INSTALLATION/USER MANUAL

Model Name: **60KW Power Conversion System**

Model Number: RES-DCVC60-480

Document Number: **100-PBJ1279-PAA**

Version Date: 10/16/2019 – Release for Customer PAB

A FRENCH language version of this document is available upon request – contact Rhombus Energy Solutions at the phone number below or visit our website at www.rhombusenergysolutions.com to submit a request.

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Version	Description	Date
100-PBJ1279-XAA	Low voltage wiring procedure & dispenser interface description	February 2018
100-PBJ1279-XAB	Release for Customer Use	April 2019

REVISION SUMMARY

ABBREVIATIONS

Abbreviation	Definition
ANSI	American National Standards Institute
AWG	American Wire Gauge
HV	High Voltage
LV	Low Voltage
CCSM	Combo Charging System Module
PCS	Power Converter System
EPO	Emergency Power Off
GFDI	Ground Fault Detector Interrupter
IDLE MODE	RES Converter is waiting for ON Command
ITB	Interface Terminal Board
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IGBT	Insulated Gate Bipolar Transistor
ISO	International Organization for Standardization
kVA	Kilovolt Amperes
kW	Kilowatt
LVPS	Low Voltage Power Supply
MCB	Miniature Circuit Breaker
MIC	Main Converter Controller (Control Board)
MIU	Main Control Board
MSDS	Material Safety Data Sheet
NEC	National Electric Code
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturer
PV	Photo-Voltaic
RES	Rhombus Energy Solutions
VAC	Voltage, Alternating Current
VDC	Voltage, Direct Current
VSB	Voltage Sense (Circuit Board)
WYE	Star-connection, 4-wire WYE

SYMBOLS USED

	Danger of electric shock hazard
	Warning: Failure to follow procedures may result in injury or death to the operator
	Caution: Failure to follow procedures may result in damage to the RES Converter.
	Ground connection to the building (or site) ground
	Chassis connected to ground

Disclaimer

There may be variance in the exact procedures used to install/operate the RES Equipment. This manual cannot possibly anticipate all such variations nor provide advice or cautions to all. Before deviating from the instructions in this manual, the installer/operator must first establish that neither personal safety, nor the integrity of the RES Equipment is compromised.

Because of the wide variety of uses for power electronics equipment, this manual does not describe every possible application or configuration. All personnel responsible for installing, commissioning, and operating this equipment must have personal assurance of the suitability and proper implementation, installation and of the intended application of this power product. In no event will Rhombus energy systems, Inc., its subsidiaries, employees, or affiliates be responsible or liable for any damages, indirect or direct, resulting from the misuse or incorrect application of this equipment.

The examples and diagrams in this manual are for illustrative purposes only. Because of the wide variety of uses, applications, peripheral equipment, and facility configurations to each installation, Rhombus Energy Solutions cannot assume responsibility or liability for actual use based on the information provided here.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

THIS MANUAL CONTAINS IMPORTANT INSTRUCTION ON DCVC/PCS EQUIPMENT WITH ITS POWER SIZE & GRID VOLTAGE THAT SHALL BE FOLLOWED DURING INSTALLATION AND MAINTENANCE OF THE DCVC/PCS

Important – Please Read before Starting

1. Enclosure Keys for PCS and remote charging unit (RCU) are enclosed, store in a secure location. ***Equipment to be serviced by authorized personnel only.***
2. After cables are ran between PCS and RCU and PRIOR to connecting cables at either end, use a MegOhm meter to measure the insulation resistance between PCS and RCU DC power cables and DC remote sense wires to ensure cable insulation integrity. RCU DC landing posts suggested for more convenient access.
    a. DC + and DC – power cables
    b. DC+ power cable to chassis ground
    c. DC – power cable to chassis ground
    d. DC + and DC – Remote Sense Wires
    e. DC+ Remote Sense Wire to chassis ground
    f. DC – Remote Sense Wire to chassis ground
3. Connect (A, B, C, N, Gnd) Grid connections to the PCS on the bottom right side panel. Follow wire gauge table on label.
4. Connect DC cables DC+, DC- from PCS to the RCU. Follow wire gauge and torque table.
5. Connect remote DC voltage sense signal wires at positive, negative at PCS (Verivolt Isoblock) located in

the lower right panel and at the RCU DC positive and negative input landing blocks.

6. Connect CAN communication wires from PCS to the RCU. Follow signal wire label in the PCS and RCU.
7. Connect Remote EPO from PCS to the RCU. Follow signal wires label from PCS to RCU.
8. Connect 24Vdc and 12Vdc signal wires from PCS to RCU.
9. Switch on the facility's AC circuit panel feed to PCS. breaker panel.
10. Switch the AC Disconnect on the front door of PCS to the ON position.
11. Ensure the (Emergency Power Off) EPO red buttons on PCS and RCU are not pressed in. To un-press, rotate EPO counter clockwise and pull.
12. Turn the ON/OFF switch to ON position.

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important instructions for the Power Converter System (PCS) that shall be followed during installation, operation and maintenance of the PCS.

WARNING: **These are <u>important safety instructions</u>. Save these instructions. Failure to follow the cautions and warnings may result in damage to the equipment, personal injury, or death.**

This manual contains WARNINGS and CAUTIONS. Warnings indicate actions that may result in an accident, which could cause bodily injury or death. Cautions indicate procedures that could result in damage to the PCS Equipment. Observe all WARNINGS and CAUTIONS. Failure to do so may result in personal injury or damage to the PCS Equipment.

The following list contains some general WARNINGS that should be followed always when working around the PCS:

- ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION
- MAKE SURE THAT (output & input) DC & AC HAS BEEN DISCONNECTED FROM THE PCS BEFORE SERVICING, UNLESS REQUIRED BY THE PROCEDURE
- FOLLOW ALL INDUSTRY-RECOMMENDED SAFETY PROCEDURES AND STANDARDS WHEN SERVICING THE PCS

WARNING: **To reduce the risk of fire, connect only to an AC Line Circuit provided with 100 Amperes maximum branch-circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.**

Over-current protection (hardware) for the AC output circuit is to be provided by the installer.

The following safety instructions should be carefully followed always:

General Safety

- This power equipment is intended for full power operation in an environment having maximum ambient temperature of 45C.
- Wear proper level protective clothing (gloves, apron, etc.) approved for working on this level of high voltage equipment.
- Keep all guards, screens, and electrical enclosures in place when the system is operating.
- Keep vents clear of debris and provide clear space for proper airflow.
- This PCS is not provided with a GFDI device. This power equipment must be used with an external GFDI device as required by the Article 690 of the National Electric Code for the installation location.

Electrical Connections: Be sure that all electrical connections and connectors are properly installed and connected with proper torque. If the DC input connections are reversed during installation, the PCS will detect it (better to avoid this from happening).

Improper Use: Rhombus Energy Solutions cannot assume responsibility for personal injury and/or equipment damage because of improper installation, use, maintenance, reconfiguration, reprogramming, or other improper actions. An incorrectly serviced or operated PCS system can cause personal injury, component damage, or reduced product life. Malfunction may result from wiring errors, an incorrect or inadequate DC supply or AC grid connection, excessive ambient temperatures or obstructed ventilation, or incorrect software configuration. Keep the door closed always when operating the system. Additionally, keep all guards, screens, and electrical enclosures in place when the system is operating. Close the inverter enclosure and put all guards and screens in place before energizing the PCS

Locked Doors: The PCS enclosure should remain locked always during normal operation and should only be unlocked for maintenance by qualified personnel. Enclosure keys should be stored in a safe place and should be accessible to appropriate personnel only

Operational Safety

- If the LED light turns red, then the system has faulted. Refer to CCSM manual for details on how to troubleshoot and follow the manual recommendation.
- When the LED flashes yellow light, the controller is still active and is functional but has sensed a warning or a non-critical fault that may result in a reduced or de-rated power output state.

WARNING: **This Power Converter System generates high voltage. Obey ALL warnings, cautions, and safety instructions. Failure to do so may result in electrical shock leading to personal injury or death.**

CONTENTS

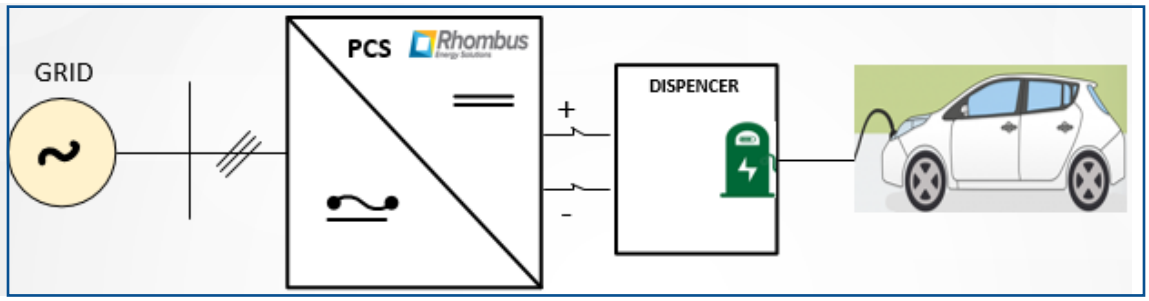
1. INTRODUCTION

This document provides important instructions that must be followed when installing the Power Converter System for Dispenser

IMPORTANT:

- Install PCS only after reading and understanding the complete instructions as specified in the manual.
- Improper Installation Can result in severe personal injury death and equipment damage. The installer must be qualified to perform the installation of electrical and mechanical equipment.
- Ensure that the mounting method and all connections comply with local codes and ordinances.
- Observe all local and national safety regulations.
- Observe local regulations regarding wiring different circuits in the same conduit. In general, all conductors occupying the same conduit must have an insulation rating equal to at least the maximum circuit voltage applied to any conductor within the conduit.
- The 60kw charger must be connected to a circuit provided with appropriate branch circuit over-current protection in accordance with the National Electrical Code, ANSI/NFPA 70.

1.1. GENERAL PRODUCT OVERVIEW



The PCS Power Converter System converts three phase grid voltage to high voltage DC which is then delivered to the vehicle either through a remote charging unit/cable combination or from a charging cable connected to the PCS .

1.2. BEFORE YOU BEGIN

- Ensure that the appropriate wiring, circuit protection, and metering is in place at the installation location by reviewing the specifications, wiring diagrams, and grounding requirements described chapters 1 and 2 of this Installation manual. **NOTE:**
- Verify that the installation site has a load capacity sufficient to support the equipment 60 kW charger.
- The site must be large enough for locating the equipment and provide adequate room for air to circulate through the equipment

WARNING: Locate Power Converter System in a place with adequate room for air to circulate through the equipment and or enclosure consistent with local, state, and national electrical installation guidelines.

1.3. GROUNDING INSTRUCTIONS

The Dispenser must be connected to a grounded, metal, permanent wiring system. An equipment-grounding conductor must be run with circuit conductors and connected to an equipment-grounding terminal on Power Converter System.

1.4. SPECIFICATION

ELECTRICAL INPUT

Utility Grid Voltage (Vac)	422 – 528 Vac (3 phase) {480 +10%, -20%}
Utility Grid Frequency (Hz)	60Hz ±3%
Max Rated Utility Grid Current	79A @480Vac (60Hz)
Standard Wiring	4- Wire 3 phase (L_1, L_2, L_3, Ground)

ELECTRICAL OUTPUT

Nominal Output Power	60 kW Max
Output Voltage (Vdc)	270 – 840 Vdc
Output Current (Idc)	222A (Max)

SAFETY AND OPERATIONAL RATING

Enclosure Rating	TYPE 3R
Safety Standards	UL standards 2202, 2231
Surge Protection	6kV @ 3000A. In geographic areas subject to frequent thunderstorms, supplemental surge protection at the service panel is recommended.
EMC Standards	IEEE1547
Efficiency	>94%
Power Factor	0.97 @ 60KW
Cooling	Forced Air Cooled
Operational Temperature	-30 °C to 45 °C (-22°F to 113°F) Output power derating may apply @ 45°C (113°F) {Optional: Cold Temperatures}
Storage Temperature	-30 °C to 60 °C (-22°F to 140°F)
Operating Humidity	0 to 95% (Non – Condensing)

GENERIC SPECIFICATIONS, PCS

Dimensions (Enclosure with Base Plinth)	**31.5W x 24.5D x 82H inches**
Shipping Dimensions	40.00W x 37.0D x 84.00H inches
Weight	1500 Lbs.
Shipping Weight	1900 Lbs.

NOTE: Rhombus reserves the right to alter product offerings and specifications at any time without notice and is not responsible for typographical errors that may appear in this document.

IMPORTANT: Always transport and store the Rhombus Power Converters in its original pakaging and in as received orientation when possible.

2. PRE-INSTALLATION NOTES

After the installation location is prepared as described in Section 1 you are ready to begin the installation

 IMPORTANT SAFETY INSTRUCTIONS

- Confirm that the installation site has sufficient floor/ground load capacity and footprint area.
- Do not block the intake or exhaust ports.
- The PCS must be grounded to true earth.
- Shut off the power supply before opening the PCS door.
- Do not touch the inside components of the PCS while it is powered or operational.
- The PCS includes capacitors that retain energy after the PCS is powered off. Wait at least 5 minutes with the power off before opening the PCS door.
- Ensure no voltage is applied when you check inside the PCS.
- Operate the PCS only when the PCS door is closed and locked.

2.1. RECOMMENDED ITESMS NEED FOR INSTALLATION

Tools & Items that may be needed for PCS installation

- 3/16 Hex Key
- Qnty 2 of 3/4 inch wrenches
- No. 2 Phillips head screwdriver
- 10mm wrench
- 17mm wrench

2.2. INSTALLATION OVERVIEW

Steps to be followed when installing the PCS:

1. Position and Unpack shipping crate and protective materials.
2. Connect Wiring – follow label instructions.
3. Prepare for Operation
4. Verify installation and operation per manual.

3. INSTALLATION

3.1. LOCATING & UNPACKING THE EQUIPMENT

The Site must be suitable for locating the equipment. Be sure to observe the following guidelines:

- The installation location must provide adequate clearance for air circulation throughout the equipment.
- Follow safety and building codes when installing the PCS Equipment. External wiring (when required), shall follow the National Electric Code, ANSI/NFPA 70. Any external wiring not specifically detailed in this manual is the responsibility of the installer.
- Communications and electrical wiring should be contained in conduit.

Upon receiving the PCS Equipment, inspect for signs of damage that may have been caused during shipping. If damage is found, contact Rhombus Energy Solutions at 1-888-978-6564.The equipment system has a combined weight of approximately more than 1000lbs. Use a pallet jack or forklift to transport.

When installing the PCS Equipment, allow sufficient space for operating/servicing the PCS Equipment and door swing clearances. For dimensions and clearances refer to appendix

3.2. BEFORE WIRING

Before connecting the wiring, note the following requirements:

1. Electrical input must be 480V three phase in a Wye configuration.
2. Use 90 °C copper wire only.
3. The circuit breaker at the panel must be OFF.
4. The PCS must be grounded to true earth.
5. Installer must have an insulated grounding conductor as part of the branch circuit that supplies the PCS.
6. The grounding conductor is to be grounded to earth at the service equipment or, when supplied by a separately derived system, at the supply transformer.
7. All connections must comply with all local codes and ordinances.

3.3. PROCEDURE TO CONNECT HIGH VOLTAGE CABLES

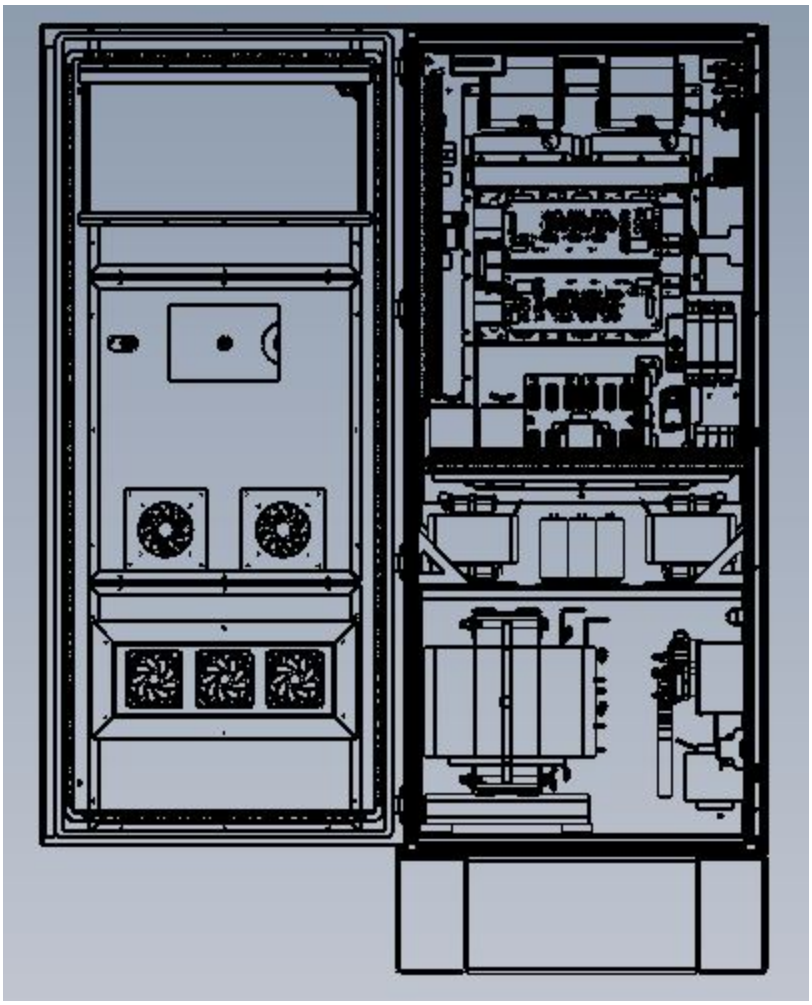
WARNING: Determining the PCS electrical requirements and installating the appropriate wiring must be performed by a qualified electrician.

- There is a danger of electric shock
- Ensure the power is off before connecting the wiring.

- After unpacking the shipping crate locate the door unlock Key for the PCS that is included with the PCS shipment.

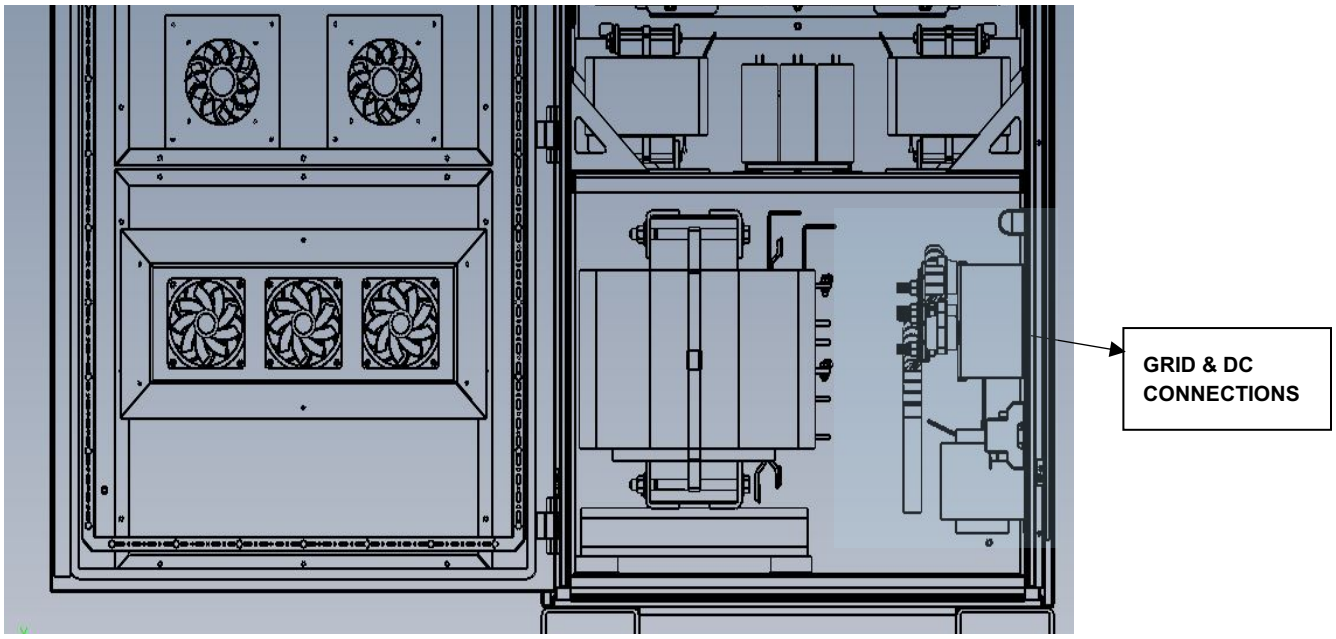
STEP: 1 Unlock the PCS door handle

STEP: 2 Review open door view of PCS and locate cable connections and termination points

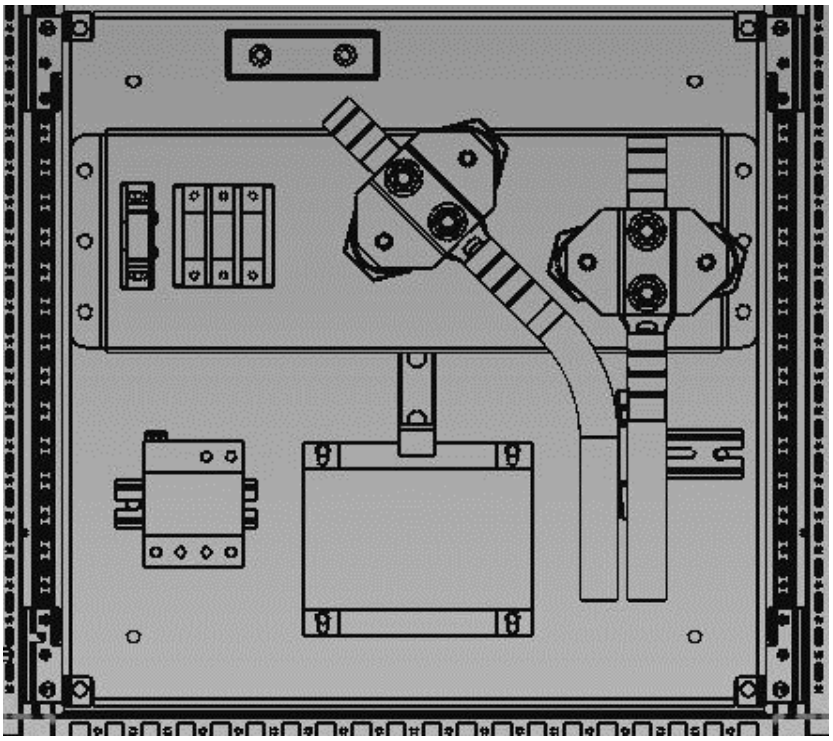


PCS OPEN DOOR FRONT VIEW

- Grid and DC connections are located in the lower shelf, right side panel of the PCS



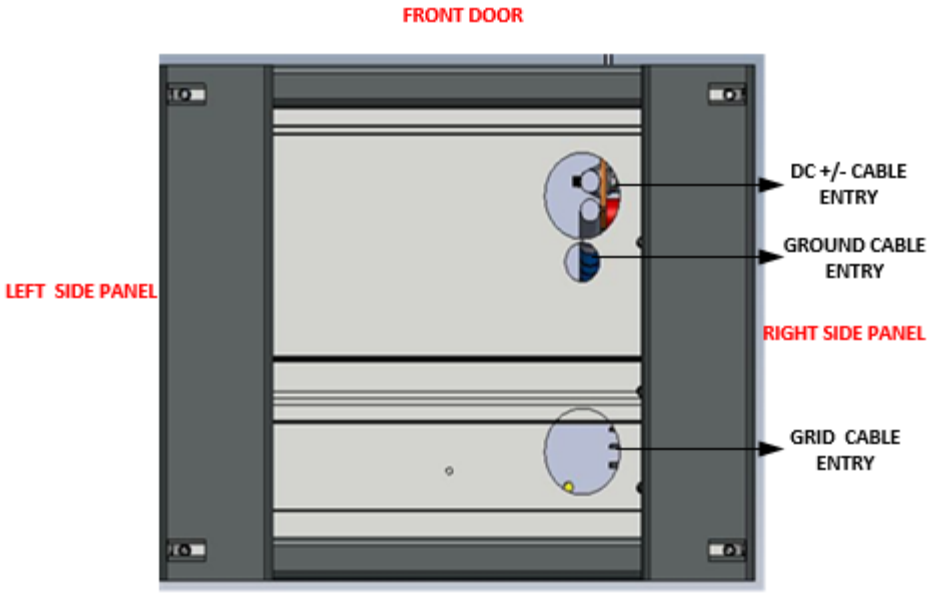
GRID & DC CONNECTIONS LOCATED VIEW

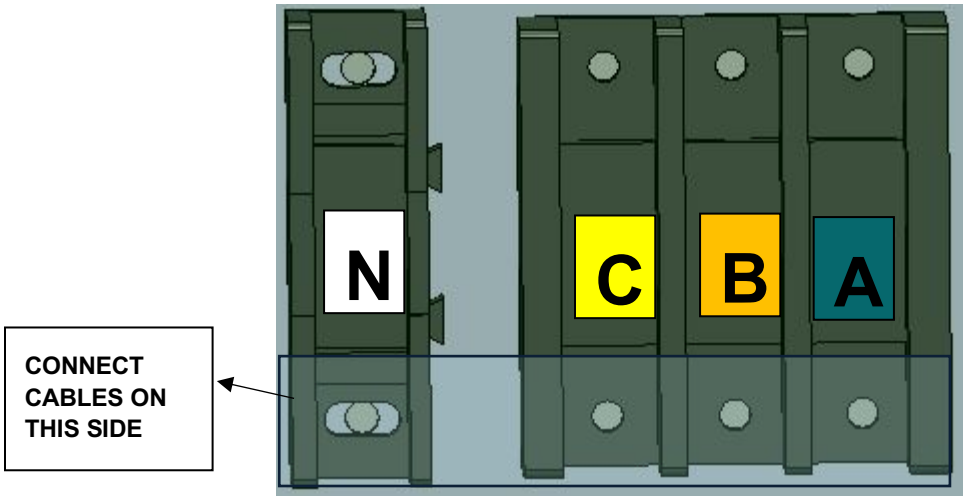


EXPANDED LOWER (RHS) RIGHT-SIDE PANEL VIEW

STEP:3 Connect the Grid Phase A, B, C and N as specified below (RHS View)

Connections Overview: Cable entry for the Grid is shown below in the Plan View





EXPANDED VIEW OF GRID CONNECTIONS

- When installing the PCS Equipment, be sure that the phase sequence is correct. The system is phase rotation sensitive. Verify proper clockwise rotation (A, B, C) with the use of a phase rotation meter
- For wiring the grid you will need 3/16” hex key to loosen the Set screw.
- After loosening the screw ferrule the cable *[use the cable size as specified in torque table*] if needed [*use ferrules as suggested in section 2*].

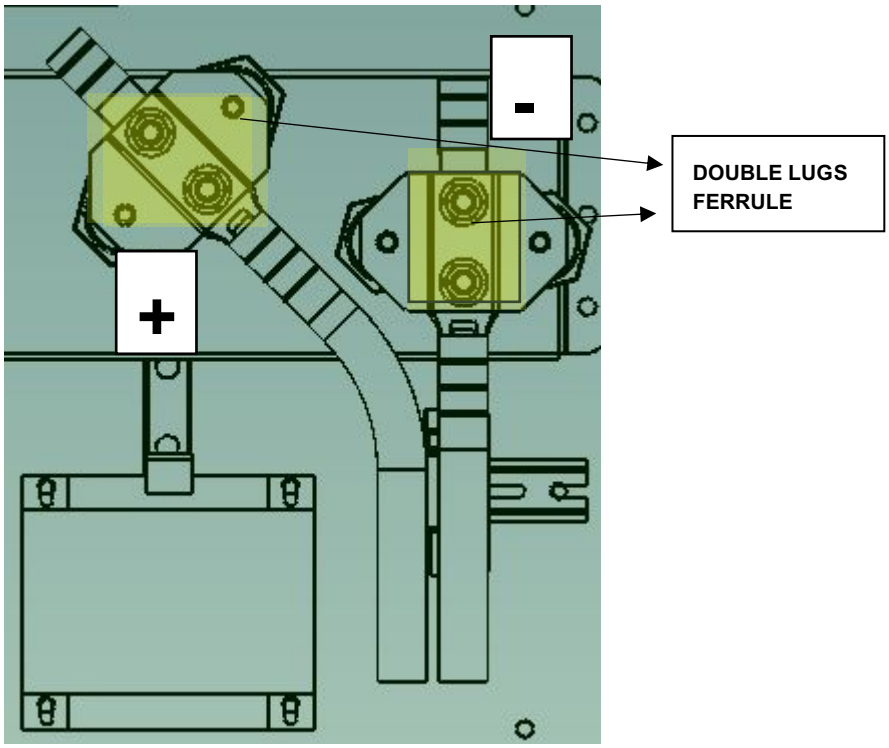
- Insert the cable in the opening of the Terminal and tighten Set screw to the torque specified in the torque table.

STEP:4 Connect the ground to the Terminal Grounding bar located on the top of the grid connections

The PCS is shipped with a cover on the Terminal grounding bar.

- Remove the Terminal grounding bar covering.
- Take the No. #2 Philips screwdriver to loosen the screw
- Insert the ground cable (refer to torque table for cable size) in the screw opening.
- Tighten the Screw as per the torque specifications.

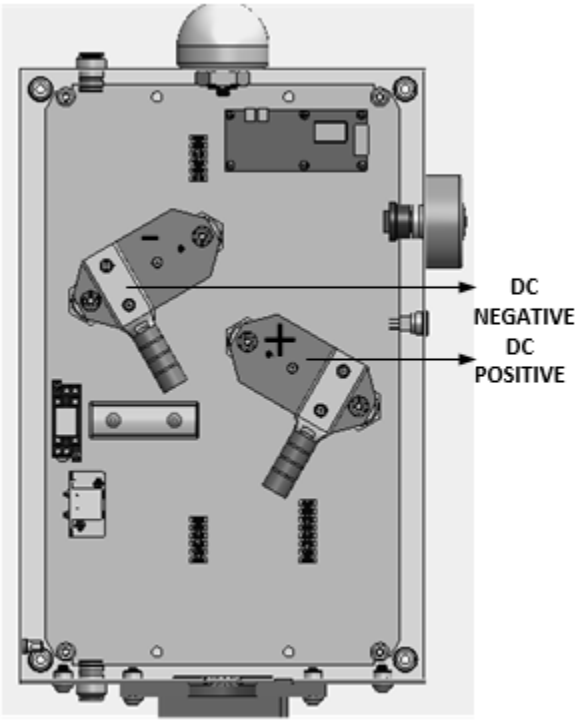
STEP: 5 Connecting the DC connections to the PCS



DC POSITIVE AND NEGATIVE TERMINALS

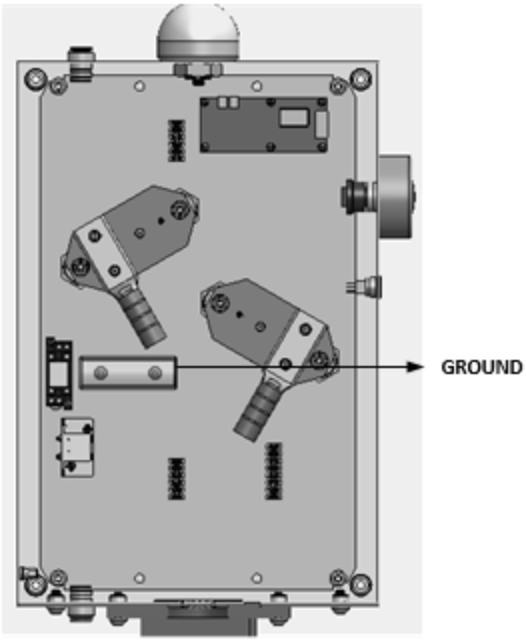
- You will need a ¾” wrench to remove the nuts.
- After removing the nut remove the lock washer and flat washer.
- Crimp the suggested double lug Terminal [as specified in chapter 2] on the cable. [cable size is specified in the torque table.]
- Put the double lug on the threaded screws.
- Then put the flat washer.
- Then the lock washer.
- And then tighten the Nut. [refer to the torque table for torque specifications].

STEP: 6 Connect the other end of the DC cables from the PCS to the Dispenser (pictured below).



- You will need a ¾” wrench to remove the nuts.
- After removing the nut remove the lock washer and Flat washer.
- Crimp the suggested double lug ferrule [as specified in chapter 2] on the cable. [cable size is specified in the torque table.]
- Put the double lug on the threaded screws.
- Install the flat washer.
- Install the lock washer.
- Tighten nut as per the torque specifications.

STEP: 7 Connect the ground from wire from the PCS to the Dispenser.



- Remove the Ground terminal covering.
- Take the No. #2 Philips screwdriver unscrew the screw
- Insert the ground cable (refer to torque table for cable size) in the screw opening.
- Tighten the Screw as per the torque specifications.

3.4. PROCEDURE TO CONNECT LV WIRES

STEP: 1 Connect the Modbus High and Low from the PCS to the Dispenser.

- Check for the label Modbus High in the PCS.
- Connect the wire from PCS to the terminal strip pin-3
- Check for the label Modbus Low in the PCS.
- Connect the wire from PCS to the terminal strip pin-4

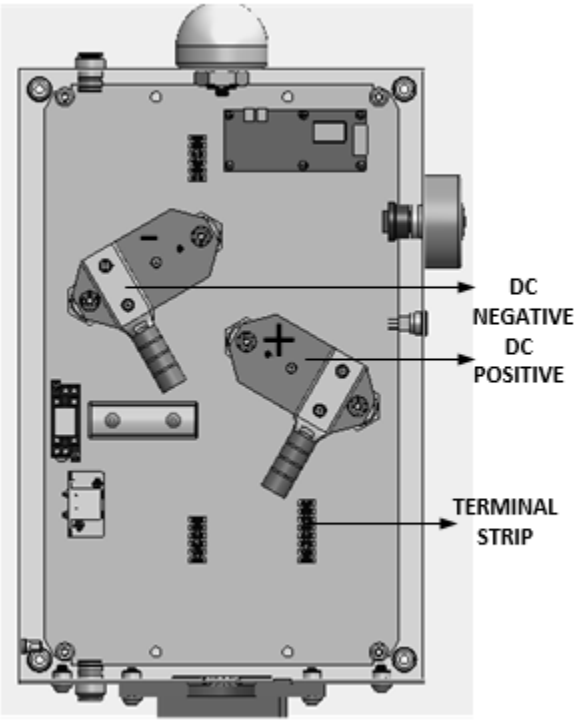
STEP: 2 Connect the E- Stop from the PCS to the Dispenser

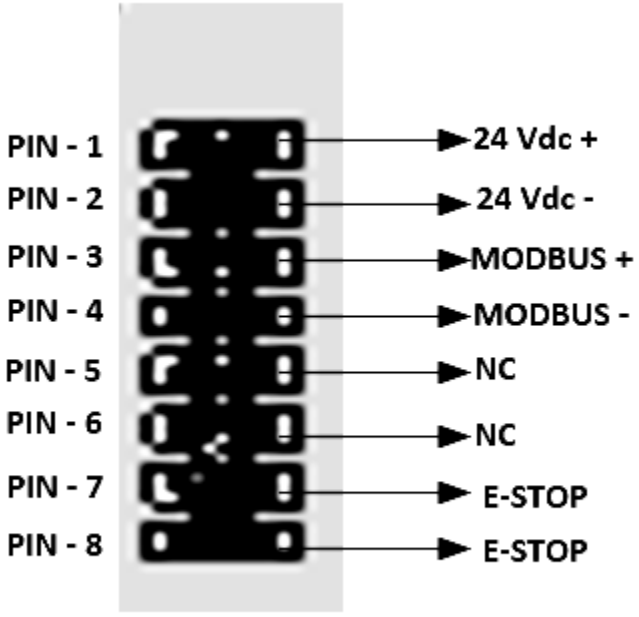
- Check for the label EPO (E-Stop) in the PCS.
- Connect the wire from PCS to the terminal strip pin-7
- Check for the label EPO (E – Stop) - in the PCS.
- Connect the wire from PCS to the terminal strip pin-8.

STEP: 3 Connect 24 Vdc from PCS to the Dispenser.

- Check for the wire labeled 24 Vdc + in the PCS.
- Connect the wire from PCS to the terminal strip pin-1
- Check for the wire labeled 24 Vdc - in the PCS.

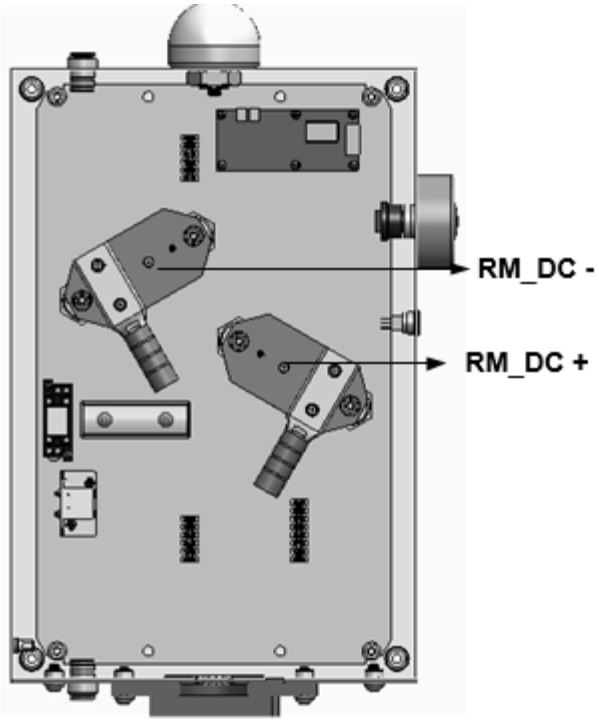
- Connect the wire from PCS to the terminal strip pin-2.





STEP: 4 Connect remote DC sensing from the PCS to the Dispenser.

- Check for Remote Voltage Sense + on the terminal strip in the PCS.
- Use 10mm wretch to unscrew the nut from the positive terminal.
- Crimp a ring terminal on the RM_DC + wire.
- Insert the ring terminal on to the screw
- Now tighten the according to the torque required



3.5. WIRING SPECIFICATIONS

3.5.1. HIGH VOLTAGE WIRING SPECIFICATION

The DC power connections are to be connected to the PCS in the lower shelf right side panel as specified in the diagram Below

Grid power is fed to the PCS equipment via a 4-wire WYE connection that includes three phases (A, B, C), neutral and a ground, contained in the lower right panel of the equipment.

The 480 VAC connections are made on the right-side panel in the lower shelf. When installing the PCS Equipment, be sure that the phase sequence is correct. The system is phase rotation sensitive. Verify proper clockwise rotation (A, B, C) with the use of a phase rotation meter. If a phase sequence fault is detected, correct the corresponding phase wires.

WARNING: Determining the PCS electrical requirements and installating the appropriate wiring must be performed by a qualified electrician.

- There is a danger of electric shock
- Ensure the power is off before connecting the wiring.

Follow the torque specifications as specified in the table

3.5.2. LOW VOLTAGE WIRING SPECIFICATION

The low voltage wiring from the PCS are located on the lower right-side panel. The signals are on the terminal strip and are labeled with the signal name

WIRE AS LABELED	LOCATION ON DISPENSER
DC +	HV wiring step 6
DC -	HV wiring step 6
GROUND	HV wiring step 7
REMOTE EPO	Pin - 7
REMOTE EPO	Pin - 8
MODBUS +	Pin - 3
MODBUS -	Pin - 4
24 Vdc +	Pin - 1
24 Vdc -	Pin - 2

The following are recommended Wire Sizes, based on 35^{O}C Ambient temperatures, and cable in conduit. Follow NEC standards and use only copper conductors.

Cable[1] Description	**Minimum Size In Conduit**	**Maximum Size In Conduit**	**Cables**	**Torque required**
480 VAC Grid	2 AWG	1 AWG	3	120 in lbs.
Neutral	4 AWG	4 AWG	1	120 in lbs.
Chassis to Earth	4 AWG	4 AWG	1	50 in lbs.
Equipment Ground	8 to 4 AWG	4 AWG	1	45 in lbs.
DC Input	4/0	373 MCM	2	65ft in lbs.

3.6. TORQUE SPECIFICATIONS

4. OPERATING THE PCS

4.1. PREPARING THE PCS FOR OPERATION

SAFETY CHECK

Performing a routine safety check each time before starting the PCS Equipment will minimize both the risk of injury to the operator and potential damage to the PCS Equipment or device under test. Before operating the PCS Equipment, check for obvious signs of damage. The following is a list of suggested items to be checked before operating the PCS Equipment:

- Inspect the equipment for visible signs of damage.
- Verify that all inlet and outlet vents are clear of debris. See for the air flow path.
- Inspect externally connected wires and cables for signs of damage, such as fraying or cracked insulation.
- **NOTE:** *Additional safety checks may be necessary depending on the installation of the RES Equipment. The safety checklist above is not intended to be all-inclusive.*

To power-up the PCS Equipment after proper installation follow these procedures:

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1. Ensure that all electrical connections are clean, tight, and free of wire strands and metal shavings.
2. Turn the external circuit breaker on and verify that the PCS is receiving 480VAC phase to ground and 277VAC phase to phase, +/- 10%. Voltages must be verified by a qualified electrician.
3. Close and lock the PCS door.
4. Turn AC Disconnect handle to ON position.
5. Remove protective film from door (if needed).
6. Turn the PCS On/Off switch located on the front side of the PCS to the “ON” position. A green LED signals the PCS initial power up sequence is OK.
7. The PCS is now ready for operation.

4.2. PCS OPERATION

NOTE: For the PCS & Dispenser operation please refer to CCSM operating manual

PROCEDURE TO RUN PCS USING MODBUS

1. Run MODBUS program.
2. Configure to match baud rate, parity, and type (RTU or ASCII) to match with PCS unit

Address: 2

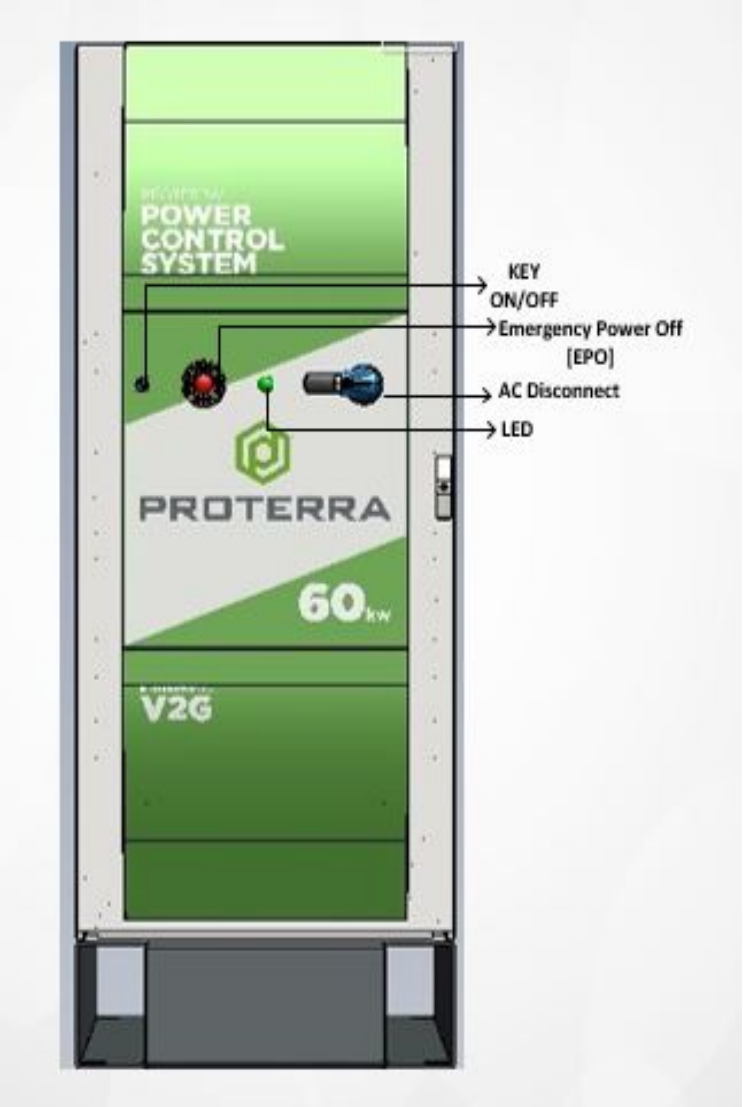
Baud rate: 19200

Parity: None

Type: RTU

Set Port Active.

3. Set PCS to Run in Master Mode.
4. MODBUS operation of the PCS requires the user to enter a passcode to enable writing to the registers
5. Go to security code register #41025 and enter the number 125. This allows the user write on the registers.
6. Enter the heart beat counter is located at address #41027. This heart beat option monitors proper communications to the PCS and expects a counter value to be entered. For example, If you enter 1000, it expects a counter every 100 seconds so be sure to write on the counter every 90 seconds or sooner. This heart beat option can be bypassed by entering 333(33.3 s) on the heartbeat register.
7. Check if the grid trip timings and limits registers (41045 - 41057) are set as required.
8. Check it the battery settings in (41029 – 41035) and (41038 – 41044) are set as required
9. Set power settings in registers 41033 and 41042 to 30 kW {(Power desired) 30 *(scaling factor) 218.44 = (value to type in register) **6553**}. Refer to Modbus document
10. The set point for PCS can be changed in the operational set point register 41029. Refer to the Modbus map for details on scaling values.
11. To power on the PCS set the op mode register 41028 to 4 for constant Power Mode.
12. To power off the PCS, enter 0 in op mode register.



STATUS LEDS

One multi-color status LED is mounted on the front door enclosure panel. The LED. Table contains the LED color definitions.

If the LED is flashing Yellow, the system has detected a warning. PCS Equipment will continue to run if the warning is not grid related. If it is grid related warning (under/over volt/frequency condition), the PCS power equipment will go to IDLE MODE and resume normal operation once the grid recovers and the CCSM commands ON again. The PCS Equipment automatically reconnects after 5 minutes of grid recovery.

If the LED is solid Yellow, then the PCS is operating in Maintenance Mode.

If the LED is solid Red, a fault occurred which could not be cleared, and the PCS Equipment has entered Shutdown Mode. Refer CCSM manual for more information on faults. The fault conditions must be cleared either by remote access or by cycling the ON/OFF switch on the RES Equipment.

LED Color	Status	Description
Green	ON	PCS is in active power delivery or IDLE mode
Yellow	WARNING (solid)	Maintenance mode
	WARNING (flashing)	Warnings are present in the system
Red	SHUTDOWN (solid)	Shutdown due to an internal fault, or ground fault

Showing the LED operation

EMERGENCY STOP

The emergency stop switch (E-STOP) switch is wired to all the internal modules. When pressed, the switch will immediately cease power output from the RES Equipment and isolate the RES Equipment from the grid. The EPO switch is connected in series with a low voltage power circuit to grid side output contactor. When pressed, the circuit is broken, which will not only de-energize the contactor isolating the system from the grid, but also disable the controller switching in a few microseconds (hardware shut-off).

5. MAINTENANCE

MAINTENANCE

To maintain optimal performance of the RES Equipment, the following items should be addressed at the indicated intervals:

NOTE: Failure to follow the maintenance guidelines may negatively affect the performance of the RES Equipment and may void the warranty.

RE-TORQUE

Due to normal thermal cycling, certain fasteners may loosen over time, resulting in increased impedance and possible heat damage. After an initial break-in period of 30 days, all of the fasteners listed in the Wiring Specifications tables in *Section 200 (Specifications)* should be re-torqued to the values shown in the tables.

Additionally, these fasteners should be checked at 12-month intervals and re-torque as necessary.

AIR INTAKE

The air intake should be inspected once every 3 to 6 months, or if the RES Equipment shutdowns frequently due to high enclosure temperatures. Check for excessive accumulation of contamination. Any debris caught in the filter should be removed. The debris (i.e. paper) caught in the screen will normally fall off when the RES Equipment is off at night.

ENCLOSURE VENTS

The enclosure vents should be kept clear of debris. It is suggested that they be checked once every 3 months.

RECOMMENDED MAINTENANCE INTERVAL SUMMARY

MAINTENANCE ITEM	INTERVAL
Re-Torque Field Installed Fasteners	After 30 days from initial start-up; every 12 months thereafter
Inspect Air Intake and Exhaust Vents	Periodically based on environment Inspection: every 3 months

	Cleaning: every 12 months

TABLE: 6 showing the maintenance interval

5.1. MAINTENANCE PROCEDURES

The following procedures should be used when performing maintenance on the RES Equipment:

RE- TORQUE FASTNERS

Using the appropriate torque wrench, re-torque all fasteners listed in the **Wiring Specifications** tables in *Section 1.4 (Specifications)* to the torque value indicated in the tables. Be careful not to over-torque any connection, as damage to the wiring or terminal may occur.

ENCLOSURE VENTS

To clean the enclosure vents, vacuum them. Be sure to check all vents. It is also recommended to vacuum the insides after the vents have been cleaned.

CAUTION: Do not spray water or use solvents to clean the enclosure vents. Excessive moisture within the enclosure can cause corrosion, damage circuitry, and increase the risk of fire.

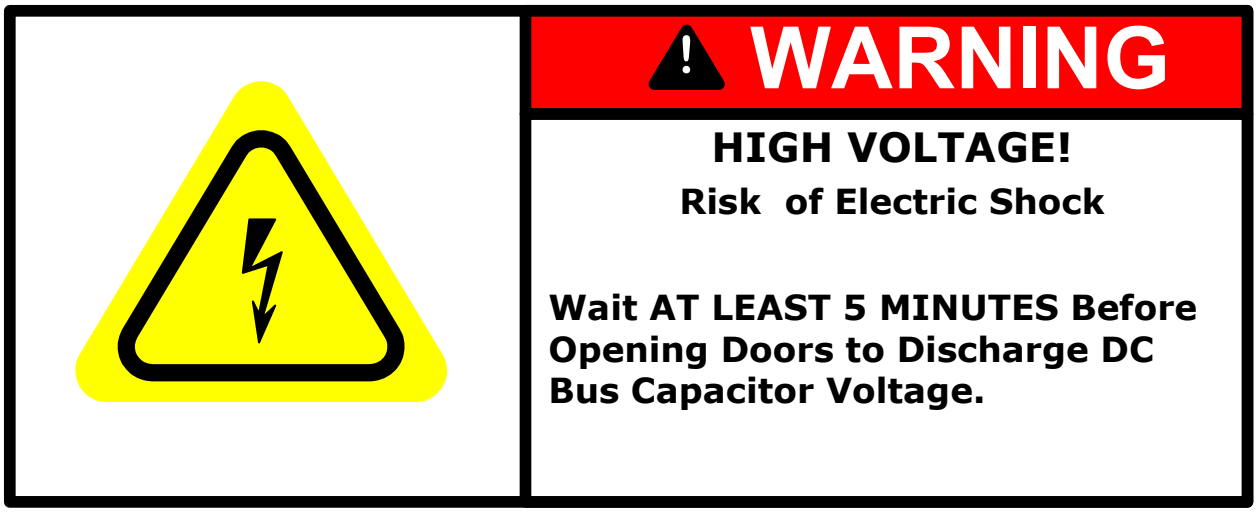
Make sure the RES Equipment is shut off before servicing the inside of the enclosure.

There are two vents for the air flow located on the front of RES equipment check the mesh and clean it before turning ON the RES Equipment

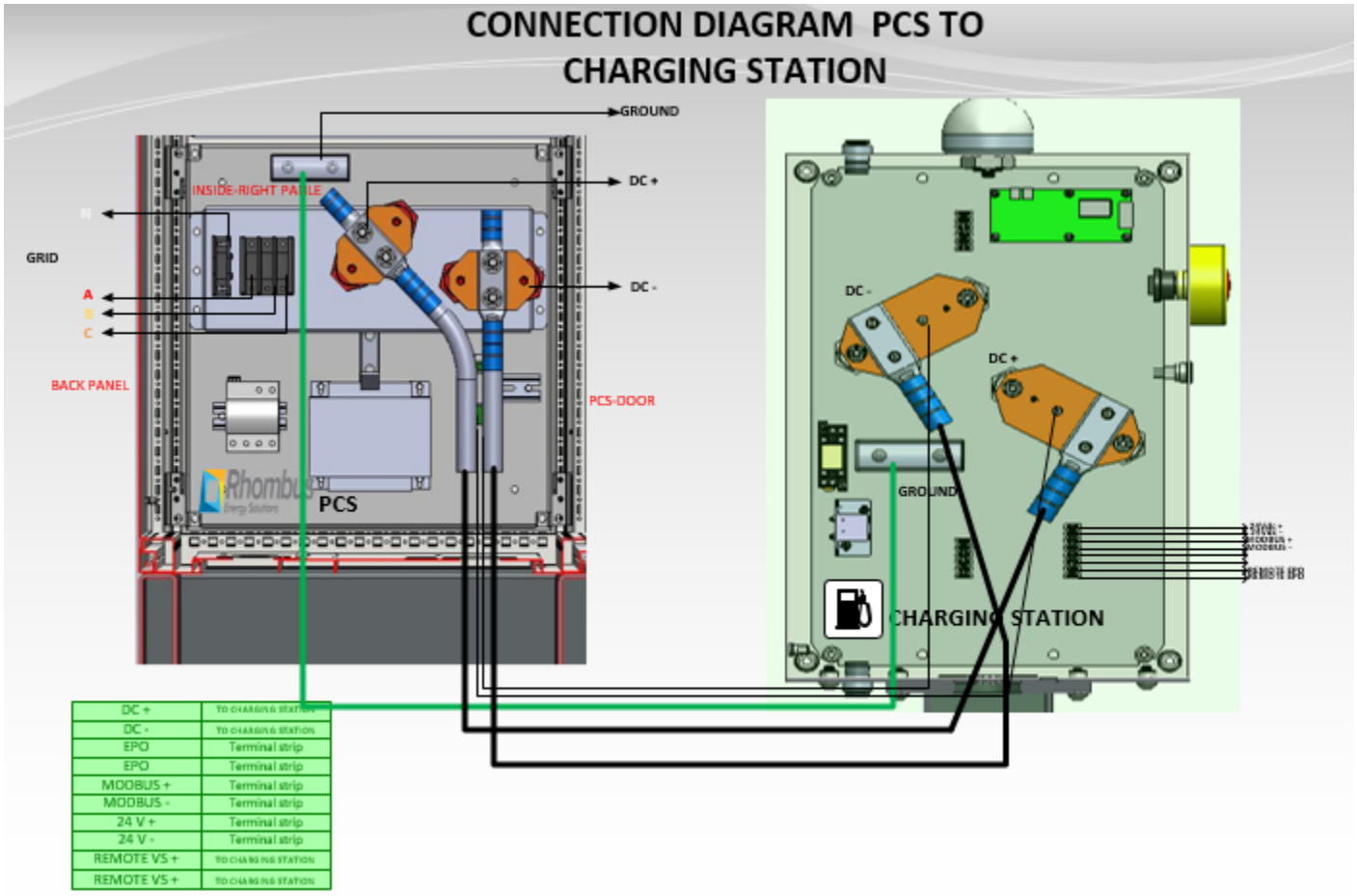
HIGH VOLTAGE ELECTRICAL EQUIPMENT MAINTENANCE

- Disconnect ALL sources, use proper caution before opening the doors or working on the equipment or transformer.
- Disconnect the DC and AC before servicing the RES Equipment, since the DC input may supply hazardous voltage.
- The RES Equipment's DC-link capacitors will hold a charge for up to 5 minutes after the RES Equipment has been shut off, and the grid and DC input load or source have been disconnected from the RES Equipment. Wait 5 minutes before opening enclosure doors. (there is a warning label on the front panel right near the opening of the RES Equipment)
- Remove jewelry, watches, rings, and metal objects that can cause short circuits.
- Use anti-static wristbands when servicing electronic components.
- Verify the presence of voltage with a proper instrument before working on the RES Equipment or the transformer. (RES Equipment comprises of DC Capacitors and AC capacitors for safety its recommended to wait for 5 mins and then open the Door and check the voltage of the capacitors using a multi-meter and it is also advised to check the voltage on the place you are trying to work on)
- Be sure that all electrical connections and connectors are properly installed and connected with proper torque. Torque specifications for terminals can be found in the Torque Specifications section.
- For continued protection against risk of fire, only use replacement fuses of the same type and rating as the originally installed fuses.

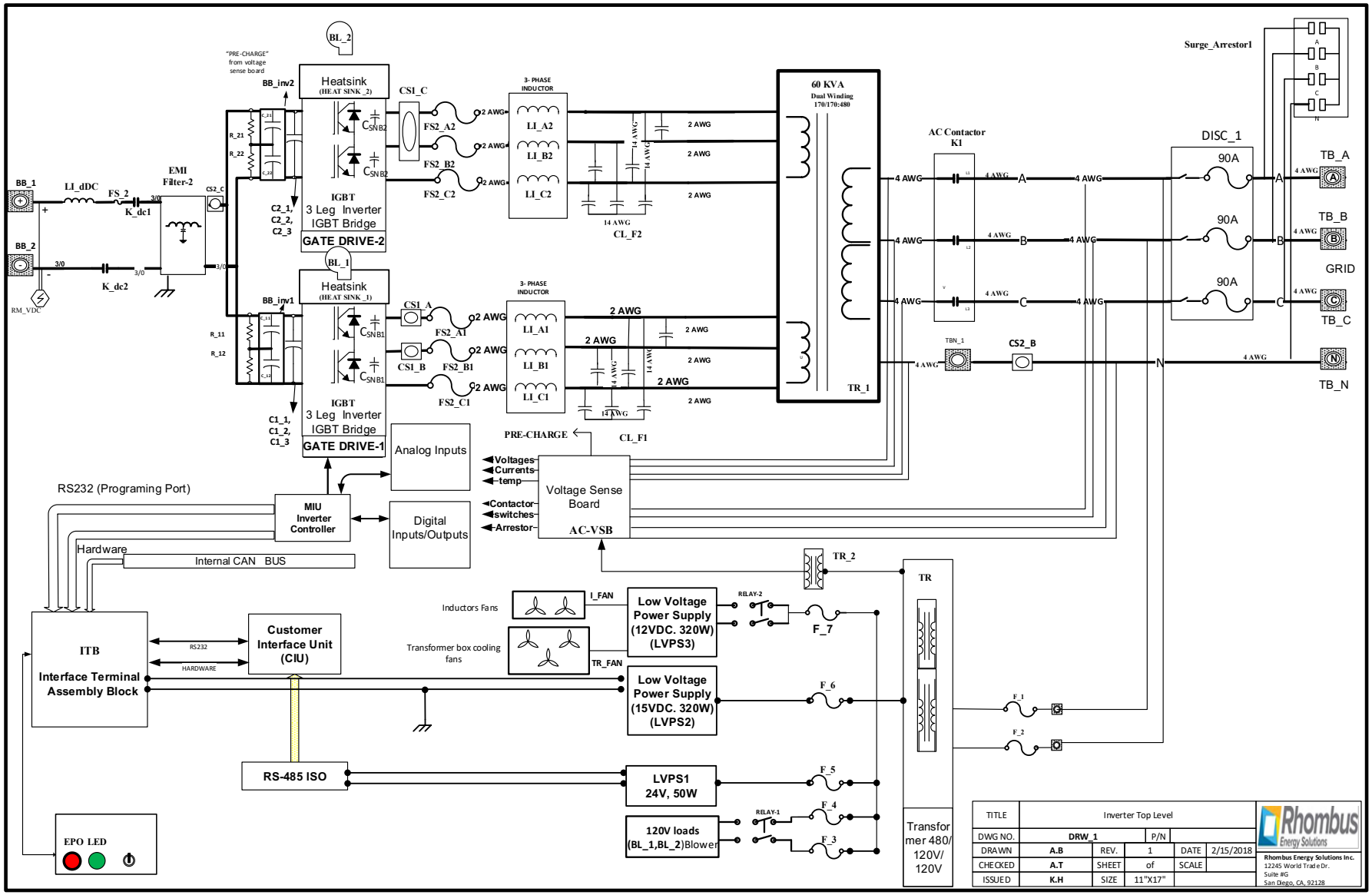
- Avoid hazardous voltage situations that could result from unsafe conditions such as, but not limited to, the following:
    - Back-feed from the utility
    - Improper grounding
    - Handling electrical leads or devices with wet hands, or on wet ground
    - Frayed electrical leads
    - Working with or on an electrically hot system or component, or when connected to an energized load
    - Improper connection or re-connection of the terminal leads
    - Short circuits
    - Energized normal and emergency power sources
    - Possible battery bank connection to the DC bus.



APPENDIX


CONNECTION DIAGRAM PCS TO CHARGING STATION
GROUND
DC +
DC -
INSIDE-RIGHT PANEL
GRID
A
B
C
BACK PANEL
PCS-DOOR
PCS
DC -
DC +
GROUND
CHARGING STATION
DC + TO CHARGING STATION
DC - TO CHARGING STATION
EPO Terminal strip
EPO Terminal strip
MODBUS + Terminal strip
MODBUS - Terminal strip
24 V + Terminal strip
24 V - Terminal strip
REMOTE VS + TO CHARGING STATION
REMOTE VS + TO CHARGING STATION

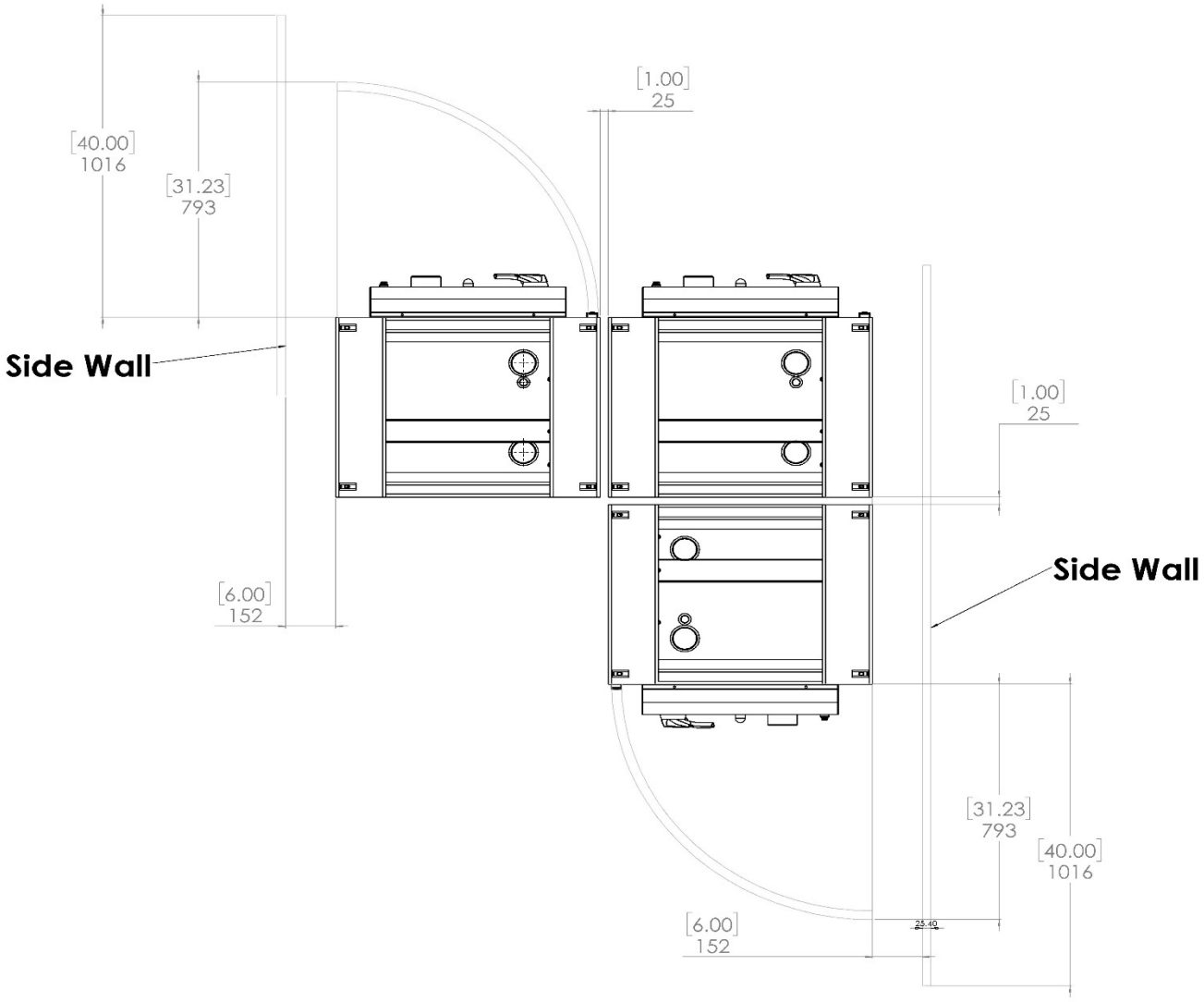
DETAILED SCHEMATIC RES-DCVC60KW-480



DIMENSIONS AND CLEARANCES

DIMENSIONS OF RES-DCVC60KW-480

CLEARANCES FOR RES-DCVC60KW-480



- Min 6 inch from either side of wall
- Min 1 inch from back wall
- Min 1-inch gap between two units side to side
- Min 1-inch gap between two units back to back
- 32-inch clearance in front of unit for door opening