SPOT & BOSS BOX – V2: User Manual

Alencon Systems Integrated Form Factor for Paralleling Multiple SPOT or BOSS units in an Outdoor Rated Container.

Alencon Systems – Passionate About Power

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2 General Information

All efforts have been made to ensure the accuracy of material provided in this document at the time of release. Items are subject to continuous development and improvements. All specifications and descriptions are subject to change without notice.

2.1 Purpose

This manual provides information about installing, operating, maintaining, and troubleshooting the Alencon BOX device.

Who Should Read this Manual?

This manual should be read by anyone who needs to:

- Understand the product
- Plan the installation
- Install the product
- Commission the product
- Operate the product
- Maintain the product, if necessary

2.2 Product Warranty

Alencon Systems warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for three years from the date of delivery. Extended warrantees of an additional five (5), ten (10) and twenty (20) years are also available for purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Alencon System, or which have been subject to misuse, abuse, accident, or improper installation. This warranty does not cover the repair or replacement of any goods which fail as a result of damage in transit, misuse, neglect, accident, Act of God, abuse, improper handling, misapplication, modification, improper storage, excessive stress, faulty or improper installation, testing or repair, negligent maintenance, or failure to comply with the written instructions for installation, testing, use or maintenance (if any) provided by Alencon Systems. Alencon Systems assumes no liability under the terms of this warranty as a consequence of such events.

Because of Alencon Systems' high quality-control standards and rigorous testing, most of our customers never need to use our warranty service. If an Alencon Systems product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult Alencon Systems for more details. If you think you have a defective product, follow these steps:

- Collect all the information about the problem encountered. (For example, issues you are encountering in your PV array) Note anything abnormal when the problem occurs.

- Call Alencon Systems or your licensed Alencon Systems dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
- If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from Alencon Systems. This allows us to process your return more quickly.
- Carefully pack the defective product (preferably in the original packaging material it was shipped in), a fully completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

For more information on the Terms and Conditions request the Alencon Standard Warranty Document

2.3 Warnings, Cautions, and Notes

	***Warning!***	*Warnings indicate conditions, which if not observed, can cause personal injury!*
	***Caution!***	*Cautions are included to help you avoid damaging hardware or losing data.*
	***Note!***	*Notes provide optional additional information.*

2.4 Packing List

In most cases, to minimize carbon impact of shipping as well as cost, the BOX enclosure ships direct from the cabinet manufacturer to the customer's designated site. The SPOT or BOSS units, JBOX, and cables ship from Alencon to the customer site.

BOX Components (already assembled):

- (1) BOX Cabinet - Single Bay Outdoor Enclosure, 45U, 19"
- (4) Exterior Pad Mounting Feet, 1/2" Anchor Clearance, kit includes (4) feet w/ hardware
- (5) Fixed Shelf, 2U 19" Rack, 22.5" Deep, Black Powder Coated 12 GA CRS
- (4) Exterior pad mounting feet

Additional System Hardware:

- (1) Rack Mounted JBOX (Junction Box – configured for customer application)
- (1-4) SPOT/BOSS units with FEED (configured for customer application) — each unit numbered and marked on the box
- (4+4) SPOT/BOSS mounting brackets (left + right)
- (16) Bracket mounting screws – ¼"-20 x 3/4 Hex Washer Head w/ Slot, Type F SZP
- (22) Rack mounting screws – #10-32 x 1/2" SEMS Screw / Internal Tooth Washer / Phillips / Pan Head / Steel / Black Oxide

Cabling:

- (8) 4-foot power cables with SurLok connectors (unless non-standard wiring configuration is specified)
- (8) 5-foot power cables with SurLok connectors (unless non-standard wiring configuration is specified)
- (3) 2-foot CAT Communication Cables with RJ-45 Connectors
- (1) 6-foot CAT Communication Cable with RJ-45 Connectors
- (1) PODD unit package with accessories

3 Important Safety Instructions

SAVE THESE INSTRUCTIONS– This manual contains important instructions for use with the BOX that shall be followed during installation and maintenance of these devices.

WARNING! Always ground the BOX before energizing the power converters within.

FIGURE 1: THE GRAPHIC ABOVE INDICATES THAT THE BOX IS A GROUNDING CONDUCTOR

Installation of this equipment must be performed by an authorized electrician in accordance with the local and NEC ANSI/NFPA 70 and OSHA requirements.

1. Before installing and using the BOX, read all instructions presented in this manual and the cautionary markings shown on the enclosure.

2. During operation, hazardous voltages and currents may be present. Only authorized and qualified personnel should perform servicing/installation.

3. Test any wire or terminal for voltage before touching them. Check if any current is flowing through the strings before disconnection.

4. Only use accessories recommended or approved by the manufacturer.

5. Ensure that wiring is in good conditions and that all wiring is sized according to NEC 310-16 specifications. Ignoring to do so may result in a risk of fire.

6. Always have BOX manual on hand, for reference.

4 BOX Features

The BOX is an integrated racking system used to put multiple SPOT or BOSS units in parallel within an outdoor rated container. The features of the BOX include:

4.1 Parallel SPOT/BOSS (Up to 4)

The power rating of a single BOSS or SPOT device may not be sufficient for the source or load of a system, depending on how it is configured.

For example, a single SPOT device can be used to perform string level optimization as input to a combiner box, a set of parallel SPOT devices would be needed to perform array level optimization on the output of a combiner box.

The BOX system allows the parallel operation of multiple SPOT or BOSS units, increasing the power capacity to 4X while maintaining a single point of primary and secondary connection.

4.2 JBOX – Single Point of Input & Output

Alencon's JBOX (junction box) is a customizable combiner where electrical connections in and out of the BOX system land. Speak to your Alencon representative for more information on the JBOX.

4.3 Integrated Communications Device

The PODD, Alencon's communications device can be installed on the outside of or within the BOX cabinet. In all applications employing parallel operation of SPOT or BOSS units, a PODD is necessary for coordinating that operation.

4.4 Electrical Enclosure – Conduit Entry & Cable Management

The BOX has ample room for cables within, on both sides of the rack as well as in front of and behind the installed power converters. 4 conduit entry knockouts on the bottom of the cabinet and a built-in riser allow for simpler install and cable routing to/from the enclosed system.

4.5 Weather Rated Cabinet

The BOX cabinet has an Nema 3R rating which allows for outdoor installation of the entire system.

5 Technical Specifications

BOX	
Number of SPOT of BOSS Units	Up to 4
Weight (without SPOT or BOSS Units)	250 KG
Dimensions (W x D x H)	904 x 1210 x 2242 MM
Electrical Specifications	See individual SPOT or BOSS spec sheets – All SPOT or BOSS units can be installed in parallel in the BOX

5.1 Mechanical Specifications

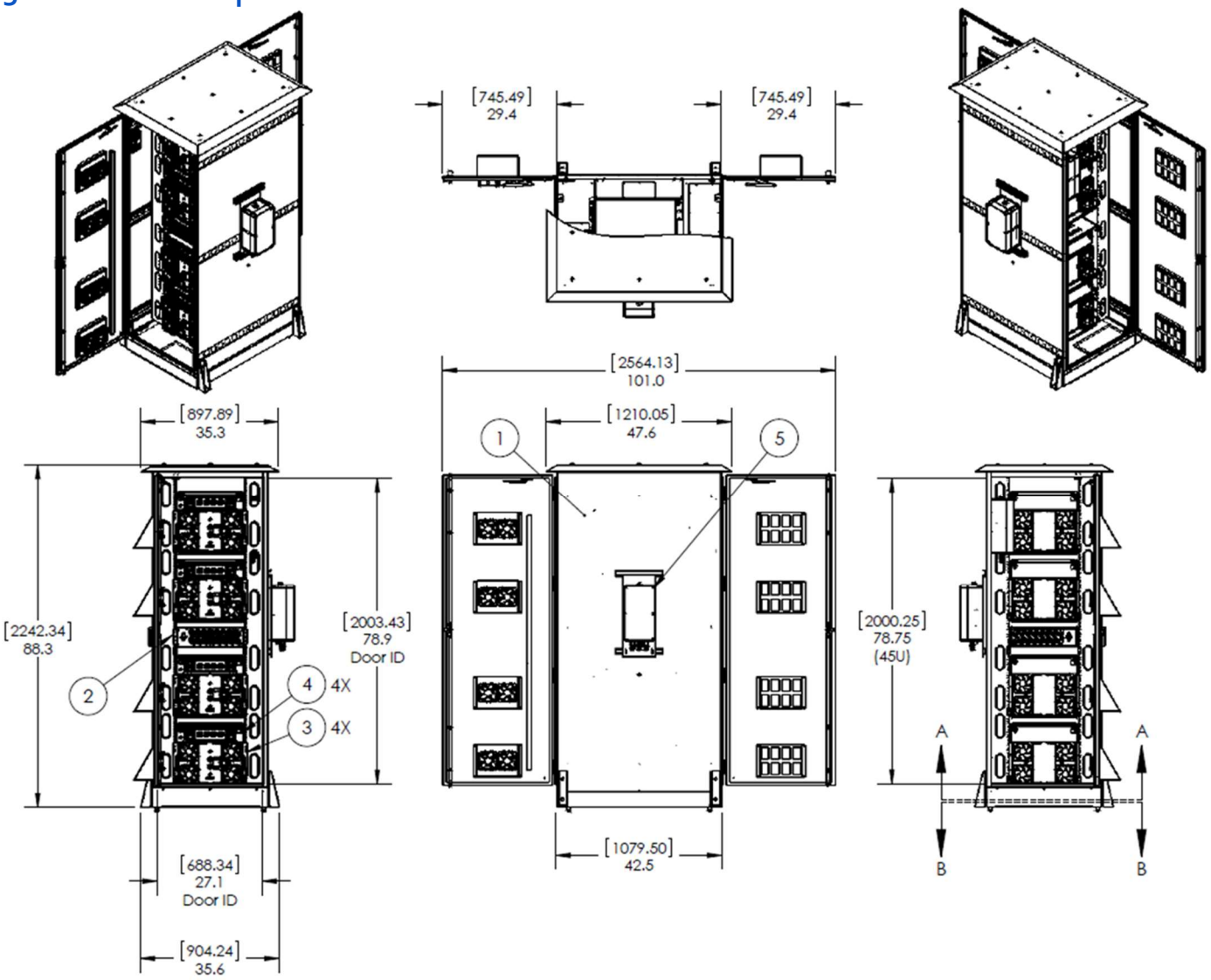

FIGURE 2: BOX CABINET ENCLOSURE, 45U, 19"

6 Installation

6.1 Installation Criteria

Only skilled professionals with experience installing rack-mounted electrical systems should perform installation of the BOX. Persons installing the BOX should be able to lift 50 lbs. without assistance. At least 2 people are required to install the BOX, 3 are recommended.

Installation instructions should be followed exactly; improper installation of the BOX could void the warranty of the BOX and any or all its component parts.

If any instructions are unclear, or any additional information is required during the process, please contact Alencon Systems LLC for assistance, see Appendix C.

6.1.1 Required Tools List:

- Hammer Drill
- Masonry Drill Bit (Appropriate size for customer supplied anchors)
- Adjustable wrench
- Power Driver with Socket Drive Adapter
- Ratchet and Extensions
- 3/8" Socket
- 9/16" Socket
- 13mm Socket
- #2 Phillips Screwdriver
- 3/16" Flathead Screwdriver

6.1.2 Customer Supplied Hardware:

- Enclosure anchoring hardware (assumed concrete anchors listed below)
  - (4) ½" concrete anchor bolts with nuts and washers
- Unistrut and Hardware to Mount PODD Enclosure
  - (2) 5/16" x ¾" L Bolts (or M8)
  - (2) 5/16" flat washers (or M8)
  - (2) 5/16" Unistrut nuts (or M8)
- (1) Waterproof grommet or bulkhead for CAT cable with RJ-45 connectors
- Zip-ties or Velcro tape for cable management

6.2 Installation Procedure

6.2.1 Unpacking and Mounting BOX

- The BOX cabinet will arrive on a pallet (Figure 3 3)
- Remove packaging and unbolt the enclosure from the pallet.

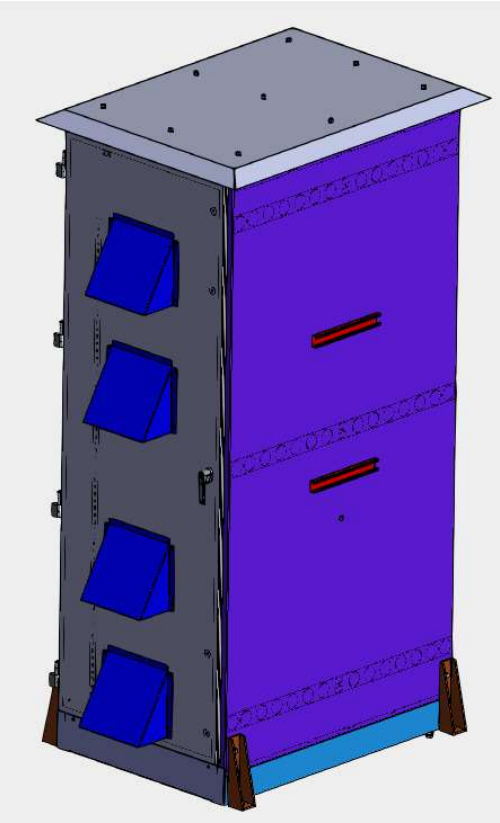

FIGURE 3: BOX CABINET ENCLOSURE MODEL, 45U, 19"

- Position cabinet on concrete pad. Use (4) ½" diameter concrete anchor bolts to mount the BOX enclosure (Figure 4).

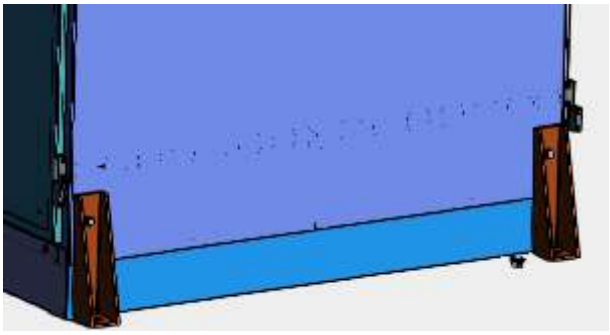

FIGURE 4: ANCHOR BOLTS (1 SIDE SHOWN)

6.2.2 Conduit Cable Entry

- Conduit access is available on the bottom of the enclosure.
- Areas depicted in red boxes in Figure 5 and Figure 6 are available for cable ingress into the cabinet.
- Visual Inspection of enclosure hardware clearance is mandatory to avoid interference along edges and corners of detailed space
- Locating Entry on Sides to avoid installed shelves is recommended but not required.

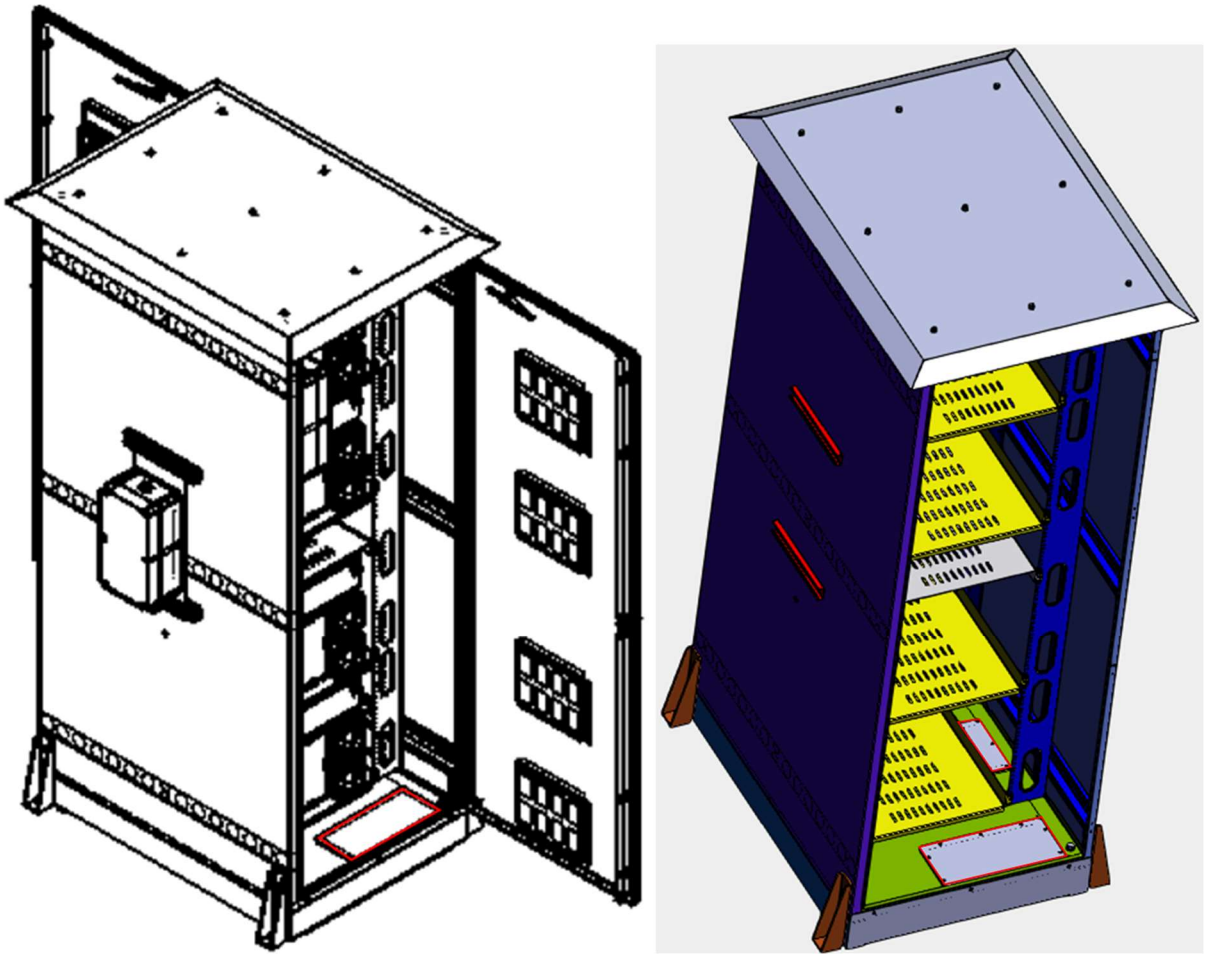

FIGURE 5: CONDUIT ACCESS (VIEW FROM INSIDE CABINET)

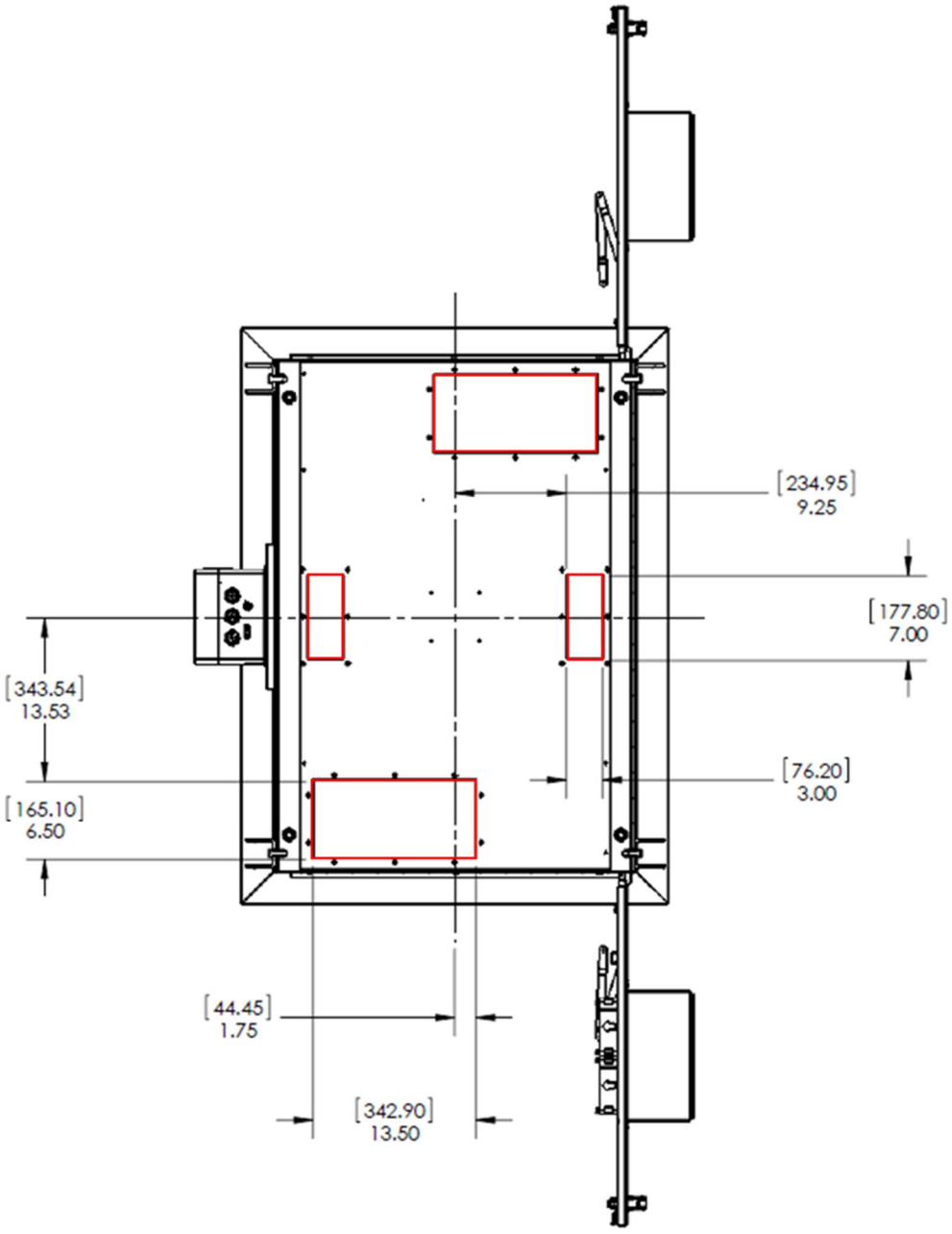

FIGURE 6: CONDUIT ACCESS (VIEW FROM BOTTOM OF CABINET)

6.2.3 Mounting the PODD Communications Device

The PODD (Figure 7) can be mounted outside of or within the BOX cabinet. The PODD mounting plate is designed to be mounted on standard 1-5/8" channel Unistrut (Figure 8).

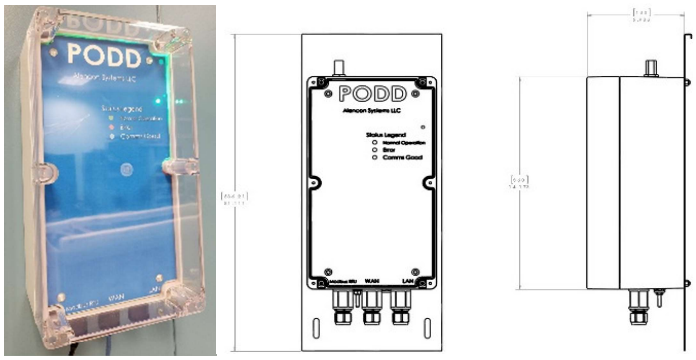

FIGURE 7: PODD UNIT (3 VIEWS)

- Customer supplied Unistrut must be mounted 20" apart on centerline (Figure 88).
- Hang the PODD mounting plate to the top Unistrut and secure the bottom of the plate through the two slots with 5/16" (M8) hardware into the bottom Unistrut channel.

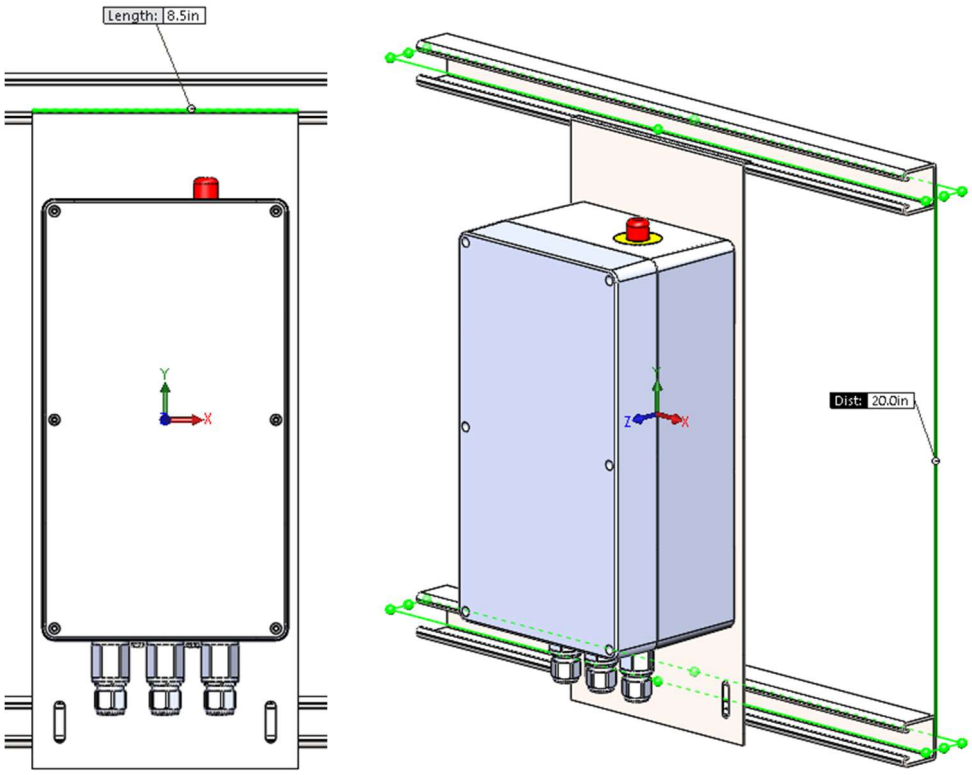

FIGURE 8: PODD MOUNTED ON UNISTRUT

For mounting on the BOX exterior, locate the PODD as shown in Figure 9.

A communication cable will be installed through the enclosure wall to connect the PODD to the SPOT or BOSS units. A separate customer supplied connection will provide access to the customer designated network/SCADA system.

- Installation will require routing a CAT cable from inside the BOX to the PODD
- Drill hole to be used for routing CAT cable from inside cabinet
    - Cable grommet or RJ-45 bulkhead is customer supplied. Follow installation instructions as defined by device manufacturer.
- Install and route cable through BOX enclosure wall to connect internally at a later step.

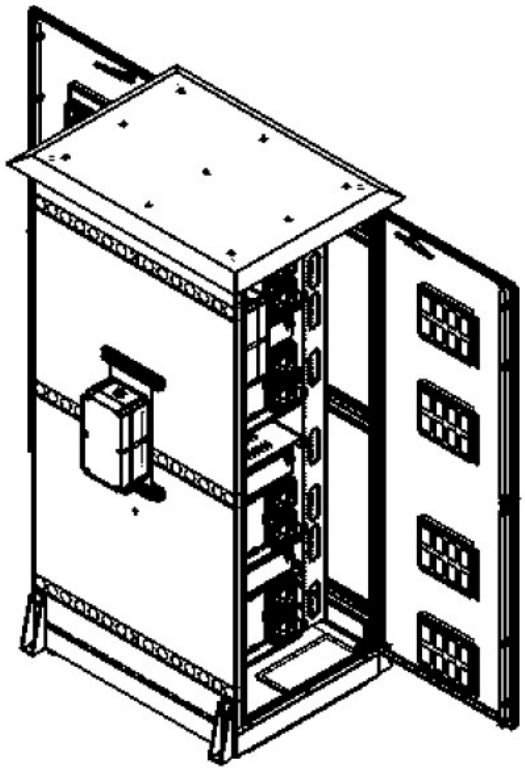

FIGURE 9: PODD MOUNTED EXTERNALLY ON BOX CABINET

For mounting in the BOX interior, locate the PODD as shown in Figure 10.

A communication cable will be installed to connect the PODD to the SPOT or BOSS units. A separate customer supplied connection will provide access to the customer designated network/SCADA system. Typically this is routed through the conduit entry in a separate conduit from high voltage cables.

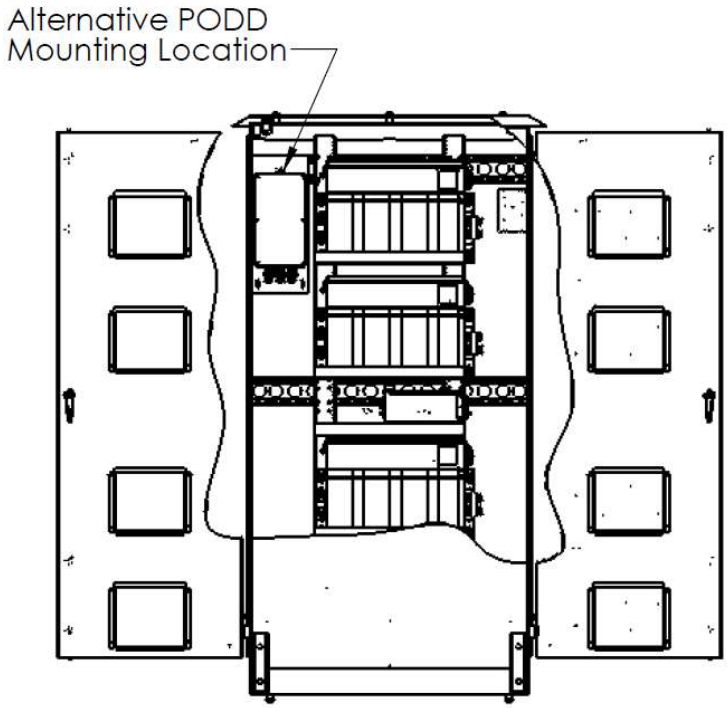

FIGURE 10: PODD MOUNTED INTERNALLY IN BOX CABINET

After installing the Unistrut and checking that the PODD hangs properly, it is recommended to remove the PODD and place it off to the side while the rest of the BOX installation is completed.

6.2.4 Install Shelves into Enclosure

The BOX enclosure is shipped with shelves already mounted on the interior 19" rack.

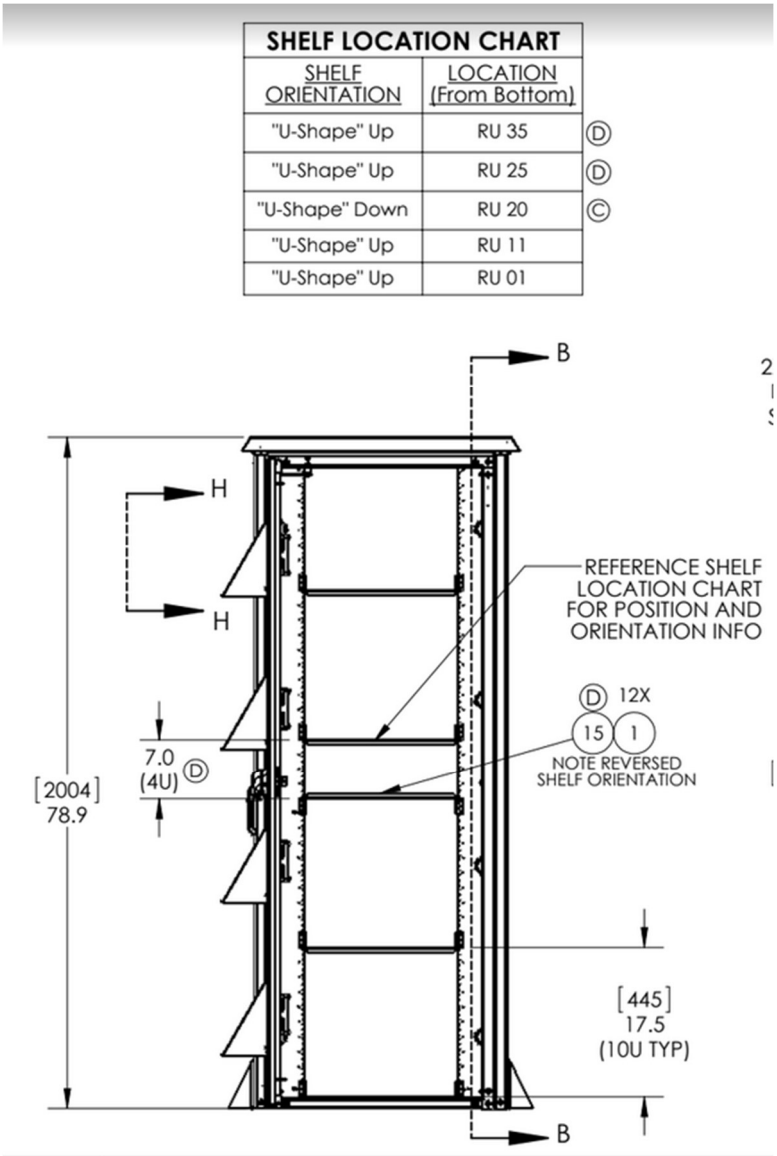

FIGURE 11: RACK SHELVES MOUNTED IN BOX CABINET

The shelf orientations are different between the JBOX and the SPOT/BOSS units.

6.2.5 Unpacking SPOT/BOSS Units and Attaching Rack-mounting Brackets

- SPOT/BOSS with FEED units (here-on called 'SPOT/BOSS' units) shown in Figure 12 can be unpackaged and lifted onto a table or work bench to attach mounting brackets (Figure 1313)
- Using (4) of the provided ¼"-20 x 3/4 Self Tapping-Type F Bracket Mounting Screws, securely attach the left and right mounting brackets to the sides of the SPOT/BOSS unit, so that 'wings' are flush to the front face

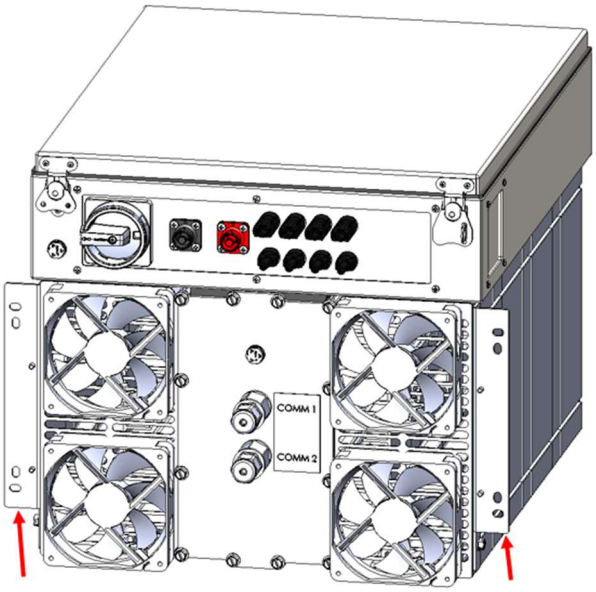

FIGURE 12: SPOT/BOSS WITH FEED AND MOUNTING BRACKETS

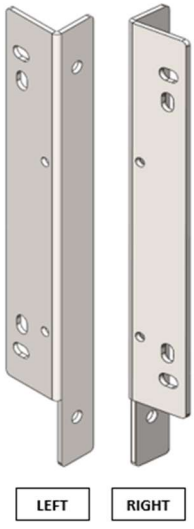

FIGURE 13: SPOT/BOSS RACK MOUNTING BRACKETS

6.2.6 Mounting SPOT/BOSS Units into Enclosure with Shelves

- SPOT/BOSS units can be lifted and placed one on each shelf in the BOX cabinet.
- SPOT/BOSS units may have a designated place within the cabinet, denoted by a numbered label on the SPOT/BOSS front face which should be matched to the diagram in Figure 1414.
- Otherwise, keep note of the installation order by SPOT/BOSS serial number.
- Leave the middle shelf of the rack unpopulated. This will be used for the JBOX at a later step.
- Each SPOT/BOSS weighs upwards of 150lbs, to avoid injury or damage to the units, at least 2 able-bodied people should lift them into place, 3 people are recommended
- Use (4) #10-32 x 1/2" screws to secure each SPOT/BOSS unit to the rack through the mounting brackets.

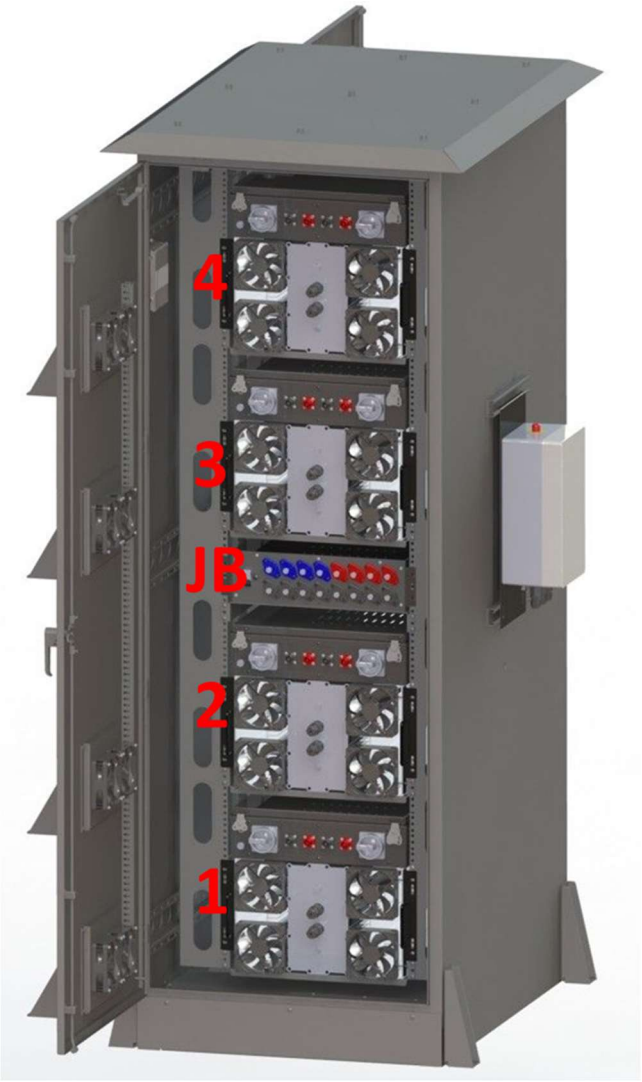

FIGURE 14: SPOT PLACEMENT MAP

6.2.7 Mounting JBOX into BOX Cabinet

- The JBOX will be placed in the middle of the rack inside the BOX, above SPOT/BOSS #2 shown in Figure 1415.
- Carefully place the JBOX on the shelf. The shelf is inverted, and there is a lip on the front that the Box must clear in order to sit flat on the shelf.
- Use (6) #10-32 x 1/2" screws to secure the JBOX to the rack through the mounting brackets (Figure 155).

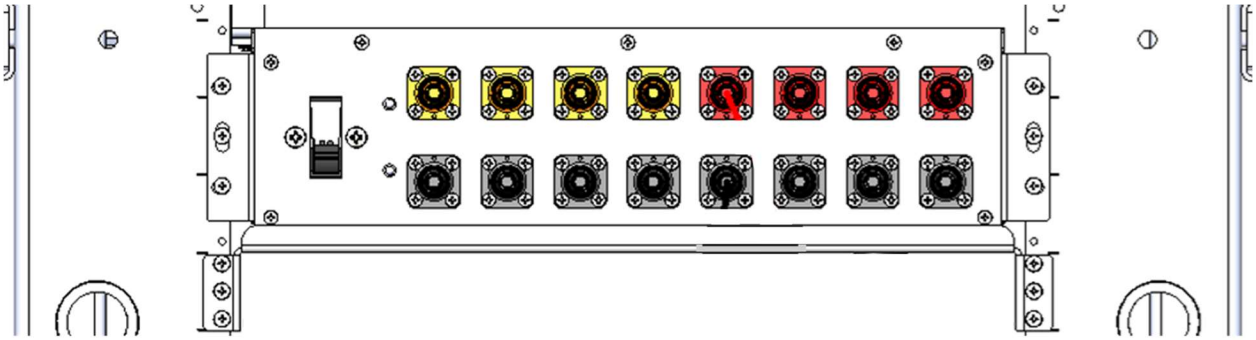

FIGURE 15: JBOX LOCATION WITH MOUNTING HARDWARE

6.2.8 Connect Power Cables Within BOX Cabinet, from JBOX Front to FEED Units

- Depending on the JBOX configuration, wiring of the internal power cables may differ.
- All cable whips for internal wiring of the BOX cabinet will be included as additional hardware with the BOX.
- Pre-made cable whips will be labelled on each end as to where they land within the BOX.
- JBOX landing terminals are designated by:
    - Internal (A for Alencon) connection OR External (E) connection
    - Location on the JBOX, 1, 2, 3, or 4 for each SPOT/BOSS unit
    - Primary or Secondary connection
    - Positive or negative polarity

Front View

R	R	R	R	O	O	O	O	
A1.1(±)	A1.2(±)	A1.3(±)	A1.4(±)	A2.1(±)	A2.2(±)	A2.3(±)	A2.4(±)	Alencon Connections
B	B	B	B	B	B	B	B	

Rear View

X2.4(±)	X2.3(±)	X2.2(±)	X2.1(±)	X1.4(±)	X1.3(±)	X1.2(±)	X1.1(±)	External Connections
R	R	R	R	R	R	R	R	
B	B	B	B	B	B	B	B	

FIGURE 16: JBOX LABELING

- FEED landing terminals are designated by:
  - Location 1, 2, 3 or 4 within the BOX (see Figure 17)
  - Primary or Secondary connection
  - Positive or negative polarity
- Cable terminations will usually match the color of the intended landing location.

FIGURE 17: FEED LABELING

6.2.8.1 Standard Wiring Configuration – Combined Primary and Combined Secondary

Standard wiring configuration on the BOX System uses a combined Primary and combined Secondary connection, in this case:

- Connect JBOX to Primary (Input) FEED:
  - (4) 5-foot power cables with SurLok connectors connect SPOT/BOSS units #1 and #4 to the JBOX
  - (4) 4-foot power cables with SurLok connectors connect SPOT/BOSS units #2 and #3 to the JBOX
- Route all cables along the left-side stanchion as shown in Figure 18.
- Secure all cables appropriately after installation.

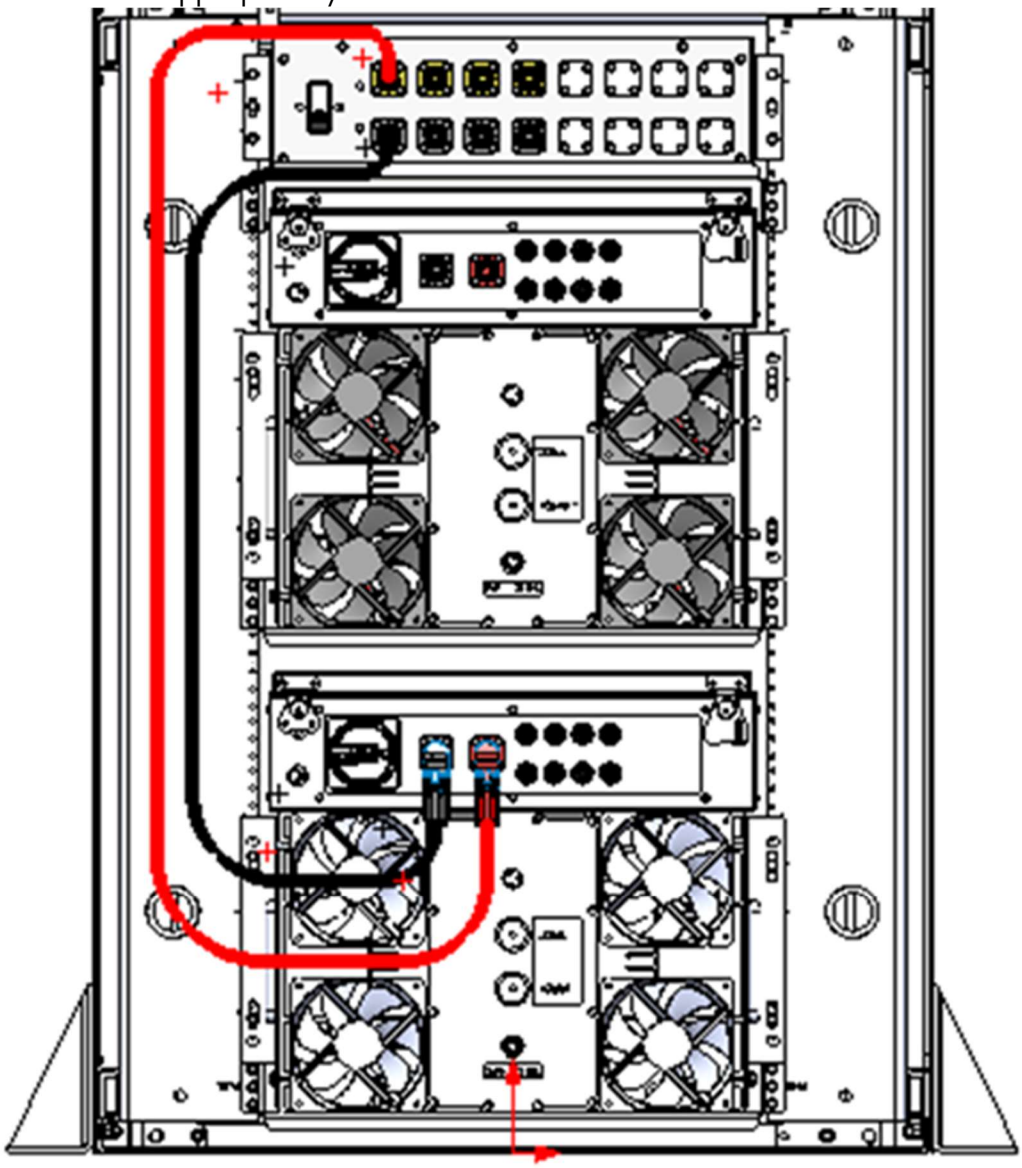

FIGURE 18: SURLOK CABLING ROUTED JBOX TO PRIMARY FEED #1

- Connect JBOX to Secondary (Output) FEED:
  - (4) 5-foot power cables with SurLok connectors connect SPOT/BOSS units #1 and #4 to the JBOX
  - (4) 4-foot power cables with SurLok connectors connect SPOT/BOSS units #2 and #3 to the JBOX
- Route all cables along the right-side stanchion as shown in Figure 19.
- Secure all cables appropriately after installation.

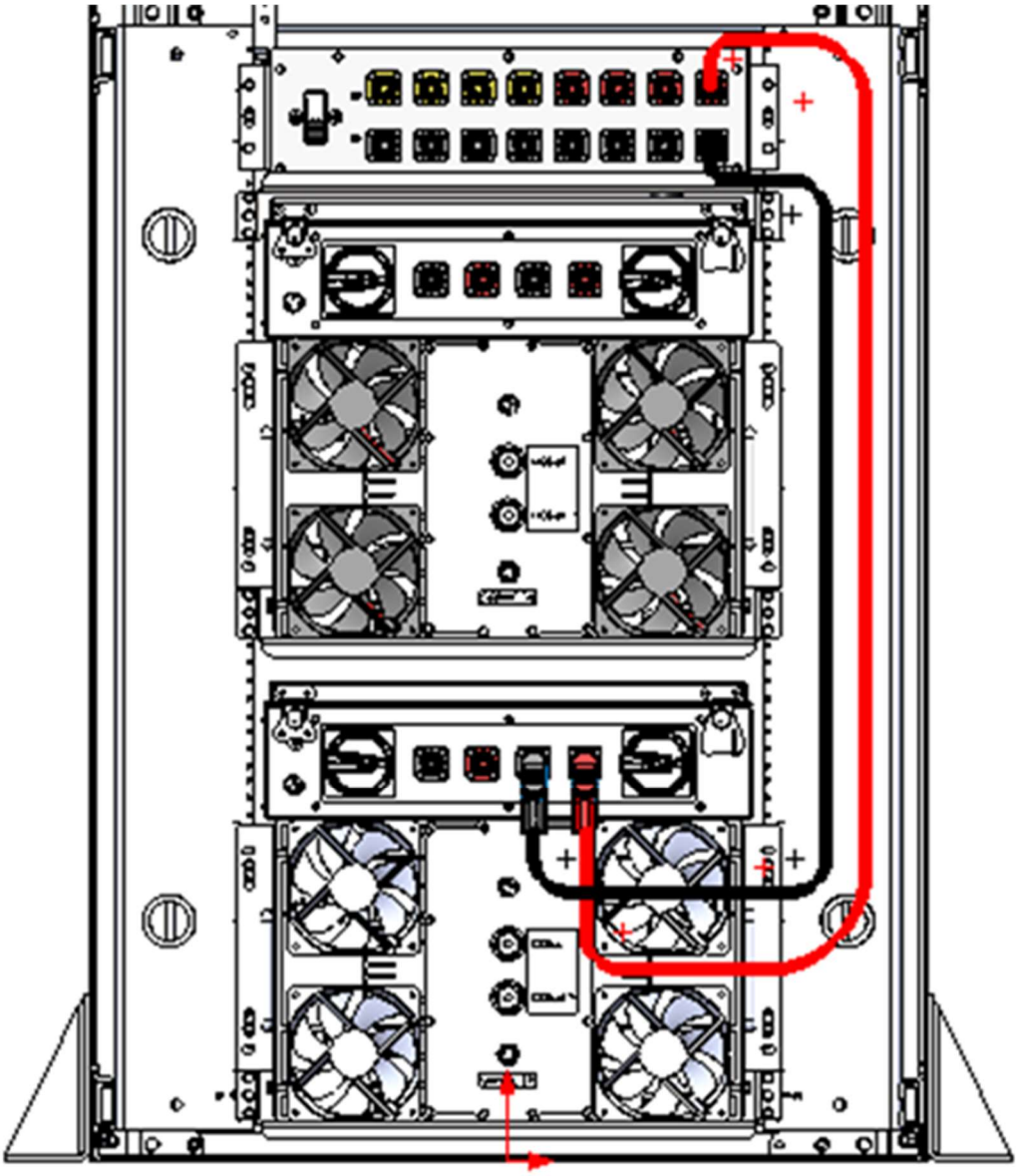

FIGURE 19: SURLOK CABLING ROUTED JBOX TO SECONDARY FEED #1

⚠ DO NOT zip-tie the cables too tightly or bend around sharp edges as it may cause breaks in the cable insulation, which could lead to leakage currents, arcing or ground-faults.

6.2.8.2 Non-Standard Wiring Configurations – Stringed Primary and or Stringed Secondary

Non-standard wiring configurations often include a non-combined stringed connection to the Primary or Secondary of SPOT/BOSS units within the BOX. In these cases:

- Bring stringed pairs directly through conduit to the BOX interior.
- Mate cables to corresponding Amphenol connectors on the FEED units. Up to 4 pairs per SPOT/BOSS unit.
    - For primary side connections, route stringed cable pairs along the left-side stanchion
    - For secondary side connections, route stringed cable pairs along the right-side stanchion (see Figure 20)
    - Secure all cables appropriately after installation.

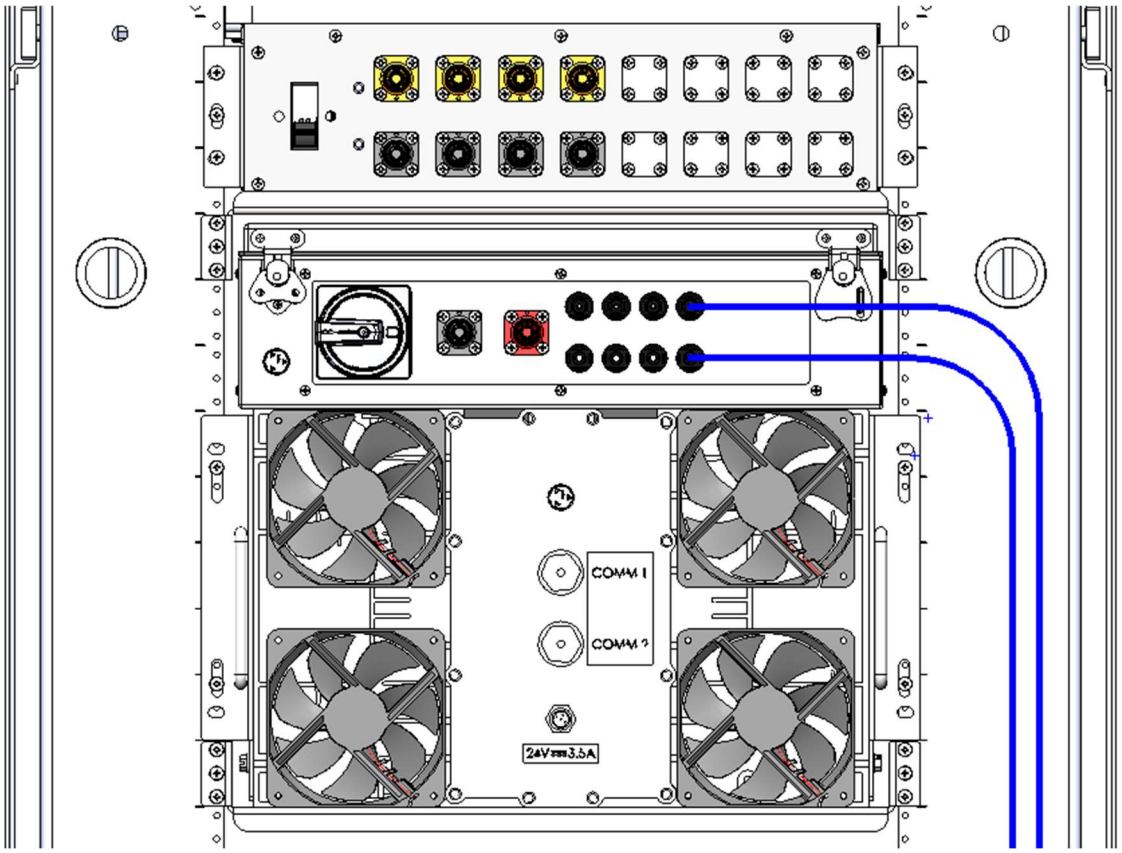

FIGURE 20: STRINGED PAIR WIRING ROUTED TO SECONDARY FEED #2

⚠ DO NOT zip-tie the cables too tightly or bend around sharp edges as it may cause breaks in the cable insulation, which could lead to leakage currents, arcing or ground-faults.

6.2.9 Connect Power Cables to/from BOX Cabinet, on JBOX Back

⚠Ensure all cables are disconnected from power before handling.

Standard wiring configuration on the BOX System uses a combined Primary and combined Secondary connection, in this case:

- The Rebling terminals on the JBOX require a cable lug with an M8 clearance ID.
- Rebling terminals support a maximum 4/0 AWG cable when the safety cover is used and maximum 450 KCMIL gauge when the connection is left bare.
- Connect Primary (Input) cables (Figure 2121):
    - Primary (Input) Positive leads connect to the blue Rebling terminals on the top right of the JBOX (Red line routed to the right)
    - Primary (Input) Negative lead connects to one of the black Rebling terminals on the bottom right of the JBOX (Black line routed to the right)
- Connect Secondary (Output) cables (Figure 2121):
    - Secondary (Output) Positive lead connects to one of the red Rebling terminals on the top left of the JBOX (Red line routed to the left)
    - Secondary (Output) Negative lead connects to one of the black Rebling terminals on the bottom left of the JBOX (Black line routed to the left)
- Connect Ground Cable (Figure 2121):
    - The system ground connects to the blue Rebling terminal centered vertically on the right side (Green line routed to the right)
- Tighten each Rebling terminal with a 13mm socket. Make sure each lug is secured and secure the cable appropriately as routed to conduit.

In cases where direct stringed connections to BOSS/SPOT units are used for a non-combined BOX Primary or Secondary, the JBOX will have no landing location for these connectors.

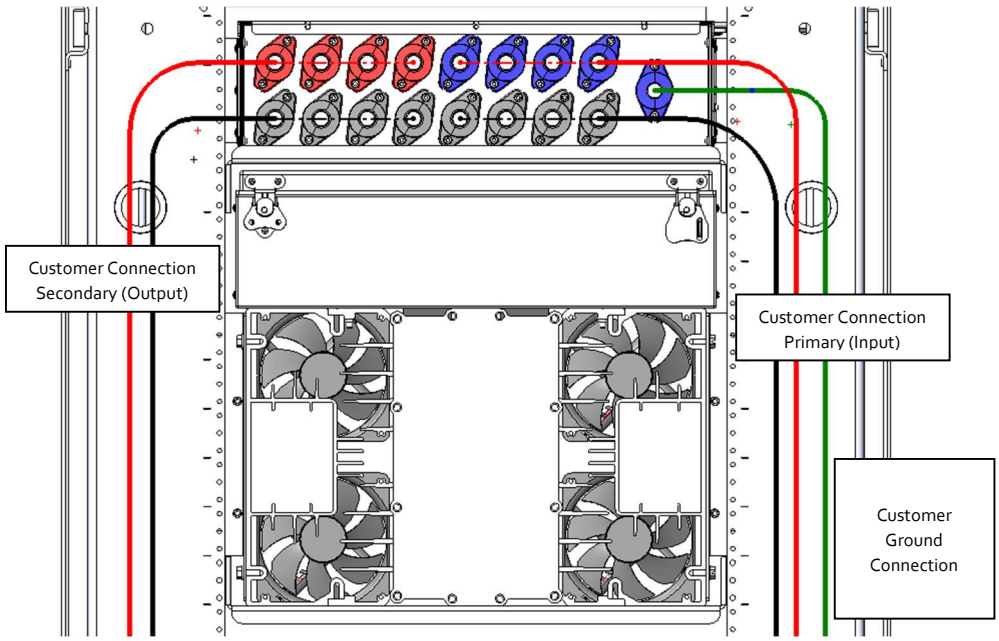

FIGURE 21: REAR VIEW OF CUSTOMER CONNECTIONS TO JBOX

DO NOT zip-tie cables too tightly or bend around sharp edges as it may cause breaks in the cable insulation, which could lead to leakage currents, arcing or ground-faults.

6.2.10 Wiring Communication Cables to PODD

Communications run through CAT cables that connect all SPOT/BOSS units to the PODD via a daisy chain.

- If previously removed, re-attach the PODD to its Unistrut mounts as described in 7.2.3
- Connect the (4) SPOT/BOSS units inside the box using (3) 2-foot CAT cables with RJ-45 STP connectors.
    - These cables route internally within the cabinet.
- One end of the SPOT unit daisy chain will be connected to the PODD with the 6-foot cable with STP RJ-45 connectors.
    - This cable may route through the cabinet wall to the exterior or internally within the cabinet, depending on PODD mounting location.
- The other end of the SPOT communication daisy chain will be terminated using the provided RS-485 Termination Dongle.

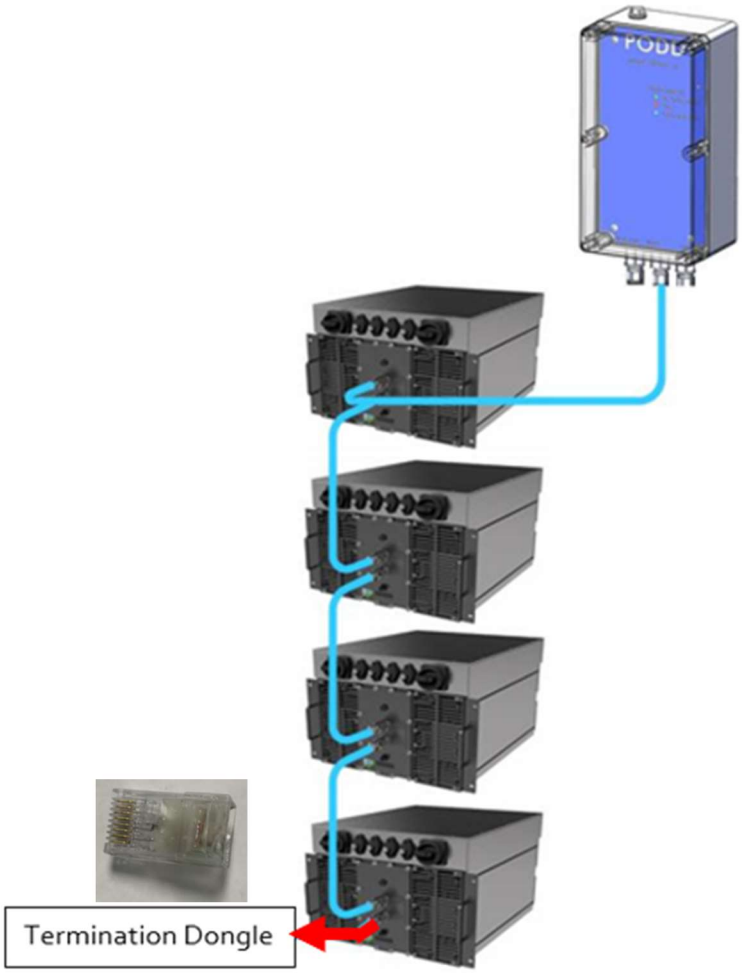

FIGURE 22: RJ-45 DAISY CHAIN

- To connect a communication cable to a PODD RJ-45 ECS connectors (Figure 233):
  - First remove the waterproof cap and grommet
  - Then feed the cable though the removed cap and grommet
  - Finally, replace the cap and grommet, tightening to reseal the port

FIGURE 23: PODD WIRING

Carefully reinstall the cap without damaging the plastic thread, to retain the waterproof seal.

- Connect communication cables to the PODD:
  - The 6-foot CAT cable installed through the enclosure wall earlier will be plugged into the PODD's "ModbusRTU" port.
  - Customer network connections can be made to the "WAN" port.

FIGURE 24: PODD PORT LABELS

6.3 BOX System Grounding

6.3.1 JBOX Grounding – Main Earth Connection ⚠

- Main earth ground must be connected to the JBOX grounding terminal.
- Ground cable should be brought in through the conduit on the bottom of the cabinet and connect to the blue Rebling terminal centered vertically on the right side of the JBOX back – see Section 6.2.9

FIGURE 25: JBOX GROUNDING TERMINAL

6.3.2 Cabinet and Rack Grounding ⚠

- A grounding terminal block is bonded to the BOX cabinet, inside the front door on the cabinet floor (see in blue in Figure 26).
- 8 landing locations available on the terminal block should be used to effectively bond:
  - 2 – cabinet doors
  - 1 – 19" rack
  - 4 – SPOT/BOSS units
  - 1 – JBOX (main earth ground point)
- Paint at the grounding points can be scraped away to ensure best possible contact between conductors

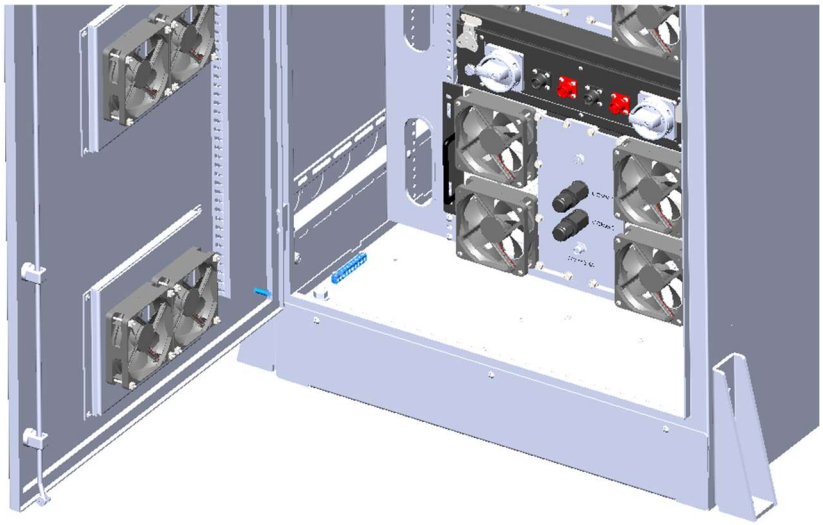

FIGURE 26: BOX CABINET GROUNDING

6.3.3 SPOT/BOSS Grounding ⚠

- The SPOT/BOSS chassis ground lug connections can be made at the device front plate.
- Bare copper cable without insulation can be used to connect the lugs to the earth ground.
- These MUST be connected to Earth ground. Not properly grounding the SPOT can be dangerous for BOX operators.

FIGURE 27: SPOT/BOSS UNIT GROUNDING

6.3.4 PODD Grounding ⚠

- The external ground lug is found next to the three RJ-45 connectors on the bottom of the PODD (Figure 2828)
- Bare copper cable without insulation can be used to connect the lug to earth ground
- This MUST be connected to earth ground. Not properly grounding the PODD can cause the PODD to malfunction and be damaged

FIGURE 28: PODD DEVICE GROUNDING

7 BOX System Commissioning

Once install is complete, energizing and commissioning of the power converters can begin, refer to the user manual of the relevant Alencon product (SPOT or BOSS) for full instructions.

8 Maintenance and Servicing

8.1 General Maintenance

The BOX is designed to require minimal maintenance. For any operating issues with the BOX system, please refer to the User Manual of the relevant devices within.

If BOX system still does not operate as expected, please contact Alencon Systems technical support for assistance with troubleshooting (see Appendix C).

8.2 Replacement of the Air Filters

Air filters are located directly behind each hooded panel on the front and back doors. The Filters can be removed every two months and checked for dust penetration. If necessary, replace with suitable 16.88" x 38.69" x ½" Urethane Foam Filter Panel.

FIGURE 29: BOX DOOR FILTER

8.3 Further Service and Repair

If the BOX requires further servicing, contact Alencon Systems technical support to assist. A damaged BOX may need to be returned to Alencon Systems, to an authorized Alencon service agent, or have Alencon approved personnel make on-site repairs.

9 Alencon Communication Environment (ACE)

For more information refer to the PODD User Manual

9.1 System Overview

Alencon's Communications Environment, the ACE, is an Internet of Things (IoT) hardware and software solution for controlling and monitoring your alternative energy assets utilizing Alencon's PODD device. The PODD can be used with other Alencon products including the SPOT and BOSS. The PODD acts as a gateway to integrate Alencon's power electronics with your plant level control systems or as a standalone controller and troubleshooting device.

FIGURE 30: PODD - POINT OF DATA DISTRIBUTION DEVICE

Appendix A - Safety Precautions

A.1 Degree of Danger Symbols

	***Warning!***	*Warnings indicate conditions, which if not observed, can cause personal injury!*
	***Caution!***	*Cautions are included to help you avoid damaging hardware or losing data.*
	***Note!***	*Notes provide optional additional information.*

A.2 Electrical hazards

A.2.1 Electric shock from live voltage

 High voltages are present at the equipment and its components. Some maintenance work must be done when voltage is present. Failure to adhere to the safety messages may lead to severe or lethal injuries due to electric shock. To avoid electric shock from live voltage:

- Wear class 2 personal protective equipment.
- Always perform work in compliance with the regulations specified in 29 CFR, Chapter XVII, Part 1910 (OSHA), NEC, and NFPA 70E.
- Do not touch any live components of the equipment or the medium-voltage grid.
- Follow all instructions precisely.
- Observe safety messages.
- Before performing any work on the equipment, always disconnect the equipment if voltage is not
- absolutely necessary.
- After disconnecting the equipment, wait at least 10 minutes for the equipment's capacitors to discharge completely.
- Before performing work on the equipment, ensure that no voltage is present (with a Voltmeter or other measuring instrument).

A.2.2 Danger due to Battery Voltage

 BOSS may be connected to high voltage batteries on both primary and secondary sides of the equipment. Before beginning to work on the BOSS, disconnect the power sources on both primary and secondary sides.

A.2.3 Electric shock caused by ground fault

 If a ground fault occurs, plant sections that are supposedly grounded may in fact be live. Failure to adhere to the safety messages may lead to severe or lethal injuries due to electric shock. To avoid electric shock from ground faults:

- Ensure that no voltage is present before touching any components.
- Wear class 2 personal protective equipment.

A.2.4 Electric shock due to damaged equipment

 Operating damaged equipment can lead to hazardous situations that may result in serious or lethal injuries caused by electric shock. To avoid electric shock from damaged equipment:

- Only operate the equipment if it is in safe and technically faultless working order.
- Only operate the equipment if there is no visible damage.
- Regularly check the equipment for visible damage.
- Make sure that all external safety equipment is always freely accessible.
- Make sure that all safety equipment is in good working order.

A.3 Environmental hazards

A.3.1 Danger to life due to blocked escape routes

In hazardous situations, blocked escape routes can lead to serious injury or death. To avoid harm from blocked escape routes:

- An escape route of at least 3 ft. (915 mm) wide must always be available.
- Do not place any objects in the escape route area.
- Remove all tripping hazards from the escape routes.

A.3.2 Damage to the equipment caused by dust or moisture penetration

 Dust intrusion or moisture penetration can damage and impair the functionality of the equipment. To avoid damage from dust or moisture penetration:

- Do not open the equipment when it is raining or when humidity exceeds 95%.
- Perform maintenance on the BOX only when the environment is dry and free of dust
- Always cover electrical bus channel prior activating the equipment.
-

A.3.3 Danger to life due to electric shock when the equipment is unlocked

Unlocked equipment can be opened by unauthorized persons. This means that unauthorized persons have access to components on which lethal voltages are present. To avoid danger from unlocked equipment:

- Ensure that unauthorized persons have no access to the equipment.
- Always lock the equipment
- Keep the electrical bus channel covered

Appendix B – Glossary

Word(s)/Acronyms	Definition
ALS	ALENCON Systems, LLC
DC	Direct Current
ESD	Electrostatic Discharge
ESS	Energy Storage System
FEED	Fused Electrical Disconnect
GFDI	Ground-Fault Detection
GND	System Ground Potential
HV / LV	High Voltage / Low Voltage
IP	Internet Protocol
JBOX	Junction Box
LD	Leak Detector
PODD	Point of Data Distribution
RTU	Remote Terminal Unit. Microprocessor controlled electronic protocol to exchange data with other devices
SCADA	Supervisory Control and Data Acquisition system. Performed by transmitting telemetry data to a master system and by using messages from the master supervisory system to control connected objects
SPOT	String Power Optimizer and Transmitter
SPOT-BOX	Container with (1) to (4) SPOT units and Junction Box
BOSS	Bidirectional Optimizer for Storage Systems
BOSS-BOX	Container with (1) to (4) BOSS units and Junction Box
GARD	Ground and Arc fault Rapid Disconnect
UI	User Interface

Appendix C – Technical Support and Assistance

Visit the Alencon Systems web site at www.alenconsystems.com where you can find the latest information about the product. Contact your distributor, sales representative, or Alencon Systems' technical support if you need additional assistance. Please have the following information ready before you call:

- Product name, serial number, and LIN (all can be located on the product label)
- Description of your peripheral attachments including fusing and cables

For technical support please email: support@alenconsystems.com or call +1 (215) 816-3366