



Station Expander User Instructions

Table of Contents

1	Features	4
2	Required Parts	4
3	Location	4
4	Station Expander Power	5
5	Harnesses	5
6	Tools For Installation.....	6
6.1	Required	6
6.2	Optional	6
7	Installation	7
7.1	Station Expander	7
7.2	Power Cable	8
7.3	Control Head Harnesses.....	8
7.4	Engine Stop Switch	8
7.5	Control Heads.....	9
8	Set Up Procedures	9
8.1	Station Expander Components Used In Set Up.....	9
8.2	Station Expander Display LED	10
8.3	Push Buttons.....	10
9	Activating Set Up Mode and Storing a Value.....	11
10	Set Up Functions & Values.....	12
10.1	A0 - Station Expander Identification.....	13
10.2	H0 - Diagnostic	13
10.3	H1 - Erase EPROM	14
11	Dock Trials	14
11.1	Control Head (Engines Stopped)	14
11.2	Engine Stop Switches Test (Engines Running).....	14
12	Periodic Checks and Maintenance	15
12.1	Station Expander	15
12.2	Control Head.....	15
13	Parts List	15
13.1	Control Heads.....	15
13.2	Cable (Electric)	16
13.3	Wire Harness (Plug).....	16
13.3	Wire Harness (Plug).....	16
13.4	Test Unit	16

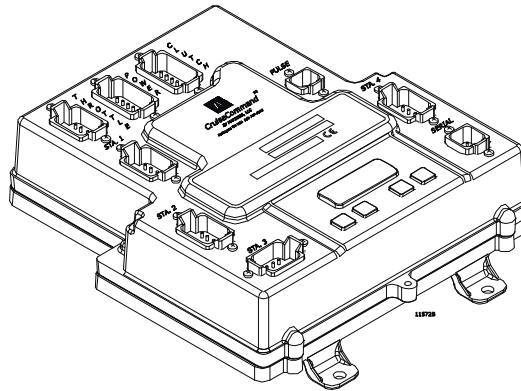


Figure ENG-283-1: Station Expander

The station expander (SE) is designed to be an addition to the 9000 Series / CruiseCommand Processors. The station expander allows the user to install more than the maximum allowed control heads (up to four).

1 Features

- Station-in-Command Indication
- Audible and Visual Indicators
- Key-Pad Set Up
- Plug-in Cable Connections
- Built-in Diagnostics
- Addition of One to Four Remote Stations

The Station Expander receives the variable DC voltage from the Control Head(s) and serially communicates these inputs to the Processor.

2 Required Parts

- One Station Expander required per Processor.
- Mounting Hardware is installer supplied.
- System Operation Manual included with the Processor.

3 Location



NOTE: Read the MMC-165 Warranty in the Sales and Service Information Appendix. Improper mounting location may cancel warranty.

- Expanders are spray proof, but must not be immersed.
- An engine room location of the Expanders is preferred.
 - If the engine room is too small, locate in any area where it is accessible for electrical connections.

Bulkhead mounting preferred for ease of access for wiring and adjustments.

The Expander can be mounted in any attitude as long as the LED on the front cover is readable.

Do not mount the Expander on the engine, on the transmission, or in any location that will subject it to excessive vibration.

Refer to Figure ENG-283-4: Station Expander Dimensions, for Expander dimensions.



Locate Expander(s) away from heat sources, such as engine exhaust manifolds turbochargers. Allow 4 feet (1,2m) of clearance, or more, between the Expander(s) and such heat sources.



CAUTION: Electro-magnetic fields can influence the Station Expander's electronic circuits.

Do not mount close to gas engine ignition systems, alternators, or electric motors. Allow 4 feet (1,2m) of clearance between the Expander and alternators or electric motors.

A threaded hole is provided for connection to the vessel's bonding system.

4 Station Expander Power

The Station Expander requires:

- A battery source of 12 or 24 volts DC
- A 10 ampere circuit breaker with manual reset
- Automatic Power Selector (refer to S-214 Automatic Power Selector Model: 13505)



NOTE: The Processor and the Station Expander may use the same Automatic Power Selector, but the Station Expander **MUST** have a separate circuit breaker.

The power source should be the same as the processors power source which can be either 12 or 24 volts DC. It is important to keep the length of power cable short to reduce voltage drop.



CAUTION: It is important that the wire size from the battery to the circuit breaker panel is large enough to keep voltage drop due to current flow, to less than 3% of 7 amps. The DC return to the battery must be large enough to supply all current requirements with a voltage drop of less than 3%. Refer to ABYC E-9.

It is recommended by ZF Marine Electronics that an Automatic Power Selector (APS) and a second power source be used. Refer to S-214 Automatic Power Selector Model: 13505 and Section 7.2 Power Cable.

5 Harnesses

Below is a general list of Wire Harnesses available to Station Expander. A complete harness list and part numbers are located in section 13 Parts List.

Stations 2-4 connectors on the Station Expander are sealed with plugs at the factory. Every connector should either have inserted a Wire Harness or plug. Do not leave a connector empty.

- **(2) Power Wire Harness** (Station Expander to Power connections)
- **(4) Control Head Wire Harness** (Station Expander to Control Head)
- **(5) Serial Communication Wire Harness** (Processor to Station Expander to 2nd (etc.) Processor)

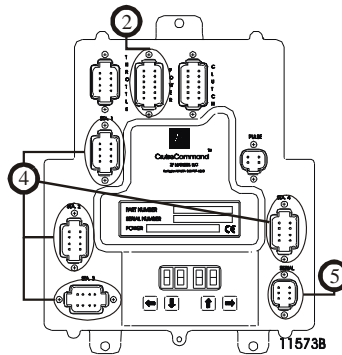


Figure ENG-283-2: Station Expander Harness Connector Locations

The Harnesses use one or both of the plug connector types detailed in Figure ENG-283-3: Harness Plug Connectors. When connecting the plugs, ensure that the release button or buttons are depressed and held until plug is fully connected or disconnected. Connecting or disconnecting plugs without depressing and holding the release button or buttons will damage the plug.

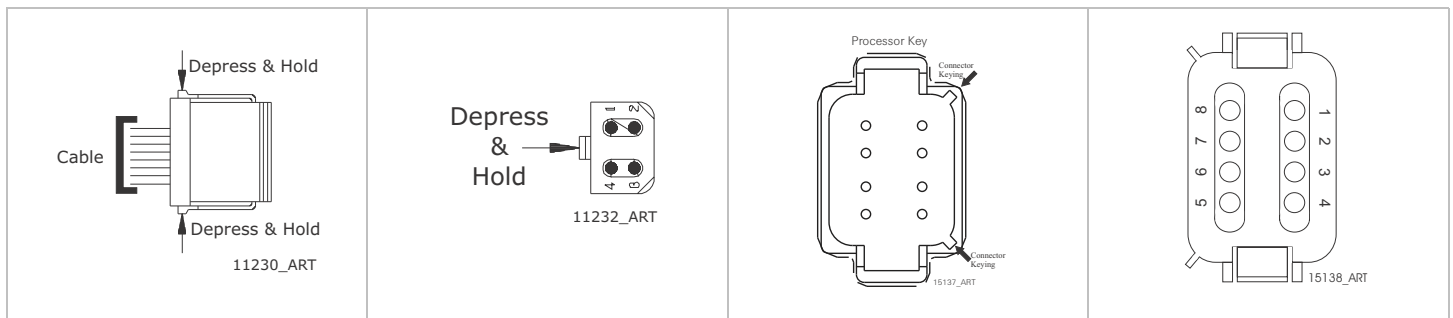


Figure ENG-283-3: Harness Plug Connectors

Ensure that the harness cable lengths are long enough to make one complete run from the Station Expander to:

- the power supply
- the remote station.
- the Port and Starboard Processor

6 Tools For Installation

6.1 Required

- Screwdriver – med. Phillips #2
- Hole saw -- 1 inch (25,4mm)
- Drills -- 9/32 inch (7,2mm) and 7/32 inch (5,6mm)
- Saw (appropriate type of saw for cutting material Control Head will be mounted on)

6.2 Optional

Wire cutter, stripper, crimper (Recommend Thomas & Betts WT-2000) (if using single terminated harnesses)

7 Installation

Before starting the actual installation of the Station Expander, make sure you have the correct parts and tools. See section 6 Tools For Installation. Read ALL the instructions pertinent to each part before beginning the installation of that part



NOTE: When connecting the plugs, ensure that the release buttons are depressed and held until plug is fully connected. To disconnect the plugs, the release buttons **MUST** be held depressed until plug is disconnected.



NOTE: When installing the harness cable, support the cables using clamps or straps not more than 18 inches (0,5m) apart, unless contained in a conduit. Install each cable so it is protected from physical damage. Refer to ABYC Standard E-9.

7.1 Station Expander

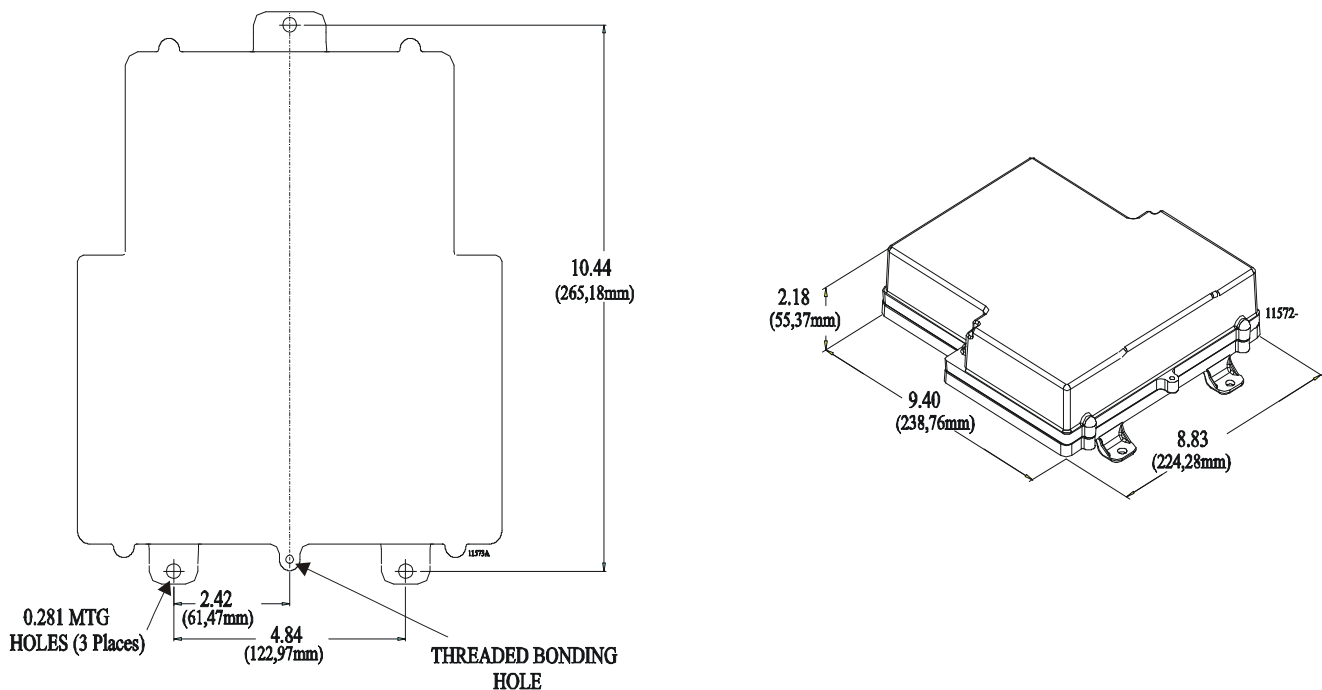


Figure ENG-283-4: Station Expander Dimensions

- Place the Station Expander on the mounting surface and mark the three screw holes.
- Remove the Expander and drill the screw holes.
- Secure the Expander using 1/4 inch or M6 fasteners.
- Connect to the Bonding System.



WARNING: When connecting the Power Harness to the Station Expander be sure the power is OFF.

- Insert the Wire Harness plug into the **POWER** connector on the Station Expander.
- Continue with the following Sections that apply to this application.

7.2 Power Cable

It is critical to design and wire the Control System in a manner where the chance of losing power to the Control System is kept to a minimum.

ZF Marine Electronics recommends that two power sources are utilized along with the APS see document S-214 Automatic Power Selector Model: 13505 for more information.

- A Install the Power cable from the Station Expander to the DC Power Source.
 - Install each cable so it is protected from physical damage.
- B Review the DC Power Supply documents to confirm termination points for power connection.



NOTE: Repeat for all Station Expanders.

7.3 Control Head Harnesses

There are two choices of Control Head Harnesses depending on the type of Control Head being used with this application.

- Plug at Station Expander end of harness only. (terminal connection Control Heads)
- Plug at Station Expander and Control Head ends. (Plug connection Control Heads)

The distance of the Control Head from the Station Expander is limited to the length of an uninterrupted 7-conductor harness. This cable may never be spliced.

- A Install the Control Head Wire Harness between each Control Head and the appropriate Station Expander.
- B **Label** each harness at **both ends** with the station it connects, and Port, Center, or Starboard for Multi Screw applications.



CAUTION: Ensure that each Control Head is plugged into the same Numbered Station Connector on each Station Expander.

EXAMPLE: Station 1 Control Head will plug into the Station 1 connector on the Port Station Expander and the Station 1 connector on the Starboard Station Expander. Failure to do this will result in incorrect Station Transfer.

Install each harness so it is protected from physical damage.

When installing the cable, support using clamps or straps not more than 18 inches (0,5m) apart, unless contained in a conduit. Refer to the ABYC Standard E-9.

7.4 Engine Stop Switch

The Installer supplies the Stop Switches. Refer to the information supplied with the Stop Switches for installation.



WARNING: Each Station must have some method to stop the engine, refer to CFR 46, SEC. 62.35-5 and ABYC P-24.5.8.

7.5 Control Heads

Refer only to the following Sections that relate to the Control Heads used.

- Mounting
 - 400 Series Control Head:
 - A Use the template supplied in MMC-280 400 Series Control Head Variations and drill the screw holes and the corner cutout holes.
 - B Saw between the corner cutout holes.
 - C Check that the four mounting screws will start into the Control Head.
 - D Remove the Control Head.
 - E Strip the adhesive cover from the gasket and apply the adhesive side to the console.
 - 700 Series Control Head:
 - A Use the template supplied in MMC-307 700 Series Standard Control Head Variations and drill the screw holes and the corner cutout holes.
 - B Drill the screw holes and the cable holes.
 - MC2000 Series Control Head:
 - A Use the template supplied in MMC-329 MC2000 Series Standard Control Head Variations and drill the screw holes and the corner cutout holes.
 - B Saw between the corner cutout holes.
 - Check that the two mounting screws will start into the Control Head 500 Series Control Head Assembly:

Refer to Installation Manual supplied with the 500 Series Control Head Assembly for installation instructions.

8 Set Up Procedures



NOTE: Main Processor function should be set to A3-01 to enable station expander.

The Station Expander utilizes push buttons in conjunction with Display LED's to program, adjust, calibrate and set up the various features. The push buttons also allow you to access and display information regarding the health of the System.

The following paragraphs explain how to locate and use the push buttons and Display LEDs:

8.1 Station Expander Components Used In Set Up

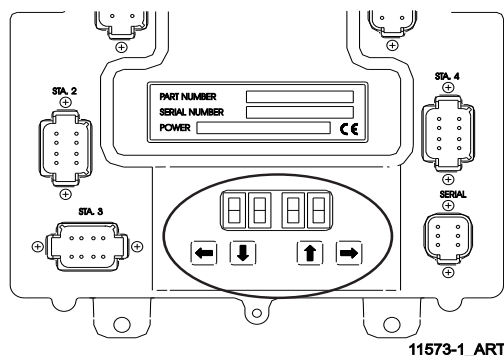


Figure ENG-283-5: Station Expander Display LED and Arrow Push Buttons

Each Station Expander has a Display LED and Arrow Push Buttons located on the front cover. (Figure ENG-283-5: Station Expander Display LED and Arrow Push Buttons)

- The Display LED is to view the Function Codes and Values. It consists of four 7-segment display pads.
- The Arrow Push Buttons are used to scroll through and select the Function Codes, and set the Values.

8.2 Station Expander Display LED

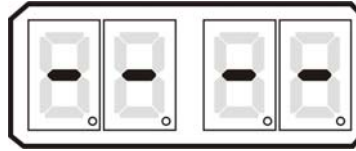


Figure ENG-283-6: Display LED at Normal Operation

- The Station Expander's Display LED has four 7-segment LED's, which light up to show either letters or numbers.
- The Display LED during Normal operation has running red center dash lines (Figure ENG-283-6: Display LED at Normal Operation)
- The first two digit Display LED's to the left, indicate the Function Code, which is alphanumeric.

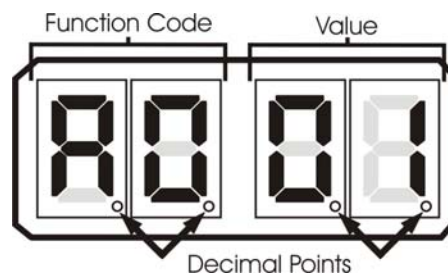


Figure ENG-283-7: Display LED Designations

- The second two digit Display LED's indicate the numeric Value that is currently programmed into the Station Expander for the Function Code displayed to the left.
- A decimal point indicator is located on the bottom right corner of each Display LED. (Figure ENG-283-7: Display LED Designations)

8.3 Push Buttons

There are four Push Buttons with arrows located below the Display LED on the Station Expander cover. These push buttons are used to scroll through, select, and store the Functions and Values. The direction of the arrow indicates "Left", "Down", "Up", and "Right". See Figure ENG-283-5: Station Expander Display LED and Arrow Push Buttons.

- "Up" and "Down" Push Buttons

Pressing the "Up" or "Down" Push Buttons *once* has the following functions:

- Stops Normal Operation Display (running red center dash lines) and activates the Function Menu.
- While in the Function Menu, scrolls through the Function Codes one at a time.
- When in Set Up Mode, increases (Up) or decreases (Down) the Function Value one digit at a time.
- When an Error Code is displayed, scrolls through the error messages one at a time.



NOTE: Refer to Troubleshooting section of the processor manual for steps to be taken for Error Messages.



- "Left" and "Right" Push Buttons

Pressing and holding the "Left" and "Right" Push Buttons *at the same time* has the following functions:

- Activates Set Up Mode as indicated by the blinking Display LED. (Operator must hold the buttons down until the blinking begins, then release.)
- While in Set Up Mode, deactivates Set Up Mode, saves the displayed Value to memory, and returns to the Function Menu. (Operator must *hold* the buttons down until the blinking stops, then *release*.)

- "Left" Push Button Only

Pressing the "Left" Push Button *once* has the following functions:

- Deactivates Set Up Mode **WITHOUT** any changes to the Function Value stored in memory. (Operator must *hold* the button down until function code stops blinking, then *release*.) The previously saved Function Value will then be displayed.



Figure ENG-283-8: Error Menu Example

- While in Function Menu, changes the Display LED to the Error Menu, if any errors are present. (has no effect if there are no errors stored)
- While in the Error Menu, changes the Display LED back to the Function Menu.

- "Right" Push Button Only

Pressing the "Right" Push Button *once* has the following function:

- While in the Error Menu, clears inactive errors. (Active errors blink, inactive do not)

Pressing and holding the "Right" Push Button has the following function:

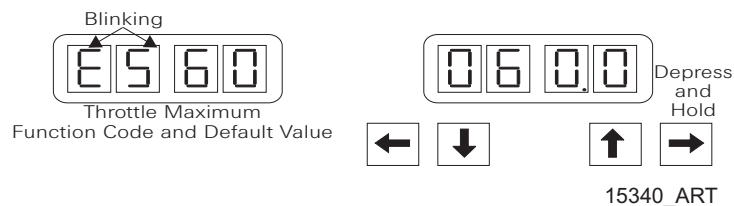


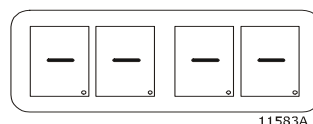
Figure ENG-283-9: Display LED Four Digit Value

- While in Set Up Mode, or Function Menu, allows the Function Value of the current Function Code to be displayed with all four Display LEDs.

9 Activating Set Up Mode and Storing a Value



NOTE: To escape from the set up procedure at any time without saving the changed value. Depress the LEFT Arrow Push Button. The Function Code will stop flashing and the Function will be saved with the original value.



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Figure ENG-283-10: Display Normal Operating Condition

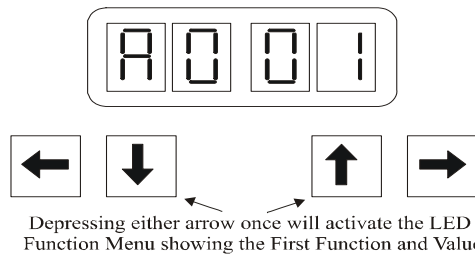


Figure ENG-283-11: Display Function Menu Activated

- A The Display is in Normal Operating condition with red running center dash lines.
- B Depressing either the Up or Down Arrow Push Button will activate the Function Menu. (refer to Figure ENG-283-11: Display Function Menu Activated)
- C Depressing either the Up or Down Arrow Push Button will scroll through the Function Menu one at a time.

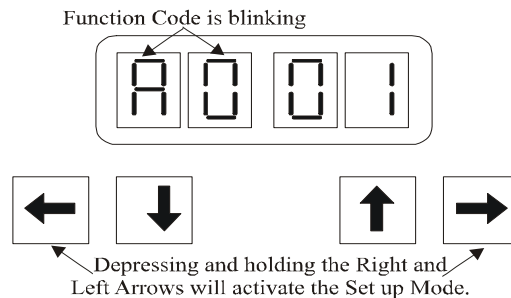


Figure ENG-283-12: Display with Set up Activated

- D Once the desired Function Code is visible on the Display, **depressing** and **holding** the Left and Right Arrow Push Buttons at the same time will activate Set Up. The left two Display pads will begin to blink, indicating that the value is ready to be changed. Refer to Figure ENG-283-12: Display with Set up Activated
- E Depressing either the Up or Down arrow push buttons will change the Value of the Function. Holding down either the Up or Down arrow push buttons will scroll quickly through the values.
- F When the value required is displayed, depress and hold the Right and Left Arrow push buttons until the Display Function Code stops blinking and becomes solid. The new Value is now set into memory.
- G Depressing either the Up or Down arrow push buttons will now scroll through the Function Codes.

10 Set Up Functions & Values

The following table lists the various Function Codes, the Function's Name, Default Value and Range. Each Function will be explained in one of the following Sections.

Table ENG-282-1: Functions List


Function Code	Function Name	Default Value	Value Range or Options
STATION EXPANDER FUNCTIONS			
A0	Station Expander Identification	01	01, 02, 03, 04, 05 (Must match Processor Identification set in the 9000 Series / CruiseCommand Processor the Expander is connected to.)



Table ENG-282-2: Troubleshooting Functions

Function Code	Function Name	Default Value	Value Range or Options
H0	Diagnostic	00	Input Voltage (+/- 0.5VDC)
			Tachometer Sensor Frequency
			Station 1 Lever A/D
			Station 2 Lever A/D
			Station 3 Lever A/D
			Station 4 Lever A/D
			Transfer Button, Stations 1, 2, 3 & 4
			Software Revision Level
H1	Erase EPROM	00	Store to Erase (For Authorized Personnel Only)

10.1 A0 - Station Expander Identification



CAUTION: This feature **MUST** be the **SAME** value as set in the 9000 Series / CruiseCommand Processor the Expander is connected to.

In applications where there is more than one screw, the system must have some way of determining which Station Expander is where. Every Station Expander must have it's own identifying unique number that corresponds to the Processor it is connected to. At no time can two Station Expanders be identified by the same Station Expander Identification Number.

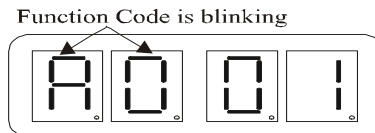


Figure ENG-283-13: Display with A0 - Station Expander Identification Set Up Activated

The values of this Function are **01** (Default Value), **02**, **03**, **04**, and **05**.

To change the value:

- A Depress any Arrow Push-Button to stop running center dash lines.
- B This is the first code on the Function Menu List and the Function Code for Station Expander Identification.
- C Activate Set Up Mode. Refer to Section 9 Activating Set Up Mode and Storing a Value.
- D Depress either the Up or Down arrows to change the Value of the Function.
- E When the value required is displayed, store the value. Refer to Section 9 Activating Set Up Mode and Storing a Value.

10.2 H0 - Diagnostic

This Function is used during Troubleshooting. Refer to the 9000 Series / CruiseCommand Manual supplied with the Control System for information on this Function.

10.3 H1 - Erase EPROM

This Function is used during Adjustments or Troubleshooting. **(For Authorized Personnel Use ONLY)**

11 Dock Trials

Ensure 9000 Series / CruiseCommand System has been installed, adjusted, and tested before performing the following tests for the Station Expander.

11.1 Control Head (Engines Stopped)

A Turn the power ON to the control system.



WARNING: Turn OFF the control system power before disconnecting from the batteries. Do not disconnect battery terminals when engine is operating.

- B The Control Head at each station will produce an intermittent tone.
- C Take command at a remote station.
- D Perform each of the following steps on all Control Heads.
 - Move each Control Head lever full Ahead and full Astern. Ensure correct 9000 Series / CruiseCommand Processor and Station Expander reacts to lever movement.



NOTE: This will check that the Control Head is operating. * On Twin Screw or more applications ensure the Port Control Head lever operates the Port Processor and the Starboard Control Head lever operates the Starboard Processor, etc. *

- Place the Control Head levers in the Neutral detent position.
- Depress and hold the station transfer button.
- Move the Control Head levers to the Ahead detent position before releasing the transfer button.
- The red indicator light on the Control Head should blink, indicating 9000 Series / CruiseCommand has been placed in Warm-up Mode. Warm-up Mode only operates in the Ahead direction.
 - If the red indicator light blinks, continue with Control Head testing
 - If the red indicator light does not blink, check connections as stated in Section 7.5 Control Heads.

11.2 Engine Stop Switches Test (Engines Running)

- A Start engine(s).
- B Verify that all Engine Stop Switches function correctly at all stations.

Refer to information supplied by engine manufacturer or switch supplier for set up and adjustments.



CAUTION: An Engine Stop Switch at each station is an absolute requirement. Refer to CFR46, SEC. 62.35-5 and ABYC P-24.5.8.



WARNING: Do not attempt to continue tests until Engine Stop Switches function correctly.



12 Periodic Checks and Maintenance

12.1 Station Expander

Check all terminal connections for signs of corrosion or loose connections.

12.2 Control Head

Verify once a year that Control Head terminals are secure and free of corrosion. Apply a light coating of Teflon grease, or corrosion block, to the contacts.

13 Parts List

Part No. Description

13.1 Control Heads

A Single Screw

450-3L or 3R Left or Right Control Head, 'T' Lever
 453-3L or 3R Left or Right Control Head, Chrome Knob Lever
 455-3L or 3R Left or Right Control Head, Black Low Profile Lever
 456-3L or 3R Left or Right Control Head, Chrome Low Profile Lever
 456-3LP or 3R P Left or Right Control Head, Chrome Low Profile Lever, Pluggable
 521-4 Control Head, Single Lever Tournament Style - Aluminum
 521-5 Control Head, Single Lever Tournament Style - Chrome
 750-L or -R Left or Right Control Head, Heavy Duty
 MC2000-1L or 1R Left or Right Black Control Head, Black Lever
 MC2000-2L or 2R Left or Right Chrome Control Head, Chrome Lever
 MC2000-4L or 4R Left or Right Black Control Head, Chrome Lever
 MC2000-4LP or 4RP Left or Right Black Control Head, Chrome Lever, Pluggable
 MC2000-5L or 5R Left or Right Black Control Head, Gold Lever

B Twin Screw (Synchronization Indication)

460-4 Control Head, 'T' Lever
 460-4P Control Head, 'T' Lever, Pluggable
 463-4 Control Head, Chrome Knob Lever
 463-4P Control Head, Chrome Knob Lever, Pluggable
 464-4 Control Heads, Split, with Single Levers, Chrome Knobs (pair)
 465-4 Control Head, Black Low Profile Lever
 466-4 Control Head, Chrome Low Profile Lever
 522-4 Control Head, Dual Lever Tournament Style - Aluminum
 522-5 Control Head, Dual Lever Tournament Style - Chrome
 760 Control Head, Heavy Duty
 760P Control Head, Heavy Duty, Pluggable
 MC2000-1 Black Head, Black Levers
 MC2000-1P Black Head, Black Levers, Pluggable
 MC2000-2 Chrome Head, Chrome Levers
 MC2000-2P Chrome Head, Chrome Levers, Pluggable
 MC2000-3 Gold Head, Gold Levers
 MC2000-4 Black Head, Chrome Levers
 MC2000-4P Black Head, Chrome Levers, Pluggable
 MC2000-5 Black Head, Gold Levers



13.2 Cable (Electric)

180	8-Cond. Shielded CablePer/ft.
350	8-Cond. Shielded Cable500' Spool
11811	8-Cond. Shielded Cable1000' Spool
212	2-Cond. Power CablePer/ft.
349	2-Cond. Power Cable250' Spool
183	2-Cond. Start Interlock CablePer/ft.
355	2-Cond. Start Interlock Cable250' Spool

13.3 Wire Harness (Plug)

Replace the # after the Part Number with the length of harness required. EXAMPLE: 13316-10; 13316-20; 13316-30

13316-#	Serial Communication (Twin Screw)
13408-#	Serial Communication (Multiple Screw)
15544-#	Serial Communication - CruiseCommand (Multiple Screw)
13432-#	Throttle, Voltage
13494-#	Throttle, Current
13533-#	Throttle, PWM
14363-#	Throttle, MAN
15027-#	Throttle, Frequency
13322-#	Clutch – Ahead/Astern/Clutch Power
13324-#	Clutch – Ahead/Astern/Neutral/Clutch Power
13240-#	Clutch – Ahead/Astern/Troll/Troll CMD/Clutch Power
14310-#	Clutch – Ahead/Astern/Troll CMD/Clutch Power
14925-#	MAN with Troll
14542-#	MAN without Troll
13239-#	Magnetic Pickup or Pulse Transmitter
13422-#	ZF Autotroll (MS70-13231 only)
15364-	ZF Autotroll (MS570-15382 Cannon Connector only)
15208-	ZF Autotroll (MS570-15382 Harting Connector only)
13552-#	Power/Start Interlock/Clutch Pressure
13756-#	Power/Start Interlock
15023-#	Power
13557-#	Control Head - 1 Connector
14261-#	Control Head - 2 Connectors

13.4 Test Unit

13927	Service Field Test Unit
14000	Field Test Control Head - Dual