Electronic Control System Second Station Installation Manual for SY GEN III, 6LY3, and BY Unlimited Series Engines

ELECTRONIC CONTROL SYSTEM
MANINYM03
REVISION 2.0

CE RECREATIONAL CRAFT DIRECTIVE 94/25/EC

Maximum performance, and compliance with the EMC Directive, can only be ensured by correct installation. It is strongly recommended that the installation conforms with the following standards:

APPLICABLE STANDARDS

a) ISO 8846 Small Craft-Electrical Devices
   Protection against ignition of surrounding flammable gases.
b) ISO = International Standards Organization

SAFE BOATING STATEMENT

This device meets or exceeds the applicable ABYC, ISO, and USCG safe boating rules, regulations, standards, and guidelines.

SAFE BOATING ON THE WEB

U.S. Coast Guard www.uscg.mil
U.S. Power Squadron www.usps.org

ABYC Setting Standards for Safer Boating American Boat & Yacht Council (http://www.abycinc.org)

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

NOTICE TO INSTALLER

The WARNINGS and CAUTIONS within this manual are used to alert the installer to hazards that exist concerning a particular service, operation or component. They also may convey special instructions to reduce the risk of injury during the operation or servicing of the engine.

However, these safety alerts alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing installation, operation, and maintenance is the most effective accident prevention measure along with exercising care and using common sense when performing such actions.

California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

California Proposition 65 Warning

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

Table of Contents

System Identification

NOTE: each section will be accompanied by a "pie chart" to indicate which systems are covered. If the system is covered, the piece of the pie will be black with white text; if not the piece will be white with grayed text.

Example: the chart below on the left indicates that ALL systems use the same installation. The chart on the right indicates SY GEN III (SY3) and 6LY3 (LY3) systems are affected. The chart at the bottom indicates that only the BY Unlimited (BYU) system is being affected.

Pages with this indication cover all three systems

Pages with this indication cover the SY GEN III and 6LY3 Systems

Pages with this indication cover the BY Unlimited System

Overview and Operation

Overview

This manual covers the installation of a second station on a boat using the 6LY3, SY GEN III, or BY Unlimited operating systems. Please refer to the System Manual for all other installation directions.

To put in the second station for these systems, five steps must be done:

1. Identify the components to be used, e.g. control head, control modules (if applicable), i5601E and gauges.
2. Mount the components.
3. Extend the CANBus. There will be two ways to do this depending on the operating system. SY GEN III and 6LY3 are alike and shown on pages 10 and 15. The BY Unlimited is installed differently and shown on pages 11 through 14 and page 16.
4. Check for adequate CANBus power.
5. Install the appropriate ignition switches.

Operation

Station Select Function is similar on all control styles.

BYU SY3 LY3

Select/change Station:

NOTE: Station Select Protection may be turned on. See Appendix B.

A lit **green** SELECT lamp indicates a station is active. ○

- On single station boats, station selection is automatic.
- For mutli-station boats, choose a station and then press SELECT button with levers in neutral.

to Change Stations:

- Move to new station and press SELECT button. (Green lamp flashes.) ☼
- Match control handle positions with those of active station. (**Green** lamp goes steady when levers match and this station is now in control.) ○

Step 1 - Component Identification

2nd Helm

Note: Some components are pre-configured and labeled port and starboard.

CH67500: Dual Function, Dual Lever Control Head

CH64600: Single Lever, Dual Function Control Head

CH67505: Dual Function, Dual Lever Control Head

CH1900: Palm Beach Control

CH4400: Single Function, Dual Lever Control Head

CH5600: Single Function, Dual Lever Control Head

All of the second station controls work on the CANBus. The connections and functions are the same. Therefore the style of controls can be different at each operating station.

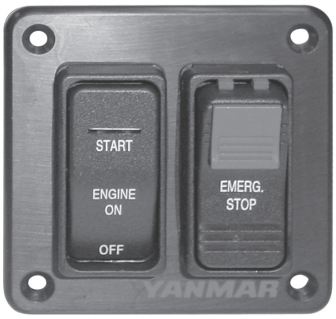
Step 1 - Component Identification

CH67000: Control Module

i5601E: Digital Display(s)

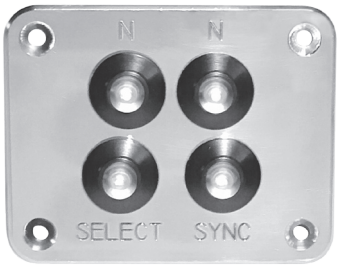
Shown with cable CM10504

Ignition Switch
(for 2nd Station)



Note: Various ignition switches are available

CP1200: Dual Engine Switch Panel



CP1100: Single Engine Switch Panel

CP67601: Trolling Switch
(optional)

3" and 2" Gauges:
(optional - representational sampling)

Step 1 - Cable Identification

Note: xx indicates cable length in feet

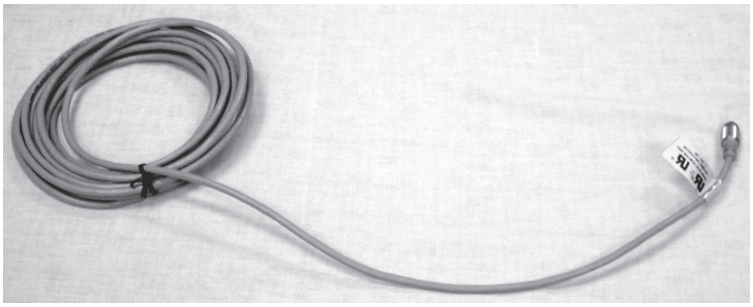
CP19200: 2nd Station Ignition Switch
(plug and cable detail)

CE40300: "Y" Connector for
2nd Stations Extensions

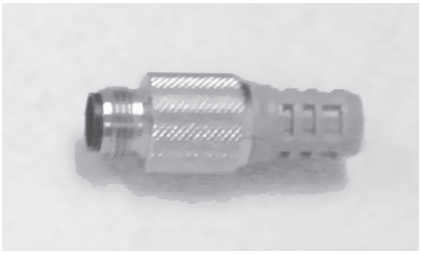
Two CE405xx: Extensions for 2nd Stations

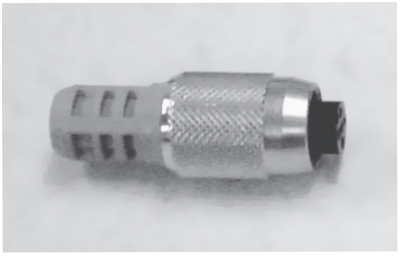
Step 1 - NMEA 2000® CANBus Cables

CM100xx: Cable



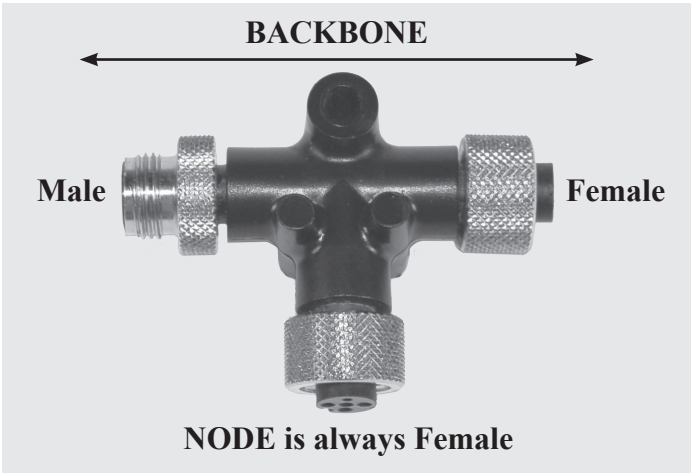
CM10051: male terminator / **CM10052:** female terminator





"T" Connector:

Supplied by several vendors under part numbers CM10050 and CM10060.
Appearance may vary - parts are interchangeable.



Note regarding connectivity of "T" Connectors:

- When connecting a "T" connector to a component (for example, an i5601E digital display) always install via the middle connection ("NODE").
- When connecting a "T" connector to a CANBus cable (for example, CM100xx) to connect components that are far from each other, always install via the male/female end of the connector (whichever applies).
- Hand-tighten after the connection is made.
- Do not tightly tie down the "T" connectors, as this will create stress and can cause damage.

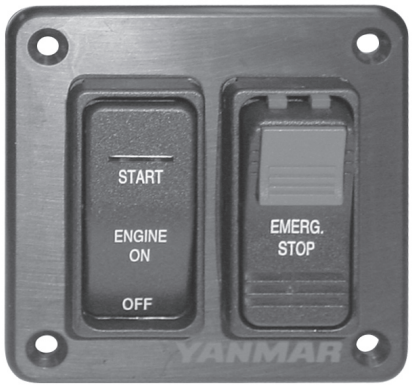
Step 2 - Mounting

2nd Station

Note: Mounting templates are included with the product and/or in basic system installation.

1. Mount the i5601E display(s).

2. Mount Ignition Switches or Panels (for 2nd Stations)



3. Mount the Control Head (CH67500 shown as representational).

4. Install the optional CP67601 Trolling Switch, if required.

Step 2 - Mounting

5a. Install the gauges (optional).

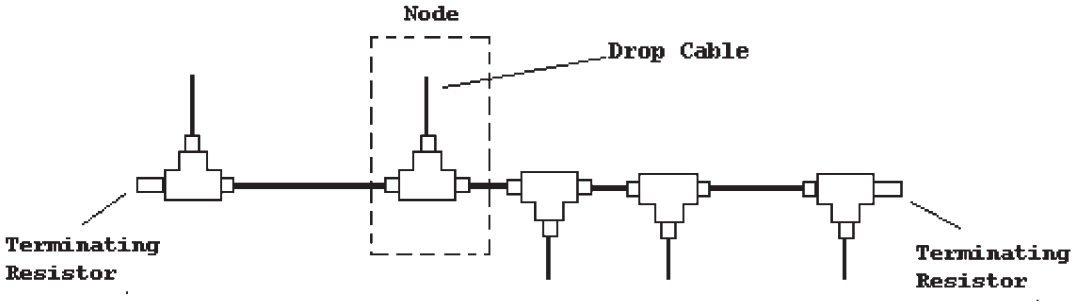
5b. Install the Tachometer (optional).

Step 3 - Extending the CANBus

SY GEN III and 6LY3 Connectivity

The Network must consist of a single cable run to which devices are connected to it by means of a "T" Connector. All products must connect to the node part of the "T" connector. Each end of the cable must have a terminator. It is essential there be a total of two and only two terminators.

- Locate the end of he cable.
- Use a CM100xx cable to reach to the second station.
- Put in required "T" connectors.
- Terminate the ends using the proper gender terminator.

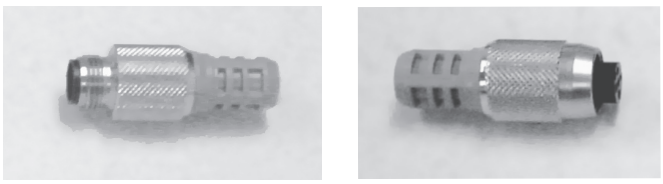


Warning
Before pulling the cables, make absolutely sure of the gender of the connections!

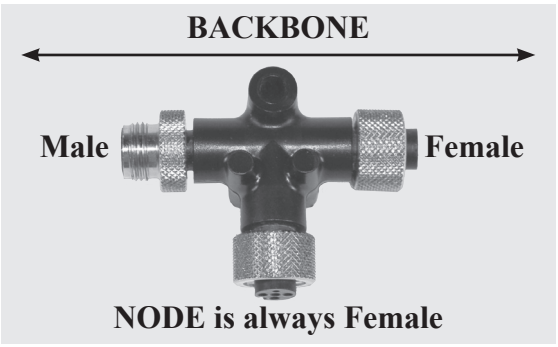
Note regarding connectivity of "T" Connectors:

- When connecting a "T" connector to a component (for example, an i5601E digital display) always install via the middle connection ("NODE").
- When connecting a "T" connector to a CANBus cable (for example, CM100xx) to connect components that are far from each other, always install via the male/female end of the connector (whichever applies).
- Hand-tighten after the connection is made.
- Do not tightly tie down the "T" connectors, as this will create stress.

CM10051: male terminator / **CM10052:** female terminator



"T" Connector:



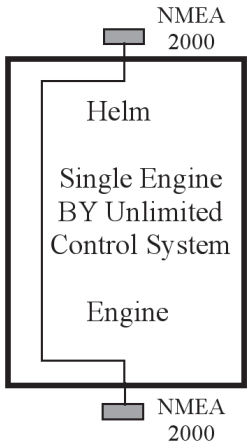
For SY GEN II and 6LY3 installation proceed to page 15.

Step 3 - Extending the CANBus

BY Unlimited Connectivity

General Information

Each BY Unlimited engine harness system has a NMEA 2000 CANBus in the harness that connects the engine area and the first helm station. This diagram is used to represent the BY Unlimited harness system for a single engine.

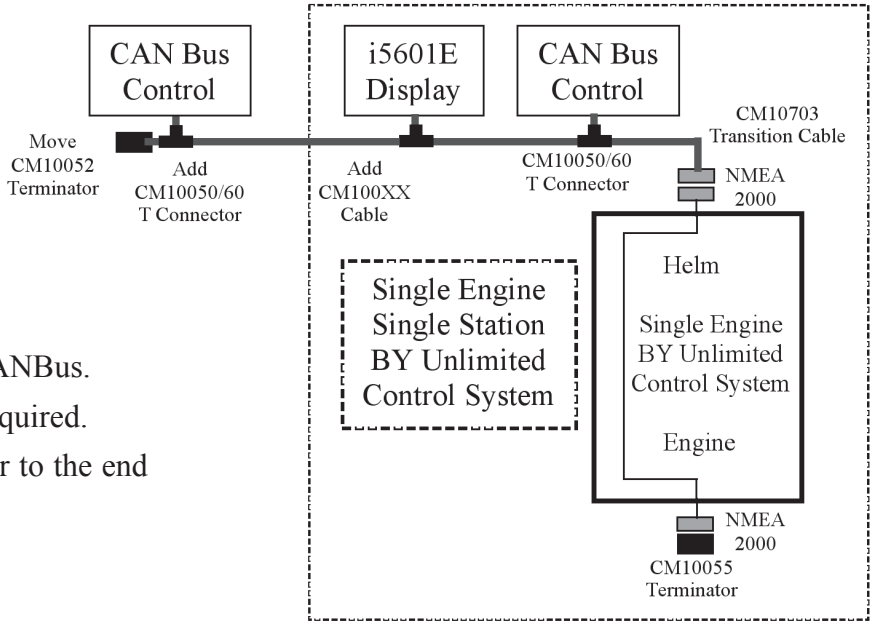


In the engine area the NMEA 2000 connector is part of the CE50206 cable. At the helm the NMEA 2000 connector is part of the CE50100 helm cable.

Step 3 - Extending the CANBus

Single Engine

The NMEA 2000 CANBus may be extended from the Helm, from the Engine Area, or from both locations if required. Since the BY Unlimited system already uses the NMEA 2000 interface at the helm there is a difference in the material that is used.

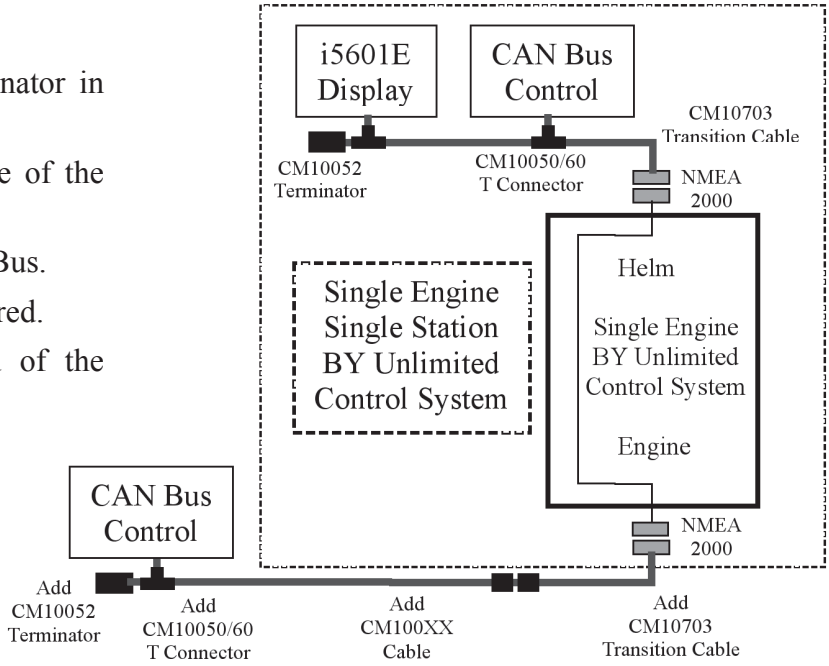


Helm Extension

1. Use CM100XX cables to extend the CANBus.
2. Add CM10050/60 "T" connectors as required.
3. Move the existing CM10052 terminator to the end of the CANBus.

Engine Area Extension

1. Remove and discard the CM10055 terminator in the engine area.
2. Add a CM10703 transition cable in place of the terminator.
3. Use CM100XX cables to extend the CANBus.
4. Add CM10050/60 "T" connectors as required.
5. Add a CM10052 terminator at the end of the CANBus.



Step 3 - Extending the CANBus

Dual Engine

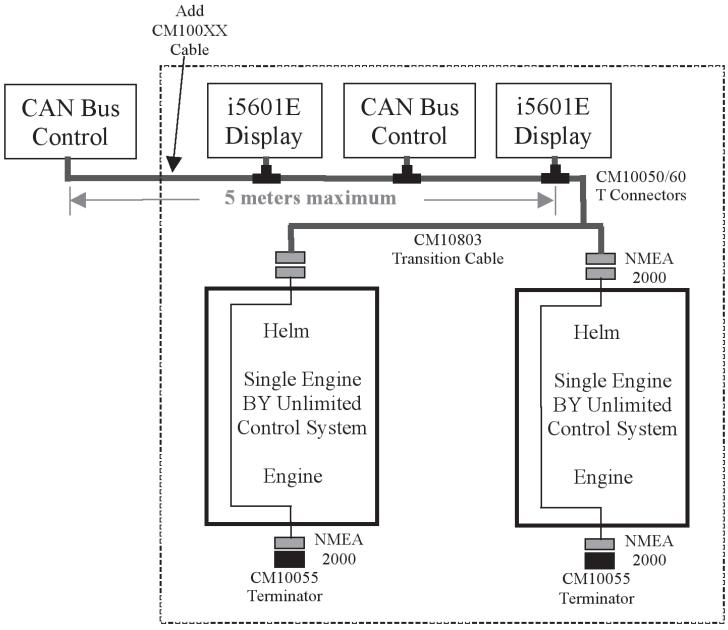
The NMEA 2000® CANBus may be extended from the Helm, from the Engine Area, or from both locations if required. On dual engine BY Unlimited systems the distance to the second helm station will affect the approach that is required. The helm extension short is an easy method of extending the NMEA 2000® CANBus so long as the length restrictions are acceptable.

Helm Extension Short

BYU
SY3 LY3

Note: This method of extending the CANBus (CM100XX cable) has a five meter limit on the total length of the extension. The five meters is measured from the connection point of the CM10803 to the end of the branch.

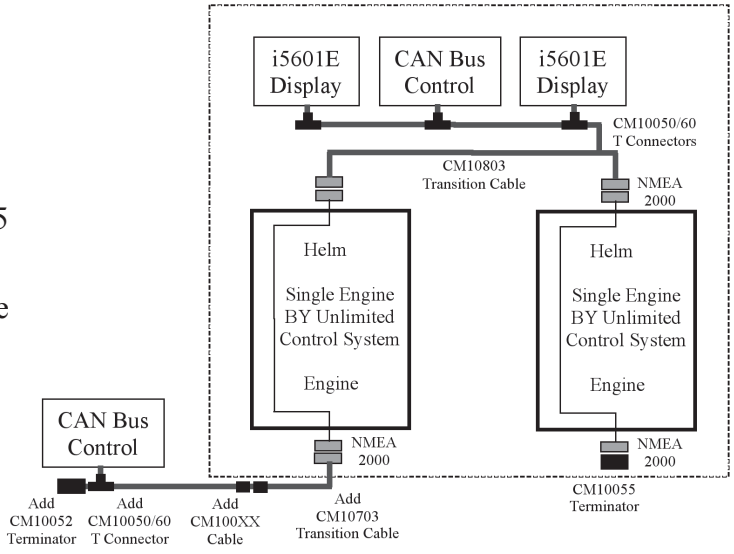
The dotted line contains a dual engine single station BY Unlimited System.



1. Add CM100XX CANBus cable up to a maximum of 5 meters.
2. Add CM10050/60 “T” connectors as required.
3. Do NOT add a terminator. As long as the open end of the “T” connector is in a dry location, no further precautions are necessary.

Engine Area Extension

The dotted line shows a dual engine single station BY Unlimited System.



1. Remove and discard one of the CM10055 terminators in the engine area.
2. Connect a CM10703 transition cable in place of the terminator.
3. Add CM100XX CANBus cables as required.
4. Add CM10050/60 “T” connectors as required.
5. Add one CM10052 terminator.

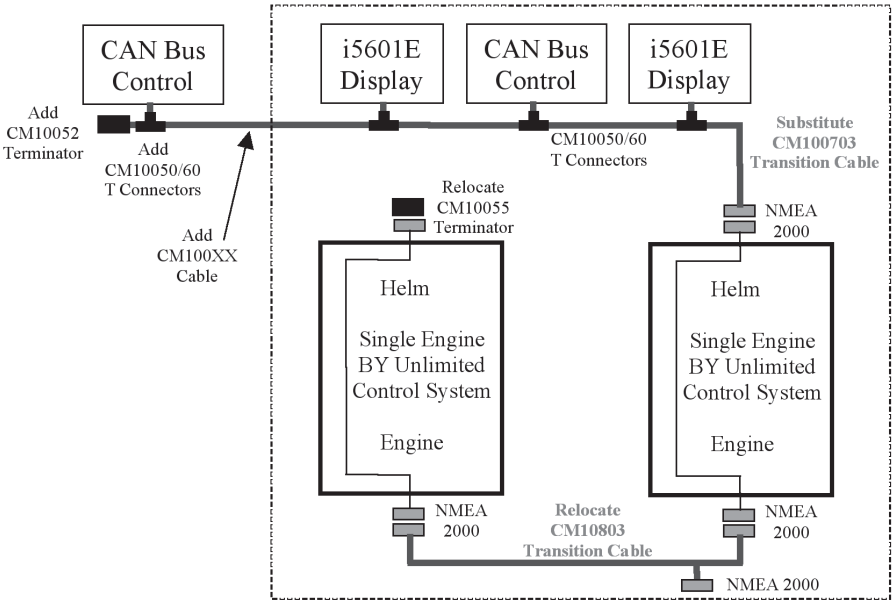
Note: The NMEA 2000® CANBus extension may be added to either engine or it may be added to both if there is a need to extend the NMEA 2000® CANBus in another direction.

Step 3 - Extending the CANBus

Helm Extension Long

Note: On dual engine BY Unlimited systems, where it is desirable to run the second station wire from the helm but the length is over 5 meters, this is the required connection.

The dotted line contains a dual engine single station
BY Unlimited System.



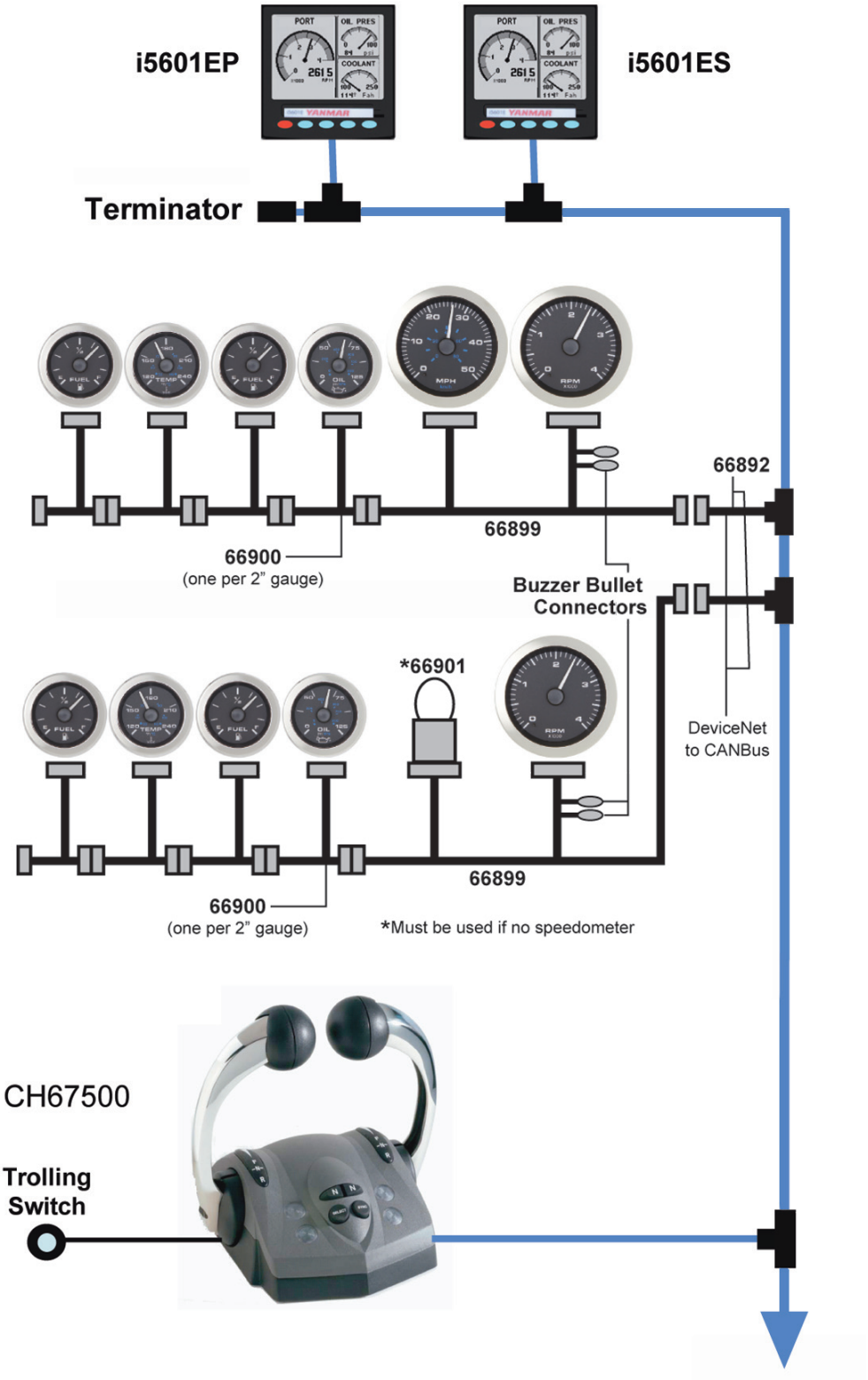
Note: The NMEA 2000® CANBus may be extended from either or both of the The NMEA 2000® helm connectors.

1. Remove the CM10055 terminators at each engine.
2. Remove the CM10803 cable at the helm and use it to interconnect the two NMEA 2000® connectors in the engine room. Note: the DeviceNet connector on the cable is not used by the system but may be used for other NMEA 2000® certified equipment.
3. Use one of the CM10055 terminators from the engine area to terminate the unused NMEA 2000 helm connector.
4. Add a CM10703 transition cable to connect the other helm NMEA 2000® connector to the CANBus as shown in the diagram.
5. Add the needed CM100XX cables to connect the helm area equipment with the second station.
6. Add CM10050/60 “T” connectors as needed at the second station.
7. Add a CM10052 terminator at the end of the CANBus.

For BY Unlimited installation proceed to page 16.

Step 3 - Extending the CANBus

6LY3/SY GEN III 2nd Station Wiring Diagram - Dual Engine

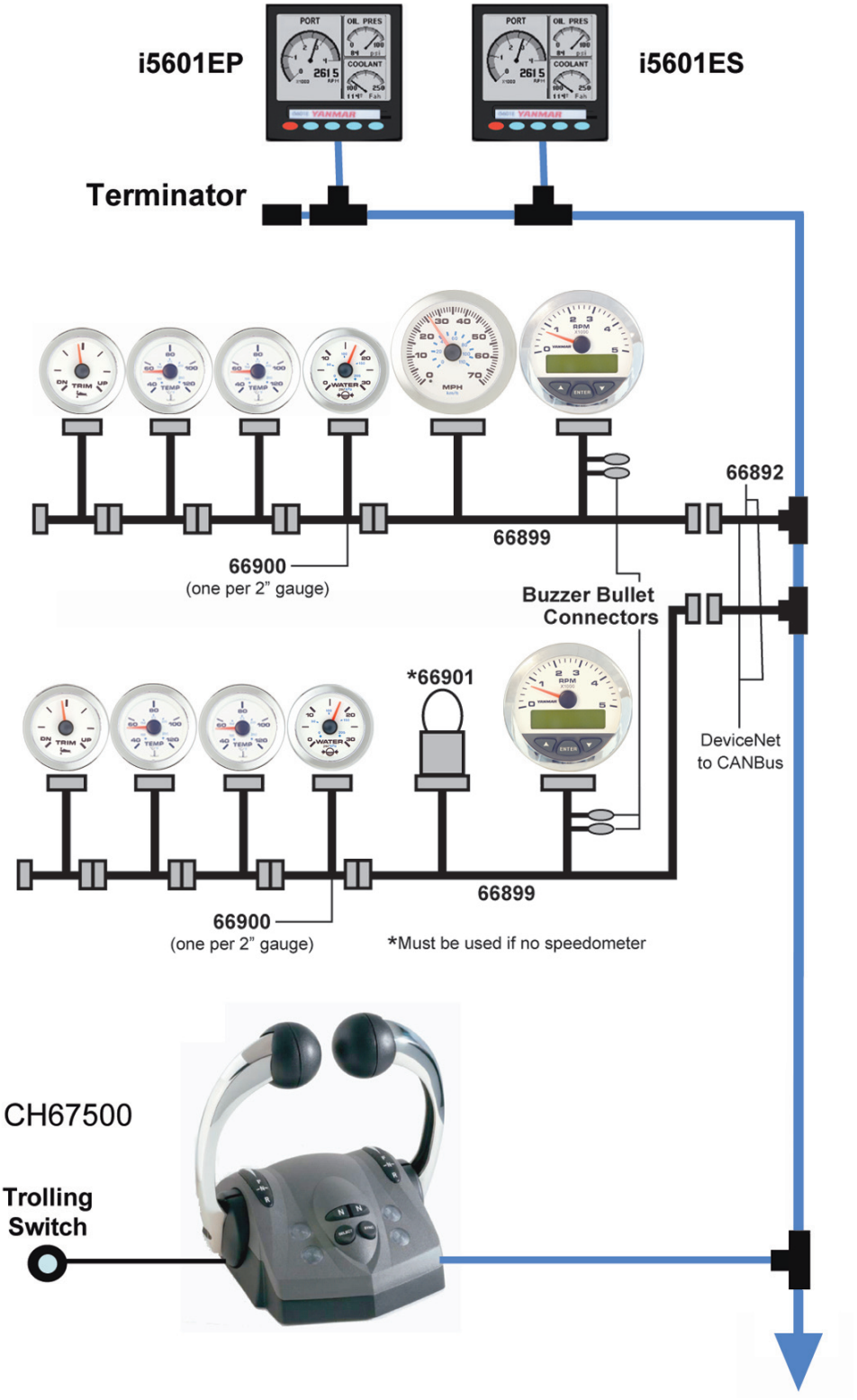


Must extend to the Main CANBus from a male or female "backbone" connection, NOT from the NODE of the "T" connector (see page 7).

Step 3 - Extending the CANBus

BY Unlimited Second Station Wiring Diagram - Dual Engine

BYU
SY3 LY3



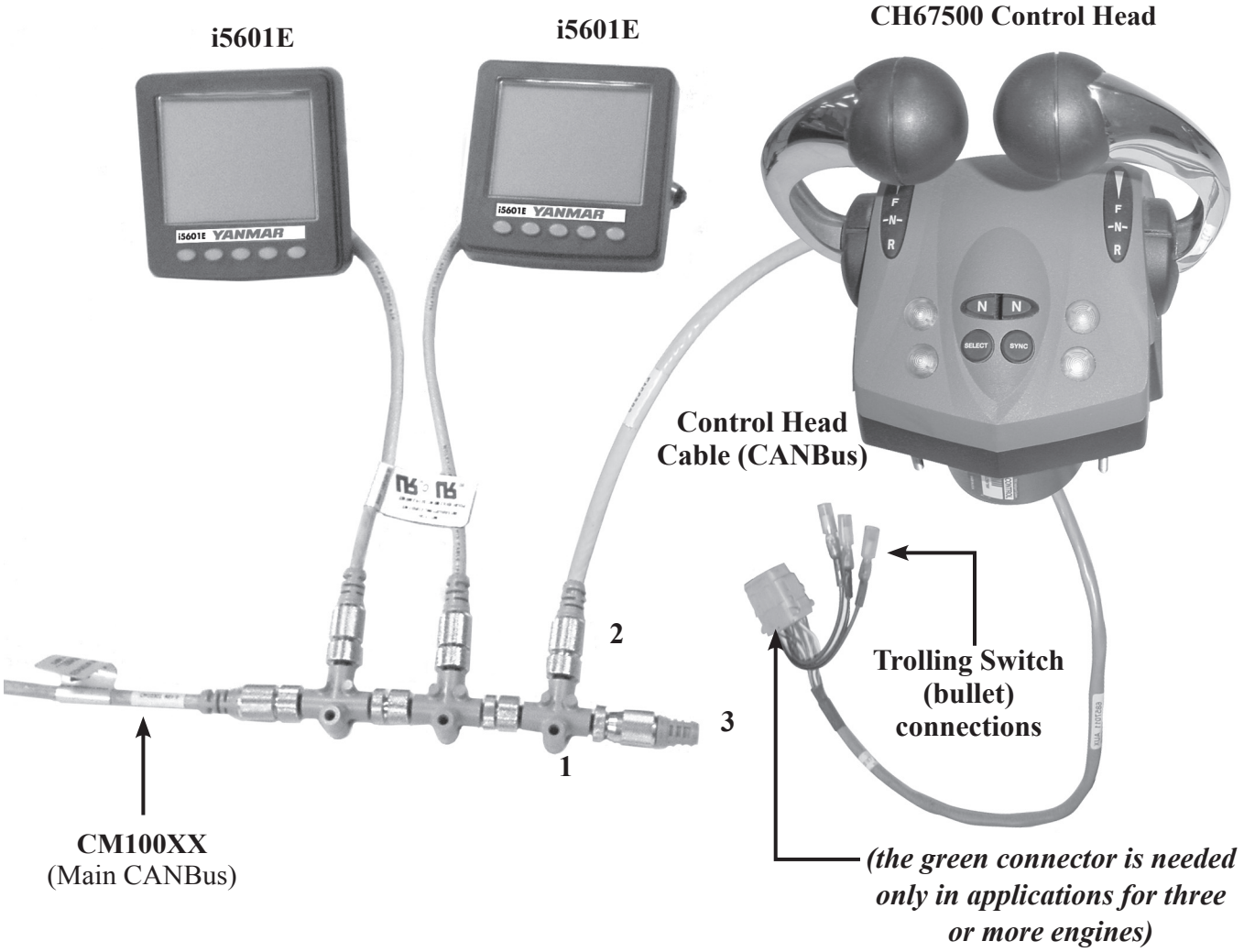
Must extend to the Main CANBus from a male or female "backbone" connection, NOT from the NODE of the "T" connector (see page 7).

Step 3 - Extending the CANBus

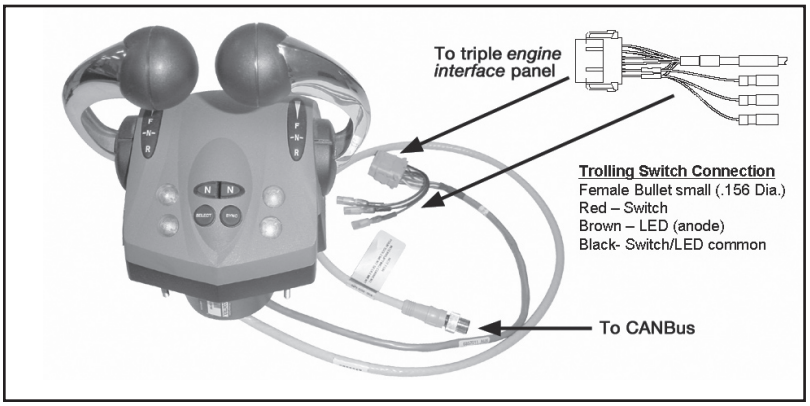
Connecting the 2nd Station Control Head - Dual Engine

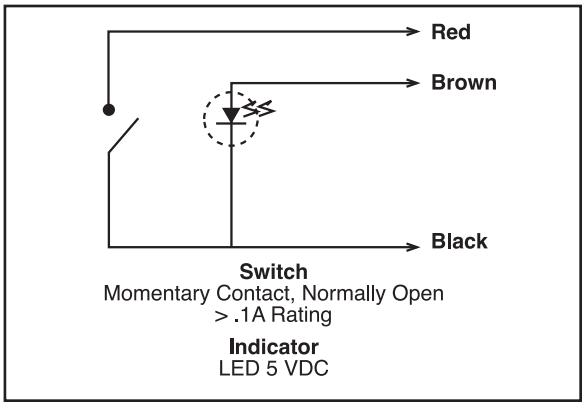
Connect the Control Head, as follows:

1. Connect a "T" connector to the end of the "T" assembly from the previous page.
2. Connect the control head cable to the "T." Connect via the NODE.
3. Terminate with the appropriate gender CANBus Terminator.



Trolling Switch and Connection Diagram

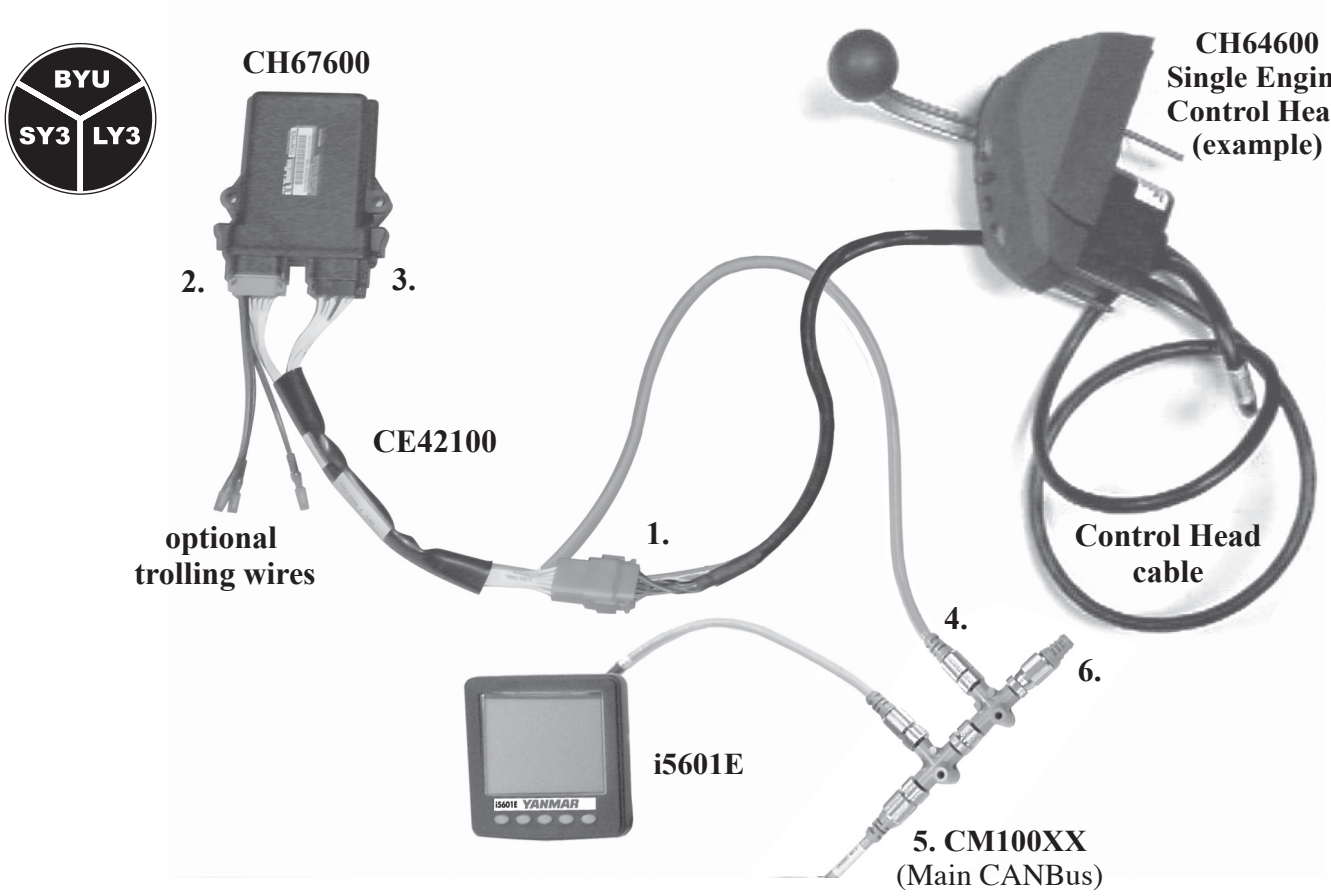




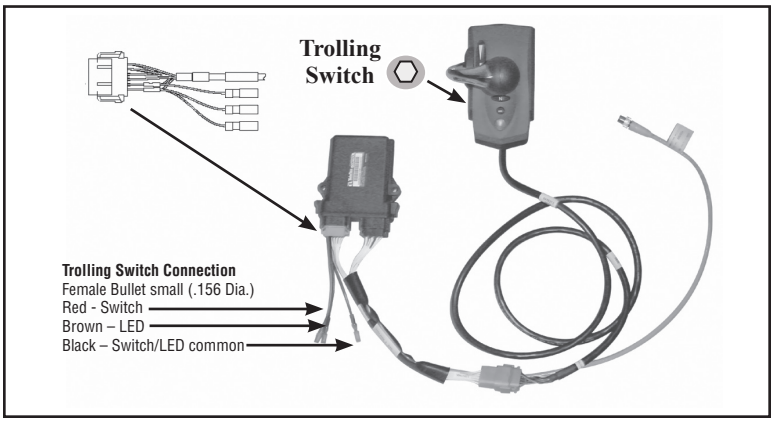
Step 3 - Extending the CANBus

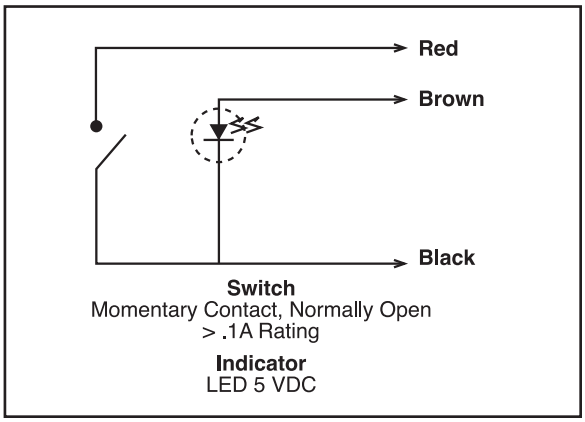
Connecting other Controls Requiring a Control Module

1. Connect the Control Head cable to the appropriate end of cable harness CE42100 (big grey connector).
2. Connect the GREY connector on cable harness CE42100 to the GREY port on the CH67600 module.
3. Connect the BLACK connector on cable harness CE42100 to the BLACK port on the CH67600 module.
4 Install a CANBus "T" connector to the CANBus end of the CE42100 cable. Connect at the NODE.
5. Connect the "T" to the CM100XX CANBus cable from the first station.
6. Terminate the "T" end with the appropriate gender CANBus Terminator.



Trolling Switch and Connection Diagram





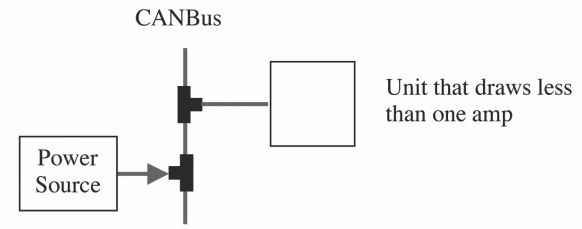
Step 4 - Power Connectivity

Powering the CANBus

The CANBus requires power in the 10 to 16 volt range. The power may be supplied by one or more of the products on the Data Bus or from as separate source. Yanmar strongly recommends that at least two independent sources are used to supply the data bus power. When installed on dual or triple engine systems per Yanmar 6LY3 instructions, redundant power is supplied.

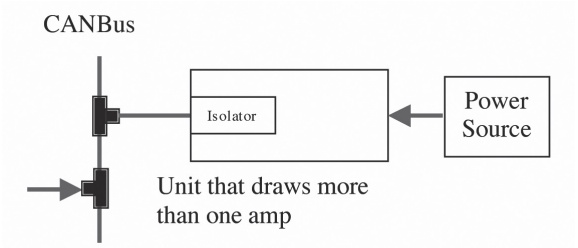
CANBus Power

The CANBus is used to supply power to all the items that are connected on the bus. For items drawing less than one amp, not having any other power connection, or another path back to ground the entire power for the item may be pulled from the CANBus. This is the case for the Yanmar CANBus Control Head, Control Interfaces, the i5601E Digital Display, and the i2200 Gauges.

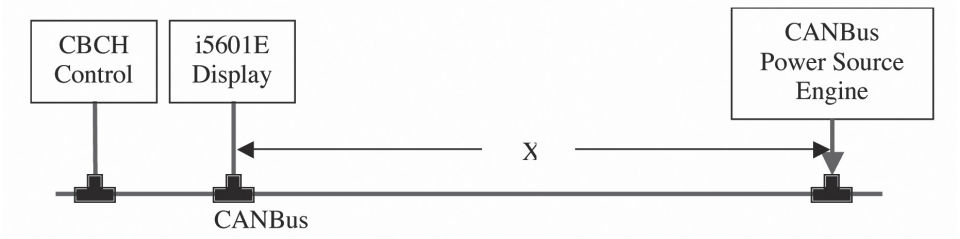


Each 6LY3 engine supplies power to the CANBus through diodes which stop the CANBus from becoming a commoning path between the engines.

Products that require more than one amp must draw their power from another source. The CAN Port that connects this type of device to the CANBus must be isolated from the unit's main power source. This is normally accomplished with optical isolators. This protects the network from a local failure and prevents ground loops. The circuits that are in these units on the CANBus side of the isolators receive their power from the CANBus. Thus all items on the CANBus use some amount of power from the CANBus.



The CANBus cable has a modest wire gauge (22AWG) to handle power. As items are added to the CANBus and as the CANBus cable length increases resistance losses in the cable can cause a unit to drop below its rated voltage and shutdown. To protect against this failure it is necessary to take into account both the length of the cable and the number and type of devices on the cable. When the distance is too long for the connected equipment an additional power feed needs to be added along the cable.



Step 4 - Power Connectivity

For Yanmar equipment here are some guidelines for the distance from the engine room to the helm. This is the X distance in the above diagram.

> ***Caution:***
> ***If the distance exceeds the length in the tables add CANBus power at the helm.***
> ***Power should have the same ground reference as other parts of the CANBus.***

Single Engine Installations with 1 Helm Station

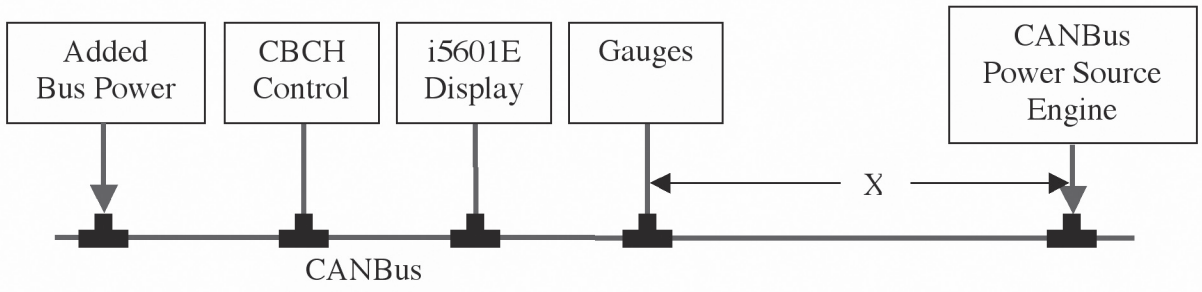
Units at Helm	X max feet
Control Head and one i5601E	150
Control Head, i5601E, Gauges	55

Dual Engine Installations with 1 Helm Station

Control Head and two i5601E	85
Control Head, i5601E, Gauges	30

Triple Engine Installations with 1 Helm Station

Control Head and three i5601E	40
Control Head, i5601E, Gauges	12

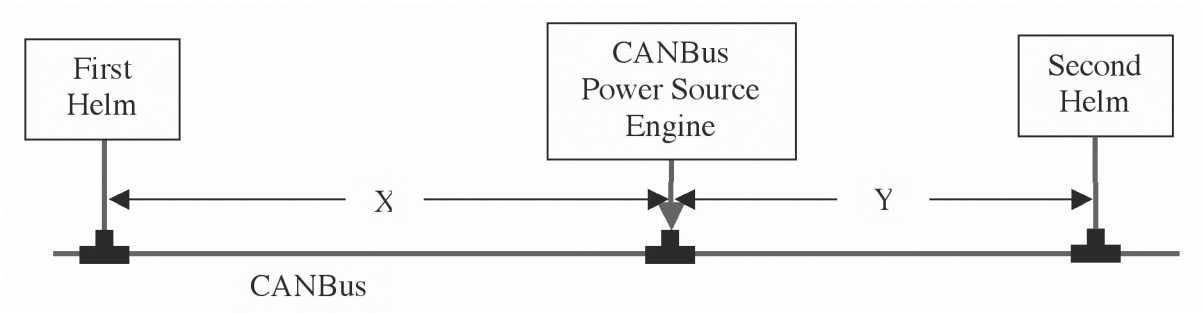


Adding CANBus power is typically accomplished by running a pair of wires (plus and minus) from the battery or an auxiliary power feed to the location where the power is to be put on the CANBus. The connection should have a circuit breaker or fuse and a diode in the positive line to stop any back feed. Reminder: This extra feed should be switched since it will keep the CANBus active. Yanmar has a cable available that has the diode and fuse built in. The part number is CMS-1.

Boats with Two or more Helm Stations

In these cases it matters how the engine (source of CANBus power) is located on the CANBus. The engine may be located near the middle of the CANBus or near one end of the CANBus. How the CANBus was run has a significant impact as you will see in the information that follows.

Case 1



Step 4 - Power Connectivity

If a distance in the case one table is exceeded add power at all helms that exceed the distance.

Case 1 - Single Engine Installations with 2 Helm Station

Units at Helm	X max feet	Y max feet
Control Head and one i5601E	150	150
Control Head, i5601E, Gauges	55	55

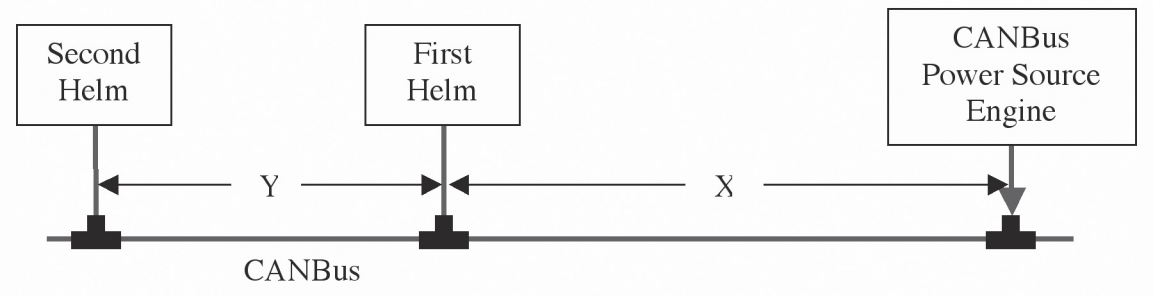
Case 1 - Dual Engine Installations with 1 Helm Station

Control Head and two i5601E	80	80
Control Head, i5601E, Gauges	25	25

Case 1 - Triple Engine Installations with 1 Helm Station

Control Head and three i5601E	40	40
Control Head, i5601E, Gauges	12	12

Case 2



Add X plus Y and use this number in the table.

Case 2 - Single Engine Installations with 2 Helm Stations

Units at Helm	X +Y max feet
Control Head and one i5601E	75 Add power at the first helm above this number
Control Head, i5601E, Gauges	25 Add power at the first helm above this number and Add power at the second helm if Y exceeds 55 feet.

Case 2 - Dual Engine Installations with 2 Helm Stations

Control Head and two i5601E	40 Add power at the first helm above this number
Control Head, i5601E, Gauges	12 Add power at the first helm above this number and Add power at the second helm if Y exceeds 40 feet.

Case 2 - Triple Engine Installations with 2 Helm Stations

Control Head and three i5601E	20 Add power at the first helm above this number and Add power at the second helm if Y exceeds 20 feet
Control Head, i5601E, Gauges	Always add CANBus power at both helms.

Step 4 - Power Connectivity

Useful Information

The following information is supplied for those who need to calculate voltage drops in complex networks:

The lowest voltage permitted at any node is 9.00 volts. Below this level equipment may start to shut down. Good practice is to have some safety factor.

The power wires (red and black) in the CANBus cable are 22 AWG. The resistance of 22 AWG wire is 16.14 ohms per 1000 feet. Remember the plus and minus both must be considered. A 20 foot long cable adds 40 feet of wire to the circuit.

The following are the loads presented by each of the various Yanmar products.

Product	Current	NMEA2000 Load Equivalency Number
• CBCH	200 mAmp	4
• CH67XXX	200 mAmp	4
• i83XX	100 mAmp	2
• i5601E	400 mAmp	8
• i5601E	400 mAmp	8
• i2200 gauges*	1000 mAmp	20

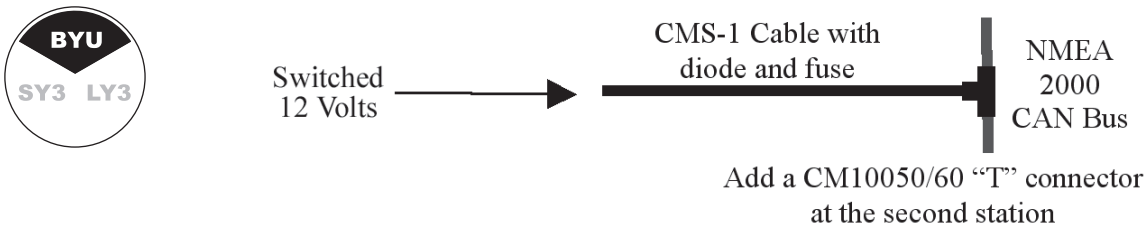
Note: this applies to a system that uses a combination of one 3" and four 2" gauges.

BY Unlimited CANBus Power

The CANBus is used to supply power to all the items that are connected on the bus. When a second station is added that meets either of the following criteria, additional power needs to be supplied to the CANBus at the second station.

More than 10 meters of CM100XX cable is required to reach the second station.
There are round gauges at both the first and the second station.

When additional CANBus power is required the use of cable CMS-1 is recommended as it has a fuse and the required diode. Connect at the second helm station per this diagram.



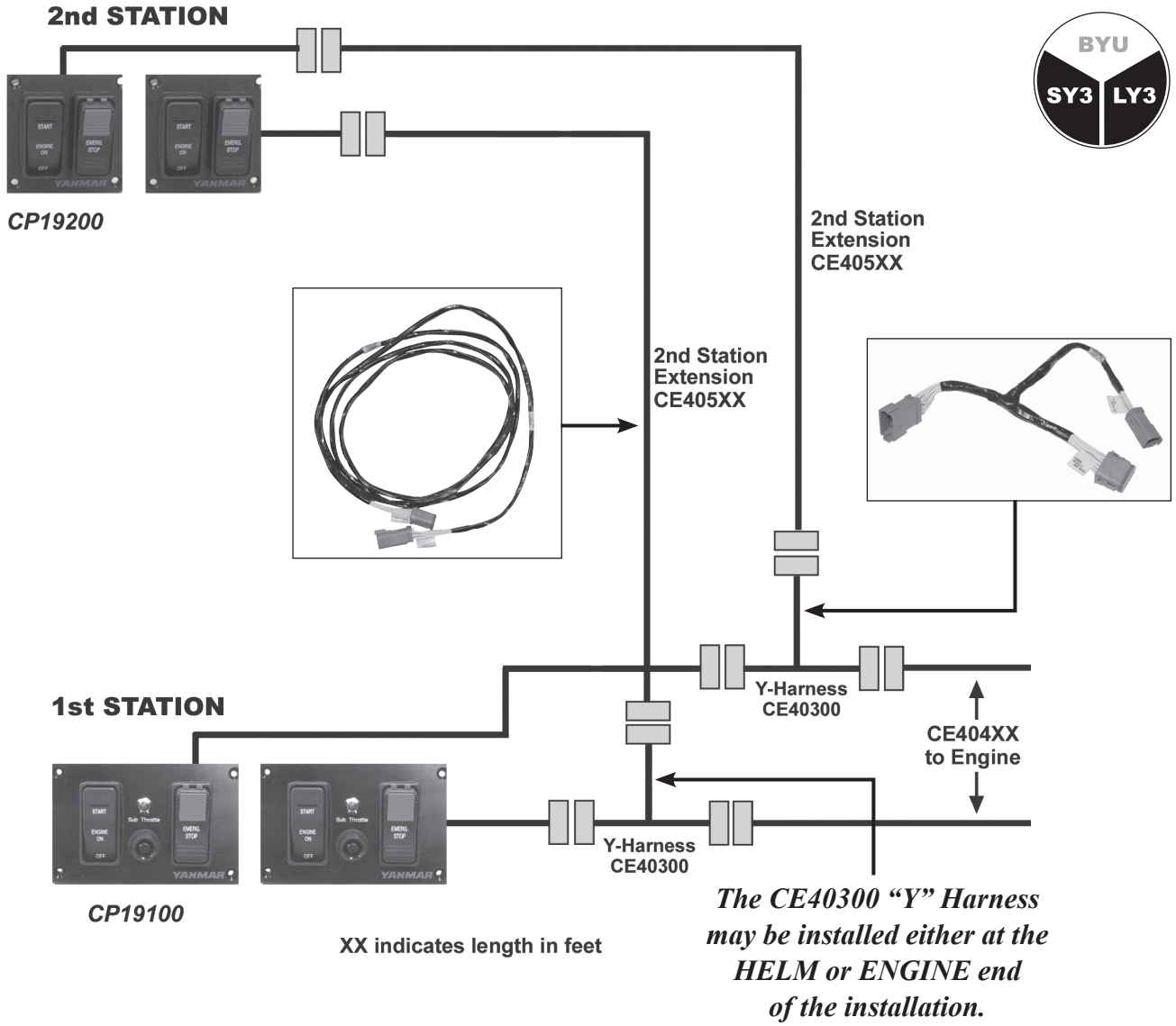
For complete details about NMEA 2000® CANBus power see the technical manual.

Step 5 - Installing the Switches

Connecting the Ignition Panel Switch

Connecting the CE405xx 2nd Station Extension and CE40300 "Y" Harness

1. Determine the proper location of the CE40300 "Y" harness. Based on the convenience, it may be connected to the CE404XX Engine cable at either the HELM or ENGINE end of the installation.
2. Connect the correct end of the CE405XX 2nd Station Extension to the "2nd Station Helm" connector on the red-taped cable harness CE40300. This is for the port engine.
3. Run the CE405xx from CE40300 to the CP19200 Ignition Panel (see below).
4. Repeat Steps 1 and 2 for the starboard engine using the green-taped CE405xx cable harness.



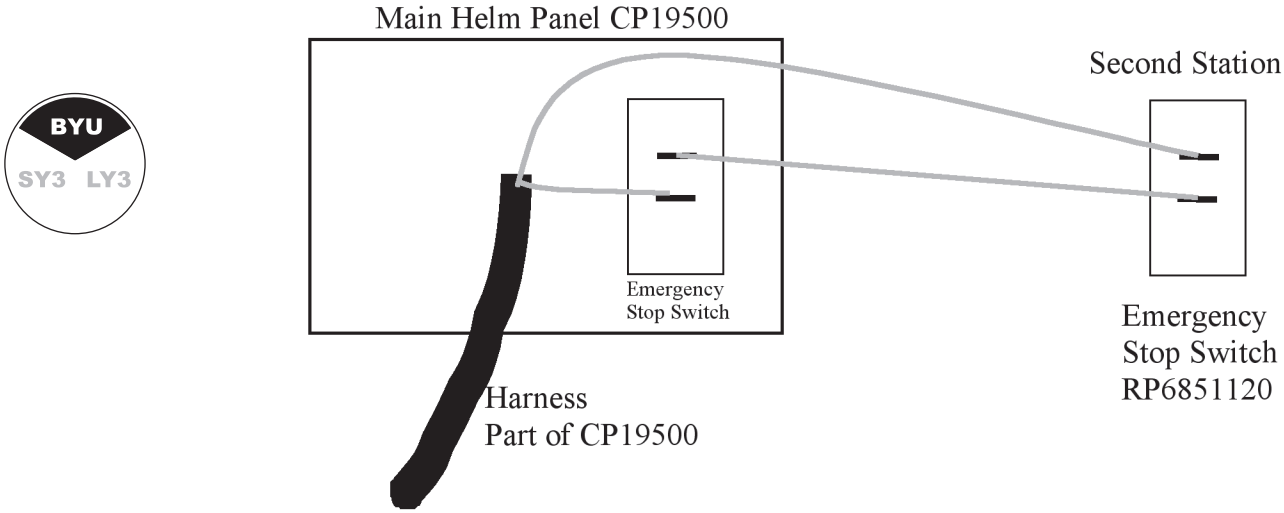
Connecting the CP19200 Ignition Panel

1. Connect the CP19200 Ignition Panel to the "2nd Station Helm" connector on the red-taped CE405xx cable harness. Repeat for the starboard engine using the green-taped CE405xx cable harness.

Step 5 - Installing the Switches

BY Unlimited Ignition Shutdown Switch

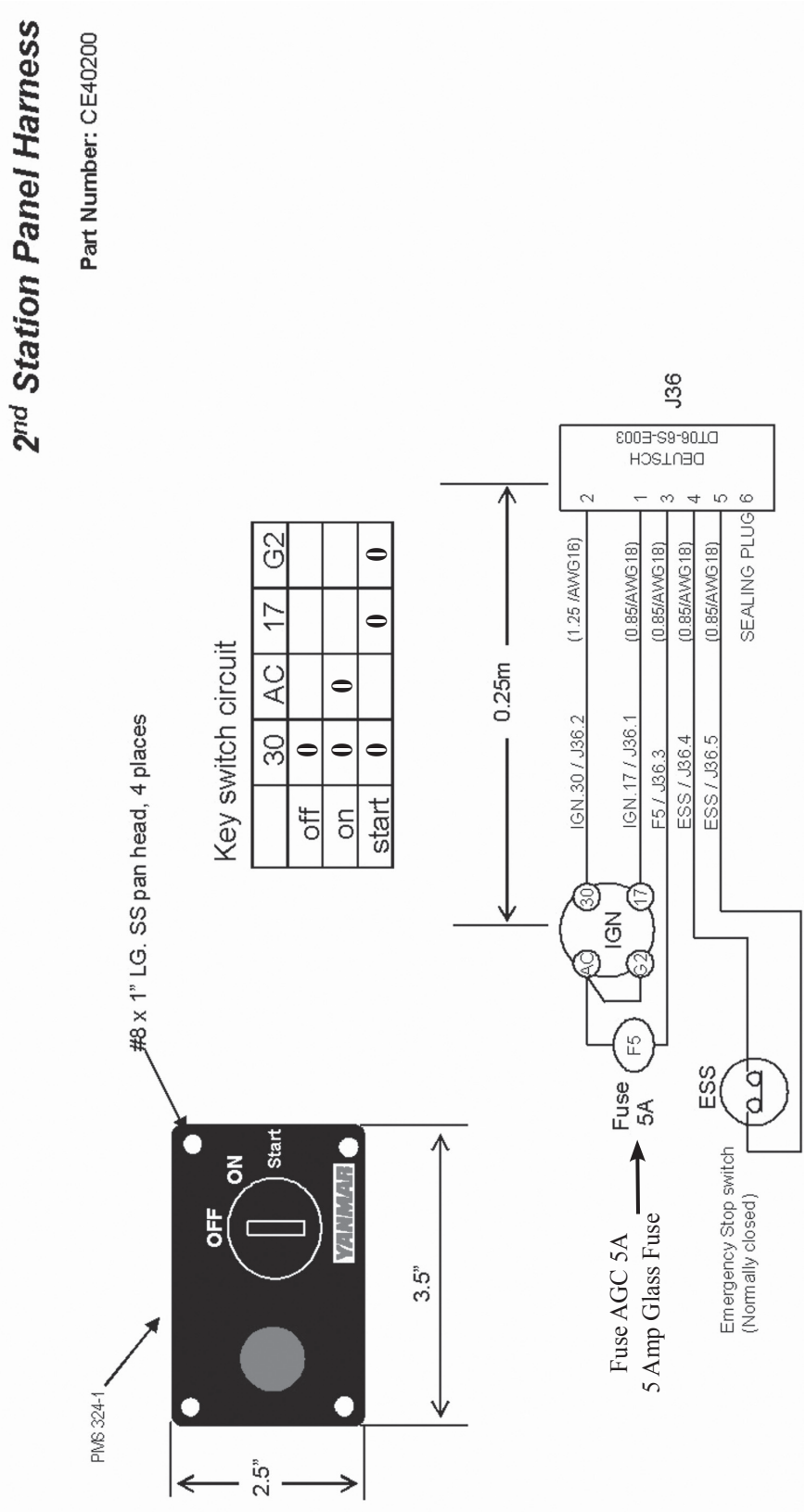
A kill switch is required at all stations except the main helm station. We recommend switch RP6851120 and it is connected per the following diagram.



Put the second station emergency stop switch in series with the main station emergency stop switch. Remove one of the violet wires from the main helm emergency stop switch and run it to one of the contacts of the second station emergency stop switch. Take the other contact of the second station emergency stop switch and connect it back to where the violet wire was removed from the emergency stop switch at the main helm panel.

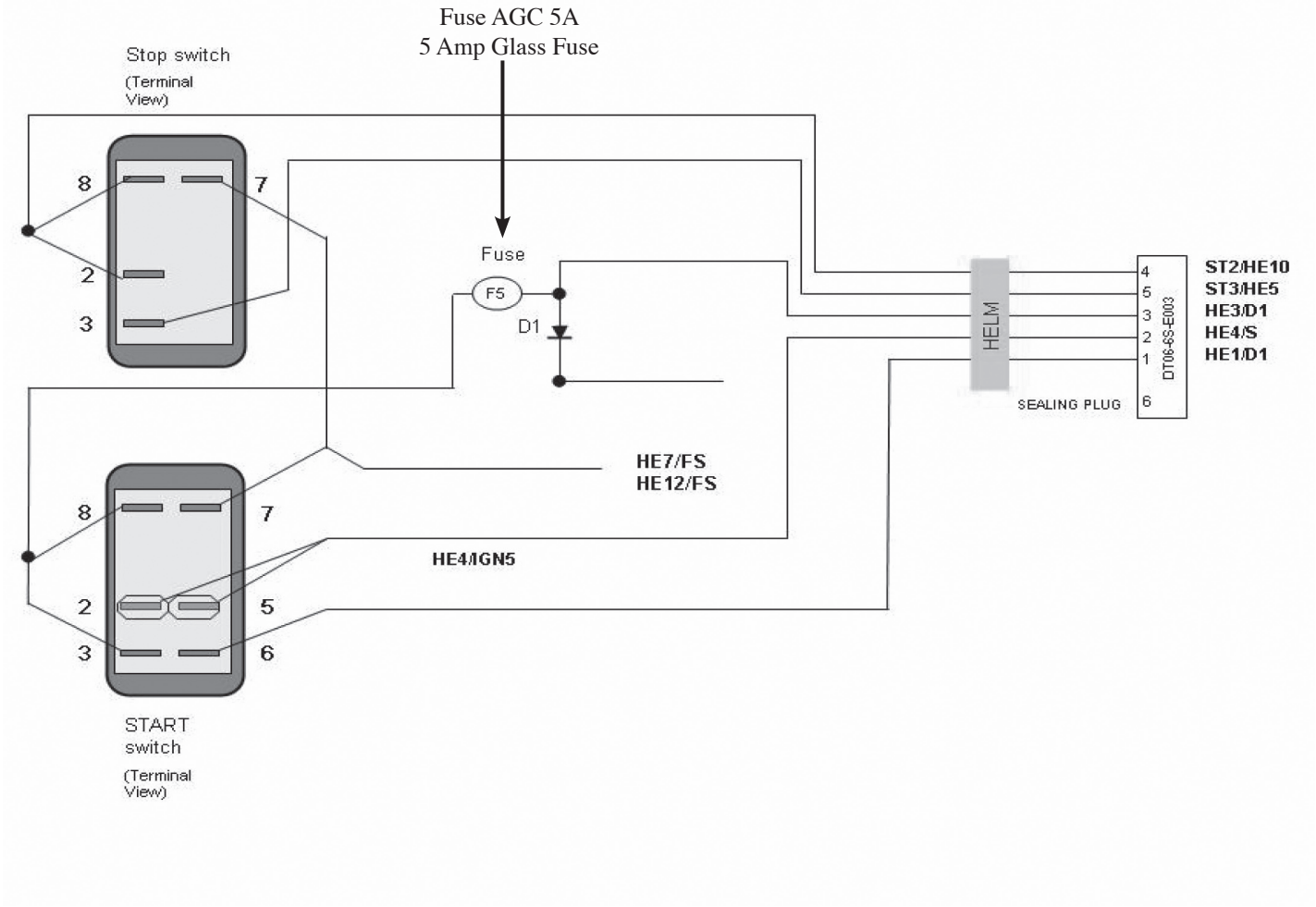
Appendix A

CE40200 Key Switch Panel Diagram: 2nd Station



Appendix A

CP19200 Ignition Switch Diagram



Appendix B

Station Select Protection

Station Select Protection prevents accidental switching between control stations on multi-stationed boats. If turned on, a change of control stations requires that control head buttons be pressed in a specific sequence - SELECT, SELECT, NEUTRAL, SELECT to change stations.

The i5601E menu options are:

- Station Select Protection Off (N) (Default Setting).
- Station Select Protection On (Y).

NOTE: If the status of Station Protection is in question, it may be checked through the i5601E Digital Display. Sequence: "Main Menu - Calibration," "Calibration," "User Settings." "Station Protect" is the last option under "User Settings." OR try to set the second station - if Station Protection is on (Y) Station Select will not engage.

Operation

To change stations this is the button sequence:

- Go to the station you wish to make active.
- Press the SELECT button.
- Press the SELECT button again.
- Press the NEUTRAL or 'N' button.
- Press the SELECT button.
- The station will go active (green light on solid) if the handles are matched with the originally active station. ○
- If the green light flashes ☼, match the handles with the originally active station and the green light will go solid. ○

Warning:
Until the green light is on solid, the original active station retains controls of the boat.

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