

PureWave® SMS Storage Management System





Operation

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Introduction

Qualified Persons

WARNING

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

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

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

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

Read this Instruction Sheet

Read this instruction sheet thoroughly and carefully before operating and maintaining your RED PureWave SMS Storage Management System. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 through 6. The latest version of this instruction sheet is available online in PDF format at <https://renewableenergyanddrives.com/downloads/>

Retain this Instruction Sheet

This instruction sheet is a permanent part of your PureWave SMS. Instruction sheets from the original battery manufacturer is provided separately as part of the Instruction Manual. Designate a location where you can easily retrieve all information and refer to it.

Proper Application

WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the selected equipment. Contact RED Electric Company if more application information is needed. Failure to do so may result in damage of the equipment.

Warranty

The warranty and/or obligations described in RED'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 the end user's exclusive remedy and a fulfillment of all of the seller's liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to 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 RED PureWave SMS Storage Management System in accordance with RED's applicable instruction sheets, data sheets, and/or data bulletins.

Understanding Safety-Alert Messages

There are several types of safety-alert messages that may appear throughout this instruction sheet and on labels attached to the PureWave SMS container and power conversion system (PCS). Familiarize yourself with these types of messages and the importance of the various signal words, as explained below.

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 or product or property damage 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

DANGER

Read this instruction sheet thoroughly and carefully before operating your RED PureWave SMS. Failure to do so may result in equipment damage, personal injury , or even death.

If you need additional copies of this instruction sheet, contact your nearest RED Sales Office, RED Authorized Distributor, RED Headquarters, or RED Electric.

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

Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your nearest RED Sales Office, RED Authorized Distributor, or RED Headquarters.

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

Location of Safety Labels

NOTICE

For the exact location of safety labels on the equipment, consult the project-specific safety label drawings found in the Instruction Handbook

Front of the PureWave SMS container		Rear of the PureWave SMS container			
Top and bottom of container	Intake hoods	Top and bottom corners of container	Exhaust hoods	Vertical panels	Horizonal panels
A	B	A	C	C	F
					
			D	D	
					
			E		
					

Double-door side of PureWave SMS container	Right side of the PureWave SMS container	Cable-entry boxes (all sides)	Man doors
C	C	C	C
			
G			
			
H			H
			

PCS Enclosure



K	L	M	N	P

Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Number
A	⚠ DANGER	Do not use for lifting...	GP0010-269
B	⚠ WARNING	Airborne particles and load noise hazards...	6703-032
C	⚠ DANGER	High voltage...	6703-047
D	⚠ DANGER	Hazardous arc-flash	6703-035
E	⚠ DANGER	Shock hazard 800 Vdc...	6703-036
F	⚠ DANGER	Hazardous voltage...	6703-031
G	⚠ DANGER	Door must be closed...	PE-70343-1
H	⚠ DANGER	No unauthorized persons...	6703-048
K	⚠ DANGER	Arc flash and shock hazard...	6703-030
L	⚠ WARNING	Moving parts can crush and cut...	6703-033
M	⚠ WARNING	Hazardous voltage – This unit is to be serviced...	6703-052
N	⚠ DANGER	Arc flash and shock hazard (horizontal label)...	6703-076
P	⚠ WARNING	Pressurized Plenum – Do not open door...	PE-70383-3

⚠ DANGER



The power conversion system and battery system operate at high ac and dc voltages. High voltage dc is present even without utility power connected. Hazardous voltages should also be expected in all interconnecting components and lines. 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 power conversion system (PCS) must be restricted only to qualified persons. See "Qualified Persons" on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules. If doors to the electrical controllers or panels on the system enclosure must be opened, refer to the instruction sheet for procedures for guarding against electric shock. Lockout and tagout procedures should be developed and implemented (in accordance with 29 CFR 1910.147).
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment such as rubber gloves, rubber mats, hard hats, safety glasses, and arc flash-rated clothing in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **OPERATING MECHANISM AND BASE.** The power conversion system contains fast-moving parts that can severely injure fingers. Do not remove or disassemble operating mechanisms or breakers, or remove access panels on the power conversion system, unless RED directs you to do otherwise.
6. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. To maintain safety, the user should use padlocks on each power conversion system door. The door and the use of the padlock provide protection against inadvertent contact with high-voltage circuits.
7. **GROUNDING.**
 - The power conversion system base must be connected to a suitable earth ground or to a suitable building ground for testing, both before energizing the unit and at all times when energized.
 - The ground wire(s) must be bonded to the system neutral, if present. If the system neutral is not present, proper precautions must be taken to ensure the local earth ground, or building ground, cannot be severed or removed.
8. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
9. **INSULATED HAND TOOLS.**
 - Insulated hand tools are required when working on or around any energized equipment. Use only properly rated tools for the energy present.
 - Tool inventories should be kept to ensure all tools that enter the system enclosure are removed before energizing the system.
10. **EMERGENCY PROCEDURES AND EQUIPMENT.**
 - The owner should develop policies and procedures for handling emergency situations.
 - It is the responsibility of the owner to develop site-specific emergency action plans for response to such situations.

Controls and Indicators

The PureWave SMS is a fast-response power controller that converts ac power to dc to charge the energy storage system (batteries). It also controls the discharge of the battery into the electrical system. This permits a wide variety of applications to be powered by stored energy during times when primary power from the utility is not available.

The PCS and the batteries are connected in parallel to the distribution feeder system. The unit is connected to the utility distribution system through a three-phase transformer. It can be controlled so the batteries charge during off-peak times and supply real power during peak demand times. This would offset excess power demands by controlling the power flow between the batteries and the utility distribution system. The system can also provide leading or lagging vars, if needed, to make the energy from the batteries immediately available.

Entering the Container

DANGER

Do not enter the container unless trained, certified, and authorized to do so by RED Electric Company. Potentially lethal voltages are present inside the power conversion system enclosure. High-voltage dc is present even without the utility power connected.

The power conversion system enclosure is meant to provide access for field troubleshooting purposes only when the unit is properly grounded. Never, under any circumstances, open the power conversion system enclosure doors while it is online or has not been fully discharged and grounded. Doing so may result in serious personal injury or death.

Inside the typical container are two rooms: the inverter room and the control room. See Figure 1. The inverter room contains the PCS enclosure, and the control room contains the master control rack. The control room can be used to monitor the PureWave SMS.

Inside the inverter room is the PCS enclosure. See Figure 2.

The PCS enclosure consists of the following:

- An ac section
- Inverter bays (left and right side)
- Dc bays (left and right side)

Ac section—This section contains the ac circuit breaker(s), ac filter capacitors, and the connections for the utility (ac) interconnection to the PureWave SMS. A fan is also located at the top of this bay for cooling.

Inverter bays—The inverter bay contains the three-phase dc-ac inverter, the dc-dc converter (chopper), and the ac filter inductor to transform the battery voltage into a three-phase ac power source. A blower is located at the top of the inverter bay to keep the bay from overheating. Variable frequency drives (located next to the blower) are used to control blower speed.

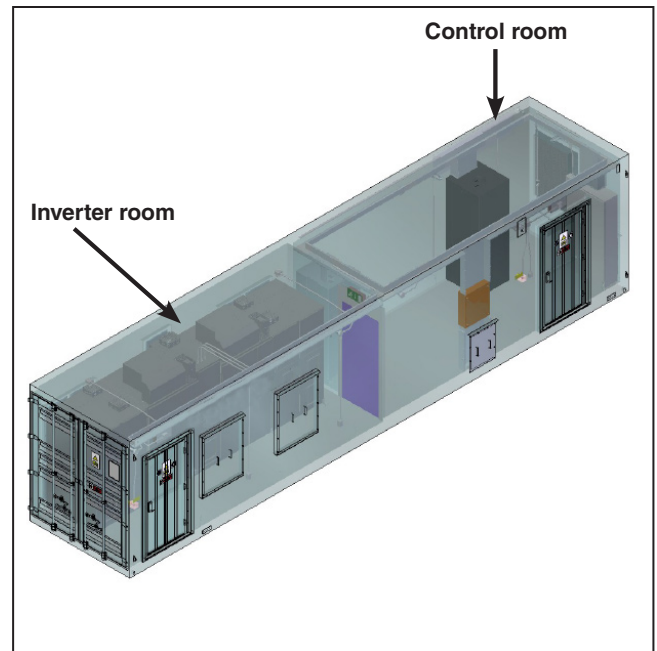


Figure 1. Typical configuration of a container consisting of the inverter and control rooms

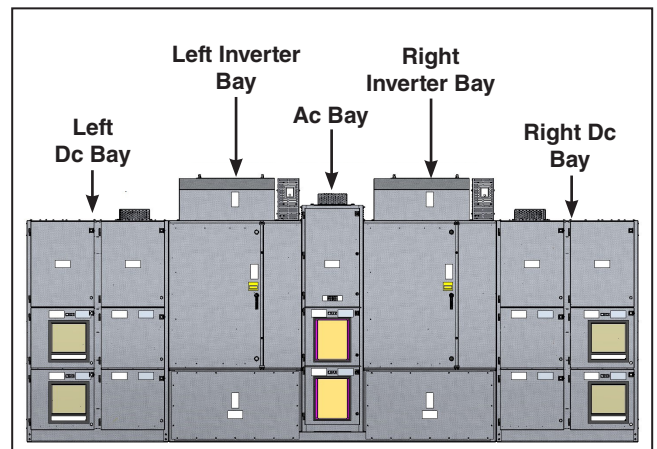


Figure 2. Typical 2-MW/2-MVA PCS enclosure.

Dc bays—A dc bay contains two dc circuit breakers and the dc interface control panel. The two dc circuit breakers are used to connect the batteries to the PureWave SMS. The dc interface control panel is used to control the ac circuit breaker, the dc circuit breakers, the inverter, and the chopper. Included with these controls are all of the power supplies and interface circuit boards necessary to properly control the system. Fans are located at the top of each dc bay for cooling. See Figure 3.

Master control rack—Located inside the control room, the master control rack is a stand-alone rack, separate from the PCS enclosure. It contains the HMI, master control, and the associated circuitry needed to support proper control operation of the PureWave SMS. See Figure 4.

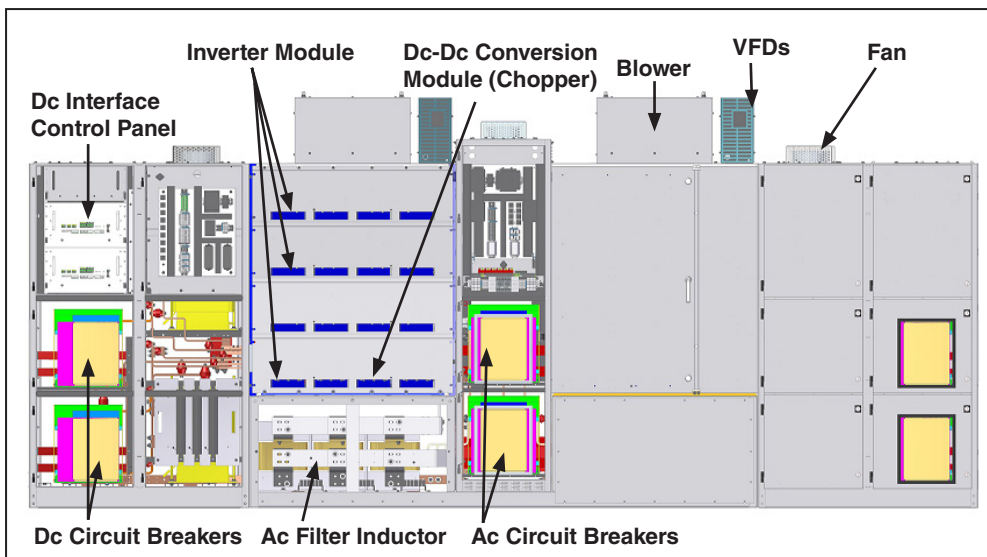


Figure 3. Location of key components within the bays.



Figure 4. Master control rack.

Typical Operating Controls and Indicators

The PureWave SMS can be controlled through the control panel on the master control rack. Figure 5 shows the control panel in the master control rack that contains the manual switches for the control.

Disabled/Not Disabled—The key interlock allows the user to disable the system by turning the key to the **Disabled** position and removing the key. The key can be placed back in and turned to the **Not Disabled** position as a first step to resume desired system operation. When in a **Not Disabled** status, the key cannot be removed.

Local/Remote—This switch allows the user to switch control from SCADA to the Human Machine Interface (HMI) and vice versa.

Inhibited/Not Inhibited—The switch allows the user to stop the system without opening or closing the circuit breakers. This can be done by turning the switch to the **Inhibited** position.



Figure 5. Control panel on the master control rack.

Manual Reset—This pushbutton enables the user to administer a manual reset.

A few operating controls are on the ac and dc circuit breakers located on 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 breaker LCDs but also on the HMI.

Inverter Stop

The user can stop the PureWave SMS from running for servicing or emergency purposes by pressing the INVERTER STOP button. An Inverter Stop button is typically found by each container man door. See Figure 6.

Human Machine Interface

Located on the master control rack, the HMI is an industrial personal computer with a Linux operating system. It is used to control and monitor the PureWave SMS. See Figure 7.

The HMI platform and software is accessible locally and through a network access to allow a remote user to operate the computer.

The HMI computer is powered by the PCS and is activated from power-saving mode when the mouse is moved or when a key on the keyboard is pressed. The HMI computer will then prompt the user to enter a password.

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. Usernames and passwords are required for the different levels. Passwords will expire after 180 days and will need to be changed. Contact the system administrator if there are any issues with HMI accessibility. Remote connectivity to the HMI can only be done with electronic certificates.

Usernames and passwords are not allowed for remote connectivity.

Once the HMI computer is online, the HMI program will automatically start up. The user can then navigate the program to monitor and analyze the system.

NOTICE

For more information about monitoring the PureWave SMS through the HMI, use the Help feature within the HMI program.

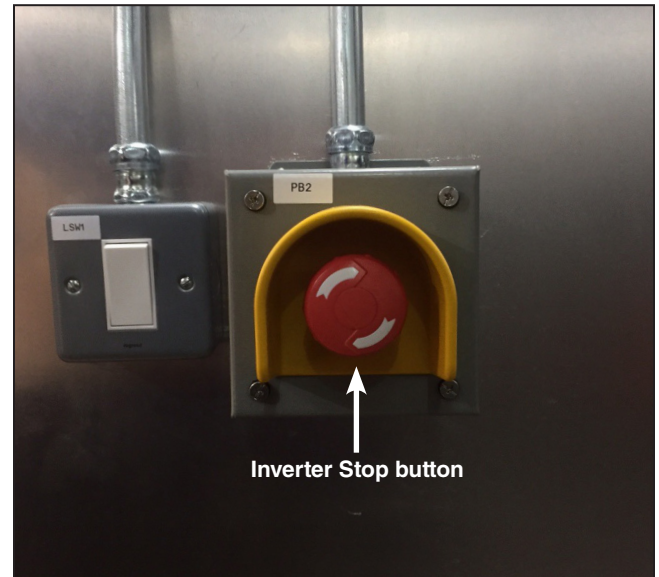


Figure 6. Inverter Stop button.

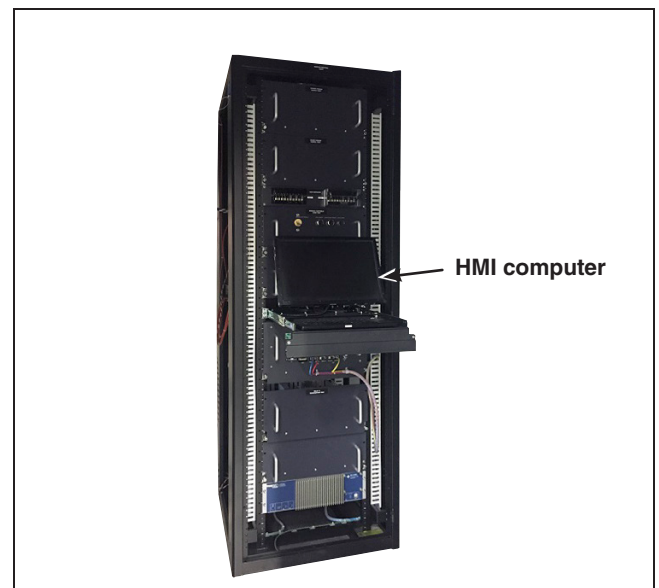


Figure 7. HMI computer deployed in the master control rack.

System Modes

The PureWave SMS is capable of performing several customizable functions through a SCADA interface or the HMI computer. Discharging the battery into the electrical system is controlled by the power mode selected. The modes of system operation are shown in Table 1.

Table 1. Modes of Operation for the System

Modes	Description
Islanding	The system will automatically re-energize the load(s), controlling the voltage magnitude and frequency while supplying the power and vars the load requires in the event of a utility disturbance.
Direct Power Control	The system will charge or discharge real power on command.
Frequency Regulation	The system will charge or discharge power based on a frequency calculation done external to the PureWave SMS.
Power Smoothing	The system will charge or discharge power based on power fluctuations from the utility, creating a smooth or rate-limited total power.
Power Scheduling	The system will charge or discharge power at a given time for a certain duration on any day of the week.
Peak Shaving	The system will charge real power during off-peak times and discharge real power during peak demand times.
Vac Regulation using Vars	The system will regulate the ac voltage by discharging reactive power.
Direct Var Control	The system will charge or discharge reactive power on command.

States

Depending on the alarm condition encountered, the PureWave SMS can be in any of eight states. The user interface shall inform the user of the system's current state. Table 2 lists the states and descriptions for each.

Table 2. System States

State	Description
Program Reset	After the system is powered on, the hardware and software are initialized. If the configuration data is good, the system will move from this state to the Inhibit state.
Inhibit	This state is active when an alarm indicates a problem needs attention and will affect the proper operation of the system. The system will stop operating when Inhibit is displayed on the user interface. Once the problem clears, the system will return to normal operation.
Trip Offline	This state is active when a severe problem needs attention and will affect the proper operation of the system. The system will stop operating when a Trip Offline state is displayed on the user interface. The ac and dc circuit breakers will open, and the inverter and chopper will be off.
Ready	The PureWave SMS is ready to protect the load in the event of a disturbance.
Voltage Source (VS) Run	During this state, the chopper and inverter run at the requested ac voltage, supplying power as required by the connected load.
Current Source (CS) Run	During this state, the chopper and inverter run at the requested operation mode, producing ac power and/or vars.
Open Input Switch	During this state, the PureWave SMS is preparing to run in voltage-source operation.
Close Input Switch	During this state, the PureWave SMS is preparing to transition from voltage-source operation to current-source (grid-connected) operation.

Resets

To clear an alarm condition, the PureWave SMS will require a “reset” to set the unit to the **Ready** state. This enables the system to be ready for another event should one occur. Table 3 lists the three resets available for the PureWave SMS: **Manual**, **Auto**, and **Self**.

Table 3. System Reset Types

Reset Type	Description
Manual Reset	Requires a person to use the local user interface, a SCADA connection, or the pushing of the RESET button on the master control rack to RESET the system.
Auto Reset	Automatically performed until a predetermined reset count has been reached. If the maximum count has been reached, the system will then require a manual reset. When the system undergoes the manual reset, the Auto Reset Attempt counter will clear.
Self Reset	Clears alarms when the alarm condition clears. No reset counter is used.

Basic Operation

NOTICE

To operate the PureWave SMS through the HMI, please use the HMI computer on the master control rack and run the HMI program. Use the **Help** feature to navigate and further understand how to operate the system.

For definitions of each operating state described in this section, refer to “States” on page 11.

For definitions of islanding and the power modes of the **CS Run** state, refer to “System Modes” on page 10.

To go from one operating state to another, find the appropriate scenario below and follow the steps as described.

Scenario 1: Ready or CS Run state → VS Run state

Automatic islanding is controlled by PureWave SMS. It is not a user-controlled function.

Operation Description

When a utility disturbance occurs (-over or under-voltage event or an over- or under-frequency event), the following occurs:

- (a) The disturbance is detected.
- (b) After an adjustable time delay, if the utility disturbance still exists, the system commands the islanding circuit breaker open.
- (c) After the islanding circuit breaker opens, the system receives confirmation it is open from an auxiliary contact on the islanding circuit breaker.
- (d) Once confirmation of the islanding circuit breaker **Open** status is obtained, the PureWave SMS inverter starts running in **Voltage Source** mode, supporting the loads connected to the PureWave SMS.
- (e) While there is a disturbance on the utility, the PureWave SMS inverter and battery will continue to support the load.

Scenario 2: VS Run state → Ready or CS Run state

This operation is controlled by the PureWave SMS. It is not a user-controlled function.

Operation Description

- (a) When the utility disturbance goes away, the PureWave SMS will synchronize to the utility source and match its voltage.
- (b) When the utility source does not have the disturbance for an adjustable time delay (5 minutes is the default), the PureWave SMS will command the islanding circuit breaker closed.
- (c) When the islanding circuit breaker closes, the PureWave SMS will run in parallel with the utility source as a voltage source for 3 cycles after the islanding circuit breaker auxiliary contacts indicate the islanding circuit breaker is closed.
- (d) When the transfer is complete, the PureWave SMS will return to the Ready state (or continue its operation in current source mode if the operation is commanded).

Scenario 3: Ready state → CS Run state

The user can select a **CS Run** control mode by following its respective procedure:

Procedure 1. Direct Power Control Mode

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to the power required with respect to the capabilities of the PureWave SMS.

NOTICE

Monitor the real power feedback on the ac side of the inverter by looking at the analog input DNP Point 0 (SMS Real Power).

Procedure 2. Frequency Regulation

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to the power required with respect to the capabilities of the PureWave SMS.

NOTICE

Monitor the real power feedback on the ac side of the inverter by looking at the analog input DNP Point 0 (SMS Real Power).

The frequency-regulation calculation is external to the PureWave SCADA control.

Procedure 3. Power Smoothing

- (a) Set the following analog outputs to the desired values:
 - DNP Point 18 (Power Smoothing Time Constant)
 - DNP Point 19 (Power Smoothing State of Charge [SOC] Restoration Percentage)
 - DNP Point 20 (Power Smoothing Target SOC)
 - DNP Point 21 (Maximum SOC in Smoothing)
 - DNP Point 22 (Minimum SOC in Smoothing)
- (b) Pulse on the control point DNP Point 6 (Power in CS mode from Power Smoothing).
- (c) Continue to update the following analog output to the desired value (e.g. wind power, solar power measurements):
 - DNP Point 8 (Power Smoothing Set Point)

Procedure 4. Power Scheduling

- (a) Pulse on the control point DNP Point 4 (Power in CS mode from Schedule).

NOTICE

System will respond based on charge and discharge preconfigured schedules.

Procedure 5. Peak Shaving

- (a) Set the analog output DNP Point 10 (Discharge Power Threshold Set Point) to the desired value.
- (b) Set the analog output DNP Point 11 (Charge Power Threshold Set Point) to the desired value.
- (c) Pulse on the control point DNP Point 5 (Activate Peak Shaving).
- (d) Continue to update analog output DNP Point 9 (Present Load Power Level) with the desired load value.

Procedure 6. Vac Regulation using Vars

- (a) Pulse on the control point DNP Point 14 (var control in CS mode from Vac Set Point).
- (b) Set the analog output DNP Point 2 (Voltage Set Point for voltage regulation mode and commanded VS mode) to the desired value.

Procedure 7. Direct Var Control Mode

- (a) Pulse on the control point DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 1 (Reactive Power Set Point) to the power required with respect to the capabilities of the PureWave SMS.

NOTICE

Monitor the real power feedback on the ac side of the inverter by looking at the analog input DNP Point 1 (SMS Reactive Power).

Scenario 4: CS Run state → Ready state

The user can go from a **CS Run** state control mode to the **Ready** state by following the respective procedure:

Procedure 8. Direct Power Control Mode

- (a) Pulse on the control point DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 9. Frequency Regulation

- (a) Pulse on the control point DNP Point 13 (var control in CS mode from Var Set Point)
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 10. Power Smoothing

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point) and DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 11. Power Scheduling

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point) and DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 12. Peak Shaving

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point) and DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 13. Vac Regulation using Vars

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point) and DNP Point 13 (var control in CS mode from Var Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Reactive Power Set Point) to 0.

Procedure 14. Direct Var Control Mode

- (a) Pulse on the control point DNP Point 3 (Power in CS mode from Power Set Point).
- (b) Set the analog output DNP Point 0 (Real Power Set Point) to 0.
- (c) Set the analog output DNP Point 1 (Real Power Set Point) to 0.

Scenario 5: Ready state → Inhibit state

The user can go from the **Ready** state to the **Inhibit** state by following this step.

- (a) Pulse on the control point DNP Point 10 (**Inhibit** state).

Scenario 6: Inhibit state → Ready state

The user can go from the **Inhibit** state to the **Ready** state by following this procedure.

- (a) Pulse on the control point DNP Point 9 (Remove System Inhibit) for the PureWave SMS to go to the **Ready** state.
- (b) Any inhibit alarms must be cleared.

Scenario 7: Ready state → Trip Offline state

The user can go from the **Ready** state to the **Trip Offline** state by following this step:

- (a) Pulse on the control point DNP Point 1 (System Disable) for the PureWave SMS to go to the **Trip Offline** state.

Scenario 8: Trip Offline state → Ready state

The user can go from the **Trip Offline** state to the **Ready** state by following this procedure:

- (a) Pulse on the control point DNP Point 0 (System Enable) for the PureWave SMS to go to the **Ready** state.
- (b) Any trip offline alarms must be cleared.

Alarms and Troubleshooting Tips

The PureWave SMS contains an extensive self-diagnosis system. If any abnormal condition occurs, or if the unit cannot support the critical load, the PureWave SMS will activate an alarm. Alarm types are categorized as Information Status, Warning, Inhibit, and Trip Offline. Each alarm type is sub-categorized by the component where the alarm came from (master, inverter, or chopper). The reset type is also provided for each alarm.

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. Contact RED Electric Company for information about disabled and unused alarms.

The troubleshooting tips listed in the following tables are for guidance purposes. Please contact RED 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 indicate the status of the PureWave SMS and will not affect the proper operation of the system. See Table 4 for the listed information status alarms.

Table 4. Information Status Alarms

Master	Description	Reset Type
AutoReset	Indicates the inverter is resetting a problem. <i>Troubleshooting Tip:</i> No action is required.	SELF
BatteryAnyBmsSystemAlarm	Indicates a nonspecific alarm condition at the battery. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyCommsLossAlarm	Indicates there was a communication issue internal to the battery. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyOverCurrentAlarm	Indicates the battery detected an overcurrent condition. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyOverTempAlarm	Indicates one or more cells within the battery has exceeded its temperature limit. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyOverVoltageAlarm	Indicates one or more cells within the battery has exceeded its over-voltage limit. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyUnderTempAlarm	Indicates one or more cells within the battery has a temperature below its lower limit. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryAnyUnderVoltageAlarm	Indicates one or more cells within the battery has a voltage below its lower limit. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
BatteryRequestDischarge	Indicates the battery is requesting a state-of-charge recalculation (bringing the battery to top or bottom of charge). <i>Troubleshooting Tip:</i> Discharge the battery to 0% state of charge or charge the battery to 100% state of charge. If the alarm persists, contact RED Electric Company.	SELF
EmergencyFrequencyResponseActive	Indicates the system is outside the desired frequency and EmergencyFrequencyResponse is enabled. When this alarm is active, the PureWave SMS is actively compensating the frequency with real power, stopping all other real power modes of operation. <i>Troubleshooting Tip:</i> This alarm will clear when the utility is brought within frequency again, or when EmergencyFrequencyResponse is disabled.	SELF

Table Continued ►

Table 4. Information Status Alarms – Continued

Master	Description	Reset Type
ForcedIO	Indicates the input/output data has been forced into the PureWave SMS through the HMI. <u>Troubleshooting Tip:</u> No action is required.	SELF
InputBusVoltageGood	Indicates the utility has been within frequency and voltage limits for 2 seconds. <u>Troubleshooting Tip:</u> No action is required.	SELF
InputSwitchClosed	Indicates the input switch is closed (voltage-source switch feedback). <u>Troubleshooting Tip:</u> No action is required.	SELF
InputSwitchClosedFeedback	Indicates that the input switch has sent feedback stating that it is closed. <u>Troubleshooting Tip:</u> No action is required.	SELF
InputSwitchMinOpenTime	Indicates the PureWave SMS has commanded the input switch open long enough for the input switch to physically open. <u>Troubleshooting Tip:</u> No action is required.	SELF
InputSwitchOpenFeedback	Indicates that the input switch has sent feedback stating that it is open. <u>Troubleshooting Tip:</u> No action is required.	SELF
InputVoltageMatchesOutput	Indicates the input voltage matches the output voltage. <u>Troubleshooting Tip:</u> No action is required.	SELF
LocalControlEnabled	Indicates the PureWave SMS was placed in a state to accept commands locally at the HMI and not from SCADA. <u>Troubleshooting Tip:</u> No action is required.	SELF
ManualReset	Indicates the inverter has been reset manually. <u>Troubleshooting Tip:</u> No action is required.	SELF
RemoteControlEnabled	Indicates the PureWave SMS was placed in a state to accept commands from SCADA and not locally at the HMI. <u>Troubleshooting Tip:</u> No action is required.	SELF
SlowUdmDelay	Indicates the utility has had a disturbance. The system will not transition to voltage source (VS) mode until a utility alarm is present for the Delay On feature of this alarm. This allows for the system not to transition to VS mode on short utility events, only on sustained events. <u>Troubleshooting Tip:</u> No action is required.	SELF
UtilityGoodDelay	Indicates the utility has had a disturbance. While this alarm is active, current-source operation will not be allowed. The default Delay Off is 300 seconds. Any utility alarm will cause current-source operation to be blocked for the Delay Off time. <u>Troubleshooting Tip:</u> No action is required.	SELF
Inverter	Description	Reset Type
AutoResetCommand	Indicates an auto reset has been sent. Auto resets allows the inverter to try resetting a problem. If the problem returns quickly, the resets are locked out. <u>Troubleshooting Tip:</u> No action is required.	SELF
AutoResetLockout	Indicates the PureWave SMS has tried to clear an auto-reset alarm on its own. After the reset attempts are exhausted without the alarm clearing, the alarm will require a manual reset. <u>Troubleshooting Tip:</u> No action is required.	MANUAL
ChopperNotReadyOrRun	Indicates the chopper is not available for charge/discharge. <u>Troubleshooting Tip:</u> No action is required.	SELF
CloseBreakerComplete	Indicates the ac breaker has been closed and the system will proceed to the Ready state. <u>Troubleshooting Tip:</u> No action is required.	SELF
CurrentLimitSnapshot	Indicates when any phase goes into current limit. The alarm is used to take a snapshot and limits the number of snapshots. <u>Troubleshooting Tip:</u> No action is required.	SELF
ManualResetCommand	Indicates the inverter has been reset manually. <u>Troubleshooting Tip:</u> No action is required.	SELF
PreChargeAboveMinDelay	Indicates the inverter is stuck in pre-charge. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
Chopper	Description	Reset Type
AutoResetCommand	Indicates an auto reset has been sent. Auto resets enable the inverter to try resetting a problem. If the problem returns quickly, the resets are locked out. <u>Troubleshooting Tip:</u> No action is required.	SELF
AutoResetLockout	Indicates the maximum number of auto-reset commands have been sent and the problem did not clear. The system will go to the Trip Offline state with this alarm activated. <u>Troubleshooting Tip:</u> No action is required.	MANUAL

Table Continued ►

Table 4. Information Status Alarms – Continued

Chopper	Description	Reset Type
BatteryRequestsSocRecalcA	Indicates the battery is requesting a state-of-charge recalculation. This usually consists of bringing the battery to top or bottom of charge. <i>Troubleshooting Tip:</i> Discharge the battery to 0% state of charge or charge the battery to 100% state of charge. If the alarm persists, contact RED Electric Company.	SELF
BatteryRequestsSocRecalcB	Indicates the battery is requesting a state-of-charge recalculation. This usually consists of bringing the battery to top or bottom of charge. <i>Troubleshooting Tip:</i> Discharge the battery to 0% state of charge or charge the battery to 100% state of charge. If the alarm persists, contact RED Electric Company.	SELF
DcSwitchIsOpenA	Indicates the Chopper A dc circuit breaker is open. <i>Troubleshooting Tip:</i> No action is required.	SELF
DcSwitchIsOpenB	Indicates the Chopper B dc breaker is open. <i>Troubleshooting Tip:</i> No action is required.	SELF
InverterNotReadyOrRun	Indicates the inverter is not available for charge/discharge. <i>Troubleshooting Tip:</i> No action is required.	SELF
ManualResetCommand	Indicates the inverter has been reset manually. <i>Troubleshooting Tip:</i> 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” is being displayed. See Table 5 for the listed Warning alarms.

Table 5. Warning Alarms

Master	Description	Reset Type
AcControlVoltageBad	Indicates the ac control power has been lost. <i>Troubleshooting Tip:</i> If ac control power has not been lost, check the ac control power circuit breaker. If the circuit breaker is open, close the circuit breaker. If the circuit breaker is closed and the ac control power is unaffected, contact RED Electric Company.	SELF
AnyControlPointRejected	Indicates the controls rejected a mode change or an enable request. <i>Troubleshooting Tip:</i> Check the current mode of the PureWave SMS and whether more than one control point is being sent.	SELF
AnySetpointRejected	Indicates the analog set point was not updated (possibly out of range). <i>Troubleshooting Tip:</i> Check which set points were sent and whether the values were within the valid range.	SELF
CalibrationNvError	Indicates an error has occurred while reading the analog calibration values. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
ChargerDcVoltageBad	Indicates the battery backed dc control power has been lost. <i>Troubleshooting Tip:</i> If dc control power has not been lost, check the dc control power circuit breaker. If the circuit breaker is open, close the circuit breaker. If the circuit breaker is closed and the dc control power is unaffected, contact RED Electric Company.	SELF
ChopperCommsError	Indicates one (or more) of the chopper(s) is not functioning. <i>Troubleshooting Tip:</i> Disable the system and re-seat the Ethernet cables. If the alarm remains, contact RED Electric Company.	SELF
EmergencyFreqResponse Misconfigured	Indicates the Emergency Frequency Response parameters in the Master DSP are not in order from least to greatest for a Frequency At Full Discharge, a Frequency At Zero Discharge, a Frequency At Zero Charge, a Frequency At Full Charge. <i>Troubleshooting Tip:</i> Set Frequency At Full Discharge to be lower than all other values. Set Frequency At Zero Discharge to be less than or equal to Frequency At Zero Charge. Set Frequency At Zero Charge to be less than Frequency At Full Charge. Save and activate the parameter changes. If the alarm persists, contact RED Electric Company.	SELF
GroundFault	Indicates a ground fault has been detected in the system. This could be a ground-fault detection at any inverter, any chopper, or through a digital input at the master. <i>Troubleshooting Tip:</i> De-energize the system and find and repair the ground fault.	SELF

Table Continued ►

Table 5. Warning Alarms – Continued

Master	Description	Reset Type
InputSwitchOpen	Indicates one (or more) of the inverter(s) is not functioning. <i>Troubleshooting Tip:</i> Disable the system and re-seat the Ethernet cables. If the alarm remains, contact RED Electric Company.	SELF
InverterCommsError	Indicates one (or more) of the inverter(s) is not functioning. <i>Troubleshooting Tip:</i> Disable the system and re-seat the Ethernet cables. If the alarm remains, contact RED Electric Company.	SELF
IoDeviceCommsError	Indicates the master did not receive a response from an (I/O) device. <i>Troubleshooting Tip:</i> Stop the system and re-seat the Ethernet cables. If the alarm remains, contact RED Electric Company.	SELF
LostSyncExternalDevice	Indicates an external device (such as an SEL relay) is not synchronized. <i>Troubleshooting Tip:</i> Verify the voltage and current connections to the external device are all seated and terminated properly. If the alarm persists, contact RED Electric Company.	SELF
LostSyncInputBus	Indicates the input bus is not synchronized. This indicates the PureWave SMS voltage is less than 90% of the average voltage or the voltage is not within 10 degrees of the utility voltage. <i>Troubleshooting Tip:</i> Verify the input bus potential and current transformers have sensing connected and terminated properly in the user interface panel. If the alarm persists, contact RED Electric Company.	SELF
LostSyncOutputBus	Indicates the output bus is not synchronized. This indicates the PureWave SMS voltage is less than 90% of the average voltage or the voltage is not within 10 degrees of the output voltage. <i>Troubleshooting Tip:</i> Verify the output bus potential and current transformers have sensing connected and terminated properly in the user interface panel. If the alarm persists, contact RED Electric Company.	SELF
MisconfiguredSchedule	Indicates the schedule for the week has overlapping schedules, a zero elapsed time schedule enabled, or schedules on a given day scheduled out of order. <i>Troubleshooting Tip:</i> Verify power schedules to ensure schedules do not overlap.	SELF
NoPcmsAvailable	Indicates all of the inverter-chopper pairs are not available. The voltage-source application's risk of load loss is imminent. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
UdmInputBusDetected	Indicates fast detection of the utility going out of voltage or frequency thresholds. <i>Troubleshooting Tip:</i> If this alarm is unexpected, check the potential and current transformers connections at the user interface panel.	SELF
UdmOutputBusDetected	Indicates fast detection of the output bus going out of voltage thresholds. <i>Troubleshooting Tip:</i> If this alarm is unexpected, check the potential and current transformers connections at the user interface panel.	SELF
Inverter	Description	Reset Type
AnyNegative24VdcSupplyBad	Indicates one of the negative 24-V power supplies is no longer working. <i>Troubleshooting Tip:</i> De-energize and troubleshoot PS4 (power supply at the top of the ac section). If the problem remains, contact RED Electric Company.	SELF
DcLinkMidpointUnbalance	Indicates the mid-point of the dc link is unbalanced. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
GroundedNeutral	Indicates the neutral has been grounded. <i>Troubleshooting Tip:</i> Return the system to the original resistively ground configuration.	MANUAL
GroundFaultAc	Indicates the ac voltage is detected on the resistively grounded transformer neutral. <i>Troubleshooting Tip:</i> De-energize the system, find the fault on the ac side of the system, and repair the fault.	MANUAL
GroundFaultDc	Indicates the dc voltage is detected on the resistively grounded transformer neutral. <i>Troubleshooting Tip:</i> De-energize the system, and contact RED Electric Company and the battery manufacturer.	MANUAL
Igbt1CurrentLimit	Indicates IGBT1 is working at its limit. <i>Troubleshooting Tip:</i> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt1OverTemperatureWarning	Indicates IGBT1 is too hot. <i>Troubleshooting Tip:</i> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF

Table Continued ►

Table 5. Warning Alarms – Continued

Inverter	Description	Reset Type
Igbt1ThermistorOpen	Indicates the thermistor for IGBT1 is an open circuit. <i>Troubleshooting Tip:</i> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt1ThermistorShorted	Indicates the thermistor for IGBT1 is shorted. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
Igbt2CurrentLimit	Indicates IGBT2 is working at its limit. <i>Troubleshooting Tip:</i> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt2OverTemperatureWarning	Indicates IGBT2 is too hot. <i>Troubleshooting Tip:</i> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt2ThermistorOpen	Indicates the thermistor for IGBT2 is an open circuit. <i>Troubleshooting Tip:</i> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt2ThermistorShorted	Indicates the thermistor for IGBT2 is shorted. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
Igbt3CurrentLimit	Indicates IGBT3 is working at its limit. <i>Troubleshooting Tip:</i> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt3OverTemperatureWarning	Indicates IGBT3 is too hot. <i>Troubleshooting Tip:</i> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt3ThermistorOpen	Indicates the thermistor for IGBT3 is an open circuit. <i>Troubleshooting Tip:</i> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt3ThermistorShorted	Indicates the thermistor for IGBT3 is shorted. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
OverFrequency	Indicates the line frequency at the inverter ac connection is above the Over Frequency threshold. <i>Troubleshooting Tip:</i> The inverter will respond based on the over-frequency settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Frequency threshold can be changed.	SELF
OverVoltage	Indicates whether any of the three phases at the ac connection are above the Over Voltage threshold. <i>Troubleshooting Tip:</i> The inverter will respond based on the over-voltage settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Voltage threshold can be changed.	SELF
ParamCalNvError	Indicates corrupt memory was found in the inverter settings that can cause a malfunction in the inverter. <i>Troubleshooting Tip:</i> Power-cycle the inverter control. If the alarm still remains, contact RED Electric Company.	SELF
Redundant125VdcSupplyBad	Indicates that, if redundant station batteries are installed, one of the station batteries is no longer working. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
Redundant24VdcSupplyBad	Indicates that, if redundant power supplies are installed, one of the 24-V power supplies is no longer working. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
TransformerOverTempWarning	Indicates the transformer temperature is above the manufacturer's warning level. <i>Troubleshooting Tip:</i> Reduce the output level of the operation.	SELF
UnderFrequency	Indicates the inverter detects a low input frequency. <i>Troubleshooting Tip:</i> The inverter will respond based on the under-frequency settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Frequency threshold can be changed.	SELF

Table Continued ►

Table 5. Warning Alarms – Continued

Inverter	Description	
UnderVoltage	Indicates the inverter detects a low input voltage. <i>Troubleshooting Tip:</i> The inverter will respond based on the under-voltage settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Voltage threshold can be changed.	SELF
VeryOverFrequency	Indicates the inverter detects a very high input frequency. <i>Troubleshooting Tip:</i> The inverter will respond based on the very-over-frequency settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Frequency threshold can be changed.	SELF
VeryOverVoltage	Indicates the inverter detects a very high input voltage. <i>Troubleshooting Tip:</i> The inverter will respond based on the very-over-voltage settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the Voltage threshold can be changed.	SELF
VeryUnderFrequency	Indicates the inverter detects a very low input frequency. <i>Troubleshooting Tip:</i> The inverter will respond based on the very-under-frequency settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the frequency threshold can be changed.	SELF
VeryUnderVoltage	Indicates the inverter detects a very low input voltage. <i>Troubleshooting Tip:</i> The inverter will respond based on the very-under-voltage settings. Default settings are according to IEEE 1547. To change the sensitivity, the Time Delay On or the voltage threshold can be changed.	SELF
Chopper	Description	Reset Type
AnyNegative24VdcSupplyBad	Indicates one of the negative 24-V power supplies is no longer working. <i>Troubleshooting Tip:</i> De-energize and troubleshoot PS4 (power supply at the top of the ac section). If problem remains, contact RED Electric Company.	SELF
Control125VdcSupplyBad	Indicates the backup power to the controls is compromised. This is fed by the PS5 (power supply) at the top of the master control rack, which is powered by the battery. <i>Troubleshooting Tip:</i> Check the fuses and circuit breakers in the backup control power path.	SELF
DcStorageLimitingChargeA	Indicates the battery charge power limit, charging current limit or upper voltage limits are limiting the output of the PureWave SMS. <i>Troubleshooting Tip:</i> If the batteries are limiting the output more often than expected, contact RED Electric Company.	SELF
DcStorageLimitingChargeB	Indicates the battery charge power limit, charging current limit, or upper voltage limits are limiting the output of the PureWave SMS. <i>Troubleshooting Tip:</i> If the batteries are limiting the output more often than expected, contact RED Electric Company.	SELF
DcStorageLimitingDischargeA	Indicates the battery discharge power limit or lower voltage limit is limiting the output of the PureWave SMS. <i>Troubleshooting Tip:</i> If the batteries are limiting the output more often than expected, contact RED Electric Company.	SELF
DcStorageLimitingDischargeB	Indicates the battery discharge power limit or lower voltage limit is limiting the output of the PureWave SMS. <i>Troubleshooting Tip:</i> If the batteries are limiting the output more often than expected, contact RED Electric Company.	SELF
DcStorageNearDischargeLimitA	Indicates the battery is nearing discharge power limit or lower voltage limit. This could result in the PureWave SMS stopping discharge in the near future. <i>Troubleshooting Tip:</i> Charge the battery.	SELF
DcStorageNearDischargeLimitB	Indicates the battery is nearing discharge power limit or lower voltage limit. This could result in the PureWave SMS stopping discharge in the near future. <i>Troubleshooting Tip:</i> Charge the battery.	SELF
GroundedNeutral	Indicates the neutral has been grounded. <i>Troubleshooting Tip:</i> Return the system to the original resistively ground configuration.	MANUAL
GroundFaultAc	Indicates the ac voltage is detected on the resistively grounded transformer neutral. <i>Troubleshooting Tip:</i> De-energize the system, find the fault on the ac side of the system, and repair the fault.	MANUAL
GroundFaultDc	Indicates the dc voltage is detected on the resistively grounded transformer neutral. <i>Troubleshooting Tip:</i> De-energize the system, and contact RED Electric Company and the battery manufacturer.	MANUAL

Table Continued ►

Table 5. Warning Alarms – Continued

Chopper	Description	Reset Type
Igbt1CurrentLimit	Indicates IGBT1 is working at its limit. <u>Troubleshooting Tip:</u> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt1OverTemperatureWarning	Indicates IGBT1 is too hot. <u>Troubleshooting Tip:</u> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt1ThermistorOpen	Indicates the thermistor for IGBT1 is an open circuit. <u>Troubleshooting Tip:</u> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt1ThermistorShorted	Indicates the thermistor for IGBT1 is shorted. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
Igbt2CurrentLimit	Indicates IGBT2 is working at its limit. <u>Troubleshooting Tip:</u> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt2OverTemperatureWarning	Indicates IGBT2 is too hot. <u>Troubleshooting Tip:</u> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt2ThermistorOpen	Indicates the thermistor for IGBT2 is open circuit. <u>Troubleshooting Tip:</u> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt2ThermistorShorted	Indicates the thermistor for IGBT2 is shorted. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
Igbt3CurrentLimit	Indicates IGBT3 is working at its limit. <u>Troubleshooting Tip:</u> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igbt3OverTemperatureWarning	Indicates IGBT3 is too hot. <u>Troubleshooting Tip:</u> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt3ThermistorOpen	Indicates the thermistor for IGBT3 is open circuit. <u>Troubleshooting Tip:</u> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt3ThermistorShorted	Indicates the thermistor for IGBT3 is shorted. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
Igbt4CurrentLimit	Indicates IGBT4 is working at its limit. <u>Troubleshooting Tip:</u> If this is a continued occurrence, verify there is no phase-to-phase fault or a grid condition that can overload the PureWave SMS.	SELF
Igb4OverTemperatureWarning	Indicates IGBT4 is too hot. <u>Troubleshooting Tip:</u> Check the vents at the back of the PCS enclosure to ensure there are no air restrictions. Also check the variable frequency drives, blower, ac fan, and dc fans for proper functionality.	SELF
Igbt4ThermistorOpen	Indicates the thermistor for IGBT4 is open circuit. <u>Troubleshooting Tip:</u> 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 overcurrent alarm, contact RED Electric Company.	SELF
Igbt4ThermistorShorted	Indicates the thermistor for IGBT4 is shorted. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
ParamCalNvError	Indicates corrupt memory was found in the chopper settings that can cause a malfunction the chopper. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
Redundant24VdcSupplyBad	Indicates that PS1 or PS3 (power supplies) is no longer working. <u>Troubleshooting Tip:</u> De-energize and troubleshoot PS1 or PS3 (power supply at the top of the ac section). If problem remains, contact RED Electric Company.	SELF

Inhibit Alarms

These alarms indicate a problem that needs attention and will affect the proper operation of the system. The system will stop operating when an “Inhibit” is being displayed. Once cleared, it may return to normal operation. The PCS circuit breakers will remain in the same position. See Table 6 for the listed **Inhibit** alarms.

Table 6. Inhibit Alarms

Master	Description	Reset Type
AnyAppBoardPowerSupplyUV	Indicates an application board power supply is below the required voltage value. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	AUTO
CalibrationChangeActivation	Indicates new analog calibration values are being saved and activated. <u>Troubleshooting Tip:</u> No action is required.	SELF
ExternalInhibit	Indicates the PureWave SMS has been inhibited externally. <u>Troubleshooting Tip:</u> Investigate SC25-5 for problems.	MANUAL
InputBusVoltageBad	Indicates one or more phases of the input or output bus RMS line-to-neutral voltages is below a threshold (defaulted to 5% of nominal). <u>Troubleshooting Tip:</u> Measure the input and output bus voltages and confirm whether a phase is below the threshold. If a phase is below the threshold, troubleshoot the source for loose connections, blown fuses, etc. If the voltages are present on all phases, investigate which phase is not reading properly through the analog values on the HMI and check the respective connections to the master control chassis.	SELF
InputSwitchFailedToClose	Indicates the input switch was commanded closed but did not provide feedback it was closed. <u>Troubleshooting Tip:</u> Verify the Isolation switch for the PureWave SMS is operational and the Close command is active at the device	MANUAL
InputSwitchFailedToOpen	Indicates the input switch was commanded to open but did not provide feedback that it opened. <u>Troubleshooting Tip:</u> Verify the Isolation switch for the PureWave SMS is operational and the Open command is active at the device.	MANUAL
LoadOverCurrent	Indicates the load current is greater than the PureWave SMS can handle. This alarm is used to block the transition to Island mode if the system cannot provide enough current to the island. <u>Troubleshooting Tip:</u> The system will continue to operate normally, but will not transition to island mode in the event of a utility disturbance. To clear this alarm, the load current should be reduced.	SELF
LoadOverPower	Indicates the load power is greater than the PureWave SMS can handle. This alarm is used to block the transition to Island mode if the system cannot provide enough power to the island. <u>Troubleshooting Tip:</u> The system will continue to operate normally, but will not transition to island mode in the event of a utility disturbance. To clear this alarm, the load power should be reduced.	SELF
McuCommsError	Indicates the interprocessor communications on the control board is not functioning correctly. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
OverFrequency	Indicates if the frequency is above the Over Frequency threshold. This alarm looks at the line frequency of the input bus. It is used to comply with IEEE 1547, inhibiting operation in the event of a over-frequency condition. <u>Troubleshooting Tip:</u> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
OverVoltage	Indicates whether any of the three phases on the input bus connection are above the Over Voltage threshold. This alarm looks at the RMS line-to-line voltage of each of the three phases. It is used to comply with IEEE 1547, inhibiting operation in the event of an over-voltage condition. <u>Troubleshooting Tip:</u> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF

Table Continued ►

Table 6. Inhibit Alarms – Continued

Master	Description	Reset Type
ParamCrcBad	Indicates an error has been detected in the section of memory in which the parameter configuration is stored. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	SELF
ParameterChangeActivation	Indicates the inverter will stop operating and allow new parameters to activate with the inverter not switching. <i>Troubleshooting Tip:</i> No action is required. If this alarm is on for an extended period of time, contact RED Electric Company.	SELF
ReversePhaseRotationInputBus	Indicates the PureWave SMS is connected to a voltage that is rotating A - C - B instead of A - B - C with the voltage positive zero crossing occurring on A then B and finally C as expected. The controls expect a phase rotation of A - B - C and are configured for this phase rotation. <i>Troubleshooting Tip:</i> If this alarm is on and stays on, the phase rotation can be corrected by swapping the utility connection wires (e.g. swapping B and C wires).	SELF
ReversePhaseRotationOutput Bus	Indicates the PureWave SMS is connected to a voltage that is rotating A - C - B instead of A - B - C with the voltage positive zero crossing occurring on A then B and finally C as expected. The controls expect a phase rotation of A - B - C and are configured for this phase rotation. <i>Troubleshooting Tip:</i> If this alarm is on and stays on, the phase rotation can be corrected by swapping the load connection wires (e.g. swapping B and C wires).	SELF
ScadaCommsLoss	Indicates the SCADA controller is not communicating with the PureWave SMS. <i>Troubleshooting Tip:</i> Verify the Ethernet connection on the master chassis add-on port. Also verify the connections are seated properly in the SCADA rack. If the alarm persists, contact RED Electric Company.	SELF
SystemInhibitCommand	Indicates the PureWave SMS is in the Inhibit state because of user command. <i>Troubleshooting Tip:</i> Verify there is no Inhibit command through SCADA or the master control rack. If there is no Inhibit command sent in any of those ways, contact RED Electric Company.	SELF
UnderFrequency	Indicates the frequency is below the Under Frequency threshold. This alarm looks at the line frequency of the input bus. It is used to comply with IEEE 1547, inhibiting operation in the event of an under-frequency condition. <i>Troubleshooting Tip:</i> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
UnderVoltage	Indicates whether any of the three phases on the input bus connection are below the under-voltage threshold. This alarm looks at the RMS line-to-line voltage of each of the three phases. It is used to comply with IEEE 1547, inhibiting operation in the event of an under-voltage condition. <i>Troubleshooting Tip:</i> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
VeryOverFrequency	Indicates the frequency is above the very-over-frequency threshold. This alarm looks at the line frequency of the input bus. It is used to comply with IEEE 1547, inhibiting operation in the event of a very over-frequency condition. <i>Troubleshooting Tip:</i> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
VeryOverVoltage	Indicates whether any of the three phases on the input bus connection are above the very-over-voltage threshold. This alarm looks at the RMS line-to-line voltage of each of the three phases and provides a faster response than the Over Voltage alarm. It is used to comply with IEEE 1547, inhibiting operation in the event of a very over-voltage condition. <i>Troubleshooting Tip:</i> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF

Table Continued ►

Table 6. Inhibit Alarms – Continued

Master	Description	Reset Type
VeryUnderFrequency	Indicates the frequency is below the very-under-frequency threshold. This alarm looks at the line frequency of the input bus. It is used to comply with IEEE 1547, inhibiting operation in the event of a very under-frequency condition. <u>Troubleshooting Tip:</u> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
VeryUnderVoltage	Indicates whether any of the three phases on the input bus connection are below the very-under-voltage threshold. This alarm looks at the RMS line-to-line voltage of each of the three phases. It is used to comply with IEEE 1547, inhibiting operation in the event of a very under-voltage condition. <u>Troubleshooting Tip:</u> The system will respond based on the voltage settings. To change the sensitivity, Time Delay On can be changed or the voltage threshold as a percent of nominal voltage can be changed.	SELF
Inverter	Description	Reset Type
AnyAppBoardPowerSupplyBadUV	Indicates an application board power supply is below the required voltage value. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	AUTO
ChopperInhibitingVs	Indicates the chopper is not ready to charge/discharge and the master is commanding Voltage Source mode. <u>Troubleshooting Tip:</u> Look at the chopper alarms and investigate which alarm is keeping the chopper from coming online.	SELF
ChopperNotReadyOrRunInhibit	Indicates the chopper is not available for charge/discharge and the master is commanding the system to voltage source operation. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
DcLinkUnderVoltage	Indicates the internal dc bus voltage fell below 650 V. <u>Troubleshooting Tip:</u> If running, investigate the ground fault. If starting up the system, verify circuit breakers CB5R and CB6R are closed.	AUTO
EthernetProblem	Indicates the Ethernet communications between the inverter and master are not functioning correctly. <u>Troubleshooting Tip:</u> Re-seat the yellow Ethernet cable at the inverter control chassis and at the ac section.	SELF
Igbt1GateDriveAlarm	Indicates the IGBT1 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt1OverTemperatureTrip	Indicates IGBT1 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods and check the rear hood to ensure the dampers can move freely.	AUTO
Igbt2GateDriveAlarm	Indicates the IGBT2 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt2OverTemperatureTrip	Indicates IGBT2 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods and check the rear hood to ensure the dampers can move freely.	AUTO
Igbt3GateDriveAlarm	Indicates the IGBT3 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt3OverTemperatureTrip	Indicates IGBT3 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods and check the rear hood to ensure the dampers can move freely.	AUTO
InhibitCommand	Indicates the inverter was commanded to inhibit by the master. <u>Troubleshooting Tip:</u> Verify there is no inhibit command through SCADA or the master control rack. If there is no inhibit command sent in any of those ways, contact RED Electric Company.	SELF

Table Continued ►

Table 6. Inhibit Alarms – Continued

Inverter	Description	Reset Type
LostSynchronism	Indicates the inverter is unable to synchronize to the ac terminal voltage. <u>Troubleshooting Tip:</u> If the utility voltage, frequency, and phase rotation are good, contact RED Electric Company. If the voltage, frequency, or phase rotation is bad, the inverter may not be able to lock to the utility until the voltage and frequency are both within tolerance.	SELF
McuCommsError	Indicates the interprocessor communications on the control board are not functioning correctly. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
OutputFault1	Indicates the utility fault voltage sag is to 70% and current limit for 20 ms. <u>Troubleshooting Tip:</u> Investigate the fault on the inverter ac connection.	MANUAL
OutputFault2	Indicates the utility fault voltage sag is to 90% and current limit for 100 ms. <u>Troubleshooting Tip:</u> Investigate the fault on the inverter ac connection. Chances are this was not a transient event because the timer for this alarm is slower.	MANUAL
ParamCalChangeActivation	Indicates the PureWave SMS will stop operating and allow new parameters to activate with the IGBTs not switching. <u>Troubleshooting Tip:</u> No action is required. If the alarm persists, call RED Electric Company.	SELF
ReversePhaseRotation	Indicates a phase connection(s) is not correct. <u>Troubleshooting Tip:</u> Verify the phasing by checking the utility connection wires.	SELF
TccOverload	Indicates the PureWave SMS time-current trip curve was exceeded and the system tripped offline. <u>Troubleshooting Tip:</u> Reduce the island load.	MANUAL
UncontrolledBatteryPower	Indicates more current is flowing in the battery than expected based on operation. <u>Troubleshooting Tip:</u> Investigate the ac side of the system for voltage sags.	SELF
Chopper	Description	Reset Type
AnyAppBoardPowerSupplyBad UV	Indicates an application board power supply is below the required voltage. <u>Troubleshooting Tip:</u> Check the output of the 24-V supplies. Check the terminations of the wires at the power supply and the master control chassis. If both supplies are good and the 24 V is present on pins 1 and 3 of the master chassis, contact RED Electric Company.	AUTO
BatteryAnySystemAlarmA	Indicates the battery has reported an issue not covered by other battery alarms. <u>Troubleshooting Tip:</u> If alarm persists, contact RED Electric Company.	SELF
BatteryAnySystemAlarmB	Indicates the battery has reported an issue not covered by other battery alarms. <u>Troubleshooting Tip:</u> If alarm persists, contact RED Electric Company.	SELF
BatteryCellOverUnderTempA	Indicates a battery cell has had an over- or under-temperature event. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryCellOverUnderTempB	Indicates a battery cell has had an over- or under-temperature event. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryCellOverUnderVoltageA	Indicates a battery cell has had an over- or under-voltage event. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryCellOverUnderVoltageB	Indicates a battery cell has had an over- or under-voltage event. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryLocalCommsFaultA	Indicates a communications issue between the battery and the PureWave SMS. <u>Troubleshooting Tip:</u> Identify which battery has an issue by looking through the chopper alarms. Check the connections between the alarmed chopper and the battery container. If the alarm persists, contact RED Electric Company.	SELF
BatteryLocalCommsFaultB	Indicates a communications issue between the battery and the PureWave SMS. <u>Troubleshooting Tip:</u> Identify which battery has an issue by looking through the chopper alarms. Check the connections between the alarmed chopper and the battery container. If the alarm persists, contact RED Electric Company.	SELF
BatteryModuleCommLossA	Indicates there has been a communications issue internal to the battery. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryModuleCommLossB	Indicates there has been a communications issue internal to the battery. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF

Table Continued ►

Table 6. Inhibit Alarms – Continued

Chopper	Description	Reset Type
BatterySetpointRejectedA	Indicates the battery monitoring system has sent a value that is out of the expected range. <u>Troubleshooting Tip:</u> This could be an indication of the battery monitoring system having internal issues, or issues within the communication pathway of the battery. If the alarm persists, contact RED Electric Company.	SELF
BatterySetpointRejectedB	Indicates the battery monitoring system has sent a value that is out of the expected range. <u>Troubleshooting Tip:</u> This could be an indication of the battery monitoring system having internal issues, or issues within the communication pathway of the battery. If the alarm persists, contact RED Electric Company.	SELF
BatteryStringOverCurrentA	Indicates the battery has seen more current than expected. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company.	SELF
BatteryStringOverCurrentB	Indicates the battery has seen more current than expected. <u>Troubleshooting Tip:</u> If the alarm persists, contact RED Electric Company	SELF
DcLinkUnderVoltage	Indicates the internal dc bus voltage fell below 650 V. <u>Troubleshooting Tip:</u> If running, investigate the ground fault. If starting up the system, verify circuit breakers CB5R and CB6R are closed.	AUTO
DcStorageOverPowerA	Indicates Battery A has been discharging above rated power for too long. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
DcStorageOverPowerB	Indicates Battery B has been discharging above rated power for too long. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	AUTO
DcStorageOverVoltageA	Indicates the terminal voltage at the battery connected to Chopper A has exceeded the trip threshold. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	AUTO
DcStorageOverVoltageB	Indicates the terminal voltage at the battery connected to Chopper A has exceeded the trip threshold. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	AUTO
EthernetProblem	Indicates the Ethernet communications between the chopper and master are not functioning correctly. <u>Troubleshooting Tip:</u> Re-seat the yellow Ethernet cable at the chopper control chassis in question and at the ac section.	SELF
Igbt1GateDriveAlarm	Indicates the IGBT1 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt1OverTemperatureTrip	Indicates IGBT1 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods, and check the rear hood to ensure the dampers can move freely.	AUTO
Igbt2GateDriveAlarm	Indicates the IGBT2 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt2OverTemperatureTrip	Indicates IGBT2 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods and check the rear hood to ensure the dampers can move freely.	AUTO
Igbt3GateDriveAlarm	Indicates the IGBT3 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO
Igbt3OverTemperatureTrip	Indicates IGBT3 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods and check the rear hood to ensure the dampers can move freely.	AUTO
Igbt4GateDriveAlarm	Indicates the IGBT4 gate drive is in an alarm condition, usually because of undervoltage. <u>Troubleshooting Tip:</u> Reset the alarm. Check the connections on the back of the control chassis. Verify all terminal blocks are seated properly. If the alarm persists, contact RED Electric Company.	AUTO

Table Continued ►

Table 6. Inhibit Alarms – Continued

Chopper	Description	Reset Type
Igbt4OverTemperatureTrip	Indicates IGBT4 is running at too high a temperature. <u>Troubleshooting Tip:</u> De-energize the system. Check the filters in the intake hoods, and check the rear hood to ensure the dampers can move freely.	AUTO
InhibitCommand	Indicates the inverter was commanded to inhibit by the master control. <u>Troubleshooting Tip:</u> Verify there is no inhibit command through SCADA or the master control rack. If there is no Inhibit command sent in any of those ways, contact RED Electric Company.	SELF
McuCommsError	Indicates the interprocessor communications on the control board are not functioning correctly. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	SELF
ParamCalChangeActivation	Indicates the PureWave SMS will stop operating and allow new parameters to activate with the IGBTs not switching. <u>Troubleshooting Tip:</u> No action is required. If the alarm persists, contact RED Electric Company.	SELF

Trip Offline Alarms

These alarms indicate a problem that needs attention and will affect the proper operation of the system. The component or system affected will not operate when a “Trip Offline” is being displayed. If the chopper is tripped offline, the dc circuit breaker is opened. If the inverter is tripped offline, the ac circuit breaker is opened. And if the master control is tripped offline, the ac and dc circuit breakers are opened. See Table 7 for the listed **Trip Offline** alarms.

Table 7. Trip Offline Alarms

Master	Description	Reset Type
CertsMode	Indicates the PureWave SMS is operating and dispatching power using the CERTS settings. <u>Troubleshooting Tip:</u> Unless explicitly intended, turn off CERTS mode.	MANUAL
DspFpgaHeartbeatLost	Indicates the internal processor communications have been lost. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	MANUAL
EmergencyStop	Indicates emergency shutdown has been activated. <u>Troubleshooting Tip:</u> Twist and pull out the INVERTER STOP button that has been pushed.	SELF
ExecutionTimeOverrun	Indicates the execution time of the code has exceeded the allowed limits. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	MANUAL
ExternalTrip	Indicates a digital signal commanding the system to trip offline has been detected. <u>Troubleshooting Tip:</u> Investigate SCL2505 for problems.	MANUAL
SystemDisable	Indicates the system has been disabled. <u>Troubleshooting Tip:</u> Investigate whether the system was commanded through SCADA or the HMI. If neither, contact RED Electric Company.	MANUAL

Table Continued ►

Table 7. Trip Offline Alarms

Inverter	Description	Reset Type
AcBreakerFailToClose	Indicates the ac breaker did not close as expected. <i>Troubleshooting Tip:</i> Verify whether there is 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 and check whether the circuit breaker closes.	MANUAL
AcBreakerFailToOpen	Indicates the ac breaker did not open as expected. <i>Troubleshooting Tip:</i> 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
AcBreakerOverCurrentTrip	Indicates the ac circuit breaker trip unit detected an over- current condition. <i>Troubleshooting Tip:</i> Reset the red plunger on the ac circuit breaker and investigate the cause of the over-current trip.	MANUAL
BatteryStop	Indicates the battery on the PCS has commanded the PCS to stop. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	MANUAL
CurrentSensorFault	Indicates the sum of the three instantaneous currents is not less than 50 V. Since this is expected to be 0 volts, there may be an issue with a current sensor. <i>Troubleshooting Tip:</i> Identify which inverter is displaying the alarm and verify the connections are all intact. If the alarm persists, contact RED Electric Company.	MANUAL
DcLinkOverVoltage	Indicates the internal dc bus voltage exceeded 900 V. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	MANUAL
DcLinkPreChargeTooSlow	Indicates the internal dc bus voltage is not increasing fast enough. <i>Troubleshooting Tip:</i> If the PureWave SMS is in the Run state, investigate the ground fault. If starting up the system, verify circuit breakers CB5R and CB6R are closed.	AUTO
DcLinkShorted	Indicates the internal dc bus will not pre-charge (0 volts detected). <i>Troubleshooting Tip:</i> If the PureWave SMS is in the Run state, investigate the ground fault. If starting up the system, verify circuit breaker CB5R and CB6R are closed.	MANUAL
DcLinkUnderVoltageTrip	Indicates the internal dc bus voltage fell below 650 V while the ac circuit breaker was closed. <i>Troubleshooting Tip:</i> the PureWave SMS is in the Run state, investigate the ground fault. If starting up the system, verify circuit breakers CB5R and CB6R are closed.	SELF
DspFpgaHeartbeatLost	Indicates the internal processor communications have been lost. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	MANUAL
EmergencyStop	Indicates emergency shutdown has been activated. <i>Troubleshooting Tip:</i> Twist and pull out the INVERTER STOP button that has been pushed.	SELF
ExecutionTimeOverrun	Indicates the execution time of the code has exceeded the allowed limits. <i>Troubleshooting Tip:</i> Contact RED Electric Company.	MANUAL
Igbt1OverCurrent	Indicates the current being drawn in IGBT1 exceeds the limit. <i>Troubleshooting Tip:</i> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
Igbt2OverCurrent	Indicates the current being drawn in IGBT2 exceeds the limit. <i>Troubleshooting Tip:</i> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
Igbt3OverCurrent	Indicates the current being drawn in IGBT3 exceeds the limit. <i>Troubleshooting Tip:</i> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
MaintainDcBusMode	Indicates the system is in a mode in which it simulates a battery. <i>Troubleshooting Tip:</i> Remove the system from battery simulate mode or contact RED Electric Company.	MANUAL
TransformerOverTempTrip	Indicates the transformer temperature is above the manufacturer's trip level. The PureWave SMS will trip offline until the temperature lowers. <i>Troubleshooting Tip:</i> Wait for the transformer temperature to cool down.	SELF
TripOfflineCommand	Indicates the inverter was commanded offline by the master. <i>Troubleshooting Tip:</i> Investigate whether the system was commanded line through SCADA or the HMI. If neither, contact RED Electric Company.	SELF

Table Continued ►

Table 7. Trip Offline Alarms – Continued

Chopper	Description	Reset Type
BatterySimulationMode	Indicates the system is in a mode in which it simulates a battery. <u>Troubleshooting Tip:</u> Remove the system from battery simulation mode or contact RED Electric Company.	MANUAL
DcBreakerControlVoltageBadA	Indicates the control power to the circuit breaker is too low. <u>Troubleshooting Tip:</u> Verify the control power at the circuit breaker.	SELF
DcBreakerControlVoltageBadB	Indicates the control power to the circuit breaker is too low. <u>Troubleshooting Tip:</u> Verify the control power at the circuit breaker.	SELF
DcBreakerFailToCloseA	Indicates the Chopper A dc breaker did not close as expected. <u>Troubleshooting Tip:</u> Verify whether there is a circuit breaker Overcurrent alarm. If there is, reset the alarm. Verify 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 and check whether the circuit breaker closes.	MANUAL
DcBreakerFailToCloseB	Indicates the Chopper B dc breaker did not close as expected. <u>Troubleshooting Tip:</u> Verify whether there is a circuit breaker Overcurrent alarm. If there is, reset the alarm. Verify 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 and check whether the circuit breaker closes.	MANUAL
DcBreakerFailToOpenA	Indicates the Chopper A dc breaker did not open as expected. <u>Troubleshooting Tip:</u> 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 chopper controls has been damaged.	MANUAL
DcBreakerFailToOpenB	Indicates the Chopper B dc circuit breaker did not open as expected. <u>Troubleshooting Tip:</u> 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 chopper controls has been damaged.	MANUAL
DcBreakerOvercurrentTripA	Indicates the Chopper A dc circuit breaker trip unit detected an overcurrent condition. <u>Troubleshooting Tip:</u> Reset the red plunger on the dc circuit breaker and investigate the cause of the overcurrent trip.	MANUAL
DcBreakerOvercurrentTripB	Indicates the Chopper B dc circuit breaker trip unit detected an overcurrent condition. <u>Troubleshooting Tip:</u> Reset the red plunger on the dc circuit breaker and investigate the cause of the overcurrent trip.	MANUAL
DcCapsShortedA	Indicates the system is trying to precharge the dc capacitors, but the capacitors are not holding the charge. <u>Troubleshooting Tip:</u> Disable the system. Clear the alarm and attempt to bring the system back online. If the alarm persists, contact RED Electric Company.	AUTO
DcCapsShortedB	Indicates the system is trying to precharge the dc capacitors, but the capacitors are not holding the charge. <u>Troubleshooting Tip:</u> Disable the system. Clear the alarm and attempt to bring the system back online. If the alarm persists, contact RED Electric Company.	AUTO
DcLinkOverVoltage	Indicates the internal dc bus voltage exceeded 900 V. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	MANUAL
DcStorageUnderVoltageA	Indicates the battery connected to Chopper A terminal voltage dropped below the trip threshold. <u>Troubleshooting Tip:</u> Verify the battery has no alarms and consult battery manual to bring the battery back online.	MANUAL
DcStorageUnderVoltageB	Indicates the battery connected to Chopper B terminal voltage dropped below the trip threshold. <u>Troubleshooting Tip:</u> Verify the battery has no alarms and consult battery manual to bring the battery back online.	MANUAL

Table Continued ►

Table 7. Trip Offline Alarms – Continued

Chopper	Description	Reset Type
DspFpgaHeartbeatLost	Indicates the Internal processor communications have been lost. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	MANUAL
EmergencyStop	Indicates emergency shutdown has been activated. <u>Troubleshooting Tip:</u> Twist and pull out the INVERTER STOP button that has been pushed.	SELF
ExecutionTimeOverrun	Indicates the execution time of the code has exceeded the allowed limits. <u>Troubleshooting Tip:</u> Contact RED Electric Company.	MANUAL
Igbt1OverCurrent	Indicates the current being drawn in IGBT1 exceeds the limit. <u>Troubleshooting Tip:</u> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
Igbt2OverCurrent	Indicates the current being drawn in IGBT2 exceeds the limit. <u>Troubleshooting Tip:</u> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
Igbt3OverCurrent	Indicates the current being drawn in IGBT3 exceeds the limit. <u>Troubleshooting Tip:</u> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
Igbt4OverCurrent	Indicates the current being drawn in IGBT4 exceeds the limit. <u>Troubleshooting Tip:</u> A utility transient fault may have caused the alarm. Check the thermistor alarms for all phases. If they are clear, the system can be reset. If the thermistor alarms are present, do not reset the alarm. Contact RED Electric Company.	MANUAL
TripOfflineCommand	Indicates the inverter was commanded offline by the master. <u>Troubleshooting Tip:</u> Investigate whether the system was commanded to trip offline through SCADA or the HMI. If neither, contact RED Electric Company.	SELF
UncontrolledBatteryPower	Indicates more current is flowing in the battery than expected based on operation. <u>Troubleshooting Tip:</u> Investigate the ac side of the system for voltage sags.	SELF



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