

**813CE Troll Actuator  
Installation Manual  
MM14411 Rev. B 6/02**



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## Revisions List

Rev	Date	Revision Description
-	10/01	Placed 813CE Troll Sections from MM12793 Rev.- into current format.
A	10/01	Revised Manual to Current Standards. Read entire manual carefully.
B	6/02	Added MM14411 RevA to MM12793 585CE Manual as Trolling Section



## 1.0 INTRODUCTION

**NOTE: The MicroCommander 585CE System must be completely installed and thoroughly tested as a system before installing the 813CE Troll System. Keep the 585CE Manual for reference during the 813CE Troll System installation.**

Throughout the manual special attention should be paid to the following boxes:

**NOTE: Contains Helpful Information**

**CAUTION: Damage to equipment may occur if this message is disregarded.**

**WARNING: Personal Injury may result if this message is disregarded.**

The 813CE is dependent on the Control System it is connected to for requirements, options, and operation. Always refer to the MicroCommander Manual to verify requirements or options of the 813CE Troll System. For ease of explanation, the following reflects 585CE Software Version SW12705.5, unless otherwise indicated. For the most part, the drawings, diagrams, and instructions reflect this concept.

### 1.1 PURPOSE OF AN 813CE TROLLING VALVE SYSTEM

The Trolling Valve System consists of a single Model 813CE Actuator (hereafter referred to as the 813CE) for single or twin screw applications.

The 813CE works together with the Port and Starboard Actuators, allowing integration of the functions of Ahead/Astern clutch selection and main engine speed with trolling valve modulation. The movement of a single lever on a Control Head accomplishes this.

Movement of this single Control Head lever sends an electrical signal to the Actuator, which in turn sends an electrical signal to the 813CE. The 813CE is linked by push-pull cable with the trolling valve selector lever on the transmission.

**CAUTION: Consult the transmission dealer or manufacturer for specific engine RPM limitations.**

### 1.2 TROLLING VALVE SYSTEM REQUIREMENTS

Refer to Section 3.0 for specific information.

**NOTE: Trolling valve lever load should not exceed 40 pounds (18kg).**

**NOTE: A propeller shaft tachometer is strongly recommended in order to properly and accurately adjust the Trolling Valve in Section 5.6.**

- One 813CE Actuator for single or twin screw applications
- A new or existing MicroCommander System
- One Two-conductor electric cable for power connection, Part No. 212
- One Circuit Breaker, Part No. 810
- One Eight-conductor electric cable for interconnection of the 813CE and the Actuators, Part No. 180 (two cables for Twin Screw)
- One 33C Push-Pull cable for Troll connection (two for Twin Screw)
- A battery source of 12 to 32 volts DC for the 813CE
- MicroCommander 585CE Manual
- One Troll Mode Switch at Primary Station (Optional, refer to the following NOTE )

**NOTE:** When the 813CE is used in conjunction with an Actuator that has the current software revision (SW12705.5), each Remote Station has the ability to Enable/Disable Troll Mode by depressing the Transfer Button on the Control Head. In this situation, the Troll Mode Switch is not required. However, the Jumper installed at TB5-3 & 4 on the 813CE **MUST** be left in place. Details of the switch's installation can be found in Section 6.1.

**CAUTION:** The 813CE is dependent on the Control System it is connected to for the requirement or option of a Troll Mode Switch.

- 585CE Actuators with Software Versions .0 through .3: **Troll Mode Switch required.** Refer to the MicroCommander Manual Trolling Section and Appendix C.1 Twin Engine with Troll Drawing for explanation of Troll Mode Switch.
- 585CE Actuators with Software Version .5: **Troll Mode Switch optional.** Refer to Section 6.1 of this manual.

**Always refer to the MicroCommander System Manual to verify requirements or options of the 813CE Troll System. For ease of explanation, the following reflects 585CE Software Version .5 only. The drawings, diagrams, and instructions reflect this concept.**

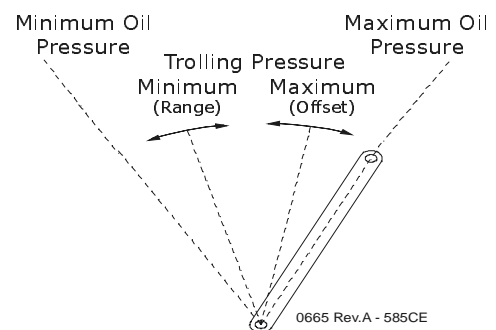
## 2.0 OPERATION

### 2.1 DC POWER ON

This system has two Modes of Operation: **Troll** and **Non-Troll**. When the system is initially powered up, the Mode in which it starts is selectable. (Refer to Section 5.1.)

During **Non-Troll** Mode:

- All stations will operate as a standard single lever control of vessel speed and direction
- Trolling valve lever will be at the maximum oil pressure position. (refer to Figure 1:)



**Figure 1: Trolling Valve Selector Lever**

### 2.2 CONTROL HEAD TONES

**Tone-Over-Tone** at all Remote Stations, warns of a problem with the 813CE. This tone would sound for any of the following reasons:

- 813CE power has not been turned On.
- The 813CE was turned On after the Actuator.
- 813CE component failure.
- 813CE cannot drive the push-pull cable to the desired position.
- Low voltage.
- Incorrect wiring between the 813CE and the Actuator.

To isolate the cause, refer to “TROUBLESHOOTING” on page 1 of Appendix B.1.



## 2.3 TROLL MODE ON

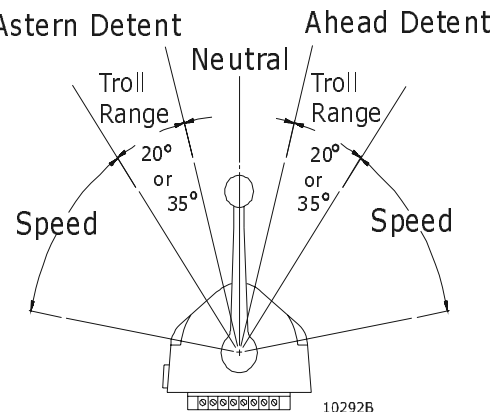
**CAUTION: The 813CE is dependent on the Control System it is connected to for the selectable degrees of Troll Range.**

- **585CE Actuators with Software Versions SW12705.0 through .4:** Set to a standard Troll Range of **20 degrees**, not selectable. Refer to the appropriate 585CE Installation Manual Troll Section for Troll operation.
- **585CE Actuators with Software Version SW12705.5:** A Troll Range of **20 or 35 degrees** can be selected. Refer to this Manual for the proper Troll Valve operation.

**Always refer to the MicroCommander System Manual to verify 813CE Troll System options. For ease of explanation, the following reflects 585CE Software Version SW12705.5 only. The drawings, diagrams, and instructions reflect this concept.**

During Troll Mode:

- Control of the trolling valve is integrated with the clutch and throttle control.
  - The degree of Control Head lever movement dedicated to Troll Range command, is selectable for either 20 or 35 degrees (refer to Figure 2:)
  - (585CE Software Versions SW12705.4 & .5) Allows the installer the ability to select whether Troll is ON or OFF when power is first applied. For the purpose of this explanation, Troll OFF has been selected.
- A) Place the Station-in-Command Control Head lever in the Ahead or Astern Detent. (Troll functions the same in Ahead or Astern)
- B) Depress and hold the transfer button for one second.
- The solid red indicator light will begin blinking rapidly, indicating the system is now in Troll Mode. (MicroCommander Software SW12705.4 & .5 only)
- C) When the system is placed into Troll Mode, the following occurs:
- The Troll push-pull cable moves the trolling valve selector lever to the Minimum Pressure position.
  - The Clutch selector will remain in the Ahead or Astern position.
  - The Engine will remain at Idle.
- D) Moving the Control Head lever through the next 20 or 35 degrees will:
- Move the Trolling Valve selector lever from the Minimum Pressure position to the Maximum Pressor position.
  - The Clutch selector will remain in the Ahead or Astern position.
  - The Engine will remain at Idle.
- E) Moving the Control Head lever beyond the Troll Range:
- The red indicator light will stop blinking and become a solid Red.
  - The Trolling Valve selector lever will be positioned to the Full Pressure (Lock-up) position.
  - The Clutch selector will remain in the Ahead or Astern position.
  - The Engine speed signal will increase from Idle to Full Speed.



**Figure 2: Control Head Troll Range**

## 2.4 TROLL MODE OFF

- A) Place the Control Head lever in the Ahead or Astern Detent.
- B) Depress and hold the transfer button for one second.
  - The rapidly blinking red indicator light will become a solid red, indicating the system is now in Non-Troll Mode. (MicroCommander software 12905.4 and .5 only)
  - The Trolling Valve selector lever is positioned to the Full Pressure (Lock-up) position.
  - The system functions in the normal fashion as if there were no Trolling Valve/813CE present.

## 3.0 PLAN THE INSTALLATION

### 3.1 REQUIRED PARTS FROM YOUR DEALER

#### 3.1.1 813CE Actuator

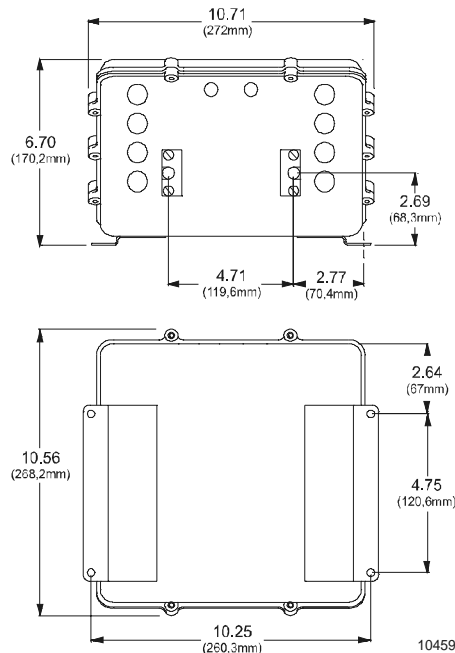


Figure 3: 813CE Actuator Dimensions

The 813CE is spray proof but cannot be immersed

The 813CE uses electronic circuits that can be influenced by static charges. Do not mount close to gas engine ignition systems, alternators, or electric motors. Allow 4 feet (1.2m) of clearance or more between the 813CE and such devices.

Locate the Actuator away from heat sources, such as engine exhaust manifolds. Allow 4 feet (1.2m) of clearance, or more, between the Actuator and such heat sources.

Bulkhead mount preferred for ease of access for wiring and adjustments, but the 813CE can be mounted in any attitude.

Mount the 813CE in any attitude that allows easy connection of push-pull cables to trolling valve.

**CAUTION: Do not mount to the engine, or transmission, or any location that will allow excessive vibration.**

Locate the Actuator such that the push-pull cable(s) from it to the trolling valve(s) have large radius bends, with the least total degrees of bend and moderate length.

**NOTE: Example: Minimum bend radius 10-inches (254mm); total degrees of bends less than 270 degrees; total length not to exceed 20 feet (6m).**

813CE power source must be bonded to the hull in metal-hulled vessels, or to the bonding bus in non-metal vessels. Refer to Appendix A.1 Bonding for specific information.

#### 3.1.2 MicroCommander 585CE Single Screw System

- One Auxiliary Board P/N 1133
- Provides trolling valve control and is needed for installation in the Single Screw 585CE Actuator.

### 3.1.3 MicroCommander 585CE Twin Screw System without Synchronization Option

- **One Lead Auxiliary Board** (P/N 1133) for the Port Actuator
- **One Follow Auxiliary Board** (P/N 1135 or 1135-1) for the Starboard Actuator

The Auxiliary Boards provide for trolling valve control and the option of the addition of Synchronization.

### 3.1.4 MicroCommander 585CE Twin Screw System with Synchronization Option

- Auxiliary Boards were previously installed during the Synchronization Installation. **One Lead Auxiliary Board** (P/N 1133) and **One Follow Auxiliary Board** (P/N 1135 or 1135-1)

The Auxiliary Boards provide for synchronization and trolling valve control.

### 3.1.5 Electric Cable

**NOTE: If synchronization was previously installed and operational, and the decision was made to add Troll, the following applies:**

- **Remove the existing cable that connects to Terminal Block TB1, Pin 6 of the 1133 Auxiliary Board to Terminal Block TB1, Pin 6 of the 1135 Auxiliary Board.**

**Eight-Conductor cable** will connect the 813CE with the existing Actuator(s), Part No. 180

- One eight-conductor cable required for each Actuator.

**Two-Conductor power cable** will connect the 813CE with the vessel's power distribution panel, Part No. 212.

- It is important to keep the length of power cable short to reduce voltage drop. The 14 gauge twisted pair power cable should not exceed 20 feet (6m). Reference ABYC E-9.

**CAUTION: All Actuators (813CE, 585CE) must connect to power sources that have a common DC return (-).**

## 3.2 REQUIRED PARTS FROM INSTALLER

### 3.2.1 Push-Pull Cables and Cable Connection Kits

One 33C push-pull cable per trolling valve lever is required.

The cable length is measured from end of thread to end of thread. Cables are usually stocked in one foot (0,3m) increments.

Verify installation of push-pull cable brackets on the trolling valve. If the brackets are missing, contact the trolling valve manufacturer or fabricate brackets as shown in Universal Mounting Appendix A.1.

### 3.2.2 DC Power Source

**NOTE: Power MUST be applied to the 813CE whenever the Control System is in use. This is regardless of whether the Trolling Valve(s) are in use or not. If power is not applied to the 813CE prior to, or at the same time, as the 585CE, throttle will be limited to 10% of full and a persistent Tone-over-Tone will be sounded at all Remote Stations. To clear this situation, power down all Actuator(s) and reapply power to the 813CE first, followed by the 585CE(s). Refer to Figure 4: Alternate Power Supply drawing for accomplishing this automatically.**

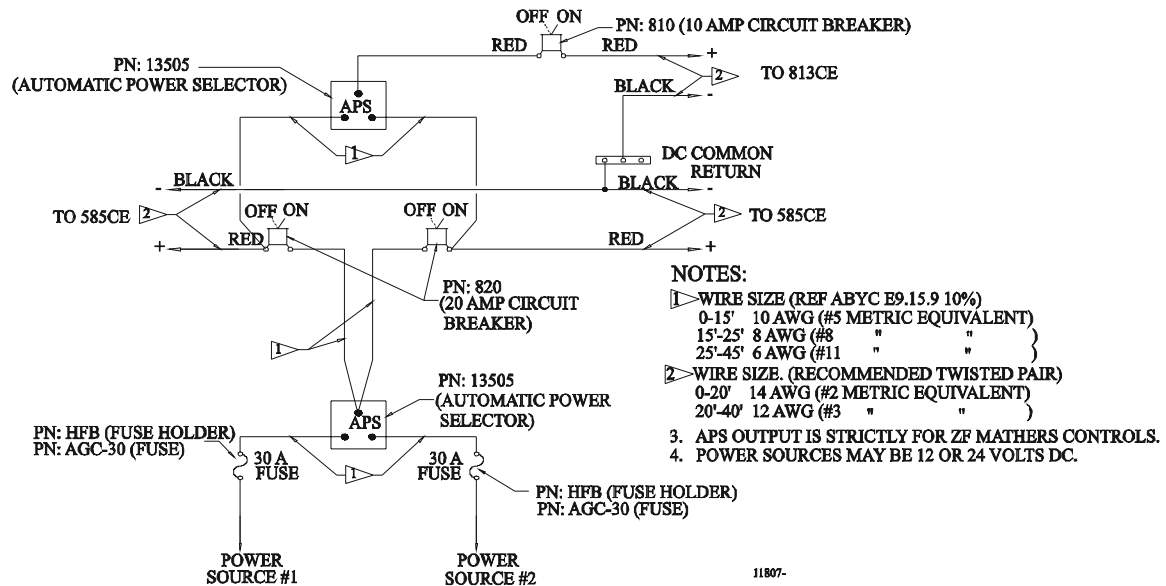


Figure 4: Alternate Power Supply

- The 813CE requires a reliable battery source (12, 24, or 32 Volts DC) protected by a 10 ampere Circuit Breaker.
- The use of the engine starting battery is not recommended on 12 VDC systems, unless the alternate method of supplying DC power, discussed below, is utilized. This is due to the voltage drop that may be experienced while cranking the engine.
- One option for supplying power to the 813CE is through a dedicated ON-OFF Switch/Circuit Breaker. Refer to Figure 5: Twin Screw with Troll DC Power for more information on this option.

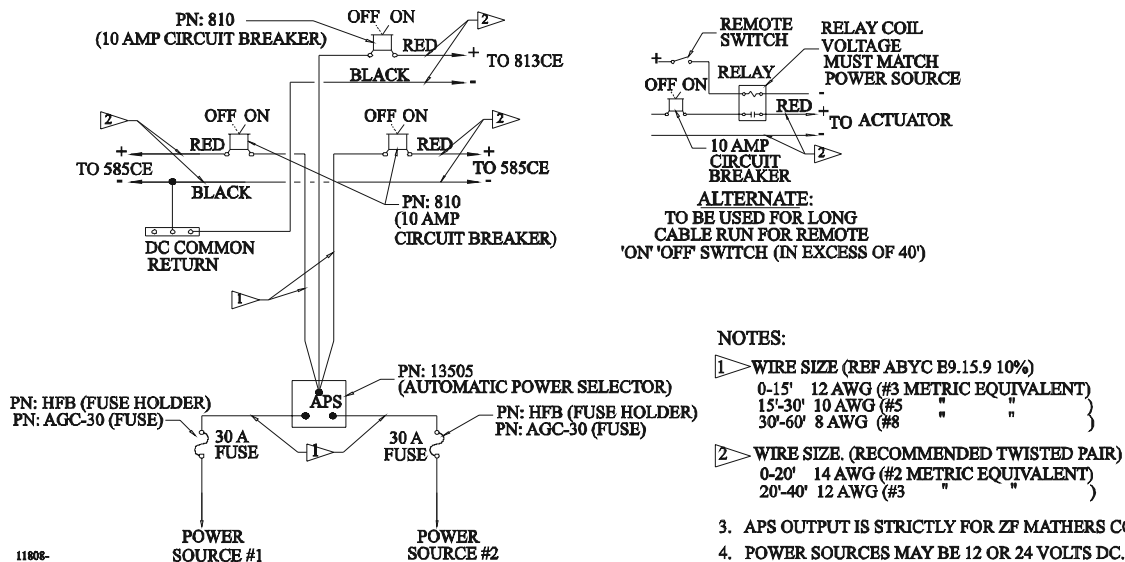


Figure 5: Twin Screw with Troll DC Power

- An alternate method of supplying DC power to the 813CE is with the use of an APS (Automatic Power Selector). Refer to Figure 4:. The use of this circuit benefits the installation in two ways:
  1. The APS is connected to two different power sources and automatically switches the better of the two to the 813CE. This ensures the availability of good power to the 813CE at all times, even when cranking over an engine.

2. Power must be applied to the 813CE prior to, or at the same time, power is turned ON to the Main Propulsion Control System. To ensure this occurs, power can be connected as shown in Figure 4:, page 6. As long as the 813CE Circuit Breaker is left ON, turning either the Port or Starboard Actuator power ON will automatically energize the 813CE Troll Actuator.

## 4.0 INSTALLATION

**NOTE:** Before starting the actual installation of the 813CE Troll System, make sure you have the correct parts on hand. Refer to Section 3.0. Read **ALL** the instructions pertinent to each part before beginning the installation of that part.

**CAUTION:** Static electricity can destroy electronic components. Connect the wrist strap provided to the Actuator frame whenever working on the Actuator. This will drain any static charge you may have on your person.

### 4.1 EIGHT-CONDUCTOR CABLE

- A) Install the eight-conductor electric cable between each Actuator and the chosen 813CE location.

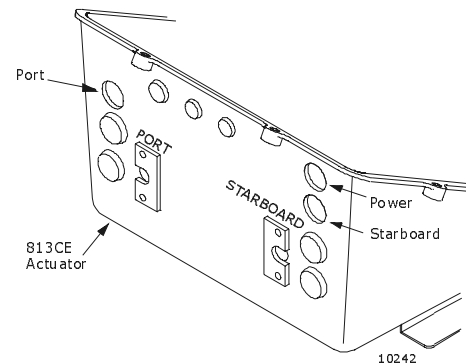
**CAUTION:** Support the cable(s) using clamps or straps not more than 18 inches (0,5m) apart if not contained in a conduit. Verify cable location protects the cable from physical damage.

- B) Label each eight-conductor cable at the 813CE with the Actuator it will connect to (Port or Starboard).

### 4.2 813CE ACTUATOR

**CAUTION:** When not working on the Actuator, keep the cover in place to prevent damage to circuits.

- A) Secure the 813CE using 1/4 inch or M6 fasteners.
- B) Remove the 813CE cover.
- C) Connect the wrist strap to your person, and the ground connector to the 813CE frame.
- D) Bond the 813CE to the hull or bonding bus. (Refer to Bonding in Appendix A.1).
- E) Remove only the Hole Plugs needed for the eight-conductor cable and the two-conductor power cable as shown in Figure 6:
- F) Install the watertight cable grips into the open entry holes of the 813CE. Refer to the 585CE Manual for Watertight Cable Grip installation.



**Figure 6: 813CE Actuator Entry**

### 4.3 ELECTRIC CABLE

#### 4.3.1 Two-Conductor Power Cable Connection

**NOTE:** When connecting the DC power cable to the 813CE be sure the power is Off.

- A) Run the length of two-conductor power cable between the DC Power Source and the 813CE. Use a Circuit Breaker (P/N 820) on the positive lead.

- B) Run the two-conductor power cable through the watertight cable grip at the 813CE.
- C) Strip each wire 3/8-inch (9,5mm), and install crimp terminals.
- D) Connect the two-conductor cable as indicated on the Twin Engine with Troll Drawing in Appendix C.1.
- E) Feed through a little slack cable and tighten the cable grip.
- F) Tie wrap the power cable to the 813CE frame.
- G) Make the connections at the vessel's DC Power Source. Review the information supplied with the DC Power Source for connections.

#### 4.3.2 Eight-Conductor Cable

**CAUTION: On a Twin Screw Systems, ensure the Port eight-conductor cable enters the Port watertight cable grip on the 813CE, and the Starboard in the Starboard entry.**

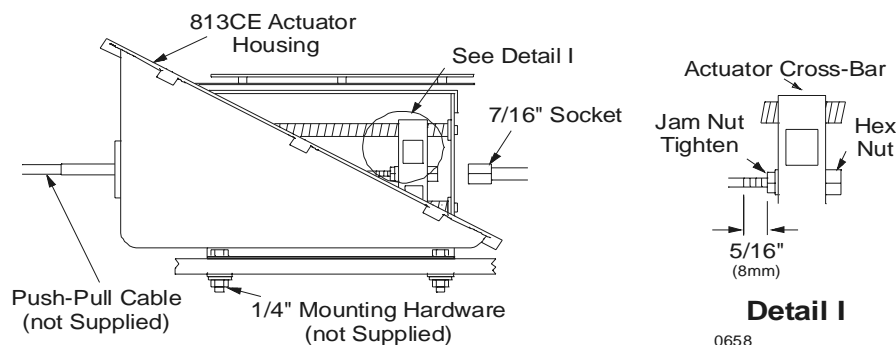
- A) Run the eight-conductor cable(s) through the watertight cable grip on the 813CE.
- B) Strip back the PVC cover on the eight-conductor cable(s) approximately 2-1/2-inches (63,5mm).
- C) Strip and cut off the shielding flush with the end of the PVC cover.
- D) Strip 3/8-inch (9,5mm) insulation off the end of each wire.
- E) Use the WAGO tool that was supplied with the Actuator(s) to install each wire.
  - Refer to the 585CE Manual for reference on use of the WAGO Tool.
  - Install each wire by color code as shown on the Twin Engine with Troll Drawing in Appendix C.1 of this manual.
- F) Connect the drain wire(s) to Terminal 8 on the terminal block.

**CAUTION: Do not connect the other ends of the Drain wire(s) at the MicroCommander Actuator(s).**

- G) Feed through a little slack cable and tighten the cable grip.
- H) Tie wrap the eight-conductor cable to the 813CE frame.

#### 4.4 PUSH-PULL CABLE CONNECTIONS

- A) Refer to Figure 7:.



**Figure 7: 813CE Push-Pull Cable Connections**

- B) Remove the #10-32 Jam Nut and the two Rubber Seals from the end of each push-pull cable that is to connect to the 813CE and discard the seals.

- C) On the 813CE remove one screw from the Cable Anchor Clip and loosen the other. Swing the Cable Anchor Clip clear.
- D) Insert the push-pull cable.

**NOTE: On Twin Screw applications ensure insertions of push-pull cables are into the correct push-pull cable entry. Port cable and Starboard cable should enter according to the labels on the 813CE. See Figure 6:.**

- E) When the push-pull cable end is visible within the 813CE interior, reinstall the #10-32 jam nut such that there is approximately 5/16 inch (7,9mm) of thread showing beyond the jam nut. Refer to Figure 7:, Detail I.
- F) Tighten the jam nut to the hex nut.
- G) Align the push-pull cable sleeve ferrule such that the Cable Anchor Clip will engage the peripheral grooves. Position the Cable Anchor Clip and reinstall the screw removed in Step C).
- H) Tighten both screws.

**NOTE: Do not connect push-pull cables at the trolling valve lever at this time. Connections will be made during trolling cable adjustments.**

#### **4.5 585CE AUXILIARY BOARDS INSTALLATION**

**This section is for 585CE Actuator(s) without the Synchronization Option.** If the Synchronization Option was installed in the existing 585CE System, skip and go on to Section 4.6 for Auxiliary Board eight-conductor cable connections.

**CAUTION: When not working on the Actuator, keep the cover in place to prevent damage to circuits.**

##### **4.5.1 Auxiliary Board P/N 1133**

- A) At the **Port (Lead)** or Single Screw 585CE Actuator, remove the Actuator cover.
- B) Connect the anti-static wrist strap to your person, and the ground connector to the Actuator frame.
- C) If not already present, plug the Lead Auxiliary Board into the plug connector of the Actuator. Refer to Appendix C.1 - Twin Engine with Troll Drawing for Auxiliary Board location.
- D) Remove the Hole Plug from the TROLL entry hole of the Actuator and install the 3/4-inch watertight cable grip for the eight-conductor cable from the 813CE. Refer to the 585CE Manual for Watertight Cable Grip installation.

##### **4.5.2 Auxiliary Board P/N 1135 or P/N 1135-1**

- A) At the **Starboard (Follow)** 585CE Actuator, remove the Actuator cover.
- B) Connect the anti-static wrist strap to your person, and the ground connector to the Actuator frame.
- C) If not already present, plug the Follow Auxiliary Board into the plug connector of the Actuator. Refer to Appendix C.1 - Twin Engines with Troll Drawing for Auxiliary Board location.

- D) Remove the Hole Plug from the TROLL entry hole of the Actuator and install the 3/4-inch watertight cable grip for the eight-conductor cable from the 813CE. Refer to the 585CE Manual for Watertight Cable Grip installation.

## **4.6 AUXILIARY BOARD EIGHT-CONDUCTOR CONNECTIONS**

### **4.6.1 MicroCommander 585CE Single Screw System**

- A) At the 585CE Actuator remove the Actuator cover.
- B) Connect the anti-static wrist strap to your person, and the ground connector to the Actuator frame.
- C) Run the eight-conductor cable through the watertight cable grip on the 585CE.
- D) Strip back the PVC cover on the eight-conductor cable(s) approximately 2-1/2-inches (63,5mm).
- E) Strip and cut off the shielding flush with the end of the PVC cover.
- F) Strip 2/3-inch (9,5mm) insulation off the end of each wire.
- G) Bend the green wire out of the wire bundle and wrap, or otherwise compact it at the cover, for possible use in optional wiring.
- H) Cut back the Drain wire to the PVC jacket.
- I) Use the supplied WAGO Tool to install each wire.
- Refer to the 585CE Manual for reference on use of the WAGO Tool.
  - Install each wire by color code as shown on Twin Engine with Troll Drawing in Appendix C.1.
- J) Feed through a little slack cable and tighten the cable grip.
- K) Tie wrap the eight-conductor cable to the Actuator frame.

### **4.6.2 MicroCommander 585CE Twin Screw System without Synchronization Option**

Complete all steps in Section 4.6.1 for **each** 585CE Actuator.

### **4.6.3 MicroCommander 585CE Twin Screw System with Synchronization Option**

1. Complete steps A) through H) in Section 4.6.1 for **each** 585CE Actuator. Then continue with Step 2) of this Section.
2. Connect green wire to Terminal 6 of TB1 in **both** Port and Starboard 585CE Actuators.
3. Complete steps J) through K) in Section 4.6.1 for **each** 585CE Actuator.

## **5.0 ADJUSTMENTS AND TESTS**

### **5.1 585CE AUXILIARY BOARD DIP (DUAL INLINE PACKAGE) SWITCH SETTINGS**

The following settings apply to installations where the 813CE is used with 585CE Actuator(s) with current software (SW12705.5). The Switch is located on the 585CE Actuators' Main Control Circuit. Always refer to the MicroCommander Installation Manual to verify the switch functions.



**Table 1: 585CE Auxiliary Board DIP Switch Settings**

SW1-1:	ON =	Allows the operator the ability to toggle Troll Mode Off/ On at the Control Head by depressing the station Transfer Button while the Control Head lever(s) is in the Ahead or Astern Detent.
	OFF =	The operator is unable to toggle Troll Mode Off/ On at the Control Head.
SW1-2:	ON =	35 degrees of Control Head lever range dedicated to Troll.
	OFF =	20 degrees of Control Head lever range dedicated to Troll.
SW1-3:	ON =	The red LED will blink rapidly On and Off while in Troll Mode.
	OFF =	The red LED will stay lit solid while in Troll Mode.
SW1-4:	ON =	The system is in Non-Troll Mode at power up.
	OFF =	The system is in Troll Mode at power up.
SW1-5:		Not Used
SW1-6:	ON =	Enables the use of Troll Mode.
	OFF =	Disables the use of Troll Mode.

**NOTE: Switch SW1-6 MUST be set to the ON position to enable the use of Troll Mode. Reference Appendix C.1 – Two Engines with Troll drawing for the location of the switch.**

### 5.2 813CE PUSH-PULL CABLE DIRECTION

- A) Verify the trolling valve lever at the transmission is in the maximum oil pressure position. (refer to Figure 1:, page 2)
- B) Apply DC power to the MicroCommander and 813CE Systems.
- C) Take command at a remote station.
- D) The 813CE will be at maximum oil pressure position.
- E) Verify the push-pull cable direction matches the trolling valve lever.
  - **If not**, change the direction of the push-pull cable(s) movement by repositioning the Shunt onto the other set of pins on the appropriate Jumper. Refer to Appendix C.1 - Twin Engines with Troll drawing for the location of the Jumpers on the 813CE circuit board.

**Table 2: Troll Push-Pull Cable Directions**

JMPR4	JMPR3
<b>ON Port Cable Fully Extended for Maximum Pressure (Lockup)</b>	<b>ON Starboard Cable Fully Extended for Maximum Pressure (Lockup)</b>
<b>OFF Port Cable Fully Retracted for Maximum Pressure (Lockup)</b>	<b>OFF Starboard Cable Fully Retracted for Maximum Pressure (Lockup)</b>

### 5.3 TROLLING VALVE PUSH-PULL CABLE BRACKETS

Verify whether push-pull cable anchor brackets are installed on the trolling valve. If brackets are not provided, refer to Appendix A.1 - Morse Standard Kits or Universal Mounting.

## 5.4 813CE TROLLING PRESSURE ADJUSTMENTS (ENGINES STOPPED)

### 5.4.1 Push-Pull Cable Direction

- A) Manually move the troll selector lever to the maximum oil pressure position.

**CAUTION: Refer to the transmission manufacturer's data for the position of the trolling valve selector lever at maximum oil pressure. (Refer to Figure 1:)**

- B) Take command at a remote station.
- C) Verify System is in the **Non-Troll** Mode.
- D) Verify troll push-pull cable is disconnected at the trolling valve.
- E) Verify that the push-pull cable has extended or retracted to the Trolling Valve lever Maximum Oil Pressure position (Lock-up).
- If the cable movement direction to reach the Trolling Valve's Maximum Oil Pressure position (Lock-up) is **not correct**, refer to Section 5.2. Otherwise, continue with Step F)
- F) Adjust the troll cable ball joint to align with the troll selector lever at the maximum oil pressure (lock-up) position.

**NOTE: Do not connect the Troll push-pull cable to the trolling valve at this time.**

### 5.4.2 Control Head Troll Indication

- A) Place the Control Head lever in the Ahead detent.

**CAUTION: Control Head lever is active during this set-up procedure. Ensure the Control Head lever remains in the Ahead Detent during set-up.**

- B) Turn ON **Troll Mode**.
- C) Verify Control Head LED begins blinking rapidly.
- If LED **blinks**, continue with the next step.
  - If LED **does not blink**, verify that Dip Switch SW1-1 & SW1-3 are in the ON position on the Lead and Follow Auxiliary Circuit Boards in the 585CE.

## 5.5 CONTROL HEAD OPERATION TEST (ENGINES RUNNING)

- A) Turn power 'On' to the Control System and take command at a remote station.
- B) Place the Control Head lever in the Ahead or Astern Detent.
- C) If the red LED is not blinking rapidly, turn Troll Mode 'On' by depressing the Transfer Button and then go on to step D).
- D) Move the Control Head lever into the Troll Range.
- Verify that the push-pull cable moves the Trolling Valve lever in the direction that increases oil pressure.
  - Verify that the Clutch selector remains in the Ahead or Astern position.
- E) Move the Control Head lever past the Troll Range.
- Verify that the rapidly blinking red LED becomes solid.

- Verify that the push-pull cable positions the Trolling Valve lever to the Full Pressure (Lockup) position. (Refer to Figure 1, page 2.)
  - Verify that the Clutch selector remains in the Ahead or Astern position.
- F) Return the Control Head lever into the Troll Range.
- Verify that the push-pull cable moves the Trolling Valve lever in the direction that decreases Oil Pressure.
  - Verify that the Clutch selector lever remains in the Ahead or Astern position.
- G) Return the Control Head lever to the Ahead or Astern detent.
- H) Turn Troll Mode ‘Off’.
- Verify that the red LED is now lit solidly.
- I) Return the Control Head lever to the Neutral/ Idle position.
- Verify that the Clutch selector return to the Neutral position.

**5.6 RANGE AND OFFSET ADJUSTMENTS (ENGINES RUNNING)**

Initial adjustments of the Troll push-pull cable’s Minimum and Maximum pressures can be adjusted at either the dock or underway. In either case, the final adjustments must be accomplished underway and with the Gear Box at normal operating temperature.

**WARNING: Prior to attempting any adjustments to the Trolling Valve at the dock, you must ensure that the dock and dock lines will safely restrain the vessel at Idle in-gear. If there is any doubt, perform the adjustments while underway, NOT at the dock.**

ZF Mathers, LLC recommends that the Minimum Troll Pressure set at the dock be 30 percent of the normal Propeller Shaft RPM at Idle, and 30 to 50 percent while underway. The range of 30 to 50 percent is based on the desired minimum speed for the vessel.

If the initial adjustments are being accomplished at the dock, start and adjust one Trolling Valve at a time. If the adjustments are being done underway, adjust both Trolling Valves at the same time.

- A) Start the engine(s).
- B) Take command at a Remote Station.
- C) Place the Control Head lever(s) into the Ahead detent.
- D) Record the Propeller Shaft RPM in Table 3:.

<b>Propeller Shaft RPM at Idle</b> Take measurements only after the Reduction Gear has reached it’s normal operating temperature.	
<b>PORT</b>	<b>STARBOARD</b>

**Table 3: Propeller Shaft RPM**

**5.6.1 Minimum Pressure (Range) Adjustment**

- A) Move DIP Switch SW1-1 on the 813CE Main Control Circuit to the ‘On’ position.
  - Both the Port and Starboard Troll push-pull cables will drive to the “Minimum Pressure” (Range) position.

B) Minimum Pressure is adjusted by locating the appropriate Trim Pot, rotating it slowly in a counterclockwise direction until the desired Propeller Shaft RPM is reached.

- **Trim Pot R7** is for adjusting the **Port** minimum pressure (Range) position.
- **Trim Pot R8** is for adjusting the **Starboard** minimum pressure (Range) position.

C) Record the Propeller Shaft RPM in Table 4:.

Propeller Shaft RPM At Minimum Trolling Pressure at the <u>Dock</u>		Propeller Shaft RPM At Minimum Trolling Pressure <u>Underway</u>	
Approximately 30% of the Value recorded in Table 3:		Approximately 30- 50% of the Value recorded in Table 3:	
<b>Port</b>	<b>Starboard</b>	<b>Port</b>	<b>Starboard</b>

**Table 4: Minimum Trolling Pressure RPM**

D) When the Minimum Trolling Pressure (Range) adjustment is complete, turn DIP Switch SW1-1 on the 813CE Main Control Circuit Board to the ‘Off’ position.

**5.6.2 Maximum Pressure (Offset) Adjustment**

A) Turn DIP Switch SW1-2 on the 813CE Main Control Circuit Board to the ‘On’ position.

B) Maximum Pressure is adjusted by locating the appropriate Trim Pot, rotating it slowly in a counterclockwise direction until the desired Propeller Shaft RPM is reached.

- **Trim Pot R10** is for adjusting the **Port** maximum pressure (Offset) position.
- **Trim Pot R9** is for adjusting the **Starboard** maximum pressure (Offset) position.

C) Record the Propeller Shaft RPM in Table 5:

Propeller Shaft RPM At Maximum Trolling Pressure at the <u>Dock</u>		Propeller Shaft RPM At Maximum Trolling Pressure <u>Underway</u>	
Approximately 70% of the Value recorded in Table 3:		Approximately 70% of the Value recorded in Table 3:	
<b>Port</b>	<b>Starboard</b>	<b>Port</b>	<b>Starboard</b>

**Table 5: Maximum Trolling Pressure RPM**

D) When the maximum trolling pressure (Offset) setting is completed, turn DIP Switch SW1-2 on the 813CE Main Control Circuit Board to the ‘Off’ position.

**NOTE: 1. The Troll Minimum and Maximum Pressure adjustments may need to be gone through more than once in order to get the desired results.**

**2. The actual effect on the Propeller Shafts’ RPM’s may be delayed with respect to the movement of the Trolling Valve lever. Therefore, leave enough time between adjustments for the Propeller Shaft speed to stabilize.**

**CAUTION: For Normal operation, the 813CE DIP Switch's SW1-1 and SW1-2 MUST be in the 'Off' positions.**

## 6.0 OPTIONS

### 6.1 TROLL MODE SWITCH

A Troll Mode Switch is not required in systems where the latest 585CE Actuators are used with SW12705.5 Software. However, the installer may elect to install one as a master Troll On/ Off Switch. When this switch is ON, (closed Troll Switch) the system operates as if the Troll Switch Jumper were in place. If the Troll On/Off Switch is OFF, (open Troll Switch) the Trolling Valve push-pull cables will always be at the Full Pressure (Lockup) position.

Only one switch is used to select Troll. Install this switch at the Primary Remote Station.

#### 6.1.1 Installation

A) Install the Troll On/Off Switch at the Primary Remote Station.

**NOTE: This switch is installer supplied. Refer to the manufacturer for installation instructions**

B) Run a two-conductor cable from the Troll On/Off Switch to the 813CE.

C) Locate an unused hole and remove the plug.

D) Insert a Liquid Tight Connector into the hole and run the two-conductor cable through the Connector.

E) Strip back the PVC jacket just inside of the 813CE Enclosure.

F) Strip back 3/8 inch from each of the conductors.

G) Using the WAGO Tool supplied with the 813CE Actuator, remove the Jumper connected between Terminals TB5-3 and TB5-4 and connect the two-conductors in its place.

## 7.0 MAINTENANCE

The 813CE Actuator requires the following annual checks:

- Check all terminal connections for signs of corrosion or loose connections.
- Check mechanical connections within the Actuator
- Check mechanical connections at the Trolling Valve.
- Check mechanical movement of the Trolling Valve selector lever from minimum oil pressure to full oil pressure. Ensure that the cable does not jam while positioning the selector lever.
- Cycle the Actuator and if lead screws are noisy, apply a light coating of silicone grease to the stainless steel lead screw.



## *APPENDIX A.1*







## **Automatic Power Selector (APS) Model: 13505**

### **A) GENERAL INFORMATION**

The APS (Automatic Power Selector), Model 13505, provides a simple, solid state solution to the need for routing redundant DC power sources for vital electronic equipment while maintaining isolation of the DC power sources.

Two independent batteries rated at the same nominal voltage are wired to separate terminals on the APS and internal diodes maintain total isolation between them. A single output terminal is wired to the ZF Mathers Propulsion Control System.

The APS is rated for loads of up to 70 Amps on 12-24V systems. The unit is ruggedly constructed with heavy-duty wiring studs and epoxy-potted components in an anodized aluminum case.

### **B) APS SPECIFICATIONS**

**Model:** 13505

**Maximum Load Current:** 70 amps

**Operating Temperature:** -40 degrees C to +80 degrees C; derate linearly from 100% @ 50 degrees C to 70% @ 80 degrees C

**Voltage Drop:** 0.7 VDC @ 50% load; 0.9 VDC @ full load

**Dimensions:** 3.25" x 4.5" x 3.1" (8,3 x 11,4 x 7,9 cm)

### **C) MATERIALS PROVIDED**

The APS is supplied with a hardware packet containing (8) hex nuts, (4) lock washers, (6) self-tapping mounting screws, (1) instructions diagram.

**NOTE: Not all of the hardware will be used in the installation; some spares are provided. Nut size is M-6.**

### **D) INSTALLATION**

Refer to the installation diagram Figure 1:.

1. Shut off all charging sources and disconnect the negative (ground) side of each battery which will be wired to the APS.
2. Mount the APS in a suitable location which will keep wire runs to a minimum length, and is (preferably) ventilated, for cooler operation. The case of the APS is electrically isolated from the internal diodes, so mounting on either a metal or non-metal surface is acceptable. Complete the wiring as shown on Page 2.
3. Reconnect the negative battery posts.

## E) IMPORTANT NOTE ABOUT BATTERY SOURCES

Whenever the load is turned on, it can be drawing power from the batteries. Therefore, if the batteries are not simultaneously being recharged, or if charging will not be available for an extended period, it is recommended that the load be shut off to prevent complete discharge of batteries.

## F) INSTALLATION DIAGRAM

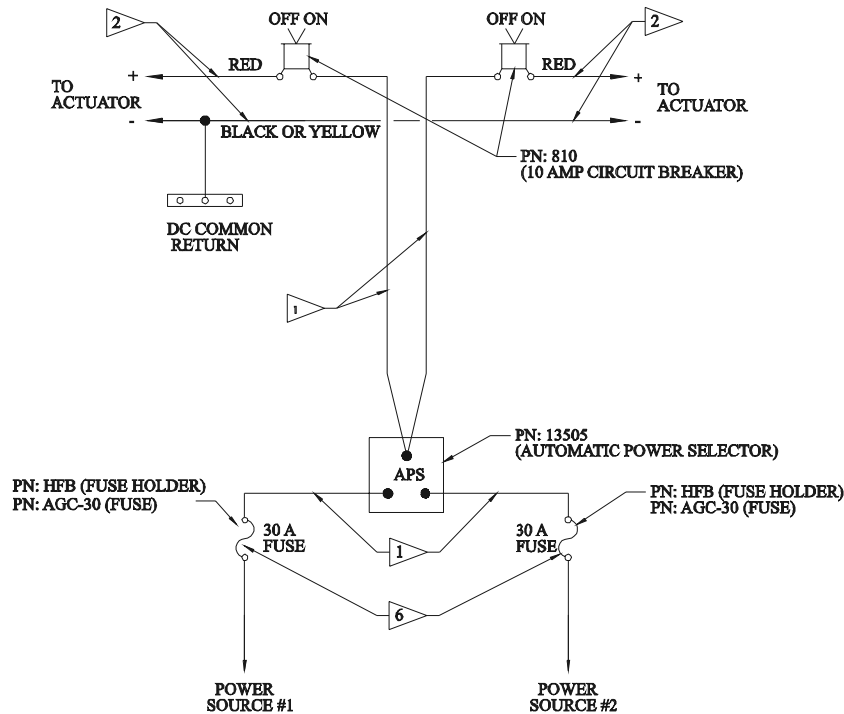


Figure 1:

**Flag 1:** Wire Size (Ref ABYC E9.15.9 10%)  
 0-15' 12 AWG (#3 Metric Equivalent)  
 15'-30' 10 AWG (#5 Metric Equivalent)  
 30'-60' 8 AWG (#8 Metric Equivalent)

**Flag 2:** Wire Size (Recommended Twisted Pair)  
 0-20' 14 AWG (#2 Metric Equivalent)  
 20'-40' 12 AWG (#3 Metric Equivalent)

**Flag 6:** Maximum wire size allowed in fuseholder is 12 AWG. If a larger wire size is required for installation, the customer shall provide an appropriate fuse and fuse holder.

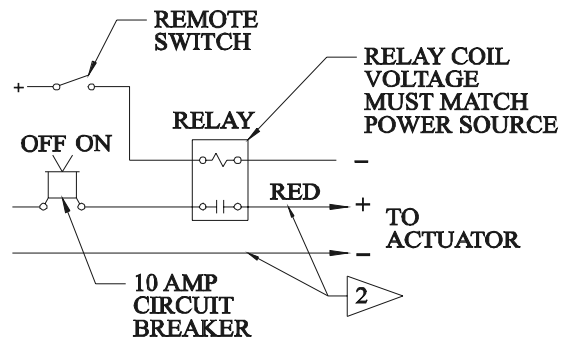
**Flag 7:** If this configuration is used with an electronic engine, the circuit breaker must be turned on prior to applying power to the remote switch.

**Note:**  
 1. APS output is strictly for ZF Mathers Controls  
 2. Power Sources may be 12 or 24 volts DC

### A.P.S. (Auto Power Selector) Kits

**Twin Screw** 13984  
**Single Screw** 13983  
 Include the following:

Quantitv	Description	Part Number
1	A.P.S. Unit	13505
2	10 amp Switch Circuit Breaker	810
2	Fuse Holder In-Line	HFB
2	30 Amp Fuse	AGC-30



**ALTERNATE:** **7**  
 TO BE USED FOR LONG CABLE RUN FOR REMOTE 'ON' 'OFF' SWITCH (IN EXCESS OF 40')

Figure 2:

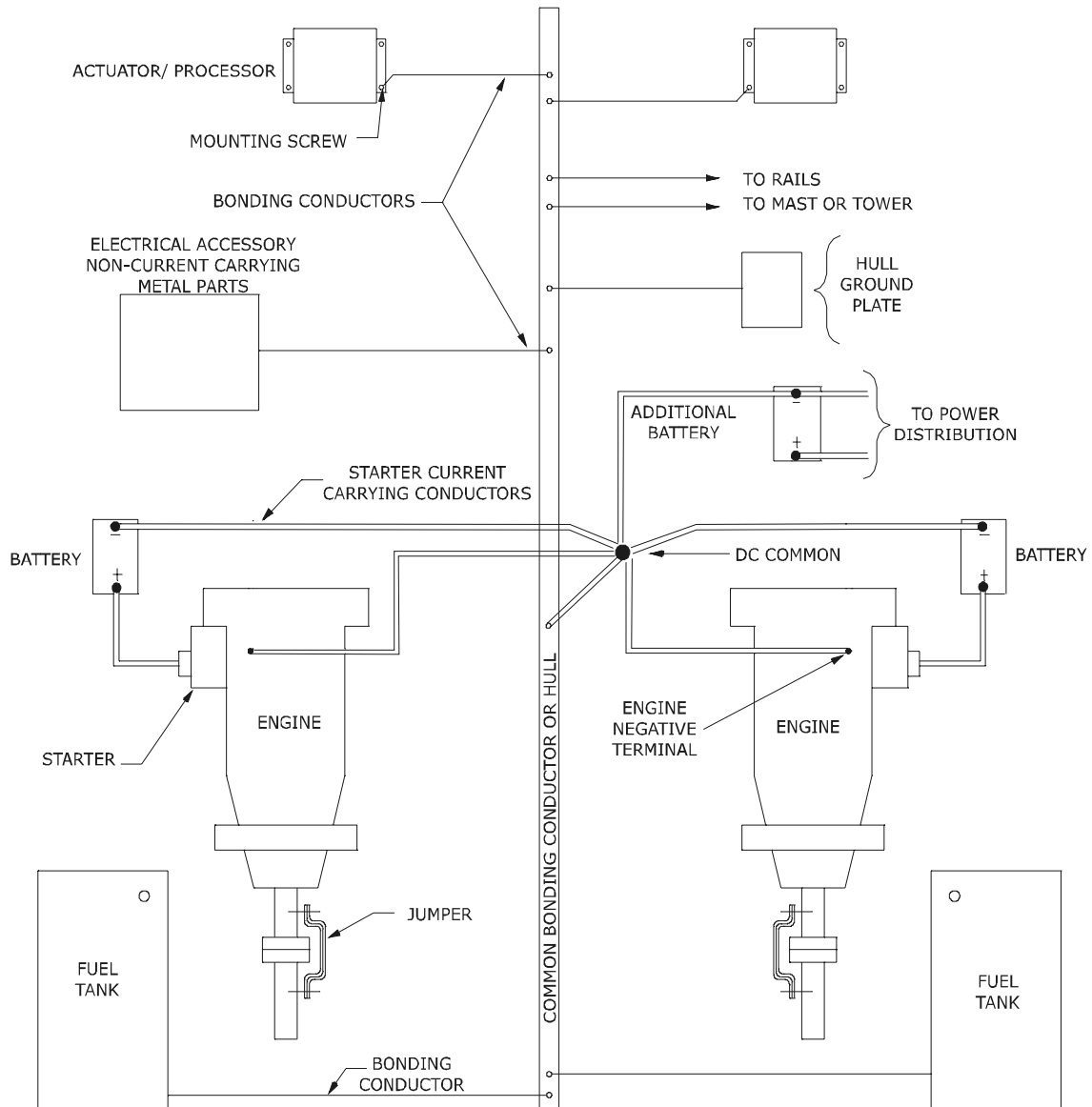


**Bonding: A.B.Y.C. E-9 46 CFR 111.05**

All boats equipped with a permanently installed electrical system shall also be equipped with a bonding system. The negative terminal of all batteries should be connected at only one point, the DC common, and from DC common to bond system or hull.

**Metal - Hull Vessels**

The hull of a metal - hull vessel may serve as the common bonding conductor. Any item to be bonded not in contact with the hull requires a bonding conductor to the hull.







## References and Parts Source

### A) REFERENCES

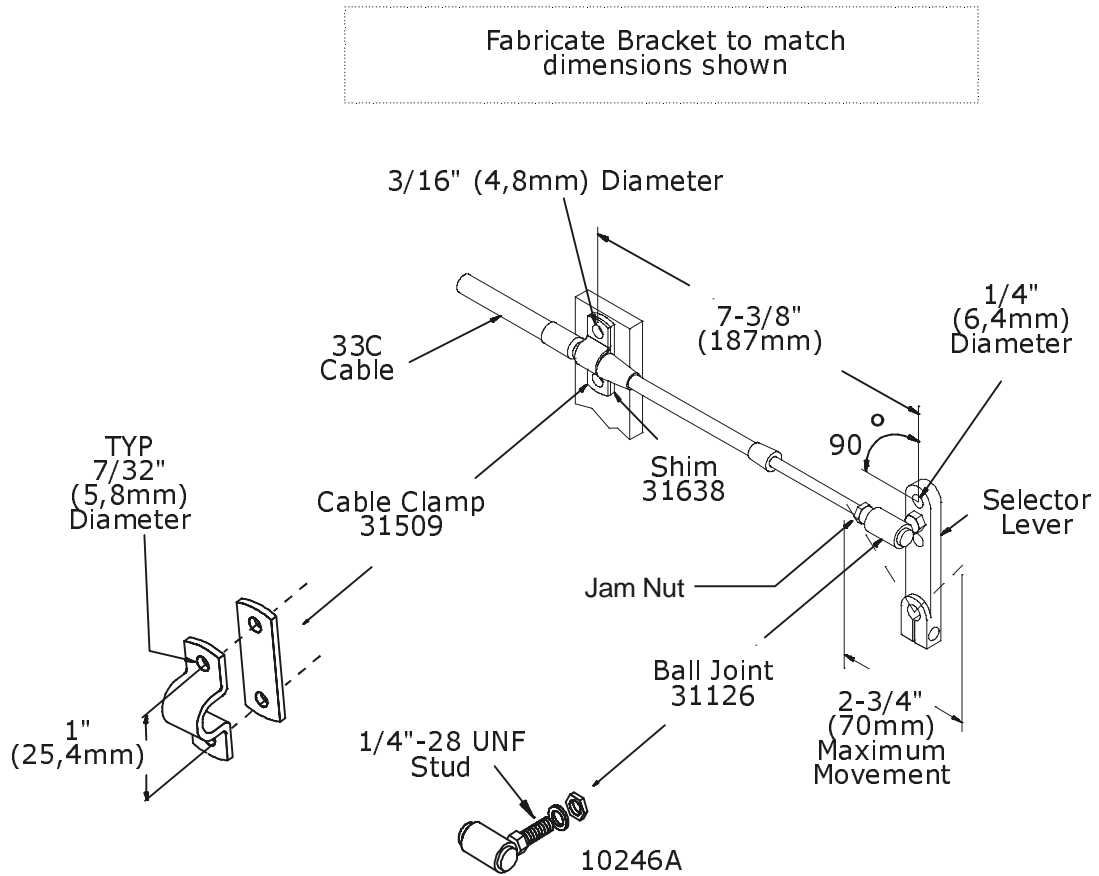
1. American Boat & Yacht Council (ABYC)  
3069 Solomons Island Road  
Edgewater, MD 21037-1416  
E-3 Wiring Identification on Boats  
E-9 DC Electrical Systems on Boats  
H-2.4e or 32.4g Ambient Temp. 50 degrees C  
P-24 Electric/Electronic Propulsion Controls
2. Code of Federal Regulations  
33 CFR 183 Subpart I - Electrical Systems  
33 CFR 183.410 Ignition protection  
33 CFR 183.415 Grounding  
33 CFR 183.425 Conductors: General  
33 CFR 183.430 Conductors in circuit of less than 50 Volts  
33 CFR 183.445 Conductors: Protection  
33 CFR 183.455 Over-current and Protection: General  
46 CFR 111.01 - 15(b) Ambient Temp. Machinery Spaces 50 degrees C  
46 CFR 111.05- System Grounds
3. Society of Automotive Engineers  
400 Commonwealth Drive  
Warrendale, PA 15096  
J1171 External Ignition Protection  
J1428 Marine Circuit Breakers  
J378 Marine Engine Wiring
4. National Marine Manufacturers Association  
401 North Michigan Avenue  
Chicago, IL 60611
5. Underwriters Laboratories

## B)PARTS SOURCE

Anti-Static Wrist Strap	P/N 517 [Thomas & Betts (P/N AWCC)]
Automatic Power Selector	P/N 13505
Circuit Breaker- UL Approved	P/N 810 [E-T-A (P/N 41-2-514-LN2-10)]
Fuse	P/N 1030 [Bussman (P/N. GDC-1A)]
Relay 12 VDC	P/N 1114 [Potter-Brumfield (P/N KRPA5D6-12)]
Relay 24 VDC	P/N 1122 [Potter-Brumfield (P/N KRPA5D6-24)]
Service Field Test Unit (Break-out Box)	P/N 13927
WAGO Tool	P/N 397 [WAGO (P/N 236-332)]



## Universal Mounting Kit



**Universal Mounting Kit**







## **Electronic Propulsion Control Systems Three** **Year Limited Warranty**

Your ZF Mathers product has been designed and manufactured by experienced engineers and craftsmen. ZF Mathers LLC, warrants for the period indicated below, each product to be free from defect in material and workmanship. Repair or replacement, at ZF Mathers option, will be provided if the product, upon ZF Mathers inspection, is found to be properly installed and operated in accordance with ZF Mathers Manual. This warranty does not apply to malfunction caused by damage, unreasonable use, misuse, repair or service by unauthorized persons or normal wear and tear.

### ***A)Coverage Under Warranty***

Three years from the date of purchase by the original end user.

#### ***Year One***

No charge for equipment repair, parts and labor. Up to three hours labor toward troubleshooting and replacement of defective equipment.

#### ***Year Two and Three***

There is no charge for equipment repairs performed at the factory that are covered under warranty. No labor allowance for troubleshooting and replacement of defective equipment.

### ***B)No Coverage Under Warranty***

The following will not be covered under warranty.

1. Travel to and from the job site.
2. Adjustment or calibration of any ZF Mathers equipment.
3. Adjustment or calibration of any associated equipment which may include but not limited to push-pull cables, engine governor or carburetor, transmission or trolling valve.
4. Damage due to accidents, improper installation or handling and or improper storage.
5. Damage due to faulty repairs performed by an unauthorized service representative.
6. Damage due to conditions, modifications or installation contrary to published specifications or recommendations.
7. Original installation charges or start-up costs.
8. Battery service including labor charges related to battery service.
9. Rental of equipment during performance of warranty repairs.
10. Unauthorized repair shop labor, without prior approval from ZF Mathers Service Department.
11. Shop supplies such as connectors, wire, cable, etc.

### ***C)Warranty Service***

Call 1-800-546-5455 or 1-360-757-6265 for your nearest ZF Mathers Factory Authorized Dealer.

1. Prior to returning any product to the factory, you must contact ZF Mathers Service Department for a Material Return Authorization (MRA) number. Return the product freight prepaid, marked clearly with the MRA number and a description of the malfunction.

2. If there is a defect covered by warranty, ZF Mathers will, at its option, either repair or replace the defective part or product. If after inspection, ZF Mathers determines that the product is not defective, ZF Mathers will charge a testing fee and return the product to the sender, freight collect.
3. Repair or replacement during the warranty period will not extend the warranty period.
4. All claims must be submitted within 30 days from date of service.
5. Claims for over 3 hours must be pre-approved by the ZF Mathers Service Department.

***This Warranty is expressly in lieu of all other Warranties, express or implied. Except to the extent prohibited by applicable law, ZF Mathers hereby disclaims all other implied or express warranties of any kind, including warranties of merchantability and fitness for a particular purpose. Under no circumstances shall ZF Mathers be liable for any consequential damages sustained in connection with the product or its use, including any costs or damages which result from loss of use of the product or any engine or boat with which it is used. ZF Mathers does not authorize any representative or agent to assume for it any obligation or liability other than those expressly set forth above. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. All implied warranties, if any, are limited to the duration of this express warranty. This warranty gives you legal rights, and you may have other rights which may vary from State to State.***

## *APPENDIX B.1*



## 1.0 TROUBLESHOOTING

Refer to the Troubleshooting Section in the MicroCommander Manual.

Before beginning troubleshooting, review the Appendix C.1 Drawing. Become familiar with the component configuration on your vessel.

Carefully inspect the following:

- DC Power Source
- Component Location
- Component Condition
- Interconnecting Wiring
- Wire Termination's

A key in troubleshooting the ZF Mathers System is identifying the problem as:

- DC Power Source
- Interconnection wiring or termination
- Component Calibration
- Component Failure

The ZF Mathers System has Station-in-Command indicator lights on each Control Head, as well as audible tone indicators. These indicators will assist in troubleshooting and control system status.

When contacting an authorized ZF Mathers servicing dealer, or the ZF Mathers Service Department, please be ready with the Actuator Part Number and Serial Number.

**CAUTION: Static electricity can destroy electronic components. Any time the Actuator cover is off, wear the wrist strap provided and connect it to the Actuator frame. This will drain any static charge you may have on your person.**

**NOTE: Always check the other Stations, to see if the symptom can be repeated.**

### ***1.1 SYMPTOM - TONE-OVER-TONE FROM ALL CONTROL HEAD STATIONS***

#### **Cause:**

Any fault or failure of the 813CE will produce this same symptom. A systematic approach to eliminating potential causes must be performed.

#### **Remedy:**

- A) No Power or Low Voltage at the 813CE.
  - Measure the voltage at the BATT+ and BATT- Terminals on the 813CE Circuit Board.
  - If the voltage is less than 8.0 VDC, correct the power problem
- B) The 813CE power was turned ON after the 585CE Actuator power was applied.
  - Turn power OFF to both the 813CE and the Actuator(s).
  - Apply power to the 813CE only.
  - Apply power to the Actuator(s)
  - If the tone persists, go to the next Step.

C) One or both the 813CE's servos is jammed or misadjusted.

- Disconnect the push-pull cable(s) from the Trolling Valve selector lever.
- Cycle power to the 813CE only.
- If the tone is no longer present, check the Trolling Valve selector lever for ease of movement.
- If the Trolling Valve selector lever's movement is normal, readjust the push-pull cables' travel.
- If tone is still present, replace the 813CE

D) Incorrect or bad connection between the 813CE and the Actuator.

- Disconnect all of the eight-conductor wires at both the 813CE and the Actuator's Auxiliary board.
- Reconnect the wires per the Wiring Diagram in Appendix C.1
- If the tone persists, replace the 813CE.

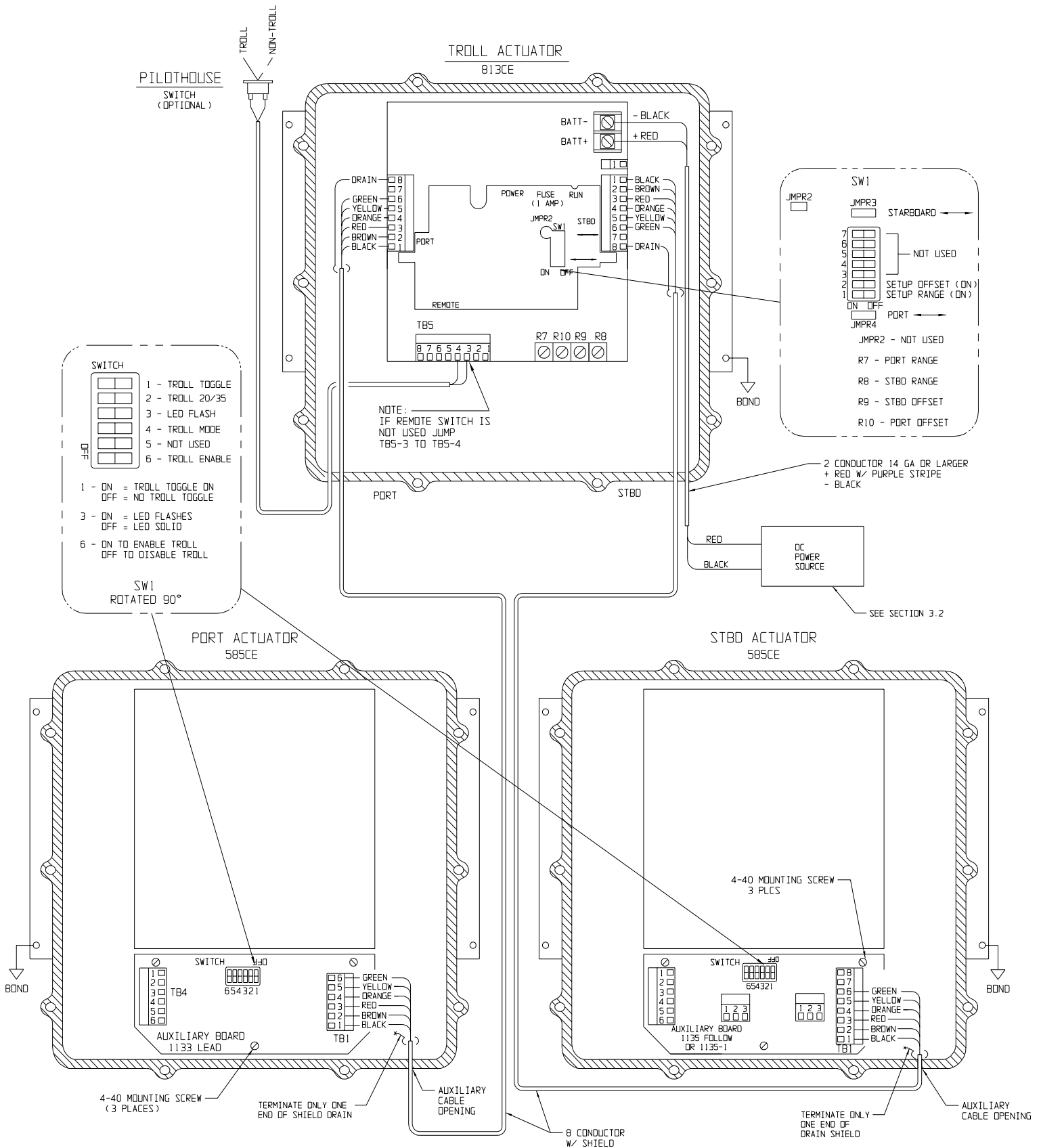
## *APPENDIX C.1*





# MicroCommander Twin Engine with 813CE Troll

Software Version SW12705.5



1 - ON - ENABLES TROLL TOGGLE  
OFF - DISABLES TROLL TOGGLE

2 - ON - 35 DEGREES  
OFF - 20 DEGREES

3 - ON - TROLL BLINKING LED  
OFF - TROLL SOLID LED

4 - ON - NON-TROLL ON POWER-UP  
OFF - TROLL ON POWER-UP

5 - NOT USED

6 - ON - TROLL ENABLED  
OFF - TROLL DISABLED

TWIN SCREW WITH  
813CE TROLLING VALVE  
10235-A REV B

