AC Power Distribution Unit

The AC Power Distribution units provide the boat builder with up to 8, 13 or 19 remotely controlled hydraulic-magnetic circuit breakers in one package that can be mounted in virtually any dry areas of 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.

Product Highlights

(8 Position Unit)

- 50 Amps Maximum Capacity
- Remote Actuation of Breakers
- Dual CAN BUS Communication

(13/19 Position Unit)

- 100 Amps Maximum Capacity
- Remote Actuation of Breakers
- Dual CAN BUS Connection/Communication
- Three Phase Power Capability; 120/208VAC or 230/415VAC

PRODUCTS

PART NUMBER [1]	DESCRIPTION	NUMBER OF POSITION [2]		
		8	13	19
A3000-X-1	AC Power Distribution Unit - 120V (No Main Breaker)	X	X	X
A3000-X-1M	AC Power Distribution Unit - 120V (With Main Breaker)	X	X	X
A3000-X-2	AC Power Distribution Unit - 120/240V (No Main Breaker)	X	X	X
A3000-X-2M	AC Power Distribution Unit - 120/240V (With Main Breaker)	X	X	X
A3000-X-3	AC Power Distribution Unit - 120/208V (No Main Breaker)	N/A	X	X
A3000-X-3M	AC Power Distribution Unit - 120/208V (With Main Breaker)	N/A	X	X
A3000-X-4	AC Power Distribution Unit - 230V Single Pole (No Main Breaker)	X	X	X
A3000-X-4M	AC Power Distribution Unit - 230V Single Pole (With Main Breaker)	X	X	X
A3000-X-5	AC Power Distribution Unit - 230V Double Pole (No Main Breaker)	X	X	X
A3000-X-5M	AC Power Distribution Unit - 230V Double Pole (With Main Breaker)	X	X	X
A3000-X-6	AC Power Distribution Unit - 230/415V (No Main Breaker)	N/A	X	X
A3000-X-6M	AC Power Distribution Unit - 230/415V (With Main Breaker)	N/A	X	X

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

Configuration

Configuration of an OctoPlex® AC Unit and its associated functions can be performed running running a licensed version of N2K Analyzer on a computer with a CAN interface. Consult the N2K Analyzer User's Guide for complete details on adjusting configurable parameters. AC box configuration settings are initially loaded and controlled with the N2K Analyzer utility and contained in xml Files. The parameters below can be modified by using the Multi-Function Display.

N2K Analyzer Configuration Parameters

SPECIFICATIONS

PARAMETER	SETTING	DESCRIPTION
Default State	ON, OFF, Last State	Circuit breaker state on network power up
Default Lock State	Locked or Unlocked on Network Power up	Lock state on network power up
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

CAUTION!

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

Breaker Slot / Official 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 and 230/415V 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 TRIPLE POLE
8 Position	8	4	N/A
13 Position	13	6 (plus 1 SP)	4 (plus 1 SP)
19 Position	19	9 (plus 1 SP)	6 (plus 1 SP)

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.

NOTE

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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 N2K Analyzer.

Discrete I/O	Description
Off & Lock	Turn AC Breaker OFF and Lock in OFF position
Always Turn On	Turn AC Breaker ON but does not turn breaker OFF
Always Turn Off	Turn AC Breaker OFF but does not turn breaker ON
Toggle On/Off	Toggle the state of the AC Breaker

AC Breaker Assignment Considerations

The relationship between the AC units physical breaker positions, the main breaker type & the load breaker assignment (Single Pole, Double Pole, Three Pole) must be taken into consideration & assigned accordingly to the Multi-Function Display AC Unit configuration. The table below illustrates this relationship.

UNIT BREAKER POSITION	SINGLE POLE	GROUP	LINE	DOUBLE POLE	GROUP	LINE	THREE POLE	GROUP	LINE
1	Main L1	32	L1	Main L1	32	L1	Main L1	32	L1
2	Load 1	1	L1	Main L2	32	L2	Main L2	32	L2
3	Load 2	2	L1	Load 1	1	L1	Main L3	32	L3
4	Load 3	3	L1	Load 2	2	L2	Load 1	1	L1
5	Load 4	4	L1	Load 3	3	L1	Load 2	2	L2
6	Load 5	5	L1	Load 4	4	L2	Load 3	3	L3
7	Load 6	6	L1	Load 5	5	L1	Load 4	4	L1
8	Load 7	7	L1	Load 6	6	L2	Load 5	5	L2
9	Load 8	8	L1	Load 7	7	L1	Load 6	6	L3
10	Load 9	9	L1	Load 8	8	L2	Load 7	7	L1
11	Load 10	10	L1	Load 9	9	L1	Load 8	8	L2
12	Load 11	11	L1	Load 10	10	L2	Load 9	9	L3
13	Load 12	12	L1	Load 11	11	L1	Load 10	10	L1
14	Load 13	13	L1	Load 12	12	L2	Load 11	11	L2
15	Load 14	14	L1	Load 13	13	L1	Load 12	12	L3
16	Load 15	15	L1	Load 14	14	L2	Load 13	13	L1
17	Load 16	16	L1	Load 15	15	L1	Load 14	14	L2
18	Load 17	17	L1	Load 16	16	L2	Load 15	15	L3

18 Single Pole slots available

Double Pole uses 2 positions

Single Pole uses 1 position
Double Pole uses 2 positions
Three Pole uses 3 positions

NOTE

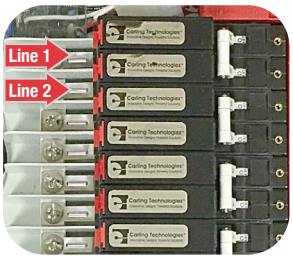
[illegible]

AC Main Circuit Breaker Installed - Unit Configurations

There are three distinct AC Distribution Unit 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 Units.

1. Single Phase 120VAC or Euro 230VAC
2. Single Phase Dual Line 120/240VAC
3. Three Phase 120/208VAC or 230/415VAC

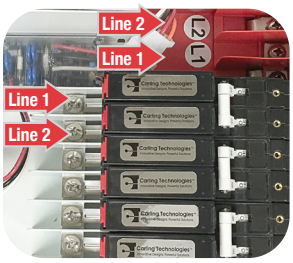
Single Phase 120VAC or Euro 230VAC: Line Bus Bars 1 and 2 are connected together at the factory using a bus bar jumper.



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.

Three Phase 120/208VAC or 230/415VAC: Line Bus Bars 1, 2 and 3 are brought into the box separately allowing for single, double or three 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.

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 or 230/415VAC) 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 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

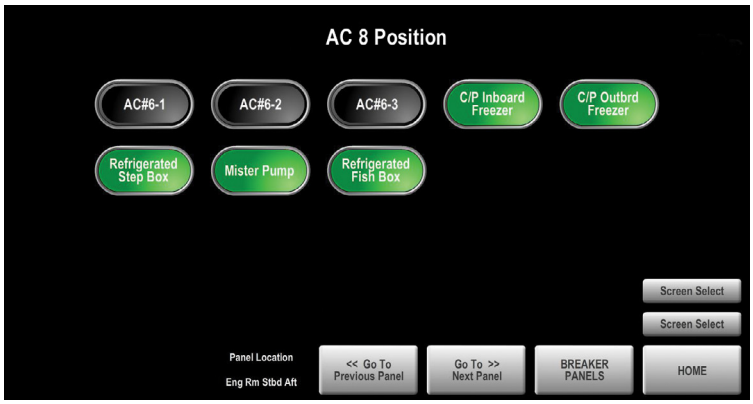
Use the shortest drop length possible when connecting the AC Unit to the CAN backbone. NMEA2000® spec is maximum 6 meters for drop cables.

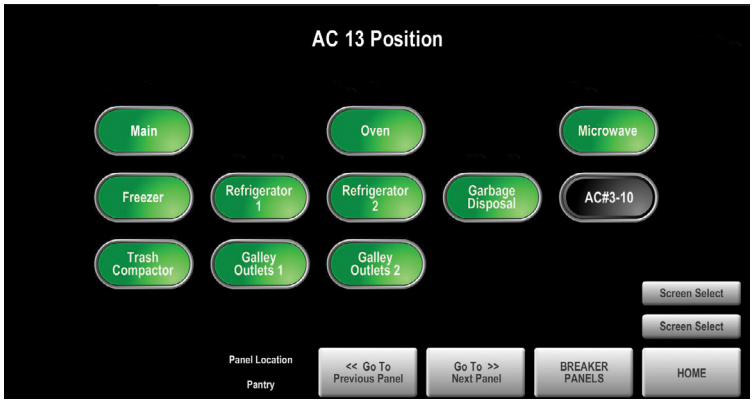
Operation

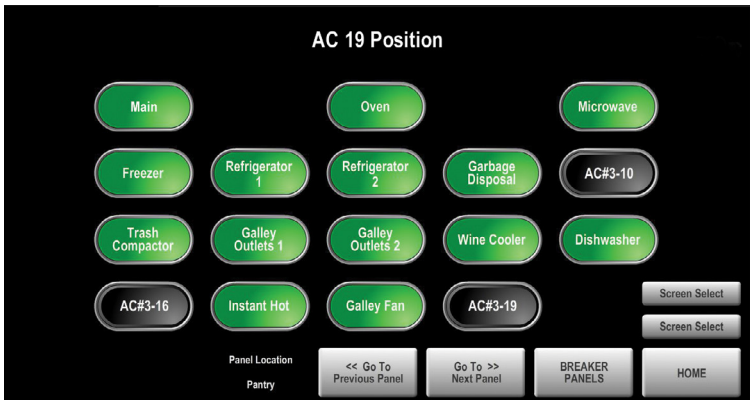
Depending on the AC Unit power configuration, 120VAC, Single 240VAC (Euro), dual 120/240VAC or three phase (120/208VAC or 230/415VAC), there are two groups of up to three LED's visible through the cover of the AC Power Distribution Unit. These LEDs signify that AC power is present inside the unit ("Power In") and after the Main breaker ("Power Out"). 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.

Standard AC Power Distribution Unit Screen Layouts

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). For breaker status flags, refer to the appendix page.







NOTE

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

CAN LEDs

The two LEDs labeled “BUS A” and “BUS B” indicate the status of their respective CAN buses, flashing approximately once a second which also serves as a “Heartbeat” indicator from the onboard processor. The possible colors, and their meaning are:

LED COLOR	DESCRIPTION
Flashing Green	Bus is healthy
Flashing Orange	Bus has transmit or receive data errors, but is still usable

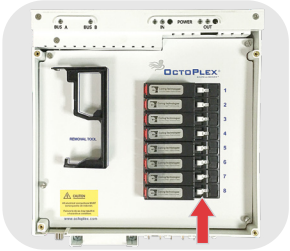
AC Processor Protection Circuit

The AC Distribution Unit contains electronics (TVSS) that protect the AC Processor Board from transient voltages and surges; it does not protect the Line Voltages supplied by the AC breakers. The TVSS is mounted inside the AC Distribution Unit near the AC Processor Board. Two (2) keyed connectors connect the TVSS to the input voltage and to the AC Processor Board. A green indicator LED inside the TVSS is lit when all line voltages are present and the TVSS is operating and protecting the AC Processor Board; the case of the TVSS is clear plastic so that the indicator LED can be seen from any angle. The Indicator LED will turn off if the TVSS is at the end of life (provided that all line voltages are present). A TVSS that is at end of life will not compromise the protection of the AC Unit electronics, but could cut off AC power to the electronics if not replaced before exposure to more transients and surges. It is highly recommended to replace the TVSS as soon as possible when end of life is reached.

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.

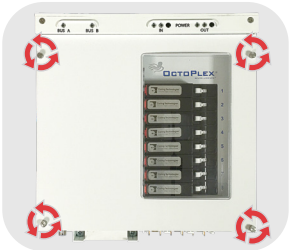
Breaker Replacement

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:

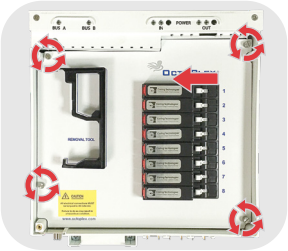
WARNING!

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

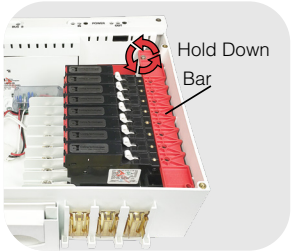
Step #1:
Turn off the main power feeding the AC Power Distribution Unit at the source. Turn all breakers to OFF position. Do not remove the front panel if the LED's are lit (indicating that AC power is being provided to the panel).



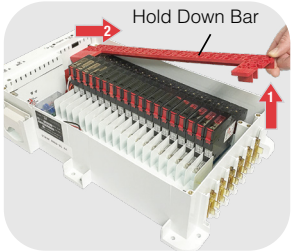
Step #2:
Remove front cover by unscrewing the four slotted-head screws located at the corners. Once the screws are removed, the front cover can be lifted straight up and away.



Step #3:
Turn the main AC breaker to the OFF position, if configured.
Remove sub-cover by unscrewing the four slotted-head screws located at the corners. Once the screws are removed, the sub-cover can be lifted straight up and away.

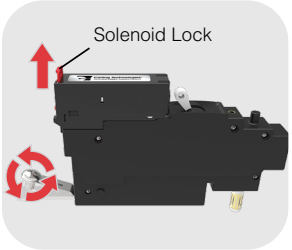


Step #4 (For 8 Position):
Remove the circuit breaker hold down bar by unscrewing the phillips-head screw at the top of the bar. Once the screw is loosened, the hold down bar can be lifted straight up and away.

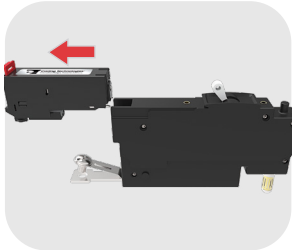


Step #4 (For 13 & 19 Position):
Remove the circuit breaker hold down bar by unscrewing the phillips-head screw at the **bottom** of the bar. Once the screw is loosened, lift the bottom of the bar straight up and pull the bar out of the slot at the top.

Breaker Replacement (continued)



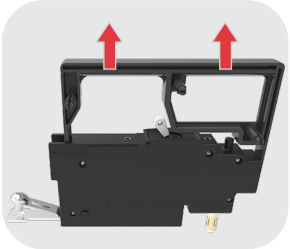
Step #5:
Locate and pull up on the red colored solenoid lock.
Remove load terminal connection by unscrewing the load terminal screw



Step #6:
Slide the solenoid away from the circuit breaker as shown.

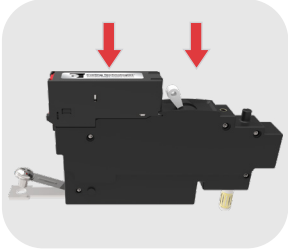
Step #7:
Position the Removal Tool and insert hook into circuit breaker slot as shown.

Step #8:
Once the Removal Tool hook is inserted in the circuit breaker slot, snap the other side down to secure the connection to the circuit breaker.



Step #9:
The circuit breaker can now by removed by pulling the Removal Tool straight up and away from the AC enclosure.

Note: The Removal Tool is only used to remove the circuit breaker. You cannot install the breaker with the Removal Tool.

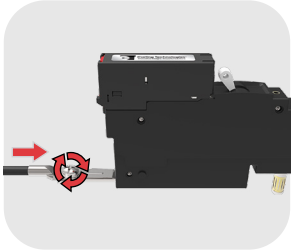


Step #10:
Ensure that the replacement circuit breaker actuator is in the OFF position with solenoid installed and the solenoid tab in the locked position. Position breaker above slot, push straight down until the circuit breaker is in its full seated position.

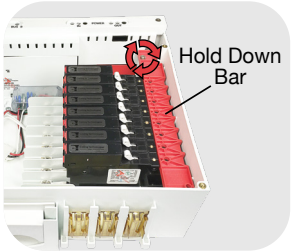
WARNING!

Make sure main power feeding the AC Power Distribution Unit at the source is

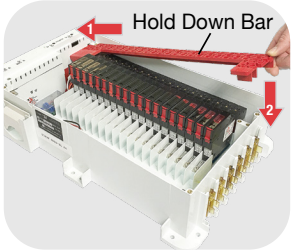
Breaker Replacement (continued)



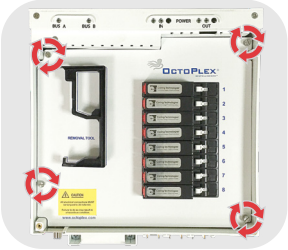
Step #11:
Install load wire ring terminal to circuit breaker as shown.



Step #12 (For 8 Position):
Re-Install the circuit breaker hold down bar by placing it as shown and screwing the phillips-head screw at the **top** of the bar.



Step #12 (For 13 & 19 Position):
Re-Install the circuit breaker hold down bar by pushing the top of the bar into the slot of the unit and then pushing the **bottom** of the bar down. Screw the phillips-head screw at the bottom of the bar.



Step #13:
Re-Install the sub-cover by screwing the four slotted-head screws located at the corners. Turn the main AC breaker to the ON position.

Step #14:
Re-Install the front cover by screwing the four slotted-head screws located at the corners. Turn the main power feeding the AC Power Distribution Unit at the source to the ON position.

WARNING!

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.

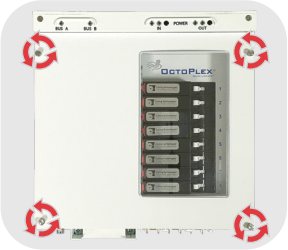
CAUTION!

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.

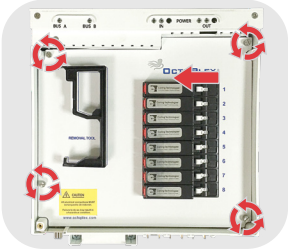
AC Processor Protection Circuit Replacement

Electric Shock RISK

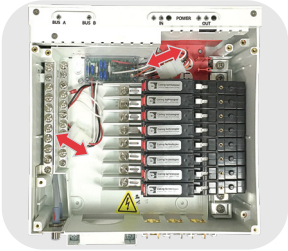
Step #1:
Turn off the main power feeding the AC Power Distribution Unit at the source. Turn all breakers to OFF position. Do not remove the front panel if the LED's are lit (indicating that AC power is being provided to the panel).



Step #2:
Remove front cover by unscrewing the four slotted-head screws located at the corners. Once the screws are removed, the front cover can be lifted straight up and away.



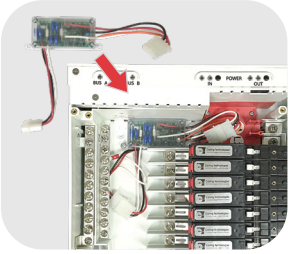
Step #3:
Turn the main AC breaker to the OFF position, if configured.
Remove sub-cover by unscrewing the four slotted-head screws located at the corners. Once the screws are removed, the sub-cover can be lifted straight up and away.



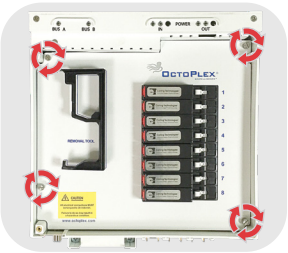
Step #4:
Locate the input and output connectors of the TVSS and pull them apart.

Step #5:
Remove the two (2) screws holding the TVSS to the AC Unit case and remove the old TVSS.

AC Processor Protection Circuit Replacement (continued)



Step #6:
Install new TVSS connecting the input and output connectors and reinstall the two (2) screws.



Step #7:
Re-Install the sub-cover by screwing the four slotted-head screws located at the corners. Turn the main AC breaker to the ON position.

Step #8:
Re-Install the front cover by screwing the four slotted-head screws located at the corners. Turn the main power feeding the AC Power Distribution Unit at the source to the ON position.

CAUTION!

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.

Tech Specs

ELECTRICAL

Operating Voltage, Power Input	
(Single Phase)	120VAC; Euro 230VAC
(Double Phase)	120/240VAC
(Three Phase)	120/208VAC; 230/415 VAC
CAN Bus Operating Voltage	9 VDC – 16 VDC, 15 VDC Nominal

MECHANICAL

Dimensions	12.36” X 11.63” X 4.98”
Dimensions	20.66” X 13.39” X 4.98”
CAN Bus Connectors	Two (2) Micro-C Male
CAN A Bus LED Indicator	Green / Red
CAN B Bus LED Indicator	Green / Red
MAIN Power In Indicator	Green (3)
MAIN Power Out Indicator	Green (3)
8 Position Mounting	4 each
19 Position Mounting	10 each

CERTIFICATIONS

NMEA 2000	Category B
Lloyd’s Register	Lloyd’s Type Approved, Test Specification #1, Env 2

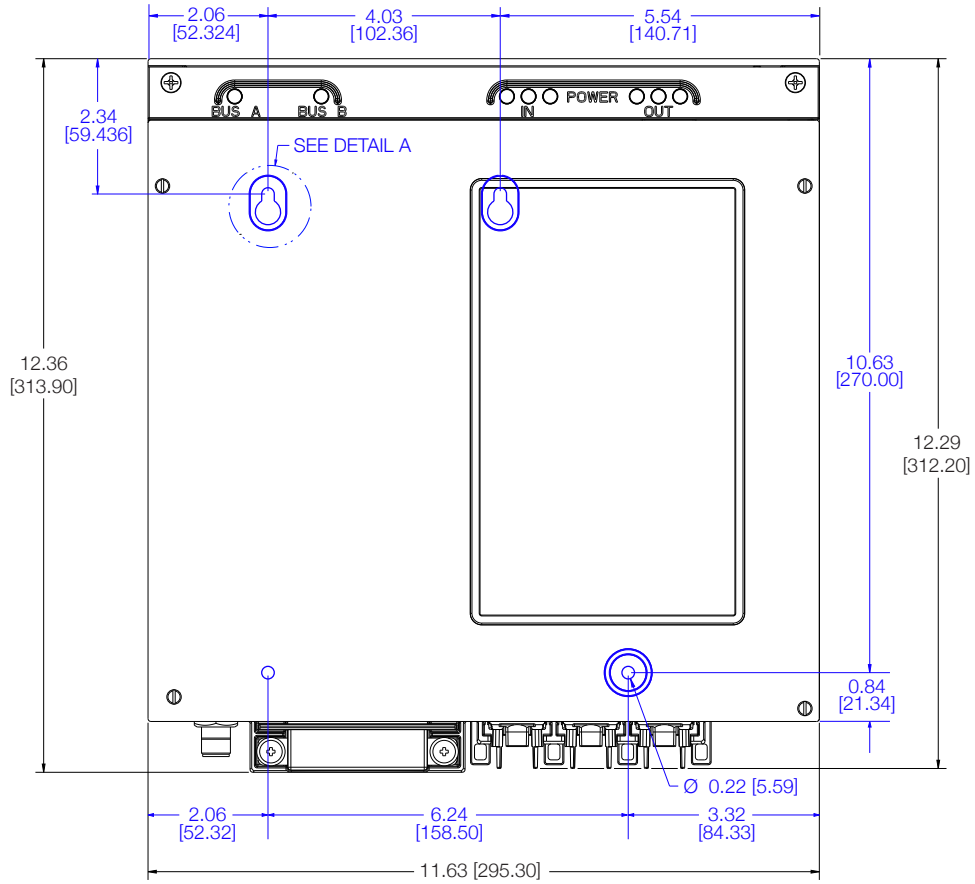
ENVIRONMENTAL

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

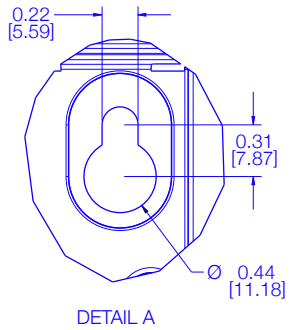
Dimensional Specs in. [mm]

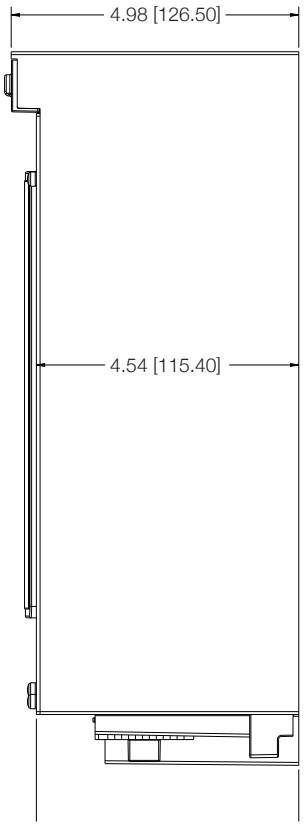
8 Circuit AC Power Distribution Unit

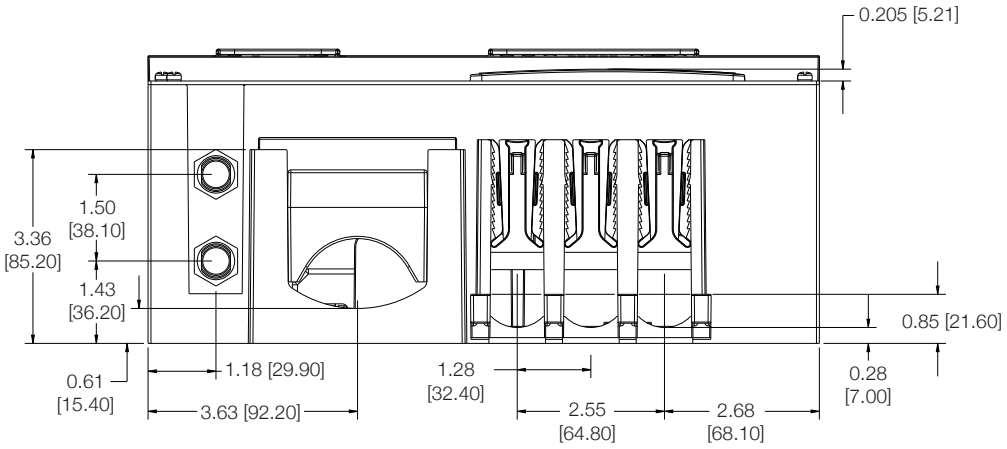
A3000-08-[ ]



Mounting Dimensions shown in Blue represented underneath cover.

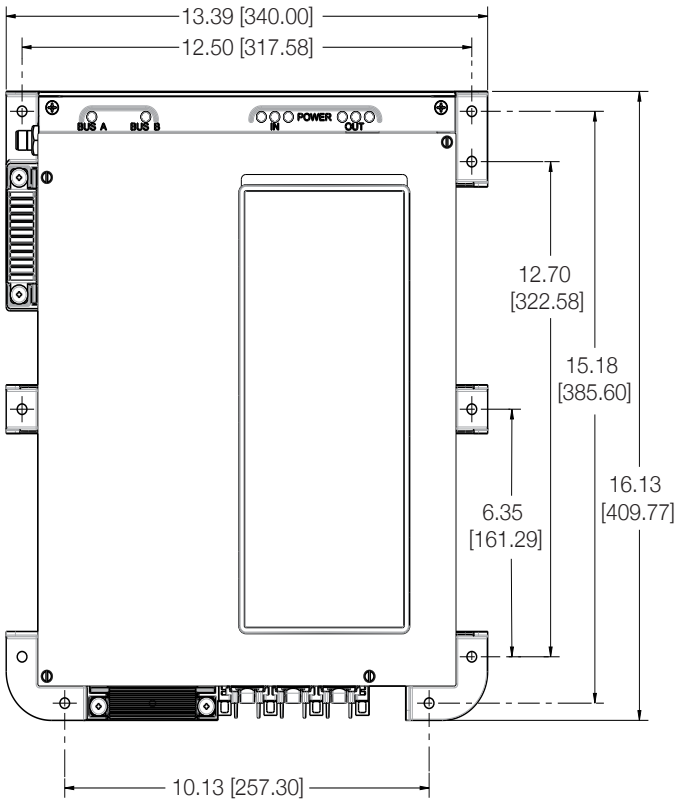


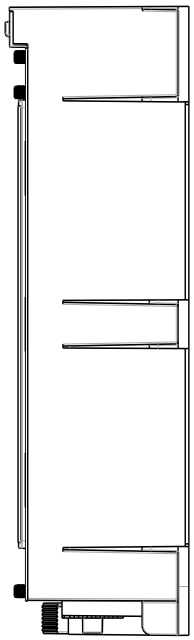


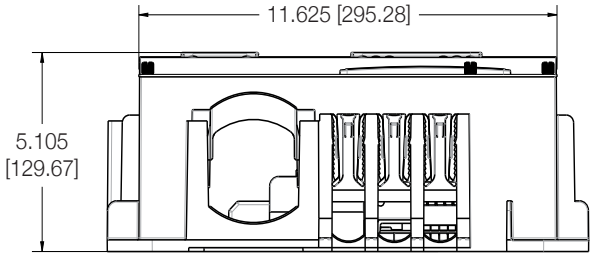


Dimensional Specs in. [mm]

13 Circuit AC Power Distribution Unit
A3000-13-[ ]







Dimensional Specs in. [mm]

19 Circuit AC Power Distribution Unit

A3000-19-[ ]