

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



NOTE

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)

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



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

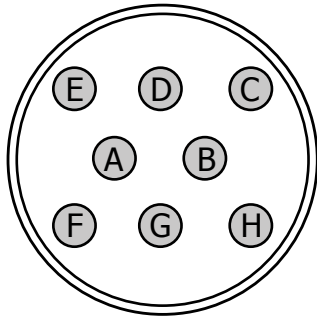


CAUTION!

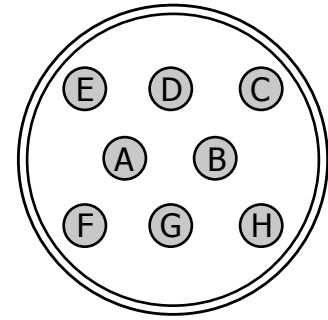
The recommended crimp tool for the solid contact is HDT-48-00. Refer to www.laddinc.com/product/?sku=HDT-48-00 for proper use and instructions on using this tool. The recommended crimp tool for the stamped contacts is, Deutsch DTT-12-00. Refer to www.laddinc.com/product/?sku=DTT-12-00 for proper use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

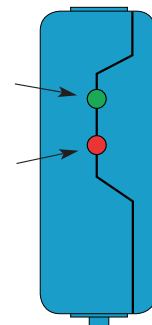
Operation

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



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

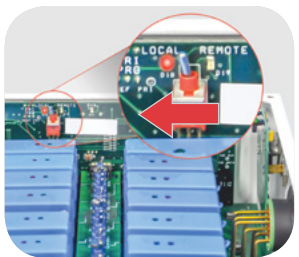
All ECB's can be controlled directly from the DC Power Distribution Unit (overriding/bypassing network control from the Multi-Function Display(s)). If it's installed upright (all connectors on the bottom), the main breaker is in the lower left corner of the Unit. Follow the instructions below for using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



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



Step #1:
Remove cover to DC Power Distribution Unit.



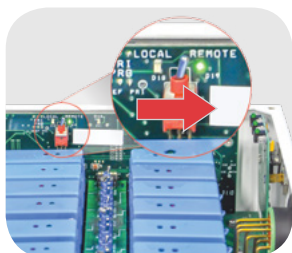
Step #2:
Place the toggle switch located on the board along the left side of the panel to the up position. A Red LED will light up indicating that the panel is in local or "override" mode.

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:



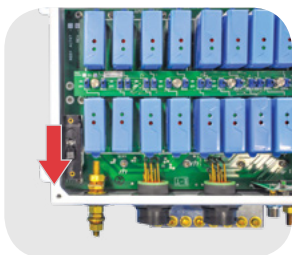
WARNING!

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!

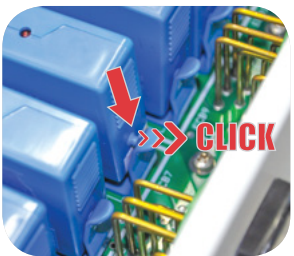
Verify that the middle LED (power present) is OFF before proceeding or damage to the unit may occur.

ECB Replacement (continued)



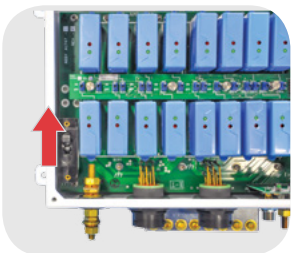
Step #3:

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.

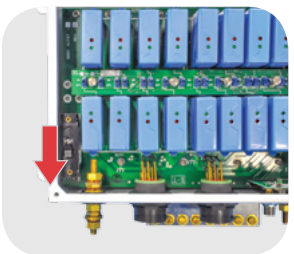
Fuse Replacement

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:

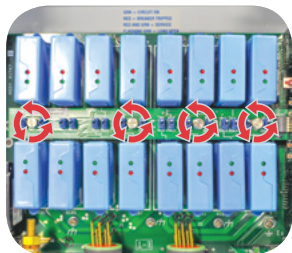
Turn off the Main Breaker (lower left corner of the unit) to the DC Power Distribution Unit.



WARNING!

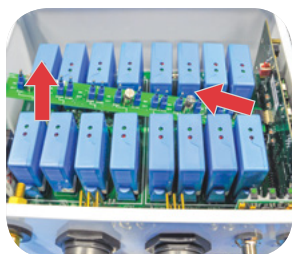
Verify that the middle LED (power present) is OFF before proceeding or damage to the unit may occur.

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.)



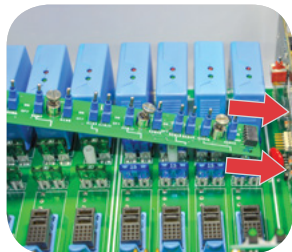
Step #3:

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.



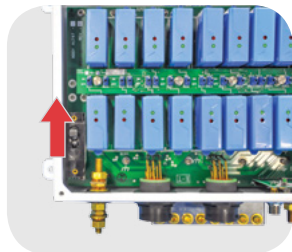
Step #4:

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

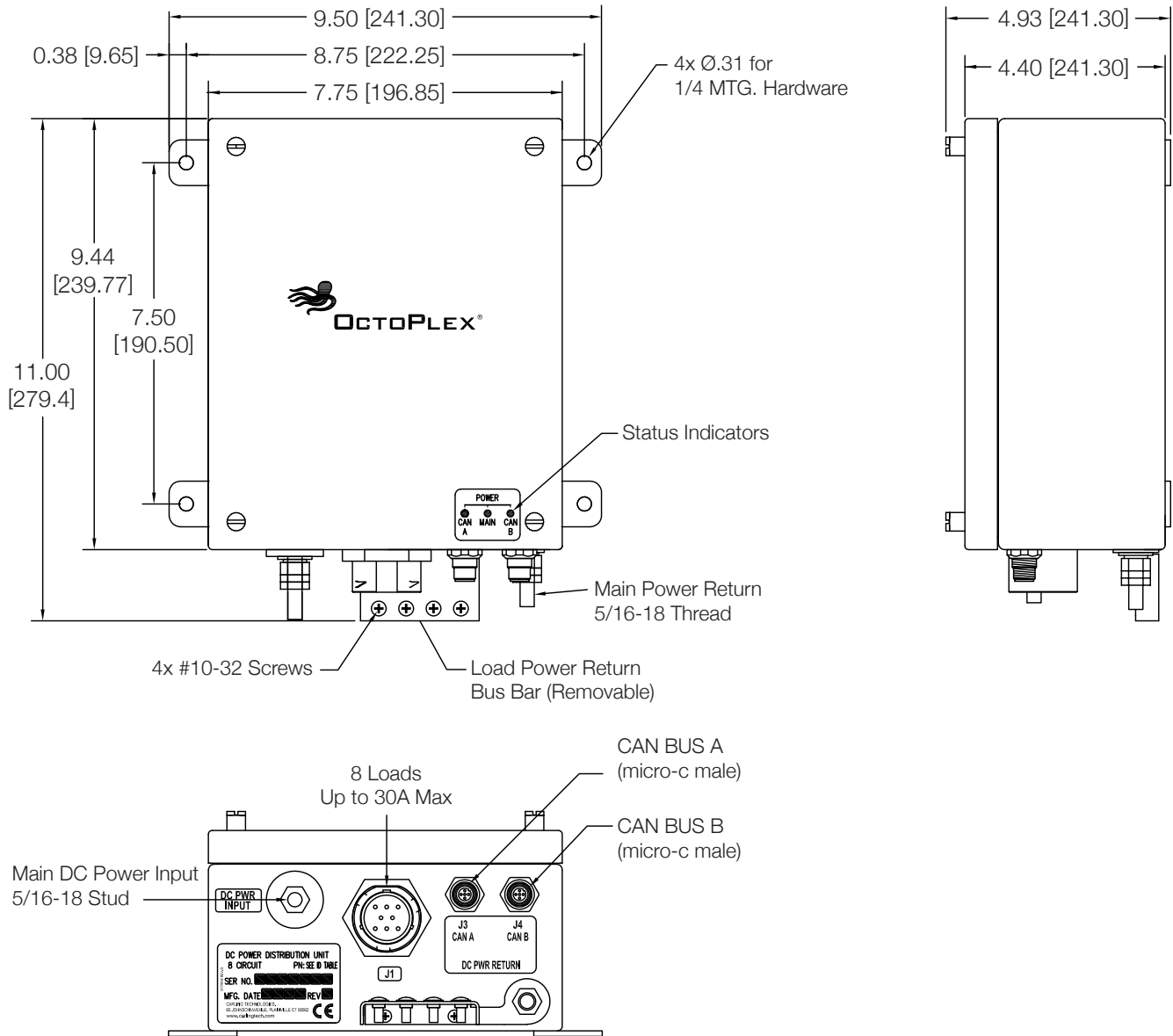
NMEA 2000	Category B
Lloyd's Register	Lloyd's Type Approved, Test Specification #1, Env 2
CE	IEC 60533 Electrical and Electronic Installations in Ships IEC 60945 Maritime Navigation and Radio Communication Equipment and Systems

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

