

MEMBER
ABYC
Setting Standards for Safer Boating

60

SIXTY
ISO 9001

OPTIMUS EPS
BY SEASTAR

BAYSTAR[™]

SEASTAR[™]

INSTALLATION MANUAL

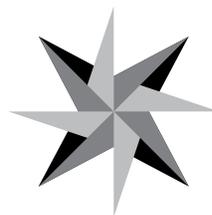
SUPPLEMENTAL

www.seastarsolutions.com



OPTIMUS360
BY SEASTAR[™]

Joystick Control System for
Outboard Powered Vessels



SEASTAR
SOLUTIONS[®]

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

©2013 SeaStar Solutions.

All Rights Reserved. This document, subject matter and all information herein is the sole, exclusive and confidential property of SeaStar Solutions and shall not be disclosed, copied, reproduced or used in whole or in part for any purpose other than as specifically authorized in writing by Marine Canada Acquisition (DBA SEASTAR SOLUTIONS).

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



is a registered trademark of the American Boat & Yacht Council (<http://www.abycinc.org>)

NMEA 2000® is a registered trademark of the National Marine Electronics Association.

Optimus, Optimus 360, SeaStar, and BayStar are all trademarks of SeaStar Solutions.

**California
Proposition 65 Warning**

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

Wash hands after handling.

Thank you for choosing an Optimus™ 360 Joystick Control System. You have chosen a state of the art vessel control system that will provide years of effortless and trouble free steering performance.

About this Book

This book contains the information required to install and calibrate the Optimus 360 Joystick Control System. Use it together with the Optimus EPS Installation Manual (Book 50, PID #682100). Book 50 contains installation, calibration and purging instructions for the base electronic steering system, upon which the joystick control system is built. This book is to be delivered to the customer when installation is complete.

Notice to the Installer

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

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

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.

INDEX

Abbreviations.....	V
1.0 Safety Information.....	1-1
1.1 Safety Labels	1-3
2.0 System Overview.....	2-1
2.1 System Description.....	2-1
2.2 Optimus 360 System Diagrams	2-2
3.0 Installation Overview	3-1
3.1 Important Information/Technical Support Contact	3-1
3.2 Installation Overview	3-1
3.2.1 <i>Part 1: Component Installation</i>	3-1
3.2.2 <i>Part 2: System Calibration, Purging and Setup</i>	3-2
4.0 Installation – Part 1.....	4-1
4.1 Installing the Joystick.....	4-1
4.1.1 <i>Joystick Types</i>	4-1
4.2 Installing the Control Head	4-1
4.2.1 <i>Control Head Trim Switch Connection</i>	4-1
4.3 Installing the Actuators	4-3
4.3.1 <i>Location, Identification & Mounting</i>	4-3
4.3.2 <i>Start-In-Gear Protection</i>	4-3
4.3.3 <i>Actuator Power Connections</i>	4-4
4.3.4 <i>Shift Actuator Electrical Connections</i>	4-4
4.3.5 <i>Throttle Actuator Electrical Connections</i>	4-5
4.4 CAN1 Harness Connections.....	4-6
4.4.1 <i>Connecting a Second Station</i>	4-7
4.5 CAN2 Harness Connections.....	4-8
5.0 System Setup, Purge, and Calibration	5-1
5.1 Initial Setup.....	5-1
5.2 Purge and Calibrate	5-3
5.3 Actuator Setup	5-4
5.3.1 <i>Step 1 – Actuator Configuration Using the CANrak Display</i>	5-4
5.3.2 <i>Step 2 – Cable Installation and Adjustment</i>	5-7
5.3.2.1 <i>Shift Cable Installation</i>	5-8
5.3.2.2 <i>Throttle Cable Installation</i>	5-9
5.3.3 <i>Final Setup and Actuator Adjustment</i>	5-10
5.4 Control Head Setup	5-13
6.0 Sea Trial	6-1
6.1 Shift Performance.....	6-1
6.2 Throttle Performance	6-1
6.3 Control Head Adjustments.....	6-1
6.4 Conclusion of Sea Trial.....	6-2
6.5 Complete Warranty Checklist	6-2
7.0 Joystick Setup	7-1
7.1 Joystick Tuning Overview	7-2
7.2 Joystick Tuning Procedure.....	7-3
7.2.1 <i>STEP 1 – Import Engine-Specific Settings</i>	7-3
7.2.2 <i>STEP 2 – Set Throttle Limits</i>	7-5
7.2.3 <i>STEP 3 – Run Throttle Wizards</i>	7-7
7.2.4 <i>STEP 4 – Set Forward Heading Correction</i>	7-8
7.2.5 <i>STEP 5 – Balance Rotation Power</i>	7-9
7.2.6 <i>STEP 6 – Set Sideways Rudder Angle</i>	7-10
7.2.7 <i>STEP 7 – Balance Sideways Power</i>	7-11

7.2.8	STEP 8 – Adjust Power Levels	7-13
7.2.9	STEP 9 – Sea Trial	7-14
7.2.10	STEP 10 – Save the Joystick Tuning File.....	7-15
7.3	Importing a Joystick Tuning File.....	7-16
7.3.1	Using a template file.....	7-16
7.3.2	Replacing a joystick.....	7-16
7.3.3	Updating Joystick Firmware.....	7-17
7.3.4	Basic Import Procedure.....	7-17
8.0	Post-Installation Warranty Checklist.....	7-18
9.0	Updating Firmware	7-18
10.0	Warranty	7-19
10.1	Statement of Limited Warranty	7-19
10.2	Return Goods Procedure	7-19
10.3	Technical Support	7-19
Appendix A	– Mounting Templates	A-1
A.1	Joystick.....	A-1
A.2	Control Head.....	A-3
Appendix B	– Setup and Tuning with Datalink.....	B-1
B.1	Using Datalink for Optimus 360	B-1
B.2	Actuator Setup	B-3
B.2.1	Step 1 – Actuator Configuration Using Datalink	B-3
B.2.2	Step 2 – Cable Installation and Adjustment	B-5
B.2.3	Step 1 – Final Setup and Actuator Adjustment	B-5
B.3	Control Head Setup	B-7
B.4	System Setup.....	B-8
B.4.1	System Parameters	B-8
B.4.2	Settings Menu Access	B-9
B.4.3	Cycle Power to System.....	B-9
B.5	Joystick Tuning Procedure.....	B-10
B.5.1	General Notes	B-11
B.5.2	Before You Start.....	B-11
B.5.3	STEP 1 – Import Engine-Specific Settings	B-12
B.5.4	STEP 1a – System	B-12
B.5.5	STEP 2 – Set Throttle Limits	B-12
B.5.6	STEP 3 – Run Throttle Wizards	B-14
B.5.7	STEP 4 – Set Forward Heading Correction	B-15
B.5.8	STEP 5 – Balance Rotation Power	B-16
B.5.9	STEP 6 – Set Sideways Rudder Angle.....	B-17
B.5.10	STEP 7 – Balance Sideways Engine Power.....	B-18
B.5.11	STEP 8 – Adjust Power Levels	B-19
B.5.12	STEP 9 – Sea Trial	B-20
B.5.13	STEP 10 – Saving the Joystick Tuning File	B-20
B.6	Adding a Second Control Station.....	B-21
B.6.1	Configure the Secondary Helm and CANtrak Display	B-21
B.6.2	Configure the Secondary Control Head	B-21
B.6.3	Configure the Secondary Joystick.....	B-22
B.7	Importing a Joystick Tuning File.....	B-22
B.7.1	Configuring a second joystick	B-22
B.7.2	Using a template file.....	B-22
B.7.3	Replacing a joystick.....	B-23
B.7.4	Updating joystick firmware.....	B-23
B.7.5	Basic Import Procedure.....	B-23

Abbreviations

The following abbreviations are used in this manual:

ABYC	American Boat & Yacht Council
AUX	Auxiliary
BAT	Battery
CAN	Controller Area Network
CAN bus	Controller Area Network (data) bus. (A harness of wires that carry digital signals and power between electronic modules)
DC	Direct current
ENG	Engine
EPS	Electronic Power Steering
FT-LB	Foot-pounds, a US unit of torque
FWD	Forward
GND	Ground
HI	High
IN-LB	Inch-pounds, a US unit of torque
LED	Light emitting diode
LO	Low
MPH	Miles per hour
NA	Not applicable or Not available
N/C	No connection
Nm	Newton-meters, a metric measure of torque
NMEA	National Marine Electronics Association
NMEA 2000®	A protocol for digital communication on a CAN Bus
PCM	Pump control module
REV	Reverse
ROT	Rotation mode (joystick control)
RPM	Revolutions per minute
SIDE	Sideways mode (joystick control)
STBD	Starboard (right when facing forward)
SW	Switch
WOT	Wide open throttle

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

1.0 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 manual. 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), splashwell, outboard engine, or any combination of these parts, by performing the following steps:
 - a) With the engine fully tilted **DOWN**, turn the steering wheel from hard over to hard over and confirm that no interference occurs.
 - b) Repeat step 1a with engines tilted **UP**.
 - c) Perform step 1a with each engine in alternating **DOWN/UP** positions and confirm that independent **TRIM/TILT** can be done without any interference.
2. Check that the steering cylinder can be fully stroked in both directions, as well as full tilt and trim, 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 9.1 in the Optimus EPS Installation Manual (Book 50) 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. Take control with the joystick and verify that steering, shift and throttle respond to joystick movement.
7. Verify that no alarms or warnings are shown on the CANtrak display.

⚠ WARNING

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

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

Rinse off the SmartCylinders 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 Safety Labels

⚠ WARNING

THE LABELS BELOW SHOULD CALL ATTENTION TO THE POSSIBLE HAZARDS ASSOCIATED WITH THE EQUIPMENT SHOWN LATER IN THIS MANUAL.

Component labels

The labels shown below are specific to the Optimus 360 system and are supplemental to those shown in the SeaStar Optimus EPS System Installation Manual (SeaStar Solutions Book 50) PID # 682100.



Figure 1-1. Optimus 360 Start-In-Gear Advisory Decal, PID# 682050.

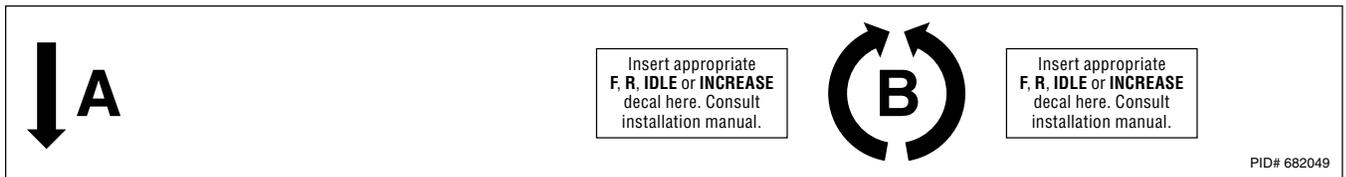


Figure 1-2. Optimus 360 A and B Locator Decal, PID# 682049.

Affix PORT/STARBOARD decal here, consult installation manual.	<h1>ACTUATOR</h1>	Affix SHIFT/THROTTLE decal here, consult installation manual.
<h3>MANUAL OVERRIDE OPERATION</h3> <ol style="list-style-type: none"> 1. MOVE ALL LEVERS A IN THE DIRECTION OF ARROW TO DISENGAGE DRIVE MECHANISM. 2. ROTATE "SHIFT" LEVER B CLOCKWISE, OR COUNTER-CLOCKWISE TO MOVE CONTROL CABLE INTO DESIRED GEAR. 3. CONFIRM YOUR DESIRED GEAR IS ENGAGED BEFORE APPLYING THROTTLE. 4. VERY SLOWLY ROTATE LEVER B ON THROTTLE ACTUATOR TO "INCREASE" RPM. NO MORE THAN 1/2 TURN SHOULD BE REQUIRED. 5. KEY OFF IGNITION TO SLOW AND STOP VESSEL. 		<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">⚠ WARNING</p> <p style="text-align: center; font-size: small;">USING THE ACTUATOR OVERRIDE SYSTEM MAY SEVERELY LIMIT YOUR BOATS CONTROL. IT SHOULD ONLY BE USED IN AN EMERGENCY IF YOU ARE UNABLE TO CALL FOR ASSISTANCE. ALWAYS TRY ALTERNATIVE CONTROLLING DEVICES. PROCEED WITH EXTREME CAUTION, READ USER'S MANUAL, ALWAYS WEAR A PFD & LANYARD.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p style="text-align: center;">⚠ WARNING</p> <p style="text-align: center; font-size: small;">U.S. COAST GUARD REQUIRES START-IN-GEAR PROTECTION. IF YOUR ENGINE DOES NOT HAVE THIS FEATURE, THIS CONTROL SYSTEM WILL PROVIDE START-IN-GEAR PROTECTION MEETING U.S.C.G. REQUIREMENTS OF 33 CFR PART 183, SUB PART L. CONSULT INSTALLATION MANUAL.</p> </div>

Figure 1-3. Optimus 360 actuator decal, PID# 682048.

2.0 SYSTEM OVERVIEW

2.1 System Description

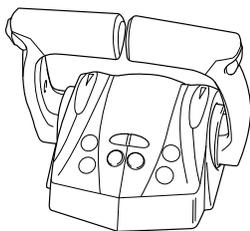
The Optimus 360 Joystick Control System builds on the base Optimus Electronic Power Steering (EPS) system. It uses the same helm, PCM, power steering pumps, service valves and smart steering cylinders. It also operates using the same CANbus networks power steering.

The Optimus 360 system adds several components and advanced control algorithms to enable complete vessel control.



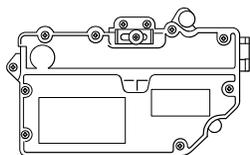
Joystick

The three-axis joystick features on-board electronics and micro-processors that convert an operator's inputs into steering, shift, and throttle commands, then sends these commands over CAN2 to the pump control module (PCM) and to the shift and throttle actuators. The joystick can rotate, move forward and back, and side to side. Combinations of these movements give the operator precise control of the vessel's direction and speed.



Control Head

The control head looks much like a conventional mechanical remote control, but it is a throttle-by-wire device that converts lever position into digital messages that are sent over CAN2 to the shift and throttle actuators. The control head features adjustable lever feel, status lights, a synchronous trim switch, and control buttons for added functionality.



Shift and Throttle Actuators

The actuators are electromechanical devices that receive digital commands on the CAN2 network and convert these commands into movement of a mechanical cable for gear selection and throttle control. The actuators are universal, and are easily setup for their specific application using the CANtrak display.

2.2 Optimus 360 System Diagrams

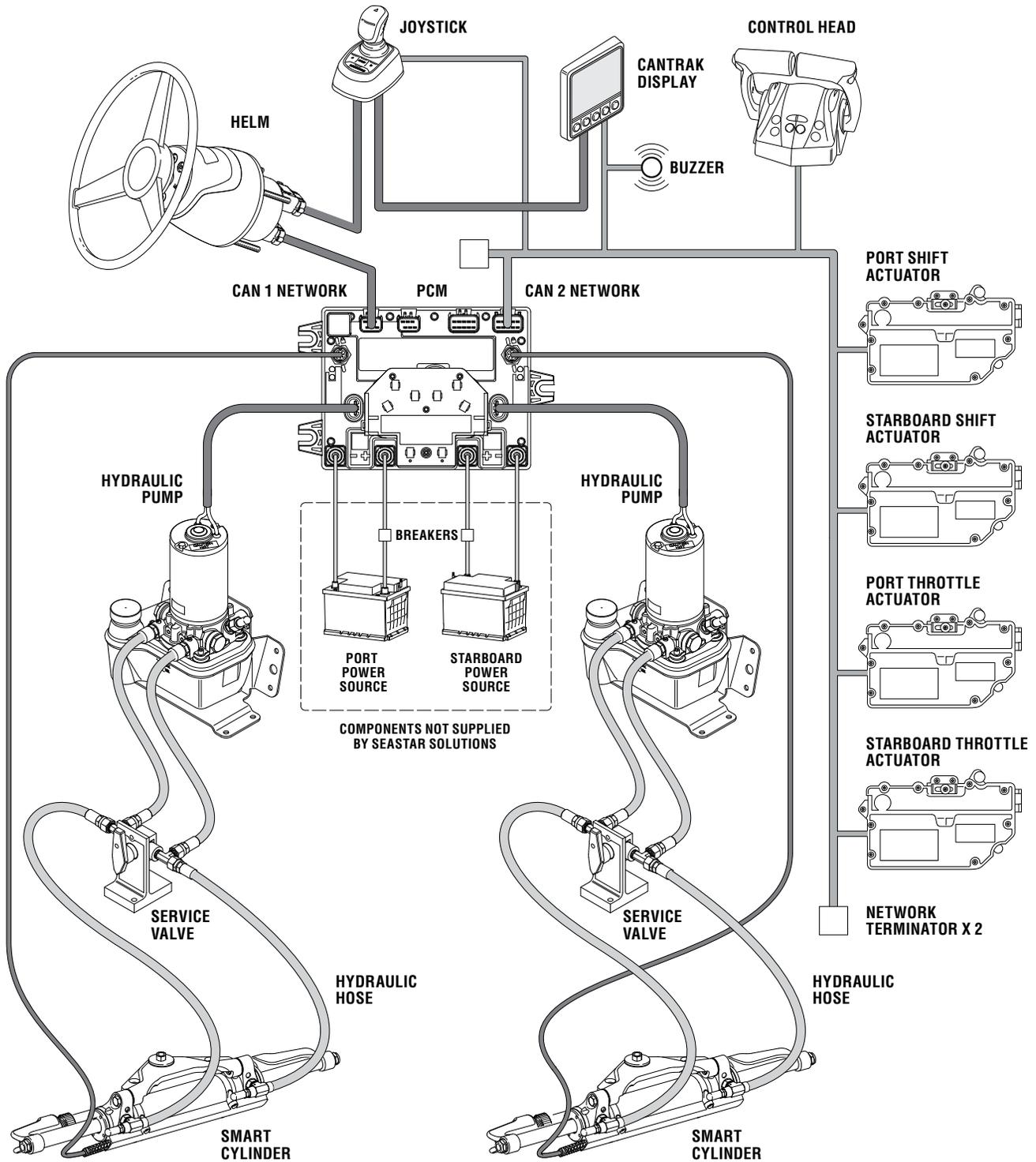


Figure 2-1. Optimus 360 system diagram, single station.

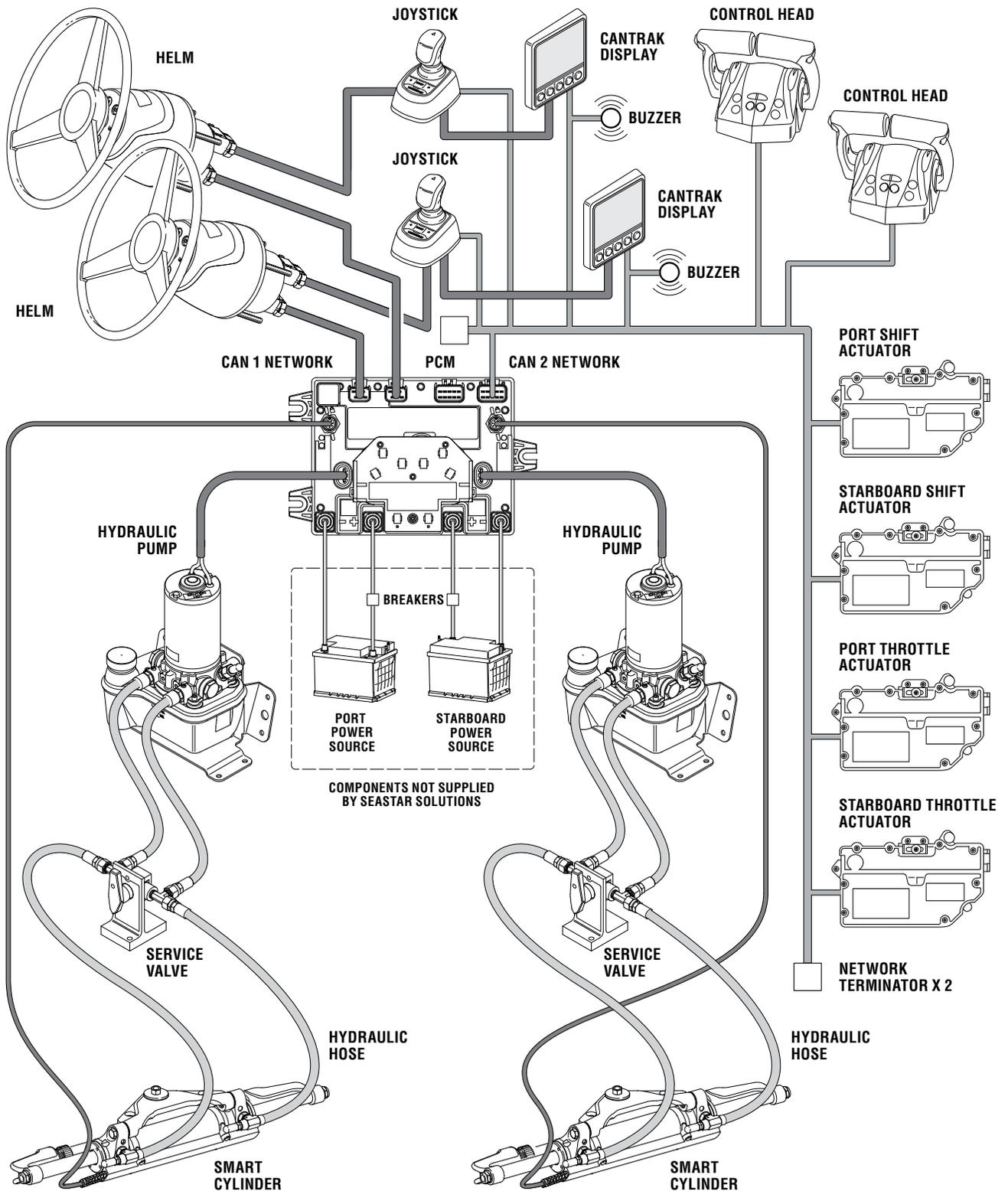


Figure 2-2. Optimus 360 system diagram, dual station.

3.0 INSTALLATION OVERVIEW

3.1 Important Information/Technical Support Contact

To assist with the installation and maintenance of this steering system, SeaStar Solutions recommends that:

- Installation *must* be performed by a SeaStar Solutions authorized installer.
- Read and understand *all* installation manuals before starting the installation process (cylinders, helms, etc.). Knowing the correct order of installation and location of components will drastically reduce installation time as well as prevent common installation errors.
- Read and understand all safety information noted in this and all other installation manuals and instructions.

If any problems are found before, during or after the installation of the steering system, please contact Technical Support for assistance:

Technical Support

Web: www.seastarsolutions.com

E-mail: seastar@seastarsolutions.com

Phone: 604.248.3858

Fax: 604.279.2202

3.2 Installation Overview

Before reading this supplemental, read the Optimus EPS Installation Manual (Book 50), Optimus EPS User's Manual (Book 51) and Optimus 360 Joystick Control System User's Manual (Book 61) available at www.optimusdealers.com. This will provide a basic working knowledge of the base Optimus EPS and Joystick Control System.

The installation of the Optimus 360 system falls into two parts, component installation and system calibration, purging and setup.

3.2.1 Part 1 – Component Installation

Component installation can be done in any order. Table 3-1 shows where the installation information can be found for each component.

NOTICE

Do not connect the mechanical shift and throttle cables to the actuators until the actuators have been configured in section 5.3.

COMPONENT	REFERENCE DOCUMENT
Steering Helm	Optimus EPS Installation Manual (Book 50)
CANtrak Display	
Hydraulic Pumps	
Smart Cylinders	
Steering Service Valves	
System Plumbing	
Base (EPS) System Wiring	
Joystick	
Control Head	This document (Section 4.2)
Shift & Throttle Actuators	This document (Section 4.3)
360 System Wiring	This document (Sections 4.4 & 4.5)

Table 3-1. Component list and installation references.

3.2.2 Part 2 – System Calibration, Purging and Setup

The system calibration, purging and setup must be done in the correct order as defined in Table 3-2.

STEP	DESCRIPTION	REFERENCE DOCUMENT
1	Initial Setup	This document (Section 5)
2	Purge and Calibrate	Optimus EPS Installation Manual (Book 50)
3	Actuator Setup	This document (Section 5.3)
4	Sea Trial	Optimus EPS Installation Manual (Book 50)
5	Joystick Setup	This document (Section 7.0)

Table 3-2.

Table 3-2. System setup order of operations.

4.0 INSTALLATION – PART 1

4.1 Installing the Joystick

Install the joystick on the dash in an area that allows convenient, unobstructed access. Whenever possible, mount the joystick on a horizontal surface in a location that will minimize water spray.

Install the joystick using the hardware provided in the kit. The joystick harnesses *must* be strain relieved to one of the mounting studs using the cable tie provided with the joystick hardware.

A dash cutout template is provided in Appendix A.

4.1.1 Joystick Types

There are two types of joysticks: master and additional station. Every installation must have at least one master joystick, which comes factory configured for the number of engines in the installation. The master joystick can be installed at any control station – the joystick type is independent of the joystick station.

If there is no master joystick in the system you will get a persistent “Missing Master Joystick” warning on the CANtrak display. Similarly, if the master joystick type doesn’t match the configured number of engines, the CANtrak will display a persistent “Invalid Joystick Configuration” warning.

Table 4-1 lists the supported joysticks at the time of printing.

JOYSTICK PART NO.	DESCRIPTION
EJ1400	Joystick, Master, Twin Engine
EJ1401	Joystick, Additional Station

Table 4-1. Supported joysticks.

4.2 Installing the Control Head

Install the control head on the dash in a location that allows convenient and unobstructed access. Whenever possible, mount the control head in a location that will minimize water spray.

Ensure that the control levers can be moved throughout their complete range of motion in both forward and reverse without interference. ABYC standard P-14 calls for a minimum of 2 1/2" (64 mm) clearance between the control lever and the steering wheel rim under all possible lever and wheel positions.

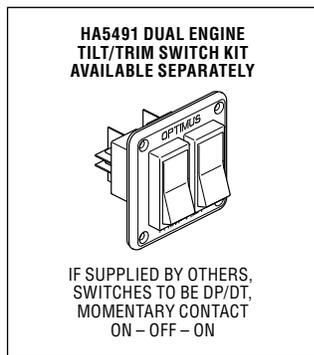
A dash cutout template is provided in Appendix A.

4.2.1 Control Head Trim Switch Connection

The control head includes a single trim/tilt switch on the end of the port handle. This switch can be wired to provide synchronous trim/tilt control of all engines. If independent trim/tilt is desired use tilt/trim kit HA5491 (for twin engine configurations) and connect the wiring as shown in Figure 4-1.

⚠ WARNING

ALL ELECTRICAL CONNECTIONS AND HARNESS MUST COMPLY WITH ABYC WIRING STANDARDS, BE RATED FOR 105°C (221°F), AND COMPLIANT WITH SAEJ1128.



WIRE COLOR LEGEND

TRIM UP	BLUE	=====
TRIM DOWN	GREEN	=====
POWER	RED	=====

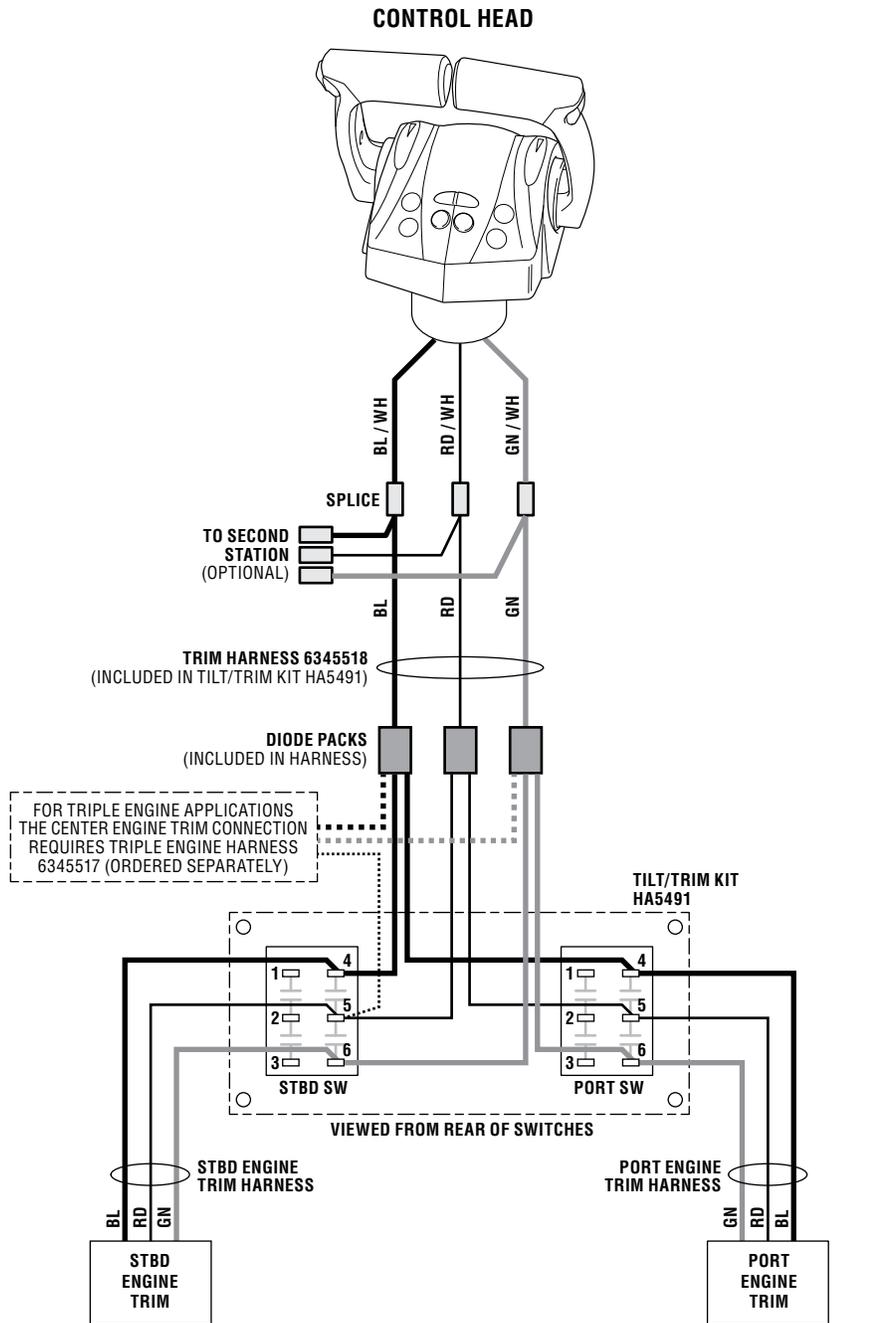


Figure 4-1. Independent trim switch wiring.

4.3 Installing the Actuators

4.3.1 Location, Identification & Mounting

- Actuators should be mounted to allow for the shortest, straightest, most direct mechanical cable run.
- Actuators should be mounted in as dry of a location as possible.
- The actuators will require power and network connections and may require start-in-gear protection wiring connections.
- Shift and throttle cables require adequate clearance where they exit the actuators and enter the engines and should avoid tight bends.
- Actuators should be mounted where they can be accessed for manual operation if required, and where manual override instruction decals are clearly visible.

All actuators are configured identically from the factory so they can be used interchangeably during installation. Once an actuator's function has been decided, apply labels from the label sheet provided to identify its type (shift vs. throttle) and side (port vs. starboard), then record the serial numbers in Table 4-2 below. (See figure 5-10 for location of serial number.) These serial numbers will be used when the actuators are configured electronically in Section 5.3.

Actuator	Serial Number
Port Shift	
Port Throttle	
Starboard Shift	
Starboard Throttle	

Table 4-2. Actuator serial numbers.

The label sheet also contains labels to identify the correct override knob direction. These will be applied when the actuators are configured in Section 5.3.

There are two ways to mount the actuators:

1. Three bolts (M8 x 1.25 x 440 mm) can be used for rear mount applications (Bolt heads behind the mounting panel).
2. Three screws and washers can be used for front mount applications (#12 MAX).

NOTICE

You may rough in the mechanical cables but do not connect them to the actuators at this point.

4.3.2 Start-In-Gear Protection

The US Coast Guard requires start-in-gear protection. If your engine does not have this feature, this control system will provide start-in-gear protection meeting U.S.C.G. requirements of 33CFR part 183, sub part L.

The shift actuators contain a switch that is continuous electrically when the actuator is in neutral position and open circuit when in gear position. This switch may be used to interrupt the ignition start wire to the engine as start-in-gear protection if required. See Section 4.3.4 for actuator wire identification.

4.3.3 Actuator Power Connections

The shift and throttle actuators for each engine are paired together and connected with a shared CE20425 power harness. Each CE20425 harness includes two 4-pin power connections, one for shift and one for the throttle. It is not important which connector is connected to the shift actuator and which is connected to the throttle. Refer to Figure 4-2.

1. Connect the 4-pin connectors to the mating connector on the shift and throttle actuators
2. Connect the black and green wires to ground.
3. Connect the red wire through a 25 amp circuit breaker to a positive power source; preferably direct to the vessel's batteries or to a battery switch.
4. Connect the white wires to an ignition source which is live when *either* of the engines is in the on position. If such a source does not exist, use SeaStar Solutions Dual Ignition Kit P/N HA1201.

4.3.4 Shift Actuator Electrical Connections

1. To use the start-in-gear protection built into the actuator, intercept the start wire between the ignition switch and the engine start solenoid and connect the actuator switch leads as follows:

Yellow: Connect to ignition switch

Yellow w/red tracer: Connect to engine start solenoid

The following table lists the ignition start system wire colors typically used by each manufacturer. This table serves as a guide only, always consult manufacturer's documentation for correct wire identification.

Manufacturer	Wire Colors
Yamaha	Start circuit – brown
Suzuki	Short the brown wires together
BRP	Start circuit – yellow/red
Mercury	Start circuit – yellow/red

Table 4-3. Start-in-Gear wire colors.

2. If not using start-in-gear protection, cap and tie back the two yellow wires.
3. Connect the round DeviceNet connector to the CAN2 network as shown in Section 4.5.
4. Repeat steps 1-3 for other shift actuator.

NOTICE

The polarity of the start-in-gear protection wires is important. Make the connections as described – do not reverse the wires.

4.3.5 Throttle Actuator Electrical Connections

1. Cap and tie back the two yellow wires; these are unused for throttle actuators.
2. Connect the round DeviceNet connector to the CAN2 network as shown in Section 4.5.
3. Repeat steps 1 & 2 for other throttle actuator.

RED AND BLACK ARE ACTUATOR POWER
 WHITE AND GREEN ARE CAN POWER

**Older CE20425 used Orange and Brown for CAN Power.*

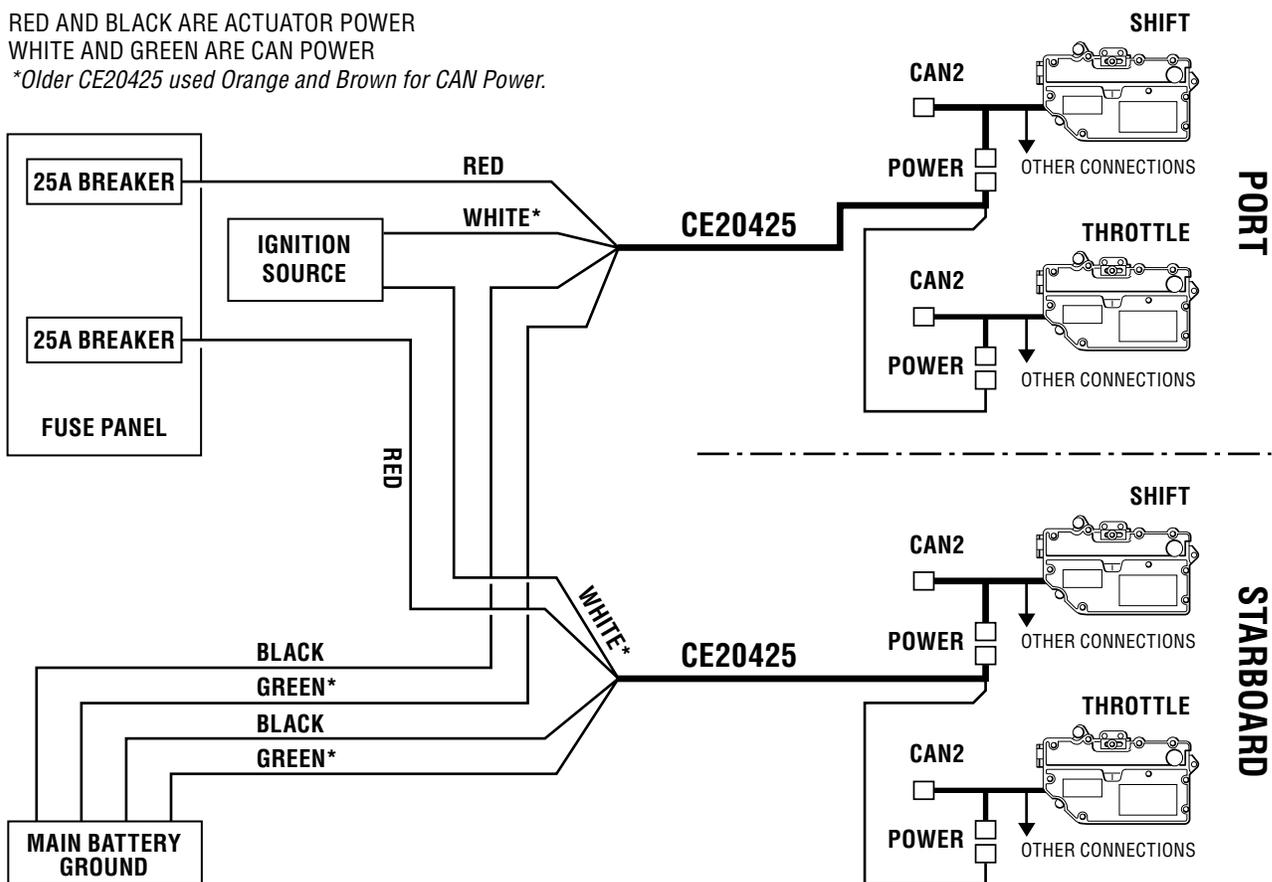


Figure 4-2. CE20425 power harness connection.

4.4 CAN1 Harness Connections

Refer to the Optimus EPS Installation Manual (Book 50) for CAN1 harness selection and connections.

In addition to this, the Optimus 360 system requires a 6-pin CAN1 harness connection between the steering helm and the joystick.

Refer to book 50 for proper harness selection and strain relieving.

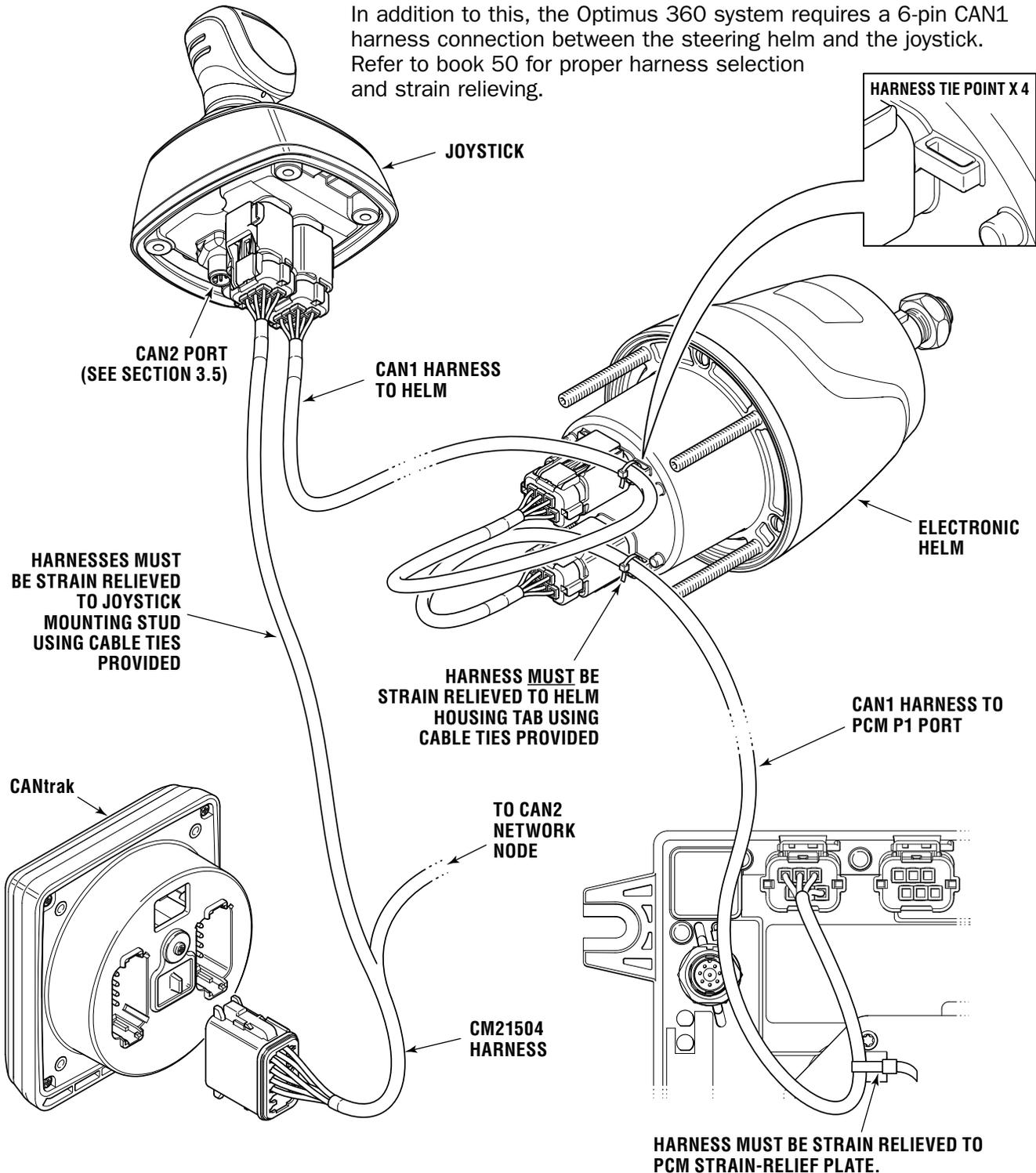


Figure 4-3. CAN1 harness connections.

⚠ WARNING

SEALING PLUGS MUST BE INSTALLED ON ALL UNUSED CAN1 PORTS.

4.4.1 Connecting a Second Station

Figure 4-4 shows the acceptable CAN1 connections when adding a second station. If harness lengths allow (see Section 4.3.1 in Book 50 – Optimus EPS Installation Manual), connect the second helm to the second CAN1 port as shown in a). This parallel configuration makes it less likely that both helms and joysticks would be lost if a wiring harness is damaged.

In some cases the control station layout will require a series connection as shown in b). This is allowable provided the total harness length (from PCM to furthest component) does not exceed 36 feet. This configuration requires a wye harness (CM21702) in order to have enough CAN1 ports available at the main station.

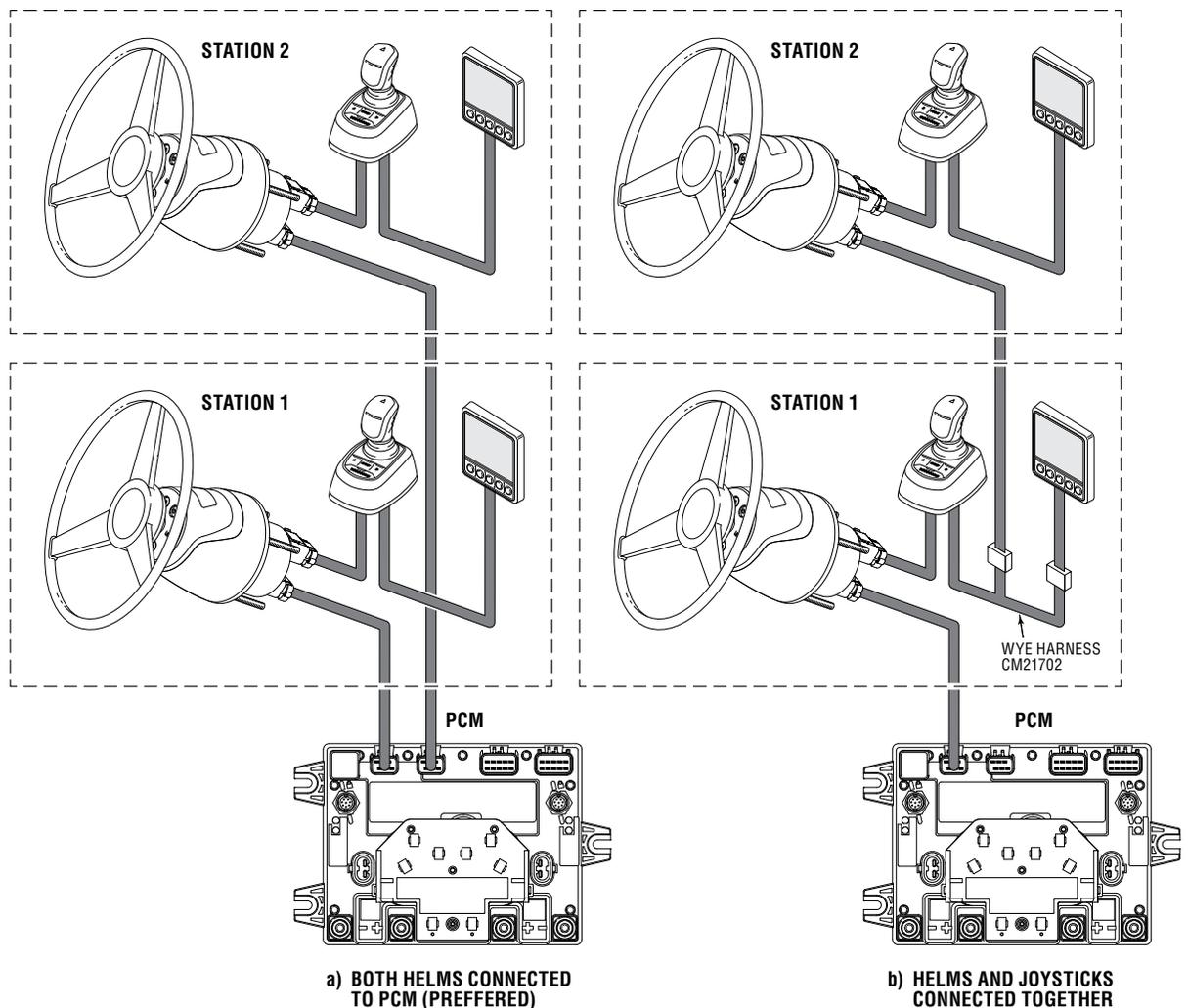


Figure 4-4. CAN1 Alternate helm/joystick connections in dual-station applications.

4.5 CAN2 Harness Connections

⚠ WARNING

FAILURE TO SECURE HARNESS MAY RESULT IN HARNESS WEAR, CAUSING LOSS OF STEERING CONTROL, PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

The Optimus 360 system uses the same CAN2 network, cables and structure as the basic Optimus EPS system. In addition to the CANtrak the Optimus 360 system adds the shift and throttle actuators, control head and joystick to the CAN2 network.

Figures 4-5 and 4-6 show the CAN2 network wiring diagram. Refer also to Book 50 for CAN2 wiring, harness selection and installation best practices. All tees *must* be secured using both screw holes, and the cable drops at each tee must be appropriately secured and strain-relieved to prevent any pull on the tees. See Figure 4-7 for proper tee installation.

The CAN2 network must contain two, and only two, terminating resistors. One terminator should be installed at each end of the network backbone.

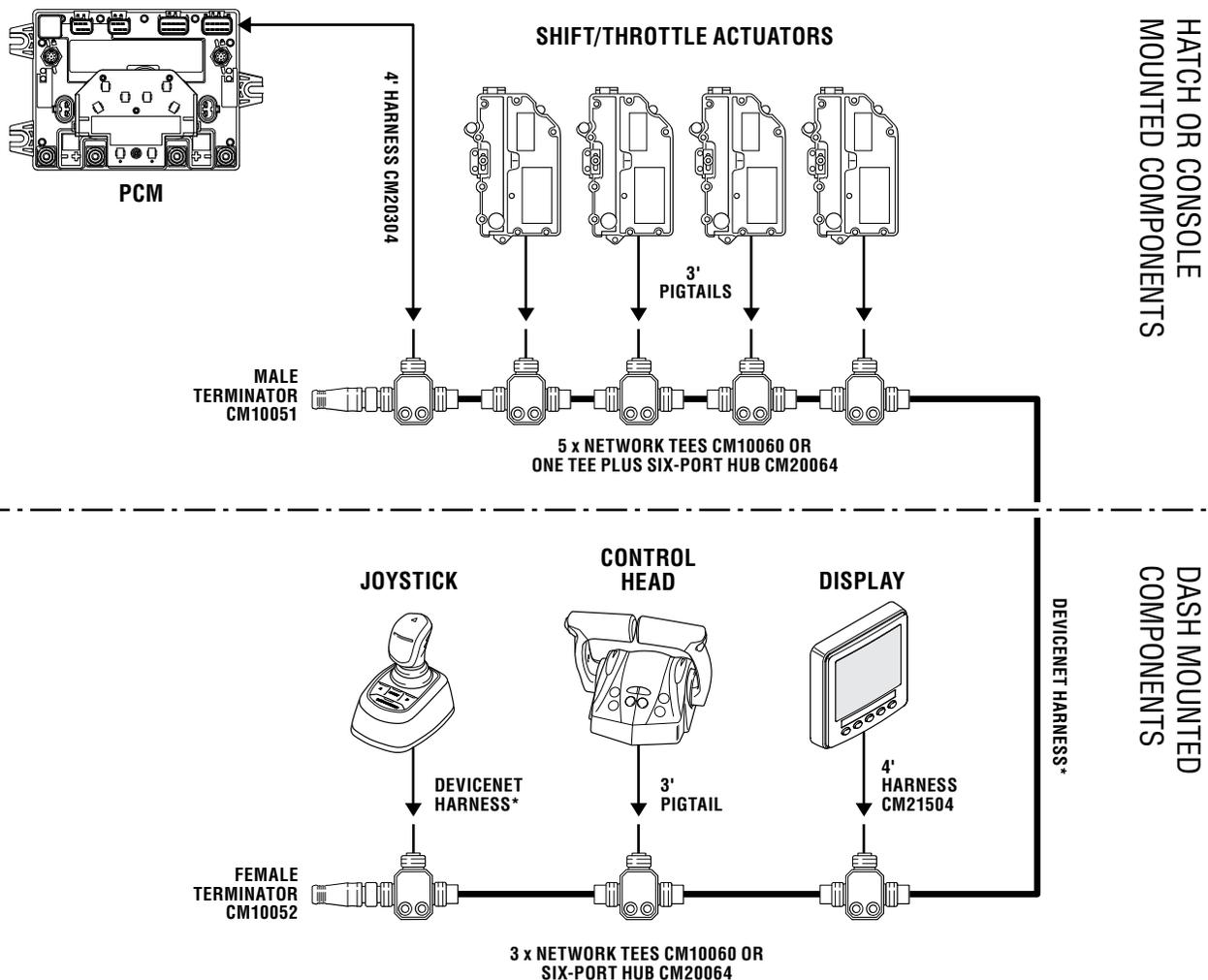


Figure 4-5. CAN2 wiring diagram, single station.

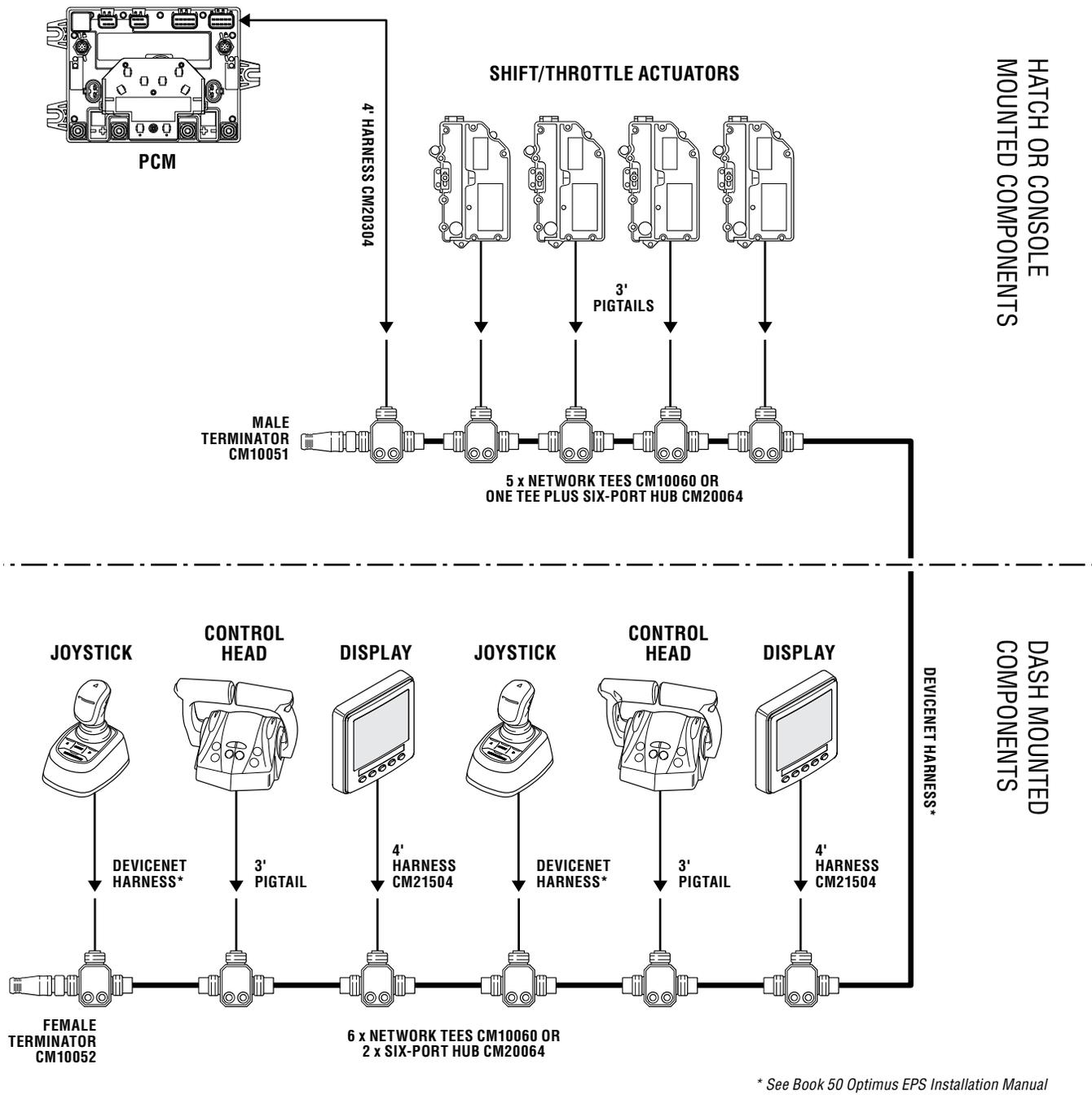


Figure 4-6. CAN2 wiring diagram, dual station.

⚠ WARNING

FAILURE TO SECURE HARNESS MAY RESULT IN HARNESS WEAR, CAUSING LOSS OF STEERING CONTROL, PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

⚠ CAUTION

Do not connect anything other than SeaStar Optimus components, or SeaStar approved autopilots, to the CAN2 network.

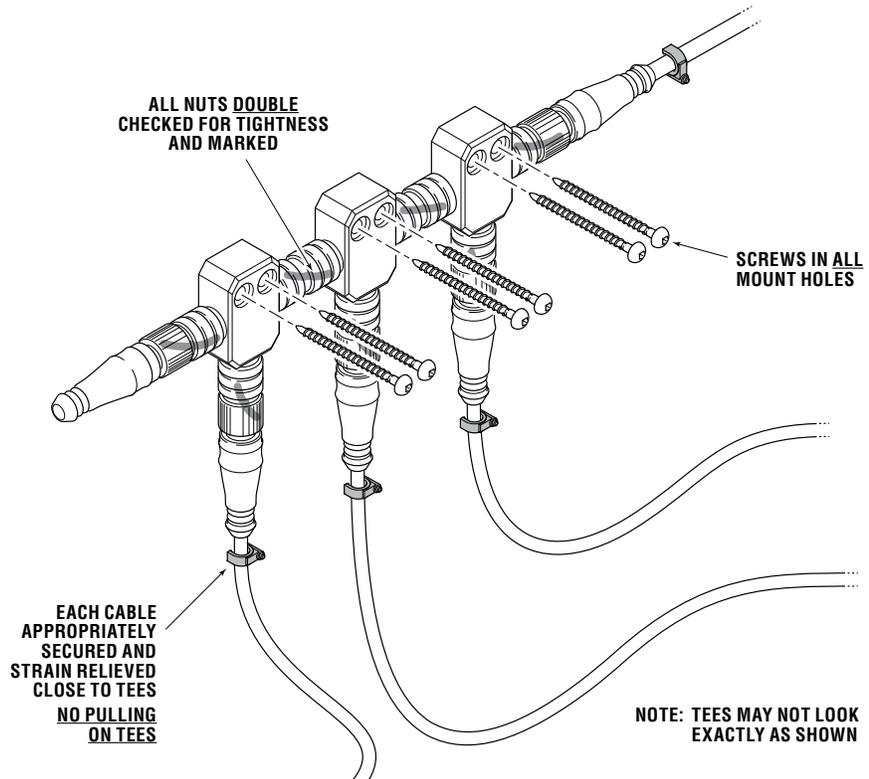


Figure 4-7. Correct CAN2 Tee installation example.

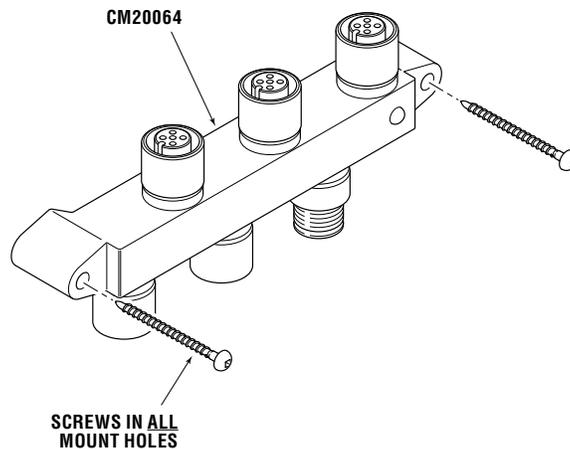


Figure 4-8. Alternative CAN2 6-port hub connection.

5.0 SYSTEM SETUP, PURGE, AND CALIBRATION

Before you proceed you need to have all Optimus EPS and Optimus 360 components installed, harnesses connected, and ignition sensing and power wiring completed.

This section will describe the system setup using the color CANtrak display. If you prefer to use Datalink you can find instructions in Appendix B.

5.1 Initial Setup

The system setup is performed easily with the color CANtrak display. It is designed to walk you through the following tasks:

- Configure the system type
- Choose the number of devices in your system
- Update system software
- Select device locations

You will need access to the CANtrak Dealer Menu for all setup tasks. See Appendix D in the Optimus EPS Installation Manual (Book 50) for instructions on how to navigate the CANtrak display and access the Dealer Menu.

Procedure:

1. On the display, navigate to **Dealer Menu > Initial Setup > System** to access the System Setup menu.

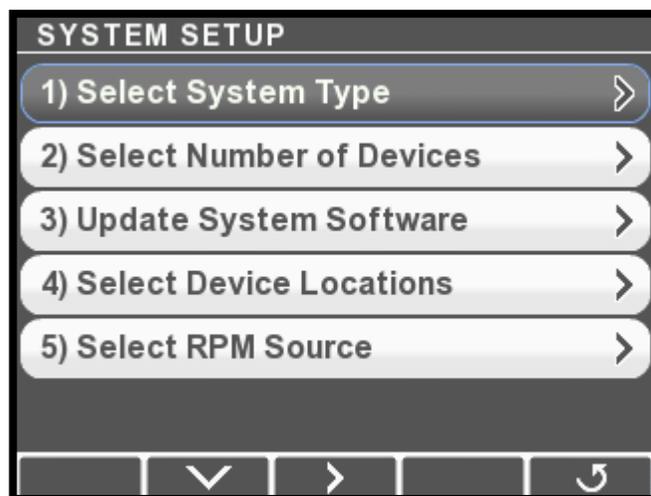


Figure 5-1.

2. Press > to enter the System Type menu.

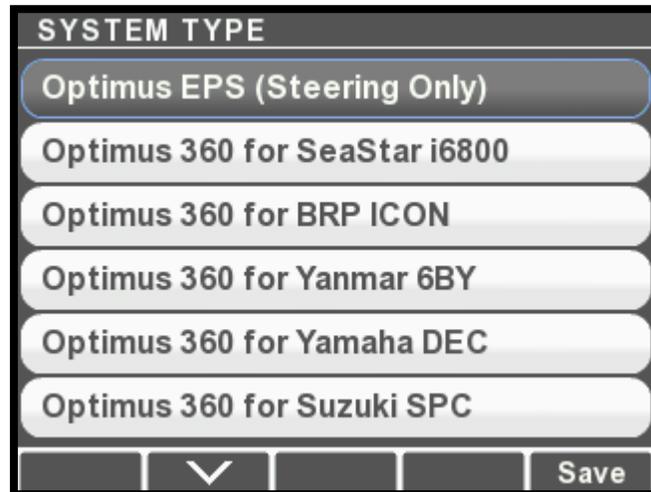


Figure 5-2.

3. Use the down arrow button to select **Optimus 360 for SeaStar i6800**, then press Save or ↵ to return to the System Setup menu. When you set the system type the CANtrak automatically configures the menus to show only items that relate to your system.
4. Choose **Select Number of Devices** and press >.

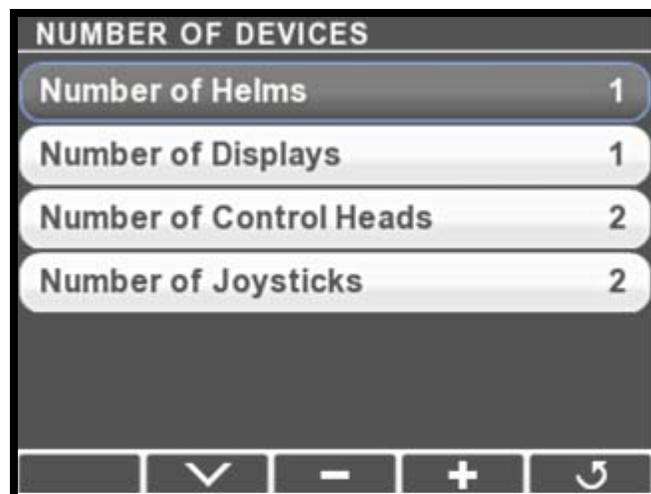


Figure 5-3.

5. Use the + and – buttons to change the quantity of each device to match your system. Press **Save** or ↵ when finished to return to the System Setup menu.

6. Review Appendix E in Book 50 and determine if your system software needs to be updated.
7. Multiple helm stations only: choose **Select Device Locations** from the System Setup menu and press >. The display will list the installed components along with their serial numbers. Check the serial numbers and use the + and - buttons to toggle the components between Main and Second station. Press Save to return to the System Setup menu.



Figure 5-4.

Note: ignore the Actuators at this point. We will configure them in section 5.3.

5.2 Purge and Calibrate

You are now ready purge and calibrate your steering system. Refer to the Optimus EPS Installation Manual (Book 50) for instructions. *Be sure to perform the steering installation checks described in Book 50.* The steering portion of the system should now be fully functional.

5.3 Actuator Setup

5.3.1 STEP 1 – Actuator Configuration Using the CANtrak Display

The default configuration type for all actuators is Port Shift. Before installing the cables and adjusting the actuator parameters you must configure each actuator to the correct type.

⚠ CAUTION

Ensure mechanical cables are not connected to the actuators at this point.

Procedure:

1. On the CANtrak display, navigate to **Dealer Menu > Initial Setup > System > Select Device Locations**.
2. Find the four actuators in the list of devices, and match their serial numbers with the serial numbers you recorded in section 4.3.1. You now know the type (shift or throttle) and the instance (port or starboard) of each actuator.
3. Use the + and – buttons to change each actuator’s configuration to match the type and instance. Make sure that you have one of each type of actuator configured.
4. Press **Save** when finished, then ↻ repeatedly to exit. You will be prompted to cycle system power to save the changes.
5. Navigate to **Dealer Menu > Initial Setup > Shift & Throttle** to get to the Shift & Throttle Setup menu.

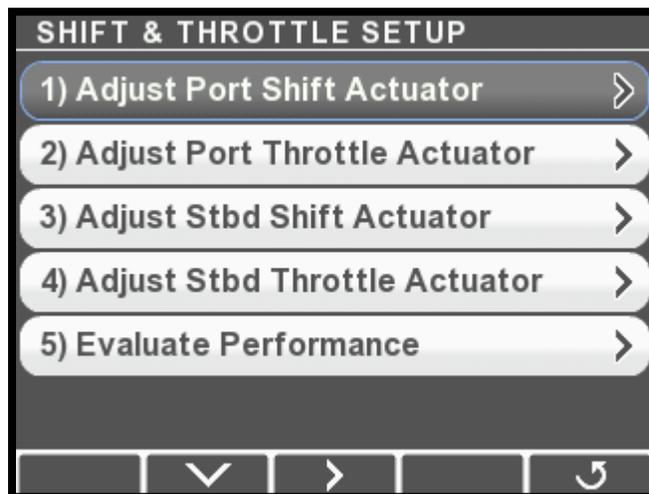


Figure 5-5.

6. For the shift actuators, set the Shift to Forward Direction parameter 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 5-6.

7. For the throttle actuators, set the Acceleration Direction parameter to Push or Pull to match the direction the actuator is required to move to *increase* throttle. Don't adjust the other parameters yet.



Figure 5-7.

8. Remove the cable access covers (see figure 5-10) on all actuators. Do not connect the mechanical cables yet.

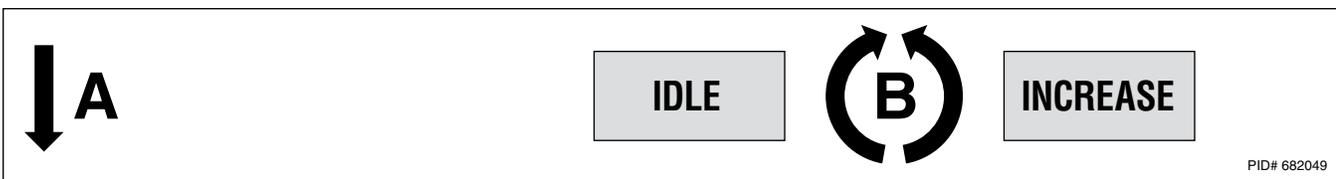
⚠ CAUTION

The actuator contains moving parts and pinch hazards. Keep away from the exposed parts while the cover is removed.

9. With the covers removed, move the port and starboard control head levers to the forward and reverse gear positions and verify that the shift actuator racks move accordingly.

10. Increase the throttle on each of the control head handles from idle to full throttle and check that the throttle actuator racks advance and return to accordingly.
11. Apply the correct manual override decals (see figure 5-8 and figure 5-9) to the cable access covers.
12. Press **J** repeatedly to exit. You will be prompted to cycle system power to save the changes.

For **PUSH** to Throttle Acceleration



For **PULL** to Throttle Acceleration

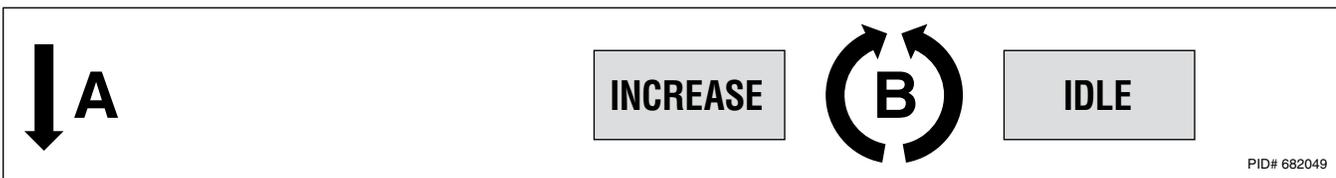
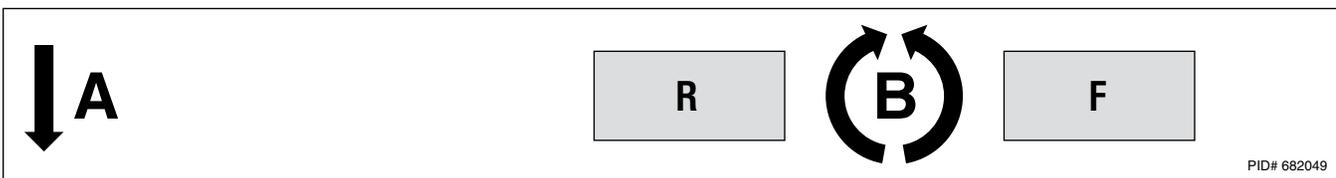


Figure 5-8. Throttle actuator manual override decal placement.

For **PUSH** to Shift to Forward



For **PULL** to Shift to Forward

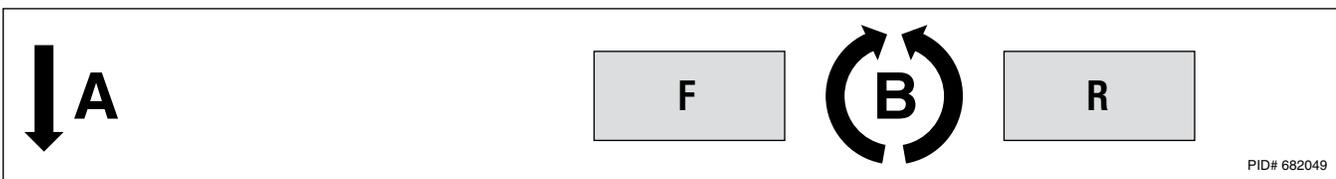


Figure 5-9. Shift actuator manual override decal placement.

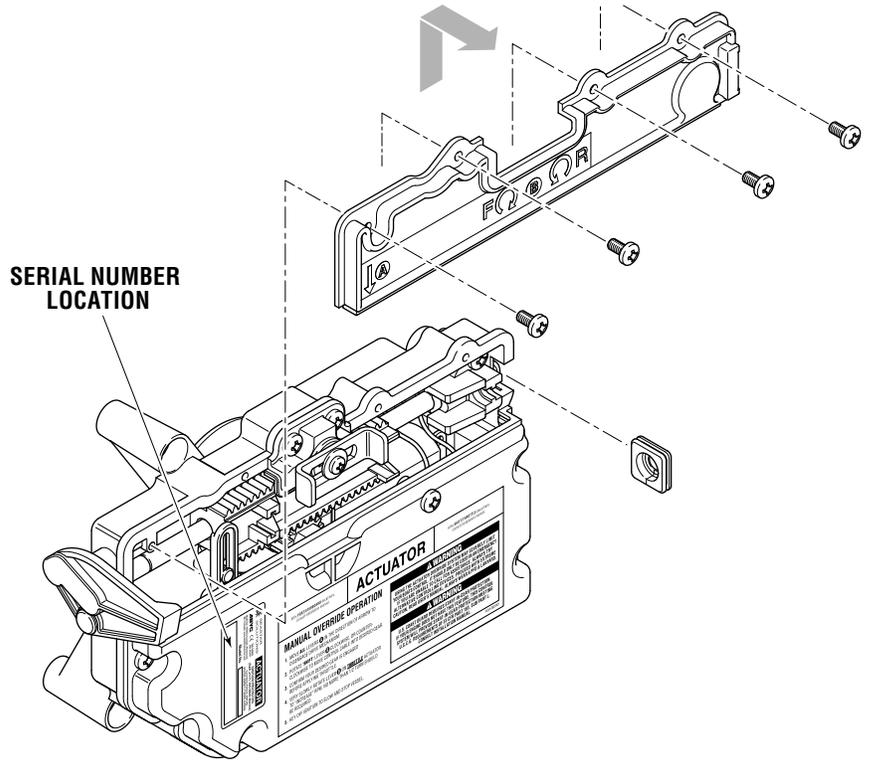


Figure 5-10. Actuator cover removal and location of serial number.

5.3.2 Step 2 – Cable Installation and Adjustment

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

NOTICE

Take into consideration when installing mechanical cables that you may not be able to shift outboard engines unless the engine is running or the prop is spun by hand.

Mechanical cable installation notes

In most cases, the engine side cable adapters supplied with the engine or by the engine manufacturer will work with the SeaStar Solutions Xtreme cables (P/N CCX633xx). If your engines do not have cable end adapters, see Table 5-1 below.

Yamaha	Use engine manufacturer's cable adapters*
Honda, Suzuki, Tohatsu	CA27319P**
Evinrude	CA27320P
Mercury	CA27319P

Table 5-1. Engine-Side cable end kits.

* If longer cable ends are required, for Yamaha ONLY use SeaStar Solutions P/N CA38383P adapters

** Require only the cable ends, discard other kit components

5.3.2.1 – Shift Cable Installation

Engine Side

1. Position the engine's shift linkage in the neutral position.
2. Connect the cables to the engine using the appropriate adapters. For new adapter kits, refer to the instructions provided with the kit. If reusing the existing cable ends, position the cable ends approximately half way down the threaded portion of the cable. Always use jam nuts to lock the cable end in place. See figure 5-11.

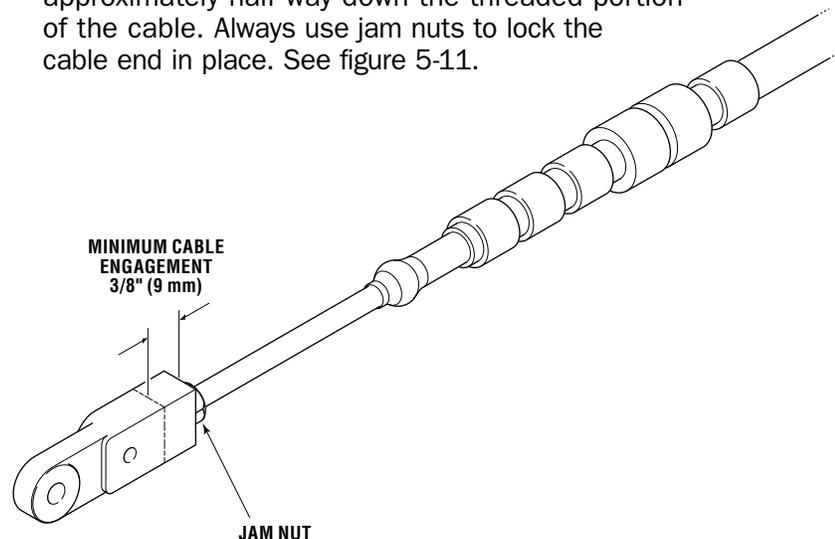


Figure 5-11. Cable End, engine side installation.

⚠ CAUTION

There must always be at least 3/8" of thread engagement on the engine side cable end. See figure 5-11. If correct adjustment cannot be achieved while maintaining 3/8" of thread engagement, longer cable ends may be required.

Actuator Side

1. Position the U-shaped steel retainer clip (A) into the slot on the actuator rack as shown in figure 5-12.
2. Screw the adjustment barrel (B) onto the cable end to the point where the cable can be set into the actuator with the barrel engaging the steel retainer clip (A) and the cable housing groove (C) engaging the cable mount in the actuator. Ensure there is enough cable sticking out of the adjustment barrel (B) to install and tighten the lock nut (D).

NOTICE

If there is not enough cable protruding to install the lock nut, adjust the cable end on the engine side to lengthen the cable at the actuator side.

3. Lay the cable into the actuator and install the dust seal (E).
4. Re-install the actuator cover (See figure 5-10).
5. Repeat for the other shift actuator

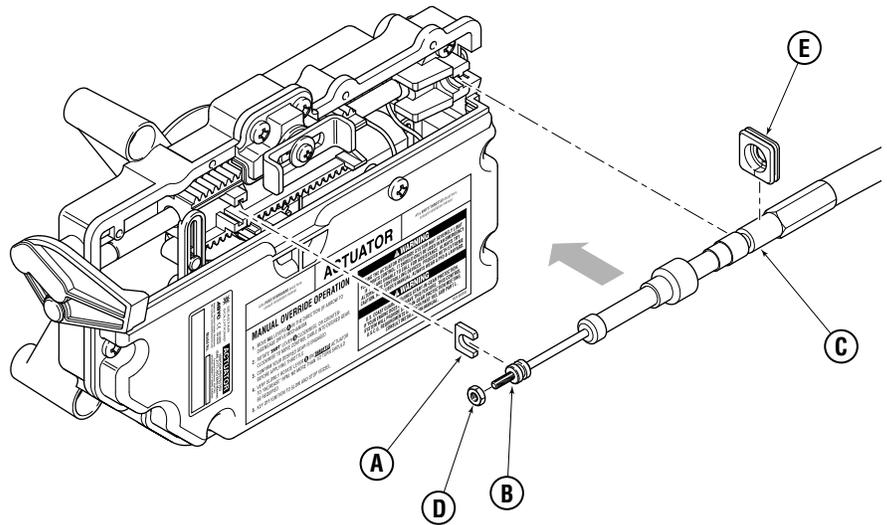


Figure 5-12. Actuator cable installation.

5.3.2.2 – Throttle Cable Installation

Engine Side

1. Put the engine's throttle linkage in the idle position against the idle hard stop.
2. Connect the cables to the engine using the appropriate adapters. For new adapter kits, refer to the instructions provided with the kit. If reusing the existing cable ends, position the cable ends approximately half way down the threaded portion of the cable. Always use locknuts to lock the cable end in place. In most cases the original engine adapter may be re-used. In some cases they may not provide adequate adjustability. See Table 5-1 for engine adapter kit part numbers.

⚠ CAUTION

There must always be at least 3/8" of thread engagement on the engine side cable end. See figure 5-11. If correct adjustment cannot be achieved while maintaining 3/8" of thread engagement, longer cable ends may be required.

Actuator Side

1. Position the U-shaped steel retainer clip (A) into the slot on the actuator rack as shown in figure 5-12.
2. Screw the adjustment barrel (B) onto the cable end to the point where the cable can be set into the actuator with the barrel engaging the steel retainer clip (A) and the cable housing groove (C) engaging the cable mount in the actuator. Ensure there is enough cable sticking out of the adjustment barrel (B) to install and tighten the lock nut (D).

NOTICE

If there is not enough cable protruding to install the lock nut, adjust the cable end on the engine side to lengthen the cable at the actuator side.

1. Lay the cable into the actuator and install the dust seal (E).
2. Re-install the actuator cover (See figure 5-10).
3. Repeat steps 1 to 4 for the other throttle actuator.

5.3.3 Final Setup and Actuator Adjustment

SHIFT

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

- To have shift cables adjusted so neutral position of actuator represents neutral position of engine shift linkage.
- To set the stroke length to achieve full engagement of gear yet not interfere with 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.**

⚠ DANGER

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

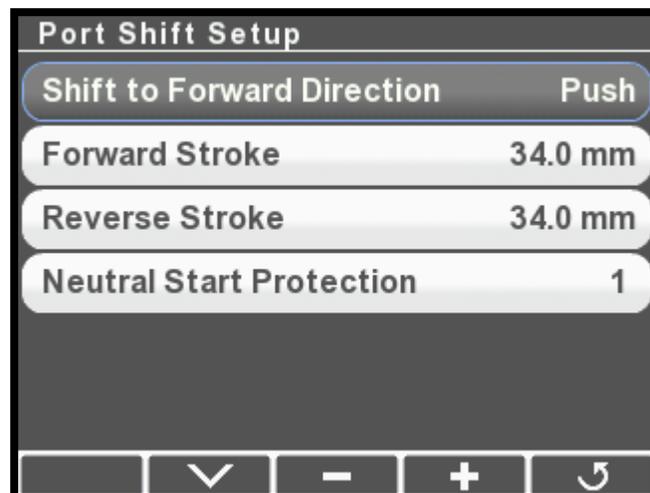


Figure 5-13.

NOTICE

It is not uncommon to have stroke length a little longer for the push direction gear to take up the lost motion of the cable in the push direction. This is more pronounced with longer cables.

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 1 mm 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 adjustment barrels until the neutral position is correct. (See section 5.3.2.1 for adjustment.)
7. Repeat steps 1 to 6 for the starboard shift actuator.
8. Tighten the actuator side lock nut (see figure 5-12) for both shift actuators. Once the final adjustments are made you will need to apply Loctite 242 to the threads, but you will do this after the sea trial.
9. If your engine already has neutral start-in-gear protection, you can change the Neutral Start Protection parameter to 0. Otherwise, leave the default value.

THROTTLE

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

- To have throttle cables adjusted evenly so engines *start* to rev up at the same time given the same throttle (handle) position.
- That throttle always returns to idle when handle(s) are moved to idle.
- That there is minimal handle travel before engines rev up.
- That the stroke length is set to achieve wide open throttle (WOT) engine speed without unnecessary throttle cable movement.

Procedure

1. Turn ignition on, do not start engines.
2. Navigate to **Dealer Menu > Initial Setup > Shift & Throttle > Adjust Port Throttle Actuator.**



Figure 5-14.

3. Increase the port throttle lever to the full throttle position and verify that the throttle linkage reaches the wide open throttle (WOT) position.

NOTICE

It is not uncommon to have stroke length a little longer for the push direction gear to take up the lost motion of the cable in the push direction. This is more pronounced with longer cables.

4. Increase the Stroke parameter as necessary to reach the WOT position. Press Save after each adjustment to have it take effect.
5. Return Repeat steps 2 to 4 for the starboard throttle actuator.
6. Tighten the actuator side lock nut (see figure 5-12) for both throttle actuators. Once the final adjustments are made you will need to apply Loctite 242 to the threads, but you will do this after the sea trial.
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 actuator adjuster barrels (section 5.3.2.1).
 - 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 (or the actuator adjuster barrels) until they are synchronized.

⚠ WARNING

AFTER FINAL ADJUSTMENT IS MADE APPLY LOCTITE® 242 (BLUE) AND TIGHTEN JAM NUT ON ACTUATOR SIDE.

5.4 Control Head Setup

The control head has several configurable parameters, as shown in Figure 5-15 below. The default settings will generally provide excellent performance for most boats.

To Access the parameters, navigate to **Dealer Menu > Settings > Shift & Throttle** on your CANtrak display.

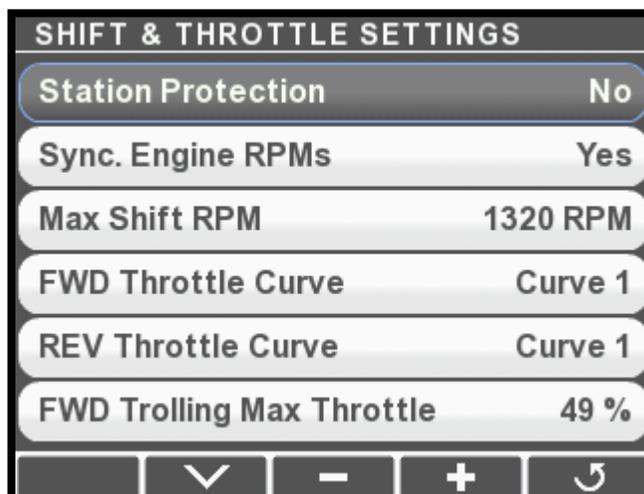


Figure 5-15.

- Station Protection** This feature prevents accidental switching between control stations on multi-station boats by requiring a specific sequence of button presses on the control head. The Optimus 360 User's Manual (Book 61) has more information about this feature.
- Sync. Engine RPMs** Controls the throttle behavior when the Power Train Sync (PTS) feature of the control head is engaged. When set to Yes the control system will use tachometer feedback to match engine speeds. When set to No the system will simply match the throttle command. If you find the engine RPMs oscillate in PTS mode change this parameter to No.
- Max Shift RPM** Sets the maximum RPM at which a gear shift will be attempted by the control head. It is designed to delay a shift until engine RPM reaches a safe shifting speed.
- FWD/REV Throttle Curve** There are two throttle curves that control the response characteristics when the control lever is at or near idle. Curve 1 is the default curve, and is suitable for most applications. Curve 2 requires more lever travel before throttle is increased.

FWD/REV Trolling
Max Throttle

Sets the maximum percentage of wide open throttle when trolling mode is engaged. A forward 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.

6.0 SEA TRIAL

⚠ 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 you must:

- complete the installation and pre-trip checks detailed in section 8 of the Optimus EPS Installation Manual (Book 50).
- check that both engines shift correctly into forward and reverse gear, and that they respond to throttle inputs.

In addition to the steering system checks outlined in section 8.3 of Book 50, the sections below detail the checks required for the shift and throttle system.

6.1 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 5.3.3.

6.2 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 5.3.4.

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 5.4.

6.3 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 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. Engage the Power Train Sync feature and check that engine speeds are matched. If the RPMs sound like they are oscillating you may need to disable the Sync Engine RPMs parameter on the control head (section 5.4).

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 5.4) 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.

6.4 Conclusion of Sea Trial

Once you are satisfied with the vessel's performance, the shift, throttle, and steering settings, 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.

You must also properly secure the actuator adjustment jam nuts (section 5.3):

- 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

6.5 Complete Warranty Checklist

The warranty checklist (PID 214740) 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.

7.0 JOYSTICK SETUP

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

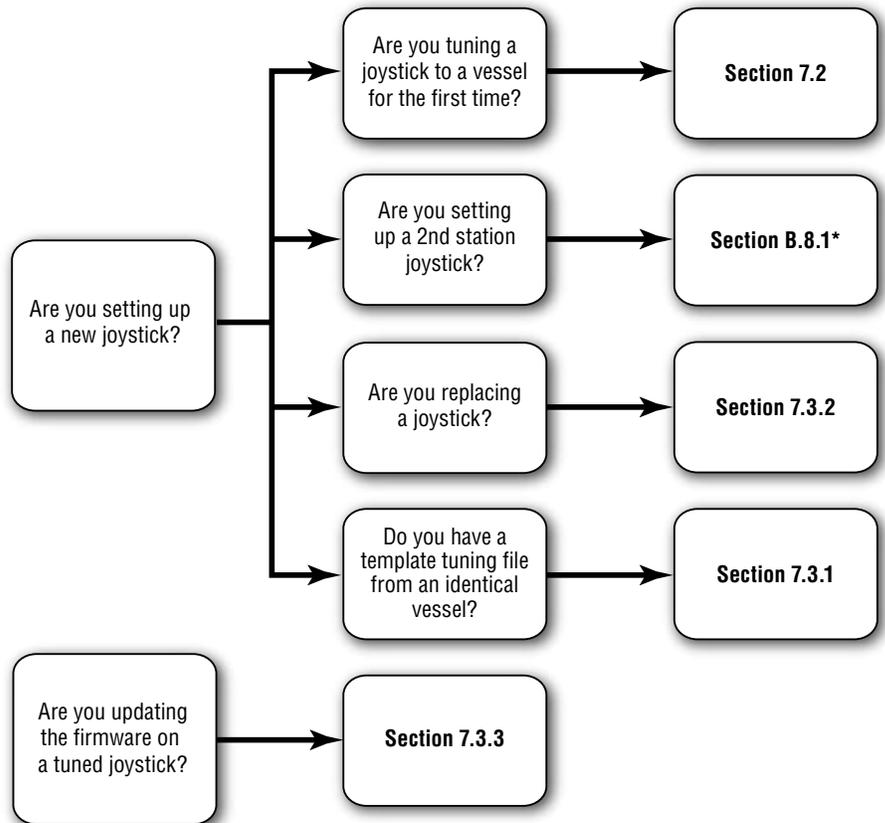


Figure 7-1 Joystick setup options.

* This only applies when tuning with Datalink software. When tuning with the CANtrak, all joysticks are tuned at the same time.

7.1 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 7-2 shows an overview of the tuning procedure. Each step is detailed in the sections that follow.

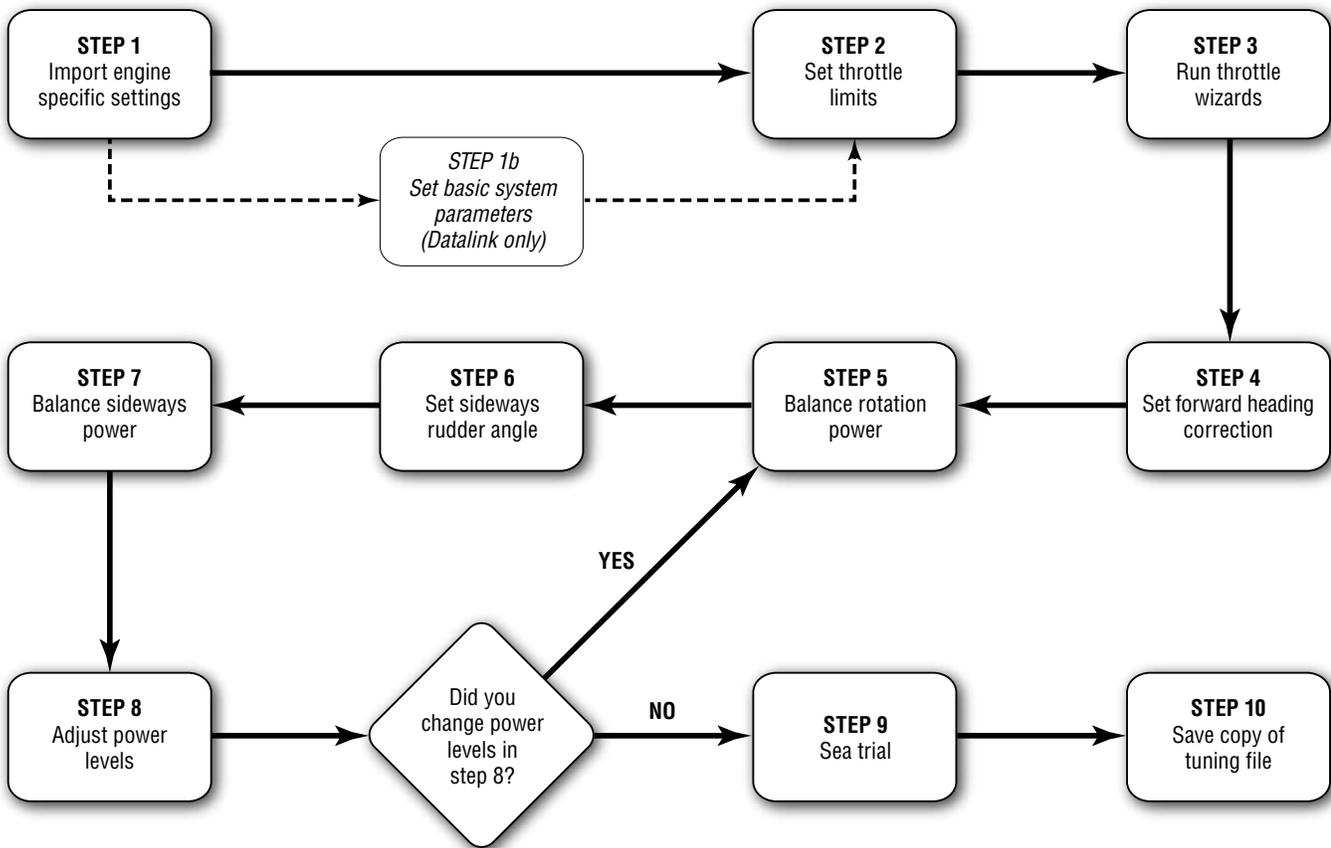


Figure 7-2. Joystick Tuning procedure.

7.2 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, as shown in Appendix B. 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.

7.2.1 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.

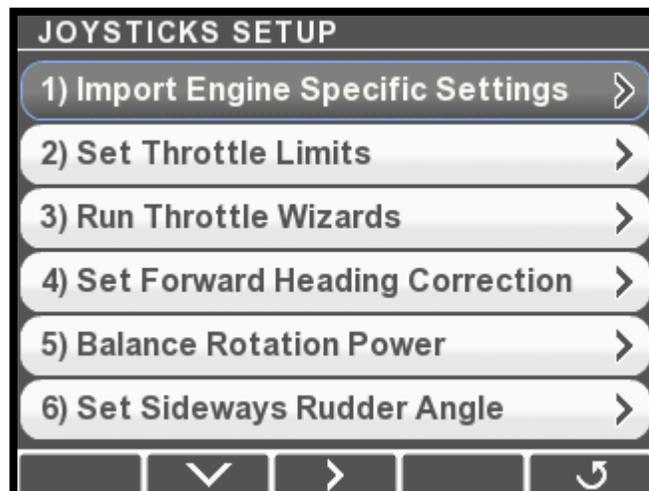


Figure 7-3.

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

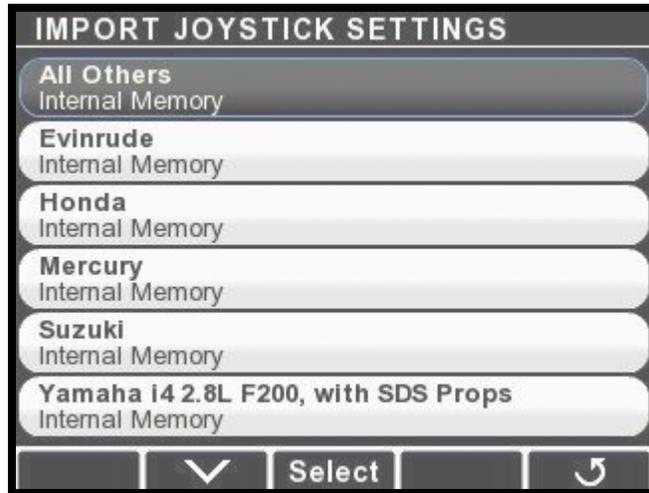


Figure 7-4.

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 7-5.

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.

7.2.2 **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.
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 7-6.

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 Position (Read Only)	12.8 %
Port Engine RPM (Read Only)	637 RPM
Port Idle FWD Throttle	13 %
Port Idle REV Throttle	15 %
Port Max FWD Throttle	40 %
Port Max REV Throttle	40 %
	

Figure 7-7.

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 the starboard engine.

7.2.3 **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 7-8.

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 7-9.

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.

7.2.4 **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**.

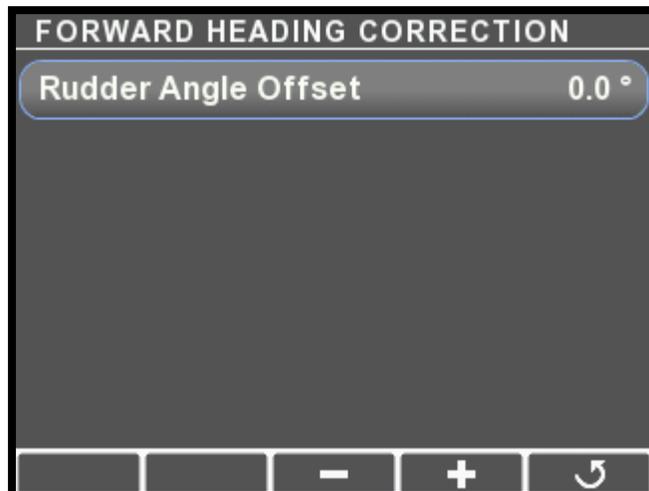


Figure 7-10.

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.

7.2.5 **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.

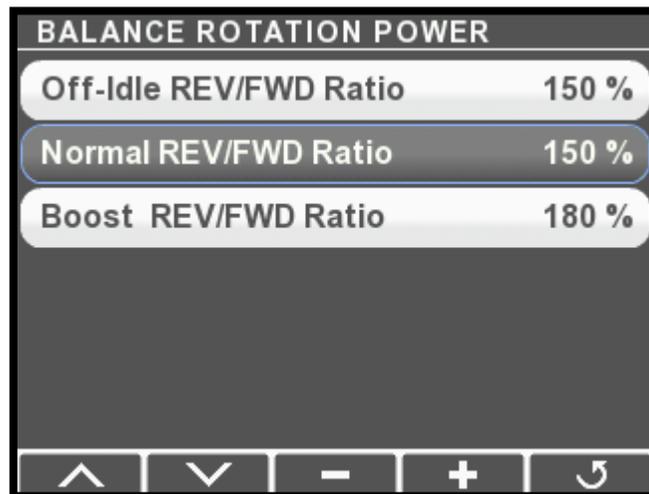


Figure 7-11.

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.

7.2.6 **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.

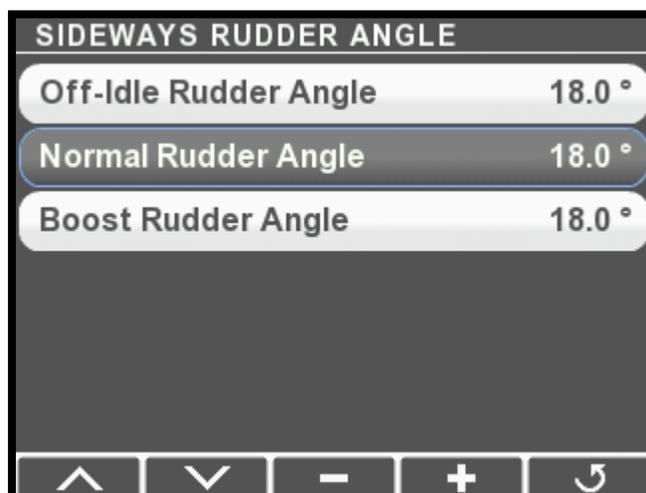


Figure 7-12.

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 counter clockwise, 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.

7.2.7 **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.

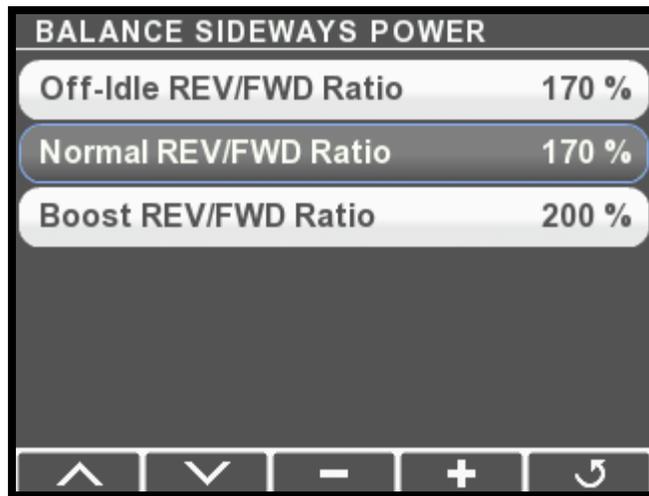


Figure 7-13.

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.

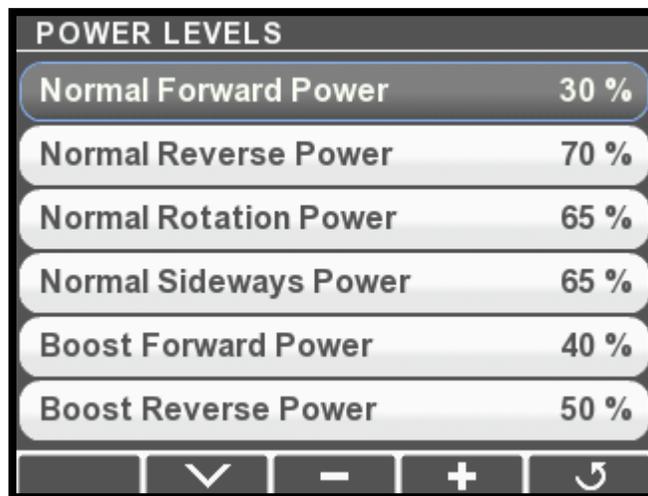
In many cases the off-idle sideways power balance will be adequate at this point, but you may find the vessel drifts aft at small joystick inputs, especially when the joystick is tuned with higher peak power levels. You can improve the off-idle performance with the optional step below.
6. Optional: Keep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

7.2.8 **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**.



POWER LEVELS	
Normal Forward Power	30 %
Normal Reverse Power	70 %
Normal Rotation Power	65 %
Normal Sideways Power	65 %
Boost Forward Power	40 %
Boost Reverse Power	50 %

The screenshot shows a menu titled 'POWER LEVELS' with six rows of settings. Each row consists of a label on the left and a percentage value on the right. The labels are: 'Normal Forward Power', 'Normal Reverse Power', 'Normal Rotation Power', 'Normal Sideways Power', 'Boost Forward Power', and 'Boost Reverse Power'. The corresponding percentage values are: 30 %, 70 %, 65 %, 65 %, 40 %, and 50 %. At the bottom of the menu, there are five icons: a downward-pointing chevron, a minus sign, a plus sign, and a circular arrow.

Figure 7-14.

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.*

7.2.9 **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.

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.

⚠ WARNING

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

7.2.10 **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.

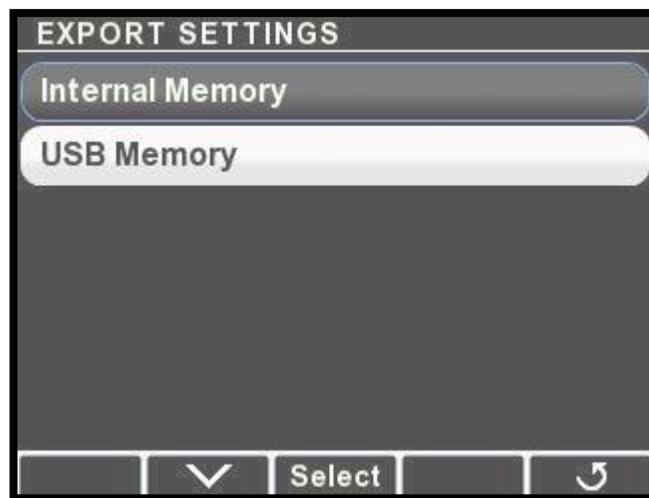


Figure 7-15.

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 Appendix E of the Optimus EPS Installation Manual(Book 50) 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.

7.3 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.

7.3.1 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 Appendix E of Book 50 for firmware updating instructions.

Procedure

1. Follow the basic import procedure in section 7.3.4. Be sure to select the correct template file.
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 7.2.2) and STEP 3 (section 7.2.3) 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 7.2.9). If the vessel's performance under joystick control is poor, double-check that the template file you used was for an identical vessel.

7.3.2 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 7.2).
- the latest firmware revision on all system components. See Appendix E of Book 50 for firmware updating instructions.

Follow the basic import procedure shown in section 7.3.4. Once the import is complete, perform a sea trial as shown in STEP 9 (section 7.2.9).

7.3.3 Updating Joystick Firmware

In general, system firmware should always be updated using the 'Update All' utility described in Appendix E of the Optimus EPS Installation Manual (Book 50).

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.

7.3.4 Basic Import Procedure

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

8.0 POST-INSTALLATION WARRANTY CHECKLIST

After completion of the system installation, configuration and initial Sea Trial, the Post-Installation Warranty Checklist supplied with your system documentation must be filled out and returned to SeaStar Solutions as part of the Limited Warranty Registration. Failure to fill out the form or incomplete information may result in loss of warranty coverage.

9.0 UPDATING FIRMWARE

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

Refer to Appendix E of the Optimus EPS Installation Manual (Book 50) for instructions.

10.0 WARRANTY

10.1 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.

10.2 Return Goods Procedure

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

Be sure to label the goods with:

- a) the name and address of the sender, and
- b) the return goods authorization number (claim number)

Please address the returned goods as follows:

From U.S.A.

RGA # ?
SeaStar Solutions
c/o UPS-Supply Chain Solutions Inc.
Door A37
1201 C Street NW, Auburn, WA,
98001

From Canada

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

10.3 Technical Support

Phone: 604-248-3858

email: seastar@seastarsolutions.com

Hours: Monday to Friday 05:00 – 15:30 PST

Web: www.seastarsolutions.com

This page left intentionally blank.

APPENDIX A – MOUNTING TEMPLATES

A.1 Joystick

⚠ CAUTION

The helm may effect a ship's or the autopilot's compass. For less than one degree of effect keep the EPS helm and the compass a minimum of 8 inches (20.5 cm) apart.

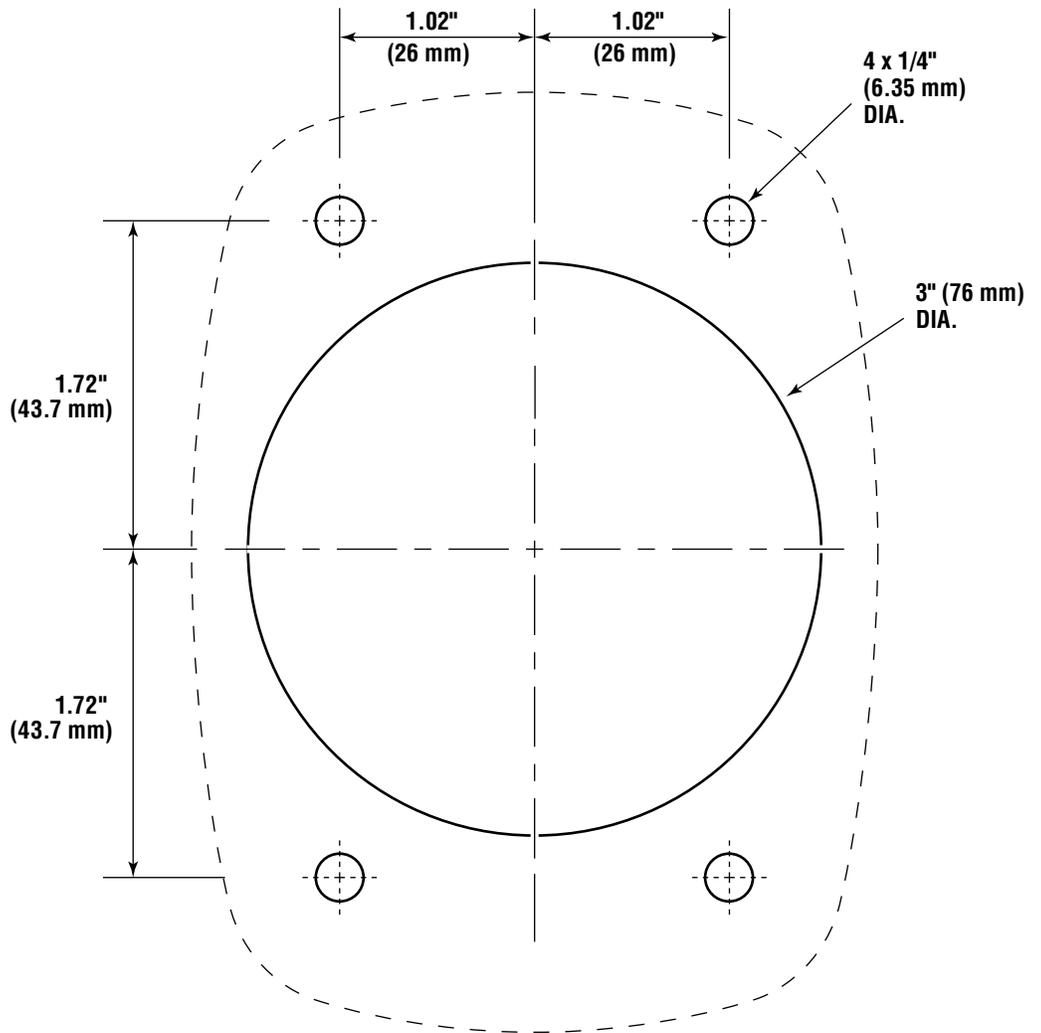


Figure A-1. Joystick mounting template.

NOTICE

If you must photocopy this mounting template for use, check ALL measurements using a measuring device prior to using as a template.

A.2 Control Head

⚠ CAUTION

The helm may effect a ship's or the autopilot's compass. For less than one degree of effect keep the EPS helm and the compass a minimum of 8 inches (20.5 cm) apart.

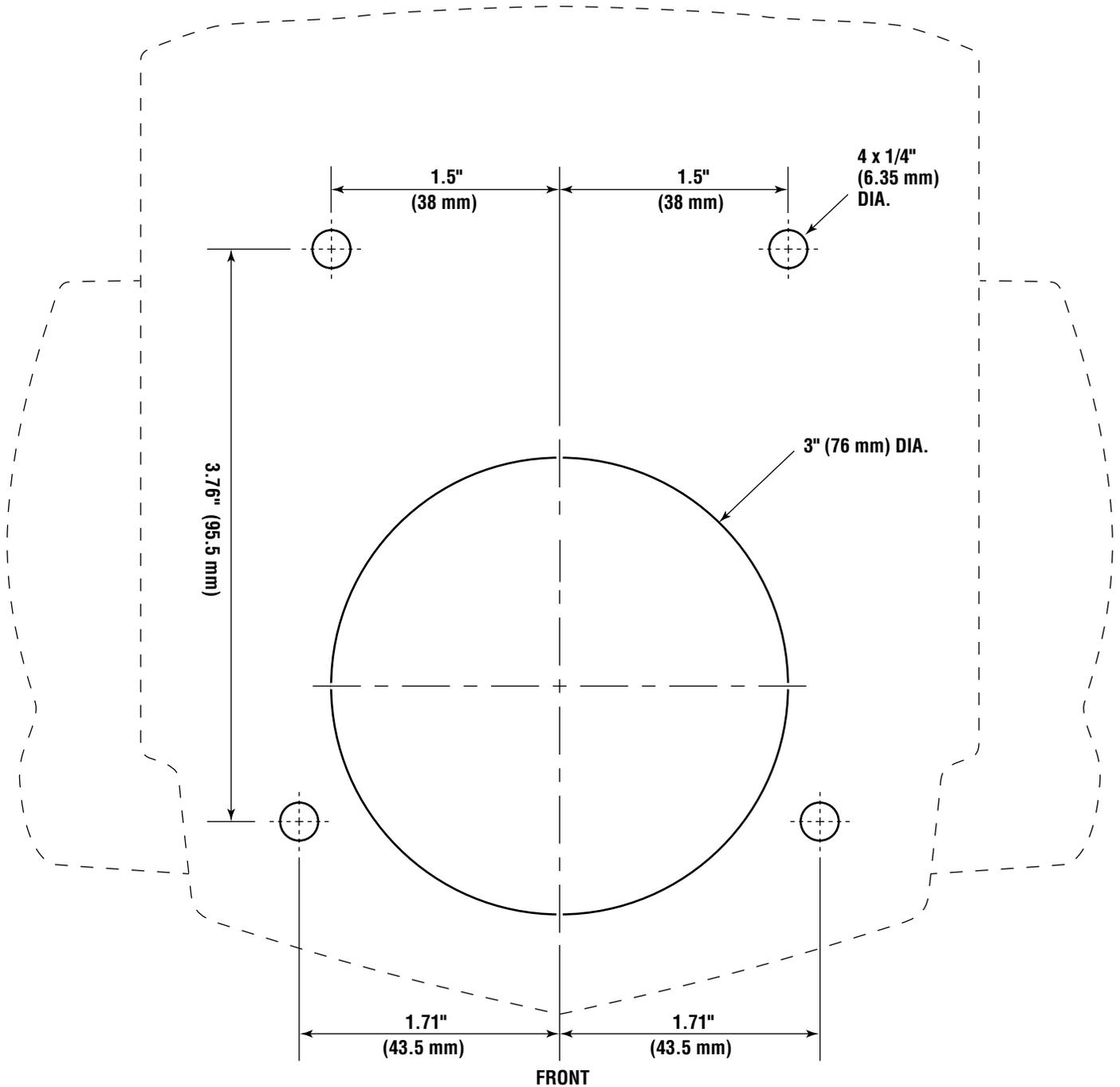


Figure A-2. Control Head mounting template.

NOTICE

If you must photocopy this mounting template for use, check ALL measurements using a measuring device prior to using as a template.

APPENDIX B – SETUP AND TUNING WITH DATALINK

B.1 Using Datalink for Optimus 360

The Optimus 360 uses the same Datalink dealer setup program as the standard Optimus EPS system. However, in order to communicate with the joystick and related vessel command components, the computer must be connected to the system via the CAN2 network rather than the CAN1 connection outlined in the Optimus EPS manual. The CAN2 programming cable (P/N CM21106) is provided in the Optimus dealer kit.

NOTICE

Always make sure the latest version of Datalink is installed and in use. Check www.optimusdealers.com for latest program revision.

Procedure

1. Connect the notebook computer to an unused CAN2 network port using the CAN2 programming harness as shown in Figure B-1. If necessary an additional tee may be installed but *must* be removed or capped after use. If the spare tee is left in the system, there must still be one (and only one) terminator at each end of the CAN2 bus.
2. Turn on the notebook computer and open the Datalink program located on the desktop.
3. Once Datalink opens, the Interfaces section of the Workspace should become populated with components connected to the network. If not, double click on Optimus CAN2 in the protocols section. The components should turn green as communication is established. See figure B-2 to familiarize yourself with the Datalink workspace.
4. Double-clicking on any of the components will enter the configuration pages for that particular component.
5. Before proceeding with the setup, verify that the firmware revisions are up to date for each of the components. Refer to Appendix E of the Optimus EPS Installation Manual (Book 50) for instructions on checking and updating firmware revisions.

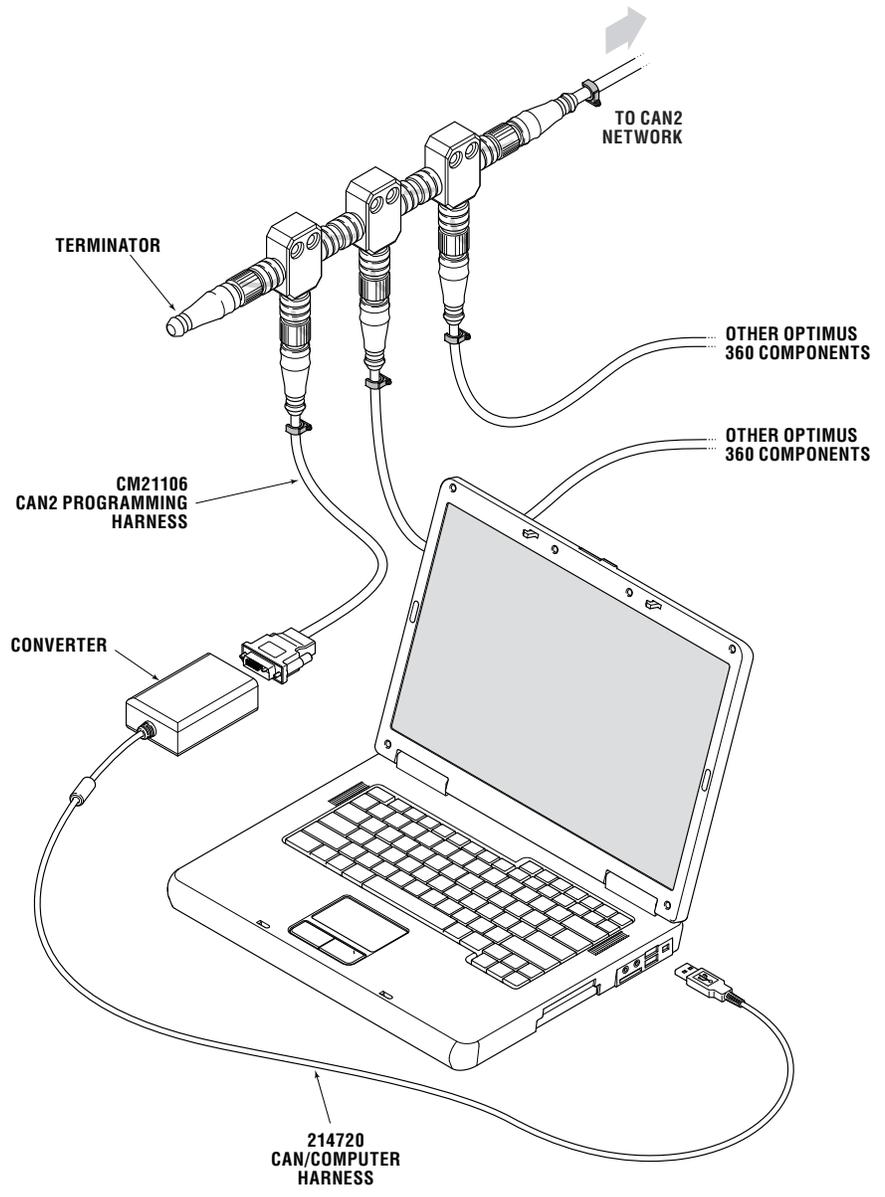


Figure B-1. Dealer Kit connection.

B.2 Actuator Setup

B.2.1 Step 1 – Actuator Configuration Using Datalink

This step will establish communication between the shift and throttle actuators and Datalink and will configure the shift and throttle actuator settings. From the factory, all actuators default to being Port Shift actuators. This section will assign the correct function to each of the actuators.

⚠ CAUTION

Ensure mechanical cables are not connected to the actuators at this point.

Procedure

1. In the Datalink workspace you should see four Port Shift Actuators as shown in figure B-2 below. Click on the + beside an actuator to view the part and serial number information associated with it.

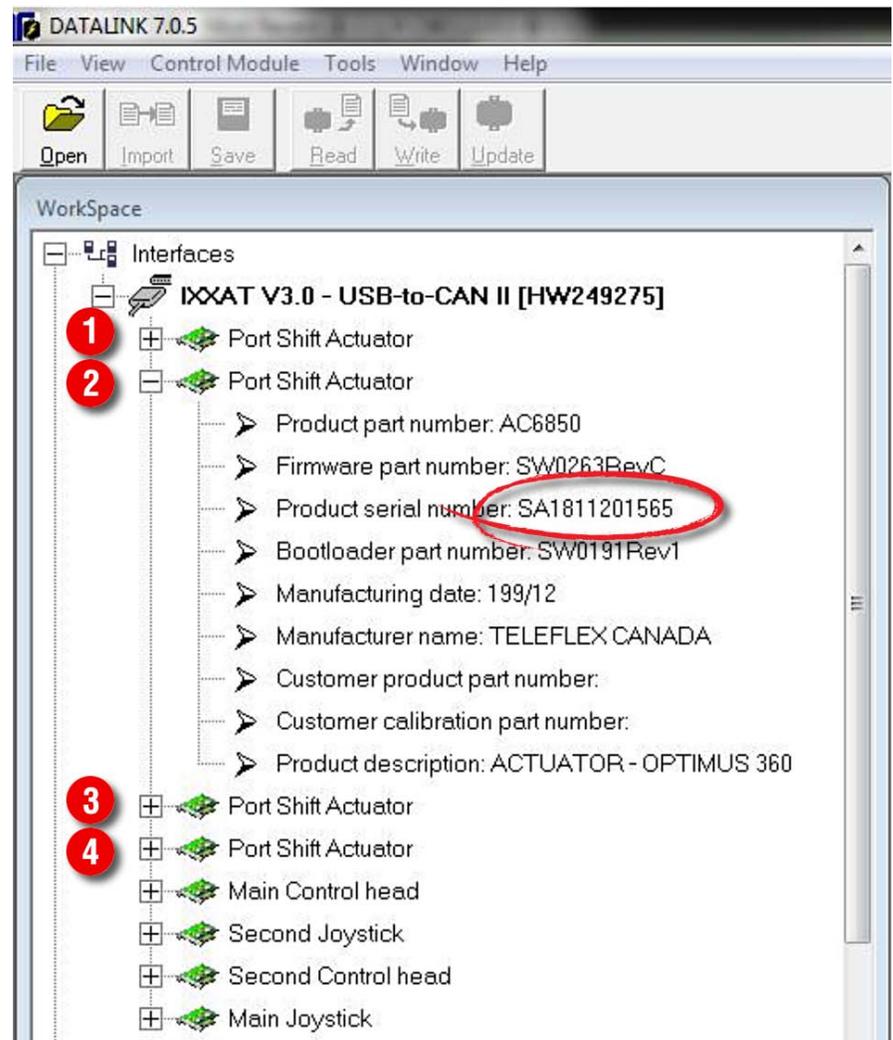


Figure B-2. Shift/Throttle actuator configuration.

2. Match the serial number shown with the serial numbers you recorded in section 4.3.1. You now know the type (shift or throttle) and the instance (port or starboard) of the actuator. Double-click the actuator to open its configuration file.
3. Open the Parameters tab.
4. Set the Actuator Type and Actuator Instance parameter as required. (See Figure B-3.)
5. Set the type-specific parameters as follows:
 Throttle actuators: Set the Throttle Acceleration parameter to Push or Pull for the direction the throttle actuator is required to move to *increase* throttle.
 Shift actuators: Set the Shift to Forward parameter to Push or Pull for the direction the shift actuator is required to move to engage *forward gear*.
6. Click **Write** to save the changes. The strokes and throws will be set in section B.2.3 after the cables have been installed.
7. Repeat items 1 through 6 for each actuator.
8. Remove cable access covers (See figure B-4) on all actuators. DO NOT connect mechanical cables at this point.
9. With the covers removed, move the port and starboard control head handles to the forward and reverse positions and verify that the shift actuator racks both move accordingly.
10. Increase the throttle on each of the control head handles from idle to the full throttle positions and verify that the throttle actuator racks advance and return to idle accordingly.
11. Apply manual override direction decals as shown in section 5 (figure 5-8 and figure 5-9).

Dealer	
Actuator Type:	Shift
Actuator Instance:	Port
Throttle Acceleration:	Pull
Shift To Forward:	Push
Throttle Offset:	8.0 mm
Throttle Stroke:	60.0 mm
Shift To Forward Throw:	34.0 mm
Shift To Reverse Throw:	34.0 mm
Neutral switch connected	<input checked="" type="checkbox"/>

Figure B-3. Shift/Throttle actuator configuration.

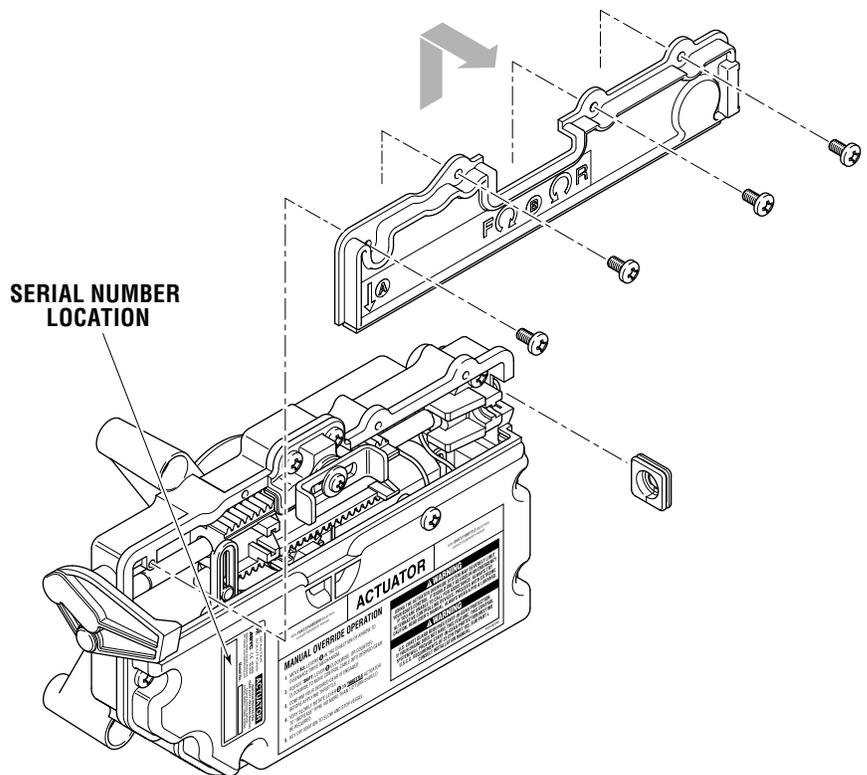


Figure B-4. Actuator cover removal and location of serial number.

B.2.2 Step 2 – Cable Installation and Adjustment

Refer to section 5.3.2 for instructions on the mechanical installation of the cables.

B.2.3 Final Setup and Actuator Adjustment

SHIFT

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

- To have shift cables adjusted so neutral position of actuator represents neutral position of engine shift linkage.
- To set the stroke length to achieve full engagement of gear yet not interfere with physical shift linkage limit. (Done in Step 4 below.)
- To have both gears fully disengage when returned to neutral.

⚠ DANGER

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

Procedure

1. Turn ignition on but *do not* start engines.
2. Open the starboard shift actuator in Datalink.
3. With an assistant spinning the prop by hand, put the starboard engine into forward gear and verify that the gear engages.
4. Increase the Shift to Forward Throw value 1 mm at a time as necessary to fully engage the gear. Click **Write** to save each change.
5. Repeat items 3 and 4 for reverse gear, modifying the Shift to Reverse Throw value as necessary to fully engage the gear.

⚠ DANGER

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

⚠ WARNING

6. Verify that the engine returns to neutral properly. The propeller should freewheel in neutral. If the propeller does not freewheel in neutral, adjust the actuator side adjustment barrels as necessary to achieve the correct neutral position (See Section 5.3.2.1) then repeat items 1 to 6.
7. Repeat items 1 to 6 for the port shift actuator.
8. During sea trial, verify that both engines engage both gears properly and hold the gear in both forward and reverse under load. If necessary repeat items above to achieve proper gear engagement.

AFTER FINAL ADJUSTMENT IS MADE APPLY LOCTITE® 242 (BLUE) AND TIGHTEN JAM NUT ON ACTUATOR SIDE.

NOTICE

It is not uncommon to have stroke length a little longer for the push direction gear to take up the lost motion of the cable in the push direction. This is more pronounced with longer cables.

THROTTLE

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

- To have throttle cables adjusted evenly so engines *start* to rev up at the same time given the same throttle (handle) position.
- That throttle always returns to idle when handle(s) are moved to idle.
- That there is minimal handle travel before engines rev up.
- That the stroke length is set to achieve wide open throttle (WOT) engine speed without unnecessary throttle cable movement.

Procedure

1. Turn ignition on, do not start engines.
2. Open the starboard throttle actuator in Datalink.
3. Increase the starboard throttle lever to the full throttle position and verify that the throttle linkage reaches the wide open throttle (WOT) position.
4. Increase the Throttle Stroke value in Datalink as necessary to reach the WOT position. Click **Write** to save each change.
5. Repeat items 1-4 for the port throttle actuator.
6. During sea trial, verify that both engines can reach WOT RPM and that both return to idle properly. On some engines, the throttle levers may have to be moved forward quite a bit before any RPM increase is achieved. On these engines, increase the Throttle Offset value in Datalink to minimize this deadband. Alternately, the actuator adjuster barrels may be adjusted as necessary to remove the throttle deadband. If the Throttle Offset value is modified, repeat steps 2-6 to verify that WOT is still reached and that the throttle cable is not over-stroking.
7. During sea trial, also verify that when moving both control head handles forward at the same time, both engine RPMs start to increase at the same time. If they do not, increase or decrease the Throttle Offset parameter or adjust the actuator adjuster barrels as required to achieve synchronous RPM increase.
8. After final adjustment is made apply Loctite® 242 (blue) and tighten jam nut on actuator side.

B.3 Control Head Setup

The control head has several configurable parameters, as shown in figure B-5 below. The default settings will generally provide excellent performance for most boats.

Access the parameters by double-clicking on the Main Control Head in the Datalink interface list, then clicking on the Parameters tab. A reset function is provided so that default values can be restored at any time. Remember to click **Write** after making any changes.

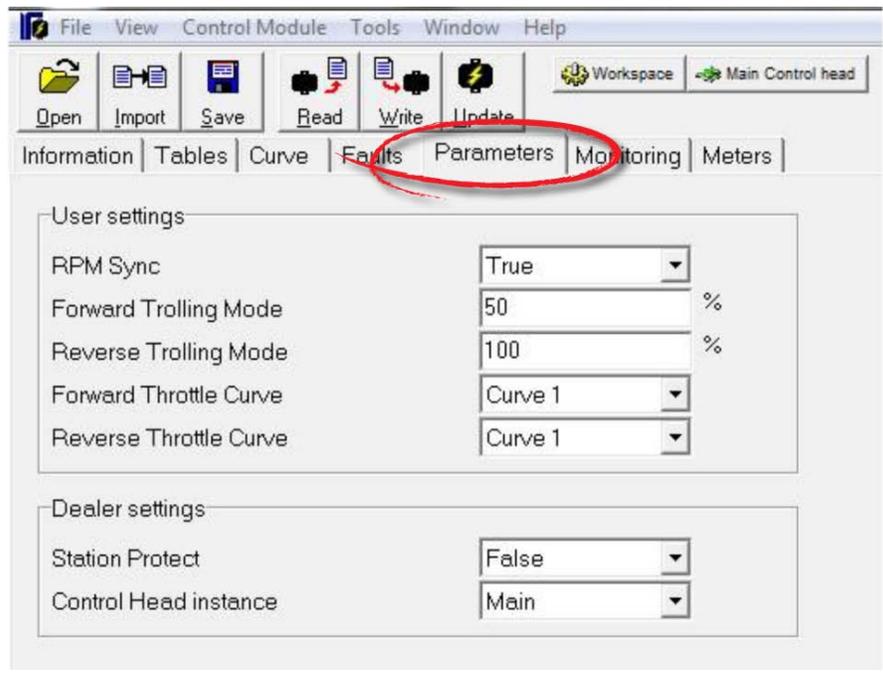


Figure B-5. Control Head setup.

The functions of these parameters are as follows:

RPM Sync – Controls the throttle behaviour when the Power Train Sync (PTS) feature is engaged. When True the control system will use tachometer feedback to match engine speeds. When False the control system will simply match the throttle command. If engine RPMs oscillate in Sync mode change this setting to False.

Forward/Reverse Trolling Mode – sets the maximum percentage of wide open throttle when trolling mode is engaged. A forward 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.

Forward/Reverse Throttle Curve – There are two throttle curves that control the response characteristics when the control lever is at or near idle. Curve 1 is the default curve, and is suitable for most applications. Curve 2 requires more lever travel before throttle is increased.

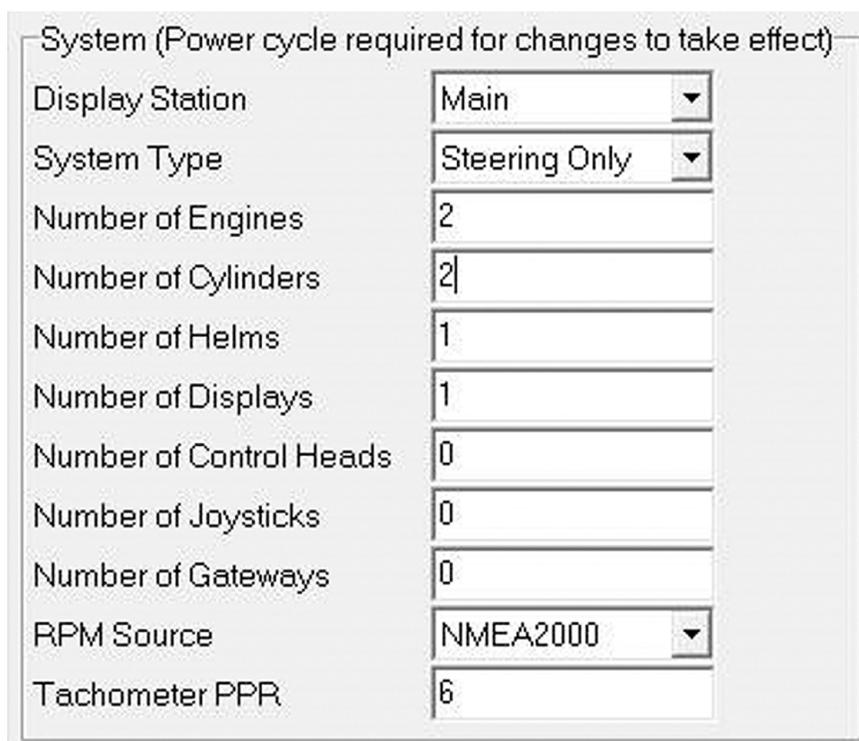
Station Protect – When enabled (True), this feature prevents accidental switching between control stations on multi-station boats by requiring a specific sequence of button presses. Refer to Book 61 – Optimus 360 Operations Manual for more information.

B.4 System Setup

Basic system configuration is set through the color CANtrak display parameters. The display then broadcasts these settings to all the system devices connected to the network.

Access the parameters by double-clicking on Main Color Display in the Datalink workspace, then clicking on the Configuration tab. Remember to click **Write** after making any changes.

B.4.1 System Parameters



System (Power cycle required for changes to take effect)	
Display Station	Main
System Type	Steering Only
Number of Engines	2
Number of Cylinders	2
Number of Helms	1
Number of Displays	1
Number of Control Heads	0
Number of Joysticks	0
Number of Gateways	0
RPM Source	NMEA2000
Tachometer PPR	6

Figure B-6. Color display – System parameters.

Display Station	Set the instance of the display. The default is Main; you only need to change the second station display instance.
System Type	Choose SeaStar i6800 from the drop-down list.
Number of Engines	At the time of printing only twin engine configurations are supported.
Number of [component]	Enter the quantity of each listed component in your system.
RPM Source	Select the RPM source that you're using.
Tachometer PPR	If the RPM Source is set to Analog Tach, enter the tachometer PPR here.

B.4.2 Settings Menu Access

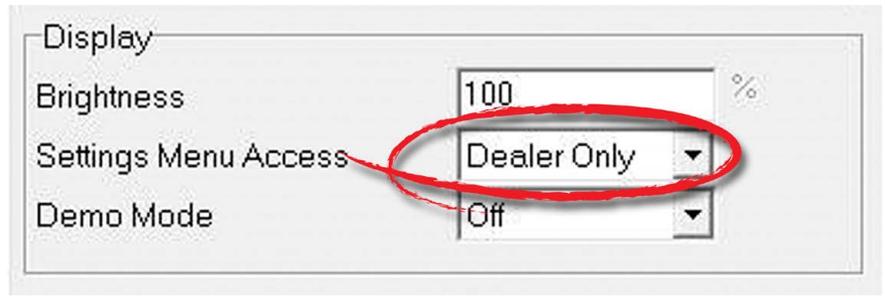


Figure B-7. Display parameters.

The adjustable steering settings are limited to those with Dealer Menu access by default. To allow users to adjust the steering settings, change the Settings Menu Access parameter to 'All'.

B.4.3 Cycle Power to System

Changes to system parameters will not take effect until the power has been cycled.

To cycle power, turn the key off for several seconds and turn it on again.

B.5 Joystick Tuning Procedure

The joystick setup procedure is organized into eleven steps, detailed in the following sections. You will perform the majority of the procedure from the Setup tab of the joystick's Datalink interface.

1a. Engine Specific Settings
Click the following button and follow prompts to customize settings to your engine.

1b. System
Joystick Instance:

2. Set Throttle Limits

Port Idle Forward Throttle	<input type="text" value="15"/>	%
Stbd Idle Forward Throttle	<input type="text" value="15"/>	%
Port Max Forward Throttle	<input type="text" value="30"/>	%
Stbd Max Forward Throttle	<input type="text" value="30"/>	%
Port Idle Reverse Throttle	<input type="text" value="15"/>	%
Stbd Idle Reverse Throttle	<input type="text" value="15"/>	%
Port Max Reverse Throttle	<input type="text" value="40"/>	%
Stbd Max Reverse Throttle	<input type="text" value="40"/>	%

Throttle Positions

Port Throttle	<input type="text" value="0.0"/>	%
Stbd Throttle	<input type="text" value="0.0"/>	%

Engine RPM

Port Engine RPM	<input type="text" value="650"/>	RPM
Stbd Engine RPM	<input type="text" value="650"/>	RPM

3. Run Engine Throttle Wizards ("Throttle vs Engine RPM" map)

Port Fwd Throttle [%]	X	<input type="text" value="0"/>	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30
Port Fwd Engine RPM	Y	0	500	675	850	1025	1200	1375	1550	1725	1900	2075	2250

Stbd Fwd Throttle [%]	X	<input type="text" value="0"/>	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30
Stbd Fwd Engine RPM	Y	0	500	675	850	1025	1200	1375	1550	1725	1900	2075	2250

Port Rev Throttle [%]	X	<input type="text" value="0"/>	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40
Port Rev Engine RPM	Y	0	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000

Stbd Rev Throttle [%]	X	<input type="text" value="0"/>	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40
Stbd Rev Engine RPM	Y	0	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000

4. Set Forward Heading Correction
Rudder Correction:

5. Balance Rotation Engine Power ("Power level vs Rotation Ratio" map)

Power Level [%]	X	<input type="text" value="0"/>	65	75	100
Rotation Rev/Fwd Ratio [%]	Y	150	150	150	150

6. Set Sideways Rudder Angle ("Power level vs Rudder Angle" map)

Power Level [%]	X	<input type="text" value="0"/>	65	75	100
Sideways Rudder Angle [°]	Y	18.0	18.0	18.0	18.0

7. Balance Sideways Engine Power ("Power level vs Sideways Ratio" map)

Power Level [%]	X	<input type="text" value="0"/>	65	75	100
Sideways Rev/Fwd Ratio [%]	Y	150	150	150	150

8. Adjust Power Levels

Normal Forward Power	<input type="text" value="30"/>	%
Normal Reverse Power	<input type="text" value="40"/>	%
Normal Sideways Power	<input type="text" value="65"/>	%
Normal Rotation Power	<input type="text" value="65"/>	%
Boost Forward Power	<input type="text" value="40"/>	%
Boost Reverse Power	<input type="text" value="50"/>	%
Boost Sideways Power	<input type="text" value="85"/>	%
Boost Rotation Power	<input type="text" value="85"/>	%

Figure B-8. Joystick Setup tab.

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.

B.5.1 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.
- When you change a parameter, you must click **Write** to copy it from Datalink to the joystick. Otherwise the change will not take effect.
- Click **Read** at any time to copy the joystick's saved parameters into Datalink. We suggest you do this regularly to confirm that the changes you make have been correctly stored in the joystick.
- To return all parameters to their default settings, click **Reset Setup to Factory Defaults**. Click **Read** to read the default values from the joystick.

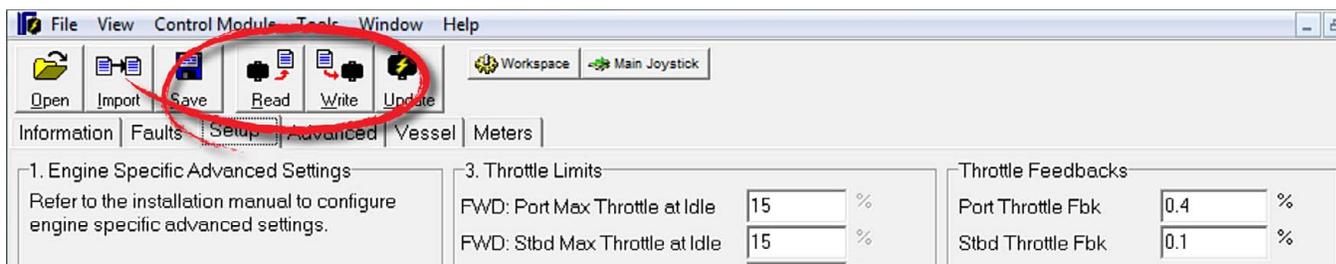


Figure B-9. Read and Write buttons in Datalink.

B.5.2 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.
- Connect the netbook computer and open Datalink.
- Double-click on the joystick component to access the configuration. If the boat has two control stations, match the serial number on the joystick with the serial number displayed in Datalink to ensure that you are accessing the correct joystick instance. If you aren't sure, you can disconnect the secondary joystick from the CAN2 network and it will be removed from the list of available components. The secondary joystick will be configured in section B.6.

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.

B.5.3 **STEP 1** – Import Engine-Specific Settings

On the Setup tab of the Joystick interface, click **Import Engine Specific Settings**. A dialog will pop up, click **Yes** to confirm.

A file selector will open. From the engine(s) listed, choose the one that matches yours and click **Open**. Click **Yes** at the dialog prompts to write and confirm the imported settings.



Figure B-10.

B.5.4 **STEP 1a** – System

Return to the Setup tab. Set the Joystick Instance to either Main or Second. In most cases you will be doing the setup with the main joystick.

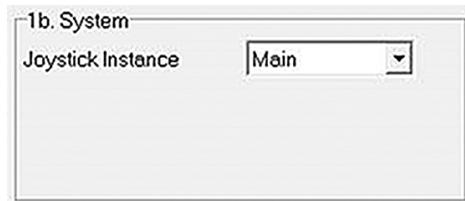


Figure B-11. The System parameters section of the Setup tab.

B.5.5 **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. Maximum Throttle at Idle (Forward)
 - a) Use the control head to put the port engine in forward gear.
 - b) Very slowly increase throttle until the engine RPM increases. Note the maximum *throttle percentage* at which the engine is *still at idle*. (The RPM and throttle percentage are displayed in the boxes as shown in figure 9-7).
 - c) Enter the value in the Port Idle Forward Throttle.

2. Set Throttle Limits		Throttle Positions	
Port Idle Forward Throttle	15 %	Port Throttle	0.0 %
Stbd Idle Forward Throttle	15 %	Stbd Throttle	0.0 %
Port Max Forward Throttle	30 %		
Stbd Max Forward Throttle	30 %		
Port Idle Reverse Throttle	15 %		
Stbd Idle Reverse Throttle	15 %		
Port Max Reverse Throttle	40 %		
Stbd Max Reverse Throttle	40 %		
		Engine RPM	
		Port Engine RPM	650 RPM
		Stbd Engine RPM	650 RPM

Figure B-12. Throttle Limits are found on the Setup tab.

2. Maximum Joystick Throttle (Forward)
 - a) Slowly increase throttle until the engine reaches approximately 1800 RPM.
 - b) Enter the throttle percentage in Port Max Forward Throttle.
3. Maximum Throttle at Idle (Reverse)
 - a) Put the port engine in reverse gear.
 - b) Very slowly increase throttle and note the maximum throttle percentage at which the engine is still at idle.
 - c) Enter the value in Port Idle Reverse Throttle.
4. Maximum Joystick Throttle (Reverse)
 - a) Slowly increase throttle until the engine reaches the maximum desired RPM for joystick operation. This will be either:
 - i. the maximum throttle just before cavitation, or
 - ii. if cavitation does not occur, the maximum throttle for comfortable use.
 - b) Enter the throttle *percentage* in the Port Max Reverse Throttle field. Write down the corresponding *RPM* in the adjacent table – you will use it in STEP 3.
 - c) Return the engine to neutral.
5. Repeat the preceding steps for the starboard engine. Be sure you are entering the throttle percentages in the correct boxes for the starboard values.
6. Click **Write** to save the values.

RPM @ Maximum Joystick Throttle in reverse	
Port	Starboard

B.5.6 **STEP 3** – Run Throttle Wizards

The engine response 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 with boat safely secured, or in an open area.

Forward Throttle Wizard:

1. Press **Take Command** on the joystick. Ensure boost mode is *off*.
2. Click **Run Port Engine Forward Throttle Wizard** (see figure B-13). The joystick's A LED will flash to indicate the port wizard is running.

SECOND Y-VALUE

3. Run Engine Throttle Wizards ("Throttle vs Engine RPM" map)

		Run Port Engine Forward Throttle Wizard											Run Port Engine Reverse Throttle Wizard											
Port Fwd Throttle [%]	X	0	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30											
Port Fwd Engine RPM	Y	0	500	675	850	1025	1200	1375	1550	1725	1900	2075	2250											
Port Rev Throttle [%]	X	0	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40											
Port Rev Engine RPM	Y	0	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000											
		Run Stbd Engine Forward Throttle Wizard											Run Stbd Engine Reverse Throttle Wizard											
Stbd Fwd Throttle [%]	X	0	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30											
Stbd Fwd Engine RPM	Y	0	500	675	850	1025	1200	1375	1550	1725	1900	2075	2250											
Stbd RevThrottle [%]	X	0	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40											
Stbd Rev Engine RPM	Y	0	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000											

FINAL Y-VALUE

Figure B-13. The engine response configuration wizards are found on the Setup tab.

3. 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.
 - b) When the wizard finishes the LED will stop flashing. This takes about one minute.
4. Click **Read** to import the wizard values into Datalink.
5. Examine the *second Y-value* (see figure B-13) in the table. If it is more than 100 RPM higher than the engine's in-gear idle RPM, go back to STEP 2 and *decrease* FWD: Port Max Throttle at Idle by 0.5%. Click **Write** if you make a change.

6. Examine the *final Y-value* in the table. The target value is 1800 \pm 200.
 - a) If it is less than 1600, go back to STEP 2 and *increase* FWD: Port Max Joystick Throttle by 0.5%.
 - b) If it is more than 2000, *decrease* FWD: Port Max Joystick Throttle by 0.5%.
 - c) Click **Write** if you make a change.
7. If you changed the throttle parameters, repeat the wizard and recheck the results until the conditions are met.
8. Click **Run Stbd Engine Forward Throttle Wizard** to repeat this procedure for the starboard engine. The C LED will flash on the joystick to indicate the starboard wizard is running.

Reverse Throttle Wizard:

Run the reverse wizards with the joystick held in full reverse. The procedure is identical, except that the target for the final Y-value (step 6) is the maximum RPM you recorded in STEP 2. Use the same adjustments to ensure the final Y-value is within 200 RPM of the target.

NOTICE

It isn't necessary that the port and starboard Throttle vs RPM maps are the identical. The system will synchronize the engines to the same speed.

B.5.7 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. Perform in an area with no wind or current.

1. Press **Take Command** on the joystick. Ensure boost mode is *off*.
2. Push the joystick all the way forward without rotating the knob. If the boat holds a straight course then no adjustment is necessary. Move on to STEP 5.
3. Change the Rudder Correction value until the boat holds a straight course. Remember to click **Write** with each change.
 - a) Each unit equals one degree of rudder correction. If the boat drifts to port, enter a positive value. If the boat drifts to starboard, enter a negative value.

The screenshot shows a software interface window titled "4. Set Forward Heading Correction". Inside the window, there is a label "Rudder Correction" followed by a text input field containing the number "0.0". To the right of the input field is a small asterisk symbol. The window has a light gray border and a title bar.

Figure B-14. Rudder Correction.

B.5.8 **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. Perform in an area with no wind or current to remove outside interference.

1. If this is the initial tune, skip to step 3.
If you adjusted the power levels in STEP 8 and are now performing a re-tune, adjust the X-values in the table as follows (see figure B-15):
 - a) 1st = 0
 - b) 2nd = Normal Rotation Power from STEP 8
 - c) 3rd = Boost Rotation Power from STEP 8, minus 10%
 - d) 4th = 100
2. **Write** settings.

Power Level [%]	X	0	65	75	100
Rotation Rev/Fwd Ratio [%]	Y	150	150	150	150

Figure B-15. Power Level vs Rotation Ratio.

3. Bring the boat to a complete stop with boost mode off.
4. Rotate the joystick clockwise (CW).
 - a) If the boat moves aft while rotating, decrease both *normal mode Y-values* (see figure B-15) by the same amount. If the boat moves forward, increase the values.
 - To start, adjust in increments of up to 50 units. Decrease the increment size as the fore/aft movement is reduced.
 - b) **Write** settings.
 - c) Repeat until the boat rotates on the spot with no fore/aft movement.
5. Press **Boost** on the joystick to enable boost mode, then repeat step 4. This time, adjust the *boost mode Y-values* until fore/aft movement is eliminated while rotating.
6. **Write** settings.

Tip: In many vessels, the Y-values will all be the same.

B.5.9 **STEP 6** – Set Sideways Rudder Angle

When moving sideways we don't want the boat to rotate. We achieve this by tuning the Power Level vs Rotation Ratio map. Perform in an area with no wind or current to remove outside interference.

This step only adjusts for rotation during sideways movement. Fore/aft movement during sideways movement will be adjusted in STEP 7.

1. If this is the initial tune, skip to step 3.

If you adjusted the power levels in STEP 8 and are now performing a re-tune, adjust the X-values in the table as follows (see figure B-16):

- a) 1st = 0
- b) 2nd = Normal Sideways Power from STEP 8
- c) 3rd = Boost Sideways Power from STEP 8, minus 10%
- d) 4th = 100

2. Write settings.

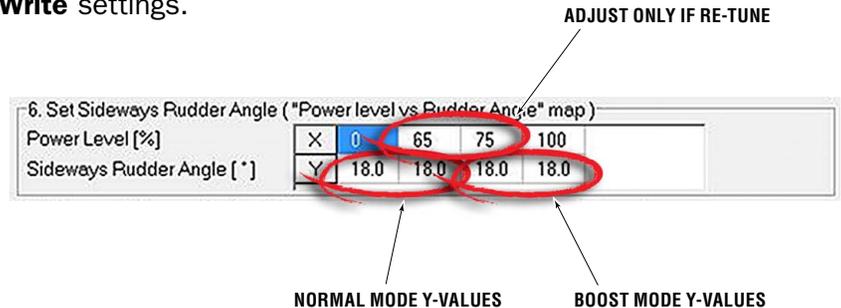


Figure B-16. Power Level vs Rudder Angle.

3. Bring the boat to a complete stop with boost mode off.

4. Move the joystick sideways fully to port without rotating the knob.

- a) If the boat rotates clockwise as it starts to move, decrease both *normal mode Y-values* (see figure B-16) by up to two units. If the boat rotates counterclockwise, increase the values.

- *Note:* The boat will rotate counterclockwise as it gains speed. This is normal – our objective is to remove rotation during *initial* movement.

- b) **Write** settings.

- c) Repeat until the boat's initial movement is directly sideways.

5. Repeat step 4 with boost mode enabled. This time adjust the *boost mode Y-values* until there is no rotation during initial movement.

6. Write settings.

Tip: *In many vessels, the Y-values will all be the same.*

B.5.10 **STEP 7** – Balance Sideways Engine 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. If this is the initial tune, skip to step 3.

If you adjusted the power levels in STEP 8 and are now performing a re-tune, adjust the X-values in the table as follows (see figure B-17):

- a) 1st = 0
- b) 2nd = Normal Sideways Power value from STEP 8 plus 5 units
- c) 3rd = Normal Sideways Power value from STEP 8, minus 10%
- d) 4th = 100

2. Write settings.

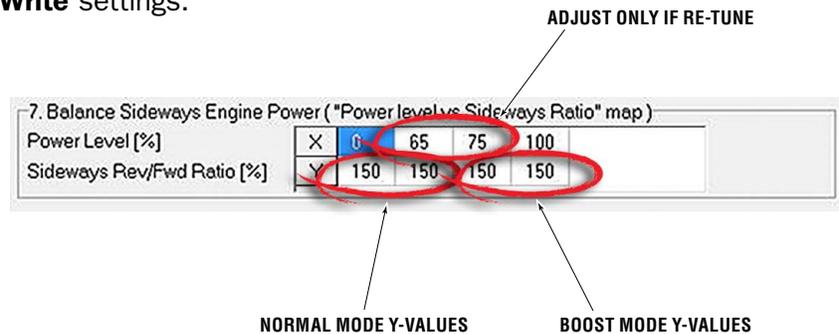


Figure B-17. Sideways REV/FWD Ratio Curve parameters.

3. Bring the boat to a complete stop with boost mode off.

4. Move the joystick sideways fully to port without rotating the knob.

- a) If the boat moves aft, decrease both *normal mode Y-values* (see figure B-17) by the same amount. If the boat moves forward, increase the values.
 - To start, adjust in increments of up to 50 units. Decrease the increment size as the fore/aft movement is reduced.

b) **Write** settings.

c) Repeat until the boat moves directly sideways.

5. Repeat step 4 with boost mode enabled. This time adjust the *boost mode Y-values* until the boat moves directly sideways.

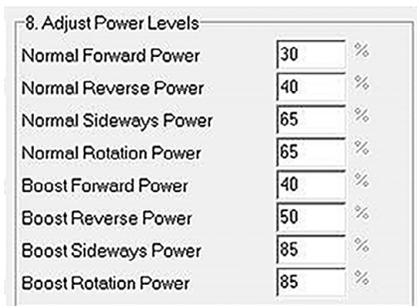
6. Write settings.

Tip: In many vessels, the Y-values will all be the same.

B.5.11 **STEP 8** – Adjust Power Levels

In this step you will customize the boat's response by fine-tuning power levels associated with each direction. Note that large changes in these values can affect the rudder offset and FWD/REV ratios calibrated in STEP 4 through STEP 8.

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



8. Adjust Power Levels		
Normal Forward Power	30	%
Normal Reverse Power	40	%
Normal Sideways Power	65	%
Normal Rotation Power	65	%
Boost Forward Power	40	%
Boost Reverse Power	50	%
Boost Sideways Power	85	%
Boost Rotation Power	85	%

Figure B-18. Vessel Control Power Levels.

1. Ensure boost mode is off.
2. Move the joystick all the way forward and adjust Normal Forward Power until the boat's speed over water (SOW) is 3–4 knots.
3. 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.
4. Move the joystick all the way port and adjust Normal Sideways Power until the boat moves sideways at a comfortable close-quarters docking speed.
5. Rotate the joystick all the way clockwise and adjust Normal Rotation Power until the boat rotates at a comfortable close-quarters docking speed.
6. Press **Boost** to enable boost mode.
7. Move the joystick all the way forward and adjust Boost Forward Power until the boat's SOW is 4–5 knots.
8. 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.
9. Move the joystick all the way port and adjust Boost Sideways Power until the boat moves sideways noticeably faster than in normal mode.
10. Rotate the joystick all the way clockwise and adjust Boost Rotation Power until the boat rotates noticeably faster than in Normal mode.
11. *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.*

B.5.12 **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.

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 REV Zone Thrust parameters as required.

B.5.13 **STEP 10** – Saving the Joystick Tuning File

The joystick tuning (.ecu) file should be saved as a backup in the event of a joystick failure, or to facilitate setup of a second control station. You will also need to email a copy of the tuning file to SeaStar Solutions as part of the post-installation warranty checklist (Part # 214740). Refer to Appendix E.3 in the Optimus EPS Installation Manual (Book 50) for instructions.

B.6 Adding a Second Control Station

At a minimum, a second control station must consist of a helm, a control head, and an alarm buzzer. A secondary joystick and CANtrak display are optional.

B.6.1 Configure the Secondary Helm and CANtrak Display

If the secondary helm and CANtrak display have not already been configured, refer to the Optimus EPS Installation Manual (Book 50) for instructions.

B.6.2 Configure the Secondary Control Head

The instance setting of the secondary control head needs to be configured, and any changes to the user parameters on the primary control head need to be copied.

Procedure

1. If both control heads are connected to the CAN2 network you will see two Main Control Head instances in the Interfaces list. Click the + beside both instances to view the serial numbers associated with them, then identify which of the two instances is installed as the secondary control head. Connect to it by double-clicking it.
2. Open the Parameters tab and change the Control Head instance to Second.

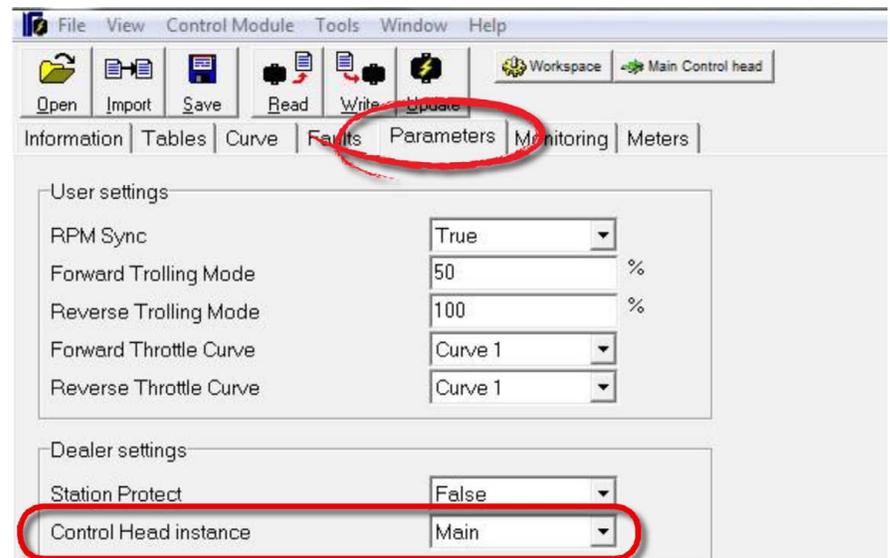


Figure B-19. Configuring the second station control head.

3. Update the settings, if required, to match the primary control head.
4. Click **Write** to save the change.

B.6.3 Configure the Secondary Joystick

It is important that both joysticks are configured with the same tuned parameters to ensure that the boat handles correctly when controlled from either station. The simplest way to do this is to import the tuning (.ecu) file from the primary (main) joystick to the secondary joystick. See section B.7.1 for details.

B.7 Importing a Joystick Tuning File

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

- configure a second station joystick.
- use a template tuning file to set up identical vessels without tuning every vessel individually.
- replace a joystick.
- update the firmware revision on a joystick.

B.7.1 Configuring a second joystick

You will be importing the .ecu tuning file that you saved in STEP 10 of the joystick tuning procedure. Follow the basic import procedure shown in section B.7.5. Be sure to set the joystick instance number to 2 in step 4.

Once you have completed the import procedure, perform a sea trial as shown in STEP 9 (section B.5.12) using both joysticks. Confirm that the vessel performs as expected from both stations.

B.7.2 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.ecu

You will need:

- a copy of the template tuning file (.ecu) on your computer.
- the latest firmware revision on all system components. See Appendix E of Book 50 for firmware updating instructions.

Procedure

1. Follow the basic import procedure in section B.7.5. Be sure to select the correct template file and the correct joystick instance number for the destination joystick.
2. Open the joystick's interface in Datalink.
3. Perform STEP 2 (section B.5.5) and STEP 3 (section B.5.6) 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 B.5.12). If the vessel's performance under joystick control is poor, double-check that the template file you used was for an identical vessel.

B.7.3 Replacing a joystick

You will need:

- a copy of the original joystick's tuning file (.ecu) on your computer. If you do not have the tuning file you will need to tune the joystick from scratch (section B.5).
- the latest firmware revision on all system components. See Appendix E of Book 50 for firmware updating instructions.

Follow the basic import procedure shown in section B.7.5. Once the import is complete, perform a sea trial as shown in STEP 9 (section B.5.12).

B.7.4 Updating joystick firmware

In some cases, updating the joystick firmware can cause the loss of the saved tuning parameters. Accordingly, you should create a backup of the tuning file before updating. Firmware updating instructions are found in Appendix E.2 of the Optimus EPS Installation Manual (Book 50).

After updating the firmware, follow the basic import procedure shown in B.7.5, using the backup .ecu file that you just created.

Once the import is complete, perform a sea trial as shown in STEP 9 (section B.5.12).

B.7.5 Basic Import Procedure

1. Connect the destination joystick to the network and open its configuration page with Datalink. If there is more than one joystick on the network, identify the correct joystick by matching the serial number shown in the Workspace with the label on the joystick. Alternatively, you can unplug any other joysticks from the network.
2. Click **Import** in the toolbar. Use the file browser to find the .ecu tuning file you wish to import. Highlight it and click **Open**.
3. You will see the following warning. Click **OK** to continue.

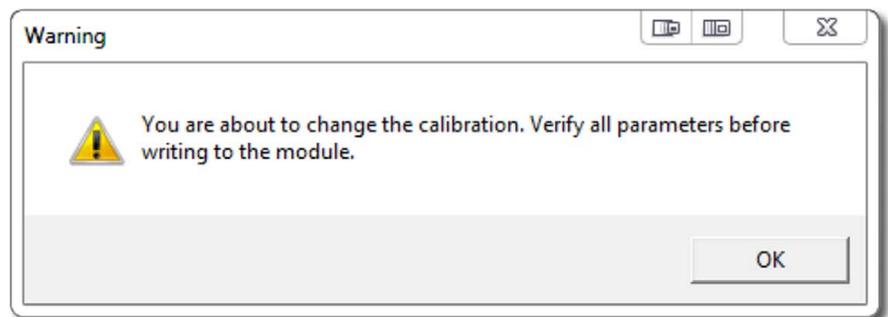


Figure B-20. Import warning dialog.

4. The dialog box shown in figure B-21 will be displayed. Use this dialog to set the instance number of the joystick. If you are configuring a second station joystick, change this instance number to 2. Otherwise, accept the default. Click **OK**.

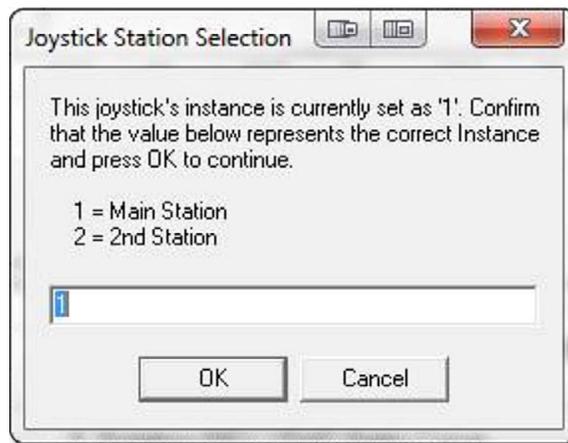


Figure B-21. Joystick instance setting for import.

5. The following confirmation dialog will be displayed. Click **OK** to accept.

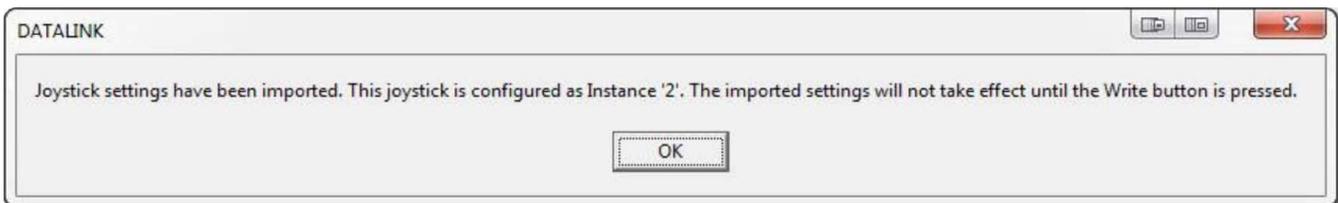


Figure B-22. Joystick import confirmation dialog.

6. Click **Write** to save the settings. At the subsequent prompt, click **Yes**.
7. The Optimus system requires a power cycle before use. Turn the ignition off, wait at least five seconds, then turn it on again.



**SEASTAR
SOLUTIONS®**

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

FAX 604-270-7172

www.seastarsolutions.com

ISO 10592



© 2013 MARINE CANADA ACQUISITION INC.
DBA SEASTAR SOLUTIONS

PRINTED IN CANADA

FORM NO. 682102

04/14 Rev. C