

**Smart Actuator
Installation & Operation Manual** v0.3

Complete Controls *by Glendinning*



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Handheld Remote Control

A word about the Symbols used in the Manual

When driving from one destination to another, road signs prove to be invaluable. Road signs are an important source of information. For example, road signs can warn you about potential problems ahead to help divert certain disaster or they can let you know where to turn off for a rest or a meal.

In an effort to help you navigate your way through this manual we will from time to time use the following symbols:



Throughout the manual the NOTES symbol will appear in the margin to support what has been mentioned in the text. A note can be used where further explanation is needed or where something needs highlighting. BE CAREFUL to read all NOTES.



Sometimes it is helpful to take a break and really absorb what you just read. The WARNING symbol will alert the reader to information that needs to be completely understood before you continue on in the reading of the manual. ALWAYS STOP and READ these points.



The TIP symbol will be used when something mentioned in the text need more “light” shed on it. The tip could explain or be a list of do’s and don’ts. Whatever the TIP is, you do not want to miss out on the information it contains.

1.0 System Description & Capabilities

With the advent of electronically controlled engines in the marine industry, *GLENDINNING* has developed the Complete Controls System to be compatible with all types of electronically & mechanically governed engines and will provide the boat operator with total control over the boat's propulsion system. The Complete Control System incorporates the following standard features:

- *Single lever control from up to 6 control stations* — Single lever control permits gear and throttle control using a single control lever. The Complete Controls control processor correctly sequences the operation of engine and transmission, so that the engine and transmission are protected during shifting at up to 6 separate helm control stations. Only one station is in control of the propulsion plant at any time.
- *Adjustable control head detent / friction settings* — This feature allows for the setting of the control head detent and /or friction quickly and easily while underway, without disassembling the control head!
- *“Posi-lock” gear lockout* — A dedicated button (WARM) is provided to lockout the gear and allows engine RPM to be increased safely.
- *Battery voltage warning indicator* — Our system alerts you when either too low or too high voltage exists. The control system will continue to operate as long as possible, within the limits of its operating voltage.
- *System diagnostic warning indicator* — The Complete Controls System monitors many parameters and notifies you when conditions fall outside suitable operating range.
- *Neutral gear position indicating lights* — You know that the transmission has shifted into neutral gear with this visual gear position indicator.
- *Two button station transfer* — No more accidental transfer of control from one station to another. Our system's TAKE button must be depressed twice in order to transfer control from one station to another.

In addition to these standard features, the Complete Controls system includes the following optional features that are available with the upgraded 4-button control head:

- *Adjustable control head detent / friction settings* — This feature allows for the setting of the control head detent and /or friction quickly and easily while underway, without disassembling the control head!
- *High idle mode* — Up to 10 idle speeds are available and can be adjusted through system calibration.
- *Bump mode* — Want to make minute adjustments in engine speed (approx. 10-15 RPM)? Simply press the WARM or TROLL buttons!
- *Slow mode* — Limits maximum RPM available to approximately 50% of normal WOT. Very useful for maneuvering or slow speed cruising (SLOW).
- *Gear position indicating lights* — You know that the transmission has shifted into the appropriate gear with this visual gear position indicator.
- *Control head light dimmer* — Bright lights are great for daylight conditions, but can be distracting at night. This feature allows you to dim the control head lights for each station individually.

1.1 System Components

The Complete Control System consists of 4 separate components. They are:

Control Head

The Control Head was designed with a more contempo-



4-Button
Control Head



2-Button
Control Head



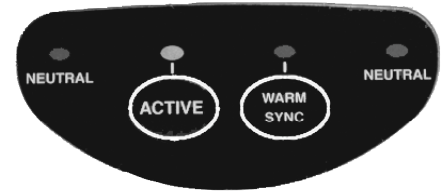
Single Engine
Control Head

rary, stylish look that is sure to accentuate any console—but good looks isn't all that it has going for it.

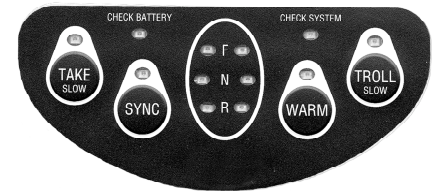
The Control Head is by far the most informative control head in the industry today. The control head keypad has integrated switches and indicator lights which allow the boat operator to control all aspects of the boat's propulsion system.

Robust, watertight construction is a hallmark at *Glendinning* — we build our control heads to withstand the extreme conditions that exist in the marine environment.

2-BUTTON KEYPAD
(Close-up)



4-BUTTON KEYPAD
(Close-up)

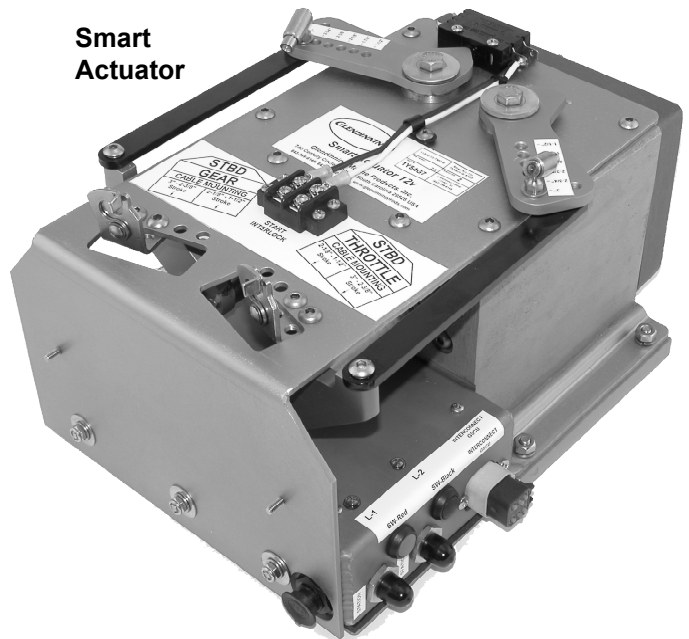


OPTIONAL Handheld Remote Control allows boat operator to control both throttle and transmission from almost anywhere on board his vessel.

Smart Actuator

The electromechanical actuators convert the electronic commands that are generated by the control head into specific positions at the engine gear, throttle and trolling valve. The actuators are housed in rugged, corrosion resistant, aluminum enclosures that are sealed to eliminate problems which may be caused by exposure to the marine environment. The actuator motor drive assembly uses precision ground steel gears and components that are manufactured to very precise tolerances. Combined with a high frequency pulse width modulation (PWM) input, the actuator is able to resolve a linear position of less than 0.005 inch very smoothly with no “steps.”

Smart Actuator

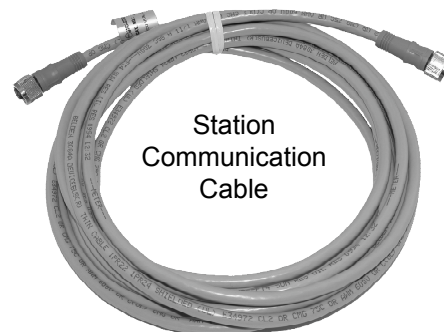


Station Cables

Glendinning's station cables are pre-terminated at the factory for ease of installation, and are completely shielded to eliminate problems caused by electromagnetic interference, complying with the latest and strictest standards in the industry. Both ends of the station cable has a connector which is identical on either end—no mistakes when it comes to plugging in the cable!

Engine / Gear Harnesses

The engine and gear harnesses relay information from the control processor to the engine and gear controls. Connecting your gear and engine to the Control Processor has never been easier. Each engine harness and/or gear harness is clearly labelled and simply plugs into the appropriately labelled port on the control processor.



Station Communication Cable

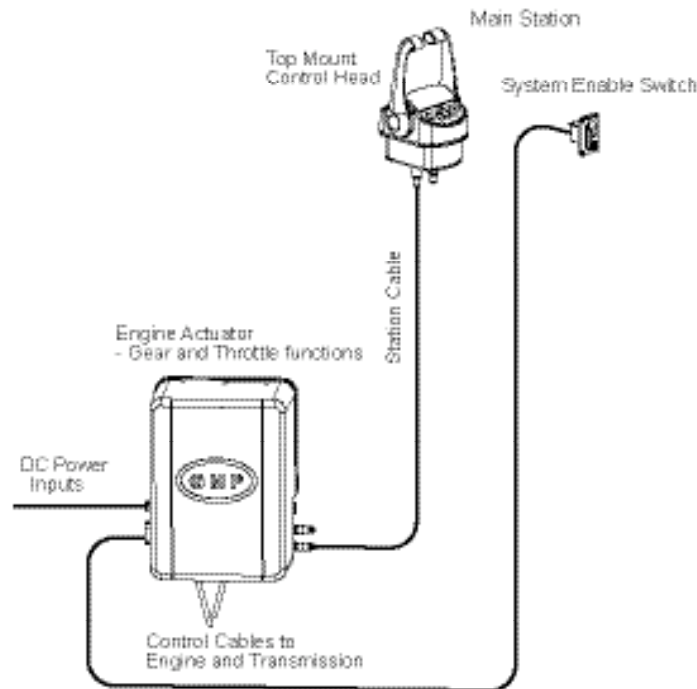


CLOSE-UP Station Communication Cable Connector

1.2 System Layout

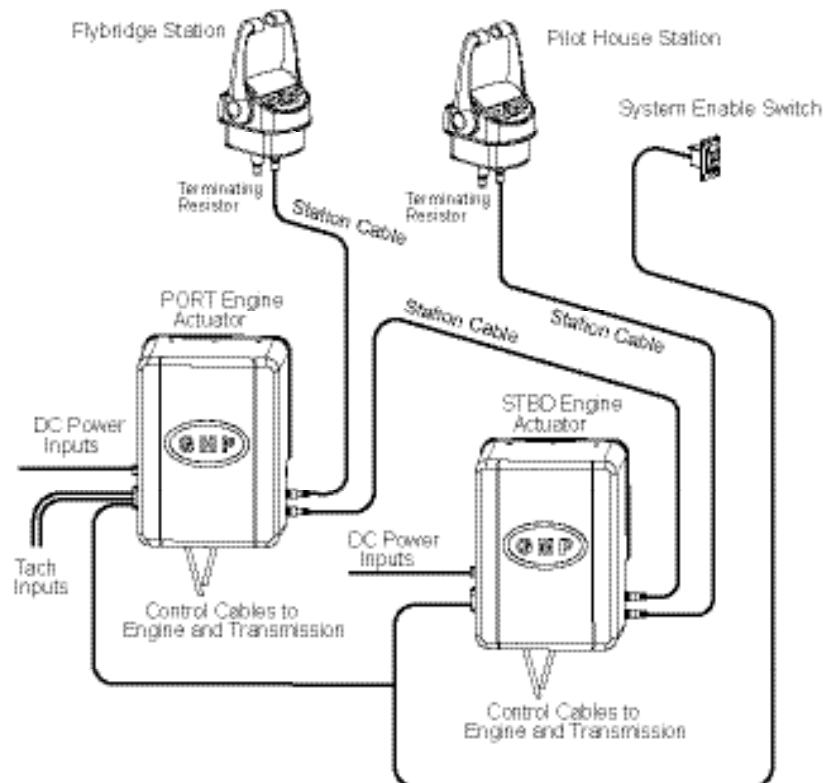
Single Engine

- Mechanically controlled engine and transmission
- Single Station



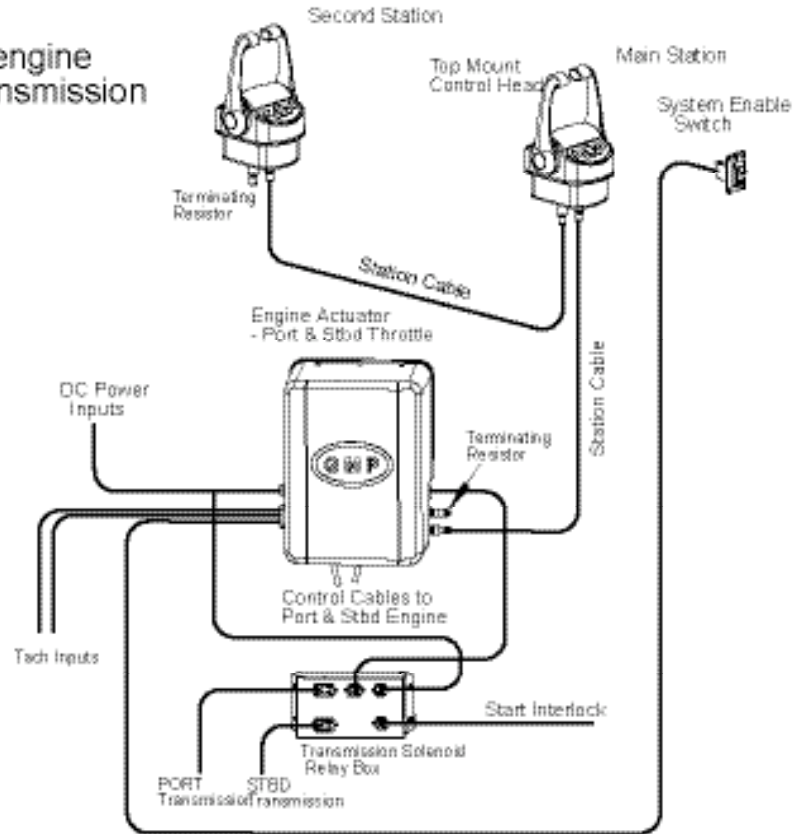
Twin Engine

- Mechanically controlled engine and transmission
- Twin Station



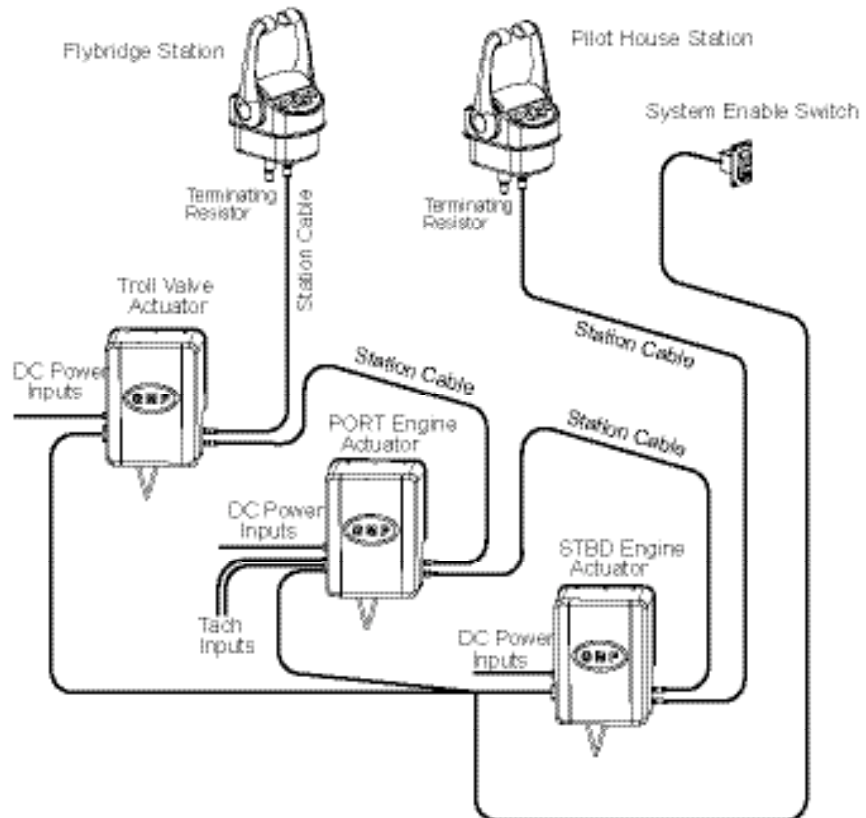
Twin Engine

- Mechanically controlled engine
- Electrically controlled transmission
- Twin Station



Twin Engine with Trolling Valves

- Mechanically controlled engine and transmission
- Twin Station
- Trolling Valves



2.0 Operating the Smart Actuator

Operating the Smart Actuator is just as easy as the installation process. The Control Head will constantly monitor various parameters and will alert the boat operator if the system falls outside the normal operating range.

Familiarize yourself with the following functions BEFORE operation.

The functions necessary for operating are:

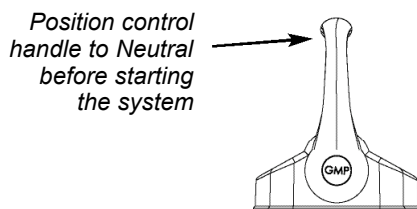
- System Startup Procedure
- Cruise Mode
- Warm Up Mode
- Automatic Synchronization Mode
- Station Transfer Process
- Warning Mode
- Alarm Mode

2.1 System Startup

The procedure for starting up the system is as follows:

1. Control Handles must be in the NEUTRAL position prior to starting the system.
2. Turn ON the system enable switch. The system will perform a brief diagnostic test (approx. 1 second), checking various system parameters (indicated by the TAKE light fully illuminated). Control handles should remain in **NEUTRAL** until system is operational.
3. The system is operational when the TAKE light and WARM lights are fully illuminated (not blinking). The system is automatically placed in WARM Mode at startup (This feature can be turned OFF if desired, see sec 4.0).

Step 1

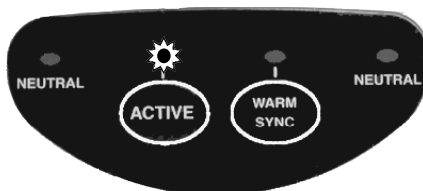


Step 2

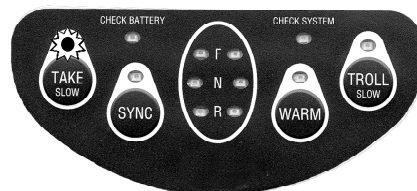
Turn system ON.

System will perform a brief diagnostic test indicated by these keypad lights being fully illuminated.

2-BUTTON KEYPAD



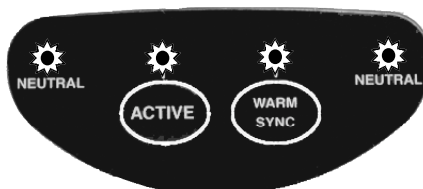
4-BUTTON KEYPAD



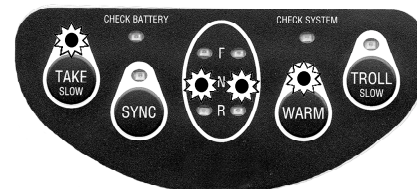
Step 3

System is fully operational when you see these keypad lights fully illuminated (not flashing).

2-BUTTON KEYPAD



4-BUTTON KEYPAD





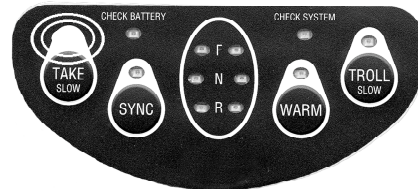
If the TAKE light (4-button keypad) or the ACTIVE light (2-button keypad) flashes slowly, accompanied by a slow beep, the control handles are not in NEUTRAL. Leave control system enable switch on and move one control handle at a time to verify that handles are in the neutral position. When both handles are in NEUTRAL, system will automatically complete startup procedure (TAKE light or ACTIVE light fully ON).

2-BUTTON KEYPAD



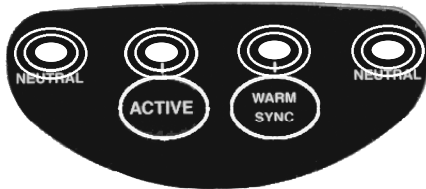
If these lights are flashing during startup — leave system ON and move each control handle to verify that it is in NEUTRAL

4-BUTTON KEYPAD



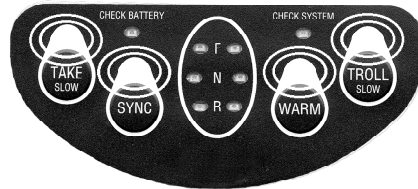
If all four (4) lights on the keypad blink in unison, the EEC system is in Alarm Mode. Restart the system by turning OFF the system enable switch and then turning back ON.

2-BUTTON KEYPAD



If these lights are flashing during startup — system is in Alarm Mode — Restart of system is required

4-BUTTON KEYPAD



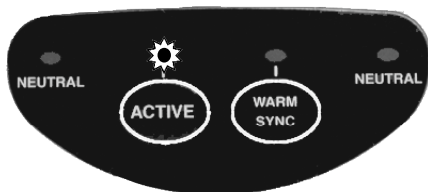
2.2 Cruise Mode

Cruise Mode is the normal operating mode. Other functions may be accessed while in Cruise Mode (see below):

The Control Head may respond in one of three ways during Cruise Mode:

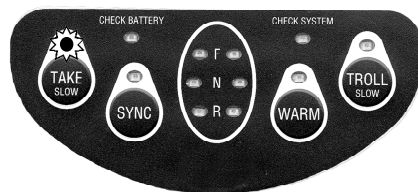
1. **ACTIVE STATION** — During normal operation only the active station will be in command. ACTIVE or TAKE light will be fully illuminated (not flashing) indicating that the station is “active” and in command of boat’s propulsion system.

2-BUTTON KEYPAD



ACTIVE light is ON (not flashing) at station that is in control

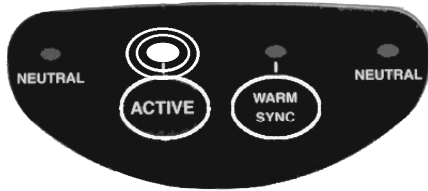
4-BUTTON KEYPAD



TAKE light is ON (not flashing) at station that is in control

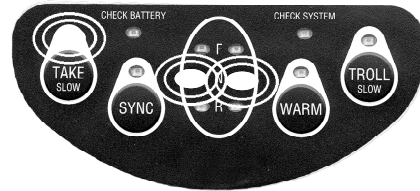
2. **INACTIVE STATION** — During normal operation all other stations are “inactive”. The ACTIVE light or TAKE light and Gear positioning lights on each inactive station will blink every 2 seconds indicating that the control head is an inactive station. The Check Battery/Check System lights will operate.

2-BUTTON KEYPAD



ACTIVE light is flashing at station that is INACTIVE

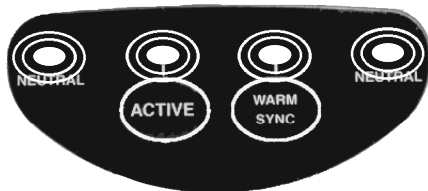
4-BUTTON KEYPAD



TAKE light and gear indicator lights flash at station that is INACTIVE

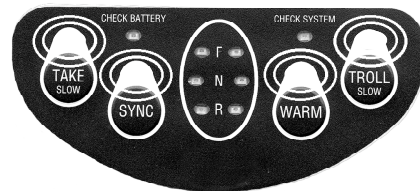
3. **ALARM MODE** — During normal operation, the system continuously monitors parameters and will alert operator of alarm conditions when they exist. Alarm Mode is indicated by all four (4) keypad lights blinking in unison.

2-BUTTON KEYPAD



All 4 lights flashing in unison indicates system is in ALARM Mode

4-BUTTON KEYPAD



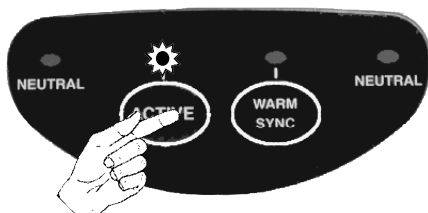
All 4 lights flashing in unison indicates system is in ALARM Mode

Other Functions available from Cruise Mode are:

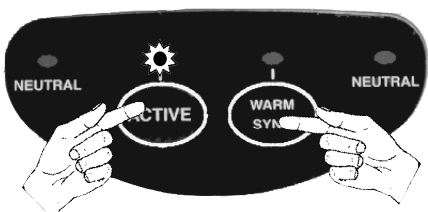
1. **THROTTLE “BUMP” MODE** — During normal operation, small changes in engine speed (approximately 10-15 RPM) may be made by pressing and releasing the buttons described below for your keypad style.

Engine speed can only be “bumped” when control handles are in gear and above idle speed. Amount of speed change per bump can be adjusted during system calibration.

2-BUTTON KEYPAD



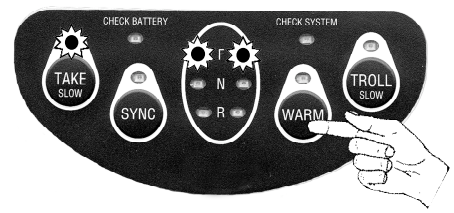
Press and Release ACTIVE button



Press and Release ACTIVE & WARM button

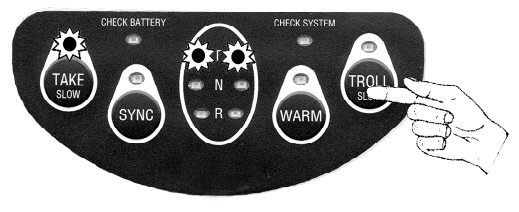
4-BUTTON KEYPAD

To INCREASE engine speed by using Bump Mode



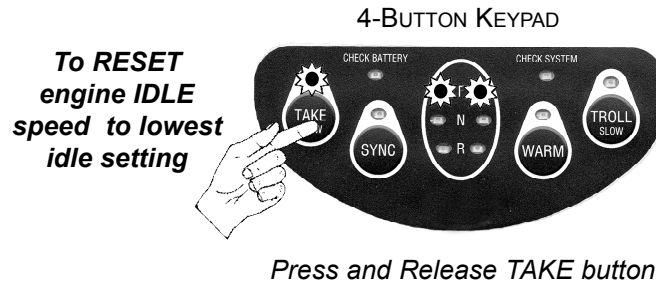
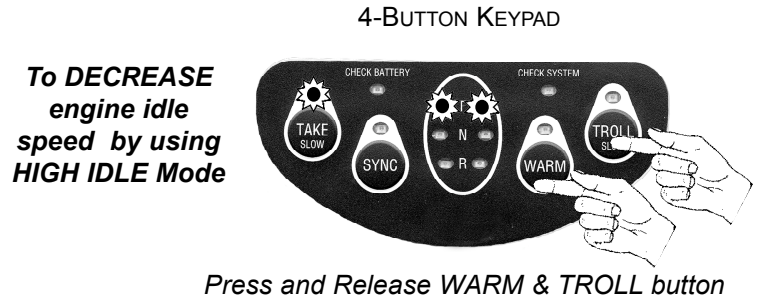
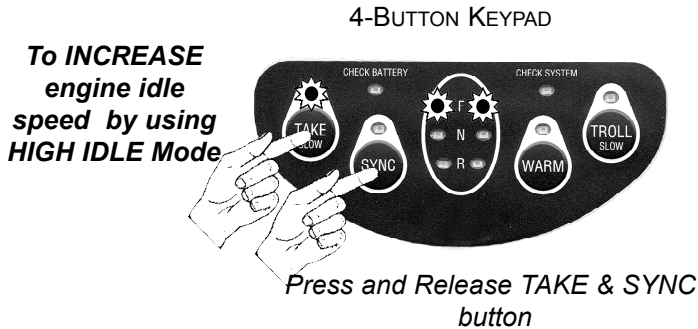
Press and Release WARM button

To DECREASE engine speed by using Bump Mode



Press and Release TROLL button

2. **HIGH IDLE MODE** — (*HIGH IDLE MODE is only available with our 4-Button Keypad*) During normal operation, the boat operator is able to change the engine idle speed up to 10 different idle speed settings.



Engine idle speed can only be changed while control handles are in NEUTRAL. Idle speed change can be adjusted during system calibration.

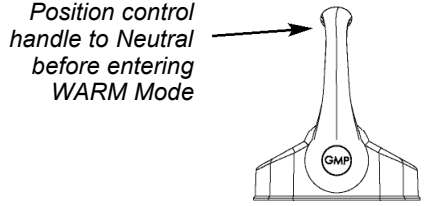
2.3 Warm Up Mode

Warm up Mode allows the boat operator to operate the engine throttle by itself, while locking the transmission in NEUTRAL. It is **STRONGLY RECOMMENDED** that the system be in Warm Up Mode **AT ALL TIMES** while boat is at the dock! This safety procedure will prevent the accidental engagement of transmission if the control head handles are inadvertently moved.

To utilize the Warm Up feature:

1. To engage, press and release the WARM button one time (control handles must be in NEUTRAL position to engage Warm Up Mode).
2. Advance the control lever into and beyond the Ahead detent position. The engine gear will remain in NEUTRAL while engine speed is increased.
3. To disengage, bring handles back to NEUTRAL and press and release the WARM button one time.

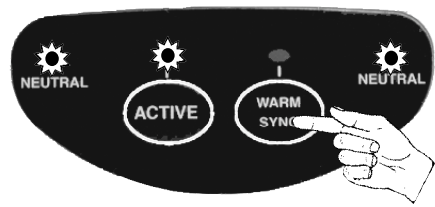
Step 1



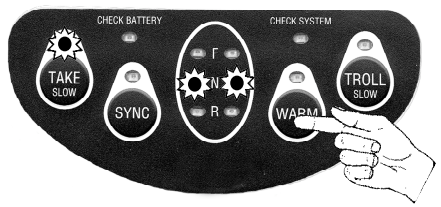
Step 2

To ENGAGE, press & release the WARM button one time. WARM light will be ON and engine speed may be increased while gear is "locked" in NEUTRAL.

2-BUTTON KEYPAD



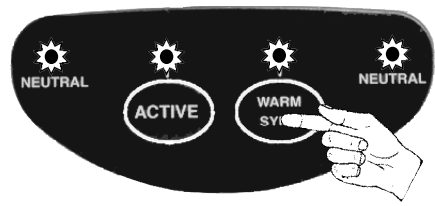
4-BUTTON KEYPAD



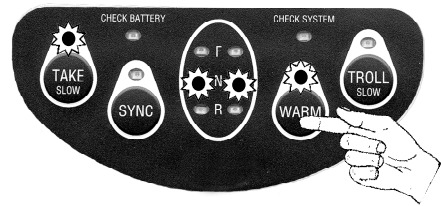
Step 3

To DISENGAGE, make sure control handles are in the NEUTRAL position and press & release WARM button one time. WARM light will be OFF.

2-BUTTON KEYPAD



4-BUTTON KEYPAD



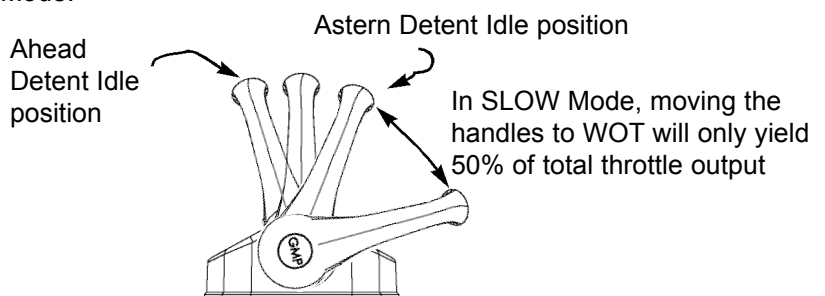
2.4 Slow Mode (only available on 4-button keypad)

The Slow Mode limits the maximum RPM available to approximately 50% of normal WOT. This feature is very useful for maneuvering or slow speed cruising.

The Slow Mode is activated by:

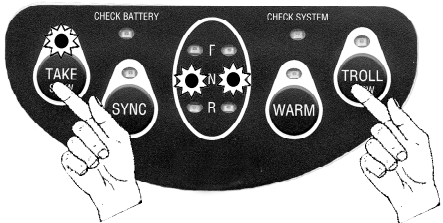
1. To engage, press and release TAKE and TROLL buttons in unison, one time. Control handles must be in NEUTRAL position or Ahead/Astern detents to engage Slow Mode.
2. To disengage, press and release TAKE and TROLL buttons in unison, one time. Control handles must be in NEUTRAL position or Ahead/Astern detents to disengage Slow Mode.

In order to activated the Slow Mode, control handles must be in NEUTRAL position or Ahead/Astern detents



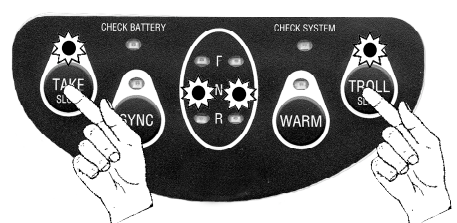
4-BUTTON KEYPAD

To ENGAGE, press & release TAKE & TROLL buttons in unison. When activated the TROLL light will be ON and moving handles to WOT will only yield 50% of total throttle output



To DISENGAGE, press & release TAKE & TROLL buttons in unison. TROLL / SLOW light will go OFF and system will revert to Normal operation

4-BUTTON KEYPAD



2.5 Automatic Synchronization Mode

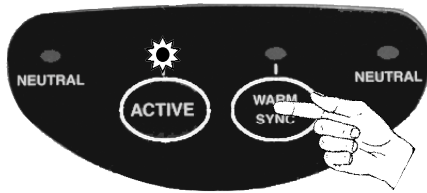
The Automatic Synchronization Mode allows the control system to automatically control one engine speed to exactly match speed of the other engine. Think of it as cruise control for your boat. Once underway, follow the instructions below to activate this feature and control both engines' speed with one handle.

To activate the Automatic Synchronization Mode:

Before the SYNC function can engage, both engines must be in the Ahead gear and handles must be approximately matched — within 10% of total travel.

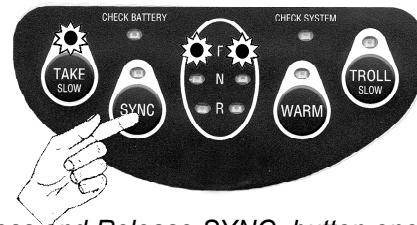
1. Press and release the SYNC button one time.
2. When SYNC function is energized, system will automatically control one engine speed to match the speed of the other engine. If engine speed is changed manually by the boat operator, engine speed will automatically be changed to match (NOTE: Slave / Lead engine can be designated during system calibration).
3. To disengage, bring slave handle to match position of lead engine control handle and press and release SYNC button one time. *It is extremely important that the slave handle is brought back to a position relative to the lead handle prior to disengaging.*

2-BUTTON KEYPAD

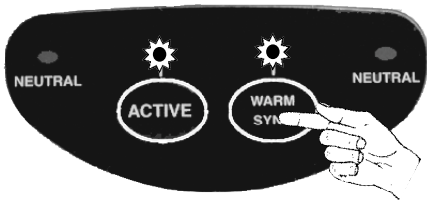


Press and Release SYNC button one time

4-BUTTON KEYPAD

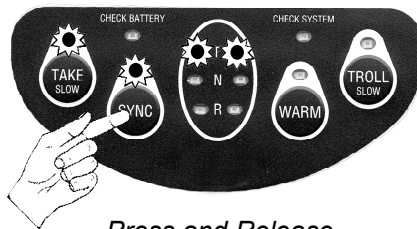


Press and Release SYNC button one time



Press and Release SYNC button one time

To disengage engine SYNC Mode, move slave engine control handle to approximately match position of lead engine



Press and Release SYNC button one time



1. Synchronization mode will be automatically disengaged if both control handles are moved to NEUTRAL position together.

2. If lead handle is moved to NEUTRAL gear position by itself, synchronization mode will be automatically de-energized. Slave engine operation will continue to match lead engine operation (gear and throttle) until slave control handle is matched to lead control handle position.

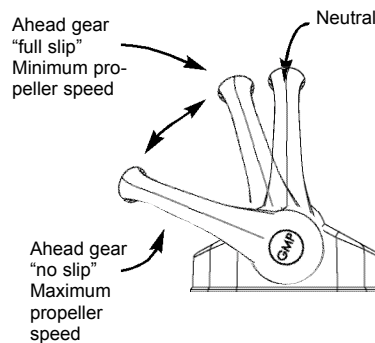
2.6 Troll Mode (only available on 4-button keypad)

The Troll Mode is available only if the boat has been equipped with trolling valves and allows the boat operator to control the position of the transmission trolling valves.

To activate Troll Mode:

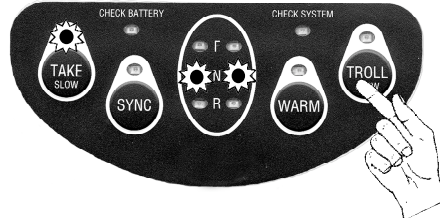
1. With control handles in NEUTRAL, press and release TROLL button one time (control handles must be in NEUTRAL to engage Troll Mode).
2. Control troll valve position by movement of control handle. Engine throttle speed is maintained at idle while system is in Troll Mode.
3. To disengage, move control handles back to NEUTRAL and press and release TROLL button one time.

In order to activate the Troll Mode, control handles must be in NEUTRAL position



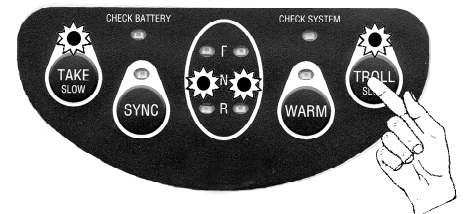
4-BUTTON KEYPAD

To ENGAGE, press & release the TROLL button. When activated the TROLL light will be ON and moving handles will control troll valve position



To DISENGAGE, press & release the TROLL button. TROLL light will go OFF and system will revert to Normal operation

4-BUTTON KEYPAD



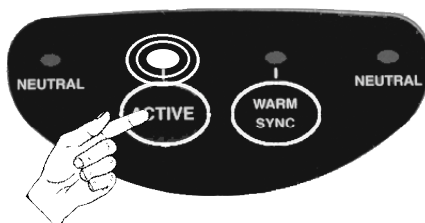
2.7 Station Transfer Process

The Complete Control System allows the propulsion system control to be transferred from one control station to another control station. This process requires the operator to depress the ACTIVE or TAKE button twice in order for the transfer to take effect thus avoiding any inadvertent transfers from taking place without the boat operator's knowledge.

To transfer control follow these steps:

1. Press and release ACTIVE or TAKE button one time, at the helm station where you want to take control (ACTIVE or TAKE light will begin to blink and control head beeper will begin to sound).

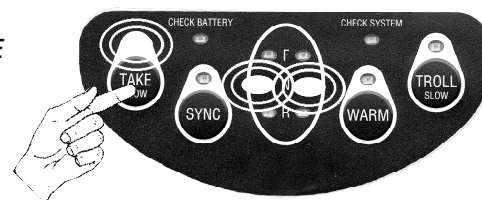
2-BUTTON KEYPAD



Press & Release ACTIVE button one time to begin the station transfer process

4-BUTTON KEYPAD

At INACTIVE station



Press & Release TAKE button one time to begin the station transfer process

2. At the station where you want to take control, move the control handles to an appropriate throttle position.

Active Station Handle Position	Station Taking Control Handle Position
In Neutral	In Neutral
In gear, at Idle	In Neutral, or same gear position at Idle
In gear, above Idle	In Neutral, or same gear position at same or lower speed setting

ADJUST CONTROL HANDLES
(see chart at left)

3. Press and release ACTIVE or TAKE button a second time. The new control station is now the active station and has control of the engine and transmission.

2-BUTTON KEYPAD

Press & Release ACTIVE button one more time to complete the station transfer process

4-BUTTON KEYPAD

At INACTIVE station

Press & Release TAKE button one more time to complete the station transfer process

See the illustrations below for the light sequence at the INACTIVE station's keypad:

2-BUTTON KEYPAD

Light flashes 1 time every 2 seconds

Prior to pressing button, light flashes 1 time every 2 seconds (inactive station heartbeat)

4-BUTTON KEYPAD

Slow flash — handles not in appropriate position
Quick flash — handles in appropriate position

After pressing button 1 time, ACTIVE or TAKE light will flash depending on handle setting at control station taking control

Solid ACTIVE or TAKE light indicates transfer complete

Control transfer is complete when ACTIVE or TAKE button is pressed a second time while light quick flashes

2.8 Warning Mode

During operation of the Complete Control System, the system will warn the operator when a problem is detected. System will continue to operate in unaffected functions.

2-BUTTON KEYPAD



If an alarm occurs while operating the 2-button keypad, whatever system light is ON at the time of the alarm will flash quickly (4 times every 1 second)

System will continue to operate in unaffected functions

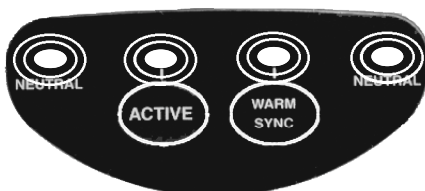
4-BUTTON KEYPAD

	SYMPTOM	ACTION
<p>CHECK BATTERY light blinks</p> <p>CHECK BATTERY INDICATOR will blink when battery voltage conditions exist that are questionable.</p>	<ol style="list-style-type: none"> SLOW BLINK—One battery is either too high or too low. QUICK BLINK—Both batteries are either too high or too low. 	<ol style="list-style-type: none"> Determine cause of input power problem. System will continue to operate normally, unless battery exceeds system parameters. If this occurs system will be switched into Alarm Mode (see page 10).
<p>CHECK SYSTEM light blinks</p> <p>CHECK SYSTEM INDICATOR will blink when a possible problem has been detected within the system.</p>	<ol style="list-style-type: none"> Diagnostics tests have detected that part of the control system is not functioning normally. 	<ol style="list-style-type: none"> Restart control system (turn OFF/ON). Move handles to Neutral during system startup. Determine part of system not operating properly (ie. gear, throttle, troll, etc.). Utilize alarm code recovery procedure to discover source of problem (see Operations Guide).

2.9 Alarm Mode

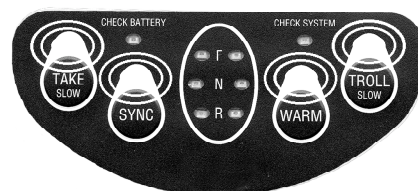
During operation, the system continuously monitors system functions and will alert operator if a system problem has been detected. When Alarm Mode is activated, control system will not continue to operate. In absence of control signal from the system, transmission will normally go to NEUTRAL and engine throttle will normally go to IDLE.

2-BUTTON KEYPAD

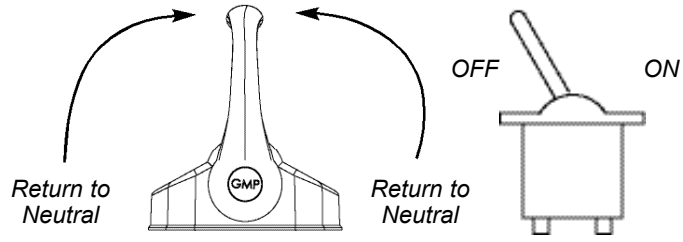


ALARM IS INDICATED when all 4 lights are blinking in unison on the control keypad.

4-BUTTON KEYPAD



Return the main station control handles to NEUTRAL and turn system power switch OFF. Restart the system.



3.0 Installing the Complete Control — Smart Actuator

Installing the Complete Control System is simple and easy. It is always important that proper care be given when installing any equipment on board your vessel. It is always a wise practice before cutting into the ship's interior to follow the old adage "measure twice, cut (or drill) once!"

The installation process includes the following:

- Pre-installation Planning
- Engine Compartment — Mount the Smart Actuators
- Engine Compartment — Control Cable Connections
- Engine Compartment — Electrical Connections
- Mounting the Control Head

3.1 Pre-installation Planning

Before beginning the installation of the Glendinning Complete Control System, proper consideration and pre-planning should be given to several very important parts of the control system. Proper planning of the installation will help to insure that the Complete Control system will operate correctly and within specification. Failing to properly plan out the installation may decrease the reliability of the system. The following are the most important things to consider in planning. Close attention should be given to these issues:

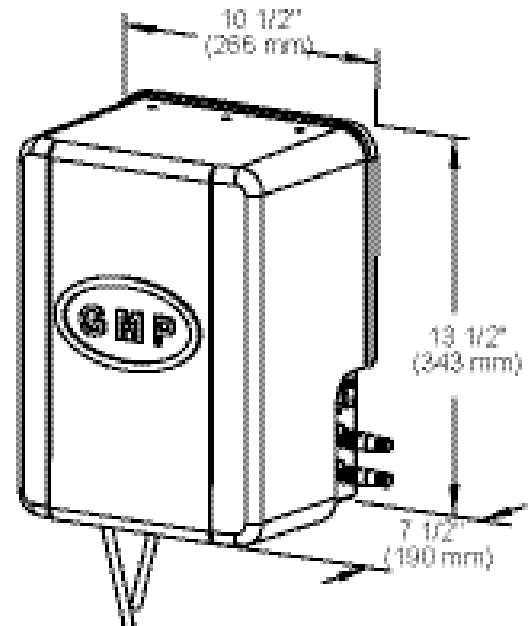
● Smart Actuator Location

Operational Clearances —The primary factor in choosing a location for the actuators is finding a location that results in the shortest, most direct path for the push-pull cable that connects the actuator(s) to the transmission and/or engine governor. In general, for engines where the control cable travels aft from the engine governor / throttle lever, the throttle actuator will be mounted in the aft section of the engine room. Conversely, for engines where the control cable heads forward from the engine governor lever, the actuator will be mounted toward the forward end of the engine room. The Smart Actuator(s) should NOT be mounted on the engine. In general, the length of the control cable from the actuator(s) to the transmission and engine governor should not be greater than 10 feet and 180 total degrees of bend. (Longer lengths may be used after review and approval of the physical layout of the product installation by Glendinning Marine Products).

One reason why a short cable to the engine governor is critical has to do with engine synchronization. In order to accurately synchronize one engine to the other, it is necessary to position the governor with an accuracy of less than five thousandths (0.005") of an inch. Any unnecessary bend in the control cable to the governor lever, or using a cable that is longer than necessary, will result in lost motion between the actuator and engine, causing a reduction in synchronization accuracy.

Environmental conditions —The Smart Actuator(s) should be mounted in an area that is relatively dry and cool. Although the electronic components are reasonably well-sealed from moisture, the product enclosure is not designed for constant, direct contact with water. Since the longevity of electronic components is reduced in high temperature environments it is best to find an area of the engine compartment that is not exposed to temperature extremes. The Smart Actuator(s) has been designed for installation in the engine compartment, and should be mounted where there is some air movement or ventilation.

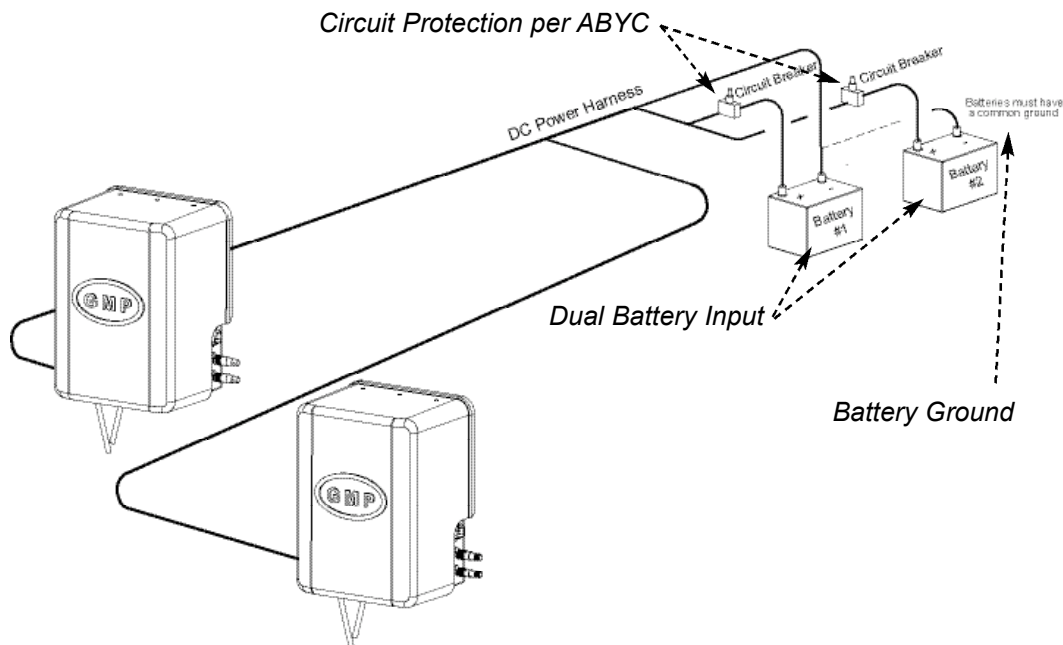
Accessibility — During system calibration or troubleshooting, it will be necessary for the installer or repair technician to have access to the connection points of the Smart Actuator(s). In view of this, the Smart Actuator should be mounted in a relatively accessible area.



● Power Supply / Enable Switch

In the installation of any electronic device, the source of power is one of the most important factors to consider during the installation. The Complete Control System has a unique and very reliable power supply system which, if the system is properly installed, greatly improves the overall reliability of the engine control system.

Dual Battery Input—The Smart Actuator(s) provide for the connection of two independent sources of DC power. During normal operation, the Smart Actuator(s) will draw power from both power sources. In a typical boat, the DC power distribution system is designed to take power from a single battery source and then distribute it to the various equipment that require power. Although the Smart Actuator(s) can be powered off the DC distribution panel, this is NOT RECOMMENDED because it is not able to provide for the supply of power from 2 independent sources to any single device.



In other boats, several batteries are arranged in parallel. Obviously, these batteries are not independent—that is, the voltage observed at one battery terminal will be the same at the other battery terminal. It is important that each battery source be completely independent of the other.

Power Source to Smart Actuator(s) Must be Uninterrupted—It cannot be overemphasized that providing a secure, uninterrupted source of power to the Smart Actuator is vitally important to the reliable operation of the control system. For this reason, it is best that the power be drawn as close as possible to the battery positive terminal, without having various components which may interrupt the flow of current to the control system.

Circuit Protection / Enable Switch—Per the ABYC guidelines, some type of current protection—circuit breaker or fuse—must be installed within 7 inches (17cm) of the connection to the source of power. It is very important to understand that circuit protection is installed for the protection of the wire, not the Smart Actuator. The Smart Actuator has its own internal current protection and does not need any external fuse. However, the wire which connects the Smart Actuator to the boat power must be protected in case of chafing or other damage. In order to not limit power to the system during normal operation, a minimum 15 amp fuse or circuit breaker must be installed (if a 30 amp fuse or circuit breaker are used, then it is necessary that 10 AWG wire, or larger, is used to connect the Smart Actuator to its power source). Since the fuse or circuit breaker is physically located in the engine compartment, it would be extremely inconvenient to require the boat operator to have to go to the engine compartment to start-up the Complete Control system each time the boat operator wishes to use the boat. For this reason, Glendinning has allowed for the installation of an enable switch which allows the boat operator to remotely turn ON or OFF the Complete Control system from the helm station. When the enable switch is used, the Smart Actuator circuit protection is typically left in the ON position. The enable switch only requires a small (2 conductor, 18 gauge) wire to be run from the engine compartment to the helm station. **DO NOT APPLY POWER TO THE ENABLE SWITCH**—The purpose of the enable switch is only to open or close the circuit which allows power to be applied to the control system.

Battery Ground—The dual battery system requires that the battery positive terminals be at roughly the same voltage. In order for the battery positive terminals to be at the same voltage, it is necessary that the negative terminals of the batteries be connected at some common point. This is normal marine electrical practice and is specified in the ABYC guidelines. Prior to the final electrical hookup of the Complete Control system, the installer should verify that the battery ground termi-

nals are connected at some common point.

● **Station Communications Cable / Network Installations**

The Complete Control System utilizes CANbus technology to communicate between the Smart Actuator and the Control Station(s). Simply put, the CAN(Controller Area Network)bus network consists of a series of devices connected by a single wire routed throughout the boat. Station communication connects each system component sequentially which minimizes cable runs and lengths. At each end of the bus network a CANbus terminator (terminating resistor) must be connected in order for the system to perform correctly.

Station Communication Cable Routing—When routing Station Cables it is advisable to inspect the route and make sure surfaces are free of any sharp edges or burrs which could nick the cable and compromise the reliability of the system.

Connectors are pre-terminated at the factory and should NEVER be forced into their proper receptacle. Make sure that the connector is properly aligned prior to insertion into the receptacle. If the connector is properly aligned, only a small amount of force will be necessary to insert the connector into the Smart Actuator or Control Head. Failure to properly align connector may damage the pins and cause the system to fail. Connectors are one of the most important parts of the Complete Control system. Keep connectors covered and clean during installation. Most problems occur due to bad connections.



Terminating Resistor

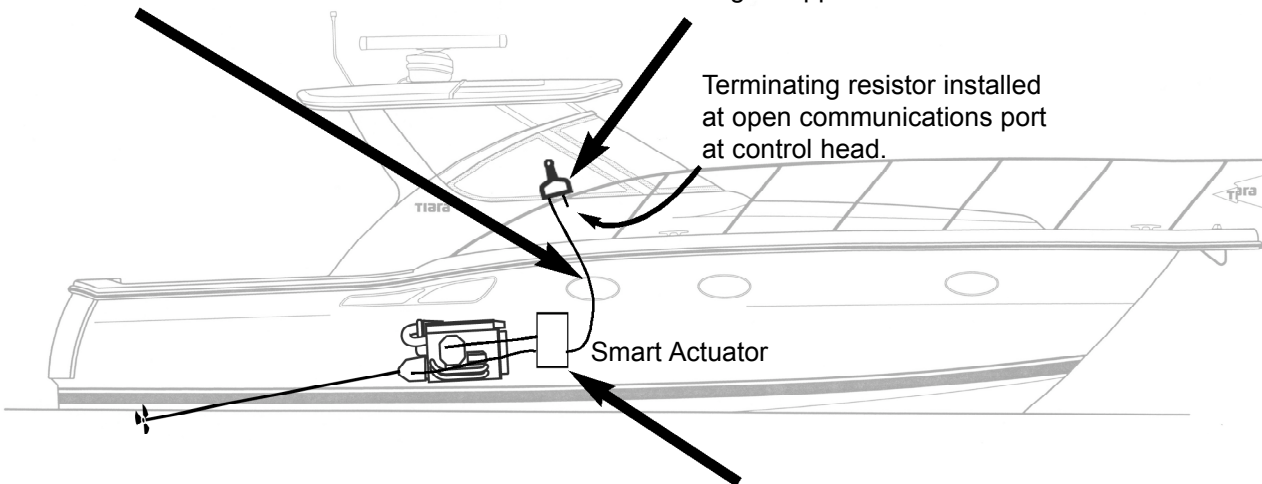
● **EEC3 System Layouts**

Single Station Layout

Single cable connects control head to control processor.

Standard CP Control Head must be installed for single engine applications

Terminating resistor installed at open communications port at control head.



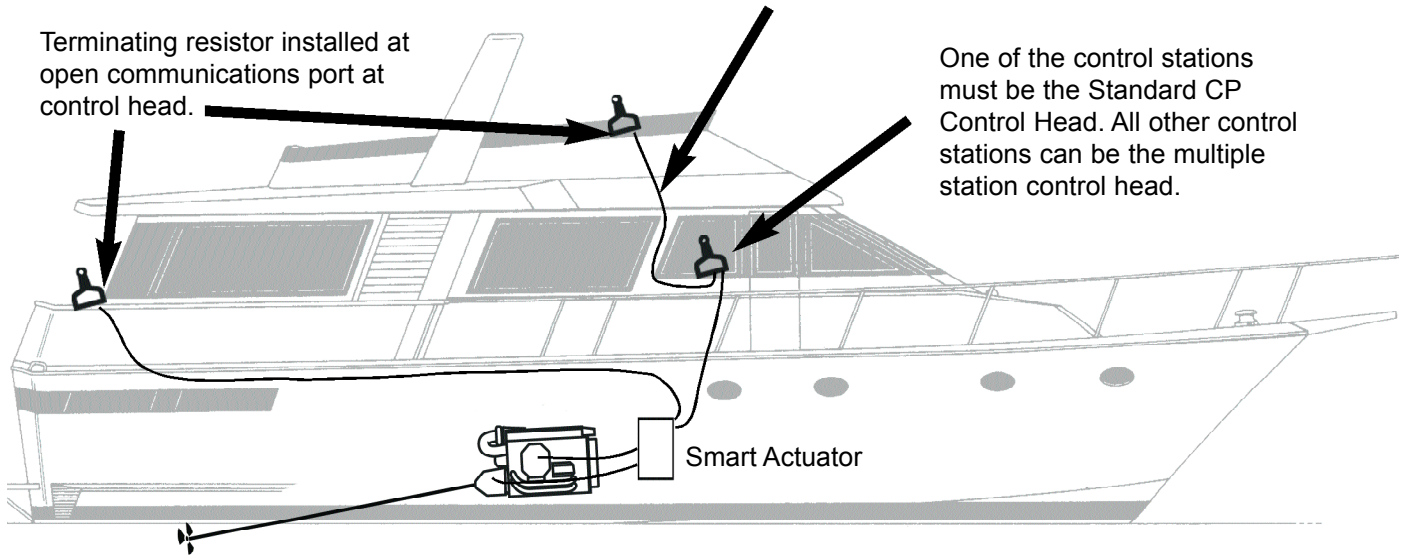
Terminating resistor installed at open communications port at Smart Actuator.

Multiple Station Layout

Single cable connects control head to control head (“daisy chained”).

Terminating resistor installed at open communications port at control head.

One of the control stations must be the Standard CP Control Head. All other control stations can be the multiple station control head.



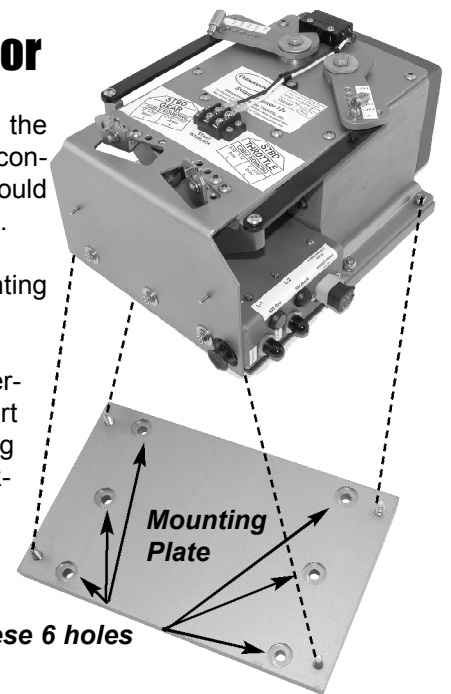
3.2 Engine Compartment — Mount the Smart Actuator

The Smart Actuator(s) can be mounted anywhere in the engine room providing that the Actuator(s) is reasonably accessible so that inspection and/or repairs to the unit, and connection of throttle and/or gear control cables may be performed. The Smart Actuator should NOT be installed in adverse locations subject to saltwater exposure or excessive heat.

The installation process consists of two steps: (1) installing the Smart Actuator Mounting Plate and (2) connecting the Smart Actuator to the mounting plate.

STEP 1: Once the proper location for the mounting of the Smart Actuator has been determined (see Pre-Installation Planning section 3.1 for guidelines), mount the Smart Actuator Mounting Plate using (6) 1/4" (7mm) machine bolts or lag screws. If using lag screws, screw length should be no less than 1-1/2" (38mm). If using machine bolts, lock-washers or locknuts MUST be used.

STEP 2: Attach the Smart Actuator to the mounting plate using (4) 1/4" - 20 nuts with lockwashers.



3.3 Engine Compartment — Control Cable Connections

A. Using the control cable swing clamp, mount the throttle / gear / troll lever control cables in their respective locations on the engine and transmission. Mount cables - do not connect the cable ends to the control levers at this time (NOTE: Although 43c cables can be installed with our system, we recommend premium grade, Type 33C control cables as

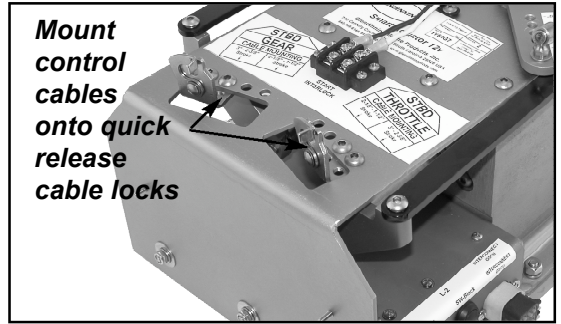
the best cable choice).

B. Install swivel ball joints on the end of each control cable, ensuring that you have at least 1/2" (13 mm) of thread engagement. Do not tighten the cable jam nuts yet.

NOTE

In some cases, sufficient over-travel will not be able to be obtained even with adjustment of the cable clamp holder. This is caused by the connection point on the engine or transmission lever (normally called the pivot pin) being too far away from the shaft that the lever is connected to. In these cases, the pivot pin will have to be moved closer to the shaft (the "fulcrum point") in order to shorten the pivot pin travel. This will give you the correct over-travel required. The recommended length of travel of the control lever pivot pin should be approximately 2-1/2" to 2-3/4".

Mount control cables onto quick release cable locks



C. Compare the travel of each control cable to its associated lever at the transmission and engine. Ensure that each control cable has "over-travel" or that the cable is able to travel farther than the lever that it will be attached to. Check this for both ends of travel. If the control cable will not "over-travel" in both directions, adjustments will have to be made:

- If 1/4" or less adjustment is required, the terminal eye on the end of the cable may be screwed on or off the cable end. Ball joint thread engagement on the control cable end must never be less than 1/4".
- If more than 1/4" inch adjustment is necessary to achieve correct over-travel, the cable clamp position on the engine or transmission will have to be moved.

Once correct control cable over-travel is verified, connect the terminal eye of each control cable to the engine governor / throttle and transmission lever and install the pivot pin cotter pins or clips. Tighten the control cable terminal eye jam nuts.

D. After the control cable terminal eyes are attached to the control levers on the engine governor and transmission, measure the amount of travel for each control cable. Do this measurement at the actuator end of the control cable. (This is the distance that the cable will travel when the engine or transmission control lever is moved from one mechanical stop to the other. Record the information below - this information is needed in order to determine the correct cable connection on the Actuator coupler plates.

PORT ENGINE		STARBOARD ENGINE	
CONTROL CABLE	LENGTH OF TRAVEL	CONTROL CABLE	LENGTH OF TRAVEL
Throttle		Throttle	
Gear		Gear	
Troll Valve		Troll Valve	

E. Once the control cables are properly attached to the engine governor / throttle and transmission control levers as described above in paragraphs A, B, and C, they may be connected to the Actuator levers as described below in paragraphs F, G, H and I. The following summarizes this process:

Paragraph F - Select the correct control cable mounting location on the Actuator, depending on the length of control lever / control cable travel.

Paragraph G - Move the ball joint ball pin on Actuator plate to the correct actuator travel.

Paragraph H - Select the correct coupler plate connection hole to be used, depending on length of control cable travel.

Paragraph I - Adjust control cable terminal prior to attaching to Actuator coupler plate

F. Mount the engine / transmission control cables to the proper control cable mounting location on the actuator. There are two possible mounting locations on the actuator for the control cables depending on the length of control cable travel - the distance measured in paragraph D. above. For control cable travel between 1-1/2" and 2-3/16", mount the control cable in the SHORT Travel Mounting location. For control cable travel between 2-1/4" and 3-1/8", mount the control cable in the LONG Travel Mounting location. (See the following drawing for clarification). Use the middle set of holes in each mounting location slot to mount the cable.

3.4 Engine Compartment — Electrical Connections

A. Battery Power Supply Connections to the Actuator(s)

In the installation of any electronic device, the source of power is one of the most important factors to consider during the installation. The Glendinning Electronic Engine Control has a unique and very reliable power supply system which, if the system is properly installed, greatly improves the overall reliability of the engine control system. *NOTE: The EEC can use 12 or 24V DC power, however, see the specific wiring diagram (see sec 7.1, or supplied by GMP technician) for the correct power to use. In some installations it is required to use 24V DC instead of 12V DC.*

The Glendinning EEC system is equipped with a sophisticated power management system that allows it to receive power from two (2) independent batteries (normally the port and starboard engine start batteries). In normal operation, the EEC will receive power from both battery sources, taking power from each battery proportionate to the voltage from level available. In the event of loss or reduction of voltage from one battery source, such as during engine start, the EEC system will continue to function normally by receiving power from the other battery with normal voltage.

1) Connect the EEC DC Power Harness (supplied) to two (2) independent battery sources, (normally the port and starboard engine start batteries). On the positive side of these two runs, install a 15amp circuit breaker near each battery or power source (follow ABYC standards which require a circuit protection device within 7" of the wire connection to the power source — NOTE: If the total wire run is longer than 15 feet from the battery to the Control Processor, install an approved junction box that the DC Power Cable may be connected to).

2) Make sure that the breakers are in the OFF position and then connect the "DC Power" to the Control Processor where indicated (see detail above).

3) Run a bonding wire (#12 AWG, green jacket) from one of the actuator mounting bolts (1/4").

B. Remote Enable Switch

While the boat is tied up at the dock and not in use, it is recommended that the EEC system be turned off. Since power is normally supplied directly to the Engine Processor from power sources in the engine room, turning power ON and OFF in the engine room may be difficult to do each time the system is started up. For this reason, a remote enable switch is available for use with the EEC control system. This enable switch allows power to the system to be turned ON or OFF at the Main station.

The EEC System Enable Switch is installed as follows:

1. Make sure the circuit breakers that control the power to the Control Processor are turned off before starting this installation.

2. Install a Single Pole, Single Throw (SPST) switch in the instrument panel. GMP has a switch/nameplate assembly designed for this purpose. The switch features a locking rocker that eliminates inadvertant activation of the switch. *NOTE: If installing a switch other than GMP's, locate the switch in an area where it will not be inadvertently turned OFF during operation.*

3. Connect switch to harness provided.

NOTE: Do not connect an indicator light to the remote enable switch connections.

NOTE: A “jumper” can be installed in the place of wires on the connector at Smart Actuator. Power may then be turned OFF and ON by using the 10amp breakers installed at battery input.

C. Start Interlock

The Smart Actuator system includes a “start interlock” safety feature — this feature verifies that the transmission control lever is in Neutral prior to starting the engines. In order to utilize this product feature, the signal wire from the helm station start switch to the engine starter solenoid must be intercepted and run through the control switches within the Control Processor.

To install the Start Interlock system:

- 1) Run a wire to the terminal strip on the front of the actuator marked “Start Interlock”.
- 2) Route these wires to the engine distribution box and connect using appropriate connectors (see wiring diagram).

D. Tachometer Sender Inputs

The purpose of the tachometer sender is to provide RPM information to the EEC system. This information is used by the System during engine synchronization. Installation of the tachometer senders is relatively straightforward. The following points should be considered:

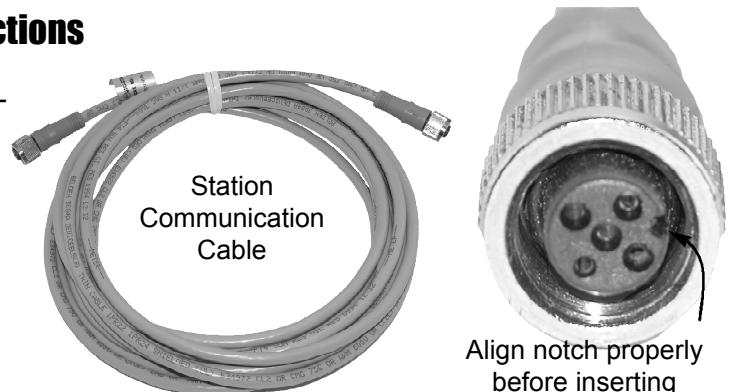
- 1) Only tachometer senders that are supplied by GMP are to be used with the EEC system.
- 2) On engines equipped with mechanical tachometer outlets, such as Detroit Diesel, Caterpillar 3208, MAN, etc. the tach senders may be directly connected to the tachometer outlet on the engine. The tach senders that are supplied by GMP are “in-line” senders; that is, they may be installed between the engine tachometer connection and any other tachometer senders or tachometer drive cables that are attached to that tachometer connection.
- 3) On engines that are not equipped with a tach sender outlet, such as Volvo Diesel or any gasoline engine, a mechanical tachometer adapter will have to be used. See the back of the Installation Manual (Section 6.2) for a list of applicable drive adapters and drive adapter installation instructions.
- 4) The tach senders must be driven at a speed that corresponds to 1/2 engine speed. This is normal on most engines that have mechanical tachometer outlets or that use a mechanical drive adapter. On some engines, it may be possible to drive the tach sender at 1:1 or even twice engine speed. If this is done, the Engine Processor will be damaged due to excessive voltage output from the tach sender. To check for excessive tach sender speed, set your meter on frequency or hertz, verify that at full open the frequency is no larger than 5000 hz. (If you cannot check frequency, check the voltage from the tach sender while the engine is running at full speed. No more than 18 VAC should be present at the tachometer sender terminals.)

E. Station Communication Cable Connections

Review comments made in Pre-Installation Planning, paragraph 12, for determining proper routing of cables. Cables are manufactured in 20' increments and are available from 20 - 120 feet.

When routing and connecting station communication cables, BE SURE TO DO THE FOLLOWING:

- Use a terminating resistor at each end of the bus (see diagram pg. 11).



- Align the cables before connecting them to the proper connector on the Control Head and/or Smart Actuator(s).

**REMEMBER:**

—Connector nut requires 6 turns of the nut to be fully seated, failure to do this will result in inconsistent operation of the system.

—If the connector is properly aligned, only a small amount of force will be necessary to insert the connector into the Control Processor or Control Head. Failure to properly align connector may damage the pins and cause the system to fail.

F. Solenoid Gear Interface Box

The Solenoid Gear Interface Box communicates information necessary for the control of the Smart Actuator(s) and your boat's solenoid controlled transmissions. The components of the Solenoid Gear Interface Box are:

- DC Power Harness
- Gear Harnesses (Port & Starboard)
- Start Interlock Harness
- Interconnect Harness

Installation of the Solenoid Gear Interface Box is very easy and requires two main steps. They are:

STEP 1: Mount the Interface Box near the Smart Actuator using (4) screws. An ideal location would be next to the Smart Actuator directly under the control cables as they leave the Actuator.

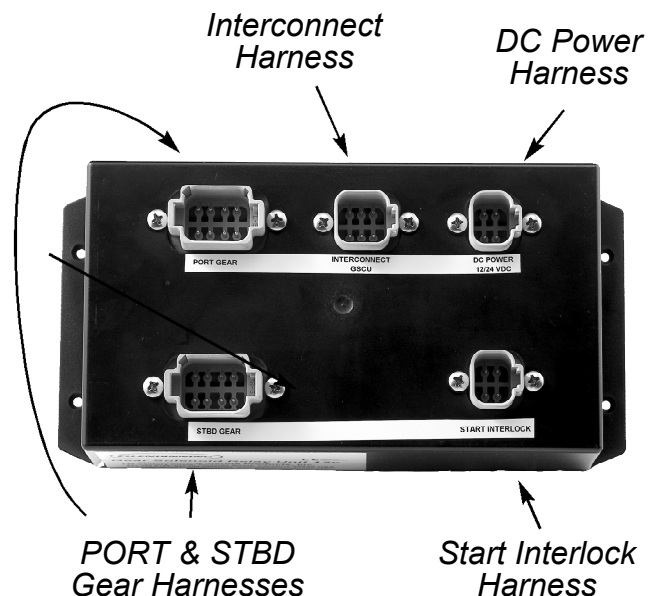
STEP 2: Connect the various harnesses (see below):

a. **DC Power Harness** — The DC power harness for the Smart Actuator comes equipped with two connectors. One connector plugs into the proper receptacle on the Smart Actuator. The other connector plugs into the appropriate labeled receptacle on the Solenoid Gear Interface Box.

b. **Gear Harnesses** — One end of the the Port and Starboard Gear Harnesses is connected to the Solenoid Gear Interface Box in the properly labeled receptacles. The other end is connected to the appropriate (Port or Starboard) gear solenoid on your engines.

c. **Start Interlock Harness** — The Start Interlock Harness should be connected to the appropriate labelled connector on the Interface Box and the engine starter solenoid.

d. **Interconnect Harness** — Normally 1' long, this cable connects to the 6 position connector on the Smart Actuator and the Solenoid Gear Interface Box.



3.5 Mounting the Control Head

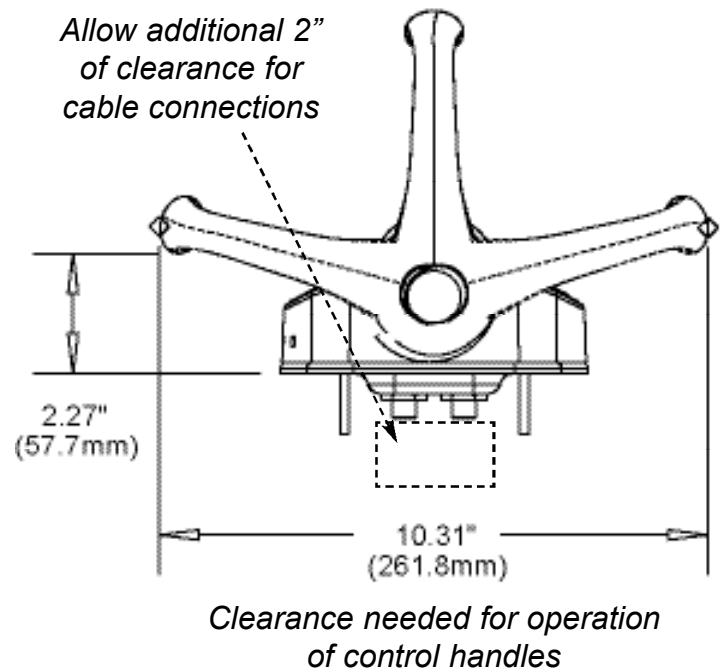
One of the most important factors in selecting control head locations is the ability to control the vessel by allowing FULL movement of the control head handles. The area around the control head should have proper drainage to eliminate standing water. Although the control heads are sealed to withstand damage from exposure to moisture, they are not designed to be submerged.

There are two types of control heads available with the Smart Actuator system — they are the Main CP control head and the Multi station control head. Both the main and multi station control heads perform all functions necessary for the control of your boat's propulsion system. The Main CP control head also includes the necessary components built-in for communication between all control stations along the CANbus network and the Smart Actuator(s). For single station applications you will need the Main CP control head. For multiple station applications you are required to have (1) one Main CP control head and the other control heads may be the multi station control heads.

STEP 1: Mark the location for the Control Head using the template provided (see pg. 53). Cut the 3-3/8" x 4-7/8" hole.

STEP 2: Place the Control Head assembly into the cutout. The Control Head clamps, which hold the control head against the console, have a break off point indicated by a perforation. For consoles 1/4" to 1" thickness, use bracket as supplied. For 3/4" to 1-5/8" thickness, break off clamp at 3/4" break off point.

STEP 3: Install Control Head clamps and tighten wing nuts provided. Make sure Control Head is firmly mounted to console.



4.0 System Configuration

Introduction

System configuration customizes the Complete Control system to suit operator preference. There are three different configuration modes which allow you to make changes to the three (3) components that can be configured. See the sections listed below for more complete details for each configuration mode:

- 4.1 — Control Processor (CP) Configuration Mode
- 4.2 — Control Head Configuration Mode
- 4.3 — Smart Actuator Configuration Mode

The **Control Processor (CP) Configuration Mode** — the Control Processor (CP) Configuration Mode will allow you to make changes to the control processor functions which are located in the Standard CP Control Head. These changes will affect different operational functions for the Complete Control System (for more complete details, see section 4.1).

The **Control Head Configuration Mode** — each Multi Station Control Head that you add to the CANbus network will need a specific **handle identifier** which allows the control head to “talk” to the network (for more complete details, see section 4.2).

The **Smart Actuator Configuration Mode** — allows you to set actuator ids and calibrate the Smart Actuator for use with your boat’s engine gear and/or throttle levers (for more complete details, see section 4.3).



For NEW installations GMP has already configured the Complete Control System to the specifications given to us at the time of your order. The only configuration that needs to be done by the NEW installer would be the Smart Actuator Configuration (see section 4.3).

4.1 Control Processor (CP) Configuration Mode

Introduction

Although configuration of the control processor was performed at GMP from the information given at the time the order was placed, changes to the control processor configuration can be made at any time according to operator preference. Changes to the control processor configuration are entered from the **control head keypad**. Follow the instructions for each option when making changes.

To Enter CP Configuration Mode

The configuration of the control processor can be best described by 3 steps:

- Preparing the system
- Choosing the feature to change and
- Saving the selection

● Preparing the System (Fig. 1 & 2)

STEP 1 — Move the handles to the FULL AHEAD position at the main station (that is the station that is in control when the system is first turned ON).

STEP 2 — Turn system ON.

STEP 3 — Press and release the WARM button three (3) times. All the LEDs will

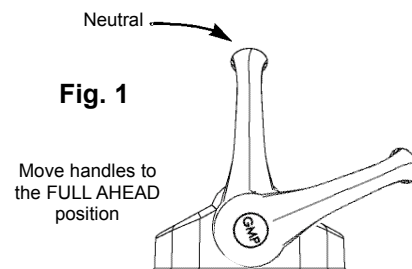


Fig. 1

start flashing indicating that you have entered the configuration mode (Fig. 2).

● **Choosing the Feature to Change** (Fig. 3)

STEP 4 — Once in configuration mode, you can **advance through the configuration features by pressing and releasing the ACTIVE or SYNC button**. The LEDs will indicate which feature you have selected (Fig. 3). For more information on configuration features, see pgs. 22-32.

● **Saving the Selection** (Fig. 4)

STEP 5 — To store your configuration selection, **press and release the WARM button**. By pressing the WARM button, your selection will be recorded and you will be able to make another feature selection or exit calibration mode (Fig. 4).

FIGURE 2

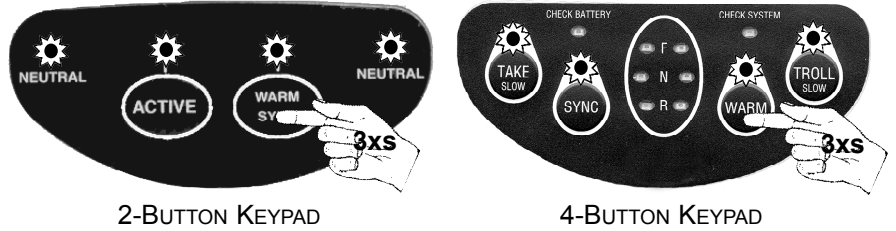
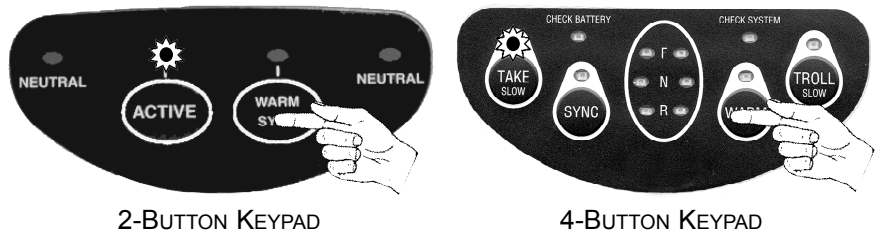


FIGURE 3



FIGURE 4

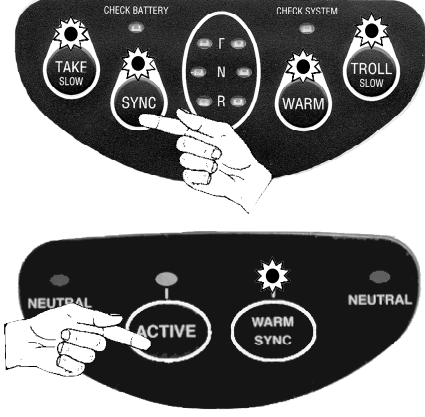
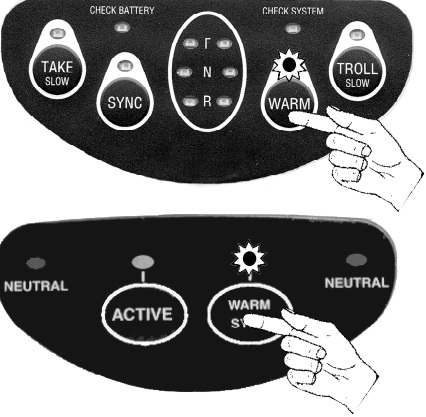
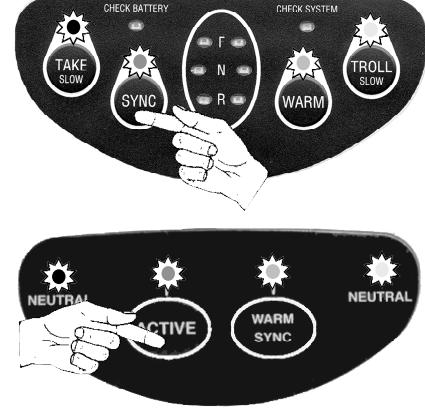
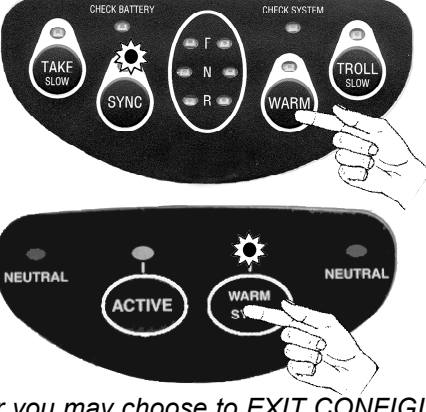


Control Processor Configuration Options

Actuator Optionspg. 27
 Throttle on Top of Troll Optionspg. 28
 Troll Delay Optionspg. 30
 Throttle Delay Optionspg. 32
 Gear Delay Optionspg. 34
 High-Idle Step Size Options, PT 1pg. 36
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 System Startup Mode Optionspg. 40
 Station Transfer Optionspg. 42
 Set Configuration Settings to Default Valuespg. 44
 Sync Gain Optionspg. 46

Actuator Options

Once you have entered the CP Configuration Mode you can select which actuator configuration your boat has:

<p>1</p> 	<p>Press SYNC 1 times for Actuator Options (WARM LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 1 times for Actuator Options (WARM LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Actuator Options</p> <p>or</p> <p>Press ACTIVE to cycle through Actuator Options</p>	<p>4</p>  <p>Press WARM to save Actuator Option</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Actuator Options In Depth

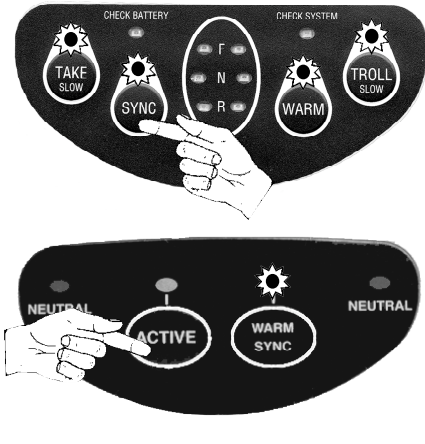
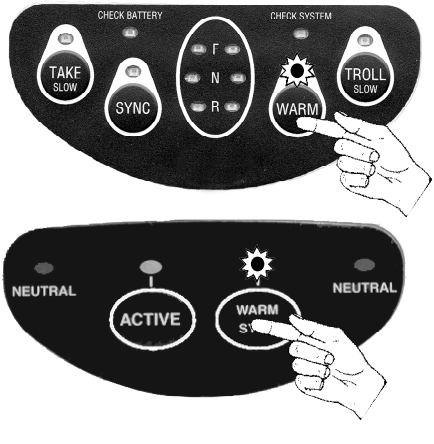
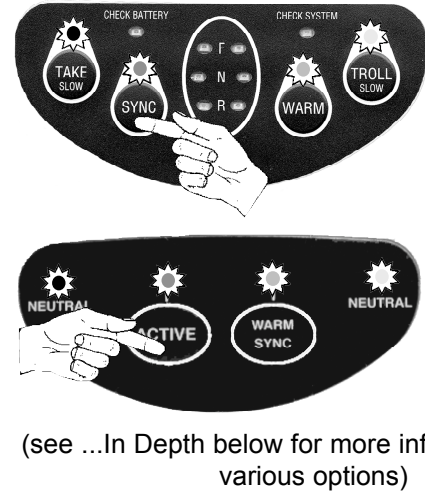
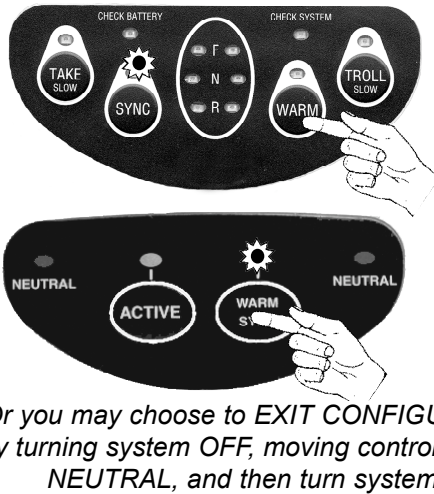
Mechanical Throttle / Mechanical Gear (default) — TAKE LED or PORT Neutral LED ON > Choose this selection if your boat is equipped with mechanical throttle and mechanical gear levers.

Mechanical Throttle / Mechanical Gear / Mechanical Troll — SYNC LED or ACTIVE LED ON > Choose this selection if your boat is equipped with mechanical throttle, mechanical gear, and mechanical trolling valves.

Mechanical Throttle / Electric Gear — TAKE & SYNC LED or PORT Neutral & ACTIVE LED ON > Choose this selection if your boat is equipped with mechanical throttle and electric gear.

Mechanical Throttle / Electric Gear / Mechanical Troll — WARM LED ON > Choose this selection if your boat is equipped with mechanical throttle, electric gear, and mechanical trolling valves.

Throttle on Top of Troll Options

<p>1</p> 	<p>Press SYNC 2 times for Throttle on Top of Troll Options (SYNC LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 2 times for Throttle on Top of Troll Options (ACTIVE LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Throttle on Top of Troll Options</p> <p>or</p> <p>Press ACTIVE to cycle through Throttle on Top of Troll Options</p>	<p>4</p>  <p>Press WARM to save Throttle on Top of Troll Option</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Throttle on Top of Troll Options In Depth

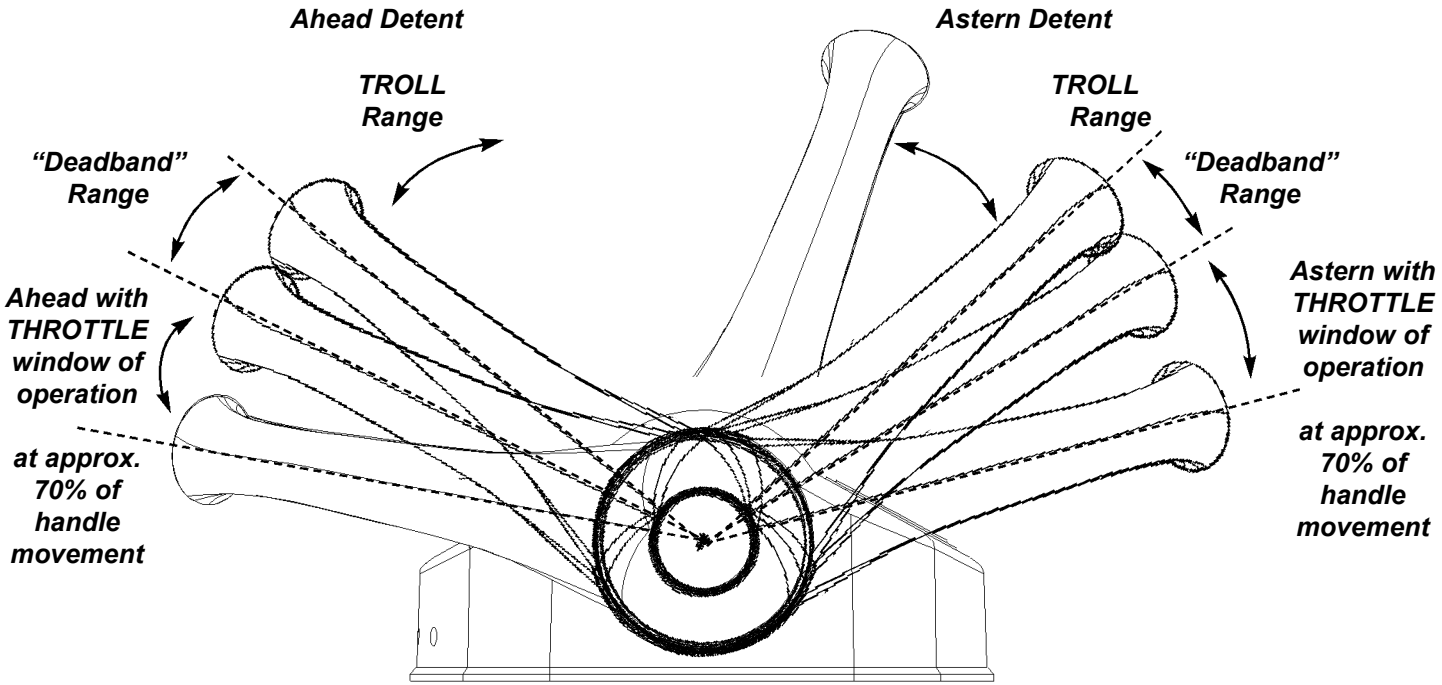
NO Throttle on Top of FULL Lockup (default) — No LEDs ON > Choose this selection if you DO NOT want to allow 1/3 throttle output after reaching full lockup on the trolling valve outputs.

Throttle on Top of FULL Lockup (1/3 throttle range) — TAKE LED or PORT Neutral LED ON > Choose this selection if you want to allow 1/3 throttle output after reaching FULL lockup on the trolling valve outputs.

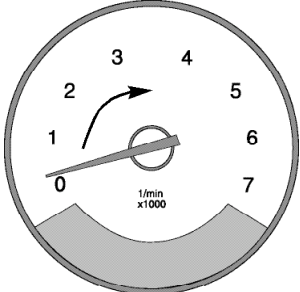
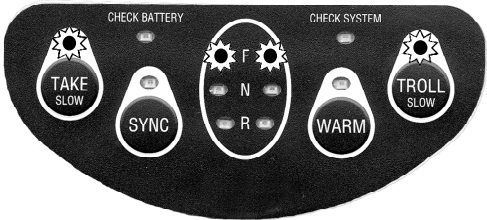
Throttle on Top of Troll Illustrated

While operating in Troll Mode there are times when it becomes necessary to switch from Trolling Valve operation to normal throttle range. One way to do this would be to bring handles to the Neutral gear position and exit trolling mode, however, this is time consuming especially when that trophy fish is on-line. Glendinning provides this unique feature called “Throttle on Top of Troll” to allow you to stay in Trolling Mode while being able to apply the throttle range when the control handles enter a designated window of operation.

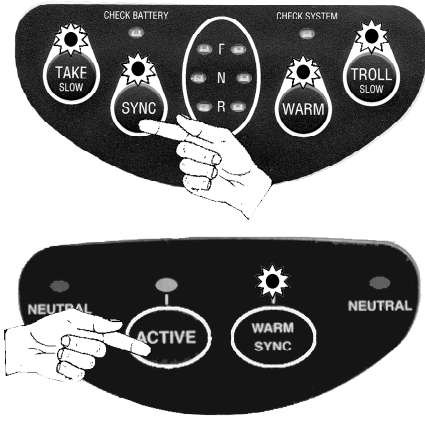
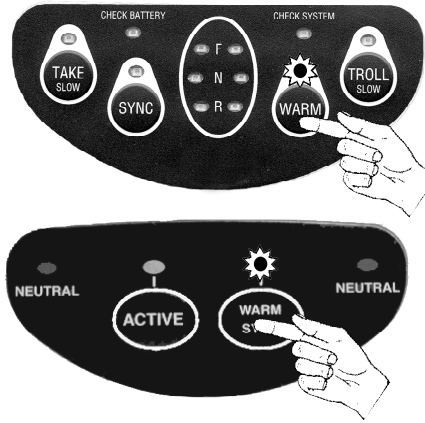
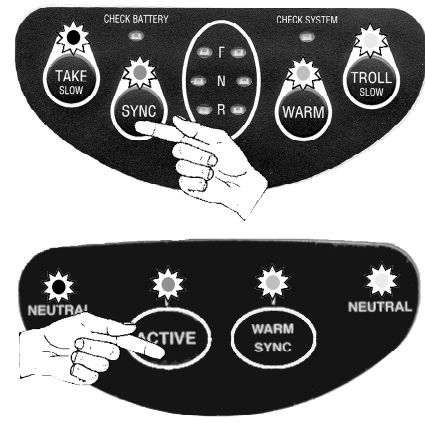
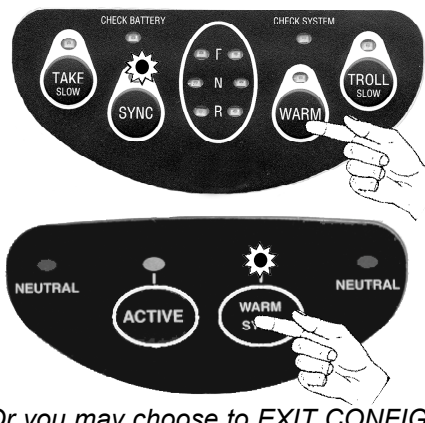
Throttle on Top of Troll Operation



The “deadband” range allows the transmission to get into gear from trolling valve operation before RPMs are increased.



Troll Delay Options

<p>1</p> 	<p>Press SYNC 3 times for Throttle on Troll Delay Options (SYNC LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 3 times for Troll Delay Options (ACTIVE LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Troll Delay Options</p> <p>or</p> <p>Press ACTIVE to cycle through Troll Delay Options</p>	<p>4</p>  <p>Press WARM to save Throttle on Top of Troll Option</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Troll Delay Options In Depth

NO Troll Delay (default) — No LEDs ON > Choose this selection if you DO NOT have trolling valves or DO NOT want a delay to occur before re-entering TROLL Mode.

1.0 Second Troll Delay — TAKE or PORT Neutral LED ON > Choose this selection if you want to allow a 1 second delay before re-entering TROLL Mode.

2.0 Second Troll Delay — SYNC or ACTIVE LED ON > Choose this selection if you want to allow a 2 second delay before re-entering TROLL Mode.

3.0 Second Troll Delay — TAKE & SYNC or PORT Neutral & ACTIVE LED ON > Choose this selection if you want to allow a 3 second delay before re-entering TROLL Mode.

4.0 Second Troll Delay — WARM LED ON > Choose this selection if you want to allow a 4 second delay before re-entering TROLL Mode.

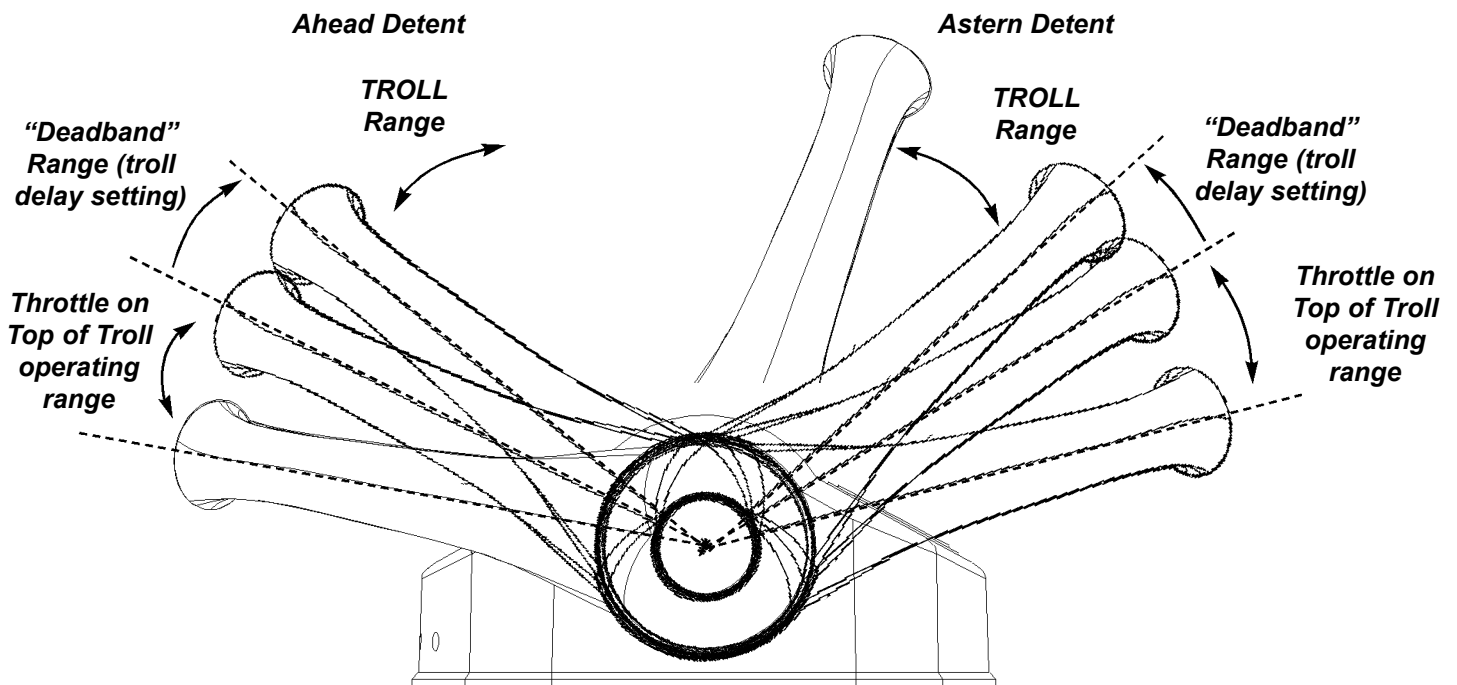
5.0 Second Troll Delay — TAKE & WARM or PORT Neutral & WARM LED ON > Choose this selection if you want to allow a 5 second delay before re-entering TROLL Mode.

Troll Delay Illustrated

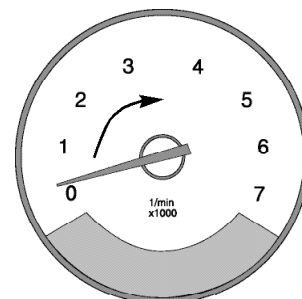
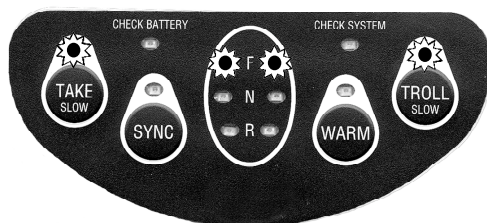
Troll Delay is the “deadband range” (described in the Throttle on Top of Troll option, pg. 29) that can be set between the normal troll valve operation range and throttle on top of troll. This features allows your engine’s transmission to fully engaged (either full lockup or full slip) before rpms are increased.

When you move the handles out of the deadband range ...

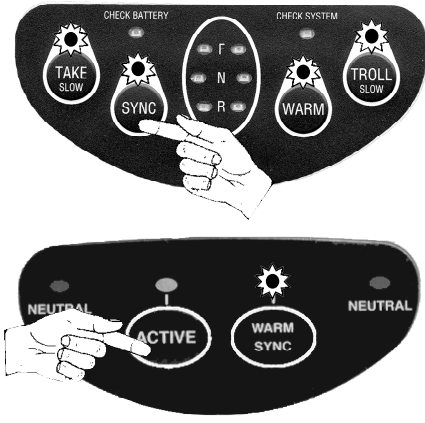
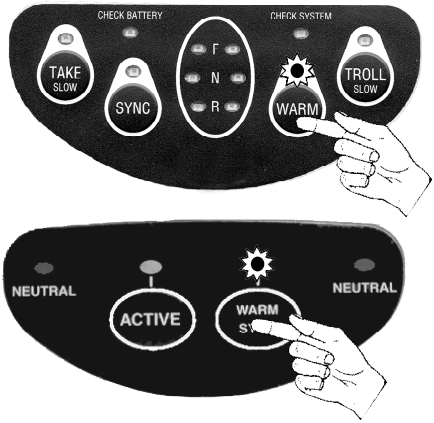
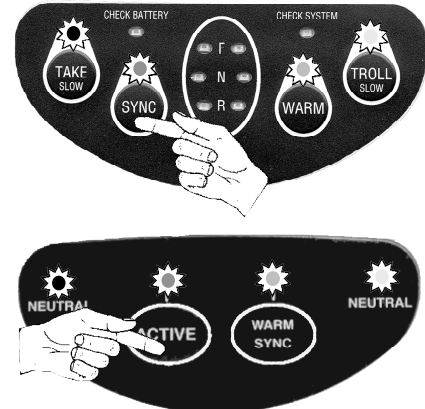
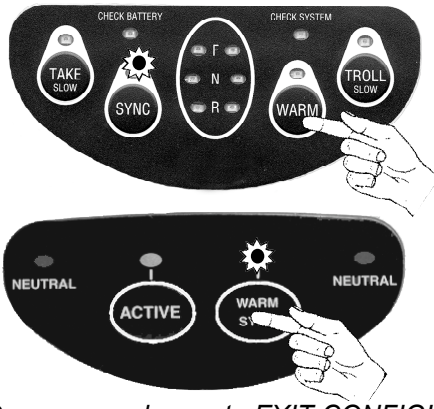
Neutral Position



... the transmission fully engages before RPMs are increased



Throttle Delay Options

<p>1</p> 	<p>Press SYNC 4 times for Throttle Delay Option (WARM LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 4 times for Throttle Delay Option (WARM LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Throttle Delay Options</p> <p>or</p> <p>Press ACTIVE to cycle through Throttle Delay Options</p>	<p>4</p>  <p>Press WARM to save Throttle Delay Option selection</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Throttle Delay Options In Depth

NO Throttle Delay (default) — No LEDs ON > Choose this selection if you DO NOT want a delay when moving from ahead/astern gear detent into the throttle range.

1.0 Second Throttle Delay — TAKE LED or PORT Neutral LED ON > Choose this selection if you want a 1 second delay before the engine's rpms increase when moving control handles beyond the ahead / astern detents into the throttle range.

2.0 Second Throttle Delay — SYNC LED or ACTIVE LED ON > same as above with a 2 second delay.

3.0 Second Throttle Delay — TAKE & SYNC LED or PORT Neutral & ACTIVE LED ON > same as above with a 3 second delay.

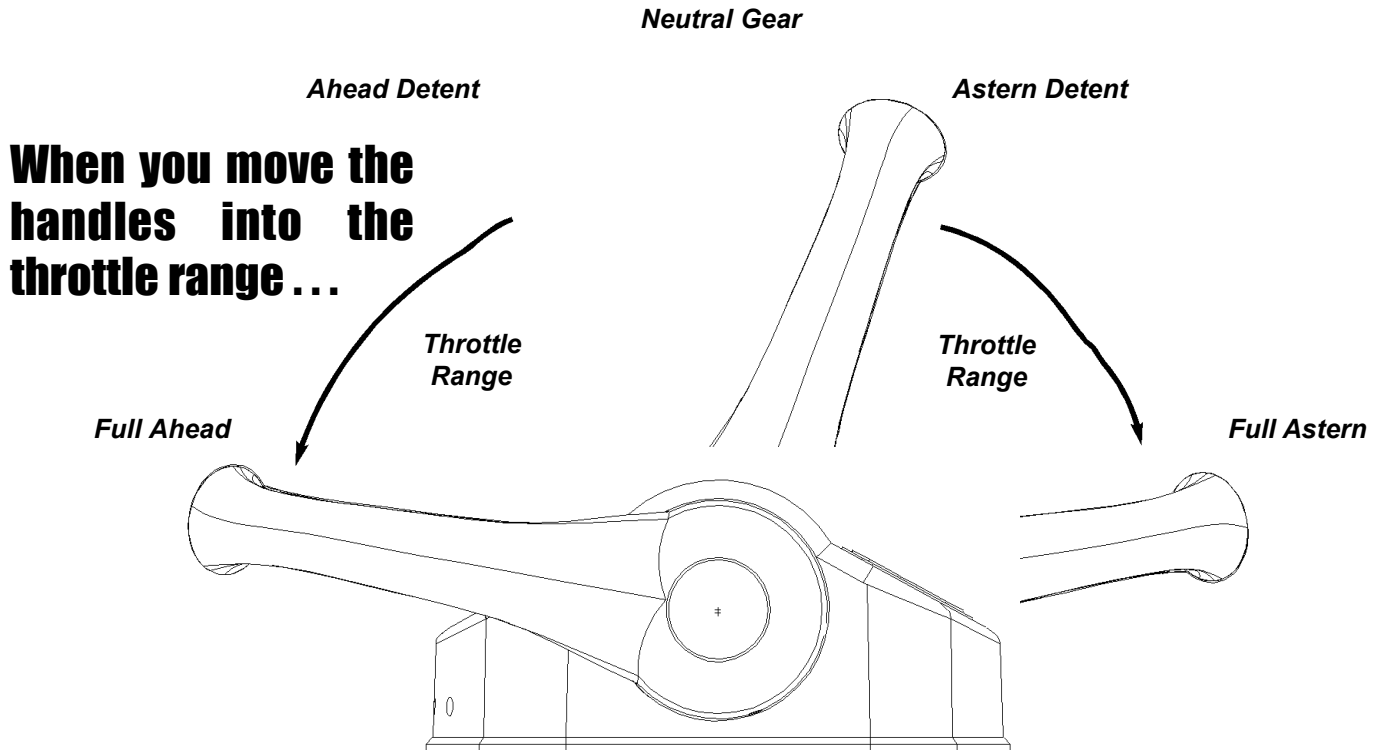
4.0 Second Throttle Delay — WARM LED ON > same as above with a 4 second delay.

5.0 Second Throttle Delay — TAKE & WARM LED or PORT Neutral & WARM LED ON > same as above with a 5 second delay.

Throttle Delay Illustrated

Throttle Delay is best explained as the interval that elapses between the movement of the control handle into the throttle range and the engine's rpm increasing to correspond with that handle movement.

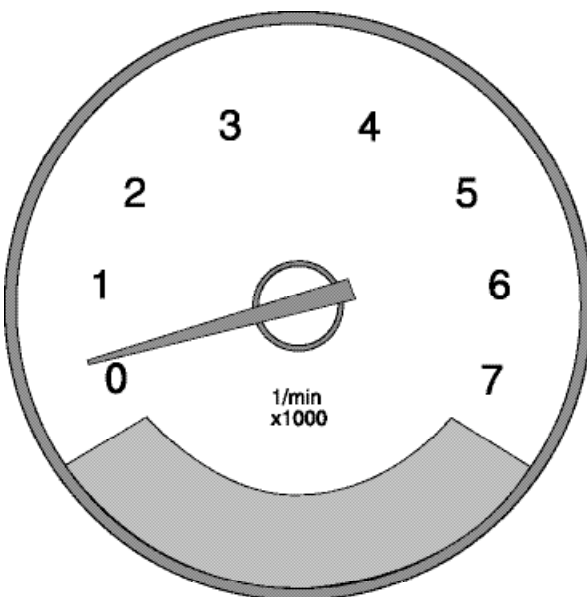
Glendinning offers 6 different settings for throttle delay depending on operator preference.



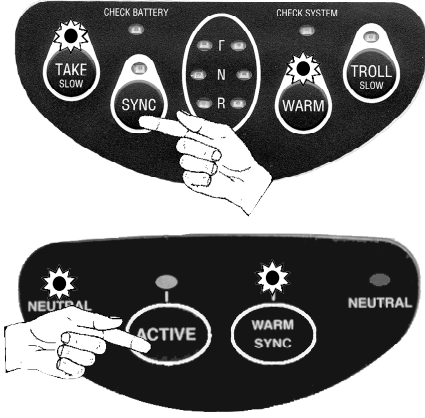
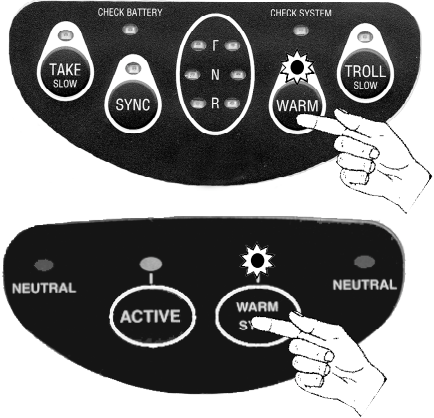
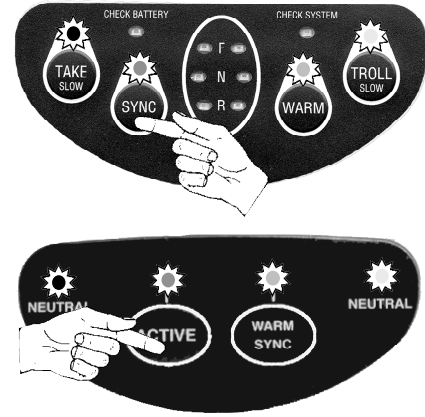
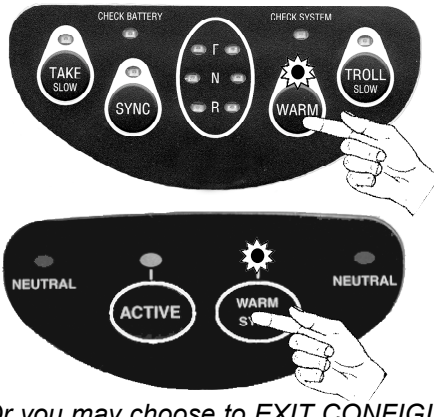
... RPM is delayed (or not delayed) depending on throttle delay setting chosen.

For Example:

If you choose throttle delay option of 2 seconds — when boat operator shifts from Neutral into the Ahead or Astern Detents or into the throttle range, a 2-second delay will occur BEFORE engine's RPMs are increased.



Gear Delay Options

<p>1</p> 	<p>Press SYNC 5 times for Gear Delay Option (TAKE & WARM LED will begin to flash) or Press ACTIVE 5 times for Gear Delay Option (Port Neutral & WARM LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection (BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Gear Delay Options or Press ACTIVE to cycle through Gear Delay Options</p>	<p>4</p>  <p>Press WARM to save Gear Delay Option selection (BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Gear Delay Options In Depth

NO Gear Delay (default) — No LEDs ON > Choose this selection if you DO NOT want to allow a delay when shifting from the throttle range to ahead/neutral/astern gear detents.

1.0 Second Gear Delay — TAKE LED or PORT Neutral LED ON > Choose this selection if you want a 1 second delay when shifting from the throttle range to ahead/neutral/astern gear detents.

2.0 Second Gear Delay — SYNC LED or ACTIVE LED ON > Choose this selection if you want a 2 second delay when shifting from the throttle range to ahead/neutral/astern gear detents.

3.0 Second Gear Delay — TAKE & SYNC LED or PORT Neutral & ACTIVE LED ON > Choose this selection if you want a 3 second delay when shifting from the throttle range to ahead/neutral/astern gear detents.

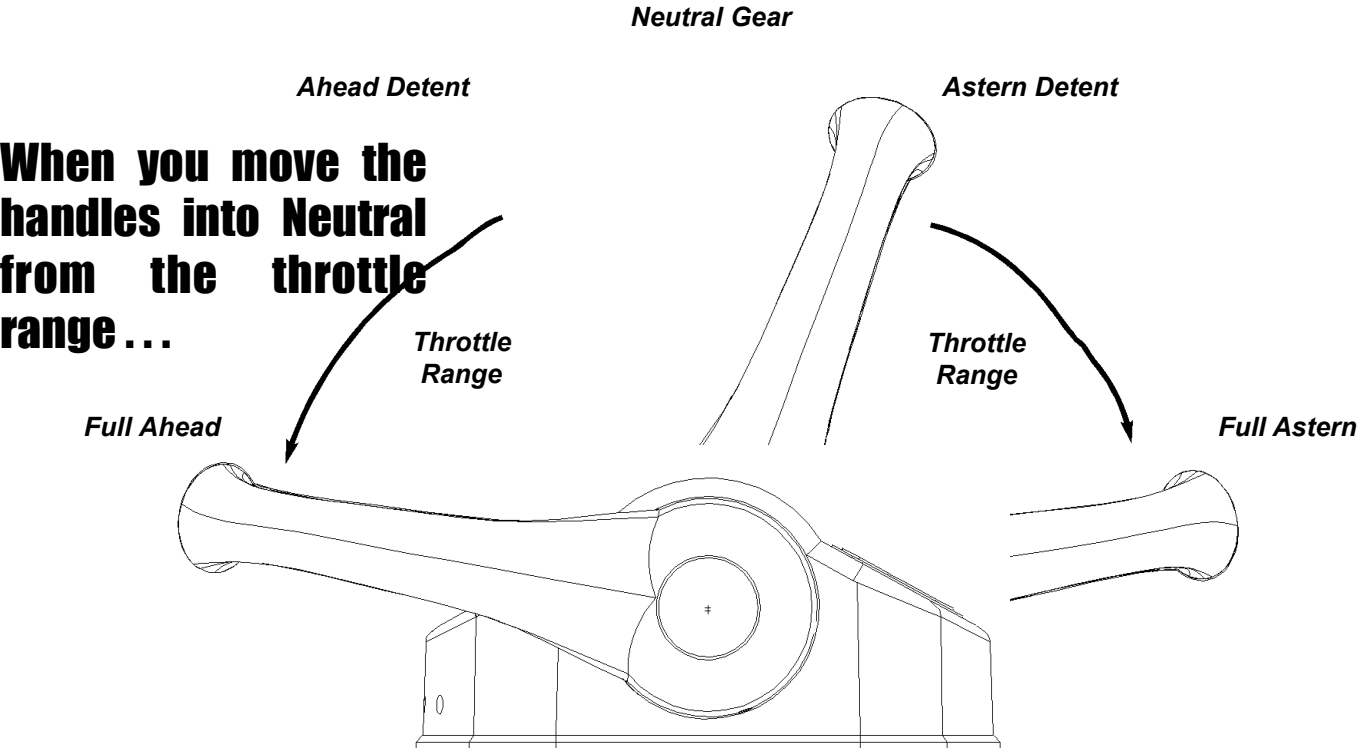
4.0 Second Gear Delay — WARM LED ON > Choose this selection if you want a 4 second delay when shifting from the throttle range to ahead/neutral/astern gear detents.

5.0 Second Gear Delay — TAKE & WARM LED or PORT Neutral & WARM LED ON > Choose this selection if you want a 5 second delay when shifting from the throttle range to ahead/neutral/astern gear detents.

Gear Delay Illustrated

Gear Delay occurs when the boat operator shifts from ahead / astern with throttle into neutral, allowing the engine's RPMs to reach idle before shifting into the desired gear.

Glendinning offers 6 different settings for gear delay depending on operator preference.



When you move the handles into Neutral from the throttle range ...




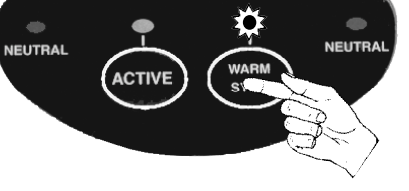

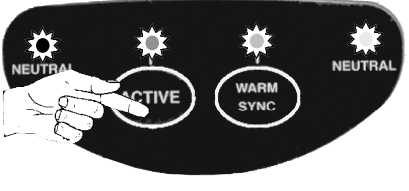

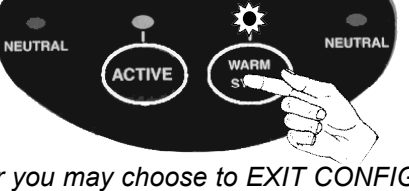
... shifting into gear is delayed (or not delayed) depending on gear delay setting chosen.

The diagram shows an RPM gauge with a scale from 0 to 7 (labeled '1/min x1000'). The needle is shown moving from a high RPM value towards 0. Below the gauge is a control panel with several buttons: 'TAKE SLOW', 'SYNC', 'WARM', and 'TROLL SLOW'. A large black arrow points from the RPM gauge down to the control panel.

For Example:

If you choose gear delay option of 2 seconds — when boat operator shifts from the Ahead or Astern Detents with throttle into Neutral, a 2-second delay will occur allowing the engine's RPMs to reach idle before transmission shifts into gear.

1st High Idle Step Size Options

<p>1</p>  <p>or</p> 	<p>Press SYNC 6 times for 1st High Idle Step Options (SYNC LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 6 times for 1st High Idle Step Options (ACTIVE LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p> 
<p>3</p>  <p>or</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through 1st High Idle Step Options</p> <p>or</p> <p>Press ACTIVE to cycle through 1st High Idle Step Options</p>	<p>4</p>  <p>Press WARM to save Throttle on Top of Troll Option</p> <p>(BOTH key - pad styles)</p>  <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

1st High Idle Step Size Options In Depth

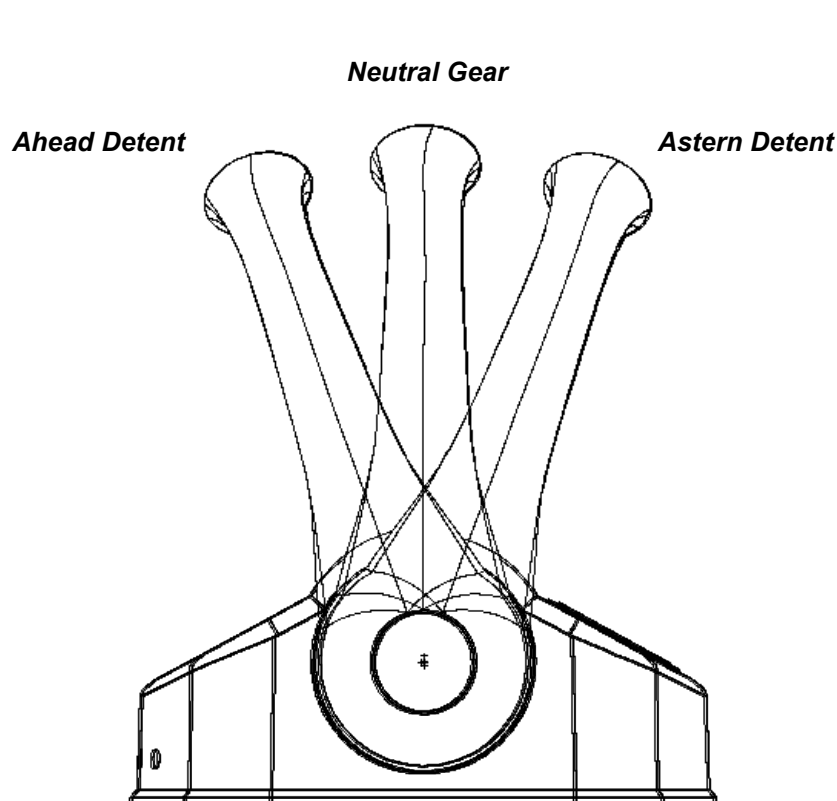
- 0.5% of Throttle Range — No LEDs ON > Choose this selection if you want to allow for a higher idle setting of 0.5% of throttle range.
- 1% of Throttle Range — TAKE or PORT Neutral LED ON > Choose this selection if you want to allow for a higher idle setting of 1% of throttle range.
- 2% of Throttle Range (default) — SYNC or ACTIVE LED ON > Choose this selection if you want to allow for a higher idle setting of 2% of throttle range.
- 3% of Throttle Range — TAKE & SYNC or PORT Neutral & ACTIVE LED ON > Choose this selection if you want to allow for a higher idle setting of 3% of throttle range.
- 4% of Throttle Range — WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 4% of throttle range.
- 5% of Throttle Range — TAKE & WARM or PORT Neutral & WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 5% of throttle range.
- 10% of Throttle Range — SYNC & WARM or ACTIVE & WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 10% of throttle range.
- 20% of Throttle Range — TAKE, SYNC, & WARM or PORT Neutral, ACTIVE, & WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 20% of throttle range.
- 30% of Throttle Range — TROLL or STBD Neutral LED ON > Choose this selection if you want to allow for a higher idle setting of 30% of throttle range.

1st High Idle Options Illustrated

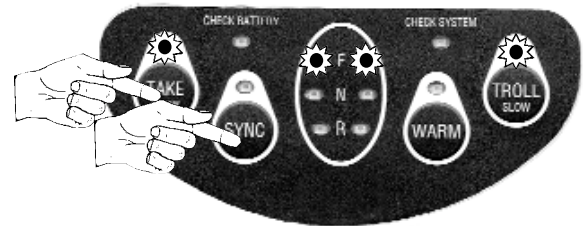
High idle settings allow the boat operator to adjust the idle speed according to operator preference. There are a total of 10 High Idle steps — the first high idle step is larger (from 0.5% to 30% of throttle range) than the remaining nine (from 0.5% to 5% of throttle range, see pg. 38). Setting the High Idle steps will determine how much the idle setting increases when the boat operator presses the appropriate buttons while in the ahead / astern detents or in neutral (you can not adjust idle speed when in the throttle range).

One reason why it may be desirable to have a higher idle setting is to improve your troll's responsiveness while in the trolling range.

When the boat operator enters Troll Mode and wishes to increase the engine's high idle setting he follows the procedure below - the amount of increase is determined by the setting configured on the opposite page.



To increase high idle — press & release the TAKE & SYNC buttons



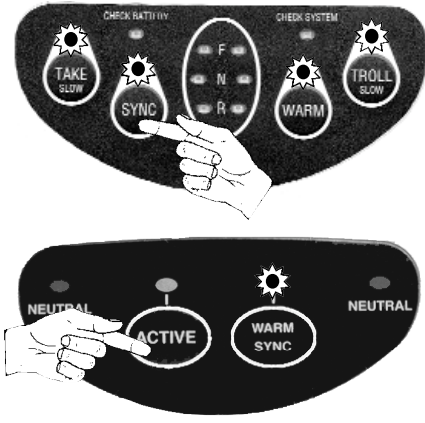
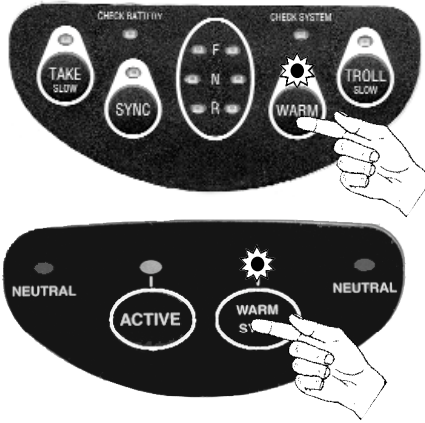
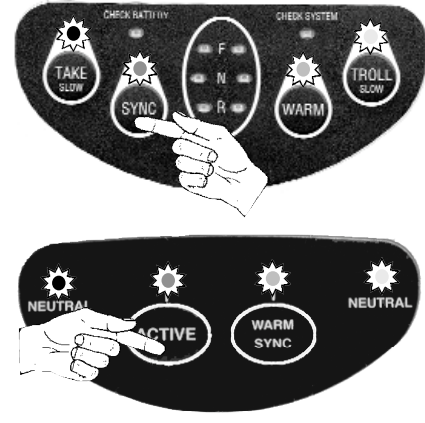
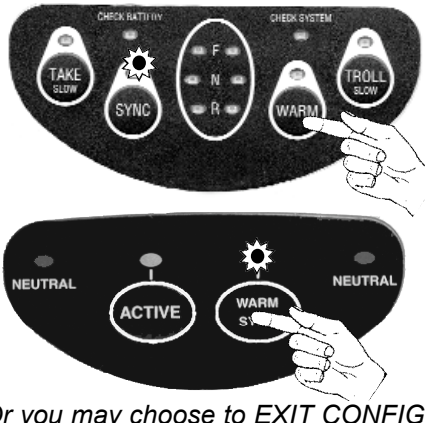
To reset to normal setting — press & release the TAKE button



To save high idle — press & release the TAKE & WARM buttons

Once the high idle setting has been stored in memory from the Troll Mode, the system will use that idle setting each time the system enter Troll Mode.

Remaining High Idle Step Options

<p>1</p> 	<p>Press SYNC 7 times for Remaining High Idle Options (SYNC LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 7 times for Remaining High Idle Options (ACTIVE LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>Press SYNC to cycle through Remaining High Idle Options</p> <p>or</p> <p>Press ACTIVE to cycle through Remaining High Idle Options</p> <p>(see ...In Depth below for more information about various options)</p>	<p>4</p>  <p>Press WARM to save Throttle on Top of Troll Option</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>	

Remaining High Idle Step Options In Depth

0.5% of Throttle Range — No LEDs ON > Choose this selection if you want to allow for a higher idle setting of 0.5% of throttle range..

1% of Throttle Range — TAKE or PORT Neutral LED ON > Choose this selection if you want to allow for a higher idle setting of 1% of throttle range.

2% of Throttle Range (default) — SYNC or ACTIVE LED ON > Choose this selection if you want to allow for a higher idle setting of 2% of throttle range.

3% of Throttle Range — TAKE & SYNC or PORT Neutral & ACTIVE LED ON > Choose this selection if you want to allow for a higher idle setting of 3% of throttle range.

4% of Throttle Range — WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 4% of throttle range.

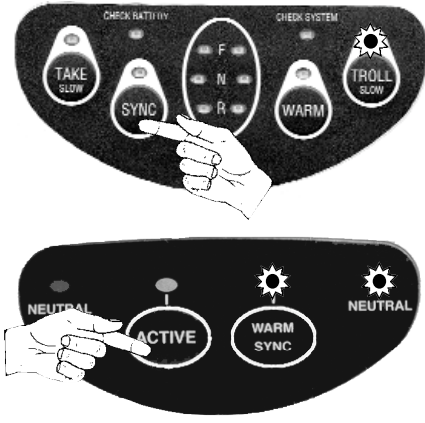
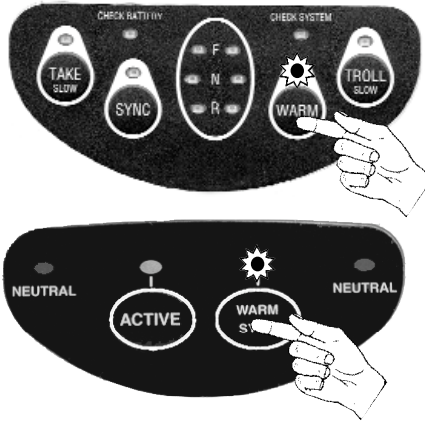
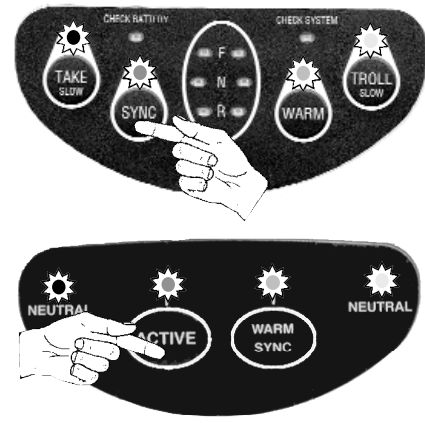
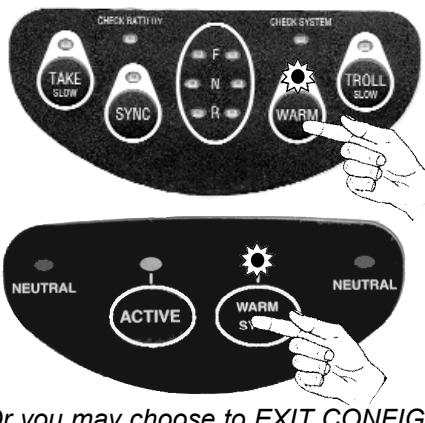
5% of Throttle Range — TAKE & WARM or PORT Neutral & WARM LED ON > Choose this selection if you want to allow for a higher idle setting of 5% of throttle range.

Remaining High Idle Options Illustrated

The remaining High idle settings allow the boat operator to adjust the idle speed in smaller increments (from 0.5% to 5% of throttle range) than the 1st High Idle Step explained on page 36. Setting the High Idle steps will determine how much the idle setting increases when the boat operator presses the appropriate buttons while in the ahead / astern detents or in neutral (you can not adjust idle speed when in the throttle range).

One reason why it may be desirable to have a higher idle setting is to improve your troll's responsiveness while in the trolling range.

System Startup Options

<p>1</p>  <p>Press SYNC 8 times for System Startup Option (TROLL LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 8 times for System Startup Option (Stbd Neutral & WARM LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>Press SYNC to cycle through System Startup Options</p> <p>or</p> <p>Press ACTIVE to cycle through System Startup Options</p> <p>(see ...In Depth below for more information about various options)</p>	<p>4</p>  <p>Press WARM to save System Startup Option selection</p> <p>(BOTH keypad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Gear Delay Options In Depth

WARM MODE / GEAR LOCKOUT (default) — No LEDs ON > Choose this selection if you want the EEC4 system to startup in WARM (Gear Lockout) Mode.

NORMAL RUN MODE — TAKE LED or PORT Neutral LED ON > Choose this selection if you want the EEC4 system to startup in normal RUN Mode.


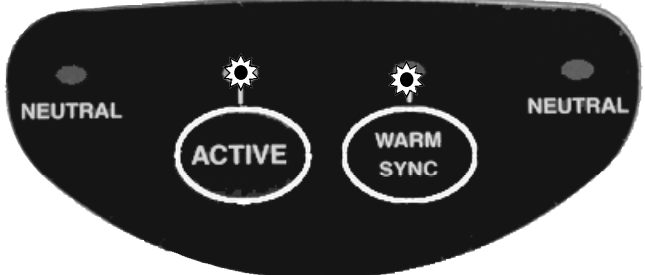
System Startup Option Illustrated

By default when the EEC system is started (power ON) the transmission will automatically be locked in the Neutral position — called WARM mode. While the system is in WARM mode, the transmission will not be allowed to shift into gear by the inadvertent movement of the control head handles unless the WARM button is depressed. This is an IMPORTANT safety feature built-in to the system particularly useful when your boat is docked.

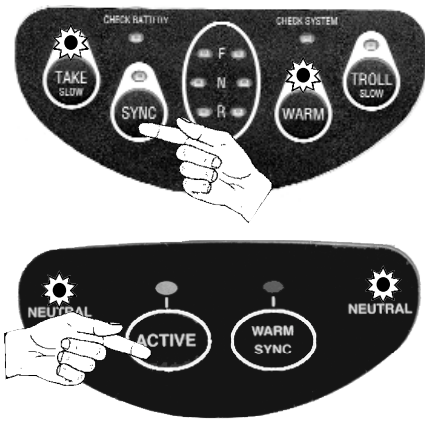
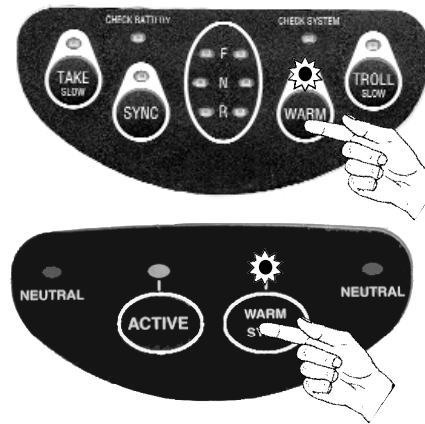
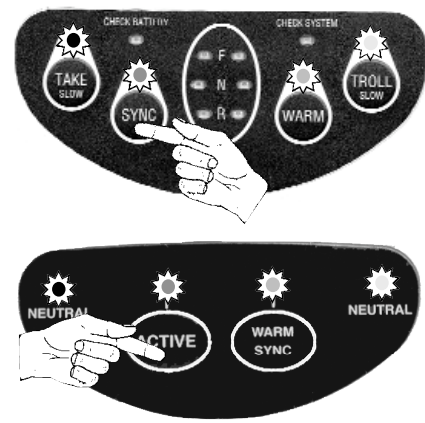
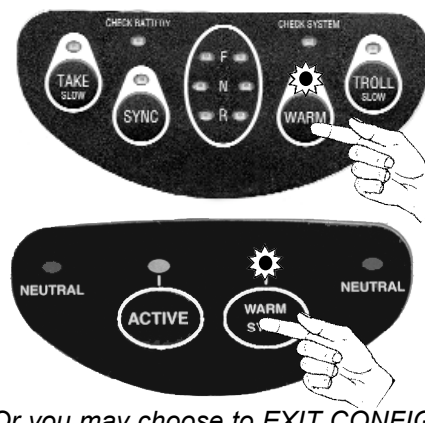
An option is given to change the System Startup option from WARM mode to the Normal RUN mode if the boat operator prefers. This means that at startup, any movement of the control head handles will result in the boat's transmission engaging and engine speed being increased.

IT IS STRONGLY RECOMMENDED TO LEAVE THE SYSTEM STARTUP OPTION IN THE DEFAULT (WARM MODE) SETTING.

When the system is powered ON, (by default) any movement of the control head handles will result in transmission being “locked” in Neutral position (called WARM mode) .

4-button keypad	2-button keypad
 <p data-bbox="154 1627 771 1753"><i>With the default setting — upon system startup transmission will be “locked” in the Neutral position indicated by the WARM LED on the keypad being illuminated</i></p>	 <p data-bbox="844 1627 1485 1753"><i>With the default setting — upon system startup transmission will be “locked” in the Neutral position indicated by the WARM LED on the keypad being illuminated</i></p>

Station Transfer Method Options

<p>1</p>  <p>Press SYNC 9 times for Station Transfer Options (TAKE & TROLL LEDs will begin to flash)</p> <p>or</p> <p>Press ACTIVE 9 times for Station Transfer Option (Port Neutral & Stbd Neutral will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>Press SYNC to cycle through Station Transfer Options</p> <p>or</p> <p>Press ACTIVE to cycle through Station Transfer Options</p> <p>(see ...In Depth below for more information about various options)</p>	<p>4</p>  <p>Press WARM to save Station Transfer Option selection</p> <p>(BOTH keypad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Station Transfer Options In Depth

TRANSFER AT ANY MATCHED HANDLE POSITION (default) — No LEDs ON > Choose this selection if you want to be able to transfer station control to any other station by approximately matching control station handle position before engaging.

TRANSFER AT NEUTRAL ONLY — TAKE LED or PORT Neutral LED ON > Choose this selection if you want to transfer station control only when control stations are in NEUTRAL.

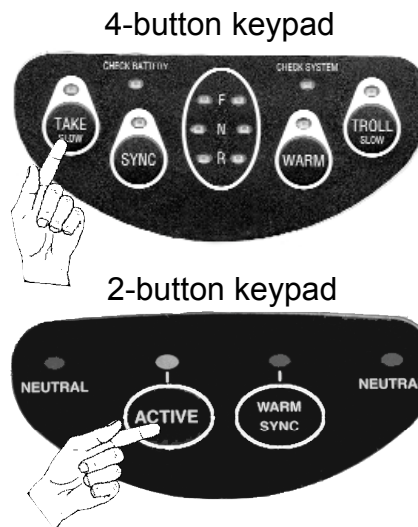
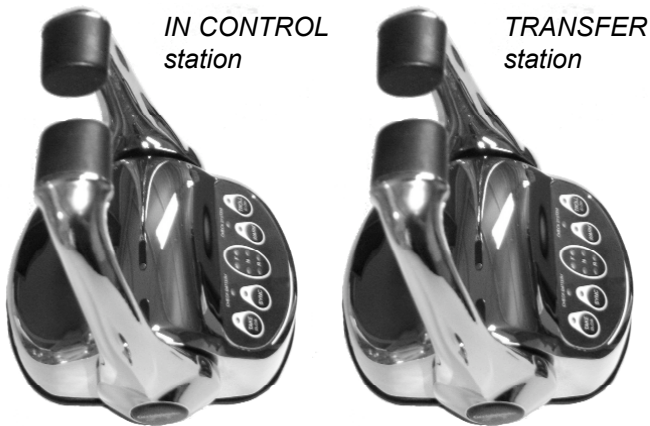
Station Transfer Option Illustrated

By default, when it is necessary to change control from one station to the other the boat operator may do so by approximately matching control head handle position (on-the-fly) at the station where control will be transferred and pressing the TAKE button (4-button keypad) or ACTIVE button (2-button keypad) twice. Pressing the TAKE or ACTIVE button will result in the corresponding LED quick flashing. Station Transfer will not take place unless TAKE or ACTIVE button is pressed a second time. When executed properly TAKE or ACTIVE light should be fully illuminated and engine throttle and transmission should respond to control head handle positions.

An option is given to change the Station Transfer option from the default to transfer only occurring when BOTH stations control head handles are in the NEUTRAL positions.

Station Transfer options can be changed to:

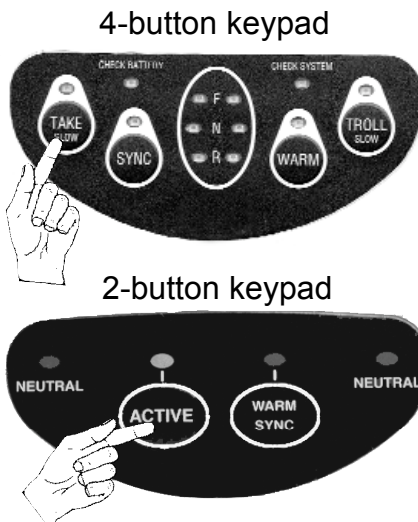
Allow “on-the-fly” station transfer



CONTROL HANDLES AT BOTH STATIONS MUST BE IN APPROXIMATELY THE SAME POSITION BEFORE SYSTEM TRANSFER MAY TAKE PLACE

PRESS TAKE ON TRANSFER STATION KEYPAD TWICE TO TRANSFER CONTROL

Allow Neutral position ONLY station transfer



CONTROL HANDLES AT BOTH STATIONS MUST BE IN NEUTRAL BEFORE SYSTEM TRANSFER MAY TAKE PLACE

PRESS TAKE ON TRANSFER STATION KEYPAD TWICE TO TRANSFER CONTROL

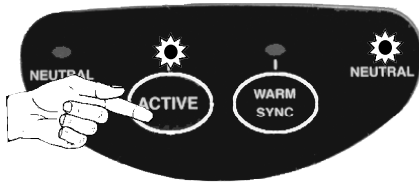
Set Configuration Settings to Default Option

1



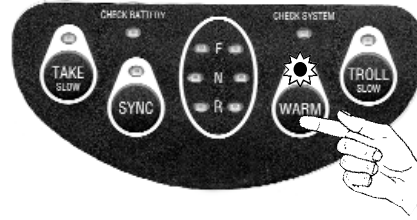
Press SYNC 10 times to Return Configuration Settings to Factory Defaults (SYNC & TROLL LEDs will begin to flash)

or



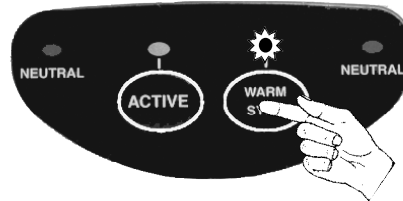
Press ACTIVE 10 times for Return Configuration Settings to Factory Defaults (ACTIVE & Stbd Neutral will begin to flash)

2



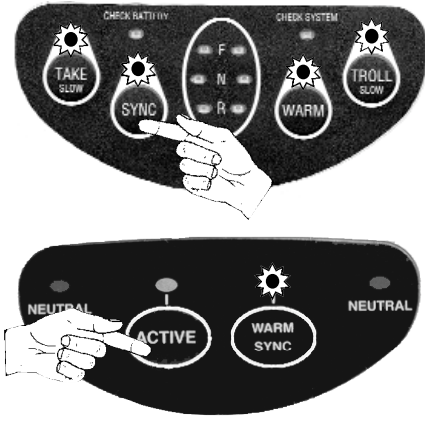
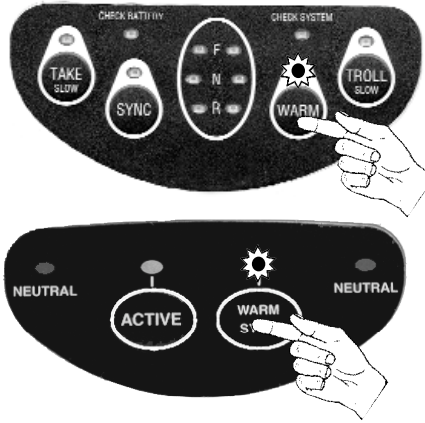
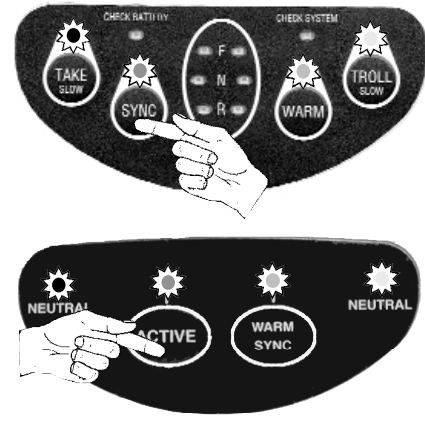
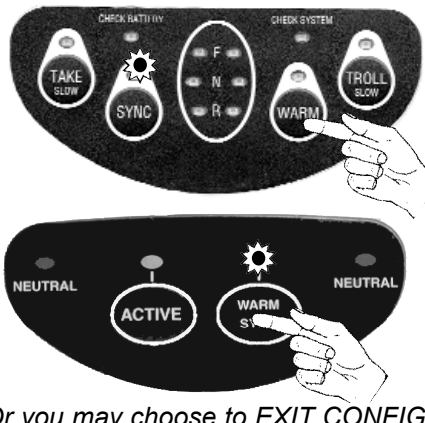
Press WARM to save "Return to Configuration Settings to Factory Defaults" selection

(both keypad styles)



To EXIT CONFIGURATION MODE:
Turn system OFF
Move control handles back to NEUTRAL
Turn system ON again.

Sync Gain Options

<p>1</p> 	<p>Press SYNC 11 times for Sync Gain Options (SYNC LED will begin to flash)</p> <p>or</p> <p>Press ACTIVE 11 times for Sync Gain Options (ACTIVE LED will begin to flash)</p>	<p>2</p>  <p>Press WARM to activate selection</p> <p>(BOTH key - pad styles)</p>
<p>3</p>  <p>(see ...In Depth below for more information about various options)</p>	<p>Press SYNC to cycle through Sync Gain Options</p> <p>or</p> <p>Press ACTIVE to cycle through Sync Gain Options</p>	<p>4</p>  <p>Press WARM to save Throttle on Top of Troll Option</p> <p>(BOTH key - pad styles)</p> <p>Or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</p>

Sync Gain Options In Depth

When cycling through the Sync Gain options the following LEDs will indicate which Sync Gain you have chosen:

Sync Gain #1 — TAKE or PORT Neutral LED ON.

Sync Gain #2 — SYNC or ACTIVE LED ON.

Sync Gain #3 — TAKE & SYNC or PORT Neutral & ACTIVE LED ON.

Sync Gain #4 — WARM LED ON.

Sync Gain #5 — TAKE & WARM or PORT Neutral & WARM LED ON.

Sync Gain #6 — SYNC & WARM or ACTIVE & WARM LED ON.

Sync Gain #7 — TAKE, SYNC, & WARM or PORT Neutral, ACTIVE, & WARM LED ON.

Sync Gain #8 (Default) — TROLL or STBD Neutral LED ON.

Sync Gain #9 — TAKE & TROLL or PORT Neutral & STBD Neutral LED ON.

Sync Gain #10 — SYNC & TROLL or ACTIVE & STBD Neutral LED ON.

Sync Gain #11 — TAKE, SYNC, & TROLL or PORT Neutral, ACTIVE, & STBD Neutral LED ON.

Sync Gain #12 — WARM & TROLL or WARM & STBD Neutral LED ON.

Sync Gain #13 — TAKE, WARM, & TROLL or PORT Neutral, WARM, & STBD Neutral LED ON.

Sync Gain #14 — SYNC, WARM, & TROLL or ACTIVE, WARM, & STBD Neutral LED ON.

Sync Gain #15 — ALL 4 LEDS ON.

Sync Gain Option Illustrated

4.2 Control Head Configuration Mode

Introduction

Control Head configuration allows you to set your Control Handle Identifier which enables the Control Processor to communicate with the Control Head.

If you purchased a complete system, configuration and handle identification was performed at the factory. If changes need to be made to the configuration settings, see Section 4.0 instructions.

If you purchased a control head separately, you will NEED to set the handle identifier for that control station.


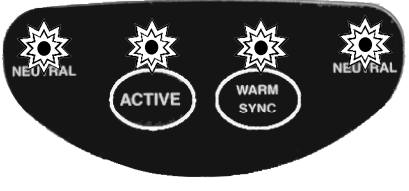
To Enter Control Head Configuration Mode:

- 1) Move both handles to full astern.
- 2) Turn system ON.
- 3) Press and hold the 2 center buttons (Sync & Warm on 4-button keypad OR Active & Warm on 2-button keypad) for approximately 2 seconds until LEDs start flashing.
- 4) Release the buttons. You are now ready to select handle identifier.

1	<div style="background-color: black; color: white; padding: 10px; width: fit-content; margin: 0 auto;"> Move handles to FULL ASTERN </div>		<p>Move both handles to the FULL ASTERN position.</p>
2	<div style="background-color: black; color: white; padding: 10px; width: fit-content; margin: 0 auto;"> Turn system ON </div>		<p>Turn system ON.</p>
3	<div style="background-color: black; color: white; padding: 10px; width: fit-content; margin: 0 auto;"> Press & Hold 2 center buttons </div>		<p>Press and HOLD the 2 center buttons (SYNC & WARM or ACTIVE & WARM) for approximately 2 seconds until LEDs start flashing.</p>

4

Release Buttons

When you release the buttons you were holding in step 3, the 4 keypad LEDs should continue to flash. This signifies that you are now ready to enter the Control Handle Identifier.

To Select Handle Identifier follow the steps below:


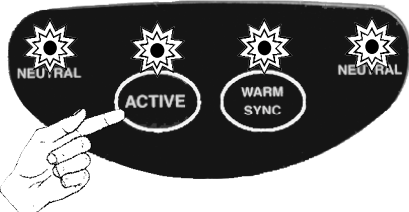
- 1) Press Sync button once — Take LED will flash.
- 2) Press Warm button once — you have now selected handle ID configuration.
- 3) Press Sync button until the desired handle ID is displayed on the LEDs as follows (binary combination):

ID 1 — TAKE LED on	ID 2 — SYNC LED on	ID 3 — TAKE & SYNC on
ID 4 — WARM LED on	ID 5 — TAKE & WARM on	ID 6 — SYNC & WARM on

- 4) Press WARM button to store selection.
- 5) Mark the handle ID on tag attached to bottom of handle.

1


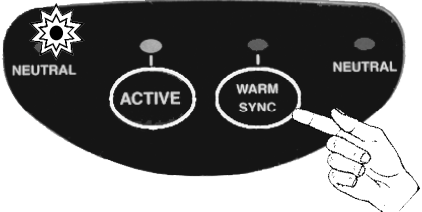
Press SYNC or ACTIVE button once

To select the Handle Identifier Press the SYNC button one time — the TAKE LED will begin to flash (if you have the 2-button keypad press the ACTIVE button to perform this step).

2

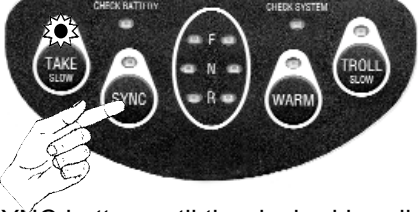
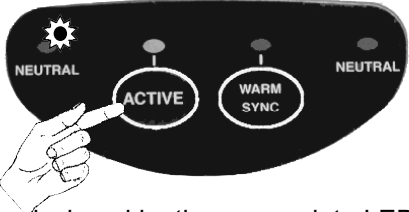
Press WARM button once

Press the WARM button one time — you have now entered handle ID configuration (if you have the 2-button keypad you would press the same button).

3


Press SYNC or ACTIVE button until desired ID is displayed

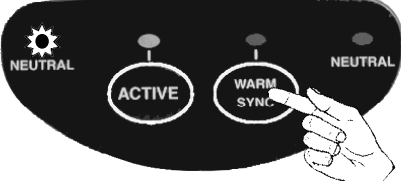



Press the SYNC button until the desired handle ID is displayed by the appropriate LEDs being illuminated — refer to chart above (if you have the 2-button keypad press the ACTIVE button to perform this step).

4

Press WARM button once



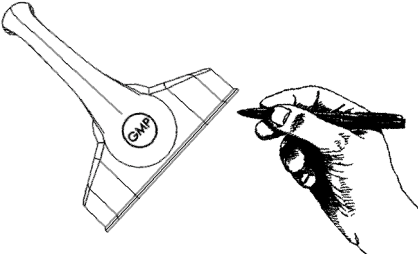


Once you have selected your handle ID (signified by the appropriate illuminated LEDs according to the chart on the previous page) you will need to store your selection by pressing the WARM button one time.

BEFORE pressing WARM button, the illuminated LEDs should match Handle ID

5

Record Handle ID on bottom of Head



AFTER pressing WARM button in step 4 above, the illuminated LEDs should change to all 4 LEDs flashing.

Record the Handle ID you just stored on the tag located at the bottom of the Control Head.

To exit Handle Configuration you must turn the system OFF.

If changes to the Control Processor Configuration are desired, refer to “section 4.1 Control Processor (CP) Configuration Mode” instructions.

4.3 Smart Actuator Configuration Mode

Introduction

The Smart Actuator Configuration Mode allows you to change settings for the Smart Actuator so that it will perform correctly with you boat’s propulsion system. The Smart Actuator Configuration Mode is in two sections:

- Section 1 — Setting the Actuator Identifier
- Section 2 — Calibrating Actuator Endpoints and Cable Direction

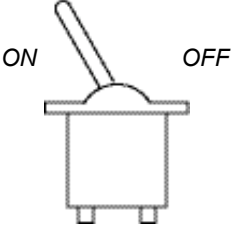
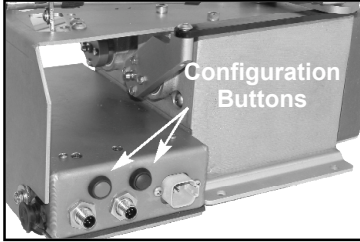
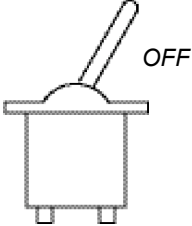
Setting the Actuator Identifier is necessary to enable the Smart Actuator to “talk” to the CANbus network. Calibrating the Actuator endpoints and cable direction .

If you purchased a complete system, the Actuator identifier was performed at the factory. All that is needed by the installer is to calibrate the Actuator endpoints and cable direction.

If you purchased an Actuator separately, you will NEED to set the Actuator identifier for that Actuator as well as perform calibration for the endpoints and cable direction.

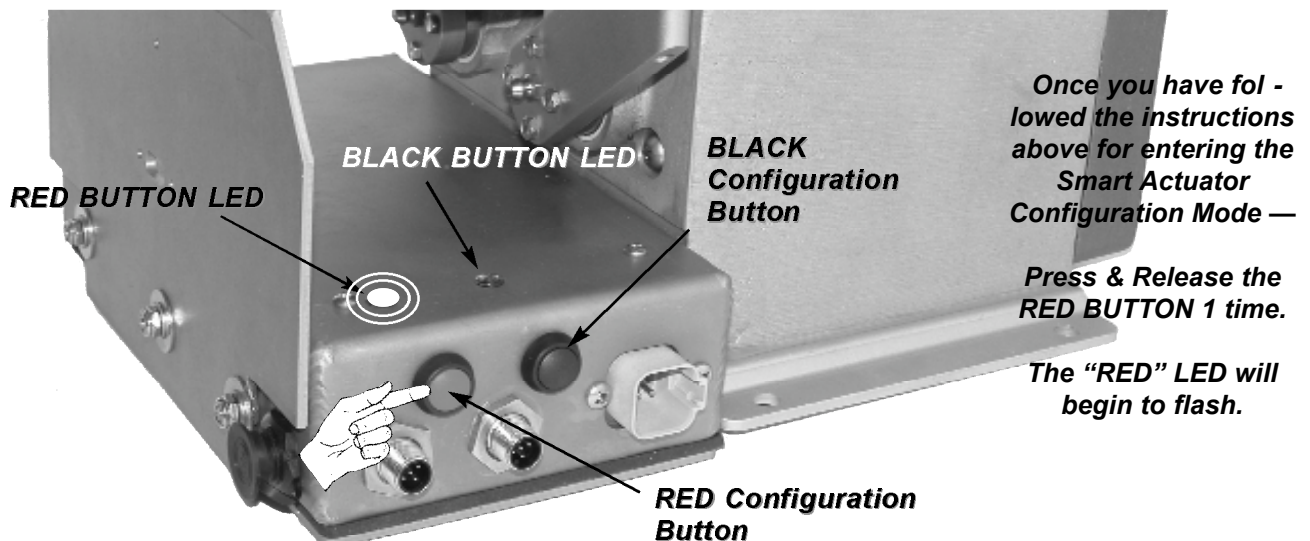
To Enter Smart Actuator Configuration Mode:

- 1) Apply power to the Smart Actuator.
- 2) Press and release both configuration buttons on the Smart Actuator 3 times. Both configuration LEDs will flash to indicate that you have entered the Smart Actuator Configuration Mode.
- 3) Once desired settings have been made, to EXIT the Smart Actuator Configuration Mode you will need to turn power to the actuators OFF.

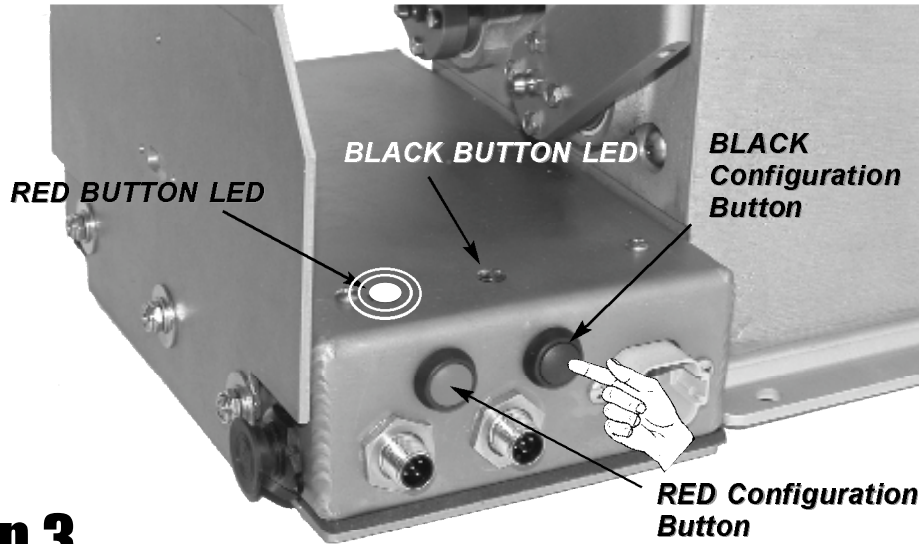
<h3>Step 1</h3>  <p>ON OFF</p> <p>Turn power to Actuators ON</p>	<h3>Step 2</h3>  <p>Configuration Buttons</p> <p>Press & Release BOTH configuration buttons 3 times</p>	<p>Follow instructions below for each setting you would like to change</p>	<h3>Step 3</h3>  <p>ON OFF</p> <p>Turn power to Actuators OFF</p>
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Setting Actuator Identifier

Step 1



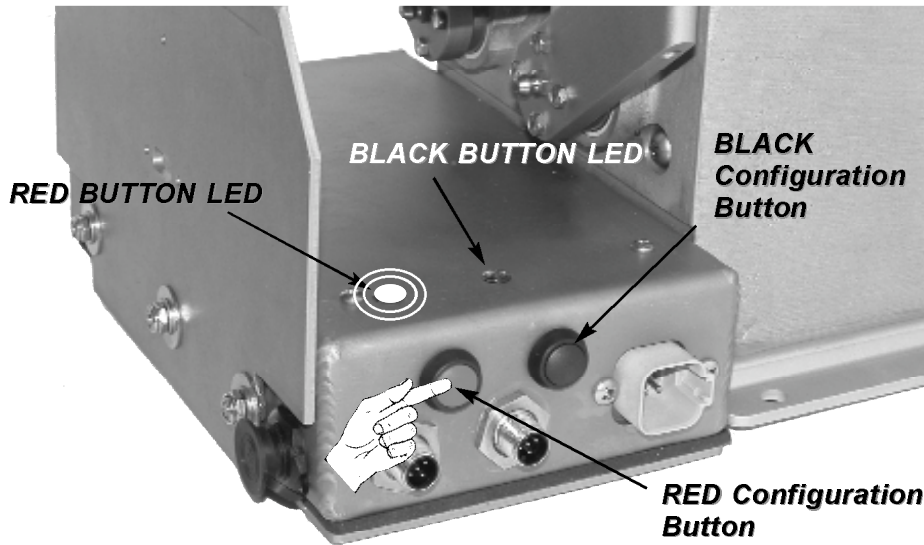
Step 2



Press & Release the **BLACK BUTTON** 1 time to select Actuator Identifier.

If the Actuator Identifier was set at the factory the **RED & BLACK LEDs** will light according to that setting (see light sequence below).

Step 3



Press & Release the **RED BUTTON** 1 time to cycle through the 5 Actuator Identifiers listed below.

As you press the **RED** button to cycle through the selections the appropriate **LED** will illuminate (see below for light sequence for each identifier).

LIGHT SEQUENCE FOR ACTUATOR IDENTIFIERS

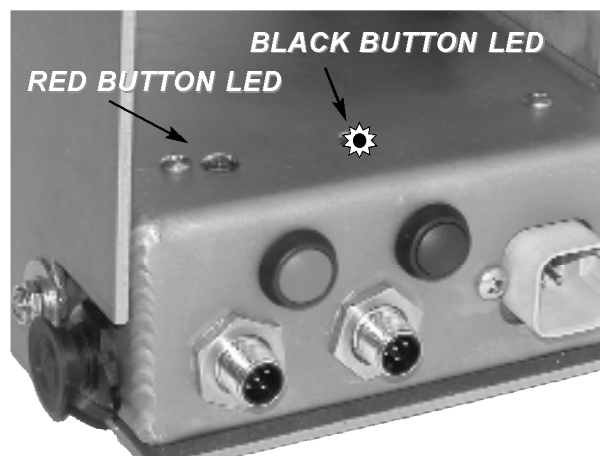
ACTUATOR IDENTIFIER #1 PORT THROTTLE / GEAR ACTUATOR

This selection is indicated by a **SOLID RED** Button LED



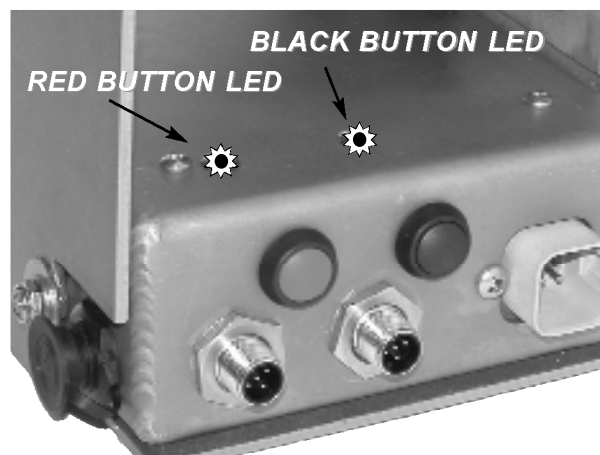
**ACTUATOR IDENTIFIER #2
STBD THROTTLE / GEAR ACTUATOR**

This selection is indicated by a **SOLID BLACK** Button LED



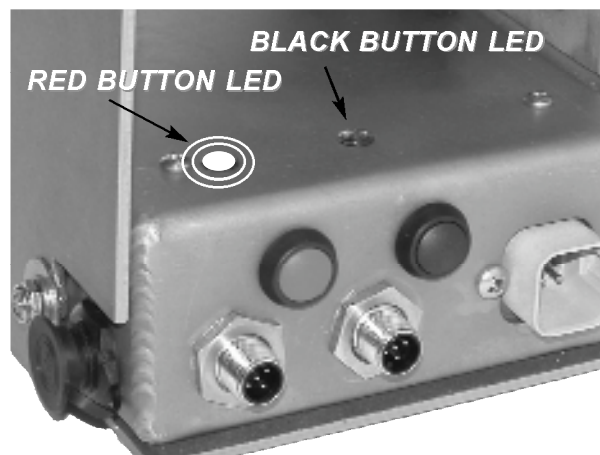
**ACTUATOR IDENTIFIER #3
PORT / STBD TROLL ACTUATOR**

This selection is indicated by a **SOLID RED & BLACK** Button LED



**ACTUATOR IDENTIFIER #4
PORT / STBD THROTTLE ACTUATOR WITH
SOLENOID SHIFT**

This selection is indicated by a **FLASHING RED** Button LED

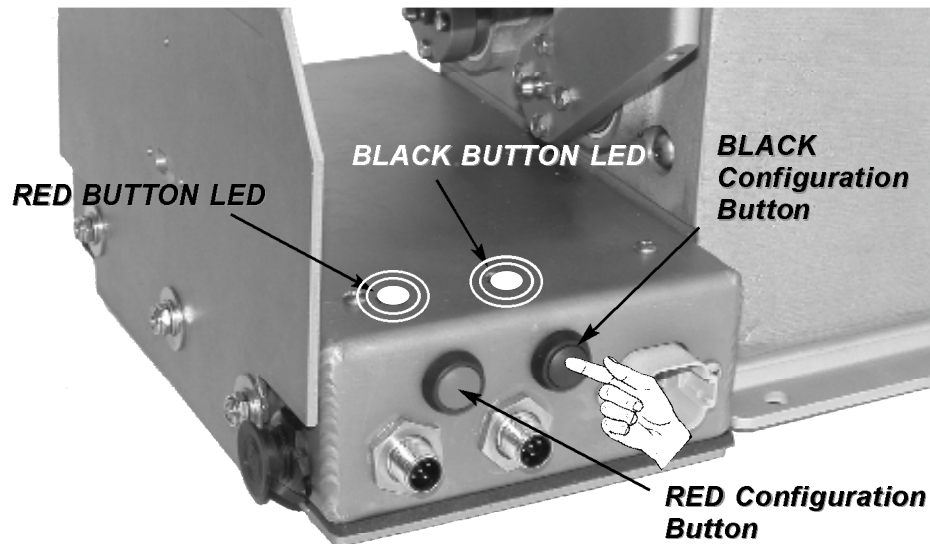


**ACTUATOR IDENTIFIER #5
PORT / STBD GEAR ACTUATOR**

This selection is indicated by a **FLASHING BLACK** Button LED



Step 4



When the desired Actuator Identifier has been selected (indicated by the appropriate LEDs displayed) — PRESS & RELEASE the BLACK Configuration Button on the Smart Actuator.

This will store your ID selection in memory and return you to the Smart Actuator Configuration main menu indicated by BOTH LEDs flashing.

Calibrating Actuator Endpoints & Cable Direction

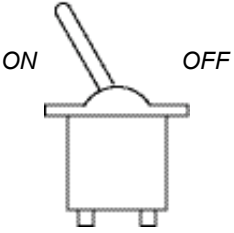
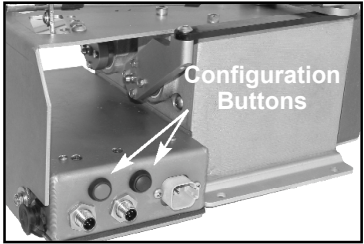
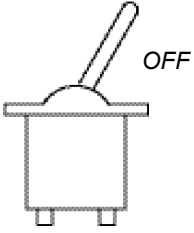
The Smart Actuator receives electronic impulses from the control head which moves the actuator plates into a position where the associated engine's gear or throttle control lever has reached its mechanical stop position (endpoints). Calibration of the Smart Actuator endpoints is necessary to ensure that the engine achieves idle speed or full throttle when moved by the Smart Actuator. It is important to find the proper balance between the control cable position being "too loose" and not reaching its endpoint position (and therefore the engine not achieving idle speed or full throttle), and the cable being set up "too tight" and constantly operating in a compressed or stretched condition when moving to its endpoint of travel. Calibrating the Smart Actuator(s) with this proper balance will yield trouble-free operation of your engine's propulsion system. There are 3 steps to calibrating the Smart Actuator endpoints and control cable direction. They are:

- Entering Smart Actuator Configuration Mode
- Selecting Actuator Calibration
- Sequence for Calibrating the Actuator & Selecting Cable Direction

To Enter Smart Actuator Configuration Mode:

When setting the Actuator Identifier is completed (see above) and your Actuator ID is stored in memory you will be automatically returned to the Smart Actuator Configuration Mode. Proceed to "Selecting Actuator Calibration" section for the next steps in the process. However, if you are not in configuration mode you will need to follow the instruction below for entering the Smart Actuator Configuration Mode.

- 1) Apply power to the Smart Actuator.
- 2) Press and release both configuration buttons on the Smart Actuator 3 times. Both configuration LEDs will flash to indicate that you have entered the Smart Actuator Configuration Mode.
- 3) Once desired settings have been made, to EXIT the Smart Actuator Configuration Mode you will need to turn power to the actuators OFF.

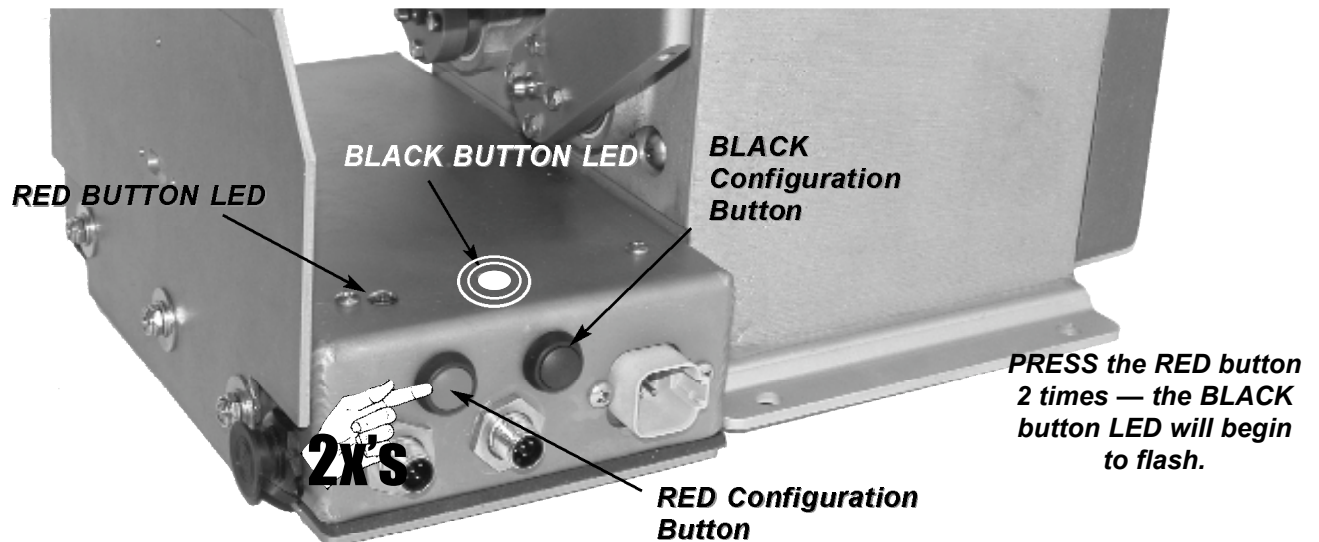
<p>Step 1</p>  <p>ON OFF</p> <p>Turn power to Actuators ON</p>	<p>Step 2</p>  <p>Configuration Buttons</p> <p>Press & Release BOTH configuration buttons 3 times</p>	<p>Follow instructions below for each setting you would like to change</p>	<p>Step 3</p>  <p>ON OFF</p> <p>Turn power to Actuators OFF</p>
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Selecting Actuator Calibration:

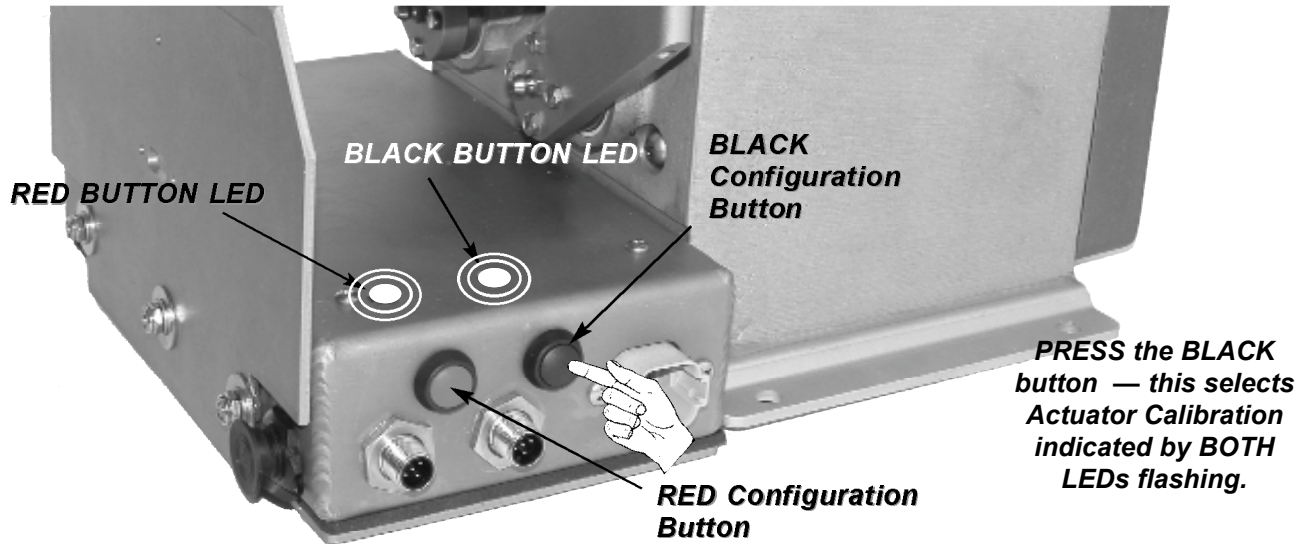
Selecting Actuator calibration prepares the Smart Actuator to receive the settings entered when calibrating the actuator endpoints.

- 1) Press the RED button 2 times — the BLACK button LED will begin to flash.
- 2) Press the BLACK button to select Actuator Calibration — this will be indicated by both LEDs flashing.

Step 1



Step 2



You are now ready to proceed to the actual calibrating of the Smart Actuator(s).

Sequence for Calibrating the Actuator(s):

To calibrate the Actuator(s) perform the following steps:

- 1) Press both the RED & BLACK buttons simultaneously to enter the right side actuator calibration (usually throttle or Port troll) — this is indicated by NO LEDs being ON.
- 2) PRESS and HOLD down the RED button to extend the actuator piston until the desired position is achieved.
- 3) Once the extended position is achieved PRESS BOTH buttons simultaneously to store the position in memory — the RED button LED comes ON to confirm that the extended position has been saved.
- 4) PRESS and HOLD down the BLACK button to retract the actuator piston until the desired position is achieved.
- 5) Once the retracted position is achieved PRESS BOTH buttons simultaneously to store the position in memory — the BLACK button LED comes ON to confirm that the retracted position has been saved.

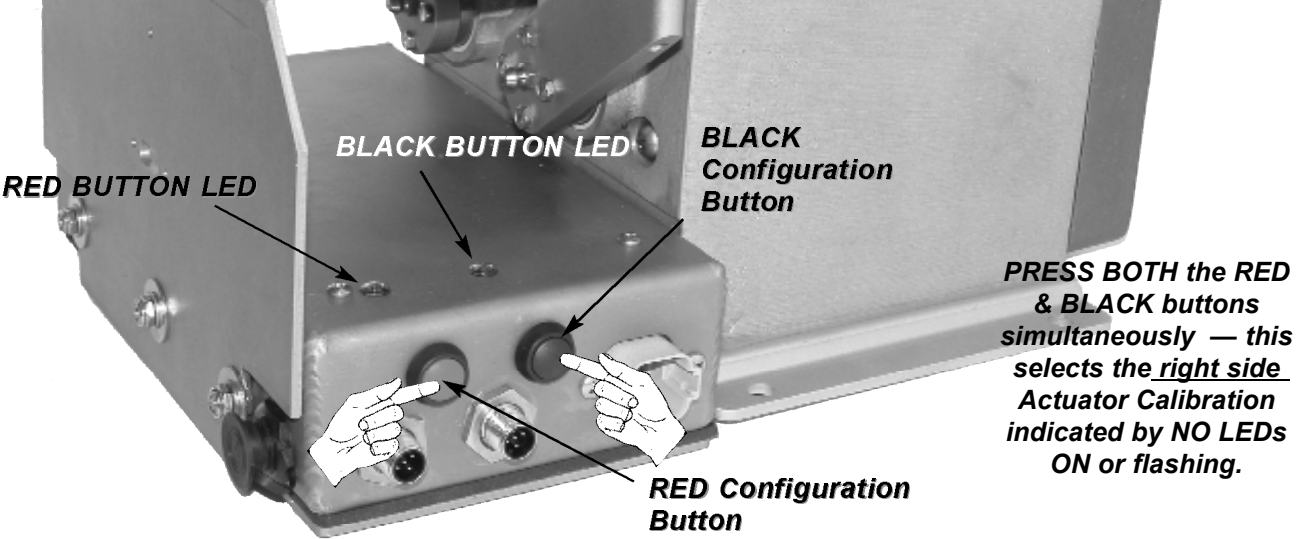
At this point in the process you will need to know if your cable direction for the operation of the engine's control lever is PUSH-to-OPEN / PUSH-to-AHEAD / PUSH-to-LOCKUP or if it is PULL-to-OPEN / PULL-to-AHEAD / PULL-to-LOCKUP.

- 6) If your cable direction is PUSH to ... then press the RED button — the RED button LED will illuminate to indicate your selection.
- 7) If your cable direction is PULL to ... then press the BLACK button — the BLACK button LED will illuminate to indicate your selection.

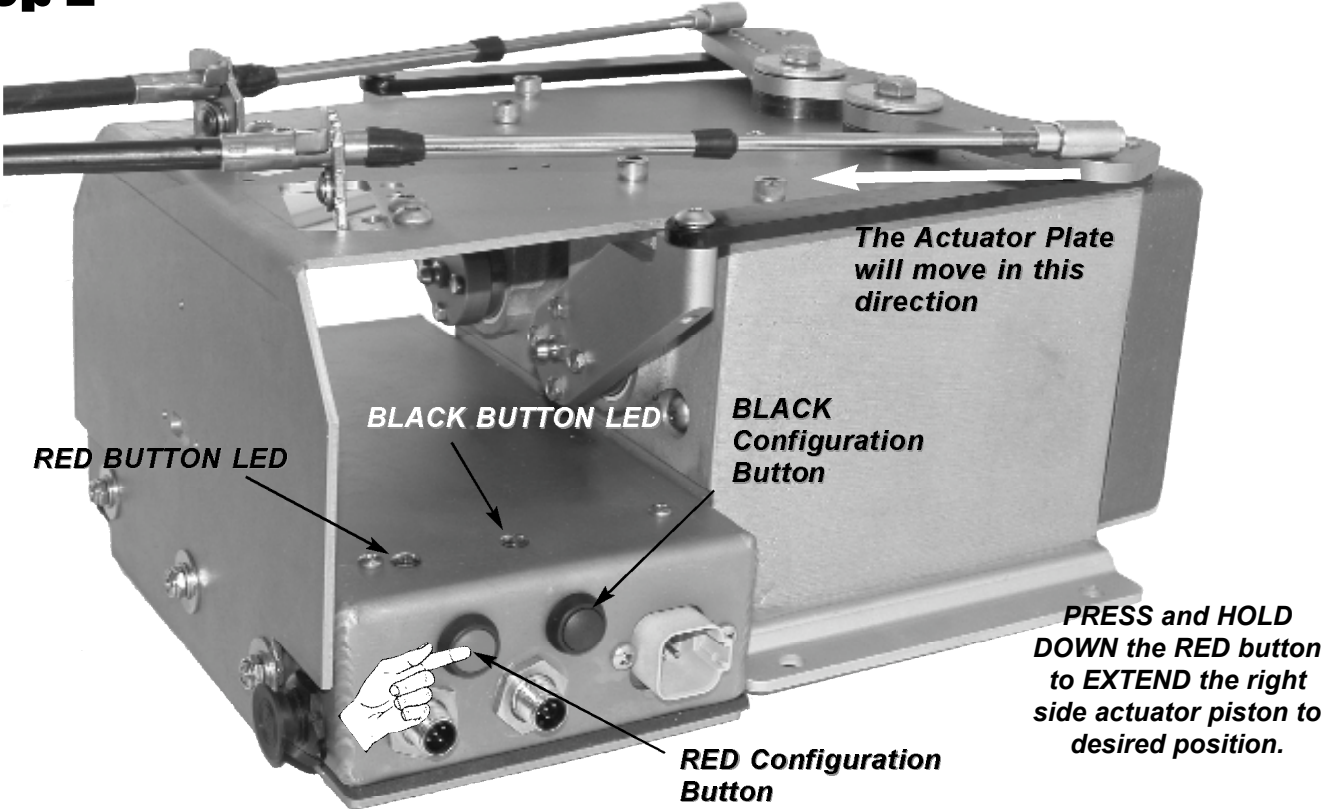
Repeat steps 1-7 above to enter left side actuator calibration (usually gear or Stbd troll).

Once you have completed the calibration of both actuators — turn power OFF.

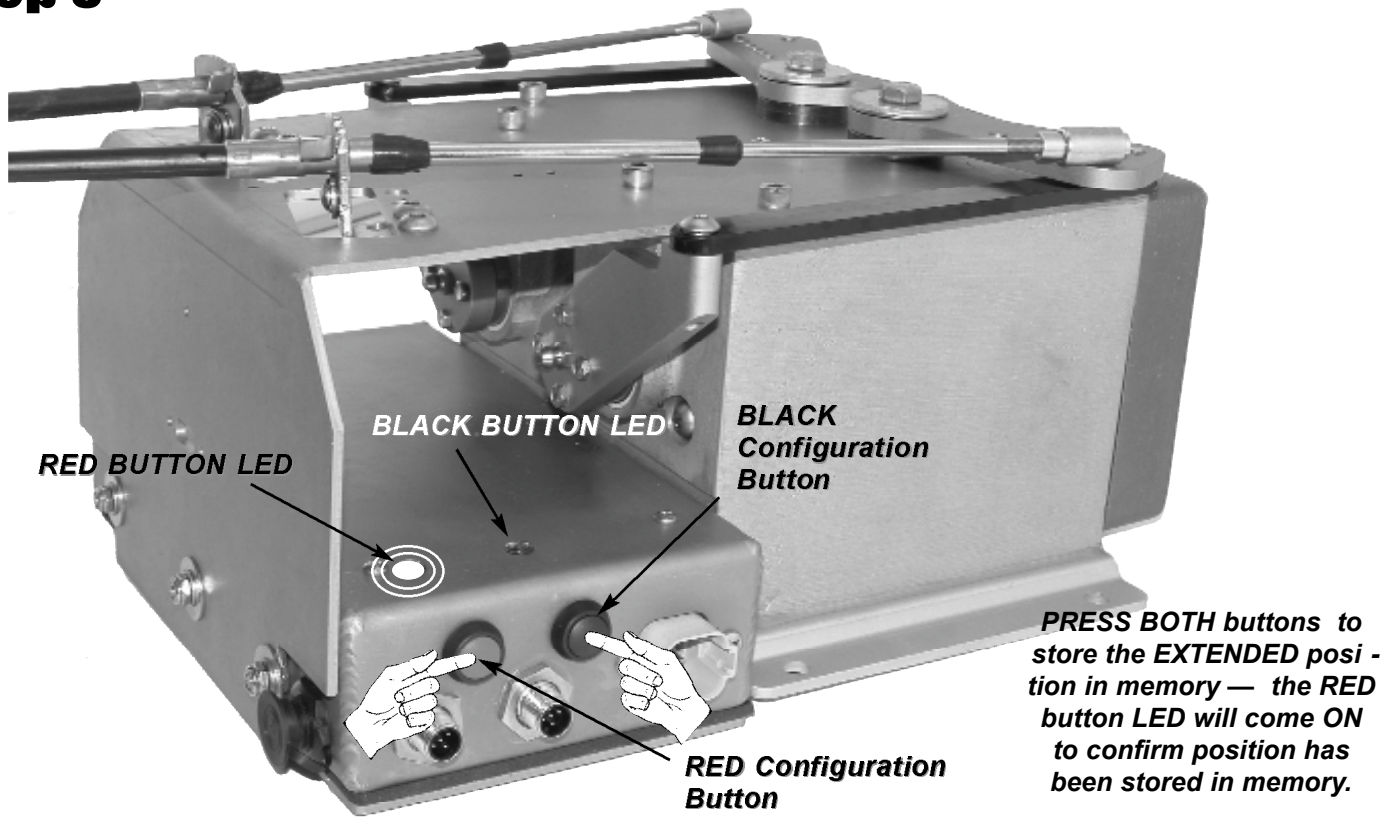
Step 1



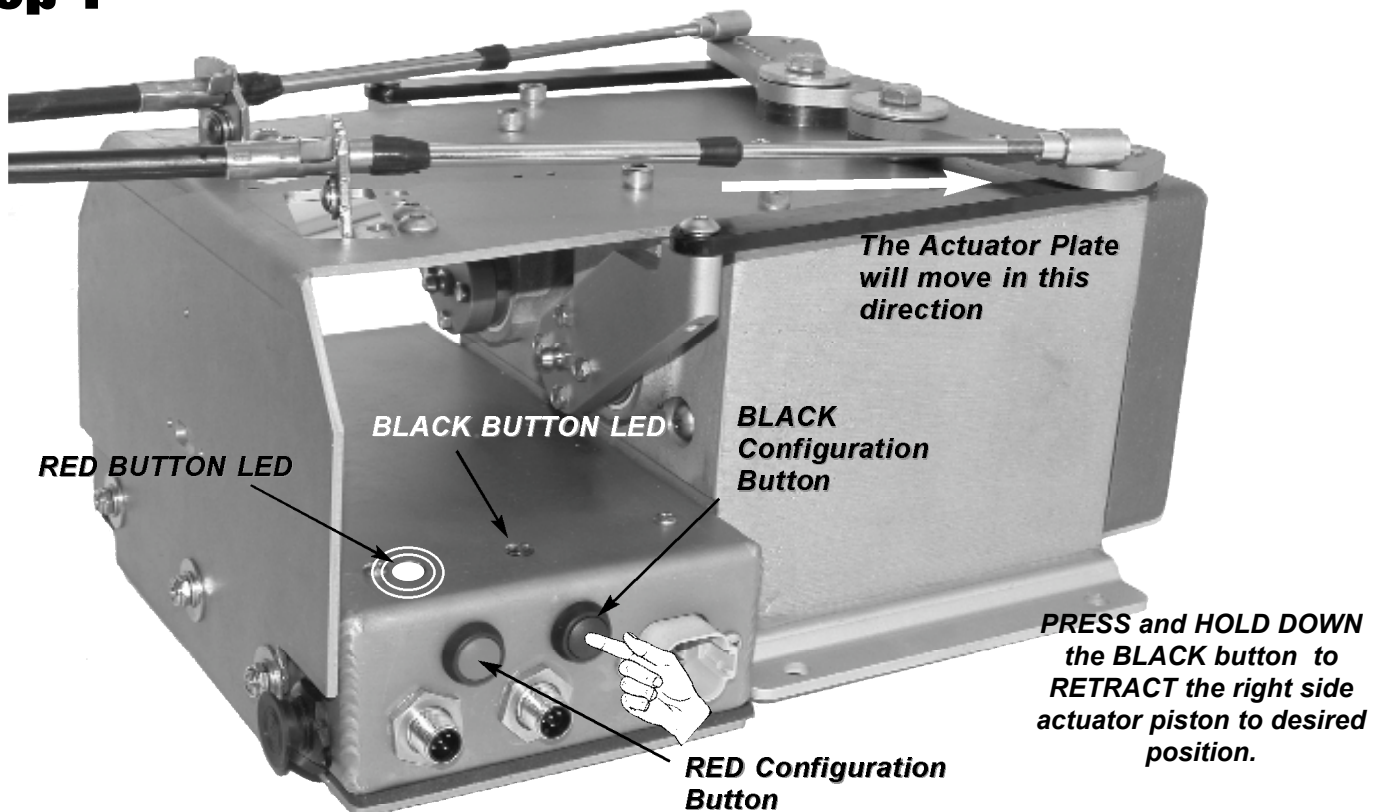
Step 2



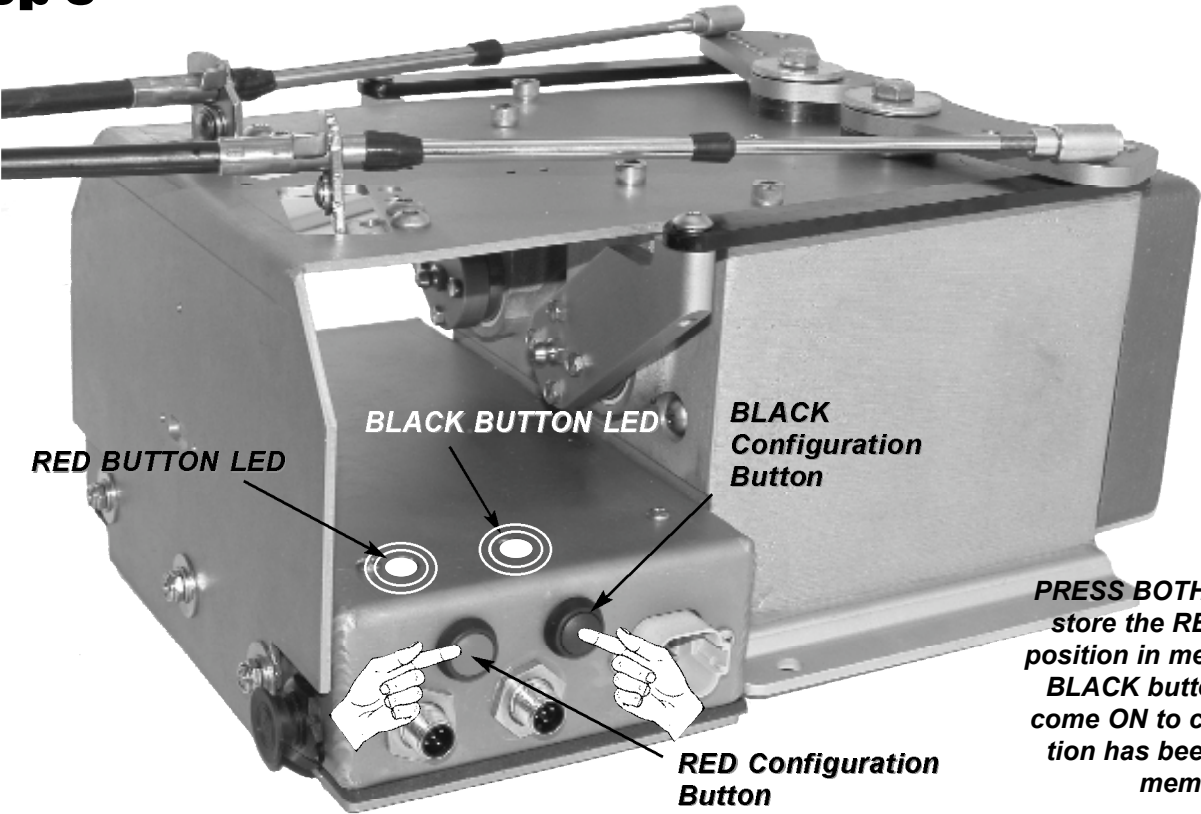
Step 3



Step 4



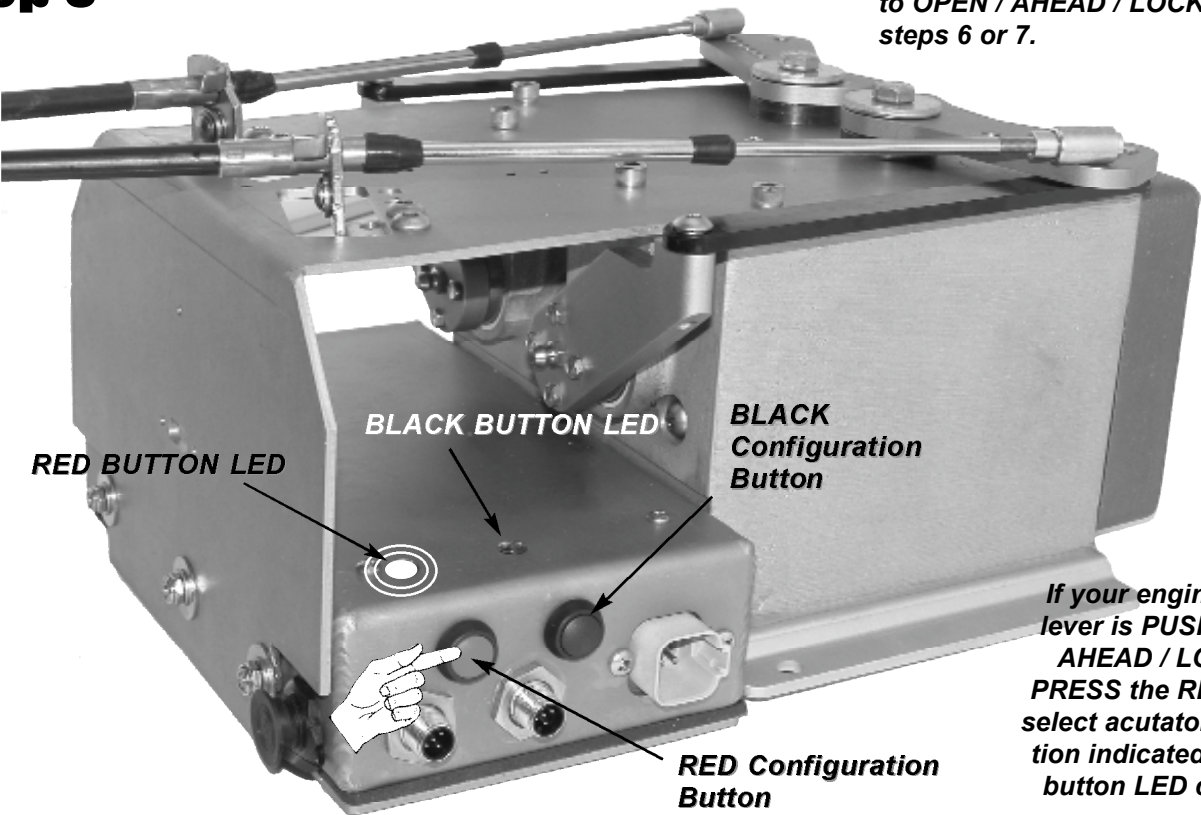
Step 5



PRESS BOTH buttons to store the **RETRACTED** position in memory — the **BLACK** button LED will come **ON** to confirm position has been stored in memory.

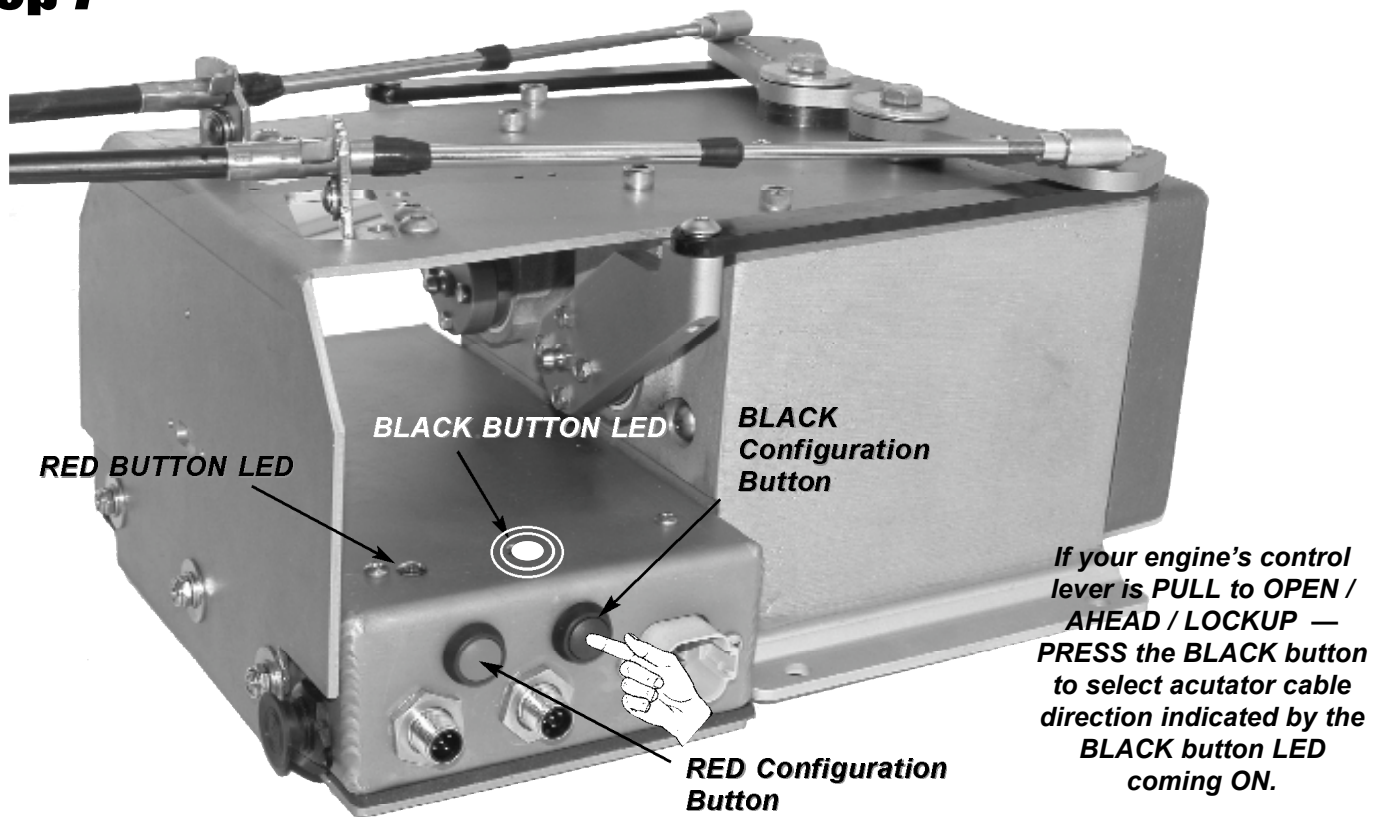
You are now ready to enter the setting for your cable direction (either **PUSH** to **OPEN / AHEAD / LOCKUP** or **PULL** to **OPEN / AHEAD / LOCKUP**). Follow steps 6 or 7.

Step 6



If your engine's control lever is **PUSH** to **OPEN / AHEAD / LOCKUP** — **PRESS** the **RED** button to select actuator cable direction indicated by the **RED** button LED coming **ON**.

Step 7



You have now completed calibration of the right side of the Smart Actuator. You must also complete the calibration process for the left side. To complete calibration for the left side — Repeat steps 1-7 above to calibrate LEFT SIDE actuator calibration (usually gear or Stbd troll).

Once you have completed the calibration of BOTH SIDES of the actuator(s) — turn power OFF.

5.0 System Test & Checkout

System test and checkout consists of 2 steps:

- 1) **Component installation checks** — verify that the components appear to be correctly mounted and installed.
- 2) **Operational tests** — make sure the system is operating correctly.

5.1 Component Installation Checks

A. Control Processor

1.1	Verify Control Processor is securely fastened to boat structure.
1.2	<p>Verify electrical power connections:</p> <p><i>Battery Negatives</i>—Negatives from both batteries should be connected (not at Control Processor. It is vital that there be zero voltage potential between battery negative terminals. Battery negative terminals should be connected to Bonding system also.</p> <p><i>Negative Lead</i>—Negative wire from EEC system is connected to single battery negative.</p> <p><i>Positive Leads</i>—Power should be connected from Battery positive terminal or disconnect switch (battery side of switch) to CP via 10 amp fuse / circuit breaker. Check that all battery connections are tight. Verify that Bonding Wire is properly connected to Bonding stud (see sec. 3.6).</p>
1.3	Verify that all connectors are properly inserted into their receptacles (Station Cables, Transmission Cables, Throttle Cables, and Troll Cables). DO NOT FORCE connectors into receptacles!. All wires should be secured with tie-wraps along route.

B. Control Head(s)

2.1	Verify Control Head(s) are securely fastened to boat structure.
2.2	Verify that Control Handles have an unobstructed freedom of movement (full ahead and full reverse).
2.3	Return all handles to NEUTRAL.

5.2 Operational Checks

A. General Functions

NOTE: While performing system checks, verify that the “Check System” LED stays OFF. If it comes ON, the system is in Alarm Mode (see pg.) and alarm condition must be checked and corrected before proceeding.

B. Start Interlock

3.1	Turn System ON (see sec. 2.1).
3.2	Verify at the main station various functions: Warm up, Slow, Troll, Sync.
3.3	Transfer control to other stations (see pg.) and verify proper operation of functions at each station.

C. Power Inputs

4.1	Move Starboard Control Handle out of NEUTRAL position. Attempt to start engine. <i>(NOTE: Be prepared to immediately shutdown engine if start interlock has been wired incorrectly!)</i>
4.2	Engine should NOT start; if it does, start interlock has not been wired correctly. Fix wiring and re-check.
4.3	Move Starboard Control Handle back to NEUTRAL position. After handle is moved to NEUTRAL position, then try to start engine. Engine should start.
4.4	Perform same check for Port engine.

D. Engine Room Checks

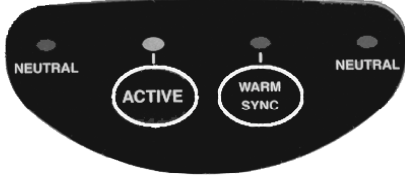

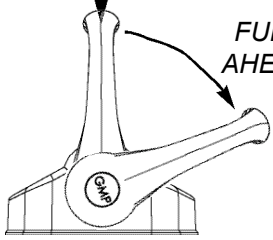
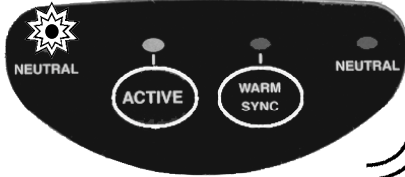

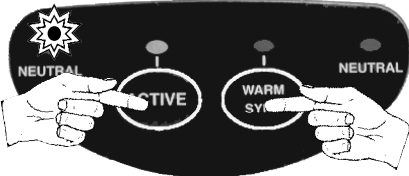

5.1	To verify separate power inputs, turn ON individual breakers one at a time and verify that DC power (12 or 24 VDC) is supplied to the Control Processor.
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E. Trolling Valves (if equipped)

6.1	Gear Operation — Verify that transmission solenoid valves are turning ON and OFF as you move Control Handles into and out of gear. Make sure that transmission shifts into appropriate direction — pushing handle forward causes forward boat motion, etc.
-----	--

6.0 Enter Handle Troubleshoot Mode

To review the stored alarm codes you must first enter “Handle Troubleshoot Mode.” To do this you must use the main station control head and follow the 4 simple steps below:

<p>1</p> <p>Turn system OFF</p>	<p><i>LEDs <u>not</u> illuminated</i></p>  <p><i>LEDs <u>not</u> illuminated</i></p>  <p>Check to see that the control head keypad LEDs are NOT illuminated. This is a visual indication that the system has been turned OFF.</p>
<p>2</p> <p>Move handles to FULL AHEAD position</p>	<p><i>NEUTRAL</i></p>  <p><i>FULL AHEAD</i></p> <p>Before the system is turned ON the control handles MUST be in the FULL AHEAD position.</p>
<p>3</p> <p>Turn system ON</p>	  <p>When the system has been turned ON the TAKE LED will blink slowly and a buzzer will be beeping.</p>
<p>4</p> <p>Press the 2 center buttons on keypad</p>	<p><i>Press the 2 middle buttons simultaneously 3 times</i></p>  <p>X 3</p>  <p>After pressing the two buttons, the keypad's 4 LEDs will now begin to alternate between slow blinking and fast blinking every 4 seconds.</p>

6.1 Retrieve alarm count & alarm codes

The control head keypad LEDs will alternate between **slow blinking** and **fast blinking**, every 4 seconds, to indicate the alarm count and the alarm codes. The system stores in memory the 16 most recent alarm codes beginning with the latest.

1 **Record Alarm Count**

All LEDs slow blinking *All LEDs fast blinking*

LEDs alternate between slow & fast blinking every 4 seconds

Record the sequence of blinking LEDs in the space provided on page 4. Determine the number of counts from the chart.

2 **Press SYNC to view Alarm Codes**

LEDs alternating every 4 seconds

Pressing the SYNC button will allow you to cycle through the 16 most recent alarm codes. Record the sequence of blinking LEDs on page 5. Determine the alarm code by using the chart on page 6 and fill in the appropriate space on the chart.

6.2 Deleting Alarm Codes and Resetting Alarm Count to Zero

While in Handle Troubleshoot Mode you can delete the 16 most recent alarm codes and reset the alarm count to zero at any time. Deleting alarm codes and resetting alarm count will minimize confusion for future troubleshooting. Follow the step below:

1 **Press SYNC & WARM buttons**

All LEDs flashing

Press SYNC & WARM buttons anytime after entering Handle Troubleshoot Mode to delete alarm codes & reset alarm count to zero. All LEDs will flash to indicate alarm codes have been deleted.

6.3 Exiting Handle Troubleshoot Mode

Once alarm codes have been reviewed and / or deleted, simply turn the system OFF and return the main station control handles to NEUTRAL before restarting system.

1 **Power OFF & Move handles into NEUTRAL**

NEUTRAL

Out of NEUTRAL *Out of NEUTRAL*


To Exit Handle Troubleshoot Mode:

- 1—Power system OFF
- 2—Move handles back to NEUTRAL.
- 3—Restart system.

EXAMPLE

The following describes an actual problem that occurred on a boat which will illustrate the use of our troubleshooting mode.

When John turned his system on he noticed that all 4 LEDs on the keypad were flashing and the control head was beeping. He knew this was not normal and wanted to troubleshoot what was wrong.

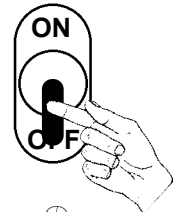


All LEDs flashing

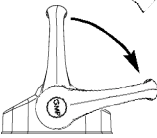
Beeping sound emitted

John entered the system into "Handle Troubleshoot Mode" by **turning the system OFF**, moving the handles of the main station control into the **FULL AHEAD position**, and **turning the system back ON**. Now John can easily troubleshoot the problem.

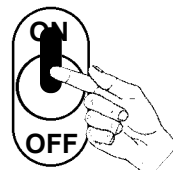
Turn system OFF



Move handles into FULL AHEAD position




Turn system ON




John next noticed that the keypad LEDs began to alternate every 4 seconds between **slow blinking** and **fast blinking**. He recorded the LEDs that were blinking slow and the LEDs that were blinking fast on the chart (see pg. 4). The sequence below showed the system went into alarm a total of 3 times.

Slow blinking




Fast blinking




John **pressed the SYNC button** to reveal the first alarm code. He recorded the sequence of blinking LEDs (pg. 5) and using the alarm code description chart (pg. 6), John determined that the battery voltage at startup was below 9.6 volts. By pressing the SYNC button a second time John was able to retrieve the next alarm code, and repeated this process for the last alarm code.


Slow blinking



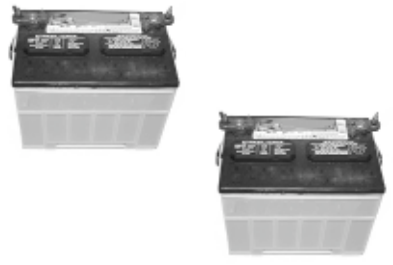
Fast blinking



Now that John discovered that the reason for the EEC system alarm code was low battery input voltage, he was able to focus on discovering the reason for this low battery voltage. After further investigation, he found two problems with his battery supply to the control system. The first problem is that only one battery power sources was connected to the EEC system, rather than two battery sources (see paragraph ___ for more information).



Secondly, the battery source that was connected (generator battery) was very low in voltage due to a failed battery charger. John fixed the problem with the generator battery charger, which charged the generator battery, and the EEC system immediately began to operate. Later, John had his marine electrician install a wire and circuit breaker to his house (domestic) battery source to provide a second battery source for the EEC system.



Alarm Count Chart

LEDs SLOW BLINKING				LEDs FAST BLINKING				= alarm count
TAKE	SYNC	WARM	TROLL	TAKE	SYNC	WARM	TROLL	
PORT N	ACTIVE	WARM	STBD N	PORT N	ACTIVE	WARM	STBD N	

COUNT	LEDs SLOW BLINKING				LEDs FAST BLINKING			
	TAKE	SYNC	WARM	TROLL	TAKE	SYNC	WARM	TROLL
	PORT N	ACTIVE	WARM	STBD N	PORT N	ACTIVE	WARM	STBD N
1	☀							
2		☀						
3	☀	☀						
4			☀					
5	☀		☀					
6		☀	☀					
7	☀	☀	☀					
8				☀				
9	☀			☀				
10		☀		☀				
11	☀	☀		☀				
12			☀	☀				
13	☀		☀	☀				
14		☀	☀	☀				
15	☀	☀	☀	☀				
16					☀			
17	☀				☀			
18		☀			☀			
19	☀	☀			☀			
20			☀		☀			
21	☀		☀		☀			
22		☀	☀		☀			
23	☀	☀	☀		☀			
24				☀	☀			
25	☀			☀	☀			
26		☀		☀	☀			
27	☀	☀		☀	☀			
28			☀	☀	☀			
29	☀		☀	☀	☀			
30		☀	☀	☀	☀			
31	☀	☀	☀	☀	☀			
32						☀		

COUNT	LEDs SLOW BLINKING				LEDs FAST BLINKING			
	TAKE	SYNC	WARM	TROLL	TAKE	SYNC	WARM	TROLL
	PORT N	ACTIVE	WARM	STBD N	PORT N	ACTIVE	WARM	STBD N
33	☀							☀
34		☀						☀
35	☀	☀						☀
36			☀					☀
37	☀		☀					☀
38		☀	☀					☀
39	☀	☀	☀					☀
40				☀				☀
41	☀			☀				☀
42		☀		☀				☀
43	☀	☀		☀				☀
44			☀	☀				☀
45	☀		☀	☀				☀
46		☀	☀	☀				☀
47	☀	☀	☀	☀				☀
48					☀			☀
49	☀				☀			☀
50		☀			☀			☀
51	☀	☀			☀			☀
52			☀		☀			☀
53	☀		☀		☀			☀
54		☀	☀		☀			☀
55	☀	☀	☀		☀			☀
56				☀	☀			☀
57	☀			☀	☀			☀
58		☀		☀	☀			☀
59	☀	☀		☀	☀			☀
60			☀	☀	☀			☀
61	☀		☀	☀	☀			☀
62		☀	☀	☀	☀			☀
63	☀	☀	☀	☀	☀			☀

Alarm Codes Description chart

Check alarm code values that you recorded on the preceding page with the list of alarm code descriptions below. Enter the description in the appropriate column on the chart.

LEDs SLOW BLINKING				LEDs FAST BLINKING				ALARM CODE DESCRIPTION
TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	
								Detected multiple handles with the same handle ID at startup.
								No handle connected at startup.
								Handle #1 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #2 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #3 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #4 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #5 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #6 PORT potentiometer reading below 0.25V or above 4.75V.
								Handle #1 STBD potentiometer reading below 0.25V or above 4.75V.
								Handle #2 STBD potentiometer reading below 0.25V or above 4.75V.
								Handle #3 STBD potentiometer reading below 0.25V or above 4.75V.
								Handle #4 STBD potentiometer reading below 0.25V or above 4.75V.
								Handle #5 STBD potentiometer reading below 0.25V or above 4.75V.
								Handle #6 STBD potentiometer reading below 0.25V or above 4.75V.
								**CP lost communication with Handle #1.
								**CP lost communication with Handle #2.
								**CP lost communication with Handle #3.
								**CP lost communication with Handle #4.
								**CP lost communication with Handle #5.
								**CP lost communication with Handle #6 (will not be stored).
** = Handle loosing communication will cause an alarm condition if handle is the active handle at time of fault								
								Detected multiple actuators with the same actuator ID at startup.
								CP actuator configuration does not match actuator settings.
								CP lost communication with actuator #1 (port throttle / gear).
								CP lost communication with actuator #2 (stbd throttle / gear).
								CP lost communication with actuator #3 (port / stbd troll).
								CP lost communication with actuator #4 (port / stbd throttle / electronic gear).
								Actuator # 1 battery input below 11.5V / 23V (code not stored in history).
								Actuator # 1 battery input above 16V / 30V (code not stored in history).
								Actuator # 1 battery input below 9V / 18V.
								Actuator # 1 battery input above 17V / 32V.

LEDs SLOW BLINKING				LEDs FAST BLINKING				ALARM CODE DESCRIPTION
TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	
		☼				☼		Acutator # 1 battery reading does not match 12 or 24V input range.
☼		☼				☼		Acutator # 1 — PORT throttle exceeded 5A for more than 10 seconds.
	☼	☼				☼		Acutator # 1 — PORT throttle exceeded 10A for more than 5 seconds.
☼	☼	☼				☼		Acutator # 1 — PORT throttle can't reach commanded position.
			☼			☼		Acutator # 1 — PORT throttle feedback more than 4.80V or less than 0.20V.
☼			☼			☼		Acutator # 1 — PORT gear exceeded 5A for more than 10 seconds.
	☼		☼			☼		Acutator # 1 — PORT gear exceeded 10A for more than 5 seconds.
☼	☼		☼			☼		Acutator # 1 — PORT gear can't reach commanded position.
		☼	☼			☼		Acutator # 1 — PORT gear feedback more than 4.80V or less than 0.20V.
				☼		☼		Acutator #2 — battery input below 11.5V / 23V (code not stored in history).
☼				☼		☼		Acutator #2 — battery input above 16V / 30V (code not stored in history).
	☼			☼		☼		Acutator #2 — battery input below 9V / 18V.
☼	☼			☼		☼		Acutator #2 — battery input above 17V / 32V.
		☼		☼		☼		Acutator # 2 battery reading does not match 12 or 24V input range.
☼		☼		☼		☼		Acutator # 2 — STBD throttle exceeded 5A for more than 10 seconds.
	☼	☼		☼		☼		Acutator # 2 — STBD throttle exceeded 10A for more than 5 seconds.
☼	☼	☼		☼		☼		Acutator # 2 — STBD throttle can't reach commanded position.
			☼	☼		☼		Acutator # 2 — STBD throttle feedback more than 4.80V or less than 0.20V.
☼			☼	☼		☼		Acutator # 2 — STBD gear exceeded 5A for more than 10 seconds.
	☼		☼	☼		☼		Acutator # 2 — STBD gear exceeded 10A for more than 5 seconds.
☼	☼		☼	☼		☼		Acutator # 2 — STBD gear can't reach commanded position.
		☼	☼	☼		☼		Acutator # 2 — STBD gear feedback more than 4.80V or less than 0.20V.
					☼	☼		Acutator #3 — battery input below 11.5V / 23V (code not stored in history).
☼					☼	☼		Acutator #3 — battery input above 16V / 30V (code not stored in history).
	☼				☼	☼		Acutator #3 — battery input below 9V / 18V.
☼	☼				☼	☼		Acutator #3 — battery input above 17V / 32V.
		☼			☼	☼		Acutator #3 battery reading does not match 12 or 24V input range.
☼		☼			☼	☼		Acutator #3 — PORT troll exceeded 5A for more than 10 seconds.
	☼	☼			☼	☼		Acutator #3 — PORT troll exceeded 10A for more than 5 seconds.
☼	☼	☼			☼	☼		Acutator #3 — PORT troll can't reach commanded position.
			☼		☼	☼		Acutator #3 — PORT troll feedback more than 4.80V or less than 0.20V.

LEDs SLOW BLINKING				LEDs FAST BLINKING				ALARM CODE DESCRIPTION
TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	TAKE PORT N	SYNC ACTIVE	WARM WARM	TROLL STBD N	
								Actuator #4 — battery input below 11.5V / 23V (code not stored in history).
								Actuator #4 — battery input above 16V / 30V (code not stored in history).
								Actuator #4 — battery input below 9V / 18V.
								Actuator #4 — battery input above 17V / 32V.
								Actuator # 4 — battery reading does not match 12 or 24V input range.
								Actuator #4 — PORT throttle exceeded 5A for more than 10 seconds.
								Actuator #4 — PORT throttle exceeded 10A for more than 5 seconds.
								Actuator #4 — PORT throttle can't reach commanded position.
								Actuator #4 — PORT throttle feedback more than 4.80V or less than 0.20V.
								Actuator #4 — STBD throttle exceeded 5A for more than 10 seconds.
								Actuator #4 — STBD throttle exceeded 10A for more than 5 seconds.
								Actuator #4 — STBD throttle can't reach commanded position.
								Actuator #4 — STBD throttle feedback more than 4.80V or less than 0.20V.

7.0 Appendix / Reference

The Appendix / Reference section is divided as follows:

7.1 Wiring Diagrams (many other engine layouts available, contact GMP)

- A. SINGLE Engine Wiring Diagram73
- B. TWIN Engine Wiring Diagram74
- C. TWIN Engine w/TROLL Wiring Diagram75
- D. TWIN Engine w/ELECTRIC GEAR Wiring Diagram76
- E. Smart Actuator Harnesses77

7.2 Dimensional Drawings / Cutout Templates

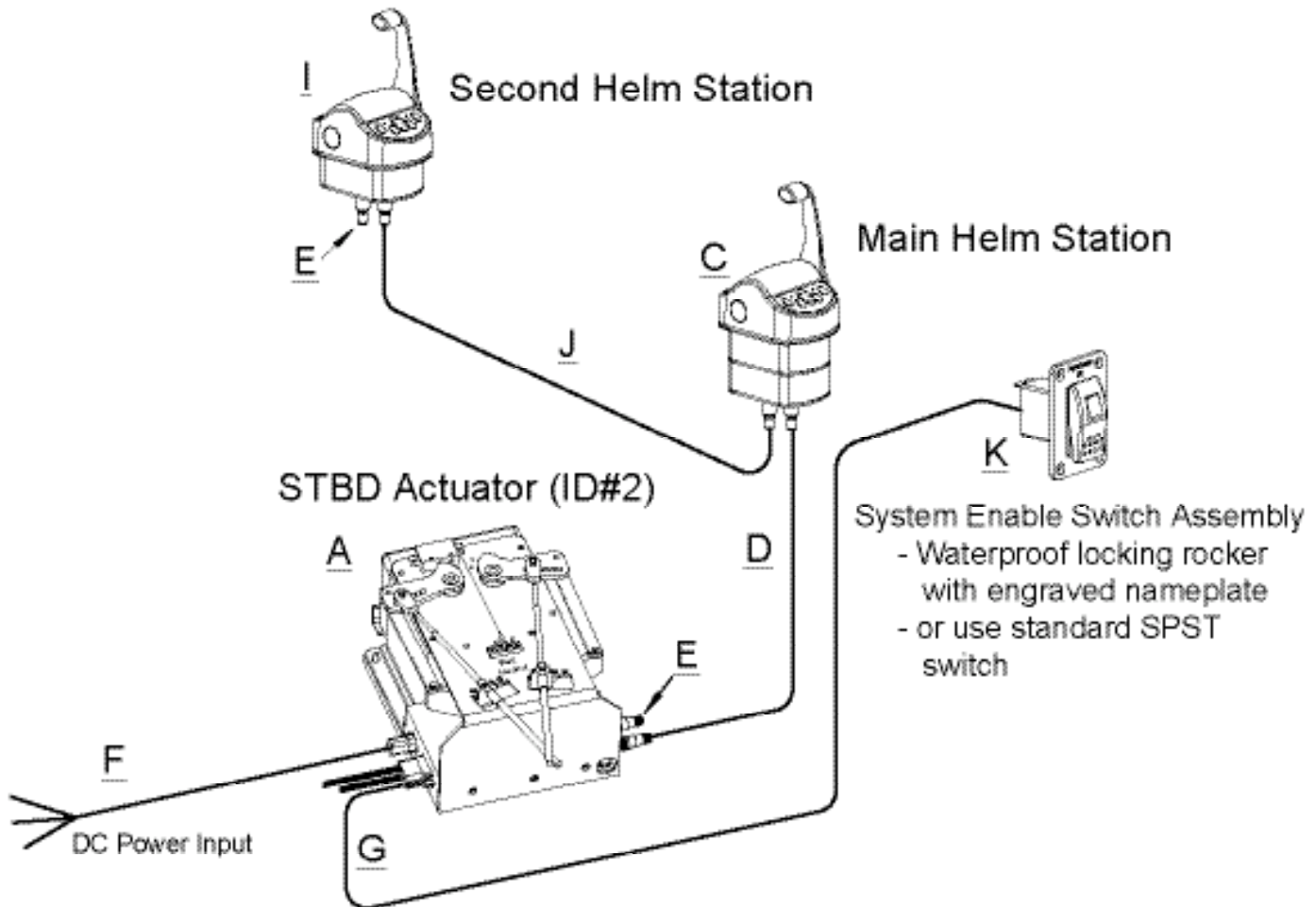
- A. Actuator Dimensions81
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- E. 4-button Control Head CP Single Dimensions85
- F. Smart Actuator Mounting Dimensions86
- G. Cutout templates for Control Heads87

7.3 Optional Equipment

- A. Sidemount Control Head
- B. Handheld Remote Control

SINGLE Engine Wiring Diagram

- Single Engine
- Mechanical Throttle
- Mechanical Gear
- Twin Helm Stations

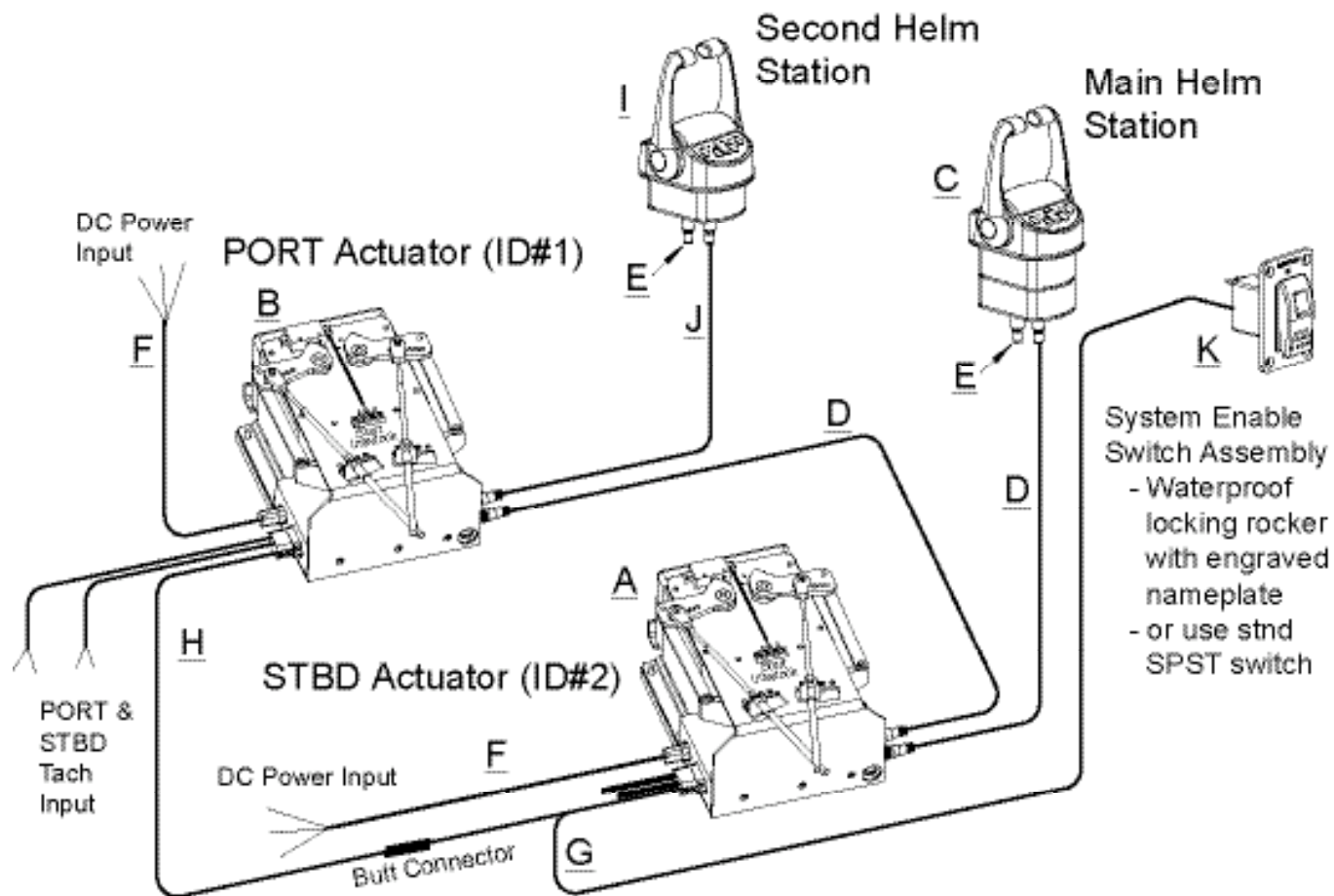


Typical Parts Required

Item	Qty	Part #	Description
A	(1)	11312-xx-TMG-S	Smart Actuator STBD (12 or 24v DC)
C	(1)	11413-CT-CP-SGL	CH2001 Control Head 4 button CP single
D	(1)	11600-02-XX	Station Cable (20 - 100' lengths)
E	(2)	11600-TRF	Terminating Resistors
F	(1)	11601-01	Harness - DC Power Input (30' length std.)
G	(1)	11603-02-SGL-xx	Harness - Enable Single (20 - 100' lengths)
Extra Control Station Requires			
I	(1)	11413-C15T-SGL	CH2001 Control Head 4 button Single
J	(1)	11600-02-xx	Station Cable (20 - 100' lengths)
Optional Enable Switch Assembly			
K	(1)	11490-x	Enable Switch Assembly (Black or White nameplate)

TWIN Engine Wiring Diagram

- Twin Engine
- Mechanical Throttle
- Mechanical Gear
- Twin Helm Stations

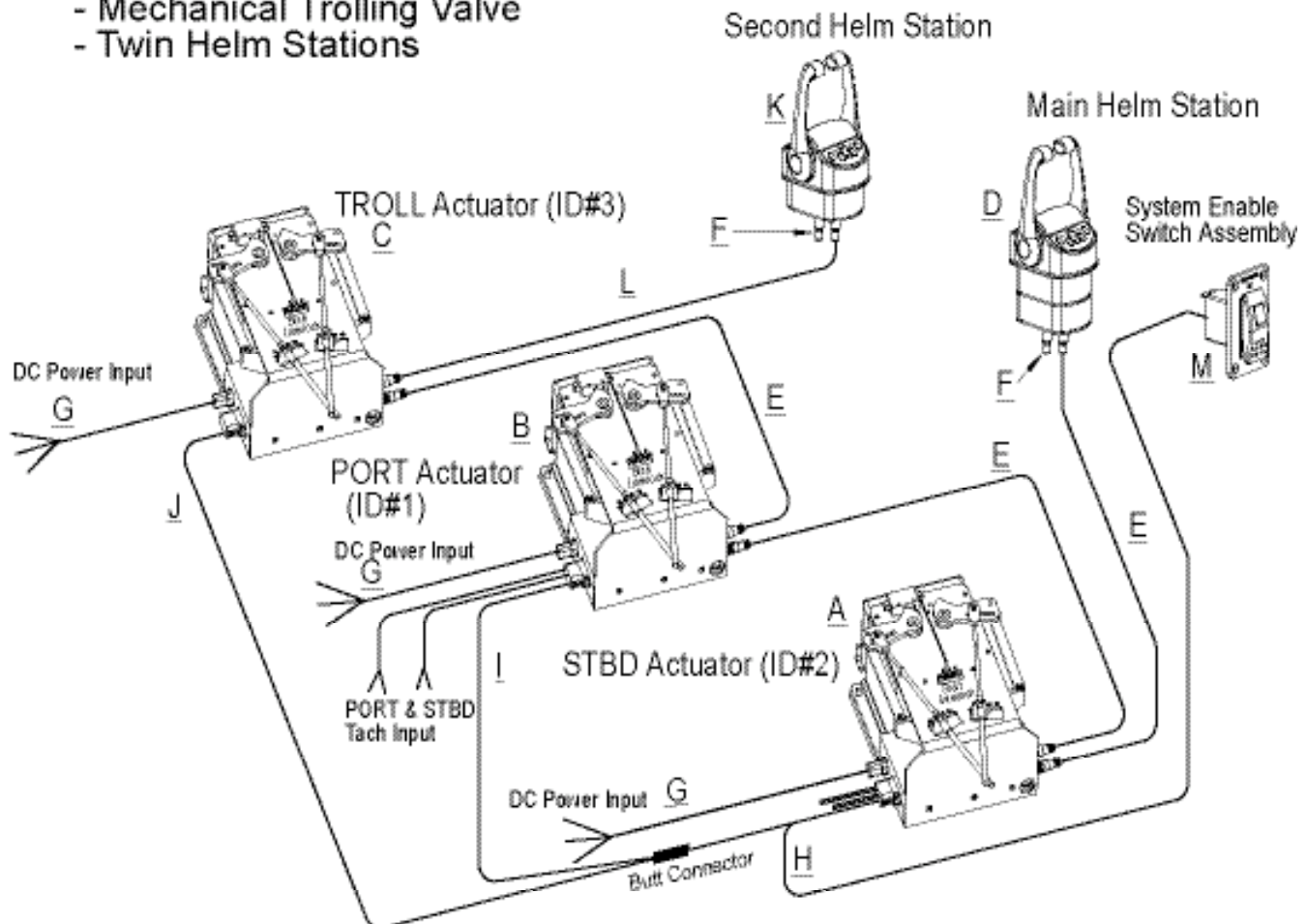


Typical Parts Required

Item	Qty	Part #	Description
A	(1)	11312-xx-TMG-S	Smart Actuator STBD (12 or 24v DC)
C	(1)	11413-CT-CP-SGL	CH2001 Control Head 4 button CP single
D	(1)	11600-02-XX	Station Cable (20 - 100' lengths)
E	(2)	11600-TRF	Terminating Resistors
F	(1)	11601-01	Harness - DC Power Input (30' length std.)
G	(1)	11603-02-SGL-xx	Harness - Enable Single (20 - 100' lengths)
H	(1)	11603-02-P	Harness - Enable/Tach PORT (30' length std)
Extra Control Station Requires			
I	(1)	11413-C15T-SGL	CH2001 Control Head 4 button Single
J	(1)	11600-02-xx	Station Cable (20 - 100' lengths)
Optional Enable Switch Assembly			
K	(1)	11490-x	Enable Switch Assembly (Black or White nameplate)

TWIN Engine w/TROLL Wiring Diagram

- Twin Engine
- Mechanical Throttle
- Mechanical Gear
- Mechanical Trolling Valve
- Twin Helm Stations

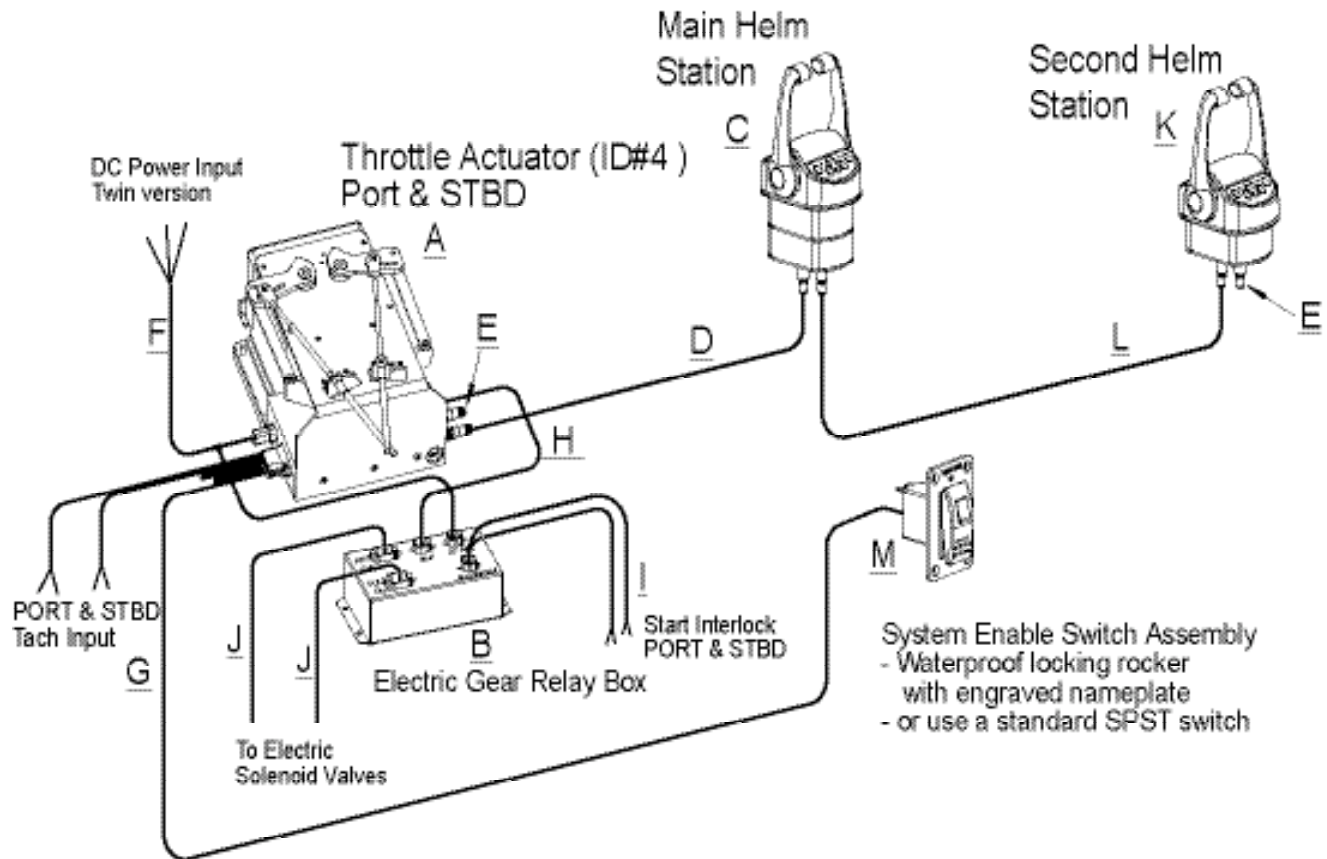


Typical Parts Required

Item	Qty	Part #	Description
A	(1)	11312-xx-TMG-S	Smart Actuator STBD (12 or 24v DC)
B	(1)	11312-xx-TMG-P	Smart Actuator PORT (12 or 24v DC)
C	(1)	11312-xx-TROLL	Smart Actuator TROLL (12 or 24v DC)
D	(1)	11413-CT-CP-SGL	CH2001 Control Head 4 button CP single
E	(3)	11600-02-XX	Station Cable (20 - 100' lengths)
F	(2)	11600-TRF	Terminating Resistors
G	(3)	11601-01	Harness - DC Power Input (30' length std.)
H	(1)	11603-02-S-xx	Harness - Enable STBD (20 - 100' lengths)
I	(1)	11603-02-P	Harness - Enable/Tach PORT (30' length std.)
J	(1)	11603-02-T	Harness - Enable TROLL (30' length)
Extra Control Station Requires			
K	(1)	11413-C15T	CH2001 Control Head 4 button
L	(1)	11600-02-xx	Station Cable (20 - 100' lengths)
Optional Enable Switch Assembly			
M	(1)	11490-x	Enable Switch Assembly (Black or White nameplate)

TWIN Engine w/ELECTRIC Gear Wiring Diagram

- Twin Engine
- Mechanical Throttle
- Electric Gear
- Twin helm station



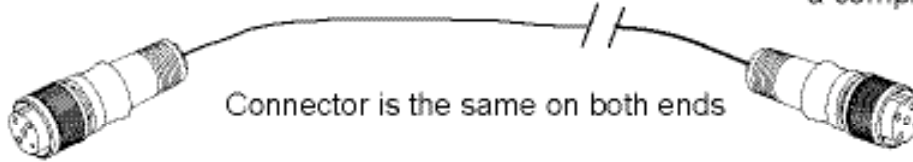
Typical Parts Required

Item	Qty	Part #	Description
A	(1)	11312-xx-TEG	Smart Actuator Throttle/Electric Gear (12 or 24v DC)
B	(1)	11705-xx	Electric Gear Relay Output Box (12 or 24v DC)
C	(1)	11413-CT-CP	CH2001 Control Head 4 button CP
D	(1)	11600-02-xx	Station Cable (20 - 100' lengths)
E	(2)	11600-TRF	Terminating Resistors
F	(1)	11601-02	Harness - DC Power Input Twin (30' length std.)
G	(1)	11603-02-TEG-xx	Harness - Enable TEG (20 - 100' lengths)
H	(1)	11609-03-xx	Harness - Interconnect (12 or 24v DC)
I	(1)	11602-01	Harness - Start Interlock (30' length std.)
J	(1)	11604-L1-xx	Harness - Gear ZF IRM (10 - 30' lengths)
Extra Control Station Requires			
K	(1)	11413-C15T	CH2001 Control Head 4 button
L	(1)	11600-02-xx	Station Cable (20 - 100' lengths)
Optional Enable Switch Assembly			
M	(1)	11490-x	Enable Switch Assembly (Black or White nameplate)

Complete Control - Smart Actuator Harnesses

Station Cable
Part # 11600-02-xx' (available 20' - 100' in 20' increments)

NOTE: Connector Nut must turn 6 turns to ensure a complete connection

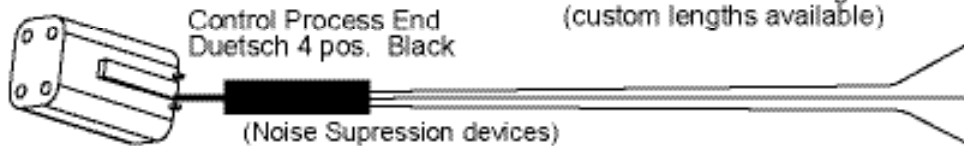


Terminating Resistor
Part # 11600-TRF
Two required per system

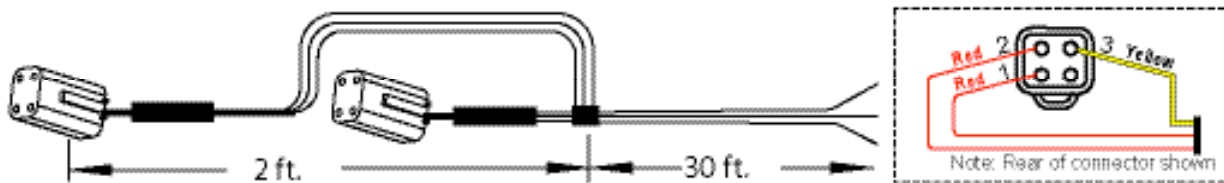


DC Power Harness
Part # 11601-01 (30' long std.)

NOTE: Power wires are 30' long standard (custom lengths available)



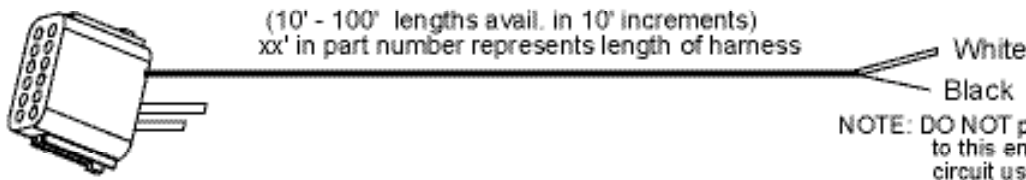
DC Power Harness - Twin Output Part # 11601-02 (30' long std.)



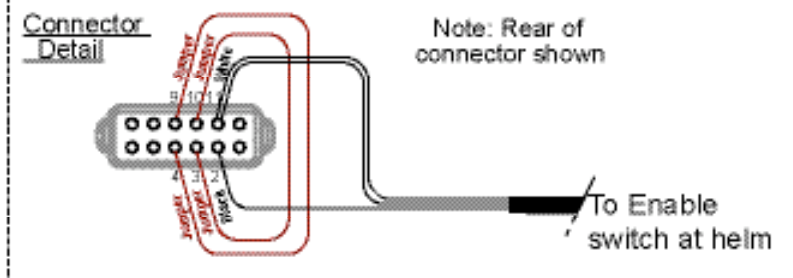
Smart Actuator - Single Engine Harness
Part # 11603-02-SGL-xx

SINGLE

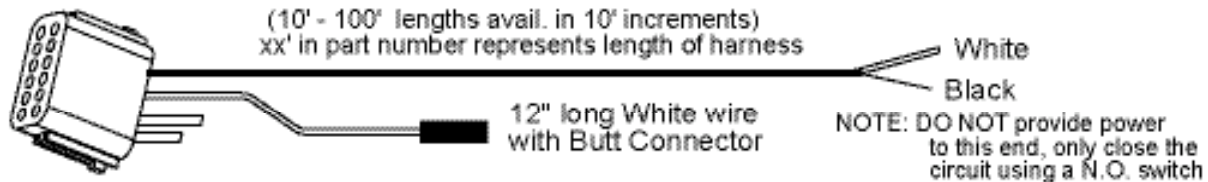
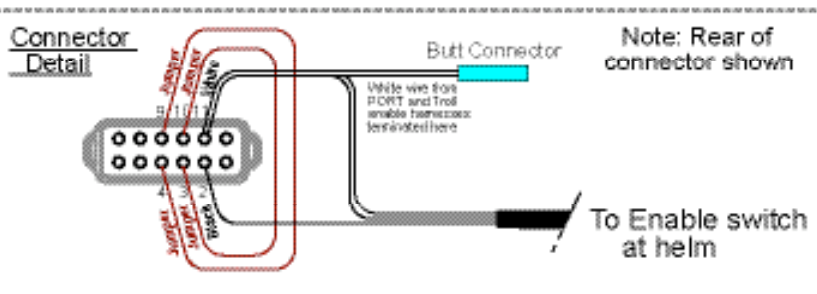
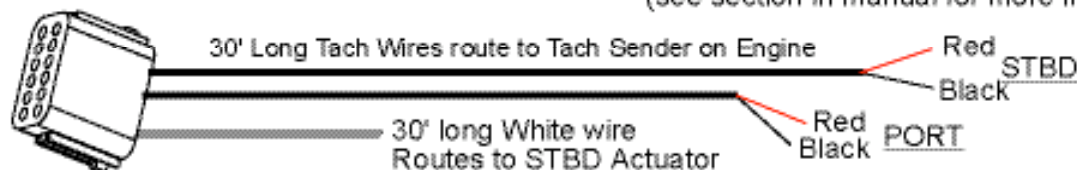
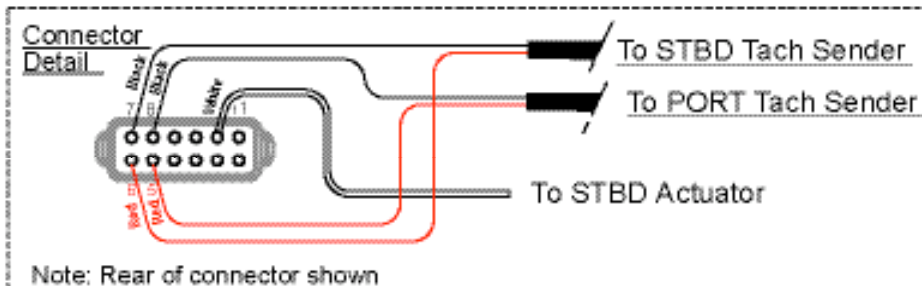
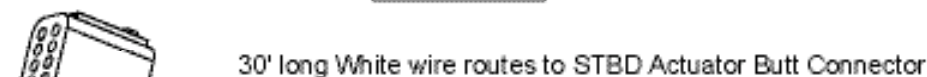
Enable Switch End
- see GMP Enable Switch Kit #11490-x
- or a SPST installer provided switch



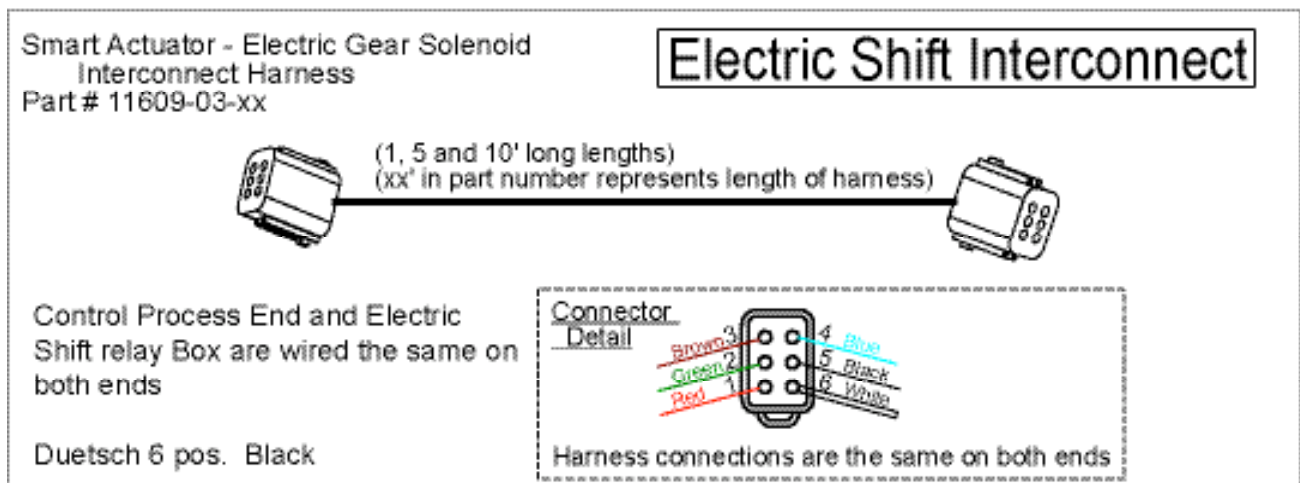
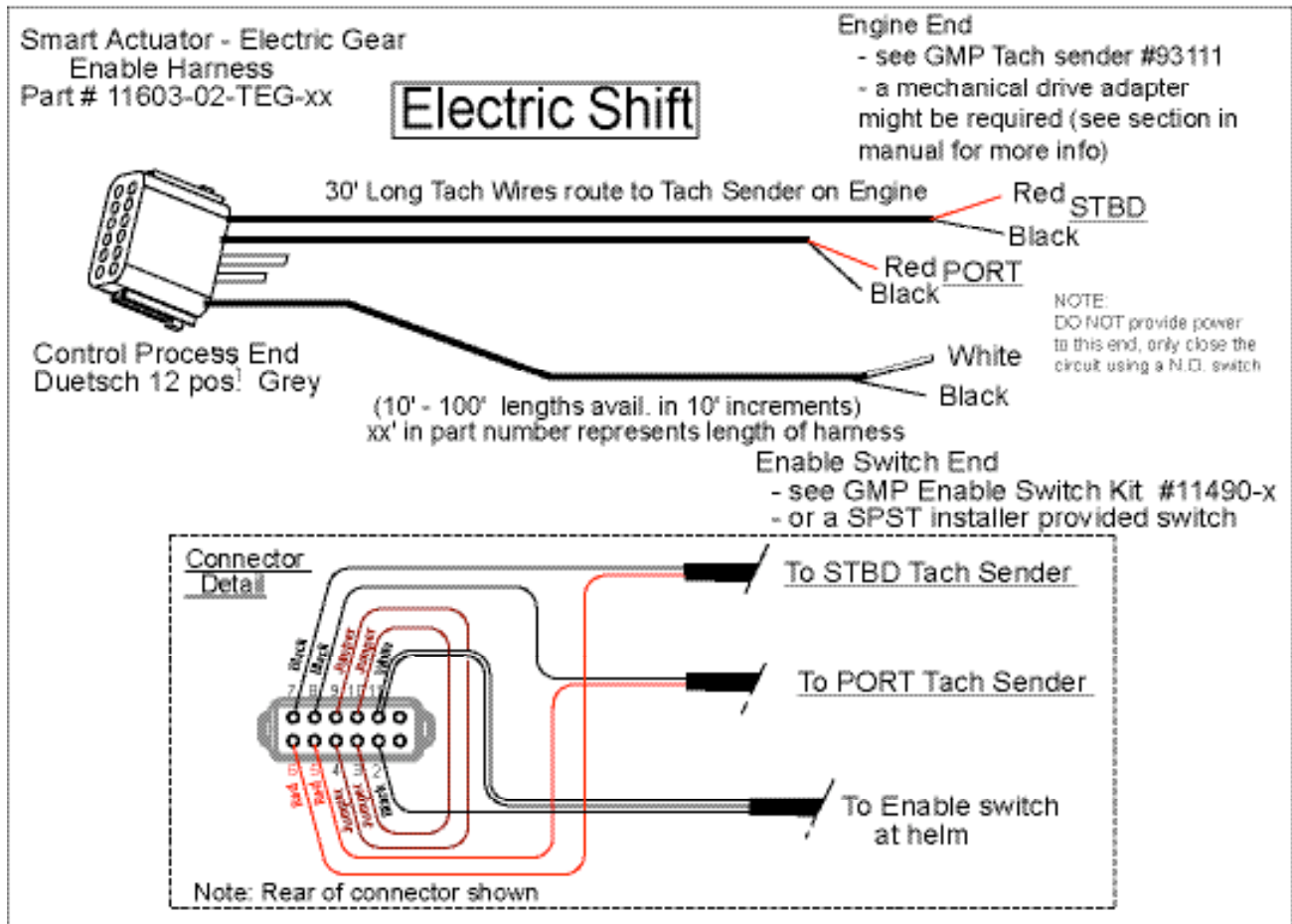
Control Process End
Duetsch 12 pos.
Grey



Complete Control - Smart Actuator Harnesses

Smart Actuator STBD Harness
Part # 11603-02-S-xx**STBD**Enable Switch End
- see GMP Enable Switch Kit #11490-x
- or a SPST installer provided switchControl Process End
Duetsch 12 pos.
GreySmart Actuator PORT Harness
Part # 11603-02-P**PORT**Engine End
- see GMP Tach sender #93111
- a mechanical drive adapter might be required
(see section in manual for more info)Control Process End
Duetsch 12 pos.
GreySmart Actuator - Troll Harness
Part # 11603-02-T**TROLL**Control Process End
Duetsch 12 pos. Grey

Complete Control - Smart Actuator Harnesses



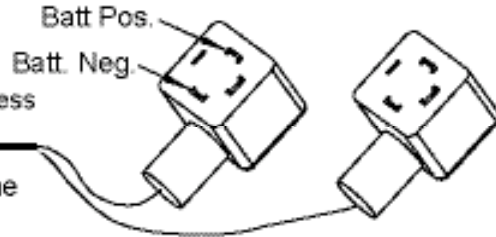
Complete Control - Smart Actuator Harnesses

Smart Actuator - Transmission Harness to Solenoid valves
Part # 11604-L1-xx

ZF Solenoid Valve Connectors
- with LED indicators

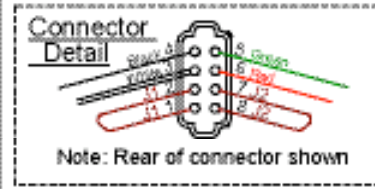


(5'- 30' lengths avail. in 5' increments)
xx' in part number represents length of harness



NOTE: Voltage output will be the same
as input to Relay Box

Control Processor End
Duetsch 8 pos. Grey

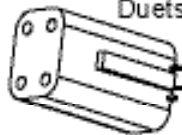


Start Interlock Harness
Part # 11602-01 (30' long std.)

NOTE: N.C. circuit between wires for PORT and STBD
Circuit OPENS when system is ON and
is NOT in Neutral position
8 amp max current

Control Process End
Duetsch 4 pos. Black

NOTE: Each start interlock wire is 30' long standard
(custom lengths available)

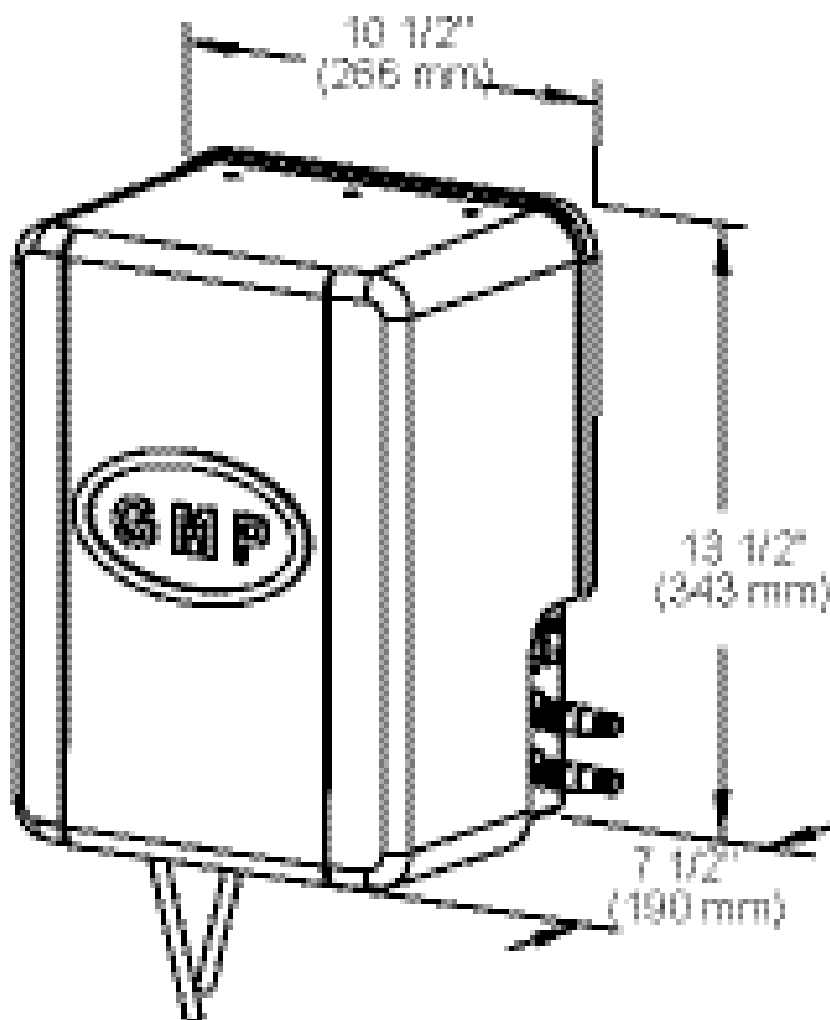


PORT
STBD

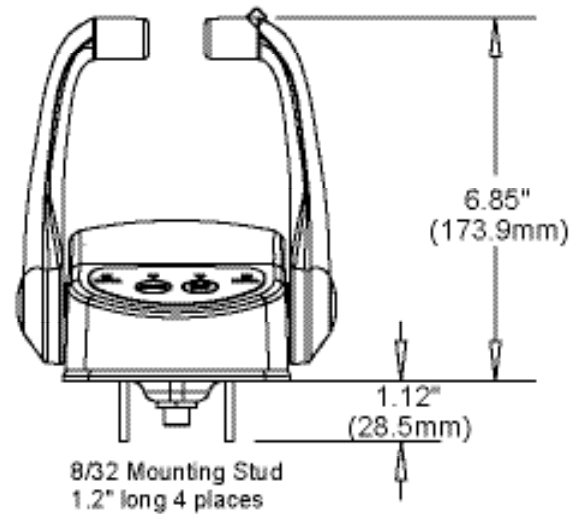
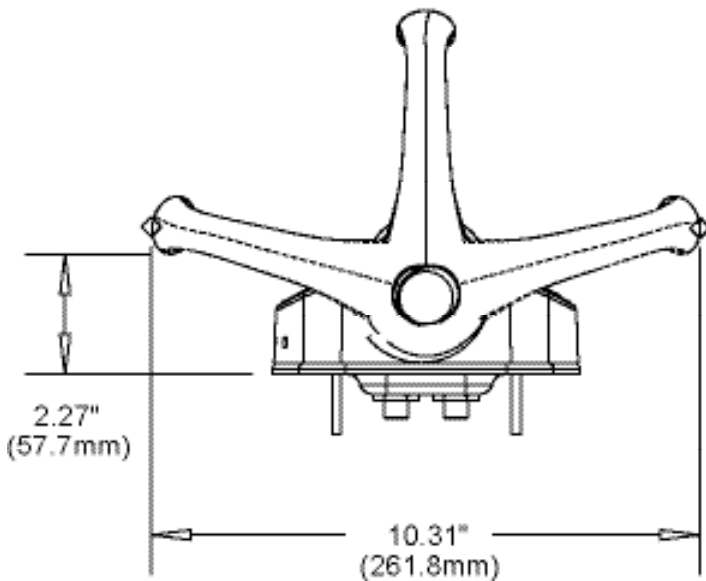
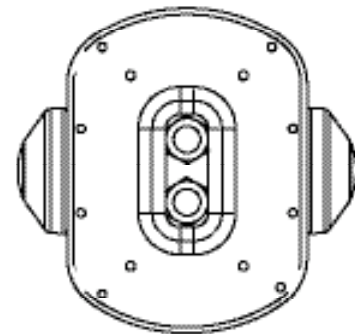
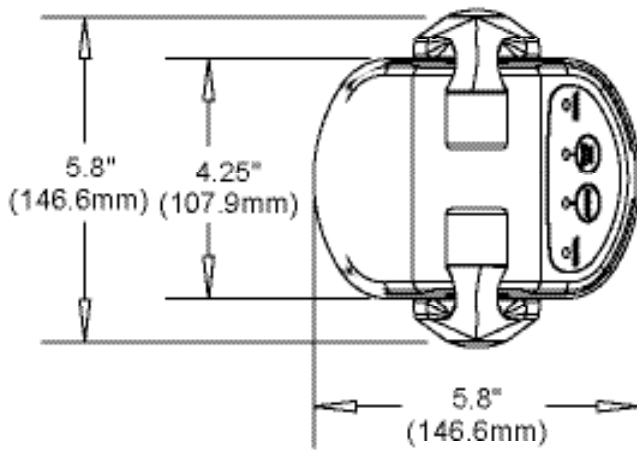
NOTE : All wires are yellow
with red stripe



Actuator Dimensions

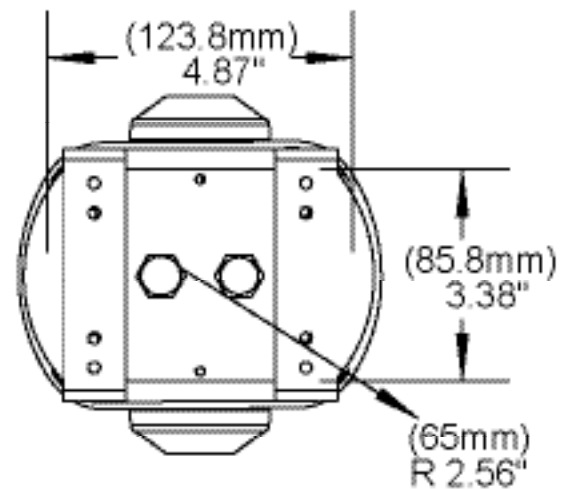
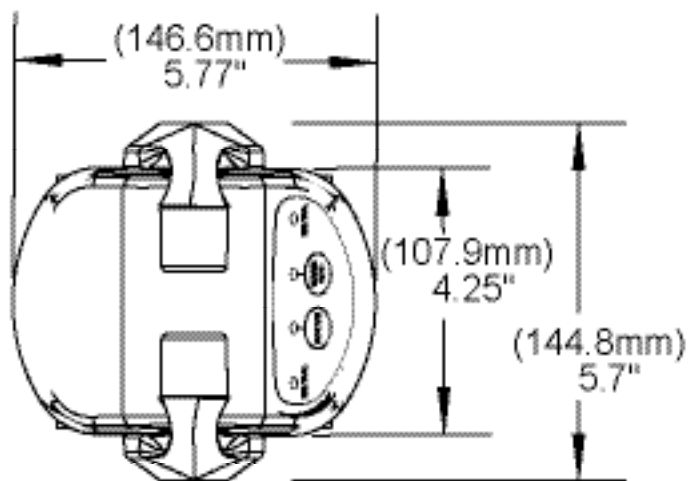
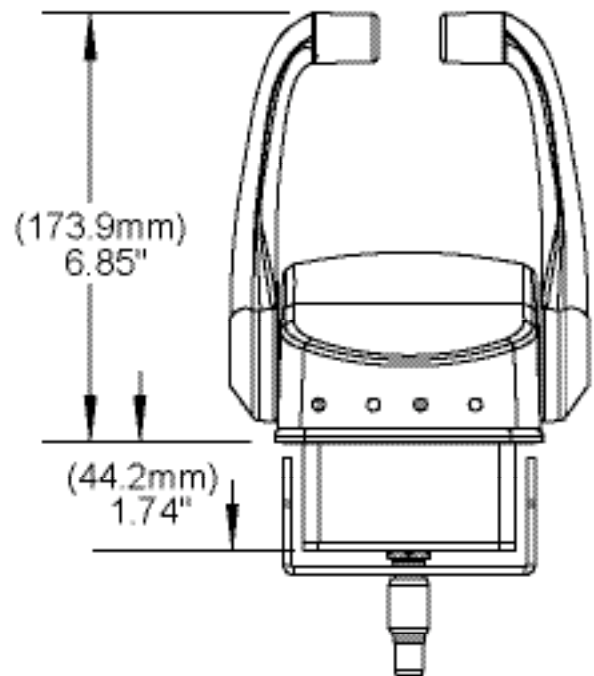
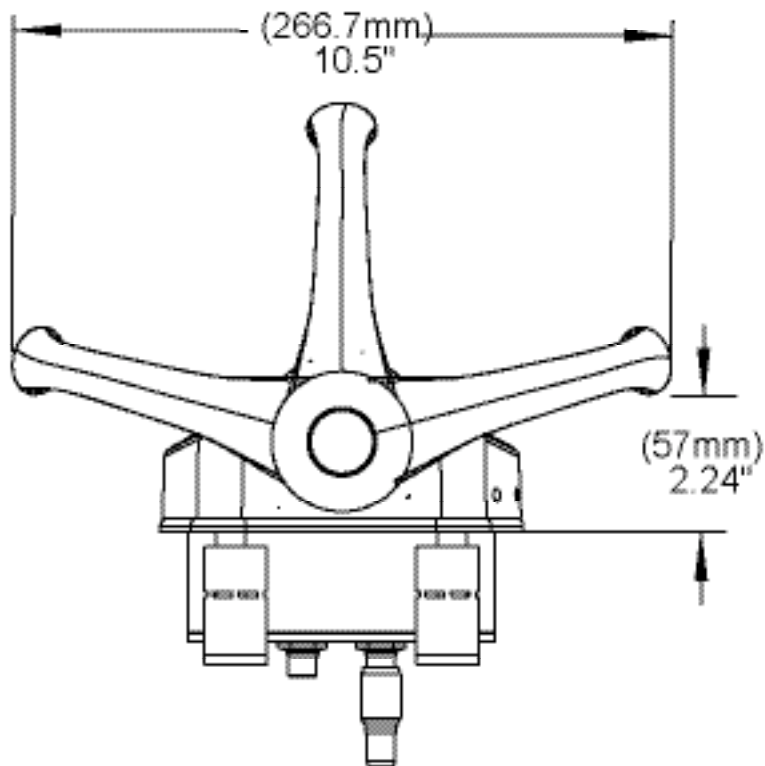
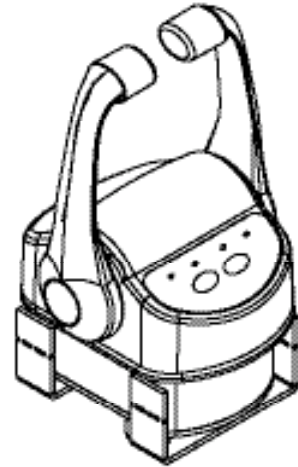


2-button Control Head (Remote) Dimensions

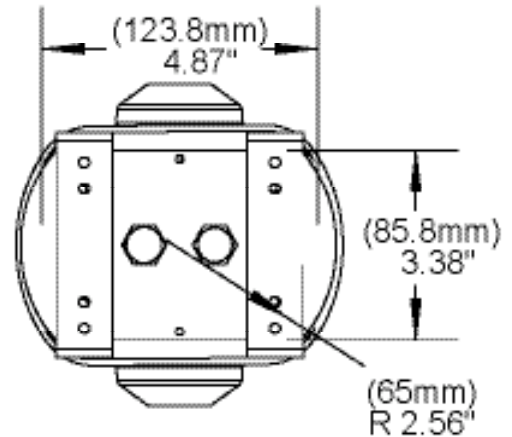
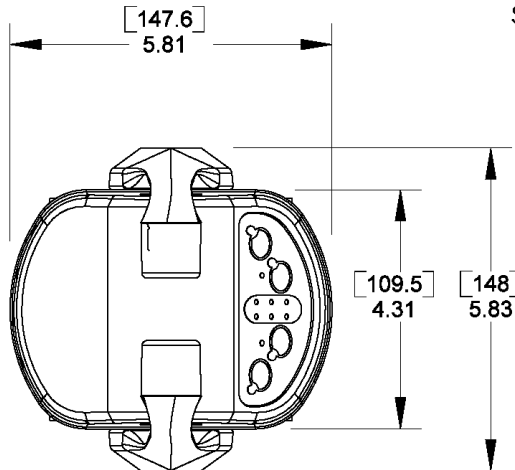
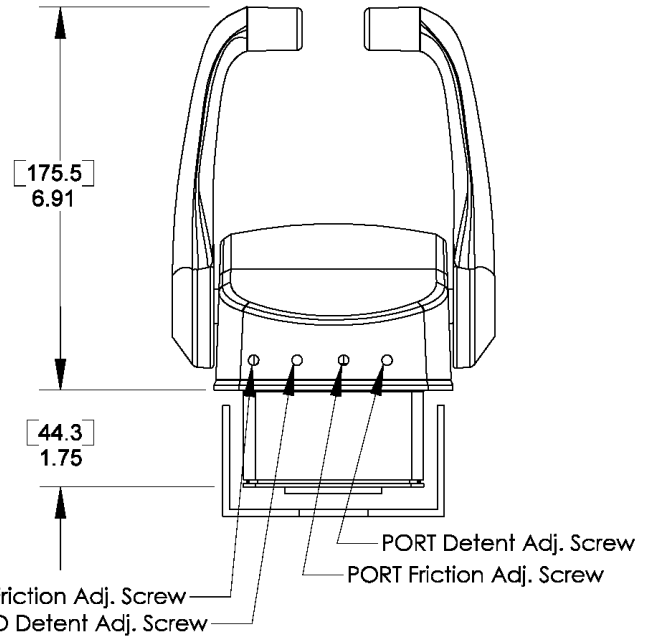
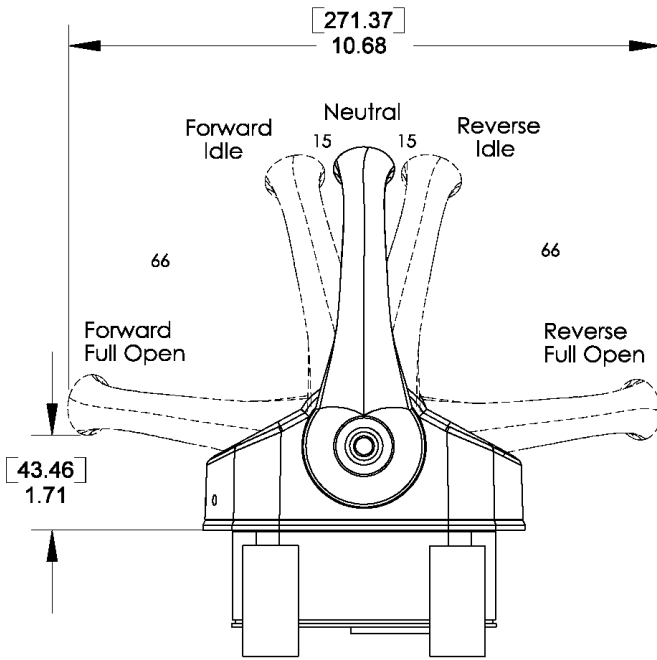
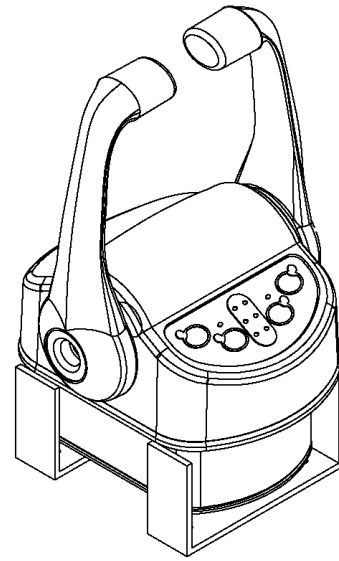


NOTE: 2.0" [51mm] required below connector for cable connector

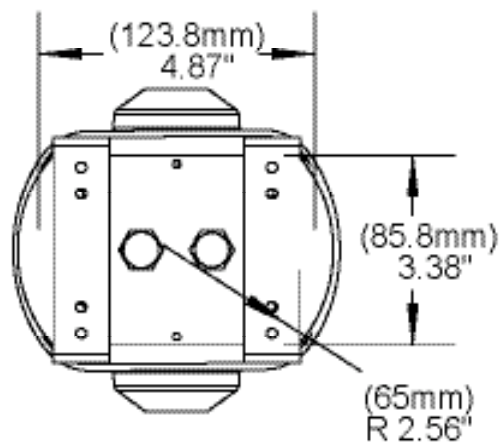
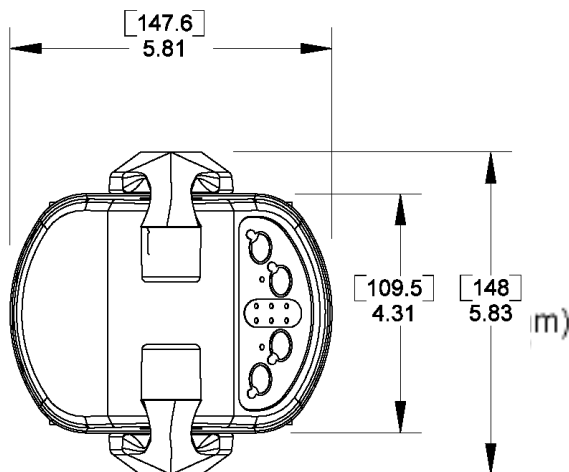
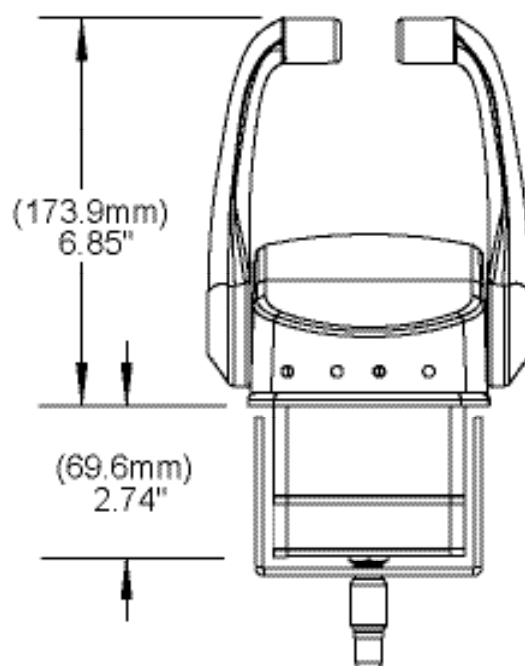
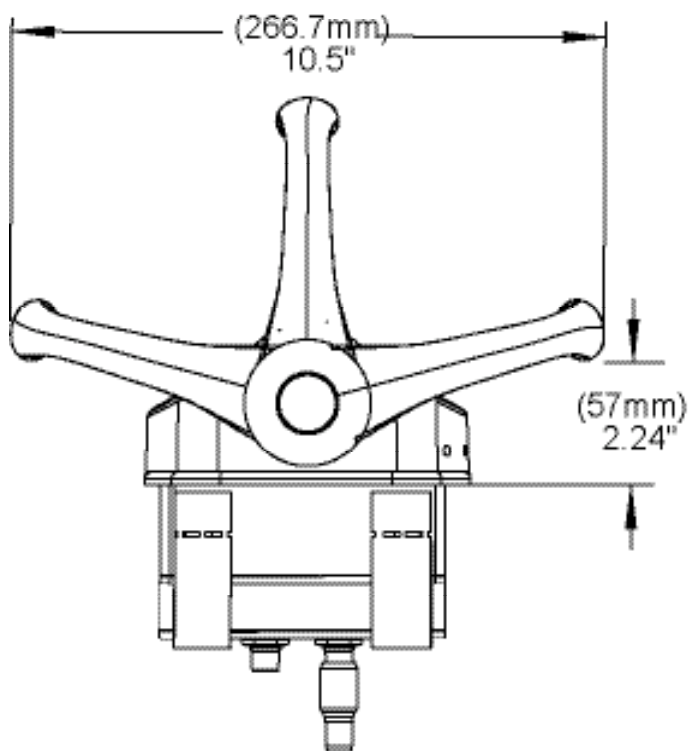
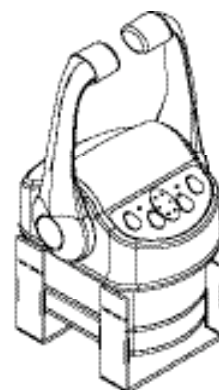
2-button Control Head CP Dimensions



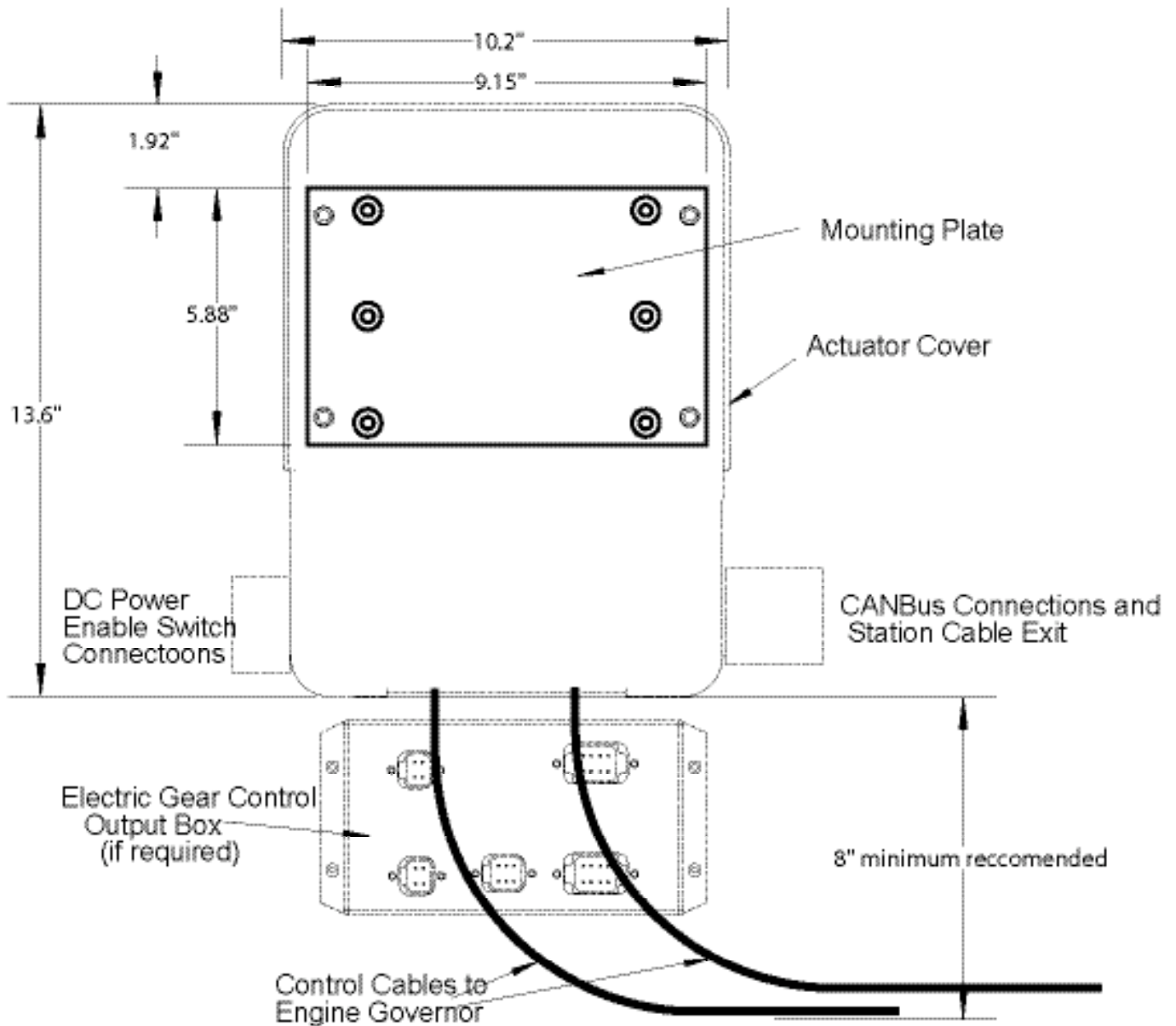
4-button Control Head (Remote) Dimensions



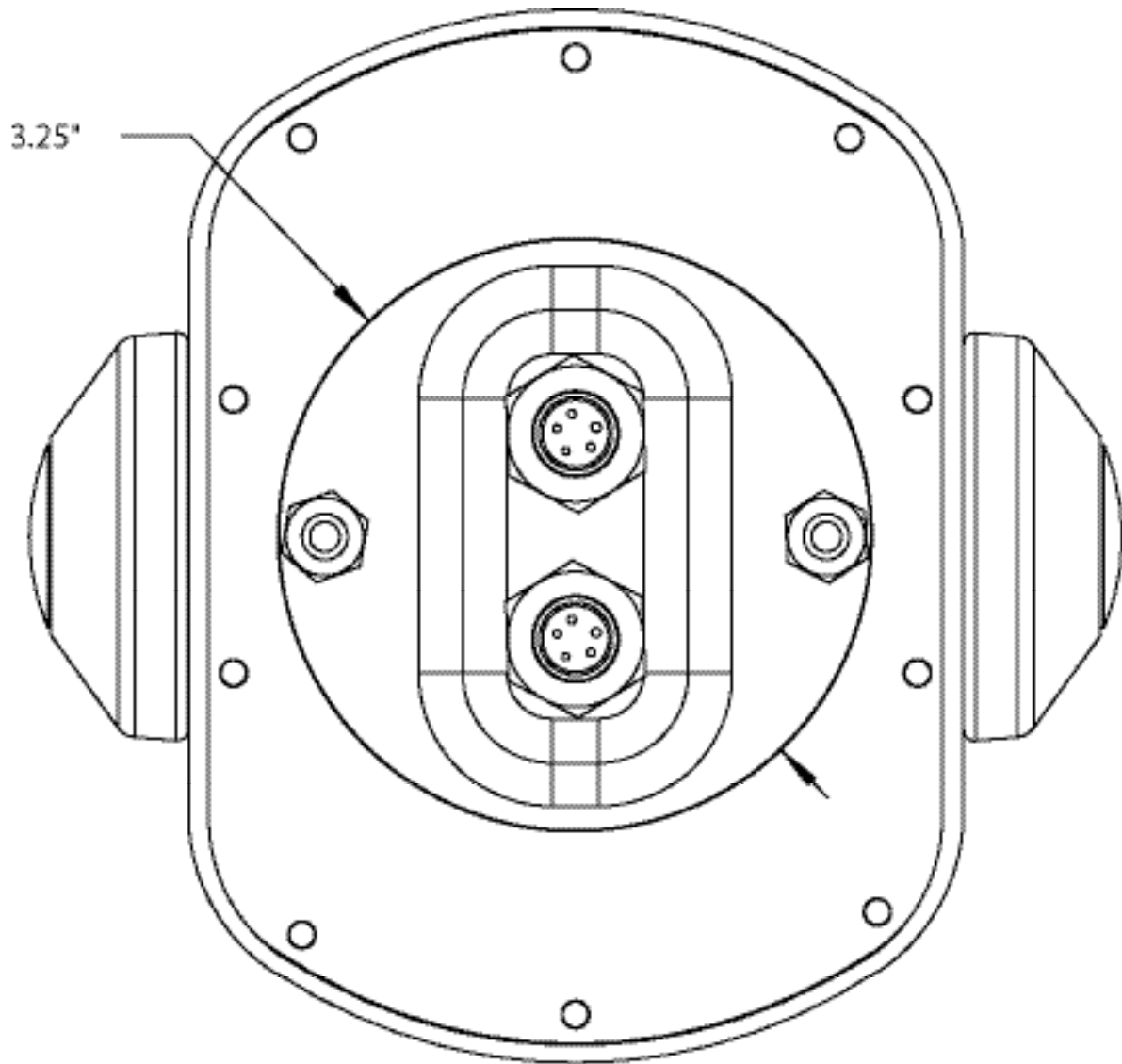
4-button Control Head CP Single Dimensions



Smart Actuator Mounting Dimensions



2-button Control Head (Remote) Cutout Template



Control Head Cutout Template for:

- 2-button Control Head CP
- 4-button Control Head (Remote)
- 4-button Control Head CP

