

# DISTRIBUTED POWER CONTROL AND MONITORING SYSTEM



## INSTALLATION & OPERATION GUIDE G1-SERIES

**FOUNDED IN  
1920**



Since its founding, Carling Technologies has continually forged a tradition of leadership in quality and product innovation.

There are few products that Carling Technologies hasn't turned "ON" and fewer industries that haven't turned to Carling for solutions. With ISO and TS registered manufacturing facilities and technical sales offices worldwide, Carling ranks among the world's largest manufacturers of circuit breakers, switches, power distribution units, digital switching systems and electronic controls.



**SWITCHES & CONTROLS**

- Rocker
- Toggle
- Pushbutton
- Rotary

**CIRCUIT PROTECTION**

- Hydraulic-Magnetic
- Thermal
- GFCI / ELCI

**CUSTOM SOLUTIONS**

- PDU's
- Keypads
- Control Modules

**MULTIPLEXED POWER SYSTEMS**

- HMI Devices & I/O Modules
- Programmable Displays
- Data Communication Interfaces
- Electrical Systems Monitoring

**STRATEGIC MARKETS SERVED:**



On/Off Highway



Marine



Telecom/Datacom



Military



Renewable Energy

**GLOBAL LOCATIONS:**

Carling Technologies  
World Headquarters  
Plainville, CT, USA  
ISO9001:2008  
ISO/TS16949:2009

Maretron  
Phoenix, AZ, USA

Carling Technologies  
Brownsville, TX, USA  
ISO14001:2004  
ISO9001:2008  
ISO/TS16949:2009

Carling Technologies  
Matehuala, Mexico  
ISO14001:2004  
ISO9001:2008  
ISO/TS16949:2009

Carling Technologies  
Jupiter, FL, USA

Carling Technologies  
European Headquarters  
Exeter, UK  
ISO9001:2008  
ISO/TS16949:2009

Carling Technologies  
Kowloon, Hong Kong  
ISO9001:2008  
ISO/TS16949:2009

Carling Technologies  
Zhongshan, China  
ISO14001:2004  
ISO9001:2008  
ISO/TS16949:2009

**OTHER SERVED INDUSTRIES:**



Medical



Industrial Control



Audio / Visual



Commercial Food



HVAC



Floor Care



Generators



Small Appliances



Security Systems



Test & Measurement

**WORLDWIDE NUMBERS:**

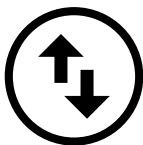


**2000+**  
EMPLOYEES



**150+**  
ENGINEERS

**COMPETITIVE ADVANTAGES<sup>+</sup>**



Vertical Integration



Reliable & On-Time Delivery



Excellent Customer Service



Innovative & Eco-Friendly Products



**70+**  
DISTRIBUTORS



**50+**  
REP FIRMS

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## OctoPlex® System Overview

The Carling Technologies® OctoPlex® system puts the user in complete control of all AC and DC loads within the vessel. Utilizing an NMEA 2000® CAN bus network, system reliability and safety are achieved through a redundant architecture that eliminates single point failures. The OctoPlex system offers significant weight reduction in wiring and reduced installation complexity, while also allowing for the monitoring and control of common NMEA 2000 marine devices, such as compass, GPS, tank level adapters and more. Field-replaceable AC and DC circuit breakers can be controlled remotely through the NMEA 2000 network, allowing panels to be placed in remote locations, thereby eliminating the need for traditional large electrical panels.

Through the use of a Multi-Function Display, Carling Technologies has created a fully configurable and/or customizable user interface. Acting as the main human interface of the system, the Multi-Function Display brings the system functions, status reports and alarms directly to the user.

The OctoPlex suite of products also includes the Network Power Supply (NPS), Battery Monitor, System Interface Unit Monitor (SIU), AC Monitor, AC Distribution Units (8, 16 positions) & DC Distribution Units (8 & 16 positions).

## Certifications



### CE Approved

IEC 60533 Electrical and Electronic Installations in Ships

IEC 60945 Maritime Navigation and Radio communications Equipment and Systems



### NMEA 2000® Approved

Certified, Category B



### Lloyd's Type Approved

Test Specification #1, ENV2 Certificate No. 10/00021

# User Information



**CAUTION!**

This symbol identifies information that is **important** to the practices and/or installation of the product.



**HIGH VOLTAGE!**

This symbol alerts individuals that **HIGH VOLTAGE** may be present in, on or around the product.



**WARNING!**

This symbol identifies information that is **critical** to the practices and/or installation of the product.



**NOTE**

This symbol indicates additional configurable information to the user.

The purpose of the OctoPlex® Installation Guide is to educate the system users and/or installers on the components that create the OctoPlex system. Its primary purpose is not only to educate, but also act as a troubleshooting guide that will aide in making sure that the system is operating to its full potential as designed or intended.

The OctoPlex Installation Guide serves as a reference guide only. For more information contact Carling Technologies® at [sales@carlingtech.com](mailto:sales@carlingtech.com) or visit [www.carlingtech.com](http://www.carlingtech.com).

**A periodic check of all mounting hardware and connections is recommended. The OctoPlex products are not ignition protected devices and shall not be installed in areas with combustible fumes.**

Disclaimer: With respect to the use or application of the OctoPlex System and/or its components, Carling Technologies Inc.'s liability to the installer or user shall be limited to direct economic damage or loss, provided in any and all circumstances, the guidelines herein are strictly followed. NOTWITHSTANDING THE FOREGOING IN NO EVENT SHALL CARLING TECHNOLOGIES, INC. BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THIS PRODUCT. Some states do not allow the exclusion on incidental or consequential damages, so the above limitation may not apply to customers in those states.

All illustrations contained in this Installation and Operation Guide are for reference purposes only. Nothing contained in this Guide shall replace or modify the requirements of any Industry Standard applicable to wire or other protection, including without limitation, those of the American Boat and Yacht Council (ABYC); the National Electric Code (NEC); and/or the National Fire Protection Association (NFPA). Failure to install the OctoPlex System or any components thereof in compliance with any such Industry Standard may limit the warranties made by Carling Technologies, Inc. See warranty information for further details.

[www.carlingtech.com/octoplex-warranty](http://www.carlingtech.com/octoplex-warranty)

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## Installation Guide Outline

- › **Multi-Function Display** A1415-CE
- › **8 Circuit AC Power Distribution Unit** A2000-08-[-]-CE
- › **16 Circuit AC Power Distribution Unit** A2000-16-[-]-CE
- › **8 Circuit DC Power Distribution Unit** A1650-CE
- › **16 Circuit DC Power Distribution Unit** A1655-CE
- › **Network Power Supply** A2205-[-]-CE
- › **Battery Monitor** A1680-CE
- › **AC Power Monitor** A1770-CE
- › **System Interface Unit Monitor (SIU)** A1470-CE



### 1 AC Power Distribution Unit 8 Position

Provides AC circuit protection, remote actuation and status monitoring for up to eight positions (single or double pole breakers).



### 9 Battery Monitor

Measures and reports 12 and/or 24 voltage, single current and up to four battery temperatures. Configurable alarm thresholds for voltage, current and temperature can be annunciated via the Multi-Function Display.



### 8 AC Power Distribution Unit 16 Position

Provides AC circuit protection, remote actuation and status monitoring for up to sixteen positions (single, double or three-pole breakers).



### 7 AC Power Monitor

Measures and reports status of up to four AC lines including voltage, current and frequency. It can be used in 110V, 220V, three phase and 240V European applications.





## 2 DC Power Distribution Unit 8 Position

Provides DC circuit protection and remote control for up to eight DC circuits. Each circuit has a fully configurable trip profile.



## 3 Multi-Function Display

A configurable Multi-Function Display that provides an extremely simple interface for system control and monitoring.

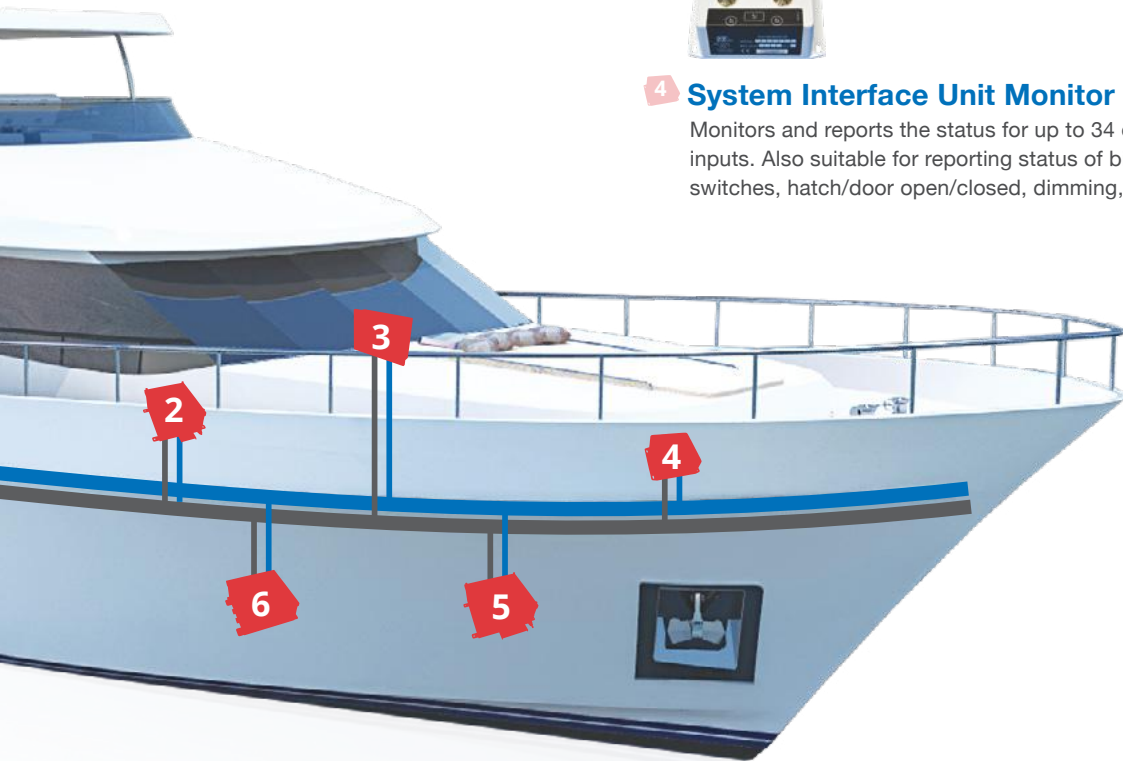


## Remote Capabilities



## 4 System Interface Unit Monitor (SIU)

Monitors and reports the status for up to 34 discrete DC inputs. Also suitable for reporting status of bilge float switches, hatch/door open/closed, dimming, etc.



## 6 Network Power Supply

Provides regulated power to the dual NMEA 2000 network.



## 5 DC Power Distribution Unit 16 Position

Provides DC circuit protection and remote control for up to sixteen DC circuits. Each circuit has a fully configurable trip profile.

# DISPLAY

## MULTI-FUNCTION DISPLAY

### A1415-[ ]-CE: 6.5 INCH

The OctoPlex® A1415-CE Multi-Function Display allows the users to control and monitor the OctoPlex system. The heart of the Touch Screen Display is a 500 Mhz single board computer running Windows CE 5.0. The single board computer is used to interface with the dual CAN bus network, to process user input and to display system status. The Multi-Function Display is well suited for use in high ambient light environments.

In addition to the dual CAN bus interface, supplementary connections are provided for an external audible alarm, external LCD backlight control and an external reset input. The configuration of the A1415-CE Touch Screen Display is accomplished using the OctoPlex Network Configuration (ONC) utility. The Touch Screen Display comes with a convenient mounting bracket as well as a cover to keep the LCD area protected when not in use.



#### Product Highlights:

- ◆ Fanless
- ◆ Included mounting bracket
- ◆ 6.5" TFT LCD with LED Backlight:
  - Widescreen 5:3 Aspect Ratio
  - 800 x 480 pixels



## Configuration

The configuration of the OctoPlex MFD is accomplished via the OctoPlex Network Configuration (ONC) utility. This Windows-based program will provide the tools for building and/or editing pages, buttons, monitors, etc. in order to achieve the visual architecture you desire. Please consult the ONC User's Guide for a full description of ONC's capabilities and operation.

## Memory Card Access

Touch Screen configuration information is maintained on a CompactFlash memory card located inside the unit. Physical access to the memory card is available through the access plate on the bottom of the unit. Access to the files located on the memory card may also be made through the USB port (if available) located on the lower right front of the unit. Microsoft ActiveSync (XP) or Mobile Computing (Vista) may be used to copy/delete files to/from a PC and the memory card. The following table lists the required and typical optional files utilized by the Touch Screen

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.



## Software Files

File	Description
NK.nbo	Touch Screen binary image file
Octflash.bin	Touch Screen variable definition file
Scp.ini	Touch Screen initialization file
Octplexdata.dat	Touch Screen Configuration file
MANIFEST.TXT	Bootloader Instructions (Deleted after initial boot)
PFSN.TXT	TS Serial number (Deleted after initial boot)
Version 1. xx.xx	TS binary image Version file (optional)
Fuel Xfer disclaimer.bmp	Vendor specific fuel transfer disclaimer (optional)

Touch Screen page layout is maintained on the octplexdata.dat file. Therefore any modifications other than button text changes will require the use of ONC and the replacement of the octplexdata.dat file. If the octplexdata.dat file is updated/replaced, the Touch Screen must be rebooted before the changes will take effect. Each touch screen must be updated independently. Octplexdata.dat file information IS NOT propagated to other Touch Screens as is the case with Button Text changes. Depending on the model of the Touch Screen rebooting may be accomplished by one of the following procedures.

1. Reset button located just above the USB port, if available.
2. Disconnect/reconnect both (at the same time) CAN interface cables located on the back of the Touch Screen.
3. Cycle Network Power on both CAN busses (A & B) via Network Power Supply Circuit Breakers.
4. Remove ALL inputs (1 AC and 2 DC) to Network Power Supply by powering down the ships AC and DC systems.

## Standard Screen Layouts:

### AC Power Distribution Unit

The AC Distribution Power Unit screen shows the AC Breaker Label and the current state of the AC Breakers. State of the breaker options include: ON, OFF, Trip, Group Control (ON or OFF), Load Shedding (ON or OFF) or Locked Status (Locked ON or Locked OFF). The user can also scroll forward or backwards to select a specific AC Distribution Power Unit (Example AC Panel #3). See [AC Power Distribution Unit section](#) for additional information.

### DC Power Distribution Unit

The DC Distribution Power Unit screen shows the DC Breaker Label and the current state of the DC Breakers. State of the breaker options include: ON, OFF, Trip, Local Override, ECB Error, or Locked Status (Locked ON or Locked OFF). See [DC Power Distribution Unit section](#) for additional information.

### Network Power Supply

The NPS screen shows Status of the input power, Source of power (AC, DC1 DC2), CAN A and CAN B status, CAN A and CAN B Voltage and Current readings, and the internal box temperature. See [Network Power Supply section](#) for additional information.



#### NOTE

The indicated temperature will turn red when the measured temperature inside the NPS goes above 50° C (122° F). In most cases a reported temperature of up to 55° C is normal. If the reported temperature goes above 55° C for a sustained period of time, service may be required.

### Battery Monitor

The Battery Monitor screen shows the status (voltage, current, temperature & state of charge) of the battery banks being monitored. Specific configuration and installation of the battery monitor is defined by the boat builder. See [Battery Monitor section](#) for additional information.

## AC Power Monitor

The AC Power Monitor page shows the status (voltage, current and frequency) of all AC line inputs. Specific configuration and installation of AC monitors are defined by the boat builder. See [AC Power Monitor section](#) for additional information.



### NOTE

The indicated temperature will turn red when the measured temperature inside the AC Monitor goes above 60° C (140° F) for a sustained period of time indicating service may be required.

## System Interface Unit Monitor (SIU)

The SIU screen shows the 34 Discrete I/O indicators that are being monitored by the SIU. These indicators cannot be acknowledged by the user; up to Qty. 10 also appear on the bottom of most pages. See [System Interface Unit Monitor section](#) for additional information.



### NOTE

These pages can vary between installations, as format is determined and/or customizable by the boat builder or owner. The screenshots shown are standard layout pages.

## Breaker Configuration:

AC and DC circuit breaker settings can be changed directly from the Touch Screen Display(s). This can be done by pressing the “Config” button on the display and then pressing the button for the circuit breaker to be configured.

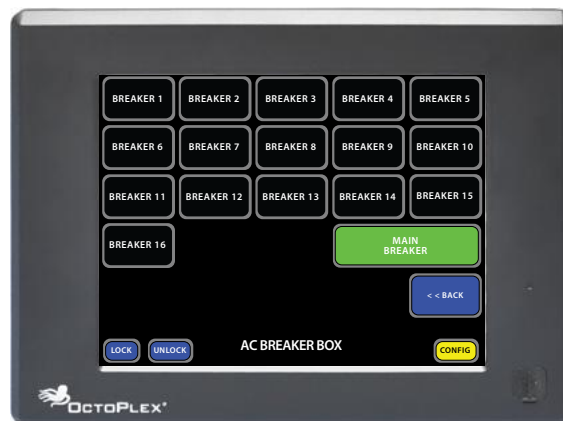
### AC Breaker Configuration

The configurable parameters are divided into Basic and Advanced levels. Each of these levels can be password protected with passwords created in the ONC application. The following section illustrates the parameters of each level, brief descriptions, and their valid ranges.



### NOTE

Configuration of an AC circuit breaker can be enabled or disabled by ONC or by adjusting the parameter in the Advanced Configuration section. If configuration is disabled the parameter will be displayed, but adjustment will not be allowed. To re-enable configuration, adjust the Configuration Allowed parameter in the Advanced Configuration section.



### AC Breaker Configuration: Basic Level Parameters

#### Default State

This parameter defines the state in which a circuit breaker should be set to upon power up. Available options OFF, ON, or LAST KNOWN STATE.

#### Default Lock State

This parameter specifies whether a circuit breaker should be locked or unlocked upon power up. Available options UNLOCKED, LOCKED.

## AC Breaker Configuration: Advanced Level Parameters

### User Configuration Allowed

This parameter specifies whether circuit breaker parameters can be configured from the flat panel configuration interface. Available options NO, YES. ONC has full configuration capability whether this parameter is enabled or disabled.

## ECB (DC Breaker) Configuration

The configurable parameters are divided into Basic and Advanced levels. Each of these levels can be password protected with passwords created in the ONC application. The following section illustrates the parameters of each level, brief descriptions, and their valid ranges.



**NOTE**

Configuration of an ECB can be enabled or disabled by ONC or by adjusting the parameter in the Advanced Configuration section. If configuration is disabled the parameter will be displayed, but adjustment will not be allowed. To re-enable configuration, adjust the Configuration Allowed parameter in the Advanced Configuration section.



## ECB Configuration: Basic Level Parameters

### Default State

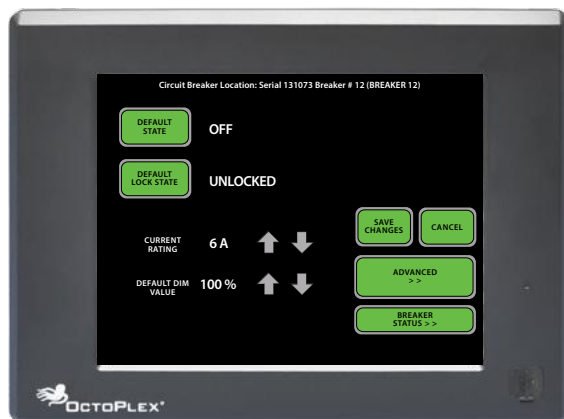
This parameter defines the state in which an ECB should be set to upon power up.

Available options OFF, ON, or LAST KNOWN STATE.

### Default Lock State

This parameter specifies whether an ECB should be locked or unlocked upon power up.

Available options UNLOCKED, LOCKED.



### Current Rating

This parameter defines the maximum current rating for an ECB. Exceeding this current will initiate a trip.

Available options ECBs 1-8: 0-30 Amps; ECBs 9-16: 0-15 Amps.



**NOTE**

Setting Current Rating to 0 Amps will cause an immediate trip if the ECB when turned ON

### Default Dim Value

This parameter specifies the Dim value that an ECB should use upon power up. Available options 25-100%.



**NOTE**

This Dim value will only be applied if Dimming is enabled for the ECB (see Advanced Configuration Parameters on the next page).

## ECB Configuration: Advanced Level Parameters

### Factory Max Current Rating

This parameter specifies the maximum value that the Current Rating (Basic Level parameter) can be set to. This value should be determined by the maximum nominal current for the wire gauge of the circuit and the load requirements.

Available options ECBs 1-8: 0-30 Amps; ECBs 9-16: 0-15 Amps.

### Trip Delay

This parameter specifies the delay, in milliseconds, between detection of an over current condition and the tripping of the ECB.

Available options 0-750 milliseconds in 50 millisecond intervals.

### In-Rush Delay

This parameter specifies the delay, in milliseconds, between an ECB turning ON and the activation of the over current detection logic. This allows for a brief period of current in-rush, preventing the circuit from inadvertently tripping when energized. Available options 0-1500 milliseconds in 100 millisecond intervals.

### Dimming Enabled

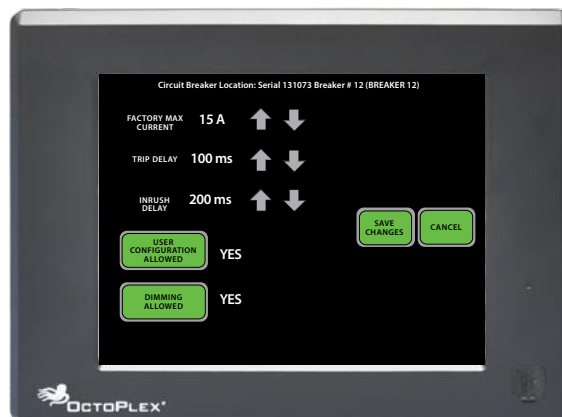
This parameter specifies whether dim values other than 100% can be applied to an ECB.

Available options NO, YES.

### User Configuration Allowed

This parameter specifies whether ECB parameters can be configured from the flat panel configuration interface.

Available options NO, YES.



#### NOTE

- ONC has full configuration capability whether the "User Configuration Allowed" parameter is enabled or disabled.
- All breaker settings (default state, trip settings, etc.) are stored within their respective breaker box. It is irrelevant which display is used to make any changes or updates to breaker settings.
- In most configurations, all spare breakers will be given a button on the display pages. If the spare is used at a later time, the text of the button can be changed, as well as the breaker settings so that the displays will reflect the use of the spares.
- It is possible for the configuration settings to be password protected. There are two levels to the configuration pages, Basic and Advanced. The passwords for these pages could be different or the same. If a password is required, the user will be prompted after pressing the "Config" and breaker buttons. The password protection is enabled and set by the boat builder and/or Carling Technologies, Inc.

## Installation

The Multi-Function Display was designed to be installed in an environmentally protected, non-explosive area of the vessel. Take precautions to mount the display in an area that will be away from direct exposure to the weather and combustible fumes. Multi-Function Displays should be installed such that the removable oval shaped panel on the bottom of the unit is accessible. Access to this panel is required for configuration purposes on models that do not have a bezel accessible USB connection.

## CAN Connections

Two male Micro-C connectors are provided on the back of the Multi-Function Display (MFD) for connection to the primary (J1) and secondary (J2) CAN bus via drop cables. One female Micro-C connector (J3) is provided for connection to the audible alarm and auto/remote backlight ON/OFF control. The alarm output provides 12 VDC, 50mA max.



#### NOTE

Use the shortest drop length possible when connecting the Multi-Function Display to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables. Do not connect standard drop cables to J3. Carling Technologies recommends the use of a Piezo Buzzer for the audible alarm.

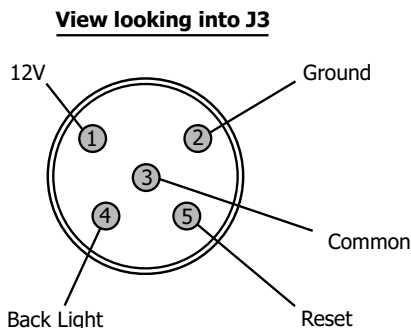
## Power Connector Pin Out

Pinout for J3	
1...	12V (normally open)
2...	GND (normally open)
3...	External Reset
4...	Back Light Switch
5...	Common

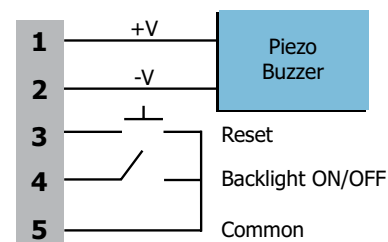


**NOTE**

RECOMMENDED: Mallory Sonalert  
www.mallory-sonalert.com  
Part #: SC628EJR



### Typical J3 Connections



## Operation

### Function

The display is used for control and monitoring of the OctoPlex system and its components. It provides an interface for controlling the state of AC and DC breakers and displaying their status, along with features for monitoring System Input Unit (SIU) signals, Battery Monitor data, and AC Power Monitor data and status. Additional controls are provided to gain access to configuration pages for: Switch/Breaker (Lockout, Status, Groups), ECD Diming (DC Only), Touchscreen Dimming, Display Power Save/Backlight Off, Alarm, Clean Screen.

### Standard Pages

Standard display pages are accessed from the HOME Page. The HOME Page is defined as the page that is initially displayed when the system is powered-up.

### Home Page

On the HOME page of the display is a banner, which indicates the status of the system. Typically found across the bottom of the page the following are messages that may appear in this area:

#### System Normal

No alerts or tripped breakers.

#### Breaker Tripped

Circuit breaker tripped - a path of red should lead to the page with the tripped breaker. The Touch Screen may be configured such that when the “Breaker Tripped” message is touched the display will take the user directly to the breaker that has tripped.

#### Battery Alert

The battery monitor is indicating an abnormal voltage or temperature.



**NOTE**

The configuration of the Home Page and Sub-pages can vary between installations as the format is determined by the boat builder and selected OctoPlex Options.

## Basic Touchscreen Navigation

The display interface is designed to be user intuitive and easy to navigate. Hot buttons are clearly marked to provide the user required control & status. Switches and breakers are defined with rounded sides and traditional breaker graphics with pre-defined color schemes.





## Switch / Breaker Button Indicators

OctoPlex Switch/Breaker Buttons are displayed as indicators with a pre-defined color scheme. Touching a Breaker button will change the state of the load.

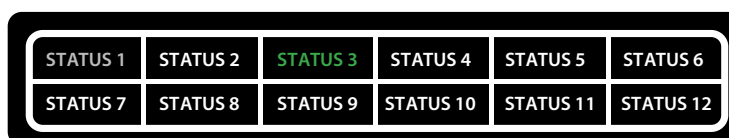
Color Code Guide	Breaker Status	Description
	ECB Not Active; Unavailable	This is an ECB that is currently not active. The distribution panel is most likely not receiving any DC power or the distribution panel's main breaker is in the OFF position (DC Only).
	ECB Active; OFF	This is an ECB that is active, but currently in the OFF position. Pressing the button will turn the ECB ON (DC Only).
	ECB Active; ON	This is an ECB which is active and currently in the ON position. Pressing the button will turn the ECB OFF (DC Only).
	ECB Active; TRIPPED	This is an ECB which is active and currently in the ON position. The blue text indicates that the breaker is turned ON but there is little or no current being drawn (DC Only).
	ECB Active; Locked OFF	This is an ECB that is active, but has been tripped by an over-current situation. Pressing the button will bring will reset the breaker, and then turn the breaker back ON with an additional press (DC Only).
	ECB Active; Locked ON	This is an ECB that is active, but has been tripped by an over-current situation. Pressing the button will bring will reset the breaker, and then turn the breaker back ON with an additional press (DC Only).
	ECB Active; Group OFF	This is an ECB that is in an Error State. Use the Config function for the button to gain access to the breaker status page which will indicate the actual error reason (DC Only).
	AC Breaker, Not Active	This is an AC Breaker which is currently not active. The distribution panel is most likely not receiving any AC power or the distribution panel's main breaker is in the OFF position.
	AC Breaker, Active, OFF	This is an AC Breaker which is active, but currently in the OFF position. Pressing the button will turn the breaker ON.
	AC Breaker, Active, ON	This is an AC Breaker which is active and currently in the ON position. Pressing the button will turn the AC Breaker OFF.
	AC Breaker, Active, Tripped	This is an AC Breaker which is active, but has been tripped by an over-current situation. Pressing the button will reset the AC Breaker, which can then be turned back ON with an additional press.
	Active; Locked OFF	This is an AC or DC breaker (ECB) that has been locked in the OFF position. The 'unlock' button can be used to unlock this breaker.
	Active; Locked ON	This is an AC or DC breaker (ECB) that has been locked in the ON position. The 'unlock' button can be used to unlock this breaker.

## Status Indicators










Status Indicators are indicators that appear on the bottom of the screen or on selected pages. These are NOT buttons that the user can acknowledge; they are status indications from the System Interface Unit Monitor (SIU) that are transmitted on the OctoPlex<sup>®</sup> system.

Color Code Guide	Breaker Status	Description
	Inactive	This is a system status indication that is currently inactive.
	Active; OFF	This is a system status indication that is currently active, but is not ON or in an alert condition.
	Active; ON	This is a system status indication that is currently active, and is ON.
	Active; ALERT	This is a system status indication that is currently active, and is in an alert condition.

The display on the right is commonly found at the bottom of each page in the Touchscreen. In this situation, STATUS 1 is inactive, STATUS 2 is active but 'off', STATUS 3 is active and 'on'. All others are active and 'off'.



## General Button Indicators

Color Code Guide	Breaker Status	Description
	Lock	This button is used to lock breakers in either the ON or OFF position. Press once to put the display in "LOCK" mode, then press any breakers to be locked. Press again to place the display back into a normal mode of operation. Locked breakers will have a yellow border.
	Unlock	This button is used to unlock breakers. Press once to put the display in "UNLOCK" mode, then press any breakers to be unlocked. Press again to place the display back into a normal mode of operation. Locked breakers will have a yellow border.
	Dim	This button is used to dim DC breakers from the Touchscreen (if enabled). Press the DIM button, then press the breaker to be dimmed. A '+' and '-' button will be displayed allowing the breaker to be dimmed up or down.
	Configuration	This button allows a user to view and/or change (if enabled) the settings of an AC or DC breaker. Pressing the button, and then pressing a breaker button will display the breakers settings. A password may be required.
	ECB Active; Locked OFF	Pressing this button will cause the Touchscreen to ignore "touches" for approximately 10 sec to allow the screen to be cleaned without inadvertently turning breakers OFF or ON.
	ECB Active; Locked ON	Pressing this button will select a page which provides diagnostic tools for basic troubleshooting of the network.
	ECB Active; Group OFF	Pressing this button will turn the backlight OFF in the Touchscreen. Touching any part of the screen will turn the backlight ON.
	AC Breaker, Not Active	Pressing this button will decrease the brightness of the screen for night time viewing
	AC Breaker, Active, OFF	Pressing this button will increase the brightness of the screen for day time viewing.

## Diagnostics

Preconfigured systems ship with a button typically labeled “System Diagnostics”, which will launch the System Diagnostics page when touched. This System Diagnostics page contains six buttons for individual system diagnostics

Accessible areas within the System Diagnostics menu include:

- Network Diagnostics
- Touch Screen Diagnostics
- Run Time Setup
- Software Info
- Password Management



## Network Diagnostics

This diagnostic feature will list all devices that the flat panel has established communications with. The following information is supplied for each such device:

- Device Serial Number
- Primary Bus Address
- Secondary Bus Address
- Type of Device
- Device Manufacturer

The Primary and Secondary Bus Addresses will contain one of the following values:

- **Uninitialized:** communication has not been established with the respective device on the particular bus.
- **Inactive:** communication was established with the respective device on the particular bus, but communications have since ceased.
- **Active:** communication has been established and is currently active



### NOTE

The active Bus is identified by an "\*" character. It is not unusual for different devices to be active on different Busses.

This diagnostic screen also provides two buttons for refreshing the flat panel network display:

**Refresh:** this button will clear the Network Display and repopulate it with all currently active devices.

**System Refresh:** this button will clear the Touch Screen Display application’s internal database of network devices and issue device identification commands, essentially performing a complete network census, then refreshing the display to reflect the current data.

Serial #	Primary	Secondary	Product	Manufacturer	Version
202145	0 Active (*)	0 Active	AC (16)	Carlting Technologies Inc.	Smv04
131073	10 Active (*)	10 Active	DC (16)	Carlting Technologies Inc.	1.3.19
196609	1 Active	1 Active (*)	DC (8)	Carlting Technologies Inc.	1.3.19
589825	43 Active (*)	43 Active	Power Supply	Carlting Technologies Inc.	1.1.8



### NOTE

Pressing SYSTEM REFRESH will request information from every device on the network causing very high network bandwidth utilization for a short period of time. You may need to press REFRESH, several times after a SYSTEM REFRESH request to get all entries to display due to network traffic and device response times.





## Touch Screen Diagnostics

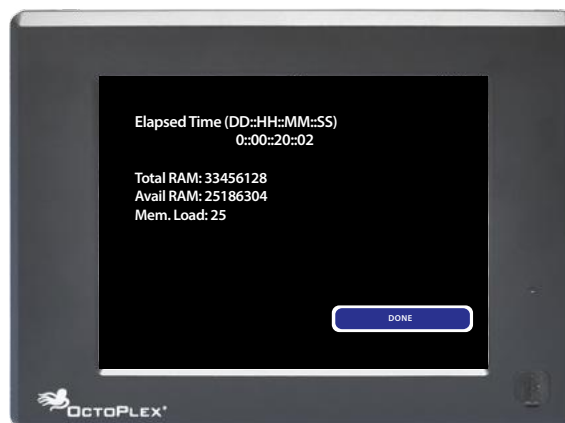
The Touch Screen Diagnostics page provides a way to measure the response accuracy of the touch screen. A small circle labeled with screen coordinates will be drawn wherever a touch is reported.

## Run-Time Stats

This diagnostics provides information about the current performance of the Touch Screen Display, including:

**Run-Time** – elapsed time since boot in Days::Hours::Minutes::Seconds format. This data will rollover after 49 days of run time.

**Memory Load** – percentage of available memory currently allocated by the Touch Screen Display operating system and application. This value will typically be within a range of 15% to 25% depending on the size of the network and its configuration.



### NOTE

Values higher than 30% may indicate a potential issue with memory utilization.



## System Alerts

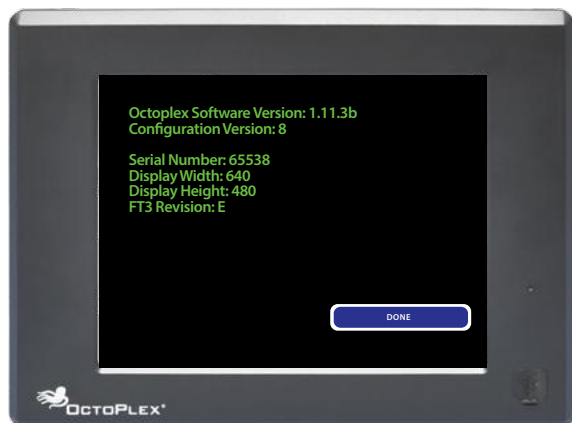
This diagnostic will list the 50 most recent system alert events, including breaker trips, battery tolerance alarms, etc. Each alert supplies a brief description of the alarm and a time-stamp.

Comm Timeouts are a diagnostic alert, and do not necessarily indicate an issue.



### NOTE

The time-stamp is generated based on the time elapsed from the last touch screen power-up.



## Software Information

This diagnostic screen will display the following information:

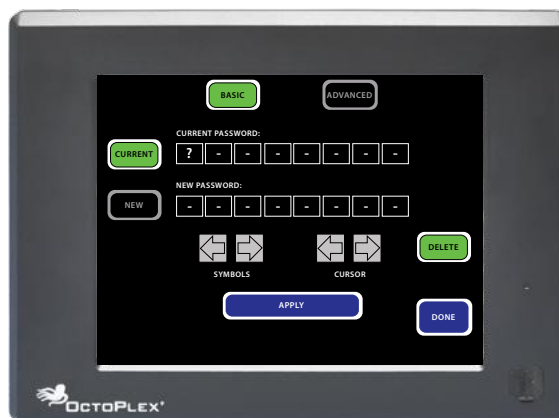
- Touch Screen Display application software version
- ONC file version number
- Screen coordinates (width & height) in pixels

## Password Management

This screen will allow you to edit the Basic and Advanced passwords on a Touch Screen Display. You will need to supply the current password (if any) in order to complete the changes.



If required, and a password has already been issued, please contact the boat manufacturer for assistance.



## Vessel Status / Monitoring

When a System Interface Unit Monitor (SIU) is included in the installation, indicators may be incorporated into the touch screen configuration to display status of the inputs being monitored. Generally, a red indicator will indicate an “off” or “inactive” state and green will indicate an “on” or “active” state.



This page can vary between installations, as format is determined and/or customizable by the boat builder or owner.

## Bilge Monitoring / Control

This page displays the current status of the bilge as well as control of the bilge pumps. Typical layouts include indications, which will show if a bilge pump is running, a float switch is receiving power or whether a high water alarm is being activated.

Builders may choose to control the bilge pumps outside of the OctoPlex system. In this case, the monitoring functions could still exist if connected to the System Interface Unit, but the control functions would not be included within this page.

## Tank Level Monitoring

When Tank Level Adapters/Monitors are included in the installation this page will show their status/levels.



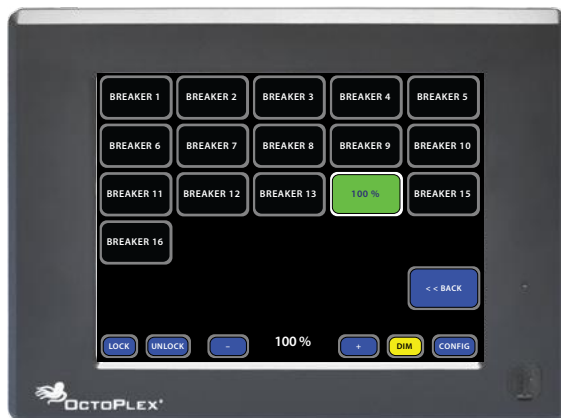
**NOTE**

The OctoPlex system has the capability to only display the data which is transmitted from the installers NMEA2000 certified tank level adapter. Please consult either the boat manufacturer or component manufacturer should any issues present themselves with regards to tank level monitoring.

## DC Circuit Breaker Dimming

The Touch Screen Display provides a mechanism for adjusting the Dim value of an ECB, if enabled. In order to gain access to Dimming commands, the page containing the target ECBs control button must contain a OctoPlex Option Bar with the “Dim” option enabled. If so, the option bar will contain a “Dim” button.

Pressing the “Dim” button will activate Dim Mode. Pressing an ECB will select it as the target for the Dim operation. If dimming is enabled for the target ECB, the button’s text will change to the ECB’s current Dim value. In addition, the current Dim value will appear within the OctoPlex Option Bar, flanked by “-“ and “+” buttons. Pressing these increment and decrement buttons will adjust the Dim value accordingly. The button’s text will change in response to any dimming modifications made. Once completed, press the Dim button again to exit Dim Mode. The button text will revert to its original text and all button presses will execute their normal functionality (circuit breaker toggling, etc.).



## ECB Error (DC Only)

An ECB has detected an error condition. Detailed status may be viewed by using the option bar “Config” button on the page that the ECB reporting the error is on. Selecting the Breaker Status option will provide you with the current ECB status.

The table below describes the status reported on the breaker status page.

Status	Description
Tripped	The ECB has tripped from an circuit overload
Open Load	The ECB is on but the circuit is not drawing current
Short Load	The ECB tripped based on a detected short circuit
Fuse Blown	The ECB slot fuse has opened
Fuse Failed	Fuse failed to open
Access Error	Internal ECB address error
Communication Error	ECB has lost communication with the DC processor
Abnormal High	ECB is OFF but voltage is present at the output
Abnormal Low	Reserved for future use.
Disable	Internal ECB A/D Error



**NOTE**

Once the cause for the ECB error has been ascertained, you may need to cycle the main breaker in the DC box that has the ECB error, or cycle the DC bus power to clear the condition. Refer to the DC Box ECB diagnostic section for troubleshooting ECB error messages and possible corrective actions.

## Display Dimming

The brightness of the display can be adjusted using these buttons typically found on the main page.

### V

The display can be configured to turn off after a specified duration of inactivity. It is also possible to configure a display to turn off the back light when a certain area is touched (a logo or button). Pressing any part of the display will turn the display back light back on.

## Alarm

There are two types of alarms available:

Global : Alarm condition is detected and sounded on all Touch Screens on the network.

Local : Alarm is detected and sounded only on the Touch Screen and page where a specific condition/activity has been activated. Example: Custom Fuel Transfer page.

The alarm can be set to respond to the following conditions:

- Tripped breaker
- Battery values out of tolerance
- Reversed AC polarity
- Configured SIU inputs

When a Global alarm has been activated, touching any button on any page/screen on any Touch Screen will turn it off throughout the system. A Local alarm can only be silenced by touching a reset button on the page/screen that alarm function is configured for.

## Clean

This button, if included, will provide a period of time where the Touch Screen is inactive so that it can be cleaned without turning breakers off or on.

## Display Menu/Button Configuration

If any button is pressed and held (for approximately 3 seconds) a page with the current button title/text will appear. This allows the user to change the text of any button. This is generally used when a spare location is utilized or load wiring is changed. Button text changes are automatically propagated to other Touch Screens on the network.



### NOTE

A button on a page cannot be moved to another page via the Touch Screen interface. Buttons can only be moved between pages with the ONC utility and requires an octoplexdata.dat file update.

## Maintenance

The Multi-Function Display requires no maintenance. If the touch screen requires cleaning, use a soft damp cloth and wipe the display gently while utilizing the Clean Button under the Commands & Settings menu. Do not rub aggressively as this may scratch the touch screen area. Any service or repair issues should be handled by a factory authorized technician.



**CAUTION!**

Do not spray any cleaning solvents directly onto the display area.

## General Specifications

### Electrical

Operating Voltage            9-16 Volts DC, 15 VDC nominal  
 Load Equivalence Number (LEN)    14

### Mechanical

Dimensions                    7.75" x 7.75" x 2.83"  
     (196.85 x 196.85 x 71.88 mm)  
 CAN Bus connectors        Two (2) Micro-C Male  
 J3 Alarm Output Connection    Micro-C Female  
 Mounting                      4 x #6 -32 Pan Head Screws

### Environmental

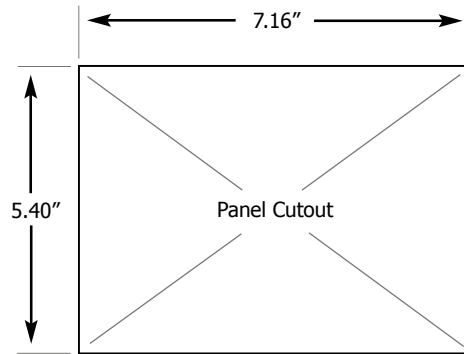
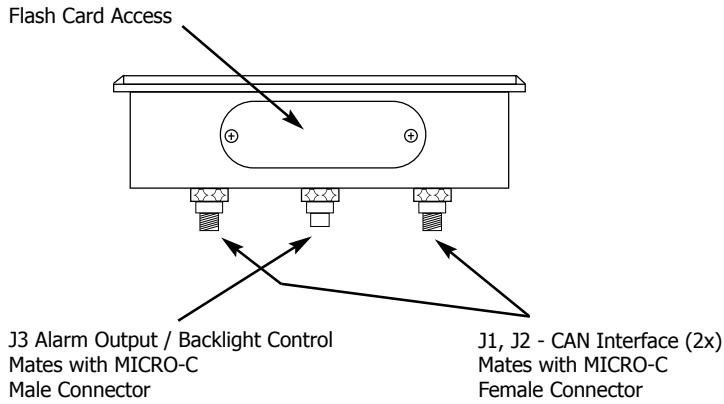
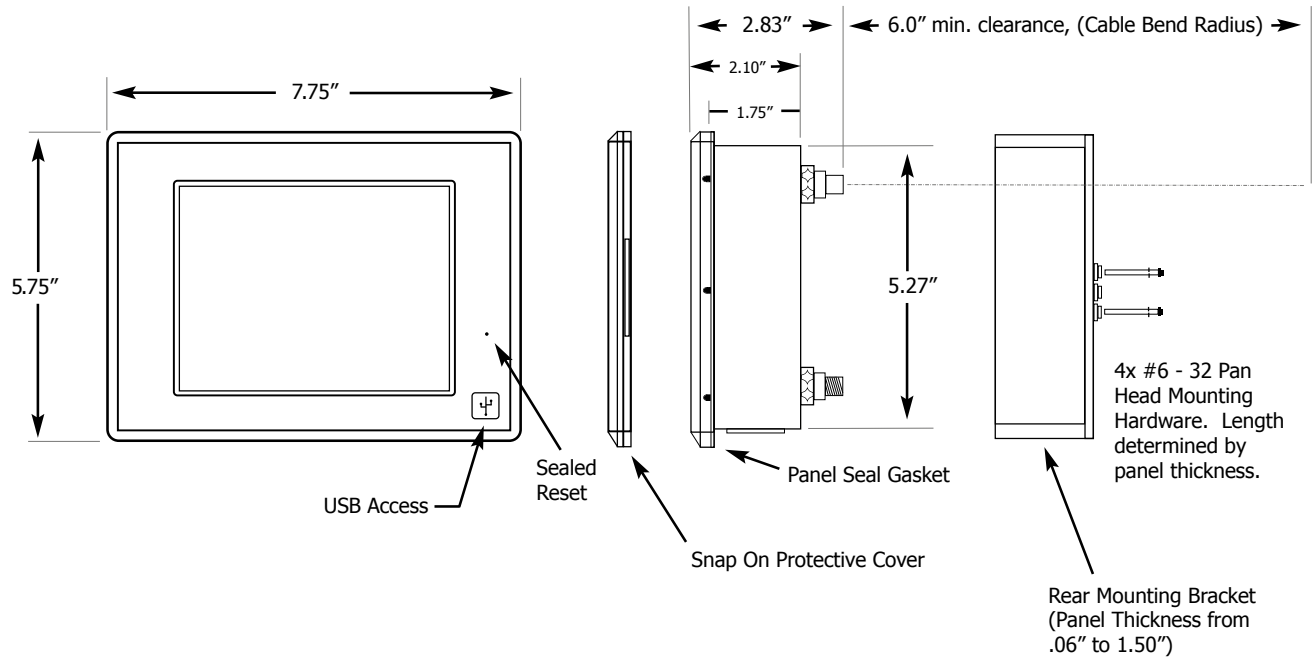
Operating Temperature    -10°C to +60°C  
 Weight                         3 lbs (1.6 kg)

### Certifications

NMEA 2000                    Category B  
 CE                                **IEC 60533** Electrical and Electronic Installations in Ships  
    **IEC 60945** Maritime Navigation and Radio communication Equipment and Systems  
 Lloyd's Register            Lloyd's Type Approved, Test Specification #1, ENV2  
    Certificate Number: 10/00021

## Dimensional Specifications: in. [mm]

### 6.5 Inch - Multi-Function Display A3415-[ ]-CE



# AC POWER DISTRIBUTION UNIT

## A2000: 8 POSITION / 16 POSITION

The AC Power Distribution units provide the boat builder with up to 8 or 16 remotely controlled hydraulic-magnetic circuit breakers in one package that can be mounted virtually anywhere in the vessel. AC Circuit breakers are available from 1 to 100 amps and are remotely controlled via external solenoids. Each breaker can also be manually actuated. The AC units utilize a 16 bit microprocessor that controls the on/off function of each circuit breaker and provides interfacing to a dual CAN bus network. The AC unit enclosures are made from white, high strength, injection molded plastic that will provide years of protection in any environment.



### Product Highlights (8 & 16 Position Unit):

- ◆ 100 Amps Maximum Capacity
- ◆ Remote Actuation of Breakers
- ◆ Dual CAN BUS Communication
- ◆ Three Phase Power Capability



## Configuration

Configuration of an OctoPlex® AC Unit and its associated functions can be performed running ONC on a computer with a CAN interface or a capably configure MFD. Configuration from within ONC provides access to all configurable aspects of an AC Box. Consult the ONC User's Guide for complete details on adjusting configurable parameters. The Flat Panel's interface to AC Box configuration is a limited subset of parameters to provide on-the-fly adjustments. AC box configuration settings are initially loaded and controlled with the ONC utility and contained in Box Configuration Files (BCF). The following parameters may be modified directly from the MFD:

### ONC Analyzer Configuration Parameters

Parameter	Setting	Description
Default State	ON, OFF, Last State	Circuit breaker state on network power up
Default Lock State	ON or OFF	Lock state on network power up
Default to Last State	ON or OFF	Last known state on network power up
Configuration Allowed	YES or NO	Allow user to modify Circuit Breaker via Multi-Function Display
Alarm on Trip	YES or NO	Audible alarm when breaker trips



**CAUTION!**

When "Default to Last State" is set to "ON" it overrides the "Default State" setting.

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.

## Part Numbers

Part Number <sup>1</sup>	Description	Number of Positions	
		8	16
A2000-X-1-CE	AC Power Distribution Unit - 120V (1 Buss Bar)	X	X
A2000-X-2-CE	AC Power Distribution Unit - 120/240V (2 Buss Bars)	X	X
A2000-X-3-CE	AC Power Distribution Unit - 120/208V (3 Buss Bars)	X	X
A2000-X-4-CE	AC Power Distribution Unit - 240V Single Pole	X	X
A2000-X-5-CE	AC Power Distribution Unit - 240V Double Pole	X	X

Notes:

1. "X" designates the number of breaker positions available for that voltage configuration; see Number of Positions Column

## Breaker Slot / Offset Load Circuit Relationship

The number of available circuit breakers in an AC Distribution Unit for loads will vary depending on the AC input power type 120V or 230V (Euro Single Phase), 240V or three Phase.

Single Pole breakers: 120V and 230V Euro loads require a single breaker slot.

Double Pole breakers: 240V loads requires two physical breaker slots.

Three Pole breakers: 120/208V requires three physical breaker slots.

The AC Distribution Unit may contain different combinations of breaker; therefore, the total number of supported load circuits in a given unit will vary depending on the load type mix;

AC Unit Type	120V / 230V Single Pole	240 Double Pole	3-Phase Three Pole <sup>1</sup>
8 Position	8	4	2
16 Position	16	8	5

Notes:

1. Three (3) Phase breakers start with position 5, allowing for a total of 15 physical slots

The Panel Breaker numbers, as identified on the panel cover, start with one at the top. The main breaker (when used) will occupy slots one through three depending on the main breaker configuration, single, double or triple pole.

AC Breaker Type	Main Breaker Slots Used	Load Breaker Slots
Single Pole	1	Begins with Slot 4
Double Pole	2	Begins with Slot 4
Three Pole	3	Begins with Slot 5



### NOTE

The highest AC Breaker Rating (amps) should be installed in lowest breaker position (i.e. Position 1, 2, etc.) to ensure proper load distribution. For example: Breaker Positions 1-2 has 100A breaker installed; breaker position 4 has 70A breaker installed; etc.



## Breaker Control by Discrete I/O Function

Analog input signals to the System Interface Unit Monitor (SIU) can trigger a Discrete I/O function in the AC processor, which can be used to control the behavior of a Circuit Breaker. Sixteen Discrete I/O's per AC Unit can be programmed. One Discrete I/O can control multiple breakers up to the unit limit. Discrete I/O functions are configured using ONC.

Discrete I/O	Description
Turn On	Turn AC Breaker ON
Turn Off	Turn AC Breaker OFF
Off & Lock	Turn AC Breaker OFF and Lock in OFF position

## AC Breaker Assignment Considerations

Installations that include remote control of breakers via N2kView must be aware of the relationship and offsets between the N2kView Configuration and the OctoPlex AC breaker position.

Panel Breaker #	N2kView Switch	ONC 1ØBox	ONC 3ØBox	Line 1ØBox	Line 3ØBox	Comments
1				A	A	Main 3Ø - 1 Ø or Double Pole
2				B	B	Main 3Ø - 1 Ø if Double Pole
3				NU	V	Main 3Ø - NU-1Ø SP and DP
4	1	1	NU	B	NU	Load 1 -1Ø
5	2	2	2	A	A	Load 2 -1Ø Load 1-3Ø
6	3	3	3	B	B	Load 3 -1Ø Load 2-3Ø
7	4	4	4	A	C	Load 4 -1Ø Load 3-3Ø
8	5	5	5	B	A	Load 5 -1Ø Load 4-3Ø
9	6	6	6	A	B	Load 6 -1Ø Load 5-3Ø
10	7	7	7	B	C	Load 7 -1Ø Load 6-3Ø
11	8	8	8	A	A	Load 8 -1Ø Load 7-3Ø
12	9	9	9	B	B	Load 9 -1Ø Load 8-3Ø
13	10	10	10	A	C	Load 10 -1Ø Load 9-3Ø
14	11	11	11	B	A	Load 11 -1Ø Load 10-3Ø
15	12	12	12	A	B	Load 12 -1Ø Load 11-3Ø
16	13	13	13	B	C	Load 13 -1Ø Load 12-3Ø
17	14	14	14	A	A	Load 14 -1Ø Load 13-3Ø
18	15	15	15	B	B	Load 15 -1Ø Load 14-3Ø
19	16	16	16	A	C	Load 16 -1Ø Load 15-3Ø
Main	17	17	17			Main Breaker

### AC Main Circuit Breaker Installed - Unit Configurations

There are three distinct AC Distribution Box configurations depending on the type of line input; each requires different hardware options depending on the input line configuration. This configuration must be determined prior to ordering the AC Boxes.

1. Single Phase (1Ø) 120 or Euro 230 VAC
2. Single/Split Phase (1Ø) 120/240 VAC
3. Three Phase (3Ø) 120/208 VAC

For 120 and Euro 230 VAC single phase configurations the Line Bus Bars (A & B) are jumpered together at the factory using a bus bar jumper.

For 120/240 VAC split phase the Line Bus Bars are not tied together at the factory, allowing two legs of 120 VAC to be brought into the box for single or double pole circuit breaker installation.

### AC No Main Circuit Breaker Installed - Unit Configurations



**Single Phase Dual Line 120/240VAC:** Line Bus Bars 1 and 2 are not tied together at the factory, allowing two legs of 120/240VAC to be brought into the unit for single or double pole circuit breaker installation. Breaker position 1 is line 1, breaker position 2 is line 2, and then they alternate. For 120/208 VAC three phase a third Line Bus Bar (C) is added and up to 15 single pole breaker positions are available for loads.

## Installation

The AC Power Distribution Unit is designed to be installed in an environmentally protected, non-explosive area of the vessel. Take precautions to mount the unit in an area that will be away from direct exposure to water, weather and combustible fumes.

## Mounting

These units should be mounted in a location that is accessible for manual/override control and serviceability. These units must be mounted in vertical position only. Installations in horizontal position (flat) with breakers facing up or down can compromise the accuracy of the AC circuit breaker function.

## AC Main Connections

Depending on configuration, connection points are provided for single 120VAC, Single 240VAC (Euro), dual 120/240VAC or three phase (120/208VAC) AC line inputs. Bus bars are provided for AC neutral (White or Blue) and grounding (Green or Green-Yellow) conductors. Main feed wires entering the panel are secured to prevent strain using a screw down “clamp” provided at the opening on the outside of the panel.



**HIGH VOLTAGE!**



**WARNING!**

Lethal voltages are present inside the AC unit. Verify that all AC power is shut off or disconnected before working inside the unit. **Required Torque** for each AC breaker terminal screw is 35 inch-lbs. This torque requirement must be applied to all circuit breaker terminal screws, no exceptions. Failure to properly torque each connection may result in damage to the AC Unit or vessel.



**CAUTION!**

The installer is responsible for verifying that the wire gauge used for the main power feed is appropriately sized for the loads being fed from the AC unit. The unit is designed to accept up to #1 gauge wire for the main power feed. All personnel performing installation or maintenance work on the AC Unit will need to have a calibrated torque screwdriver in order to verify proper installation of the circuit breakers and associated connections.

## AC Branch Circuit Connections

Branch circuit wires enter the AC Power Distribution Unit through the openings at the bottom of the panel. Line conductors are connected to their respective circuit breaker. Neutral and grounding conductors are connected to bus bars provided. Branch wires entering the panel are secured to prevent strain using a screw down “clamp” provided inside of the panel. Circuit breakers are in sequential order from top to bottom. “Tie bars” connecting circuit breaker handles for double and triple pole breakers must be used.

## CAN Connections

Two male Micro-C connectors are provided at the bottom left side of the 8 Position or at the top left side of the 13/19 Position unit for connection to the primary and secondary CAN bus via drop cables.



**NOTE**

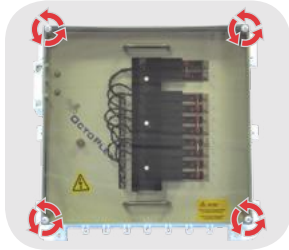
Use the shortest drop length possible when connecting the AC Unit to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables.

## Operation

Depending on the AC Unit power configuration, 120VAC, Single 240VAC (Euro), dual 120/240VAC or three phase (120/208VAC), there up to three LED's visible through the cover of the AC Power Distribution Unit. This power indication is derived from the Line input and does NOT reflect the state of the main breaker, if so equipped. As long as AC power is present, the AC Unit will be recognized by the Multi- Function Display (MFD). When AC power is not present, you will not be able to control the AC circuit breakers.

## Manual Operation

All AC Circuit Breakers can be controlled directly from the AC Power Distribution Unit (bypassing control from the Multi-Function Display(s)). Follow the instructions below to manually control an AC Circuit Breaker:



### Step #1:

Remove the cover to the AC Power Distribution Unit by unscrewing the four screws located at each corner of the unit.



### Step #2:

Operate the toggle lever for the desired circuit breaker.  
Replace the cover when done.



**CAUTION!**

When manually controlling AC circuit breakers, any time you turn one to the "OFF" position, the system will consider this a tripped breaker and activate the audible alarm if configured to do so. The system sees this as a trip because the system did not command the breaker "OFF".



**WARNING!**

**Lethal voltages are present inside the AC Unit. Verify that all AC power is shut off or disconnected before working inside the unit.**  
When a circuit breaker is turned off manually, it can still be controlled via the Multi-Function Display (MFD). This could present a hazard when performing maintenance on a circuit. It is good practice to "lock" a breaker in the "OFF" position from the Multi-Function Display (MFD) when performing any required maintenance on a circuit. Refer to page 11 for Locking Function.

## Maintenance

The AC Unit was designed to require minimal, if any, maintenance. The only field serviceable parts in the AC Unit are the Circuit Breakers and Solenoids.

## Breaker Replacement

The AC circuit breakers are not interchangeable like the breakers in the DC Units. If an AC breaker value/rating needs to be changed, the AC Power Distribution Unit will need to be disassembled. Below are the steps required for replacing an AC breaker:



**WARNING!**

Lethal voltages are present inside the AC Unit. Verify that all AC power is shut off or disconnected before working inside the unit.



**Step #1:**

Turn off the main power feeding the AC Power Distribution Unit at the source. Turn all breakers to OFF position. Do not remove the front panel if the LED's are lit (indicating that AC power is being provided to the panel).



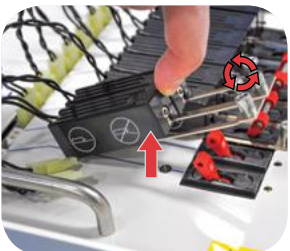
**Step #2:**

All Remote Actuators (solenoids) need to be disconnected and removed by loosening the screws to the right of the circuit breaker handle, and disconnecting the wires to the left.



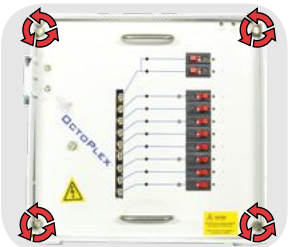
**Step #3:**

Turn the main AC breaker to the OFF position, if configured. With all Remote Actuators removed, the five large thumb screws can be loosened and four small Phillips head screws removed allowing the cover to be opened.



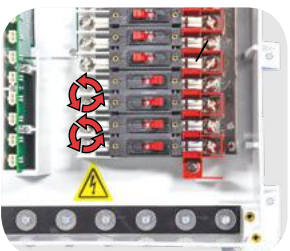
**Step #4:**

Remove each solenoid by turning the screw counter-clockwise and disconnecting the plastic connector at the end of the wire lead. Once each screw is loosened, lift the solenoid in the upright position from the screw side and pull from the box. Be careful when pulling the solenoid away as there are tabs at the back end of each, which hold it in place within the sub-panel cover.



**Step #5:**

Once the cover is removed, buses for the ground, neutral, and lines, as well as all AC breakers can be accessed.



**Step #6:**

Once any required changes are made, the AC Power Distribution Box can be reassembled by reconnecting the ground wire to the cover, replacing and securing the cover with the four screws, and re-installing all Remote Actuators (making sure that connectors line up properly with their corresponding circuit breaker) and tie bars as required



Required Torque for each AC breaker terminal screw is 35 inch-lbs. This torque requirement must be applied to all circuit breaker terminal screws, no exceptions. Failure to properly torque each connection may result in damage to the AC Unit or vessel.



All personnel performing installation or maintenance work on the AC Unit will need to have a calibrated torque screwdriver in order to verify proper installation of the circuit breakers and associated connections.

## General Specifications

### Electrical

Operating Voltage, Power Input (Single Phase)	120VAC; Euro 230VAC
(Double Phase)	120/240VAC
(Three Phase)	120/208VAC
Max Current, Power Input	100 Amps
CAN Bus Operating Voltage	9 VDC – 16 VDC, 15 VDC Nominal
Load Equivalence Number (LEN)	2

### Mechanical

8 Position Dimensions	14.46" X 15.76" X 5.04"
16 Position Dimensions	20.50" X 15.76" X 5.04"
CAN Bus Connectors	Two (2) Micro-C Male
8 Position Mounting	8 each
19 Position Mounting	10 each
Orientation	Vertical Position (not flat)

### Certifications

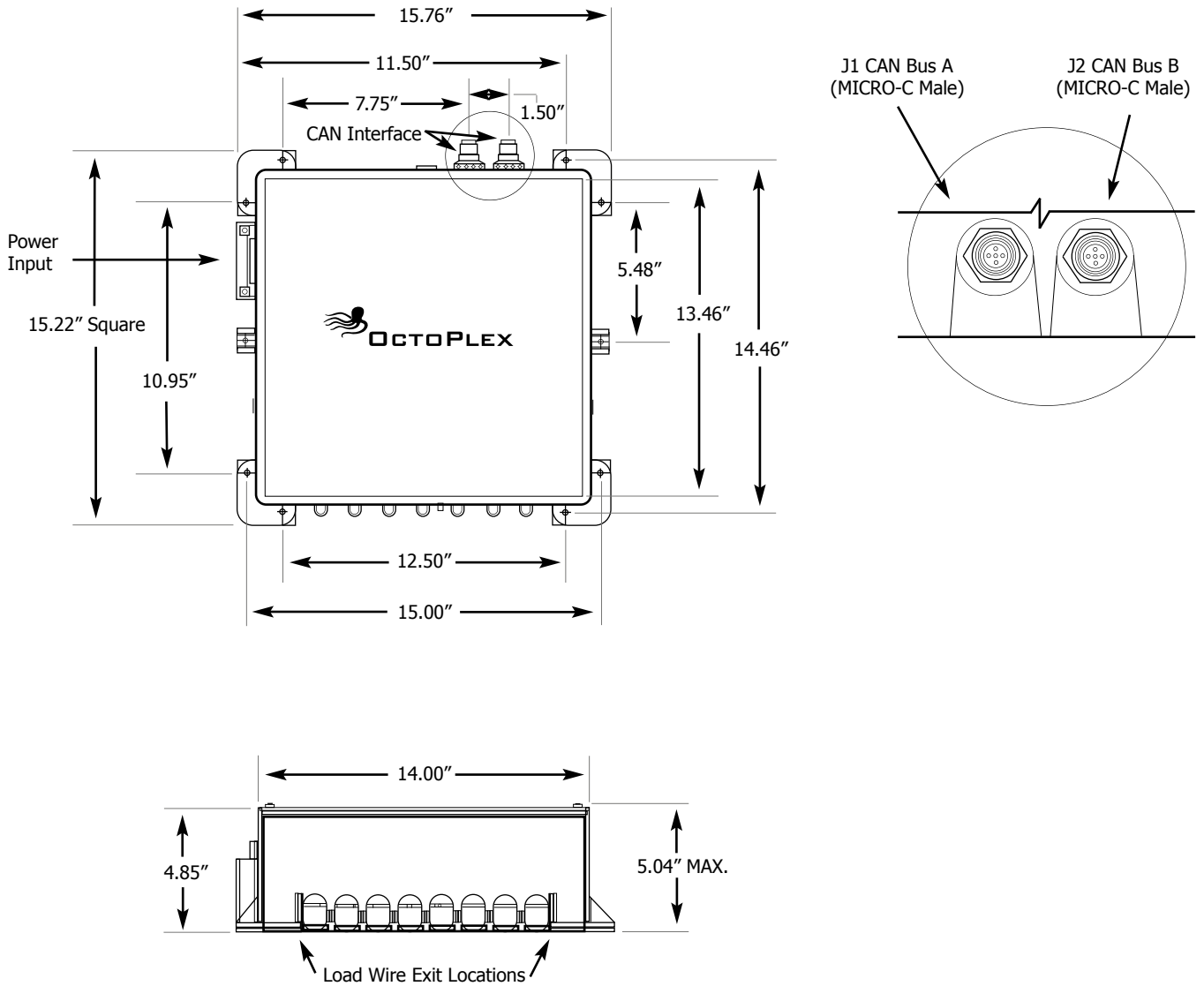
NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-20°C to +55°C
Storage Temperature	-20°C to +55°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight <i>with breakers</i>	A2000-08-[ ]-CE: 16.5 lbs. (7.5 kg) A2000-16-[ ]-CE: 20 lbs. (9.1 kg)

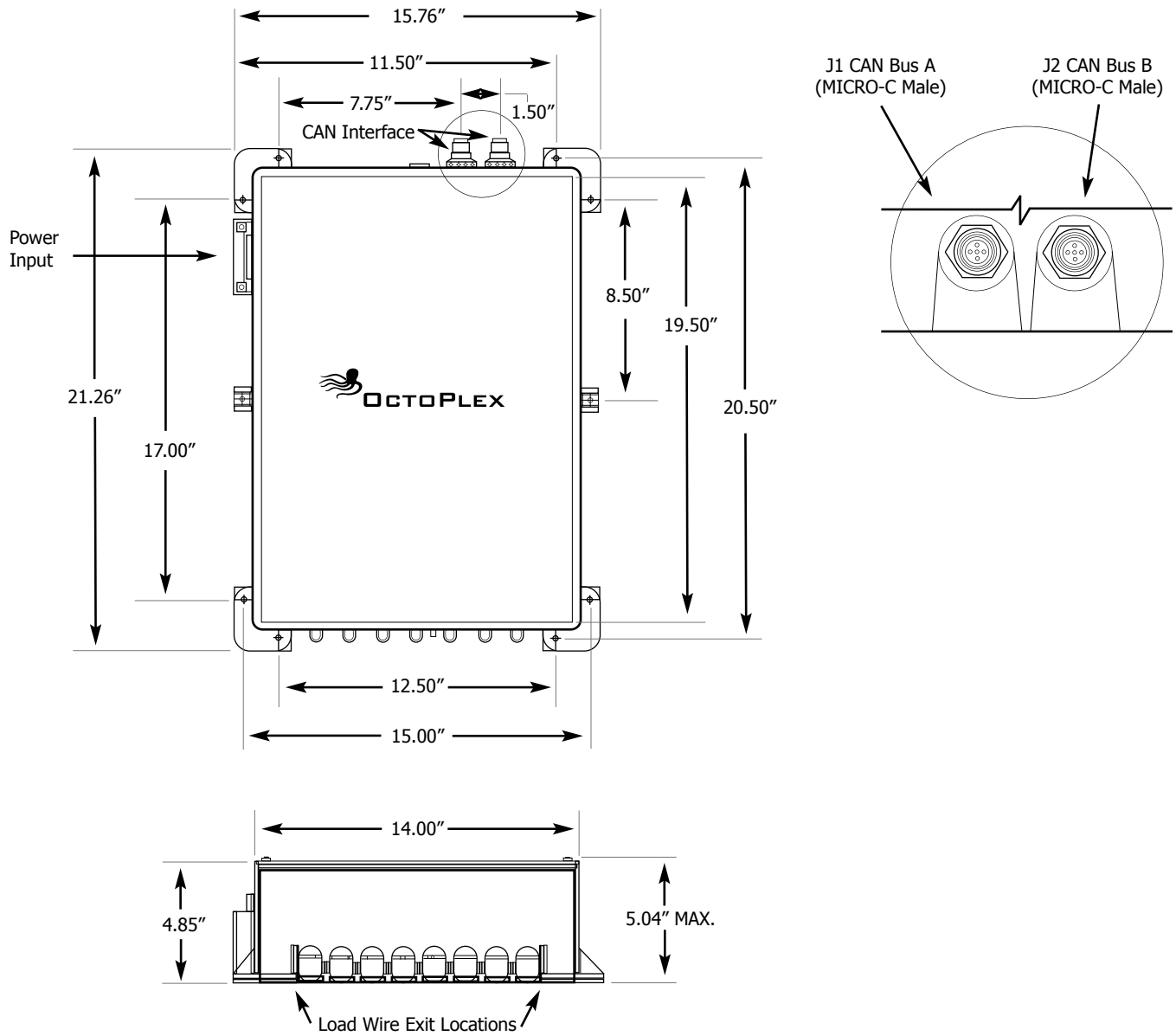
## Dimensional Specifications: in. [mm]

### 8 Circuit DC Power Distribution Unit A2000-08-[ ]-CE



## Dimensional Specifications: in. [mm]

### 13 Circuit DC Power Distribution Unit A2000-16-[ ]-CE





# DC POWER DISTRIBUTION UNIT

## A1650: 8 POSITION / A1655: 16 POSITION

The eight and sixteen DC Power Distribution units are multiprocessor based design rated for up to 100 Amps max. The Electronic Circuit Breakers (ECBs) can be configured to provide protection for DC loads up to 30 Amps.

These units contain two host processors for communicating with ECBs and also CAN networks.



### Product Highlights (8 Position Unit):

- ◆ Eight ECB's rated at up to 30 Amps
- ◆ Dual CAN BUS Communication

### Product Highlights (16 Position Unit):

- ◆ Eight ECB's rated at up to 30 Amps
- ◆ Eight ECB's rated at up to 15 Amps
- ◆ Dual CAN BUS Communication



## Configuration

Configuration of an OctoPlex DC Box and its associated ECBs can be performed either from ONC or from a capably configured flat panel. Configuration from within ONC provides access to all configurable aspects of a DC Box and its' ECBs. Consult the ONC User's Guide for complete details on adjusting configurable parameters. The Touch Screen's interface to DC Box configuration is a limited subset of parameters to provide on-the-fly adjustments of the most used configuration settings. DC box configuration settings are initially loaded with the ONC utility.

The following ECB parameters may be modified directly from the Touch Screen Display's ECB configuration page.

Parameter	Setting	Description
Default State	ON or OFF	ECB state on device up
Default Lock State	ON or OFF	Lock state on device power up
Current Setting	0 - 15/30A	ECB selected load rating
Default Dim %	0 - 100%	% of DIM on power up

The following ECB parameters may be modified directly from the Touch Screen Display's ECB advanced configuration page

Parameter	Setting	Description
Time Delay	0 - 750ms	Trip delay
Inrush Delay	0 - 1500ms	Inrush delay
Factory Current Rating	0 - 15/30A	Max allowed ECB setting
Dimming Allowed	YES or NO	Enable / Disable
Configuration Allowed	YES or NO	Configuration via touchscreen



The Factory Current Rating is the maximum allowed ECB trip setting as determined by the boat builder and/or installation (ie, load requirements / wire gauge)

### NOTE

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.

Default (Power Up) Behavior:

Parameter	Setting	Description
Default State	ON or OFF	ECB state on device up
Default Lock State	ON or OFF	Lock state on device power up
Current Setting	0 - 15/30A	ECB selected load rating
Default Dim %	0 - 100%	% of DIM on power up
Time Delay	0 - 750ms	Trip delay
Inrush Delay	0 - 1500ms	Inrush delay
Factory Current Rating	0 - 15/30A	Max allowed ECB setting
Dimming Allowed	YES or NO	Enable / Disable
Configuration Allowed	YES or NO	Configuration via Multi-Function Display



**CAUTION!**

The Factory Current Rating is the maximum allowed ECB trip setting as determined by the boat builder and/or installation (example: load requirements / wire gauge)

### Inrush & Trip Delays

Inrush Delays are commonly used for devices with high inrush loads during startup such as pumps. The configured setting (in milliseconds) is the time period that the load current is allowed to exceed the programmed current limit. Inrush Delay is typically used with loads that are powered ON/OFF via the ECB.

Trip Delay is associated with loads that are powered ON/OFF via a mechanical switch inline after the ECB (ECB is always ON and supplies power to the switch). The configured setting (in milliseconds) is the time period that the load current is allowed to exceed the programmed current limit.

### Automatic ECB Control by Flash Function

The Flash Function allows control of an ECB to be periodic. Common uses of this function include controlling a Fog Horn, automatically turning off a Head Fan or light after a set period of time, etc. Three parameters dictate the behavior of the circuit and are set via the ONC utility and maintained in the BCF file. A maximum of 15 flash table entries may be defined.

Flash On Time	Duration of time the circuit is ON
Flash Off Time	Duration of time the circuit is OFF
Number of Cycles	Number of times to repeat the cycle 0 - 255, 0 = forever

## Automatic ECB Control by Discrete I/O Function

When a System Interface Unit Monitor (SIU) is part of the installation, input signals to the SIU, it can be configured to control the behavior of the ECB's. 16 Discrete I/O's per DC Unit (both 8 and 16 positions) can be programmed. One Discrete I/O can control multiple ECB's up to the unit limit. The Discrete I/O state is maintained independent of any ECB state. Therefore, if an ECB is being controlled from multiple input signals (DIO's) an "out of state" situation is possible when input signals are switched. Example: two wall switches are controlling the same light (ECB) depending on the state of the signal a second touch of the switch may be required to obtain the desired action.

Discrete I/O	Description
Always Turn On	Turn ECB on
Always Turn Off	Turn ECB off
Toggle ON/OFF	Toggle ECB state
Brighten	Increase light intensity (voltage increases in 5% increments per button actuation)
DIM	Decrease light intensity (voltage decreases in 5% increments per button actuation)
Flash	Refers button actuation to specific flash table assigned to that button
Unlock	Unlocks ECB (state does not change)
One Button Smooth High-to-Low	Single press changes ECB state. Press and hold wall switch to turn ON; hold for High to Low voltage decrease (5% increments). Continuing to hold will reset to 100% intensity and repeat.
One Button Smooth Low-to-High	Single press changes ECB state. Press and hold wall switch to turn ON; hold for Low to High voltage increase (5% increments). Continuing to hold will reset to 5% intensity and repeat.
Smooth Scroll	Momentary touch turns ECB ON only; continuing to hold scrolls UP and DOWN (last known state is retained).
One Button Smooth Scroll	Momentary touch changes ECB state; continuing to hold scrolls UP and DOWN (last known state is retained).
Discrete Momentary	Turn ECB ON as long as signal is present (Momentary ON/OFF Button only)

A DC Electronic Circuit Breaker (ECB – 16) provides power to an incandescent lamp. The lamp is controlled via a momentary wall switch tied to an SIU input. The system is configured to allow this particular SIU input to send a message to the ECB for on/off and dim.

1. The wall switch is pressed for On/Off or pressed and held for On/Dim.
2. The SIU input receives a ground signal when the wall switch is depressed.
3. The SIU converts the analog ground signal to an NMEA 2000 PGN message which is broadcast over the network.
4. A DC Unit configured to listen for the SIU Output Pin message receives the PGN and triggers a configured internal Discrete I/O (DIO) function to control the ECB/Circuit.
5. Multi-Function Display receives the ECB status change and updates the breaker button accordingly.
6. Pulse Width Modulation (Dimming Function) can also be used to control fan speeds and multi speed devices.

## LED Configuration & Control

LED lighting control (On/Off/Dimming) is supported by both the OctoPlex Multi-Function Display and/or analog switches when properly wired and interfaced to a configured OctoPlex SIU.



**CAUTION!**

The ECB being used as a dimming module will provide an active high output at full battery voltage to the LED control module. Verify that the LED control module can accept this type of input prior to use. When an ECB is configured to provide a PWM output (dimming) the PWM frequency is 100HZ.

## Installation

The DC Power Distribution Unit is designed to be installed in an environmentally protected, non-explosive area of the vessel. Take precautions to mount the unit in an area that will be away from direct exposure to water, weather and combustible fumes.

### Mounting

These units should be mounted in a location that is accessible for manual/override control and serviceability.

### Power Input Connections

Input studs are provided for DC positive feed and negative return wires. A DC negative bus bar is provided for negative branch circuit wires. The negative bus bar is connected to the DC negative return stud.



When tightening power lug use wrench to secure backing nut and torque main nut to 105 in/lbs.



**WARNING!**

Turn off DC Power prior to working with main DC power input stud. Verify that main DC power to the Unit is off.



**CAUTION!**

All power input connections should be tightened securely to ensure a good connection. All power feeds should be protected by an appropriately sized fuse or circuit breaker located at the power source.

### Power Output Connections

The mating connectors required to interface the loads to the DC Unit are: Deutsch HDP26-18-8PN. Two connectors are required for 16 position panels. One connector is required for 8 position Unit. Connectors can accommodate 10 to 16 AWG wire depending on the terminal selected.

Wire Gauge	Contact Type	Deutsch Part Number
14 to 18	Stamped/Formed	1060-16-0122
12 to 14	Solid	0460-204-12141
12 to 14	Stamped/Formed	1060-12-0166
10	Stamped/Formed	1060-12-0222

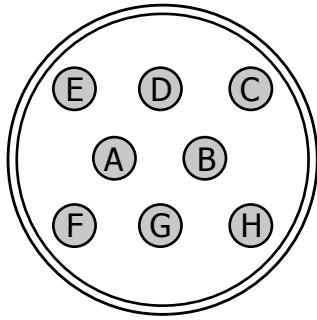


**CAUTION!**

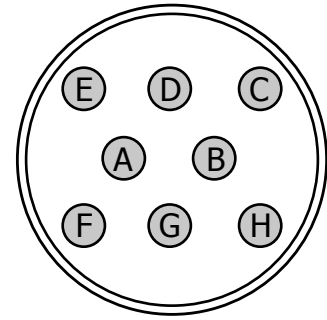
The recommended crimp tool for the solid contact is HDT-48-00. Refer to [www.laddinc.com/product/?sku=HDT-48-00](http://www.laddinc.com/product/?sku=HDT-48-00) for proper use and instructions on using this tool. The recommended crimp tool for the stamped contacts is, Deutsch DTT-12-00. Refer to [www.laddinc.com/product/?sku=DTT-12-00](http://www.laddinc.com/product/?sku=DTT-12-00) for proper use and instruction on using this tool.

Depending on the contact type selected, any gauge wire from 10 to 16 can be used to connect the loads to the DC Unit. Verify that the wire gauge, as well as, the ECB setting selected is appropriate for the load including a safety factor.

## Power Connector Pin Out



Deutsch HDP26-18-8PN			
8-Position Panel		16-Position Panel	
J1-G	Breaker 1	J2-F	Breaker 9
J1-F	Breaker 2	J2-A	Breaker 10
J1-A	Breaker 3	J2-E	Breaker 11
J1-E	Breaker 4	J2-D	Breaker 12
J1-D	Breaker 5	J2-C	Breaker 13
J1-C	Breaker 6	J2-B	Breaker 14
J1-B	Breaker 7	J2-H	Breaker 15
J1-H	Breaker 8	J2-G	Breaker 16



\* Please note the difference between J1 & J2 connections



### WARNING!

Back feeding power into the DC Unit through the power output connectors can occur if external power is applied to an output load pin. This condition will be flagged as an ECB Abnormal High error and must be corrected. In this situation power will be live in the Unit even if the main breaker inside the unit is turned OFF. Once the cause for the back feed is resolved, the DC Unit will need to be reset to allow the affected ECB to come back on line.

## CAN Connections

Two male Micro-C connectors are provided on the front of the DC Power Distribution Unit for connection to the primary and secondary CAN bus via drop cables.



### NOTE

Use the shortest drop length possible when connecting the DC Unit to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables.

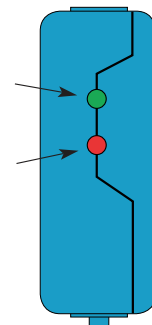
## Operation

There are three LED's visible through the cover of the DC Power Distribution Unit. The left and right LED's indicate that DC power is available on the primary and secondary CAN network. The middle LED indicates that the unit is receiving main external DC power. If the DC Power Distribution unit is not receiving power, the Touch Screen Display(s) will not be able to control the ECB's.

## ECB Operation

Each ECB inside of the DC Power Distribution unit has two LED's, one red and one green. The status of each ECB can be determined by which LED is illuminated or blinking as indicated below:

LED Indications	
Steady Green	ECB is On with a load
Blinking Green	ECB is On with no load
Steady Red	ECB is tripped
Blinking Red	ECB detected error
Steady Red, Steady Green	ECB error Refer to ECB Status Below
No Lights	ECB is Off



Any other indication represents a faulty condition, requiring the ECB to be replaced.

## ECB Status

ECB Status can be viewed on the Multi-Function Display via Breaker Status Hot Button. The following table provides a list of status messages reported by each ECB.

Status	Description
Tripped	The ECB has tripped from an circuit overload
Open Load	The ECB is on but the circuit is not drawing current
Short Load	The ECB tripped based on a detected short circuit
Fuse Blown	The ECB slot fuse has opened
Fuse Failed	Fuse failed to open
Access Error	Internal ECB address error
Communication Error	ECB has lost communication with the DC processor
Abnormal High	ECB is OFF but voltage is present at the output
Abnormal Low	Reserved for future use.
Disable	Internal ECB A/D Error
ECB Model	Current ECB hardware configuration
ECB Version	Current ECB software version



**CAUTION!**

Detected errors require that the power to the DC Unit be cycled in order to clear the error. This can be done via the main breaker inside the DC Unit or by cycling the DC power feeding the DC Unit. A shorted load indication may result from an abnormal low voltage being fed to the DC Unit power input. Each ECB is protected by a fuse, either 15 or 30 amps, depending on the position of the ECB. 1-8 are 30A and 9-16 are 15A. See Fuse Replacement section for details. Abnormal High (back feed) occurs when the ECB is in the OFF state but detects voltage on its output. Common causes are a failed external blocking diode (bilge pump etc) or wiring issue.

## Manual Operation / Overrides

All ECB's can be controlled directly from the DC Power Distribution Unit (overriding/bypassing network control from the Multi-Function Display(s)). If it's installed upright (all connectors on the bottom), the main breaker is in the lower left corner of the Unit. Follow the instructions below for using the DC Power Distribution Unit in override mode:



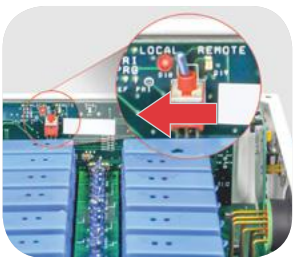
**NOTE**

Switch / Breaker buttons will appear as Active, with the words "Local Override".



### Step #1:

Remove cover to DC Power Distribution Unit.



### Step #2:

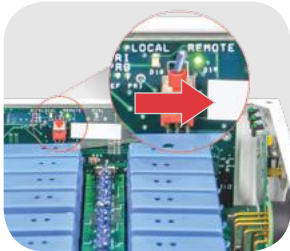
Place the toggle switch located on the board along the left side of the panel to the up position. A Red LED will light up indicating that the panel is in local or "override" mode.

## Manual Operation / Overrides (continued)



**Step #3:**

Individual toggles (either 8 or 16) are located in between the two rows of ECB's. They are in sequential order with 1 being on the left and 8 or 16 being on the right. Toggles should be in the up position to turn an ECB on and down to turn an ECB off.



**Step #4:**

To return the DC Power Distribution Unit to its normal mode so that ECB's can be controlled via the Multi-Function Display(s), place the toggle located on the board along the right side of the panel in the down position. The red LED will go out and a green LED will light indicating the DC Unit is now in remote mode and can be controlled by the Multi-Function Display.

## Maintenance

The DC Unit was designed to require minimal maintenance. The only field serviceable parts in the DC Unit are the ECBs and the fuses. It is recommended that all connections are checked on a regular basis.

## ECB Replacement

With the cover removed, the inside of the DC Power Distribution Unit can be accessed. If it's installed upright (all connectors on the bottom), the main breaker is in the lower left corner of the unit. This traditional breaker (100A) will disconnect all power to the unit. To remove or replace an ECB follow the below instructions:



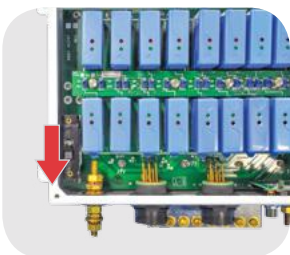
**WARNING!**

The power input stud will still have DC power.



**Step #1:**

Remove cover to DC Power Distribution Unit.



**Step #2:**

Turn off the Main Breaker (lower left corner of the unit) to the DC Power Distribution Unit.



**WARNING!**

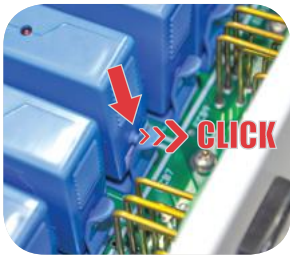
Verify that the middle LED (power present) is OFF before proceeding or damage to the unit may occur.

## ECB Replacement (continued)



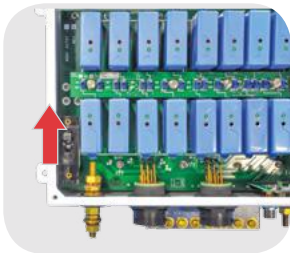
### Step #3:

Pull the tab away from the base of the ECB while pulling the ECB away from the board it is mounted to. The tabs securing the ECB's are at the base of each ECB towards the outside of the unit. (On the top row of ECB's the tab is on top, on the bottom row of ECB's the tab is on the bottom.)



### Step #4:

Install an ECB into the DC Power Distribution Unit by simply pushing the ECB into the board by lining up the pins with the connector on the ECB. A soft "click" will be heard when the ECB is properly "locked" into position.



### Step #5:

Turn the main breaker to the unit back to the on position.  
Re-install cover.

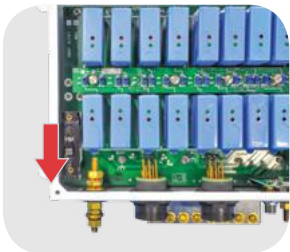
## Fuse Replacement

With the cover removed, the inside of the DC Power Distribution Unit can be accessed. If it's installed upright (all connectors on the bottom), the main breaker is in the lower left corner of the unit. This traditional breaker (100A) will disconnect all power to the unit. Follow instructions below for Backup Fuse Replacement.



**WARNING!**

The power input stud will still have DC power.



### Step #1:

Turn off the Main Breaker (lower left corner of the unit) to the DC Power Distribution Unit.

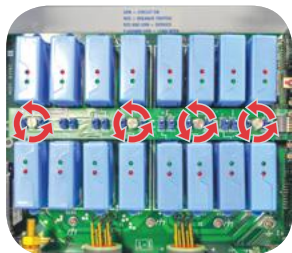


**WARNING!**

Verify that the middle LED (power present) is OFF before proceeding or damage to the unit may occur.



## Fuse Replacement (continued)



### Step #2:

Loosen the thumbscrews on the small board between the two rows of ECB's which contain the manual override toggle switches. (It may be easier to access the screws if ECB's are removed from the unit. Follow "ECB Replacement" steps on page 25 for ECB Removal.)



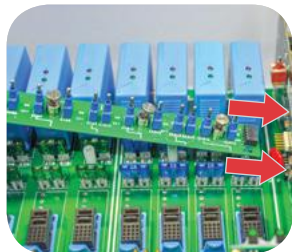
### Step #3:

When all of the screws are loosened, lift and pull the board away from the vertically mounted board located on the right-hand side of the unit. The board with the switches should come loose and allow access to the backup fuses.



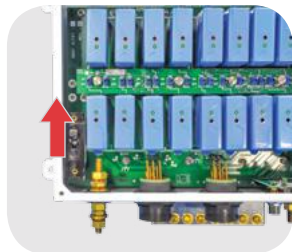
### Step #4:

In 16-position units, the left 8 ECB positions (#1-8) are protected by a 30A fuse, while the remaining 8 (#9-16) are protected by a 15A fuse. In 8-position units, all ECB's are protected by 30A fuses. Fuses can simply be pulled out and replaced with the same type (ATO automotive fuses) and value.



### Step #5:

After proper fuses are installed, replace the board with the toggles by lining up the pins on the board along the side of the unit with the connector on the vertically mounted board on the right side of the unit. After the pins are lined up and the board is inserted properly the thumbscrews can be re-tightened and the ECB's can be replaced. Replace any ECB's, which were removed in the process.



### Step #6:

Turn the main breaker to the unit back to the ON position. The red and green LED's should no longer be lit at the same time for the ECB position with the replaced fuse.



If the red and green LED's continue to illuminate after replacing the backup fuse using the above procedure, the ECB is faulty and should be replaced.

## General Specifications

### Electrical

Power Input (DC Voltage)	10 VDC – 32VDC
Power Input (Max Current)	100 Amps
CAN Bus Output Voltage	9 VDC – 16 VDC, 15 VDC Nominal
Load Equivalence Number (LEN)	1

### Mechanical

Dimensions	10.81" x 12.62" x 4.93"
CAN Bus Connectors	Two (2) Micro-C Male
CAN A Bus LED Indicator	Green
CAN B Bus LED Indicator	Green
MAIN Power Indicator	Green
Input Power Connection	5/16-18" Stud
Main Power Return Connection	5/16-18" Thread
Load Power Return Bus Bar (Removable)	8 each 10-32 screws
Mounting	4 each 4x0.31 for 1/4" mounting hardware
Orientation	N/A

### Certifications

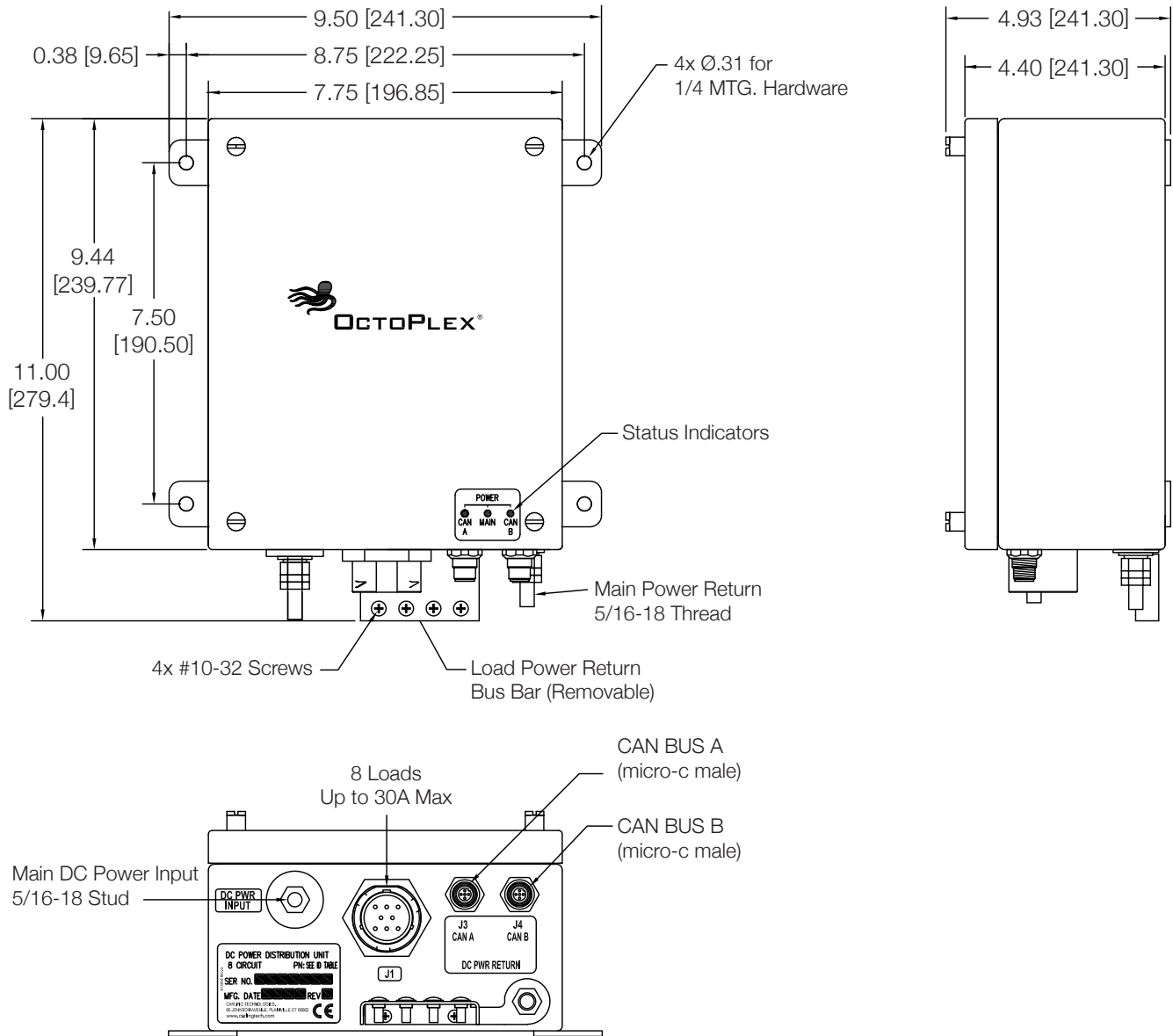
NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-40°C to +55°C
Storage Temperature	-40°C to +55°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight <i>with breakers</i>	A1650: 5.5 lbs. (2.49 kg) A1655: 8.25 lbs. (3.74 kg)

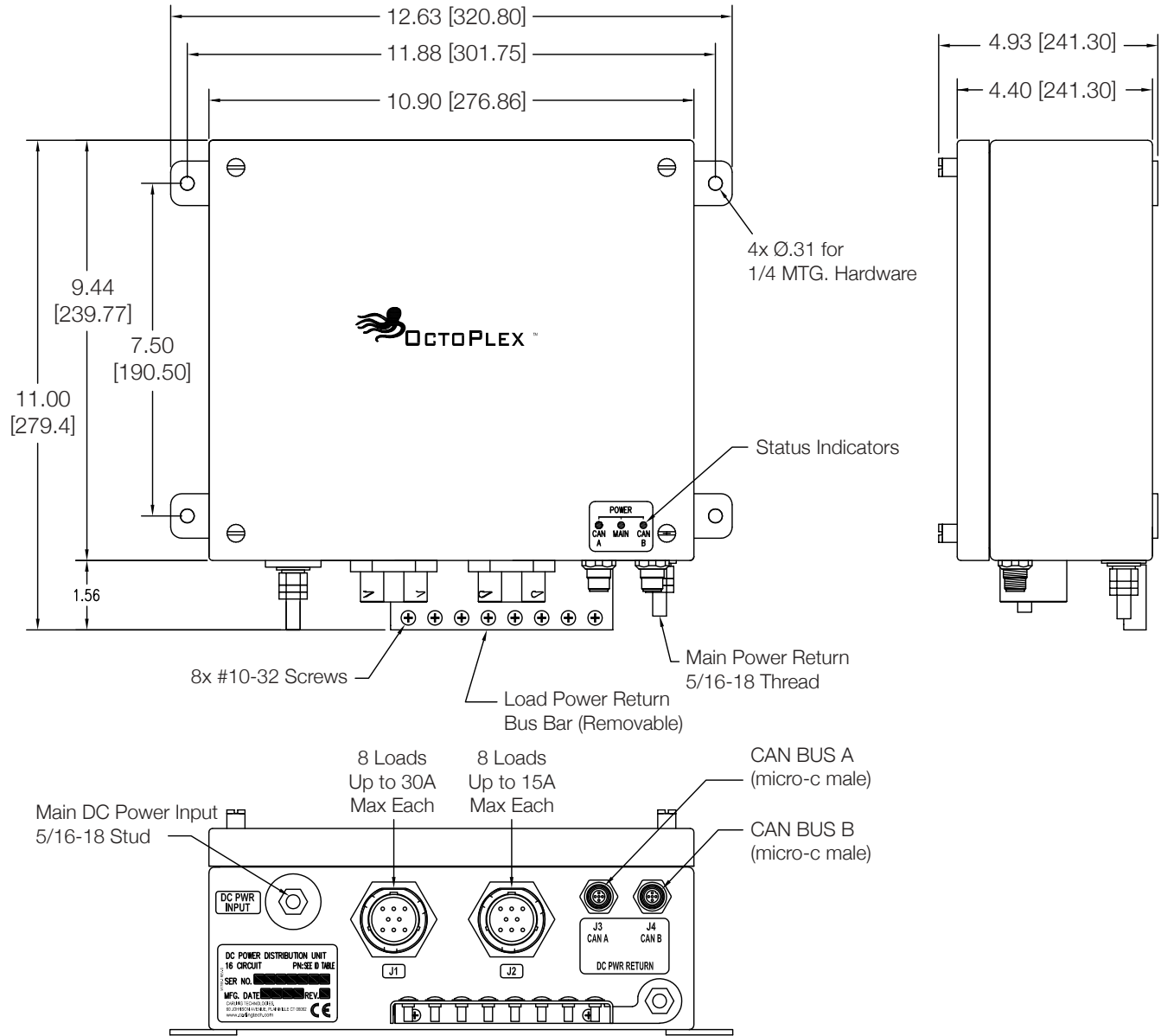
## Dimensional Specifications: in. [mm]

### 8 Circuit DC Power Distribution Unit A1650



## Dimensional Specifications: in. [mm]

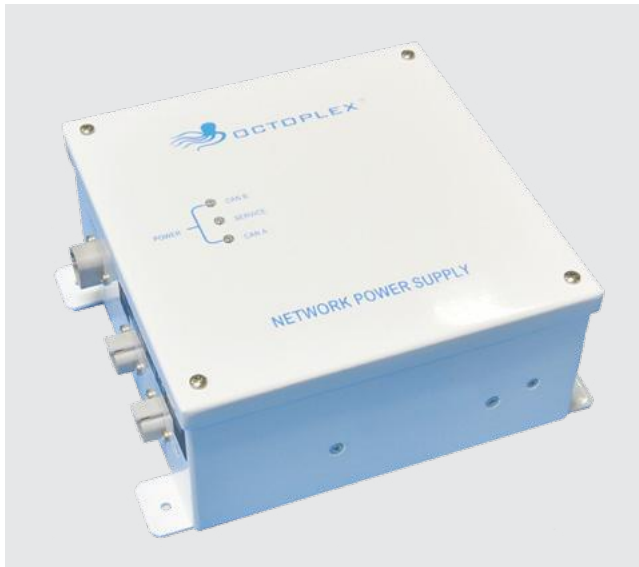
### 16 Circuit DC Power Distribution Unit A1655



# NETWORK POWER SUPPLY

## A2205-[ ]-CE

The Network Power Supply (NPS) provides regulated +15 VDC to the OctoPlex dual CAN network system. The power supply utilizes one AC and two DC power inputs for redundancy.



### Product Highlights:

- ◆ 120 VAC Input Power (Carling P/N A2205-1-CE)
- ◆ 230VAC Input Power (Carling P/N A2205-2-CE)
- ◆ +24V DC Input Power
- ◆ Dual CAN Bus Connection/Communications
- ◆ 7.5 amp Thermal breakers for each 15 volt output
- ◆ Network Health LED Status Indicators



Table 1:

LED Indicator	Color	Condition
CAN Bus A	Green	CAN Bus On
	No Indication	CAN Bus Off
Service	Red	Needs Service
	No Indication	Normal Operation
CAN Bus B	Green	CAN Bus On
	No Indication	CAN Bus Off

## Installation

The Network Power Supply should be installed in a location that allows access to the thermal circuit breakers installed on the connector side of the unit. At least one (1) power input (AC or DC) must be present for the NPS to operate. Depending on network complexity, one (1) or more Network Power Supplies can be installed. See Diagrams for Typical Single or Multiple NPS installations.

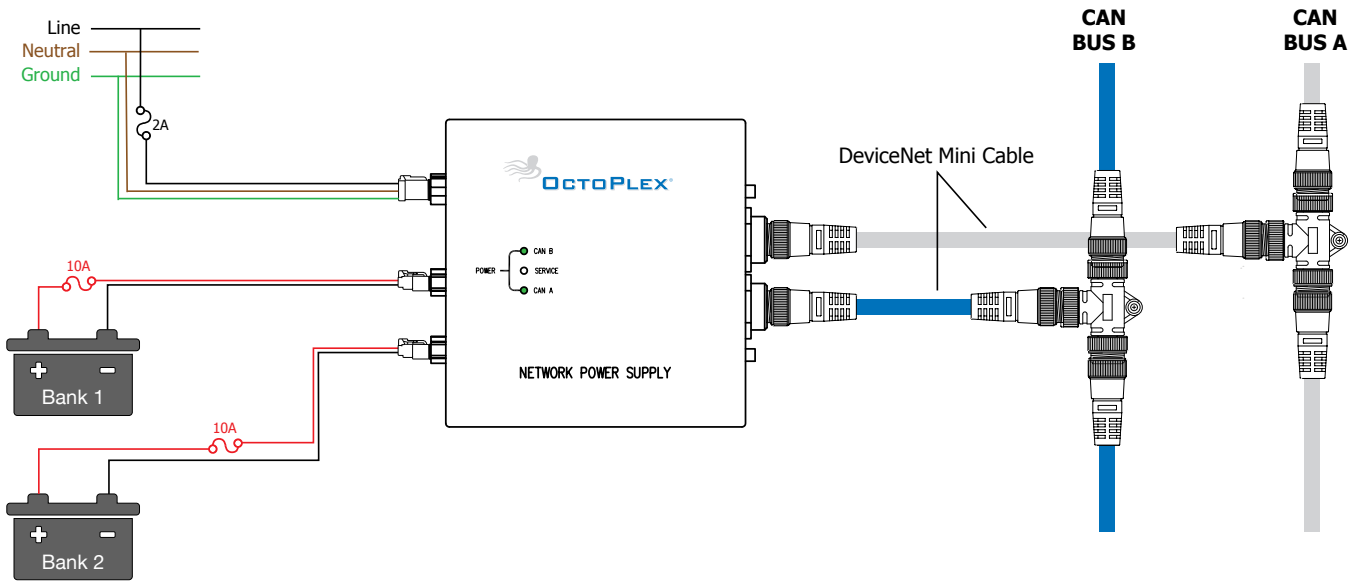


**CAUTION!**

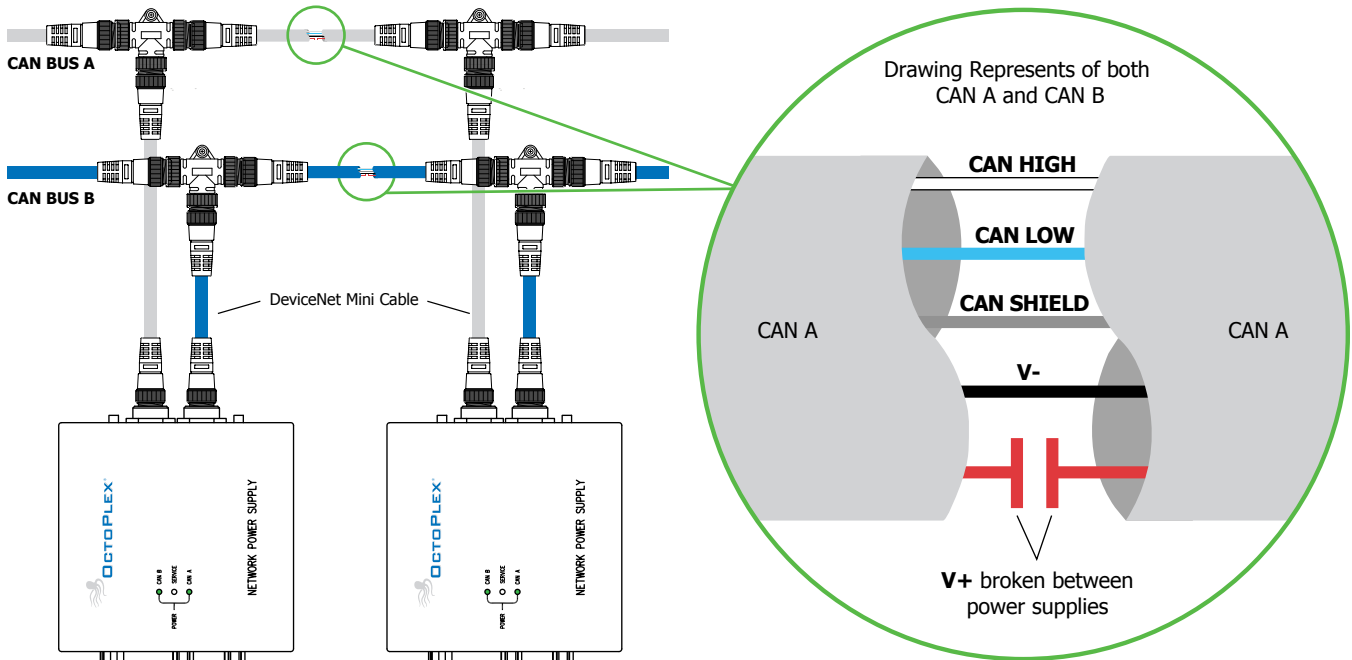
This is the only OctoPlex® component, which uses Mini/Thick cable and Mini-C connectors (other components use Micro-C connectors). The drops used for this component should have a Male Mini-C connection on both ends.

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.

## Typical Installation Diagram's Single Network Power Supply



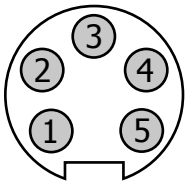
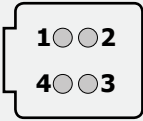

## Typical Installation Diagram's Multiple Network Power Supply



**WARNING!**

The required number of Network Power Supplies will be determined by the length of the backbone and the sum of the devices powered on the network. If multiple power sources are required, V+ (NET-S) must be broken (on both Buses) between the sources. The SHIELD (drain) must be connected at only ONE power supply.

## Pin Out Connections

Connector	Pin	Connection	View	Mating Connector
J1 / J2	1	Shield		Device Net Mini-C Male
	2	Power Output		
	3	Power Return		
	4	CAN HI		
	5	CAN LOW		
J3	1	AC Neutral		DT06-4S
	2	AC Ground		
	3	AC Ground		
	4	AC Line		
J4 / J5	1	DC Power Input		DT06-2S
	2	DC Power Return		

\* Two female Mini-C connectors are provided for connection to the primary and secondary CAN Bus via drop cables.

## Maintenance

The Network Power Supply requires no maintenance. Any service or repair issues should be handled by a factory authorized technician.

## General Specifications

### Electrical

AC Voltage Input	
A2205-1-CE:	90-126VAC; 56Hz - 63Hz
A2205-2:	220-264VAC; 47Hz-53Hz
AC Input Current (Max)	2 Amps
DC Voltage Input	18VDC – 36VDC
DC Input Current (Max)	6 Amps
CAN Bus Output Voltage	+15 VDC (± 0.5)

### Mechanical

Dimensions	7.80" X 8.84" X 3.85"
CAN Bus Connectors	Two (2) Mini Female
AC Power Input Connector	Deutsch P/N DT06-4S
DC Power Input Connector	Two (2) Deutsch P/N DT06-2S
Mounting	4 each 4 x 0.16 #6 hardware
Orientation	N/A

### Certifications

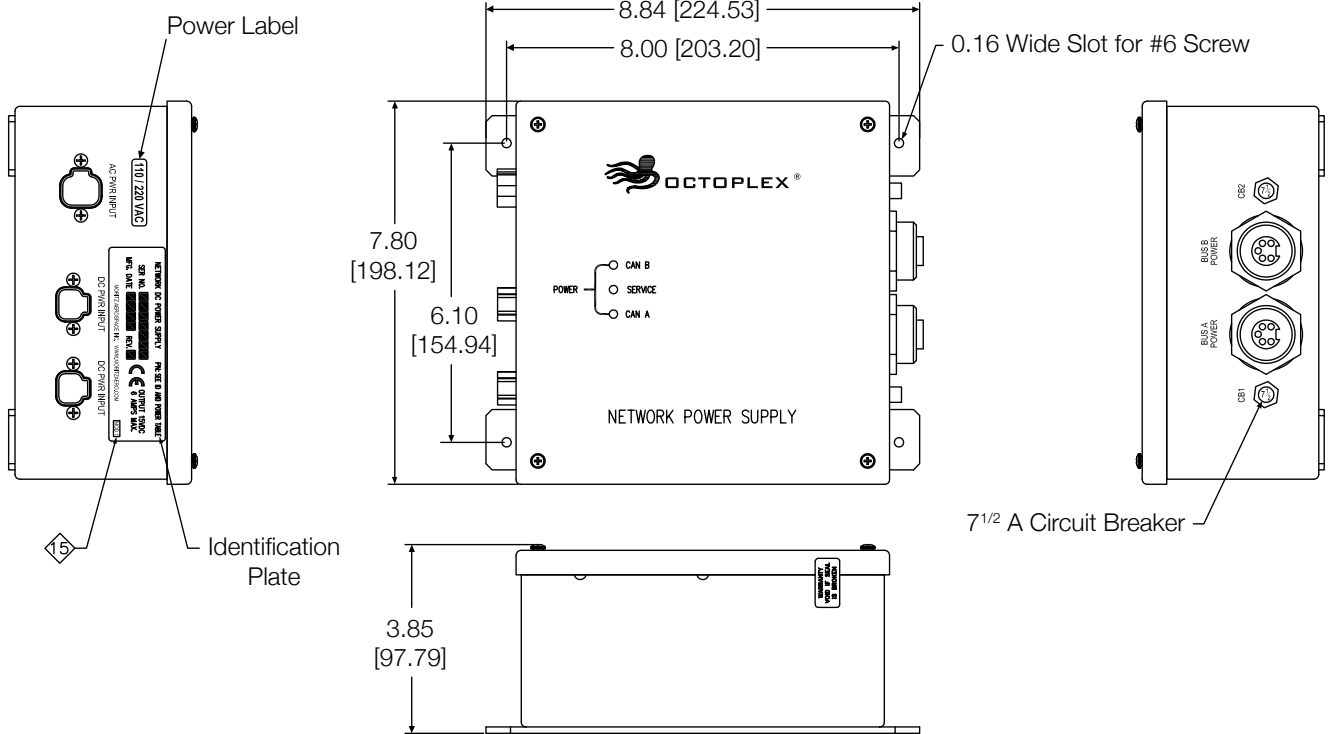
NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +85°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight	6.0 lbs (2.72 kg) Max

## Dimensional Specifications: in. [mm]

### Network Power Supply A2205-[ ]-CE





# BATTERY

## BATTERY MONITOR

### A1680-CE

The Battery Monitor is capable of measuring one (1) Current, two (2) DC Voltages, and up to four (4) individual battery temperatures. The Battery Monitor Cable Harness (P/N A2225-[], see Table 1 and 2) enables the monitor to connect to the batteries. The Battery Shunt 200 Amp, 50mV (P/N MS91587-2), is needed to measure the current that is installed on the high side of the installation. The Battery Monitor is NMEA 2000® certified, allowing the user to view all DC information over an NMEA 2000 network.



#### Product Highlights:

- ♦ Capable of Monitoring the following:
  - Current Measurement
  - Two (2) DC Voltage Measurements
  - Four (4) Temperature Measurements
- ♦ Configurable Alerts/Alarms
- ♦ Single CAN BUS Communication



## Installation

The Battery Monitor was designed to be installed in a protected, non-explosive area of the vessel. Take precautions to install the Battery Monitor in an area that will be away from direct exposure to the weather and combustible fumes.

### CAN Connections

One male Micro-C connectors is provided on the top of the Battery Monitor for connection to the primary CAN bus via drop cable.

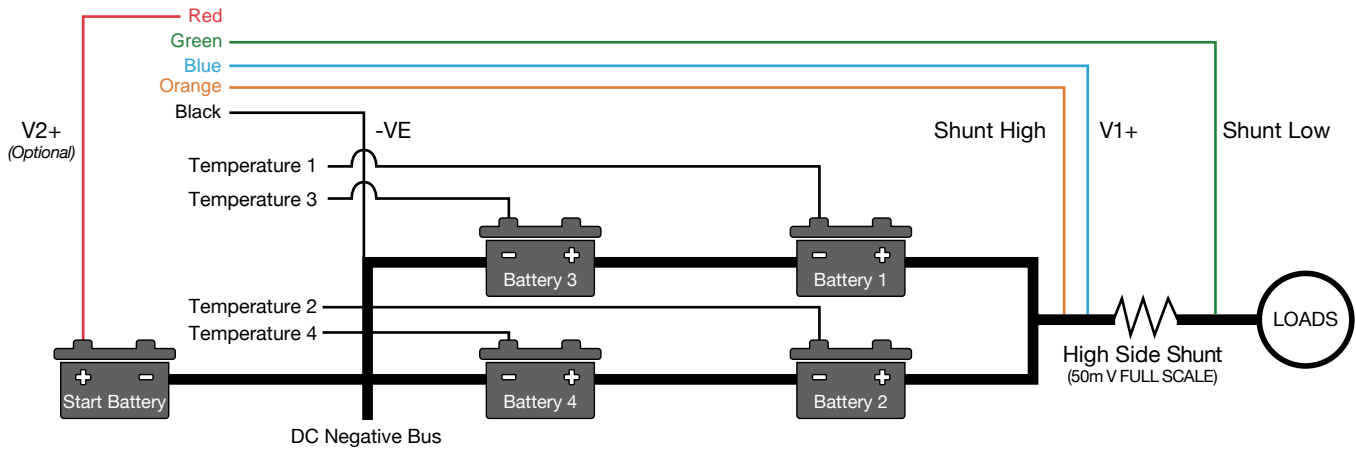


#### NOTE

Use the shortest drop length possible when connecting the Battery Monitor to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables.

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.

## Typical Installation Diagram



**NOTE**

Mount Temperature Sensors (Part of A2225-[ ]) to Battery stud or adhere directly to battery



**CAUTION!**

When no High Side Shunt is used, tie the orange, green and blue wires directly to the V1+ side of the battery. Installer must follow applicable industry standards i.e. ABYC/CE for properly wiring and utilizing external protective devices i.e. fuses as required.

## Battery Monitor Harness Cable



Table 1:

Part Number	Description
A2225-4	Battery Monitor Cable Harness - 4'
A2225-6	Battery Monitor Cable Harness - 6'
A2225-8	Battery Monitor Cable Harness - 8'
A2225-14	Battery Monitor Cable Harness - 14'
A2225-16	Battery Monitor Cable Harness - 16'
MS91587-2	Battery Shunt 200Amp, 50mV

Table 2:

Pin	Connection	Color
1	Temperature Sensor 1 Signal	
2	Shunt High	Orange
3	Temperature Sensor 2 Signal	
4	Temperature Sensor 1 Ground	
5	Ground	Black
6	Shunt Low	Green
7	Temperature Sensor 3 Signal	
8	Temperature Sensor 3 Ground	
9	Temperature Sensor 2 Ground	
10	Reserved	
11	Battery V2+ 12-30VDC	Red
12	Temperature Sensor 4 Signal	
13	Temperature Sensor 4 Ground	
14	Reserved	
15	Not Used	
16	Not Used	
17	Not Used	
18	Battery V1+ 12-30VDC (Must be connected to power monitor)	Blue

## Operation

The Battery Monitor has one (1) configurable parameter; the maximum current value of the high side shunt being used. This parameter is a factory setting. The voltage drop across the high side shunt should not exceed 50 mV for the configured current. For example, if the maximum shunt value selected is 200 amps, then the voltage drop across the high side shunt at 200 Amps should not exceed 50 mV DC.

## Maintenance

The Battery Monitor requires no maintenance. Any service or repair issues should be handled by a factory authorized technician.

## General Specifications

### Electrical

Power Input	12 VDC – 30VDC, 100 mA max (Blue Wire)
DC Voltage Input	12 VDC – 30VDC (Red Wire)
Shunt Voltage	50 mVDC (Orange/Green Wires)
CAN Bus Voltage	+15 VDC (± 0.5)
Load Equivalence Number (LEN)	1

### Mechanical

Dimensions	5.50" X 2.43" X 2.43"
CAN Bus Connectors	One (1) Micro-C Male
Mounting	4 each 4 x 0.16 #6 hardware
Orientation	N/A

### Certifications

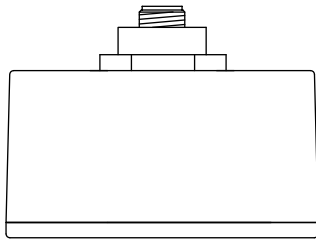
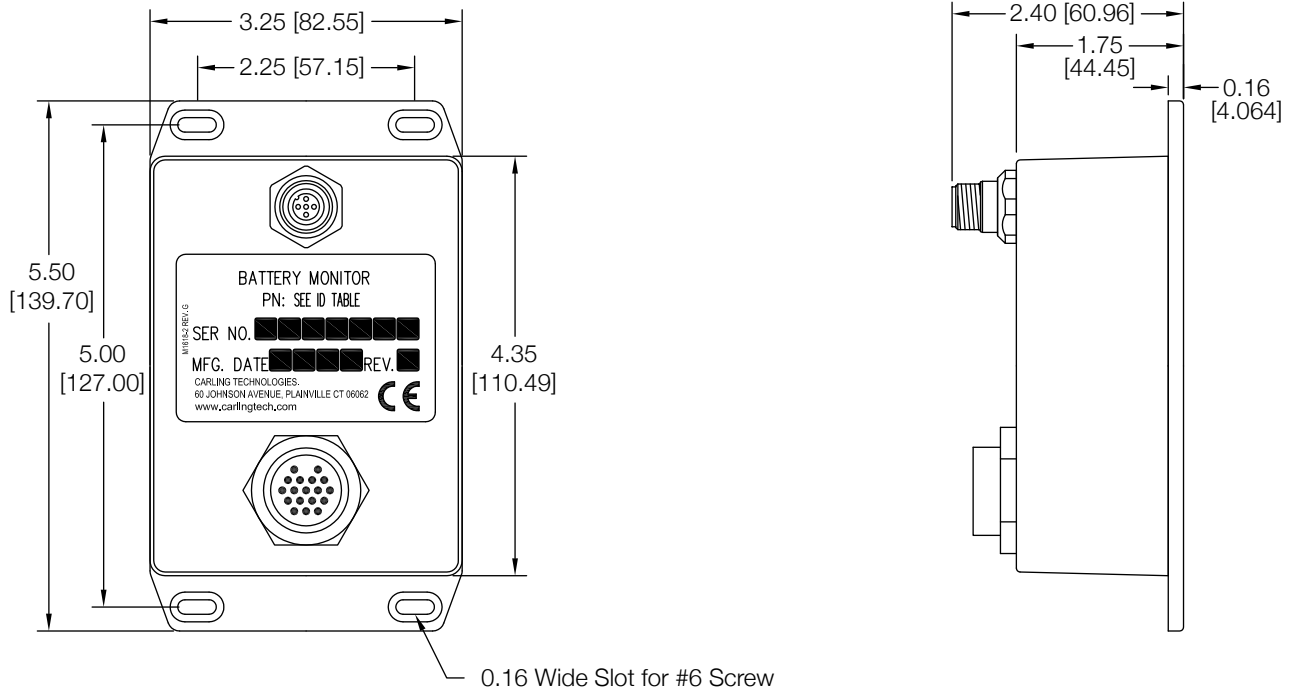
NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +85°C
Temperature Sensor Range	-20°C to +70°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight	0.75 lbs (0.34 kg) nominal

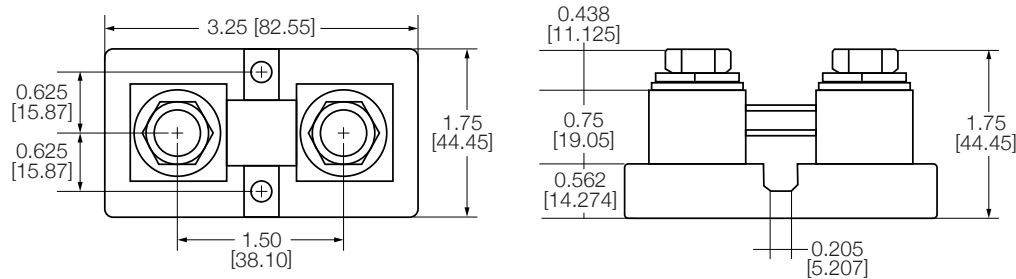
## Dimensional Specifications: in [mm]

### Battery Monitor A1680-CE



### Shunt

Source: [www.deltecco.com/MKB-DC.html](http://www.deltecco.com/MKB-DC.html)

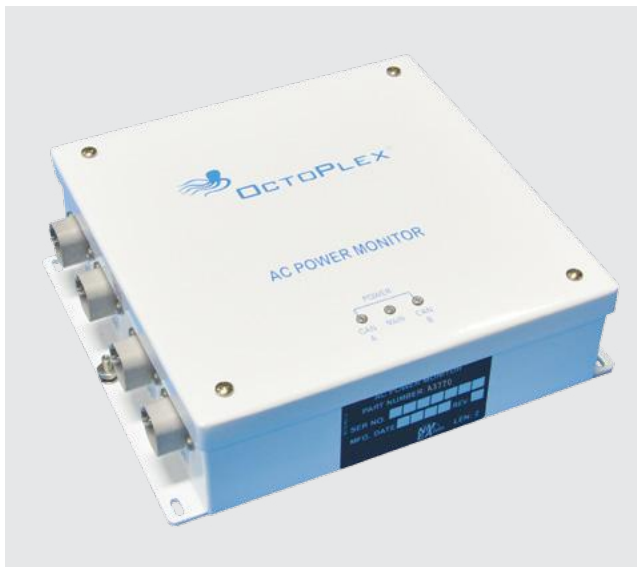


# AC MONITOR

## AC POWER MONITOR

### A1770-CE

The AC Monitor measures the voltage, current and frequency of up to four (4) Single phase single Line AC inputs, two (2) Single Phase Dual Line AC inputs, or one (1) Three phase Three Line AC input. The AC Monitor utilizes dual CAN connections for redundancy.



#### Product Highlights:

- ◆ Capable of Monitoring the following:
  - Four (4) Single Phase Single Line AC Input
  - Two (2) Single Phase Dual Line AC Inputs
  - One (1) Three Phase Three Line AC Input
- ◆ Dual CAN BUS Communication



## Installation

Depending on the type and number of AC power sources being monitored, the AC Power Monitor requires from one (1) to four (4) Deutsch DT06-4S connectors (Table 1). It is also recommended that 16 AWG wire is used for the connections to the AC sources (Table 2).

Table 1:

Deutsch DT06-4S Connector Pins
1. AC Line
2. AC Neutral
3. AC Current Transformer Input #1
4. AC Current Transformer Input #2

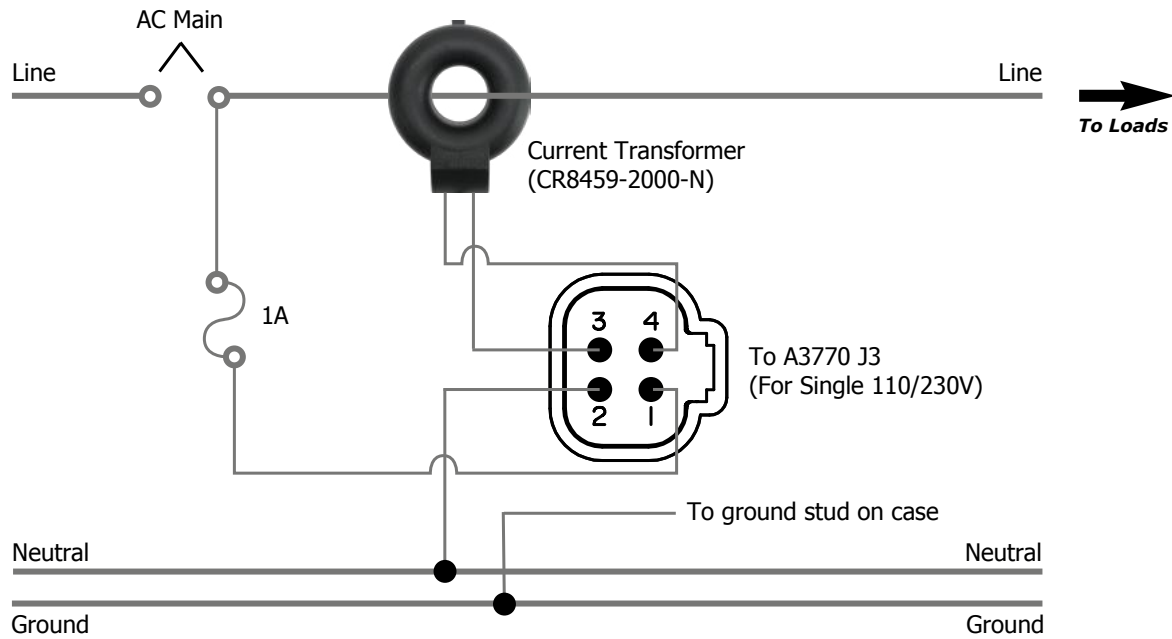
Table 2:

Wire Gauge	Contact Type	Deutsch Part Number
16 to 20	Solid	0462-201-16141
14 to 18	Stamped/Formed	1062-16-0122
14 to 18	Stamped/Formed	1062-16-0144

\*Manufacturer reserves the right to change product specification without prior notice. Please refer to our website for the latest details.

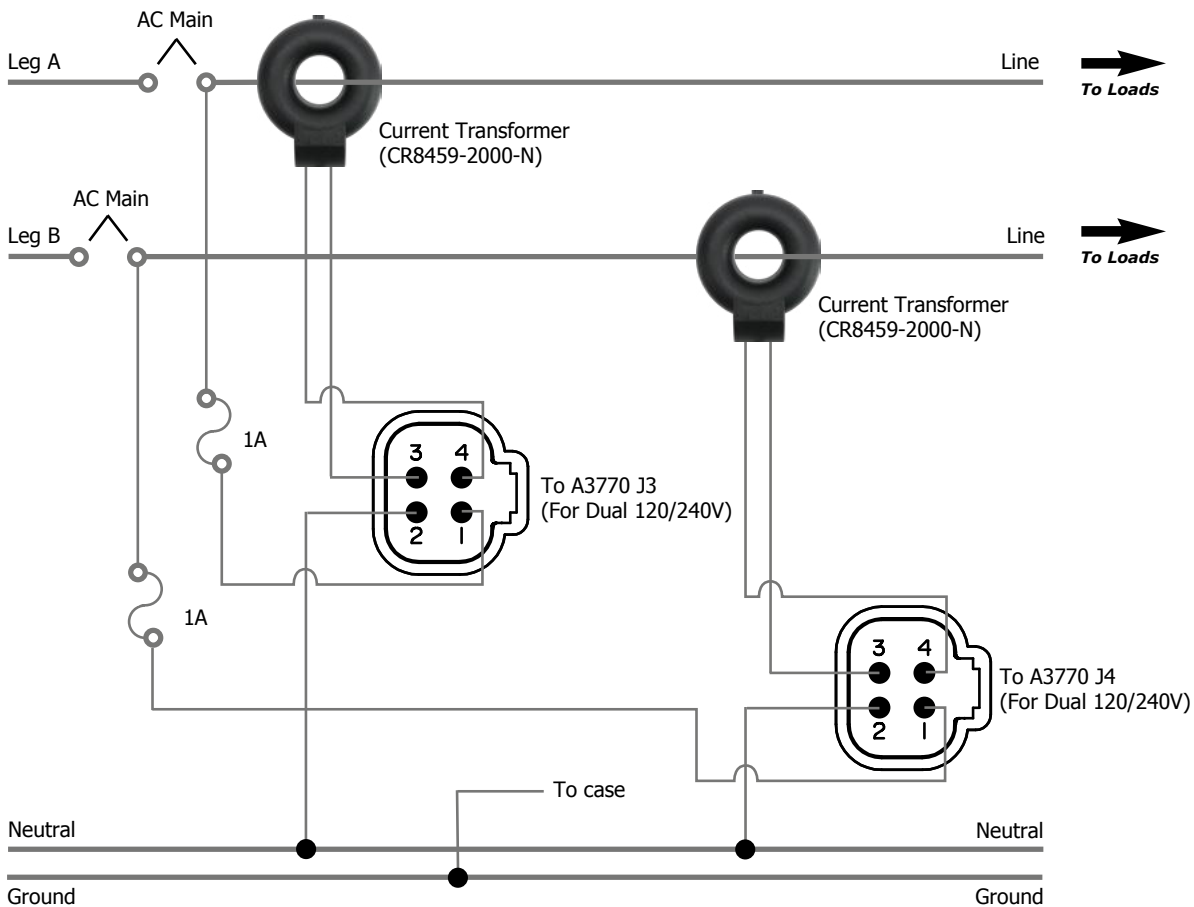
### AC Power Monitor Installation #1

Single 120 VAC/230 VAC (Euro)

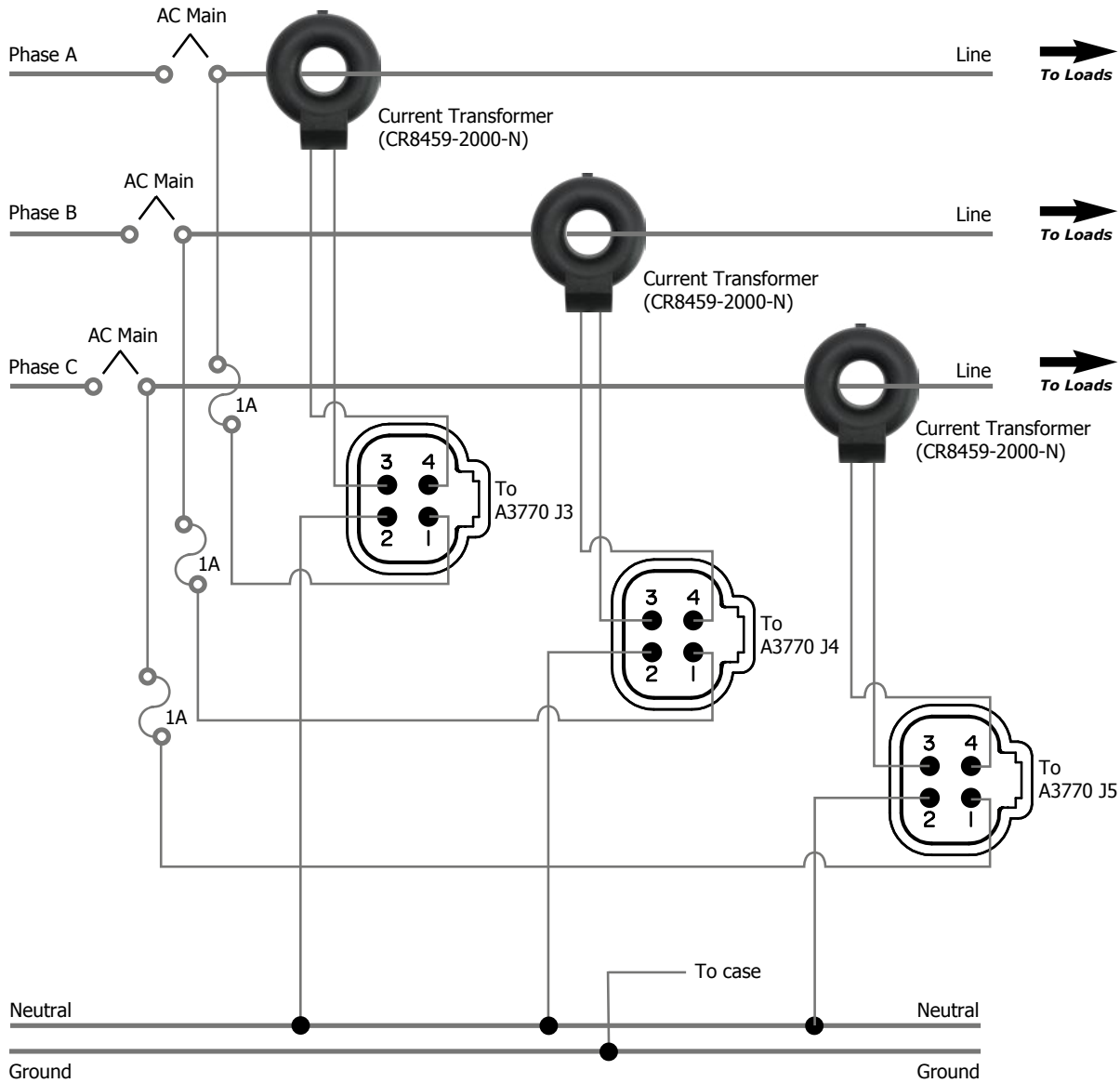


### AC Power Monitor Installation #2

Dual 120/240VAC



## AC Power Monitor Installation #3 Three Phase VAC (120/208VAC)



### CAN Connections

Two male Micro-C connectors are provided the right side of the AC Monitor for connection to the primary and secondary CAN bus via drop cables.



**NOTE**

Use the shortest drop length possible when connecting the AC Monitor to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables.

### Operation

There are three (3) LED's that are visible through the cover of the AC Power Monitor. The left and right LED's indicate that there is a primary and secondary network connection. The center LED displays the AC Input Power Status (i.e. whether the AC Power monitor is receiving power from the input connectors). The Multi-Function Display shows the AC voltage (RMS), current and frequency of up to four (4) line inputs; if one or more inputs are not used, that value shall be displayed as zero. The internal temperature of the unit is also displayed.

## Maintenance

The AC Monitor requires no maintenance. Any service or repair issues should be handled by a factory authorized technician.

## General Specifications

### Electrical

AC Voltage Input	90VAC – 264VAC
Operating Frequency	50/60 Hz
CAN Bus Voltage	+15 VDC ( $\pm$ 0.5)
Load Equivalence Number (LEN)	1

### Mechanical

Dimensions	7.52" X 8.51" X 2.67"
CAN Bus Connectors	Two (2) Micro-C Male
Mounting	4 each 4 x 0.16 #6 hardware
Orientation	N/A

### Certifications

NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

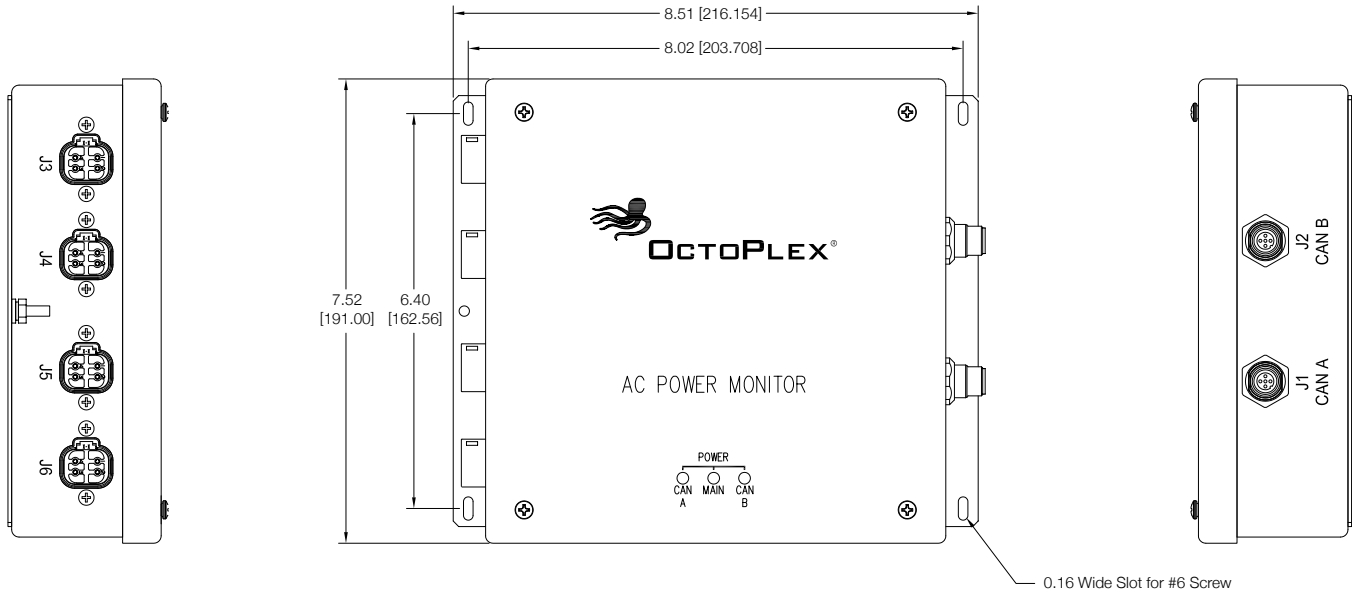
### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +85°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight	3.6 lbs (1.64 kg) nominal



## Dimensional Specifications: in. [mm]

### AC Power Monitor A1770-CE



### Transformer CR8459-2000-N



For complete detail, please visit the following link: [www.crmagnetics.com/Assets/ProductPDFs/CR8400%20Series.pdf](http://www.crmagnetics.com/Assets/ProductPDFs/CR8400%20Series.pdf)

# SYSTEM INTERFACE UNIT MONITOR (SIU)

## A1470-CE

The System Interface Unit Monitor (SIU) allows the user to interface with up to 34 digital signals (DC discrete inputs) to the OctoPlex® system for status and monitoring purposes. The SIU can be configured to perform Discrete I/O Functions, in conjunction with the AC and DC Distribution units.



### Product Highlights:

- ◆ 34 digital Signal Interface
- ◆ Discrete I/O Functions
  - Control AC Breakers
  - Control DC Breakers
  - DC Light Dimming Control
  - Time Interval On/Off
- ◆ Active high and active low states
- ◆ Can activate alarms



## Configuration

### Signal Input

Each SIU input signal can be configured to perform a function based on the input level. When an input goes to the “Active” state, the configured function will be performed. The table below describes the “Active” states that any SIU input can be configured for:

Low Input	Configured function will be Active when the input Signal is to ground (VDC -ve)
High Input	Configured function will be Active when the input signal is above 8 VDC (VDC +ve)
Both	Configured functions will be Active when either a high or low input is detected

\* Note: Both (either) State is the Default setting

\* Note: Pins 39 & 40 can only be set to Both

## Output Message

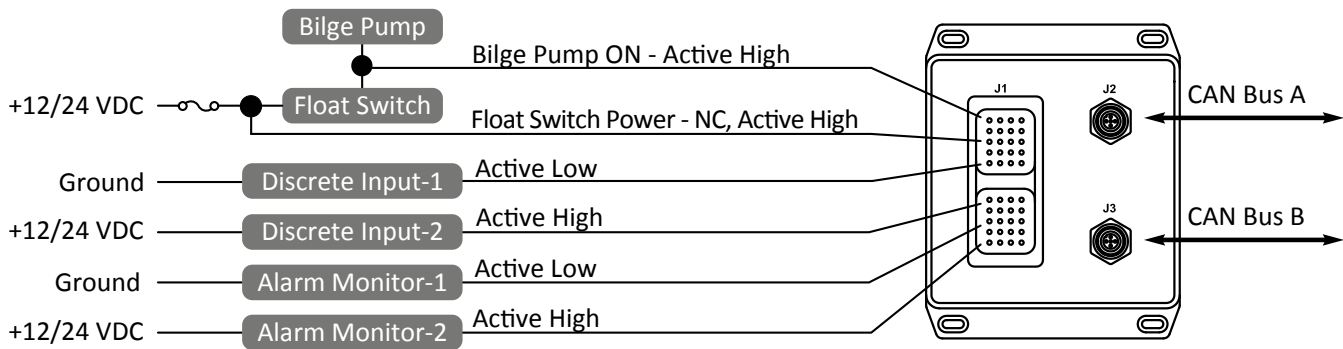
The SIU broadcasts a NMEA 2000 PGN to the OctoPlex network when the SIU receives a state change on a configured input. This information can be received and processed by any NMEA 2000 device designed to process the Binary Switch Bank Status PGN. All OctoPlex AC, DC and Multi-function Display devices allow processing of SIU signals through Discrete I/O handlers. Each Output Message has a “Normal State” and an “Abnormal State” associated with it. For example, an input could be set up such that the “Normal State” is low and the “Abnormal State” is high. When the input goes high, the Multi-function Display could be configured to provide an indication to the user that a change in the device state has been detected. In some configurations it is required to “Arm” the State/Alarm. For example, a pump inline Flow Sensor, with no flow (pump off) the sensor would be in the Normally Open/Abnormal State. The Alarm would only be activated if the sensor goes Open (Abnormal State), while the pump is running. In this example, the SIU is configured to Arm the Alarm with appropriate Signal State Stimulus.

Signal State Stimulus	Description
State to Active	Set Alarm state Off when Signal goes Active
State to Inactive	Set Alarm state On when Signal goes Inactive

## Signal Examples

Input	Status	Description
High Water Alarm	NO	Normal OFF, Circuit closes Abnormal ON - Alarm on State to Active
Float Switch Power	NC	Normal ON, Circuit Opens Abnormal OFF - Alarm on State to Inactive
Engine Temperature Alarm	NO	Normal OFF, Circuit Closes Abnormal ON - Alarm on State to Active
Water Flow Alarm	NC	Normal OFF (Closed when Pump On), Circuit Opens Abnormal ON - Alarm on State Inactive
Light Switch	NO	Normal Off, Circuit Closes Abnormal ON - trigger DIO for ECB control while ON maintained
Tank Empty	NO	Trigger a Discrete I/O to Turn OFF the associated pump breaker(s)
Holding Tank Full	NO	Trigger a Discrete I/O to Turn OFF head flush breaker(s)

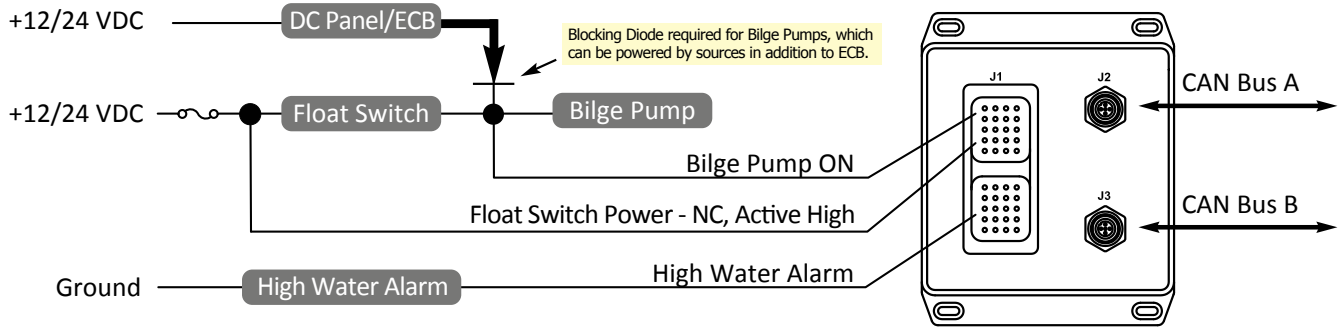
## Application Example:



## Use of Blocking Diodes

In applications where a load, controlled by an Electronic Circuit Breaker (ECB), within a DC Power Distribution Unit, can also be turned on by a float switch or another switch outside of the OctoPlex system, a blocking diode must be placed between the ECB output and the load it is controlling. Failure to install the blocking diode will result in hardware malfunction in situations where the float switch is turning the load/pump ON while the ECB for the load is OFF (ECB error of Abnormal High/Back feed). This may be applicable for sump pumps as well.

### Blocking Diodes Example:



Part Number	Diodes per Unit	Notes
A1935	2	Standard Unit
A1945	4	Special Order
A1940	10	Special Order



Blocking diodes to prevent back feed of power to the ECB are available from Carling and are rated at 15 Amps, 32 VDC.

## Installation

The SIU is designed to be installed in a protected, non-explosive area of the vessel. Take precautions to install the SIU in an area that will be away from direct exposure to the weather and combustible fumes.

### Connections

The terminals available for use in the Deutsch DRC16-40S connectors are:

Wire Gauge	Contact Type	Deutsch Part Number
14 to 18	Solid	0462-201-16141
14 to 18	Stamped/Formed	1062-16-0122
14 to 18	Stamped/Formed	1062-16-0144

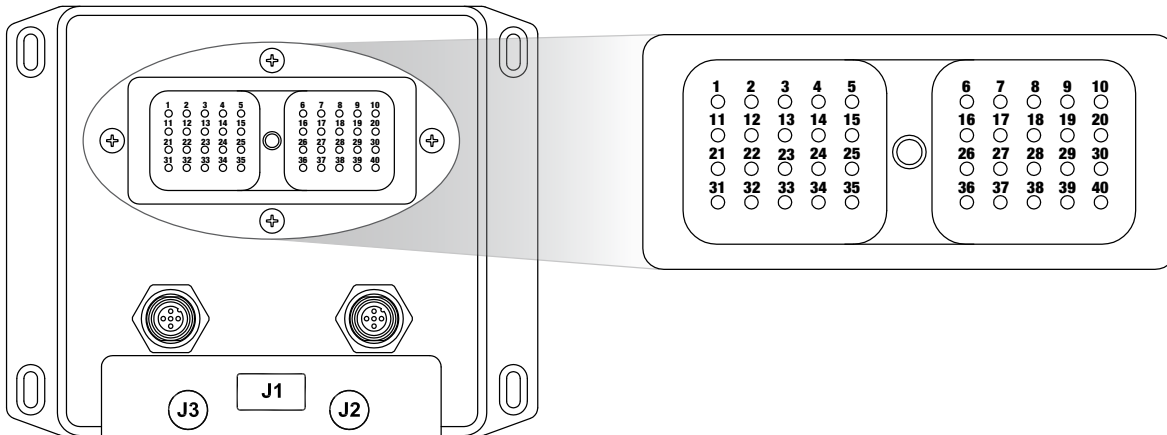


Recommended wire gauge is 16. Limit wire length to 50 feet. Deutsch recommends a torque of 25 to 28 in/lbs be applied to the center mounting screw during assembly.

## Connections (continued)

The SIU can be powered using one power input pin; the SIU allows for up to three (3) different power input pins for redundancy purposes:

Connector Pin Number	+ 12 VDC (5A Fuse)	+ 24 VDC (5A Fuse)	DC Return	Discrete Inputs
1, 2, 3	YES	YES	N/A	N/A
8, 9 ,10	N/A	N/A	YES	N/A
4-7, 11-40	N/A	N/A	N/A	YES



## CAN Connections

Two male Micro-C connectors are provided to the right side of the System Interface Unit Monitor for connection to the primary and secondary CAN bus via drop cables.



**NOTE**

Use the shortest drop length possible when connecting the System Interface Unit Monitor to the CAN backbone. NMEA 2000 spec is maximum 6 meters for drop cables.

## Maintenance

The System Interface Unit Monitor was designed to require no maintenance. Any service or repair issues should be handled by a factory authorized technician.

## General Specifications

### Electrical

Power Input	10 VDC – 32 VDC
Power Consumption	100 mA Max (@ 28 VDC)
DC Signal Input	Ground; 12 VDC; 24 VDC for each input
CAN Bus Voltage	+15 VDC (± 0.5)
Load Equivalence Number (LEN)	1

### Certifications

NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	<b>IEC 60533</b> Electrical and Electronic Installations in Ships <b>IEC 60945</b> Maritime Navigation and Radio Communication Equipment and Systems

### Environmental

Radiated, RF Field Immunity	IEC-61000-4-3
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4
Voltage Surge Immunity	IEC 61000-4-5
Conducted, Immunity	IEC 61000-4-6
Conducted Emissions	IEC 60945
Voltage Variation Immunity	IEC 61000-4-11
Conducted LF Immunity	IEC 61000-4-16
ESD Immunity	IEC-61000-4-2
Insulation Resistance	IEC-60092-504
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +85°C
Vibration	IEC-60068-2-6 Test Fc
Temperature Cycle	IEC 60945
Humidity	IEC-60068-2-30 Test Db
Corrosion	IEC 60945
Weight	1.6 lbs (0.73 kg) nominal

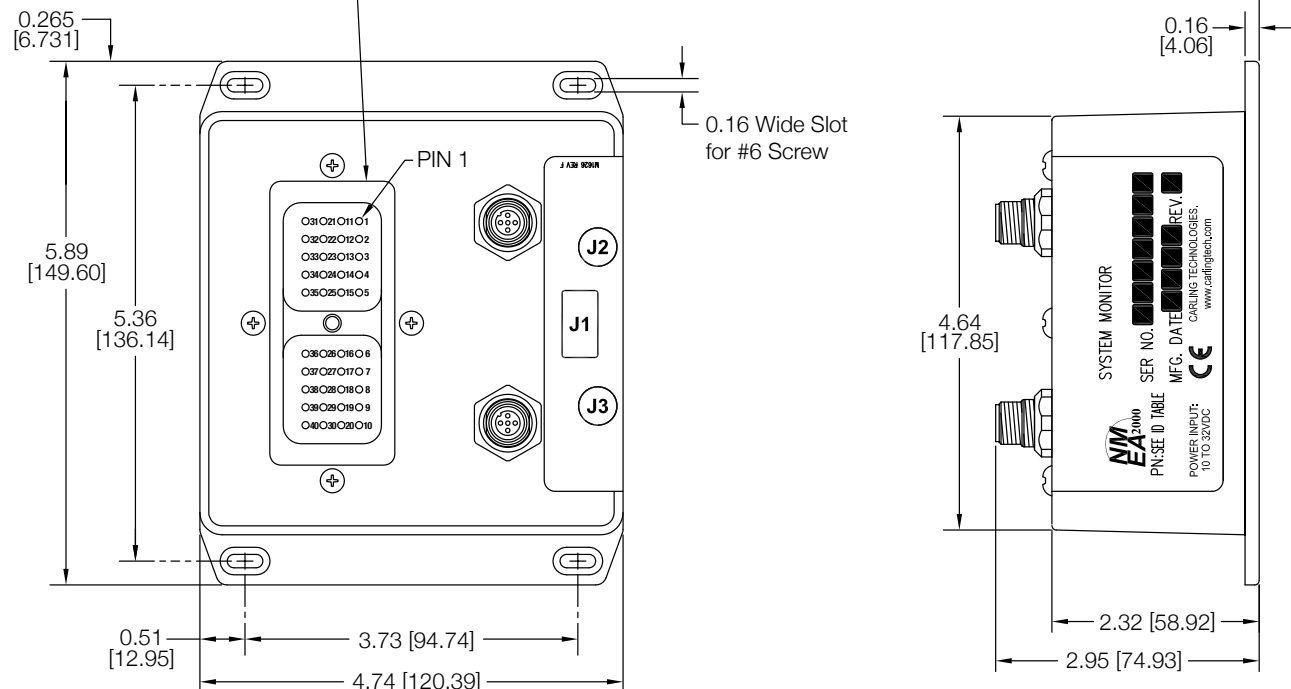
### Mechanical

Dimensions	5.89" X 4.74" X 2.95"
CAN Bus Connectors	Two (2) Micro-C Male
Mounting	4 each 4 x 0.16 #6 hardware
Orientation	N/A

## Dimensional Specifications: in [mm]

### System Interface Unit Monitor (SIU) A1470-CE

Connector, Signal / Power Input, 40 Pin, Deutsch PN DRC 10-40P



# NMEA 2000®

## NETWORK INSTALLATION GUIDE

Installing an NMEA 2000® network consists of inter-connecting NMEA 2000 electronic devices using plug-and-play cables and connectors. The following pages provide a brief description of how to setup a NMEA 2000 network using five basic steps:

1. Cable and Connector Network Basics
2. Installing Terminators
3. Supplying Power
4. Grounding the Network
5. Checking the Network

Please note that this installation guide contains a brief description of the basic concepts of installing an NMEA 2000 network and Carling Technologies suggests that you consult a trained professional for any installation. You can learn more about installing NMEA 2000 networks by contacting the National Marine Electronics Association (NMEA) at [www.nmea.org](http://www.nmea.org) and consulting the following documents:

- ♦ NMEA 2000 Standard for Serial-Data Networking of Marine Electronic Devices
- ♦ NMEA Installation Standards

### Cable and Connector Network Basics

#### Network Topology

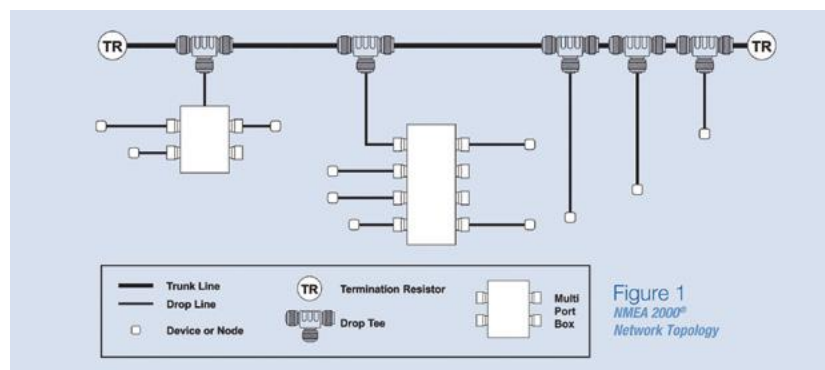
The NMEA 2000 cable system uses a trunk (sometimes referred to as the backbone) and drop line topology as shown in Figure 1.

The NMEA 2000 cable system includes five wires within a single waterproof cable: two signal wires, power and ground wires, and a drain wire. The drain wire shields the signal, power, and ground wires from external Radio Frequency Interference (RFI) and helps reduce RFI emission from the cable. You can connect devices using one of three cable options:

**Mini** - This is commonly used for the trunk line on the network because of its greater current carrying capacity (8 amps) as opposed to Micro cable (4 amps). Mini cable has an outside diameter in the range from 0.41 to 0.49 inches. Its maximum installed bend radius is 7x the cable diameter. You can also use this type of cable for drop lines.

**Mid** - This is commonly used for smaller networks as either the network trunk line or as drop lines. Mid cable and connectors are rated to 4 amps just like the Micro cable, however the larger diameter power conductors within the Mid cable provides for less voltage drop over Micro cable, especially for long runs. The diameter of the Mid cable is 0.33 inches.

**Micro** - This cable type is typically used as the drop line connecting devices to the main trunk line with an outside diameter in the range from 0.24 to 0.28 inches. Micro cable has a smaller diameter and is more flexible than mini cable with an installation bend radius of 7x the cable diameter. Smaller networks can use this type of cable for both the trunk and drop lines.



You construct the trunk line using double-ended cordsets connected between tees or taps. One end of the cordset has a male connector with male pins while the other end of the cordset has a female connector and female receptacles. The connectors are keyed so they can only connect to each other in one way. As an alternative to double-ended cordsets, you can make your own trunk line using bulk cable and field-attachable connectors. If you decide to add equipment later, you can simply disconnect a cordset from a tee, add another tee directly to the existing tee, re-connect the cordset and add the new component to the system using a drop cable. Alternatively, you could cut the trunk line, add two field-attachable connectors and insert a new tee. Trunk lines can also be run up to watertight bulkheads and connected to a waterproof bulkhead feed-thru connector to maintain the integrity of watertight compartments.

To drop off the trunk line, you connect a device using a tee connector. Daisy chaining of devices is not allowed, as it is a requirement to be able to remove a component from the network without affecting any other device. This allows you to remove a device for servicing while the rest of the network remains operational. Multi port units are also available where instruments tend to be clustered, around the helm for example.

## Maximum Cable Distance

The cable distance between any two points (a point being an electronic product or terminator) must not exceed 250 meters (820 feet) for a system based on the Mini or Mid trunk cable or 100 meters (328 feet) for a system based on a Micro trunk cable.

For most cases, the maximum distance should be measured between termination resistors. However, if the distance from a trunk line tee to the farthest device connected to the trunk line is greater than the distance from the tee to the nearest terminating resistor (TR), then you MUST include the drop line length as part of the cable length in your maximum cable distance calculation.

Figure 2 shows an example where both 5 meter drops must be included in the maximum cable distance since the drops are longer than the distance from the tee to termination resistor.

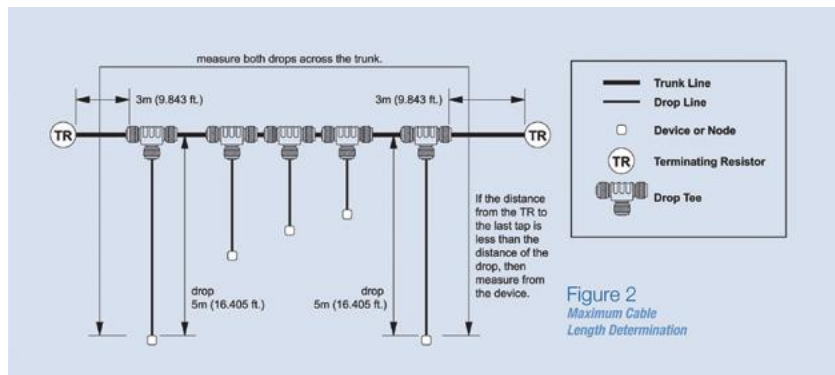


Figure 2  
Maximum Cable Length Determination

## Cumulative Drop Line Length

The cumulative drop line length refers to the sum of all drop lines, Mini, Mid or Micro cable in the cabling system. This sum cannot exceed 78 meters (256 feet). Figure 3 shows an example using four drop tees and two multiport drops to attach 11 devices to the trunk line. The cumulative drop line length is 37 meters (122 feet) and no single device is more than 6 meters (20 feet) from the trunk line.

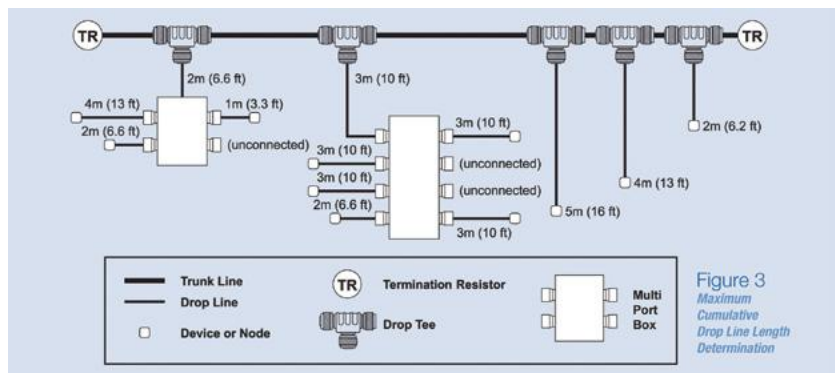


Figure 3  
Maximum Cumulative Drop Line Length Determination



## Maximum Drop Line Length

The maximum cable distance from any device on a branching drop line to the trunk line is 6 meters (20 feet).

## Maximum Number of Devices

A maximum of 50 physical devices shall be connected to the network, and the disconnection of any device shall not interrupt any other device on the network.

## NMEA 2000 Cable

The Mini, Mid and Micro cables contain five wires: One twisted pair (red and black) for network power, one twisted pair (blue and white) for signal and a drain wire (bare).

The following table shows the color, name, and usage for each wire contained within the cable.

Color	Name	Usage
White	NET-H	Signal
Blue	NET-L	Signal
Bare	SHIELD	Drain
Black	NET-C	Ground
Red	NET-S	Power

## NMEA 2000 Connectors

Connectors attach cables to devices or other components of the NMEA 2000 cable system. This allows the network to be completely “plug-and-play”. Connections can be made with pre-molded cordsets or with field-attachable connectors. The following diagram shows the pins found within Mini connector and the Micro and Mid connector and the corresponding wire colors for those pins.

## Installing Terminators

Termination resistors are attached to each end of the trunk cable to reduce reflections of the communication signals on the network. If you do not use termination resistors as described, the network will not operate properly. Termination resistors are typically connected directly to the last tee on the trunk line although they can be connected to a cordset extending from the last tee on a trunk line. Inline terminators are also available and they are used to terminate the network at the last product.

## Supplying Power

(OctoPlex Powered by Network Power Supply)

### End-Powered Network

End-powered networks are typically seen on smaller vessels with only a few NMEA 2000 devices. Figure 4 shows an end-powered network.

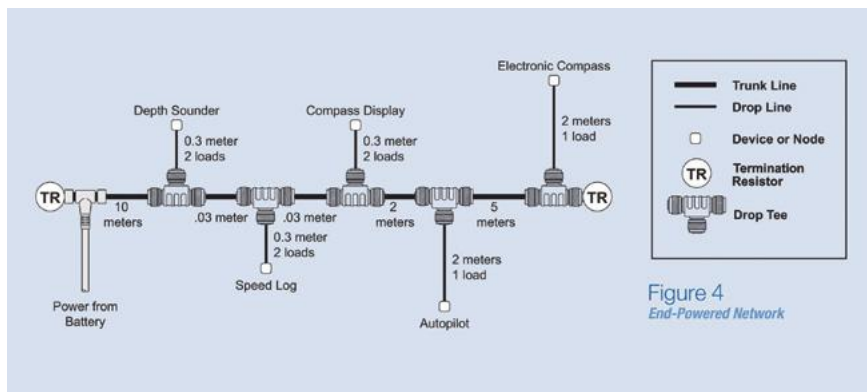


Figure 4  
End-Powered Network

### Middle-Powered Network

A middle-powered network is typically found on larger vessels and is any network where the power is connected to the network at some location other than at the end. This network consists of two legs, one leg extending in each direction from the power insertion point. Figure 5 shows a middle-powered network.

## Maximum Power Supply Voltage Drop

NMEA 2000 network is designed to work properly as long as there is no more than a 1.5 volt difference in the power supply voltage between any two devices on the network. Therefore, you should perform an estimate of the voltage drop across a network using the following equation:

$$\text{Voltage Drop} = 0.1 \times \text{Network Loads} \times \text{Network Length} \times \text{Cable Resistance}/100$$

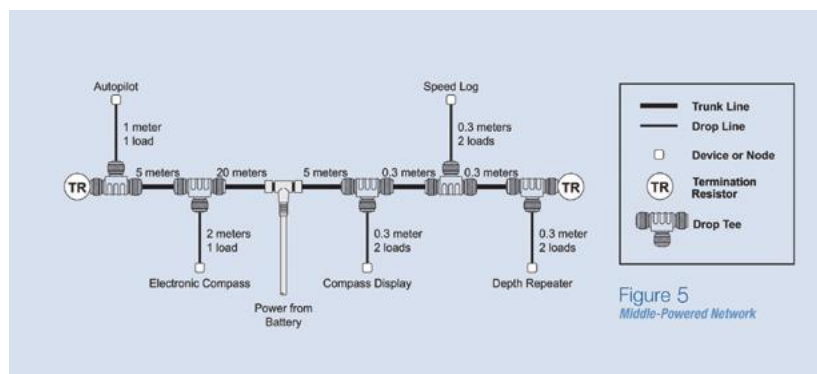
Where: Network Loads is sum of Load Equivalent Numbers (LEN) for all devices (see device nameplate) Network Length is in meters Cable resistance is in ohms/100 meters

Power supply voltage drop estimates resulting in less than 1.5 volts across the entire network require no further analysis. Likewise, estimates ranging between 1.5 and 3.0 volts require no further analysis as long as a mid-powered network is used. Occasionally, estimated power supply voltage drops will occur outside these limits and will require further consideration through detailed calculations by certified technicians.

## Checking Your Network

Verify that the network has been correctly designed and installed by reviewing the following checklist:

- ♦ Number of devices does not exceed 50
- ♦ Maximum Mini cable distance between any two devices does not exceed 200 meters (656 feet)
- ♦ Maximum Micro/Mid cable distance between any two devices does not exceed 100 meters (328 feet)
- ♦ Maximum cumulative drop line length does not exceed 78 meters (256 feet)
- ♦ No drop should be greater than 6 meters (20 feet)
- ♦ Termination resistors are installed on both ends of the trunk
- ♦ The network is grounded at a single location
- ♦ The SHIELD wire is connected to a single point, the supply ground



If you are having difficulties with the network make sure to check the following most common network problems:

- ♦ More or less than two terminating resistors
- ♦ Loose connections, make sure that all connectors are securely fastened
- ♦ Excessive trunk line length-especially with Micro cable
- ♦ Excessive drop line cable length
- ♦ Improper shield and ground connection at the power supply
- ♦ Shorts and opens in field-attachable connectors
- ♦ Failure to perform power distribution calculations for new installations and when adding new devices
- ♦ Using a typical device current rather than maximum current for power distribution calculations

In order to insure the proper installation and configuration of an NMEA 2000 network, it is a good idea to have available at least one N2KMeter. The N2KMeter\* greatly simplifies network diagnostics and can detect many fault conditions including:

- ♦ Opens and shorts
- ♦ Intermittent problems
- ♦ Incorrect topology
- ♦ Excessive scan rate
- ♦ Bad nodes & Bad termination
- ♦ Common mode voltage
- ♦ Improper shield connection

Note: The NMEA 2000 Network Installation Guide is a copy-righted document from the Maretron 2010 Product Catalog and has been approved by Maretron for use in the OctoPlex Installation & Operation Guide

\* See Maretron 2010 Product Catalog for N2KMeter information. [www.maretron.com](http://www.maretron.com)

The OctoPlex® System can be reset by removing power from all OctoPlex components. Tank Adapters receive their power directly from the network. These components can be reset by pulling out the breakers in the Network Power Supply to remove power from the bus. All other components receive their power from sources other than the network/bus. These components (DC Power Distribution Units, AC power Distribution Units, Battery Monitors, System Interface Unit Monitors, AC Power Monitor, Network Power Supply, Multi Function Displays) must have their power disabled by removing fuses or turning off the main breakers installed by the boat builder which supply their power.

## MULTI-FUNCTION DISPLAY

Symptoms	Possible Causes	Tests / Remedies
Multi-Function Display is blank	Multi-Function Display backlight is OFF	Touching any part of the display will “wake” the Multi-Function Display up.
	No AC or DC power reaching Multi-Function Display	Check to see if the fuse that is installed for the AC and/or DC source of the Network Power Supply is blown. Confirm that the boat’s main breakers for AC and/or DC power are turned ON.
	Network Power Supply thermal breakers are OFF or tripped	If the circuit breakers on the Network Power Supply are out than they are OFF or tripped. Push the breakers in to repower the network. If the breakers trip there is a problem which is overloading the Network Power Supply.
	Bad drop cable	If the cable is confirmed to be bad, replace it. Bad cables are often a result of wire tires forcing the cables into tight bends.
Multi-Function Display operation/ refresh rate is very slow	Communication problem	Reset the system by turning off all AC and DC power to the Power Supply, SIU, Battery Monitor, and DC Units. Cycle power on Multi-Function Display.
Multi-Function Display has locked up, does not respond when “touched”	<ol style="list-style-type: none"> <li>1. High network traffic</li> <li>2. Software malfunction</li> <li>3. Multi-Function Display hardware failure</li> </ol>	Reboot Touch Screen via reset button, removing network power or by disconnect/reconnecting CAN cables on the back of the unit simultaneously. Determine reason for high traffic rate. Replace Multi-Function Display.
Pages on the Multi-Function Display do not show any or correct data	Data source device is offline or not connected. Configuration file error.	Check device for power at the drop and connection to the network. Correct configuration file.
Multi-Function Display is rebooting by itself	Multi-Function Display power is cycling	Check network Power Supply and AC and DC sources.
Button for circuit breaker is white with a red ring	ECB is in an error state. Check ECB status for cause/reason	Use the config control on the TS page where the button is defined to access the ECB status display for the reason description.
No Audible Alarm (this was a repeat of previous above tests/results)	OK as is	OK as is
Cannot increase current rating for ECB via Touch Screen	ECB locations maximum current rating has been reached	ECB locations 1-8 can accommodate up to 30 Amps, locations 9-16 can accommodate up to 15 Amps. It is possible that the factory maximum current rating is lower than the 30 or 15 Amp limit. If the wiring is known to be capable of accommodating a higher current load, the factory current rating can be changed by an authorized field service engineer allowing the rating for the ECB to be increased.



**NOTE**

If the unit displays nothing or incorrect/ invalid data, verify the instance number is correct.

## AC POWER DISTRIBUTION UNIT

Symptoms	Possible Causes	Tests / Remedies
Multi-Function Display indicate AC breakers are inactive	Main breakers in AC Unit are turned OFF	If the main breaker within an AC Unit is OFF, all of the branch breakers in the unit will be inactive. Once the main breaker in the unit is turned ON (either manually or via the Multi-Function Display), the branch breakers will become active and controllable.
	Fuse on AC processor board blown	Fuse may require replacement.
	Faulty processor board in AC Unit	Processor board may require replacement. If it is an AC problem, solenoids should be checked for shorts between leads (proper resistance is ~78 Ohms for single and ~39 for double), which could damage AC processor board.
AC Distribution Unit Load Buttons do not respond to touch	AC power to the distribution unit is not present.	Check shore and/or genset input. Power Present lights on the upper right corner of unit will be ON if power is present.
	Solenoid not firing.	Measure resistance at plug ~70 Ohms. Swap Solenoids if bad
	Breaker trip Coil.	Swap breaker
	Processor board faulty.	Swap processor board
AC breakers do not appear to control circuits	Solenoid misfire / Faulty solenoid	It is possible that an AC breaker did not turn completely on when solenoid was activated. Attempt to turn the AC breaker on again, if AC breaker repeatedly trips or does not turn on when activated, check solenoid for problems. Wiring to solenoid could be faulty or fasteners holding solenoid in place could be faulty. Resistance between leads of solenoid should be ~78 ohms for single, and ~39 for double solenoids.
AC breakers trip immediately when turned on regardless of load	Solenoid not firing completely or breaker stiff	Check all solenoid connectors on the AC box in question to confirm their proper location.
	Improper Touchscreen configuration	Refer to ONC Operation Manual.

## NETWORK POWER SUPPLY

Symptoms	Possible Causes	Tests / Remedies
Network Power Supply Service Light	Input voltage is out of range Low or High	Check voltages at the input plug. Remove/replace the top Deutsch connector (AC input)
	Internal input to output out of range	
	Internal failure detected.	Call service center.



**NOTE**

If the unit displays nothing or incorrect/ invalid data, verify the instance number is correct.

## DC POWER DISTRIBUTION UNIT

Symptoms	Possible Causes	Tests / Remedies
Multi-Function Display indicate DC breakers are inactive	No DC power reaching DC Unit	If no DC power is reaching the DC Unit, the breakers can not be turned on from the Multi-Function Display and will be displayed as inactive. Check to ensure that the boat's main DC breakers are ON. There is also a main breaker within the DC Unit, if it is OFF, all of the branch breakers in the unit will be inactive. Once the main breaker in the unit is turned ON (must be done manually), the branch breakers will become active and controllable.
	Improper Multi-Function Display configuration	Refer to ONC Operation Manual.
	Faulty processor board in DC Unit	Try removing ECB's from unit and replacing with known working ECB's to eliminate the possibility of a bad ECB causing a communication problem.
DC Breakers trip immediately when turned on regardless of load.	ECB current rating too low	Check the configuration of the ECB to confirm that the current rating is properly set. Adjust if necessary.
	Faulty ECB Short Circuit in external wiring	Attempt swapping out the suspect ECB with a known good ECB. If the problem is resolved, the ECB is faulty and needs to be replaced. Remove round Deutch plugs at bottom of box & reset breaker if fault disappears check circuit for short.
DC Distribution Unit Phantom Breaker tips	Low input power voltage to unit < 9VDC	Check Input voltage at power input lug to DC Unit.
DC Load Device low voltage/slow behavior	ECB may have dimming applied	Check output voltage at pin Check TS ECB button for present settings of Default Dimming value and dimming allowed.

## BATTERY MONITOR

Symptoms	Possible Causes	Tests / Remedies
Battery Monitor displays no data or incorrect data	No DC power reaching Battery monitor	The Battery Monitor requires DC power to operate. Check to see that battery monitor is connected/wired properly. The blue wire must be connected to 12/24VDC. The black wire must be connected to Ground
	Bad drop cable	If the cable is confirmed to be bad, replace it. Bad cables are often a result of wire tires forcing the cables into tight bends.
	Improper wiring of Battery Monitor	Refer to Battery Monitor setup.



**NOTE**

If the unit displays nothing or incorrect/ invalid data, verify the instance number is correct.

## SYSTEM INTERFACE UNIT MONITOR (SIU)

Symptoms	Possible Causes	Tests / Remedies
SIU inputs do not behave as expected (monitoring and/or discrete inputs controlling breakers)	No DC power reaching SIU	The SIU requires DC power to operate, it does not receive power from the network. Check to see that the SIU is connected/ wired properly. Pin 1, 2, or 3 must be connected to and receiving 24VDC. Pin 8, 9, or 10 must be connected to Ground.
	SIU is not installed properly or miswired	The SIU requires DC Power and Ground to operate correctly. The signal inputs should use the same reference (DC Power or Ground) as what is being used to power the SIU.
	Improper Multi-Function Display configuration	Refer to ONC Operation Manual.

## AC POWER MONITOR

Symptoms	Possible Causes	Tests / Remedies
AC Monitor displays no data or incorrect data	No AC power reaching AC monitor	The AC Monitor requires an AC voltage for the line 1/J3 connector. It does not receive power from the network. Check this connector to see that an AC voltage is being supplied.
	Bad drop cable	Use the suspected component with only one drop cable connected at a time. If one of the cables appears to be bad, attempt using the good cable on the other connector to confirm that the cable is the problem and not one of the component's connectors. If the cable is confirmed to be bad, replace it. Bad cables are often a result of wire tires forcing the cables into tight bends.
	Improper wiring of AC Monitor or Current Transformers	Refer to Multi-Function Display setup.



**NOTE**

If the unit displays nothing or incorrect/ invalid data, verify the instance number is correct.

## NMEA 2000® Parameter Group Numbers

PGN Type	PGN #	PGN Name
Protocol PGNs	059392	ISO Acknowledge
	059904	ISO Request
	060928	ISO Address Claim
	056240	ISO Address Command
	126208	NMEA Request/Command/Acknowledge
Response PGNs	126464	PGN List (Transmit/Recieve)
	126996	Product Information
	126998	Configuration Information
	127508	Battery Status (Battery Monitor only)*
Periodic PGNs	127501	Binary Switch Bank Status **
Proprietary PGNs	61184	Addressable Single Frame
	65300	Global Single Frame
	126720	Addressable Fast Packet
	130921	Global Fast Packet
	65301	Global Single Frame (AC Monitor only)

\* multiple device and data instances per unit for the Battery Monitor

\*\* multiple device and data instances per unit for the System Interface Unit Monitor

## Switch / Breaker Button Indicators

OctoPlex Switch/Breaker Buttons are displayed as indicators with a pre-defined color scheme. Touching a Breaker button will change the state of the load.

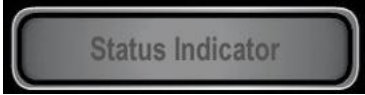



Color Code Guide	Breaker Status	Description
	ECB Not Active; Unavailable	This is an ECB that is currently not active. The distribution panel is most likely not receiving any DC power or the distribution panel's main breaker is in the OFF position (DC Only).
	ECB Active; OFF	This is an ECB that is active, but currently in the OFF position. Pressing the button will turn the ECB ON (DC Only).
	ECB Active; ON	This is an ECB which is active and currently in the ON position. Pressing the button will turn the ECB OFF (DC Only).
	ECB Active; TRIPPED	This is an ECB which is active and currently in the ON position. The blue text indicates that the breaker is turned ON but there is little or no current being drawn (DC Only).
	ECB Active; Locked OFF	This is an ECB that is active, but has been tripped by an over-current situation. Pressing the button will bring will reset the breaker, and then turn the breaker back ON with an additional press (DC Only).
	ECB Active; Locked ON	This is an ECB that is active, but has been tripped by an over-current situation. Pressing the button will bring will reset the breaker, and then turn the breaker back ON with an additional press (DC Only).
	ECB Active; Group OFF	This is an ECB that is in an Error State. Use the Config function for the button to gain access to the breaker status page which will indicate the actual error reason (DC Only).
	AC Breaker, Not Active	This is an AC Breaker which is currently not active. The distribution panel is most likely not receiving any AC power or the distribution panel's main breaker is in the OFF position.
	AC Breaker, Active, OFF	This is an AC Breaker which is active, but currently in the OFF position. Pressing the button will turn the breaker ON.
	AC Breaker, Active, ON	This is an AC Breaker which is active and currently in the ON position. Pressing the button will turn the AC Breaker OFF.
	AC Breaker, Active, Tripped	This is an AC Breaker which is active, but has been tripped by an over-current situation. Pressing the button will reset the AC Breaker, which can then be turned back ON with an additional press.
	Active; Locked OFF	This is an AC or DC breaker (ECB) that has been locked in the OFF position. The 'unlock' button can be used to unlock this breaker.
	Active; Locked ON	This is an AC or DC breaker (ECB) that has been locked in the ON position. The 'unlock' button can be used to unlock this breaker.

\*Manufacturer reserves the right to change product specification without prior notice.

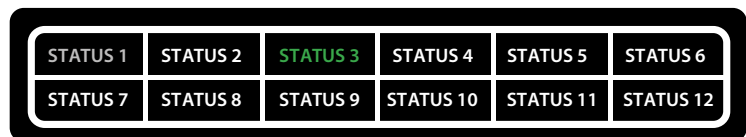


## Status Indicators










Status Indicators are indicators that appear on the bottom of the screen or on selected pages. These are NOT buttons that the user can acknowledge; they are status indications from the System Interface Unit Monitor (SIU) that are transmitted on the OctoPlex® system.

Color Code Guide	Breaker Status	Description
	Inactive	This is a system status indication that is currently inactive.
	Active; OFF	This is a system status indication that is currently active, but is not ON or in an alert condition.
	Active; ON	This is a system status indication that is currently active, and is ON.
	Active; ALERT	This is a system status indication that is currently active, and is in an alert condition.

The display on the right is commonly found at the bottom of each page in the Touchscreen. In this situation, STATUS 1 is inactive, STATUS 2 is active but 'off', STATUS 3 is active and 'on'. All others are active and 'off'.



## General Button Indicators

Color Code Guide	Breaker Status	Description
	Lock	This button is used to lock breakers in either the ON or OFF position. Press once to put the display in "LOCK" mode, then press any breakers to be locked. Press again to place the display back into a normal mode of operation. Locked breakers will have a yellow border.
	Unlock	This button is used to unlock breakers. Press once to put the display in "UNLOCK" mode, then press any breakers to be unlocked. Press again to place the display back into a normal mode of operation. Locked breakers will have a yellow border.
	Dim	This button is used to dim DC breakers from the Touchscreen (if enabled). Press the DIM button, then press the breaker to be dimmed. A '+' and '-' button will be displayed allowing the breaker to be dimmed up or down.
	Configuration	This button allows a user to view and/or change (if enabled) the settings of an AC or DC breaker. Pressing the button, and then pressing a breaker button will display the breakers settings. A password may be required.
	ECB Active; Locked OFF	Pressing this button will cause the Touchscreen to ignore "touches" for approximately 10 sec to allow the screen to be cleaned without inadvertently turning breakers OFF or ON.
	ECB Active; Locked ON	Pressing this button will select a page which provides diagnostic tools for basic troubleshooting of the network.
	ECB Active; Group OFF	Pressing this button will turn the backlight OFF in the Touchscreen. Touching any part of the screen will turn the backlight ON.
	AC Breaker, Not Active	Pressing this button will decrease the brightness of the screen for night time viewing
	AC Breaker, Active, OFF	Pressing this button will increase the brightness of the screen for day time viewing.

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