EEC4
Electronic Engine Controls
by Glendinning

Installation Manual v3.3A

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MANUAL REVISIONS

REVISION	PAGE #	DESCRIPTION	DATE of CHANGE
3.3A	33 & 41	Added Section 2.5 - Gear Throttle Backup and Section 2.6 - Triple Engine Applications to Appendix	JANUARY 2007
3.3	N/A	Initial startup of document	JULY 2006

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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 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.

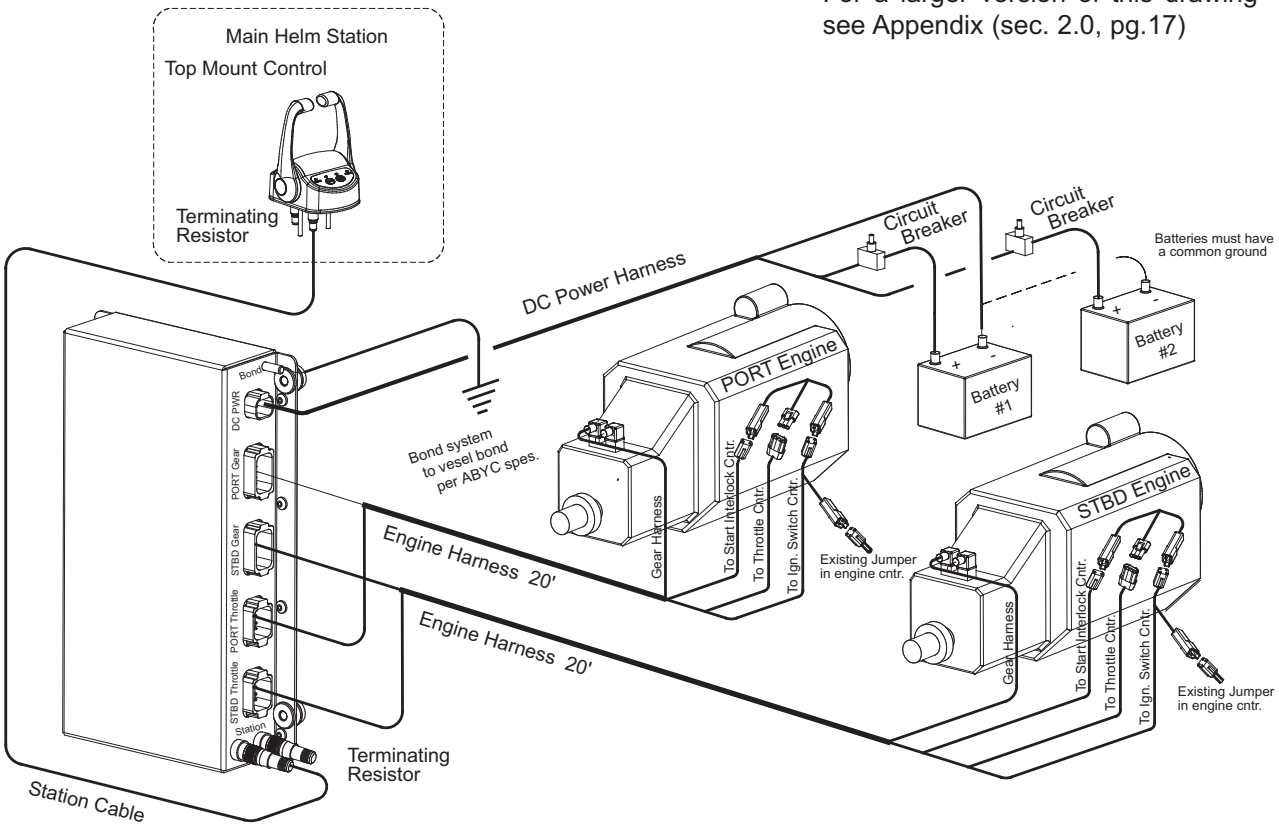
1.0 Installing the EEC4

The installation process includes the following six steps:

STEP 1: Pre-installation planning (the most important part of the process)
STEP 2: Mount the EEC4 Control Processor
STEP 3: Control Head(s) Installation
STEP 4: Station Communication Cable Routing
STEP 5: Engine Compartment Wiring
STEP 6: Operational Test

Installation Preview

For a larger version of this drawing see Appendix (sec. 2.0, pg.17)



1.1 Pre-Installation Planning

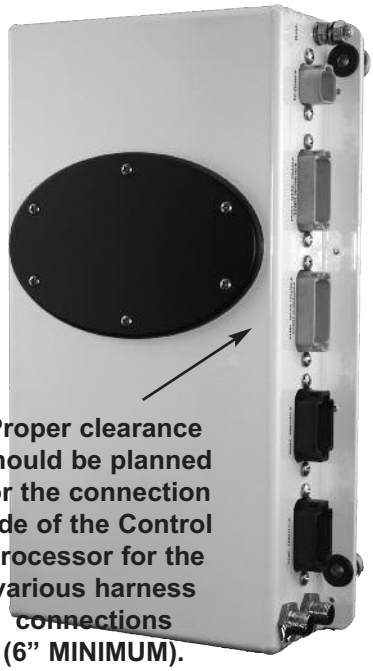
Before beginning the installation of the Glendinning EEC4 System, it is very important that some thought be given to the overall installation. The following should be considered:

— Control Processor location
— Power / Battery supply
— Station Communication Cable routing

• Control Processor Location

Environmental conditions—The CP is designed to be located in the engine compartment of a typical boat. It can be mounted in any position — horizontally on the overhead or deck or on one of the engine compartment walls. Although the CP has been designed to operate in ambient temperature conditions of up to 70 C (158 F), as far as possible, the CP should not be exposed to extreme temperature conditions (ie, touching any part of the engine exhaust). The CP is not designed for direct water impingement and therefore should not be located where it may be sprayed with water or with connectors facing upward.

Accessibility—Approximately 15 cm (6 inches) of clearance should be maintained at the side of the CP where the connection plugs are located to provide for plug installation and removal.



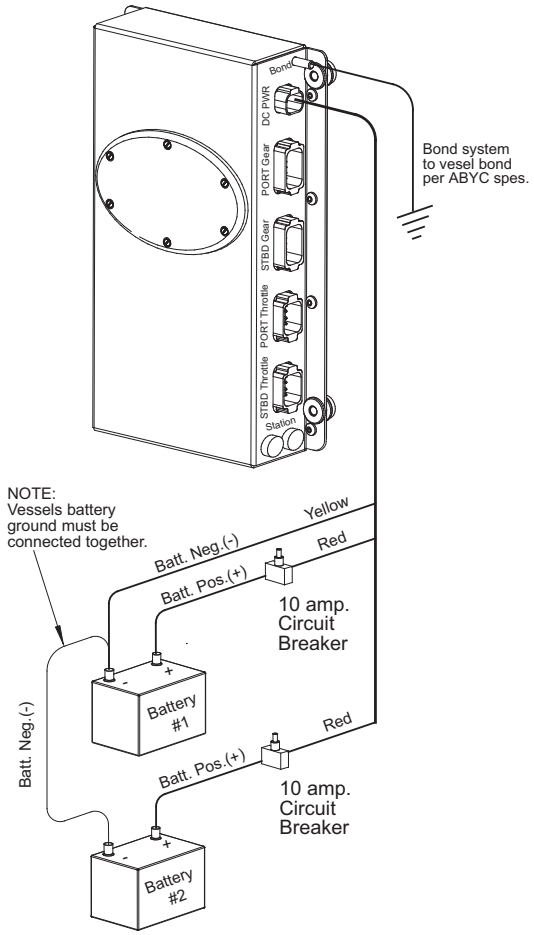
Proper clearance should be planned for the connection side of the Control Processor for the various harness connections (6" MINIMUM).

• Power Supply

In the installation of any electronic device, the source of power is one of the most important factors to consider during the installation. The EEC4 has been designed to be connected to two (2) 12 VDC power sources, although it can operate on only a single power source.



IMPORTANT! — Although the EEC4 system can operate on a single battery power source, connecting to two (2) separate battery sources is STRONGLY RECOMMENDED. If the EEC4 system is only connected to a single battery power source, intermittent drops in battery voltage — perhaps during engine start — can cause intermittent failures of the EEC4 system.



Ensure that the power supply to the control system includes the following:

— Battery sources should be independent, not 2 batteries connected in parallel.

— Circuit protection (fuse or circuit breaker) should be installed at the point where the CP power harness is connected to the battery / power source. Use 10 amp circuit protection.

— The battery ground wire should be connected to one of the batteries. Verify that the battery ground wires are connected together elsewhere on the vessel.

• Station Communications Cable — CANbus Network Design

The EEC4 system utilizes a CANbus digital communications system to link the components in the control system — Control Processor (CP) and Control Heads (CH). There are various ways in which the Station Communications cable can be connected depending on the application.

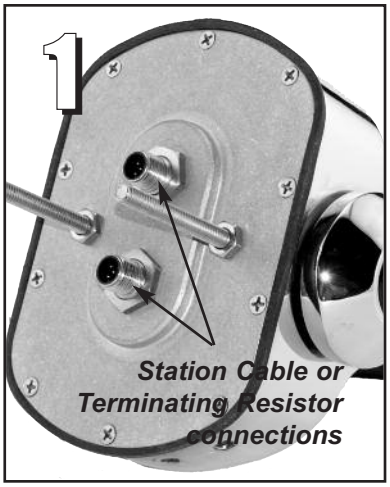


Photo 1
Control Head connection points (bottom view of control head).
Connect another control head station cable or a terminating resistor to the proper plug on the bottom of the Control Head.

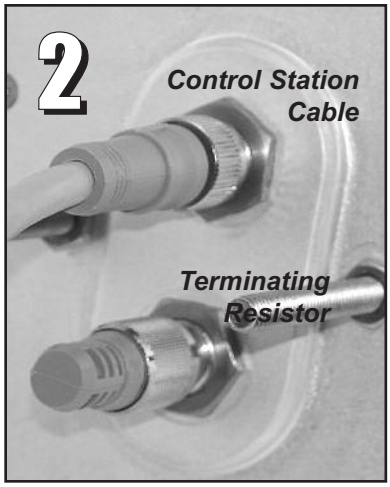


Photo 2
Correct installation of station cable and terminating resistor.
It does not matter which connection receptacle you use for either the control station cable or the terminating resistor.



Photo 3
Control Processor station connection points.
Connect control head station cables or a terminating resistor to the proper plug receptacles at the bottom of the Control Processor.

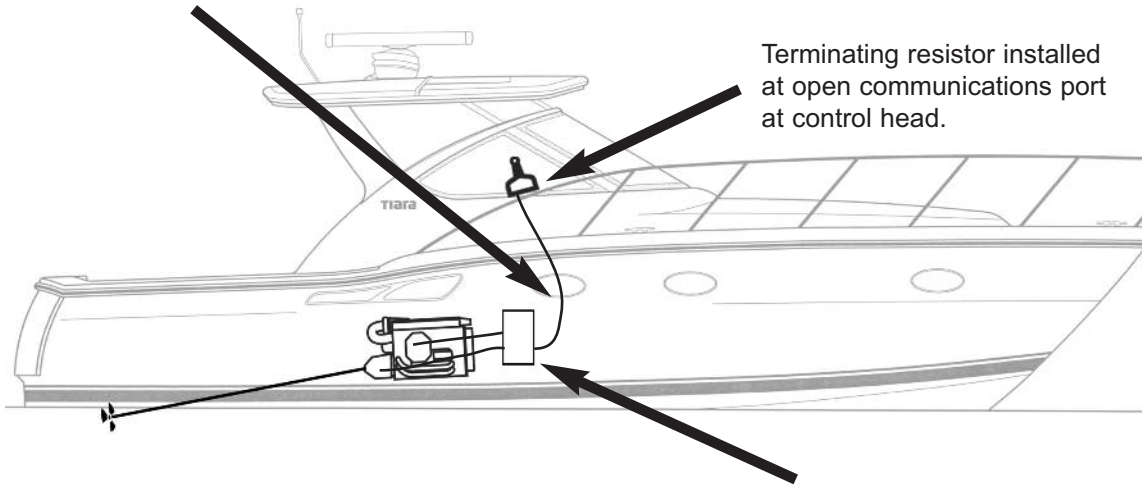


Photo 4
Terminating resistor is needed at either end of the CANbus network in order for the system to operate properly. The terminating resistor can be installed on the Control Head or the Control Processor.

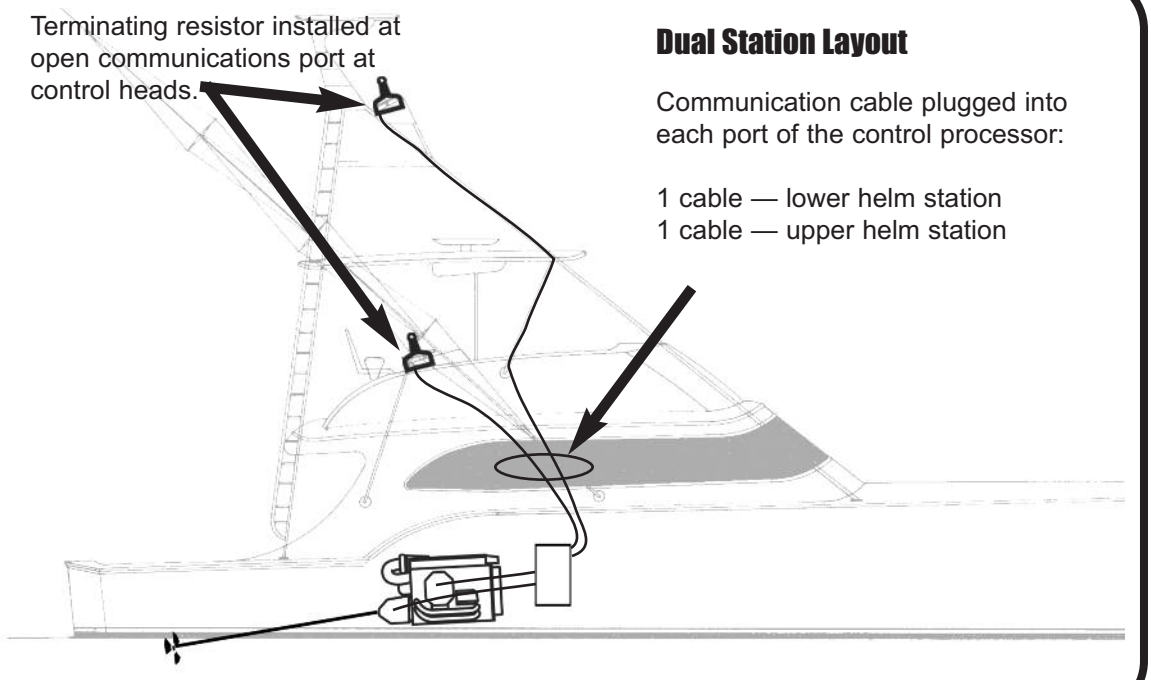
The **Single Station Layout** (see illustration on the next page) is straight-forward and easy to understand. A single Station Communications cable connects the CP and the CH — cables are available in 20, 30, 40, or 60 foot lengths. A terminating resistor is plugged into the other CANbus connector at both the CP and CH.

Single Station Layout

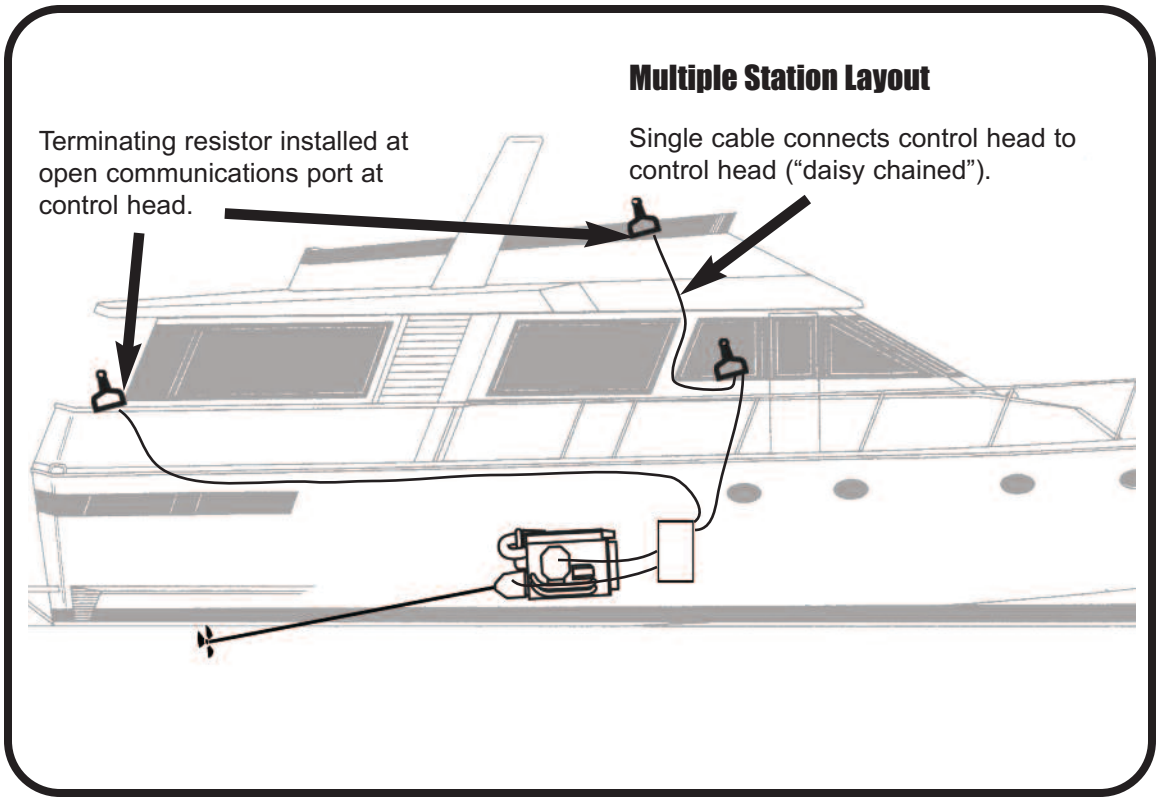
Single cable connects control head to control processor.



The **Dual Station Layout** illustrates how both control stations are connected to the control processor by separate cables. An alternative installation would be to connect the station communication cable for the upper Control Head to the lower Control Head instead of the Control Processor (as shown). A terminating resistor is plugged into the open CANbus connections that do not have a Station Communications cable connected to them.



The **Multiple Station Layout** illustrates the concept of "daisy-chaining" control stations to reduce the length of station communication cable runs to the Control Processor.





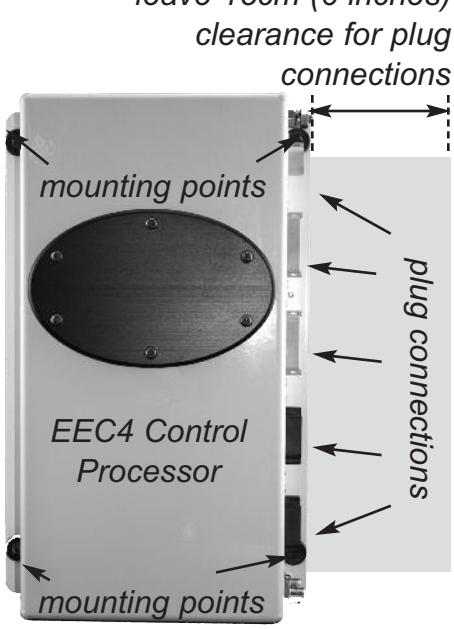
Failure to install the terminating resistors correctly will result in "poor communication" between the control station and the Control Processor causing the system to respond erratically. This could result in loss of property or life. Install terminating resistors and station cables carefully (pp. 3, 7)

REMEMBER:

— Each of the components must be linked by the Station Communications Cable — the order in which they are connected is not important.

— At each end of the CANbus network, a terminating resistor must be installed.

— When complete, all of the CANbus connections on the CP and the CH must have something connected — either a station communications cable or a terminating resistor.



1.2 Mount the Control Processor

Follow these steps to install the EEC4 Control Processor:

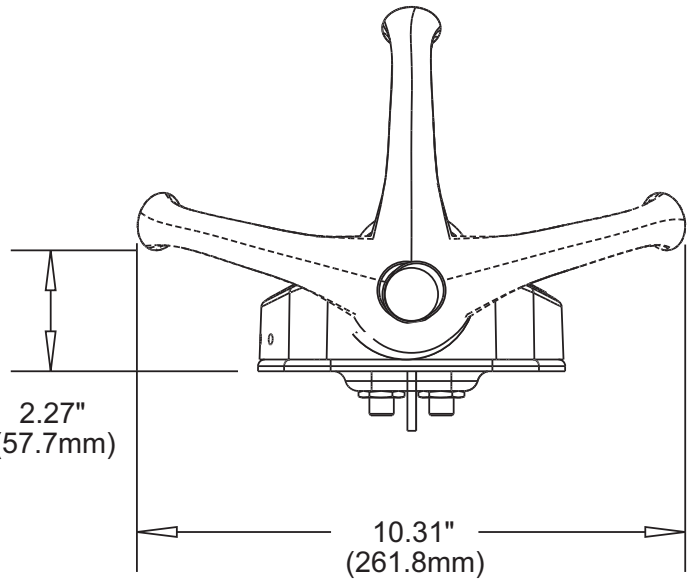
STEP 1: The Control Processor can be mounted anywhere in the engine room providing that the Processor is reasonably accessible

so that inspection and/or repairs to the unit may be performed. The Control Processor should NOT be installed in adverse locations subject to saltwater exposure or excessive heat.

STEP 2: Mount the Control Processor using 1/4" (7mm) machine bolts or lag screws. If using lag screws, screw length should be no less than 1" (25mm). If using machine bolts, lockwashers or locknuts MUST be used *(figure 1)*.

1.3 Mount 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.



STEP 1: Mark the location for the Control Head using the template provided (see pg. 53). Cut the 3" diameter hole.

STEP 2: Place the Control Head assembly into the cutout.

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



Top Mount Control Head

- **Station ID (multiple station applications)**

A total of six (6) control stations may be added to the EEC4 system. In a multi-station control system, all of the control handles are identical from a hardware point of view. However, there is a software configuration that must be completed to designate the "Station Identifier (ID) for each station.

— The basic EEC4 kit includes a control head that is configured for ID#1.

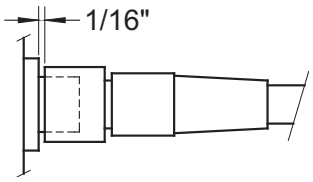
— A part number is available for a "second station" Control Head where the Control Head is factory configured for ID#2.

— If an additional Control Head is required beyond 2 stations, obtain a "second station" Control Head and then configure the Station Identifier during system startup.

1.4 Station Communication Cable Installation

Install the Station Communication cables between the Control Processor and Control Head(s) as previously discussed in Section 3.1. Station communication cables are available in 20, 30, 40. or 60 foot lengths.

It is VERY IMPORTANT that the Station Communication cable nut be connected tightly. The nut requires 6-7 turns to completely connect it, and there should be no more than a 2mm (1/16 inch) gap between the nut and the connector — see diagram below.



— when fully seated, connector is 1/16” away from nut (max)
— Connector requires 6 full turns to be fully engaged

WARNING: Failure to follow the instructions above will result in erratic system performance.

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

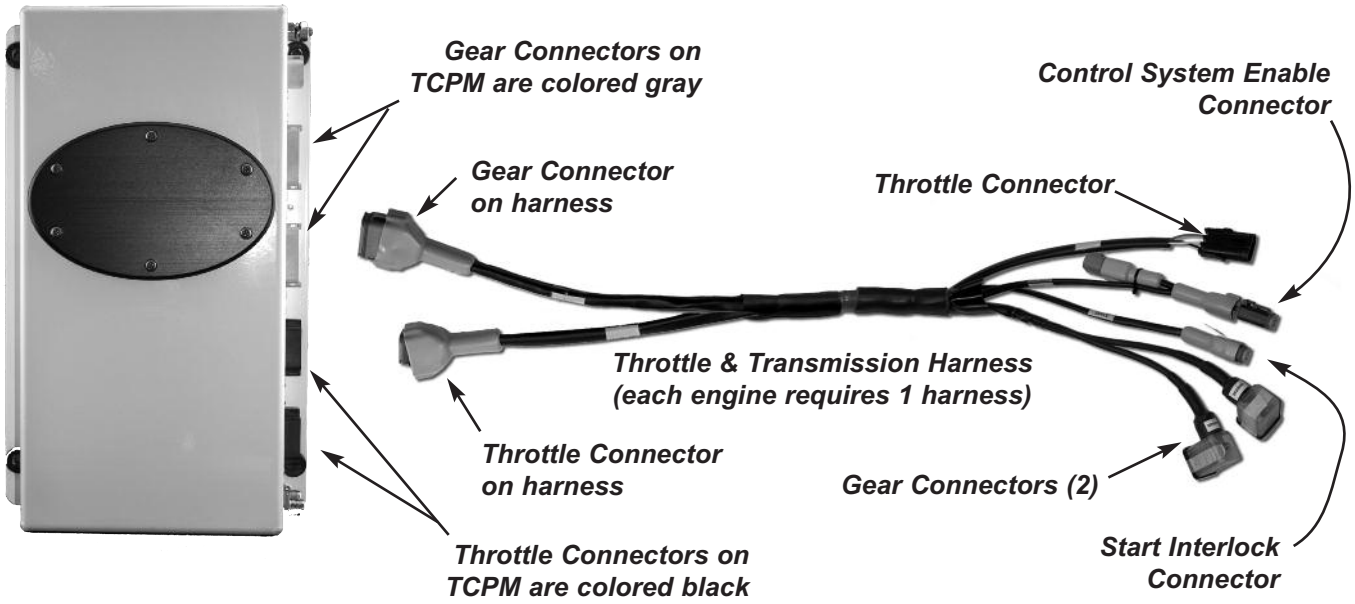
- DO use a terminating resistor at each end of the network.
- DO align the station communication cables before connecting them to the connector on the Control Head and/or Control Processor. DO NOT force the cable plug into it’s connector.
- DO NOT route cables past any sharp edges!
- DO NOT CUT THE CABLE OR SPLICE IT. If the cable is damaged during installation, it must be completely replaced!
- DO NOT use pliers or other tools to tighten the cable nut — handtight is sufficient.

1.5 Throttle and Transmission Harness Installation

A single cable harness connects the Control Processor to each engine. To install this harness:

1) At the Control Processor, plug the harness into the appropriate receptacle for the specific engine (either PORT or STBD). There are two plugs — one for throttle control and the other for gear control — the color coding on the plug will identify which plug is for which connector (see pg. 10).

2) At the engine, plug the harness plugs into the appropriate connectors, as follows:

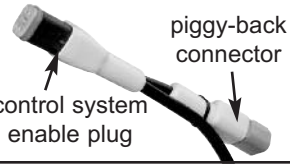


ENGINE CONNECTION	DESCRIPTION	ILLUSTRATION
Throttle	Connect the 3 pin plug into the appropriate connection on the vessel adapter harness.	
Gear	Connect the 2 DIN Gear connectors on the transmission solenoids. Note that each plug is marked “forward” or “reverse” — connect this to the correct solenoid on the transmission.	 *make sure rubber gasket is intact when connecting*
	Or . . . Connect the 2 FI Gear connectors on the transmission solenoids. Note that each plug is marked “forward” or “reverse” — connect this to the correct solenoid on the transmission.	
Start Interlock	Connect the 2 pin start interlock plug to the appropriate connection on the engine (near the transmission).	

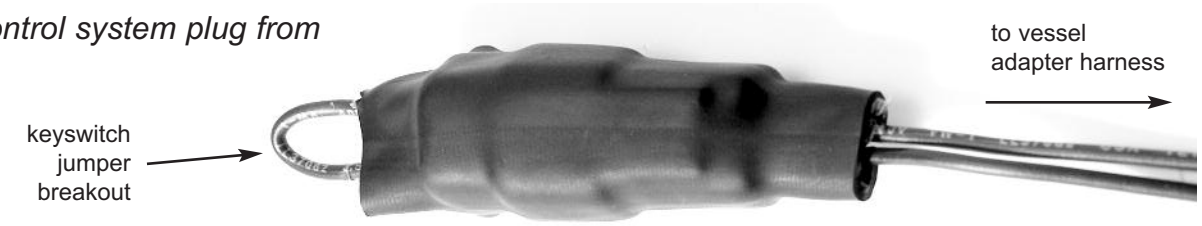
IMPORTANT — When routing and connecting the throttle and gear harness, BE SURE TO:

- ***Insert the plug completely into the receptacle on the control processor and the engine. You should hear a "click" when the plug is fully inserted.***
- ***DO NOT route cables past any sharp edges!***

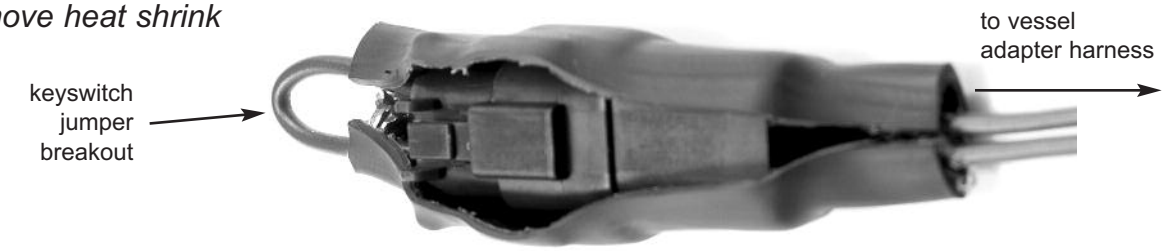
See the photos below and on the next page for step-by-step instructions for connecting the Control System Enable connections.

ENGINE CONNECTION	DESCRIPTION	ILLUSTRATION
Control System Enable	Connect the 4 pin control system enable plug to the appropriate connection on the vessel adapter harness. In order to do this you will need to **follow the steps below:**	

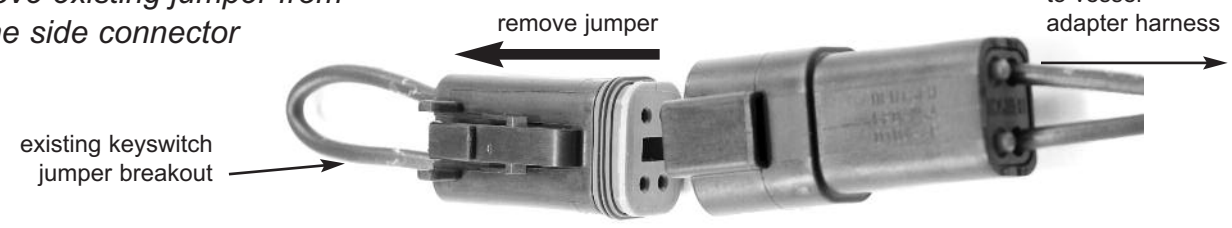
1 *Locate control system plug from engine*



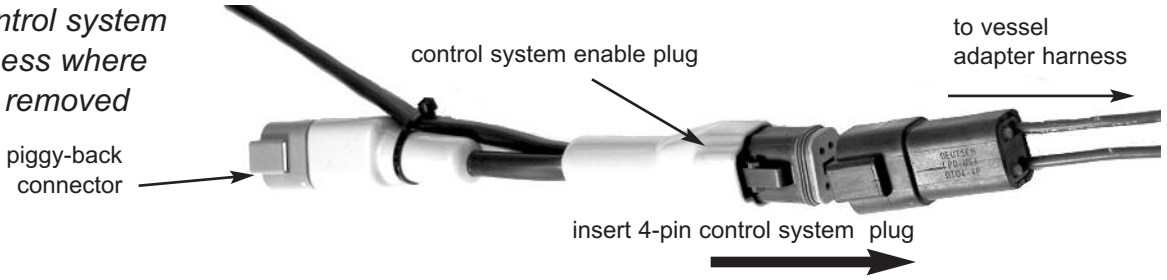
2 *Cut & remove heat shrink tubing*



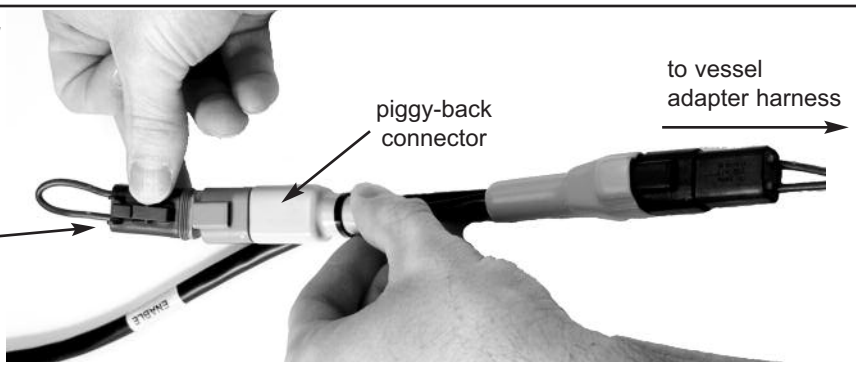
3 *Remove existing jumper from engine side connector*



4 *Connect control system enable harness where jumper was removed*



5 *Connect jumper to "piggy-back" connector on control system enable harness*



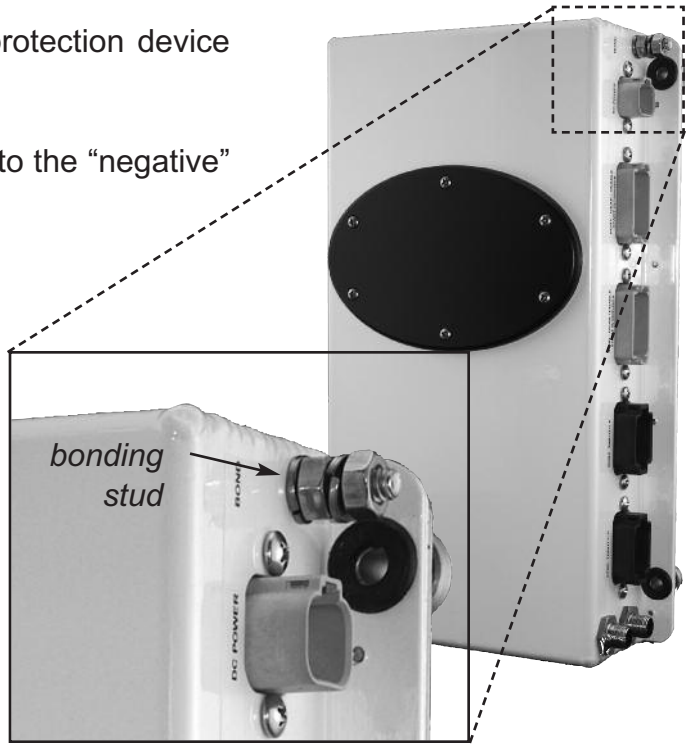
1.6 Power Harness - DC Power Input

1) Connect the two (2) RED wires of the CP Power Harness to the "positive" of two (2) independent 12 VDC battery sources, (normally the PORT and STBD engine start batteries). At the point where the CP Power Harness is connected to the positive power source, install a 10amp circuit breaker as close as possible to the power source.

a. NOTE: ABYC standards require a circuit protection device within 7" of the wire connection to the power source.

2) Connect the YELLOW wire of the Power Harness to the "negative" connection of either battery source.

a. Verify that the negatives of the independent battery sources are connected elsewhere on the boat.



1.7 Bonding Wire

Run a bonding wire (#12 AWG, green jacket) from the bonding stud (1/4") located top right on the connector side of the Control Processor to the bonding strip provided by the boat manufacturer

1.8 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.

Component Installation Checks

A. Control Processor

1.1	Verify Control Processor is securely fastened to boat structure.
1.2	Verify electrical power connections: *Battery Negatives*—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. *Negative Lead*—Negative wire from EEC4 system is connected to single battery negative. *Positive Leads*—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. 1.7, pg. 9).
1.3	Engine / Gear Harness Connections — Verify that all connectors are properly and tightly inserted into their receptacles. Verify that the harnesses are connected to the appropriate plug for each engine (example: STBD engine / gear harness plugged into STBD engine plugs on Control Processor).
1.4	Station Communication Cable Connections — make sure that the cable nuts are tightened and that the maximum gap between the nut and connector is 2 mm (1/16 inch) — see diagram on page ??
1.5	Verify that all harness connections at each engine are tight and that connectors are fully engaged.

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). Make sure that all control heads are in the neutral position.
2.3	Station Communication Cable Connections — Make sure that the cable nuts are tightened and that the maximum gap between the nut and connector is 2 mm (1/16 inch) — see diagram on page 7.

Operational Checks

A. General Functions

3.1	Turn ON System by turning ON one of the engine ignition switches. The Control Head ACTIVE light and the Neutral gear indicating lights should immediately illuminate. — If the Control Head lights DO NOT come on immediately, but all the lights flash after about 20 seconds, the system is in alarm mode and the problem is most likely due to a network communications problem. Verify the proper connection of the station communication cables on all stations and the Control Processor. Verify that 2 termination resistors are installed in the network. — If all of the Control Head lights begin to flash immediately after the ignition switch is turned ON, the problem is most likely due to a Station Identifier configuration. Verify that none of the Control Heads in the system have the same identifier (check label on the bottom of the control heads). — If none of the Control Head lights come on after 20-30 seconds, the problem is probably due to lack of power available at the DC power harness. Disconnect the harness from the Control Processor and use a meter to verify that voltage exists at the harness. There should be 12 VDC present between the yellow wire and each red wire.
3.2	Verify the Start Interlock capability as follow: a) Verify that the system is in “cruise mode” by verifying that the “Neutral” light on the Control Head is OFF. b) Move the STBD Control Handle out of NEUTRAL position. Attempt to start the STBD engine. (IMPORTANT: If start interlock circuit does not function, engine will startup in gear. Be prepared to immediately shutdown engine!). c) Engine should NOT start. Move STBD Control Handle back to NEUTRAL position. d) With handle in NEUTRAL position, try to start engine. Engine should start as normal. e) Repeat step b) through d) on PORT engine.
3.3	Verify correct gear direction: a) With both engines running, place either engine (one engine only) in gear for approximately 2-3 seconds. Return control handle immediately to NEUTRAL. Check response of propeller to control handle input. b) For twin engine applications, verify gear response on other engine: — If boat moves in the wrong direction, reverse gear connection plugs at transmission. — If the wrong engine is engaged (example: PORT engine goes into gear when STBD handle is moved, change plug connections for PORT and STBD engine.
3.4	Verify throttle response: a) IMPORTANT — Place system in “WARM” mode by pressing and releasing the WARM / SYNC button. Verify that system is in WARM mode by verifying the WARM light is ON before moving control handles into gear. b) Move both engine control handles into gear at idle. c) Verify engine idle speed — should be 600 RPM (or as specified by engine installation manual). d) If engines are at an appropriate temperature, move both engines to full throttle position. e) Verify that correct no load WOT speed is achieved. f) If either engine does not reach WOT, verify throttle harness plug connection at each engine.

Sea Trials

At the conclusion of the Operational Tests described above, the EEC4 system is ready for operation. There are no functional tests that need to be completed at sea trial to validate correct system installation. However, if the opportunity is available to provide product operational training to the boat owner, the following outline is suggested.

DO THE FOLLOWING . . .	OBSERVE THE FOLLOWING . . .
System Startup — Demonstrate the startup of the control system by turning ON either engine ignition switch.	The EEC4 system is operational when ACTIVE light is ON at the main station.
WARM Mode (Gear Lockout) — Place system in WARM Mode by pressing and releasing the WARM button. Advance the control handles past idle ahead gear detent and throttle up engines.	The WARM light should come on to confirm that the gear operation is locked out — verify that this is correct before moving control handles. The engines are able to be throttled up ("warmed" up) at the dock while the gear is locked in NEUTRAL.
Normal / Cruise Mode — With the control handles in NEUTRAL, press and release the WARM button — the WARM light should go out to indicate that the control system is in the normal "cruise" operating mode. Move the control handles in and out of gear to gain familiarity with gear response.	Observe the rate of gear response — gain familiarity with the feel of control system.
Station Transfer (multi-station applications) — Before the boat gets underway, follow the station transfer described in the Operators Manual and transfer control from one control station to another. Repeat the process until the boat owner / operator is comfortable with the process.	After the first button press but before pressing the ACTIVE button a second time, observe the quick blinking or slow blinking ACTIVE station light corresponding to whether the control handle is in an "appropriate" position.
Automatic Synchronization — After the boat is underway and is in a safe area that will allow maneuvering, enable the automatic synchronization capability by pressing and releasing the WARM / SYNC button. Both control handles must be in ahead gear and within 10% of each other in order to enable synchronization.	While in the Automatic Synchronization mode, the SYNC light will be illuminated. While in Automatic Synchronization mode, the system will automatically match the PORT engine speed to the STBD engine.

Move the STBD engine handle by itself — both STBD and PORT engines will respond simultaneously.	
Bump Mode — While the boat is underway and is in a safe area that will allow maneuvering, and while the control handles are both in gear and above the engine idle speed, demonstrate the “bump up” (speed increment) by pressing and releasing the ACTIVE button. Repeat several times. Demonstrate the “bump down” (speed decrement) by pressing and releasing the ACTIVE and WARM / SYNC buttons together. Repeat several times.	Each time that the control head buttons are pressed — either speed increment or decrement — the engine RPM will increase or decrease approximately 10 RPM.
Control Head Dimmer — To demonstrate the dim light capability of the control head lights, press and hold the ACTIVE and WARM / SYNC buttons simultaneously for about 4 seconds. Restore the control head lights to normal brightness by pressing and holding the ACTIVE and WARM / SYNC buttons simultaneously once again, for about 4 seconds.	The different control head light settings and the method of changing that setting.
Station Transfer (multi-station applications) — While the boat is underway and is in a safe area that will allow maneuvering, follow the station transfer described in section 2.5 and transfer control from one control station to another. Try transferring control from one station to another while at cruising speed, in order to obtain a minimum speed change.	

2.0 Appendix / Reference

The Appendix / Reference section is divided as follows:

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

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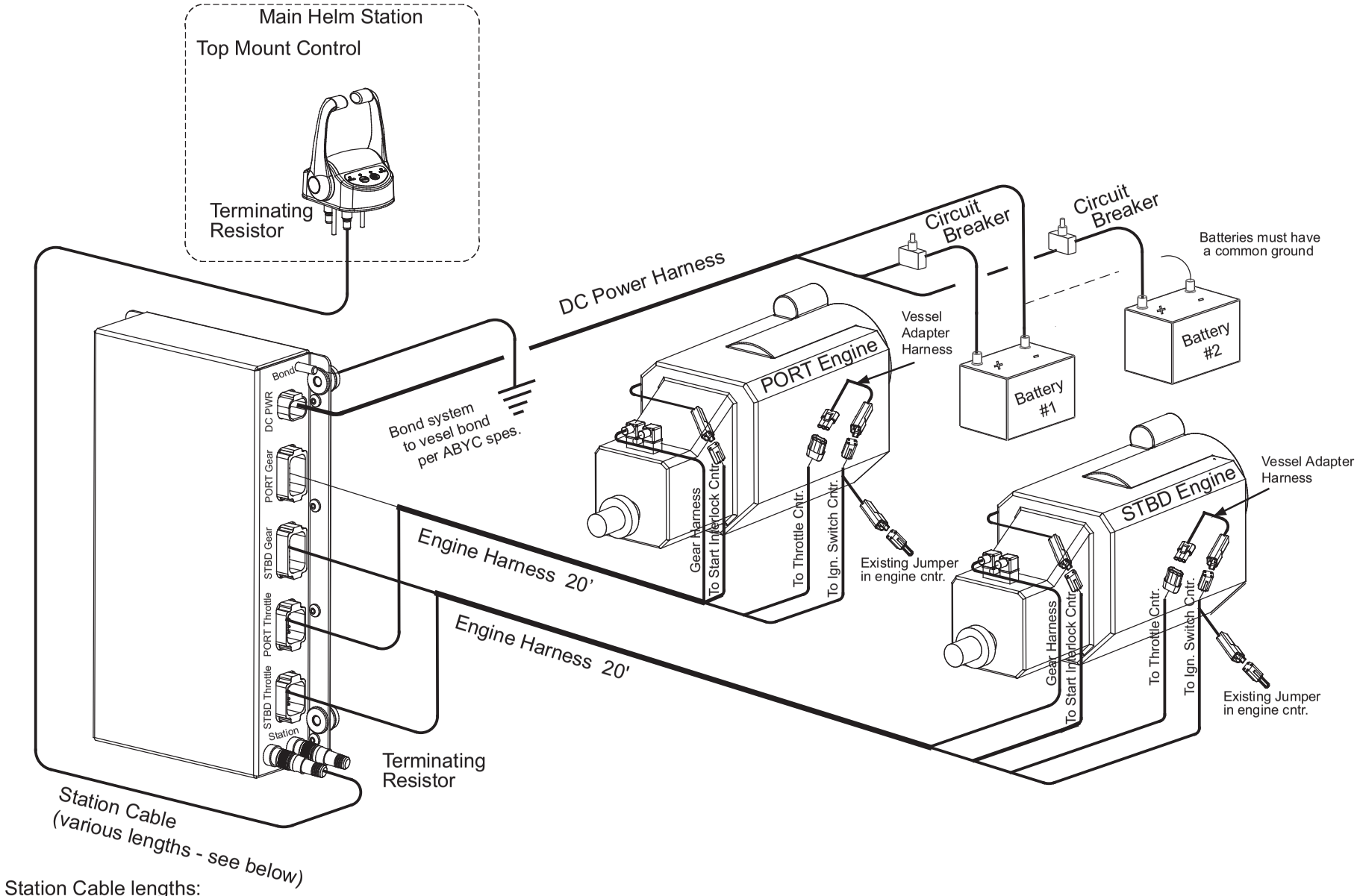
2.5 Gear / Throttle Backup System (optional)

Description 33
Operation 33
Installation 34
Installation Checkout 36

2.6 Triple Engine Application (optional)

Description 41
Operation 41

ETS Control System Wiring Diagram - Cummins QSB/QSC

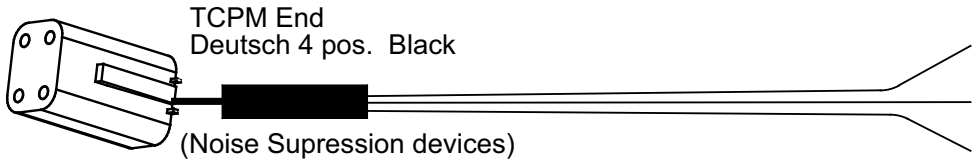


Station Cable lengths:

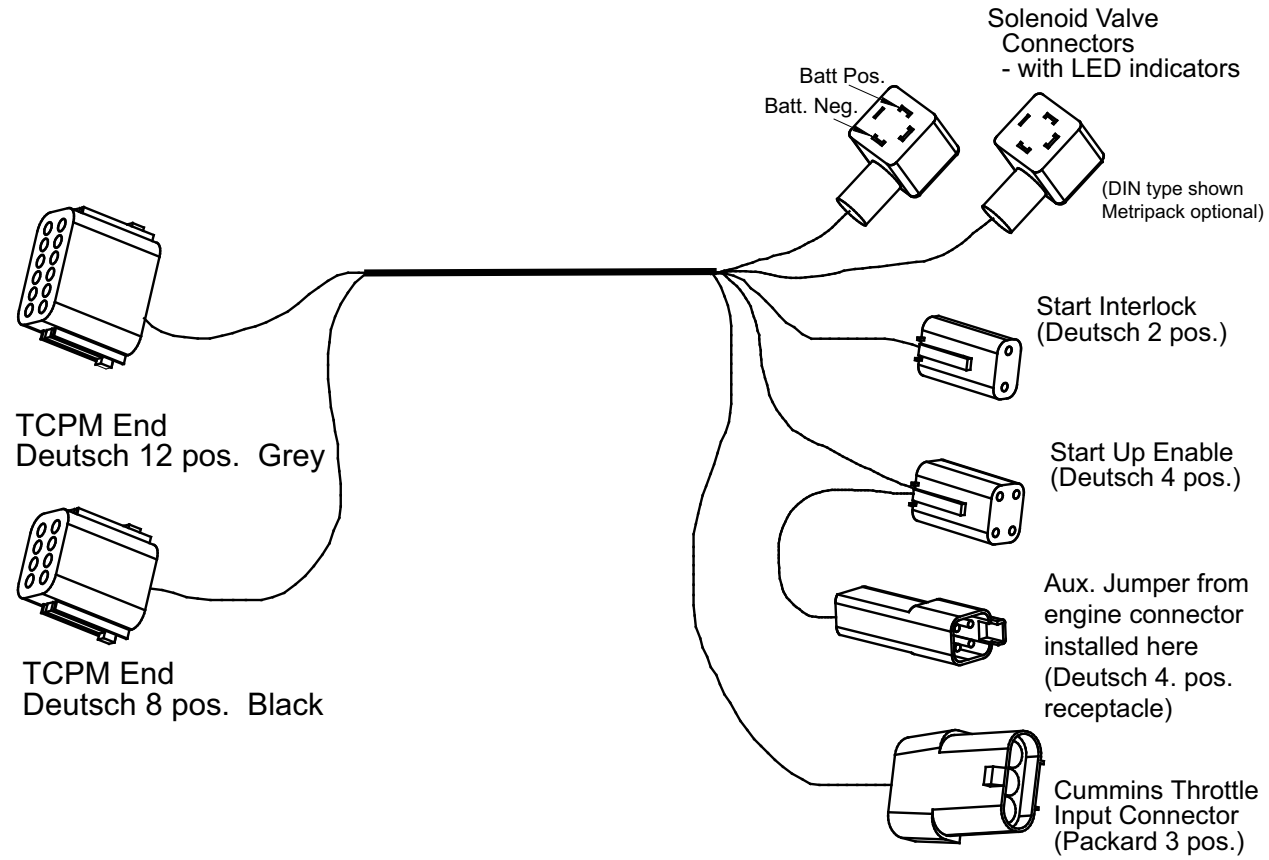
- 20' long
- 30' long
- 40' long
- 60' long

ETS 2-Button Control System Harnesses - Cummins

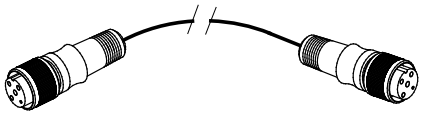
DC Power Harness 30' long (9 meters)



Throttle/ Gear / Start Interlock / TCPM Enable Harness 20' long (6 meters)

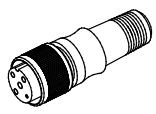


Station Cable	20ft. long	6 meters
Station Cable	30ft. long	9 meters
Station Cable	40ft. long	12.2 meters
Station Cable	60 ft. long	18.3 meters



Connector is the same on both ends

Terminating Resistor



Control Processor Pinout Description

DC Power Connector (4 pin-Gray)

(1) Battery Positive 1
(2) Battery Positive 2
(3) Battery Ground 1
(4) Battery Ground 2 (optional, if required)

PORT Gear / Start Interlock / TCPM Enable Connector (12 pin-Gray)

(1) PORT Ahead gear Positive (+)
(2) PORT Astern Gear Positive (+)
(3) PORT Start Interlock 1
(4) PORT Ignition/CP Enable Switch Input
(5) Enable Switch Power
(6) Spare Output (Com)
(7) Spare Output (N.O.)
(8) Not Used
(9) PORT Ignition Output
(10) PORT Start Interlock 2
(11) PORT Astern gear Negative (-)
(12) PORT Ahead gear Negative (-)

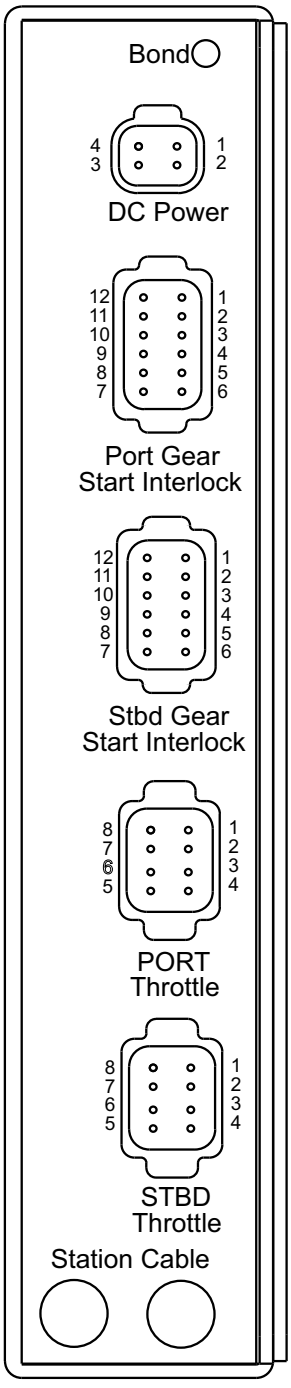
NOTE: Jumper #4 to #5 for Dry Contact CP Enable OR Apply 12v DC positive to #4 for ignition power CP enable.

STBD Gear / Start Interlock / TCPM Enable Connector (12 pin-Gray)

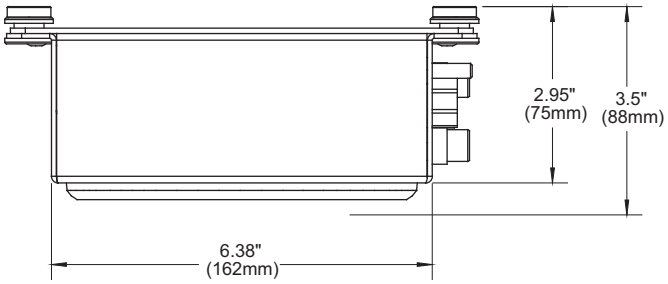
(1) STBD Ahead gear Positive (+)
(2) STBD Astern Gear Positive (+)
(3) STBD Stat Interlock 1
(4) STBD Ingnition/CP Enable Switch Input
(5) Enable Switch Power
(6) Not Used
(7) Not Used
(8) Not Used
(9) STBD Ignition Output
(10) STBD Start Interlock 2
(11) STBD Astern gear Negative (-)
(12) STBD Ahead gear Negative (-)

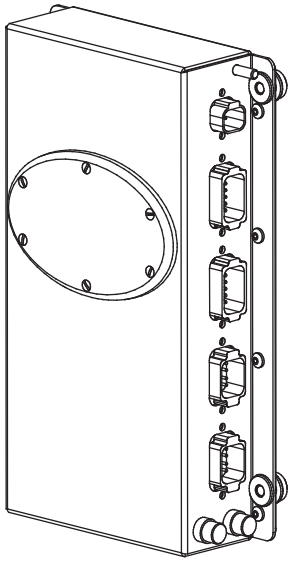
PORT/STBD Throttle Connectors - Voltage Type (8 pin-Black)

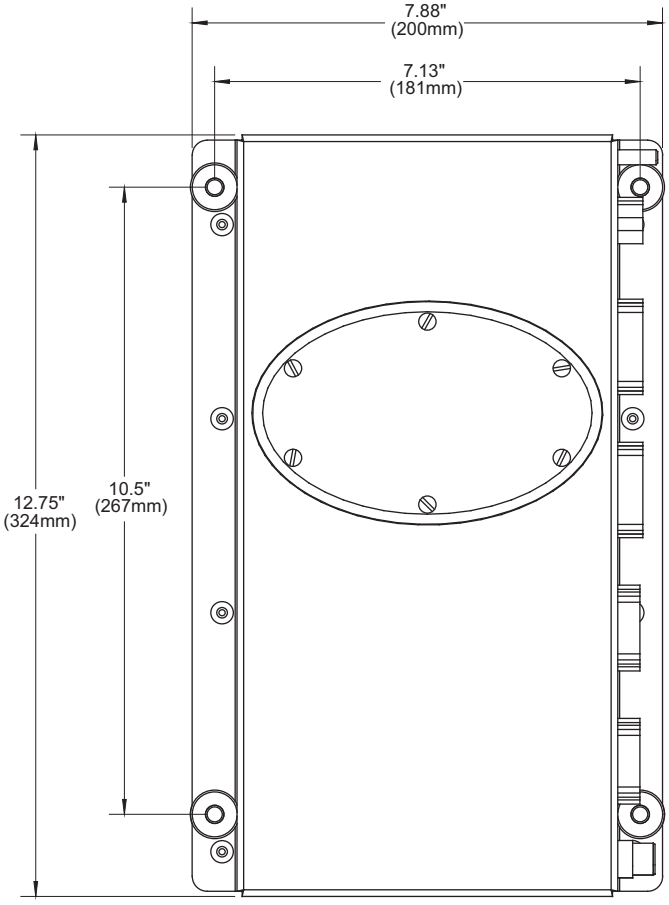
(1) Not used
(2) Ref. voltage Pos.+
(3) Ref. voltage Neg.-
(4) Voltage Output Signal
(5) Not Used
(6) Not Used
(7) Not used
(8) Chassis ground

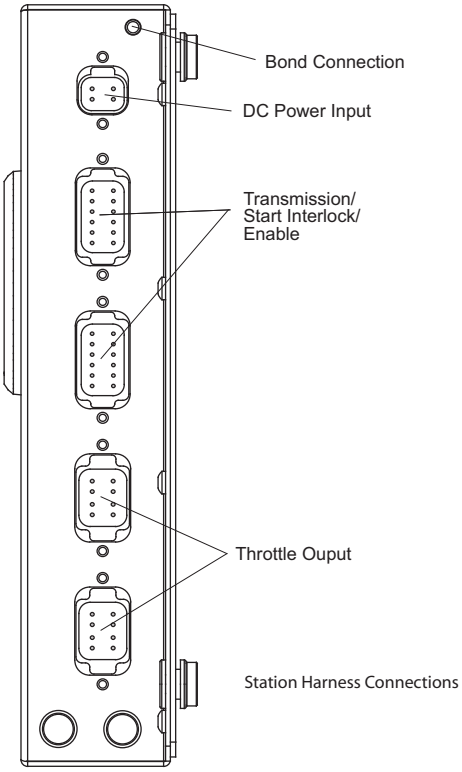


Control Processor Dimensions

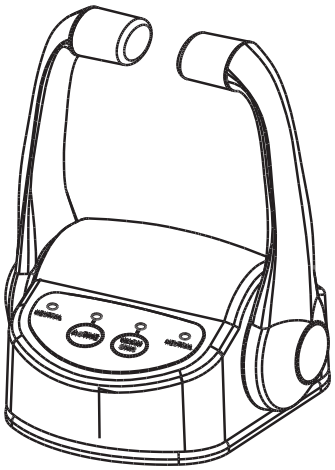


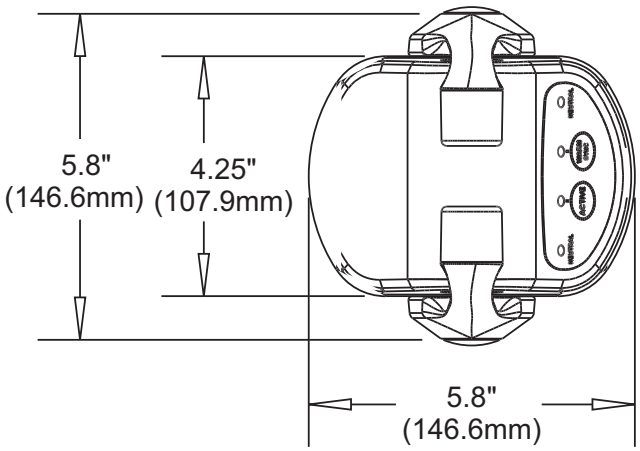


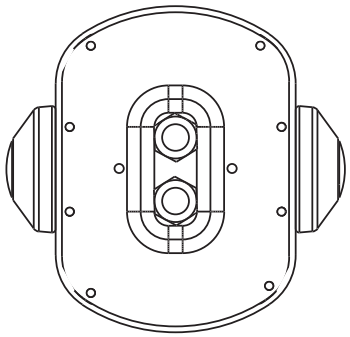


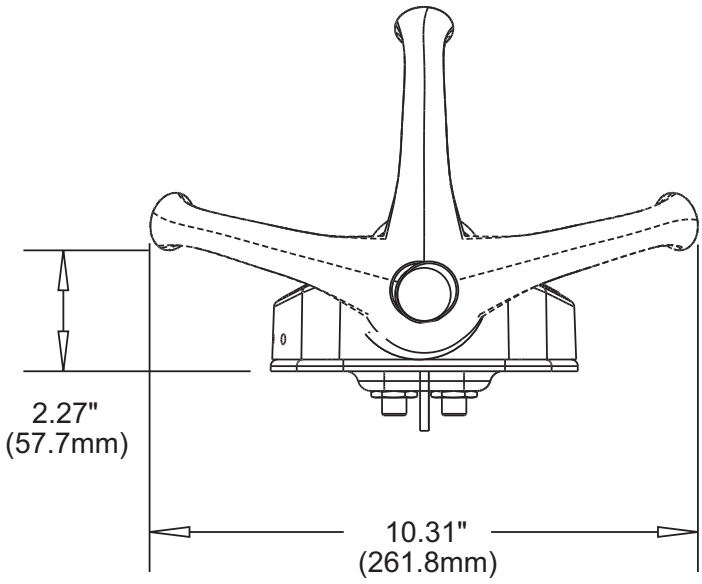


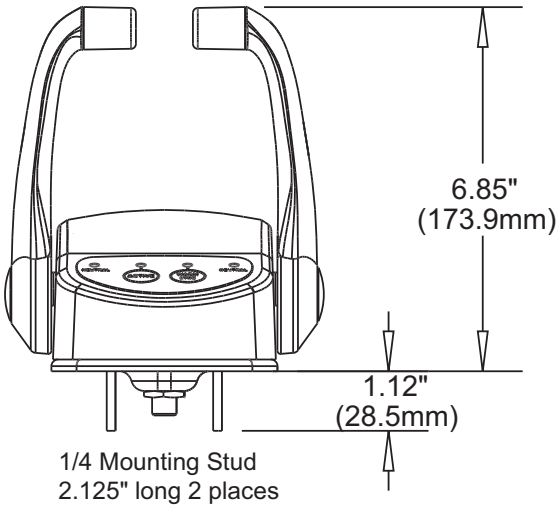
Control Head Dimensions (Top Mount)





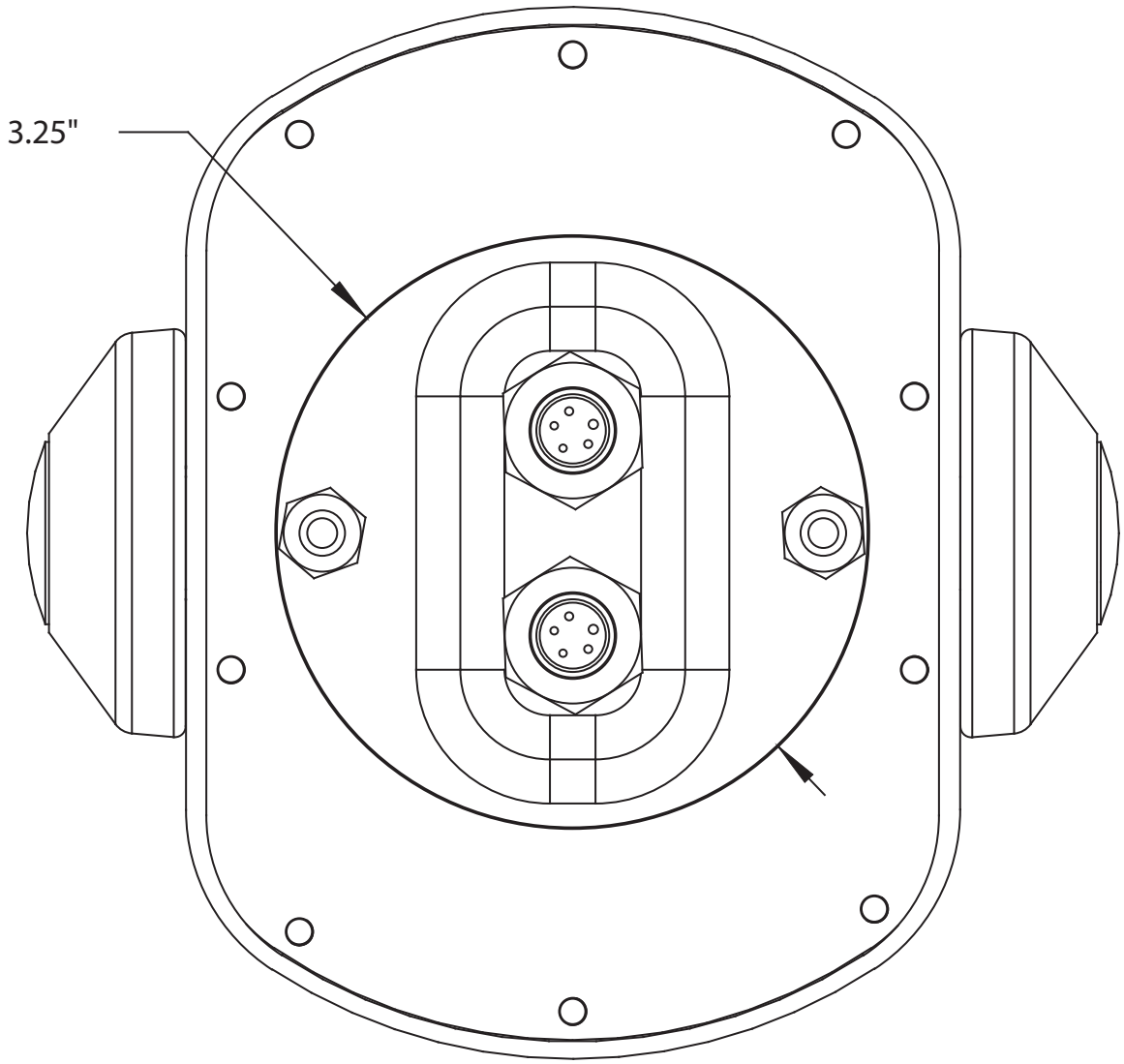






NOTE: 2.0" [51mm] required below connector for cable connector

Cutout Template for Control Head (Top Mount)



2.3 Control Head Configuration

In order for each Control Head to communicate with the Control Processor, each Control Head must have a unique Handle Identifier. If you purchased a **complete system**, configuration and **handle identification was performed by the factory**.

If you purchased a control head **separately**, you will NEED to set the handle identifier for that control station. Follow the 8 steps below:

To Change Handle Identifier, Follow These 8 Steps:

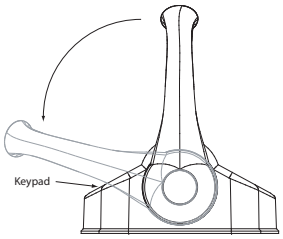
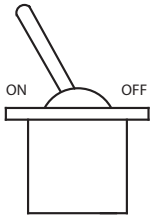
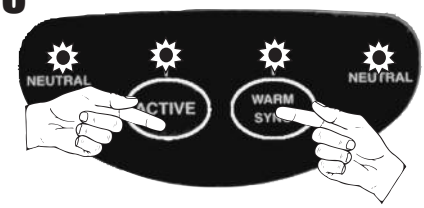
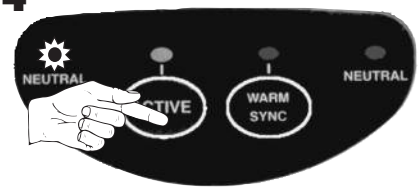
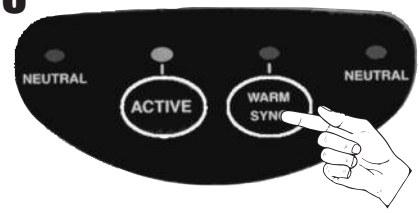
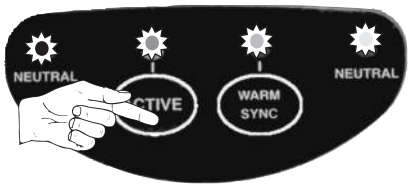
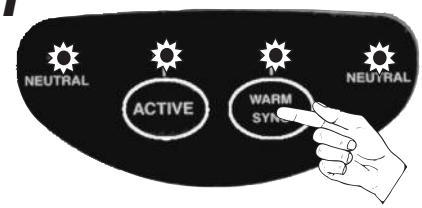
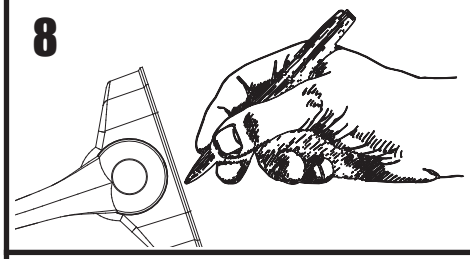
	ACTION	RESULT
1 	*Move control station handles to FULL ASTERN positions*	*No result*
2 	*Turn power ON to the system*	*ACTIVE LED will begin to flash*
3 	*Press & HOLD the 2 center buttons (ACTIVE & WARM) for approximately 2 seconds until all 4 LEDs begin to flash- RELEASE buttons*	*All 4 LEDs begin to flash*
4 	*Press & Release the ACTIVE button one time to select Handle Identifier Mode*	*PORT NEUTRAL LED will begin to flash*
5 	*Press & Release the WARM button one time to enter Handle ID Configuration*	*ACTIVE LED will be illuminated*

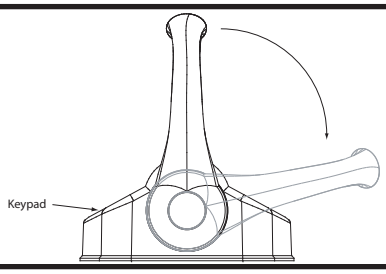
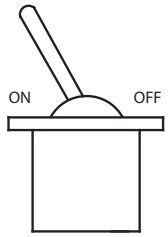
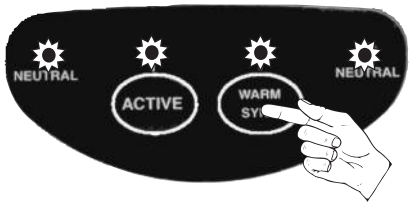
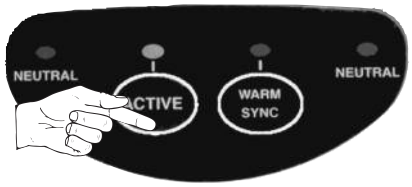
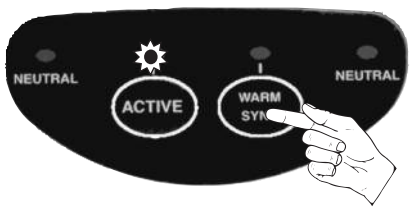
Chart is continued on next page . . .

<table>
<tr><td>6

</td><td>ACTION
Press & Release ACTIVE button until desired handle ID is achieved — see chart at right for ID# and corresponding LED that is illuminated</td><td colspan="2">RESULT
<table>
<tr><th>ID#</th><th>LEDs ON</th></tr>
<tr><td>1</td><td>PORT NEUTRAL</td></tr>
<tr><td>2</td><td>ACTIVE</td></tr>
<tr><td>3</td><td>PORT NEUTRAL & ACTIVE</td></tr>
<tr><td>4</td><td>WARM</td></tr>
<tr><td>5</td><td>PORT NEUTRAL & WARM</td></tr>
<tr><td>6</td><td>ACTIVE & WARM</td></tr>
</table></td></tr>
<tr><td>7

</td><td>Press & Release the WARM button one time</td><td colspan="2">This action stores your handle ID in memory. All 4 LEDs begin to flash after ID is stored in memory</td></tr>
<tr><td>8
</td><td>RECORD the Handle ID# on the tag located on the bottom of the Control Head</td><td colspan="2">N/A</td></tr>
<tr><td colspan="4">To Exit Control Handle Configuration Mode — turn system OFF and return control handles to NEUTRAL position.</td></tr>
</table>

2.4 System Configuration

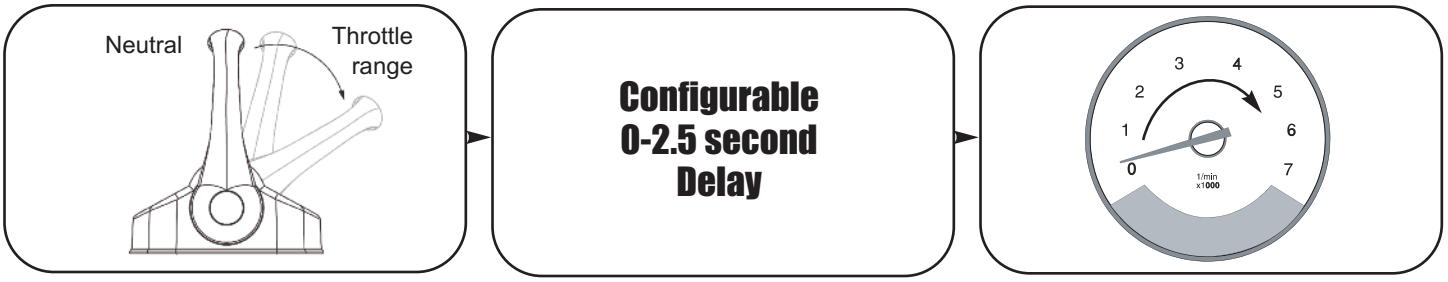
Configuration of the EEC system was performed at GMP from the information the ship operator gave at the time the order was placed. Changes to the Control Processor configuration, although not frequently done, can be made to suit operator preference and is entered from the **control head keypad.** Follow the instructions for each option when making changes.

To Enter System Configuration Mode, follow these steps:

	ACTION	RESULT
	*Move control station handles to FULL THROTTLE positions*	*No result*
	*Turn power ON to the system*	*ACTIVE LED will begin to flash*
	*Press & Release the WARM button 3 times*	*All 4 LEDs begin to flash*
	*Press & Release the ACTIVE button the number of times as outlined on pages 28-32 for particular SystemConfiguration Option you wish to change*	*Appropriate LED will be illuminated (see pages 28-32 for LED illumination for Configuration Option changed)* *Throttle Delay Options . . . . . .pg. 28* *Gear Delay Options . . . . . .pg. 29* *SystemStartup Mode Options . . . . . .pg. 30* *Station Transfer Options . . . . . .pg. 31* *Set Configuration Settings to Default . . . . .pg. 32*
	*Press & Release the WARM button one time to save your configuration changes in memory*	*Appropriate LED will be illuminated depending on which System Configuration Option you selected in Step 4 above.*

Throttle Delay Options

The Throttle Delay Option allows you to configure the EEC system to delay throttle output as you shift from Neutral, past in-gear idle, and into the throttle range.

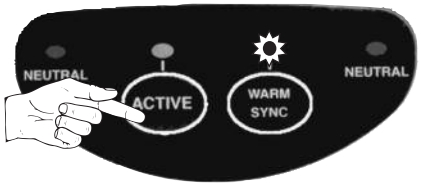
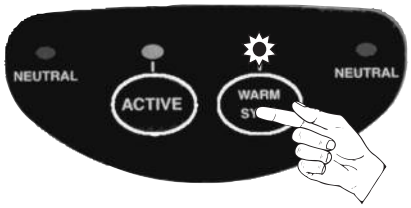
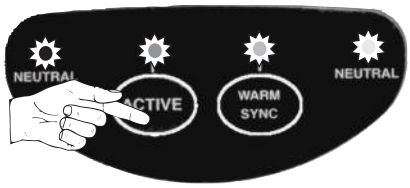
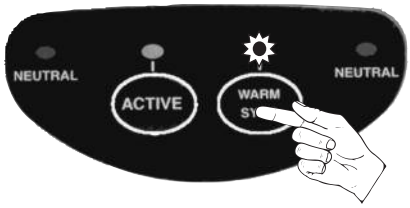


Moving handles from Neutral, past in-gear idle into throttle range . . .

system will shift transmission into gear and pause . . . (Default = 1 second)

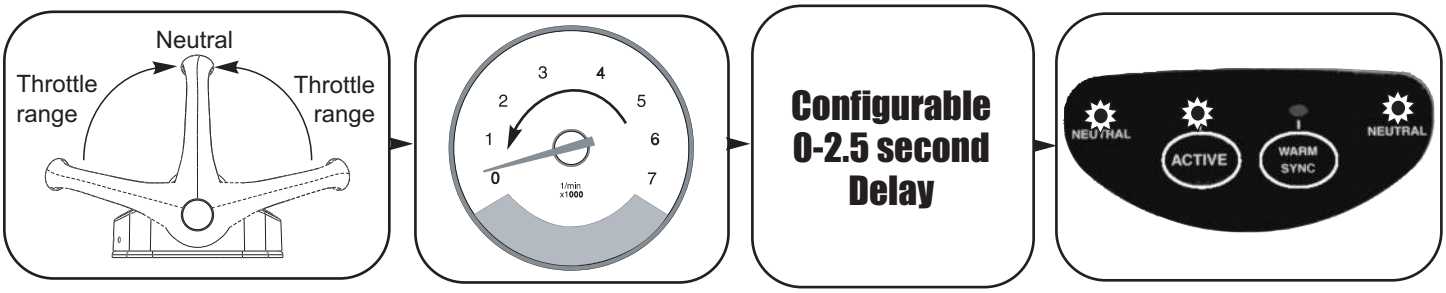
before RPMs are increased. above idle

To Change Throttle Delay Setting Follow These Steps:

	Enter Configuration Mode as described in section 2.4A (pg. 29)			
	ACTION	**RESULT**		
	*Press ACTIVE 4 times for Throttle Delay Option*	*WARM LED will begin to flash*		
	*Press WARM to activate selection*	*NO LEDs will be illuminated*		
	*Press & Release ACTIVE to cycle through Throttle Delay Options*		**LEDs ON**	**AMOUNT OF DELAY**
		1	**None**	**None**
		2	**Port Neutral**	**0.5 second**
		3	**Active**	**1.0 second (Default)**
		4	**Port Neutral & Active**	**1.5 second**
		5	**Warm**	**2.0 second**
		6	**Port Neutral & Warm**	**2.5 second**
	*Press WARM to save option selection*	*You may continue to other configuration options on the following pages or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.*		

Gear Delay Options

The Gear Delay Option allows you to configure the EEC system to remain in gear when the system goes from the throttle range to neutral, to allow throttle to reach idle before shifting transmission.



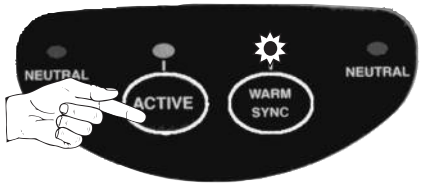
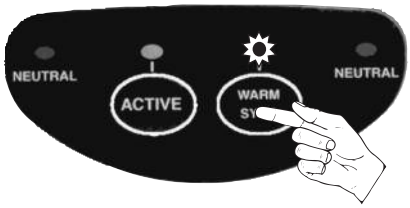
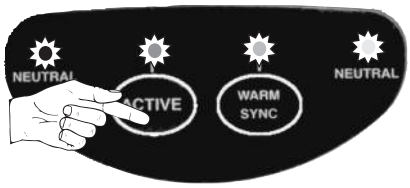
Moving handles from the throttle range (above idle) into neutral . . .

RPMs decrease to idle . . .

while transmission pauses . . . (Default = 0 seconds)

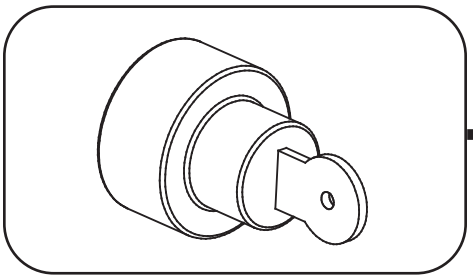
before shifting transmission into Neutral.

To Change Gear Delay Setting Follow These Steps:

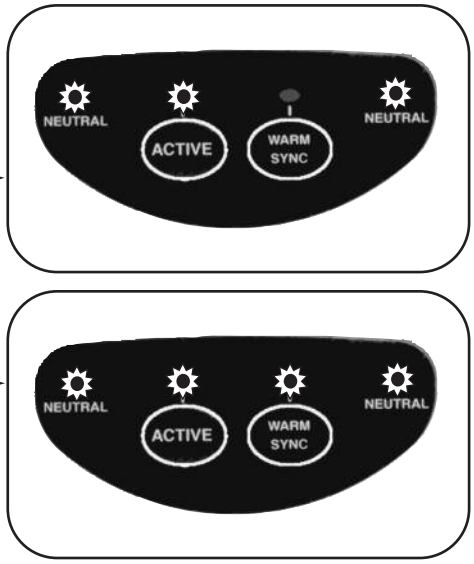
	Enter Configuration Mode as described in section 2.4A (pg. 29)			
	ACTION	**RESULT**		
	*Press ACTIVE 5 times for Gear Delay Option*	*WARM LED will begin to flash*		
	*Press WARM to activate selection*	*NO LEDs will be illuminated*		
	*Press & Release ACTIVE to cycle through Gear Delay Options*		**LEDs ON**	**AMOUNT OF DELAY**
		1	**None**	**None (Default)**
		2	**Port Neutral**	**0.5 second**
		3	**Active**	**1.0 second**
		4	**Port Neutral & Active**	**1.5 second**
		5	**Warm**	**2.0 second**
		6	**Port Neutral & Warm**	**2.5 second**
	*Press WARM to save option selection*	*You may continue to other configuration options on the following pages or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.*		

System Startup Options

The System Startup Option allows you to configure the EEC system to enter WARM Mode or Normal RUN Mode at startup (power ON).



When turning system ON . . .



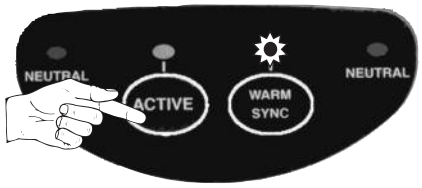
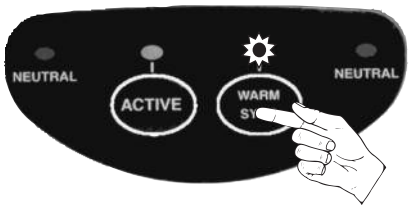
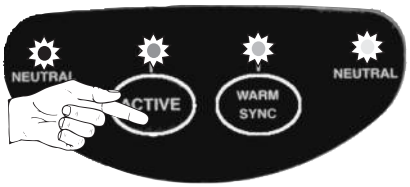
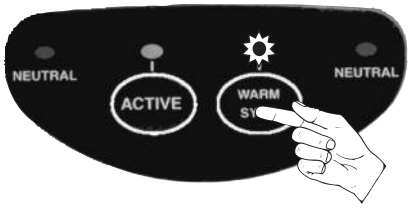
the transmission will immediately respond to the any movement of the control head handles - normal operation

OR

the transmission will be locked in WARM Mode (Neutral position) - RPMs will be increased only

(Default)

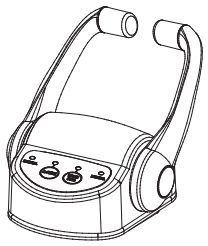
To Change System Startup Setting Follow These Steps:

	Enter Configuration Mode as described in section 2.4A (pg. 29)			
	ACTION	**RESULT**		
	*Press ACTIVE 8 times for System Startup Option*	*STBD Neutral & WARM LEDs will begin to flash*		
	*Press WARM to activate selection*	*NO LEDs will be illuminated*		
	*Press & Release ACTIVE to cycle through System Startup Options*		**LEDs ON**	**OPTION**
		1	**None**	**WARM Mode (locked in Neutral)**
		2	**Port Neutral**	**Normal RUN Mode (Default)**
	*Press WARM to save option selection*	*You may continue to other configuration options on the following pages or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.*		

Station Transfer Options

The Station Transfer Option allows you to configure the EEC system to transfer station control underway above idle or with handles at the Neutral position only.

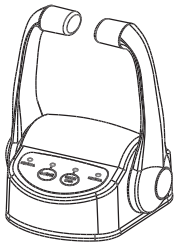
NOTE: Active Station can be at any handle position during station transfer



Inactive Station "taking control" must have control handles at Neutral or in the same gear at same or lower speed as Active Station

Choose "underway transfer" when you want to transfer control when handles are in appropriate position—not limited to Neutral gear only (Default)

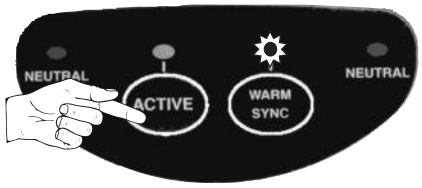
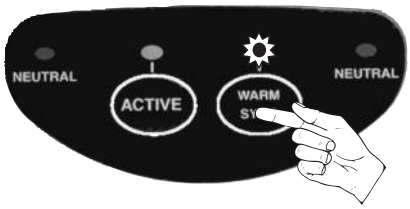
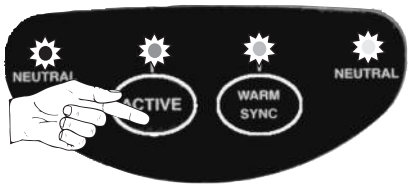
OR



Inactive Station "taking control" must be at Neutral position in order to transfer control from Active Station

Choose "Neutral transfer" when you want to transfer control when handles are in Neutral only

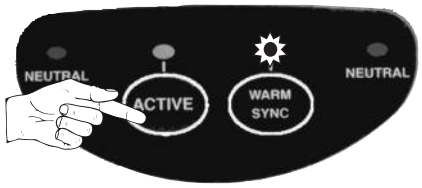
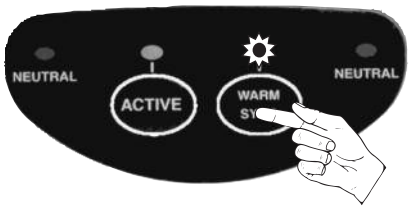
To Change Station Transfer Setting Follow These Steps:

<table>
<tr><td rowspan="2"></td><td colspan="4">Enter Configuration Mode as described in section 2.4A (pg. 29)</td></tr>
<tr><td>ACTION</td><td colspan="3">RESULT</td></tr>
<tr><td>
</td><td>Press ACTIVE 9 times for Station Transfer Option</td><td colspan="3">PORT Neutral & STBD Neutral LEDs will begin to flash</td></tr>
<tr><td>
</td><td>Press WARM to activate selection</td><td colspan="3">NO LEDs will be illuminated</td></tr>
<tr><td>
</td><td>Press & Release ACTIVE to cycle through Station Transfer Options</td><td>1</td><td>LEDs ON
None</td><td>OPTION
Underway Transfer (Default)</td></tr>
<tr><td></td><td></td><td>2</td><td>Port Neutral</td><td>Transfer At Neutral Position only</td></tr>
<tr><td>
</td><td>Press WARM to save option selection</td><td colspan="3">You may continue to other configuration options on the following pages or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.</td></tr>
</table>

Return System Settings to Default Option

The Return System Settings to Default Option allows you to return the system to it's factory default settings.

To Change System Startup Setting Follow These Steps:

	Enter Configuration Mode as described in section 2.4A (pg. 29)	
	ACTION	**RESULT**
	*Press ACTIVE 10 times for Return to Defaults Option*	*ACTIVE & STBD Neutral LEDs will begin to flash*
	*Press WARM to save option selection*	*You may continue to other configuration options on the preceding pages or you may choose to EXIT CONFIGURATION MODE by turning system OFF, moving control handles back to NEUTRAL, and then turn system ON again.*

2.5 Gear / Throttle Backup System (optional)

A. Description

The EEC Gear / Throttle Backup System allows the control of the transmission solenoid valves, as well as engine throttle through separate potentiometers other than the EEC Control System in the event of a failure. These separate potentiometers are mounted in one of the EEC Control Heads installed in the vessel. The switchover from the normal operation to backup operation is actuated by an Enable Switch mounted in the console. This Enable Switch turns on the Transfer Box which transfers control of the gear / throttle from the EEC Control System to the backup system. Presently this backup system is only for the gear / throttle and not for the trolling valves. In failure conditions the trolling valve will default to full lockup when power is removed.

B. Operation

Under normal operations, the gear and throttle are controlled by our EEC Control Processor (CP). This signal runs through the normally closed contacts of a relay in the Backup Transfer Box.

Once there is a failure of the control system, (noted by all four mode LED's blinking and a tone is heard from the Control Head) the vessel captain would switch the backup system switch on. (Note, we recommend that this on/off enable switch be protected so it cannot be accidentally energized.) This would energize all the relays in the Transfer Box and the gear / throttle would then be controlled by the backup potentiomenters that are mounted in one of the boat Control Heads. One other feature that is still operational in the backup mode is the start interlock function. This function will not allow the captain to start the engines when the transmissions are in forward or reverse gear. They must be in neutral in order to start the engines.

Backup System Items

There are three main components of the Backup System.



EEC Control Head with Backup potentiometers - Externally this looks like a normal control head but internally it has extra potentiometers mounted. These potentiometers control the port and starboard gear / throttle when the backup system is activated. Underneath this control head also has two wire exit holes on the bottom cover instead of one. One exit hole is for the normal station cable that runs to the CP and the other hole is for the cable that runs to the Backup System Transfer Box. Once the bottom cover is removed there is an instruction label inside that explains the connections and shows the model and part #.



EEC-GT Backup System Transfer Box - The Transfer Box is mounted near (within 10 feet) of the EEC Control processor. This transfer box is comprised of relays which control the gear / throttle when the system is in backup mode. Externally this box has watertight connectors that the harnesses plug into. The power for this Transfer Box is normally run from the same source that the Control Processor is connected to. The backup system can be powered by 10 - 40volts DC.

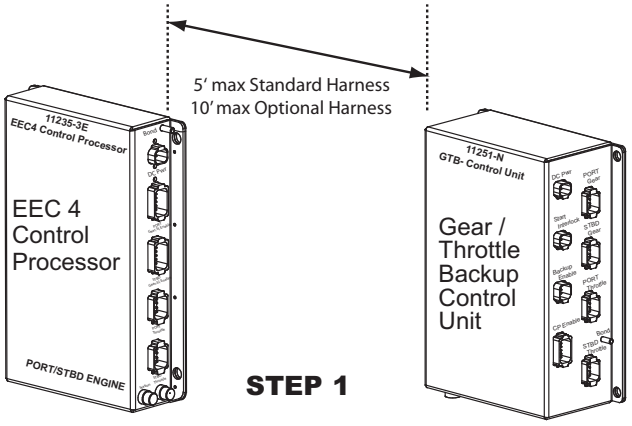


Backup System Harnesses - These are pre-terminated harnesses which redirect the start interlock, power switch, gear and throttle signals to run through the transfer box before running to the various connections on the boat.

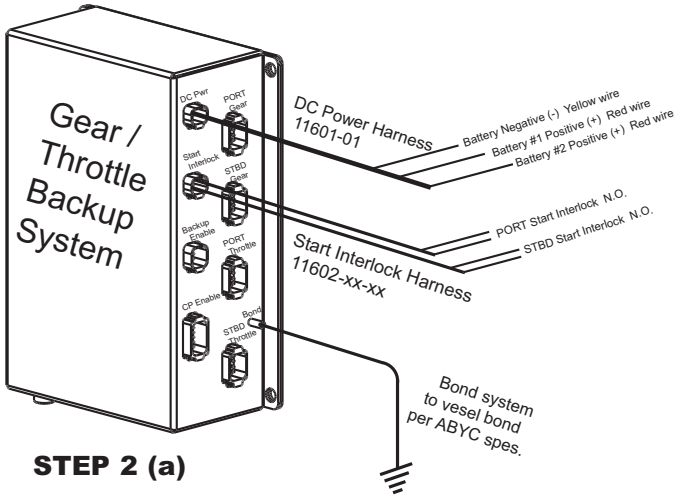
C. Installation

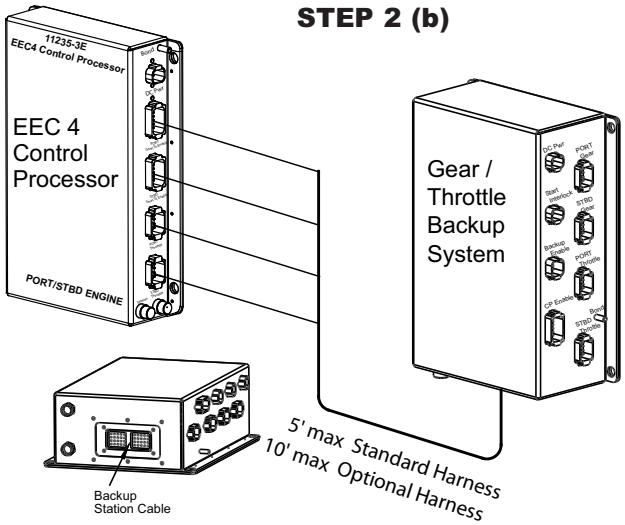
1) Mount the Transfer Box within 10 feet of the EEC-4 Control Processor which is normally mounted in the engine room. (Note: the harnesses which run from the CP to the Transfer Box come in 5' standard or 10' optional lengths.)

2) Install the various harnesses which run from the CP to the Transfer Box and to the engine.



a. DC Power and Start Interlock and Bond Wire - This harness has brown connectors (8 position) on each end and a set of wires which run to the DC power and the start interlock connections. This harness feeds DC power to the Transfer Box. It also sends the Start Interlock signals to the Transfer Box so that in backup mode the start interlock function will still operate. The backup system operating voltage range is 10-36 volts and is low current so the breaker that supplies power to the EEC system is adequate for the Backup System.

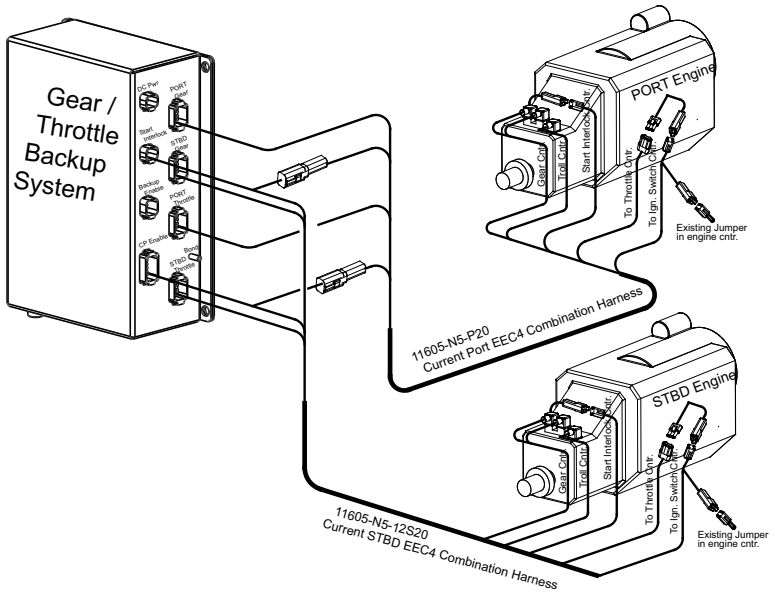




b. Interconnect Harness - This harness has six various connectors on one end and a large (40 pos.) connector on the other end. The harnesses' six various connector are plugged into the CP's CP enable, Port & Stbd Gear, Port & Stbd Throttle, and Start Interlock connectors. The large (40 pos) connector is plugged into the bottom of the GTB Box (NOTE: The socket head screw must be tightened which will seat the connector into it's receptacle). The connector that is currently plugged into the CP's CP enable connector is plugged into the Transfer Box's 12 pos. connector marked CP Enable.

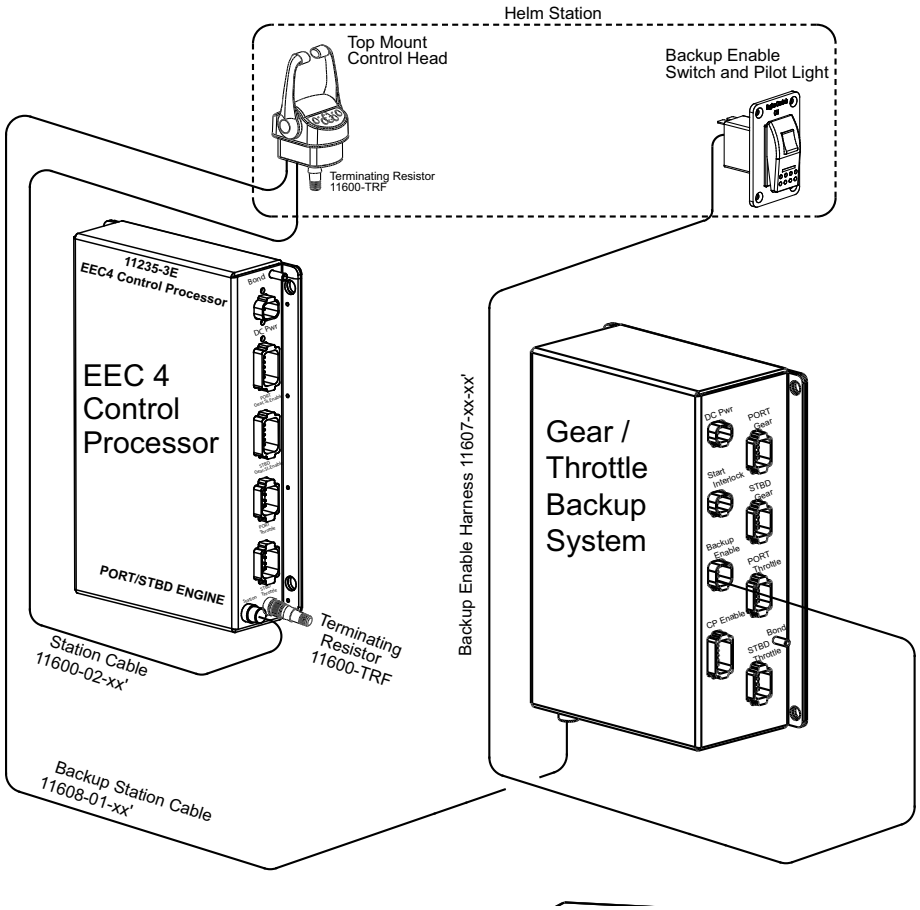
c. Gear & Throttle Harness - These harnesses have grey & black (8 pos.) connectors on one end. These route the gear & throttle to each engine and transmission. Unplug the 2 connectors that are plugged into the CP's connectors marked STBD and PORT Gear STBD and PORT THROTTLE and plug them into their respective connectors on the GTB Backup Box.

STEP 2 (c)



3) Backup Control / Enable Switch Harnesses - This harness has two wires strapped together. One wire has one large black connector (8 position) on one end and a small 6 pos. connector on the Control head end. The other wire in only stripped back so the installer can attach a switch and pilot light to it. This harness brings the signals from the backup control switches in the control head to the transfer box. It also, through the enable switch, turns on or off the Backup System and also controls the backup system pilot light. Install this harness from the Transfer Box to the control station that has the backup control head installed. Plug in this harness into the black connector on the transfer box marked Enable Switch.

STEP 3



4) **Install the Backup System Enable switch and pilot light** in the console and attach them to the Backup Control/Enable Switch harness. (This switch and light are normally provided by the installer.) This switch needs to be a normally open SPST switch. Because this switch turns on and off the backup system, it is must be highly reliable and also protected which would prevent accidental actuation from happening. Some switches have protection covers but this protection could be simply in where you mount the switch. It should be near the backup Control Head and yet mounted so the it would not be accidentally turned on (i.e. when another switch near it is being turned on.) The pilot light should be wired as per the diagram below. It should be a 12v or 24v DC low current light.

D. Installation Checkouts

Once the system has been installed the system must be checked for the proper operation. The basic checks are as follows:

1) **Backup System in General** - Once the normally EEC system is up and running and in neutral, turn the backup system enable switch on (NOTE: Do NOT have engines running!). At this point the Backup System light should come on, all the LED's on the Control head should go out. You are now in Backup Mode. Shift the Control Head levers to forward and reverse. You should hear the transmission solenoids "clicking" as you shift the transmission.

2) **Start Interlock Operation** - With the Control Head in neutral (or even put the system in Warm mode by pushing the WARM button) try to start the engine. NOTE: The checkout can be done at the dock, but care must be taken when shifting gears at the dock. Make sure that dock lines are tight and adequate. (NOTE: You do not have to start it, just try to turn over the engine with the starter.) The engine should start cranking while the Control head levers are in neutral.

Next push the Port engine control lever into forward gear. Try to start the PORT engine. You should not be able to start the engine. Put the PORT control lever back to Neutral and then try the STBD side. Make sure you do one side at a time. If you cannot start in gear but can start the engines in neutral then the Backup system start interlock function is working correctly.

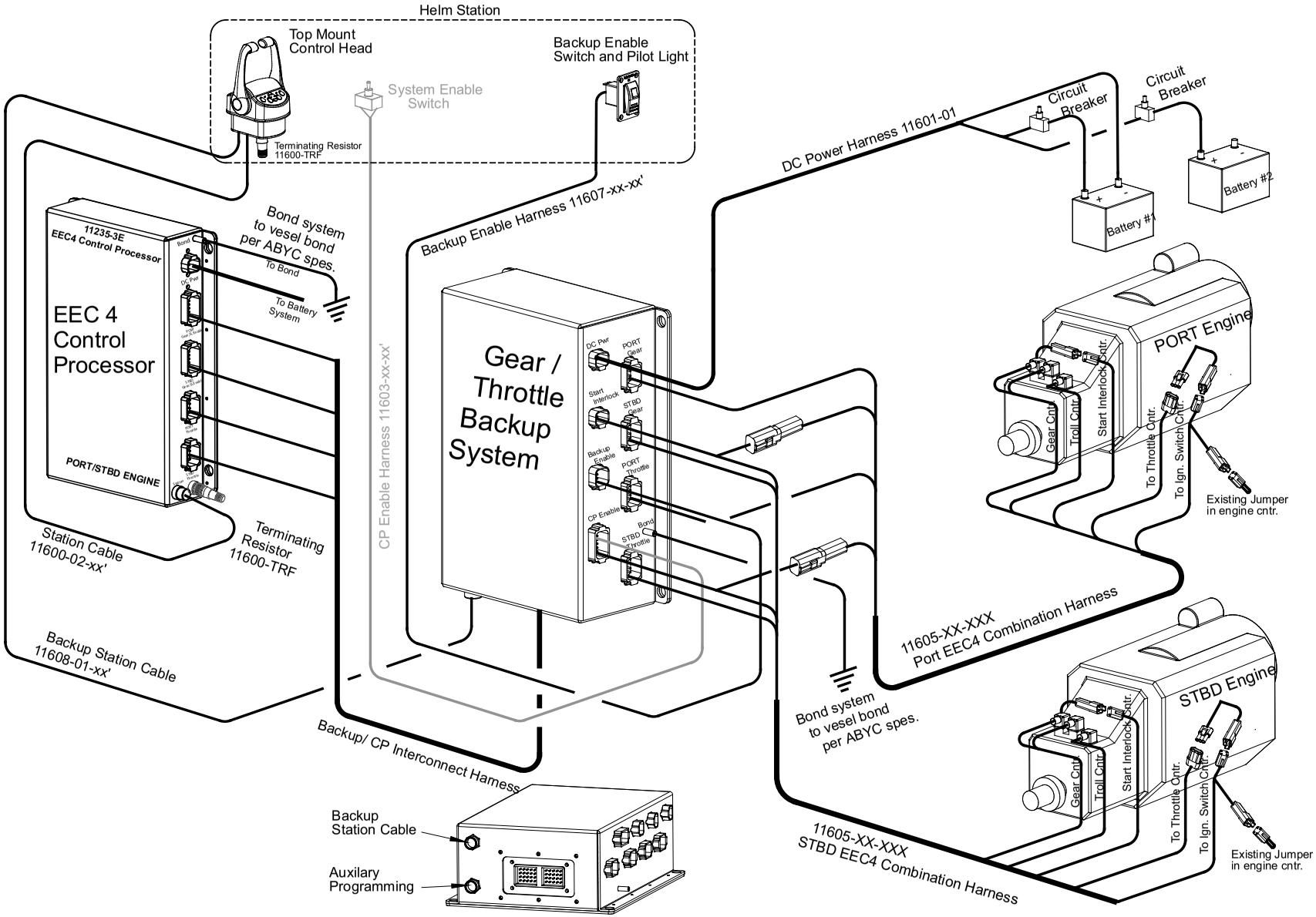
3) **Gear Operation** - NOTE: The checkout can be done at the dock, but care must be taken when shifting gears at the dock. Make sure that dock lines are tight and adequate. Once step 1 and 2 above have been checked, you can start the engines. Carefully move one Control Lever at a time in and out of gear. Check for proper direction and operation of the transmissions.

4) Now bring the Control levers to neutral and stop the engines. At this point turn off the Backup System enable switch and the lights on the Control Head should come on and the EEC system should be in normal operation.

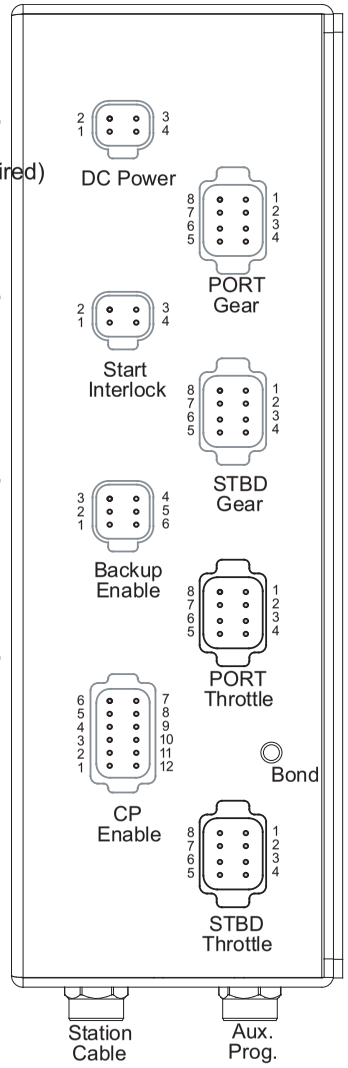
5) At this point make sure that in normal operation , with the EEC turned on, you have proper gear operation. Carefully move one Control Lever at a time in and out of gear. Check for proper direction and operation of the transmissions.

6) You are now fully tested . Make sure that all operators of the vessel know about the Backup System's operation and where the backup switch is located.

EEC 4 Control System Wiring Diagram - with Gear / Throttle Backup System Installed



EEC4 Backup Gear / Throttle Backup Pinout Connection



DC Power Connector (4 pin-Gray)

(1) Battery Positive 1
(2) Battery Positive 2
(3) Battery Ground 1
(4) Battery Ground 2 (optional if required)

Start Interlock Connector (4 pin-Gray)

(1) PORT Start Interlock 1
(2) PORT Start Interlock 2
(3) STBD Start Interlock 1
(4) STBD Start Interlock 2

Backup Enable Connector (6 pin-Gray)

(1) Switch COM (+12/24VDC)
(2) Switch (NO) 24V(enable light Pos.)
(3) Switch (NO) 12V(enable light Pos.)
(4) Batt. Neg.(enable light Neg.)
(5) Startup select jumper 1
(6) Startup select jumper 2

CP Enable/Spare Connector (12 pin-Gray)

(1) Ignition input 1
(2) Ignition input 2
(3) Backup spare output 1 (COM)
(4) Switch select - Ignition
(5) Voltage select -12V*
(6) Voltage select - (COM)*
(7) Voltage select - 24V*
(8) Switch select - dry switch*
(9) Switch select - (COM)*
(10) Backup spare output 1 (NO)
(11) Ignition output 2
(12) Ignition output 1

Note:
* references commonly used pins for this connector.
12V -(pins: 5,6) (8,9 - jumper), 24V -(pins: 6,7) (8,9 - jumper)

PORT/STBD Gear Connectors (8 pin-Gray)

(1) FWD Battery Positive +
(2) FWD Switch (COM)
(3) FWD Switch (NO)
(4) FWD Battery Negative -
(5) REV Battery Negative -
(6) REV Switch (NO)
(7) REV Contact (COM)
(8) REV Battery Positive +

Throttle Connections - 4 available Types

PORT/STBD Throttle Connectors- Voltage Type (8 pin-Black)

(1) Not used
(2) Ref. voltage Pos.+
(3) Ref. voltage Neg.-
(4) Voltage signal
(5) Not Used
(6) Not Used
(7) Not used
(8) Chassis ground

PORT/STBD Throttle Connectors- PWM Type (8 pin-Black)

(1) Batt./PWM Pos. +
(2) PWM output signal
(3) Batt./PWM Neg. -
(4) Not used
(5) Not used
(6) Not used
(7) Not used
(8) Chassis ground

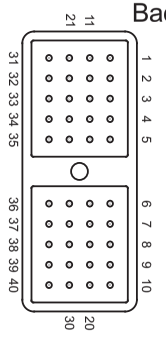
PORT/STBD Throttle Connectors- 4-20mA Type (8 pin-Black)

(1) Not used
(2) Not used
(3) Not used
(4) Not used
(5) 4-20mA output Pos. +
(6) 4-20mA output Neg. -
(7) Not used
(8) Chassis ground

PORT/STBD Throttle Connectors- MEFI Type (8 pin-Black)

(1) Ref. voltage 2 Pos. +
(2) Ref. voltage 1 Pos. +
(3) Ref. voltage 1 Neg. -
(4) Output signal 1
(5) Output signal 2
(6) Ref. voltage 2 Neg. -
(7) Not used
(8) Chassis ground

Backup to CP Connector (40 pin-Black)



(1) CP port throttle 1
(2) CP port throttle 2
(3) CP port throttle 3
(4) Chassis Ground
(5) CP Enable volt. select - 12V
(6) CP Enable volt. select - (COM)
(7) CP Enable volt. select - 24V
(8) CP port Start Interlock 1
(9) CP port FWD Gear 1 (COM)
(10) CP stbd FWD Gear 1 (COM)
(11) CP port throttle 4
(12) CP port throttle 5
(13) CP port throttle 6
(14) Chassis ground
(15) CP Enable switch select - (COM)
(16) CP Enable switch select - dry switch
(17) CP Enable switch select - ign. switch
(18) CP port Start Interlock 2
(19) CP port FWD Gear 2 (NO)
(20) CP stbd FWD Gear 2 (NO)
(21) CP stbd throttle 1
(22) CP stbd throttle 2
(23) CP stbd throttle 3
(24) Chassis ground
(25) Not used
(26) Ignition input 1 to CP
(27) CP ignition output 1
(28) CP stbd Start Interlock 1
(29) CP port REV Gear 1 (COM)
(30) CP stbd REV Gear 1 (COM)
(31) CP stbd throttle 4
(32) CP stbd throttle 5
(33) CP stbd throttle 6
(34) Chassis ground
(35) Not used
(36) Ignition input 2 to CP
(37) CP ignition output 2
(38) CP stbd Start Interlock 2
(39) CP port REV gear 2 (NO)
(40) CP stbd REV gear 2 (NO)

EEC4 Backup Gear / Throttle Wiring Harness

Backup / CP Interconnect Harness
Part # 11609-01-05' 5' long harness
Part # 11609-01-05' 10' long Harness

Control Processor End

PORT Gear
Deutsch 8 pos. Grey

STBD Gear
Deutsch 8 pos. Grey

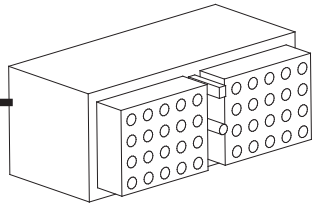
PORT Throttle
Deutsch 8 pos. Black

STBD Throttle
Deutsch 8 pos. Black

CP Enable
Deutsch 12 pos. Grey

Start Interlock
Deutsch 4 pos. Black

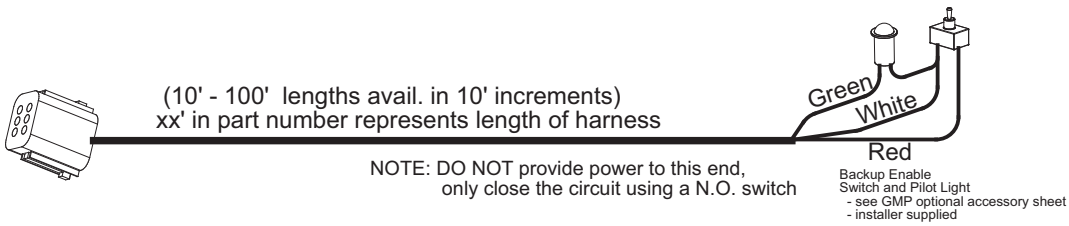
Backup System End
Deutsch 40 pos.



NOTE : Make sure center screw is tightened during installation, otherwise connector will not seat properly

Backup Enable Harness
Part # 11607-12-xx' 12v DC system
Part # 11607-24-xx' 24v DC system
Part # 11607-02-xx' 12 or 24v DC system - pinned in the field
Control Process End
Duetsch 6 pos. Black

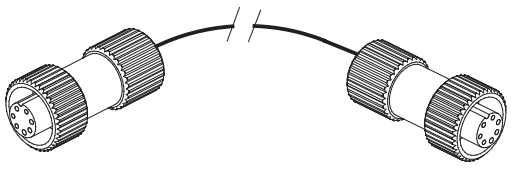
Backup Enable Switch End
- installer provided switch and pilot light
- GMP can provide a waterproof rocker switch with switch namepate
- use correct voltage pilot light



Backup Station Cable
Part # 11608-01-xx' (available 20' - 100' in 20' increments)

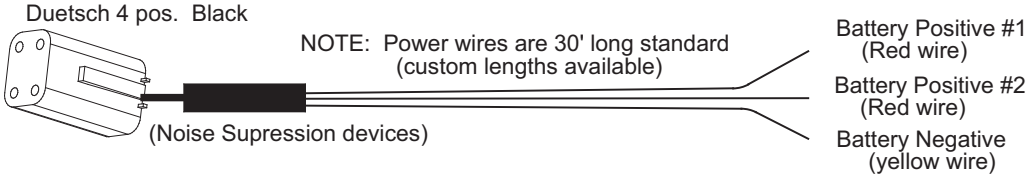
Routes from Backup System to Backup Control head

NOTE: Connector is the same on both ends

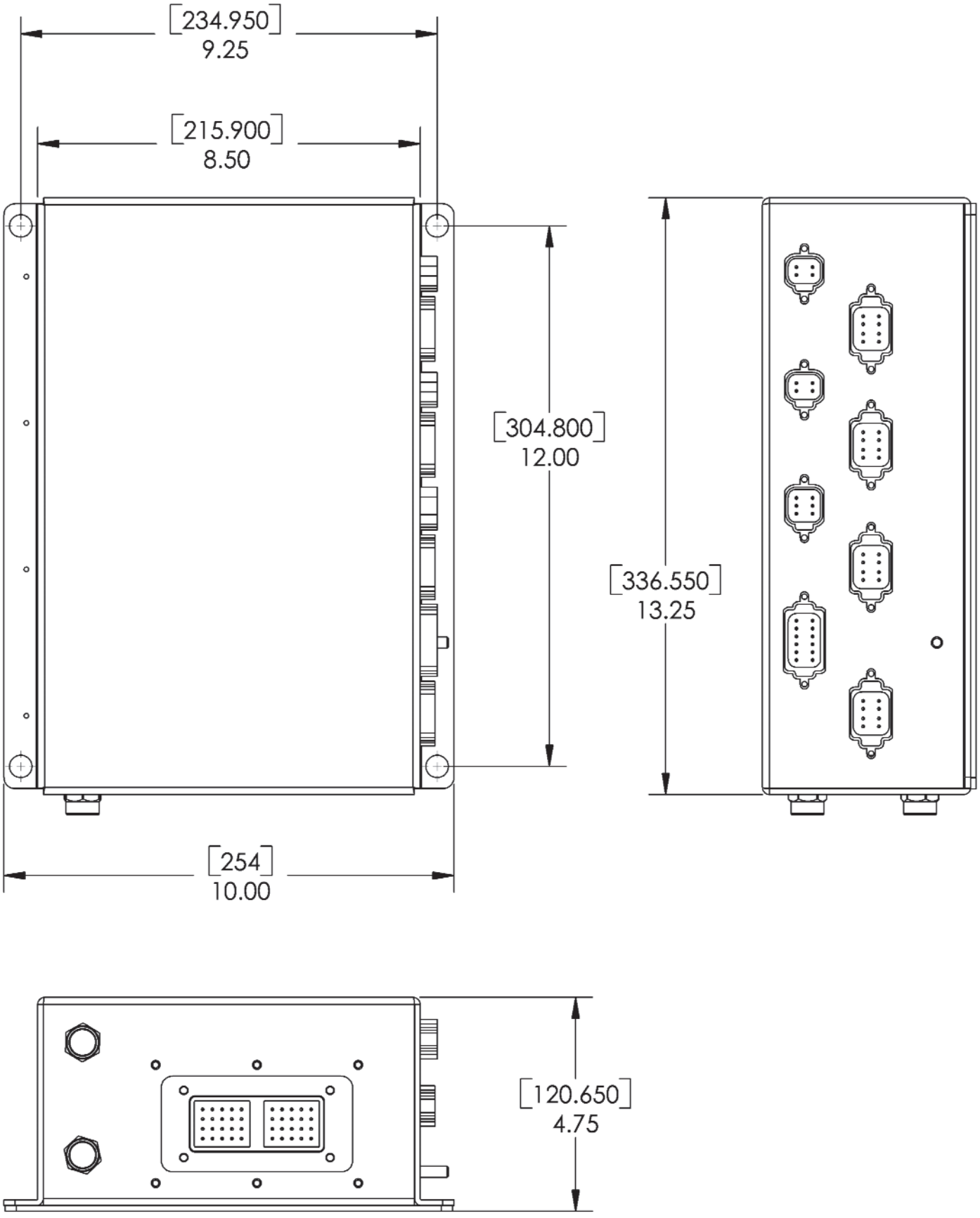


DC Power Harness
Part # 11601-01 (30' long std.)

Control Process End
Duetsch 4 pos. Black



EEC4 Backup Gear / Throttle System Dimensions



2.6 Triple Engine Applications (optional)

A. Description

The EEC-4 System is able to control the throttles and transmissions for multiple engine applications. The control head handle is designed and programmed to control three engines from 2 handles. In order for the EEC-4 System to control multiple engines, an additional EEC-4 Single Engine Control Processor must also be installed (see layout drawing following this section).

B. Operation

After proper installation, the PORT engine control handle controls the PORT engine — functioning in the same way as a standard control. The STBD engine control handle controls the starboard engine — functioning in the same way as a standard control

CENTER Engine Control:

For gear shift, the center engine is put into gear by moving BOTH the PORT and STBD engines into the same gear.

• If the PORT engine goes into gear, but the STBD engine is in Neutral or in the opposite gear (during maneuvering), then the CENTER engine stays in Neutral.

• If the STBD engine goes into gear, but the PORT engine is in Neutral or in the opposite gear (during maneuvering), then the CENTER engine stays in Neutral.

• However, if BOTH the PORT and STBD engine are placed into the same gear (either ahead or reverse), then the CENTER engine will respond the same way and shift into the same gear position as the PORT and STBD engine.

For throttle control, the engine speed of the CENTER engine will be the same as the lowest speed of either the PORT or STBD engine.



While in WARM mode, the center engine will respond the same way as above. However, the gear on all the engines will not respond while in WARM mode – all engines will remain in neutral.

Triple Engine Activation Switches

The position of the switches on the control panel at the helm station will determine which of the engines will respond to the control head.

If all of the switches are in the ON position, then the engines will respond as described above. If any

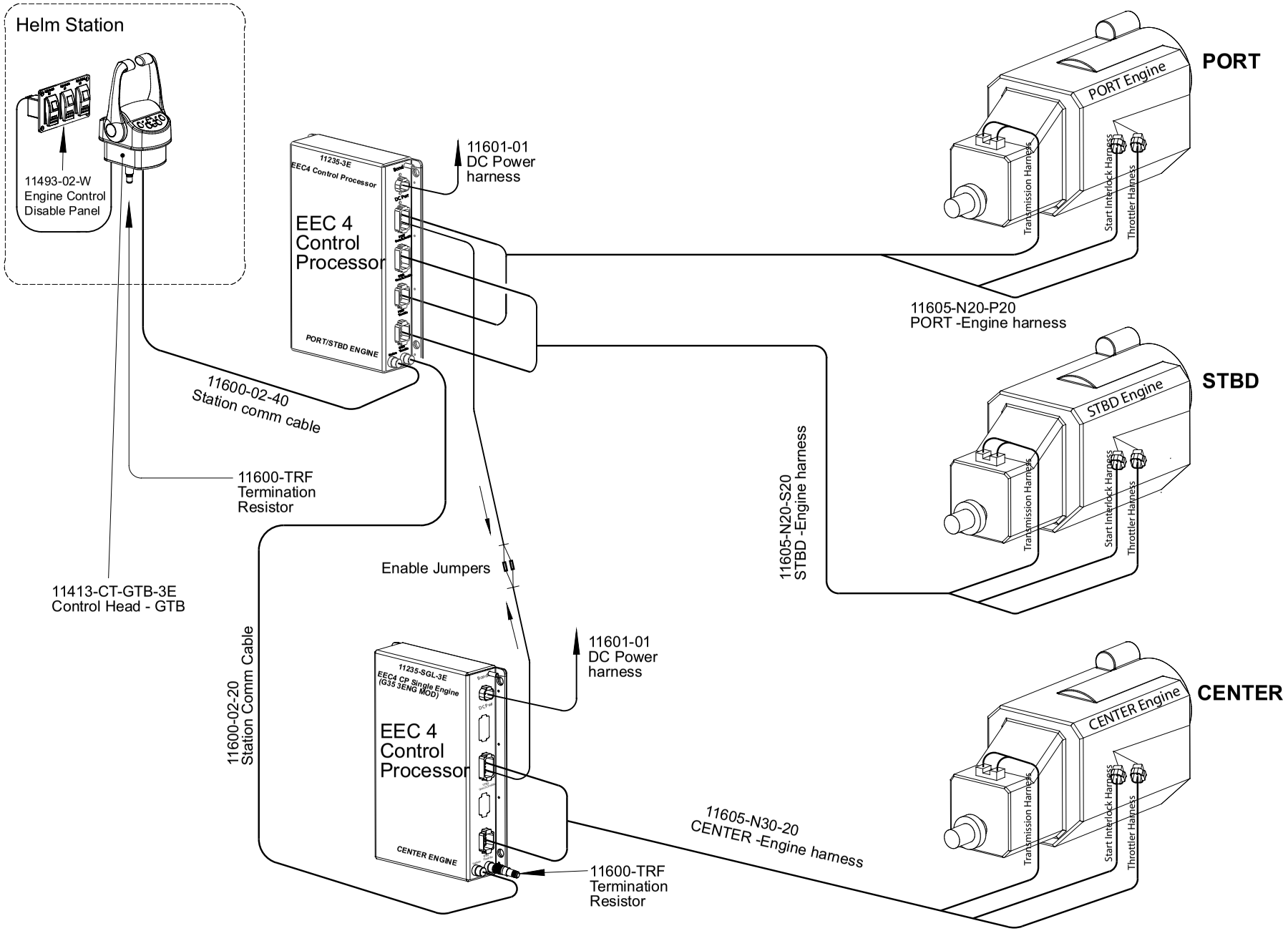
of the switches on the control panel are in the OFF position, then the engine associated with that switch will remain in the neutral / idle control position – the engine will not go into gear, it will not speed up.

If the center engine is turned off, then it will remain in neutral, while the port and starboard engines respond normally. If either the port or starboard engine switch are turned off, then the center engine will be controlled by the PORT or STBD control handle (whichever button is turned off). If ONLY the center engine switch is on, then the center engine will be controlled by the starboard handle.



The control system will only respond to a change in the switch position when the control handles are in neutral. Manipulating the switches while the engines are in gear will have no effect, until after the control handles are returned to neutral.

EEC4 Triple Engine Layout



EEC4 Triple Engine with GTB Backup Layout

