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OPTIMUS EPS
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INSTALLATION MANUAL

OPTIMUS EPS / EST / 360

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OPTIMUS EPS
BY SEASTAR

OPTIMUS 360
BY SEASTAR

System Setup & Configuration Guide



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

About this Book

This book will show you how to set up and configure:

- the Optimus EPS system.
- the Optimus 360 joystick control system.
- the OEM electronic shift and throttle gateway.
- the SeaStar i7700 EST system.

Use it in conjunction with:

- the installation manuals included with the components of your system.

Deliver this book to the customer when the installation is complete.

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Abbreviations

BCM	Boat control module (Suzuki)
CAN	Controller Area Network
CCW	Counterclockwise
CL	CommandLink (Yamaha)
CL+	CommandLink Plus (Yamaha)
CP	Center port
CS	Center starboard
CW	Clockwise
DEC	Digital Electronic Control (Yamaha)
EST	Electronic shift and throttle
F or Fwd	Forward
LED	Light emitting diode
LPS	Lever position sensor
Max	Maximum
Min	Minimum
MST	Mechanical shift and throttle
NMEA	National Marine Electronics Association
PCM	Pump control module
PPR	Pulses per revolution
PTS	Power Train Sync
R or Rev	Reverse
ROT	Rotation
RPM	Revolutions per minute
SDS	Suzuki Diagnostic System
SOG	Speed over ground
SOW	Speed over water
SPC	Suzuki Precision Control
STBD	Starboard
TPS	Throttle position sensor
USB	Universal serial bus
WOT	Wide open throttle

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1.0 INTRODUCTION

1.1 Safety Information

⚠ WARNING

THE SAFETY INFORMATION PROVIDED HERE IS INTENDED TO INFORM YOU OF THE DANGERS THAT MAY BE PRESENT BEFORE, DURING, AND AFTER INSTALLATION. IT IS CRITICAL THAT YOU READ AND UNDERSTAND THIS INFORMATION.

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.

Before Installation

1. Read and understand all installation and user's manuals provided with the steering components.
2. Ensure that all components required to complete the installation are on hand (including hoses, fittings, oil, and the proper tools).
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.
4. DO NOT use a wheel-mounted, coiled cord trim switch. The cord can wrap tight around the steering wheel shaft and inhibit steering.

During Installation

1. Install system components as directed in this and all related system manuals. Some component parts and kits (such as hoses and fitting kits) are supplied with additional installation instructions—refer also to these instructions.
2. 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.
3. If an instruction is unclear, contradictory, or you are otherwise uncertain how to proceed, do not guess. Call SeaStar Solutions technical support.

After Installation

1. Check that there is no interference between the steering cylinder(s), transom, hull, tiller, tie bar (if applicable) or any other component over the full stroke of the cylinder(s). Steer slowly while performing these checks.
2. Check that the steering cylinder can be fully stroked in both directions, without stretching, chafing rubbing, or kinking of the hydraulic hoses and electrical harnesses.
3. Check that only SeaStar Pro steering hose (1500psi rating) has been used to plumb the system.

Prior to every use

Perform a system inspection as outlined below. Refer to section 8 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, mechanical cables, and electrical harnesses 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 handles.
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.

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 who is not familiar with the operation of the steering system to operate the boat at any time.
4. If boat is equipped with multiple helms, ensure that only one is used at a time.
5. 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.

After use

If the SmartCylinder(s) have been exposed to salt water, rinse them thoroughly using only fresh, clean water.

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.

⚠ WARNING

FAILURE TO COMPLY WITH ANY WARNING, NOTICE OR CAUTION MAY LEAD TO LOSS OF STEERING CONTROL RESULTING IN A COLLISION AND/OR EJECTION FROM THE BOAT LEADING TO PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

1.1.1 Safety Alert Levels

This guide will use the safety alerts shown below to call attention to hazards related to setup tasks and system configuration parameters.

⚠ 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.

1.2 Scope

This guide covers system setup and configuration of the following SeaStar Solutions systems:

- Optimus EPS
- Optimus 360 for mechanical engines
- Optimus 360 for electronic engines
- i7700 EST

Setup and configuration with the CANtrak color display is emphasized. Reference to the appropriate configuration page in Datalink will be made, but explicit Datalink instructions are not given.

Mechanical component installation and electrical connections are not covered in this guide; refer to the correct installation manual for your system. This guide assumes that the mechanical and electrical installation is complete, with the following exceptions:

- i7700 actuator configuration must be performed before the cable installation is completed.
- Steering cylinder purging may be best performed before installation of the support brackets or tiller connection is complete.

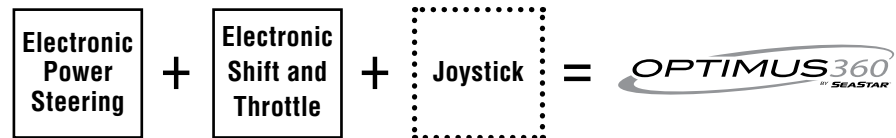
A note on terminology used in this guide:

The Optimus EPS system has been developed for outboard engines (from singles up to quads), sterndrives (singles or twins), and inboards with single rudders, dual rudders with tiebars, and dual independent rudders. To keep the text simple we will often use the word *engine* interchangeably with *cylinder*, *outdrive*, or *rudder*. So when you see *engine* it could equally refer to a sterndrive or rudder in such a system.

1.3 Overview

1.3.1 Modular System Approach

It is helpful to think of the installation and setup in terms of modular building blocks. Those with solid outlines can be installed as independent, standalone systems.



Electronic Power Steering

Optimus EPS is the base steering system. It can be installed as a stand alone steering system or be used in combination with other systems.

Electronic Shift and Throttle

An engine will have one of two types of shift and throttle control: cable operated (MST) or electronically operated (EST).

MST Engines

The SeaStar Solutions i7700 system is an electronic shift and throttle (EST) solution for MST engines. It can be installed as a standalone system, or in combination with EPS and joystick to provide joystick docking control.

EST Engines

An Optimus 360 system controls the shift and throttle on an EST engine through an EST Gateway or, in some cases, direct connection to the OEM shift and throttle network. We will often refer to this as an “OEM EST” system to differentiate it from the i7700 EST system.

Joystick

A joystick can be added on to a system that includes both electronic steering (Optimus EPS) and electronic shift and throttle control (i7700 or OEM EST). It cannot be installed as a standalone device.

1.3.2 Parameter Types

Optimus EPS, Optimus 360, and i7700 EST are electromechanical systems controlled by onboard microprocessors and embedded software (also referred to as firmware). The software uses configurable parameters to tailor system performance to each installation.

There are three parameter types:

User Parameters

These parameters allow some flexibility for the end user to adjust the system to their preference. They can be viewed and changed with the CANtrak display. (A standalone i7700 EST system does not have any user parameters.)

Dealer Parameters

These parameters are used for system setup, configuration and tuning, and are the subject of this guide. They are accessed through the passcode-protected Dealer menus on the CANtrak display or through Datalink.

Engineering Parameters

These are general system parameters set by SeaStar engineering and they do not need to be adjusted for specific applications. The Engineering parameters are not accessible through the CANtrak display and require a special license key to access in Datalink. In this guide you will learn about User and Dealer parameters and how to configure them correctly for your system.

1.4 How to Use this Book

Safety first! Always familiarize yourself with the important safety information presented in section 1.1. Even if you've installed an Optimus EPS/EST/360 system before, we recommend that you read through the installation manuals and this setup guide to review and understand the hazards and risks.

At this stage you should have completed the installation of your system components to the point where you are ready to turn the ignition on. Now you're ready to set up and commission the system.

Step 1 – Understand the CANtrak, Dealer Menu, and Fault Handling

If you haven't installed a SeaStar Optimus system, or need a refresher, review the information in section 2, section 3, and section 10. You should understand:

- how to navigate through the menus on the CANtrak display
- the menu navigation instruction conventions used in this Guide
- the Dealer Menu and the menu structure
- how the CANtrak displays Danger and Warning faults.

Step 2 – Perform the Initial Setup in Section 4

Step 3 – Perform the System-specific Setup

The table below will guide you through the setup and configuration steps for your specific system.

System Type	Setup and Configuration Steps
Optimus EPS	<ol style="list-style-type: none">1. Section 5: steering system setup2. Section 8: commissioning and sea trial
Optimus EST	<ol style="list-style-type: none">1. Section 6: i7700 shift and throttle setup2. Section 8: commissioning and sea trial
Optimus 360 with i7700 Actuators	<ol style="list-style-type: none">1. Section 5: steering system setup2. Section 6: i7700 shift and throttle setup3. Section 8: commissioning and sea trial4. Section 9: joystick setup and sea trial <p>Note: Always sea trial the steering system before proceeding to set up the joystick.</p>
Optimus 360 with OEM EST	<ol style="list-style-type: none">1. Section 5: steering system setup2. Section 7: OEM electronic shift and throttle setup3. Section 8: commissioning and sea trial4. Section 9: joystick setup and sea trial <p>Note: Always sea trial the steering system before proceeding to set up the joystick.</p>

Table 1-1.

2.0 SETUP TOOLS

2.1 CANtrak Display

The CANtrak display is an easy-to-use tool for system configuration, updating device software, and for purging and calibrating the steering cylinders in an Optimus EPS/360 system.

The CANtrak is a dash-mounted component in most Optimus EPS and Optimus 360 systems. It is available separately as a setup tool (EPSK1207) for use with standalone i7700 EST and single-engine EPS systems that do not come with a display.

2.1.1 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 will indicate the legend for each button. These legends vary based on what is on the screen.

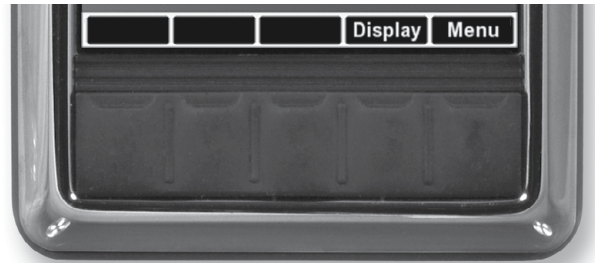








Figure 2-1. Navigation buttons and legend.

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.

2.1.2 Menu Navigation Conventions

To keep the instructions in the manual as simple as possible, we will use some simple conventions to describe the navigation through the menus. By using these conventions we can easily direct you through several levels of the menu structure.

Bold text Indicates actions that you take on the display. These actions may be button presses, or they may be menu or parameter names.

Capitalized Plain Text Refers to menu and parameter names when describing them.

> When used with the word “press”, refers to the button under the **>** symbol. When chained together with text, it is guiding you to select the next item in the chain.

Examples: Press **Save** to save changes and return to the Settings menu.

Navigate to **Dealer Menu > Initial Setup > Steering** to access the System Setup menu.

Let’s look closely at the second example, illustrated in figure 2-2.

Dealer Menu tells you to start from the Dealer Menu.

> Initial Setup tells you to highlight the Initial Setup menu item and press **>** to enter the menu.

> Steering tells you to highlight the Steering item and press **>** to enter the menu.



Figure 2-2.

You’ll notice that you needed to use the down navigation arrow to select Steering on the Initial Setup screen. You will frequently need to use the up and down arrows to select menus and parameters, but these actions will not be explicitly described.

2.1.3 Initial Startup

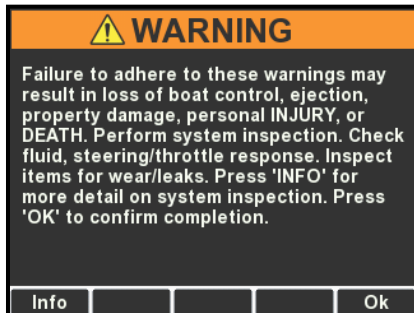


Figure 2-3.

When the system power is turned on the CANtrak will display a splash screen, followed by an initial warning screen that prompts the user to perform a system inspection. Press **Info** to step into a set of system inspection prompts.

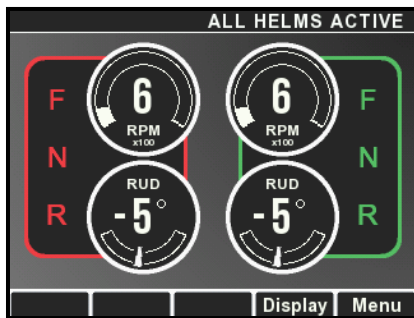


Figure 2-4.

If you've already performed a pre-trip inspection, press **OK** to continue. This will take you to the main run screen (also called the All Helms Active screen). If you press **Menu** from the main run screen you will see menus available to the user. (The screen shown is for an Optimus 360 system with joystick – the screen will be different for other systems.)

Note: every time the system is powered on the CANtrak conducts a software revision level check, during which the Menu button will not be displayed. The Menu button will appear once the check is completed; this may take several seconds.

2.1.4 Unlocking the Dealer Menu

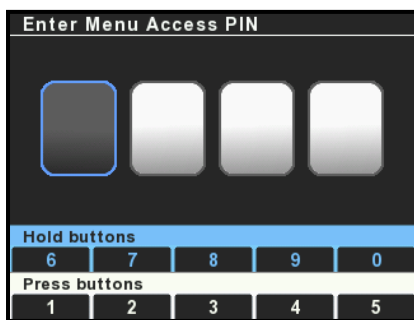


Figure 2-5.

All setup and configuration tools are reached from the Dealer Menu, which authorized installers can access with a four digit PIN code (if you don't have a code contact SeaStar Solutions technical support). From the main run screen, press and hold **Menu** until you see the PIN entry screen.

Use the buttons to enter your four digit PIN code. Press the buttons briefly for digits 1-5, press and hold for digits 6-0.

If you enter the code incorrectly you will exit the screen and be placed into the user menu. Press and hold **Menu** again to get back to the PIN entry screen.

Once you have entered the correct code you will go directly to the Dealer Menu. You won't need to enter the code again unless you cycle system power.

NOTICE

The Dealer Menu can be unlocked when faults are active. Faults are suppressed during setup and system updates.

2.2 Datalink

Datalink is a Windows®-compatible software tool that is used for system setup and configuration. These functions can be performed with the CANtrak display, but experienced users may find it quicker to use Datalink for these tasks.

To use Datalink you will need the following:

- A Windows®-compatible computer with Datalink installed on it. See section 8 for information on how to download and install the latest version of the software.
- Dealer setup kit EPSK1206, which contains the following:
 - An IXXAT USB to CAN converter, part #214720
 - Programming harness, 6-pin FCI to serial, part #CM21010
 - Programming harness, DeviceNet to serial, part #CM21106

2.2.1 Connection – CAN1

⚠ WARNING

ALWAYS REINSTALL THE CAN1 SEALING PLUGS WHEN YOU DISCONNECT THE PROGRAMMING HARNESS.

Connect the IXXAT converter to a USB port on your computer, and connect the sub-D connector on harness CM21010 to the IXXAT. Plug the other end of harness CM21010 into an available CAN1 port on the helm or the PCM as shown in figure 2-6. If you don't have any spare ports an optional wye harness (CM21702) is available that can convert a single port into two.

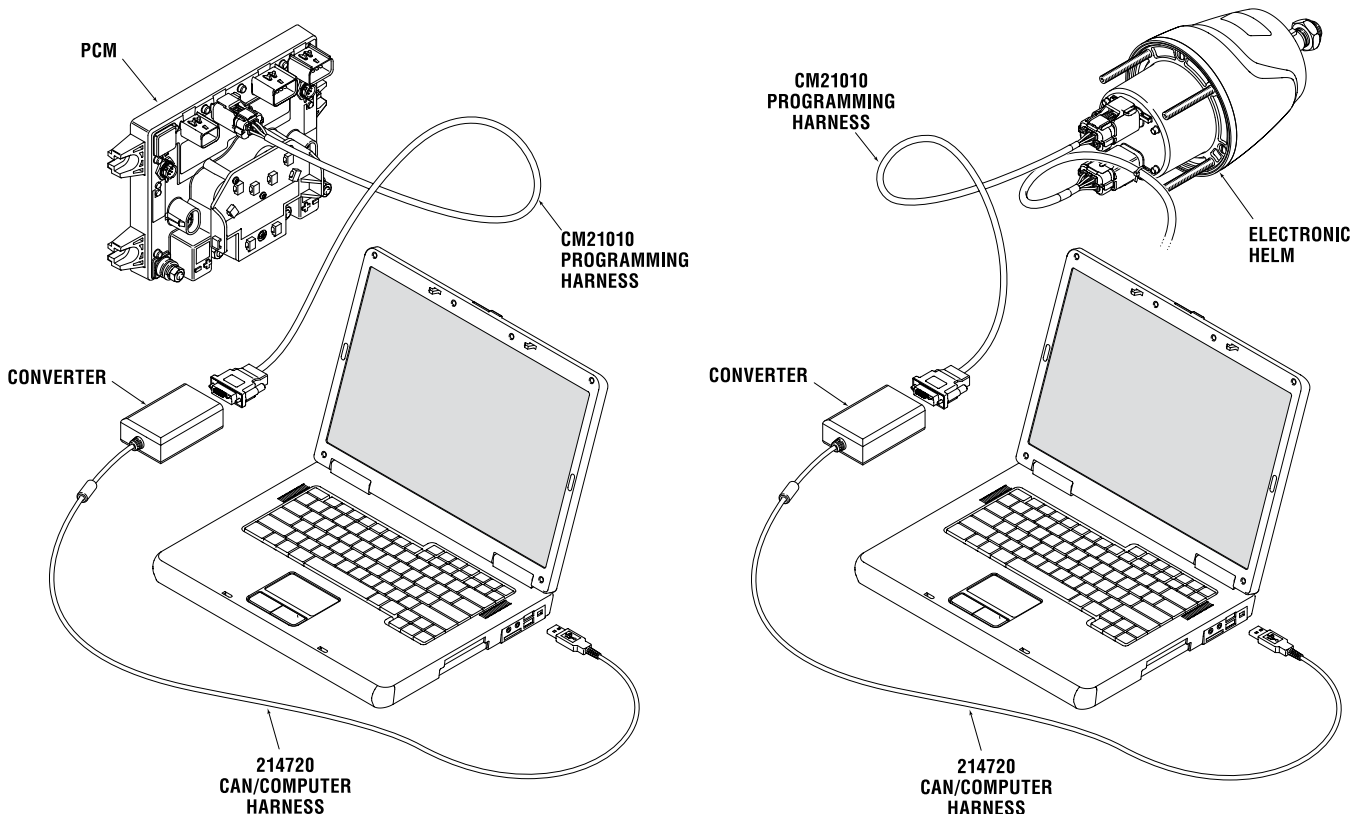


Figure 2-6. Connecting programming computer to CAN1.

2.2.2 Connection – CAN2

Some components, like the SeaStar i6800 control head, can only be accessed through the CAN2 network. Connect your computer as shown in figure 2-7. You may need to add a network tee (CM10060) to get an available connection point.

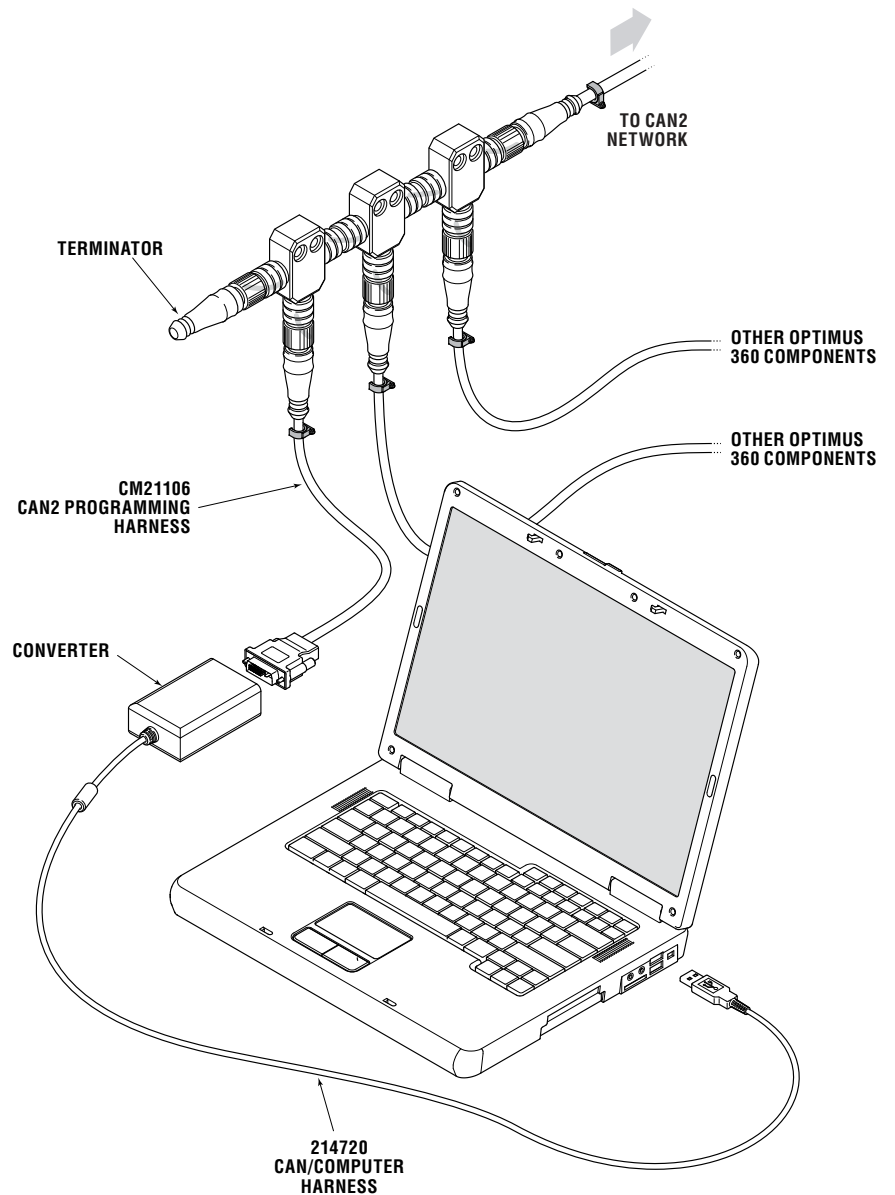


Figure 2-7. Dealer Kit connection.

2.2.3 Navigating Datalink

When you run the Datalink software it will open up with a window similar to the one shown in figure 2-8.

At the very top of the display is a series of pull-down menus that access various functions. Just below that is the toolbar, which contains buttons for the most commonly used functions.

The pane on the left is called the Workspace. It is your primary access point to the devices in your system. At the top of the workspace is a list of available Interfaces; these are the devices on the network defined by the selected protocol. In the figure you can see under Protocols that 'Optimus CAN2' is highlighted, so the list of Interfaces is a list of devices connected on the CAN2 network.

If you are connected to CAN1, double-click on 'Optimus CAN1' to bring up the connected devices. On an EPS system you should see only the Main PCM, your helm(s), and your display(s).

Double click on a device in the Interfaces list to open the configuration page for that device. Click Workspace in the toolbar at any time to bring up the **Workspace** window.

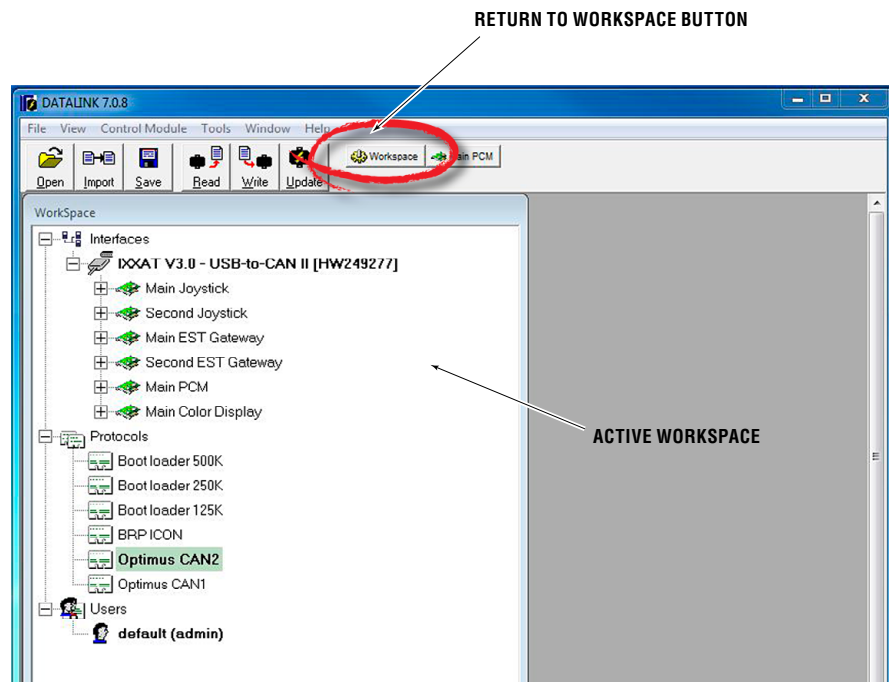


Figure 2-8. Datalink Workspace. Your available interfaces may not be exactly as shown.

When you change a parameter in Datalink you must click **Write** in order for the change to take effect. Click **Read** to get the current state of all the parameters from the device.

3.0 DEALER MENU

The Dealer Menu is the starting point for all setup and configuration activities. It is protected with a passcode – see section 2.1.4 for more information.

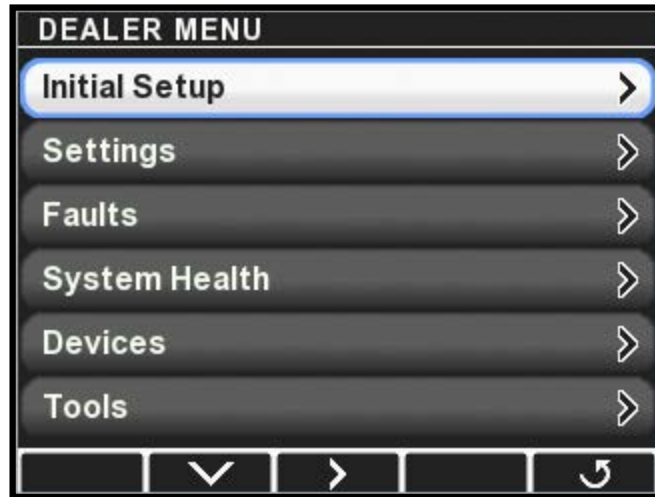


Figure 3-1.

- | | |
|------------------------|--|
| Initial Setup | All tasks related to the initial setup and commissioning of your system are found in this menu and its sub-menus. |
| Updates | Checks the revision level of all system components and prompts a software update when required. |
| Settings* | Lists all installed systems and provides access to the configuration parameters on a system basis. |
| Faults** | Displays all active system faults. |
| System Health** | Lists all system devices along with a health status icon. |
| Devices | Contains detailed information about all connected devices. Used to access all dealer parameters on a device by device basis. |
| Tools | Import and Export system settings. |

For Datalink users: there is no comparable function in Datalink. All configuration parameters are found in the various device interfaces.

* A limited version is available on the user menu.
** Also available on the user menu.

3.1 Menu Structure

The CANtrak display is built with smart menus. The options that are available to you will depend on the system type you set in the initial system setup. The menu structure is extensive, so rather than presenting a map of the entire structure we will highlight the key things you need to know.

Dealer Menu

The Dealer Menu is the base level menu for access to all of the setup tools. There are six submenus available from this screen.

Dealer Submenus

Shaded items are hidden on Optimus EPS (steering-only) systems.

INITIAL SETUP

1) System	Set system type, firmware update, set number of devices and their location, select RPM source.
2) Updates	Prompts the system to check for software updates.
3) Steering	Set cylinder types, purge and calibrate cylinders, set cylinder stroke limits.
4) Shift and Throttle	Adjust shift and throttle settings for Optimus 360 with i6800 EST system.
5) Yamaha EST Gateway	Configure EST gateway for Optimus 360 with Yamaha DEC engines.
5) Suzuki EST Gateway	Configure EST gateway for Optimus 360 with Suzuki SPC engines.
6) Joystick	Joystick tuning for Optimus 360.

SETTINGS

System	Control broadcast of RPM and gear selection on CAN3 (NMEA 2000)
Steering	Adjust steering parameters, such as helm effort and number of turns.
Shift and Throttle	Enable station protection and RPM sync, other settings. i6800 EST only.
Yamaha EST Gateway	Yamaha DEC engines only.
Suzuki EST Gateway	Suzuki SPC engines only.
Joystick	Fine tuning for joystick control.
Display	Control user access to steering adjustments.

FAULTS

Shows all active faults. A yellow hazard triangle in place of the > arrow indicates that an active fault is present.

SYSTEM HEALTH

Displays each connected device with a status icon to indicate health.

DEVICES

Lists all devices. From submenus you can find product serial numbers, configure and calibrate the device, monitor inputs and outputs, update firmware, and export or import device settings.

TOOLS

Import and export system settings.

NOTICE

The Dealer Menu can be unlocked when faults are active. Faults are suppressed during setup and system updates.

4.0 INITIAL SETUP – COMMON TO ALL SYSTEMS

The first step for all systems is the initial setup, in which you will specify the type of system you are configuring, as well as the number and location of the devices that are installed.

4.1 First-Time Power-up of the System

The first few times you turn on your system you will get a number of warnings and alarms. These warnings exist because the system has not yet been fully configured and calibrated. Silence the buzzer by pressing Mute on the display.

In some cases the active alarms will hide the Menu button, but it is always the right-most button under the display. Press and hold this button for five seconds to get access to the Dealer Menu PIN entry screen. See section 2.1.4 for more information.

4.2 Initial Setup

Initial Setup is performed from the System Setup screen. Navigate to **Dealer Menu > Initial Setup > System** and you will see the setup steps presented in order on the display. It is important to perform these steps in the order shown.

If you are unfamiliar with CANtrak display navigation, review section 2.1.

For Datalink users: the initial setup parameters are found on the Configuration tab of the Color Display interface. If you have two helm stations you will need to go to the interface for the second station helm and joystick to set them up as second station components.

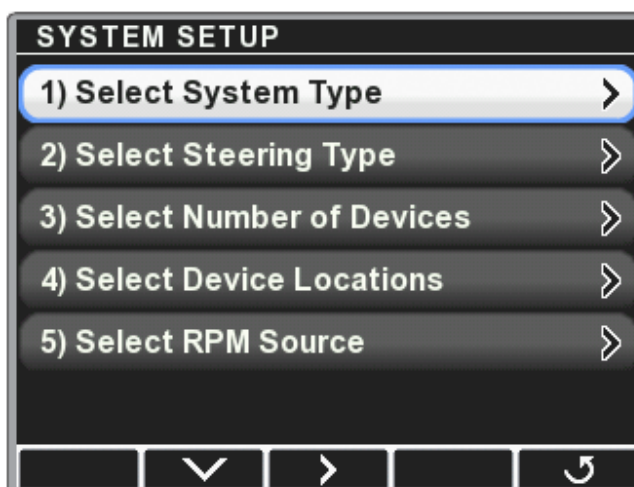


Figure 4-1.

4.2.1 Select System Type

There are four system types to choose from:

SYSTEM TYPE	DESCRIPTION
Optimus EPS	Standalone EPS system
Optimus EST	Standalone i7700 (or i6800) EST system
Optimus EPS + EST	EPS system with a standalone i7700 (or i6800) EST system
Optimus 360	Optimus 360 joystick control system

Table 4-1.

When the system type is selected the CANtrak automatically configures menus to show only items that are relevant to your system.

4.2.2 Select Shift & Throttle Type (Not displayed if system type is Optimus EPS)

The display will show a list of shift and throttle options compatible with the selected system type. Select the shift & throttle system you are using from the list.

4.2.3 Select Steering Type (Not displayed if system type is Optimus EST)

Choose your steering (cylinder) type from the list. The list will change based on the system type you selected in step 1, so you may not see all of the options listed below.

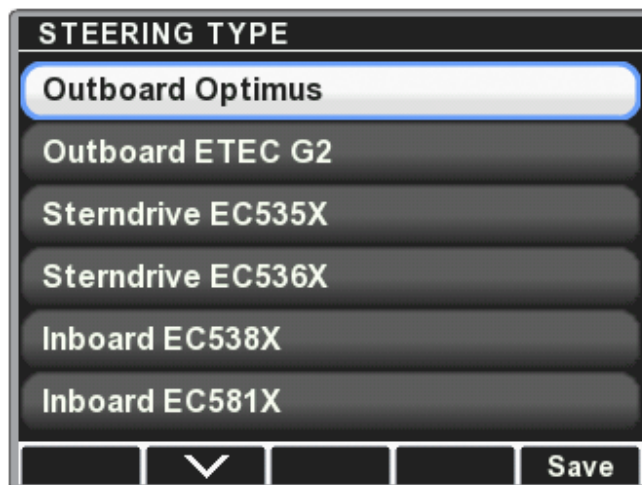


Figure 4-2.

Notes:

- If you are setting up a system with outboard engines of any type other than an Evinrude ETEC-G2, choose Outboard Optimus as your cylinder type.

- *If you are setting up an inboard or sterndrive system and you are unsure which cylinder you are using, check the carton label or the product identification label on the cylinder itself. Note that the 'X' in the part number denotes that the last digit of the number can vary while remaining the same cylinder type.*
- *The Steering Type sets a default system voltage. See section 4.3 for more information.*

4.2.4 Select Number of Devices

The CANtrak will display a list of devices based on the system type and shift/throttle type. Use the + and – buttons to change the quantity of each device to match the system.

These parameters tell the system how many of each device to look for on the CAN network. If the numbers do not match you will get repeated error messages from the display.

4.2.5 Select Device Locations

This step is only required when there are multiple helm stations or i7700 EST actuators in the system.

The CANtrak will list all of the devices on the CAN network along with their serial numbers. Match the devices by the serial numbers and use the + and – buttons to toggle the components between Main and 2nd (or 3rd in supported systems) station. You can ignore shift and throttle actuators, if present, as you will configure those in section 6.

4.2.6 Select RPM Source

Choose the engine RPM source from the list of RPM sources. Only sources that are valid for the selected system type will be displayed.

If you select an analog tachometer as the RPM source you will also need to enter the PPR value of the tachometer.

A special note about analog tachometers

When an analog tachometer reads zero RPM it is ambiguous whether an engine has stopped or the tachometer wiring has failed. For safety, the Optimus EPS/360 and the i7700 EST systems assume a wiring failure and set all speed-sensitive steering settings to the high speed settings.

In most cases this is invisible to the user, because when the engines are stopped they aren't trying to steer. The exception is when trolling with a small kicker motor. If the primary engine(s) is not running the steering settings will be set to the high speed setting. If a high speed rudder limit (section 5.6) is set the full steering range will not be available. Please consider this behavior when setting up the system.

4.3 System Voltage

The Pump Control Module (PCM) is designed to work with either a 12V or 24V power supply. When you select the steering type the default voltage is set as follows:

- Inboard EC538X: 24V. This cylinder type is generally used on large inboard vessels, which typically run on 24V power.
- All others: 12V. Most outboards, sterndrives, and small inboard vessels use a 12V source.

If the vessel's voltage matches this default you do not need to do anything. In the rare event that your system voltage does not match the default you will need to change the setting. On the CANtrak, navigate to **Dealer Menu > Devices > Main PCM > Configuration > Vessel > Battery Type** and press **+** or **-** to select the correct voltage. Press **Save** to accept the change.

4.4 Update System Software

The software pre-installed on your system devices is not compatible with all system configurations. Once the previous steps are complete the mass update function must be run to ensure that all components have compatible software revisions installed. In some cases you may need to update the CANtrak software before performing the update. See section 11.

From the Initial Setup menu, highlight **Update System Software** and press **>** to get to the Mass Update screen. Follow the prompts to update the system software.

5.0 STEERING SYSTEM (EPS) SETUP

NOTICE

Before starting the steering system setup you must have already completed the initial setup in section 4.

The setup steps in this section are required for all Optimus EPS and Optimus 360 systems. They are not required for a standalone i7700 EST system.

All the steering setup tasks are done from the Steering Setup menu at **Dealer Menu > Initial Setup > Steering**.

For Datalink users: All steering system setup parameters are found on the Configuration tab of the PCM interface.

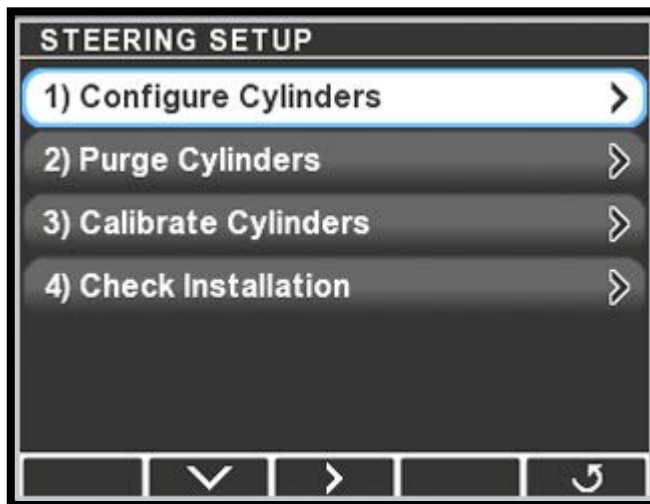


Figure 5-1.

5.1 Configure Cylinders (Inboard Only)

If you selected an inboard cylinder type during the Initial Setup you will see additional menu options in the Configure Cylinders screen.

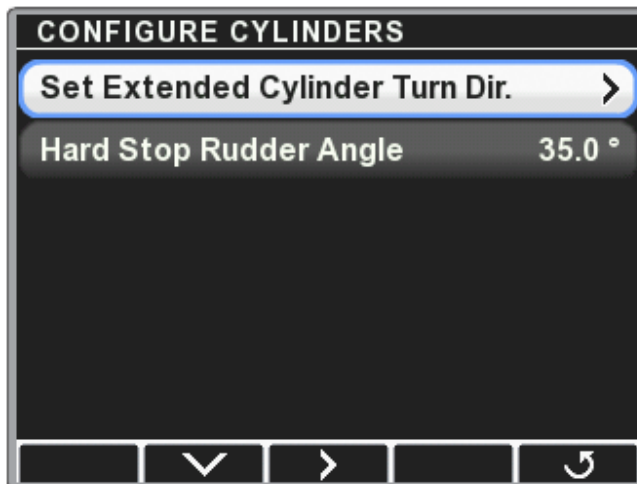


Figure 5-2.

Step 1 – Set Extended Cylinder Turn Dir.

This parameter tells the system which direction the boat steers when the steering cylinder is *extended*. The default value is N/A. Change the parameter so that it correctly reflects how the cylinder is installed. There are parameters for both port and starboard cylinders; in a single cylinder installation there is only one parameter to set.

You must set this parameter or the CANtrak will display a Danger fault after calibration and you will not be able to steer the boat.

Step 2 – Set Hard Stop Rudder Angle

The angle the rudder steers through depends on the tiller arm length, as tabulated in the installation instructions for the inboard cylinder. The Hard Stop Rudder Angle parameter tells the system the actual rudder angle at hard over, and is used to calibrate the rudder angle display on the system run screen. Changing the parameter will not change the actual steering angle of the vessel -- that is handled by the Rudder Limit parameters in section 5.6.

Note: the rudder angle is one-half the total steering angle tabulated in the installation instruction. For example, a steering angle of 70° corresponds to a rudder angle of 35° in each direction.

Select the Hard Stop Rudder Angle parameter and use the + and – buttons to adjust it as required.

5.2 Purge the Steering System

With its electronic helm and simple hydraulic circuit it is much easier to purge the air from an Optimus EPS system than traditional hydraulic steering systems. You will require the following:

- Optimus EPS Steering Fluid, HA5482. Your core component kit includes enough fluid for a typical installation.
- A purge hose kit. Available in two lengths:
 - 15ft (4.5m): HA5486
 - 30ft (9m): HA5487
- A 1/2" (13mm) open end wrench.

General Notes:

- You can only purge one cylinder/pump pair at a time.
- Before purging, open the service valve on the pump and manually move the engine (or outdrive/rudder) through the full range of the cylinder stroke and check for interference at the end of stroke. If there is any interference you will need to either address it before purge/calibrate, or purge and calibrate with the cylinder disconnected from the tiller. To prevent damage you will need to decrease the Low Speed Rudder Limit (section 5.6) before connecting the steering cylinder.

For Datalink users: Purge commands are found on the Configuration tab of the PCM interface.

- On multi-engine outboard and sterndrive boats you will need to move the inactive (not being purged) engine as far outboard as possible to avoid collision. Simply open the service valve on the associated steering pump and move the engine by hand. Remember to close the valve again. See the Installation Manual for service valve operation.

Procedure:

1. Remove the black caps from the bleed fittings on the SmartCylinder and its corresponding power steering pump. Take care not to lose them.
2. Connect the purge hose as shown in figure 5-3. An outboard system is illustrated, but the purge hose connections are the same for inboard and sterndrive systems.
3. Open all three bleed fittings 1–1/2 to 2 turns.

⚠ CAUTION

Failure to open the pump bleed fitting (item 3 in figure 5-3) may cause the purge hose to rupture.

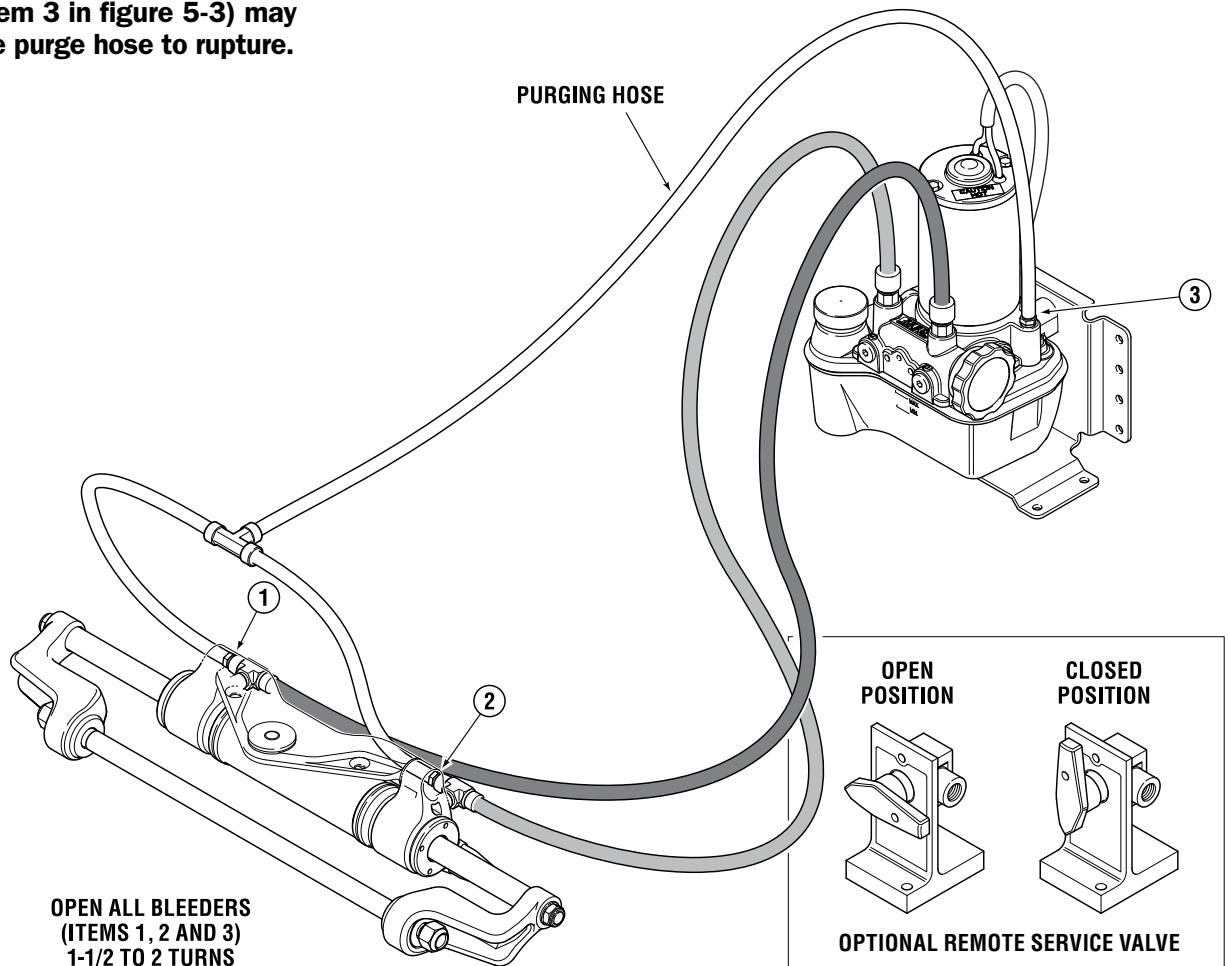


Figure 5-3.

4. Fill the reservoir on the power steering pump to the MAX level on single motor pumps and to the top of the sight glass on dual motor pumps (used on large inboard systems). Do not overfill, as air coming back during the purge may cause the fluid to overflow.
5. Double check that the purge hose is connected to the correct pump and cylinder and that the bleed fittings are opened. The purge hose may be damaged otherwise.
6. Turn the ignition on and power up the Optimus system.

⚠ CAUTION

DO NOT turn the helm at this time or the hydraulic pump will run. Should this accidentally occur power off the system for 3 seconds then power back on. This will stop the pump.

7. Navigate to Dealer **Menu > Initial Setup > Steering > Purge Cylinders** to access the Purge Cylinders menu.

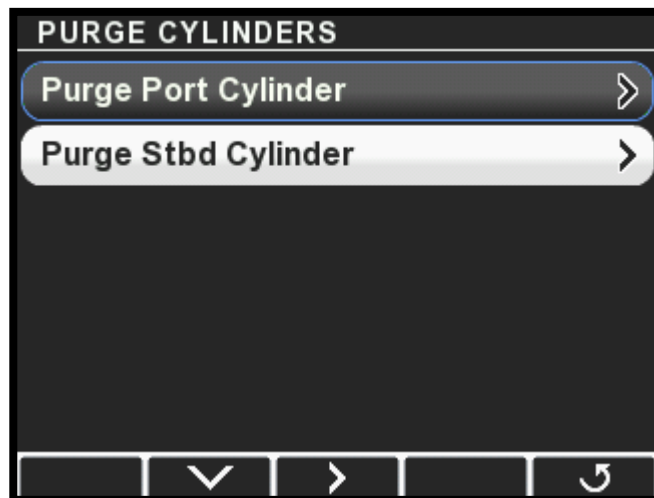


Figure 5-4.

8. Select the cylinder to purge and press > to enter Purge Mode. If you don't see the Purge Cylinder screen as shown in figure 5-5, cycle the system power and try again. The system will not enter Purge Mode if the helm has been turned since the ignition was turned on.

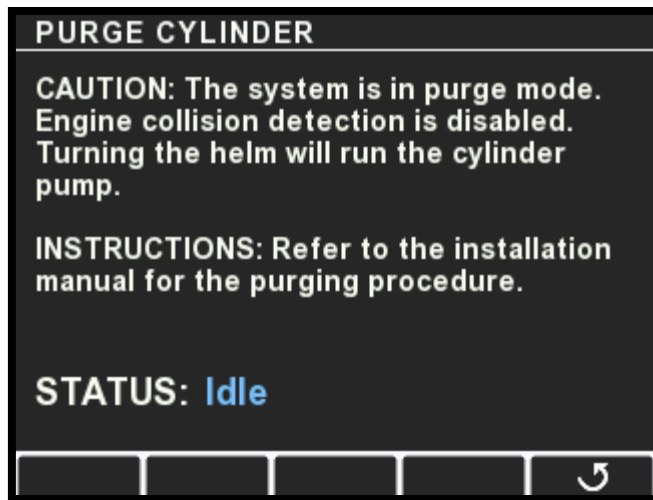



Figure 5-5.

NOTICE

When purging you will be required to turn the helm AND maintain fluid level in the pump reservoir. The pump can empty the reservoir quickly while purging. When the fluid level in the reservoir drops to the MIN mark, stop turning the steering wheel and refill the reservoir to the MAX mark (or to the top of the sight glass). DO NOT ALLOW THE FLUID LEVEL TO GO BELOW THE MIN MARK.

- 9.** Turn the helm one direction to start the purging process. The pump will run as the wheel is being turned. Continue turning the wheel until the cylinder reaches the end of travel. Verify the pump oil level frequently.
- 10.** Turn the wheel in the opposite direction until the cylinder reaches the end of travel. Verify the pump oil level frequently.
- 11.** Repeat steps 9 & 10 until no more air bubbles appear in the purge hose. Verify pump oil level frequently
- 12.** Close both cylinder bleeders. DO NOT close the pump bleeder yet.
- 13.** Open the service valve for the engine being purged and move the engine by hand so that the cylinder moves about 3 inches.
- 14.** Close the service valve.
- 15.** Re-open the cylinder bleeders 1 ½ to 2 turns.
- 16.** Repeat steps 9 & 10 until no more air bubbles appear in the purge hose. Verify pump oil level frequently.
- 17.** Close all three bleed fittings, remove the purge hose and replace the bleeder protective caps.
- 18.** Press  to return to the Purge Cylinders menu. If this is a single engine application skip to step 21.

19. Move the purge hose to the next cylinder and pump to be purged.
20. Repeat steps 7 to 18 for the other cylinder.
21. If you need to calibrate the SmartCylinders, proceed to section 5.3 now. Otherwise, press **J** repeatedly to exit. You will be prompted to perform a key cycle in order to exit the steering setup.

TIP: When purging is complete the cylinder should have 3/8" or less of movement when physically trying to shake the engine back and forth.

5.3 Calibrate the SmartCylinders

⚠ WARNING

DURING THE CALIBRATION PROCEDURE THE ENGINES WILL MOVE THE FULL TRAVEL OF THE STEERING RANGE. CONFIRM THERE ARE NO OBSTRUCTIONS IN THE PATH OF THE ENGINES. IF THERE IS AN OBSTRUCTION REQUIRING STROKE REDUCTION, THE CYLINDER MUST FIRST BE CALIBRATED WITH THE SUPPORT BRACKETS REMOVED.

⚠ CAUTION

The Optimus EPS system must be fully purged of air before calibration is attempted. Any air in the system will prohibit calibration and will cause the system to exhibit faults.

1. If this is a multi-engine outboard or sterndrive, move the starboard engine as far outboard as possible by opening the service valve and moving it by hand. Close the service valve. This will prevent collision when the port engine moves during calibration.
2. On the display, navigate to **Dealer Menu > Initial Setup > Steering > Calibrate Cylinders** to access the Calibrate Cylinders menu.

For Datalink users: Calibration commands are found on the Configuration tab of the PCM interface.

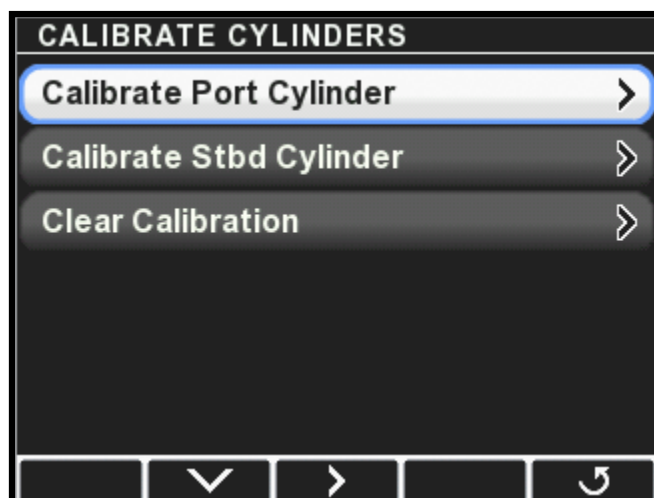


Figure 5-6.

3. Select **Calibrate Port Cylinder** and press > to enter Calibration Mode.

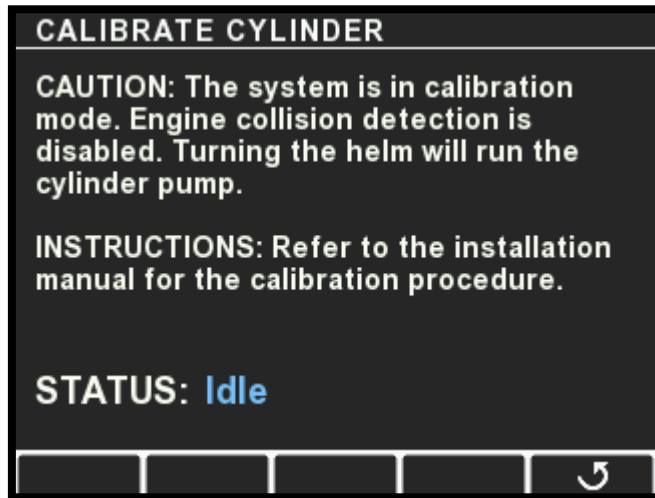


Figure 5-7.

4. Turn the helm to starboard until the status indicator reports hardstop is reached. Next, turn the helm to port until hardstop is reported. When finished, the port engine or outdrive should be turned all the way outboard
5. When cylinder calibration is completed you will be returned to the Calibrate Cylinders menu. If this is a single cylinder application skip to step 7.
6. Repeat step 4 for the starboard cylinder.
7. When all cylinders are calibrated press ↻ repeatedly to exit. You will be prompted to perform a key cycle in order to save the calibration and exit the steering setup.
8. Power up the system and turn the helm. The engines/outdrives/ rudders should align automatically, and the steering should operate normally. If the display reports a calibration error you will need to re-calibrate the indicated cylinder.

5.4 Align Rudders (Inboard & Sterndrive Only)

On inboard and sterndrive vessels it is possible that the rudders/ outdrives may not be aligned straight ahead when the steering cylinder is at its calculated zero position. On a twin sterndrive this can also result in outdrives that are not parallel.

You can correct these issues in **Steering Setup > Align Rudders**.

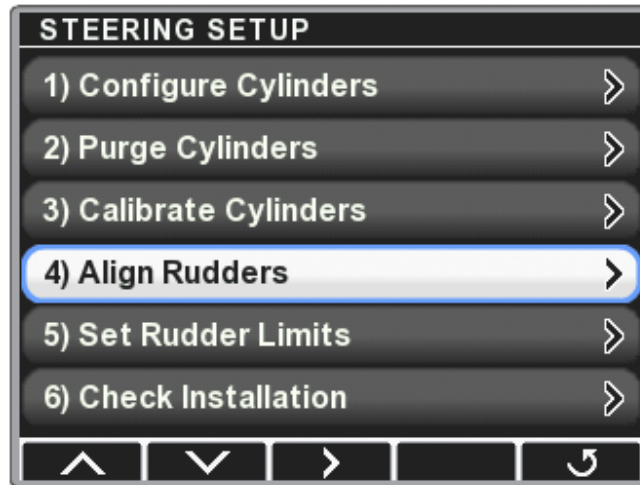


Figure 5-8. Align Rudders appears when an inboard or sterndrive cylinder type is selected.

⚠ CAUTION

The Align Rudders menu contains items that will cause the steering gear to move. Ensure that no one is near the moving parts of the steering gear, including outdrive(s), steering cylinder(s), rudders and/or tiller(s).

Step 1 – Enable Rudder Alignment

On the Align Rudders screen you must first enable rudder alignment. Use the + or – button to toggle the parameter from No to Yes. Additional menu options will be displayed as shown in figure 5-9. (The Parallel Rudder Correction parameter is only visible on systems with two steering cylinders.)

When Enable Rudder Alignment is toggled to Yes on a twin cylinder system the steering range of the cylinders is adjusted so that they are both the same. One of the cylinders may move a small amount.

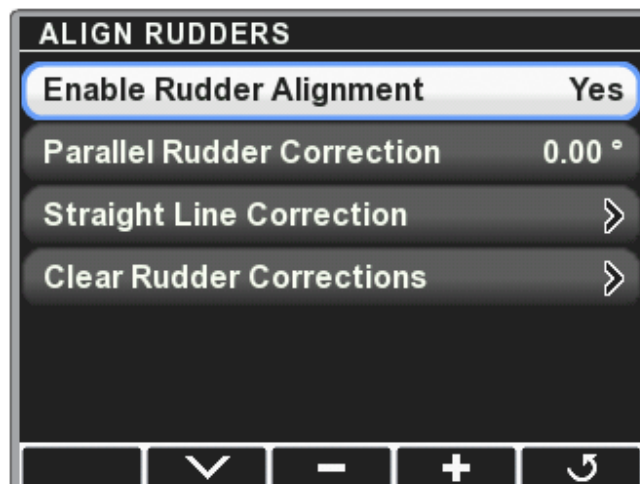


Figure 5-9. Align Rudders screen for twin sterndrive system.

Step 2 – Parallel Rudder Correction

Select Parallel Rudder Correction and press **Toe-in** or **Toe-out** to adjust the rudders or outdrives until they are parallel. For best results use a tape measure to check that they are parallel. Only the starboard drive/rudder will move.

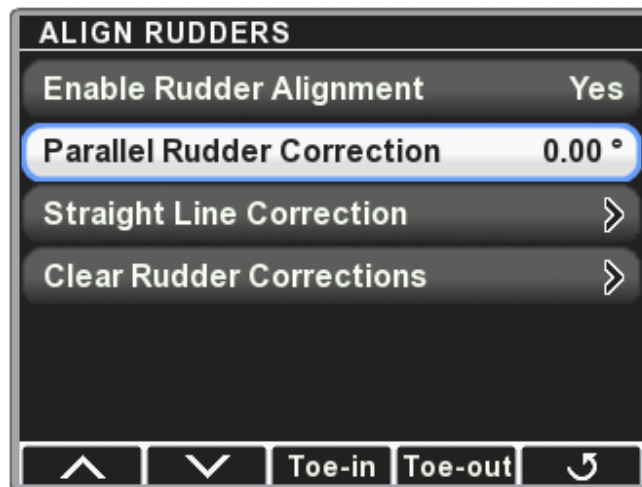


Figure 5-10. Parallel Rudder Correction.

Step 3 – Straight Line Correction

Steer with the helm until the rudder(s) or outdrive(s) are aligned straight ahead. The Rudder value on the display will show the amount of correction that will be applied. Press **Set** on the display to apply the correction; you will see the Straight Line Correction value update and the Rudder value will go to 0.0. The display will now show 0° rudder when the drive(s) is straight ahead.

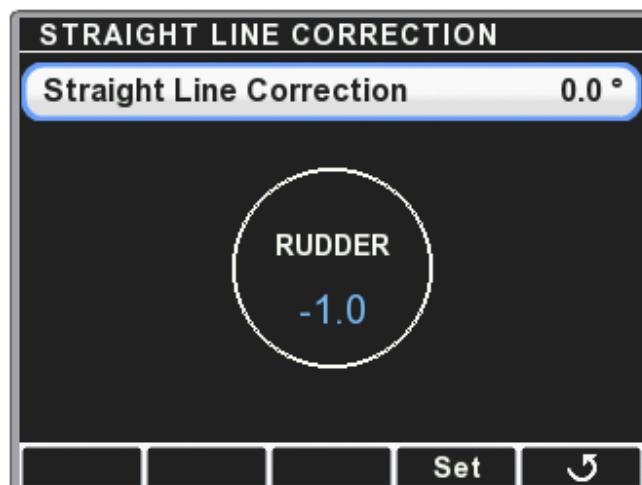


Figure 5-11. Straight Line Correction.

In some cases the vessel will not track straight through the water when the rudder/drive is aligned straight ahead. This can be corrected by performing this step again during sea trial. Steer the helm until the vessel is tracking straight at cruising speed, then press **Set**.

Clear Rudder Corrections

You can clear all rudder corrections and revert to the original calibration state using this menu item.

5.5 Set Proportional Sensitivity

Proportional rudder sensitivity can be used to increase the helm sensitivity at the neutral rudder position for more responsive steering. The total number of helm turns lock-to-lock is unchanged, so the steering becomes less sensitive as you approach hard over. Proportional Sensitivity is set in **Steering Setup > Set Proportional Sensitivity**. There are two parameters:

Proportional Sensitivity Gain: This parameter controls the increase in sensitivity. The range is from 0.5 to 4.0, and represents a multiplier of the standard helm sensitivity. The default value of 1.0 means there is no change, and a value of 4.0 means the helm sensitivity is four times the normal setting. The multiplier applies at zero steering angle, then decreases linearly as steering angle increases. We suggest that you start with a gain of no more than 2 and sea trial before increasing the gain.

Proportional Sensitivity Range: This is the steering angle range (from zero degrees) over which the Sensitivity Gain is applied. The range is from zero degrees to the Hardstop Rudder Angle that you set in section 5.1.

5.6 Set Rudder Limits

⚠ WARNING

THE OPTIMUS EPS SYSTEM MUST BE FULLY PURGED OF AIR AND THE SMARTCYLINDER MUST BE CALIBRATED BEFORE THE STEERING ANGLE IS ADJUSTED.

⚠ WARNING

CHANGING PCM PARAMETERS MAY CAUSE THE ENGINE TO MOVE AUTOMATICALLY AS SOON AS THE PARAMETERS ARE ENTERED.

Rudder Limits are optional parameters that can be used to restrict the steering angle of the system. These parameters are set from **Dealer Menu > Settings > Steering > Helm Turns and Rudder Limits**. The default values are 30° for outboard and sterndrive systems, and the Hardstop Rudder Angle (section 5.1) for inboard systems.

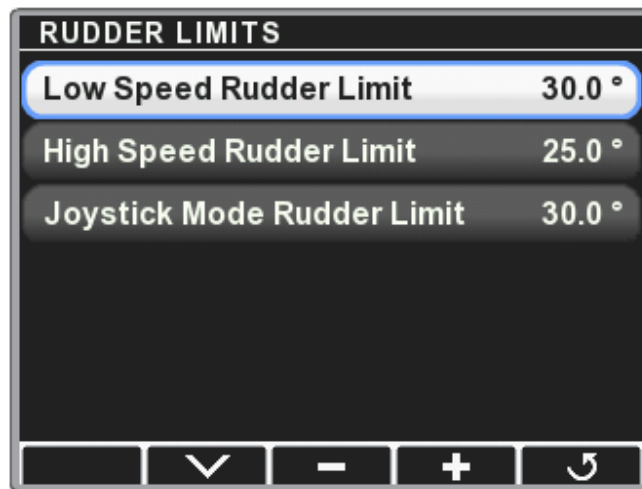


Figure 5-12.

There are three Rudder Limit parameters:

Low Speed Rudder Limit: This parameter is generally used to restrict the steering angle of outboard engines when there is interference between engines or other restrictions in the splashwell, but it can also be used on inboard and sterndrive systems if it is useful to restrict the steering angle. Despite the name, this parameter limits the maximum steering angle at all speeds, because the High Speed Rudder Limit cannot be set higher.

High Speed Rudder Limit: This parameter can be used to restrict the maximum steering angle when the vessel is operated at high speed. It can help prevent aggressive maneuvers, limit steering loads, or prevent cavitation. The rudder limit is adjusted smoothly as speed increases so there is no step change in steering angle.

Joystick Mode Rudder Limit: Used only on Optimus 360 systems, this parameter limits the steering angle of outboard engines when operating in joystick mode. It may be required if there is interference at high steering angles.

NOTICE

If the vessel is using an analog tachometer see the note in section 4.2.6 before setting a High Speed Rudder Limit.

5.7 Steering Parameters

5.7.1 Speed Sensitive Steering

A key advantage of Optimus electronic power steering is the ability to change steering parameters as boat speed changes. The steering feel and response can be tailored to user preference, and to keep vessel operation within a comfortable performance envelope.

The speed-dependent parameters are smoothly varied between low and high-speed settings as boat speed changes. Figure 5-13 illustrates how this works.

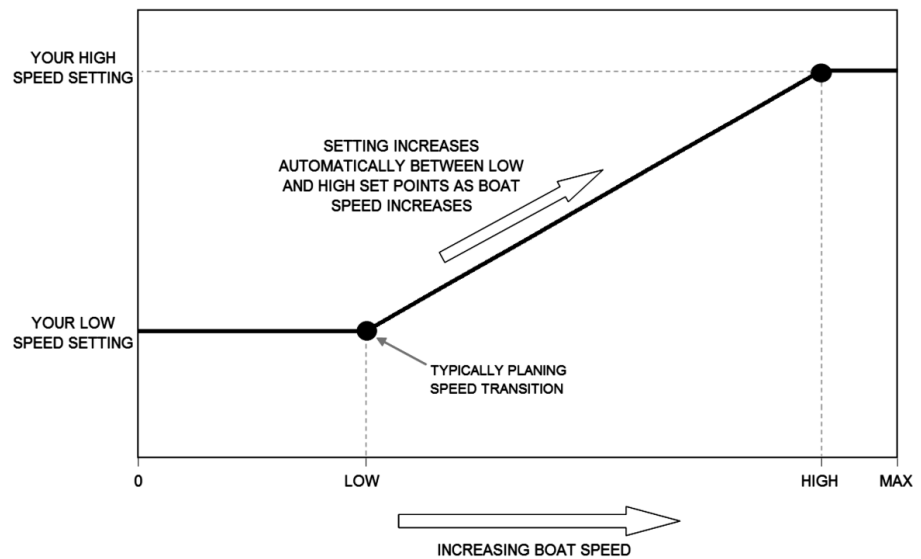


Figure 5-13.

5.7.2 Low and High Speed Thresholds

Optimus EPS uses engine RPM to determine boat speed*. There are low and high speed threshold values that you can set. The default values (see table 5-1) will be suitable for many gasoline outboard engines, but they will be too high for diesels and some large displacement, low-revving gasoline inboards.

Low Speed Engine RPM: This is the engine speed below which the low speed settings are in effect. For planing hulls you typically want to use the engine RPM at which the boat begins to get up on plane. For displacement and semi-displacement hulls you might consider using engine RPM corresponding to typical marina speed limits. The valid RPM range is shown in table 5-1.

High Speed Engine RPM: This is the engine speed above which the high speed settings are in effect. This will typically be close to maximum RPM, and must be set at least 500 higher than the Low Speed Engine RPM. The valid RPM range is shown in table 5-1.

* In some cases the throttle command percentage may be used, but this is not recommended. Consult with SeaStar.

5.7.3 Steering Parameter List

For Datalink users: these parameters are available in the Configuration tab of the PCM interface.

Table 5-1 lists the steering parameters available in the system. User parameters are marked with a (U) and can be adjusted by the vessel operator provided access is given to the Settings menu (See section 5.7.4). The shaded parameters are speed-dependent.

Steering parameters are adjusted from the CANtrak display at **Dealer Menu > Settings > Steering > Steering Settings**.

SUBMENU	PARAMETER NAME	DESCRIPTION	RANGE	DEFAULT VALUE
	Toe Angle	Sets the static toe angle of the engines (or outdrives/rudders). A positive value will toe the engines out (gear cases farther apart at front edge).	-1.5 to 1.5	0
	Inner/Outer Steering Ratio	This parameter can make the inner engine (or outdrive/rudder) turn more than the outer engine in a turn. The higher the value the less the outer engine will turn. E.g. A value of 2.0 will deliver 15 degrees of steering at the outer engine when the inner engine is steered at 30 degrees.	1 to 3	1
Speed Signal	Speed Signal	Sets how the boat speed is determined. Except in rare cases you should leave this as the default value.		Engine RPM
	Low Speed Engine RPM	Sets the engine RPM that marks the upper boundary of low speed. This is typically the RPM at which the boat begins to plane. See figure 5-13.	0 to 2500	1500
	High Speed Engine RPM	Sets the engine RPM that marks the lower boundary of high speed. Typically close to maximum RPM. See figure 5-13.	500 to 6000	4000
	Low Speed Throttle Cmd	Sets the throttle percentage that marks the upper boundary of low speed. Used when Speed Signal is set to Throttle Cmd.	0 to 35	30
	High Speed Throttle Cmd	Sets the throttle percentage that marks the lower boundary of high speed. Used when Speed Signal is set to Throttle Cmd.	45 to 100	60
Helm Effort	Helm Effort at Low Speed (U)	Sets the helm effort when the vessel is running at low speed. The value is a percentage of maximum effort (steering locked).	1 to 100	40
	Helm Effort at High Speed (U)	Sets the helm effort when the vessel is running at high speed.	1 to 100	60
	Helm Effort in Autopilot (U)	Sets the helm effort when the vessel is running in autopilot. Set it high enough to prevent accidental movement of the helm.	20 to 100	90
	Helm Effort in Joystick Mode	Sets the helm effort when the vessel is running in joystick mode.	20 to 100	90
Helm Turns and Rudder Limits	Helm Turns at Low Speed (U)	Sets the number of turns when the vessel is running at low speed.	3.5 to 8.5	5
	Helm Turns at High Speed (Full Stroke) (U)	Sets the number of turns for full stroke of the steering cylinder(s) when the vessel is running at high speed.	3.5 to 8.5	5
	Low Speed Rudder Limit (Formerly Max Steering Angle)	This parameter is most often used to restrict the travel of outboard engines in installations where there is interference at high steering angles.	15 to 'Hardstop Rudder Angle' (See 5.1)	30
	High Speed Rudder Limit	This parameter can be used to limit the maximum steering angle when the vessel is at high speed. It can restrict the operator from overly aggressive and potentially unsafe maneuvers.	10 to 'Low Speed Rudder Limit'	30
	Joystick Mode Rudder Limit (Formerly Max Joystick Angle)	This parameter applies only to Optimus 360 systems. It is used to limit the maximum steering angle in joystick mode in the event there is some interference.	0 to 30	30

Table 5-1. Steering Settings.

5.7.4 User Permissions

User access to user parameters is not enabled by default. To enable them, navigate to **Dealer Menu > Settings > Display > Settings Menu Access** and press **+** to toggle the setting.

***For Datalink users:** this parameter is available in the Configuration tab of the Color Display interface.*

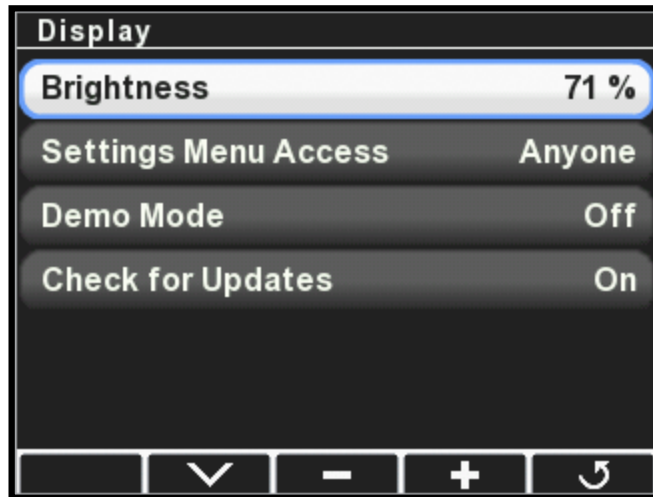


Figure 5-14.

6.0 I7700 SHIFT AND THROTTLE SYSTEM SETUP

NOTICE

Before starting the shift and throttle setup you must have already completed the initial setup in section 4.

To setup the i7700 EST system requires, at minimum, that you configure and adjust the actuators. The control head has a number of parameters that may be adjusted as well, but the default settings will be appropriate for most installations.

6.1 Actuator Setup

6.1.1 Actuator Configuration

For Datalink users: actuator setup is done through the Parameters tab of each actuator interface.

By default i7700 actuators are factory-configured as a port engine actuator. **Before installing the cables** and adjusting the actuator parameters you must designate the starboard actuator. Each actuator has a shift and throttle component that must also be configured as push or pull.

Procedure:

1. On the CANtrak display, navigate to **Dealer Menu > Initial Setup > System > Select Device Locations**.
2. Find the actuators in the list of devices. Compare the serial numbers with the actuators and use the + and – buttons to change the starboard actuator’s configuration to Stbd.
3. Press **Save** and then exit the screen. You will be prompted to cycle system power to save the changes.
4. Navigate to **Dealer Menu > Initial Setup > Shift & Throttle** to get to the Shift & Throttle Setup menu (figure 6-1).

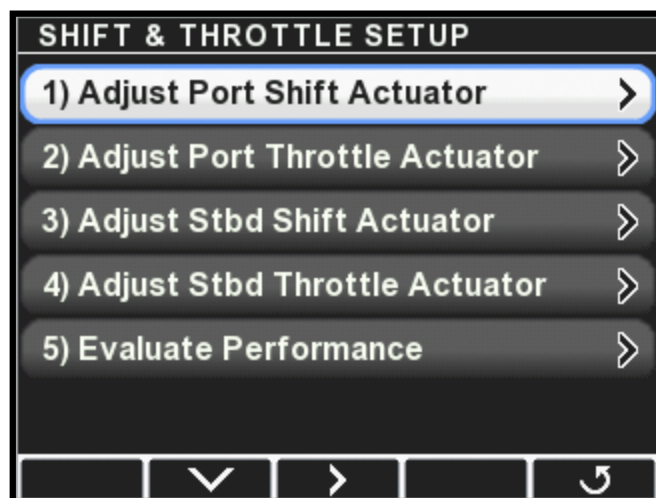


Figure 6-1. Shift and throttle setup screen.

NOTICE

See table 6-1 at the end of this section for typical actuator parameters. This information is provided for reference only, and should be verified before use.

5. For each shift actuator set the Shift to Forward Direction parameter (figure 6-2) to Push or Pull to match the direction the actuator is required to move to engage *forward* gear. Don't adjust the other parameters yet.

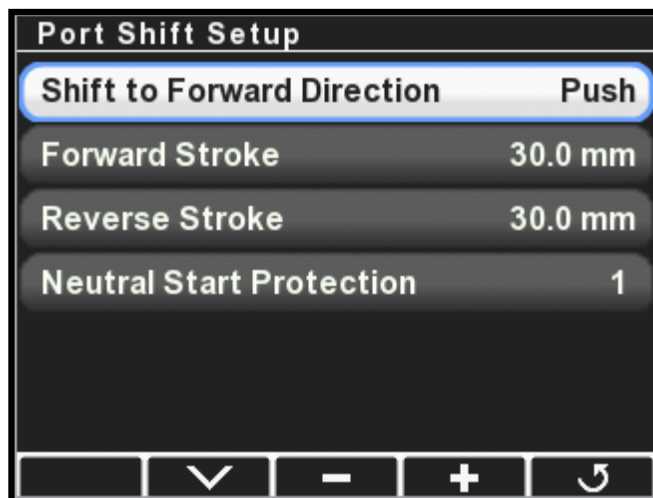


Figure 6-2. Shift setup screen.

6. For each throttle actuator set the Acceleration Direction parameter to Push or Pull to match the direction the actuator is required to move to *increase* throttle.

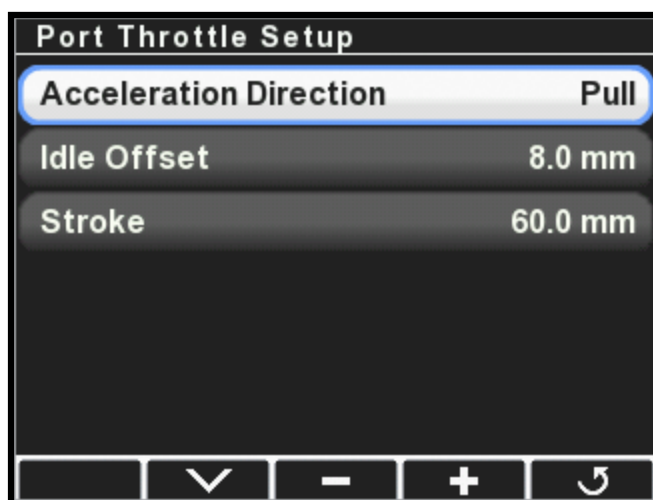


Figure 6-3. Throttle setup screen.

7. Remove the actuator covers if you haven't already done so.
8. Move the port and starboard control head levers to the forward and reverse gear positions and verify that the shift actuators move accordingly. Confirm that the control levers are controlling the correct actuators. If not, revisit step 2.

9. Increase the throttle on each of the control head levers from idle to full throttle and check that the throttle actuators advance and return accordingly. Place both levers back in the neutral position.
10. Apply the manual override decals (figure 6-4) to the actuator chassis label in the dashed boxes provided (figure 6-5).
 - a. Use 'Starboard' and 'Port' to indicate which actuator controls which engine.
 - b. Place the 'Idle' and '+' decals on the throttle actuators to indicate which direction moves the throttle to idle and which direction increases throttle.
 - c. Place the 'R' and 'F' decals on the shift actuators to indicate the shift direction for each gear.
11. Exit the setup. You will be prompted to cycle the system power to save the changes.
12. At this point you need to install the actuator cables. See the i7700 Installation Manual.

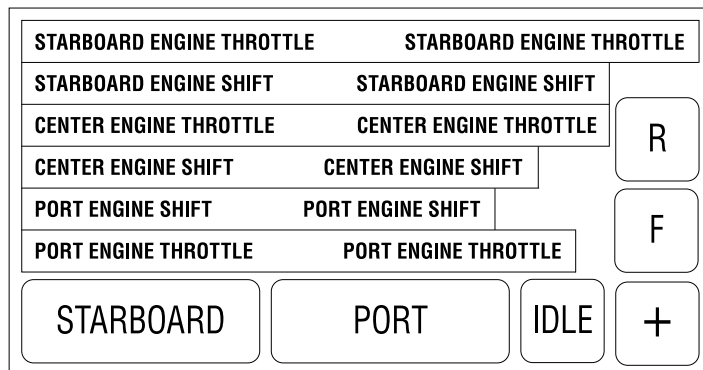


Figure 6-4. Actuator decal sheet.

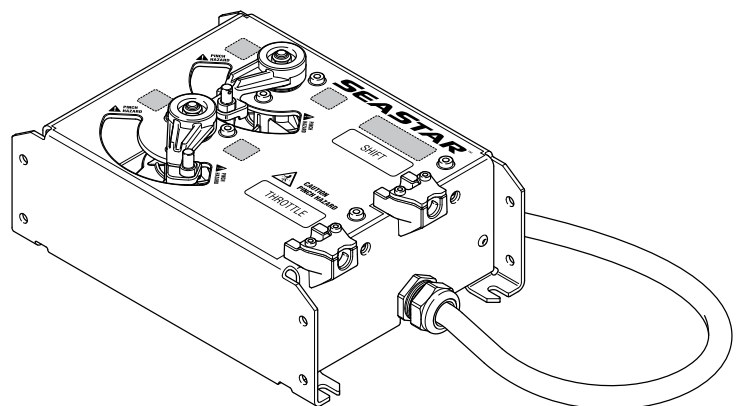


Figure 6-5. Override decal locations (shaded).

6.1.2 Actuator Adjustment

NOTICE

See table 6-1 at the end of this section for typical actuator parameters. This information is provided for reference only, and should be verified before use.

⚠ DANGER

THIS PROCEDURE REQUIRES TURNING A PROPELLER BY HAND WITH THE IGNITION ON. USE EXTREME CAUTION.

NOTICE

It is not uncommon to have a longer actuator stroke length for the push direction gear. The difference is more pronounced with longer cables.

After installing the cables, proper adjustment is critical for overall system performance. This section will describe how to adjust the shift and throttle cables. Be sure to review and understand the installation goals for each section before proceeding.

6.1.2.1 Shift Adjustment

Successful installation and adjustment of the shift cables should accomplish the following goals:

- To have shift cables adjusted so the neutral position of the actuator represents the neutral position of the engine shift linkage.
- To set the stroke length to achieve full engagement of gear without interfering with the physical shift linkage limit.
- To have both gears fully disengage when returned to neutral.

Procedure

1. Turn ignition on but *do not* start engines.
2. Navigate to **Dealer Menu > Initial Setup > Shift & Throttle > Adjust Port Shift Actuator**.
3. While an assistant spins the port engine prop by hand, use the control lever to put the port engine into forward gear. Check that the gear engages fully.
4. If the gear does not fully engage, increase the Forward Stroke Parameter by 1mm at a time, press **Save**, and repeat the test until gear engagement is satisfactory.
5. Repeat steps 3 and 4 in reverse gear, this time adjusting the Reverse Stroke parameter.
6. Verify that the engine returns to neutral properly from both forward and reverse gear. The propeller must freewheel in neutral. If it doesn't, adjust the actuator-side rod end until the neutral position is correct.
7. Tighten the rod end lock nut (refer to the i7700 installation manual). You will need to apply Loctite® 242 to the threads, but you will do this after verifying performance in the sea trial.
8. Repeat this procedure for the starboard shift actuator.

6.1.2.2 Shift Adjustment

Successful installation and adjustment of the throttle cables should accomplish the following goals:

- To have throttle cables adjusted evenly so the engines start to rev up at the same time given the same throttle (lever) position.
- To have the throttle always return to idle when the lever(s) are moved to idle.
- To have minimal lever travel before engines rev up.
- To set the stroke length so that wide open throttle (WOT) is achieved without unnecessary throttle cable movement.

Procedure

1. Turn ignition on but do not start engines.
2. Navigate to **Dealer Menu > Initial Setup > Shift & Throttle > Adjust Port Throttle Actuator.**
3. Increase the port control lever to the full throttle position (forward gear) and verify that the throttle linkage reaches the wide open throttle (WOT) position.
4. Increase the stroke parameter as necessary to reach the WOT position. Press **Save** after each adjustment to have it take effect.
5. Tighten the rod end lock nut (refer to the i7700 installation manual). You will need to apply Loctite® 242 to the threads, but you will do this after verifying performance in the sea trial.
6. Repeat this procedure for the starboard throttle actuator.
7. The Idle Offset parameter is used to fine tune throttle response and to synchronize the throttle actuation.
 - a. On some engines it may take a large amount of lever travel before RPM starts to increase. You can reduce this deadband by increasing the Idle Offset parameter or by adjusting the rod end position.
 - b. When both levers are advanced at the same time both engines should start to increase RPM simultaneously. If they do not you can adjust the Idle Offset parameter until they are synchronized.

	EVINRUDE	HONDA	MERCURY	SUZUKI	YAMAHA	YANMAR
SHIFT SETTINGS						
Shift to Forward	Pull	Pull	Pull	Pull	Pull	Varies
Forward Stroke	32	32	34	34	32	32
Reverse Stroke	32	32	34	34	32	32
THROTTLE SETTINGS						
Acceleration Direction	Push	Push	Pull	Push	Push	Pull
Throttle Stroke	62	62	58	70	52	54

Table 6-1. Typical settings for mechanical engines. Verify before use.

6.2 Control Head Setup

For Datalink users: control head parameters are found on the Configuration tab of the Control Head interface.

The i7700 EST system provides a number of control head parameters, listed in table 6-2. User parameters are marked with a (U) but they are not available to the user unless enabled as shown in section 5.7.1.

Control head parameters are adjusted from the CANtrak display at **Dealer Menu > Settings > Shift and Throttle**.

PARAMETER NAME	DESCRIPTION	RANGE	DEFAULT VALUE
Station Protection	When this parameter is enabled a specific sequence of button presses on the control head is required in order to take control of the shift and throttle. Refer to the User Manual for additional information on this feature.	Off or On	Off
One Lever Sync Mode (U)	Controls the throttle behavior when the Power Train Sync (PTS) mode is engaged. When set to RPM the software will use engine RPM feedback to match engine speeds. When set to the Throttle the control system will simply match the throttle command.	Off or On	Off
Two Lever Sync Enabled (U)	When this parameter is enabled the control system will synchronize engine speeds when both levers are in close to the same position. This feature requires engine RPM feedback.	Off or On	Off
Two Lever Sync Window (U)	The maximum throttle position difference for which Two Lever Sync will function.	1 to 10	5
Max Shift RPM	The maximum engine RPM at which a gear shift will be attempted. It is designed to delay gear shifts until the engine reaches a safe shifting speed.	100 to 2000	1500
Shift Proportional Delay Max	When there is no engine RPM source, this is the shift delay added by the control system when the control lever has been at 100% throttle for some time and is rapidly moved to another gear. In operation the shift delay is reduced in proportion to the amount of throttle commanded. We recommend you leave this parameter at the default of 5 seconds, but if the shifting is sluggish it can be reduced in small increments.	0 to 10	5
Shift Proportional Delay Gain	A multiplier applied to the Shift Proportional Delay Max time to control the shift delay.	0.1 to 1.0	0.5
FWD Throttle Curve (U)	There are two throttle curves that control the response characteristics when the control lever is at or near idle and in forward gear. Curve 1 is the default curve and is suitable for most applications. Curve 2 requires more lever travel before throttle increases.	Curve 1 or Curve 2	Curve 1
REV Throttle Curve (U)	There are two throttle curves that control the response characteristics when the control lever is at or near idle and in reverse gear. Curve 1 is the default curve and is suitable for most applications. Curve 2 requires more lever travel before throttle increases.	Curve 1 or Curve 2	Curve 1
FWD Trolling Max Throttle (U)	The maximum percentage of wide open throttle when trolling mode is engaged in forward gear. A setting of 50% means that when the throttle lever is fully forward the throttle is limited to 50% of maximum. This provides greater throttle sensitivity when moving at slow speeds.	5 to 100	50
REV Trolling Max Throttle (U)	The maximum percentage of wide open throttle when trolling mode is engaged in reverse gear.	5 to 100	100
Shift Fixed Delay	This is a Yanmar-specific parameter that delays shifting into the opposite gear when engine RPM feedback is not available. It will hold the transmission in neutral for the specified in time before shifting.	0 to 10	1

Table 6-2.

7.0 OEM ELECTRONIC SHIFT AND THROTTLE SETUP

NOTICE

Before starting the OEM EST setup you must have already completed the initial setup in section 4.

7.1 Evinrude

The Evinrude ICON system integrates seamlessly with Optimus 360. You need only configure the ICON control head according to the manufacturer's instructions. The control head firmware must be at revision 7 or higher.

7.2 Suzuki

NOTICE

Optimus 360 supports Suzuki twin and triple-engine applications only.

The Suzuki SPC system must be configured and calibrated in order to work with the Optimus joystick system. To calibrate the system you will need the Suzuki Diagnostic System (SDS) tool and the Suzuki diagnostic interface adapter (Suzuki part number 09933-19830). Connect the interface adapter and start the software according to the instructions provided by Suzuki.

When the software starts up you'll see the home screen shown in figure 7-1. If you are updating an existing installation, click **BCM Initialization** to clear the existing calibration from memory, then cycle the power (leave off for *thirty* seconds — the Suzuki gauge system can hold power for over twenty seconds). Otherwise, continue with the following steps.

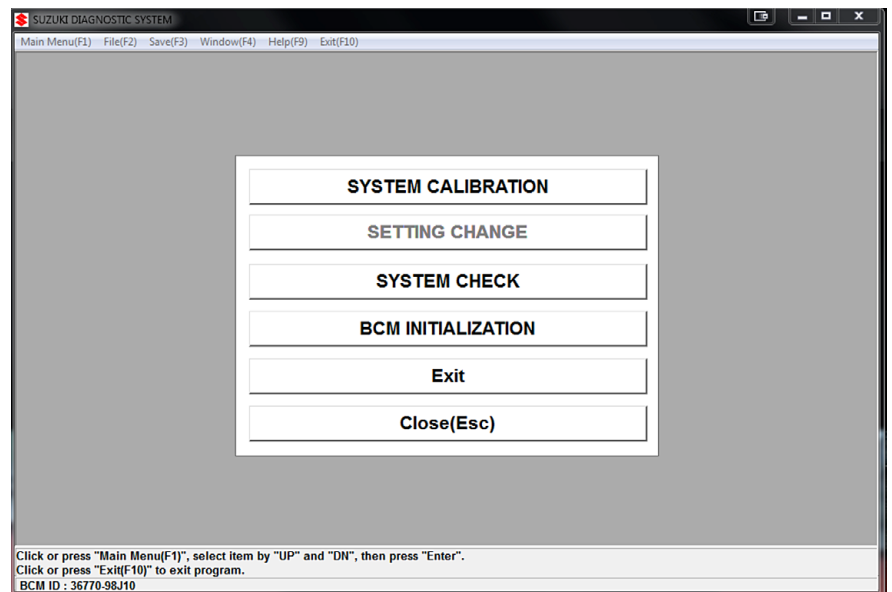


Figure 7-1. SDS home window.

1. Click **System Calibration** to start the calibration wizard. The dialog box shown in figure 7-2 will be displayed. Review the checklist and when you've confirmed that all the items are complete, click **OK**.

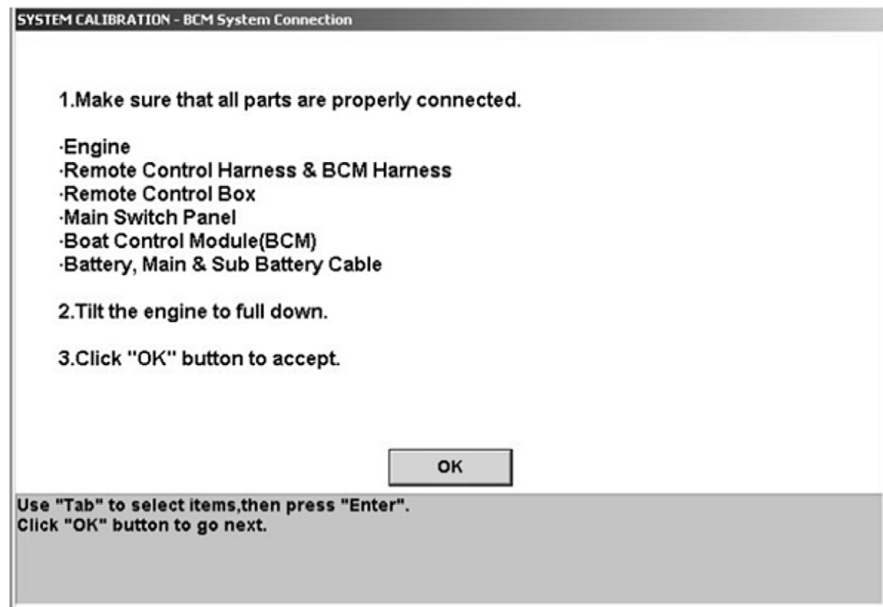


Figure 7-2. Pre-calibration checks.

2. You will be prompted to enter the number of stations and the number of engines. Always select Dual Station, regardless of the actual number of control stations. With the exception of the main remote control, all remote controls and joysticks are routed through the gateway and are treated as a second control station by the Suzuki system. Click **OK** when you've entered both parameters.

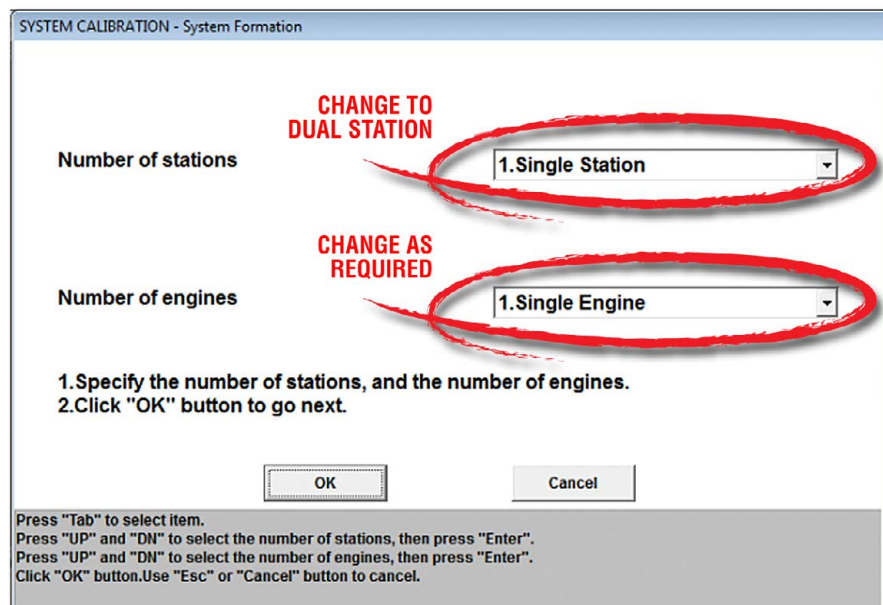


Figure 7-3. Configure number of stations and engines.

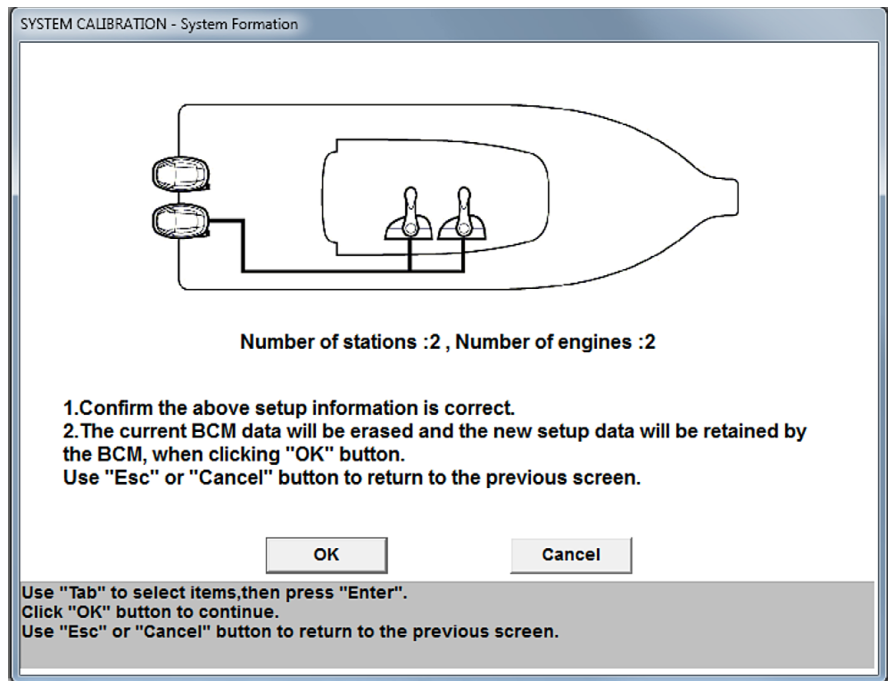


Figure 7-4. System calibration graphical confirmation window.

3. A confirmation window similar to figure 7-4 will be shown. Ensure the information is correct, then click **OK**. Click **Cancel** to return to the previous screen if you need to make a change.
4. The wizard will then guide you to trim each engine down in turn in order to register their position in the boat control module (BCM). Follow the on-screen instructions. An example is shown in figure 7-5.

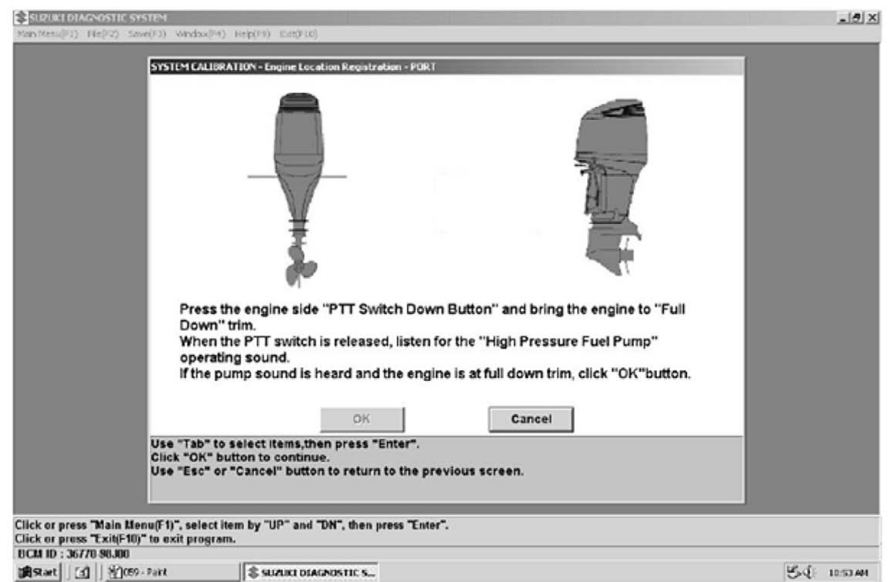


Figure 7-5. Registering the engine position

- Once each engine's position has been registered you will be prompted to calibrate the remote control lever positions. Using the **main** remote control, follow the on-screen instructions as seen in figure 7-6.

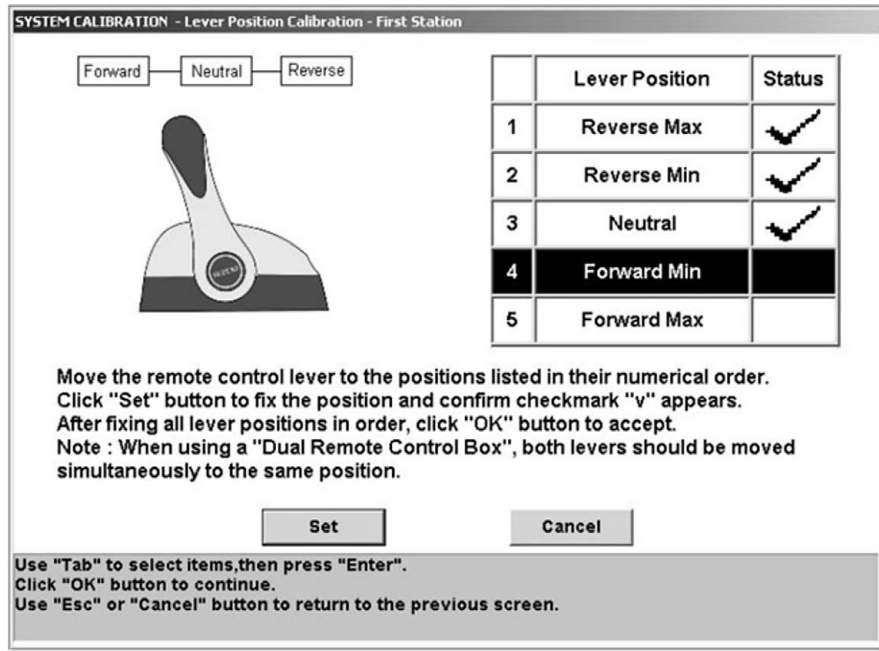


Figure 7-6. Control Head calibration.

- When all lever positions have been set, and the screen shows check marks next to all of them (see figure 7-7), return the control levers to the neutral position and click **OK** to save the calibration.

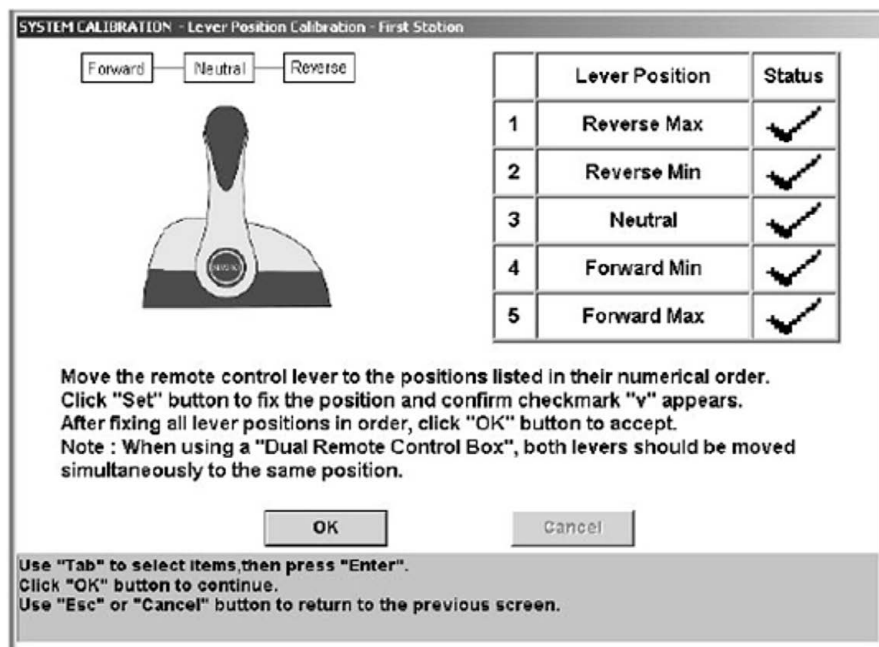


Figure 7-7. Save calibrated values.

- You will be prompted to calibrate the second remote control. If the boat has a second remote control, calibrate it now. If the boat has only a single remote control you will use the joystick lever to perform the calibration. Use table 7-1 to find the joystick position that corresponds with each lever position shown in the calibration wizard. Move the joystick all the way in each required direction, then click **Set**.

Step	Suzuki Lever Position	Joystick Equivalent Position
1	Reverse Max	Reverse
2	Reverse Min	Port
3	Neutral	Center
4	Forward Min	Starboard
5	Forward Max	Forward

Table 7-1. Lever to joystick position cross-reference.

- After you have clicked **OK** to save the calibration you will see a final dialog box indicating that the system calibration has been completed. Click **OK** to return to the main menu.
- Cycle the power (off for thirty seconds) and then click **System Check** on the SDS home screen. This will bring up a window displaying Service Data. Check that there are eight LPS Output(...) items in the list with an associated voltage reading for each. See figure 7-8.

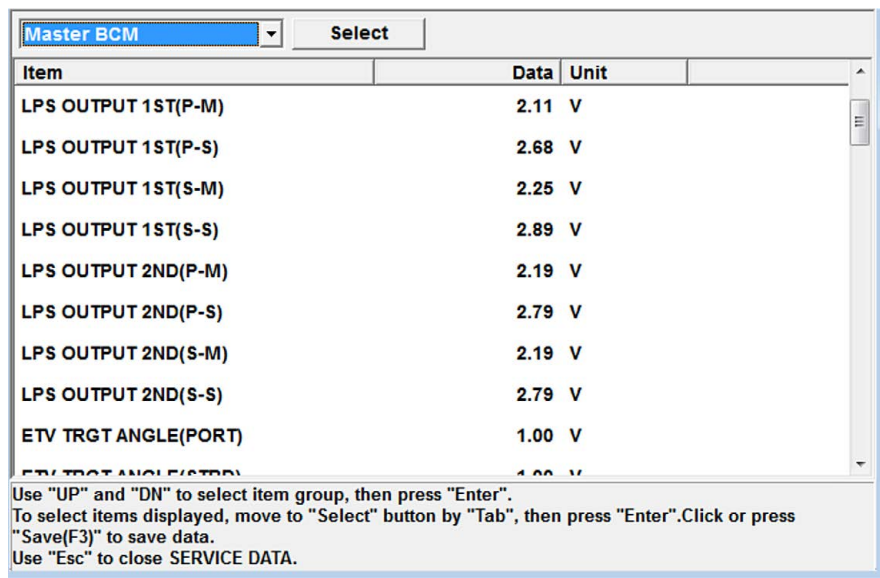


Figure 7-8. Service Data. Sample of typical values

7.3 Yamaha

Before configuring the EST gateway you should have already conducted the initial system setup described in section 4.

If you have more than one control station you will need to configure each gateway separately, as they need to be calibrated to their adjacent remote control. The calibration wizard records the output values from the remote control's lever position sensors (LPS) at various lever positions.

For Datalink users: EST Gateway calibration is done from the Setup tab of the Gateway interface.

Procedure

1. The gateway calibration must be performed with the engines keyed on, but not running. Check the RPM reading on the color CANtrak and the Yamaha display. Both should read 0 RPM at all engines. If the RPM displays as '---' on the CANtrak, check your speed source connections.
2. At the main station CANtrak, navigate to **Dealer Menu > Initial Setup > EST Gateway** to bring up the EST Gateway Setup screen. If you have two gateways, and have correctly set the number of gateways in section 4, then you will also see a 2nd station gateway on your screen.

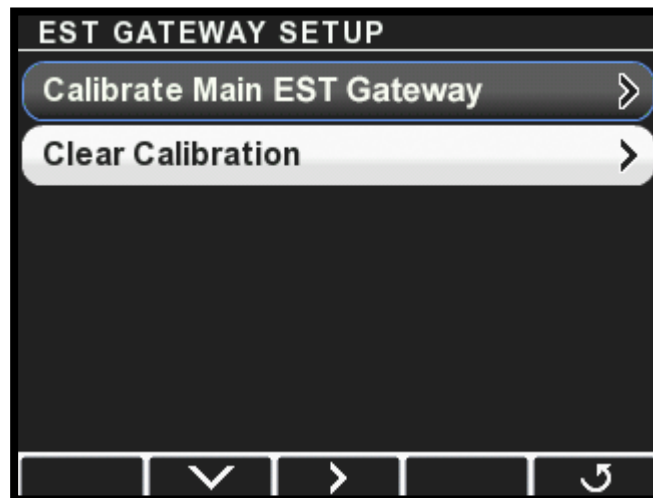


Figure 7-9.

3. Select **Calibrate Main EST Gateway** and press **>**. This will put the main station gateway into calibration mode.

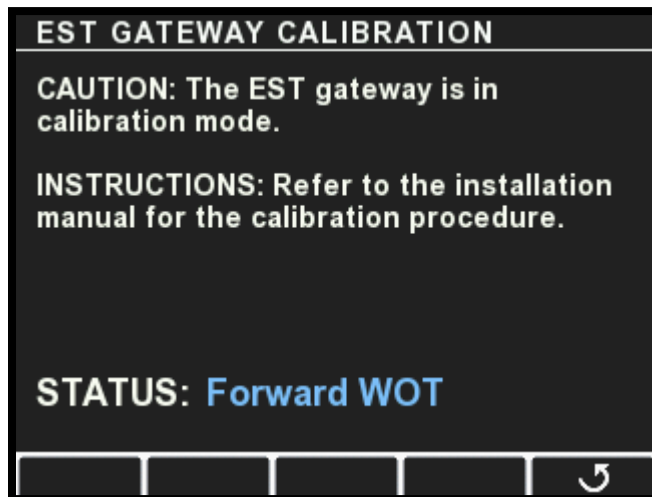


Figure 7-10.

4. The status indication will guide you through the calibration steps. Move both control levers to the position indicated in the status field. You will be directed in turn through the following:
 - a. Forward WOT – move the levers to the forward throttle stops
 - b. Forward detent – engage forward gear with levers in idle position
 - c. Neutral – put both levers in neutral
 - d. Reverse detent – engage reverse gear with levers in idle position
 - e. Reverse WOT – move levers to the reverse throttle stops
5. After the final calibration step the wizard will exit automatically.
6. Repeat the calibration wizard from the second station, if applicable.

7.4 Yanmar

The Yanmar electronic shift and throttle system integrates seamlessly with Optimus 360. You need only set up the control head; setup is identical to the SeaStar i7700 control head setup shown in section 6.2.

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8.0 COMMISSIONING

8.1 Installation Checks

To verify that the Optimus SmartCylinder(s) have been installed correctly, perform the installation checks outlined in the following sections before sea trial and after each vessel servicing. You will need someone to assist you.

⚠ WARNING

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

8.1.1 Outboard Engines

1. 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 8-1 and figure 8-2). Be sure to steer slowly while performing these checks.

- a) With the engine(s) fully tilted DOWN, turn the steering wheel from hard over to hard over and confirm that no interference occurs.
- b) With the engine(s) fully tilted UP, turn the steering wheel from hard over to hard over and confirm that no interference occurs.

For multi-engine vessels only:

- c) 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.
- d) Trim the starboard engine(s) fully DOWN and the port engine(s) fully UP. Turn the steering wheel from hard over to hard over and confirm that no interference occurs.
- e) Ensure all combinations of trim/tilt and steering do not cause interference.

2. RFU Harness – Confirm that the RFU harness is tied securely to the hoses with gradual bends as shown figure 8-2.

8.1.2 Inboard and Sterndrive Engines

Confirm that the steering cylinders move through the entire steering range with no interference. Check that the hoses and RFU harnesses move freely without stretching, kinking, rubbing, or binding. Check that the RFU harness is properly secured to the hydraulic hoses.

⚠ CAUTION

If interference occurs at high trim/tilt angles you will need to install a trim limiter. Failure to install a trim limiter may void your warranty.

⚠ WARNING

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

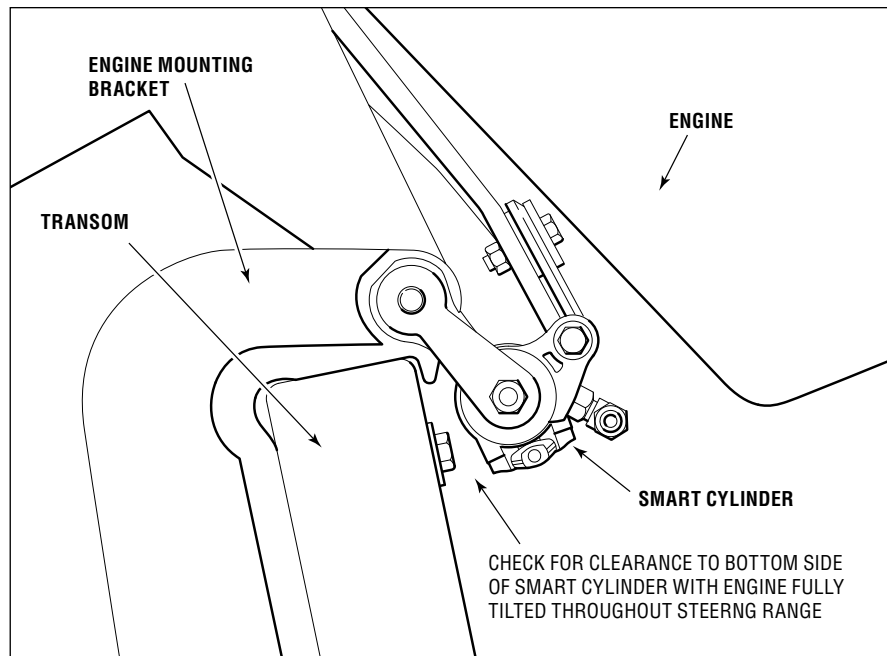


Figure 8-1. Engine side view when tilted.

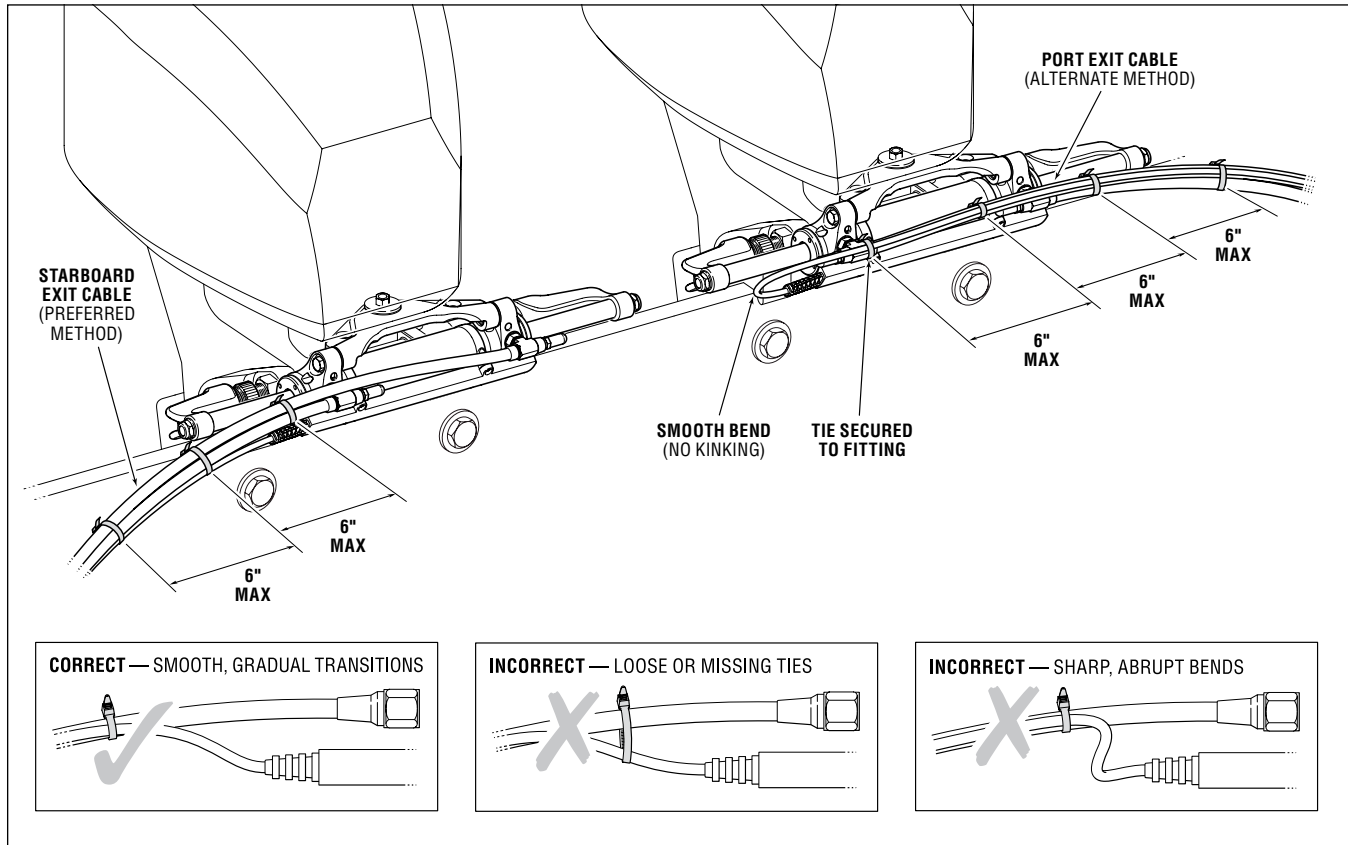


Figure 8-2. Sensor cable and hose routing checks.

8.2 Pre-trip Checks

⚠ 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 the figure below (or between the MIN mark and the top of the sight glass on the two-motor pump). Use only SeaStar Electronic Power Steering Fluid in the Optimus EPS System.

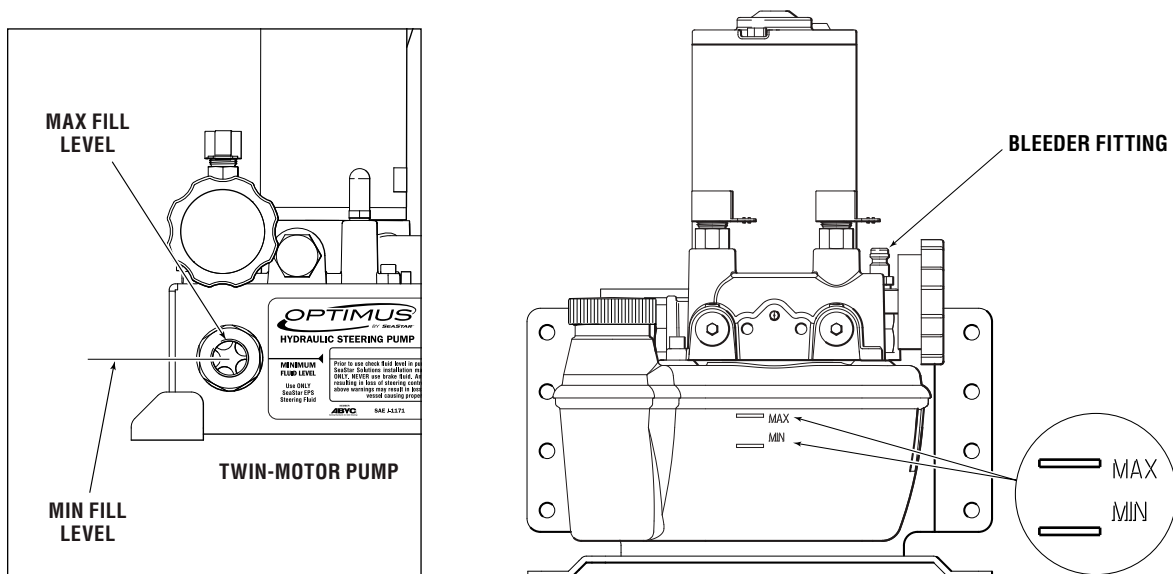


Figure 8-3.

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

Turn on the ignition and then slowly turn the steering wheel to port and to starboard and make sure the engines follow the commands. Watch that the hoses and harness move freely without any snags or hang-ups.

3. Inspect all steering hoses, fittings, mechanical cables, and electrical harness 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.

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

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

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

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 before proceeding.

Read the System Inspection steps on the CANtrak display and acknowledge them by pressing the right hand most button under OK.

7. Verify that installation checks have been performed per Section 8.1.

8.3 Sea Trial – Electronic Power Steering

⚠ WARNING

ALWAYS WEAR A PFD AND CONNECT THE ENGINE LANYARD(S) TO THE OPERATOR DURING SEA TRIAL.

⚠ WARNING

PROCEED CAREFULLY TO DEEP, OPEN WATER TO CONDUCT SEA TRIAL.

8.3.1 Verify Tachometer Signal

Look at the CANtrak display's main run screen and verify that both port and starboard engine RPM is displayed correctly. Check the displayed values against the engine tachometer gauges on the dash. If the RPM is not displayed, or the reading is incorrect, check section 4.2.6 and your installation manual and ensure that the RPM source was correctly installed and configured in the setup.

8.3.2 Check Steering Performance

Spend some time at low speeds getting used to the steering feel. Steer from lock to lock and check that the engines steer smoothly and with no interference. Hit the hardstops and check that the helm locks solidly. Spend some time in reverse gear as well, and get used to the performance when backing up the vessel. If you have multiple helm stations, steer the boat from all helms.

⚠ WARNING

USE EXTREME CAUTION WHEN MAKING AGGRESSIVE STEERING INPUTS AT PLANING SPEEDS.

Once you are familiar with the steering, run the boat at increasing speeds. Check that the steering effort and helm turns change with speed. Check that the steering feels safe, secure and responsive at high speed. Check steering response throughout the typical performance envelope of the vessel.

If you have made an autopilot connection, check that it functions. Set a course and verify that the boat turns and follows the heading. Check that the helm(s) steering effort is high enough to prevent accidental inputs, but low enough that an operator can still manually steer the vessel if required. (Note: it will take an effort to “break” the helm free.) The autopilot's override behavior will depend on the manufacturer; refer to the instructions supplied with the autopilot.

8.3.3 Steering Adjustments

Now that you have spent some time steering the boat and getting a feel for the steering, you may want to adjust some settings, such as the helm effort and number of turns. See section 5.7 for instructions and a description of the available parameters.

We recommend that you make adjustments in this order:

- 1.** Helm turns at low and high speed
- 2.** Helm effort at low and high speed
- 3.** Low speed engine RPM and high speed engine RPM

Tips:

- In general, you want more helm turns and higher helm effort at high speeds. This reduces the steering sensitivity and increases steering control at speed.
- The recommended low speed engine RPM is the RPM at which the boat starts to plane.
- The recommended high speed engine RPM is the RPM corresponding to wide open throttle.
- On vessels with a large engine center distance (e.g. catamarans and quads) you will find that the Inner/Outer Steering Ratio is a useful parameter to adjust.

NOTICE

Change steering settings in small increments and test each change thoroughly.

8.3.4 Conclusion of Sea Trial

Once you are satisfied with the steering settings and the steering performance, and you've verified the tachometer input and autopilot function (when required), the sea trial is complete.

After returning the vessel to port, thoroughly check all hose connections and make sure they are tight. Look for any leaks in the hydraulic portion of the steering system. Check that none of the electrical harnesses and wiring are exposed to water, excessive temperatures, or mechanical damage. Check that all wire splices are properly secured, sealed, and dry. Check that all unused CAN connectors are properly sealed with sealing plugs.

8.4 Sea Trial – i7700 Electronic Shift & Throttle

⚠ WARNING

ALWAYS WEAR A PFD AND CONNECT THE ENGINE LANYARD(S) TO THE OPERATOR DURING SEA TRIAL.

⚠ WARNING

PROCEED CAREFULLY TO DEEP, OPEN WATER TO CONDUCT SEA TRIAL.

Before conducting this sea trial:

- check that both engines shift correctly into forward and reverse gear, and that they respond to throttle inputs.

8.4.1 Shift Performance

Check that both engines engage gears properly in both forward and reverse, and that they hold in gear under load. Check that they shift correctly into neutral. If necessary, repeat some or all of the shift actuator adjustment in section 6.1.2.

8.4.2 Throttle Performance

Check that both engines can reach wide open throttle RPM, and that both return to idle properly. Check that the amount of lever travel before RPMs begin to increase is acceptable. Move both levers forward together and check that the RPMs on both engines begin to increase at the same time. If necessary, repeat some or all of the throttle actuator adjustment in section 6.1.2.

Some engine models have sensitive off-idle performance, and may increase RPM quickly with a small movement of the levers from the idle position. The control head has an optional throttle curve that can slow this response if necessary. See section 6.2.

8.4.3 Control Head Adjustments

During the sea trial you should test the control head features. See the Quick Reference card for instructions.

The control head has adjustable lever friction and adjustable shift detents. Check that the feel of both levers is the same as you shift into and out of gear, and as you increase throttle. Use the adjuster screws on the back of the control head to make any necessary adjustments. (See the User Manual or Quick Reference Card.)

On multi-engine boats engage the Power Train Sync feature and check that engine speeds are matched. If the Sync performance is unsatisfactory you may need to add an engine RPM source if the boat does not already have one.

Enter Trolling Mode and check that full throttle gives a satisfactory fraction of maximum, and that the low speed control is precise. Adjust the Trolling Max Throttle parameters (section 6.2) if necessary. If there are two control stations, run the vessel from both. Transfer control between control heads and verify that transfer works as it should. If you can't transfer control, check that the Station Protection feature is not enabled.

8.4.4 Conclusion of Sea Trial

Once you are satisfied with the shift and throttle performance the sea trial is complete.

After returning the vessel to port, check that none of the electrical harnesses and wiring are exposed to water, excessive temperatures, or mechanical damage. Check that all wire splices are properly secured, sealed, and dry. Check that all unused CAN connectors are properly sealed with sealing plugs.

You must also properly secure the actuator adjustment jam nuts (refer to the i7700 installation manual):

- Remove the cable access covers.
- Loosen and back off the adjuster barrel jam nuts at the actuators.
- Apply a drop of Loctite Threadlocker Blue 242 to the threads adjacent to the adjuster barrel.

- Tighten the jam nuts against the adjuster barrels.
- Install the actuator cable covers. Be sure to install them to the correct actuator, because the labels that you applied during installation give manual override instructions specific to the actuator's type and instance

8.5 Complete Warranty Checklist

The warranty checklist included with your document package should be completed at this time. It will prompt you to check several important installation points and is a valuable double-check for safety and performance.

Once you have done an orientation with the owner and handed the vessel over, return the completed checklist to SeaStar Solutions for warranty registration.

9.0 JOYSTICK SETUP

How you set up the joystick will depend on your goal. Use the diagram below to navigate to the appropriate section.

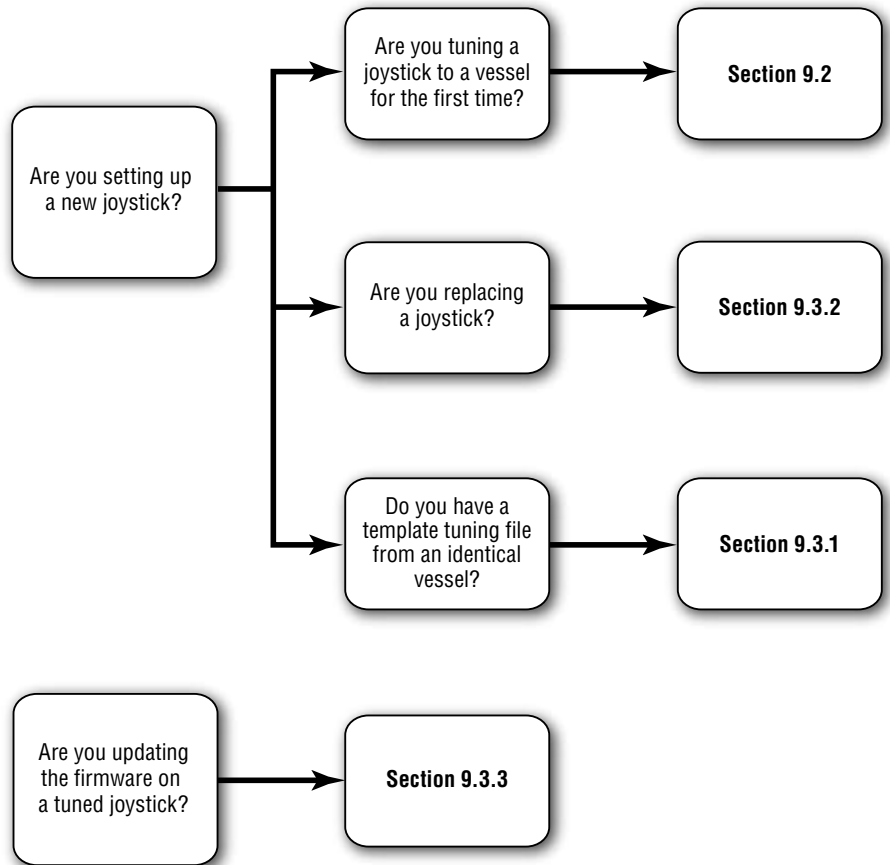


Figure 9-1 Joystick setup options.

9.1 Joystick Tuning Overview

The joystick's electronics manage the complex task of converting joystick input into the gear, throttle, and steering outputs required to move the boat in the commanded direction. To accommodate a variety of hull designs and motor/propeller configurations, there are a large number of parameters used by the joystick control. You will tune these parameters in this part of the installation.

Figure 9-2 shows an overview of the tuning procedure. Each step is detailed in the sections that follow.

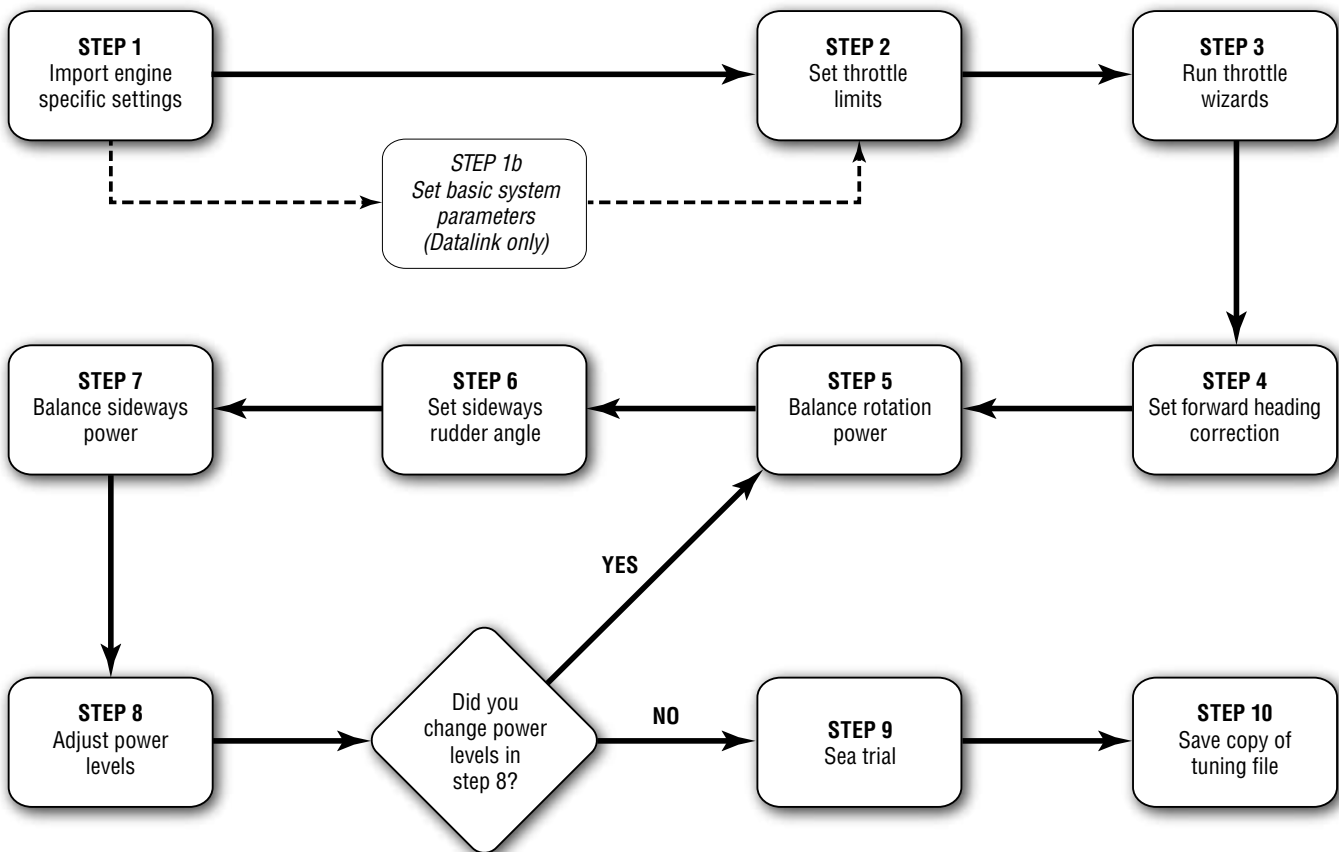


Figure 9-2. Joystick Tuning procedure.

9.2 Joystick Tuning Procedure

The joystick tuning procedure is organized into ten steps, detailed in the following sections. The entire procedure can be performed with either the color CANtrak display, as shown in this section, or with Datalink. Tuning with the CANtrak has the advantage that it will simultaneously tune all connected joysticks, which makes it simpler to tune dual station boats.

NOTICE

The joystick tuning procedure will require maneuvering of the boat. Some of these procedures can be performed at dock with the boat securely restrained, but others will require open water with adequate maneuvering space.

General Notes

- The joystick tuning procedure consists of several steps, each of which may contain several sub-steps. To differentiate between these we use all capital letters to denote the main STEPS, and lower case letters to indicate the sub-steps.

Example: Adjust the parameter as shown in step 7 of STEP 8.

Before You Start

- Trim both engines down and ensure that the correct propellers are installed. You will need to repeat the joystick tuning procedure if you change the propellers afterward.
- Warm up the engines thoroughly before you begin.

NOTICE

Erratic engine performance, stalling, or other engine control issues will affect the operation of the joystick control system. Any such issues must be addressed before attempting joystick setup.

9.2.1 STEP 1 – Import Engine-Specific Settings

There are some system parameters that need to be set for specific engines. You will do this by importing these settings with a simple wizard on the CANtrak display.

1. On the display, navigate to **Dealer Menu > Initial Setup > Joystick**. This is your home base for the joystick tuning procedure, and the numbered steps will help lead you through the tuning process.

NOTICE

Perform the joystick tuning from the main station. The system is programmed to ignore a second station during the tuning procedure.

For Datalink users: joystick tuning is performed from Setup tab of the joystick interface.

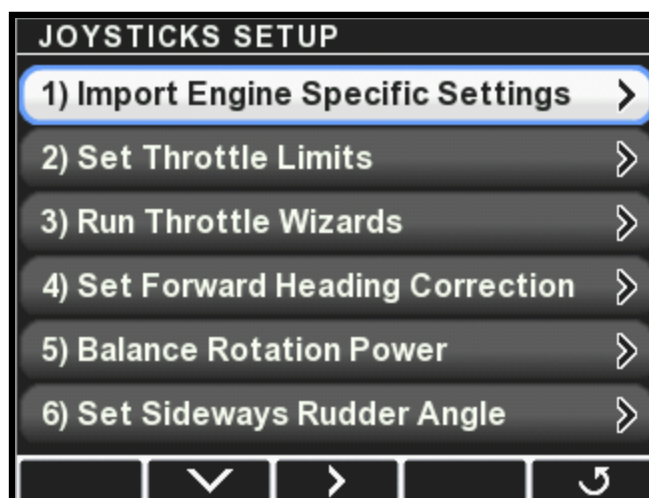


Figure 9-3.

2. Select **Import Engine Specific Settings** and press **>**. This will take you to the Import screen.

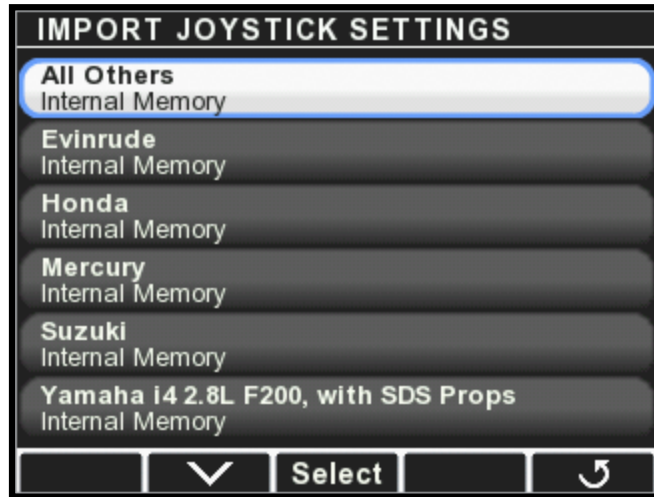


Figure 9-4.

3. Scroll down the list and look for your engine manufacturer and/or model. If your engine is not listed, use All Others. Once you've highlighted the correct item, press **Select**.
4. At the confirmation screen, press **Yes** to confirm the import.



Figure 9-5.

5. The settings will be imported to all joysticks connected to your system. When the import is finished a completion screen will be displayed. Press **↻** to return to the Joystick Setup menu.

9.2.2 **STEP 2** – Set Throttle Limits

In this step you will configure:

- the maximum throttle percent at which the engines are at idle and
- the maximum throttle percent intended for joystick use.

Perform this step with the boat safely secured, or in an open area.

NOTICE

If you are having problems getting an engine to idle, or if it is idling intermittently at different RPMs, confirm that your engine's throttle position sensor (TPS) is functioning properly.

1. Go to **Dealer Menu > Initial Setup > Joystick > Set Throttle Limits**. On the menu you'll be given options for both port and starboard throttle limits. If you've configured the system for four engines you will also see options for port center and starboard center engines.
2. Enter the Port Throttle Limits menu. At the top of the display are two feedback items that will show the current throttle position and the current engine RPM.

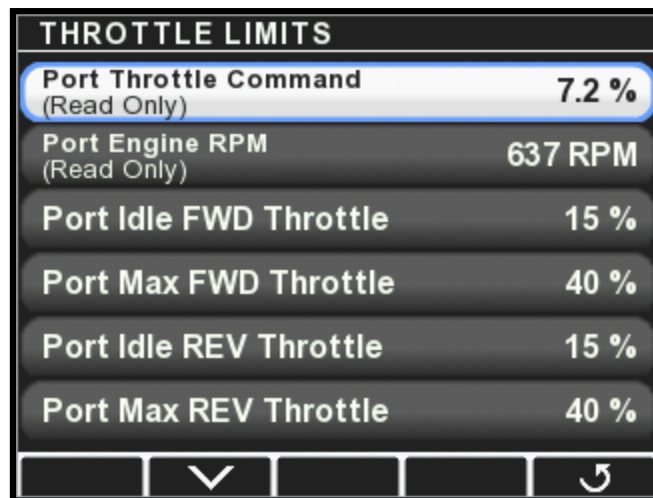


Figure 9-6.

3. Use the control lever to put the port engine in forward gear and very slowly increase the throttle. Watch the feedback display and note the maximum Port Throttle Position at which the engine is *still at idle*.
4. Select **Port Idle Fwd Throttle** and use the + and – buttons to adjust the value to match the maximum Port Throttle Position you noted in step 3.

THROTTLE LIMITS	
Port Throttle Command (Read Only)	12.1 %
Port Engine RPM (Read Only)	637 RPM
Port Idle FWD Throttle	13 %
Port Max FWD Throttle	40 %
Port Idle REV Throttle	15 %
Port Max REV Throttle	40 %
▲ ▼ − + Save	

Figure 9-7.

5. Repeat steps 2 and 3 with the port engine in reverse gear. This time, change the **Port Idle Rev Throttle** parameter.
6. Put the port engine in forward gear and slowly increase the throttle until the engine reaches approximately 1800 RPM. Adjust the **Port Max Fwd Throttle** parameter so it matches the current Port Throttle Position.
7. Put the port engine in reverse gear and slowly increase the throttle until the engine reaches the maximum desired RPM for joystick operation. This will be either:
 - a. The maximum throttle just before cavitation, or
 - b. if cavitation does not occur, the maximum throttle for comfortable use.
 Adjust the **Port Max Rev Throttle** parameter until it matches the current Port Throttle Position.
8. Press **Save** to save changes and return to the previous menu. Repeat these steps for all remaining engines listed in the menu.

9.2.3 **STEP 3** – Run Throttle Wizards

The throttle wizards will use the values acquired in STEP 2 to develop a relationship between throttle and RPM that the joystick will use to improve its control of the vessel. Perform this step with the boat safely secured, or in an open area.

NOTICE

If you abort any of the wizards before they finish you must run them again.

1. Navigate to **Dealer Menu > Initial Setup > Joystick > Run Throttle Wizards**.

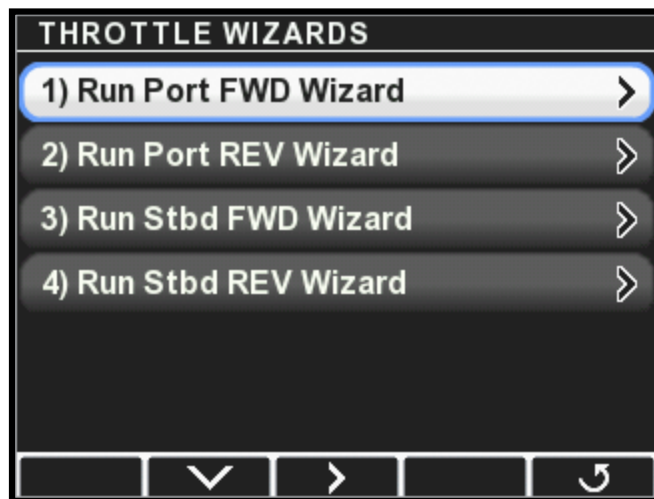


Figure 9-8. Throttle Wizards menu for twin and triple-engine boats.

2. Press **Take Command** on the joystick. Ensure boost mode is *off*.
3. On the display, select **Run Port Fwd Throttle Wizard**. The Throttle Wizard status screen will be displayed, and the joystick's A LED will flash to indicate that the port wizard is running.

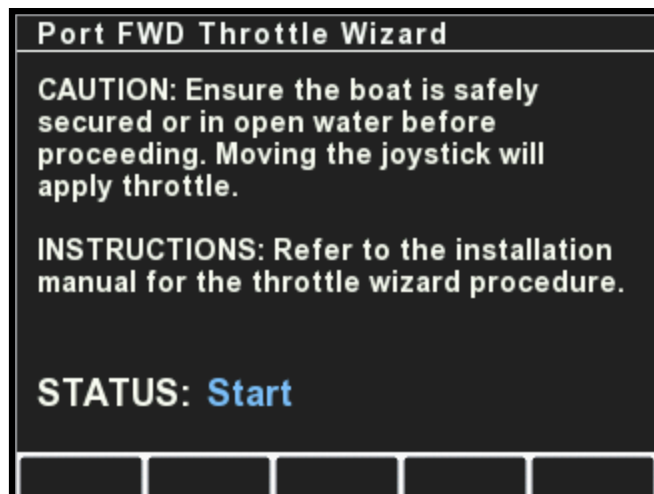


Figure 9-9.

4. Push and hold the joystick all the way forward. The wizard will increase throttle from maximum idle throttle to maximum joystick throttle (recorded in STEP 2) in increments, returning to zero throttle before each increment.
 - a. If necessary, rotate the joystick to correct the boat's heading. To abort the wizard release the joystick. You will need to run the wizard again.
 - b. The wizard takes about one minute to run. When it finishes the A LED will stop flashing, the forward gear will engage, and the engine speed will increase to max forward joystick. Release the joystick at this point. The display will return to the Throttle Wizards menu.
5. Repeat, this time selecting **Run Port REV Wizard** and holding the joystick in full reverse.
6. When you've run both forward and reverse wizards on the port engine, run the starboard wizards. If you are setting up a quad-engine vessel, you must also run the wizards for the port center and starboard center engines.

9.2.4 **STEP 4** – Set Forward Heading Correction

In this step you will adjust the rudder angles to minimize sideways drift when piloting the boat straight ahead with the joystick. For best results, perform in an area with as little wind and current as possible.

1. Navigate to **Dealer Menu > Initial Setup > Joystick > Set Forward Heading Correction**.

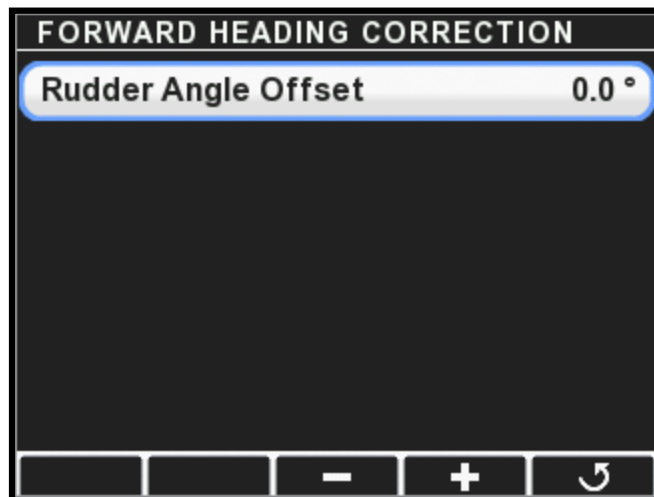


Figure 9-10.

2. Press **Take Command** on the joystick. Ensure boost mode is *off*.
3. Push the joystick all the way forward without rotating the knob. If the boat holds a straight course no adjustment is necessary. Move on to STEP 5.

4. Use the display's **+** and **-** buttons to change the Rudder Angle Offset until the boat holds a straight course. If the boat drifts to port, enter a positive value. If the boat drifts to starboard, enter a negative value.
5. Press **Save** to save the change and return to the Joystick Setup menu.

9.2.5 **STEP 5** – Balance Rotation Power

In this step you will tune the power ratio between the FWD and REV engines to yield tight circles in rotation (ROT) mode. For best results, perform in an area with as little wind and current as possible.

1. Bring the boat to a stop with boost mode off.
2. On the display, navigate to **Dealer Menu > Initial Setup > Joystick > Balance Rotation Power**. Select **Normal REV/FWD Ratio**. The default parameter values may be different on your installation.

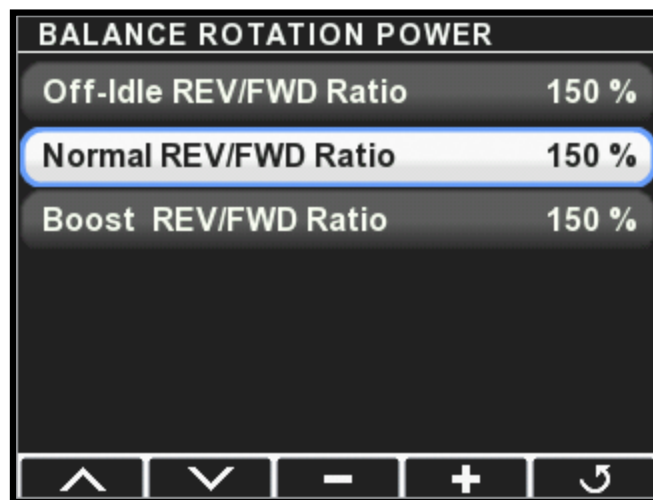


Figure 9-11.

3. Rotate the joystick all the way clockwise (CW).
 - a. If the boat moves aft while rotating, press **-** to decrease the ratio. If it moves forward, press **+** to increase the ratio. To start, adjust in increments of at least 20%. Reduce the size of the increment as you get closer to zero fore/aft movement.
 - b. Press **Save**.
 - c. Repeat until the boat rotates on the spot with no fore/aft movement.
4. Press **Boost** on the joystick to enable boost mode, and select **Boost REV/FWD Ratio** on the display. Repeat step 3.

5. Turn boost mode off on the joystick. Select **Off-Idle REV/FWD Ratio** on the display and adjust the value so that it is the same as the Normal REV/FWD Ratio parameter.

In many cases the off-idle rotation power balance will be adequate at this point, but you may find the vessel drifts aft at small joystick inputs, especially when the joystick is tuned with higher peak power levels. You can improve the off-idle performance with the optional step below.

6. Optional: Keep an eye on your *port* engine tachometer and slowly rotate the joystick clockwise (CW) until the engine comes *just* off idle. Hold the joystick at this point.
 - a. If the boat moves aft, decrease the Off-Idle REV/FWD Ratio.
 - b. If the boat moves forward, try rotating the joystick a little more. If the boat still doesn't move aft there is no adjustment to make. Leave the Off-Idle REV/FWD Ratio the same as the Normal REV/FWD Ratio. It should never be higher.
 - c. Press **Save**.
 - d. Repeat until the boat rotates on the spot with no fore/aft movement.

9.2.6 **STEP 6** – Set Sideways Rudder Angle

When moving sideways we don't want the boat to rotate. We achieve this by tuning the Sideways Rudder Angle parameters. For best results, perform in an area with as little wind and current as possible. This step only adjusts for rotation during sideways movement. Fore/aft movement during sideways motion will be adjusted in STEP 7.

1. Bring the boat to a stop with boost mode off.
2. On the display, navigate to **Dealer Menu > Initial Setup > Joystick > Set Sideways Rudder Angle**. Select **Normal Rudder Angle**. The default parameter values may be different on your installation.

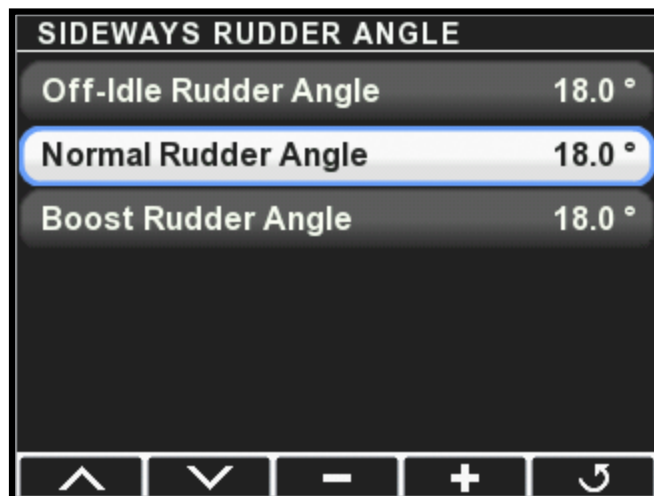


Figure 9-12.

3. Move the joystick sideways fully to port.
 - a. If the boat rotates clockwise as it starts to move, press **-** to decrease the ratio by up to two units. If it rotates counterclockwise, press **+** to increase the ratio.
 - Note: the boat will rotate counterclockwise as it gains speed. This is normal – our objective is to remove rotation during *initial* movement.
 - b. Press **Save**.
 - c. Repeat until the boat's initial movement is directly sideways.
4. Press **Boost** on the joystick to enable boost mode, and select **Boost Rudder Angle** on the display. Repeat step 3.
5. Turn boost mode off on the joystick. Select **Off-Idle Rudder Angle** on the display and adjust the value so that it is the same as the Normal Rudder Angle parameter.

In many cases the off-idle rudder angle will be adequate at this point, but you may find the vessel rotates clockwise at small joystick inputs, especially when the joystick is tuned with higher peak power levels. You can improve the off-idle performance with the optional step below.
6. Optional: Keep an eye on your *starboard* engine tachometer and slowly move the joystick to port until the engine comes *just* off idle. Hold the joystick at this point.
 - a. If the boat rotates clockwise, decrease the Off-Idle Rudder Angle.
 - b. If the boat rotates counterclockwise, try moving the joystick a little more. If the boat still doesn't rotate clockwise there is no adjustment to make. Leave the Off-Idle Rudder Angle the same as the Normal Rudder Angle. It should never be higher.
 - c. Press **Save**.
 - d. Repeat until the boat's initial movement is directly sideways.

9.2.7 **STEP 7** – Balance Sideways Power

In this step you will adjust the power ratio between the REV and FWD engines to eliminate fore/aft movement when moving the boat sideways. Perform in an area with no wind or current to remove outside interference.

1. Bring the boat to a stop with boost mode off.
2. On the display, navigate to **Dealer Menu > Initial Setup > Joystick > Balance Sideways Power**. Select **Normal REV/FWD Ratio**. The default parameter values may be different on your installation.

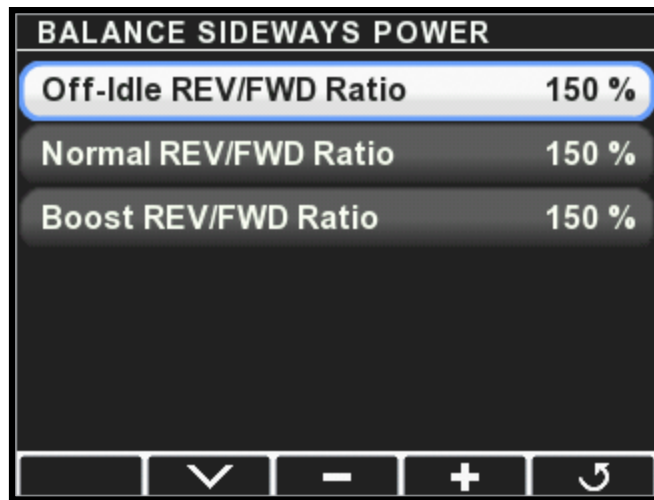


Figure 9-13.

3. Move the joystick sideways fully to port. You can rotate the knob if necessary to keep the bow from rotating as you speed up.
 - a. If the boat moves aft, press **-** to decrease the ratio. If it moves forward, press **+** to increase the ratio. To start, adjust in increments of at least 20%. Reduce the size of the increment as you get closer to zero fore/aft movement.
 - b. Press **Save**.
 - c. Repeat until the boat moves directly sideways.
4. Press Boost on the joystick to enable boost mode, and select Boost REV/FWD Ratio on the display. Repeat step 3.
5. Turn boost mode off on the joystick. Select Off-Idle REV/FWD Ratio on the display and adjust the value so that it is the same as the Normal REV/FWD Ratio parameter.

In many cases the off-idle sideways power balance will be adequate at this point, but you may find the vessel drifts aft at small joystick inputs, especially when the joystick is tuned with higher peak power levels. You can improve the off-idle performance with the optional step below.
6. Optional: Keep an eye on your *starboard* engine tachometer and slowly move the joystick to port until the engine comes just off idle. Hold the joystick at this point.
 - a. If the boat moves aft, decrease the Off-Idle REV/FWD Ratio.
 - b. If the boat moves forward, try moving the joystick a little more. If the boat still doesn't move aft there is no adjustment to make. Leave the Off-Idle REV/FWD Ratio the same as the Normal REV/FWD Ratio. It should never be higher.
 - c. Press **Save**.
 - d. Repeat until the boat moves directly sideways.

9.2.8 **STEP 8** – Adjust Power Levels

In this step you will customize the boat's response by fine-tuning the power levels associated with each direction. Note that large changes can affect the parameters you tuned in STEP 4 through STEP 7.

Note: When fine-tuning power levels, always return the joystick to the center position after making any adjustment. Make small changes and press **Save** after every change.

1. Ensure boost mode is off.
2. Navigate to **Dealer Menu > Initial Setup > Joystick > Adjust Power Levels**.

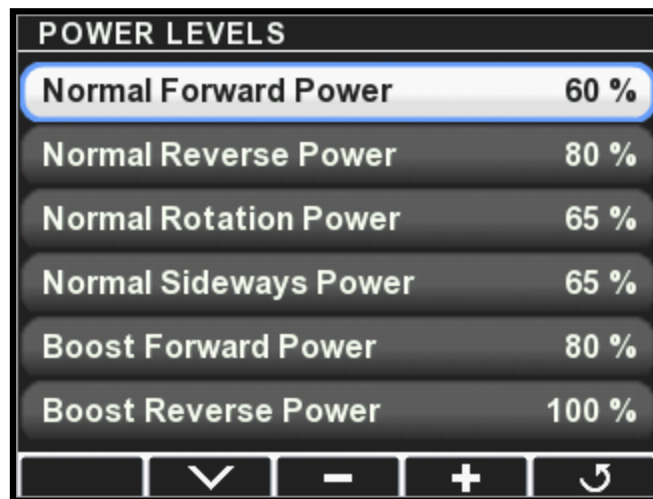


Figure 9-14.

3. Move the joystick all the way forward and adjust Normal Forward Power until the boat's speed over water (SOW) is 3–4 knots.
4. Move the joystick to full forward and hold until the boat is at speed. Abruptly move the joystick to full reverse and hold until the boat stops its forward motion.
 - a. If the boat does not stop quickly enough, increase Normal Reverse Power and repeat until you are satisfied with the stopping time.
5. Move the joystick all the way port and adjust Normal Sideways Power until the boat moves sideways at a comfortable close-quarters docking speed.
6. Rotate the joystick all the way clockwise and adjust Normal Rotation Power until the boat rotates at a comfortable close-quarters docking speed.
7. Press **Boost** to enable boost mode.
8. Move the joystick all the way forward and adjust Boost Forward Power until the boat's SOW is 4–5 knots.

9. Move the joystick to full forward and hold until the boat is at speed. Abruptly move the joystick to full reverse and hold until the boat stops its forward motion.
 - a. If the boat does not stop quickly enough, increase Boost Reverse Power and repeat until you are satisfied with the stopping time.
10. Move the joystick all the way port and adjust Boost Sideways Power until the boat moves sideways noticeably faster than in normal mode.
11. Rotate the joystick all the way clockwise and adjust Boost Rotation Power until the boat rotates noticeably faster than in Normal mode.
12. *Changes in these values can affect previously calibrated parameters. If you changed any of these parameters by more than 5 units, repeat STEPS 5 through 7.*

9.2.9 **STEP 9** – Sea Trial

Now that the basic setup procedure is completed, it is time to conduct a basic sea trial to confirm good joystick performance. Perform the sea trial in an open area and pay particular attention to gear engagement, boat response and stopping power.

⚠ WARNING

ALWAYS WEAR A PFD AND CONNECT THE ENGINE LANYARD(S) TO THE OPERATOR DURING SEA TRIAL.

Gear Engagement

Perform the following actions and check that the gear shifts occur within approximately two seconds. If you find that gear engagement is taking longer contact SeaStar Solutions technical support.

1. Engage Boost mode.
2. Move the joystick all the way to port for a few seconds.
3. Move the joystick all the way to starboard for a few seconds.
4. Move the joystick back to port.
5. Repeat, pausing at the neutral position for one second when changing directions.

Boat Response

Step through all the Joystick Modes of Operation shown on the Optimus 360 Joystick Quick Reference Guide and confirm that:

1. boat response is predictable
2. speeds are safe for operation in a marina
3. boost mode gives noticeably higher thrust than normal mode.

If the boat performance does not meet all of these requirements, return to STEP 8 and adjust the power levels according to the instructions. If further adjustments do not help, or if you need assistance, contact SeaStar Solutions technical support.

Stopping Power

1. In normal mode, hold the joystick all the way forward until the boat reaches its maximum speed.
2. Abruptly move the joystick all the way into reverse.
3. Confirm that the boat's stopping power is adequate.
4. Repeat the test in boost mode.

If the stopping power is insufficient for safe operation, return to STEP 8 and increase the Reverse Power parameters as required.

9.2.10 **STEP 10** – Save the Joystick Tuning File

The joystick tuning file should be saved as a backup in the event of a joystick failure. You will also need to email a copy of the tuning file to SeaStar Solutions as part of the post-installation warranty checklist.

1. Insert a USB flash drive in the USB port on the back of the CANtrak display.
2. Navigate to **Dealer Menu > Devices > Main Joystick > Export Settings**. You will see the Export Settings menu, with options for Internal Memory and USB Memory.

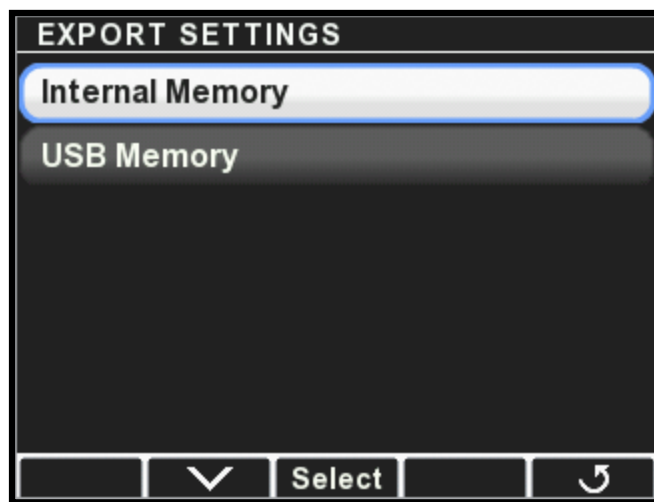


Figure 9-15.

3. Highlight **USB Memory** and press **Select**.
4. The display will save the configuration file to the USB drive and display a message when finished.

Notes:

- The display will create a folder on the USB drive called 'Optimus,' and a sub-folder named 'Joystick,' into which the configuration file will be saved.
- It will save the configuration file with the name *[serial number of the joystick].xcu*. Be sure to give the file a unique, meaningful name for later use. You can't do this from the display; you will need to insert the USB drive into a computer to rename the file. (See section 11.5 for recommendations.)
- Configuration files exported by the display have the extension .xcu. This is different than the .ecu extension generated by Datalink. Only .xcu files can be imported using the CANtrak display. Don't change the extension when you rename the file.

9.3 Importing a Joystick Tuning File

The Import utility in the CANtrak display allows you to copy an existing joystick tuning file into another joystick. This makes it easy to:

- use a template tuning file to set up identical vessels without tuning every vessel individually.
- replace a joystick.

9.3.1 Using a Template File

If you are setting up identical vessels, you can use the tuning file from the first vessel as a template for others. For vessels to be considered identical they must have the same hull (model and size) and the same engines (model, horsepower, and propellers). If any of these conditions are not met you will need to perform a full joystick tune.

When you plan to use a joystick tuning file as a template for identical vessels, save it with a meaningful name in a dedicated folder.

Example: Joystick Template – Hull Model – Engine Model – Date.xcu

You will need:

- a copy of the template tuning file (.xcu) on a USB drive.
- the latest firmware revision on all system components. See section 11 for firmware updating instructions.

Procedure

1. Follow the basic import procedure in section 9.3.4. Be sure to select the correct template.
2. If this is a multi-station vessel you will need to set the joystick instances and locations. On the CANtrak display, navigate to **Dealer Menu > Initial Setup > Select Device Locations** and set the instances by matching the joystick serial number to its location (Main or Second).
3. Perform STEP 2 (section 9.2.2) and STEP 3 (section 9.2.3) of the joystick tuning procedure. (This is necessary because throttle response can vary from engine to engine.)
4. Perform a sea trial as shown in STEP 9 (section 9.2.9). If the vessel's performance under joystick control is poor, double-check that the template file you used was for an identical vessel.

9.3.2 Replacing a Joystick

You will need:

- a copy of the original joystick's tuning file (.xcu) on a USB drive. If you do not have the tuning file you will need to tune the joystick from scratch (section 9.2).
- the latest firmware revision on all system components. See section 11 for firmware updating instructions.

Follow the basic import procedure shown in section 9.3.4. Once the import is complete, perform a sea trial as shown in STEP 9 (section 9.2.9).

9.3.3 Updating Joystick Firmware

In general, system firmware should always be updated using the software update utility shown in section 11.

If you have a situation in which you feel you need to update the joystick firmware on its own, please contact SeaStar Solutions technical support.

9.3.4 Basic Import Procedure

1. Insert the USB drive containing the joystick tuning file in the port on the back of the CANtrak display.
2. Connect all destination joysticks to the network. On the CANtrak, navigate to **Dealer Menu > Settings > Joystick > Import Settings**.
3. The display will show a list of available .xcu files on your USB drive. Find the one you want to use and press Select.
4. At the confirmation prompt, press Yes to continue. The joystick tuning file will be imported to all connected joysticks.
5. Press **J** repeatedly to exit. You will be prompted to cycle power. Turn the ignition off, wait at least five seconds, then turn it on again.

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10.0 FAULT HANDLING

The PCM has red LED fault indicators directly under the power LED indicators. Flashing Red indicates a fault. Active faults will be shown on the CANtrak display. If necessary, the fault history can be read with Datalink.

10.1 Danger Fault Handling

A danger fault is a critical system fault which will result in limited steering performance and requires immediate action and return to the nearest port. 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 the figure below.

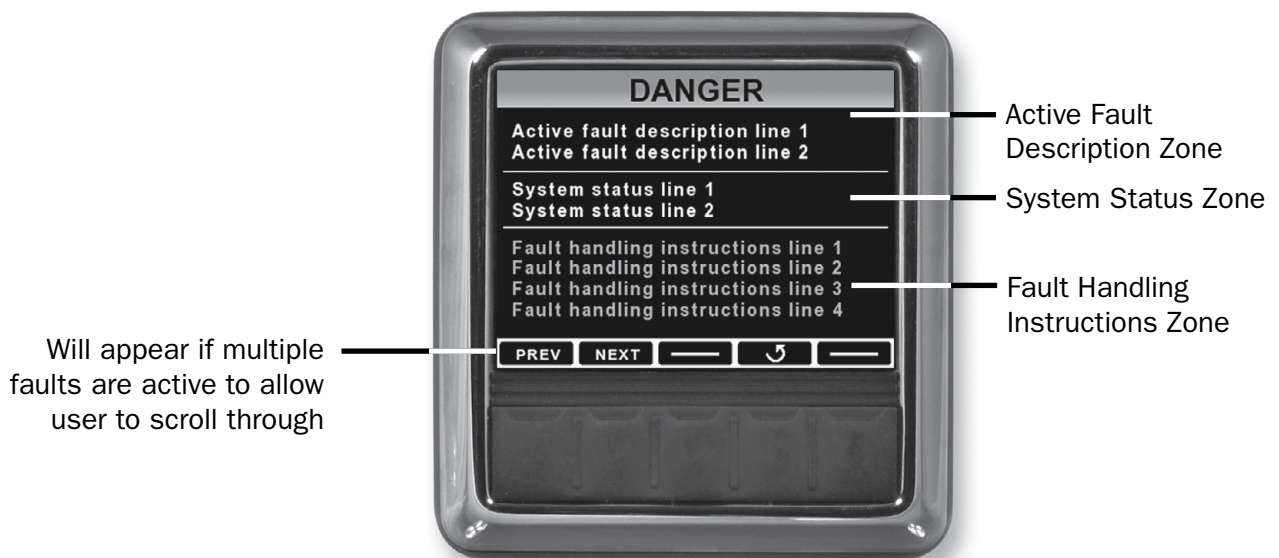


Figure 10-1. Fault screen layout.

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.

10.2 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 10-2. 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 10-2. 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.

NOTICE

Additional fault handling information is provided in the User's Manual.

11.0 UPDATING SOFTWARE

From time to time it may become necessary to update the Optimus component firmware as new versions become available.

11.1 Downloading Software Update Files

Check www.optimusdealers.com for latest available firmware. The updates are packaged in a single download file called 'Optimus and Optimus 360 Datalink Updater Version X', where X indicates the revision. A readme file describes the nature of the updates, the component revision files included in the package, and any special instructions. We recommend that you read the readme file prior to updating. There is a link to the Readme file on the website, or it can be accessed from the Datalink **Help** menu. Choose **Help > readme.txt** to view the file.

When run, the Updater will first install the latest version of Datalink on your computer, then automatically load the latest firmware files to the notebook computer and put them in the [Desktop\Optimus Firmware] folder. Each component update file will be in a separate folder with the component name. See figure 11-1.

Name	Date modified	Type
Actuator Shift_Throttle	3/27/2014 2:31 PM	File folder
BRP	3/27/2014 2:31 PM	File folder
Color CANTrak	3/27/2014 2:31 PM	File folder
Control_Head	3/27/2014 2:31 PM	File folder
EPS_Helm	3/27/2014 2:31 PM	File folder
Joystick	3/27/2014 2:31 PM	File folder
PCM	3/27/2014 2:31 PM	File folder
Suzuki_EST_Gateway	3/27/2014 2:31 PM	File folder
Yamaha_EST_Gateway	3/27/2014 2:31 PM	File folder

Figure 11-1. Desktop\Optimus Firmware – Folder Structure.

NOTE: The installer only loads the required files to the computer; it does NOT perform the actual component updates.

11.2 Updating the CANtrak Software

The CANtrak software is updated from the display. You will need a USB drive (preferably empty) and a computer to perform the update. Once the display software is updated it can be used to update the remaining components on the system.

Procedure

1. If you haven't already done so, download and install the file updater (section 11.1). Check the software revision on the CANtrak (section 11.4) against the latest revision listed in the readme.txt file. If the revision is the same then the software is already up to date.
2. Find the Optimus Firmware folder on your desktop and open it, then open the Color CANtrak folder.
3. Find the .zip file and extract all the files to the root level of your USB drive. Don't put them in a file folder.
4. Plug the USB drive into the port on the back of the CANtrak. If your system is off, turn it on now.
5. The software update process is automatic. When prompted, remove the USB drive from the display. The display will reboot into the updated software version.
6. Delete the files you copied to the USB drive. If you don't, you won't be able to use the USB drive for other CANtrak functions.

11.3 System Software Update

The CANtrak display features a software update utility that will check each component's revision level and automatically update it to the correct revision level for your system type. Before using the update utility you must have completed the initial system setup shown in section 4.

NOTICE

Before running the software updater the Color CANtrak display software must be updated as shown in section 11.2.

NOTICE

The software update will take several minutes to complete.

⚠ WARNING

ONCE THE UPDATE PROCESS HAS BEEN STARTED CONTINUE UNTIL IT IS COMPLETED. THE VESSEL MAY NOT BE SAFE TO OPERATE BEFORE THE PROCESS HAS FINISHED AND THE FINAL KEY CYCLE HAS BEEN PERFORMED.

Procedure

1. Navigate to **Dealer Menu > Initial Setup > 2) Updates** and press **>**. The system will check the revision level of all installed components and prompt if an update is required. Follow the instructions on the display to complete the update. The flowchart in figure 11-4 shows what's going on behind the scenes. You don't need to know this, but it may be helpful in the event of an error.
2. Once the update is successfully completed and you've performed the final system restart, return to Initial Setup and complete the setup and configuration of the system.
3. If you are updating a system that is already installed and configured, review the configuration of each component and ensure that nothing has changed. This is especially important for the push/pull setting on the shift and throttle actuators. You may need to repeat the setup if there were any export/import errors during the update.

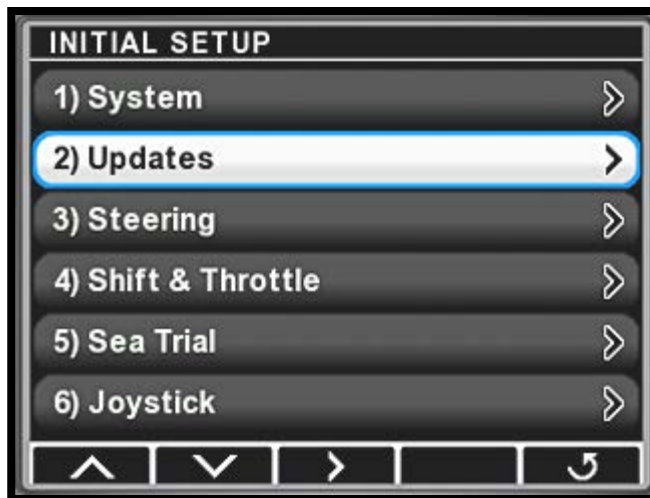


Figure 11-2.

11.4 Checking Component Firmware Revision Levels

You can check the current firmware revision of each component using the CANtrak display.

1. Navigate to **Dealer Menu > Devices > [component name] > Product Information** to go to the Product Information page.
2. The software revision is listed, along with the part number and serial number of the component.

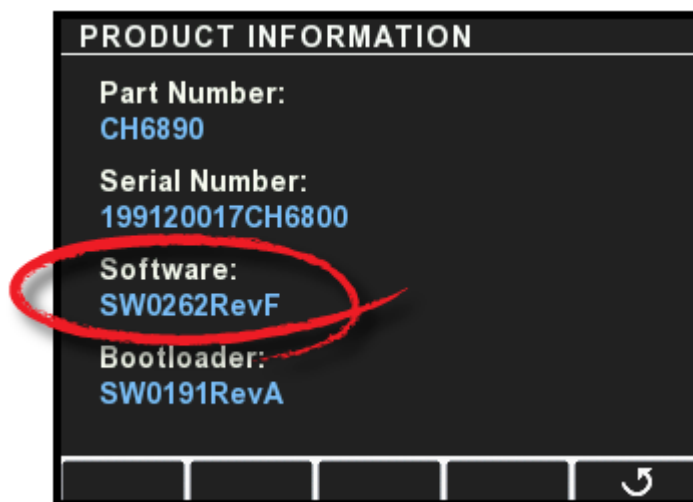


Figure 11-3.

11.5 Backing Up Component Configuration Files

It is good practice to make backup copies of component configuration files for every installation. The backups can be used to verify the correct configuration after firmware updates, and to import a configuration to a new component in the event of a failure.

The entire system can be backed up in one step using the CANtrak display and a portable USB drive.

1. Insert a USB drive into the port on the back of the CANtrak display.
2. Navigate to **Dealer Menu > Tools > Export System Settings**.
3. Set USB Drive as the destination and press **Select**.
4. The display will export the .xcu configuration file for every device in the system. If necessary, the procedure creates a directory structure on the USB drive and places the .xcu files in appropriately named folders.
5. The .xcu files are given the name [*device serial number*].xcu. For future use you should give these files meaningful names, that include the component name, revision level, and current date. (You will need to use a computer – you can't do it through the display.) For example:
 - Helm Rev B YYYY-MM-DD.xcu
 - PortShiftActuator Rev A YYYY-MM-DD.xcu

Don't change the names of the folders that were created on the USB drive. The system uses these folder names to locate the .xcu files for import later.

Individual Component Backup

You can also back up a single component. Navigate to **Dealer Menu > Devices > [Device Name] > Export Settings**. Set USB Drive as the destination and press **Select**.

11.6 Disabling Automatic Check for Updates

Every time the system is started the color CANtrak will automatically scan all the components and check the software versions. (During the scan the Menu button will not be displayed.) In most systems the scan will not trigger a warning unless a component is replaced. However, there are times when an engineering (non-production) release of software may be used in a system. In this case the automatic scan would cause a warning on every startup, so it should be disabled. Contact technical support for instructions.

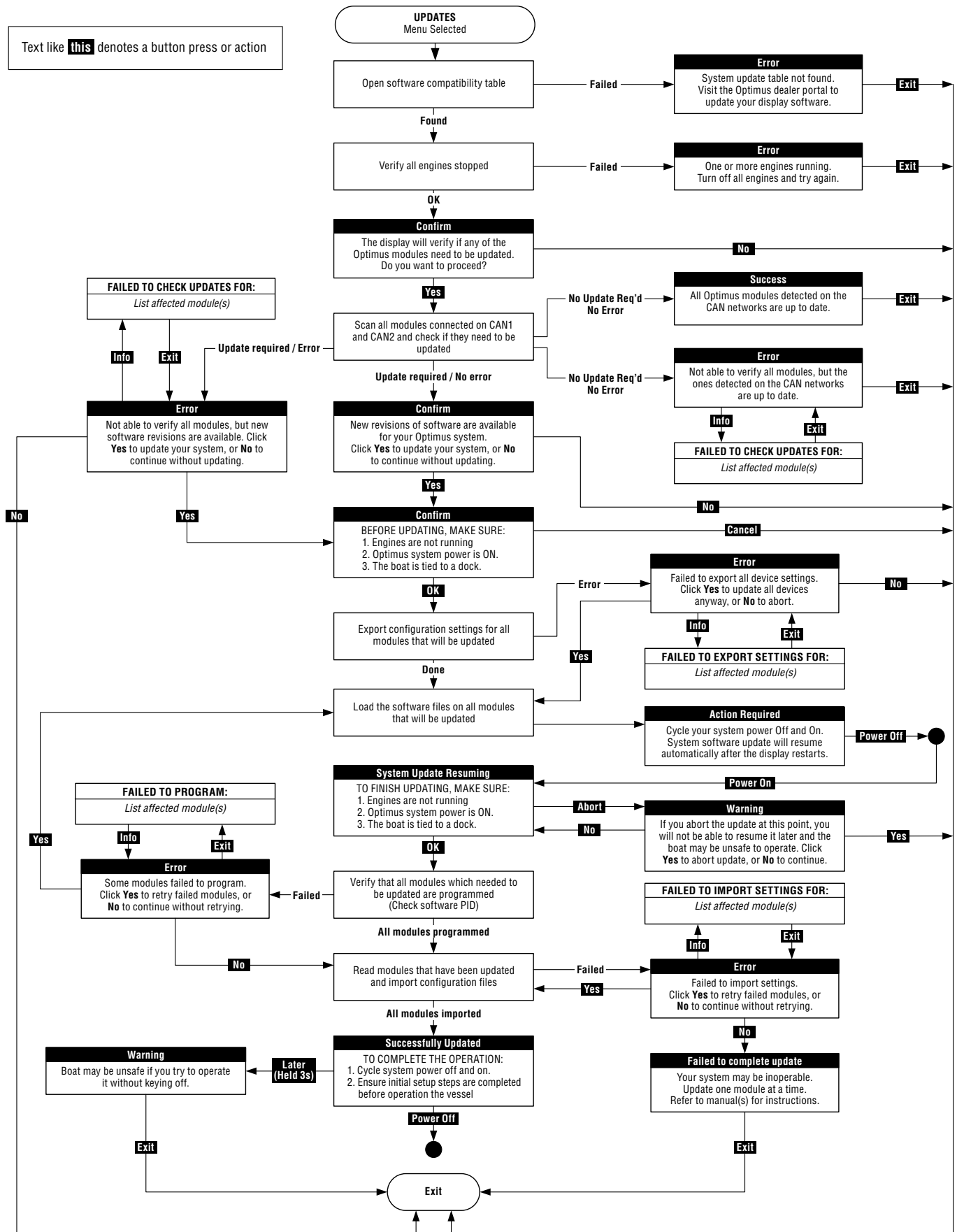


Figure 11-4. Software update process using CANtrak.

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.

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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

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