Operation and Maintenance

Table of Contents

Qualified Persons

⚠ WARNING

The equipment covered by this publication must be installed, operated, and maintained by qualified persons who are knowledgeable in the installation, operation, and maintenance of electric power distribution equipment and the associated hazards.

A qualified person is one who is trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltage to which the qualified person will be exposed
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment. Failure to comply can result in personal injury or even death.

Read this Instruction Sheet

NOTICE

Read this instruction sheet thoroughly and carefully before installing or operating your S&C PureWave UPS System. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 through 5. The latest version of this publication is available online in PDF format at **sandc.com/Support/Product-Literature.asp**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of your S&C PureWave UPS System. Designate a location where you can easily retrieve and refer to it.

Proper Application

⚠ WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the selected equipment.

Warranty

The warranty and/or obligations described in S&C's standard conditions of sale, as set forth in Price Sheet 150, plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of all the seller's liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150, and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150.

Warranty Qualifications

The seller's warranties are contingent upon the installation and adjustment of the S&C PureWave UPS System in accordance with S&C's applicable instruction sheets, data sheets, and/or data bulletins

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels attached to the containers and power conversion system (PCS) enclosures. Familiarize yourself with these types of messages and the importance of these various signal words:

⚠ DANGER

"DANGER" identifies the most serious and immediate hazards that *will likely* result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING

"WARNING" identifies hazards or unsafe practices that *can* result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION

"CAUTION" identifies hazards or unsafe practices that *can* result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE

"NOTICE" identifies important procedures or requirements that *can* result in product or property damage if instructions are not followed.

Following Safety Instructions

NOTICE

Read this instruction sheet thoroughly and carefully before operating your PureWave UPS System.

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website, **sandc.com**. Or call S&C Headquarters at (773) 338-1000.

Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Hazardous Voltages

⚠ DANGER

Potentially lethal voltages are present inside the PureWave UPS System. Dc voltage is present even without utility power connected. Hazardous voltages should also be expected in all interconnecting components and lines.

Securing the Enclosure

To maintain safety, the user should use padlocks on each enclosure door. The doors and the use of the padlocks provide protection against inadvertent contact with high-voltage circuits.

Safety Equipment, Precautions, and Practices

S&C PureWave UPS System and battery instruction sheets must be available to all operators and other employees. If doors to the electrical controllers or panels to the system enclosure must be opened, refer to the instruction sheet for procedures for guarding against electric shock. Lockout and tagout procedures should be developed and implemented in accordance with 29 CFR 1910.147.

⚠ WARNING

Insulated hand tools are required when working on or around any energized equipment. Use only properly rated tools for the energy present. Tool inventories should be kept to ensure all tools that enter the system enclosure are removed before energizing the system.

Emergency Procedures and Equipment

The owner should develop policies and procedures for handling emergency situations. It is the responsibility of the owner to develop site-specific emergency action plans for response to such situations.

Additional Safety Instructions

Consult the supplier of the batteries for additional safety instructions and procedures.

Location of Safety Labels

NOTICE

For safety labels, contact S&C Electric Company for the following:

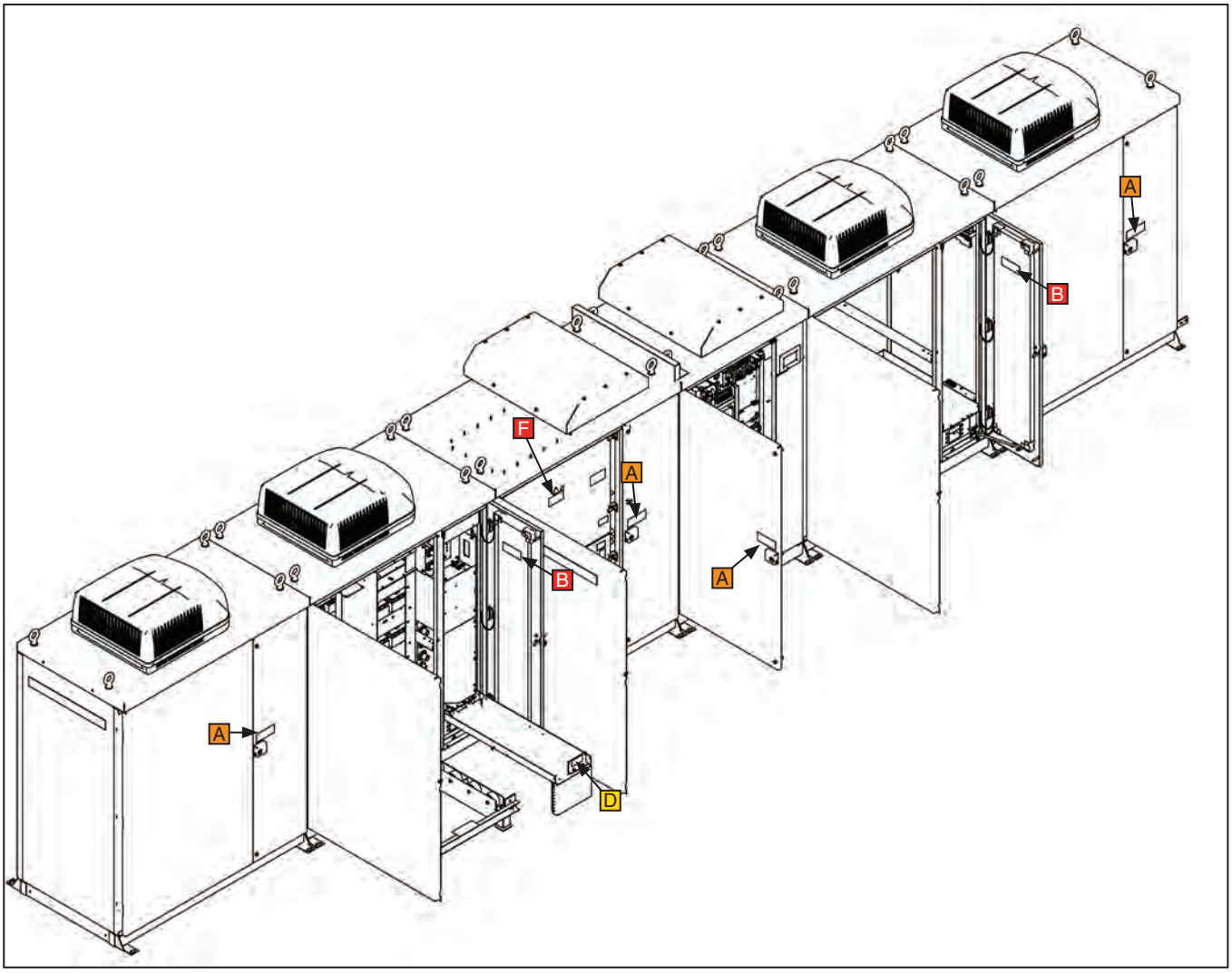
- Exact location of the standard safety labels
- Project-specific safety labels
- Replacement of labels (reference the label part numbers as shown below)

Reorder Information for Safety Information

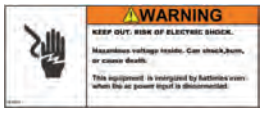
Location	Safety Alert Message	Description	Part Number
A	⚠ WARNING	Keep out. Risk of electric shock…	PE-70314
B	⚠ DANGER	Hazardous voltage…	PE-70315
C	⚠ DANGER	Keep out. Risk of electric shock…	PE-70323
D	⚠ CAUTION	Do not remove power conversion…	PE-70321
E	⚠ DANGER	Hazardous voltage inside…	PE-70319
F	⚠ DANGER	Risk of electric shock…	PE-70316
G	⚠ WARNING	To reduce risk of fire...	PE-70324
H	⚠ CAUTION	Always follow the instructions...	PE-70325

Location of Safety Labels – continued

For 750-kW and 1000-kW PureWave UPS Systems (1000-kW system pictured)



A



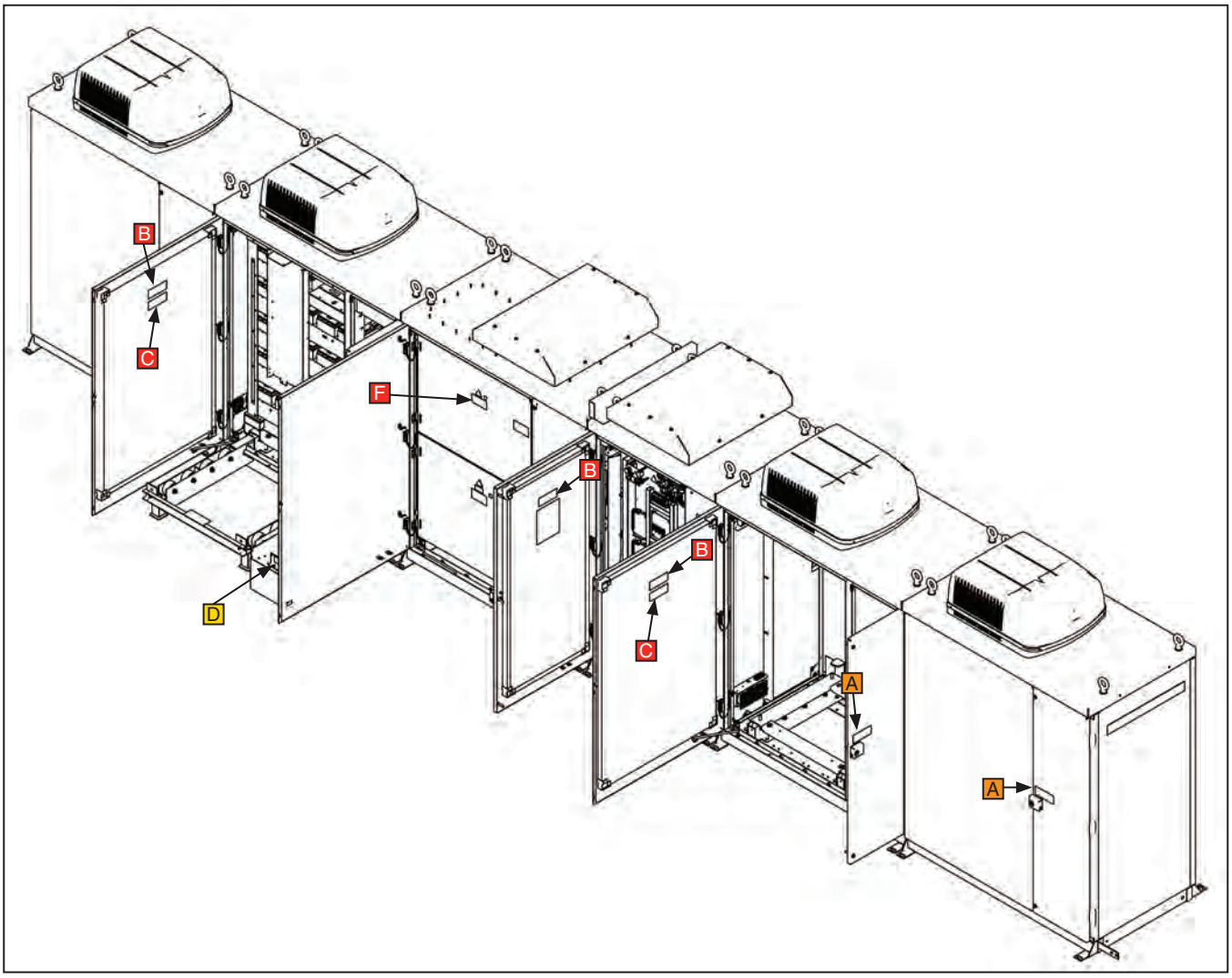
B

D

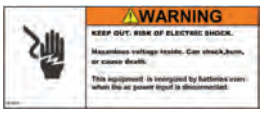
F

Location of Safety Labels – continued

For 750-kW and 1000-kW PureWave UPS Systems (1000-kW system pictured)



A



B

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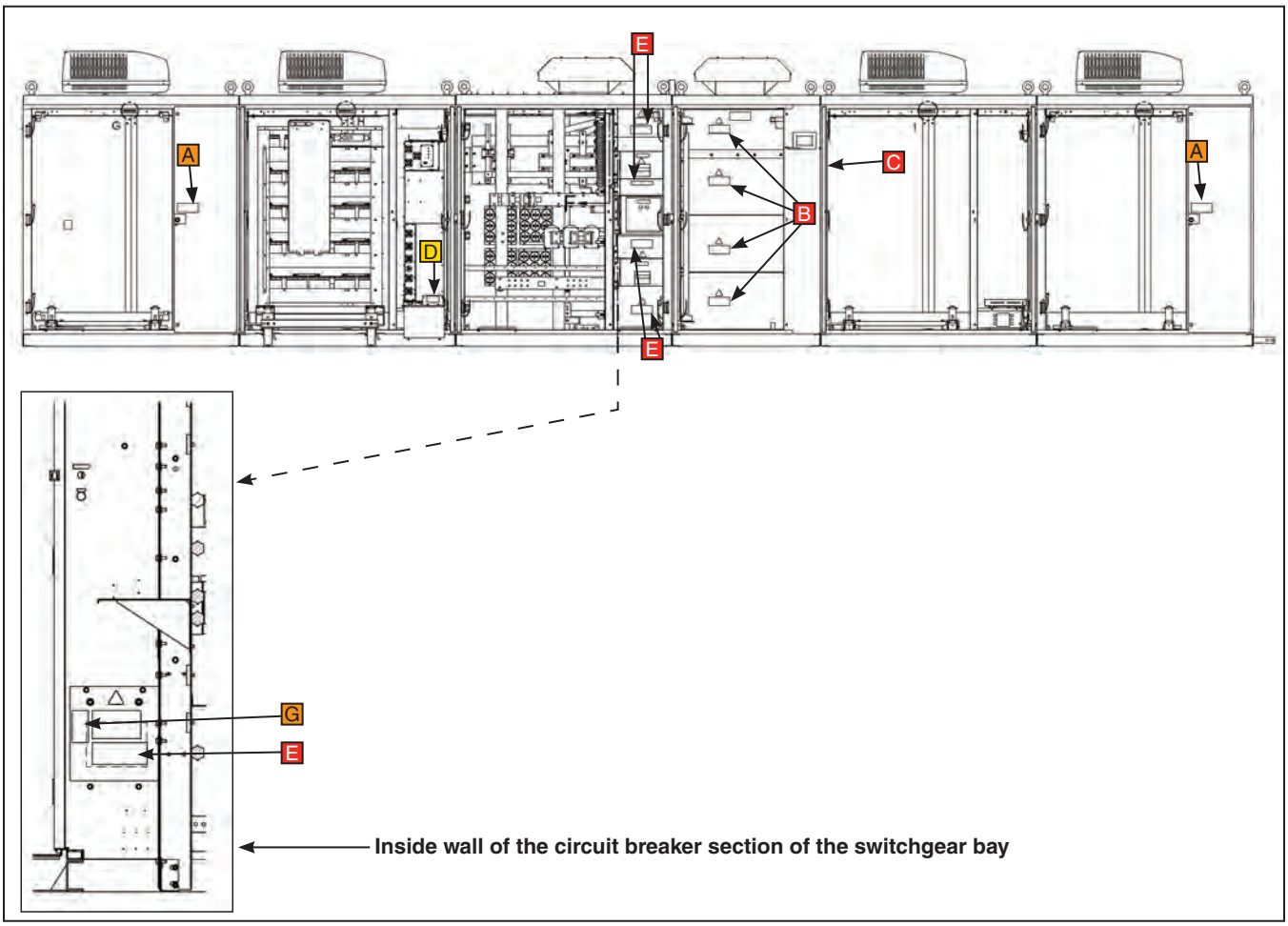
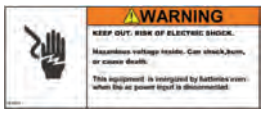
Location of Safety Labels – continued

For 750-kW and 1000-kW PureWave UPS Systems (1000-kW system pictured)



A



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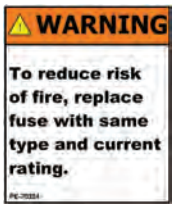
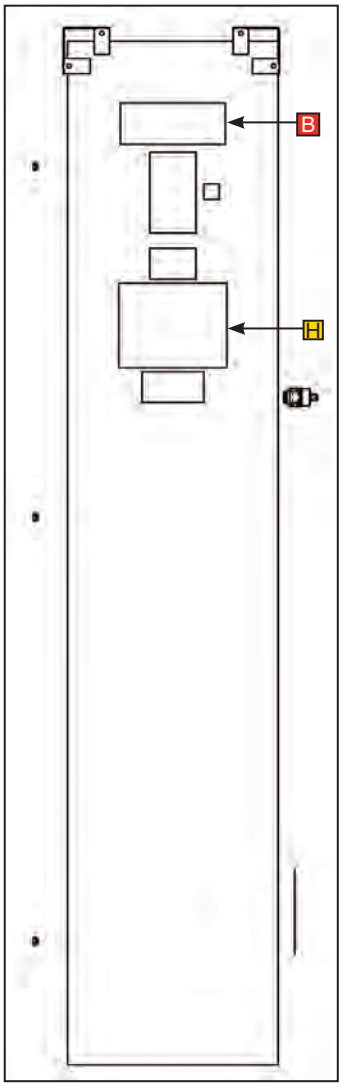
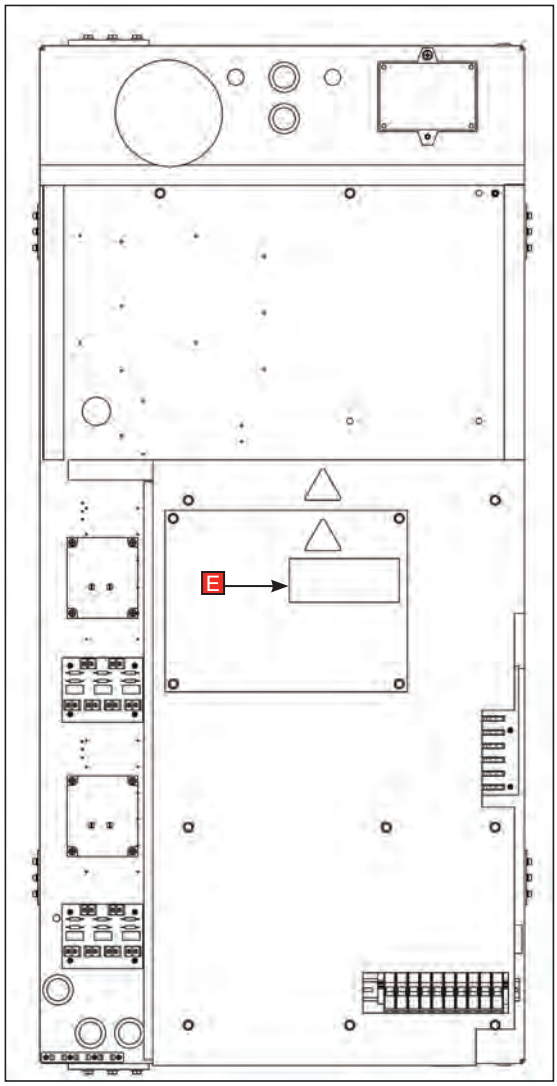


Location of Safety Labels – continued

For 750-kW and 1000-kW PureWave UPS Systems



View of the back side of the circuit breaker section door of the switchgear bay



View of the back side of the swing-out control panel inside the control bay.

B

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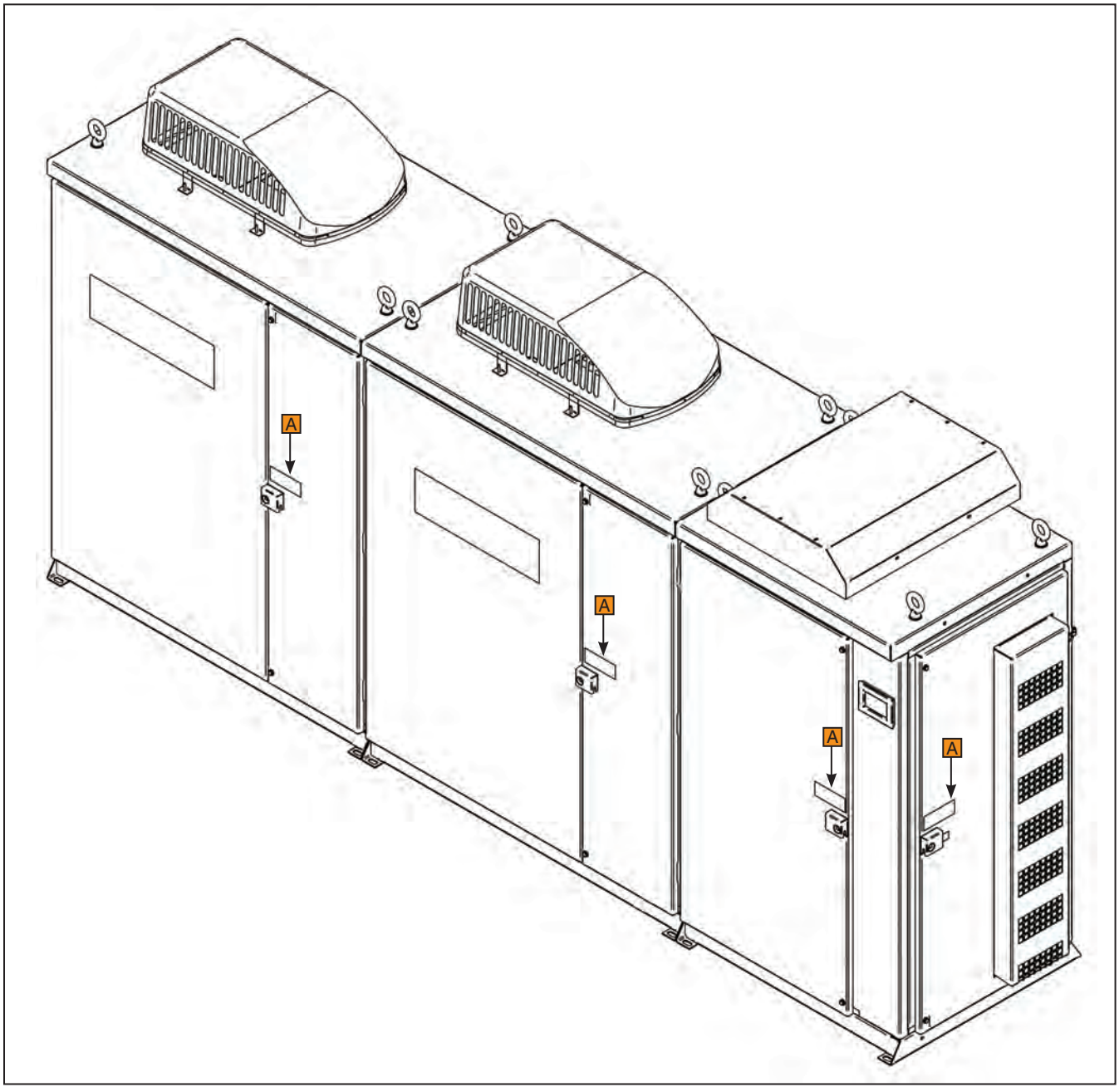
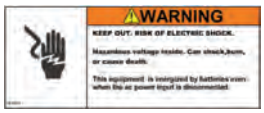
Location of Safety Labels – continued

For 250-kW and 500-kW PureWave UPS Systems (500-kW system pictured)

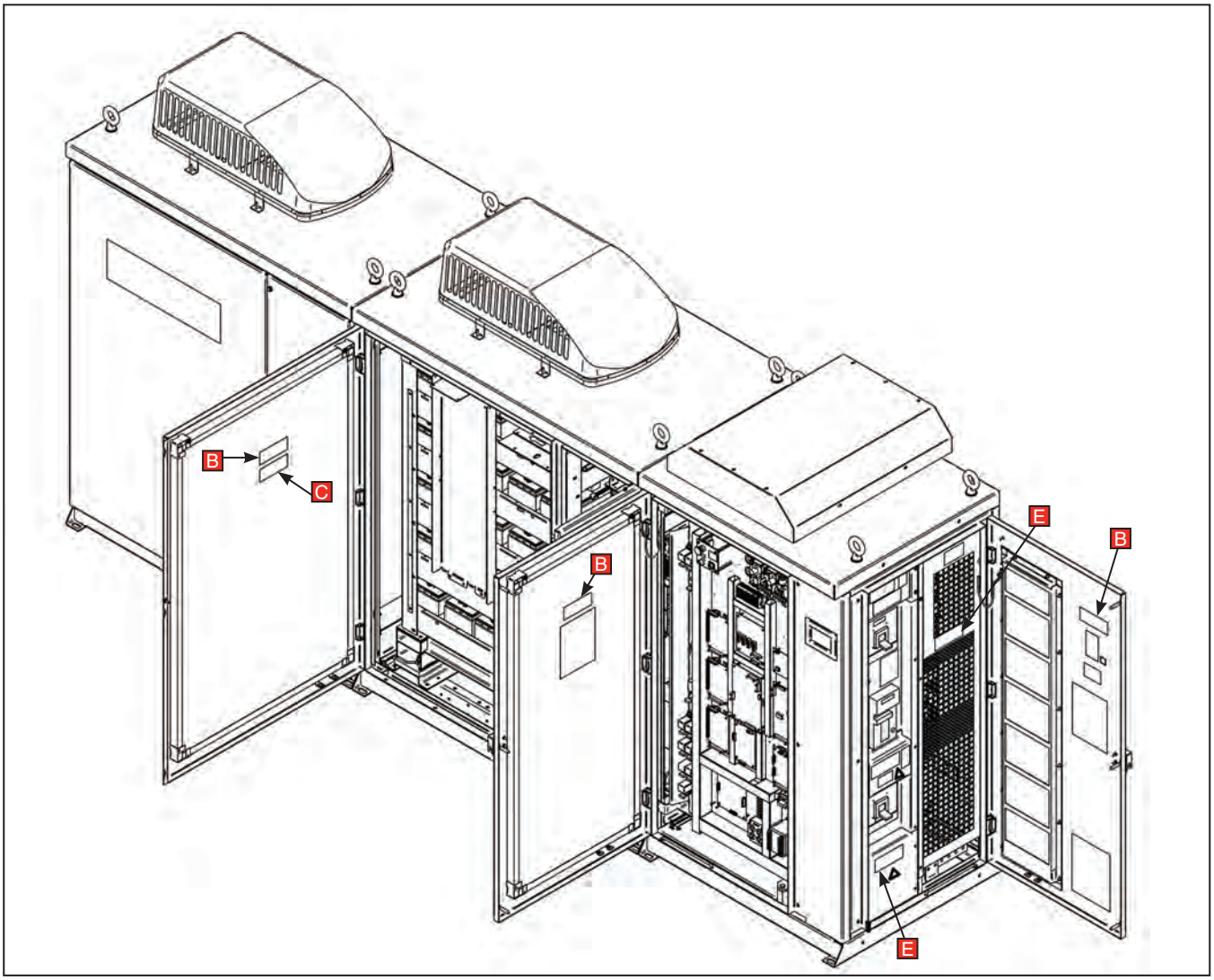


A



Location of Safety Labels – continued

For 250-kW and 500-kW PureWave UPS Systems (500-kW system pictured)



B

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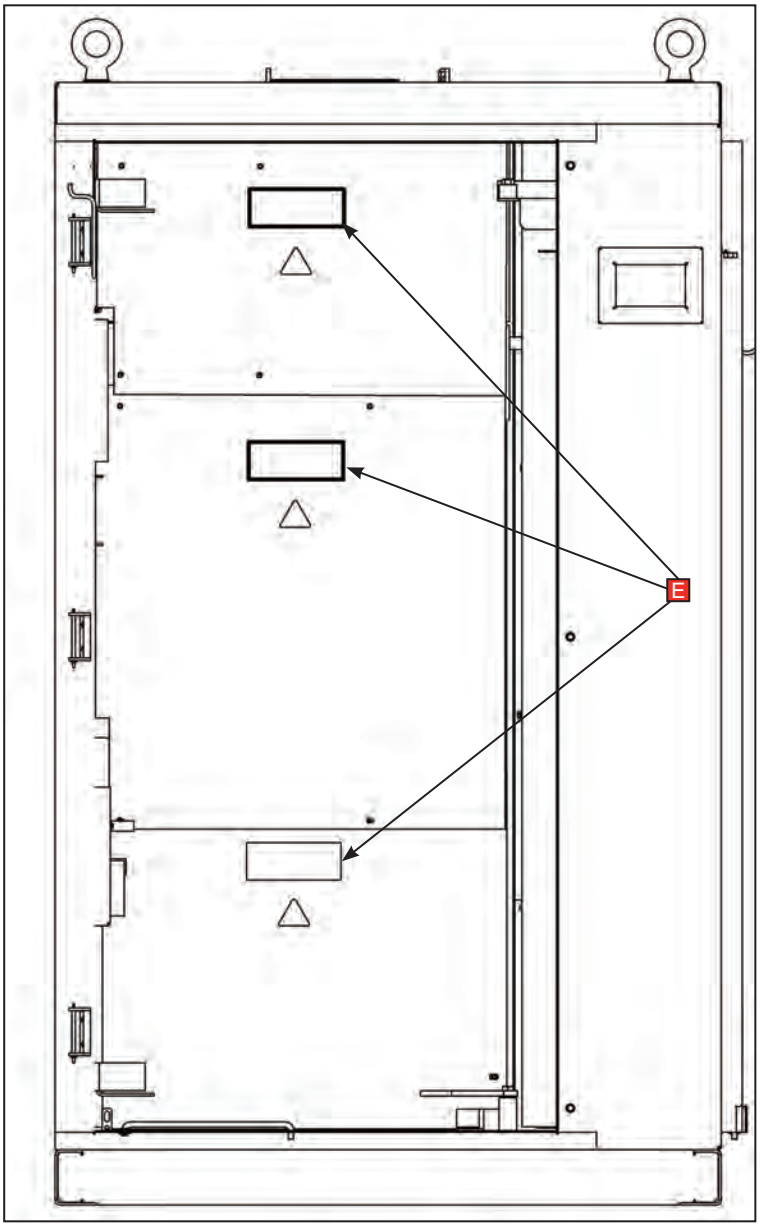
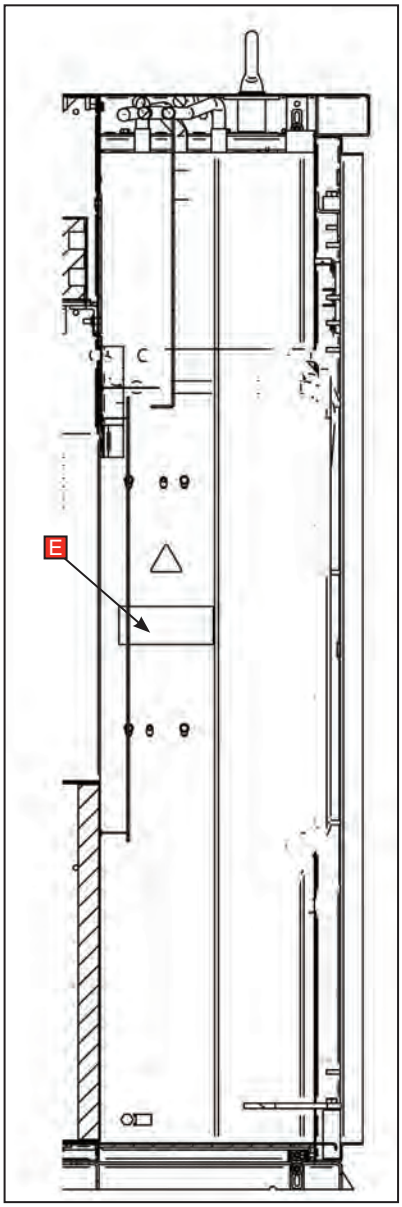
Location of Safety Labels – continued

For 250-kW and 500-kW PureWave UPS Systems



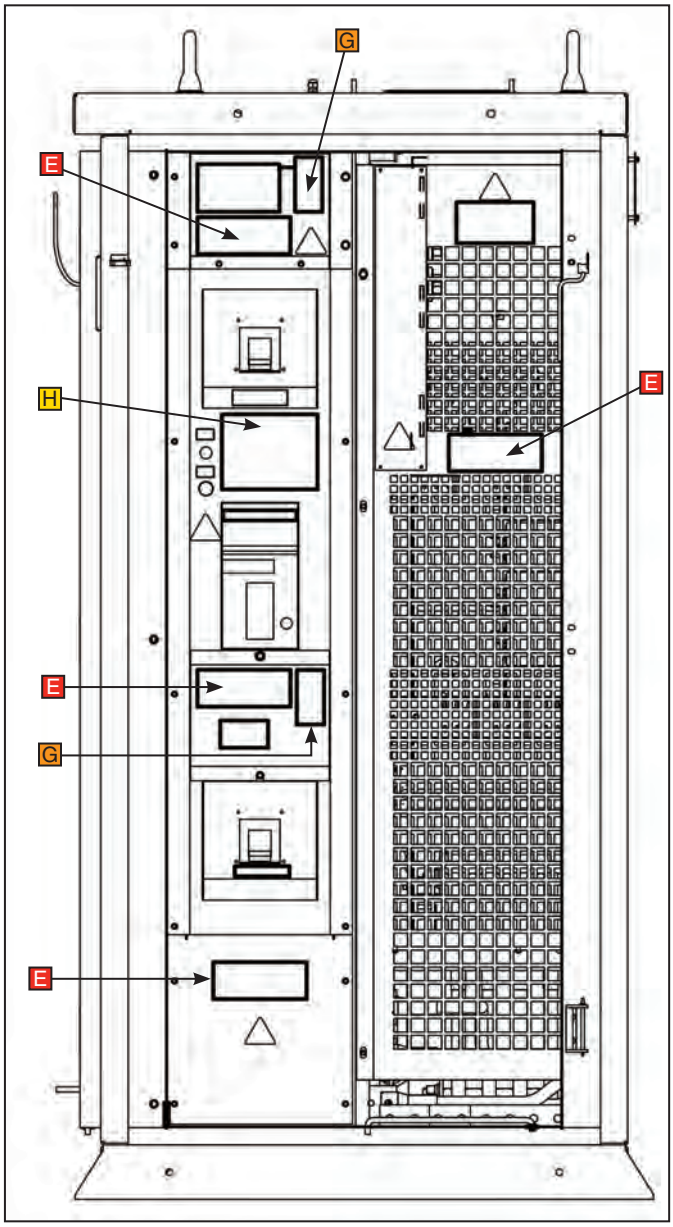


Views of the control bay (with the door open showing the dead-front panels).

E

Location of Safety Labels – continued

For 250-kW and 500-kW PureWave UPS Systems



View of the switchgear bay with door open.

E

G

H

⚠ DANGER

The S&C PureWave UPS System operates at high ac and dc voltages. Failure to observe these precautions will result in serious personal injury or death.

Some of these precautions may differ from your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to the PureWave UPS System must be restricted only to qualified persons. See "Qualified Persons" on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "*NOTICE*" labels.
5. **OPERATING MECHANISM AND BASE.** The PureWave UPS System contains fast-moving parts that can severely injure fingers. Do not remove or disassemble operating mechanism or circuit breakers or remove access panels on the PureWave UPS System unless directed by S&C Electric Company.
6. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded.
7. **GROUNDING.**
   For grounding purposes, the proceeding must be followed:
   - The PureWave UPS System PCS base must be connected to a suitable earth ground or to a suitable building ground for testing before energizing the unit and at all times when energized.
8. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

Shipping and Handling

Inspection

After the PureWave UPS System is commissioned and the unit is online, inspection and maintenance should be scheduled on a regular basis to ensure proper system operation.

Enclosure Configurations

⚠ DANGER

Do not enter the system enclosure unless trained, certified, and authorized to do so by S&C Electric Company. Physical entry into the PureWave UPS System should never be attempted while the system is enabled or when the modules are online. Voltages up to 800 Vdc and 600 Vac should be expected under normal operating conditions. Dc voltage is present even without the utility power connected.

The enclosure is meant to provide access for field troubleshooting purposes only when the unit is properly grounded. Never, under any circumstances, open the enclosure doors while it is online or has not been fully discharged and grounded. Failure to do this can result in equipment damage, personal injury, or even death.

Figures 1 through 4 show the different enclosure configurations for the 250-kW, 500-kW, 750-kW, and 1000-kW PureWave UPS System enclosures, respectively

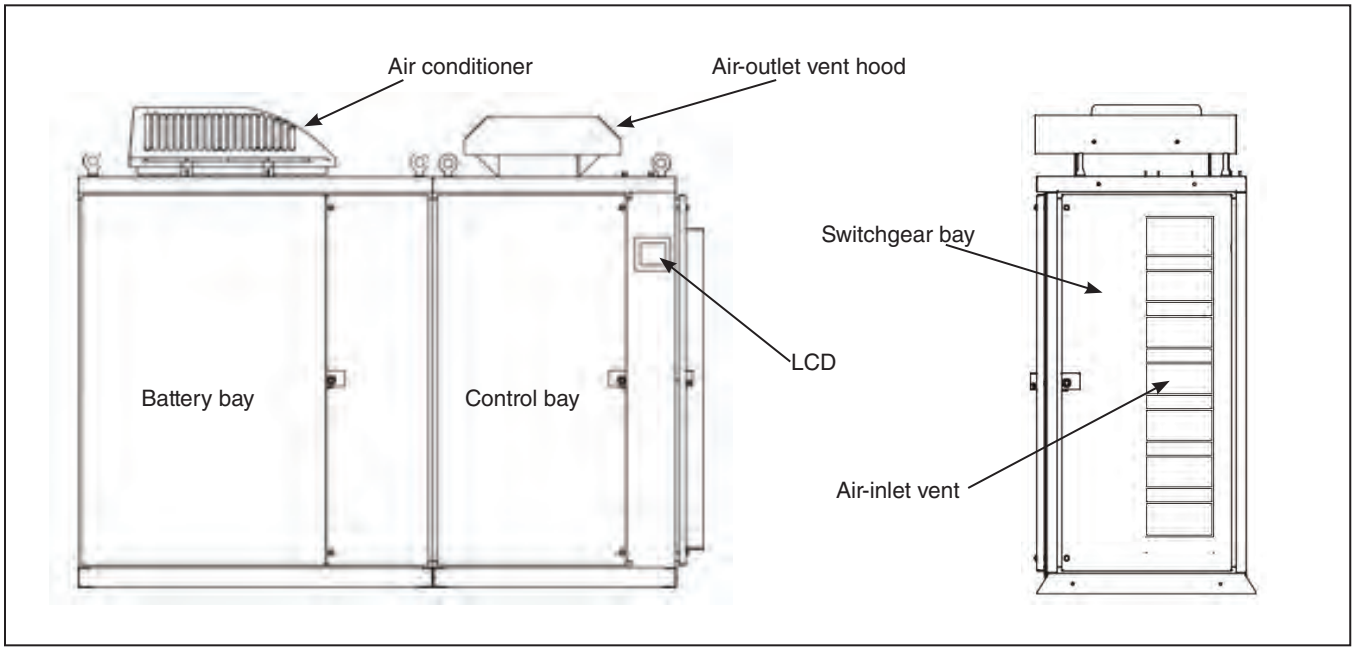


Figure 1. Front and side view of the 250-kW PureWave UPS System.

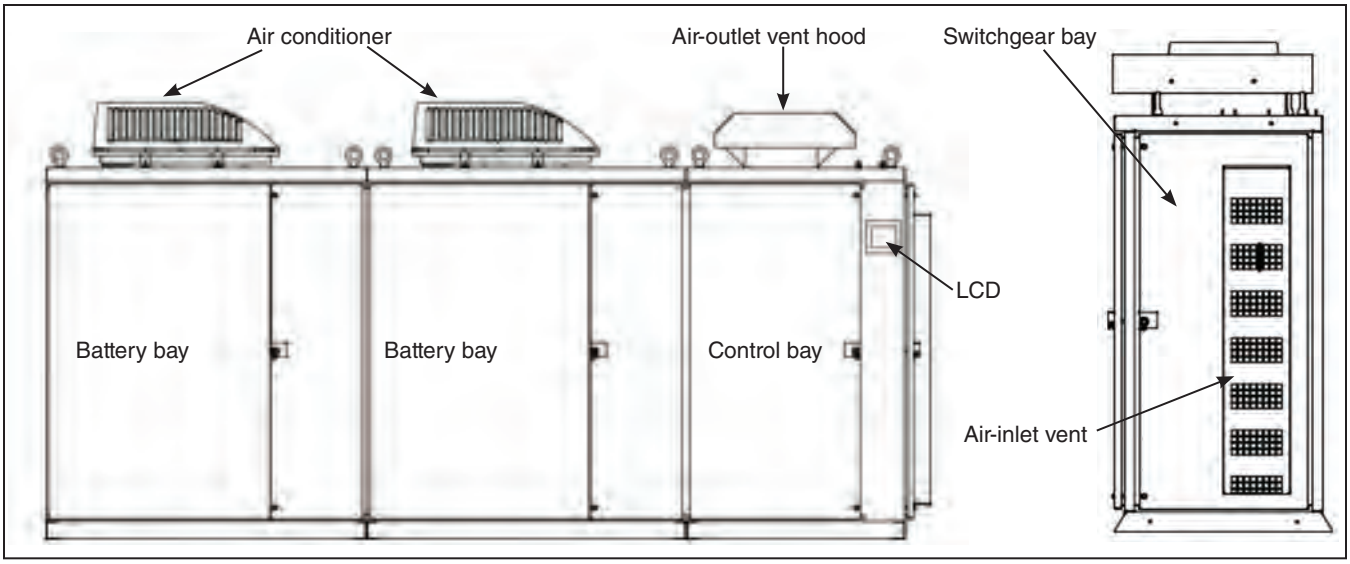


Figure 2. Front and side view of the 500-kW PureWave UPS System.

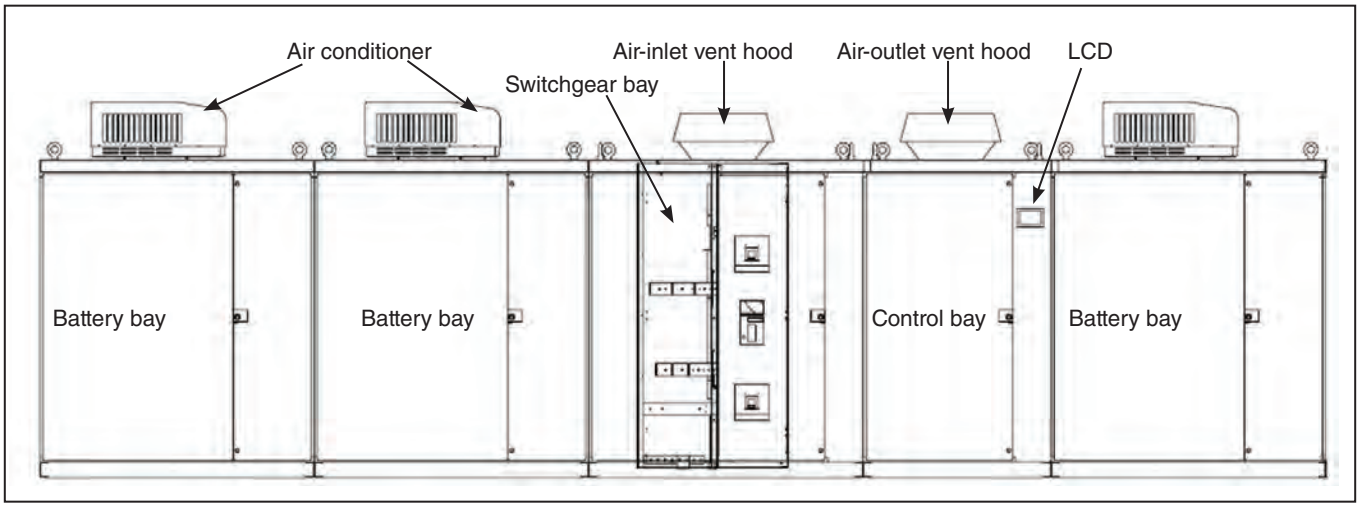


Figure 3. Front view of the 750-kW PureWave UPS System.

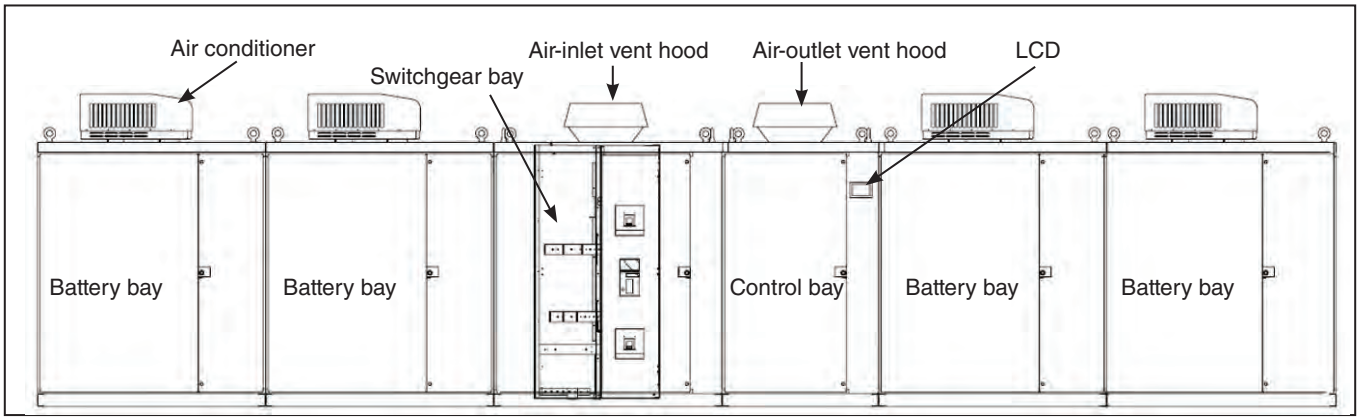


Figure 4. Front view of the 1000-kW PureWave UPS System.

Enclosure Bays

The enclosure of the PureWave UPS System consists of three types of bays:

Battery bay—Each battery bay contains a 250-kW battery module and a power conversion module (PCM). The PCM is located in its own compartment in the battery bay and is comprised of one inverter module consisting of power-conversion electronics and controls. The PCM is panel-mounted and supported by a welded and bolted steel structural base. See Figure 5 for a view of the battery bay.

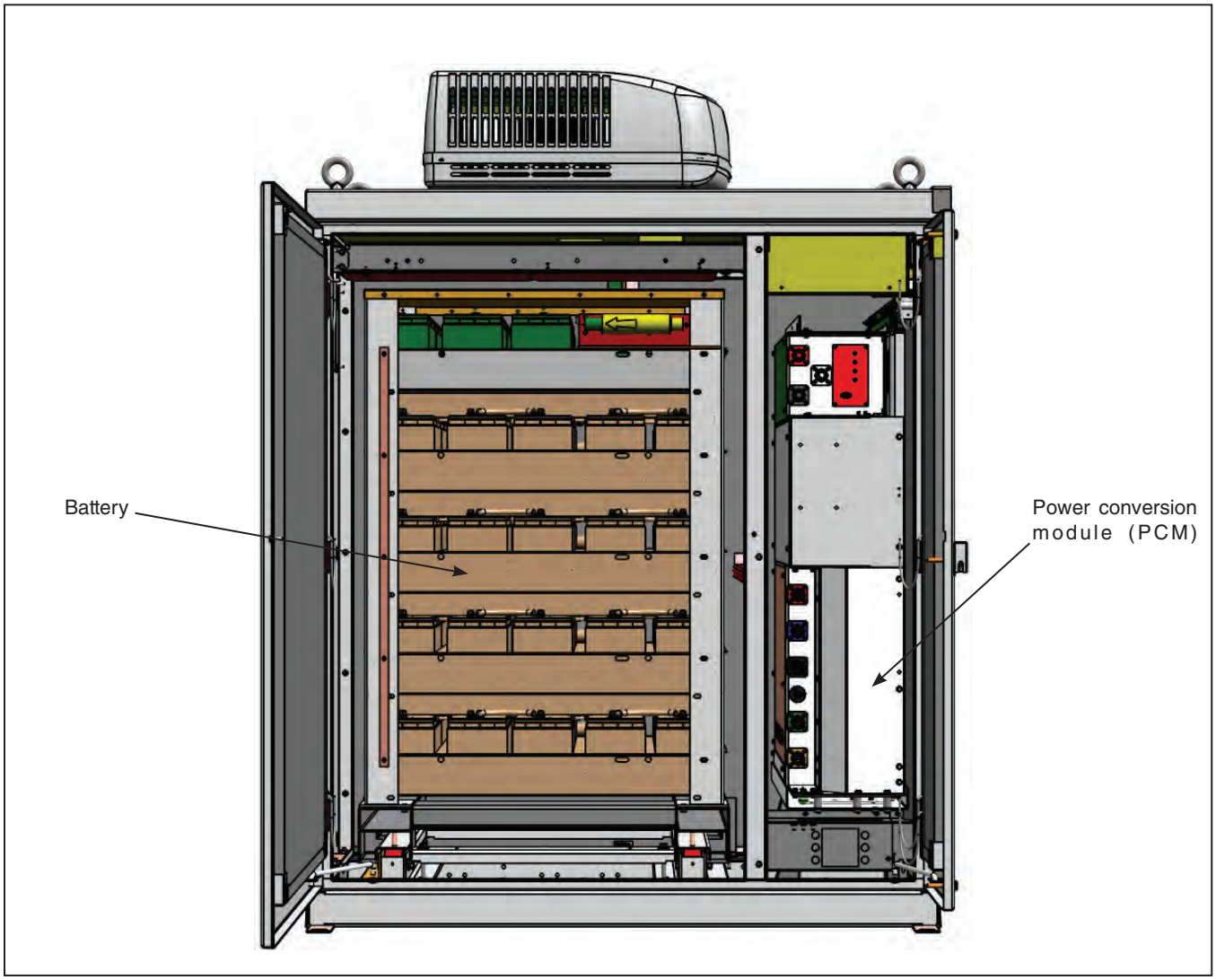


Figure 5. View of the battery bay (with the door open).

Enclosure Bays – continued

Switchgear bay—The switchgear bay houses the bypass switchgear circuit breakers, the ENABLE/DISABLE switch, the RESET pushbutton switch, and user connections. For the 250-kW and 500-kW systems, the switchgear bay is located on the side of the system. For the 750-kW and 1000-kW systems, the switchgear bay is located at the front of the system. See Figures 6 and 7.

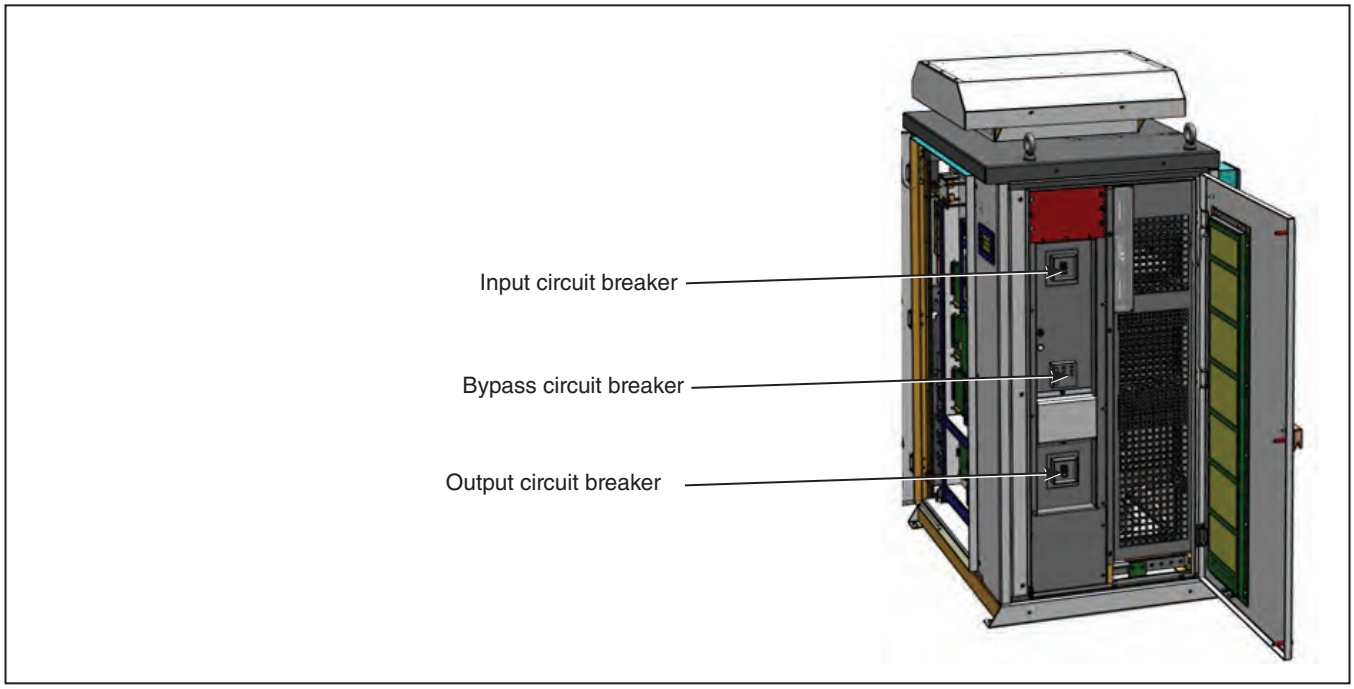


Figure 6. View of the switchgear bay for the 250-kW and 500-kW PureWave UPS system.

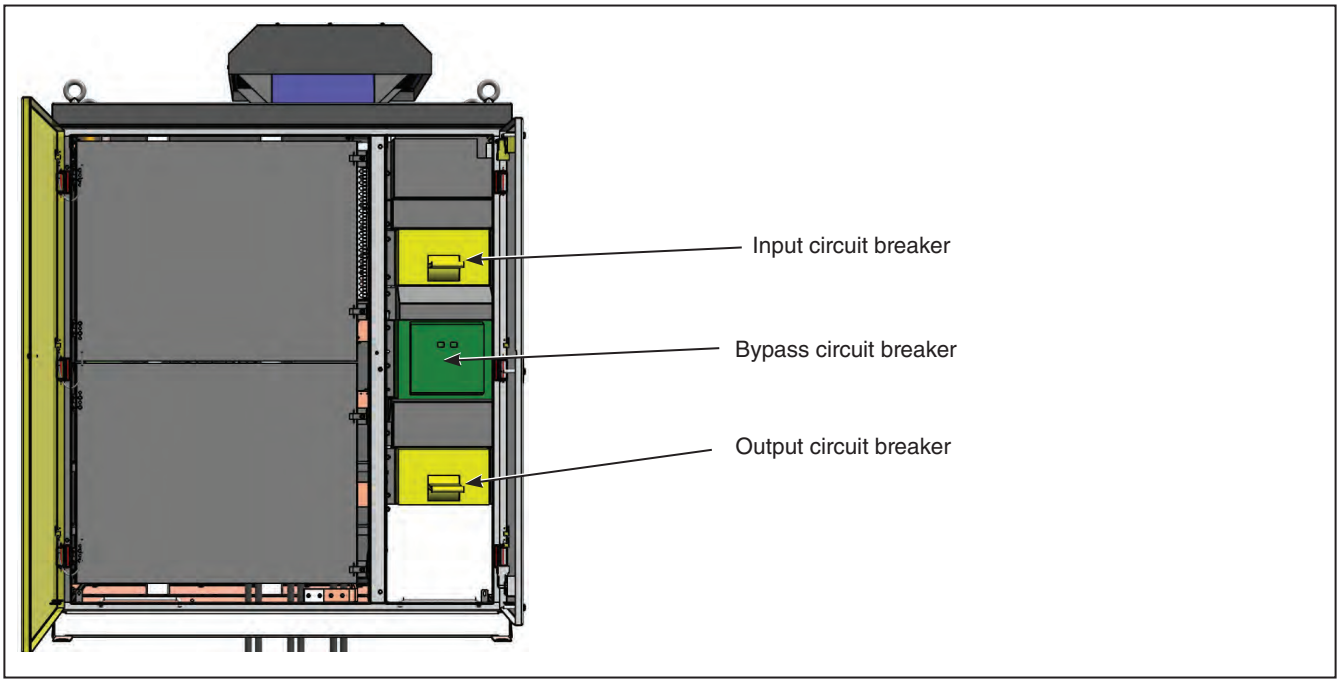


Figure 7. View of the switchgear bay for the 750-kW and 1000-kW PureWave UPS system.

Enclosure Bays – continued

Control bay—The control bay houses the monitoring computer, control system, power electronic switch (PES), and ac filter capacitor. In addition, an EMERGENCY DISABLE mushroom switch and a RESET pushbutton are located behind the door. See Figure 8 for a view of the control bay.

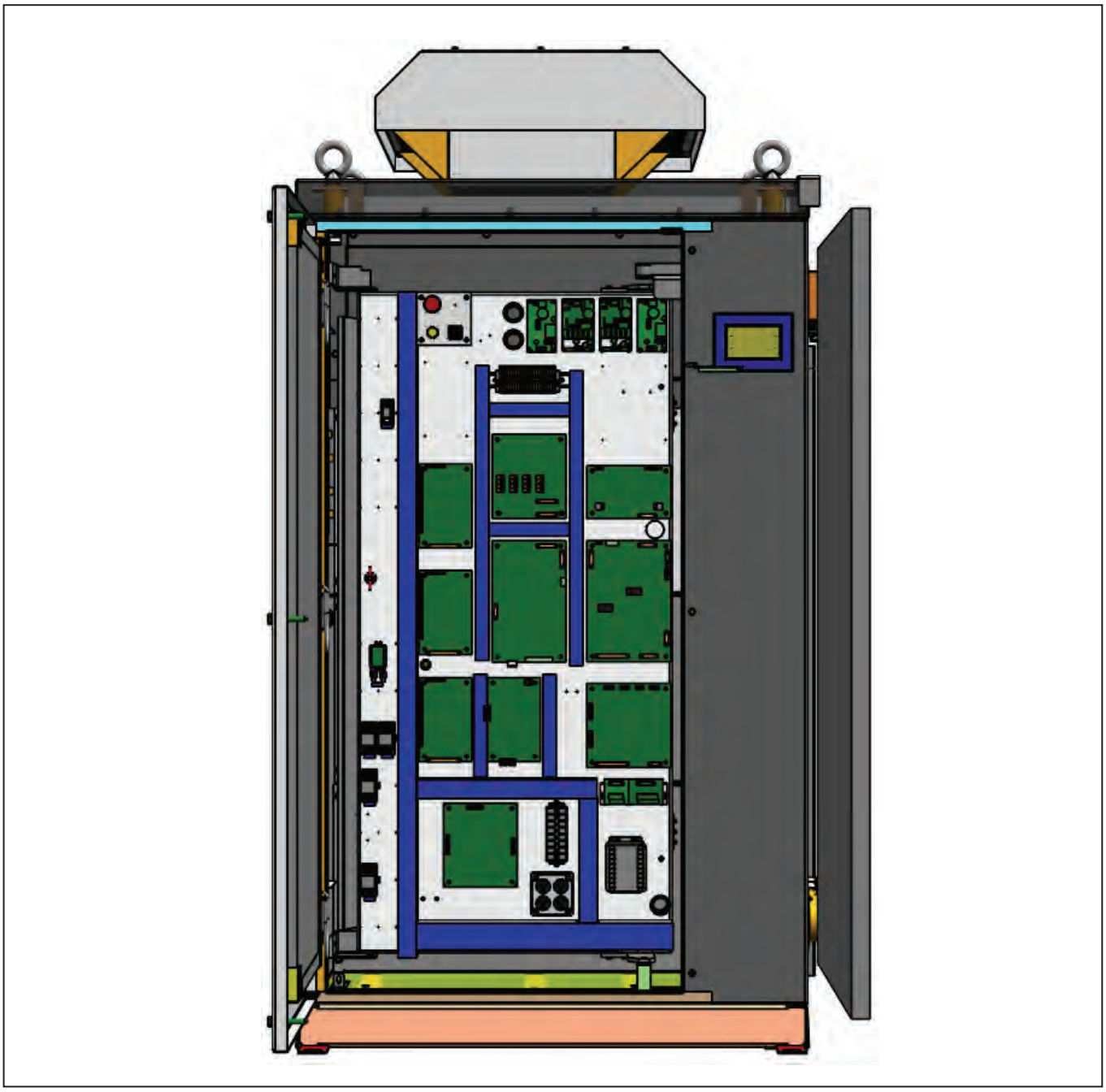


Figure 8. View of the control bay.

Doors

To open a bay door, remove the padlock from the security cover located over the center bolt. Three bolts (top, center, and bottom) secure the door closed. Loosen the three bolts so they detach from the enclosure (the bolt will not completely detach from the door). The door will now open. Once the door is opened approximately 90 degrees or 135 degrees, engage the lock-bar at the bottom of the door to prevent the door accidentally closing. See Figure 9. To close a door, disengage the lock-bar by lifting it and returning it to its storage location. Swing the door closed. Tighten the three bolts to secure the door and install the padlock.

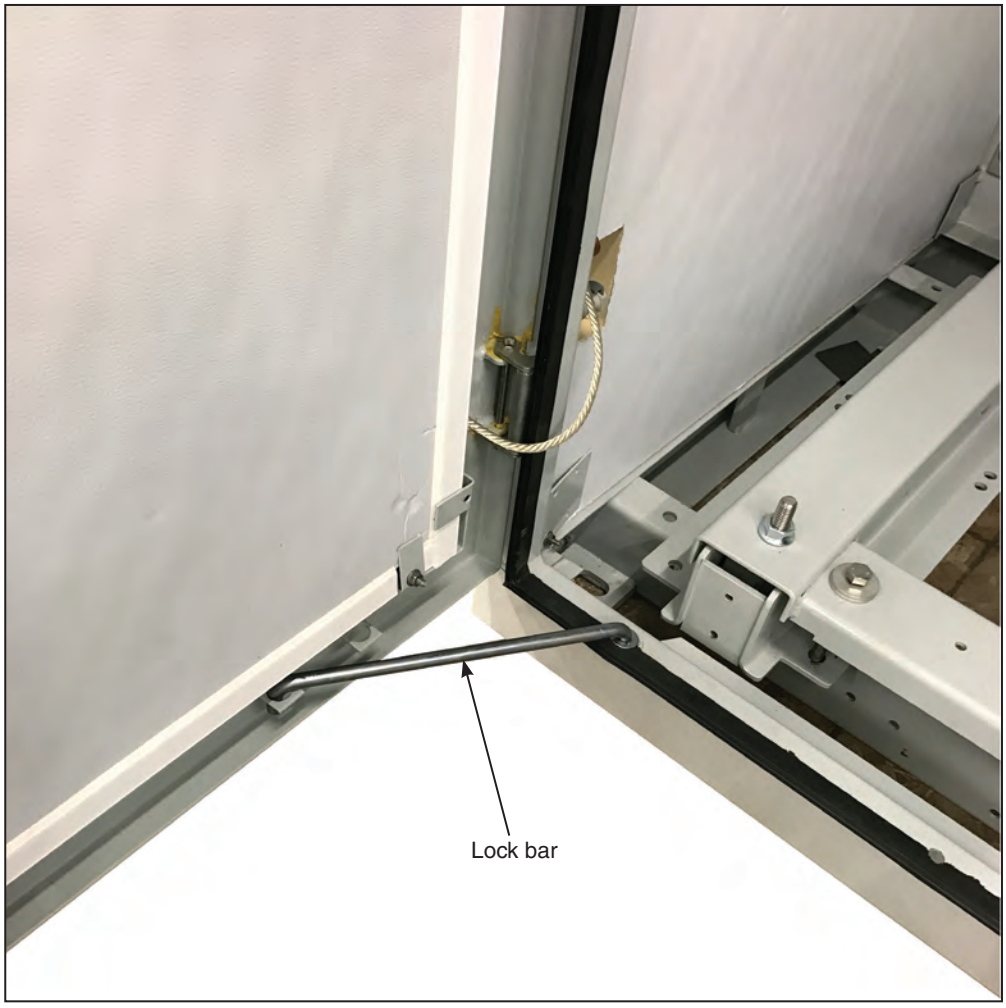


Figure 9. Lock bar at the bottom of a bay door.

LCD screen

Next to the control bay is the LCD screen, which displays information regarding the state of the PureWave UPS System. See Figure 10. The bottom line of the LCD screen displays the general messages as stated in Table 1.

Figure 10. Location of the LCD screen.

Table 1. General Messages on LCD Screen

Message	Description
S&C PUREWAVE UPS	Indicates the type of PureWave product
FWVER PQ001VvvvRrrr	Indicates the version of firmware in the PureWave UPS System
CNFG CcccRrrr	Indicates the configuration revision of the firmware running in the PureWave UPS System
Test Run Request	Indicates the PureWave UPS System has received a manual Run request

Air Control and Ventilation

Components such as air conditioners and air-inlet and -outlet vent/vent hoods are used to regulate the air inside the enclosure. Periodic maintenance is required to ensure the air conditioners, air-inlet filter, vents, and hoods are clear from debris or obstructions that can restrict air flowing in and out of the PureWave UPS System enclosure. Refer to the maintenance instruction sheet for detailed instructions for proper air ventilation maintenance.

Operating Controls

Operating controls are located inside the switchgear bay. The controls consist of the ENABLE/DISABLE toggle switch and the RESET pushbutton. See Figure 11 for the location of the operation controls for the 250-kW and 500-kW systems and Figure 12 on page 22 for the 750-kW and 1000-kW systems.

ENABLE/DISABLE–This toggle switch permits the operator to select whether the system is enabled or disabled. With the switch in the **Enable** position, the system is enabled. With the switch in the **Disable** position, the system is disabled. When the system is disabled, the system will go to the **Bypass Isolate** state, connecting the utility to the load though the bypass circuit breaker. The bypass circuit breaker will be closed and the input and output isolation circuit breakers will be opened.

RESET–This pushbutton allows the operator to manually reset the system alarm(s). When the system is in the **Bypass** state and the RESET pushbutton is pushed, all latched alarm(s) will be reset if the alarm(s) have cleared.

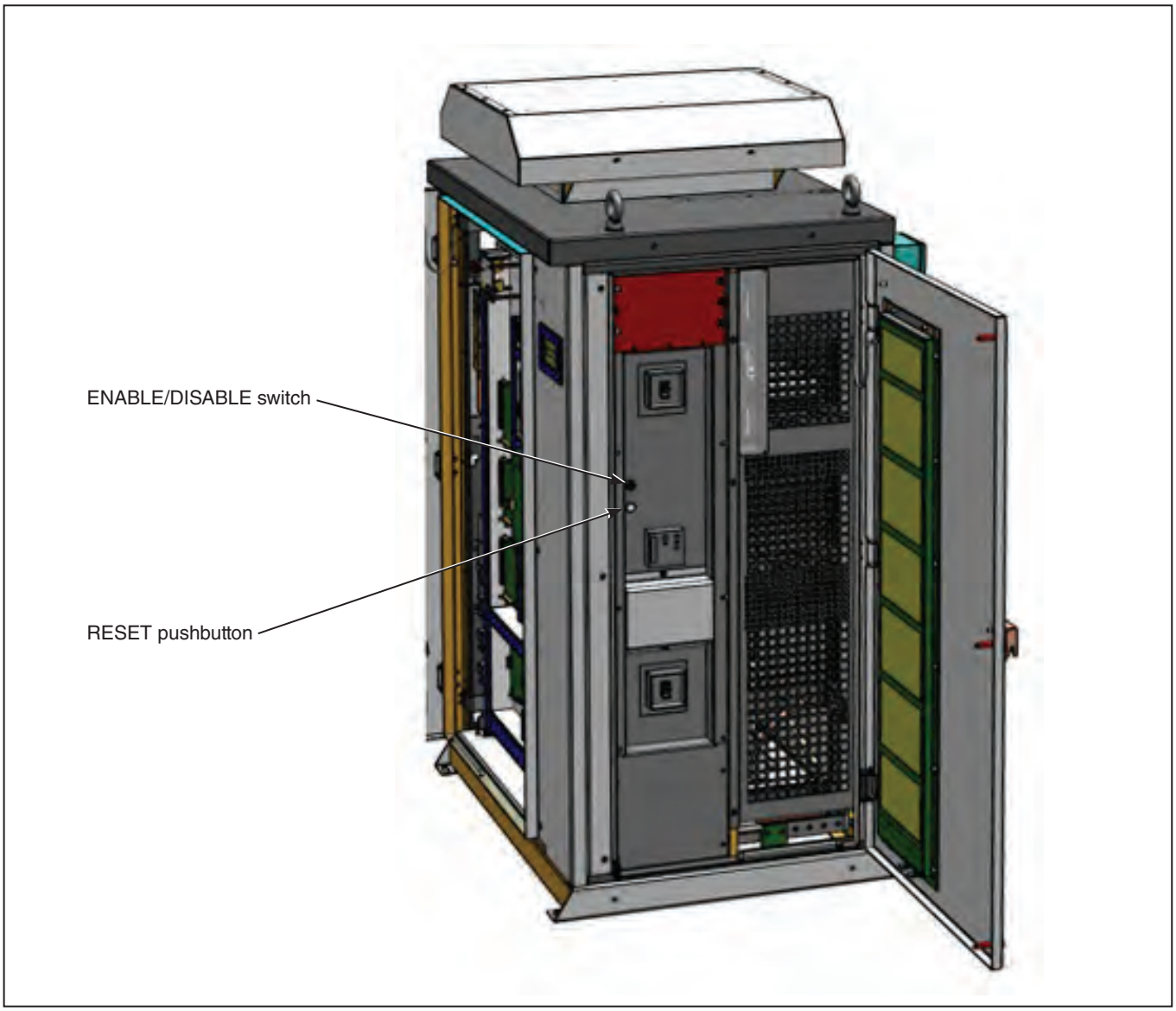


Figure 11. Location of operating controls for the 250-kW and 500-kW PureWave UPS Systems.

Operating Controls – continued

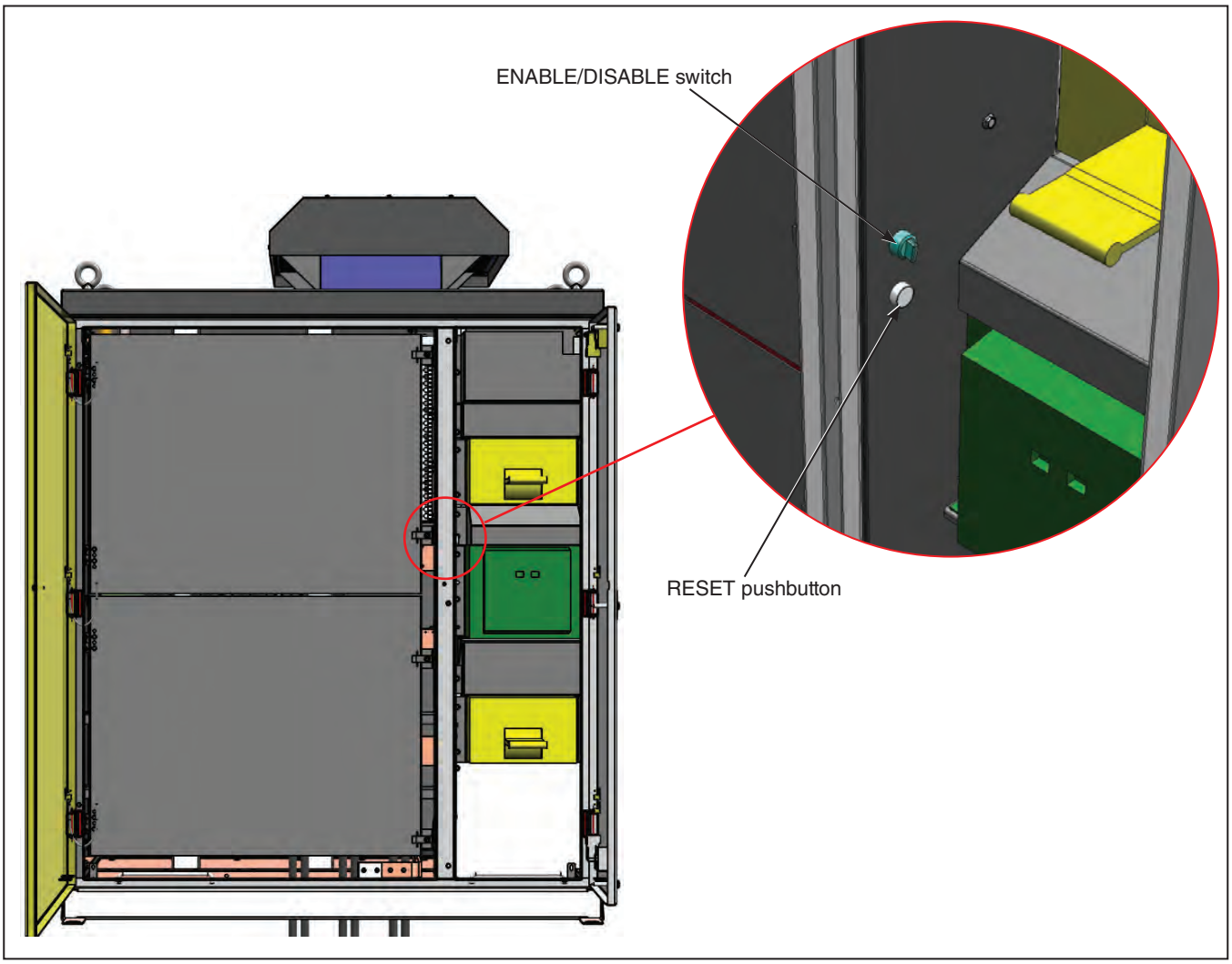


Figure 12. Location of the operating controls for the 750-kW and 1000-kW PureWave UPS Systems.

Service Personnel Controls

In addition to the operating controls located inside the switchgear bay, redundant operating controls are located in the control bay. These controls are intended to be used by authorized service personnel. See Figure 13 for the location of these controls.

ENABLE/DISABLE–This mushroom pushbutton performs the same functionality as the toggle switch in the switchgear bay. This button serves as an Emergency Stop for service personnel.

RESET–This pushbutton allows service personnel to manually reset the system alarm(s). When the system is in the **Bypass** state and the RESET pushbutton is pushed, all latched alarm(s) will be reset if the alarm(s) have cleared.

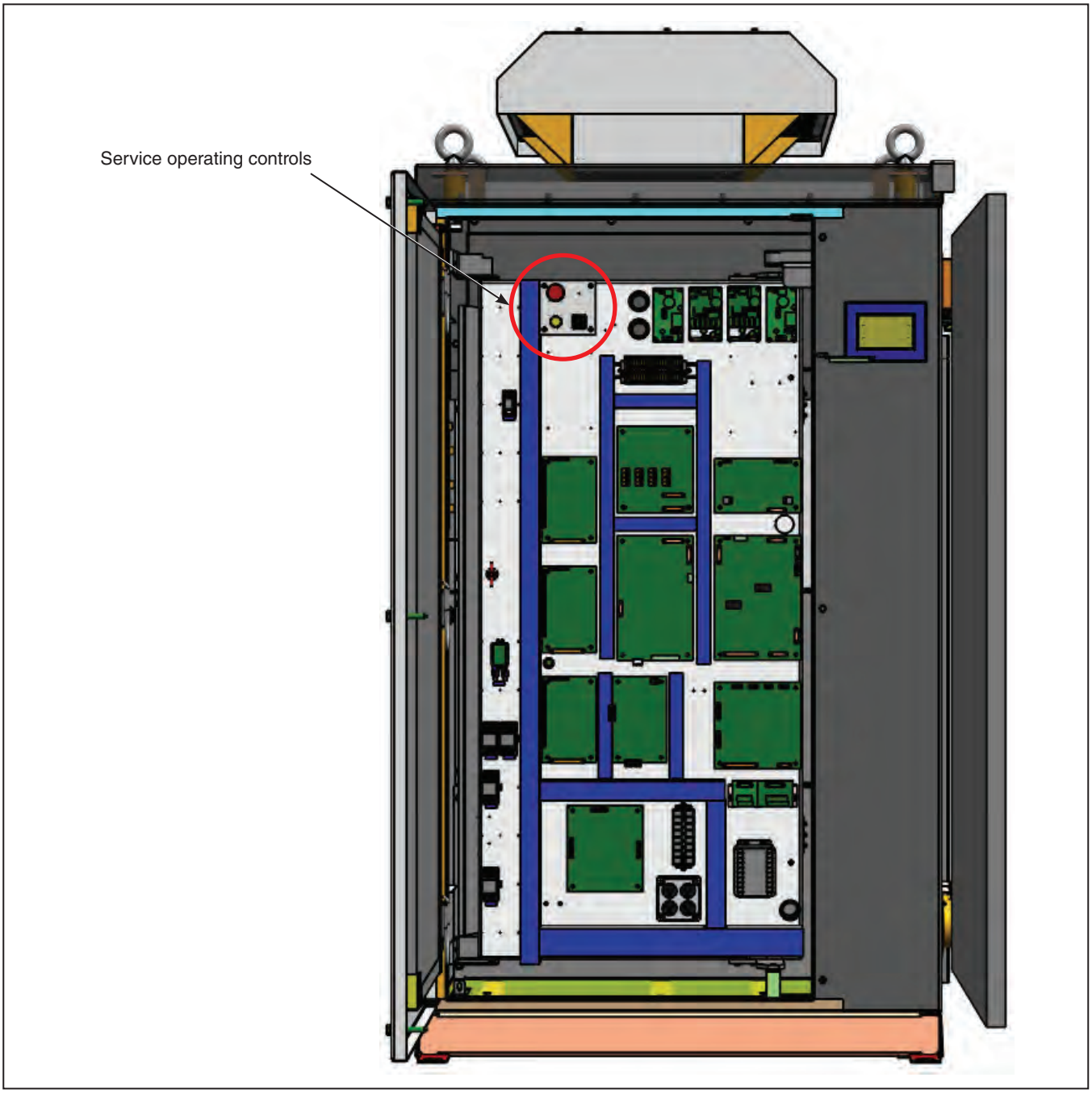


Figure 13. Location of the service operating controls.

Monitoring Computer

The monitoring computer is used to log system events and to monitor the status of the PureWave UPS System. The computer is located on the back of the swing-out panel located in the control bay. Information from the computer can be accessed via an Ethernet connection. See Figure 14 for the location of the computer.

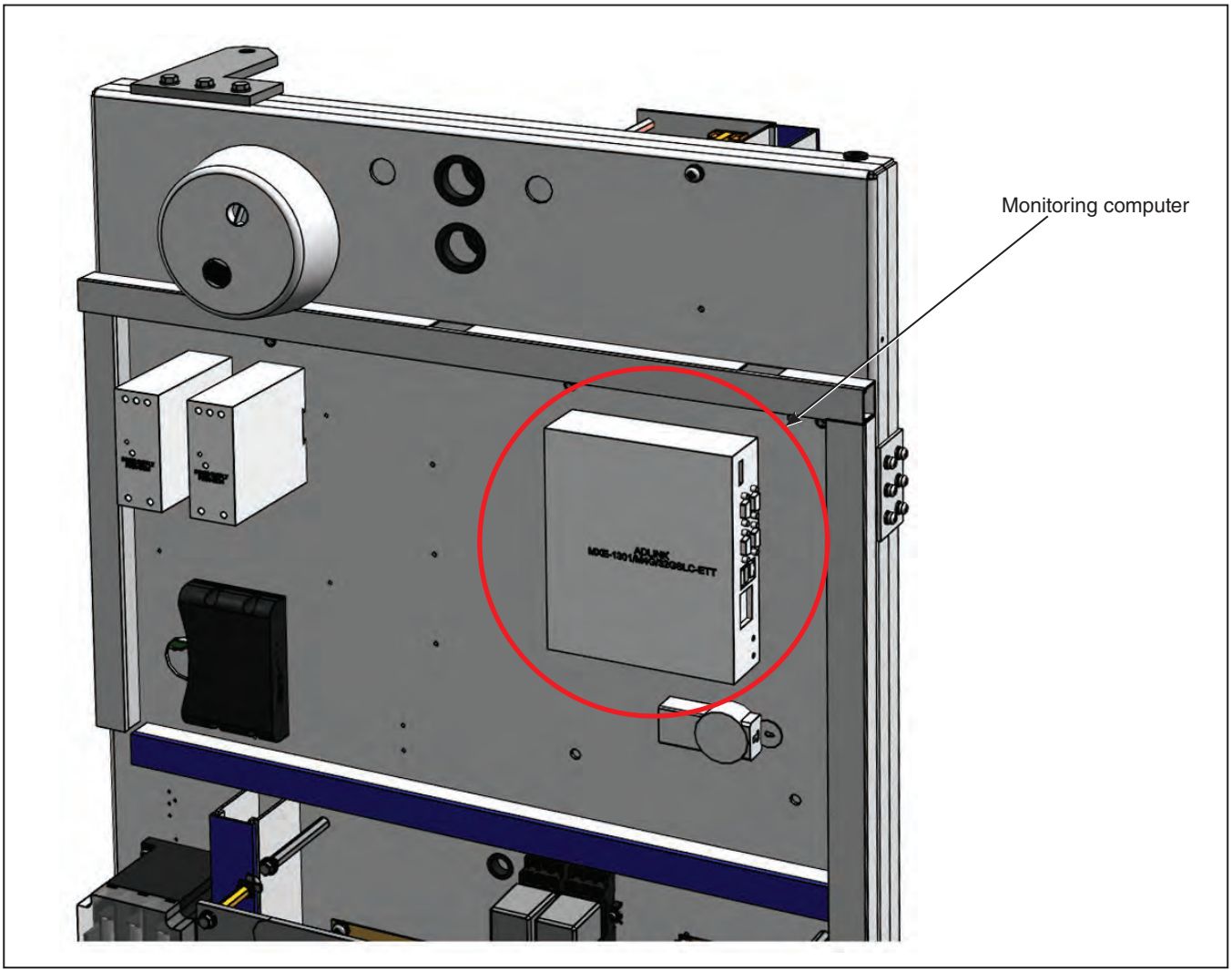


Figure 14. Location of the monitoring computer.

Contacts

The following alarm contacts are available as standard for the PureWave UPS System and can be used to activate a customer-supplied device:

System Warning: The System Warning contact will annunciate upon any warning alarm. Warning alarms indicate a condition that requires attention. However, the Pure Wave UPS System remains in the **Ready** state, protecting the load from power disturbances.

System Fault: The System Fault contact will annunciate upon any alarm that will place the PureWave UPS System in the **Inhibit** state, **Bypass** state, or **Bypass Isolate** state. System faults indicate a condition that requires attention and that the PureWave UPS System is not protecting the load from power disturbances.

The following optional contacts are available. The contacts operate as follows, if provided:

Low Battery: The Low-Battery contact will annunciate during a PureWave UPS System run after 50% of its run-time has been used. The contact will annunciate at 30 seconds during a run at full load.

Overcurrent: The Overcurrent contact will annunciate an alarm when the load current exceeds 115% of the current rating the PureWave UPS System is capable of providing.

UPS Running: The UPS Running contact will annunciate when the PureWave UPS System is in the **Run** state.

Remote Disable (Optional)

If supplied, a normally closed input contact must be provided by the user to the PureWave UPS System. Upon opening of the input contact, the system will go to the **Bypass** state, and an output contact will close to indicate the system has been remotely disabled.

System Operation

Under normal conditions, power is supplied from the utility grid to the critical load through the input circuit breaker, PES, and output isolation circuit breaker.

The system's utility disturbance monitor (UDM) continuously monitors the supply voltage for disturbance activity. When a disturbance occurs, the PureWave UPS System turns on the system's high-power inverter(s). The stored energy in the system's batteries is converted to ac and supplied through a voltage-matching isolation transformer while the PES is commanded off (open) to isolate the customer's critical loads from the faulted utility. Output power matches the customer load for one minute at full load (or up to three minutes at reduced power) during the utility voltage disturbance or momentary power interruption.

The entire transfer sequence occurs typically within 1 to 4 milliseconds (less than ¼ cycle). An electrically operated bypass circuit breaker permits continued service to the customer from the utility in the event the PureWave UPS System is out of service for maintenance. See Figure 15 for a diagram of the PureWave UPS System.

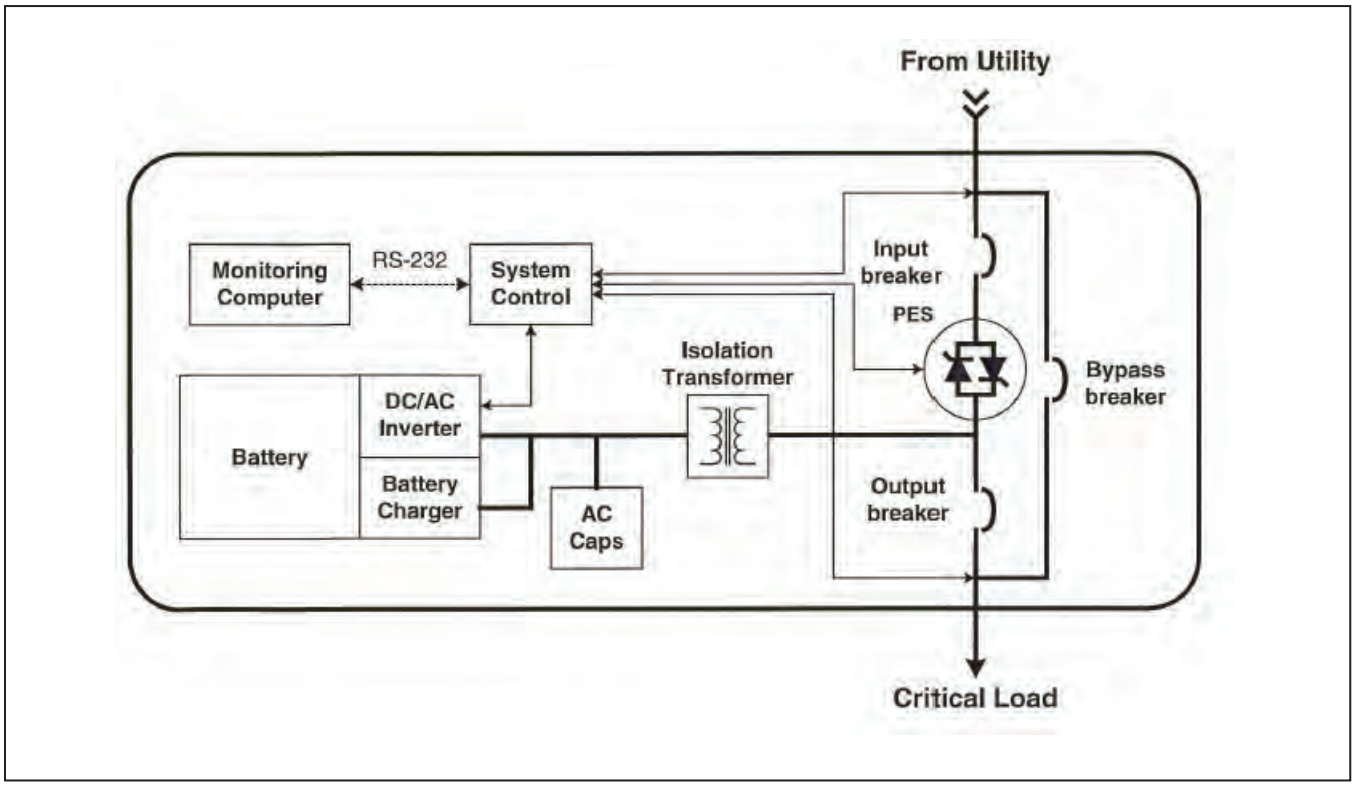


Figure 15. Diagram of the PureWave UPS System.

States

Listed in Table 2 are the states of the PureWave UPS System. Depending on the alarm condition encountered, the system can be in any of these states. The user interface shall inform the user of the system's current state. Table 2 notes the description of each state.

Table 2. Operating States for the PureWave UPS System.

States	Description
Ready	In this state, the PureWave UPS System is ready to protect the load in the event of a disturbance.
Run	In this state, the PureWave UPS System is running to protect the load from a utility disturbance. The inverters are on and the PES is open.
Inhibit	In this state, the PureWave UPS System has been inhibited from running; however, the load is being fed through the PES. The bypass circuit remains open.
Bypass	In this state, the bypass circuit breaker has been closed; however, the input and output circuit breakers remain closed.
Bypass Isolate	In this state, the bypass circuit breaker is closed, and the input and output circuit breakers are open.
Test in Bypass	This state is used during the startup of the PureWave UPS System or during service. The state permits the system to perform runs while the load is being fed from the utility through the bypass circuit breaker. In this state, the bypass circuit breaker is closed and the output circuit breaker is open.

Transition States

Listed in Table 3 are the transition states of the PureWave UPS System. These temporary states occur while the PureWave UPS control logic is transitioning from one primary state to another primary state. Primary states are listed in Table 2.

Table 3. Transition states of the PureWave UPS System.

Transition States	Description
Reset	This state is used to reset PureWave UPS System alarms.
Force Off PES	This state is used to command the PES off. The PES remains off for the duration of the **Run** state, keeping the load isolated from the utility.
Close Mechanical Bypass	This state occurs as the PureWave UPS System is going to the **Bypass** state. During this transition state, the controls are commanding the bypass circuit breaker closed before transitioning to the **Bypass** state.
Soft Transfer	The PureWave UPS System enters this state at the end of a **Run** state. In this state, the load is being transferred to the utility or generator gradually to prevent a voltage or frequency drop that could potentially affect the load.
Load Decelerate	This is an optional state that will disconnect the load from the utility if the PureWave UPS System cannot run (because of discharged batteries or from a UPS malfunction) and if the load is not in phase with the utility. The purpose of this state is to prevent spinning loads (motors) from being damaged by transferring them from the PureWave UPS System to the utility when the UPS output voltage is not in phase with the utility voltage. The loads will be permitted to decelerate before being re-energized.

Alarms List and Troubleshooting Tips

The PureWave UPS System contains an extensive self-diagnosis system. If any abnormal condition occurs or if the system cannot protect the load from a disturbance, the system will activate an alarm. The alarms can be categorized by alarm type. Alarm types are categorized as **Warning, Inhibit, Bypass,** and **Bypass Isolate**.

NOTICE

The troubleshooting tips listed in Tables 4 through 7 are for guidance purposes. Please contact S&C Electric Company if more troubleshooting assistance is required or if there are any doubts about how to handle an alarm event.

Some alarms in the following tables may be masked and will not be available for use. Alarms can also be reconfigured during operation and should be documented accordingly.

Warning Alarms

A **Warning** alarm indicates a condition that requires attention. The system will remain in the Ready state, protecting the load from power disturbances. See Table 4 for the listed **Warning** alarms.

Table 4. Warning alarms.

Warning Alarm	Description
Best Power Circuit Warning	Indicates the sequence of switching for the control power has malfunctioned ***Troubleshooting Tip:*** Call S&C Electric Company.
Broken Thermocouple	Indicates a broken thermocouple inside the system enclosure ***Troubleshooting Tip:*** One of the thermocouples that are plugged into the analog interface board on the PCS panel has been unplugged or is broken. Verify they are plugged in. If so, check the thermocouples for broken connections.
CB Over Current	Indicates one of the bypass or isolation circuit breakers tripped because of an overcurrent ***Troubleshooting Tip:*** After verification and gathering information on the states leading the system to this fault, reset the system and verify the fault clears. If problem persists, contact S&C Electric Company.
Charger Start Alarm	Indicates the charger has not turned on as expected ***Troubleshooting Tip:*** Turn off the dc power to the module. Contact S&C Electric Company.
Container Over Temp	Indicates the temperature inside the system enclosure is over 40°C (104°F) ***Troubleshooting Tip:*** The air conditioners may not be working, or they may not be able to keep up with the temperature rise. Check the output block that turns on the contactors and the circuit breakers that feed the air conditioners. It may also be that the air conditioners are frozen and need to be de-iced.
Container Under Temp	Indicates the temperature inside the system enclosure is below 5°C (41°F) ***Troubleshooting Tip:*** The heater in the air curtain may not be working. Check the output block that turns on the heater and the circuit breaker that feeds the air curtain.
Genset CB Close Alarm	Indicates the generator circuit breaker did not close as expected ***Troubleshooting Tip:*** Call S&C Electric Company.
Genset CB Open Alarm	Indicates the generator circuit breaker did not open as expected ***Troubleshooting Tip:*** Call S&C Electric Company.
Genset Start Alarm	Indicates the generator circuit breaker did not start as expected ***Troubleshooting Tip:*** Call S&C Electric Company.
Input CB Alarm	Indicates the input circuit breaker is open when it should be closed, or closed when it should be open ***Troubleshooting Tip:*** Contact S&C Electric Company.
Module Fault	Indicates a power module has a condition that renders it unavailable to operate ***Troubleshooting Tip:*** A module fault could be an effect and not a cause in most events. Rule out all other causes of the alarm.
Output CB Alarm	Indicates the output circuit breaker is open when it should be closed, or closed when it should be open ***Troubleshooting Tip:*** Contact S&C Electric Company.
PES Blower Alarm	Indicates the PES blowers are not running as expected. The system will go to bypass if the temperature has exceeded 104°C (219°F) ***Troubleshooting Tip:*** Contact S&C Electric Company.
PES Blower Warning	Indicates the PES blowers should be running but are moving less air than expected and the temperature has exceeded 93°C (199°F) ***Troubleshooting Tip:*** Contact S&C Electric Company.
PES Over Temp Warning	Indicates the PES is at 90°C (194°F) or higher ***Troubleshooting Tip:*** This could be caused by restricted air flow caused by a dirty or obstructed air filter or a malfunctioned blower. Check these components to ensure they are clean and functioning properly.

TABLE CONTINUED ►

Table 4. Warning alarms — Continued

Warning Alarm	Description
PES Over Temperature	Indicates the PES is at 100°C (212°F) or higher ***Troubleshooting Tip:*** This could be caused by restricted air flow caused by a dirty or obstructed air filter or a malfunctioned blower. Check these components to ensure they are clean and functioning properly.
Smoke Warning	Indicates a single smoke detector is activated ***Troubleshooting Tip:*** Investigate the bays to see whether there is a fire.
Test In Bypass Req	Indicates the system has been placed in the **Test in Bypass** state ***Troubleshooting Tip:*** No action is required.
Test Run Request	Indicates a test run of the system was requested ***Troubleshooting Tip:*** No action is required.
Time Not Set	Indicates the time is not set in the master control board ***Troubleshooting Tip:*** Contact S&C Electric Company.
Transformer Over Temp	Indicates the transformer compartment is at or above 88°C (190°F) ***Troubleshooting Tip:*** This could be caused by restricted air flow caused by a dirty or obstructed air filter or a malfunctioned blower. Check these components to ensure they are clean and functioning properly.
Utility Over Freq	Indicates the system is sensing a utility frequency greater than 1 Hz of the nominal frequency ***Troubleshooting Tip:*** The system will respond based on the over-frequency settings. The frequency threshold can be changed if desired.
Utility Over Voltage	Indicates the system is sensing a utility voltage greater than 110% of the nominal voltage ***Troubleshooting Tip:*** The system will respond based on the overvoltage settings. The voltage threshold can be changed if desired.
Utility Under Freq	Indicates the system is sensing a utility frequency less than 1.5 Hz of the nominal frequency ***Troubleshooting Tip:*** The system will respond based on the under-frequency settings. The frequency threshold can be changed if desired.
Utility Under Voltage	Indicates the system is sensing a utility voltage less than 90% of the nominal voltage ***Troubleshooting Tip:*** The system will respond based on the undervoltage settings. The voltage threshold can be changed if desired.

Inhibit Alarms

An **Inhibit** alarm indicates a condition that requires attention and places the system in the **Inhibit** state. The system is not available to protect the load from power disturbances. See Table 5 for the listed **Inhibit** alarms.

Table 5. Inhibit alarms.

Inhibit Alarm	Description
Battery Discharged	Indicates the batteries are discharged ***Troubleshooting Tip:*** Batteries should automatically be charging. If not and the problem persists, contact S&C Electric Company.
Load Over Current	Indicates the load current has exceeded 115% of the current rating of the system ***Troubleshooting Tip:*** Check the load against what the PureWave UPS System was sized for.
Load Over Power	Indicates the load power has exceeded 115% of the power rating of the system ***Troubleshooting Tip:*** Check the load against what the PureWave UPS System was sized for.
Lost Synch With Util	Indicates the system is not synchronized with the utility ***Troubleshooting Tip:*** If the utility voltage, frequency, and phase rotation are good, contact S&C Electric Company. If the voltage, frequency, or phase rotation is bad, the inverter may not be able to lock to the utility until the voltage and frequency are both within tolerance.
Parallel Bd Comm Err	Indicates the parallel board communication is delayed or interrupted ***Troubleshooting Tip:*** Contact S&C Electric Company.
Reverse Phase Rotate	Indicates the phase rotation of the utility and/or load conductors is not correct ***Troubleshooting Tip:*** Verify the phasing by safely checking the utility connection wires.

Bypass Alarms

A **Bypass** alarm indicates a condition that requires attention and places the system in the **Bypass** state. The system is not available to protect the load from power disturbances. See Table 6 for the listed **Bypass** alarms.

Table 6. Bypass alarms.

Bypass Alarm	Description
Bypass CB Alarm	Indicates the bypass circuit breaker is open when it should be closed, or closed when it should be open ***Troubleshooting Tip:*** Contact S&C Electric Company.
Remote Disable	Indicates the system was disabled remotely ***Troubleshooting Tip:*** If the customer did not remotely disable the system, contact S&C Electric Company.
UPS Output Fault	Indicates a fault downstream of the system ***Troubleshooting Tip:*** Investigate the distribution system and loads before returning the system to the Ready state.

Bypass Isolate Alarms

A **Bypass Isolate** alarm indicates a condition that requires attention and places the system in the **Bypass Isolate** state. The system is not available to protect the load from a power disturbance. See Table 7 for the listed **Bypass Isolate** alarms.

Table 7. Bypass Isolate alarms.

Bypass Isolate Alarm	Description
Fire Hot Temp Zone #	Indicates temperature is over 65°C (149°F) at the designated bay ***Troubleshooting Tip:*** There is a fire in the designated zone. Contain the fire and then contact S&C Electric Company.
Fire Hot Temp	Indicates the temperature inside the enclosure has reached 65°C (149°F) ***Troubleshooting Tip:*** There is a fire in the container. Respond to the fire and then contact S&C Electric Company.
Neutral Res Voltage	Indicates a bad system neutral or module fault ***Troubleshooting Tip:*** Contact S&C Electric Company.
Open PES Alarm	Indicates the PES is expected to close but does not ***Troubleshooting Tip:*** The system will automatically reset three times. After the third time, if the PES is still open, contact S&C Electric Company.
Operation Disabled	Indicates the load has been placed in the Bypass Isolate state via the ENABLE/DISABLE toggle switch. ***Troubleshooting Tip:*** No action is required. However, if the system was not disabled by the switch or pushbutton, contact S&C Electric Company.
Shorted PES Alarm	Indicates the PES is shorted ***Troubleshooting Tip:*** Contact S&C Electric Company.
Smoke In Container	Indicates the smoke detector detected smoke ***Troubleshooting Tip:*** Investigate whether there is a possible fire inside the container. After the smoke has cleared call S&C Electric Company.

Start-Up

Following initial start-up, the PureWave UPS System operates automatically and does not require manipulation of any controls to function properly.

NOTICE

In the event of an emergency shutdown, the system must be restarted by S&C Electric Company service personnel or trained personnel in consultation with S&C Electric Company.

Maintenance Bypass Procedure

NOTICE

The critical load will be connected to the utility via the bypass circuit breaker after following this maintenance bypass procedure.

⚠ WARNING

Make sure the safety guards located behind the switchgear bay door that protect personnel against contact with energized parts are in place before performing these procedures. Contact with energized parts can result in serious personal injury or even death. If safety guards are not in place, secure the switchgear bay door and contact S&C Electric Company at (888) 762-1100.

Use the following steps for the Maintenance Bypass procedure:

STEP 1. Disable the PureWave UPS system by turning the ENABLE/DISABLE selector switch to the Disable position. When the selector switch is moved to the **Disable** position, the bypass circuit breaker will automatically close and, after a short time delay, the output and input circuit breakers will open.

STEP 2. Step 2. Verify the PureWave UPS system's input and output circuit breakers are open and the bypass circuit breaker is closed. If the bypass circuit breaker did not close and the input and output circuit breakers did not open, follow the system emergency Bypass Isolation Procedure.

Returning the PureWave UPS System to the Ready State

Use the following procedure to return the Pure Wave UPS System to the **Ready** state from the **Bypass** state:

STEP 1. Verify the Pure Wave UPS System's input and output circuit breakers are open and the bypass circuit breaker is closed.

STEP 2. Enable the Pure Wave UPS System by turning the ENABLE/DISABLE selector switch to the **Enable** position.

STEP 3. Manually close the PureWave UPS System's output circuit breaker.

STEP 4. Manually close the input circuit breaker.

STEP 5. Reset the PureWave UPS System by pressing the RESET pushbutton.

Bypass Isolation Procedure

In the event the bypass circuit breaker does not close and the input and output circuit breakers do not open after the maintenance bypass procedure has been implemented, the PureWave UPS can be placed in the **Bypass Isolate** state via the following procedure:

STEP 1. Make sure the ENABLE/DISABLE selector switch is turned to the **Disable** position.

STEP 2. Manually close the bypass circuit breaker.

The PureWave UPS System may be manually isolated from the utility source and critical load via the following procedure:

STEP 1. Manually open the input and output circuit breakers.

STEP 2. If necessary, contact S&C Electric Company at (888) 762-1100.

Battery Charging

Two battery-charging modes ensure the batteries are kept in proper working condition. Once a charge cycle of any type begins, the only normal operating mode that can interrupt it is a Run event. The batteries can also be manually charged if they are being stored before installation.

Automatic Charge: The PureWave UPS System uses an automatic charging method to ensure the system is ready to handle any power disturbances. Battery modules are charged immediately following a disturbance event. The duration of the charge is directly related to the magnitude and duration of the event. The batteries are charged for two minutes for each second of discharge at full load. The battery charger will remain on for one hour after the batteries are charged.

Equalize Charge: A complete equalization charge cycle will be automatically performed every two months. Equalize charging is a battery-conditioning function that ensures top performance of the batteries.

Manual Charge: If the battery modules are to be stored after shipment, they must be stored in a cool place (50°F-60°F/10°C-16°C). Manual charging may be required if the system is not commissioned within 30 days of shipment or if the system is in the **Bypass** state for more than 30 days. Contact S&C Electric Company to make arrangements for a service visit to perform the maintenance charge.

Generator Interface

As an option and if provided, the Pure Wave UPS System control can be electrically connected to the transfer switch via a dry contact. Actuating the contact (transfer signal) commands the transfer switch to start the generator and transfer to the generator (after the generator is at rated voltage and frequency). The PureWave UPS System will actuate the transfer signal after the system has been running for 5 to 10 seconds (5 seconds at full load, 10 seconds at half-load or less).

Following is a sequence of events listing the events that occur during an outage of more than 5 seconds (assuming full load):

STEP 1. Upon a voltage disturbance, the PureWave UPS System goes into the **Run** state.

STEP 2. After 5 seconds, the PureWave UPS System actuates the transfer signal to the transfer switch.

STEP 3. The transfer switch sends a start signal to the generator.

STEP 4. After the generator is at the rated voltage and frequency (as determined by the transfer switch), the transfer switch transfers to the generator.

STEP 5. The PureWave UPS System "soft" loads the generator.

STEP 6. After the generator accepts the load, the PureWave UPS System returns to the **Ready** state.

STEP 7. The PureWave UPS System maintains the transfer signal to the transfer switch until the batteries have charged. After the batteries have charged, the PureWave UPS System will de-actuate the transfer signal.

STEP 8. The transfer switch will transfer the load back to the utility after the utility voltage is restored and all applicable time delays have timed out.

STEP 9. The PureWave UPS System will go into the **Run** state while the transfer switch returns the critical load to the utility.

If the load is at 50% or less of the PureWave UPS System rating, the system will wait for 10 seconds before actuating the transfer signal.

Overview

The PureWave UPS System can be monitored in three ways. The system can be monitored through the LCD screen display, through the computer provided in the control bay via a local connection, and remotely using an Ethernet connection.

Monitoring Software Security

The PureWave UPS System computer can only be accessed by users with the appropriate security clearance. A valid user name and password are necessary to access the system information. To access the system remotely, the remote monitoring software is required along with a user name and password for authorized access.

NOTICE

Contact S&C Electric Company to obtain the username and password for access to the monitoring program if you forget your username and/or password.

Monitoring Software

One-Line Screen

After the user name and password has been entered, the user will have access to the monitoring software. The home screen is the system one-line screen. The one-line screen shows the overview of the PureWave UPS System. It displays the power-flow path through the system, providing the user with accurate and timely system information.

Icons

Icons on the **One-Line** screen change according to the state of the system. The icons and the lines connecting the icons change color depending on the state of the object represented by the icon. See Figure 16 to see the icons and their meanings on the system **One-Line** screen.

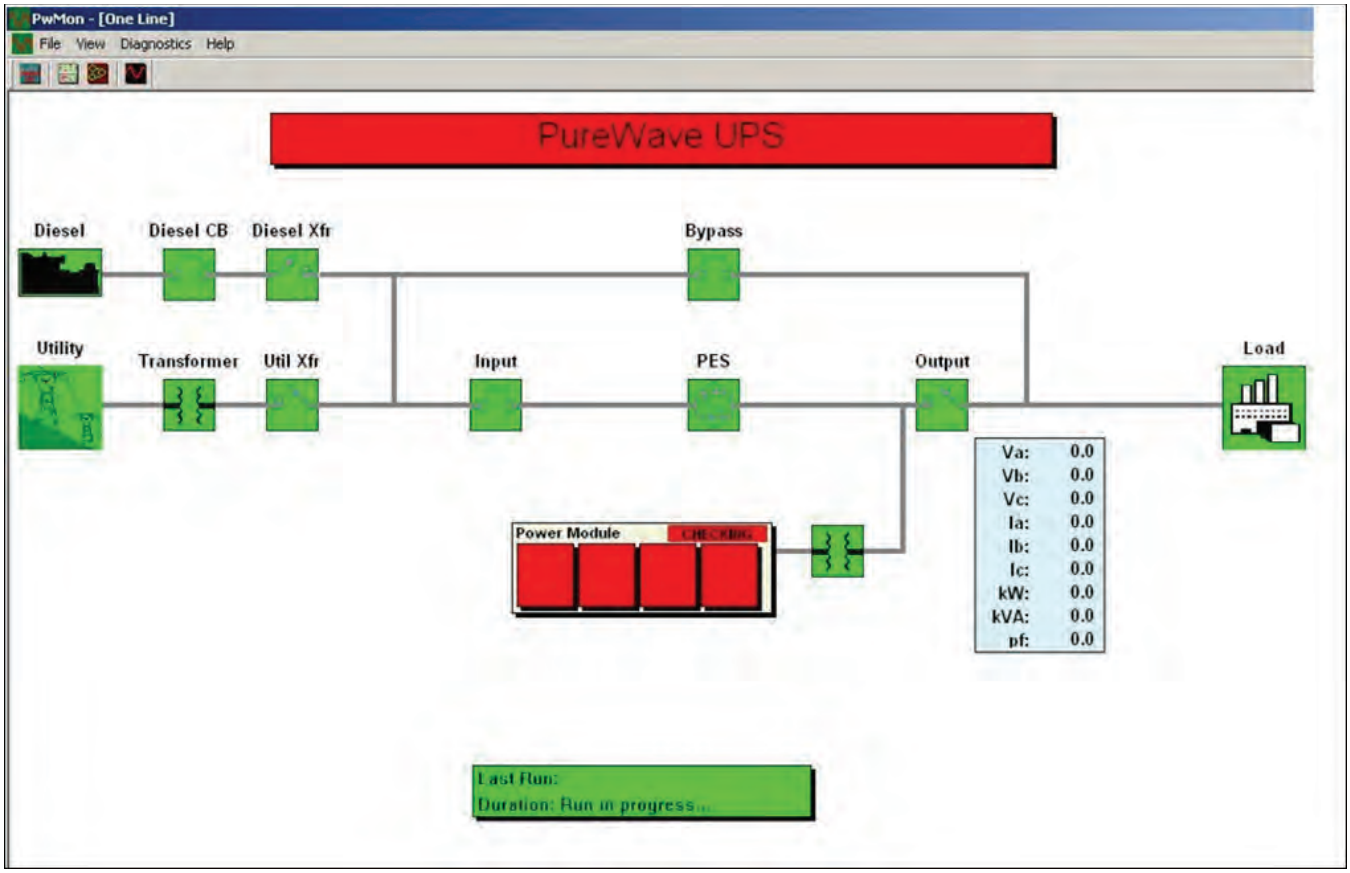


Figure 16. One-line screen of the monitoring software.

Monitoring Software – continued

Icons — continued

Utility source–If this icon is red, it indicates the utility is a good source. If the icon is green, it indicates the utility is not good (the source is not within voltage and frequency tolerance).

Power electronic switch (PES)–If this icon is green, the switch is open. If the icon is red, the switch is closed.

Circuit breakers and switches–If these icons are green, the circuit breaker or switch is open. If these icons are red, the circuit breaker or switch is closed.

Load–If this icon is red, the load is being supplied with power. If this icon is green, the load is not being supplied with power.

For power flow, a gray line indicates the power is not flowing through the line. A red line indicates that power is flowing through the line.

At the top-left of the screen are four icons that help the user navigate through the monitoring program. See Figure 17.

From left to right, when clicked on, the icons lead to the following screens:

- **One-Line**
- **Status**
- **Snapshot Viewer**–For service personnel only
- **Event Viewer**–For service personnel only.

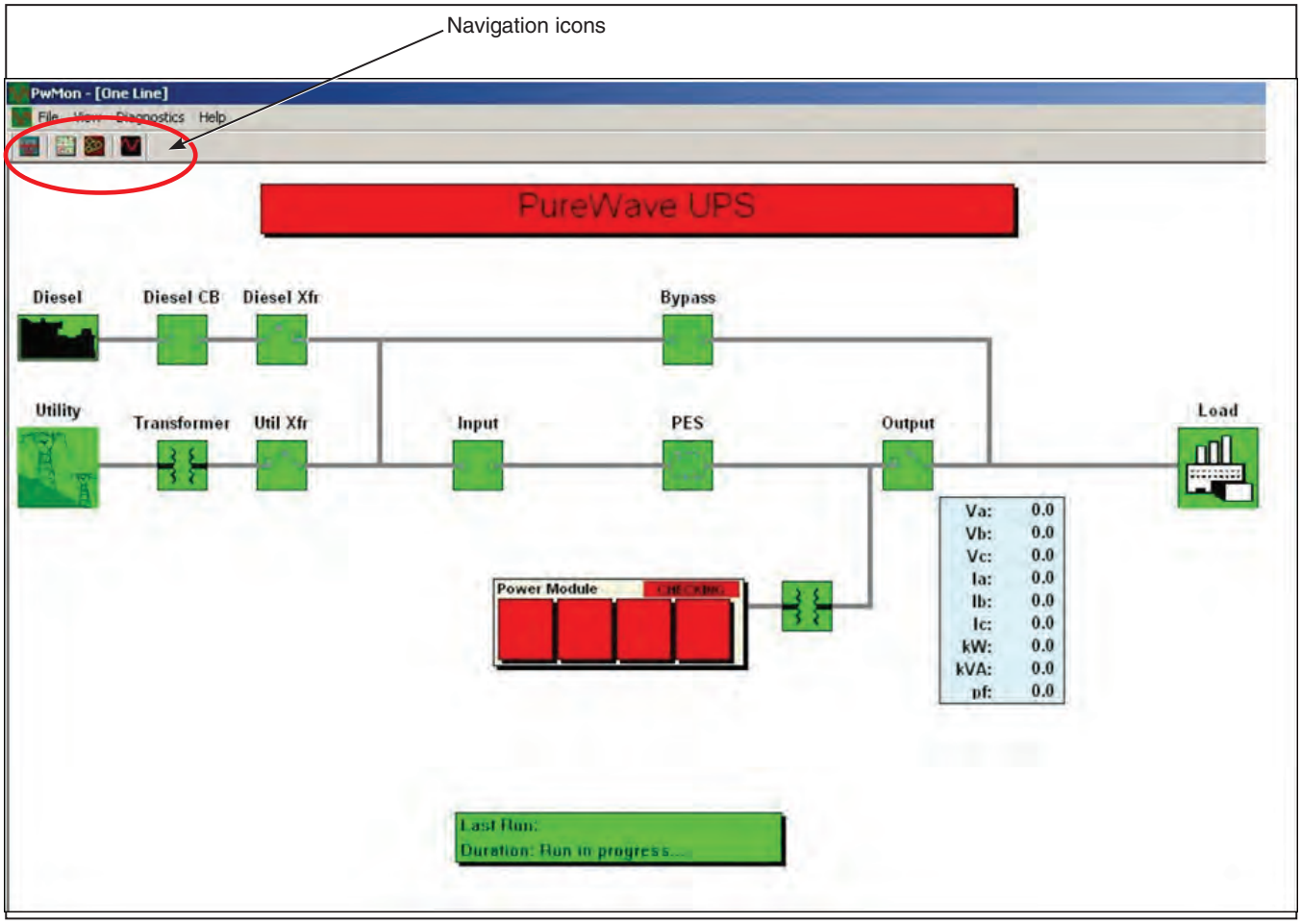


Figure 17. Navigation icons.

Monitoring Software – continued

Displayed Parameters

Figure 18 shows the areas of the **One-Line** screen where the user can find measured parameters of the PureWave UPS System.

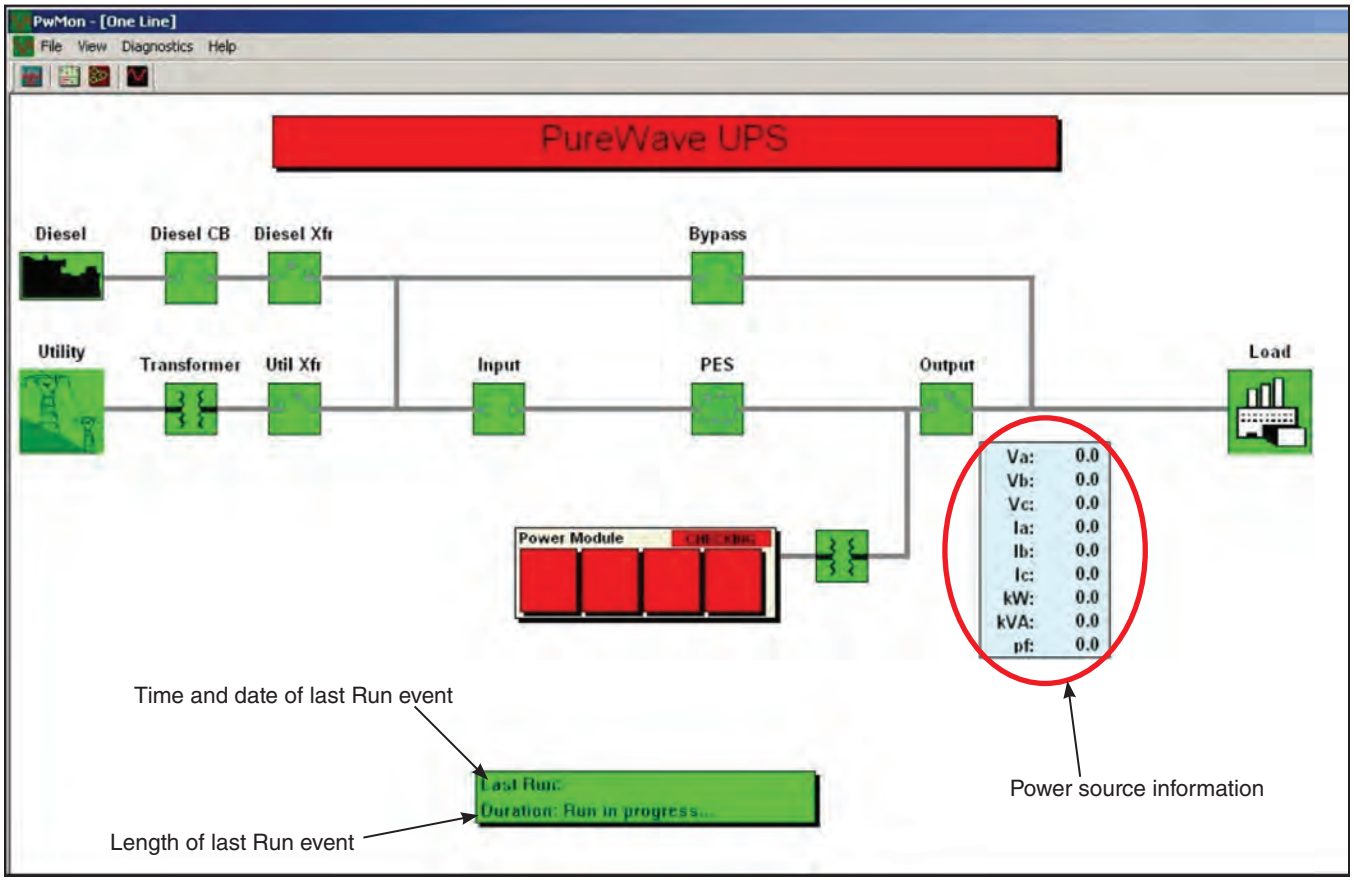


Figure 18. Displayed parameters on the One-Line screen.

Monitoring Software – continued

Status Screen

The **Status** screen shows all the alarms for the PureWave UPS System and displays the active alarms using color indicators. In addition, the screen shows the current, voltage, and other parameters of the system as displayed in Figure 19.

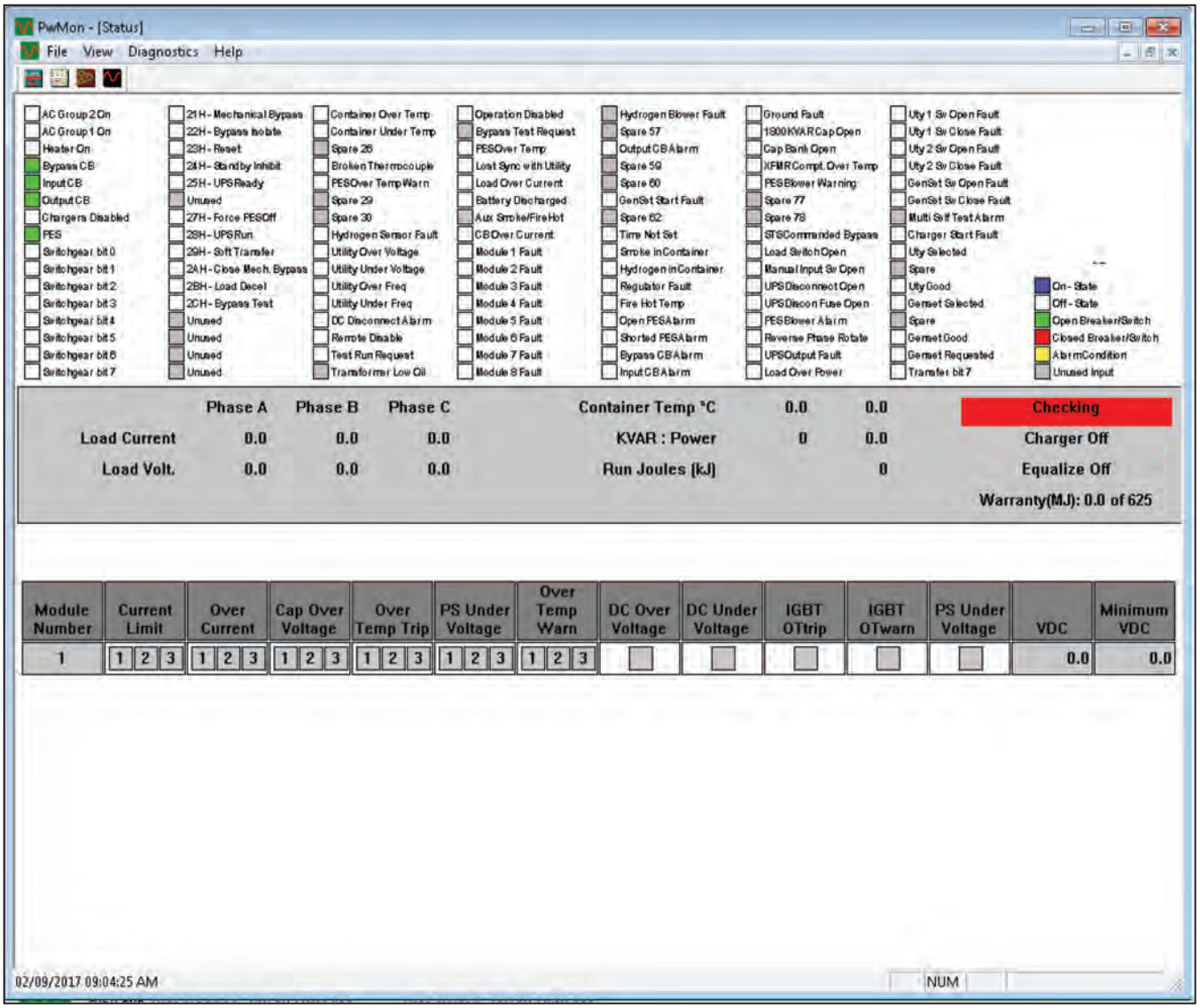


Figure 19. Status screen.

Maintenance Checklist Overview

The following checklists provide the inspection activities that are to be performed on a periodic basis (as specified) for the PureWave UPS System. The amount of dust and dirt varies from site to site. Therefore, schedules for maintenance should be reviewed by the user based on the given site conditions and, if required, the frequency of the recommended maintenance may increase to ensure the reliability of their PureWave UPS System.

S&C Electric Company has extended service agreements and spare parts kits available for the PureWave UPS System. Please contact S&C Electric Company–Power Quality Products at (414) 423-8776.

The PureWave UPS System will require maintenance to help ensure high system reliability and efficiency. The following checklists can be used as a reference to assist in properly maintaining the system.

Quarterly Maintenance

⚠ DANGER

The PureWave UPS System must be de-energized before performing maintenance on the equipment. Refer to the battery manufacturer maintenance documents to ensure proper battery maintenance and protection against serious injury or even death.

Proper personal protective equipment (PPE) must be used.

Preparation

☐ Review the steps in this procedure to prepare the proper tools and test equipment that will be needed to complete the tasks.

☐ Bring site-specific schematics and familiarize yourself with when and how you will isolate the circuits during the maintenance.

☐ Coordinate with the site facilitator to obtain keys for locks (if applicable) to unlock the doors to the PureWave UPS System enclosure(s).

☐ Confirm with the site facilitator that the PureWave UPS System is de-energized before conducting maintenance on the system.

☐ **Verified By:**_____ **Date:** _____

Required Tools

☐ Shop vacuum

☐ Rags or paper towels

☐ General purpose cleaner (e.g. Simple Green)

☐ Personal protective equipment

☐ Insulated ½-inch wrench or socket

☐ Standard insulated hand tools (wrench and flat-head screwdriver)

☐ DAP concrete sealant

☐ PureWave UPS System enclosure touch-up paint

☐ **Verified By:**_____ **Date:** _____

Arrival

☐ Jobsite name: _____

☐ Discuss maintenance plan with the local jobsite facilitator.

Record the following information:

☐ System state: _____

☐ List any active alarms: _____

☐ **Verified By:**_____ **Date:** _____

⚠ DANGER

The PureWave UPS System must be de-energized before performing maintenance on the equipment. Failure to do so can result in serious injury or even death.

Maintenance should only be conducted by S&C Electric Company personnel or personnel who are properly trained by S&C Electric Company.

☐ Follow these steps for the PureWave UPS System enclosure:

☐ Visually inspect the outside of the enclosure for signs of deterioration or rust.

☐ Rust found? **YES** or **NO** (circle one)

☐ If yes, clean the rust and paint using the correct paint color for the enclosure.

☐ If deterioration or rust is found, but not cleaned and painted, why?

☐ _____

☐ Inspect the enclosure doors. Verify the door seals are intact by closing each door.

☐ Inspect the seals between the enclosure and concrete. Reseal any cracks with DAP® concrete sealant.

Quarterly Maintenance – continued

For the 250-kW and 500-kW PureWave UPS Systems, use the following steps. (*For the 750-kW and 1000-kW PureWave UPS Systems, go to page 40.*) The air-inlet vent is located on the switchgear bay door. The inlet filter is located on the inside of the switchgear bay door. The air-outlet vent hood is located at the top of the control bay. See Figure 20.

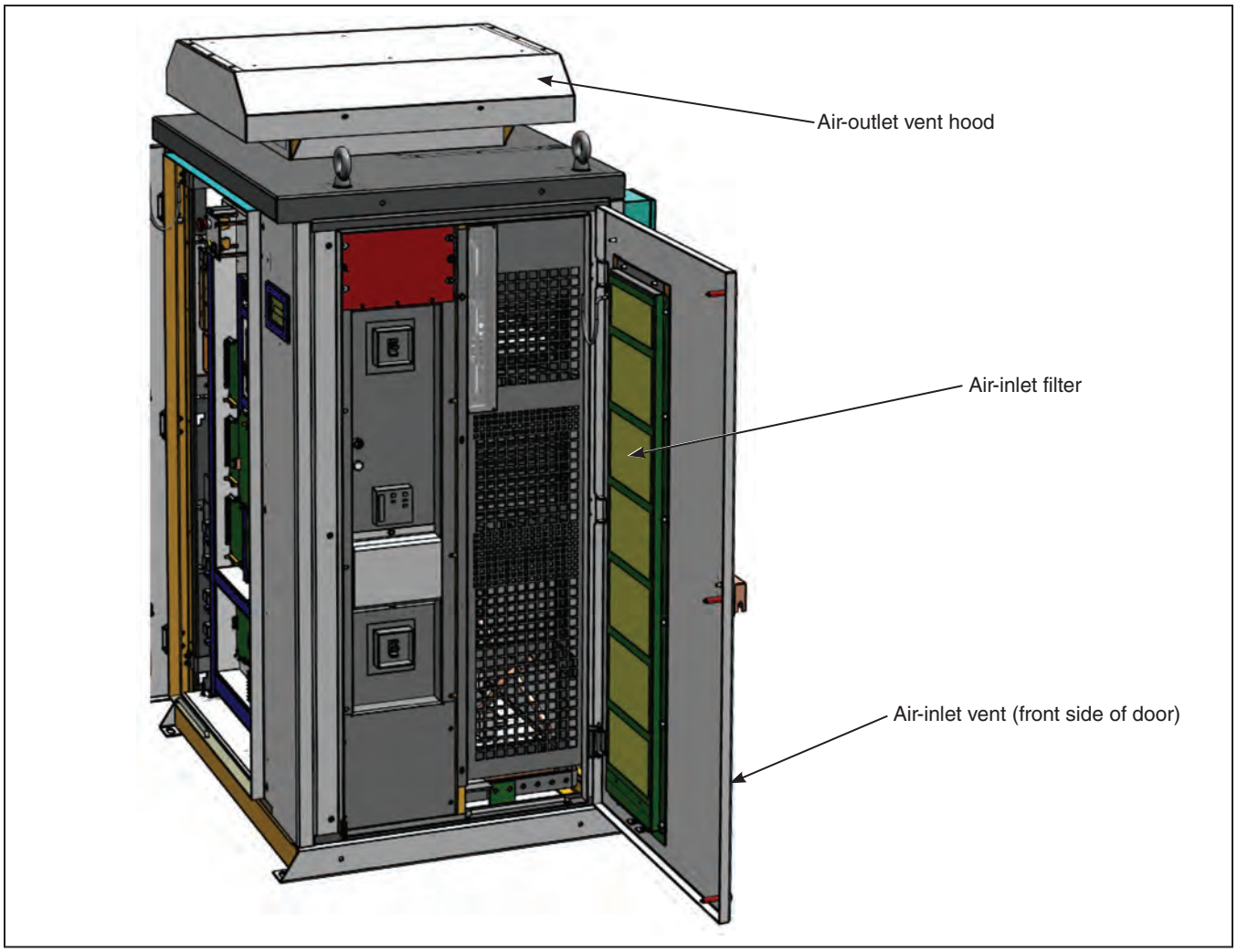


Figure 20. Location of the air-inlet filter and outlet vent hood.

☐ Inspect the air-inlet vent located on the switchgear bay door. Clean any debris and obstructions that can restrict air flow going into the PureWave UPS System.

☐ Inspect the air-inlet filter (inside of the switchgear bay door) for debris and obstructions that can cause air-flow restrictions. The filter can be replaced by unbolting the mounts with a ½-inch wrench (or socket).

☐ Rust found? **YES** or **NO** (circle one)

☐ Why or why not?_____

☐ Inspect the air-outlet vent hood at the top of the control bay. Clean any debris or obstructions that can restrict air flow going out of the PureWave UPS System.

☐ Perform general housekeeping, ensuring there is no garbage or debris in or around the enclosure.

☐ **Verified By:**_____ **Date:** _____

(After the above is complete, go to the departure procedures on page 41.)

Quarterly Maintenance – continued

For the 750-kW and 1000-kW PureWave UPS Systems, use the following steps. (*For the 250-kW and 500-kW PureWave UPS Systems, go to page 39.*) The air-inlet vent hood is located on top of the switchgear bay. The air-outlet vent hood is located on top of the control bay. See Figure 21 for an example of a 1000-kW PureWave UPS System.

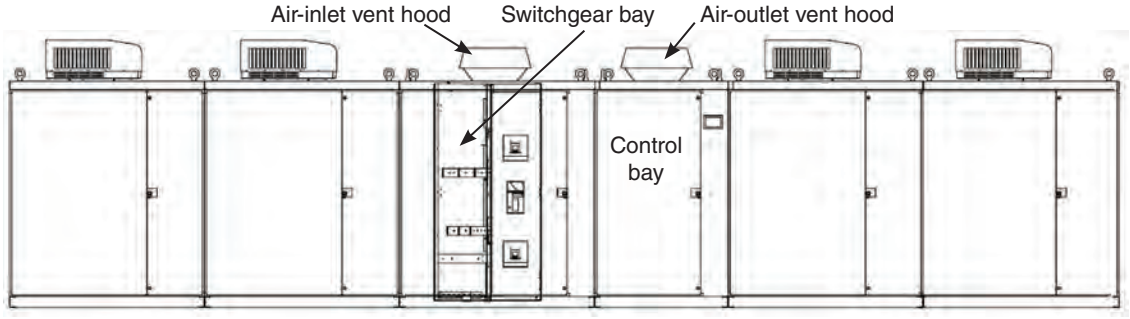


Figure 21. Location of the air-inlet and air-outlet vent hoods.

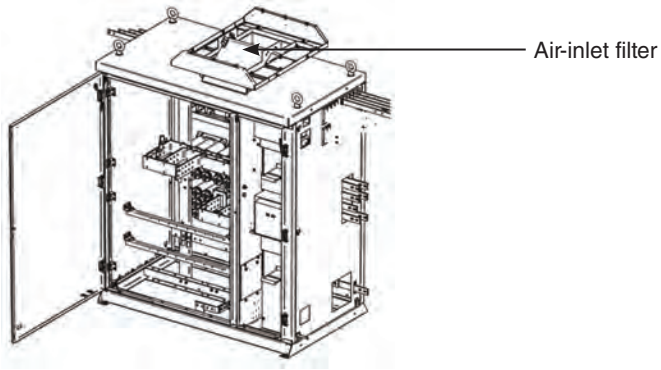


Figure 22. Location of the air-inlet filter.

☐ Inspect the air-inlet vent hood at the top of the switchgear bay. Clean any debris or obstructions that can restrict air flow going into the PureWave UPS System.

⚠ WARNING

Do not let any materials or tools fall through the air inlet. The contact of conductive materials or tools with energized parts inside the equipment can result in serious equipment damage, personal injury, or even death.

☐ Inspect the air-inlet filter for debris and obstructions that can cause air flow restrictions. See Figure 22. The filter can be replaced by unbolting the top of the air-inlet vent hood with a wrench and screwdriver. When the hood is opened, the filter must be bent into place and secured by the clips provided. The white part of the filter should face up, and the pink part of the filter should face down into the switchgear bay.

☐ Air-inlet filter replaced? **YES** or **NO** (circle one)

☐ Why or why not?_____

☐ Inspect the air-outlet vent hood at the top of the control bay. Clean any debris or obstructions that can restrict air flow going out of the PureWave UPS System.

☐ Perform general housekeeping, ensuring there is no garbage or debris in or around the enclosure.

☐ **Verified By:**_____ **Date:** _____

Quarterly Maintenance – continued

Before departing the site, conduct the following procedures:

- ☐ Perform general housekeeping, to ensure there no garbage or debris is in or around the enclosure.
- ☐ Bring the PureWave UPS System back online.
- ☐ Record the system state: _____
- ☐ Close and lock all the enclosure doors and return site keys to the facility supervisor (if applicable).

Annual Maintenance

⚠ DANGER

Refer to the battery manufacturer maintenance documents to ensure proper battery maintenance and protection against serious injury or even death.

Proper personal protective equipment (PPE) must be used.

Maintenance should only be conducted by S&C Electric Company personnel or personnel who are properly trained by S&C Electric Company.

Preparation

Follow these steps to prepare for annual maintenance:

☐ Review the steps in this procedure to prepare the proper tools and test equipment that will be needed to complete the tasks.

☐ Bring site-specific schematics and familiarize yourself with when and how you will isolate the circuits during the maintenance.

☐ Coordinate with the site facilitator to obtain keys for locks (if applicable) to unlock the doors to the PureWave UPS System enclosure(s).

☐ Confirm with the site facilitator that the PureWave UPS System is de-energized.

☐ **Verified By:**_____ **Date:** _____

Required Tools

☐ Shop vacuum

☐ Rags or paper towels

☐ General purpose cleaner (e.g. Simple Green®)

☐ Personal protective equipment

☐ Insulated ½-inch wrench or socket

☐ Standard insulated hand tools (wrench and flat-head screwdriver)

☐ DAP® concrete sealant

☐ PureWave UPS System enclosure touch-up paint

☐ Lock-out/Tag-out tags and locks

☐ Calibrated Hioki 16-Channel Digital Waveform Recorder or oscilloscope

☐ Two calibrated Fluke 87 digital multimeters

☐ **Verified By:**_____ **Date:** _____

Arrival

☐ Jobsite name: _____

☐ Discuss maintenance plan with the local jobsite facilitator.

Record the following information:

☐ System state: _____

☐ List any active alarms: _____

☐ **Verified By:**_____ **Date:** _____

Annual Maintenance – continued

⚠ DANGER

The PureWave UPS System must be de-energized before performing maintenance on the equipment. Failure to do so can result in serious injury or even death.

Maintenance should only be conducted by S&C Electric Company personnel or personnel who are properly trained by S&C Electric Company.

Follow these steps for the PureWave UPS enclosure:

☐ Visually inspect the outside of the enclosure for signs of deterioration or rust.

☐ Rust found? **YES** or **NO** (circle one)

☐ If yes, clean the rust and paint using the correct paint color for the enclosure.

☐ If deterioration or rust is found, but not cleaned and painted, why?

☐ _____

☐ Inspect the enclosure doors. Verify the door seals are intact by closing each door.

☐ Inspect the seals between the enclosure and concrete. Reseal any cracks with DAP® concrete sealant.

☐ **Verified By:**_____ **Date:** _____

Annual Maintenance – continued

⚠ DANGER

The PureWave UPS System must be de-energized before performing maintenance on the equipment. Failure to do so can result in serious injury or even death.

Maintenance should only be conducted by S&C Electric Company personnel or personnel who are properly trained by S&C Electric Company.

Follow these steps for each battery bay:

☐ Inspect the top and bottom hydrogen vents located along the inside wall of the bay. Clean any debris or obstructions that can restrict air flow. See Figure 23 for the location of the hydrogen vents.

☐ Inspect the air conditioners at the top of the battery bay. Clean any debris or obstructions that can restrict air flow. See Figure 24 for the location of the air conditioners.

☐ Clean the general interior of the battery bay using a vacuum.

☐ **Verified By:**_____ **Date:** _____

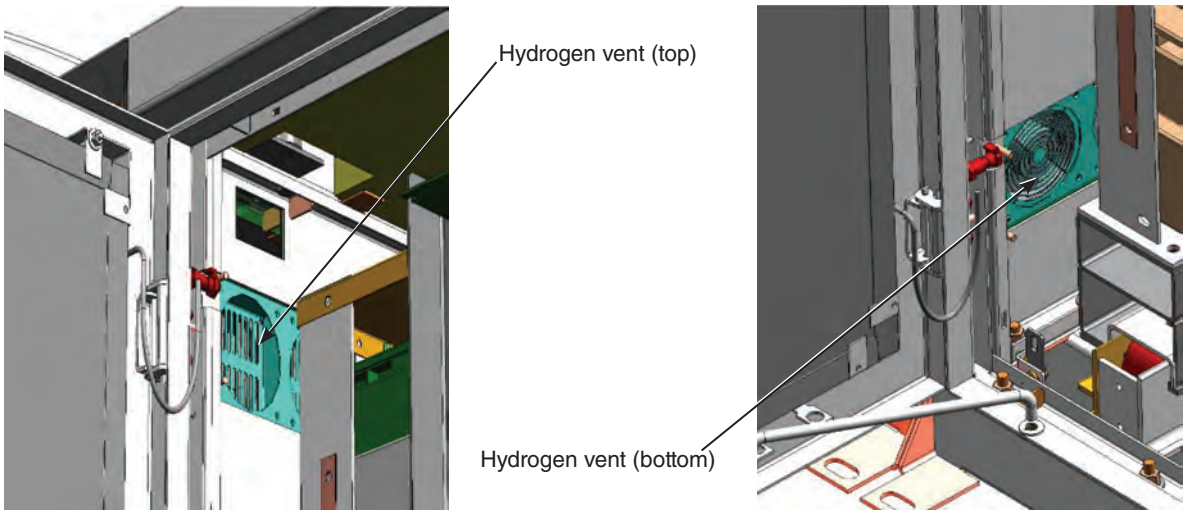


Figure 23. Location of the hydrogen vents in the battery bay.

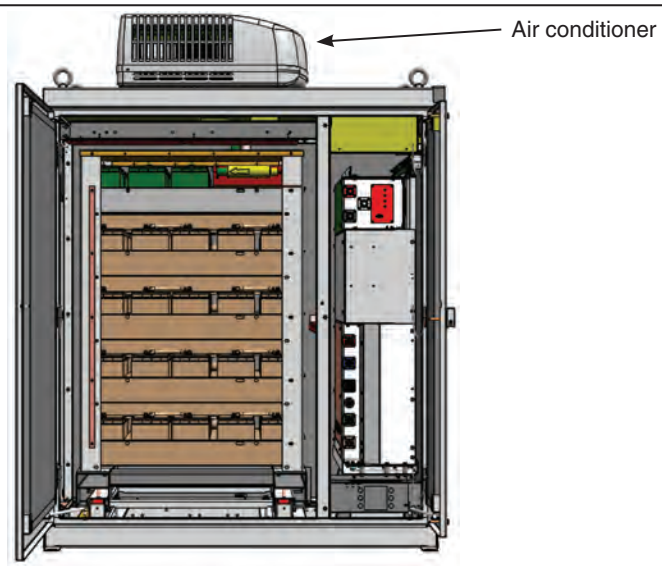


Figure 24. Location of an air conditioner on top of the battery bay.

Annual Maintenance – continued

Follow these steps for the control bay:

- ☐ Inspect the air-outlet vent hood at the top of the control bay. Clean any debris or obstructions that can restrict air flow going out of the PureWave UPS System. See Figure 25 for the location of the air-outlet vent hood.
- ☐ Inspect the control panel and the monitoring computer at the back of the swing out panel.
- ☐ Clean the general interior of the control bay using a vacuum.
- ☐ **Verified By:**_____ **Date:** _____

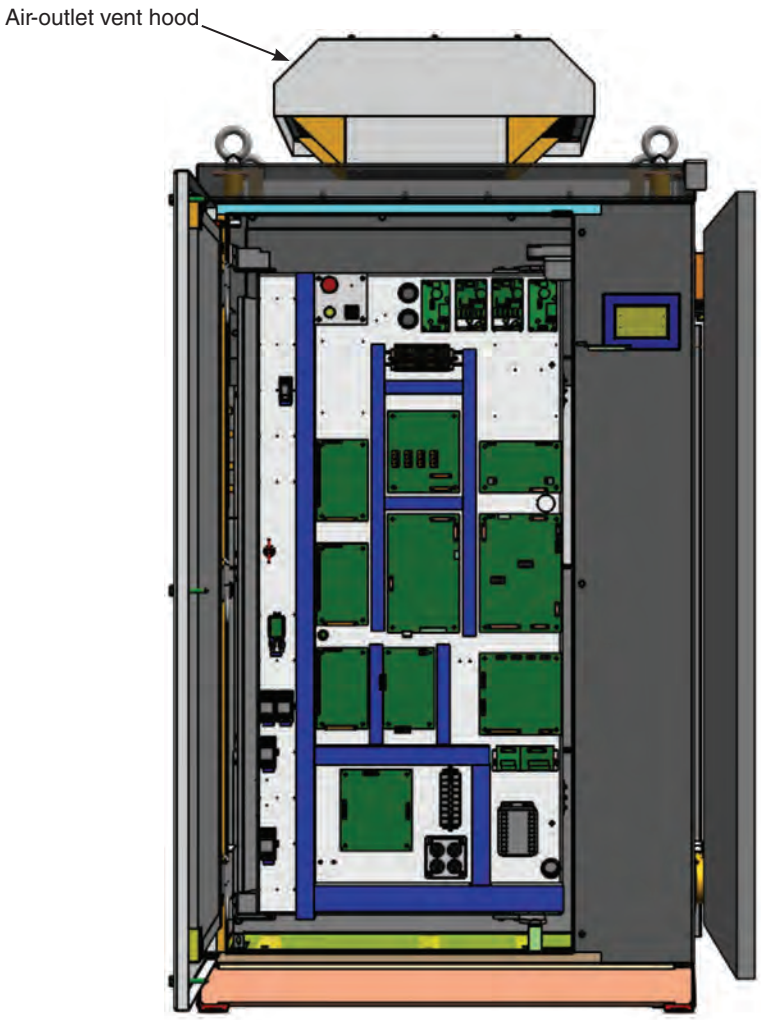


Figure 25. Location of the air-outlet vent hood on top of the control bay.

Annual Maintenance – continued

For the 250-kW and 500-kW PureWave UPS Systems, use the following steps for the switchgear bay. *(For the 750-kW and 1000-kW PureWave UPS Systems, go to page 47.)*

☐ Inspect the air-inlet vent located on the switchgear bay door. Clean any debris and obstructions that can restrict air flow going into the PureWave UPS System.

☐ Inspect the air-inlet filter (inside of the switchgear bay door) for debris and obstructions that can cause air-flow restrictions. The filter can be replaced by unbolting the mounts with a ½-inch wrench (or socket). See Figure 26 for the location of the air-inlet filter.

☐ Air inlet filter replaced? **YES** or **NO** (circle one)

☐ Why or why not? _____

☐ **Verified By:**_____ **Date:** _____

(After the above is complete, go to the equipment testing procedures on page 48.)

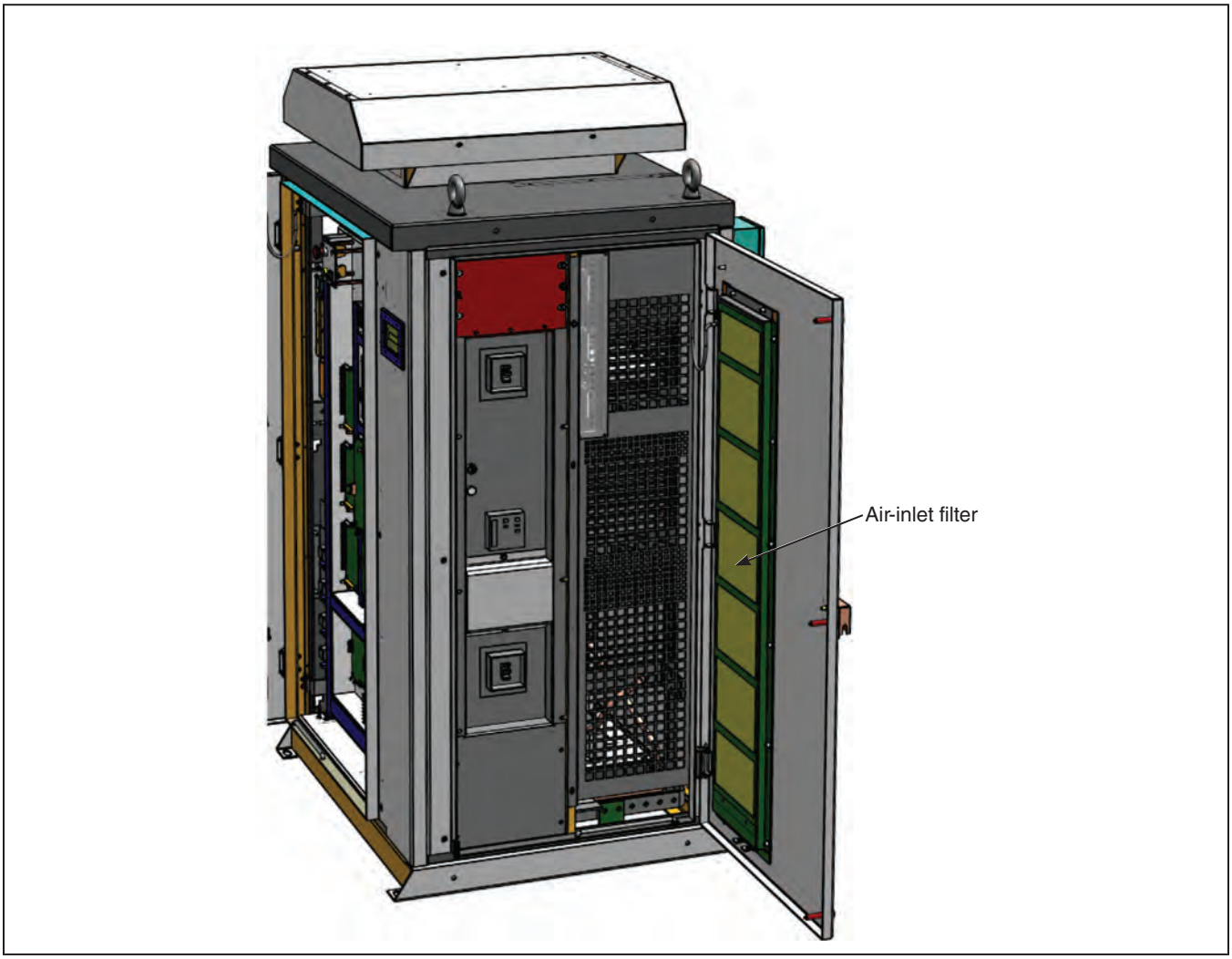


Figure 26. Location of the air-inlet filter in the switchgear bay.

Annual Maintenance – continued

For the 750-kW and 1000-kW PureWave UPS Systems, use the following steps for the switchgear bay. *(For the 250-kW and 500-kW PureWave UPS Systems, go to page 46.)*

☐ Inspect the air-inlet vent hood at the top of the switchgear bay. Clean any debris or obstructions that can restrict air flow going into the PureWave UPS System. See Figure 27 for an example of a 1000-kW PureWave UPS System.

⚠ WARNING

Do not let any materials or tools fall through the air inlet. The contact of conductive materials or tools with energized parts inside the equipment can result in serious equipment damage, personal injury, or even death.

☐ Inspect the air-inlet filter for debris and obstructions that can cause air-flow restrictions. The filter can be replaced by unbolting the top of the air-inlet vent hood with a wrench and screwdriver. When the hood is opened, the filter must be bent into place and secured by the clips provided. The white part of the filter should face up and the pink part of the filter should face down into the switchgear bay. See Figure 28.

☐ Air-inlet filter replaced? **YES** or **NO** (circle one)

☐ Why or why not?_____

☐ Clean the general interior of the switchgear bay using a vacuum.

☐ **Verified By:**_____ **Date:** _____

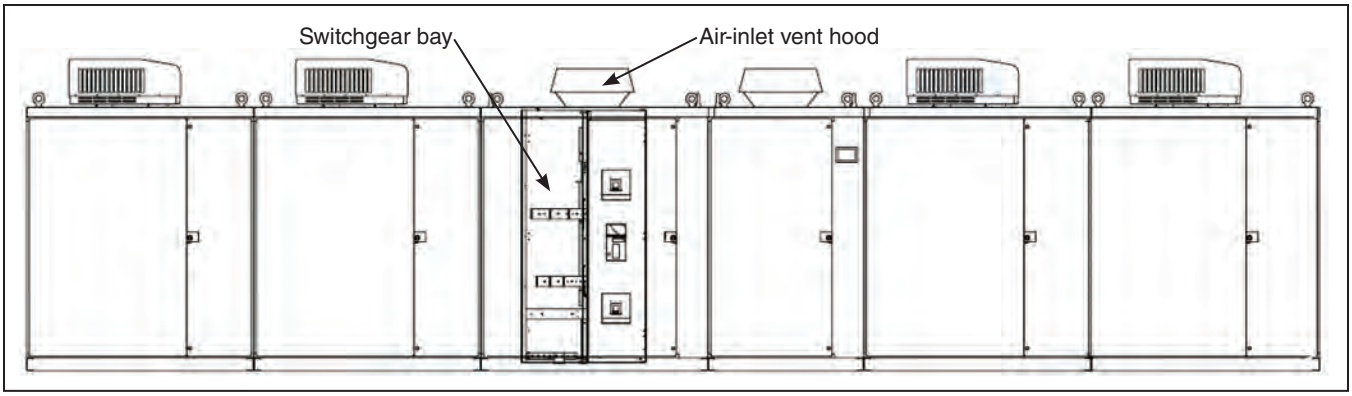


Figure 27. Location of the air-inlet vent hood.

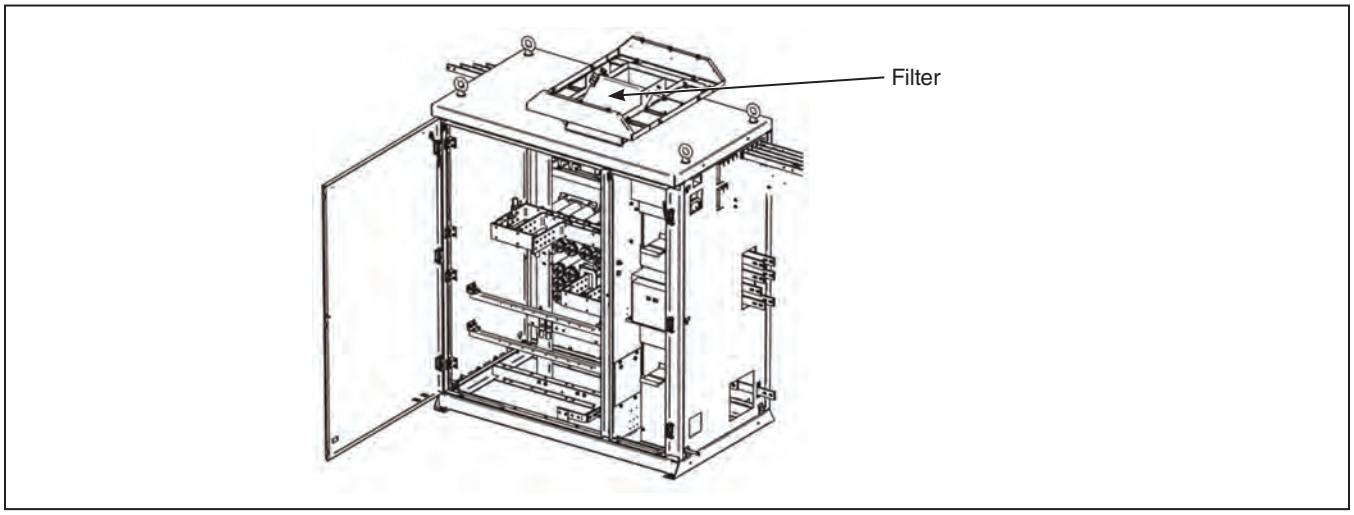


Figure 28. Location of the air-inlet vent filter.

Annual Maintenance – continued

NOTICE

Contact S&C Electric Company to conduct calibration verification and operational testing services.

⚠ WARNING

The following procedures require the PureWave UPS System to have utility power. The system should be placed in the **Bypass Isolate** state before conducting the proceeding equipment testing procedures.

Conduct the following equipment testing procedures:

☐ Verify all smoke detectors are available, undamaged, and operate when tested.

☐ Enable the system and verify the air conditioners are working properly by measuring and recording the compressor current draw on each A/C unit with an ammeter after the A/C unit is running for 2 minutes. Operate the A/C unit by installing switchable output blocks in DO00 (EA10 position S8) and DO01 (EA10 position S9) and turn on. The current should be between 10 and 15 amps. Record these measurements in Table 8 below.

☐ Hold your hand under each of the air conditioners to verify cool air is still being produced

☐ Record the ambient temperature when air conditioner testing is being performed. Replace the switchable output blocks with the original output blocks after verification (if used).

Ambient Temperature: _____

Table 8. Air conditioners testing data.

Bay	Compressor Current Draw (Amperes)
1	
2	
3	
4	

☐ To verify the heaters are working properly, check each heater to verify they are still putting out heat. Operate the heaters by installing a switchable output block in DO11 (EA11 position S11) and turn on. Replace the switchable output block with the original output block after verification.

☐ Verify the container temperature sensing via monitoring computer.

☐ Remove a thermocouple from the analog board and verify there is a broken thermocouple warning on the HMI and on the LCD.

☐ Verify (visually) the control relays are not damaged.

☐ Verify all fuses are in working order on the control panel.

☐ Verify the service outlets and lights are operational.

☐ **Verified By:**_____ **Date:** _____

Annual Maintenance – continued

Before departing the site, conduct the following procedures:

- ☐ Perform general housekeeping to ensure no garbage or debris is in or around the enclosure.
- ☐ Bring the PureWave UPS System back online.
- ☐ Record the system state: _____
- ☐ Close and lock all the enclosure doors and return site keys to the facility supervisor (if applicable).
- ☐ **Verified By:**_____ **Date:** _____