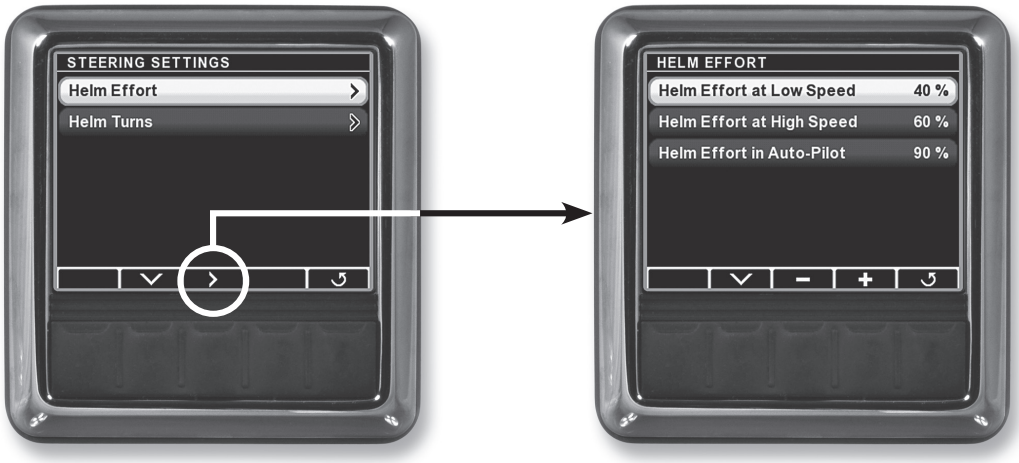


Figure 5-5. Steering Settings .

⚠ CAUTION

Adjusting steering effort or steering turns can significantly impact boat handling. Proceed with caution after making any changes.

Helm Turns at Low Speed

Sets the number of turns (hard-over to hard-over) when the vessel is running at low speeds. The range is 3.5 to 8 Turns.

Helm Turns at High Speed

Sets the number of turns (hard-over to hard-over) when the vessel is running at high speeds. The range is 3.5 to 8 Turns.

Helm Effort at Low Speed

Sets the steering resistance when the vessel is running at low speeds. It is adjustable between 1 and 100.

Helm Effort at High Speed

Sets the steering resistance when the vessel is running at high speeds. It is adjustable between 1 and 100.

Helm Effort in Auto-Pilot

Sets the steering resistance when autopilot is engaged. To prevent accidental course corrections with the wheel this should be set slightly higher than the high speed effort. It is adjustable between 1 and 100.

** May not be available on all installations. Contact your builder or dealer.*

5.1.5 Speed Sensitive Steering

A key advantage of Optimus electronic power steering is the ability to change steering parameters as boat speed changes. Both the steering effort and helm turns are smoothly adjusted between their low and high speed settings as the boat speed changes. Figure 5-6 illustrates how this works.

Low and high boat speed is defined by engine RPM using values determined by the boat builder or the dealer that installed the system. These are not user adjustable.

⚠ CAUTION

Adjusting steering effort or steering turns can significantly impact boat handling. Proceed with caution after making any changes.

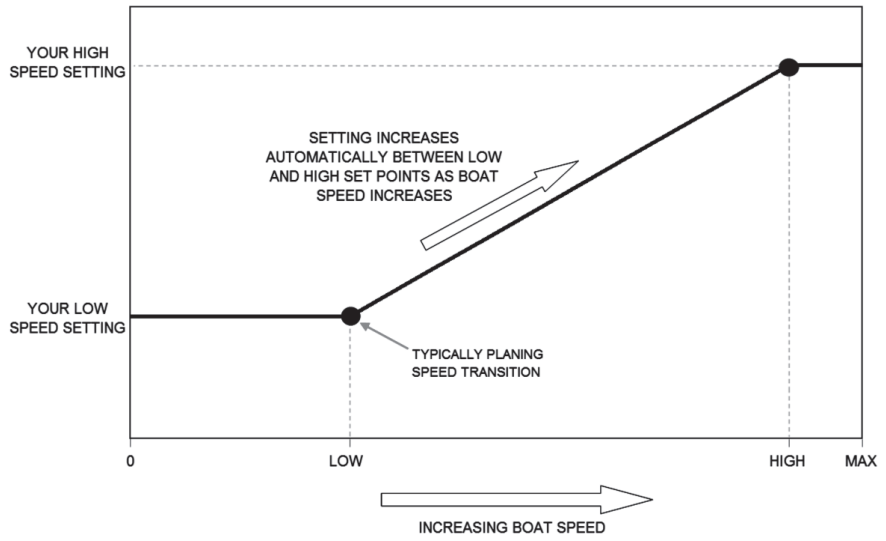


Figure 5-6. Change of helm settings with speed.

High Speed Rudder Limit

The boat builder or dealer may have set a high speed rudder limit in order to keep the vessel in a comfortable operating envelope and prevent aggressive maneuvers at high speed. If this is the case you will find that your steering angle is progressively limited as boat speed increases.

6.0 SYSTEM FAULTS & HAZARDS

Should a steering fault occur it will be communicated through the CANtrak display. This section defines the three types of hazards you may experience and how the system will handle each.

NOTICE

When a serious fault occurs, consider your options. While the system has many features to allow the boat to return to port in a slow and safe manner, local conditions or operator skills may dictate that calling for assistance is the prudent thing to do.

6.1 Hazard Definitions

6.1.1 Danger

A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action.

In some cases you will need to manually align the rudders straight ahead and return to port using shift and throttle to steer.

6.1.2 Warning

A warning fault is a non-critical system fault which may cause the steering speed to be reduced.

Although a warning fault may not always adversely affect steering performance it is an indication of a problem in the system and should be remedied.

6.1.3 Caution

A caution fault is a non-critical system fault that will have no effect on system performance. Although a caution fault will not adversely affect steering it is an indication of a problem in the system and should be corrected as soon as possible. The yellow warning triangle will remain on the CANtrak display screen until a technician has remedied the issue.

6.2 System Fault Handling – CANtrak

In case of a Danger or Warning message, the CANtrak display (if so equipped) will advise the operator how to proceed. The following sections describe what to expect in case of either fault.

6.2.1 Danger Fault Handling

A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action.

During a danger fault, the CANtrak display will display DANGER across the top, sound a continuous buzzer (until muted) and display fault information and handling in three zones. See figure 6-1.

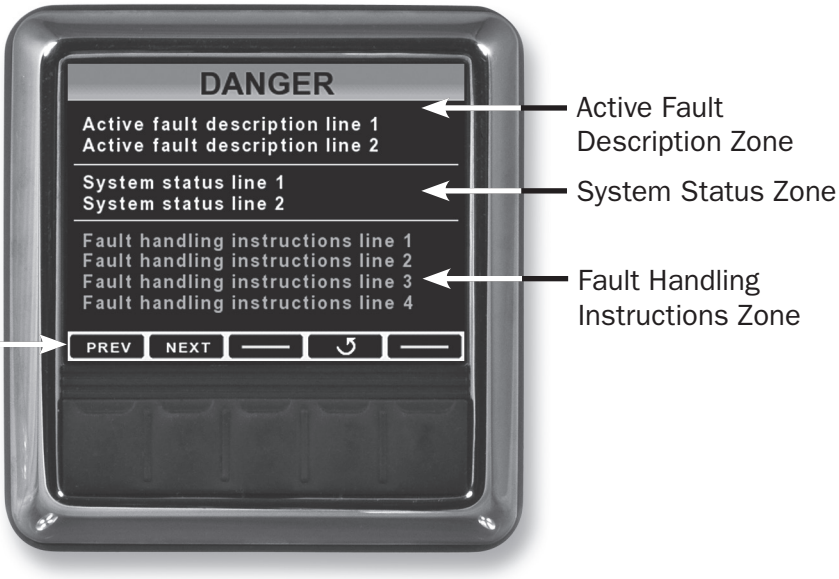


Figure 6-1. Danger fault screen layout.

Active Fault Description Zone

Provides details specific to the system fault. These will include a brief description of the fault and are primarily for troubleshooting purposes.

System Status Zone

Displays information about the status of the system and if the system has automatically reacted to the fault.

Fault Handling Instructions Zone

Provides detailed instructions on how to proceed. In the case of a danger fault, this will instruct the operator what to do and how to proceed should Limp Home mode be required.

6.2.2 Limp Home

When a Danger fault results in steering performance being restricted or suspended, the CANtrak may provide instructions on how to enter Limp Home mode.

Limp Home will provide instructions for the user to manually move the rudders and allow the user to “limp home” with reduced performance. If you aren’t familiar with the service valve location and operation, see section 3.1.6 for information.

⚠ WARNING

LIMP HOME MODE IS AN OVERRIDE SYSTEM. IT MAY SEVERELY LIMIT YOUR BOAT CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. PROCEED WITH EXTREME CAUTION. ALWAYS WEAR PDFS AND LANYARD. REFER TO THE NOTICE IN SECTION 6.0.

Limp Home Mode

The CANtrak will instruct the operator to manually center the rudder using the service valves, then proceed to port immediately using the shift and throttle controls to steer the vessel.

Figure 6-2. Limp home instructions, all steering disabled.

6.2.3 Warning Fault Handling

A warning is a non-critical system fault which will either maintain full steering system operation or cause the steering speed to be reduced.

During a warning fault, the CANtrak will display the same information as with a danger fault but WARNING will appear across the top of the screen and the buzzer will sound intermittently (until muted).

The operator may choose to exit the Warning screen and return to the All Helms Active screen by pressing the exit button, in which case the system will flash a warning icon on the run screen as shown in figure 6-3. This icon will remain in place until the fault is repaired. If the system recovers from the fault, for example if a battery runs low and is subsequently charged, the warning screen will disappear and the system will automatically resume normal operation.

Although the system may still operate normally under many warning faults, the vessel should still be returned to port and serviced immediately.

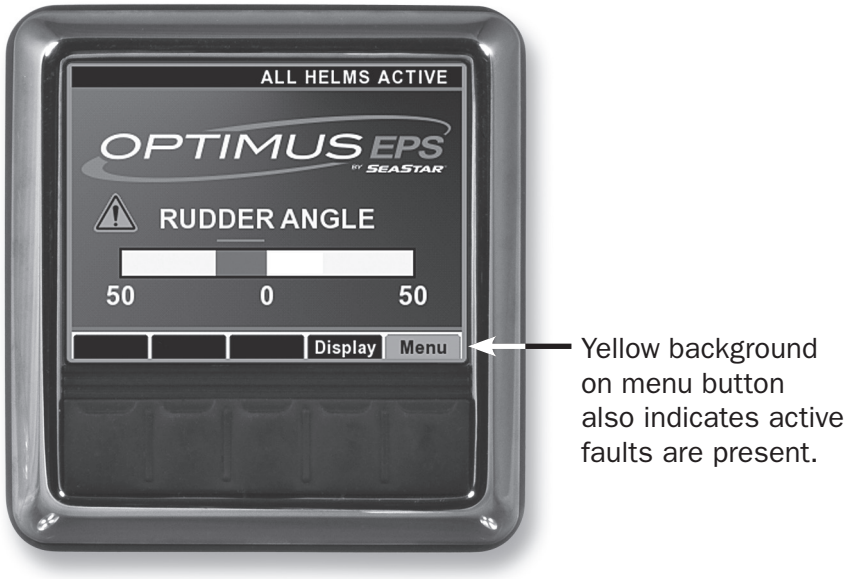


Figure 6-3. Run screen with system warning.

Some system faults may result in a reduced steering response warning. This means that the system will continue to steer normally but may respond more slowly to steering inputs.

In rare cases there may be multiple Warning faults at the same time. You can view a list of all active faults by selecting Faults from the display menu.

6.2.4 System Fault Handling – Example

The following is an example of how the system would respond to the warning fault hazard of a communication loss.

The CANtrak display will enter the warning screen mode and pulse the system warning buzzer. The three warning screen zones will appear as shown below.

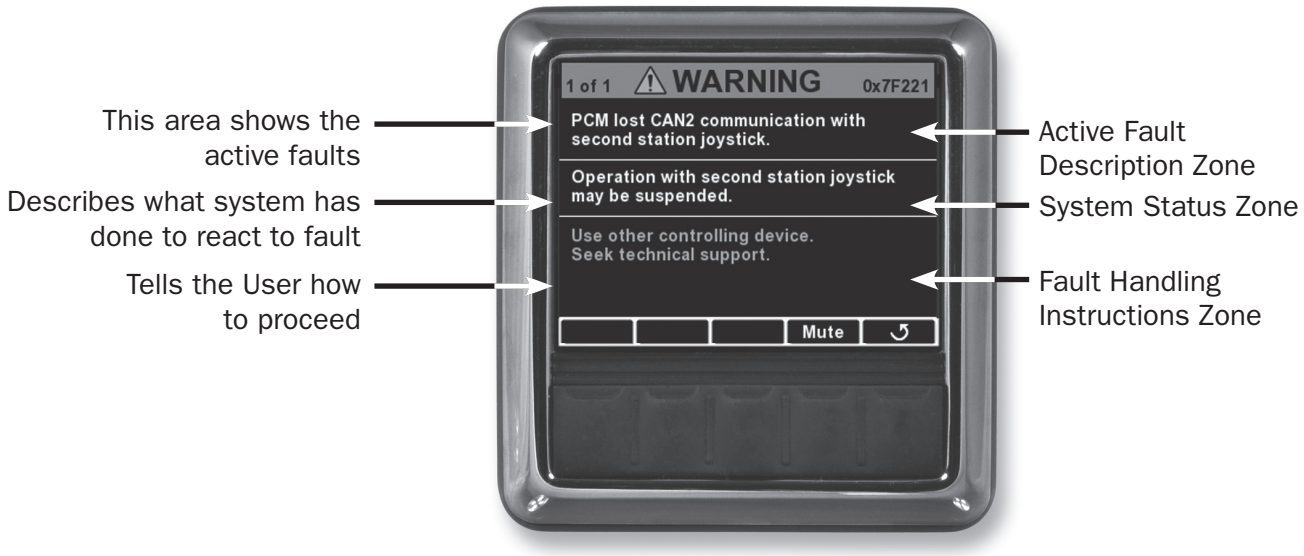


Figure 6-4. Sample warning fault.

6.2.5 CANtrak Loss of Display

If CANtrak display operation is lost proceed as follows:

1. On a multiple helm station vessel each station may be equipped with a CANtrak display. If so equipped, navigate from another helm station and return to port for service.
2. If there are no secondary displays on board, carefully verify (at low speed) that the steering system operates normally then immediately and cautiously proceed to port for service.
3. If both steering response and CANtrak display are lost, you are unable to obtain assistance, and you are in an emergency situation, limp home as shown in section 6.2.2.

⚠ WARNING

LIMP HOME MODE IS AN OVERRIDE SYSTEM. IT MAY SEVERELY LIMIT YOUR BOAT CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. PROCEED WITH EXTREME CAUTION. ALWAYS WEAR A PERSONAL FLOTATION DEVICE (PFD) AND LANYARD.

6.3 Buzzer

The buzzer is used to indicate a system fault. There are two different signals:

1. Continuously on. This indicates a danger fault. A danger fault is a critical system fault which will result in limited or no steering performance and requires immediate action. See Section 6.2.1.
2. Alternating on and off. This indicates a warning fault. A warning fault is a non-critical system fault which may cause the steering speed to be reduced. See Section 6.2.3.

All signals require immediate attention.

The buzzer may be silenced by pressing **Mute** on the CANtrak display.

6.4 Reduced Performance

Under certain fault conditions the steering response may slow down or require additional turns lock-to-lock. A typical cause might be a very low battery or failed rudder feedback sensor. When this happens the CANtrak (if so equipped) will advise the operator of the condition, indicate the reason, and supply instructions.

⚠ WARNING

PROCEED WITH CAUTION UNTIL THE FAULT IS CORRECTED AND NORMAL STEERING OPERATION RETURNS.

6.5 Steering Fluid Loss

In an emergency condition, and if SeaStar EPS steering fluid is not available, the following fluids may be used for a short period of time:

- SeaStar steering fluid
- Automatic transmission fluid
- Motor oil

If any of the above are used then the system should be flushed and refilled with SeaStar EPS steering fluid when the boat is returned to port.

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

⚠ WARNING

NEVER USE BRAKE FLUID IN THE STEERING SYSTEM.

7.0 MAINTENANCE AND REPLACEMENT PARTS

Following the routine maintenance schedules outlined below will ensure years of service from your Optimus Electronic Steering System, as well as keep you and your passengers safe from the dangers that are present on and off the water.

7.1 Owner(s) (End Users)

Prior to every use (see Section 3.2 for further details):

1. Check steering fluid level in all steering pumps.
2. Verify immediate steering response when turning steering wheel(s).
3. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
4. Check for binding, loose, worn or leaking steering or shift/throttle control components.
5. Verify proper shift and throttle response at all control levers.
6. Verify that no alarms or warnings are shown on the CANtrak display.

⚠ WARNING

DO NOT OPERATE BOAT IF ANY COMPONENT IS NOT IN PROPER WORKING CONDITION.

7.2 Qualified Marine Mechanic

After the first 20 hours, then every 100 hours or 6 months thereafter (whichever comes first).

1. All points noted above.
2. Check tightness of ALL fasteners/fittings throughout the steering system. Tighten to correct torque specifications as required.
3. Check for mechanical play or slop throughout steering system, correct as required.
4. Check for signs of corrosion. If significant corrosion is present contact your dealer or SeaStar Solutions.
5. Check all electrical cables for chafing and wear.

After the first 200 hours or 12 months thereafter (whichever comes first).

1. All points noted above.
2. Pull the protective boot off the cylinder gland and inspect for any signs of fluid leaks or damage to the cylinder shaft. Re-install the boot in the retaining groove.
3. Carefully remove the aluminum protective cover from the cylinder trunnion mount ring. Inspect the shaft and end gland for any signs of fluid leaks or damage to the cylinder shaft. Re-install the protective cover.

4. Remove the steering wheel(s) and re-grease the wheel shaft(s) using a good quality marine grease.
5. Inspect hydraulic oil for cleanliness; flush if required.
6. Check that the service valve is free to move and in the closed position.

⚠ WARNING

ANY WORK BEING PERFORMED WITH THE STEERING SYSTEM MUST BE COMPLETED BY A QUALIFIED MECHANIC WITH A WORKING KNOWLEDGE OF THE SYSTEM.

7.3 Replacement Parts

7.3.1 SeaStar Electronic Power Steering Fluid

The Optimus Steering System is designed for use with genuine SeaStar Electronic Power Steering Fluid.

Quart HA5482

8.0 TROUBLESHOOTING GUIDE

⚠ WARNING

WHENEVER, IN THE FOLLOWING TEXT, A SOLUTION CALLS FOR REMOVAL FROM VESSEL AND/OR DISMANTLING OF STEERING SYSTEM COMPONENTS, SUCH WORK MUST ONLY BE CARRIED OUT BY A QUALIFIED MARINE HYDRAULIC MECHANIC. SEASTAR SOLUTIONS OFFERS THE FOLLOWING AS A GUIDE ONLY AND IS NOT RESPONSIBLE FOR ANY CONSEQUENCES RESULTING FROM INCORRECT DISMANTLING OR REPAIRS.

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

Optimus steering systems have been designed with protection against over-pressure situations, with the inclusion of a pressure relief valve and circuit breakers, to minimize the possibility of total loss of steering.

Most faults occur when the installation instructions are not followed and usually show up immediately upon filling the system. Listed below are the most common faults encountered and their likely cause and solution.

FAULT	CAUSE	ACTIONS
1. CANtrak does not turn ON	Batteries not turned on, or in poor working condition.	Load test batteries.
	Ignition wires disconnected.	Confirm all connections are in place.
	CANtrak connection damaged and/ or not connected.	Inspect wires for damage.
2. High/Low Speed wheel turn setting not working	Tachometer is not relaying information.	Confirm Tachometer is operating properly (check connections).
	CANtrak not writing proper information.	Confirm that your settings have been saved. If they are not saved, contact Tech support.

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APPENDIX A – SPECIFICATIONS

Optimus EPS System Specifications

Operating voltage	24 VDC (or 12 VDC) nominal
Current draw, average	4A per battery feed, 8A total (8A, 16A at 12V)
Current draw, maximum	27A per battery feed, 55A total (55A, 110A at 12V)
Circuit breaker rating	24V: 30A, 12V: 60A (per battery feed)
System pressure, working	1000psi (6.9 MPa)
System pressure, maximum	2000psi (13.8 MPa)
Number of wheel turns	Variable from 3.5 to 8
Steering angle	Up to 25° – 40° in each direction subject to steering torque requirements and tiller geometry
Fluid type	SeaStar Electronic Power Steering Fluid (HA5482)
Fluid volume	Approximately 2.5qt (2.4 l) per cylinder/pump pair
Hose type	SeaStar Pro hose (1500psi working pressure) for lengths up to 40 feet.

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WARRANTY

Statement of Limited Warranty

We warrant to the original retail purchaser that **Marine Canada Acquisition Inc. DBA SEASTAR SOLUTIONS** (herein forward referred to as **SeaStar Solutions**) products have been manufactured free from defects in materials and workmanship. This warranty is effective for two years from date of purchase, excepting that where **SeaStar Solutions** products are used commercially or in any rental or income producing activity, then this warranty is limited to one year from the date of purchase.

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

The above quoted statement is an extract from the complete **SeaStar Solutions** products warranty statement. A complete warranty policy is available in our **SeaStar Solutions** products catalogue.

Return Goods Procedure

Prior to returning product to **SeaStar Solutions** under warranty, please obtain a *Return Goods Authorization number* (claim number).

Be sure to label the goods with:
a) the name and address of the sender, and
b) the return goods authorization number (claim number)

Please address the returned goods as follows:

From U.S.A.
RGA # ?
SeaStar Solutions
c/o UPS-SCS
19308 70th Ave S.
Kent, WA 98032

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

Technical Support

Phone: 604-248-3858
email: seastar@seastarsolutions.com
Hours: Monday to Friday 05:00 – 15:30 PST
Web: www.seastarsolutions.com

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

FAX 604-270-7172

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