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ABYC
Setting Standards for Safer Boating



62

SIXTY TWO
ISO 9001

OPTIMUS EPS
BY SEASTAR

BAYSTAR™

SEASTAR™

OPERATION INSTRUCTIONS

AND USER'S MANUAL

www.seastarsolutions.com



OPTIMUS360
BY SEASTAR™

Joystick Control System for
Engines with Integrated Electronic
Shift and Throttle



SEASTAR
SOLUTIONS®

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

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**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 harm.


Wash hands after handling.

Thank you for choosing an Optimus™ 360 Joystick Control System by SeaStar Solutions. You have chosen a state of the art vessel control 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.

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.

DEFINITIONS

Conventional Steering Control	This is the standard type of steering that has been used on boats for many years. The steering wheel is the only means of control.
Conventional Shift and Throttle	The type of shift and throttle control where standard control head levers allows the engine gear selection and throttle control.
Joystick Control	A single handle joystick control device that integrates the steering, the gear shift, and the throttle control for multiple engines into one easy-to-use device to provide docking control of the vessel.

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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 360 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).
- 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 3.2 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.

1.0 Safety information (continued)

During use

1. WEAR A COAST GUARD-APPROVED PERSONAL FLOTATION DEVICE (PFD).
 2. Attach engine shut-off cord (lanyard) 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

Rinse off the SmartCylinders thoroughly, using only fresh, clean water. (Outboard-powered vessels only.)

DO NOT rinse the PCM, pumps, actuators, or any other component of the Optimus system.

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

Maintenance

Maintain your Optimus 360 system as directed in Section 8 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

**⚠ CAUTION
HOT**



HYDRAULIC STEERING PUMP

PART No. EP1500	SERIAL NO:
6.9 MPa (1000psi) MAX. 12 Volt	12-100001

⚠ WARNING

Prior to use check fluid level in pump reservoirs. Install and maintain in accordance with SeaStar Solutions installation manuals. Use SeaStar Electronic Power Steering Fluid ONLY. NEVER use brake fluid. Any non-approved fluid may cause irreparable damage resulting in loss of steering control and may void warranty. Failure to comply with the above warnings may result in loss of steering control, leading to possible ejection from vessel causing property damage, personal injury and/or death.

MEMBER
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Setting Standards for Safe Boating

SAE J-1171

CE

SEASTAR SOLUTIONS
RICHMOND, BC, CANADA

061289

⚠ WARNING

DO NOT OPEN VALVE WITH ENGINE(S) RUNNING

STEERING SERVICE VALVE

Refer to User's Manual for use of valve.

OPERATION:

- TURN OFF ENGINES
- FULLY TURN KNOB COUNTER-CLOCKWISE TO OPEN
- MANUALLY MOVE ENGINE(S) TO REPOSITION
- FULLY TURN KNOB CLOCKWISE TO CLOSE

Figure 1-1. Hydraulic steering pump labels.

Pump Control Module (PCM) Labels

CAN 1
CAN 1
MODEL NUMBER:
CAN 3
CAN 2


PUMP CONTROL MODULE

⚠ WARNING

REFER TO INSTRUCTIONS FOR SPECIFIC APPLICATION. INSTALL AND MAINTAIN IN ACCORDANCE WITH SEASTAR SOLUTIONS INSTRUCTIONS. FAILURE TO COMPLY WITH ABOVE MAY RESULT IN LOSS OF STEERING CONTROL, LEADING TO POSSIBLE EJECTION FROM VESSEL CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

EM1200

SERIAL NUMBER:



CE

ABYC
Safety Standard for Safe Boating

SEASTAR SOLUTIONS
ISO 25197, Ignition Protected
SAE J1171, Patent Pending

12V/24V

Figure 1-2. PCM labels.

SmartCylinder Label

SEASTAR SOLUTIONS RICHMOND, BC, CANADA	PART # EC5310, 6.9 MPa (1000psi) MAX SMART STEERING CYLINDER	ISO10592 Patents Pending 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 outboard engine & 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 682009		

Figure 1-3. SmartCylinder labels.

Steering Service Valve Labels

To be installed close to the service valve.

STEERING SERVICE VALVE

OPERATION:

- TURN OFF ENGINES • OPEN VALVE
- MANUALLY MOVE ENGINE(S) TO REPOSITION • CLOSE VALVE

⚠ WARNING

DO NOT OPEN VALVE WITH ENGINE(S) RUNNING

FAILURE TO COMPLY WITH THE ABOVE MAY RESULT IN LOSS OF STEERING CONTROL LEADING TO POSSIBLE EJECTION FROM VESSEL CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

214461

Figure 1-4. Steering service valve label.

Ignition Connection Label

⚠ WARNING

**Avoid loss of control:
Ensure proper connection
per instructions.**

⚠ WARNING

**Avoid loss of control:
Ensure proper connection
per instructions.**

682300

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

2.0 INTRODUCTION

2.1 Welcome

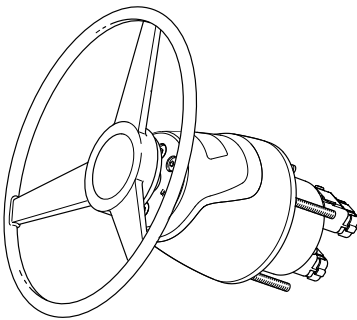
Welcome to the world of electronic joystick control. Please take a few minutes to familiarize yourself with the System Overview and the First Time Operation sections. An understanding of the system will assure your safety and help you get the most enjoyment from your Optimus 360 joystick control system.

2.2 Optimus 360 System Overview

The Optimus 360 joystick control system is a state-of-the-art steer-by-wire vessel control system consisting of the following major sub-systems:

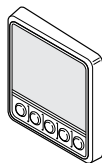
- a) Optimus Electronic Power Steering (EPS). Optimus EPS replaces a traditional hydraulic helm with electronic components that communicate over a serial data network. This state-of-the-art system incorporates many advanced features to make it safe and reliable. These features include redundant sensors, fault-tolerant communications, extensive self-monitoring, and fault communications to notify and advise the operator in case of a system fault.
- b) An interface to the engine's electronic shift and throttle (EST) that allows the system to control engine rpm and transmission.
- c) An electronic joystick that combines EPS and EST systems to provide complete vessel control with a single, intuitive interface.

The system consists of several major components:



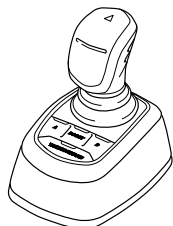
Electronic helm

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.)



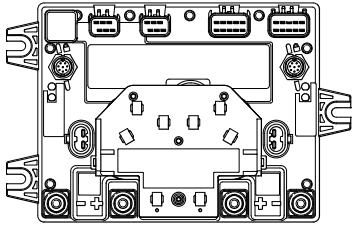
CANtrak display

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.



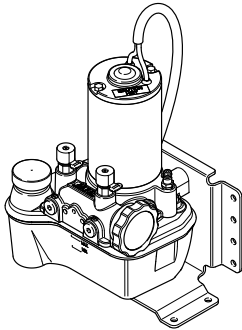
Joystick

The three-axis joystick features on-board electronics and micro-processors that convert an operator's inputs into steering, shift, and throttle commands, then sends these commands over the network to the pump control module (PCM) and to the shift and throttle system. The joystick can rotate, move forward and back, and side to side. Combinations of these movements give the operator precise control of the vessel's direction and speed.



Pump control module (PCM)

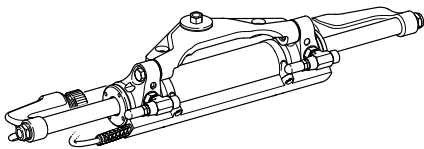
The PCM receives wheel movement messages from the helm(s) and operates the hydraulic steering pumps to steer the vessel as required. The PCM uses position feedback from the SmartCylinders for precise steering control and fault detection. The PCM can also respond to inputs from a certified autopilot system.



Power steering pumps

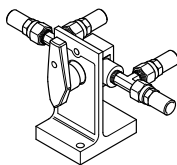
The power steering pumps supply pressurized fluid to the SmartCylinders in order to steer the boat. The PCM controls a DC motor that drives a small gear pump. The pump assembly has an integral fluid reservoir and pressure relief valves.

The steering pumps have an integral service valve that can be opened to bypass the pumps 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 a single outdrive, or up to two outboard engines 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 Optimus 360 System Diagram

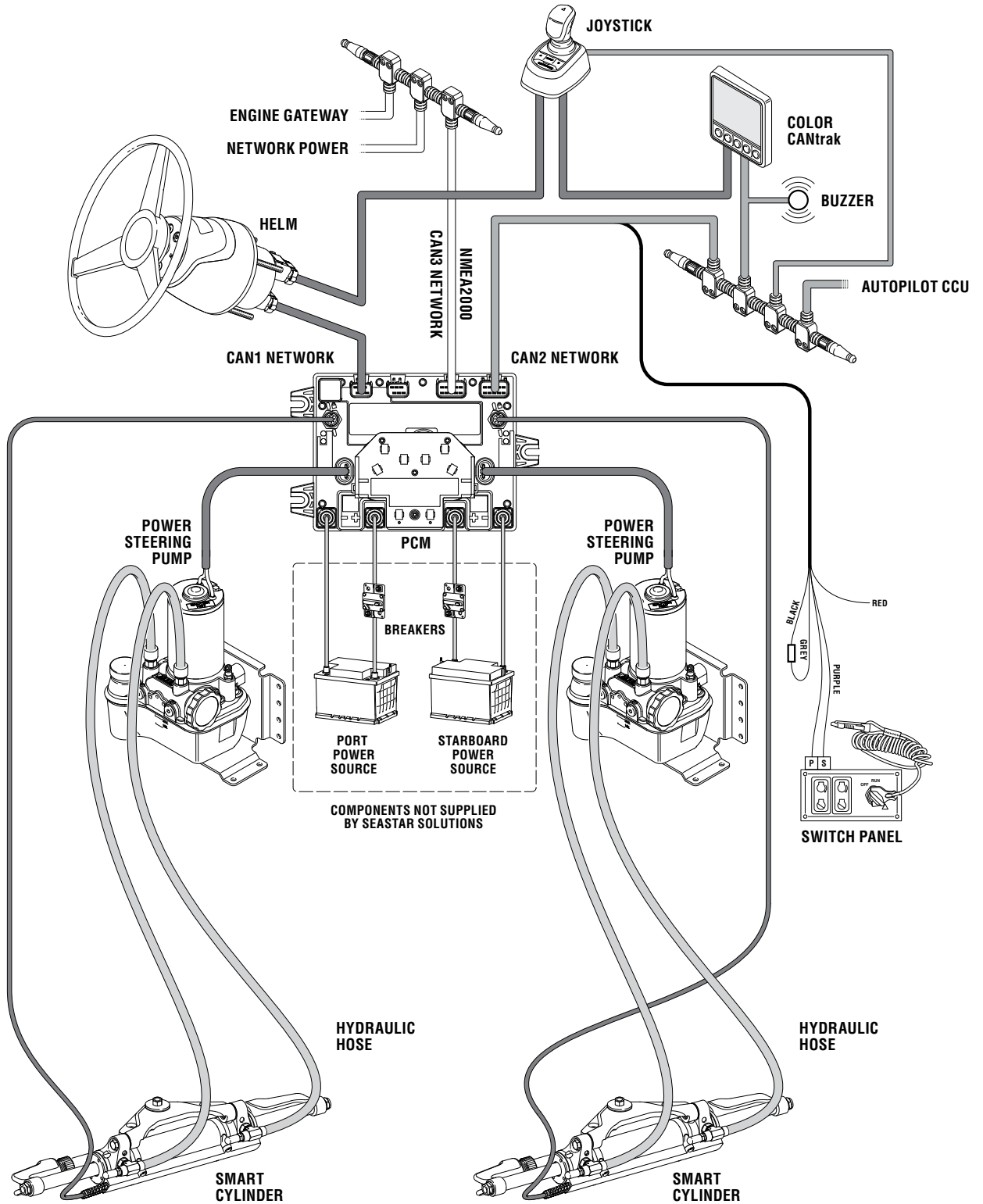


Figure 2-1. Optimus 360 system diagram, single station, twin engine.

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3.0 FIRST TIME OPERATION

Before operating your boat for the first time after the installation of the Optimus 360 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 System Components

3.1.1 Electronic Helm(s)

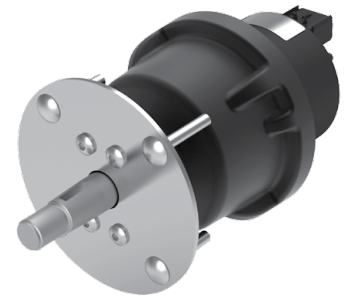
The steering wheel is attached to this unit, which may be located immediately under the wheel or just behind the dash panel. The images below show the available helm styles.

⚠ 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 Control Head (EST System)

The control head (or remote control) is the primary user interface for conventional shift and throttle control. It operate the throttle and gear shift for each engine.

For detailed control head operation, refer to your engine manufacturer's installation manual.



Figure 3-2. Example Control Head shown.

3.1.3 Joystick

The joystick is the primary user interface for joystick control. It interfaces with the steering system and with the shift and throttle system. It integrates the two systems together to provide intuitive vessel control from a single device. The joystick can only take control of the vessel when the control head is at neutral idle.

See Section 6.0 for detailed Joystick operation.



Figure 3-3. Joystick.

3.1.4 Circuit Breakers for Optimus 360 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.

3.1.5 Pump Control Module (PCM)

The PCM is located in a dry area and can usually be found inside the center console, in the area behind the dash, or in a compartment near the engines or batteries. The PCM is always located close to the steering pumps. There will be one PCM on most boats (except for some triple and quad engine configurations that use two PCMs).

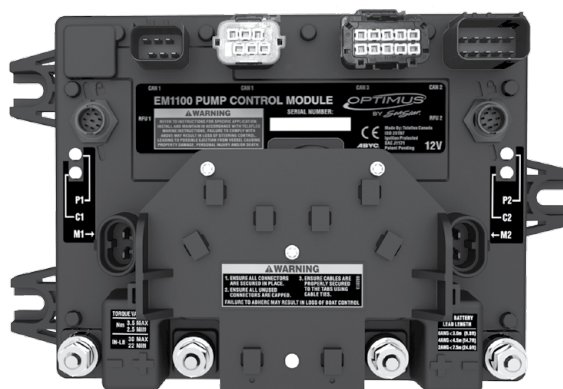


Figure 3-4. Pump control module.

3.1.6 Hydraulic Steering Pumps

The hydraulic steering pumps supply pressurized fluid to the SmartCylinders to steer the engines, and are located near the PCM. They can usually be found in a compartment near the engines, the center console, or behind the dash. There is one pump for each steering cylinder. The steering fluid reservoir is mounted directly to the pump; it is here that you will check the fluid level and add steering fluid as necessary.

Note: these pumps look similar to the trim pumps that tilt the engines. They can be distinguished by the integrated steering service valve.

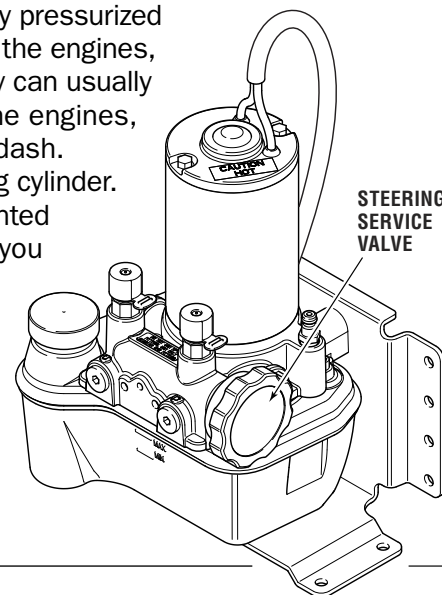


Figure 3-5. Hydraulic pump and reservoir.

3.1.7 SmartCylinders

Outboards: mounted to the engine tilt tube just below the engine cowling.

Sterndrives: located just inside the transom on the starboard side of the outdrive.

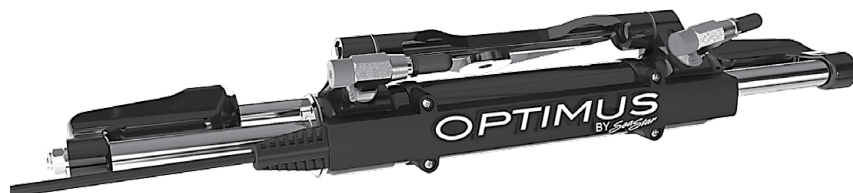


Figure 3-6. Outboard SmartCylinder with sensor.

3.1.8 Steering Service Valves

⚠ WARNING

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

The steering service valves permit the bypass of the EPS system and allow the engines to be manually positioned. They should only be used in the event of an EPS system failure, in which case instructions will be given on the CANtrak.

The service valves are integrated into the power steering pumps. 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 3-7.



Figure 3-7 Remote steering service valve.

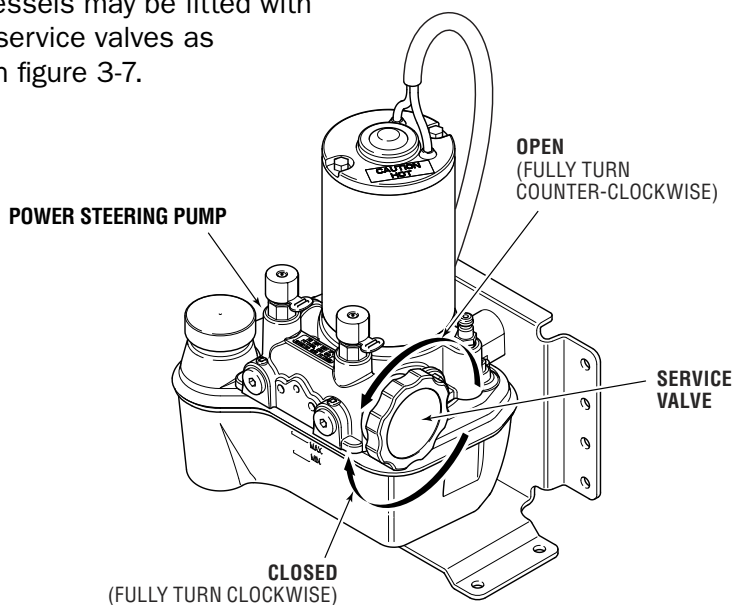


Figure 3-8. Service valve location.

3.1.9 CANtrak Display

A color display at the 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 3-9. 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 all steering pumps.

Each Optimus hydraulic pump has a steering fluid reservoir. Ensure the fluid level is between the MIN and MAX marks on the reservoir as shown in figure 3-10. 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 engines (or outdrives/rudders) follow the commands. Watch that the hoses and cables move freely without any snags or hang-ups.

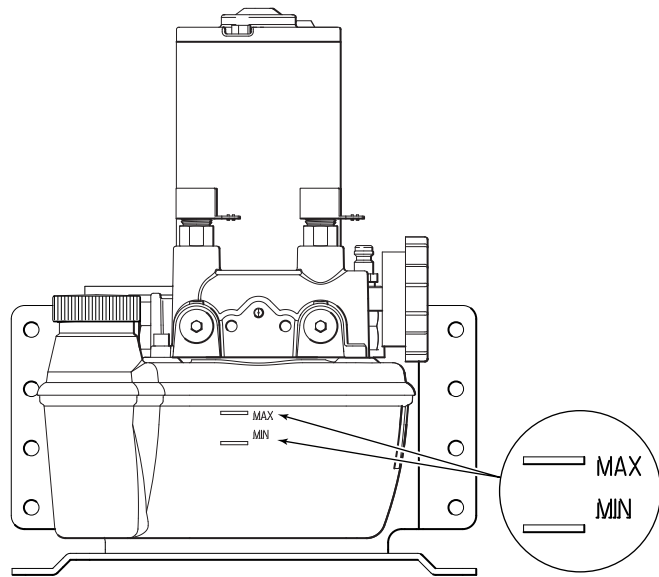


Figure 3-10. Location of fluid level marks.

⚠ 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 or dash panel.

If any warnings are found, follow the instructions on the CANtrak screen or refer to Section 7 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.

1a. Outboard Interference Checks – Confirm that there is no interference between the steering cylinder(s), splashwell, outboard engine(s), tie bars, or any combination of these parts, by performing the steps below. For each step also check that the hoses and harnesses are moving freely with no rubbing or binding (see figure 3-11 and figure 3-12). Be sure to steer slowly while performing these checks.

- i) With the engine(s) fully tilted DOWN, turn the steering wheel from hard over to hard over and confirm that no interference occurs. Repeat with engine(s) fully tilted UP.
- ii) Trim the port engine(s) fully DOWN and the starboard engine(s) fully UP. Turn the steering wheel from hard over to hard over and confirm that no interference occurs. Repeat, reversing the trim position of the engines.
- iii) Ensure all combinations of trim/tilt and steering do not cause interference.

1b. Sterndrive Interference Checks – Confirm that the steering cylinders move through the entire steering range with no interference. Check that hoses and harnesses move freely with no rubbing or binding.

⚠ WARNING

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

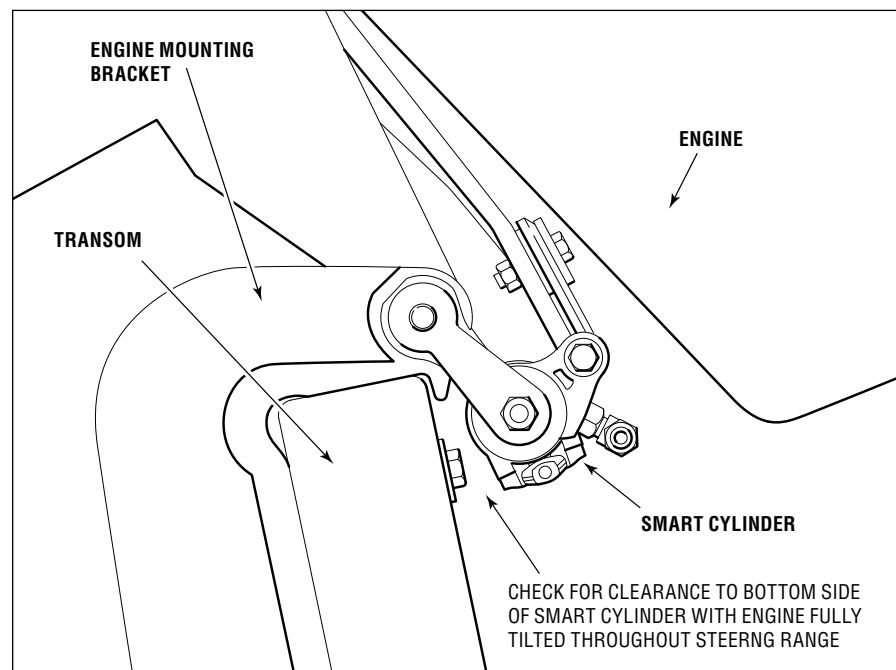


Figure 3-11. Engine side view when tilted.

2. Sensor cable – Confirm that the SmartCylinder Sensor Cable is tied securely to the hoses with gradual bends as shown figure 3-12.

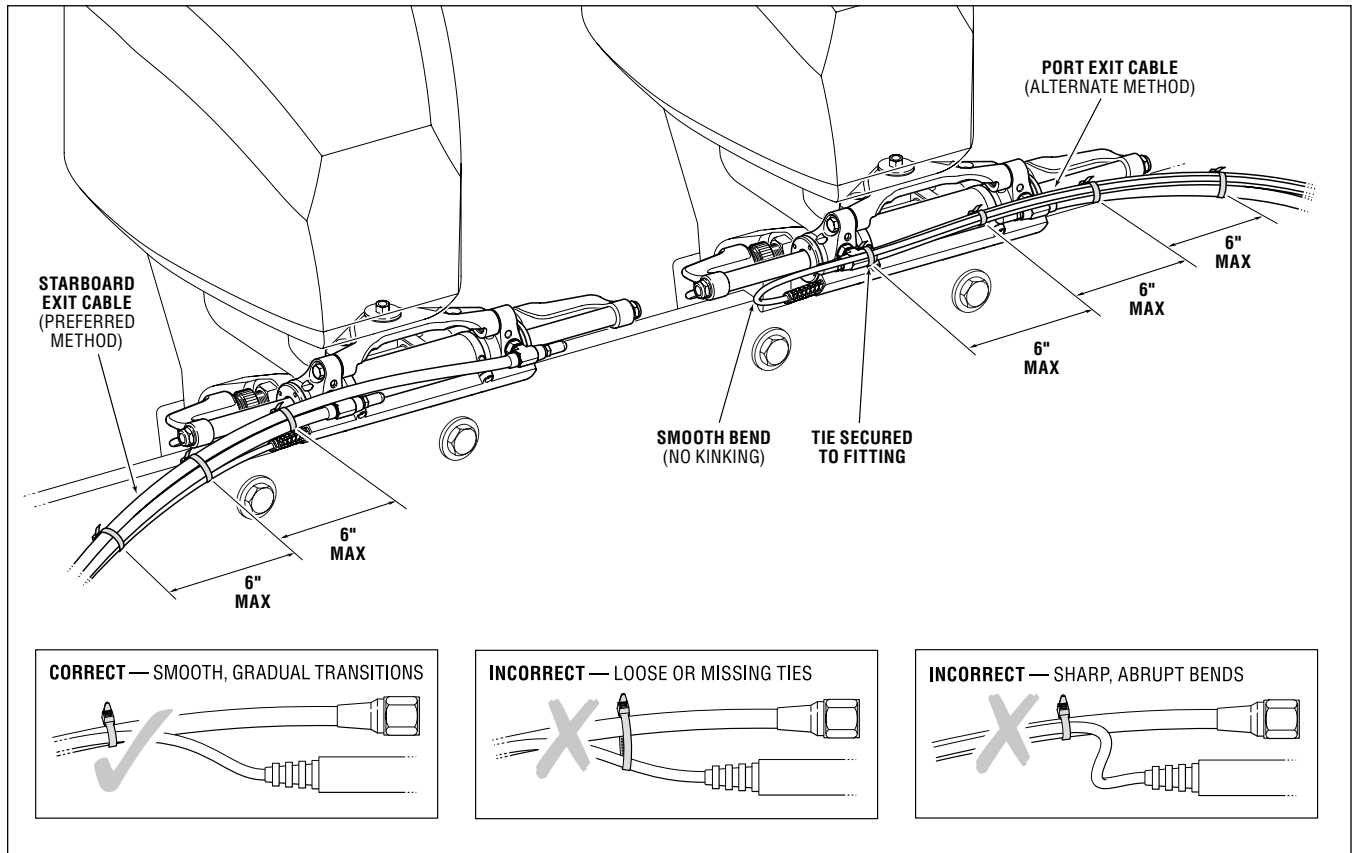


Figure 3-12. Sensor cable and hose routing checks.

3.4 Initial Sea Trial

With the engine lanyard properly connected to you, and any passengers securely seated, 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 and control 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.

CAUTION

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

Be sure to spend some time becoming comfortable with each of the following:

Steering – Check at various speeds and different rate turns.

Joystick – Try all the various modes and using both primary and secondary actions.

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

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4.0 BASIC SYSTEM OPERATION

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. Remove steering lock clips (see Appendix B) if they have been installed for trailering or storage (outboards only).
2. Check steering fluid level in all steering pumps.
3. Verify immediate steering response when turning steering wheel(s).
4. Inspect all steering hoses, fittings and mechanical and electrical cables for wear, kinks, or leaks.
5. Check for binding, loose, worn or leaking steering or shift/throttle control components.
6. Verify proper shift and throttle response for all control levers.
7. 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 Steering System Operation

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

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 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 Control Head Operation

WARNING

BE VERY CAUTIOUS WHEN FIRST ENGAGING THE GEARS TO ESTABLISH THAT FORWARD IS TRULY FORWARD AND REVERSE IS TRULY REVERSE. A QUICK IN-AND-OUT OF GEAR TEST IS RECOMMENDED. ENSURE THAT THE BOAT IS CLEAR OF ALL OBSTACLES FORWARD AND AFT BEFORE CONDUCTING THIS TEST.

The control head is the primary user interface for conventional shift and throttle controls. Please ensure you are familiar with the specific operation of your electronic shift and throttle (EST) system before use. Refer to the engine manufacturer's user manual for details.

Your Optimus 360 joystick control system is designed to work with a variety of different EST systems provided by different engine manufacturers. Each engine manufacturer will have their own unique transfer routine to switch from joystick control back to conventional shift and throttle control. Refer to the table below for your specific transfer details.

Always put the joystick in its neutral position before transferring control.

Engine Manufacturer	Transfer to control head	Indication of transfer
Evinrude	Press + button on control head	1. Joystick blue lamp(s) turn OFF* 2. Control head lamp(s) turn ON
Suzuki	Press Select button on station control panel	1. Joystick blue lamp(s) turn OFF* 2. Select LED turns ON
Yamaha	To control head at active station: Move the control head levers out of neutral OR Press Take Command on the active joystick to toggle control back to the control head. To control head at another station: Press Station Selector on the Yamaha panel.	1. Joystick blue lamp(s) turn OFF* 1. Control head lamp(s) turn ON
Yanmar – BY2 Engine	Press Take Command button on control head	1. Joystick blue lamp(s) turn OFF* 2. Control head lamp(s) turn ON

* A steady red lamp indicates transfer when the joystick is not operational due to a system fault.

Table 4-1. Transfer Control back to Control Head.

4.4 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 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.

4.5 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.

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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.

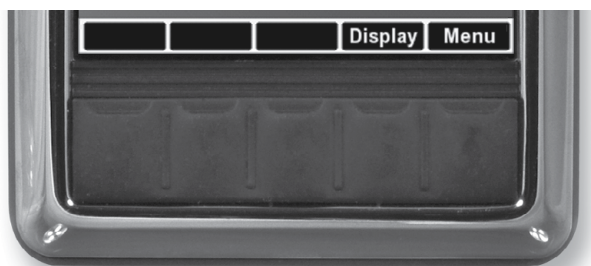






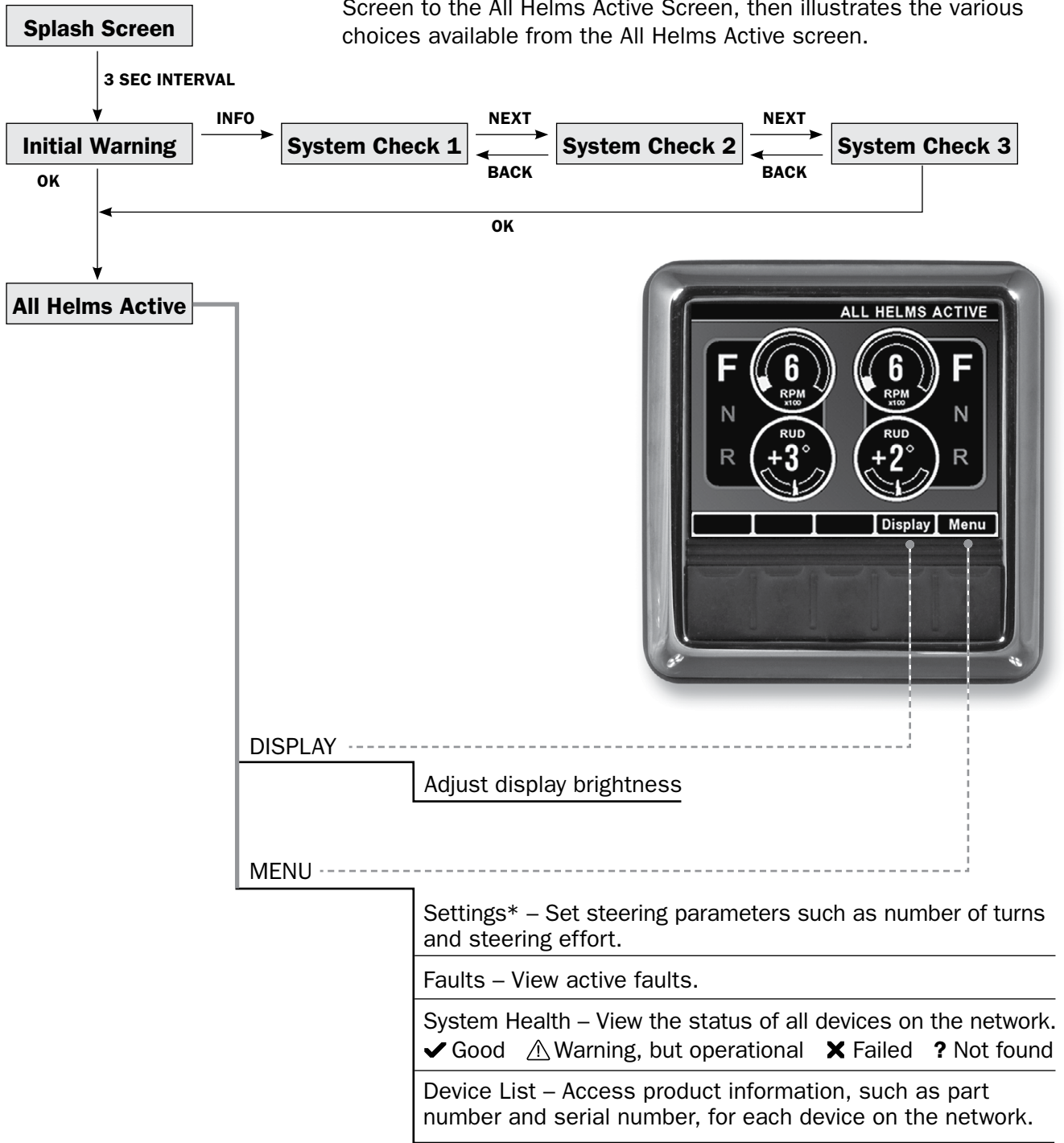


Figure 5-2. Navigation buttons and legend.

WORD OR SYMBOL	IDENTIFIES A FUNCTION OR SETTING
	Moves the cursor up the screen to the next item.
	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.



* 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 engine RPM, rudder angle, and legends for the Display and Menu buttons.



Figure 5-4. All Helms Active screen.

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.

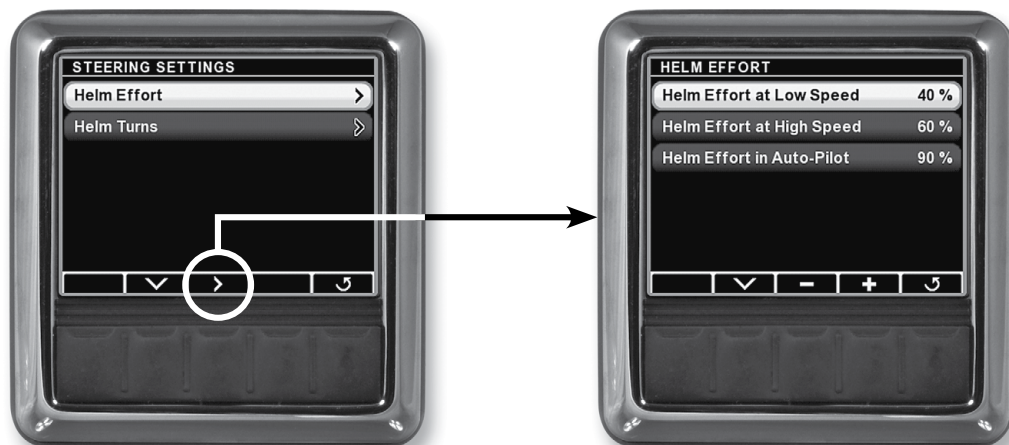


Figure 5-5. Steering Settings .

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

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.

⚠ CAUTION

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

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.

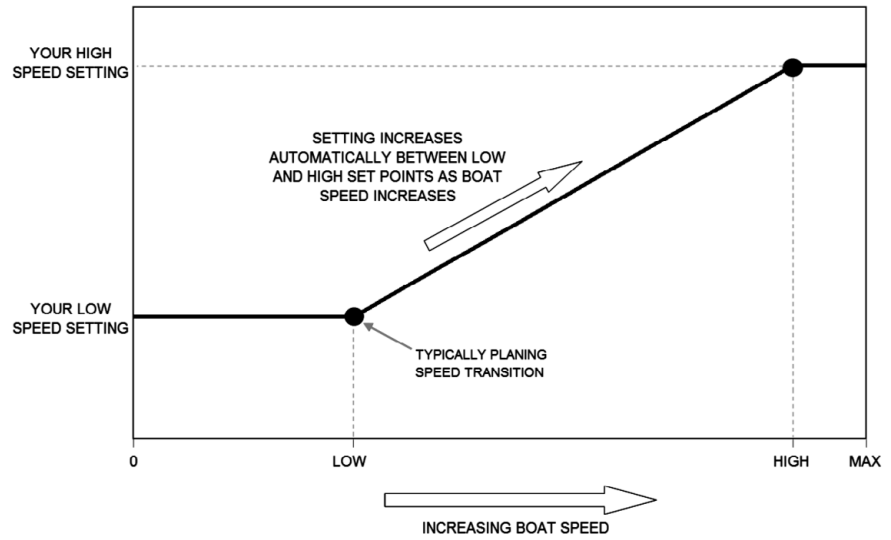


Figure 5-6. Change of helm settings with speed.

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 JOYSTICK OPERATION

The joystick is the primary user interface for the Joystick Control System. It offers the ultimate control of the vessel for docking and maneuvering at slow speeds and is especially useful in confined or difficult circumstances. It is intuitive to use, as the boat follows the actions of the handle. This section of the manual gives a detailed description of all of its capabilities and how to get the maximum benefit from this powerful feature. The Optimus 360 Joystick Quick Reference Guide, provided with the system, gives summary and reminder information on its operation and should be kept on the vessel at all times.

The joystick is spring loaded so it always returns to its center position. When the joystick is active and in the center position, the engines are in neutral and the throttles are at idle.

The joystick Take Command button will make the joystick active when it is pushed. The shift and throttle controls must be in neutral to engage the joystick. When the joystick is active, the Take Command light will be solid blue. Consult Section 5 for transferring control back to conventional shift and throttle.

While the joystick is active, the turning resistance of the steering wheel will increase to remind the user that it is disengaged.

The Boost button increases the engine RPM when pressed. It may be activated any time the joystick is active.

Note: The A and C buttons are reserved for future use and not active at this time.

NOTICE

While the joystick is active the turning resistance of the steering wheel will increase to remind the user that it is disengaged.

6.1 Joystick Fundamentals



Handle Motion

The handle can be moved in any direction or rotated left or right. When released the joystick will always snap back to center and put the engine in neutral idle.

Moving the handle away from center or rotating it will cause the engines to shift into the correct gear for the desired motion. Further handle motion in the same direction will apply throttle and provide more thrust in the chosen direction. The joystick is proportional and guided in each axis.

Boost Button

Increases the power the engines can apply and may be turned on or off at any time. It can be very handy when handling the boat in wind or current. The system will remember the boost mode status so if it is left on, it will be on again next time the joystick is activated.

A blue LED on the Boost button will illuminate when in boost mode.

Take Command Button

Activates the joystick and allows the joystick to take control of the vessel. To take control with the joystick, press **Take Command** with both control head levers in the neutral position.

Note: If your boat has Yamaha engines you can only take command with the joystick at an active control station. To transfer to joystick control at another station, you must first press the Yamaha **Station Selector** button to activate the control station.

The LED on the Take Command button is used to indicate joystick status:

LED State	Joystick Status
Off	joystick is inactive
Steady blue	joystick has control of the vessel
Slow flashing blue	joystick is initializing rudder and EST system
Alternating red and blue flashing	joystick has control of the vessel, but there is an active non-critical warning fault*
Fast flashing red	joystick has a critical fault* and is awaiting transfer of control to a control head
Steady red	joystick has a critical fault* and is not available for operation

* See section 7 for fault handling information.

Figure 6-1.

A and C Buttons

Reserved for future use. Not active at this time.

6.1 Joystick Fundamentals (continued)

Operation Fundamentals

The levers on the active control head must be in the neutral position before a joystick may take command of the system.

1. The joystick has three primary operational modes (see illustrations next page):

a) **Forward/Reverse** – engaged by pushing the joystick directly fore/aft.

Causes the boat to move directly fore and aft. In this mode, the boat can be steered by rotating the handle. Always engage the Forward/Reverse Mode by moving the handle directly fore/aft **then** rotating the handle to steer. Rotating the handle first **then** pushing fore/aft would enter Rotation Mode and apply a forward correction in rotation mode.

b) **Sideways** – engaged by pushing the joystick directly to port or starboard.

Causes the boat to move directly sideways. In this mode, the handle can then be moved fore/aft or rotated to correct the vessel's heading or position.

c) **Rotation** – engaged by twisting the joystick while it is at center position.

Causes the boat to rotate on the spot. A fore/aft handle movement **after** engaging rotation mode will cause the boat to rotate but with a forward or reverse bias. Always engage Rotation Mode first then apply the desired correction. Pushing the handle fore/aft **then** twisting would cause the system to enter Forward/Reverse mode with a steering correction.

2. When released, the joystick always returns to the center position, which provides neutral-idle for engines.

3. The joystick is proportional and guided in each axis - the more the joystick is moved, the more throttle is applied.

See the following pages for examples of each of the primary operational modes.

WARNING

IN THE EVENT OF AN ENGINE STALL, ONLY THE FORWARD/REVERSE MODE IS AVAILABLE. RESTART STALLED ENGINE OR SWITCH TO CONVENTIONAL CONTROLS.

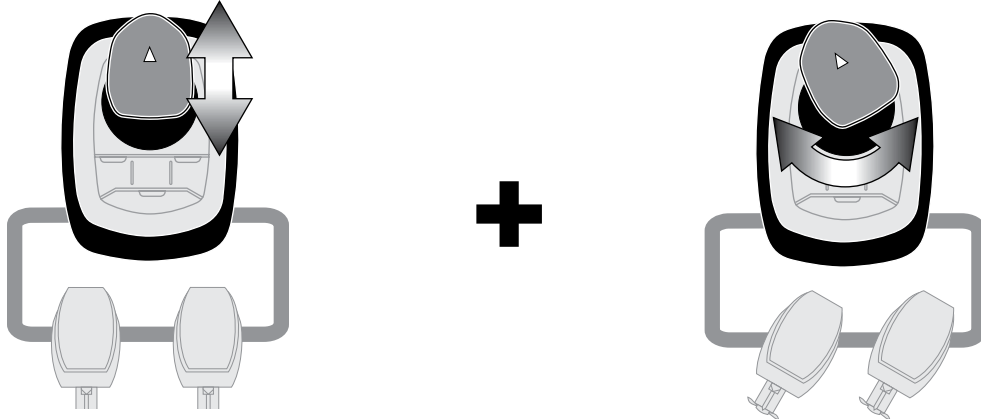
6.1 Joystick Fundamentals (continued)

PRIMARY MOTION – FORWARD/REVERSE

CORRECTION – ROTATE TO STEER

Figure 6-2.

a)



PRIMARY MOTION – SIDEWAYS

CORRECTION – ROTATE TO BIAS HEADING

Figure 6-3.

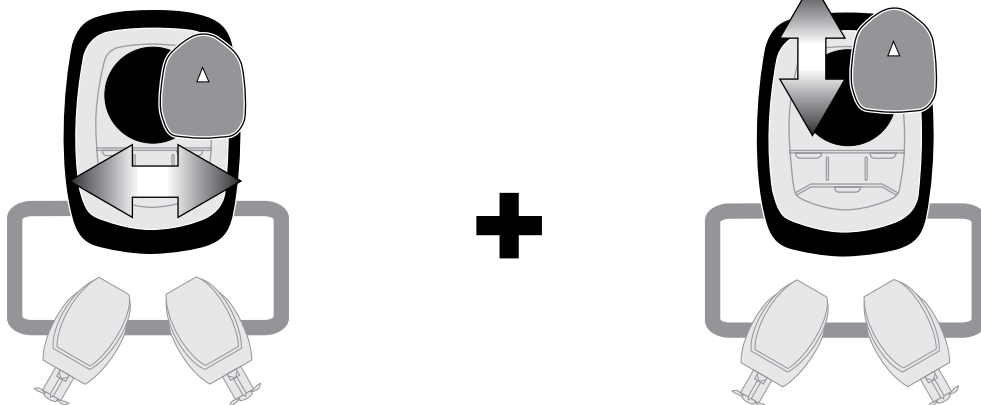
b)

PRIMARY MOTION – SIDEWAYS

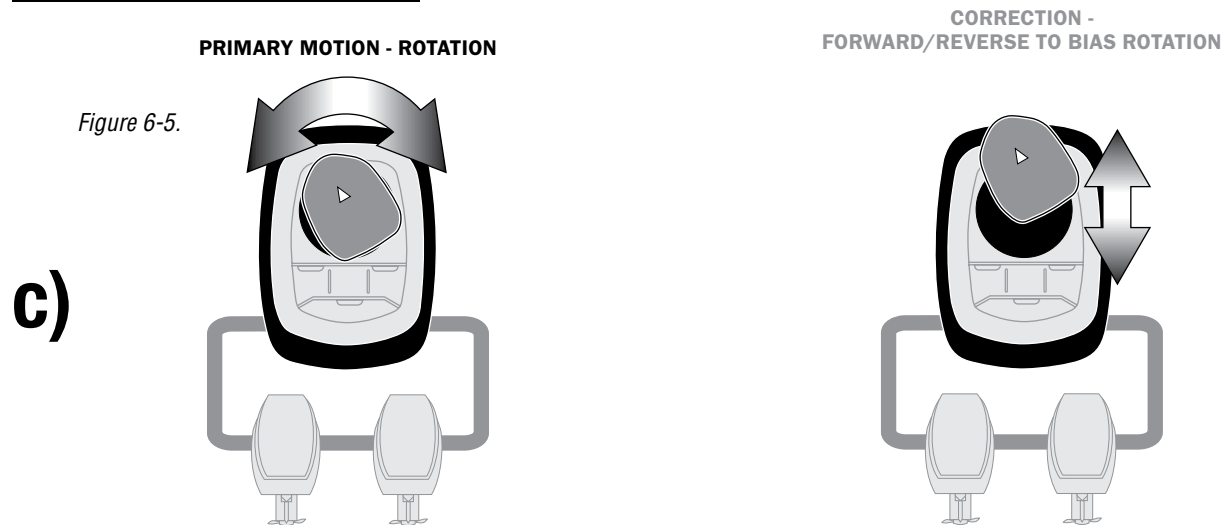
OR

CORRECTION – FORWARD/REVERSE TO DIAGONAL

Figure 6-4.



6.1 Joystick Fundamentals (continued)



6.2 Joystick Tips

1. Plan out your joystick maneuvers before you approach your target:
 - a. Keep it simple - Minimize diagonal and other complex maneuvers. This allows for better boat correction and control.
 - b. Know your boat's limitations – Be aware of wind and current, and understand the boat's movement delay due to its momentum. Some conditions may prove too strong for your engine thrust.
2. Make it clear to the system what you want to do. Do not make slight movements off of the neutral position. For example: If you want the boat to move to port, move the joystick well along the port axis.
3. Moving the handle port/stbd will move the boat sideways, but will not steer the boat (change heading). Twisting (rotating) the handle steers and rotates the boat (see illustrations previous page).
4. It is recommended to return to the center position when switching between primary operational modes.
5. Practice joystick maneuvers in open water before attempting close quarters docking. This will help you understand the primary operational modes and how they control your boat.
6. There is a momentary shift delay built into the system when returning from any gear activity to neutral. This allows bumping the handle to get a little more motion in the same direction without causing excessive engine shifting. This delay is removed if the action passes the home area in the opposite direction so you can stop the boat immediately if needed.
7. The control head must be active at the helm station with the joystick that will be used and the control handles must be in neutral and idle at that station.

6.3 Joystick Operation Examples

Example 1

Make the primary action move first and then adjust the boat motion with a secondary joystick motion. Example: the boat is parallel to the dock and you wish to move the boat against the dock. This is like parallel parking a car.

1. Move the boat forward or backward with direct forward or backward joystick motions until the boat is stopped and centered in the location on the dock you wish to approach.
2. Return the joystick to the center position.

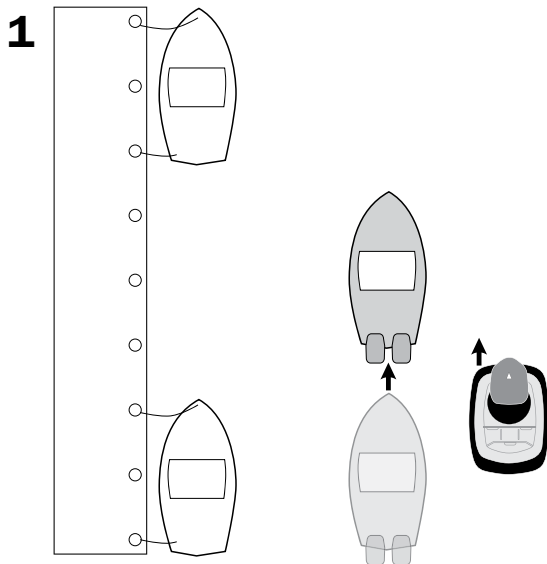


Figure 6-6.

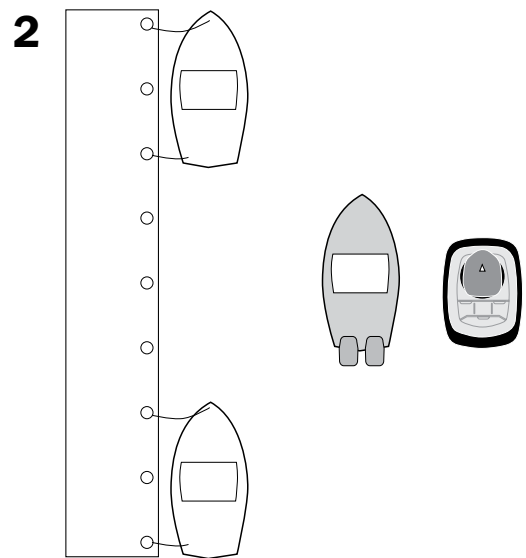


Figure 6-7.

3. Move the joystick directly port to approach the dock.
 - 3a. If the boat does not stay parallel due to wind or current while holding the joystick to the side just rotate the joystick to keep the boat parallel to the dock during the approach.
 - 3b. If the boat does not stay centered due to wind or current while holding the joystick to the side, just push or pull the joystick fore/aft to correct.
4. Once close to the dock, return the joystick to the center position.

6.3 Joystick Operation Examples (continued)

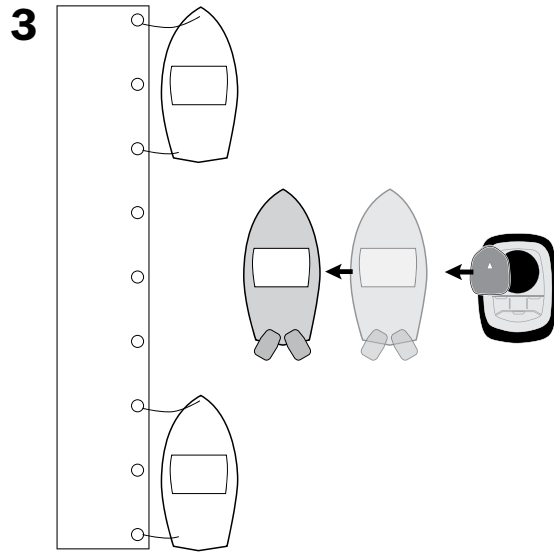


Figure 6-8.

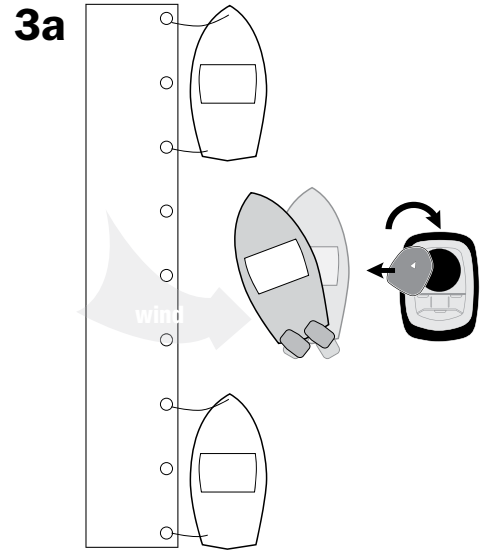


Figure 6-9.

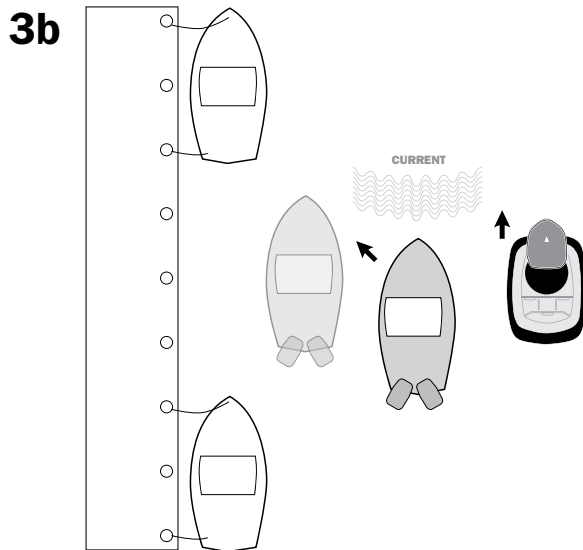


Figure 6-10.

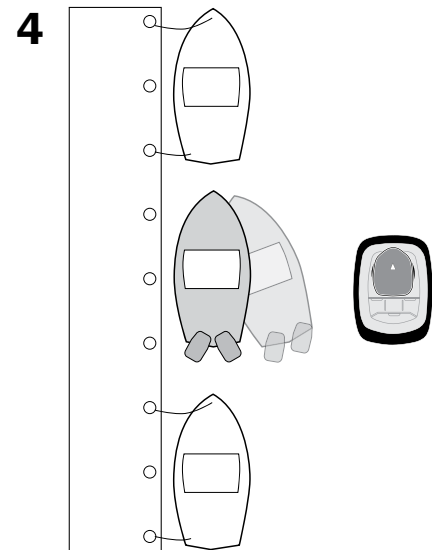


Figure 6-11.

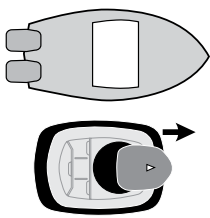
6.3 Joystick Operation Examples (continued)

Second Example

1. Move the boat forward by pushing the joystick forward.
2. With the joystick forward and the boat moving forward rotate the joystick as needed to correct for wind or current. Return the joystick to the home position as you near the slip.
3. As the boat approaches the slip pull the joystick backwards to stop the boat in front of the slip. Return the joystick to the home position when the boat stops.

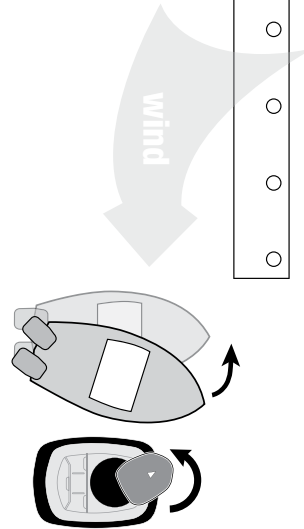
1

Figure 6-12.



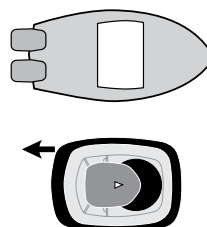
2

Figure 6-13.



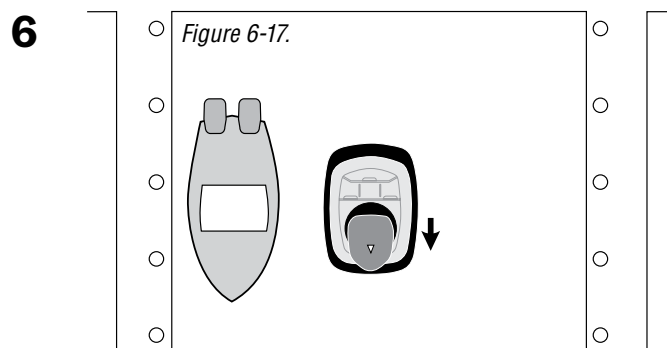
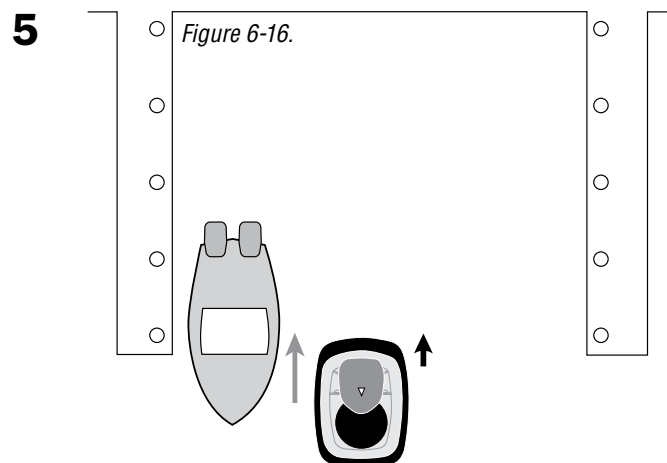
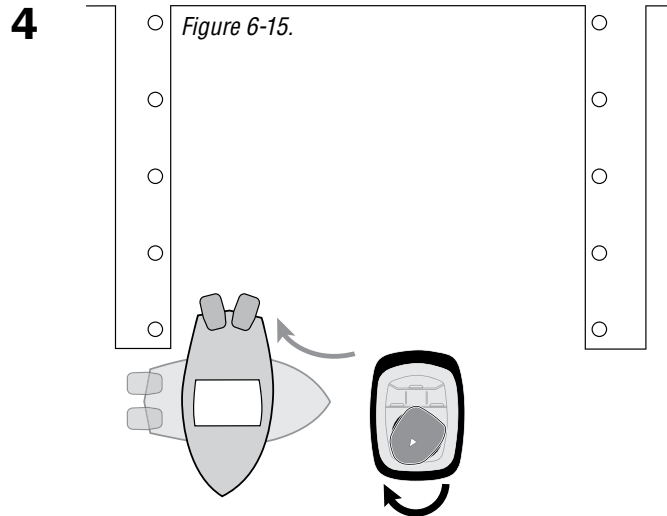
3

Figure 6-14.



6.3 Joystick Operation Examples (continued)

4. Rotate the joystick to turn the boat and align it with the slip. Use a straight port or starboard move of the joystick if necessary to realign the boat.
5. Pull the joystick back to move the boat into the slip.
6. A short bump forward on the joystick will stop the boat in position.



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7.0 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.

Note that in this section all references to “engine” may be interpreted to refer to the outdrive in sterndrive boats.

7.1 Hazard Definitions

7.1.1 Danger

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

Depending on the nature of the fault, steering will either be restricted to one engine or suspended completely. The engines may need to be manually realigned and the vessel steered using the shift and throttle.

7.1.2 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.

7.1.3 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.

7.2 System Fault Handling – CANtrak

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

7.2.1 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 7-1.

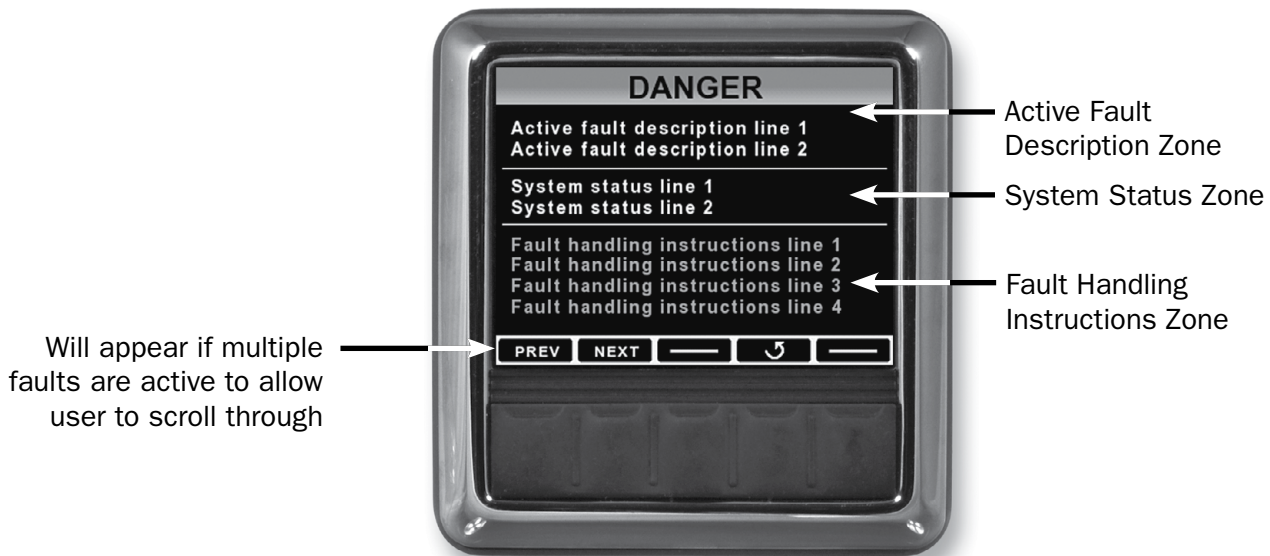


Figure 7-1. Danger fault screen layout.

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.

7.2.2 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 engine(s) 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.

There are two Limp Home modes depending on the nature of the fault.

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 PFDs AND LANYARD. REFER TO THE NOTICE IN SECTION 7.0.

Limp Home Mode 1

This mode occurs when the system can no longer provide steering to ANY of the engines. The CANtrak will instruct the operator to manually center the engines using the service valves, then proceed to port immediately using the shift and throttle controls to steer the vessel.



Figure 7-2. Limp home instructions, all steering disabled.

7.2.2 Limp Home continued

Limp Home Mode 2

This mode occurs when one of the steering cylinders is not functional. This means that one engine (or two in a triple or quad system) cannot be steered. The CANtrak will instruct the operator to realign the non-responsive engine(s), tilt it out of the water and proceed to port immediately using the responsive engine(s).



Figure 7-3. Limp home instructions, no steering on one engine.

7.2.3 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 7-4. 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 7-4. 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.

7.2.4 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 7-5. Sample warning fault.

7.2.5 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, proceed as follows:

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.

Limp Home Mode 1 – No steering is available			
Multiple Outboard or Sterndrive Engines	Multiple Inboard Steering Cylinders	Single Outboard or Sterndrive Engine	Single Inboard Steering Cylinder
Steering is disabled. <ol style="list-style-type: none"> Put all engines in neutral. Open steering service valves. Center all engines or outdrives. Close steering service valves. Return to port using throttles to steer. 	Steering is disabled. <ol style="list-style-type: none"> Put all engines in neutral. Open steering service valves. Center the rudders. Close steering service valves. Return to port using throttles to steer. 	Steering is disabled. <ol style="list-style-type: none"> Put engine in neutral Open steering service valve. Center the engine or outdrive. Close steering service valve. Return to port. Seek assistance when possible. 	Steering is disabled. <ol style="list-style-type: none"> Put engine(s) in neutral. Open steering service valve. Center the rudder. Close steering service valve. Return to port. In a multi-engine vessel use throttles to steer. Seek assistance when possible.
Limp Home Mode 2 – One of two steering cylinders is disabled			
Multiple Outboard or Sterndrive Engines	Multiple Inboard Steering Cylinders		
Affected engine steering disabled. <ol style="list-style-type: none"> Put all engines in neutral. Open steering service valves. Turn affected engine(s) or outdrive fully away from other. Close steering service valves. Fully tilt affected engine(s) or outdrive. Return to port on one engine. 	Affected rudder steering disabled. <ol style="list-style-type: none"> Put all engines in neutral. Open steering service valve of affected rudder. Center the affected rudder. Close service valve of affected rudder. Return to port on other rudder. 		

Table 7-1. Limp home modes and instructions.

7.3 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 7.2.1.
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 7.2.3.

All signals require immediate attention.

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

7.4 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. When this happens the CANtrak 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.

7.5 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.

8.0 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.

8.1 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.

After every use:

1. Rinse the SmartCylinders with clean, fresh water and replace the CANtrak sun cover.

DO NOT rinse the PCM or the pumps.

8.2 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 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. Remove support rod from engine steering/tilt tube. Clean engine steering/tilt tube and re-grease using a good quality marine grease.
3. Grease support rod liberally.

4. Grease all contact points shown in the figure below. DO NOT remove the tiller bolt to re-grease.
5. Remove the steering wheel(s) and re-grease the wheel shaft(s) using a good quality marine grease.
6. Inspect hydraulic oil for cleanliness; flush if required.
7. 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.

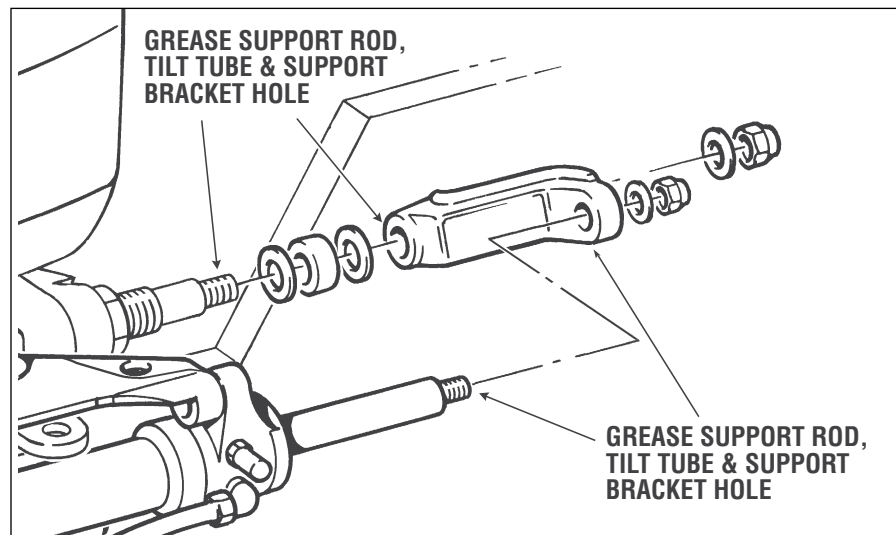


Figure 8-1. Grease points on cylinder mounts.

8.3 Replacement Parts

8.3.1 SeaStar Electronic Power Steering Fluid

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

Quart HA5482

For a comprehensive listing of part numbers, please refer to the Optimus 50 Installation Manual, part no. 682100.

9.0 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	SOLUTION
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.
3. One engine does not steer, but CANtrak display is on.	Check circuit breaker for the engine.	Reset breaker. If it immediately trips a second time look for a shorted or pinched wire or failed component.

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APPENDIX A – SPECIFICATIONS

Optimus EPS System Specifications

Operating voltage	12 VDC nominal
Current draw, average	8A per battery feed, 16A total
Current draw, maximum	55A per battery feed, 110A total
Circuit breaker rating	60A (per battery feed)
System pressure, working	500psi (3.4 MPa)
System pressure, maximum	1000psi (6.9 MPa)
Number of wheel turns	Variable from 3.5 to 8
Steering angle, outboard and sterndrive	Up to 30° in each direction
Steering angle, inboard	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 1.5qt (1.4 l) per cylinder/pump pair
Hose type	SeaStar Pro hose (1500psi working pressure)

APPENDIX B – TRAILERING AND STORAGE

When trailering or storing an outboard boat equipped with an Optimus EPS system, install the steering lock clips to all steering cylinders as shown below. These clips keep the engines from drifting, preventing contact with other components which may result in scuffing or cowl damage. Simply center the engines and snap the clips over the cylinder shafts to install.

WARNING

ENSURE STEERING LOCK CLIPS ARE REMOVED BEFORE OPERATING BOAT. FAILURE TO REMOVE STEERING LOCK CLIPS WILL RESULT IN NO STEERING CONTROL.

Alternatively, or if the clips are not available, steer the engines all the way to one side after tilting them up. The weight of the engines will keep them from shifting.

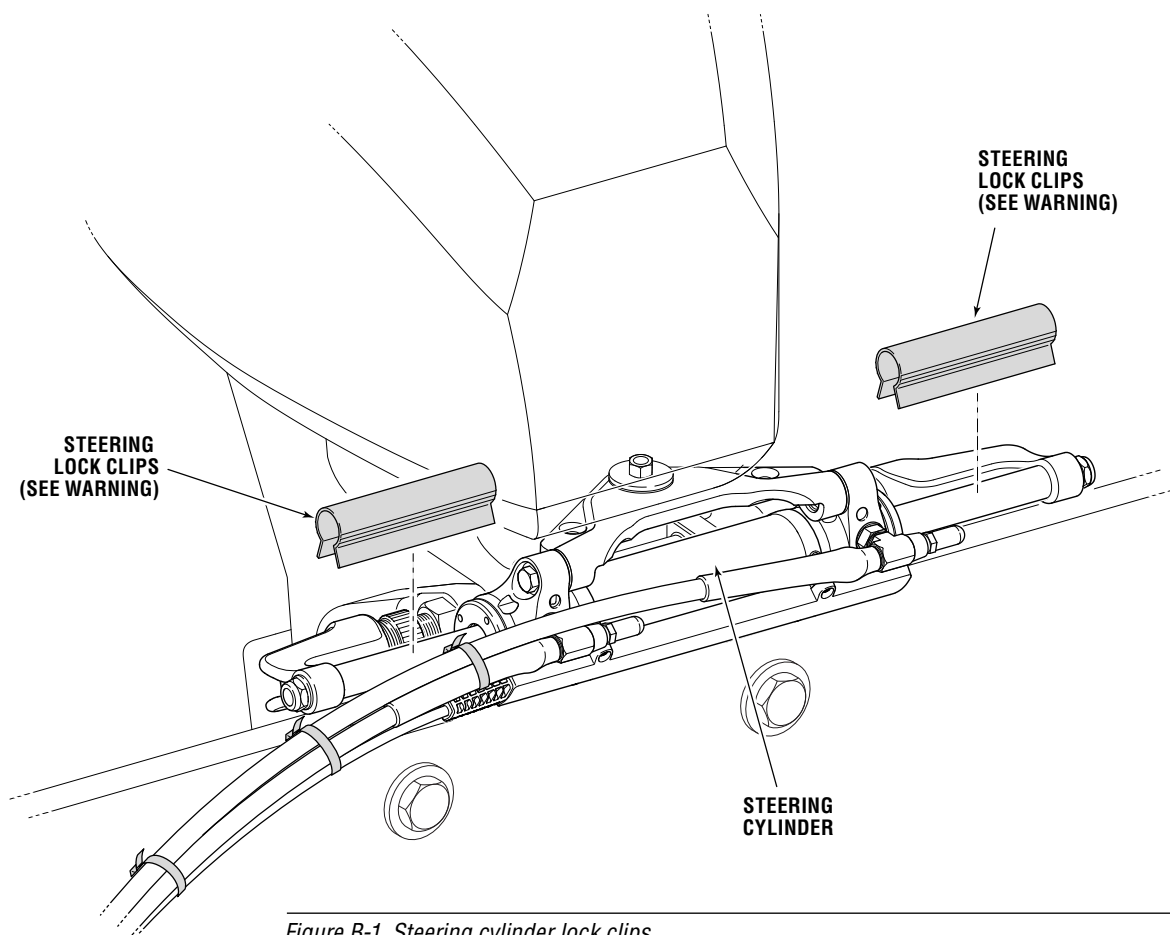


Figure B-1. Steering cylinder lock clips.

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



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