S&C PureWave® SMS-250 Storage Management System

Power Conversion System

263 kW/263 kVA, 380 V

Operation and Maintenance

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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 energy storage equipment along with 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 voltages and arc-flash levels 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.

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this entire instruction sheet before operating and maintaining the PureWave® SMS-250 Storage Management System and power conversion system (PCS). Familiarize yourself with the Safety Information and Safety Precaution on pages 3 through 5. The latest version of this instruction sheet 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 PCS. It does not include instruction sheets from the original battery manufacturer. Information sheets such as this one can be placed inside a compartment in the PCS enclosure, where they can be easily retrieved for future use.

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 equipment. Refer to S&C General Brochure 659-G358 for the S&C PureWave SMS-250 Storage Management System. Failure to do so may result in damage of the 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 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 the 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 SMS-250 Storage Management 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 PureWave SMS-250 unit. 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

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; in Canada, call S&C Electric Canada Ltd. at (416) 249-9171.

NOTICE

Read this instruction sheet thoroughly and carefully before installing or operating your S&C PureWave SMS-250 Storage Management System.

Replacement Instructions and Labels

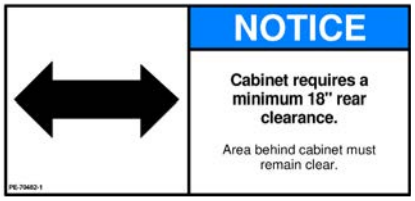
If you need additional copies of this instruction sheet, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

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.

Location of Safety Labels

A

B



C

Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Part Number
A	⚠ DANGER	KEEP OUT. RISK OF ELECTRICAL SHOCK …	PE-70479-1
B★	*NOTICE*	REAR CLEARANCE …	PE-70482-1
C	⚠ DANGER	ARC FLASH AND SHOCK …	PE-70483-1

★ Label is on the left and right sides of the PCS enclosure.

Symbols and Terminal Markings

I	The "I" symbol represents the power on button. When the "I" button with the symbol is pressed, the breaker places the equipment into a fully-powered state
⏚	Equipment grounding conductor.
O	The "O" symbol represents the power off button. When the button with the "O" symbol is pressed, the breaker disconnects the load side from the power source. The dc breaker disconnects the SMS-250 from the battery. The ac breaker disconnects the ac output to the load.
⎓	Direct current, also indicated as dc.
∿	Alternating current, also indicated as ac.

⚠ DANGER

The PureWave SMS-250 system operates at hazardous voltage. Failure to observe the precautions below 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 SMS-250 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 flame-retardant 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. **ENCLOSURE.** Do not open access doors unless the system is offline or otherwise authorized by S&C Electric Company.
6. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components, ensuring the dead-front access panels are in place after maintenance and before operation.
7. **HAZARDOUS VOLTAGES.** High-voltage dc is present even without utility power connected. Hazardous voltages should also be expected in all interconnecting components and lines.

   To maintain safety, the user should use a padlock on the door of the PCS. The door and the use of the padlock provide protection to inadvertent contact with hazardous voltages.
8. **GROUNDING.**
   For grounding purposes, the proceeding must be followed:
   - The PCS ground bar in the cable termination area must be connected to a suitable earth ground for testing before energizing the unit and at all times when energized.
   - The overall ground system should be sufficient to limit the Ground Potential Rise, step voltage, and touch voltage to acceptable limits as determined by the utility's practices and the National Electric Safety Code.
9. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, locked open, and tested.
10. **ADDITIONAL CONNECTIONS.** The user should not attempt to connect any additional logic controls or power connections to the PureWave SMS-250 system (beyond the connections shown on the interconnect drawing) without having received written approval from S&C Electric Company.
11. **INSULATED HAND TOOLS.**
    To use insulated hand tools, the proceeding must be followed:
    - 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 that all tools that enter the system enclosure are removed prior to energizing the system.
12. **EMERGENCY PROCEDURES AND EQUIPMENT.**
    For emergency procedures:
    - 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.
13. **ADDITIONAL SAFETY INSTRUCTIONS.** Consult the battery supplier for additional safety instructions and procedures regarding the battery used for the PureWave SMS-250 system.

Enclosure

The enclosure houses the PCS. The weatherproof, tamper-resistant NEMA 4 enclosure helps protect the system from environmental factors and unauthorized interference. Access to the system components shall be by means of a door at the front of the enclosure. Vents for air flow are located on the back. See Figure 1.

Figure 1. Front and rear view of the PCS enclosure.

LCD Screen

A four-line, 40 character liquid-crystal display shall be mounted on the control panel, protected by a clear plastic window. The display shall indicate status information such as voltages (ac), currents (ac), power (ac), vars (ac), battery voltage (dc), inverter state, operating mode, and active alarms. See Figure 2.

Figure 2. Location of the LCD screen.

Dead-Front Access Panels

⚠ WARNING

Do not remove the dead-front access panels unless qualified to do so. Potentially lethal voltages are present beyond the dead-front access panels. High-voltage dc may be present even without the utility power connected.

Upon opening the PCS enclosure door, the three dead-front access panels are shown. The panels protect the user from the energized components of the PCS. See Figure 3.

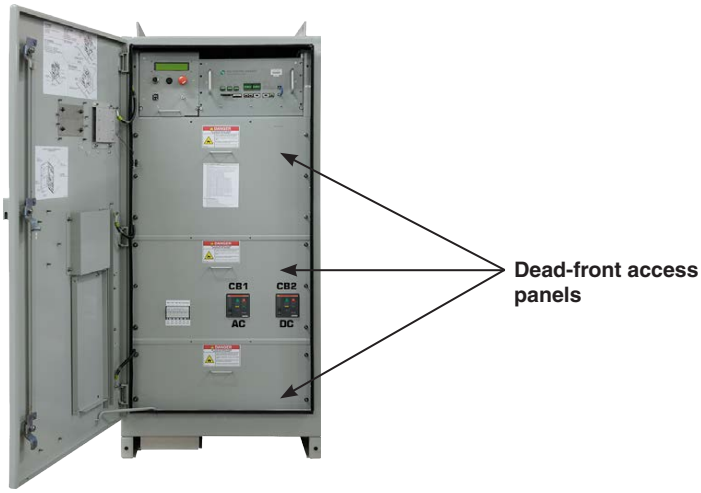


Figure 3. Dead-front access panels.

The panels may be removed starting from the top panel to the bottom panel. Use a #2 Phillips screwdriver for the two screws at the top of each panel and a 13-mm socket wrench for the side flange nuts. Refer to Figure 34 on page 46 for an illustration of the dead-front access panel removal procedure.

Inner Components

⚠ DANGER

Before removing the dead-front access panels, make sure that the PCS is de-energized to avoid serious injury. When removing the three dead-front access panels, remove them from top to bottom to avoid injury or equipment damage.

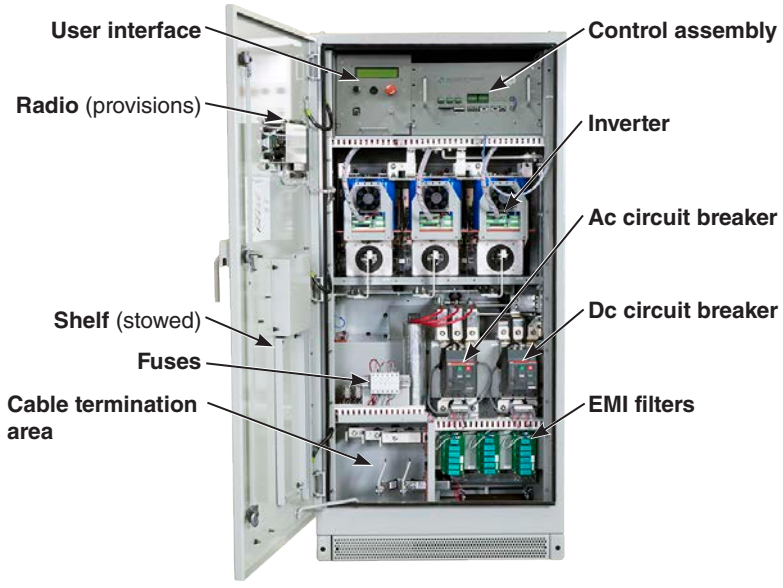


Figure 4. Components inside the PCS enclosure.

User Interface

The PureWave SMS-250 can be controlled through the user interface located at the top left side of the unit. Figure 5 shows the controls available on the user interface.

Figure 5. User interface.

The controls on the user interface are as follows:

SMS CONTROL–This switch enables the user to switch control from SCADA mode (SCADA ENABLE) to HMI mode (SCADA DISABLE) and vice versa.

RESET–This black pushbutton, when pressed, enables the user to administer a manual reset.

INVERTER STOP– This red pushbutton, when pressed, enables the user to stop any running operation. Pushing this button will open the ac and dc circuit breakers.

WEB SERVER CONNECTION–The user can use this connection port to connect locally to the system via Human Machine Interface (HMI) mode.

PRE-CHARGE–This key-lock is used when any work or maintenance requires the inverter to be de-energized. When the inverter stop pushbutton is pressed and the pre-charge key is turned to the OFF position (ac and dc circuit breakers are open), the inverter bridge will discharge to a safe level in 5 minutes.

⚠ WARNING

Capacitors in the PCS may have residual charge after the pre-charge key has been turned off. If there is no load connected to the unit, wait 5 minutes for the capacitors to discharge before proceeding with work or maintenance.

When the pre-charge key-lock is in the OFF position, the key can be removed. The inverter bridge will remain de-energized until the key is placed back in and turned to the ON position (and source power is restored). Once the key-lock is in the ON position, the key cannot be removed unless it is turned back to the OFF position.

Control Assembly

The control assembly inputs and indicators are located on the front of the control assembly pull-out drawer located at the top-right side of the unit. See Figure 6. This assembly contains all the necessary DSP, microcontroller, application, and scale boards for operation. The inputs and indicators on the assembly are for service and maintenance personnel use.

NOTICE

Access and use of the control assembly should be done by authorized personnel who are trained in servicing the PCS.

Figure 6. Control assembly inputs and indicators.

Inverter

The inverter assembly consists of a three-phase, four-quadrant inverter that converts the dc power to ac power. It creates the three-phase output from the dc battery bus. Insulated-gate bipolar transistors (IGBTs) are used for switching, and pulse-width modulation is used to control the real and reactive power produced and absorbed by the PCS. See Figure 7.

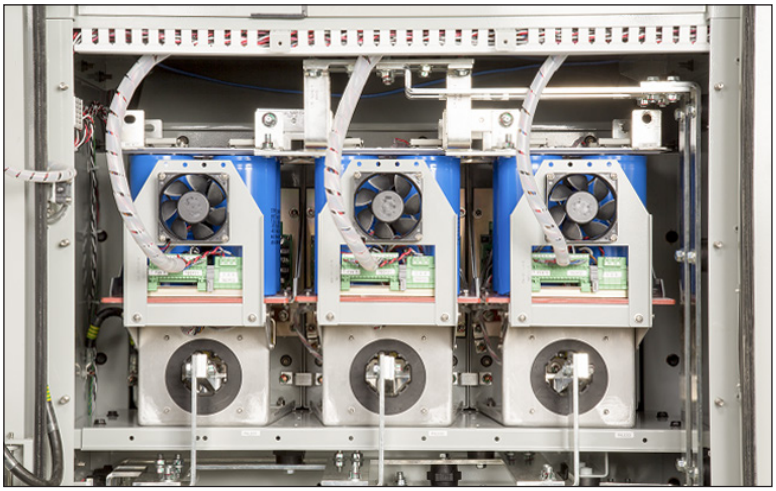


Figure 7. Inverter assembly.

Ac and Dc Circuit Breakers

The PCS has two circuit breakers located in the lower-middle section of the unit. See Figure 8 for the location of the circuit breakers. The two circuit breakers are:

Ac Circuit Breaker (CB1)–The ac circuit breaker can automatically isolate the PCS from the utility feeder in the event of a **Trip Offline** alarm. The circuit breaker is rated at 400 A. See Figure 8 for the location of the ac circuit breaker.

Dc Circuit Breaker (CB2)–The dc circuit breaker can automatically isolate the PCS from the battery in the event of a **Trip Offline** alarm or inverter stop. The circuit breaker is rated at 400 A. See Figure 8 for the location of the dc circuit breaker.

NOTICE

A few operating controls on the ac and dc circuit breakers are located inside the PCS. However, unless otherwise specified, these controls should only be operated by authorized personnel. Indicators for circuit-breaker status are present not only on the circuit breakers, but also on the Human Machine Interface (HMI).

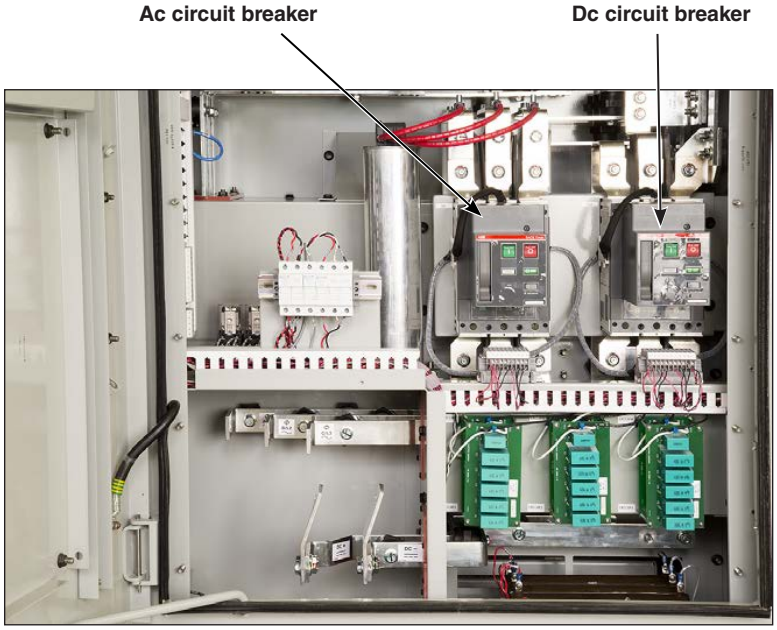


Figure 8. Ac and dc circuit breakers.

EMI Filters

Located below the circuit breakers are ac and dc electromagnetic interference (EMI) filters. These filters are designed to prevent any IGBT interference by shunting the high frequency. See Figure 9 for the location of the EMI filters.

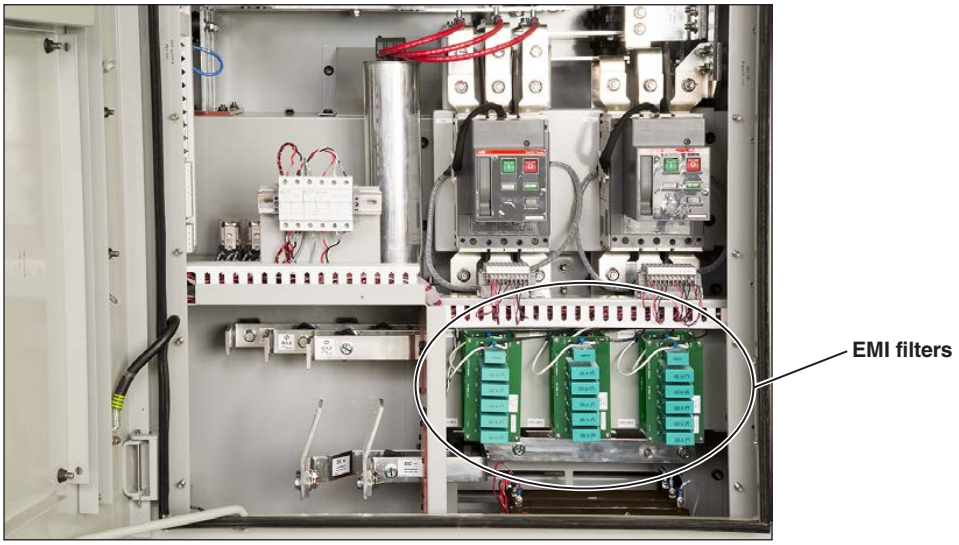


Figure 9. Location of EMI filters.

Cable Termination Area

The ac and dc cable termination area is located inside the enclosure at the bottom-left corner. This user-accessible termination area shall include terminals for connecting the utility-source cables and the dc terminals for connecting the battery pack cables. See Figure 10 for the location of the cable-termination area.

Figure 10. Cable-termination area.

Fuses

Six fuses are located to the left of the circuit breakers. See Figure 11. Some are rated differently from others because the ratings pertain to their application.

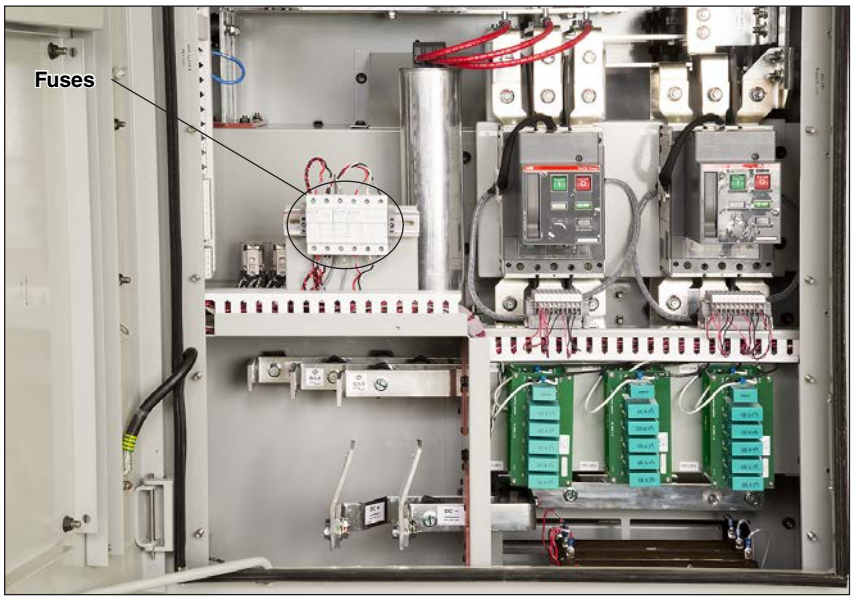


Figure 11. Location of fuses.

To replace a fuse, no hardware is necessary. Pulling the fuse latch forward will open the holder. The fuse will then be exposed for replacement.

Service Shelf

The PCS enclosure is supplied with a shelf assembly to assist personnel in servicing or monitoring the unit. The shelf-top and brackets are bolted on the inside of the enclosure door. See Figure 12.

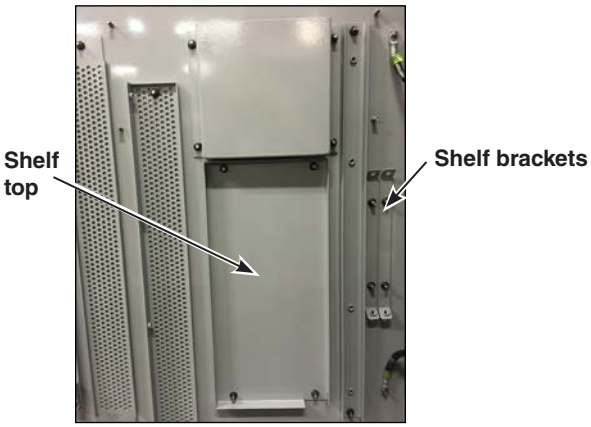


Figure 12. Location of stowed shelf-top and brackets.

Shelf Assembly

STEP 1. Using a 13-mm hexagonal wrench, unbolt the four flange nuts located at the corners of the shelf-top.

(a) Unbolt the nuts holding the brackets. The nuts will be used to assemble the shelf.

(b) Remove the shelf-top and brackets from the door.

⚠ CAUTION

Removal and placement of the shelf-top require careful attention so that mishandling, which can lead to damage or personal injury, does not occur.

STEP 2. Bolt the brackets in the location specified in Figure 13.

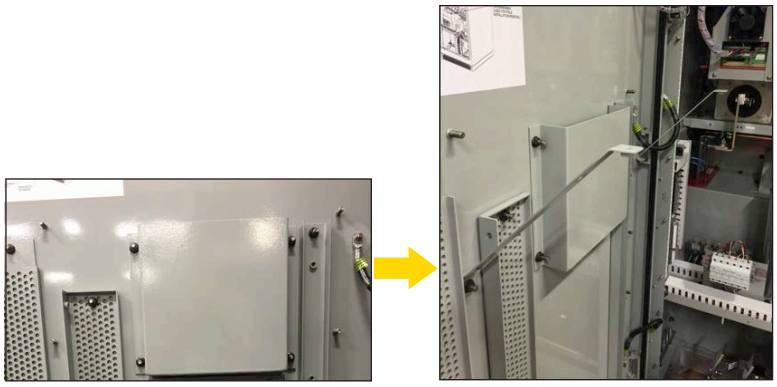


Figure 13. Location of brackets installation.

STEP 3. Place the shelf-top on top of the brackets and through the bolts as seen in Figure 14.

Figure 14. Location of shelf attachment to the enclosure door.

STEP 4. Bolt the flange nuts to secure the shelf-top to the door. The shelf is now ready for use. See Figure 15.

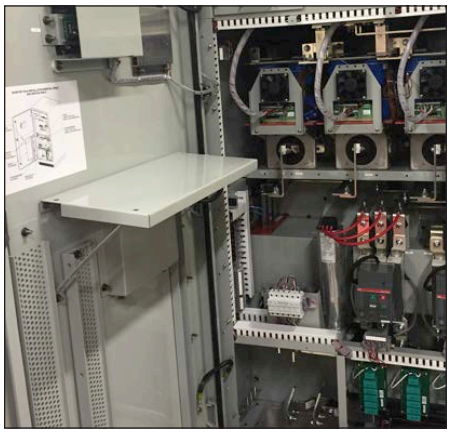


Figure 15. Shelf installed.

NOTICE

Do not close the enclosure door when the shelf is installed. The shelf will need to be disassembled after servicing is complete. Failure to do this can result in damage to the equipment.

The service shelf can also be used for removing and replacing the IGBT inverter pole assemblies inside the PCS. Refer to Figure 36 on page 48 for an illustration of installing the shelf inside the PCS to service these assemblies.

Radio Provisions

The PCS enclosure is supplied with provisions for radio communication. A removable panel to mount the radio and 24-Vdc power are located next to the LCD circuitry on the inside of the enclosure door. See Figure 16.

Figure 16. Provisions for radio communication.

Human Machine Interface

The Human Machine Interface (HMI) computer is used to control and monitor the PureWave SMS-250. A laptop computer can be used. Before connecting to the PureWave SMS-250, the user computer network settings need to be configured to the following:

- An IP address of 192.168.10.n, where n is a number greater than 0 and less than 100.
- The subnet mask should be set to 255.255.255.0.
- The default gateway can be the same as the IP address.
- Domain Name System (DNS) is not needed.

After the user computer network settings are configured, the user can attempt to connect to the HMI control by doing the following:

- Using an Ethernet cable, connect the computer to the WEB SERVER CONNECTION port on the user interface.
- Open the Firefox Web browser.
- When prompted, provide the username and password (username: operator; password: pass123).
- Enter the URL, http://192.168.10.100, into the address bar to access the HMI screens.

The user is now ready to navigate through the HMI screens.

NOTICE

The HMI has two levels of access credentials. The Level 1 access enables the user to observe the system's functions. The Level 2 access gives the user credentials to control the system. Contact the system administrator if there are any issues with HMI accessibility.

HMI Program

The HMI program contains the following screens that, when selected, show the status of the PureWave SMS-250 system and its different components. The screens are as follows:

PureWave SMS-250 System Oneline

The PureWave SMS-250 System Oneline tab displays an overview of the PureWave SMS-250 system that includes the status of the island and ac and dc circuit breakers. If the circuit breaker is red in color, this indicates that the circuit breaker is closed. If the circuit breaker is green, this indicates that the circuit breaker is open.

The oneline screen also shows the inverter, utility, and battery information. The green box to the left shows the alarm and communication status, system state, and current real and reactive power output values. If the alarm types and/or communication items are green, there are no alarms present and/or the communications are good. If the alarms and/or communication items are red, an alarm is present and/or the communication item(s) is not working. See Figure 17.

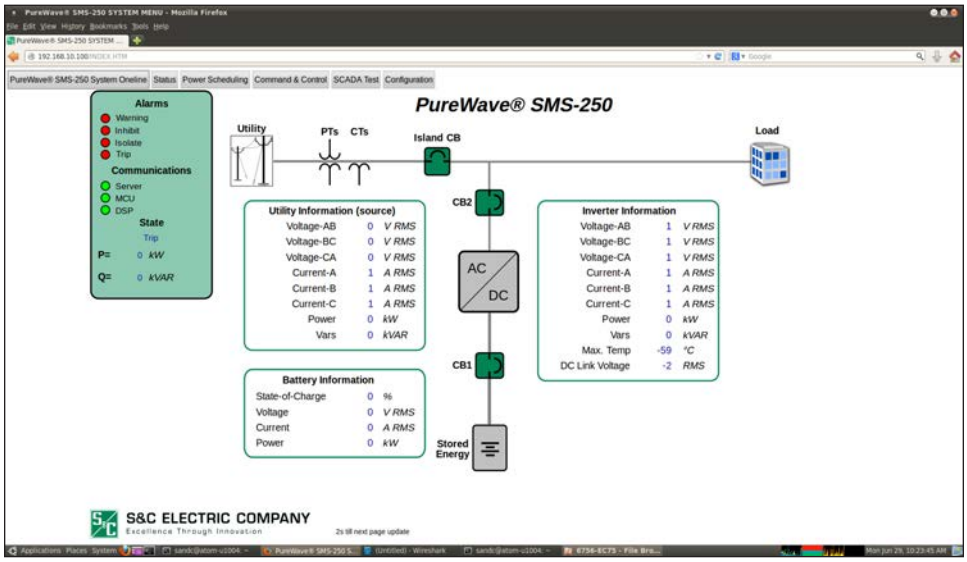


Figure 17. PureWave SMS-250 System Oneline.

Status

The Status tab displays the alarm, analog, and digital status for the PureWave SMS-250 system. Figure 18 shows where the user can find these screens by placing the mouse over the Status tab to display the status drop-down menu items: *Alarm Status*, *Analogs*, and *Digitals*.

Figure 19 is the *Alarm Status* menu screen, which displays the status of the alarms. In addition, the user can place the mouse over the listed alarm to display a tool-tip pop-up window that provides a description of what the alarm is and the suggested troubleshooting actions to clear it.

Figures 20 and 21 on page 17 show the *Analogs* and *Digitals* status menu screens, respectively.

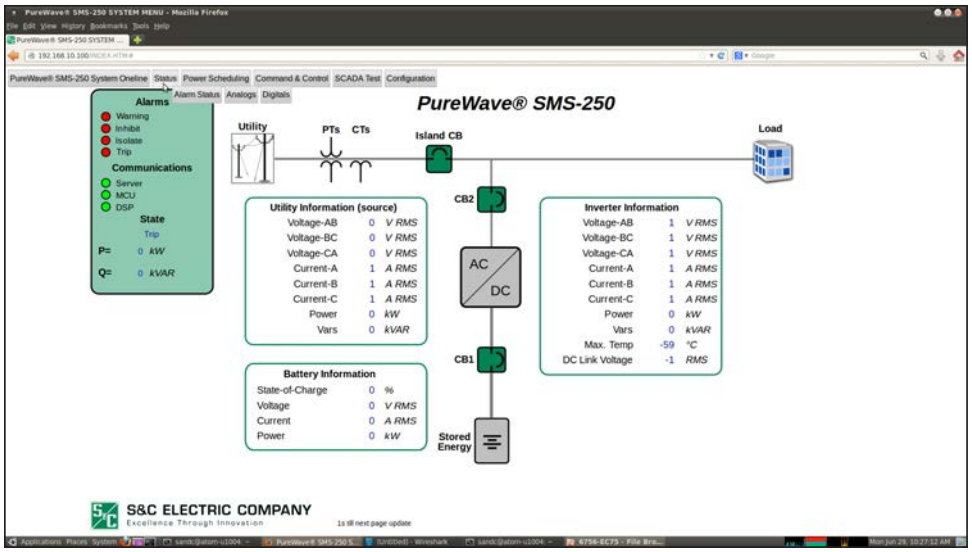


Figure 18. The Status drop down menu.

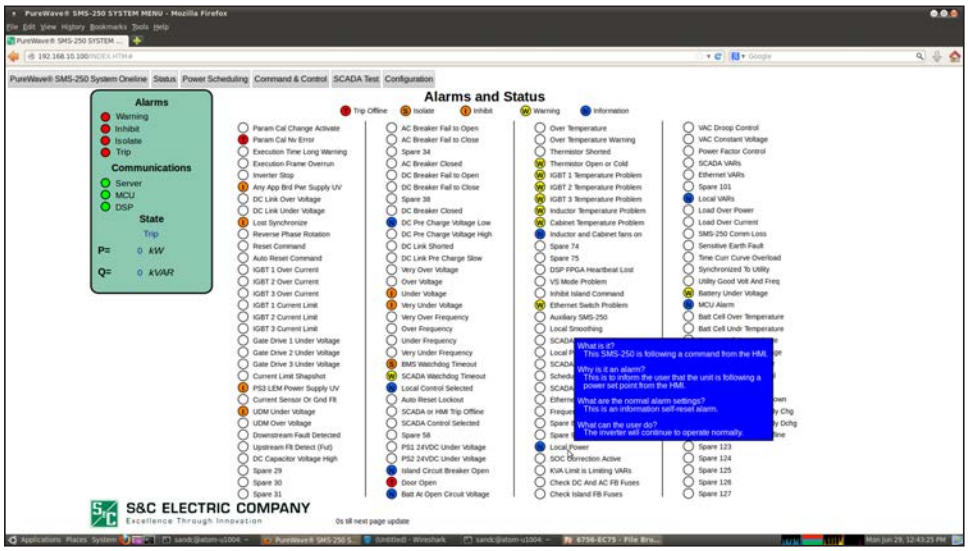


Figure 19. The Alarm and Status window.

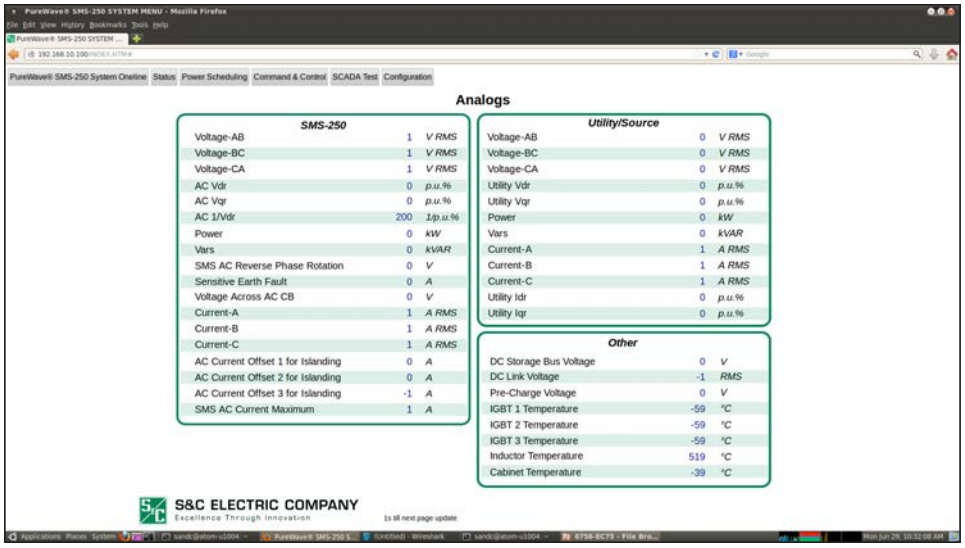


Figure 20. The Analog statuses window.

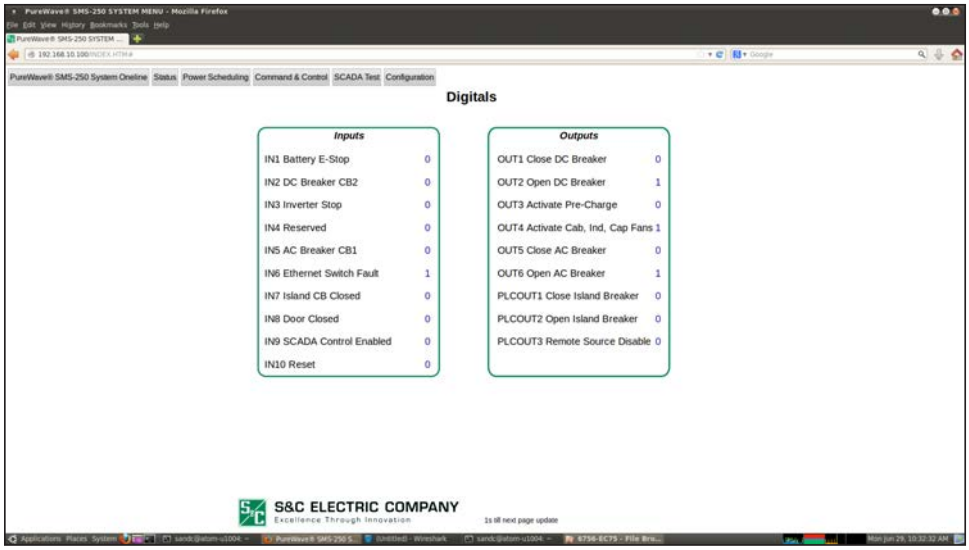


Figure 21. The Digital statuses window.

Power Scheduling

The Power Scheduling tab enables the user to charge and discharge the PureWave SMS-250 system at desired time durations and power levels during any time of the week. As seen in Figure 22, the user can place the mouse over the Power Scheduling tab to display the power scheduling drop-down menu items, *Profile Setup* and *Week Setup*. Figures 23 and 24 (on page 19) show the screen of these menu items, respectively.

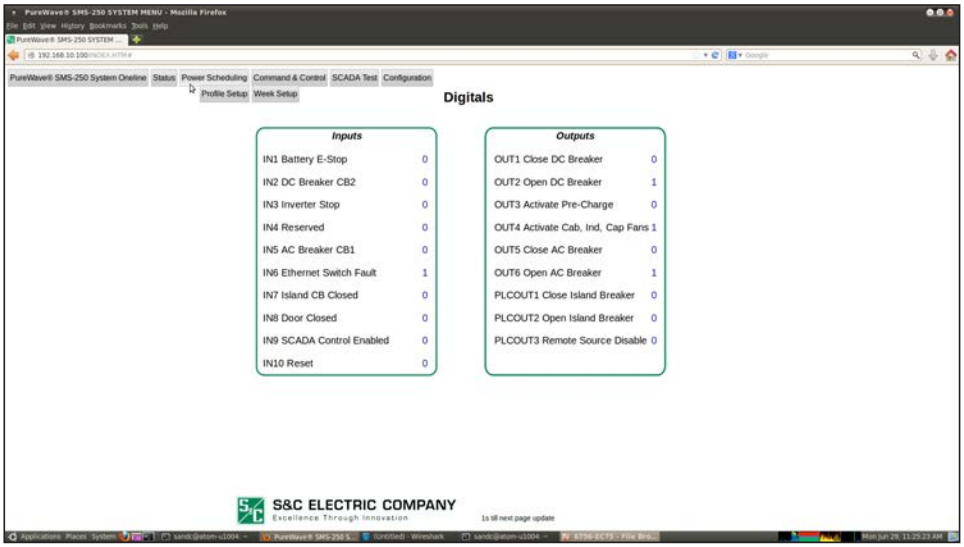


Figure 22. The *Power Scheduling* drop-down menu.

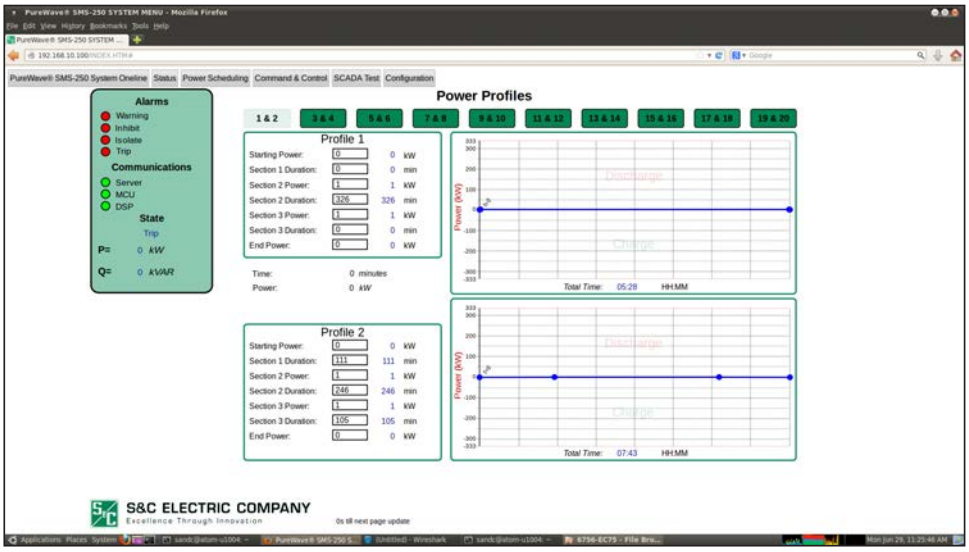


Figure 23. The Profile Setup window.

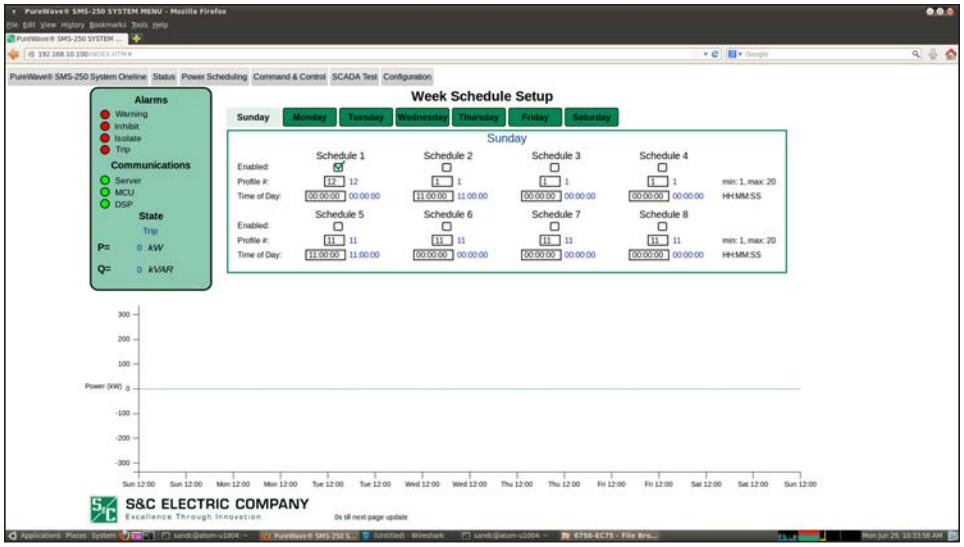


Figure 24. The Week Schedule Setup window.

Command and Control

The Command and Control tab enables the user to command real or reactive power to the load. It also allows the user to choose different modes of operation, such as peak shaving, renewable smoothing, schedule follow, or islanding. See Figure 25.

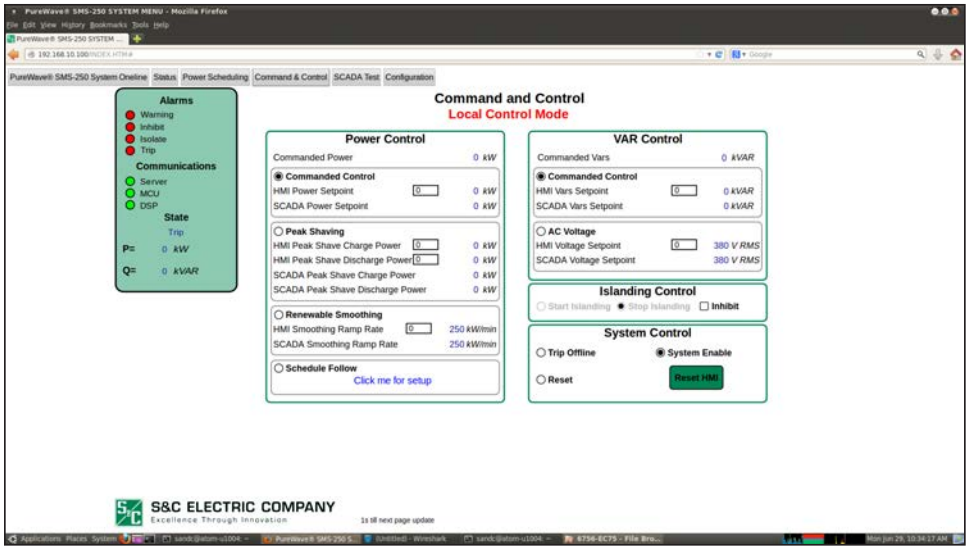


Figure 25. The Command and Control window.

SCADA Test

The SCADA Test tab enables the user to change SCADA inputs and outputs (analog and digital) for a desired time to verify that the SCADA system is functioning properly. As seen on Figure 26, the user can place the mouse over the SCADA Test tab to display the SCADA test drop-down menu items, *AI* (Analog Inputs), *AO* (Analog Outputs), *DI* (Digital Inputs), and *DO* (Digital Outputs). Figures 27, and 28, 29 (on page 21), and 30 (on page 22) show the respective screens of these menu items.

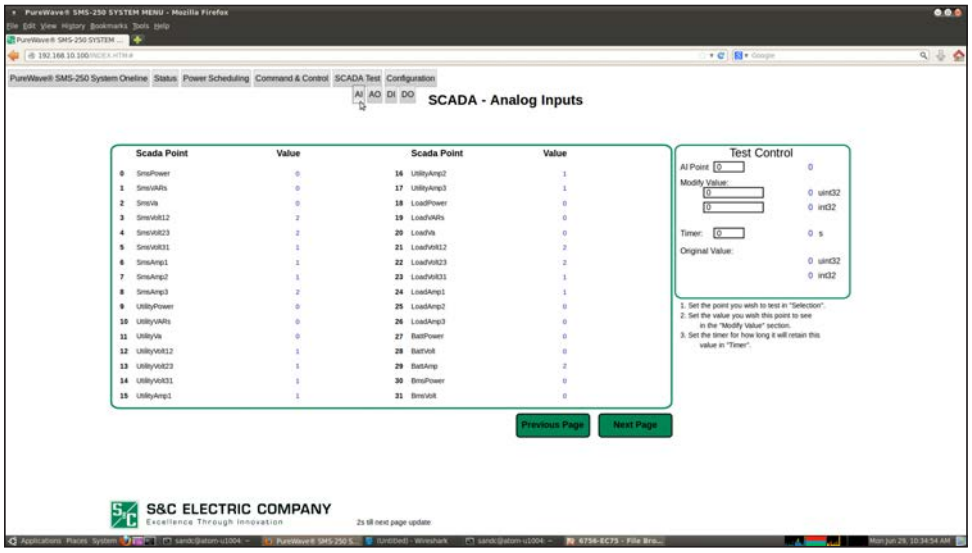


Figure 26. The *SCADA TEST* drop-down menu.

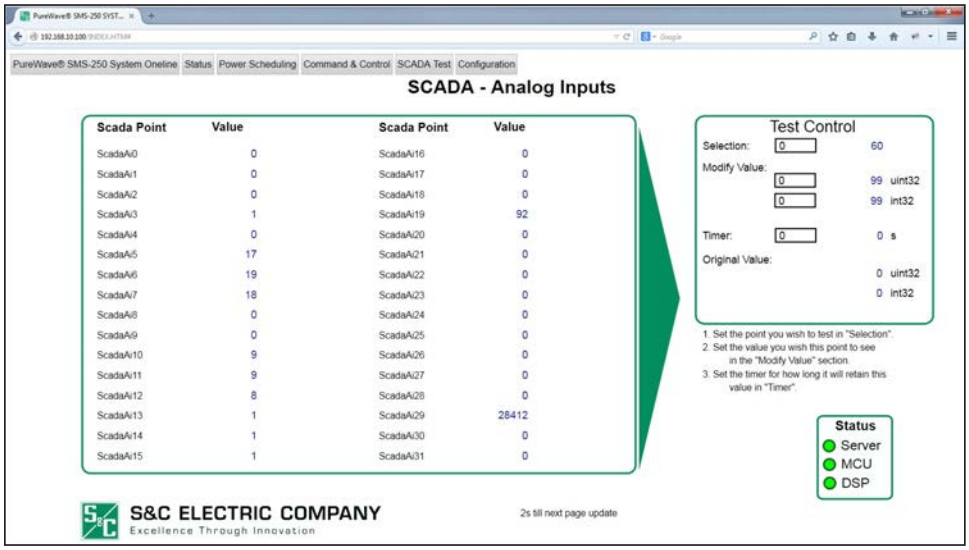


Figure 27. The Analog Inputs window.

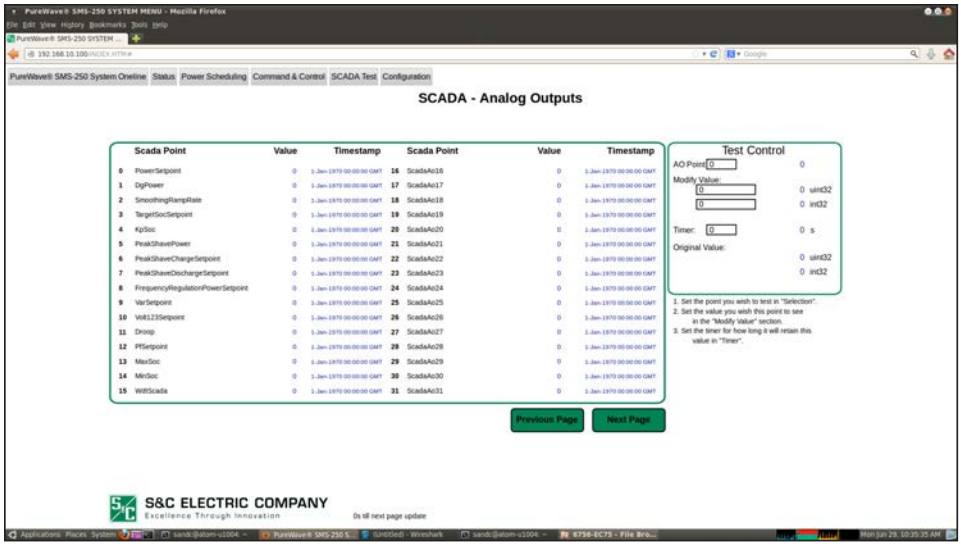


Figure 28. The Analog Outputs window.

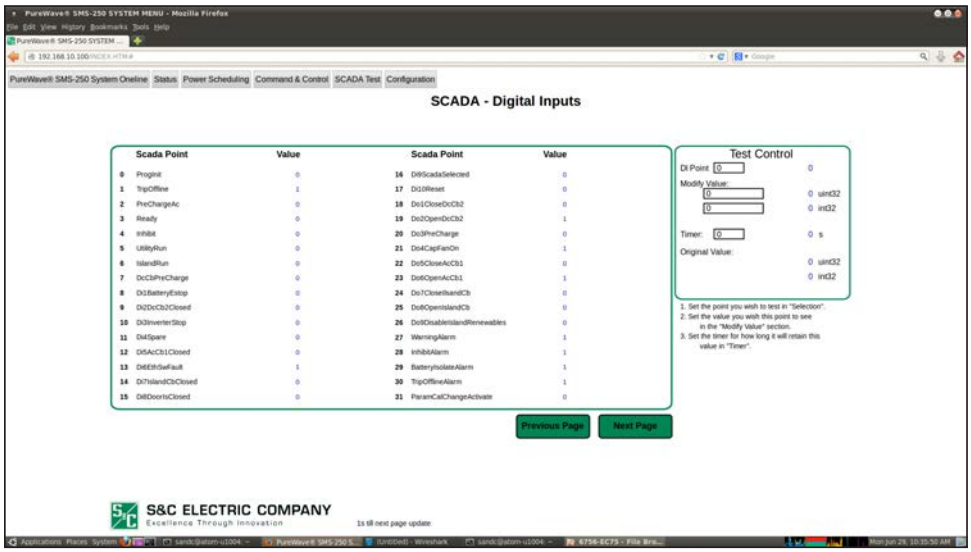


Figure 29. The Digital Inputs window.

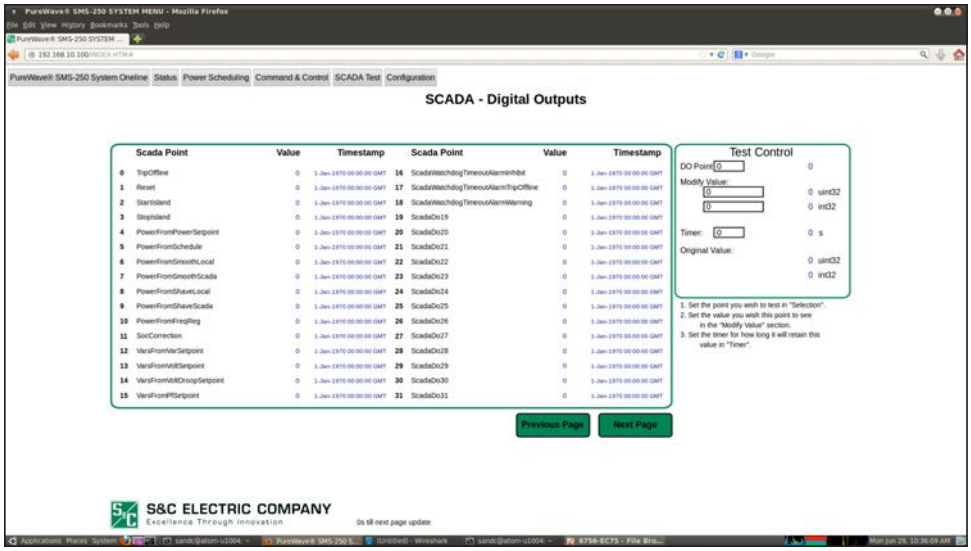


Figure 30. The Digital Outputs widow.

Configuration

The Configuration tab enables the user to change communications and field settings. As seen in Figure 31, the user can place the mouse over the Configuration tab to display the configuration *Field Parameters* and *Communication* drop-down menu items. Figures 32 and 33 (on page 23) show the screen of these menu items, respectively. Placing the mouse over each parameter in these figures reveal a tool-tip pop-up window that describes what the parameter means.

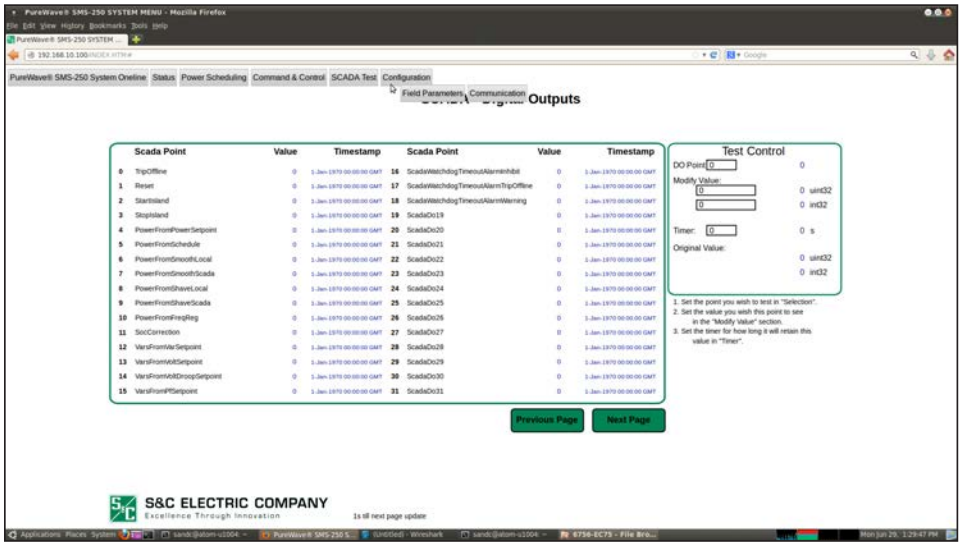


Figure 31. The *Configuration* drop-down menu.

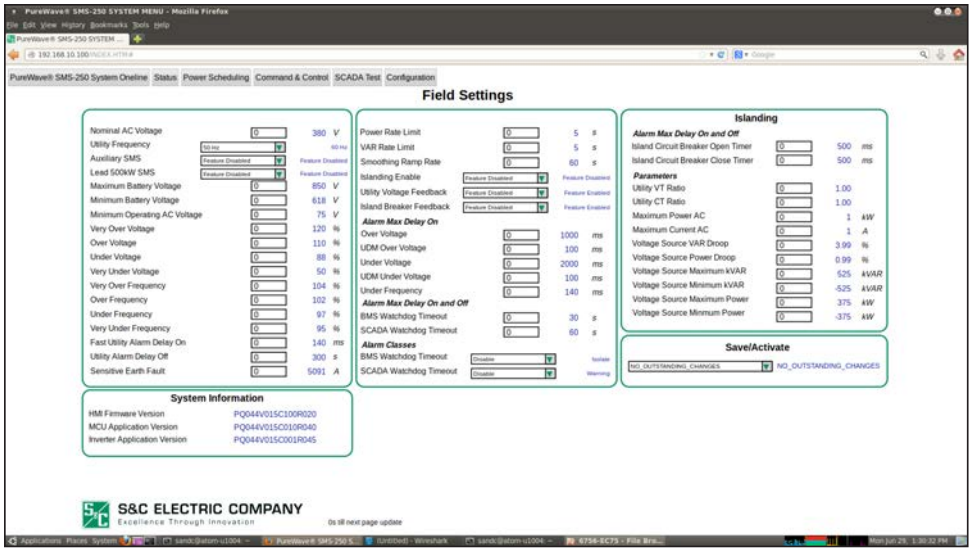


Figure 32. The Field Settings window.

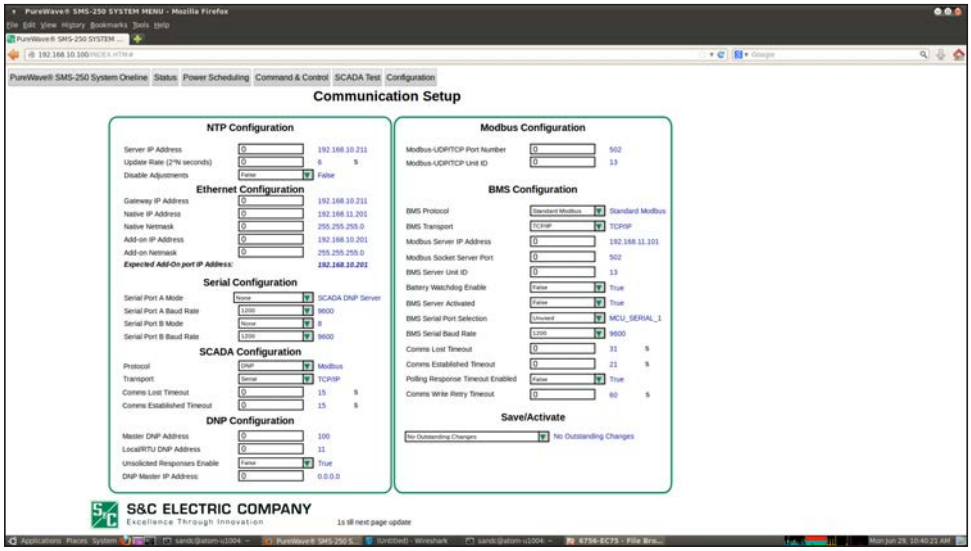


Figure 33. The Communication Setup window.

System Design

The PureWave SMS-250 is a storage-management system that can be connected to 380 Vac directly (or to 400, 415, or 480 Vac using an auto transformer), 50/60 Hz three-phase utility feeder.

The storage-management system consists of a 263-kW/263-kVA PCS housed in a weatherproof enclosure suitable for outdoor or indoor mounting on a concrete or equivalent pad applied with a user-furnished 618- to 850-Vdc, lithium-ion battery pack.

The PCS can use a modular design capable of parallel operation to achieve a rating of up to 526 kW/526 kVA.

System Operation

The PCS converts ac power to dc power to charge the energy storage system (batteries). The PureWave SMS-250 system is capable of performing several customizable functions through a SCADA interface or the Human Machine Interface (HMI) computer. Discharging of the battery into the electrical system is controlled by the power mode selected. Table 1 describes the modes of system operation.

Table 1. Modes of Operation for the PureWave SMS-250 System

Modes	Description
Commanded Control	Enables the user to command real or reactive power to the load
Frequency Regulation	Regulates frequency to close to the nominal frequency value to avoid potential load equipment malfunctioning
Islanding	Fully supports the load using battery power when the utility source is not available
Peak Shaving	Enables the system to absorb real power during off-peak times and to supply real power during peak demand times
Power Scheduling	Dispatches power at a given time for a certain duration on any day of the week
Renewable Smoothing	Limits the rate of change in power from the renewable source by charging/discharging the battery
Voltage Regulation	Mitigates voltage fluctuations by generating leading/lagging reactive power (vars)

States

Listed in Table 2 are the five operating states of the PureWave SMS-250 system. Depending on the alarm condition, the system can be in any of these states. The LCD inside the unit door and in Human Machine Interface (HMI) computer can both inform the user of the system's current state. Table 2 describes each state.

Table 2. Operating States of the PureWave SMS-250 System

States	Description
Ready	The inverter is ready to run. The ac circuit breaker is closed. If the battery is available, the dc circuit breaker is also closed. The IGBTs are not switching.
Utility Connected Run	The inverter is running. The ac circuit breaker is closed. If the battery is available, the dc circuit breaker is also closed. For var output, the ac circuit breaker is only required to be closed. For real power output, the ac and dc circuit breakers are required to be closed.
Island Run	The utility feeder source is not available and the inverter is running, powering the local load. The ac and the dc circuit breakers are closed.
Inhibit	A problem with the inverter is inhibiting the proper operation of the PCS. The inverter will not operate until the alarm is cleared. The ac and dc circuit breakers are closed.
Trip Offline	An alarm is active that requires the ac and dc circuit breakers to be open. The inverter will not operate until the alarm is cleared.

Resets

Alarm conditions can be cleared in any of three ways. Table 3 describes the three resets available for the PureWave SMS-250 system: Auto, Manual, and Self.

Table 3. Reset Types for the PureWave SMS-250 System

Resets	Description
Auto	This type of reset is automatically performed until a predetermined reset count has been reached.
Manual	This type of reset will require a person to use the HMI or a SCADA connection, or to push the RESET button on the user interface of the PCS, to reset the system.
Self	This type of reset will automatically clear an alarm when it is no longer active.

Alarm Types

The alarms of the PureWave SMS-250 system are categorized into five alarm types: **Information Status**, **Warning**, **Inhibit**, **Battery Isolate**, and **Trip Offline**. Table 4 describes each alarm type.

Table 4. Alarm Types for the PureWave SMS-250 System

Alarm Type	Description
Information Status	Indicates the status of the PureWave SMS-250 system and will not affect the proper operation of the system
Warning	Indicates a problem that may need attention but will not affect the proper operation of the system (The system will continue to operate.)
Inhibit	Indicates a problem that needs attention and will affect the proper operation of the system (The inverter will stop operating and the ac and dc circuit breakers will remain closed.)
Battery Isolate	Indicates a problem that needs attention and will affect the proper operation of the system (The dc circuit breaker will open, and the ac circuit breaker will remain closed. This will cause the inverter to lose the ability to produce/consume real power, but reactive-power operation will remain unaffected,)
Trip Offline	Indicates a problem that needs attention and will affect the proper operation of the system (The system will not operate and the ac and dc circuit breakers will open.)

Basic Operation

The following describes how the user can operate the PureWave SMS-250 system using HMI (**SCADA Disable**) and SCADA (**SCADA Enable**) modes. Toggle the SMS CONTROL switch on the user interface to select the desired mode.

To Trip the PureWave SMS-250 System Offline

To stop the storage-management system, the user can push the INVERTER STOP button located on the user interface. The **Trip Offline** state can also be activated as follows:

- HMI: On the PCS user interface, toggle the SMS CONTROL switch to the **SCADA DISABLE** setting. Then, on the *Command-Control* HMI screen, under the *System Control* menu, click on the **Trip Offline** radio button for the PureWave SMS-250 to go to the **Trip Offline** state.
- SCADA: The user can select the DNP Point 0 (Trip Offline) to pulse on a request for the PureWave SMS-250 to go to the **Trip Offline** state.

Starting the PureWave SMS-250 System

To start the storage management system, if the INVERTER STOP button on the user interface was pressed, the button will need to be twisted and released to its not-pressed position for the system to go to the **Ready** state (barring any other **Trip Offline** or **Inhibit** alarms). If the INVERTER STOP button was not pressed, then either of the following actions can be taken:

- HMI: On the PCS user interface, make sure the SMS CONTROL switch is in the **SCADA DISABLE** postion. Then, on the *Command-Control* HMI screen under the *System Control* menu click on the **Online** radio button for the system to go to the **Ready** state.
- SCADA: If the SCADA **Trip Offline c**ommand is set, the user can clear the bit at DNP Point 0 (Trip Offline) to latch off the **Trip Offline** request for the PureWave SMS-250 system to go to the **Ready** state.

Resetting the PureWave SMS-250 System

To manually reset the storage-management system, the user can press the RESET button on the user interface. In addition, either of the following can be administered to reset the PureWave SMS-250 system:

- HMI: On the PCS user interface, toggle the SMS CONTROL switch to the **SCADA DISABLE** setting. Then, on the *Command-Control* HMI screen under the *System Control* menu, click on the **Reset** radio button for the PureWave SMS-250 system to reset.
- SCADA: The user can select the DNP Point 1 (Reset) to pulse on a request for the PureWave SMS-250 system to reset.

Ready ➔ Utility Connected Run

- HMI: On the user interface, toggle the SMS CONTROL switch to the **SCADA DISABLE setting**. On the *Command-Control* HMI screen, choose the desired control mode and enter the power or vars value. This allows the PureWave SMS-250 system to go to the **Utility Connected Run** state.
- SCADA: Select the desired power or vars control mode and pulse on its DNP Point for the PureWave SMS-250 system to go the **Utility Connected Run** state.

Island Run Modes

The **Island Run** mode can be configured in three ways: automatic islanding, utility-commanded islanding with closed transition return, and utility-commanded islanding with open transition return. In addition, the **Island Run** mode can be tested through the HMI or SCADA as described further below.

NOTICE

To run the **Island** mode, the islanding panel must be installed.

Automatic Islanding: In this mode, the PureWave SMS-250 system will command the island circuit breaker open by closing the island circuit breaker open contact when it sees a Utility Disturbance Monitor (UDM) overvoltage or a UDM undervoltage event, or an overfrequency or underfrequency event for the time specified on the *Configuration—Field Parameters* HMI screen. When the island circuit breaker feedback voltage (24 V) goes away, indicating the island circuit breaker is open, the PureWave SMS-250 will run in the island mode providing power to the islanded load. When the utility power returns and is at a normal voltage and frequency for 300 seconds (configurable on the *Configuration—Field Parameters* HMI screen), the PureWave SMS-250 system will synchronize with the utility and command the island circuit breaker closed. When the island circuit breaker feedback voltage (24 V) returns, indicating that the island circuit breaker is closed, the PureWave SMS-250 system will stop islanding.

NOTICE

The PureWave SMS-250 system open contact must be wired to open the island circuit breaker.

The PureWave SMS-250 system close contact must be wired to close the island circuit breaker.

Islanding circuit breaker feedback must be configured so that, when the island circuit breaker is closed, there is voltage (24 Vdc), and when it is open, the voltage (24 Vdc) is removed.

For this mode, the user must use the *Configuration—Field Parameters* HMI screen and configure the following:

Islanding Enable—Feature Enabled

Utility Voltage Feedback—Feature Enabled

Island Breaker Feedback—Feature Enabled

Utility Commanded Islanding with Closed Transition Return: In this mode, the utility has control of the opening and closing of the island circuit breaker. When an island is detected, the utility commands the island circuit breaker open. When the PureWave SMS-250 sees a UDM overvoltage or a UDM undervoltage, or an overfrequency or underfrequency, and the island circuit breaker feedback voltage (24 V) is removed, the PureWave SMS-250 will move to the **Island** mode. After the utility returns and is at a normal voltage and frequency for 300 seconds (configurable on the *Configuration—Field Parameters* HMI screen), the PureWave SMS-250 system will synchronize with the utility. When synchronized, the PureWave SMS-250 system will turn on the **Synchronized to Utility** alarm and set the SCADA status point. When the utility sees that the ac voltage is good and the PureWave SMS-250 system is synchronized, it can close the island circuit breaker. When the island circuit breaker feedback voltage (24 V) returns, indicating that the island circuit breaker is closed, the PureWave SMS-250 system will stop islanding.

NOTICE

Islanding Breaker Feedback must be configured so there is voltage (24 Vdc when the island circuit breaker is closed and the voltage (24 Vdc) is removed when it is open.

For this mode, the user must use the *Configuration—Field Parameters* HMI screen and configure the following:

Islanding Enable—Feature Enabled

Utility Voltage Feedback—Feature Enabled

Island Breaker Feedback—Feature Enable

Utility Commanded Islanding with Open Transition Return: In this mode, the utility has control of the opening and closing of the island circuit breaker. When an island is detected, the utility commands the island circuit breaker open. When the PureWave SMS-250 system sees a UDM overvoltage or a UDM undervoltage, or an overfrequency or underfrequency, and the Start Island SCADA control point is set, the PureWave SMS-250 system will move to the **Island** mode. When the utility voltage and frequency return to normal, the utility issues the Stop Island SCADA control point. When the SCADA status point for the **Island Run** state is clear, the utility can command the island circuit breaker closed.

For this mode, the user must use the *Configuration—Field Parameters* HMI screen and configure the following:

Islanding Enable—Feature Enabled

Utility Voltage Feedback—Feature Enabled

Island Breaker Feedback—Feature Enable

Island Run Test Modes

The following modes can be used to test the automatic islanding capability of the PureWave SMS-250 without the disturbance:

HMI Commanded Islanding: In this mode, the PureWave SMS-250 is in local mode and will receive a Start Island command. When the island circuit breaker feedback voltage (24 V) goes away, indicating that the island circuit breaker is open, the PureWave SMS-250 system will run in the **Island** mode providing power to the islanded load. When the **Stop Island** command is received and the utility is providing power at a normal voltage and frequency, the PureWave SMS-250 system will synchronize to the utility and command the island circuit breaker closed. When the island circuit breaker feedback voltage (24 V) returns, indicating that the island circuit breaker is closed, the PureWave SMS-250 system will stop islanding.

NOTICE

The PureWave SMS-250 system open contact must be wired to open the island circuit breaker.

The PureWave SMS-250 system close contact must be wired to close the island circuit breaker.

The **Islanding Breaker Feedback** mode must be configured so there is voltage (24 Vdc) when the island circuit breaker is closed and the voltage (24 Vdc) is removed when it is open.

For this mode, the user must toggle the SMS CONTROL switch to the **SCADA Disable** setting. The manual controls are radio buttons located on the *Command and Control* HMI screen in the **Island Control** window.

In addition, the user must use the *Configuration—Field Parameters* HMI screen and configure the following to command islanding via the HMI:

Islanding Enable—Feature Enabled

Utility Voltage Feedback—Feature Enabled

Island Breaker Feedback—Feature Enable

SCADA Commanded Islanding: In this mode, the PureWave SMS-250 system is in **Remote** mode and will receive a **Start Island** command. When the island circuit breaker feedback voltage (24 V) goes away, indicating that the island circuit breaker is open, the PureWave SMS-250 system will run in the **Island** mode providing power to the islanded load. When the **Stop Island** command is received and the utility is providing power at a normal voltage and frequency, the PureWave SMS-250 system will synchronize to the utility and command the island circuit breaker closed. When the island circuit breaker feedback voltage (24 V) returns, indicating that the island circuit breaker is closed, the PureWave SMS-250 system will stop islanding.

NOTICE

The PureWave SMS-250 system open contact must be wired to open the island circuit breaker.

The PureWave SMS-250 system close contact must be wired to close the island circuit breaker.

Islanding Breaker Feedback must be configured so there is voltage (24 Vdc) when the island circuit breaker is closed the voltage (24 Vdc) is removed when it is open.

For this mode, the user must toggle the SMS CONTROL switch to the **SCADA Enable** setting. Then, the user can select DNP Point 2 (StartIsland) to pulse on a request for the PureWave SMS-250 system to go to the **Island Run** state.

Utility Connected Run ➔ Ready

- HMI: On the PCS user interface, toggle the SMS CONTROL switch to the **SCADA DISABLE** setting. Then, on the *Command-Control* HMI screen, change the values of the control mode so that there are no power or vars required. This allows the PureWave SMS-250 system to go to the **Ready** state.
- SCADA: Change the values of the control mode so that there are no power or vars required so the PureWave SMS-250 system can go to the **Ready** state.

Island Run ➔ Ready (for Island Run Test Modes)

The PureWave SMS-250 system automatically moves to the **Ready** state when the utility source has been restored. However, the storage-management system can also be manually commanded to the **Ready** state as follows:

- HMI: On the PCS user interface, toggle the SMS CONTROL switch to the **SCADA DISABLE** setting. Then, on the *Command-Control* HMI screen under the *Islanding Control* menu, click on the **Stop Island** radio button for the PureWave SMS-250 system to go to the **Ready** state.
- SCADA: The user can select the DNP Point 3 (StopIsland) to pulse on a request for the PureWave SMS-250 system to go to the **Ready** state.

Alarm List and Troubleshooting Tips

The PureWave SMS-250 system contains an extensive self-diagnosis system. If any abnormal condition occurs, the system will activate an alarm. Following is a list of alarms categorized by alarm type in order of: **Information Status**, **Warning**, **Inhibit**, **Battery Isolate**, and **Trip Offline**.

NOTICE

The alarms in the following tables are listed according to alarm type at the time of shipment. Alarms may be reconfigured during operation and should be documented accordingly.

The troubleshooting tips listed in the following tables 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.

Information Status Alarms

These notifications provide the status of the PureWave SMS-250 system and will not affect the proper operation of the system. See Table 5 for the listed information statuses.

Table 5. PureWave SMS-250 Information Status Alarms

Alarm	Description	Reset Type
Ac Breaker Closed	Indicates the ac circuit breaker is closed and has been closed for 300 ms. ***Troubleshooting Tip: No action is required.***	SELF
Auto Reset Command	Indicates an auto reset has been activated ***Troubleshooting Tip: No action is required.***	SELF
Auxiliary SMS-250	Indicates the PureWave SMS-250 system is taking commands from a lead PCS ***Troubleshooting Tip: No action is required.***	SELF
Battery at Open Circuit Voltage	Indicates the battery is at open circuit voltage to avoid charging or discharging the battery (This is used when the inverter is running vars and the power is held at zero.) ***Troubleshooting Tip: No action is required.***	SELF
Compact Flash Problem	Indicates there is a problem with the compact flash card used to store snapshots ***Troubleshooting Tip: Replace the Compact Flash card. If the problem still persists, contact S&C Electric Company.***	SELF
Dc Breaker Closed	Indicates the dc circuit breaker is closed and has been closed for 300 ms ***Troubleshooting Tip: No action is required.***	SELF
Dc Pre-charge Voltage High	Indicates the dc pre-charge voltage is above what is expected, causing problems with charging the dc link ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
Dc Pre-charge Voltage Low	Indicates the dc pre-charge voltage is below what is expected, causing problems with charging the dc link ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
Ethernet Power	Indicates the PureWave SMS-250 system is following a power setpoint from an Ethernet command ***Troubleshooting Tip: No action is required.***	SELF
Ethernet Switch Problem	Indicates the Ethernet switch is reporting a problem ***Troubleshooting Tip: Check all blue Ethernet cables to make sure they are connected.***	SELF
Ethernet VARs	Indicates the PureWave SMS-250 system is following a var command from the Ethernet connection to the lead unit or a master control ***Troubleshooting Tip: No action is required.***	SELF
KVA Limit Is Limiting Vars	Indicates the PureWave SMS-250 system is not outputting the commanded amount of vars due to the real power flow occurring at the same time ***Troubleshooting Tip: To generate the full reactive power expected, reduce the real power command.***	SELF

TABLE CONTINUED ►

Table 5. PureWave SMS-250 Information Status Alarms—continued

Alarm	Description	Reset Type
Load Over Current	Indicates the PureWave SMS-250 system cannot provide enough current to island and support the load ***Troubleshooting Tip: No action is required.***	SELF
Load Over Power	Indicates the PureWave SMS-250 system cannot provide enough power to island and support the load ***Troubleshooting Tip: No action is required.***	SELF
Load Control Selected	Indicates he control of the PureWave SMS-250 system is being done locally ***Troubleshooting Tip: No action is required.***	SELF
Local Peak Shave	Indicates the PureWave SMS-250 system is peak shaving from a local command ***Troubleshooting Tip: No action is required.***	SELF
Local Power	Indicates the PureWave SMS-250 system is following a command from the HMI ***Troubleshooting Tip: No action is required.***	SELF
Local Smoothing	Indicates the PureWave SMS-250 system is smoothing from a local command ***Troubleshooting Tip: No action is required.***	SELF
Local Vars	Indicates the PureWave SMS-250 system is following a var command from the local control ***Troubleshooting Tip: No action is required.***	SELF
Power Factor Control	Indicates the PureWave SMS-250 system is maintaining a power factor ***Troubleshooting Tip: No action is required.***	SELF
Reset Command	Indicates a reset has been sent ***Troubleshooting Tip: No action is required.***	SELF
SCADA Control Selected	Indicates the control of the PureWave SMS-250 system is done using SCADA ***Troubleshooting Tip: No action is required.***	SELF
SCADA Peak Shave	Indicates the PureWave SMS-250 system is peak shaving from a SCADA command ***Troubleshooting Tip: No action is required.***	SELF
SCADA Power	Indicates the PureWave SMS-250 system is following a power setpoint from SCADA ***Troubleshooting Tip: No action is required.***	SELF
SCADA Smoothing	Indicates the PureWave SMS-250 system is smoothing from a SCADA command ***Troubleshooting Tip: No action is required.***	SELF
SCADA Vars	Indicates the PureWave SMS-250 system is following a var command from the SCADA control ***Troubleshooting Tip: No action is required.***	SELF
Scheduled Power	Indicates the PureWave SMS-250 system is running a power schedule profile ***Troubleshooting Tip: No action is required.***	SELF

TABLE CONTINUED ►

Table 5. PureWave SMS-250 Information Status Alarms—continued

Alarm	Description	Reset Type
SOC Correction Active	Indicates the PureWave SMS-250 system is conducting SOC correction ***Troubleshooting Tip: No action is required.***	SELF
Synchronized to Utility	Indicates the PureWave SMS-250 system is synchronized to the utility side of the island circuit breaker ***Troubleshooting Tip: No action is required.***	SELF
UDM Over Voltage	Indicates the RMS line-to-line voltage of any of the three phases at the inverter ac connection is above the over voltage threshold ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To make the system less sensitive, time delay on can be added or the voltage can be increased.***	SELF
UDM Under Voltage	Indicates the RMS line-to-line voltage of any of the three phases at the inverter ac connection is under the under voltage threshold ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To make the system less sensitive, time delay on can be added or the voltage can be reduced.***	SELF
Utility Good Volt and Freq	Indicates the utility voltage and frequency are good ***Troubleshooting Tip: No action is required.***	SELF
VAC Constant Voltage	Indicates the PureWave SMS-250 system is following a constant voltage command ***Troubleshooting Tip: No action is required.***	SELF
VAC Droop Control	Indicates the PureWave SMS-250 system is following a voltage droop curve ***Troubleshooting Tip: No action is required.***	SELF

Warning Alarms

These alarms indicate a problem that may need attention but will not affect the proper operation of the system. The system will continue to operate when a **Warning** condition is being displayed. See Table 6 for the listed **Warning** alarms.

Table 6. PureWave SMS-250 Warning Alarms

Alarm	Description	Reset Type
Battery Under Voltage	Indicates the battery voltage is below the minimum voltage defined for the battery ***Troubleshooting Tip: Ensure the battery is connected to the PCS by closing the circuit breaker in the battery container.***	SELF
BMS Req SOC Recalc By Charge	Indicates the battery is requesting to charge so it can recalculate its state of charge ***Troubleshooting Tip: Command a charge so the battery can reach the top of charge.***	SELF
BMS Req SOC Recalc By Discharge	Indicates the battery is requesting to discharge so it can recalculate its state of charge ***Troubleshooting Tip: Command a discharge so the battery can reach the bottom of charge.***	SELF

TABLE CONTINUED ►

Table 6. PureWave SMS-250 Warning Alarms—continued

Alarm	Description	Reset Type
Cabinet or Inductor Over Temperature	Indicates the cabinet or inductor temperature is too high ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	SELF
Cabinet or Inductor Thermistor Open or Cold	Indicates the cabinet or inductor thermistor is open or cold (It is considered open or cold if the temperature is under -13°F (-25°C).) ***Troubleshooting Tip: If the ambient air is cold, this can be a normal condition. If the ambient air is not cold, contact S&C Electric Company.***	SELF
Cabinet or Inductor Thermistor Shorted	Indicates the cabinet or inductor thermistor shorted, resulting in a measured high temperature ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
Check Island Feedback Fuses	Indicates that, with the island circuit breaker indicating it's closed, the ac input voltage and island input voltages are different ***Troubleshooting Tip: Look at the data to see if the low voltage is on the island or the PureWave SMS-250 side. If it is on the island side, one at a time, check the island feedback fuses in the PCS enclosure. If the fuses are all good, check any fuses that are located between the island feedback source and the PureWave SMS-250 system. If the low voltage is on the PureWave SMS-250 side, the conductivity of the island circuit breaker could be the problem. If this is the case, contact S&C Electric Company.***	SELF
Current Limit Snapshot	Indicates a phase has gone to the current limit ***Troubleshooting Tip: This alarm should clear after 10 seconds. If it does not, one of the current limit alarms is probably on or going on and off. Look at the individual alarms to try and find the phase that is keeping this alarm on.***	SELF
Dc Ground Fault	Indicates the dc voltage is not centered around ground ***Troubleshooting Tip: Examine the battery to see if there is an obvious ground fault in the battery system. Check the wiring between the battery and the PCS. Contact S&C Electric Company.***	SELF
Dc Link Pre-charge Slow	Indicates the expected voltage cannot be reached during charging ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF

TABLE CONTINUED ►

Table 6. PureWave SMS-250 Warning Alarms—continued

Alarm	Description	Reset Type
Execution Time Long Warning	Indicates the software is running a loop that takes longer than the standard 208µs ***Troubleshooting Tip: Reset the alarm and contact S&C Electric Company.***	SELF
IGBT 1 Current Limit	Indicates IGBT 1 is working at its limit ***Troubleshooting Tip: Replace current sensor power supply or contact S&C Electric Company.***	SELF
IGBT 1 Over Temperature Warning	Indicates IGBT 1 is too hot (This alarm is used to notify the user while still continuing operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	SELF
IGBT 1 Thermistor Open or Cold	Indicates the IGBT 1 thermistor temperature is under -13°F (-25°C).) ***Troubleshooting Tip: If the ambient air is very cold, this alarm can be a normal condition. If the inverter is running, the IGBTs are fine, but if this alarm occurs with an over current alarm, contact S&C Electric Company.***	SELF
IGBT 1 Thermistor Shorted	Indicates the IGBT 1 thermistor is shorted, resulting in very high temperature readings ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
IGBT 2 Current Limit	Indicates IGBT 2 is working at its limit ***Troubleshooting Tip: Replace current sensor power supply or contact S&C Electric Company.***	SELF
IGBT 2 Over Temperature Warning	Indicates IGBT 2 is too hot (This alarm is used to notify the user while still continuing operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	SELF
IGBT 2 Thermistor Open or Cold	Indicates the IGBT 2 thermistor temperature is under -13°F (-25°C).) ***Troubleshooting Tip: If the ambient air is very cold, this alarm can be a normal condition. If the inverter is running, the IGBTs are fine, but if this alarm occurs with an over current alarm, contact S&C Electric Company.***	SELF
IGBT 2 Thermistor Shorted	Indicates the IGBT 2 thermistor is shorted, resulting in very high temperature readings ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
IGBT 3 Current Limit	Indicates IGBT 3 is working at its limit ***Troubleshooting Tip: Replace current sensor power supply or contact S&C Electric Company.***	SELF

TABLE CONTINUED ►

Table 6. PureWave SMS-250 Warning Alarms—continued

Alarm	Description	Reset Type
IGBT 3 Over Temperature Warning	Indicates IGBT 3 is too hot (This alarm is used to notify the user while still continuing operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	SELF
IGBT 3 Thermistor Open or Cold	Indicates the IGBT 3 thermistor temperature is under -13°F (-25°C).) ***Troubleshooting Tip: If the ambient air is very cold, this alarm can be a normal condition. If the inverter is running, the IGBTs are fine, but if this alarm occurs with an over current alarm, contact S&C Electric Company.***	SELF
IGBT 3 Thermistor Shorted	Indicates the IGBT 3 thermistor is shorted, resulting in very high temperature readings ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
PS1 24VDC Under Voltage	Indicates the power supply feeding off the dc bus is not working ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
PS2 24VDC Under Voltage	Indicates the power supply feeding off the utility is not working ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
SMS-250 Comm Loss	Indicates a lead PCS is not communicating with an auxiliary PCS, or an auxiliary PCS is not communicating with a lead PCS or master control ***Troubleshooting Tip: Check the Ethernet cable on both ends. If needed, replace the cable. Cables between two PCS units are crossover Ethernet cables. Cables between a master control and a PCS unit are normal Ethernet cables.***	SELF

Inhibit Alarms

These alarms indicate a problem that needs attention and will affect the proper operation of the system. The inverter will stop operating when an **Inhibit** condition is being displayed. The ac and dc circuit breakers will remain closed. See Table 7 for the listed **Inhibit** alarms.

Table 7. PureWave SMS-250 Inhibit Alarms

Alarm	Description	Reset Type
Any App Brd Pwr Supply UV	Indicates any of the application board's power supplies that are derived from the 24-V incoming power are below the required value ***Troubleshooting Tip: Contact S&C Electric Company.***	AUTO
BMS Watchdog Timeout	Indicates that the communication link with the BMS is not good (The inverter will cease charging/discharging the battery.) ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
Check Dc and Ac Feedback Fuses	Indicates that, with the dc circuit breaker indicating it's closed, the dc battery and dc link voltages are different (Or it indicates that with the ac circuit breaker indicating it's closed, the utility and inverter voltages are different.) ***Troubleshooting Tip: Look at the data to see if the difference is on the ac or dc side. If it is on the dc side, one at a time, check the dc feedback fuses. If the fuses are all good, then the conductivity of the dc circuit breaker (CB1) could be the problem. If this is the case, contact S&C Electric Company.***	SELF
Dc Link Over Voltage	Indicates the battery voltage is higher than the maximum allowed battery voltage, which can damage the battery ***Troubleshooting Tip: If the auto reset has locked out, reset the alarm.***	AUTO
Dc Link Under Voltage	Indicates the dc link is at less than 90% of the line-to-line peak voltage, which causes major current distortion ***Troubleshooting Tip: If the auto reset has locked out, reset the alarm.***	AUTO
Downstream Fault Detected	Indicates there is a fault downstream of the current sensing on the utility side of the island circuit breaker ***Troubleshooting Tip: If the alarm is continuously active, the PureWave SMS-250 is seeing currents over 2PU (800 A for a single PureWave SMS-250). If this is not expected, contact S&C Electric Company.***	SELF
Gate Drive 1 Under Voltage	Indicates the power supply voltage on gate drive 1 is low, which can result in high power loss ***Troubleshooting Tip: Reset the alarm.***	AUTO
Gate Drive 2 Under Voltage	Indicates the power supply voltage on gate drive 2 is low, which can result in high power loss ***Troubleshooting Tip: Reset the alarm.***	AUTO
Gate Drive 3 Under Voltage	Indicates the power supply voltage on gate drive 3 is low, which can result in high power loss ***Troubleshooting Tip: Reset the alarm.***	AUTO

TABLE CONTINUED ►

Table 7. PureWave SMS-250 Inhibit Alarms—continued

Alarm	Description	Reset Type
IGBT 1 Over Temperature	Indicates IGBT 1 is too hot (This alarm stops inverter operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	AUTO
IGBT 2 Over Temperature	Indicates IGBT 2 is too hot (This alarm stops inverter operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	AUTO
IGBT 3 Over Temperature	Indicates IGBT 3 is too hot (This alarm stops inverter operation.) ***Troubleshooting Tip: Check the vents at the back of the PCS enclosure to ensure there are no air restrictions.***	AUTO
Lost Synchronize	Indicates the inverter is not in sync with the utility ***Troubleshooting Tip: If the utility voltage, frequency, and phase rotation are good, contact S&C Electric Company for support. 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.***	SELF
Over Frequency	Indicates the frequency at the inverter ac connection is above the overfrequency threshold ***Troubleshooting Tip: The inverter will respond based on the Over Frequency settings. To change the sensitivity, time delay on or the frequency threshold can be changed.***	SELF
Over Voltage	Indicates the line-to-line voltage at any of the three phases at the inverter ac connection is above the overvoltage threshold ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To change the sensitivity, time delay on or the voltage threshold can be changed.***	SELF
Parameter Cal Change Activate	Indicates a parameter has changed ***Troubleshooting Tip: No troubleshooting action is required.***	SELF
PS3 LEM Power Supply Under Voltage	Indicates the power supply supporting the current sensors are under voltage, resulting in possible malfunctioning of controls ***Troubleshooting Tip: The auto reset lockout can be reset. If the problem persists, contact S&C Electric Company.***	AUTO
SCADA Watchdog Timeout	Indicates the PureWave SMS-250 system has lost communication with SCADA and, therefore, has stopped operation to avoid undesirable operation ***Troubleshooting Tip: Contact a trained technician to troubleshoot the communication problem.***	SELF
Sensitive Earth Fault	Indicates the PureWave SMS-250 system three phase current does not sum to zero. ***Troubleshooting Tip: The alarm can be reset to bring the inverter back to an operating mode. If the fault continues to occur, the ground fault must be discovered and eliminated.***	MANUAL

TABLE CONTINUED ►

Table 7. PureWave SMS-250 Inhibit Alarms—continued

Alarm	Description	Reset Type
Time Current Curve Overload	Indicates the current is too high for too long, risking damage to the IGBTs ***Troubleshooting Tip: Reduce island load.***	MANUAL
Under Frequency	Indicates the line frequency at the ac connection is below the Underfrequency threshold ***Troubleshooting Tip: The inverter will respond based on the under frequency settings. To change the sensitivity, time delay on or the frequency threshold can be changed.***	SELF
Under Voltage	Indicates the RMS line-to-line voltage of any of the three phases at the inverter ac connection is below the Undervoltage threshold (This alarm is used to prevent unintentional islanding.) ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To change the sensitivity, time delay on or the voltage threshold can be changed.***	SELF
Very Over Frequency	Indicates the line frequency at the inverter ac connection is above the Very Overfrequency threshold ***Troubleshooting Tip: The inverter will respond based on the Very Overfrequency settings. To change the sensitivity, time delay on or the frequency threshold can be changed.***	SELF
Very Over Voltage	Indicates the line-to-line voltage at any of the three phases at the inverter ac connection is above the Very Overvoltage threshold. ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To change the sensitivity, time delay on or the voltage threshold can be changed.***	SELF
Very Under Frequency	Indicates the line frequency at the inverter ac connection is under the Very Underfrequency threshold ***Troubleshooting Tip: The inverter will respond based on the Very Underfrequency settings. To change the sensitivity, time delay on or the frequency threshold can be changed.***	SELF
Very Under Voltage	Indicates the line-to-line voltage at any of the three phases at the inverter ac connection is under the Very Undervoltage threshold ***Troubleshooting Tip: The inverter will respond based on the voltage settings. To change the sensitivity, time delay on or the voltage threshold can be changed.***	SELF

Battery Isolate Alarms

These alarms indicate a problem that needs attention and will affect the proper operation of the system. The system will operate on a limited basis when a **Battery isolate** condition is being displayed. The dc circuit breaker will open. See Table 8 for the listed **Battery Isolate** alarms.

Table 8. PureWave SMS-250 Battery Isolate Alarms

Alarm	Description	Reset Type
Battery Cell Over Temperature	Indicates a battery cell has overheated, and continued operation could be dangerous ***Troubleshooting Tip: The battery cell may cool down over time. If the cell does not cool down and the alarm remains, contact S&C Electric Company.***	SELF
Battery Cell Under Temperature	Indicates a battery cell has cooled down below the operational range, and continued operation could be detrimental to battery health ***Troubleshooting Tip: The battery cell may heat up over time. If the cell does not heat up and the alarm remains, contact S&C Electric Company.***	SELF
Battery Cell Over Voltage	Indicates a battery cell has overcharged and continued operation could be dangerous ***Troubleshooting Tip: The battery cell may equalize its charge over time. If the cell does not equalize and the alarm remains, contact S&C Electric Company.***	SELF
Battery Cell Under Voltage	Indicates a battery cell has discharged beyond normal operating range, and continued operation could be dangerous ***Troubleshooting Tip: The battery cell may equalize its charge over time. If the cell does not equalize and the alarm remains, contact S&C Electric Company.***	SELF
Battery Requests Shutdown	Indicates the battery is requesting to shut down ***Troubleshooting Tip: Contact S&C Electric Company.***	SELF
Battery String Over Current	Indicates the battery string has had too much current flow ***Troubleshooting Tip: Opening the dc circuit breaker should stop the flow of current.***	SELF
Internal Battery Communications Failure	Indicates the battery is having issues communicating internally ***Troubleshooting Tip: The battery may correct the communication issue over time. If it does not, contact S&C Electric Company.***	SELF

Trip Offline Alarms

These alarms indicate a problem that needs attention and will affect the proper operation of the system. The system will not operate when a **Trip Offline** condition is being displayed. The ac and dc circuit breakers will also open. See Table 9 for the listed **Trip Offline** alarms.

Table 9. PureWave SMS-250 Trip Offline Alarms

Alarm	Description	Reset Type
Ac Breaker Fail to Close	Indicates the ac circuit breaker is open when it is being commanded closed ***Troubleshooting Tip: Verify that there is not a circuit breaker Over Current alarm. If there is, reset this alarm. Verify that the inverter stop is not active by pulling it out. Check the spring status, if the circuit breaker has a 'Discharge Spring' message, the motor operator is not working. The circuit breaker can still be closed by charging the spring by manually pulling down the charging handle several times. Reset the PureWave SMS-250 and see if the circuit breaker closes.***	MANUAL
Ac Breaker Fail to Open	Indicates the ac circuit breaker is closed when it is being commanded open ***Troubleshooting Tip: If the circuit breaker is closed, press the inverter stop button. This should open the circuit breaker. If this causes the circuit breaker to open, the output block on the inverter controls has been damaged. Replace the output block or the inverter controls.***	MANUAL
Auto Reset Lockout	Indicates the maximum number of resets have been made to clear the alarm ***Troubleshooting Tip: The user can issue a reset to clear this alarm. The system should then be watched to determine whether the original alarm comes back. If it does, troubleshoot the alarm that is causing this alarm, not this alarm.***	MANUAL
BMS Requested Trip Offline	Indicates the BMS has opened a breaker to stop the inverter from charging or discharging the battery ***Troubleshooting Tip: Check F8. This is used to protect the 24 Vdc used to power the external dry contact. If F8 is OK, refer to the battery manufacturer's manual to troubleshoot the alarm.***	SELF
Current Sensor or Ground Fault	Indicates the sum of the three phase currents is not zero, resulting in possible malfunctioning controls ***Troubleshooting Tip: Contact S&C Electric Company.***	MANUAL
Dc Breaker Fail to Close	Indicates the dc circuit breaker is open when it is being commanded closed ***Troubleshooting Tip: Verify that there is not a circuit breaker over current alarm. If there is, reset this alarm. Verify that the inverter stop is not active by pulling it out. Check the spring status, if the circuit breaker has a 'Discharge Spring' message, the motor operator is not working. The breaker can still be closed by charging the spring by manually pulling down the charging handle several times. Reset the PureWave SMS-250 and determine whether the circuit breaker closes.***	MANUAL
Dc Link Shorted	Indicates the dc link voltage is increasing very slowly with possible overheating to dc link pre-charge resistors ***Troubleshooting Tip: This may be caused by the pre-charge key switch in the OFF position. If so turn the pre-charge key switch ON. If the key switch is on and this alarm is active, contact S&C Electric Company.***	MANUAL

TABLE CONTINUED ►

Table 9. PureWave SMS-250 Trip Offline Alarms—continued

Alarm	Description	Reset Type
Execution Frame Overrun	Indicates the software has a second loop that is executed during the first loop, which can result in unexpected current ***Troubleshooting Tip: Reset the alarm and contact S&C Electric Company.***	MANUAL
IGBT 1 Over Current	Indicates the IGBT 1 current went beyond 880 A ***Troubleshooting Tip: It is possible that a utility transient caused the alarm. Check the broken thermistor alarms for all phases. If they are clear, the system can be reset. If the broken thermistor alarms are present, do not reset the alarm. Contact S&C Electric Company.***	MANUAL
IGBT 2 Over Current	Indicates the IGBT 2 current went beyond 880 A ***Troubleshooting Tip: It is possible that a utility transient caused the alarm. Check the broken thermistor alarms for all phases. If they are clear, the system can be reset. If the broken thermistor alarms are present, do not reset the alarm. Contact S&C Electric Company.***	MANUAL
IGBT 3 Over Current	Indicates the IGBT 3 current went beyond 880 A ***Troubleshooting Tip: It is possible that a utility transient caused the alarm. Check the broken thermistor alarms for all phases. If they are clear, the system can be reset. If the broken thermistor alarms are present, do not reset the alarm. Contact S&C Electric Company.***	MANUAL
Inverter Stop	Indicates the inverter has stopped operating (The battery and utility are disconnected.) ***Troubleshooting Tip: Twist the inverter stop button clockwise to clear this alarm.***	SELF
Parameter Cal Nv Error	Indicates the main processor found corrupt data where the parameter and calibration values are stored ***Troubleshooting Tip: Power cycle the PureWave SMS-250. If the alarm still remains, contact S&C Electric Company.***	MANUAL
Reverse Phase Rotation	Indicates the inverter is connected to a utility that is rotating L1-L3-L2 instead of L1-L2-L3, with the voltage rising zero crossing occurring on L1, then L2, and finally L3, as expected ***Troubleshooting Tip: If this alarm is on and stays on, the phase rotation should be corrected by swapping the utility connection wires on L2 and L3.***	SELF
SCADA or HMI Trip Offline	Indicates SCADA or the HMI commanded a trip offline to take the PureWave SMS-250 system offline ***Troubleshooting Tip: SCADA must send a 0 to the SCADA trip offline bit register or the local HMI must send a 0 to the HMI trip offline bit register to clear this alarm.***	MANUAL

NOTICE

The PureWave SMS-250 system is capable of servicing the distributed power generation needs of its users when operated within its design limitations and specifications. Nonproprietary operation specifications for the PureWave SMS-250 system beyond those identified in this instruction sheet may be obtained from S&C Electric Company.

Table 10. System Specifications

Description	Value or Range
Real/Reactive Power	263 kW/263 kVA
Secondary Voltage	380 Vac directly 400, 415, or 480 Vac using an auto transformer
Frequency	50 or 60 Hz
Dimensions (single enclosure)	36 W × 36 L × 80 H inches (915 × 915 × 2032 mm)
Weight	2,000 lbs (907.2 kg)

Table 11. Environmental Specifications

Description	Value or Range
Ambient Operating Temperature	-40°F to 104°F (-40°C to 40°C) without de-rating
Storage Ambient Temperature	-49°F to 140°F (-45°C to 60°C)
Humidity	0% to 100% condensing
Altitude	Sea level to 1,000 meters without de-rating
Seismic	Uniform Building Code Zone 4
Audible Noise	< 55 dBA at 3 meters when inverter is not running; < 65 dBA at 3 meters when inverter is running

Annual Inspections

After the PureWave SMS-250 system is commissioned and the unit is online, inspection and maintenance should be scheduled for the PCS on an annual basis to ensure the proper operation of the system. Schedules for maintenance should be reviewed by the customer based upon the given site conditions and, if required, the frequency of the recommended maintenance should increase to ensure the reliability of their PureWave SMS-250 system.

Maintenance Checklist

The following checklist provides the PureWave SMS-250 PCS inspection activities that are to be performed on an annual basis. The amount of dust and dirt accumulated in the units varies from site to site. Therefore, the customer should review schedules for maintenance based on the given site conditions and, if required, the frequency of the recommended maintenance may increase to ensure the reliability of the PureWave SMS-250.

S&C Electric Company has extended service agreements and spare parts kits available for the PCS. Please contact S&C Electric Company – Global Support Monitoring Center at (888) 762-1100.

Annual Maintenance Checklist

The PCS requires a minimal amount of maintenance to help ensure high system reliability and efficiency. The following checklist can be used as a reference to assist in properly maintaining the unit(s).

⚠ DANGER

Make sure the PCS is de-energized before performing maintenance on the equipment. Taking this necessary step will minimize serious injury or even death. Proper personal protective equipment (PPE) must be used.

Preparation

- ☐ Review the steps in this checklist to prepare the proper tools that will be needed to complete these maintenance tasks.
- ☐ Communicate with S&C Electric Company to identify any additional tasks that are expected to be accomplished during the annual maintenance visit.
- ☐ Coordinate with the site facilitator to obtain keys for the padlocks (if applicable) to unlock the door to the PCS enclosure(s).

Required Tools

- ☐ Shop vacuum
- ☐ Rags or paper towels
- ☐ General purpose cleaner (e.g. Simple Green)
- ☐ New CompactFlash Card for replacement (old card should be returned to S&C Electric Company)
- ☐ Ratchet wrench
- ☐ 11-mm socket
- ☐ 15-mm socket
- ☐ .5-M (20-inch) socket wrench extension
- ☐ 13-mm socket
- ☐ 7-mm socket
- ☐ 5.5-mm socket
- ☐ 3/8-inch socket
- ☐ Slot driver
- ☐ #1 Phillips
- ☐ #2 Phillips
- ☐ 3-mm hex wrench
- ☐ 8-mm hex wrench
- ☐ White lithium grease (door grease)

Arrival

☐ Discuss maintenance plan with site facilitator (if applicable).

☐ Record the following information:

Site Name: _____

Serial Number: _____

Control Mode (SCADA - Enabled or Disabled): _____

Current System State (from LCD): _____

Safety Checks

⚠ DANGER

Use lockout-tagout procedures before working on the PCS. Conduct the following checks to avoid damaging the equipment, personal injury, or even death.

☐ Open the PCS enclosure door and press the INVERTER STOP button located on the user interface panel.

☐ Verify the ac circuit breaker CB1 is open.

☐ Verify the dc circuit breaker CB2 is open.

☐ Use a meter with insulated leads that will not short to the dead front for the following steps:

- Verify there is line-to-line ac voltage from the bottom of F4 (ac fuse) to the bottom of F5 (ac fuse).
- Verify there is line-to-line ac voltage from the bottom of F5 to the bottom of F6 (ac fuse).
- Verify there is line-to-line ac voltage from the bottom of F6 to the bottom of F4.
- Verify there is dc voltage from the bottom of F1 (dc fuse) to the bottom of F2 (dc fuse).

☐ Disconnect the ac power that supplies the PureWave SMS-250 system.

☐ Lock open the ac power that supplies the PureWave SMS-250 system.

☐ Tag open the ac power that supplies the PureWave SMS-250 system.

☐ Disconnect the dc power that supplies the PureWave SMS-250 system.

☐ Lock open the dc power that supplies the PureWave SMS-250 system.

☐ Tag open the dc power that supplies the PureWave SMS-250 system.

☐ Verification

- Verify there is no ac voltage from the door bond to the bottom of F1.
- Verify there is no dc voltage from the door bond to the bottom of F1.
- Verify there is no ac voltage from the door bond to the bottom of F2.
- Verify there is no dc voltage from the door bond to the bottom of F2.
- Verify there is no ac voltage from the door bond to the bottom of F4.
- Verify there is no dc voltage from the door bond to the bottom of F4.
- Verify there is no ac voltage from the door bond to the bottom of F5.
- Verify there is no dc voltage from the door bond to the bottom of F5.
- Verify there is no ac voltage from the door bond to the bottom of F6.
- Verify there is no dc voltage from the door bond to the bottom of F6.
- Verify there is no ac voltage from the bottom of F1 to the bottom of F2.
- Verify there is no dc voltage from the bottom of F1 to the bottom of F2.
- Verify there is no ac voltage from the bottom of F4 to the bottom of F5.
- Verify there is no dc voltage from the bottom of F4 to the bottom of F5.
- Verify there is no ac voltage from the bottom of F5 to the bottom of F6.
- Verify there is no dc voltage from the bottom of F5 to the bottom of F6.
- Verify there is no ac voltage from the bottom of F6 to the bottom of F4.
- Verify there is no dc voltage from the bottom of F6 to the bottom of F4.

⚠ DANGER

Wait at least 5 minutes after disconnecting power before continuing work. The dc capacitor bus will go from its maximum voltage to a safe voltage in this timeframe. Waiting this amount of time will prevent equipment damage, personal injury, or even death.

⚠ CAUTION

To inspect the internal components of the PCS enclosure, the dead-front access panels require careful removal to prevent injury or equipment damage.

☐ Remove the three dead-front access panels from inside the PCS enclosure using a #2 Phillips driver for the screws at the top of each panel and a 13-mm socket wrench. See Figure 34.

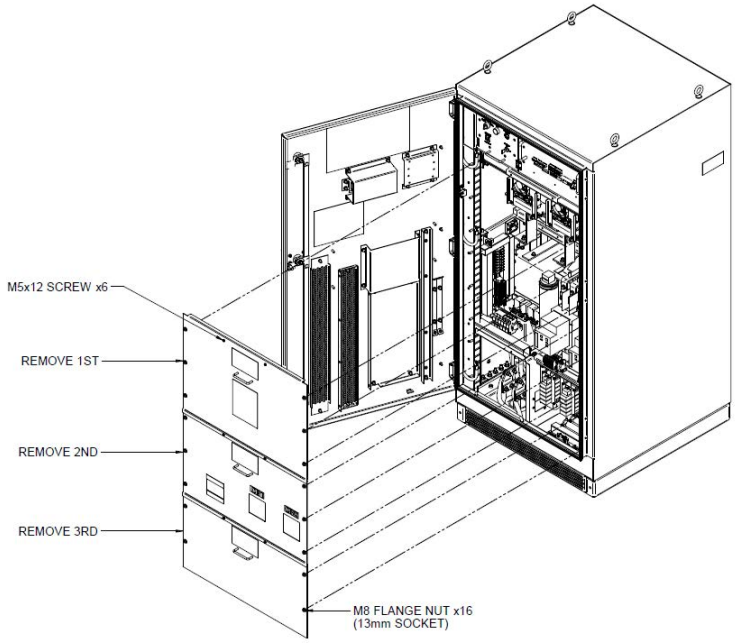


Figure 34. Dead-front access panel removal.

Maintenance Inspection

Enclosure

☐ Check painted surfaces for signs of deterioration or rust.

- Rust found? YES or NO (circle one)
- If yes, clean the rust and paint. Use S&C touch-up paint part number ***9999-080*** (ANSI 70 gray) for the PCS.
- If rust was found, but not cleaned and painted,
  Why? _____

☐ Check gaskets and seals around the door and the PCS enclosure opening.

- Are the gaskets and seals in good condition? YES or NO (circle one)
- If no, replace the gasket. Use S&C part number ***CD-2340.***
- If gasket is not in good condition, but not replaced,
  Why? _____

Internal Components

☐ Inspect door latching mechanisms. Make sure the mechanism operates easily and holds the door closed. Grease if necessary.

☐ Clean all dirty components inside the PCS enclosure using the shop vacuum or a rag. These include:

- ☐ Enclosure interior.
- ☐ Dead-front access panels.
- ☐ Intake and outlet vents at the back of the enclosure.
- ☐ Fine screen at the bottom of enclosure (requires removal of painted steel screen using a 13-mm wrench/socket).

Clean PCS Enclosure Fans

☐ Inductor fan (requires removal of inductor fan cover. See Figure 35.)

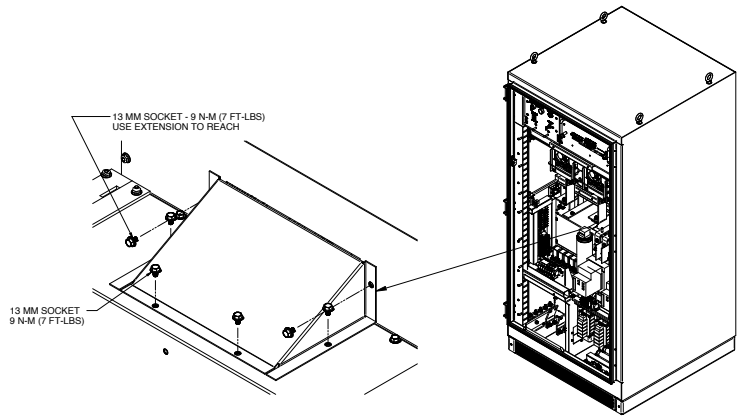


Figure 35. Removal of inductor fan cover.

☐ Three fans on the IGBT poles.

☐ Cabinet fan (located behind the pull-out control assembly at the top of the enclosure).

Fan Functionality Verification

Inductor Fan

☐ Verify the fans spin freely.

☐ Verify there is no bearing noise when the fan is rotating.

☐ Verify there is no rust visible.

IGBT Pole Fan #1

☐ Verify the fans spin freely.

☐ Verify there is no bearing noise when the fan is rotating.

☐ Verify there is no rust visible.

IGBT Pole Fan #2

☐ Verify the fans spin freely.

☐ Verify there is no bearing noise when the fan is rotating.

☐ Verify there is no rust visible.

IGBT Pole Fan #3

☐ Verify the fans spin freely.

☐ Verify there is no bearing noise when the fan is rotating.

☐ Verify there is no rust visible.

Cabinet Fan

☐ Verify the fans spin freely.

☐ Verify there is no bearing noise when the fan is rotating.

☐ Verify there is no rust visible.

NOTICE

If damage, rust, or any other problem is found, replace the fan.

Power electronic assemblies

☐ For IGBT inverter pole assembly servicing, install the service shelf in the PCS as illustrated in Figure 36.

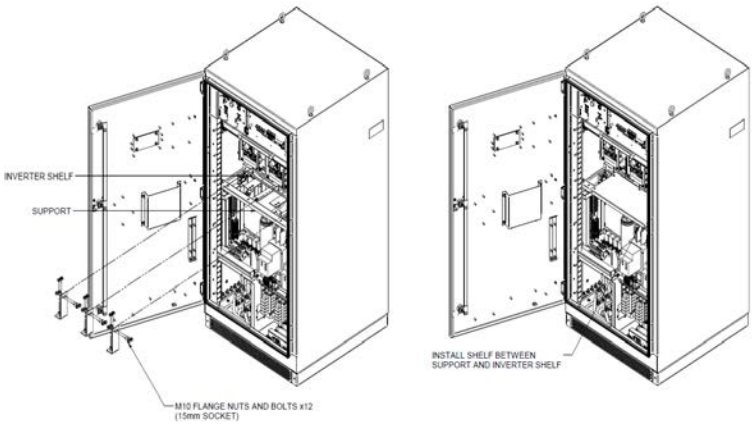


Figure 36. Shelf installation for pole(s) servicing.

☐ Remove the three IGBT inverter assemblies using the procedure located at the top inside of the PCS enclosure door.

For IGBT inverter assembly #1:

☐ Replace any damaged components.

☐ Check for and remove any foreign debris.

☐ Clean the IGBT pole, paying careful attention when cleaning the laminated bus bar.

☐ Check for signs of thermal or electrical stress as well as discolored components.

☐ Check capacitors for any signs of damage.

☐ Clean the large heat sinks.

For IGBT inverter assembly #2:

☐ Replace any damaged components.

☐ Check for and remove any foreign debris.

☐ Clean the IGBT pole, paying careful attention when cleaning the laminated bus bar.

☐ Check for signs of thermal or electrical stress as well as discolored components.

☐ Check capacitors for any signs of damage.

☐ Clean the large heat sinks.

For IGBT inverter assembly #3:

☐ Replace any damaged components.

☐ Check for and remove any foreign debris.

☐ Clean the IGBT pole, paying careful attention when cleaning the laminated bus bar.

☐ Check for signs of thermal or electrical stress as well as discolored components.

☐ Check capacitors for any signs of damage.

☐ Clean the large heat sinks.

☐ Replace the three IGBT assemblies (following the instructions located at the top-inside of the PCS door.

☐ Torque the bus connections and components according to Table 12 on the next page.

Table 12. Torque Requirements

Assembly	Part	Hardware	Tool	Torque [N-M]	Torque [Ft-Lbs]
Inverter Pole	Ground Wire	M6 Hex Nut	11-mm Socket	9.5	7
	Ground Bus	M6 Hex Nut	11-mm Socket	9.5	7
	Shorting Bus	M10 Flange Nut	15-mm Socket	54.2	40
	Typical Bus	M10 Flange Nut/Bolt	15-mm Socket	54.2	40
	Ac Connection	M10 Flange Bolt	15-mm Socket	54.2	40
Typical Bus Connections	N/A	M10 Flange Nut/Bolt	15-mm Socket	54.2	40
Inductor/Cabinet Fans	Terminal Blocks	M4 Terminals	Slot Driver	1.7	1.25
Dc Blowers	Terminal Blocks	M4x12 Screw	3-mm Hex	1.1	0.8
Circuit Breaker Terminal Block	Terminal Blocks	M3 Terminals	Slot Driver	0.5	0.4
Circuit Breaker	Bus Tabs	M10 Bolt	8-mm Hex	27.1	20
EMI Filter Board	Positive Leads	M10 Flange Nut	15-mm Socket	13.6	10
	Ground Studs	M6 Hex Nut	11-mm Socket	9.5	7
Input Box	CT PCB Terminals	10-32 Hex Nut	3/8-inch Socket	3.5	2.6
	Capacitor Terminal Block	Terminal Screws	#2 Phillips	3.9	2.9
	Relay Block Terminals	8-32 Screw	#2 Phillips	2.2	1.6
Islanding Tray	CT Terminal Block	#10-32 Terminals	Slot Driver	2	1.5
	Terminal Blocks	M4 Terminals	Slot Driver	1.7	1.25
	PLC	M3 Mounting	#1 Phillips	1.1	0.8
Resistor Tray	Contactor - Power	M4 Studs	7-mm Socket	1.4	1
	Contactor - Coil	M3 Studs	5.5-mm Socket	0.5	0.4
	Resistor Connections	M5x10 Screw	3-mm Hex	3.9	2.9
Dc Blower Terminal Block	Terminal Blocks	M3 Terminals	Slot Driver	0.5	0.4

☐ Verify that all accessible electrical control connections are tight (using a screwdriver).

Controls

☐ Open the top of the control assembly box and clean the control board with a vacuum, if needed.

☐ Verify there is no unusual particulate or fungal growth. If there is, take pictures and report it to S&C Electric Company for further evaluation.

☐ Close and re-fasten the top of the control assembly box.

☐ Remove the CompactFlash card and replace it with the new one.

Maintenance Completion

☐ Verify any damaged or inoperable components have been repaired or replaced.

☐ Verify all applicable maintenance tasks are complete.

☐ Verify all tools have been removed from the PCS enclosure.

☐ Visually inspect the PureWave SMS-250 to ensure nothing is out of place before re-energization.

☐ Replace and secure the dead-front access panels.

☐ Address and/or report any concerns the site facilitator may have.

Re-energization of the System

☐ Remove your tag from the ac source.

☐ Remove the lock from the ac source.

☐ Remove your tag from the dc source.

☐ Remove the lock from the dc source.

☐ Close the ac source to re-energize the PureWave SMS-250 system.

☐ Verify the fans start and run for 60 seconds.

- Top screen on the back is the cabinet fan.
- Next two screens down are the main IGBT blowers. Verify air flow on all three assemblies.
- The fourth screen down is the inductor fan. Verify that it is working properly.

☐ Close the dc source to supply dc power to the PureWave SMS-250 system.

☐ With the site facilitator's approval, run the PureWave SMS-250 system to verify proper functionality:

- Connect the laptop computer to the Ethernet connection and start the Human Machine Interface (HMI) browser.
- Verify that the browser screens are working.
- Toggle the SMS CONTROL switch on the user interface panel to the **SCADA DISABLE** position.
- Set the HMI power control to the **Commanded Control** setting.
- Set the HMI Power Setpoint to 0.
- Set the HMI VAR Control to the **Commanded Control** setting.
- Set the HMI VARs Setpoint to 0.
- Twist the inverter stop to bring the system to the **Ready** state.
- Command a discharge of 50 kW.
- Verify that the PureWave SMS-250 runs at 50 kW.
- Set the Power Setpoint to 0 to stop the operation.
- Disconnect the laptop computer.

Departure

Place the PureWave SMS-250 system in the desired control mode and state. Record these below:

Control Mode (SCADA - Enabled or Disabled): _____

System State: _____

☐ Close and padlock all access doors.

☐ Send the CompactFlash card to S&C Electric Company for analysis.

Annual Maintenance Performed By: _____

Date: _____