Troubleshooting

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Qualified Persons

⚠ WARNING

Only qualified persons who are knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone who is trained and competent in:

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

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating a 6800 Series Automatic Switch Control. Become familiar with the Safety Information on page 4 and Safety Precautions on page 5. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the 6800 Series Automatic Switch Control. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication is only intended for a specific application. The application must be within the ratings furnished for the equipment. See S&C Specification Bulletin 1045-31.

Special Warranty Provisions

The standard warranty contained in S&C's standard conditions of sale, as set forth in Price Sheets 150 and 181, applies to the 6800 Series Automatic Switch Control, except that the first paragraph of the said warranty is replaced by the following:

(1) General: The seller warrants to the immediate purchaser or end user for a period of 10 years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within 10 years after the date of shipment, the seller agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with the recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at the seller's option) by shipment of necessary replacement parts. The seller's warranty does not apply to any equipment that has been disassembled, repaired, or altered by anyone other than the seller. This limited warranty is granted only to the immediate purchaser or, if the equipment is purchased by a third party for installation in third-party equipment, the end user of the equipment. The seller's duty to perform under any warranty may be delayed, at the seller's sole option, until the seller has been paid in full for all goods purchased by the immediate purchaser. No such delay shall extend the warranty period.

Replacement parts provided by the seller or repairs performed by the seller under the warranty for the original equipment will be covered by the above special warranty provision for its duration. Replacement parts purchased separately will be covered by the above special warranty provision.

For equipment/services packages, the seller warrants for a period of one year after commissioning that the 6800 Series Automatic Switch Control will provide automatic fault isolation and system reconfiguration per agreed-upon service levels. The remedy shall be additional system analysis and reconfiguration of the IntelliTeam SG Automatic Restoration System until the desired result is achieved.

Warranty of the 6800 Series Automatic Switch Control is contingent upon the installation, configuration, and use of the control or software in accordance with S&C's applicable instruction sheets.

This warranty does not apply to major components not manufactured by S&C, such as batteries and communication devices. However, S&C will assign to the immediate purchaser or end user all manufacturer's warranties that apply to such major components.

Warranty of equipment/services packages is contingent upon receipt of adequate information on the user's distribution system, sufficiently detailed to prepare a technical analysis. The seller is not liable if an act of nature or parties beyond S&C's control negatively impact performance of equipment/services packages; for example, new construction that impedes radio communication, or changes to the distribution system that impact protection systems, available fault currents, or system-loading characteristics.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the 6800 Series Automatic Switch Control. Become familiar with these types of messages and the importance of these various signal words:

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Following Safety Instructions

If any portion of this instruction sheet is not understood and assistance is required, contact the nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing a 6800 Series Automatic Switch Control.

Replacement Instructions and Labels

If additional copies of this instruction sheet are needed, contact the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

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

⚠ DANGER

The 6800 Series Automatic Switch Control line voltage input range is 93 to 276 Vac. 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 6800 Series Automatic Switch Control must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

Applicable Software

This instruction sheet is used with software versions SG6801Installer-7.6.x, SG6801E33Installer-7.6.x, SG6801UInstaller-7.6.x, SG6802OverheadSTInstaller-7.6.x, SG6802VistaInstaller-7.6.x, SG6802-3PMInstaller-7.6.x and SG6802-3UInstaller-7.6.x. The "x" can indicate any number from 0 to 255.

The revision number and other related software component version information is found on the *Setup>General>Revisions* screen. For questions regarding the applicability of information in this chapter to future software releases, contact S&C Electric Company.

NOTICE

Several procedures in this document that require logging in to the IntelliLink® Setup Software. With firmware later than version 7.3.100, the default passwords for all user accounts, including the Admin account, must be changed before the IntelliLink software can connect to and configure a control. See S&C Instruction Sheet 1045-530, "6800 Series Automatic Switch Controls: *Setup,*" for more information.

NOTICE

For users upgrading from versions 3.4.x and earlier who have the **Features Enabled** mode set to the **Sectionalizing Only** or **Sectionalizing and Phase Loss Protection** settings, the settings-conversion process is setting the **3-Phase Voltage Loss** sectionalizing mode to "No" in version 3.6.x. To make the control functionally equivalent to the 3.4.x and earlier version with the **Features Enabled** mode set to the **Sectionalizing Only** or **Sectionalizing and Phase Loss Protection** setting set **3-Phase Voltage Loss** sectionalizing mode to the **IT-SG Only** setting.

Troubleshooting Overview

The following tools and switch control features are used to diagnose and correct problems:

LCD Screen

The alphanumeric display on the switch control faceplate provides information about the present state of the team. For an explanation of faceplate features, see S&C Instruction Sheet 1045-540, "6800 Series Automatic Switch Controls: *Operation*."

LEDs

LEDs on the switch control faceplate and circuit boards provide information about the present state of the control.

IntelliLink Setup Software

The screens display information about the switch control status, switch control operation, and switch sensor data. For an explanation of these screens, see the "Troubleshooting with IntelliLink® Setup Software" section starting on page 27.

To view the screens, a personal computer, a USB A to B cable or serial cable, and the IntelliLink software version for the specific 6800 Series switch control is required. For more information about the equipment required to use IntelliLink software, see S&C Instruction Sheet 1045-530, "6800 Series Automatic Switch Controls: *Setup*."

Electrical Interconnect Diagrams

The electrical interconnect diagrams in S&C Instruction Sheet 1045-510, "6800 Series Automatic Switch Controls: *Installation*," show the switch control wiring layout for specific installations. Figure 1 details component locations inside the switch control enclosure for reference.

Test Points

Most of the wiring in the switch control enclosure is terminated with insulation displacement connectors. To test a pin, gently slide the plastic cap sideways on the connector until the pin is exposed, and then replace the cap (to protect the wiring from dust and to prevent shorts). Avoid inserting the test probe into the connector receptacle because this may damage the connector.

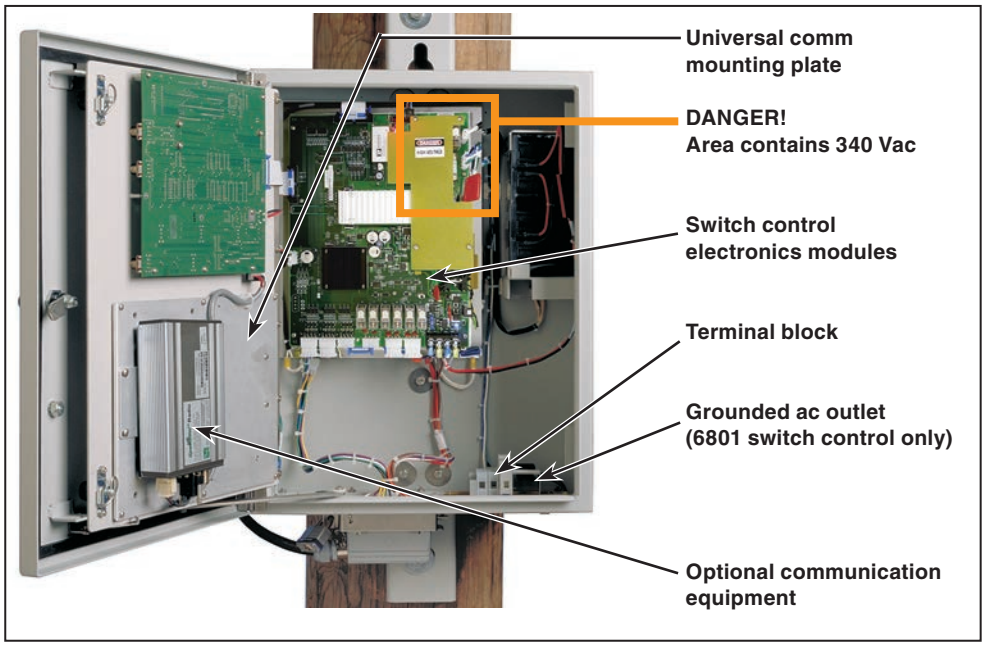

Figure 1. The 6801 Automatic Switch Control with faceplate open.

Tools Required

One or more of the following tools may be required:

- Multimeter and probes
- 4-inch long #2 Phillips screwdriver
- 4-inch long ¼-inch blade screwdriver

NOTICE

If the suggested diagnostic procedures do not resolve the problem, contact S&C Electric Company support at 1-888-762-1100. In Canada, call S&C Electric Canada Ltd. at (416) 249-9171.

Power Problems

Ac line fuse is blown

Replace the fuse. Swing open the fuse holder to replace the fuse, and close the fuse holder.

Battery does not supply power when ac power is off

See the "BAT ON LED (on PS/IO) is off" section on page 10.

Power Supply/Control I/O is not providing power

See the "BAT ON LED (on PS/IO) is off" section on page 10.

LCD Screen

LCD screen is blank or data cannot be scrolled

STEP 1. Check the LEDs. If all the switch control LEDs (including those on the PS/IO board) are off, the switch control is not receiving power. See the "AC ON LED (on PS/IO) is off" section on page 9 and the "BAT ON LED (on PS/IO) is off" section on page 10.

STEP 2. Check the faceplate circuit board connections. Check connectors J6 and J8. If one of the connectors is loose, push it into place, and then cycle power to the switch control. To cycle power to the control, remove the ac line fuse, and disconnect the red and black battery leads. Reconnect the battery, and then reinsert the ac line fuse. If the LCD screen still does not work, the LCD screen board may need to be replaced.

Backlight on the LCD screen does not turn on

Press the faceplate LAMP TEST switch. If the backlight does not turn on, but the LEDs blink, the LCD screen board may need to be replaced. If none of the LEDs blink, see the "All LEDs on the Faceplate are off" section on page 9.

LEDs

All LEDs on the Faceplate are off

STEP 1. Check the LCD screen for data. If the display contains data that can be scrolled, the processor is powered and functioning. The problem is with the door tamper switch. Make sure the magnet is present on the top inside of the enclosure door (6801 switch control) or on the low-voltage compartment door (6802/6803 switch control). Make sure the wiring to the magnetically actuated reed switch is connected. The reed switch for the 6801 control is on the circuit board, and the wiring cannot be disconnected.

STEP 2. Check the switch control power (+12 V). Check the AC ON and BAT ON LEDs (on the PS/IO board). If neither is on, the battery may be discharged. Press the BAT ON switch (on the left side of the PS/IO board, near the AC ON LED) to test this condition. Power will be restored for about one minute when the battery is low and ac power (or sensor power, if applicable) is off. If ac power (or sensor power, if applicable) is on, the battery will start recharging.

AC ON LED (on PS/IO) is off

STEP 1. Check for ac power to the switch control. Check for ac voltage between the incoming-side test point of the ac line fuse holder and the ac neutral. See Figure 2.

STEP 2. For externally powered controls, check the power line. Following utility-approved work procedures and safety practices, verify there is 120 Vac in the line providing ac control power to the switch control.

STEP 3. Check the ac line and ac neutral wiring connections. Make sure the ac line wire is securely connected to the bottom of the ac line fuse holder. Make sure the ac neutral wire is securely connected to the ac neutral connection. See Figure 2.

STEP 4. Check the ac line fuse. Swing the fuse holder open and check the fuse for continuity with a multimeter, or check for voltage at the load side of the fuse, when 120 Vac is present at the supply side of the fuse.

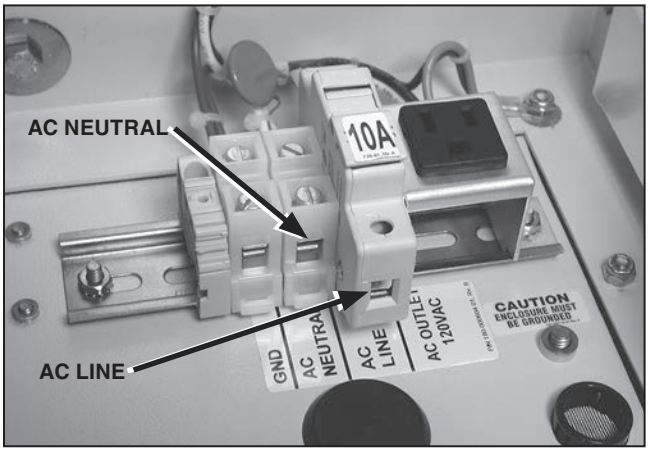

Figure 2. Test points for the ac line fuse and ac neutral connections.

STEP 5. Check the connection at PS/IO J17. Make sure the ac power connector is plugged into the PS/IO board at J17. See Figure 4 on page 21 for the location of J17.

STEP 6. For sensor-powered controls, check the voltage from the switch.

For sensor-powered controls, check the voltage from the switch. Check the dc voltage across J8, pins 1 (positive) and 3 on the PS/IO board. The voltage should be between 280 and 340 Vdc. See interconnect diagrams at the end of S&C Instruction Sheet 1045-510, "6800 Series Automatic Switch Controls: *Installation*," for the approximate connector locations.

Do not unplug PS/IO J8.

⚠ DANGER

J17 and J8 are located near the high-voltage area of the PS/IO module. When checking connections near the high-voltage area, make sure the 10-ampere ac line fuse and the 10-ampere dc whetting fuse are removed and the ac power line is de-energized. For switch controls powered from the sensors, make sure the switch interface cable(s) on the bottom of the enclosure are disconnected. **Contact with the live high-voltage section will cause electrocution.**

ANALOG PWR LED (on PS/IO) is off or blinking

Call S&C Electric Company. The PS/IO Board is malfunctioning.

BATTERY LOW LED is on

See the "Battery Low displayed on the *Operation* screen" section on page 13.

BAT ON LED (on PS/IO) is off

STEP 1. Check the BATTERY LOW LED on the switch control faceplate. When the BATTERY LOW LED is blinking, a battery test is in progress. The BAT ON LED normally turns off and on several times during a battery test.

STEP 2. Check the battery is connection.

STEP 3. Disconnect all power sources, and check the wiring from the battery. Disconnect the battery and the ac power line. For sensor-powered controls, also disconnect the switch interface cable(s). On the PS/IO board, check that the cables are connected at terminals: Bat A1+, Bat A2-, +24VOUT or +35VOUT, and BATCOM. Tighten the screws that hold these cables in place. Reconnect the battery and all other power cables.

STEP 4. Replace the battery.

CHG ON LED (on PS/IO) is off

STEP 1. Check that a battery is installed and connected to the switch control. The CHG ON LED is always off when the battery is disconnected.

STEP 2. Check the BATTERY LOW LED on the switch control faceplate. A battery test is in progress when the BATTERY LOW LED is blinking. The CHG ON LED is always off during a battery test.

STEP 3. Check for ac power to the switch control. See the "AC ON LED (on PS/IO) is off" section on page 9. The CHG ON LED is always off when ac power is off. For sensor-powered controls, check PS/IO J8, and check the voltage from the switch sensors.

STEP 4. Check the battery voltage. Disconnect the battery. With a voltmeter check that the voltage is greater than 23.0 Volts (for a 24-Vdc battery) or 35.0 Volts (for a 36-Vdc battery). Replace the battery when voltage is below this level.

STEP 5. Check the battery connections. Are the battery leads connected to the battery and the PS/IO board? Are the wires damaged?

STEP 6. Replace the PS/IO board. The PS/IO circuit board is probably bad. Call S&C Electric Company to request replacement.

Error Messages

ERROR DETECTED LED (on the faceplate) is on

Use IntelliLink software to check for troubleshooting messages. Connect the computer to the switch control and start the IntelliLink software program. Check for active messages on the *Logs* screens. Follow troubleshooting suggestions for the listed error(s).

PROCESSOR STATUS LED (on faceplate) does not blink

Blinking is the normal state and indicates the processor is functioning. Control software commands this LED to be on or off. If blinking stops with the LED on, the change command has stopped.

When blinking stops with the LED off and other LEDs are on, check for failure of the PROCESSOR STATUS LED. Hold the faceplate LAMP TEST switch to perform a lamp test. If the PROCESSOR STATUS LED goes on, a change command has not occurred.

IntelliLink software may display an error message when trying to establish communication with the switch control or a snapshot. If an error message appears, follow the corrective action given below for that message:

"IntelliLink Software won't start"

STEP 1. Close other software programs. Some software applications may interfere with IntelliLink software accessing the computer serial port. Exit any program that might take control of a serial port before using IntelliLink software.

STEP 2. Reinstall IntelliLink software on the computer. There may be a problem with one of the files. See S&C Instruction Sheet 1045-530, "6800 Series Automatic Switch Controls: *Setup*," for details.

"Could not connect to control on COM1"

See the "Opening port COM1… Trying 38400 BAUD… Connection Failed" section below.

"Incompatible Ident"

The IntelliLink software uses a different screenset (WMN file) for each type of control and automatically selects the screenset. This message appears when a screenset is selected (displayed) and tries to connect to a snapshot that requires a different screenset.

Use the correct screenset. To close the open screenset:

STEP 1. Select the **File** option from the drop-down menu and click on the **Close Screenset** option.

STEP 2. Select the **File** option from the drop-down menu and click on the **Open Snapshot** option.

STEP 3. In the Open Controller Data File dialog box, select the snapshot to view.

STEP 4. Click on the **OK** button to open both the snapshot and the correct screenset.

"IntelliLink setup incorrect or incomplete"

Reinstall the IntelliLink software on the computer. There may be a problem with one of the files. See the "Start IntelliLink Software" section in Instruction Sheet 1045-530, S&C 6800 Series Automatic Switch Control: *Setup*" for details.

"Opening port COM1... Trying 38400 BAUD... Connection Failed"

These messages appear in the Connect dialog box when the IntelliLink software in the computer cannot establish communication with the software in the switch control.

STEP 1. Check switch control power. If the LCD screen is blank, the control may have no power and cannot communicate with the computer. See the "LCD screen is blank or the data cannot be scrolled" section on page 8.

STEP 2. Check the USB or serial cable connections. Check that the USB or serial cable is plugged into the DATA PORTS access on the switch control faceplate. Check that the cable is plugged into the correct port on the computer, usually COM1 for a serial connection.

STEP 3. Try another communication port. The COM1 port on the computer may be broken or assigned to a different device. Connect the cable to another comm port. In the Connect dialog box, click on the **Change Setup** button. From the pull-down list, select the name of the port where the cable is connected. Click on the **Connect** icon.

STEP 4. Use a different USB or serial cable. The cable between the computer and the switch control may have a broken wire or pin. The cable may be wired for use with a different kind of computer, or it may be a null-modem serial cable.

STEP 5. Check the serial port on the computer. Test the serial port by trying to communicate with a modem or other serial device.

Note: Using a two-wire ungrounded extension cord to power the computer or the switch control during lab testing may damage the serial port on the computer.

"Program in the control: XXXX ... not configured for this program"

Reinstall IntelliLink software on the computer. Make sure the correct software is being installed for this switch control. For details, see the "Install IntelliLink Software" section in S&C Instruction Sheet 1045-530, "6800 Series Automatic Switch Control: *Setup*."

"Software in control incompatible with open screenset... cannot be established"

The IntelliLink software uses a different screenset (WMN file) for each type of control and normally selects the screenset. This message appears when a screenset is selected (displayed) and a switch control that requires a different screenset is being connected.

Use the correct screenset. To close the open screenset select "File" from the drop-down menu and click on the **Close Screenset** icon. Then, select "File" from the drop-down menu and click on the **Open Screenset** icon and choose the correct screenset for this switch control. When the screenset opens, select "Connection" from the drop-down menu and click on the **Connect to Device** icon.

"Software in control is XXXX ... not properly configured for this product"

Reinstall IntelliLink software on the computer. There may be a problem with one of the files. See S&C Instruction Sheet 1045-530, "6800 Series Automatic Switch Control: *Setup*," for details.

"Times New Roman font is not on your system. The project requires it."

Click on the **OK** button to close the dialog box. If the program cannot find the desired font, it displays a warning and automatically substitutes a different font.

"Cabinet Door" on the Operation screen shows the wrong door status

Check the door magnet. Make sure the magnet is present on the top inside of the enclosure door (6801 switch controls) or on the compartment door (6802/6803 switch controls). Make sure the wiring to the magnetically sensitive reed switch is connected. The 6801 switch control reed switch is on the circuit board and cannot be checked.

"Battery Low" displayed on the Operation screen

STEP 1. Test the battery. Press the BATTERY TEST switch to start a battery test. Replace the battery when the BATTERY LOW LED remains on after it stops blinking and the battery test has completed. When replacing the battery, run the test again to refresh battery status.

STEP 2. Restart the switch control. If the Battery Low message is still active or the BATTERY LOW LED is still on after replacing the battery, remove the ac line fuse, then disconnect the battery cable. For sensor-powered controls, also disconnect the external signal cable(s). Reconnect the battery cable, and then replace the ac line fuse and signal cable(s).

"Battery Charger Bad" on Logs>Status Point Log screen

Call S&C Electric Company. The battery is being charged at an abnormally high voltage. The PS/IO board may need to be replaced. This message also reports when the load resistors are disconnected from the PS/IO board at J11.

"Open/Close Contacts Bad" on Logs>Status Point Log screen

STEP 1. Check the switch control cable. The switch control must be connected to a switch to remove this active message. Check that the cable from the line switch is securely connected to the switch interface connector(s) on the bottom of the switch control. Check that the line switch and cable(s) are correctly connected and they are not damaged.

STEP 2. Check the dc whetting voltage. Check the voltage between terminals #1 and #4 on J4 of the PS/IO board. The voltage should be the same as the battery voltage on terminals #2 and #3. If the voltage is 0 and the BAT ON LED is off, see the "BAT ON LED indicator (on PS/IO) is off" section on page 10.

STEP 3. Check the red 10-ampere dc whetting fuse (on the PS/IO board). With the fuse installed, check the dc whetting fuse using the test points and a voltmeter. Replace the fuse if bad.

Incorrect Real-Time Data

Real-time data is all zero on the Site-Related or Operation screen

STEP 1. Check the switch control cable. Check that the cable is securely connected to the line switch and to the connector(s) on the bottom of the switch control. Check that the cable is not damaged.

STEP 2. Check the Sensor Conditioning board connections. Carefully check that all connections to the sensor conditioning board are secure. Make sure the three-pin dc power connector (on the top center of the sensor conditioning board) is firmly in place.

STEP 3. For externally powered controls, check the power line. Following utility-approved work procedures and safety practices, verify the distribution circuit is energized and load current is flowing through the switch. Verify ac control power is connected to the control.

STEP 4. For sensor-powered controls, check the voltage from the switch.

STEP 5. Check the dc voltage across PS/IO J8, pins 1 (positive) and 3. The voltage should be between 280 and 340 Vdc. Do not unplug PS/IO J8.

⚠ DANGER

This is a high-voltage area of the PS/IO board and may provide a serious shock. **Contact with the live high-voltage section will cause electrocution.**

Real-time voltage or current or kvar values are wrong

STEP 1. Restart the switch control software. On the *Setup>Validate/Apply* screen, click on the **Apply** button. Setup parameter values only take effect after the **Apply** button has been selected.

STEP 2. If applicable, check the values on the *Setup>General>Sensor Configuration* screen. Confirm the switch serial number(s) on the sensor-calibration data sheet(s) and on the installed switch(es) are identical. The sensor calibration information bulletin is shipped with the switch and is usually stored in the door pocket of the switch control or low-voltage cabinet. Then, confirm the values on the *Setup>General>Sensor Configuration* screen exactly match the values on the information bulletin. If changing any values, reinitialize the switch control with the **Apply** button on the *Setup>Validate/Apply* screen.

STEP 3. Check values on the *Setup>General>Site-Related* screen. Confirm the **Line kV to 120 Vac Base Ratio**, **Voltage Transformer Wiring**, and **Voltage Sensors Present** settings are correct for this switch and distribution system. If changing any setting, click on the **Apply** button on the *Setup>Validate/Apply* screen.

Table 1. Voltage Transformer Wiring for Sensor Conditioning Module Jumper

Distribution System	Line kV to 120 Vac Base Ratio	Voltage Transformer Wiring
Delta voltage reporting	Phase-to-Phase voltage / 120 Volts●	Phase-to-Phase
Wye voltage reporting	Phase-to-Neutral voltage / 120 Volts●	Phase-to-Neutral

● For example: 12,000-Volt distribution-line voltage / 120 Volts = 100:1 ratio.

STEP 4. Check the Sensor Conditioning module jumper. Make sure the correct jumper (wye or delta) is installed for this distribution line. Make sure the side of the jumper with more wire loops (two loops for wye, three loops for delta) is facing toward the bottom of the enclosure. See Tables 1 and 2 and S&C Instruction Sheet 1045-510, 6800 Series Automatic Switch Control: *Installation*," for the jumper location.

Table 2. Sensor Conditioning Module Jumper Use with Sensor Types

Wires & Grounding Type	Number of Voltage Sensors	Use
Uni-grounded Wye Three-Wire System	3 or 6	Delta jumpers
Uni-grounded Wye (Primary Neutral) Four-Wire System	3 or 6	Delta jumpers
Multi-grounded Wye Four-Wire System	3 or 6	Wye jumpers
Delta System	Phase-to-ground connected sensors should not be used with ungrounded delta systems.	

Team Does Not Communicate

Carry out the following general procedure at each member of the team, starting at the team member that is the most likely source of the problem.

STEP 1. Check the link between the switch control and its team communication device. Make sure the communication cabling is firmly in place at both ends and the communication device has power.

STEP 2. Check all other communication ports being used. If the switch control is directly connected to another team member or has a radio or cable connection to a SCADA master station, check all those cable connections. Test communication between the switch control and the other device.

STEP 3. Check the *Setup>Communications* screen settings. Make sure the baud rates, RTS active durations, and duplex settings are correct for the installed communication hardware.

STEP 4. If this switch control uses a radio, check the radio antenna. Check that the radio antenna is in place and the antenna cable is attached at both ends.

STEP 5. If this switch control uses a radio, check radio connectivity. Check that the radio at this location can see all the other radios it should see. For more details, see the radio manufacturer's documentation.

Team does not reconfigure the circuit

STEP 1. Check the **Team Logic** setpoint. Connect the computer to the switch control and start IntelliLink software. On the *Setup>Restoration> IntelliTeam SG>Team 1* screen, make sure the **Team Logic** setpoint is enabled for this team.

STEP 2. Check the other *Setup>Restoration>IntelliTeam SG>Team 1* screen settings. Make sure the DNP/RTU Address entry is correct for each team member. Also, check that the **Normal Open/Closed** setpoint is correct for each switch in the team and the **Normal Sw Func** setpoint is correct. Make sure the **Maximum Capacity** settings are appropriate for the circuit conditions.

STEP 3. Check the values on the *IntelliTeam SG>Team Summary* screen. Make sure the **Ready Status** field is in the **Ready** state. If not, check the **Operational Status**, **Line Status** and **Configuration Status** fields on the *IntelliTeam SG>Team 1* screen for reasons the team may not be ready.

STEP 4. Check team communications. See the "Team Does Not Communicate" section above.

STEP 5. Check the circuit configuration. Make sure the circuit has not been temporarily reconfigured because of construction or maintenance.

STEP 6. Check whether an event was logged. Check the *Logs>Status Point Log* screen to see whether the switch control detected and took action on an event.

STEP 7. Check the sectionalizing parameters. Check that the *Setup>General> Automatic Operation* and *Setup>General>Fault Detection* screens have the correct parameters for a **Sectionalizing** operation to occur.

Team does not return the circuit to normal

STEP 1. Check the **Return to Norm Mode** setpoints. Connect the computer to the switch control and start IntelliLink software. On the *Setup>Restoration> IntelliTeam SG>Team 1* screen, check that the **Rtn to Norm Mode** setpoint is set properly for this team, which is the **Open** or **Closed** state.

STEP 2. Check the present operation mode for each team member. On the *IntelliTeam SG>Team Summary* screen, make sure the **Ready Status** field is in the **Ready** state. If not, check the **Operational Status**, **Line Status**, and **Configuration Status** fields on the *IntelliTeam SG>Team 1* screen for reasons the team may not be ready.

STEP 3. Check team communications. See the "Team Does Not Communicate" section on page 16.

STEP 4. Be sure **Automatic Operation** mode was not disabled. If the **Automatic Operation** mode was disabled at any team member while the circuit was in its reconfigured state, the **Return to Normal** process is canceled.

*LCD screen shows ***ALARM*** or ***FAULT****

Check the *IntelliTeam SG>Team 1* screen. Check the **Operational Status**, **Line Status**, and **Configuration Status** fields on the *IntelliTeam SG>Team 1* screen for reasons that the team may not be in the **Ready** state.

DNP communication between PC and team members is not working

STEP 1. Check team communication. See the "Team Does Not Communicate" section on page 16

STEP 2. Check that the DNP cable is connected. Make sure the serial cable from the computer is connected to the cable from the COMM PORT (usually PORT B) on the bottom of the faceplate circuit board. Also check that the six-pin IDC connector is fully seated in the COMM PORT. If using Ethernet, check that the cable is connected to the ADD-ON Ethernet port.

STEP 3. Check the protocol and DNP address being used by IntelliLink software. Start IntelliLink software on the computer. From the drop-down menu, select the **Tools** option. Then click on the **Options** selection and click on the **Communication Setup** option. Make sure the **DNP** option is the selected protocol. Also check that the **Peer Address** setting matches the **DNP/RTU Address** setting of the team member to be communicated with. Make sure the **Timeout** and the **Baud Rate** settings are also correct.

STEP 4. Check for error messages on the *Diagnostics>Comm* screen. To perform this check, connect directly to the faceplate communications port and select the **TTY** option in the IntelliLink Communications Setup dialog box.

OVERCURRENT FAULT LED indicator did not show a load-side fault

STEP 1. Check whether the fault was logged. Check the *Logs>Status Point Log* screen to see whether the switch control detected and took action on the fault. If it logged the fault, go to Step 2. If not, go to Step 3.

STEP 2. Check when the fault cleared. Check the *Logs>Status Point Log* screen to determine whether the fault was cleared. The faceplate OVERCURRENT FAULT LED turns off when:

- Three-phase line voltage is sensed, the switch is in the **Closed** state, and 45 minutes have elapsed
- The faceplate SCADA REMOTE/LOCAL switch is operated
- The SCADA REMOTE/LOCAL switch is set to the **Remote** state and the OVERCURRENT FAULT indicator is cleared via SCADA

Note: When reinitializing the switch control using IntelliLink software, the OVERCURRENT FAULT indicator turns off regardless of whether the conditions above are met.

STEP 3. Check the *Setup>General>Fault Detection* screen settings. If no fault was recorded, check the values for the **Phase** and **Ground Fault Detection Current Level** setpoints and the **Phase** and **Ground Fault Duration Time Threshold** setpoints on the *Setup>General>Fault Detection* screen.

SCADA commands are ignored by the switch control

STEP 1. Check for switch control power. See the "AC ON LED (on PS/IO) is off" section on page 9 and the "BAT ON LED (on PS/IO) is off" section on page 10.

STEP 2. Check the faceplate SCADA Control REMOTE/LOCAL switch. Press on the CHANGE button to select the **Remote** mode.

STEP 3. Check the RTU address. On the *Setup>Communications>DNP* screen, check which Local Device DNP Address is assigned to this switch control. Make sure the SCADA master station is sending commands for this control to the correct DNP address.

STEP 4. Check the communication hardware. See the manufacturer's documentation for details.

Functional Description

The Power Supply/Input Output (PS/IO) board accepts +/- 170 Vdc from the SPA board, if sensor power is available, and/or 120 Vac external power, if available. If both ac and sensor sources are available, the control automatically uses control power and switches to sensor power if control power is lost. When 6801 controls have the **E33** option, line power can be obtained from either side of the switch. The control will take power from one or both sides depending on the available line power. If sensor power is disconnected, the board will switch to ac external power. The PS/IO board provides +12 Vdc for the front panel board, +/- 15 Vdc for the ASP and SPA boards, and 24-Vdc battery charging. It is also connected to the battery-testing resistors and provides power for the battery heater.

The PS/IO board accepts status input from the line switch(es) and provides the control-output signal to operate the line switch(es). Input and output signals are processed through the X-Bus converter. See Figure 3 on page 20 and Figure 4 on page 21.

Board Functions

- TP = Test Point
- Colors: Bk=Black, Rd=Red, Br=Brown , Or=Orange, Yl=Yellow, Gr=Green, Bl=Blue, Wh=White
- Pin numbers read top to bottom or left to right
- Descriptions apply to both 5800 and 6800 Series Controls
- Pin-outs are shown for the 6801 control.
- FIC = Field Interface Connector, a 2-inch (51 mm) x 5-inch (127 mm) Harting connector on the bottom of the enclosure
- STOV = Short Term Overvoltage
- VB = A voltage referenced to the battery
- Ac L Switched = Ac Line input measured after the STOV relay
- J1-4 = references Connector J1, Pin 4

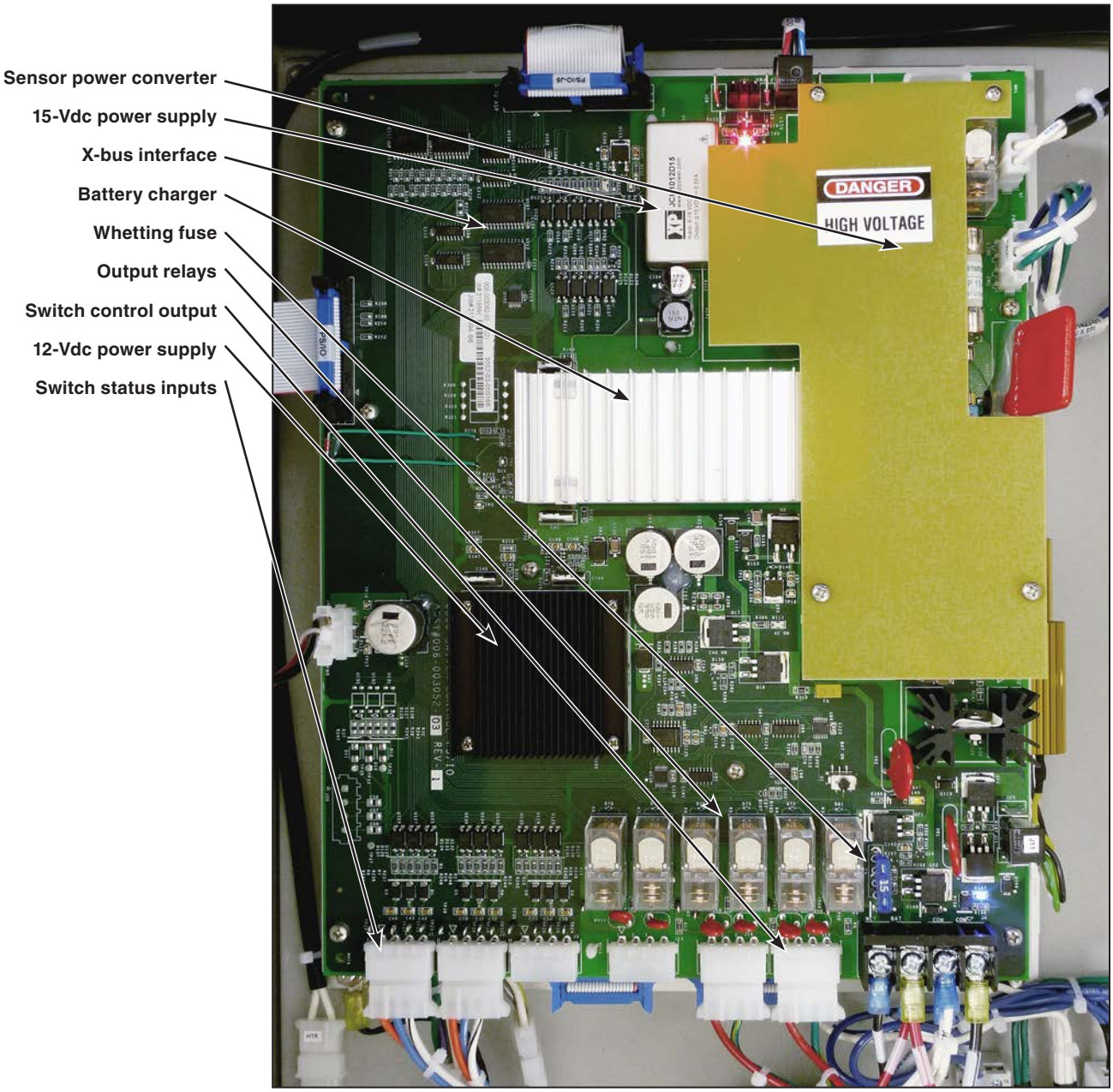

Figure 3. PS/IO board components.

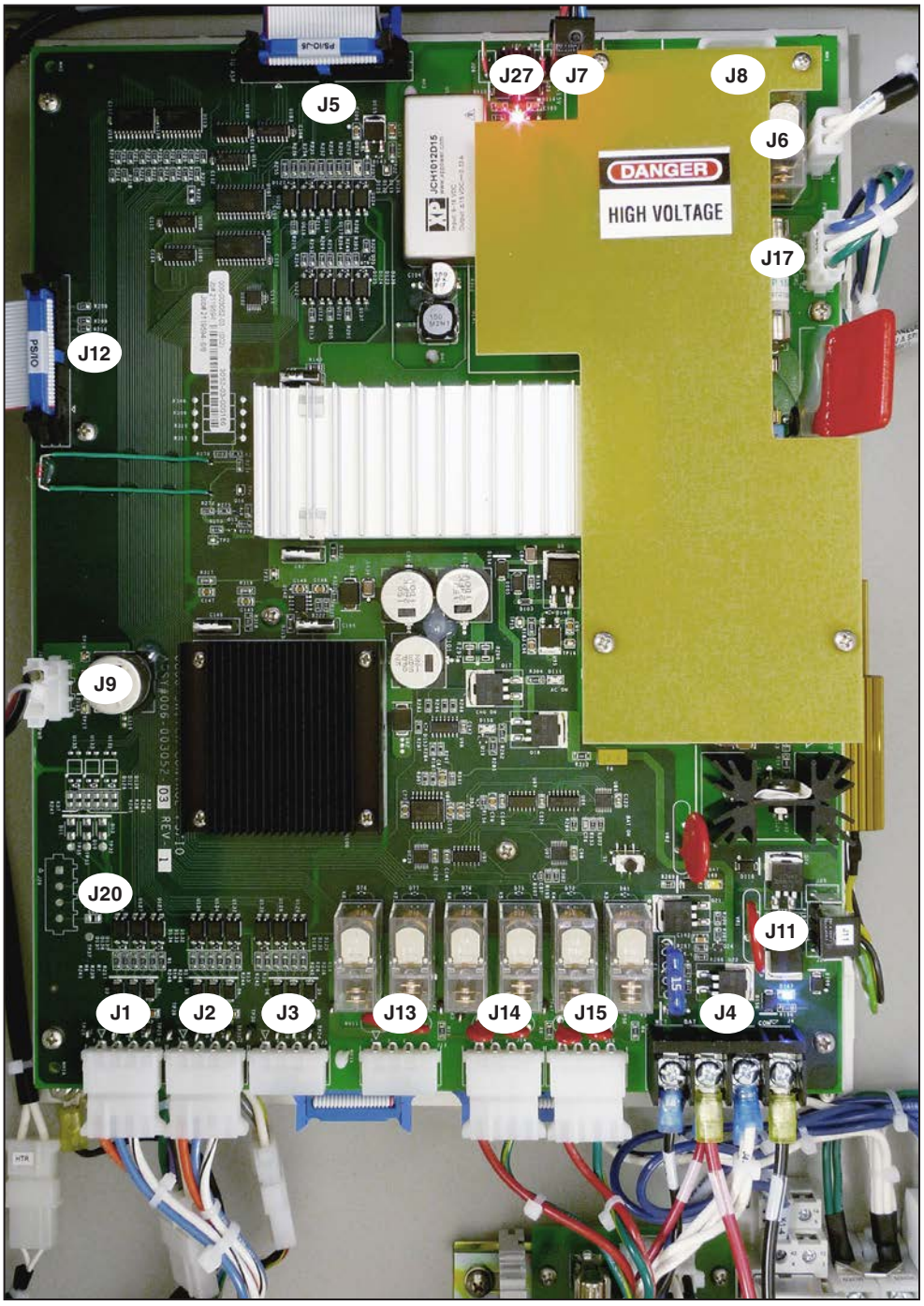

Figure 4. PS/IO connector locations.

PS/IO Board Connectors (see Figure 4):

J1 Switch 1 status
J2 Switch 2 status
J3 Switch 3 status
J4 Battery terminals
J5 Ribbon to ASP board
J6 Battery heater
J7 Power to ASP and SPA boards
J8 Power from SPA board
J9 Front panel power
J11 Battery test
J12 Ribbon to Front Panel
J13 Operate Switch 3
J14 Operate Switch 2
J15 Operate Switch 1
J17 120 Vac Control Power
J20 Auxiliary Inputs
J27 Power to ASP and SPA boards

Connectors

J1, J2, J3 Line Switch Status

With the J1, J2, or J3 connector plugged in, there is 24 Vdc to ground on Pin 1. There are 0 V between Pin 1, common, and the pin matching the line switch status. There is 24 Vdc between common and the pin not matching the line switch status. So when the line switch is closed, there will be 0 V between common and Pin 3 but there will be 24 Vdc between Pin 1 and Pin 2.

With the J1, J2 or J3 connector removed from the PS/IO, there are 0 ohms between the common on the wiring harness connector and the pin matching the line switch status. There will be an open circuit between the common and the pin not matching the line switch status. So if the line switch is closed, there will be a short between Pin 1 and Pin 3 and an open between Pin 1 and Pin 2.

If installed, the visual disconnect works the same way as when in a **Closed** state. If the visual disconnect is closed and latched, there will be a short between Pins 1 and 4. If it is not closed and latched, there will be an open connection between Pins 1 and 4. When the connector is plugged into the PS/IO board, there will be 24 Vdc between Pins 1 and 4 if the visual disconnect is in the **Open** position and 0 V if it is in the **Closed** position.

J4 Battery Terminal Strip

If there is no voltage on pins 3 & 4 and the yellow BATT LED is off, manually connect the battery by pushing the black button. If the yellow BATT LED is on, there should be +24 Vdc on Pin 3. If there is no voltage on Pin 4 and the blue WHET ON LED is off, the blue automotive style fuse is probably blown.

J6 Battery Strip Heater

The heater is powered when software turns it on and when there is external ac power. Sensor power is not sufficient to run the battery heater, so it operates only when there is external ac control power.

J7 DC Power to ASP & SPA Boards

There are two identical and interchangeable connectors. One is for the ASP board and the other is for the SPA board. The old-style cable that plugs into both the ASP and SPA boards can also be used in a single J7 connector.

J8 +/- 170 Vdc

Always present is +/- 170 Vdc when either sensor power or external ac power is connected. When there is no sensor power connected and 120 Vac is connected, J8 should be covered because 340 Vdc is present and the high-voltage cover does not extend over the J8 connector pins.

The SHDN line, Pin 4, is used to temporarily shut off power collection for calibration purposes.

J9 Front Panel Power

Test points TP17 and TP18 are surface mount and are very fragile. Do not put any tension on these test points or they will pull off the circuit board.

J11 Battery Test Resistors

On Pin 2, 24 Vdc is always present. Pins 1 and 3 are switched on during the battery test to provide two different load levels.

J13, J14, J15 Switch Operation for Line Switch 1, 2, or 3

When the CLOSE or OPEN faceplate switch is pushed or when a **Close** or **Open** SCADA command is issued, a 1-second 24-Vdc pulse is sent to the appropriate J13, J14, or J15 pin. If the line switch status does not change, a second pulse is sent.

There are test points for pins 2 and 4 even though nothing is connected to these pins. The Pin 4 test point measures the whetting voltage available to the close relay. Pin 2 measures the whetting voltage available to the open relay and will be interrupted during the time that the **Close** command is asserted. This prevents a **Close** and **Open** command from being asserted at the same time.

J20 Auxiliary Contacts

Three dry contacts may be used for customer inputs, such as Low Pressure Alarm, Vault Door Open, High Water Alarm, Smoke Detector, or any other alarm that can close a dry contact. There presently is no hardware or software support for these contacts. A future harness could connect a terminal strip on the communications plate to an Amp connector that plugs into J20. The customer could then connect the alarm wires to the terminal strip. Future software will monitor these auxiliary contacts and report a contact closure as a SCADA event.

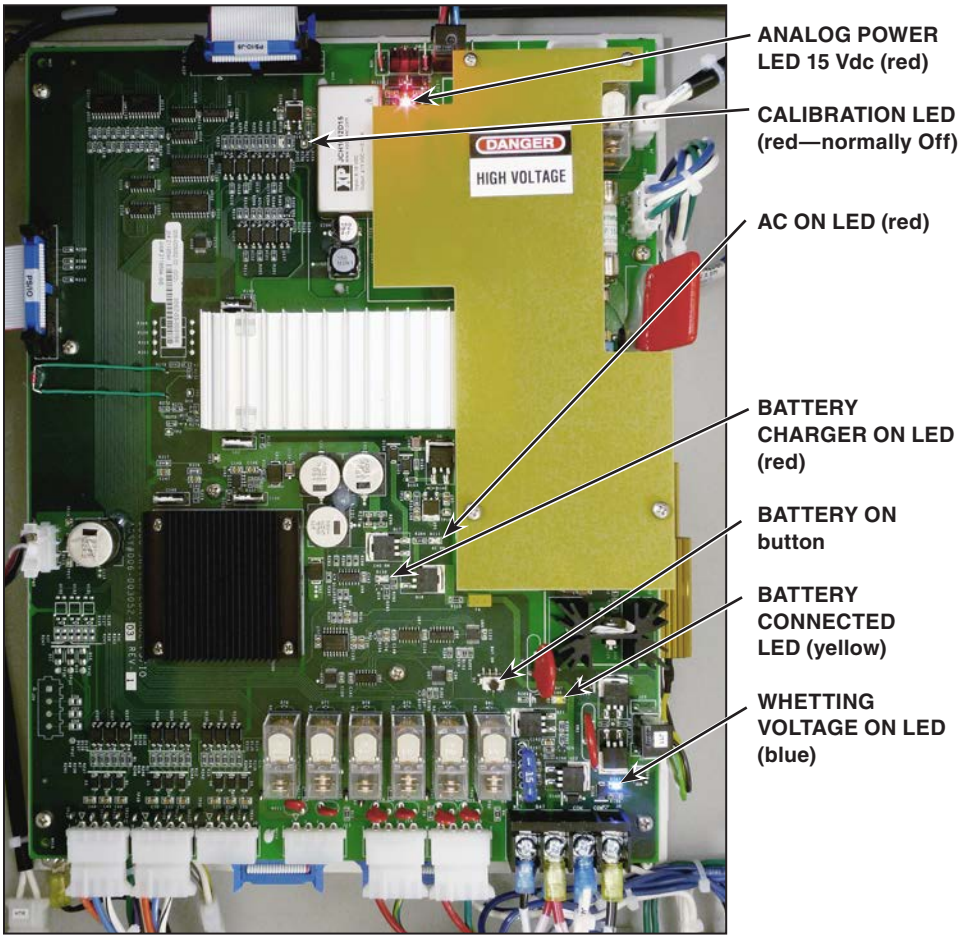

Figure 5. Power supply LEDs and the Battery On button.

Indicators

Five LEDs should be on for normal operating conditions and one should be off. See Figure 5 on page 23.

The ANALOG POWER red LED shows that +/-15-Vdc supply is working and sending power to the ASP and SPA boards. The LED is connected to the output of the voltage converter. If it is on, +/-15 Vdc should be present.

The CALIBRATION red LED is for calibration and should not be on. This LED is only used for factory calibration.

The AC ON red LED indicates sensor power or 120-Vac external power is connected.

The BATTERY CHARGER ON red LED shows the battery charger is working and charging the battery. This LED will be off during automatic or manual battery testing.

The BATTERY CONNECTED yellow LED shows the battery is connected to the PS/IO board. If this LED is not on, press the BATTERY ON black button to do a manual connection. If the battery is bad, it will disconnect after the manual connection is made.

The WHETTING VOLTAGE ON blue LED shows whetting voltage is going to the line switch. When the BATTERY ON LED is on and this LED is off, the blue automotive fuse is probably blown.

The black BATTERY ON button makes a manual connection to the battery.

Test Points

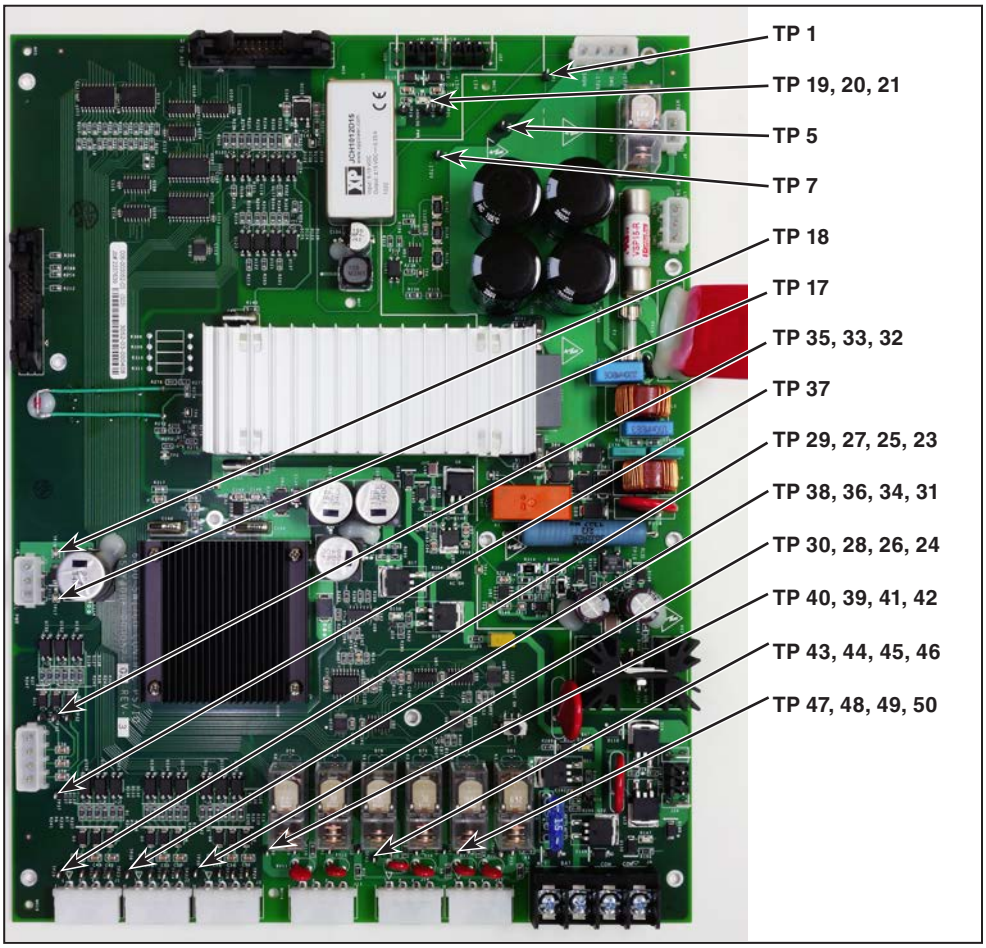

Figure 6. Test point locations on the new PS/IO board.

There are 71 test points for troubleshooting and monitoring the status and control signals to and from the line switch. There are three test point types: Field Troubleshooting, Engineering Testing, and Manufacturing. See Figure 6 on page 24.

Field Troubleshooting—These test points are loops through-hole soldered to the circuit board. A scope probe or small alligator clip can be easily attached. The +/- 170-Vdc test points are located under the high-voltage cover. See Table 3.

Table 3. Field Troubleshooting Test Points

Test Point	Description	Test Point	Description
TP1 J8-4	+170 Vdc Bus	TP5 J8-2	170 Vdc Bus Common
TP7 J8-3	-170 Vdc Bus	TP19 J7-1	+15 Vdc
TP20 J7-2	+/- 15 Vdc Common	TP21 J7-3	-15 Vdc
TP23 J1-4	Visual Disc 1 Status	TP24 J3-4	Visual Disc 3 Status
TP25 J1-3	Line Switch 1 Close Status	TP26 J3-3	Line Switch 3 Close Status
TP27 J1-2	Line Switch 1 Open Status	TP28 J3-2	Line Switch 3 Open Status
TP29 J1-1	Common	TP30 J3-1	Common
TP31 J2-4	Visual Disc 2 Status	TP32 J20-4	Aux 3
TP33 J20-3	Aux 2	TP34 J2-2	Line Switch 2 Close Status
TP35 J20-2	Aux 1	TP36 J2-3	Line Switch 2 Open Status
TP37 J20-1	Aux Common	TP38 J2-1	Common
TP39 J13-1	Close Switch 3 Command	TP40 J13-2	Switch 3 Close Whetting Voltage +24 Vdc
TP41 J13-3	Open Switch 3 Command	TP42 J13-4	Switch 3 Open Whetting Voltage +24 Vdc
TP43 J14-1	Close Switch 2 Command	TP44 J14-2	Switch 2 Close Whetting Voltage +24 Vdc
TP45 J14-3	Open Switch 2 Command	TP46 J14-4	Switch 2 Open Whetting Voltage +24 Vdc
TP47 J15-1	Close Switch 1 Command	TP48 J15-2	Switch 1 Close Whetting Voltage +24 Vdc
TP49 J15-3	Open Switch 1 Command	TP50 J15-4	Switch 1 Open Whetting Voltage +24 Vdc

Engineering Testing—These test points are surface-mounted loops designed for lab use. They can be pulled off the board if any mechanical force is applied, such as dropping an attached meter. See Table 4.

Table 4. Engineering Testing Test Points

Test Point	Description	Test Point	Description
TP2	Battery Charger	TP3	Ac L Switched
TP4	Vicor Pin 2 Gate	TP6	Common
TP8	STOV Meas. Supply +	TP9	12.5 STOV Regulated Supply
TP10	STOV Meas. Supply -	TP11	STOV Comparator Output
TP14	+11 VB	TP15	+5 VB
TP16	+5 VB Common	TP17 J9-2	+12 Vdc
TP18 J9-1	+12 Vdc Ground	TP22	+5 Vdc Digital
TP72	Vicor Pin 2 Output		

Manufacturing—These test points are solder pads located on the back side of the board. See Table 5.

Table 5. Manufacturing Test Points

Test Point	Description
TP51	Dc BUS-Vicor Tripped Output
TP52	LW-Switched Charger Voltage
TP53	CHRGR – Charger Voltage
TP54	COM – Charger Reference
TP55	Vicor Pin 2 Gate
TP56	STOV Measurement Supply +
TP57	12.5 V STOV Regulated Supply
TP58	STOV N Capacitor Neutral
TP59	STOV Measurement Supply -
TP60	STOV Comparator Output
TP61	+11 VB
TP62	+5 VB
TP63	BAT LED Voltage
TP65	BAT Sw-Pushbutton Signal
TP66	BAT-Front Panel Control for BAT Connection
TP70	+5 Vdc Digital
TP71	+12 Vdc Ground

PS/IO Board Replacement

S&C Instruction Sheet 1045-574, "6800 Series Automatic Switch Control: *PS/IO Board Installation*," describes the procedure to install the new series Power Supply/Input-Output circuit board in an 5800 Series or 6800 Series switch control.

If the original board malfunctioned, it may have generated errors in the Status Point log, such as setting the **Temperature Trouble** status point to **Active** mode. After installing the new PS/IO board, connect to the control and execute the **Clear Electronics Bad** command. This command is on the *Operation* screen in IntelliLink software version 6 and on the *Setup>General* screen in IntelliLink software version 5. See Figure 7.

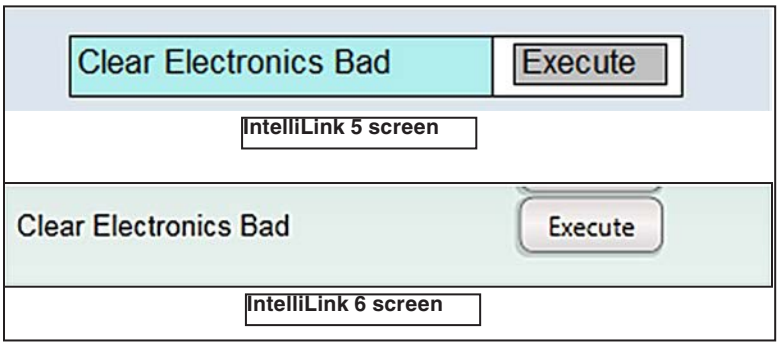

Figure 7. Clear Electronics Bad command.

Operation Screen

NOTICE

With firmware later than version 7.3.100, the default passwords for all user accounts, including the admin account, must be changed before the IntelliLink software can connect to and configure a control. See Instruction Sheet 1045-530, "6800 Series Automatic Switch Controls: *Setup,*" for more information.

The *Operation* screen presents 6800 Series Control status information and can issue operation commands. User-assigned location-identification information (Connected to and Location) is shown at the top of every screen. See Figure 8.

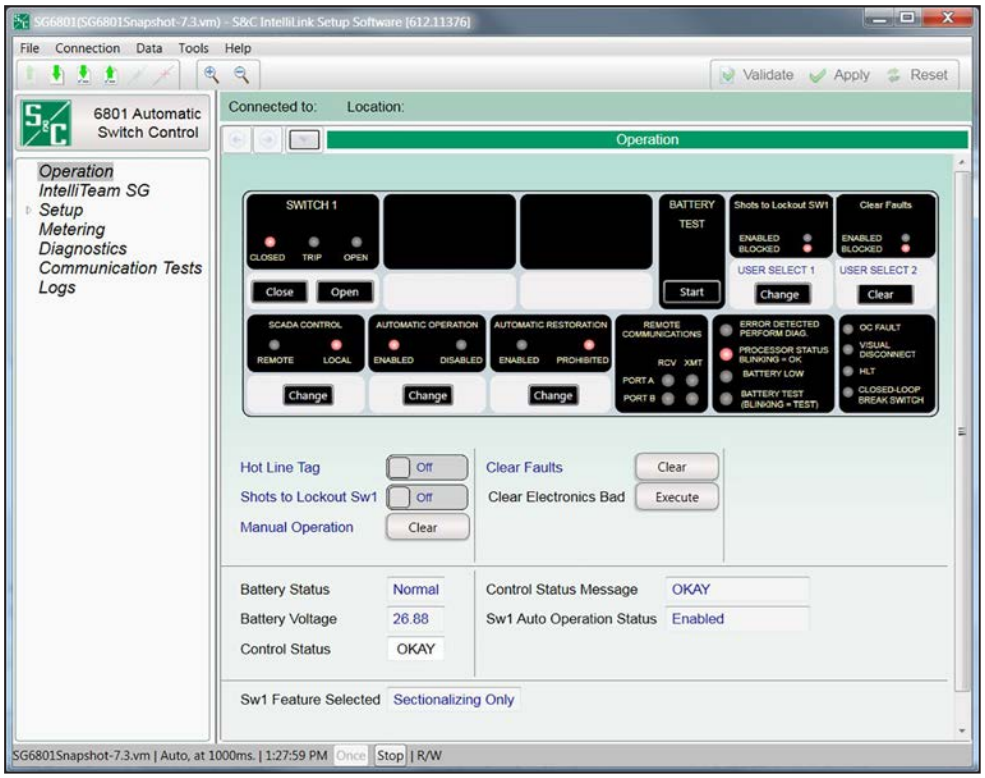

Figure 8. The *Operation* screen (6801/2/3 shown).

Switch Position Indication and OPEN/CLOSE Command Buttons

The switch position is indicated for each operated switch, and the switches can be manually operated from this screen. To operate a switch, the **IntelliLink Remote Commands** setting must be enabled on the *Setup>Security* screen.

The switch position is indicated by switch contact information for each line switch:

Closed—The switch position contacts indicate a closed switch position.

Trip—This indicates the switch was opened automatically and it goes off when the switch is in the **Closed** position.

Open—The switch position contacts indicate an **Open** switch position.

Battery Test

The **Start** button manually starts the battery test.

User Select Commands

These buttons change the status for the two **User Select** commands configured on the *Setup>General>User Commands* screen.

SCADA Control

When set to the **Remote** state, SCADA commands are permitted. When set to the **Local** state, SCADA commands are blocked. The **SCADA Control** mode can be set to the **Local** state from the front panel, a local connection (serial or Wi-Fi), and with an IntelliLink Remote software command.

NOTICE

When the **SCADA Control** mode is set to "Local" by an IntelliLink software command, the **Remote Operation** state can only be enabled by a local connection (serial or Wi-Fi) at the 6800 Series control site.

Automatic Operation

This setting enables or disables automatic operation.

Automatic Restoration

This setting enables or prohibits automatic restoration.

Remote Communications

These indicators show communication activity.

Error Detected Perform Diagnostics

This indicates an active error condition.

Processor Status Blinking = OK

This shows the processor heartbeat, and blinking indicates proper operation.

Battery Low

This indicates a marginal battery condition that may not permit line switch operation.

Battery Test

This indicator blinks to show a battery test is in progress.

OC (Overcurrent) Fault

This indicates fault current has been registered on any phase.

Note: Vista® Underground Distribution Switchgear, with an overcurrent relay and the **Fault Interrupter Option** setpoint set to "Present" on the *Setup>General>Sensor Cfg* screen, will cause the OC FAULT indicator to blink when fault current is sensed.

Visual Disconnect

This indicates an open visual disconnect when one is installed.

External Local/Remote Switch *(for SG6802Vista only)*

This indicates the External LOCAL/REMOTE switch on the switch operator is in the **Local** mode, and the switch operator will not respond to **Open** or **Close** commands from a 6802 switch control. The ERROR DETECTED virtual LED on the *Operation* screen will also be lit. This condition is indicated on the *Logs>Status Point Log* screen as "SW1 Disabled/Local Mode" or "SW2 Disabled/Local Mode." This condition is recorded in the historical log using the same text and reports under the SWX category.

When the LED is off, it indicates the external switch operator is in the **Remote** mode, and the switch operator will respond to **Open** and **Close** commands from the 6802 switch control.

The **External Local/Remote** feature is not the same as the **Local/Remote** feature that manages operation of the 6802 switch control.

Low Gas *(Only applicable to SG6802Vista software)*

This indicates SF_6 gas pressure is low for the Vista Underground Distribution Switchgear.

HLT (Hot Line Tag) (Only applicable to SG6801 and SG6801E33 software)

Indicates an active **Hot Line Tag** status.

Closed-Loop Break Switch *(Only for SG6801, SG6802Vista, and SG68023PM software)*

When lit, **IntelliTeam** logic has set this control as the designated load-center switch and enabled the **Shots to Lockout** mode for one shot. The **Shots to Lockout** indication will be "On." This switch will break the loop if an event occurs.

This is only displayed on the IntelliLink *Operation* screen; there is no CLOSED-LOOP BREAK SWITCH LED on the faceplate. The faceplate displays the active **Shots to Lockout** mode by blinking the SWITCH CLOSED LED, and on the LCD screen under the "Maintenance" section as "Shots-to-Lockout: ON."

Hot Line Tag *(Only applicable to SG6801 and SG6801E33 software)*

The **Hot Line Tag** mode can be applied by selecting "On." The **Hot Line Tag** mode can be set by this button, a software screen command, and a SCADA command. The **Hot Line Tag** mode can only be cleared by the same method used to set it.

Note: Hot Line Tag mode cannot be applied if the switch is in the **Closed** state. Clicking on the **Hot Line Tag** button in the **Closed** state opens a dialog box with two buttons: **OK** and **Cancel.** Clicking on either button closes the window and terminates the request.

Shots to Lockout Switch 1/2

This enables the **Shots to Lockout** feature, which is the configured number of three-phase voltage losses that must be detected during the configured **Shots to Lockout Time Threshold** setting before the control can trip open the switch.

Manual Operation

The **Clear** button clears a manual operation to return the IntelliTeam system to the **Ready** state.

Clear Faults

This **Clear** button clears all fault indicators.

Clear Electronics Bad

This **Execute** button clears all bad electronics indicators.

Battery Status

This is the overall status of the battery system:

Normal—Enough charge is present to operate the line switch.

Low—The battery is in a marginal condition and line switch operation may not be possible.

Bad—The battery charge is too low to operate the line switch.

Low Impedance—Battery resistance is below 15 milliohms for 24- or 36-Vdc systems.

Battery Voltage

This shows the battery voltage under normal operating load with the charger disconnected. If ac power is present, the switch control updates this voltage only during a battery test. If ac power is not present, this is the real-time measurement of battery voltage.

Control Status

This can indicate:

OKAY—The control is functioning correctly.

Alarm—The control is functioning normally, but maintenance is required (for example, battery replacement).

Warning—The control can function in a limited capacity (for example, loss of SCADA communication).

Error—The control cannot function properly and may not be able to open or close.

Maintenance Mode—The control cannot function properly and an application program needs to be loaded.

Control Status Message

This can indicate:

OKAY—The control is operating correctly.

Problem Present—An error has been detected that is not a **Warning** or **Alarm** condition.

Switch 1/2 Auto Operation Status

SCADA commands can enable/disable the **Automatic Operation** mode for each switch. This indicates a **Disabled** condition for both switches when the **Automatic Operation**

mode has been disabled on the *Operation* screen or the faceplate. When the **Automatic Operation** mode has been enabled on the *Operation* screen or the faceplate, this indicates the state of the **Automatic Operation** mode configured for each switch by SCADA. This will have the same indication for both switches if a SCADA command has not been received.

Switch 1/2 Feature Selected

The **Automatic Operation** setting is configured on the *Setup>General>Automatic Op.* screen. This indicates the setting configured for each switch. Possibilities are:

- Sectionalizing Only
- Three-Phase Voltage Loss
- Phase Loss Protection
- Phase Loss Protection with Automatic Reclose

Note: If there is no action, this field displays "Normal."

Switch 1/2 Identification (only for the Dual-Overhead Switch Control)

These read-only fields are configured on the *Setup>General>SG6800* screen.

Pad-Mount Configuration

This shows the settings for pad-mount configuration only, set on the *Setup>General>Sensor Config.* screen.

Switch Action Status

This field indicates the status of SW1/SW2 if an active user-defined input has resulted in the switch action being blocked. The following statuses will be displayed in this field:

- Sw1 Close Op Blocked
- Sw1 Open Op Blocked
- Sw2 Close Op Blocked
- Sw2 Open Op Blocked

Statuses only become active when the **User-Defined Input** feature is also set to block operation (block **Close** operations or block both **Open** and **Close** operations). The statuses clear when the **User-Defined Input** status points go inactive.

Metering Screen

The *Metering* screen is shown in Figure 9. All values are time-averaged and reported locally and via SCADA on a one-second interval.

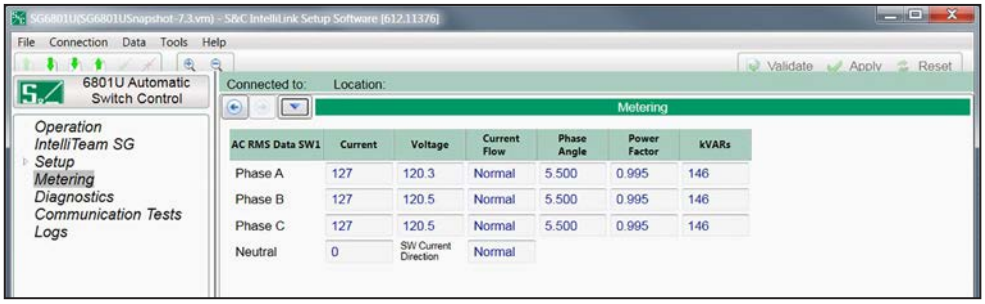

Figure 9. The *Metering* screen (6801/2/3 shown).

Primary Metering Data

Current

The current sensor output is scaled according to the calibration factors entered on the *Setup>General>Sensor Config* screen.

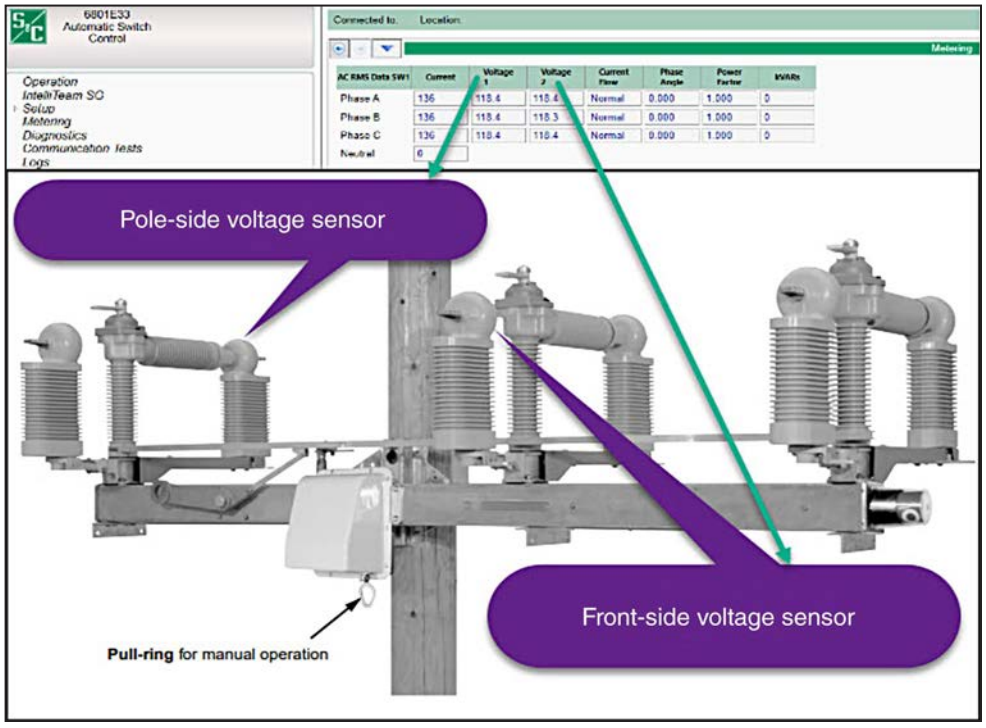

Figure 10. The Scada-Mate Switching System "-E33" option.

Voltage

This represents the true RMS voltage values for each phase (in Volts). This is the present value of the distribution line voltage transformed to the nominal 120-Vac base. The switch control uses this as the input-sensed value when it calculates the primary voltage. Either the **Phase-Neutral** or **Phase-Phase** measurement may be selected, as configured on the *Setup>General>Site-Related* screen. The second voltage is displayed only when the "-E33" option is installed. Voltage 1 corresponds to the pole-side voltage sensor and Voltage 2 corresponds to the front-side voltage sensor. See Figure 10 on page 32.

Current Flow

All three fields display a **Normal** condition when the switch control is properly configured and power is flowing through the circuit in the normal direction. The value in all three fields changes to a **Reverse** condition when unusual circuit switching conditions cause the direction of current to reverse.

Phase Angle

This is the calibrated phase angle or the offset of the current waveform referenced to the voltage after all setup calibration factors have been applied. These corrected phase-angle values will all be 0 ± 89.9 degrees when the switch control is properly configured.

Lagging phase angles are represented as values between 0 and 90 degrees. Leading phase angles are represented as values between 0 and -90 degrees.

Power Factor

Power factor is calculated as the cosine of the corrected phase angle. The leading power factor is represented by a negative number.

kvars

The switch control uses line-to-neutral voltage, current, and the sine of the phase angle to calculate the kvar (kilovolts-amperes, reactive) value.

SW1 Current Direction (only available with software version 7.3)

This field displays "Normal" when the switch control is properly set up and three-phase current is flowing in the normal direction (from normal source to load). This field displays "Reverse" if conditions cause the direction of current to flow in the reverse direction (from load to normal source).

If current is not flowing in the same direction for all three phases, the direction in which the greatest amount of current flows will be displayed. Phases with less than 6 amps flowing are disregarded in this determination. If all three phases are below 6 amps, the current direction shows "Normal."

Fault Information

The screen shown in Figure 11 shows the last fault-related event for the switch(es). The switch control logs an event after the fault event and all described actions are completed. The left field is the time stamp, to the nearest 6.25 milliseconds, when the event was logged.

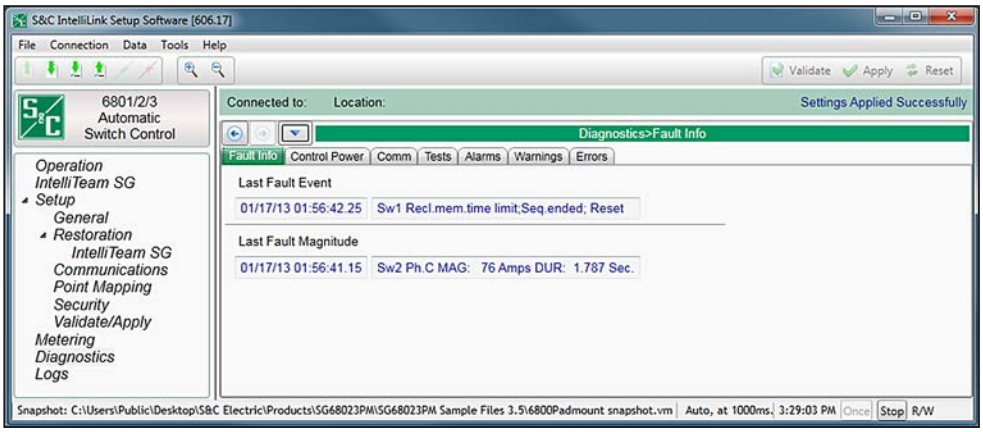

Figure 11. The *Diagnostics>Fault Info* screen.

Last Fault Event

In this section of the screen, the left field is the date and time stamp of the event. The right field is the event message that describes the event, the assumption the switch control made about the event, and the action(s) taken. See Figure 11.

Note: For the 6802/3 switch control, each event message is specific to one switch/circuit and is preceded by either "Sw1:" for Switch 1 or "Sw2:" for Switch 2. Possible entries are:

Phase A OC; Fault current sensed & cleared; Noted—The switch control detected an overcurrent fault on Phase A. That overcurrent fault has ended. The switch control is waiting to see whether voltage will be lost on all three phases. If all voltage is lost, the switch control will begin timing for a possible recloser operation. The switch control displays similar messages for Phase B, Phase C, and Ground overcurrent conditions.

Phase B OC; Fault current sensed & cleared; Noted—See Phase A OC; Fault current sensed & cleared; Noted.

Phase C OC; Fault current sensed & cleared; Noted—See Phase A OC; Fault current sensed & cleared; Noted.

Ground OC; Fault current sensed & cleared; Noted—See Phase A OC; Fault current sensed & cleared; Noted.

OC then voltage o.k.; Load-side protective open; Noted—The switch control detected an overcurrent fault. This condition was not followed within 0.6 seconds by a loss of voltage on the same phase. The control assumed a load-side fault occurred, but the condition was cleared on the load side by a fuse, or recloser, etc. No timer or other action is started for this type of event.

OC then VL; Source-side protective open; Counting—The switch control detected an overcurrent fault that was followed within 0.6 seconds by a loss of voltage on all phases. The switch control assumed a load-side fault occurred and the condition was cleared on the source side by a three-phase device, such as a breaker, interrupter, or recloser. The control added one count to the **Recloser Operations** counter.

Reclose memory time limit; Sequence ended; Count reset—The **Sectionalizer Reset** timer expired. The switch control will consider future events to be part of a different event sequence. The switch control always displays this message when the timer expires.

VL; Source-side fault; Sectionalizing disarmed—The switch control detected a three-phase voltage loss but no overcurrent fault condition. The control assumed a source-side fault occurred and the condition was cleared on the source side by a three-phase device, such as a breaker, interrupter, or recloser. The control started the **Sectionalizer Reset** timer and set the value in the **Recloser Operations** counter to "1." Because the fault was on the source side, the control will not trip open the switch because recloser counts with fault current were detected but will open the switch if the Recloser Counts to Trip, Voltage Loss Only count is reached.

VL; Load-side fault; Sectionalizing armed—The switch control previously detected a phase or ground overcurrent fault followed within 0.6 seconds by three-phase voltage loss. The control then assumed the present voltage loss was associated with the previous load-side fault and the condition was again cleared on the source side by a three-phase device, such as breaker, interrupter, or recloser. The control incremented the **Recloser Operations** counter.

Full count reached; Source-side fault; Noted—The full count was reached on the **Recloser Operations** counter. Because the first voltage loss in the sequence was not preceded by an overcurrent fault, the control took no sectionalizing action on the count of Recloser Counts to Trip, Fault Current Detected.

Full count reached; Load-side fault; Noted—The full count was reached on the **Recloser Operations** counter. Because the first voltage loss in the sequence was preceded by an overcurrent fault and all subsequent voltage losses, if the setting for **Fault Current Required Before First/All Voltage Loss(es)** is set to "All," the control will take the appropriate sectionalizing action.

Full count reached with sectional. disabled; Noted—The full count was reached on the **Recloser Operations** counter. Because sectionalizing was disabled, the switch control did not trip open the switch. Review the earlier log messages to identify the exact events that led to this action.

Full count reached; Open operation executed—The full count was reached on the **Recloser Operations** counter so the switch control tripped open the switch. Review the earlier log messages to identify the exact events that led to this action.

No OC before VL; Source-side open; Counting—The switch control detected a three-phase voltage outage that was not preceded by an overcurrent fault. The control assumed a source-side fault occurred and the condition was cleared by a source-side device. The control added one count to the **Recloser Operations** counter.

OC then VL; Source-side fuse blown for load-side fault—The switch control detected a phase or ground overcurrent fault. This was followed within 0.6 seconds by a loss of voltage on the same phase without all other phases losing voltage. The control assumed a load-side fault occurred and the condition was cleared on the source side by a fuse or single-phase recloser.

No OC then VL; Source-side (SS) fuse blown - SS fault—The switch control detected a loss of voltage on one or two phases that was not preceded by an overcurrent fault. The control assumed a source-side fault occurred and the condition was cleared on the source side by a fuse or a single-phase recloser.

Close operation executed, shots-to-lockout requested—In response to an **Automatic Transfer** command or a SCADA or faceplate **Shots-To-Lockout** command, the control closed the switch and started the **Shots-To-Lockout** timer. If voltage is restored on any phase and then lost on all three phases before the timer expires, the control will trip open the switch. If the **Overcurrent Required before Shots-To-Lockout Operation** setting is enabled, the switch control also detected overcurrent.

Lockout close complete with event after - Open executed—An operator requested a **Shots-to-Lockout** operation. The switch control detected the appropriate number of three-phase voltage losses within the specified **Shots-to-Lockout** time interval, so it tripped open the switch. If the **Overcurrent Required before Shots-To-Lockout Operation** setting is enabled, the switch control also detected overcurrent. If the **Number of Shots Required for Lockout** setting is set to 2, the relationship between the detection of overcurrent and voltage losses follows the **Fault Current Required before First/All Voltage Loss(es)** setpoint.

Persistent phase imbalance; Open executed—The switch control detected a loss of voltage on one or two phases, but not on all three phases. The imbalance continued for the full count of the **Phase Loss Protection Time Threshold** timer. Because this loss occurred while the **Phase Loss Protection and Automatic Operation** settings were both enabled, the switch control tripped open the switch.

Phase imbalance w. reclose enabled; Waiting—The switch control detected a phase imbalance while the **Automatic Reclose** setting was enabled. The control tripped open the line switch and is now waiting for three-phase voltage to return. When full voltage returns, the control will start the **Automatic Reclose** timer. The control will reclose the switch when voltage is continuously present for the full count of the timer.

Switch closed; Operator action; Reclose canceled—While the switch control was waiting for three-phase voltage to return with the **Automatic Reclose** setting enabled, an operator manually closed the line switch from the faceplate or via a SCADA command. This operator action canceled the pending **Automatic Reclose** operation.

Voltage OK after imbalance; Voltage restored; Waiting—After the switch control tripped open the switch because of a phase imbalance, three-phase voltage returned. The control started the **Automatic Reclose** timer because the **Automatic Reclose** setting was enabled. The control is waiting for the timer to expire. The control will close the switch when the **Automatic Reclose Time…** setpoint value is reached.

Imbalance corrected w. reclose enabled; Close executed—After the switch control tripped open the switch because of a phase imbalance, three-phase voltage was restored

and remained present for the full count of the **Automatic Reclose** timer. The control reclosed the switch because the **Automatic Reclose** setting was enabled.

No OC before VL; Voltage Loss Only count reached—The switch control detected a three-phase voltage outage that was not preceded by an overcurrent fault. The **Sectionalizing On Voltage Loss Only** setting is enabled and the **Recloser Counts to Trip, Voltage Loss Only** value has been reached.

Open operation executed on Voltage Loss Only—The **Sectionalizing On Voltage Loss Only** setting is enabled and the **Recloser Counts to Trip, Voltage Loss Only** value has been reached. The switch control sent the command to open the switch.

Sectionalizing disabled on Voltage Loss Only; None—The necessary criteria for sectionalizing on voltage loss only have been reached but the feature is disabled. Neither a count of voltage losses nor an extended voltage loss will cause an operation.

Reclose memory time limit; Extended Volt Loss; Open—The **Reclose Memory Time** limit expired without the restoration of voltage on any phase. This constitutes an **Extended Voltage Loss** condition and the switch control opened the switch.

Shots-to-lockout latched on—An operator enabled the **Shots-to-Lockout Operation** setting on a closed switch. The switch control will open the switch if the detected three-phase voltage count equals the **Number of Shots Required for Lockout** value.

Successful reclose; Sequence ended; Count reset—The **Successful Reclose Reset Time** timer has expired. The switch control will consider future events to be part of a different event sequence. The switch control always displays this message when the timer expires.

Note: Some events result in a code being displayed. See Table 6 for a list of codes and their corresponding Historic Log Event.

Table 6. Fault Screen Codes

Fault Information Screen Code	Historic Log Event Equivalent
48	LOV Sectionalizing Fail - Sync Error
49	FI Breaker Tripped
4A	FI Breaker Closed
4B	3P Volt Loss w/ Current Present
4C	Volt Loss Only Count Reached
4D	OPEN Exec on Volt Loss Only
4E	Sect Disabled for Voltage Loss Only
4F	Extended Volt Loss; OPEN
50	Instant reclose Qualification w/ OC
51	Instant reclose Qualification No OC
52	Persistent VLoss; Reclose Qualified
53	Instant Reclose Disqualified
54	Tripped on Phase Loss
55	SW Ph. Loss Prot. LOV Phase A
56	SW Ph. Loss Prot. LOV Phase B
57	SW Ph. Loss Prot. LOV Phase C
58	SW Ph. Loss Prot. LOV Phase D
59	SW Ph. Loss Prot. LOV Phase E
5A	SW Ph. Loss Prot. LOV Phase F
5C	Rejected Extended STL Enable Request

Last Fault Magnitude

In this section of the screen, the left field is the date and time stamp of the event. See Figure 11 on page 34. The right field is the event message and contains the following information:

Phase—This is the phase, and switch if applicable, on which the overcurrent fault occurred. (For example, A2, C1, or G2.)

Magnitude—This is the peak (maximum) overcurrent fault magnitude during the event. (This is displayed as an RMS, asymmetric value.)

Duration—This is the duration of the overcurrent fault event. (The value is displayed in units of seconds, with resolution to the nearest 0.00625 seconds (6.25 milliseconds). The maximum recorded fault duration is 409.6 seconds (6.82 minutes). Any fault that lasts longer than that is recorded as 409.6 seconds.)

Control Power

The screen shown in Figure 12 shows the status of the battery system, control power source, and cabinet temperature.

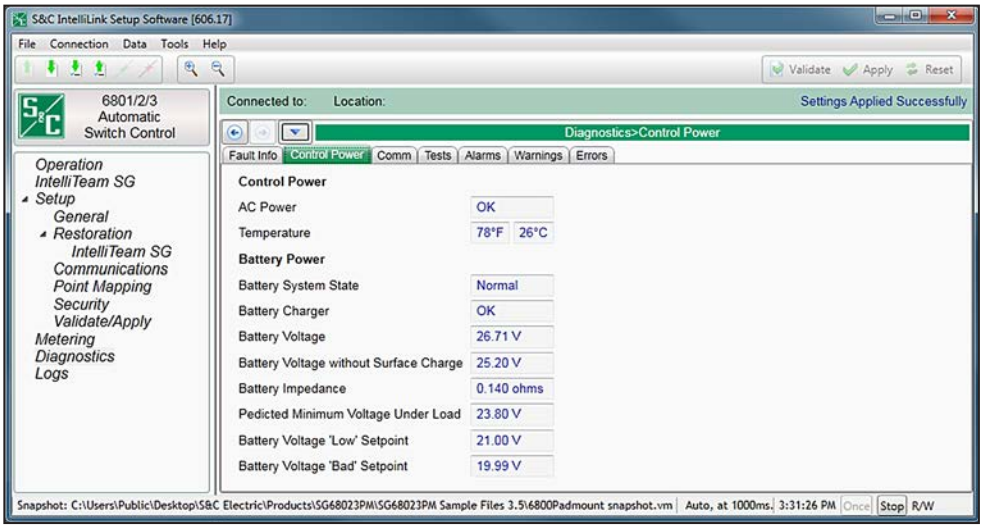

Figure 12. The *Diagnostics>Control Power* screen.

AC Power

This reports that power is OK or off.

Temperature

This reports temperature, measured at the processor board behind the faceplate, and reports as whole degrees in Fahrenheit and centigrade.

Battery Power

Battery System State

The following states may be displayed: **Normal**, **Battery Low**, **Battery Bad**, **Low Impedance**, **Disconnected**, and **Testing**.

Battery Charger

The following states may be displayed: **OK**, **Overvoltage**, **Low Impedance**, and **Overvoltage + Low Impedance**.

Battery Voltage

This reports present battery voltage to the nearest 0.01 Vdc.

Battery Voltage without Surface Charge

This reports present battery voltage to the nearest 0.01 Vdc.

Battery Impedance

This reports battery impedance to the nearest 0.001 Ohm.

Predicted Minimum Voltage Under Load

This value is calculated during the battery test and is reported to the nearest 0.01 Vdc.

Battery Voltage "Low" Setpoint

This factory-set value configures the voltage threshold for reporting the **Battery Voltage Low** status.

Battery Voltage "Bad" Setpoint

This factory value configures the voltage threshold for reporting the **Battery Voltage Bad** state.

Communications

Clear Button

The **Clear** button clears all data on the *Diagnostics>Comm* screen and enters a time-stamp in the **Last Time Cleared** field. See Figure 13.

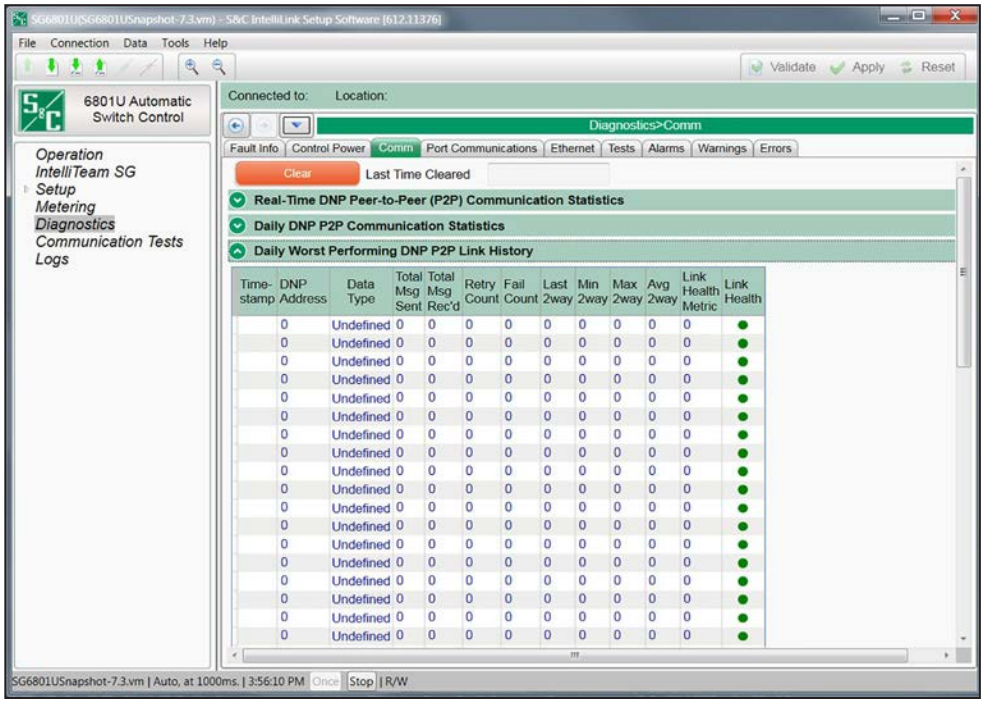

Figure 13. The *Diagnostics>Comm* screen.

Last Time Cleared

This is the timestamp of the last **Clear** command. Recently cleared counters represent present communication performance more accurately.

Real-Time DNP Peer-to-Peer (P2P) Communication Statistics Section

These are the counters and statistics associated with peer communication for each team in which this control is a member.

DNP Address

This is the DNP/RTU address of the team member associated with the displayed counts.

Data Type

This is the **Data Type** setting configured on the *Setup>Communications>Communication Tests* screen. Possible values are: **Undefined, General, Internal DNP, Coach, Runner, Contract Agent, Netlist Transfer, Alley Oop RSH, IT-II Events, Protection, Data Load Mgmt PRLM, CEC Signal, Diagnostics,** or **NetObjectMgmt.**

Total Messages Sent
This is the number of original packets transmitted to the team member.

Total Messages Received
This is the number of responses received from the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Daily DNP P2P Communication Statistics Section

These are the counters and statistics associated with daily peer communication for each team in which this control is a member.

DNP Address
This is the DNP/RTU address of the team member associated with the displayed counts.

Data Type
This is the **Data Type** setting configured on the *Setup>Communications>Communication Tests* screen. Possible values are: **Undefined**, **General**, **Internal DNP**, **Coach**, **Runner**, **Contract Agent**, **Netlist Transfer**, **Alley Oop RSH**, **IT-II Events**, **Protection**, **Data Load Mgmt PRLM**, **CEC Signal**, **Diagnostics**, or **NetObjectMgmt**.

Total Messages Sent
This is the number of original packets transmitted to the team member.

Total Messages Received
This is the number of responses received from the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency (in seconds) associated with the last request sent to the team member.

Min 2way
This is the minimum latency (in seconds) recorded for a request sent to the team member.

Max 2way
This is the maximum latency (in seconds) recorded for a request sent to the team member.

Avg 2way
This is the average latency (in seconds) recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad, Link Health Metric is less than 25%

Yellow–Marginal, Link Health Metric is 25% or greater and less than 95%

Green–Good, Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

Daily Worst Performing DNP P2P Link History Section
These are the counters and statistics associated with peer communication for the worst performing link.

Time Stamp
This is the time of the transmission.

DNP Address
This is the DNP/RTU address of the team member associated with the counts shown.

Data Type
This is the **Data Type** setting configured on the *Setup>Communications>Communication Tests* screen. Possible values are: **Undefined, General, Internal DNP, Coach, Runner, Contract Agent, Netlist Transfer, Alley Oop RSH, IT-II Events, Protection, Data Load Mgmt PRLM, CEC Signal, Diagnostics,** or **NetObjectMgmt.**

Total Messages Sent
This is the number of original packets transmitted to the team member.

Total Messages Received
This is the number of responses received from the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad, Link Health Metric is less than 25%

Yellow–Marginal, Link Health Metric is 25% or greater and less than 95%

Green–Good, Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

DNP V3 Real-Time Communication Statistics Section

These are the counters and statistics associated with DNP communications.

DNP Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Messages Sent
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency (in seconds) associated with the last request sent to the team member.

Min 2way
This is the minimum latency (in seconds) recorded for a request sent to the team member.

Max 2way
This is the maximum latency (in seconds) recorded for a request sent to the team member.

Avg 2way
This is the average latency (in seconds) recorded for requests sent to the team member.

Daily DNP V3 Communication Statistics Section

These are the counters and statistics associated with DNP communications.

DNP Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Messages Sent
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency (in seconds) associated with the last request sent to the team member.

Min 2way
This is the minimum latency (in seconds) recorded for a request sent to the team member.

Max 2way
This is the maximum latency (in seconds) recorded for a request sent to the team member.

Avg 2way
This is the average latency (in seconds) recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad, Link Health Metric is less than 25%

Yellow–Marginal, Link Health Metric is 25% or greater and less than 95%

Green–Good, Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

Peer-SCADA Master Communication Statistics

Master
This is the Master Station identifier.

DNP Address
This is the DNP address of the Master Station associated with the counts shown.

Total Messages Sent
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communications failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Daily Worst Performing DNP V3 Link History Section

These are the counters and statistics associated with DNP communications.

Time Stamp
This is the time of the message transmission.

DNP Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Xmit Count
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communications failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad, Link Health Metric is less than 25%

Yellow–Marginal, Link Health Metric is 25% or greater and less than 95%

Green–Good, Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

DNP Counts Section
These are counts of diagnostic information for DNP communications-related buffers within this control.

Transport Function Receive List
This is the number of DNP frames received and placed in the transport function frame buffer. A frame may remain in the buffer if it is part of a multi-frame fragment for which all frames have not been received. It may also remain in the buffer for a limited time if the application layer is busy and cannot accept the new frame.

Transport Function Transmit List
This is the number of DNP fragments processed by the application layer and waiting for a data link layer service. A fragment may remain in the buffer for a limited time if the data link layer is busy.

Application Layer Message List
This is the number of application layer messages waiting to be processed or serviced by the transport function, primarily consisting of originated messages to team members for which responses are expected. The messages remain in the buffer until a response is received or until the retry time and count have expired.

Peer Device List

This is the number of peer devices or team members registered with DNP for which an association is maintained.

Special Function List

This is the number of application processes registered with DNP that will be triggered by read or write operations to special predefined virtual memory locations.

URBE Function List

This is the number of functions or application processes registered with DNP that will be triggered by unsolicited event messages from specific peer devices.

Binary Input Point List

This is the total number of binary input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Double-Bit Binary Input Point List *(Only for SG6801, SG6802Vista, and SG68023PM)*

This is the total number of double-bit binary input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Analog Input Point List

This is the total number of analog input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Counter Input Point List

This is the total number of counter input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Control Input Point List

This is the total number of control input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Analog Output Point List

This is the total number of analog output points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Route Table List

This is the number of routing table entries registered with DNP. They originate from the *Setup>Communications Routing* screen.

Master Event Counts

Binary Inputs

This is the number of binary input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Double Binary Inputs (Only for SG6801, SG6802Vista, and SG68023PM)

This is the number of double-bit binary input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Analog Inputs

This is the number of analog input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Counters

This is the number of counter input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Tests

The battery test is started from the screen shown in Figure 14. Test results are displayed here and may also be indicated on the *Diagnostics>Alarms*, *Diagnostics>Warnings*, or *Diagnostics>Errors* screens.

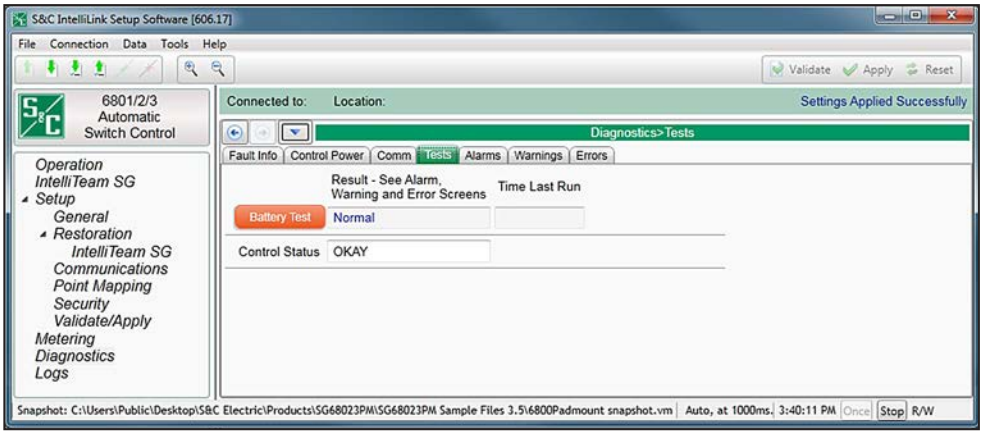

Figure 14. The *Diagnostics>Tests* screen.

The **Battery Test** button starts the test that can display one of the following results:

Normal—Enough charge is present to operate the electronics.

Battery Low—The battery is in marginal condition.

Battery Bad—The battery charge is too low to operate the electronics.

Low Impedance—The calculated battery impedance is too low to be valid.

Disconnected—The battery is not connected.

Testing—The battery test has not completed.

Control Status

This field can indicate:

OKAY—The control is operating correctly.

Warning—A warning condition is active.

Alarm—An alarm condition is active.

Maintenance Mode—The software is not running.

Alarms

Clear Alarms

This button clears alarm statistics and enters a time stamp in the **Last Clear Time** and **Time Cleared** fields. See Figure 15.

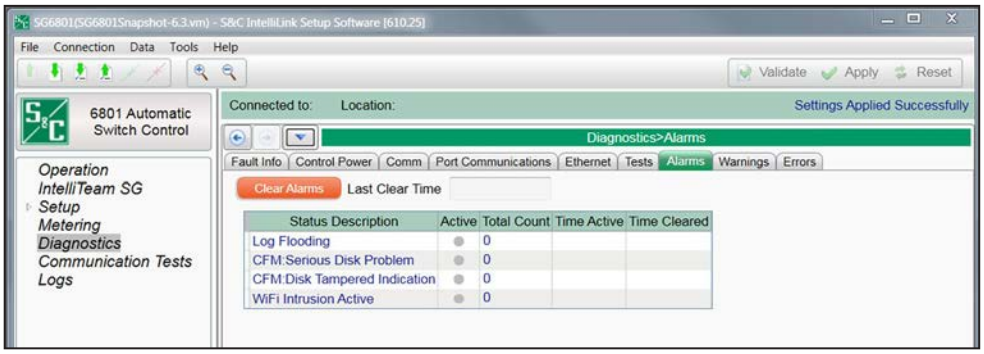

Figure 15. The *Diagnostics-Alarms* screen.

Last Clear Time

This time stamp indicates the last time the **Clear Alarms** command was performed. If counters have not been recently cleared, they may not accurately represent present performance.

The *Diagnostics-Alarms* screen shows the status of various alarms. See Table 7:

Table 7. Alarm Descriptions

Alarms		
Status Description	**Active When**	**Clear When**
Log Flooding	One or more events have stopped being recorded because they were flooding the log by generating 1000 or more entries in a 2-second time period	No events have stopped being recorded because they were flooding the log
CFM: Serious Disk Problem	Problem with flash memory	Flash memory directory contents corruption was not detected on startup
CFM Disk Tampered Indication①	This indicates compact flash directory contents corruption was detected on startup	No events have stopped being recorded because they were flooding the log
IntelliLink Intrusion	This indicates IntelliLink software access was attempted by an unauthorized user	IntelliLink software intrusion cleared
Wi-Fi Intrusion Active	Wi-Fi intrusion activated by attempted access by unauthorized user	Wi-Fi intrusion cleared

① Restarting the control may correct this condition.

Warnings

Clear Warnings

This button clears warning statistics and enters a time stamp in the **Last Clear Time** and **Time Cleared** fields. See Figure 16.

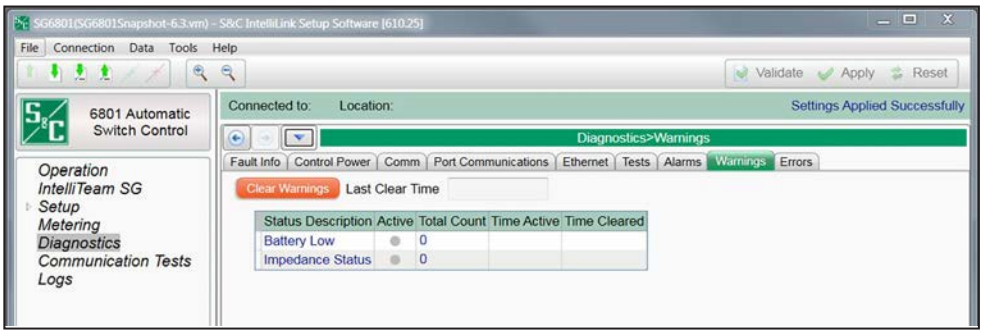

Figure 16. The *Diagnostics-Warnings* screen.

Last Clear Time

The time stamp indicates the last time a **Clear Warnings** command was performed. If counters have not been recently cleared, they may not accurately represent present performance.

The *Diagnostics>Warnings* screen shows the status of various warnings. See Table 8:

Table 8. Warnings Descriptions

Warnings		
Status Description	**Active When**	**Clear When**
Battery Low①	The battery voltage is less than or equal to the **Battery Voltage Low** setpoint on the *Diagnostics>Control Power* screen	The battery voltage is greater than the **Battery Voltage Low** setpoint
Impedance Status②	Battery impedance low when the calculated value is below 15 milliohms for both 24-V and 36-V batteries	Battery impedance is above 15 milliohms

① Battery is at the battery low setpoint shown on the *Diagnostics>Control Power* screen.
② Battery may require replacing.

Errors

Clear Errors

The **Clear Errors** button clears error statistics and enters a time stamp in the **Last Reset Time** and **Time Cleared** fields. See Figure 17.

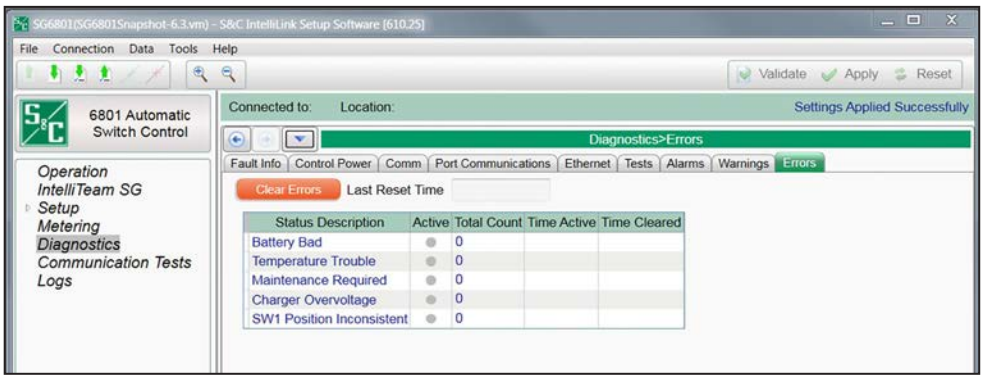

Figure 17. The *Diagnostics-Errors* screen.

Last Reset Time

The time stamp indicates the last time the **Clear Errors** command was performed. If counters have not been recently cleared, they may not accurately represent present performance.

The *Diagnostics>Errors* screen shows the status of various error conditions. See Table 9:

Table 9. Error Descriptions

Errors		
Status Description	**Active When**	**Clear When**
Battery Bad①	The battery voltage is less than or equal to the **Battery Voltage Bad** setpoint on the *Diagnostics>Control Power* screen	The battery voltage is greater than the **Battery Voltage Bad** setpoint
Charger Overvoltage②	Battery charger in **Overvoltage** state	Battery charger is normal
Hot Line Tag③	This indicates an active **Hot Line Tag** state	**Hot Line Tag** state is cleared
Low Pressure④	When the **Low Pressure Indication** option is enabled, this indicates a **Low Pressure** state. When the **Low Pressure Indication** option is not enabled, a **Low Pressure** state will not be indicated	Pressure in **Normal** state
Maintenance Required	Hardware maintenance is required, contact S&C	Hardware maintenance is not required
SW1 Disabled⑤	This indicates switch 1 operation is in the **Disabled** state. This is a summary point that reports for the **Battery Bad** status and other detected hardware issues	**Disabled** state is cleared

TABLE CONTINUED ►
FOOTNOTES ON PAGE 52 ►

Table 9. Error Descriptions—Continued

Errors		
Status Description	**Active When**	**Clear When**
SW2 Disabled⑥	This indicates switch 2 operation is in the **Disabled** state. This is a summary point that reports for the **Battery Bad** status and other detected hardware issues	**Disabled** state is cleared
SW1 Disabled/External Local⑦	This indicates switch 1 operation is in the **Disabled** state. This is a summary point that reports for the **Battery Bad** status and other hardware issues. Only this point reports when the LOCAL/REMOTE switch in the motor operator cabinet is set to the **Local** position. The 6802/6803 switch control has no ability to command switch operation when the motor operator LOCAL/REMOTE switch is set to the **Local** position	The LOCAL/REMOTE switch is set to the **Remote** position
SW2 Disabled/External Local	Same as switch 1	Same as switch 1
SW3 Disabled/External Local⑧	Same as switch 1	Same as switch 1
SW1 Position Inconsistent⑨	This indicates both the **Open** and **Close** position are indicated for switch 1	Only one position is indicated
SW2 Position Inconsistent⑨	This indicates both the **Open** and **Close** position are indicated for switch 2	Only one position is indicated
SW3 Position Inconsistent⑨	This indicates both the **Open** and **Close** position are indicated for switch 3	Only one position is indicated
SW1 Visible Disconnect Open	This indicates the switch 1 visible disconnect is in the **Open** position	Visible disconnect is closed
SW2 Visible Disconnect Open	This indicates the switch 2 visible disconnect is in the **Open** position	Visible disconnect is closed
SW1 Voltage Sensor Bad⑩	This indicates the switch 1 voltage sensor output is out of expected range	Voltage sensor output is in the normal range
SW2 Voltage Sensor Bad⑩	This indicates the switch 2 voltage sensor output is out of expected range	Voltage sensor output is in the normal range
Temperature Trouble⑪	Temperature sensor output is out of expected range. Readings are less than -40°C (-40°F) or greater than +85°C (+185°F)	Temperature sensor output is within the expected range
Voltage Sensor Bad③	Voltage sensor output is out of the expected range	Voltage sensor output is within the expected range

① Battery voltage is at or below the **Battery Voltage Bad** setpoint on the *Diagnostics>Control Power* screen.

② Battery voltage exceeds 32.2 Vdc for a 24-V battery, or 48.3 V for a 36-V battery.

③ Only for SG6801 and SG6801E33 software.

④ Only for SG6802Vista software.

⑤ Only for SG6801, SG6801E33, SG6802DO, and SG68023U software.

⑥ Only for SG6802DO, and SG68023U software.

⑦ Only for SG68023PM, and SG6802Vista software.

⑧ Only for SG68023PM software.

⑨ Operation of this switch position is disabled when this condition exists.

⑩ Only for SG6802DO software.

⑪ The control was unable to read the temperature sensor. The **Temperature Trouble** error will also be asserted and automatic operation will be blocked.

Communication Tests

Diagnostic communication tests determine whether nodes are responding to communication and how quickly they respond. Periodically scheduled tests run for one hour and record response time, failure, and retry statistics. Any network node can send tests to other network nodes. Test messages (Connection IDs) do not contain real data, but they can be configured to mimic a typical coach or runner message. See Figure 18.

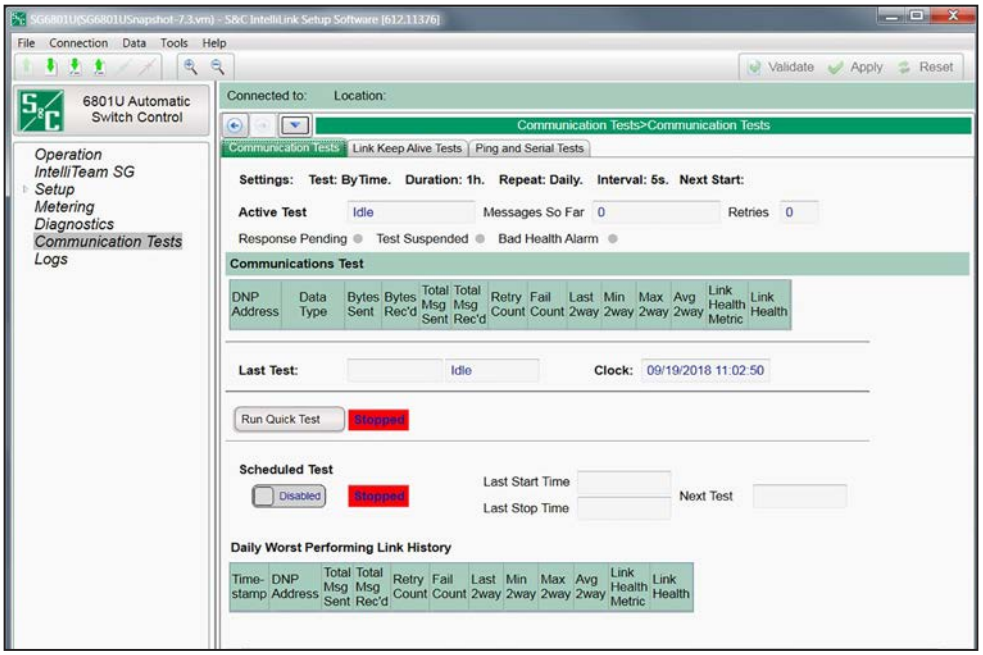

Figure 18. The *Communication Tests>Communication Tests* screen.

These parameters are reported:

Settings

These settings are configured on the *Setup>Communications>Communication Test* screen and displayed here for convenience.

Active Test

For the test in progress it can display: Idle (no test running), Quick Diagnostic (manually started Diagnostic Test), Scheduled (scheduled diagnostic test), Quick Keep Alive (manually started Keep Alive), Keep Alive (scheduled Keep Alive).

Note: This reports for any test running on either the **Diagnostic Communication Tests** tab or the **Link Keep Alive Tests** tab.

Messages So Far

This is the total number of messages transmitted by the running test.

Retries

This is the number of retry transmissions sent when a node did not respond to the message transmission within the number of seconds specified by the **Time Delay Between Retries** setting on the *Setup>Communications>DNP* screen.

Response Pending

This indicates the test has transmitted a message and is waiting for a node response.

Test Suspended

This indicates a higher priority communication system event, such as a circuit event or an IntelliTeam system operation, preempted the test. The test resumes when that event is complete.

Bad Health Alarm

This indicates when any LINK HEALTH indicator is red (bad health) and resets when all red LINK HEALTH indicators are off.

This test reports statistics for each message type sent to each node. The report sequence follows this example if there are 2 nodes and 3 message types:

- Node 1, Message Type 0
- Node 1, Message Type 1
- Node 1, Message Type 2
- Node 2, Message Type 0
- Node 2, Message Type 1
- Node 2, Message Type 2

Communications Test Section

These parameters are reported:

DNP Address

This is the node address of the message.

Data Type ID

This is the message type, such as coach or runner.

Bytes Sent

This is the number of bytes sent in the message.

Bytes Received

This is the number of bytes received for the message.

Total Messages Sent

This is the number of transmissions for the message type.

Total Messages Received

This is the number of responses for the message type.

Retry Count

This is the number of times a response was not received for this message type and the message was retransmitted. The **Number of Retries for Confirm** setting is on the *Setup>Communications>DNP* screen.

Fail Count

This is the number of times the message type was sent and no response was received, even after the allotted number of retries.

Last 2way

This is the response time, in milliseconds, for the last two-way message-type response. This is the interval from the start of transmission to receipt of the response. If a messages fails, there is no two-way transmission report data. A completed retry counts as a two-way transmission, and the timeout delay will be included in all two-way statistics.

Min 2way

This is the shortest response time, in milliseconds, for all two-way responses for this message type.

Max 2way

This is the longest response time, in milliseconds, for all two-way responses for this message type.

Avg 2way

This is the average response time in milliseconds for all two-way responses for this message type.

Link Health Metric

This is the percentage of tests for this message type that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health

This shows a color indication of the Link Health Metric for this message type:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

Last Test:

This is the time stamp of the last test statistics displayed. The test type can be reported as: Quick Diagnostic, Schedule, or Idle (no test was run).

Clock:
This is the present date and time.

Run Quick Test Button
This starts a Quick Test. The indicator shows the Quick Test status: **Running**, **Stopped**, or **Suspended**. A Quick Test sends only one message (the first message type configured) to each node and stops.

Scheduled Test
This enables or disables running the scheduled test. The indicator shows the scheduled test status: **Running**, **Stopped**, or **Suspended**.

Last Start Time
This is the time stamp of the start of the last scheduled test.

Last Stop Time
This is the time stamp of the end of the last scheduled test.

Next Test
This is the scheduled time of the next test.

Daily Worst Performing Link History Section

This report shows the worst link performance for the last 10 scheduled tests. It aggregates all message types sent to each node and reports statistics for the node with the worst link health. These parameters are reported:

Time Stamp
This is the time of the scheduled test.

DNP Address
This is the RTU address of the node.

Total Messages Sent
This is the number of transmissions for this message type to this node.

Total Messages Received
This is the number of responses for this message type received from this node.

Retry Count
This is the number of times a response was not received for this message type from this node and the message was retransmitted. The number of retries is configured in the **Number of Retries for Confirm** setting on the *Setup>Communications>DNP* screen.

Fail Count
This is the number of times a message for this message type to this node was sent and no response was received, even after the allotted number of retries.

Last 2way

This is the response time, in milliseconds, for the last two-way message response, this is the interval from when a message was sent to when the response was received. If a message fails, there will be no two-way transmission report data. A completed retry counts as a two-way transmission, and the timeout delay will be included in all two-way statistics.

Min 2way

This is the shortest response time, in milliseconds, for all two-way message responses.

Max 2way

This is the longest response time, in milliseconds, for all two-way message responses.

Avg 2way

This is the average response time, in milliseconds, for all two-way message responses.

Link Health Metric

This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health

This shows a color indication for Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

The threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

Link Keep Alive Tests

The **Link Keep Alive** process periodically sends a single message to every node to keep all links active because an idle TCP connection may be shut down. When more than one message is configured for a scheduled test, the **Link Keep Alive** process only sends the first configured message and records statistics for the message transmissions. See Figure 19.

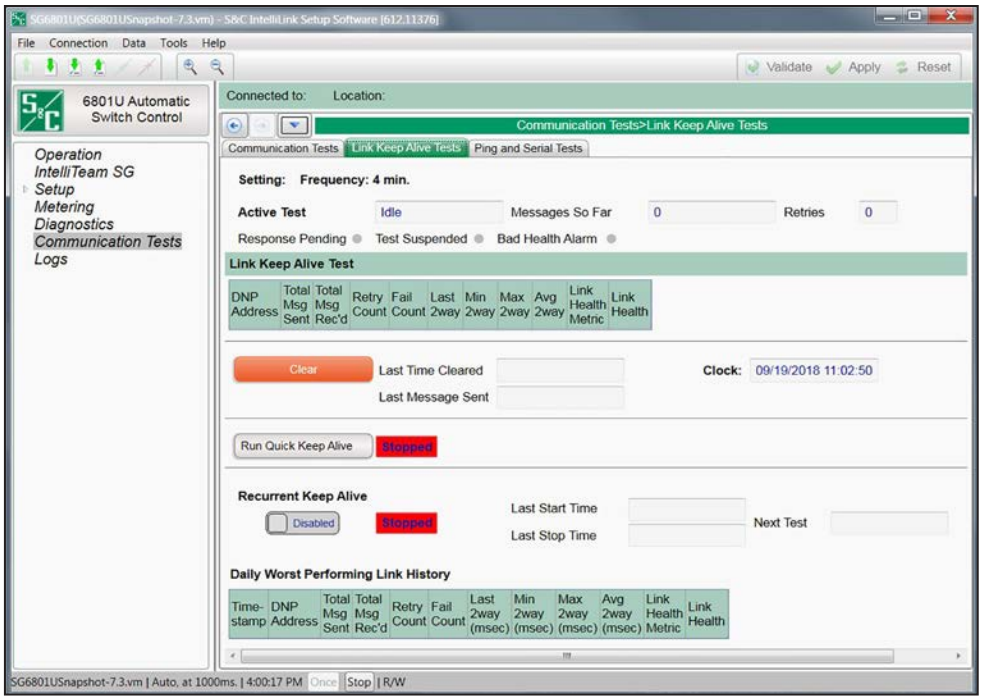

Figure 19. The *Communication Tests>Link Keep Alive Tests* screen.

These parameters are reported:

Settings

These settings are configured on the *Setup>Communications>Communication Test* screen and are displayed here for convenience.

Active Test

For the test in progress, the screen can display: Idle (no test running), Quick Diagnostic (manually started diagnostic test), Scheduled (scheduled diagnostic test), Quick Keep Alive (manually started **Keep Alive** process), Keep Alive (scheduled **Keep Alive** process).

Messages So Far

This is the total number of messages transmitted by the running test.

Retries

This is the number of retry transmissions sent when a node did not respond to the message transmission within the number of seconds specified by the **Time Delay Between Retries** setting on the *Setup>Communications>DNP* screen.

Response Pending

This indicates the test has transmitted a message and is waiting for a node response.

Test Suspended

This indicates a higher priority communication system event, such as a circuit event or an IntelliTeam system operation, preempted the test. The test resumes when that event is complete.

Bad Health Alarm

This indicates when any LINK HEALTH indicator is red (bad health) and resets when all LINK HEALTH indicators are off.

Link Keep Alive Test Section

Only the first message type (Data Type ID) is sent to each node. This report shows statistics for each node that aggregates until the statistics are cleared manually or clear automatically at midnight. These parameters are reported:

DNP Address

This is the node address for the message.

Total Messages Sent

This is the number of transmissions for this node.

Total Messages Received

This is the number of responses received for this node.

Retry Count

This is the number of times a response was not received from this node and the message was retransmitted. The number of retries is configured in the **Number of Retries for Confirm** field on the *Setup>Communications>DNP* screen.

Fail Count

This is the number of times the message was sent and no response was received, even after the allotted number of retries.

Last 2way

This is the response time, in milliseconds, for the last two-way message response, this is the interval from the start of the transmission to receipt of the response. If a messages fails, there is no two-way transmission report data. A completed retry counts as a two-way transmission, and the timeout delay will be included in all 2way statistics.

Min 2way
This is the shortest response time, in milliseconds, for all two-way message responses.

Max 2way
This is the longest response time, in milliseconds, for all two-way message responses.

Avg 2way
This is the average response time, in milliseconds, for all two-way message responses.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric for this message:

Green—The last Keep Alive message was received successfully without any retries.

Yellow—The last Keep Alive message was received successfully with retries.

Red—The last Keep Alive message was not received successfully.

Note: For Keep Alive tests, the link-health calculations are based on the last message, but for the diagnostic tests and worst performing link history, the calculations are based on averages.

Clear Button
This clears Link Keep Alive data.

Last Time Cleared
This is the time stamp of the last time statistics were cleared, either manually or automatically, at midnight.

Last Message Sent
This is the time stamp of the last message transmission.

Clock
This shows the present date and time.

Run Quick Keep Alive Button
This button starts a **Quick Keep Alive** test. The indicator shows the **Quick Keep Alive** test status: **Running**, **Stopped**, or **Suspended**. The Quick Keep Alive test sends only one message—the first message type configured—to each node and stops.

Recurrent Keep Alive Button
This button enables or disables running a Recurrent Keep Alive test. The indicator shows the Recurrent Keep Alive test status: **Running**, **Stopped**, or **Suspended**.

Last Start Time
This is the time stamp of the last test start time.

Last Stop Time
This is the time stamp of the last test stop time.

Next Test
This is the start time of the next Recurrent Keep Alive test.

Daily Worst Performing Link History Section
This report shows performance of the worst link for the past 24 hours. At midnight, the report aggregates all message types sent to each node and reports performance of the node with the worst link health. It also clears the Link Keep Alive table. These parameters are reported:

Time Stamp
This is the time of the node transmission.

DNP Address
This is the DNP address of the node.

Total Messages Sent
This is the number of messages sent by this node.

Total Messages Received
This is the number of messages received by this node.

Retry Count
This is the number of times a response was not received from this node and the message was retransmitted. The number of retries is configured in the **Number of Retries for Confirm** setting on the *Setup>Communications>DNP* screen.

Fail Count
This is the number of times a message for this node was sent and no response was received, even after the allotted number of retries.

Last 2way (msec)
This is the response time, in milliseconds, for the last two-way message response. This is the interval from when a message was sent to when the response was received. If a message fails, there will be no two-way transmission report data. A completed retry counts as a two-way transmission, and the timeout delay will be included in all two-way statistics.

Min 2way (msec)
This is the shortest response time, in milliseconds, for all two-way message responses.

Max 2way (msec)

This is the longest response time, in milliseconds, for all two-way message responses.

Avg 2way (msec)

This is the average response time, in milliseconds, for all two-way message responses.

Link Health Metric

This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health

This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

Note: Link Health in this table indicates the average of all messages, but Link Health in the Link Keep Alive table indicates the health for the last message sent.

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

Ping and Serial Tests

User-Initiated Ethernet Ping or Serial Link Status Request

The user can manually ping a node at the network level to test response time. This is useful when statistics indicate a node is not responding at the messaging level and one needs to check that the node is responding at the network level. See Figure 20.

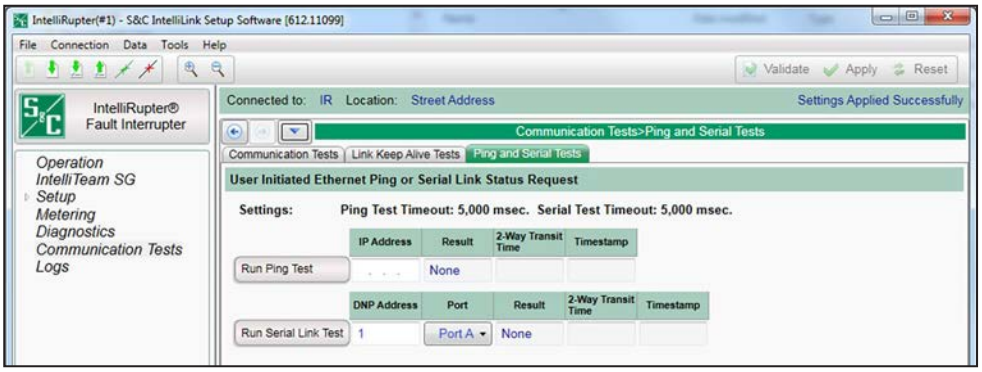

Figure 20. The *Communication Tests>Ping and Serial Tests* screen.

These parameters are reported:

Settings
These settings are configured on the *Setup>Communications>Communication Test* screen and are displayed here for convenience.

Run Ping Test Button
This button starts a Ping Test to the specified IP address.

IP Address
This is the IP address of the tested node.

Result
This is the **Ping Test** status reported as: **Pending** (waiting for a response), **Success**, **Timeout**, **Bad Address or No Route**, **Interface Down**, **Unknown**, or **None** (no test done yet).

2-Way Transit Time
This is the response time, in milliseconds, for the two-way message response.

Time Stamp
This is the time stamp of the last ping sent or the response received.

Run Serial Link Test Button
This button starts a Serial Link Test to the specified DNP address.

DNP Address
This is the address of the tested node.

Port
This is the serial port used for transmission.

Result
This is the **Serial Link Test** status reported as: **Pending** (waiting for a response), **Success**, **Timeout**, **Bad Address or No Route**, **Interface Down**, **Unknown**, or **None** (no test done yet).

2-Way Transit Time
This is the response time, in milliseconds, for the two-way message response.

Time Stamp
This is the time stamp of the last Serial Link Test or the response received.

Diagnostics Communication Data

Clear Button

This button clears all data on the *Diagnostics>Comm* screen and enters a time stamp in the **Last Time Cleared** field. See Figure 21.

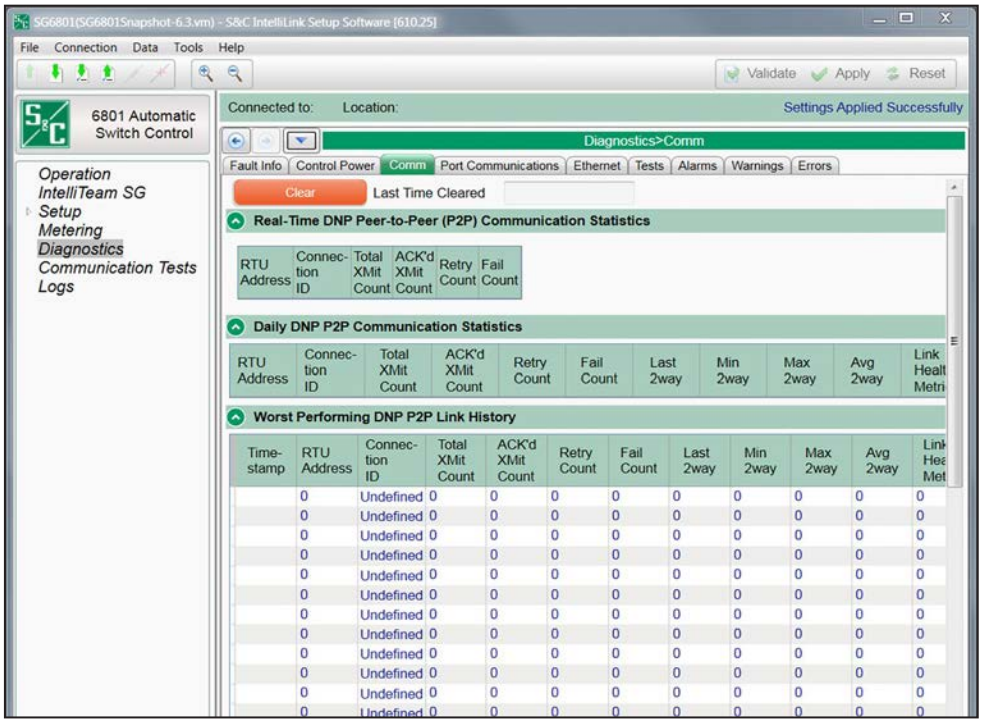

Figure 21. The *Diagnostics>Comm* screen.

These parameters are reported:

Last Time Cleared

This is the time stamp of the last **Clear** command. Recently cleared counters represent present communication performance more accurately.

Real-Time DNP Peer-to-Peer (P2P) Communication Statistics Section

This report shows the counters and statistics associated with peer communication for each team in which this control is a member.

RTU Address

This is the DNP/RTU address of the team member associated with the displayed counts.

Connection ID

The **Connection ID** setting is configured on the *Setup>Communications> Communication Tests* screen. Possible values are: **Undefined**, **General**, **Internal DNP**, **Coach**, **Runner**, **Contract Agent**, **Netlist Transfer**, **Alley Oop RSH**, **IT-II Events**, **Protection**, **Data Load Mgmt PRLM**, **CEC Signal**, **Diagnostics**, or **NetObjectMgmt**.

Total Xmit Count

This is the number of original packets transmitted to the team member.

Acknowledged Xmit Count

This is the number of responses received from the team member.

Retry Count

This is the number of packets retransmitted to the team member.

Fail Count

This is the number of communication failures for the team member.

Daily DNP P2P Communication Statistics Section

The counters and statistics associated with daily peer communication for each team in which this control is a member. These parameters are reported:

RTU Address

This is the DNP/RTU address of the team member associated with the displayed counts.

Connection ID

The **Connection ID** setting is configured on the *Setup>Communications> Communication Tests* screen. Possible values are: **Undefined**, **General**, **Internal DNP**, **Coach**, **Runner**, **Contract Agent**, **Netlist Transfer**, **Alley Oop RSH**, **IT-II Events**, **Protection**, **Data Load Mgmt PRLM**, **CEC Signal**, **Diagnostics**, or **NetObjectMgmt**.

Total Xmit Count

This is the number of original packets transmitted to the team member.

Acknowledged Xmit Count

This is the number of responses received from the team member.

Retry Count

This is the number of packets retransmitted to the team member.

Fail Count

This is the number of communication failures for the team member.

Last 2way

This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

These threshold settings can be adjusted in the "Peer Communications Statistics Configuration" panel of the *Setup>Communications>DNP Diagnostics* screen.

Worst Performing DNP P2P Link History Section
This report shows the counters and statistics associated with peer communication for the worst performing link. These parameters are reported:

Time Stamp
This is the time of the transmission.

RTU Address
This is the DNP/RTU address of the team member associated with the counts shown.

Connection ID
The **Connection ID** setting is configured on the *Setup>Communications>Communication Tests* screen. Possible values are: **Undefined**, **General**, **Internal DNP**, **Coach**, **Runner**, **Contract Agent**, **Netlist Transfer**, **Alley Oop RSH**, **IT-II Events**, **Protection**, **Data Load Mgmt PRLM**, **CEC Signal**, **Diagnostics**, or **NetObjectMgmt**.

Total Xmit Count
This is the number of original packets transmitted to the team member.

Acknowledged Xmit Count
This is the number of responses received from the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

The Link Health threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

DNP V3 Real-Time Communication Statistics Section
This report shows the counters and statistics associated with DNP communications. These parameters are reported:

RTU Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Xmit Count
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Daily DNP V3 Communication Statistics Section

This report shows the counters and statistics associated with DNP communications.

RTU Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Xmit Count
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communication failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health

This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

The **Link Health** threshold settings can be adjusted in the "Peer Communications Statistics Configuration" panel of the *Setup>Communications>DNP Diagnostics* screen.

Peer-SCADA Master Communication Statistics Section

These parameters are reported:

Master

This is the Master Station identifier.

DNP Address

This is the DNP address of the Master Station associated with the counts shown.

Total Xmit Count

This is the number of original packets transmitted to the team member.

Retry Count

This is the number of packets retransmitted to the team member.

Fail Count

This is the number of communications failures for the team member.

Last 2way

This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way

This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way

This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way

This is the average latency, in seconds, recorded for requests sent to the team member.

Worst Performing DNP V3 Link History Section

This report shows the counters and statistics associated with DNP communications. These parameters are reported:

Time Stamp
This is the time of the message transmission.

RTU Address
This is the DNP/RTU address of the team member associated with the counts shown.

Total Xmit Count
This is the number of original packets transmitted to the team member.

Retry Count
This is the number of packets retransmitted to the team member.

Fail Count
This is the number of communications failures for the team member.

Last 2way
This is the latency, in seconds, associated with the last request sent to the team member.

Min 2way
This is the minimum latency, in seconds, recorded for a request sent to the team member.

Max 2way
This is the maximum latency, in seconds, recorded for a request sent to the team member.

Avg 2way
This is the average latency, in seconds, recorded for requests sent to the team member.

Link Health Metric
This is the percentage of tests that had a response even if a retry was required. This is the ACK'd XMit Count divided by the Total XMit Count.

Link Health
This shows a color indication for the Link Health Metric:

Gray–Less than 100 transmissions have been sent

Red–Bad; Link Health Metric is less than 25%

Yellow–Marginal; Link Health Metric is 25% or greater and less than 95%

Green–Good; Link Health Metric is 95% or greater

The Link Health threshold settings can be adjusted in the "Peer Communications Statistics Configuration" section of the *Setup>Communications>DNP Diagnostics* screen.

DNP Counts Section
These are counts of diagnostic information for DNP communications-related buffers within this control. These parameters are reported:

Transport Function Receive List

This is the number of DNP frames received and placed in the transport function frame buffer. A frame may remain in the buffer if it is part of a multi-frame fragment for which all frames have not been received. It may also remain in the buffer for a limited time if the application layer is busy and cannot accept the new frame.

Transport Function Transmit List

This is the number of DNP fragments processed by the application layer and waiting for a data link layer service. A fragment may remain in the buffer for a limited time if the data link layer is busy.

Application Layer Message List

This is the number of application layer messages waiting to be processed or serviced by the transport function, primarily consisting of originated messages to team members for which responses are expected. The messages remain in the buffer until a response is received or until the retry time and count have expired.

Peer Device List

This is the number of peer devices or team members registered with DNP for which an association is maintained.

Special Function List

This is the number of application processes registered with DNP that will be triggered by read or write operations to special predefined virtual memory locations.

URBE Function List

This is the number of functions or application processes registered with DNP that will be triggered by unsolicited event messages from specific peer devices.

Binary Input Point List

This is the total number of binary input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Double-Bit Binary Input Point List *(Only for SG6801, SG6802Vista, and SG68023PM)*

This is the total number of double-bit binary input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Analog Input Point List

This is the total number of analog input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Counter Input Point List

This is the total number of counter input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Control Input Point List

This is the total number of control input points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Analog Output Point List

This is the total number of analog output points that may be mapped to SCADA point numbers. It is the size of the buffer, not the actual number of mapped points.

Route Table List

This is the number of routing table entries registered with DNP. They originate from the *Setup>Communications Routing* screen.

Master Event Counts Section

Binary Inputs

This is the number of binary input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Double Binary Inputs (Only for SG6801, SG6802Vista, and SG68023PM)

This is the number of double-bit binary input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Analog Inputs

This is the number of analog input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Counters

This is the number of counter input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Ethernet Diagnostics

Clear Button

This button clears both Ethernet ports statistics and the DNP Link and Transport statistics. It also enters a time stamp in the **Last Clear Time** field. Link status statistics are not cleared. See Figure 22.

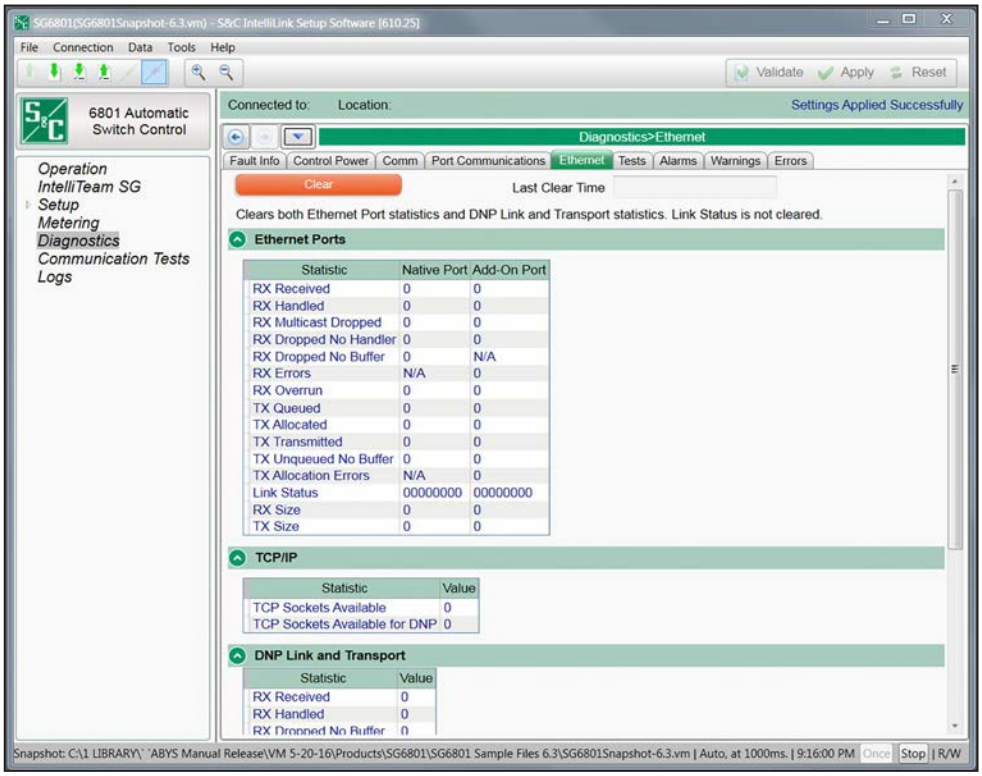

Figure 22. The *Diagnostics>Ethernet* screen.

The following parameters are reported:

Last Clear Time

This time stamp registers the last **Clear** command. Recently cleared counters represent present communications performance more accurately.

Ethernet Ports Section

These counts show **Native** and **Add-On Port** link status.

RX Received

This is the total number of received packets. The total is calculated with this equation:

RX_RECEIVED = RX_HANDLED + RX_MULTICAST + RX_FAULTS + RX_DROPPED

RX Handled
This is the total number of recognized and handled packets.

RX Multicast Dropped
This is the total number of multicast packets received. S&C controls do not support multicast packets. Therefore, all received multicast packets are dropped.

RX Dropped No Handler
This is the total number of dropped packets with no handler.

RX Dropped No Buffer
This is the total number of dropped packets with no buffer.

RX Errors
This is the total number of erroneous packets: misaligned packed, broken CRC, or wrong length. This statistic is only available for the Add-On Ethernet Port.

RX Overrun
This is the number of detected hardware (chip) errors.

TX Queued
This is the total number of packets queued for sending.

TX Allocated
This is the total number of allocation requests.

TX Transmitted
This is the total number of successfully transmitted packets.

TX Unqueued No Buffer
This is the total number of packets not queued because of a lack of buffer space.

TX Allocation Errors
This is the total number of allocation request failures. This statistic is only available for the Add-On Ethernet port.

Link Status
This report shows the PHY Link Status Registers:

PHY registers 1, 18 of SMSC LAN91C111 chip for Add-on Ethernet port.

PHY registers 1, 18 of AM79C874 or 1, 16 for DP83848 chip for Native Ethernet port.

RX Size
This is the total size (bytes) of all header and payload packets received since the last reset.

TX Size

This is the total size (bytes) of all header and payload packets transmitted since the last reset.

TCP/IP Section

This report shows the following parameters:

TCP Sockets Available

This is the number of available TCP sockets.

TCP Sockets Available for DNP

This is the number of available TCP sockets for DNP3 traffic only. DNP-P2P does not use the TCP/IP protocol.

NP Link and Transport Section

This is the counters associated with DNP communications.

RX Received

This is the number of DNP packets recognized in the input stream. The total is calculated with this equation:

RX_RECEIVED = RX_HANDLED + RX_FAILURES

RX Handled

This is the number of DNP packets routed and passed to the application layer.

RX Dropped No Buffer

This is the number of DNP/UDP frames dropped because of a lack of free packet buffers.

RX Overrun

This is the RX_BUFFER of a given port was overrun and its contents were dropped.

RX Dispatch Self

This is the dispatcher recognized the RTU address equal to FFFC (65,532), the DNP Self Address.

RX Dispatch Local

This is the dispatcher recognized the RTU address equal to one of the local addresses or FFFC (65,532), the DNP Self Address.

RX Dispatch Remote

This is the dispatcher recognized the RTU address equal to one of the remote addresses to be routed.

RX Dispatch Broadcast

This is the dispatcher recognized the RTU address equal to one of the broadcast addresses: FFFD-FFFF; 65,633-65,535.

RX Dispatch Application
This is the packet is dispatched to the application layer.

RX Dispatch EOS
This is the packet is dispatched to the EOS simplified DNP sockets.

RX Out of Sockets
This is the packet failed to be dispatched to the EOS-simplified DNP sockets because of a lack of available sockets.

RX Bad Config
This is the packets violate routing tables, with wrong destination ports, etc.

TX Queued
This is the packets are queued for transmission to serial ports or are waiting for MAC resolution via ARP.

TX Transmitted
This is the packets have been successfully sent.

TX Failures
This is the packets failed to be sent because of a changed serial protocol or a UDP/IP problem.

OOB Size
This is the Out-of-Bound data and skipped traffic.

RX Size
This is the received packet bytes.

TX Size
This is the transmitted packet bytes for all serial ports.

Port Communications Diagnostics

IntelliTeam II/SG System Communications Section

(This section applies only to controls using the IntelliTeam® II Automatic Restoration System or the IntelliTeam SG Automatic Restoration System)

As shown in Figure 23, these counters and statistics are associated with peer communications for each team in which this control is a member:

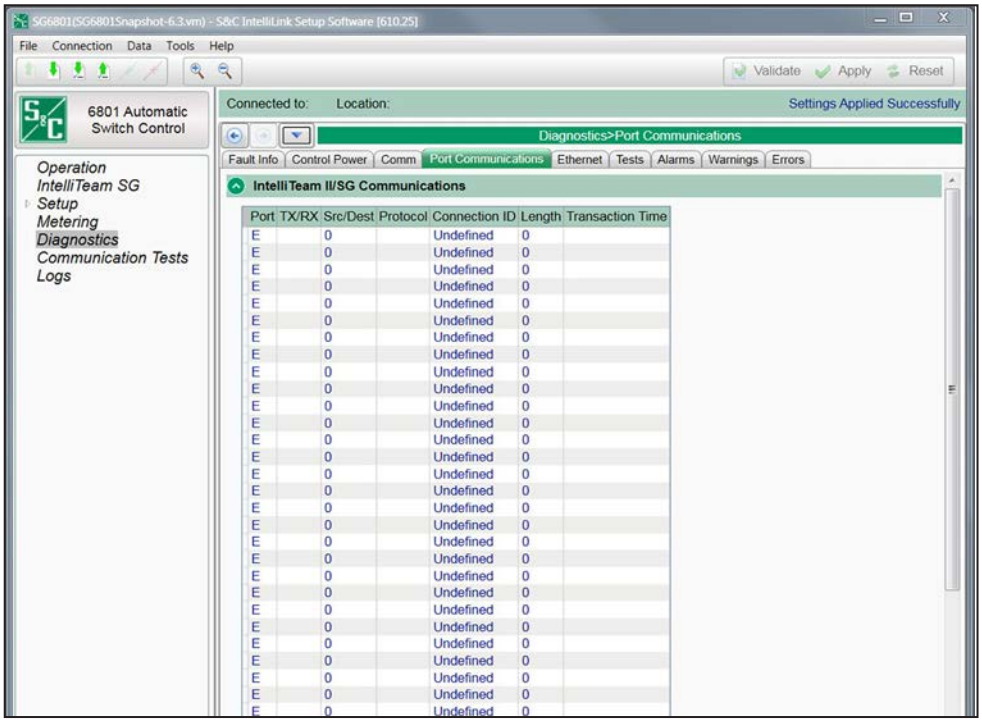

Figure 23. The *Diagnostics>Port Communications* screen.

Port

This is the port connected to the control.

TX/RX

This report indicates whether the packet was transmitted or received.

Src/Dest

This is the destination address for a transmitted message and the source address for a received message.

Protocol

The protocol is only peer to peer and is reported as "DNPP2P."

Data Type
This report notes the message type as: **Undefined**, **General**, **Internal DNP**, **Coach**, **Runner**, **Contract Agent**, **Netlist Transfer**, **Alley Oop RSH**, **IT-II Events**, **Protection**, **Data Load Management PRLM**, **CEC Signal**, **Diagnostics**, **NetObjectMgmt**.

Length
This is the number of bytes in the message packet.

Transaction Time
This is the time stamp of the packet.

IntelliTeam II/SG System Communications Totals

TxFragCount
This is the number of packets transmitted. Each packet is a fragment.

RxFragCount
This is the number of packets received. Each packet is a fragment.

TxTotalCount
This is the total number of bytes transmitted.

RxTotalCount
This is the total number of bytes received.

SCADA Master Communications Section

This report notes the counters and statistics associated with peer communications for each SCADA Master.

Port
The port connected to the control.

TX/RX
This indicates whether the packet was transmitted or received.

Scr/Dest
This is the destination address for a transmitted message and the source address for a received message.

Application Control
This is part of the DNPV3 message header.

Function Control
This is part of the DNPV3 message header.

IIN 1
This is part of the DNPV3 message header.

IIN 2
This is part of the DNPV3 message header.

Length
This is the packet length in number of bytes.

Transaction Time
This is the time stamp of the packet.

SCADA Master Communications Totals

The following parameters are reported:

TxFragCount
This is the number of packets transmitted. Each packet is a fragment.

RxFragCount
This is the number of packets received. Each packet is a fragment.

TxTotalCount
This is the total number of bytes transmitted.

RxTotalCount
This is the total number of bytes received.

Other DNP V3 Communications Section

This report notes the counters and statistics associated with peer communications for DNP V3 communications.

Port
This is the port connected to the control.

TX/RX
This report indicates whether the packet was transmitted or received.

Scr/Dest
This is the destination address for a transmitted message and the source address for a received message.

Application Control
This is part of the DNPV3 message header.

Function Control
This is part of the DNPV3 message header.

IIN 1
This is part of the DNPV3 message header.

IIN 2
This is part of the DNPV3 message header.

Length
This is the packet length in number of bytes.

Transaction Time
This is the time stamp of the packet.

Other DNP V3 Communications Totals

The following parameters are reported:

TxFragCount
The fragment is the packet. This is the number of packets transmitted.

RxFragCount
The fragment is the packet. This is the number of packets received.

TxTotalCount
This is the total number of bytes transmitted.

RxTotalCount
This is the total number of bytes received.

Team Summary

The **Ready** status is indicated for each team. If a manual operation is issued, the team(s) will go out of the **Ready** state. The manual operation can be cleared by clicking on the **Clear Manual Operation** button at the bottom of the screen. See Figure 24.

All teams must be in the **Ready** state and the **IntelliTeam SG Restoration** mode must be enabled for the IntelliTeam SG system to operate. To view individual team information, click on the **Team 1** through **Team 8** tabs.

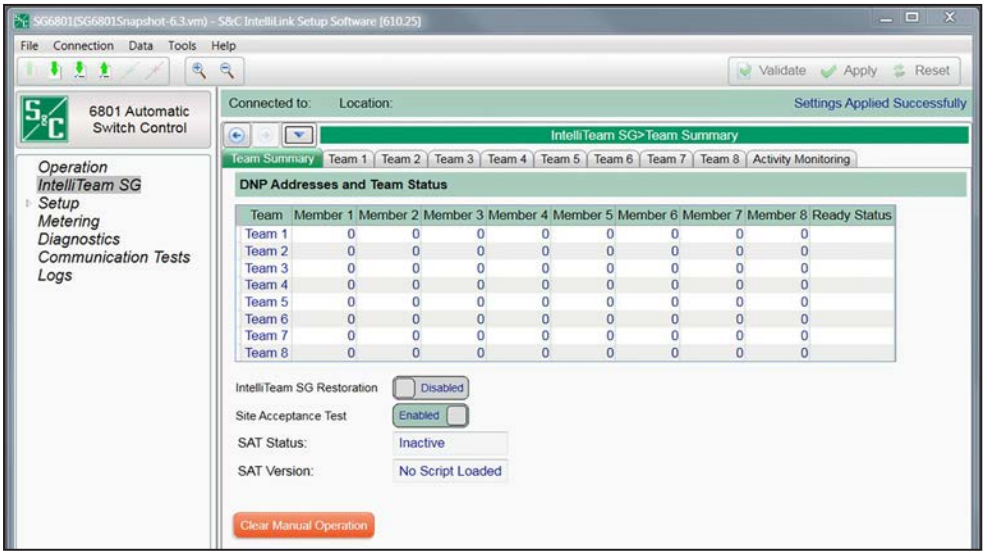

Figure 24. The *IntelliTeam SG>Team Summary* screen.

The following parameters are reported:

Team

This is the team number for the listed data.

Member 1 through Member 8

This is the DNP address of the team member.

Ready Status

This is the **Ready** status of the team.

IntelliTeam SG Restoration

This slide control is used to enable or disable the IntelliTeam SG Automatic Restoration System from this screen.

Site Acceptance Test

This slide control is used to enable or disable a Site Acceptance Test (SAT) script. Leave this set to the **Disabled** position for normal operation.

NOTICE

The Site Acceptance Test-related functions are not available for firmware versions 7.6 and later.

SAT Status:

This indicates status information for a Site Acceptance Test. During normal operation, this indicator displays the **Inactive** state.

SAT Version:

This indicator shows version identification for the Site Acceptance Test script. If a SAT script is not present in the control, this displays ***No Script Loaded***.

Clear Manual Operation

Click on this button to clear a manual operation command issued from the local user interface or by a SCADA command.

Team Information

The screen displays team-related parameters and information about each team member. See Figure 25.

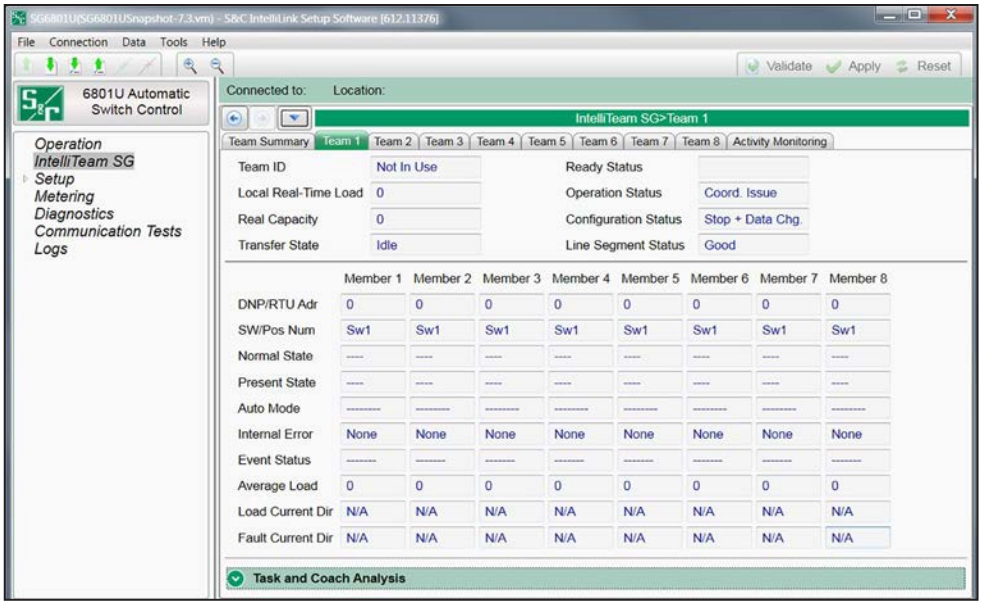

Figure 25. The *IntelliTeam SG>Team 1* screen.

The following parameters are reported:

Team ID

This is the name entered in the **Team ID** field on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Local Real-Time Load

This is the two-minute average three-phase load (in amperes) measured on the line segment protected by this team. It does not include load outside the local line segment.

Real Capacity

This is the load capacity available on the line segment protected by this team. It takes into account the real capacity of source-side teams, the maximum capacity of the team's present source device, and any load already transferred during circuit reconfiguration.

Transfer State

This is the present state of any transfer operation. Possible values displayed:

Idle—The Team configuration is normal. No transfer or **Return-To-Normal** operations are taking place.

Init—Data are being collected from team members in preparation for a transfer event.

Rqst—The line segment is requesting service restoration from an adjacent line segment.

Grant—The line segment is being asked to grant service restoration to an adjacent line segment.

Wait—The team configuration is not normal. The team is waiting for an additional circuit reconfiguration or **Return-To-Normal** operation.

RTN—The team is returning to normal configuration.

Stop—This displays when an error has occurred, stopping a transfer operation.

Fault—This displays when the team is presently isolating a fault.

Hold—This displays when the team has begun a transfer event but the line segment is not yet fully de-energized.

Ready Status

This is the present **Ready** state. Possible values displayed:

Ready—This displays when **Operation** status, **Configuration** status, and **Line Segment** status all indicate that no errors are present.

Alarm—This displays when errors are present.

Fault—This displays when the team is isolating a faulted line segment.

PLI—This displays when the team is isolating a phase-loss event.

Operation Status

This is the system operation status. Possible values displayed:

Good—This displays when the team members can perform team operations.

Coordination—This displays when the team coach is not passing through the team, causing a lack of team coordination.

Remote Config—This displays when the configuration of an adjacent team member is not consistent with the configuration of this IntelliTeam system device.

Local Config—This displays when the local team configuration has been changed on the *Setup>Restoration>IntelliTeam SG>Team x* screen and it has not been accepted.

Remote Error—This displays when an adjacent team member indicates an error condition.

Local Error—This displays when a local team member is disabled because the **Prohibit Restoration** function is enabled or the device changed state because of a remote IntelliLink software command or a SCADA command.

Logic Disabled—This displays when the team logic has been disabled on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Not In Use—This displays when this team is not in use.

No 2nd Contin.—This displays when the team is in a transferred state and no further restoration activity is allowed.

Configuration Status

This is the status of user-configured parameters essential for team operation. Possible values displayed:

NoRTU Addr—This displays when no RTU address is specified on the *Setup>Communications* screen.

Stop + Data Chg—The **Set Team** status is in the **Stopped** state following a change made to the team parameters on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Stopped—This displays when the **Set Team** status is in the **Stopped** state on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Data Change—This displays when an unexpected change has been made to the team parameters on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Record Count—This displays when the count of team member records on the *Setup>Restoration>IntelliTeam SG>Team x* screen is incorrect. The team database requires at least one record to be valid.

Not 1 Source—This displays when an incorrect number of source devices was configured on the *Setup>Restoration>IntelliTeam SG>Team x* screen. A team may have only one source switch.

No Local Rec—This displays when no local record was found in the team database. One of the team records must contain a DNP address configuration that matches the **DNP Address** setting entered on the *Setup>Communications>DNP* screen.

Line Segment Status

This displays the status of the line segment protected by this team of IntelliTeam system devices. Possible values displayed:

Good—This displays when no faults or voltage loss is detected on the line segment.

Segment Dead (Dd)—This displays when the line segment is de-energized.

Segment Open (Op)—This displays when all team members are in the **Open** position in preparation for a circuit reconfiguration.

Overcurrent (OC)—This displays when an overcurrent is detected on this line segment.

Voltage Loss (VL)—This displays when a voltage loss is detected on this line segment.

Team Error (Er)—This displays when an error is detected.

Alt Source (AS)—This displays when the line segment is being fed by an alternate source, either directly from an adjacent line segment or indirectly from another location.

Individual Team Member Status

DNP/RTU Adr

This report shows the DNP/RTU address of each team member, as entered on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Sw/Pos Num

This report shows the position number associated with the team member, for example "Sw1" for a single overhead switch, as entered on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Normal State

This report shows the state of each team member when the circuit is configured normally, as entered on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Present State

This is the present position of each team member displayed as:

Open—The Team member is open.

Closed—The Team member is closed.

---- —The position of the team member switch is unknown or the record is not in use. This is considered an error condition during normal operation.

Auto Mode

This report shows the automatic features enabled for each team member, as entered on the *Setup>Restoration>IntelliTeam SG>Team x* screen. This also indicates when the team member has been temporarily placed in manual operation mode. A combination of values can be displayed:

B—This switch is temporarily blocked from use as a valid source for the team during the reconfiguration event. This may be because of a loss of voltage at this switch, or this switch is used to shed load following a reconfiguration.

M—The team member is temporarily placed in manual.

A—Automatic Sectionalizing logic is enabled.

V—Sectionalizing on Loss-of-Voltage logic only is enabled.

T—Automatic Transfer logic is enabled.

P—Sectionalizing on Phase Loss logic is enabled.

Ro—Return-to-Normal logic using an open transition is enabled.

Rc—Return-to-Normal logic using a closed transition has been enabled.

Internal Error

Possible values displayed:

None—No internal errors are present in a team member.

Trouble—A team member is disabled because of a **Bad Battery** or other condition.

NotAuto—A team member is in a **Non-automatic** condition.

ManOR—The **Open/Close** state of a team member is manually overridden.

No Op—A **Close** or **Open** operation was requested but the team member is unable to perform the operation.

Note: For 6800 Series Automatic Switch Controls, **ManOR** and **No Op** status can be cleared on the *Operation* screen by clicking the **Manual Operation Clear** button. For all IntelliTeam SG system devices, **ManOR** and **No Op** status can be cleared on the *IntelliTeam SG>Team Summary* screen by clicking the **Clear Manual Operation** button or with a SCADA command.

ProRes—This report notes the team member has been sent a **Prohibit Restoration** command.

Event Status

This report notes the present status of events related to this team member. A combination of values can be displayed:

O—Latched On for an overcurrent event

V—Latched On for a voltage loss on any or all phases

P—Latched On for a phase loss during a sectionalizing event

Vr—The real-time voltage loss on any phase

3Vr—The three-phase real-time voltage loss

C—A team member is in the cycling state

Average Load

This is the two-minute average three-phase load reported by each team member. It is used to determine the **Local Real-Time Load** value. To ensure the team uses pre-event values during a transfer, it is frozen after the event at the last value reported before the event began. The value is not updated until the transfer is complete.

Load Current Direction

This is the direction of load current. Possible values displayed:

N/A—There is presently no current flowing in the team.

No Dir—Load current direction is presently unavailable.

Out of Team—Load current is flowing out of the team. The switch is the load/tie point of the team.

Into Team—Load current is flowing into the team. The switch is the present source of the team.

Fault Current Direction

This is the direction of fault current. Possible values displayed:

N/A—There is presently no fault in the team.

No Dir—Fault current direction is presently unavailable.

Out of Team—Fault current is flowing out of the team. The switch is the load/tie point of the team.

Into Team—Fault current is flowing into the team. The switch is the present source of the team.

Task and Coach Analysis

Task and Coach Analysis Section

The screen shown in Figure 26 displays team-related parameters and information about each team member.

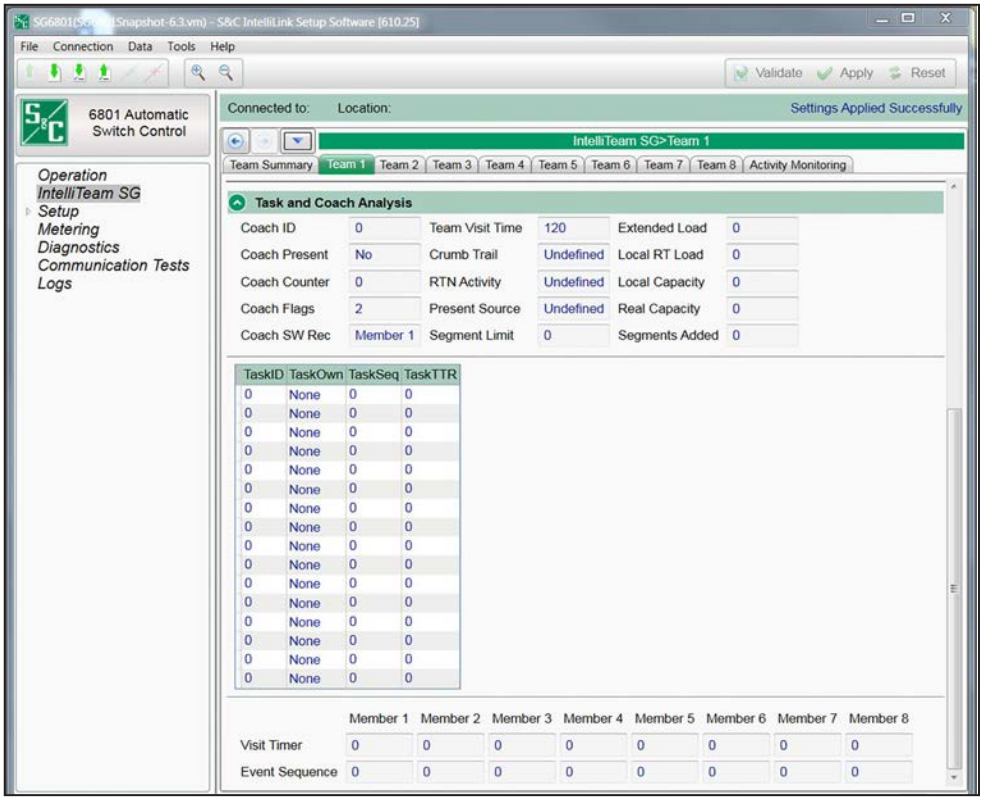

Figure 26. The *IntelliTeam SG>Team 1>Task and Coach Analysis* screen.

The following parameters are reported:

Coach ID

This is the identification number of the present team coach. When the coach is lost, the next coach generated will have a higher ID number.

Coach Present

This indicates the team coach is present at this team member and shows the coach status.

Coach Counter

This is the number of times the present coach has arrived at team members. This is used with the Coach ID to validate the coach when it arrives.

Coach Flags

This indicates the coach has arrived and left this team member. It shows that team data has been refreshed.

Coach Sw Rec

When the coach is present at this team, it indicates where the coach is executing.

Team Visit Time

This indicates the remaining time in seconds before a new coach is generated. This timer is refreshed while the coach is present. This team member will generate a new coach if the coach does not return and the timer expires.

Crumb Trail

This is a database record allowing team functions to span multiple teams. Provides a path back to the originating team.

RTN Activity

This is a database record indicating where the **Return-to-Normal** process originated.

Present Source

This is a database record showing the team member through which the line segment is presently receiving power.

Segment Limit

This is the number of line segments allowed to be restored on this circuit. It is the lesser of the limit configured by the **Line Segment Limit** setpoint on the *Setup>Restoration>IntelliTeam SG>Team x* screen and the limits set in the adjacent source-side teams.

Extended Load

This report notes extended team loading, which includes the line-segment loading and all downstream load.

Local RT Load

This is the local real-time load on the line segment protected by this team.

Local Capacity

This is the loading capacity of the local team. This value is compared with the remote capacity of the adjacent source-side team to determine the real capacity of the team.

Real Capacity

This is the loading capacity available on the line segment protected by this team.

Segments Added

This is the number of segments presently added. The team compares this value to the **Line Segment Limit** setting on the *Setup>Restoration>IntelliTeam SG>Team x* screen when a transfer event occurs.

The table in the center of the *Task and Coach Analysis* screen shows tasks presently being executed. S&C Electric Company uses this information for diagnostic purposes.

TaskID

This identifies the task being executed.

TaskOwn

This indicates the team in which the task is being executed. A task may require global execution at all team members.

TaskSeq

This is the sequence number of the task being executed.

TaskTTR

This is the time-to-run for the task being executed.

Visit Timer

This indicates the remaining time in seconds before the coach should visit a specific team member. The coach carries the timer, which will only update while the coach is at the team member.

Event Sequence

This is the sequence number of the last event received from this team member.

Task Operation

Figure 27 shows tasks presently being executed by the team member. S&C Electric Company uses this information for diagnostic purposes.

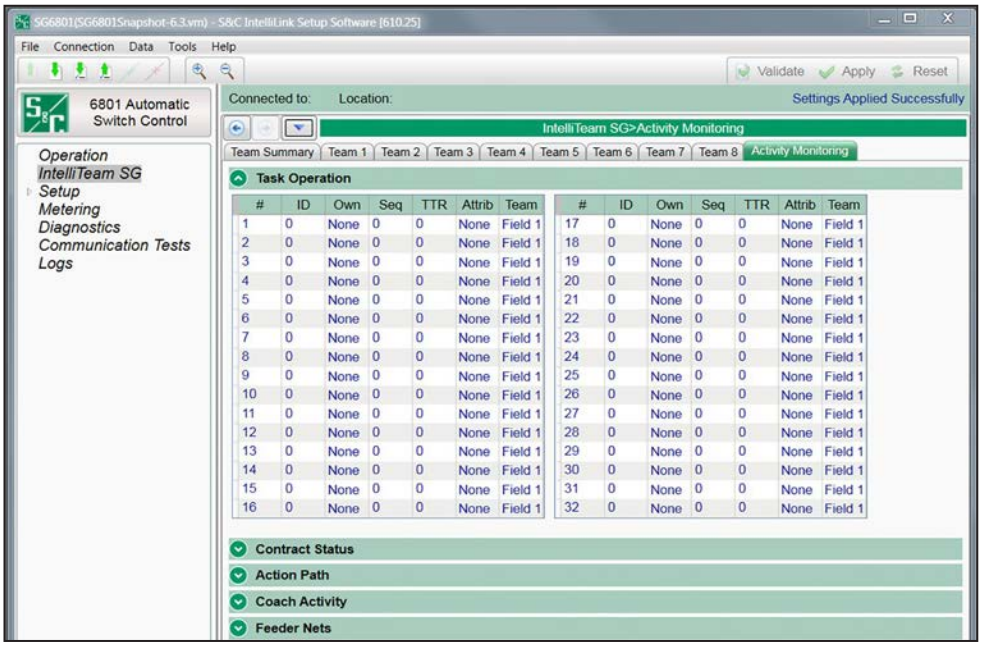

Figure 27. The *IntelliTeam SG>Activity Monitoring>Task Operation* screen.

The following parameters are reported:

ID
This identifies the task being executed.

Own
This identifies the team database record associated with the execution of this task.

Seq
This identifies the sequence number of the task being executed.

TTR
This identifies the time to run for the task being executed.

Attrib
This identifies the lock and execute attributes associated with the task being executed.

Team
This identifies the team number associated with execution of this task.

Contract Status

The *Contract Status* screen shows information about contracts associated with the contract agent at this control. This information is used for diagnostic purposes when working with S&C support engineers. See Figure 28.

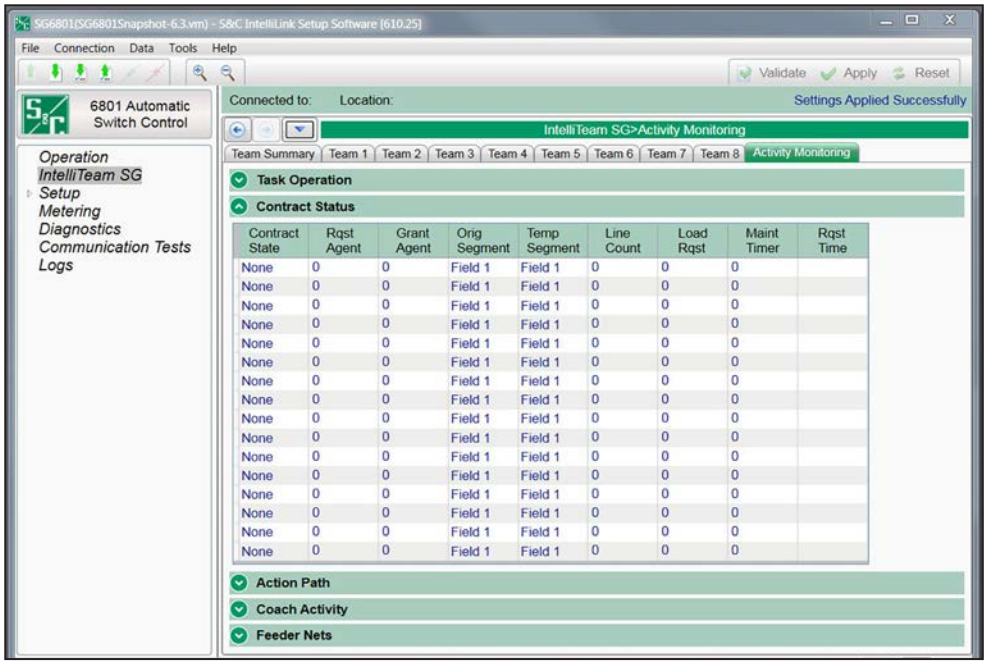

Figure 28. The *IntelliTeam SG>Activity Monitoring>Contract Status* screen.

If a contract is required for a particular line segment, a contract agent is used to track and secure the contract. Every contract request is uniquely identified by the requesting agent, the originating segment, and the time stamp when the request was made.

Information about contracts associated with this team member are shown on the *Contract Status* screen. S&C Electric Company uses this information for diagnostic purposes.

When a contract is required for a particular line segment, the contract agent is used to track and secure the contract. Every contract request is uniquely identified by the requesting agent and the originating segment, and it is time stamped when the request is made.

Contract State

This field shows the present state of the contract. Possible values are:

Active—This value shows the contract has been granted and is presently active.

Rqst unsent—This value shows the contract agent received a contract request from the team member but has not yet sent the request to the next contract agent.

Rqst pending—This value shows the contract request is pending.

Rqst travel—This is the contract agent is forwarding the contract because the decision to grant the contract cannot be made at this location.

Rqst accept—This value shows the contract request was accepted by this agent and contract approval is travelling to the originating agent. The contract is approved when contract approval arrives at the originating agent.

Rqst decline—This value shows the contract request was declined by this agent. The request is returned to the originating agent.

Decline cont.—This value shows a declined message is being transmitted to the requesting agent.

Dissolve start—This value shows an agent (usually the requesting agent) is dissolving the contract.

Dissolve cont.—This value shows a dissolve message is being transmitted.

Maint start—This value shows the maintenance timer on an active contract has expired, causing the maintenance action to occur.

Maint tickle—This value shows the contract agent has not recently received a maintenance message for the contract and sends a reminder to the requesting agent to determine whether the contract is still required.

Maint travel—This value shows a maintenance message is being transmitted from the requesting agent to other agents along the contract route.

Maint tra NF—This value shows the contract agent received a maintenance message for a contract that is not found in its list.

Maint tra NF rt—This value shows a "Maint tra NF" message is being returned to the requesting agent. This message can also appear at other agents along the contract route.

Maint tic NF—This value shows the contract agent received a tickle message for a contract that is not found in its list.

Maint tic NF rt—This value shows a "Maint tic NF" message is being returned to the agent that initiated the tickle. This message can also appear at other agents along the contract route.

Maint restart—This value shows the requesting agent confirmed that it still needs the contract, and the maintenance timer is restarted.

Maint res cont.—This value shows a restart message is being passed to other agents along the contract route.

Rqst Agent

This value shows the agent that requested the contract.

Grant Agent

This value shows the agent that approved the contract.

Orig Segment

This is the database record number for the segment where the contract request originated.

Temp Segment
This is the database record number for the present location of the contract request.

Line Count
This is the number of line segments that will be picked up if the contract request is granted. This value is usually "1."

Load Rqst
This is the amount of load that will be picked up if the contract request is granted.

Maint Timer
After a contract request is granted, this is the time remaining before contract maintenance should be performed. When a contract is no longer needed, the requesting agent sends a message to dissolve the contract. If the local contract agent does not receive a response within the timer setting, it checks with the requesting agent. The requesting agent can extend the contract if it is still needed or dissolve the contract if it is no longer required.

Rqst Time
This is the date and time when the contract was requested.

Team Member Action Path

The *Action Path* screen shows a table of the actions taken during the execution of a switch operation. This information is used for diagnostic purposes when working with S&C support engineers. See Figure 29.

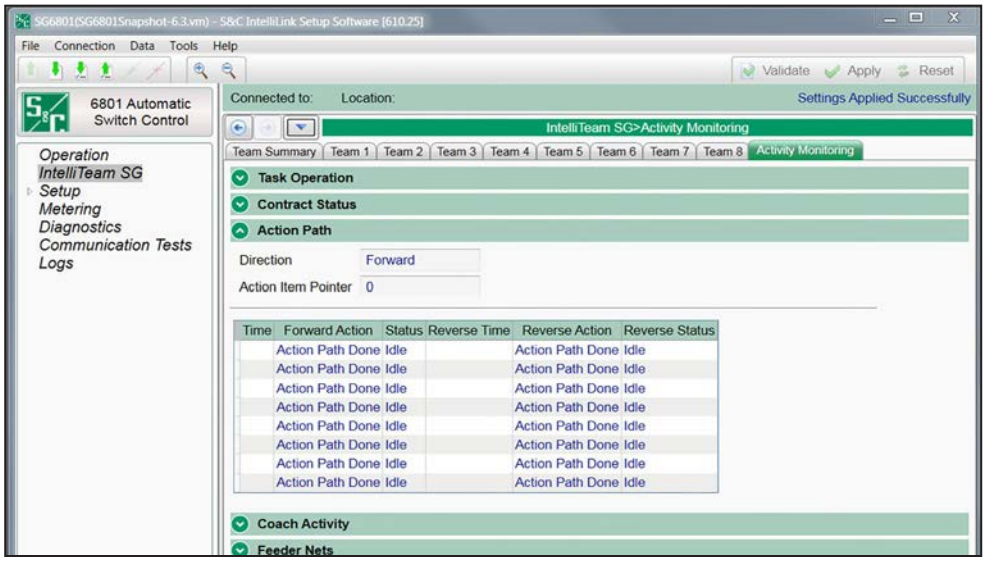

Figure 29. The *IntelliTeam SG>Activity Monitoring>Action Path* screen.

Some switchgear requires different steps to be taken during the operation of the switch than other gear. These steps are often further changed by the configuration of switch parameters, the team parameters, and the conditions of the event. Together the steps are called the "action path." The action path displayed in this table is created on the fly based on the present conditions during each event.

Because of the complexity of some action paths, it is necessary to have the ability to back out of a series of steps. Backing out of an action path may occur when one of the steps can not be performed, thus requiring that the switch be put back into its normal state.

The screen shown in Figure 29 reports the actions taken during execution of a team member operation. S&C Electric Company uses this information for diagnostic purposes.

Backing out of an action path may occur when one of the steps cannot be performed. This will require that the team member be returned to its normal state.

The following information is reported for the action path:

Direction

This is the direction the action path is presently taking. Reversing the action path will only occur if the forward path is stopped before completion.

Action Item Pointer

This is the record within the action path that is presently being executed. S&C Electric Company uses this information for diagnostic purposes.

Time or Reverse Time

This is the time stamp of the action.

Forward Action / Reverse Action

This is the name of the step to be taken during execution of the action path and the time stamp at the start of that step. Step names that may be displayed include:

- Action path done
- Close for xfer
- Contract request
- Contract terminate
- Block recloser
- Unblock recloser
- Block ground trip
- Unblock ground trip
- Alternate settings
- Normal settings
- Status

Status

This is the status of the associated step in the action path and the relative time at which this step occurred. The status can be reported as: **Idle**, **Running**, **Failed**, or **Success**.

Coach Activity

The screen in Figure 30 shows time stamps for basic coach activities and the counter for each team's coach.

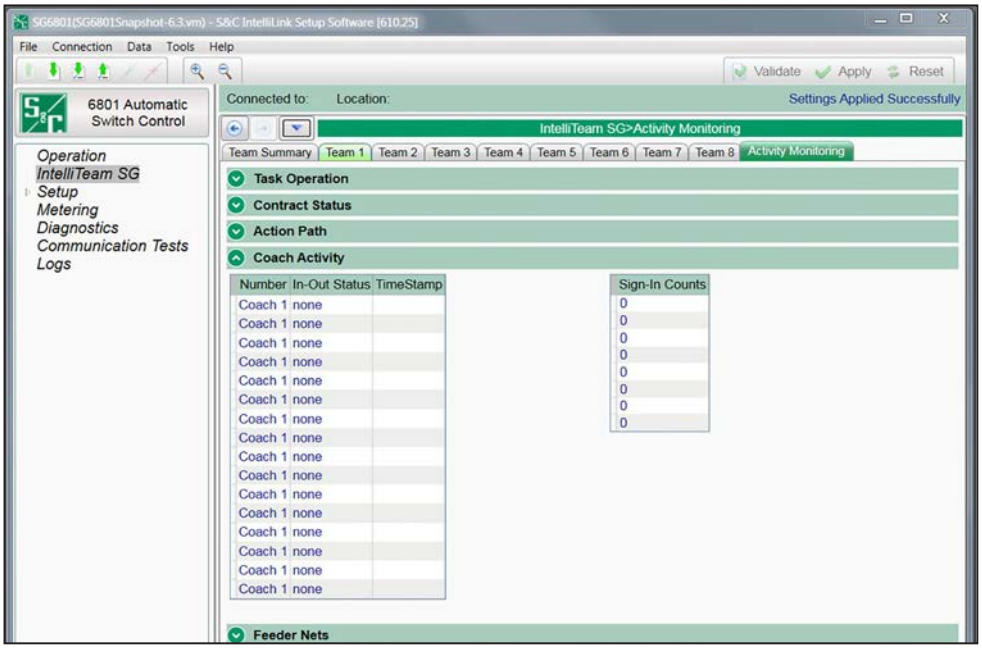

Figure 30. The *IntelliTeam SG>Activity Monitoring>Coach Activity* screen.

The following parameters are reported:

Number

This is the coach/team number.

In-Out Status

This is the coach activity signing in or going to the specified team member (Rec 1, Rec 2, etc.).

Time Stamp

This is the date and time when the activity occurred.

Sign-In Counts

This is the ongoing count for each team's coach.

Feeder Nets

The screen shown in Figure 31 contains data associated with the Feeder Netlists.

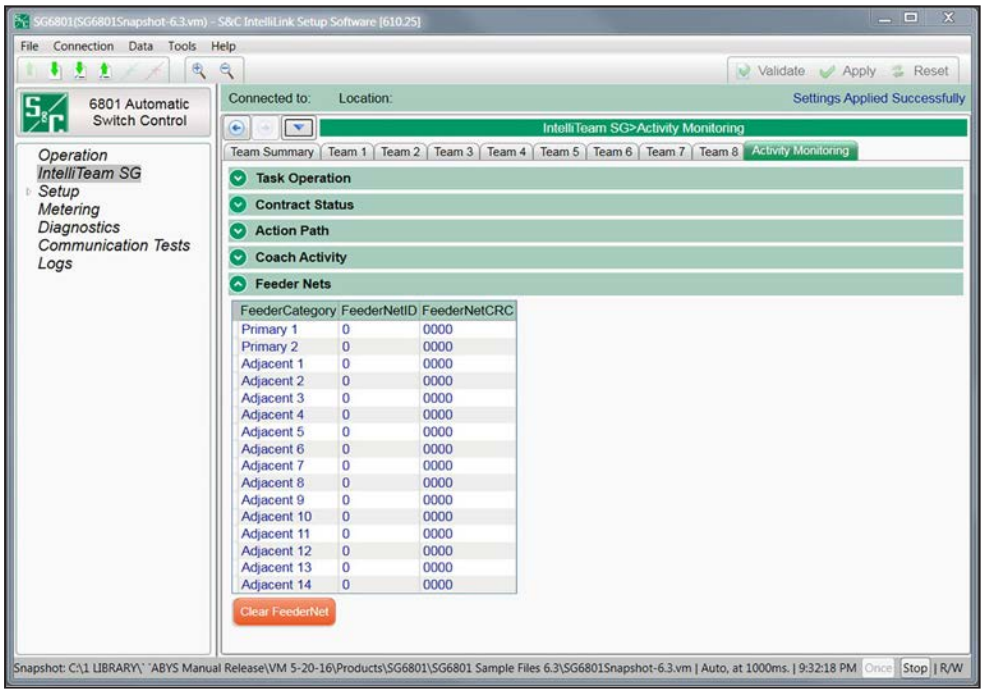

Figure 31. The *IntelliTeam SG>Activity Monitoring>Feeder Nets* screen.

The following parameters are displayed:

Feeder Category

The FeederNet is a database of the teams and controls that use the same breaker at a substation (or equivalent source) as their primary power source. These categories may be displayed:

Primary 1—Every switch has a Primary 1 FeederNet associated with its primary substation breaker.

Primary 2—Only a tie-point control will have a Primary 2 FeederNet associated with the adjacent substation breaker for this tie point.

Adjacent—This is the FeederNet on the other side of the tie point. These are listed for every tie point on the primary feeder. There will generally be as many adjacent FeederNets listed as there are alternate sources for the primary feeder.

FeederNet ID

This is the unique identifier assigned by the IntelliTeam Designer system that defines a specific substation breaker (or equivalent) and the circuit it supplies out to the end loads and/or open tie points.

FeederNet CRC

This is the cyclic redundancy check (CRC), a value calculated for a specific FeederNet configuration. The CRC changes when any FeederNet data are changed. It is used to identify a specific FeederNet configuration version.

Clear FeederNet Button

This command clears the stored FeederNet data. When cleared, a new Feeder Netlist must be pushed.

Data Logging Setup

The screen shown in Figure 32 configures the filter settings for viewing log screens. The Administrative login is required to execute any of the log-control functions.

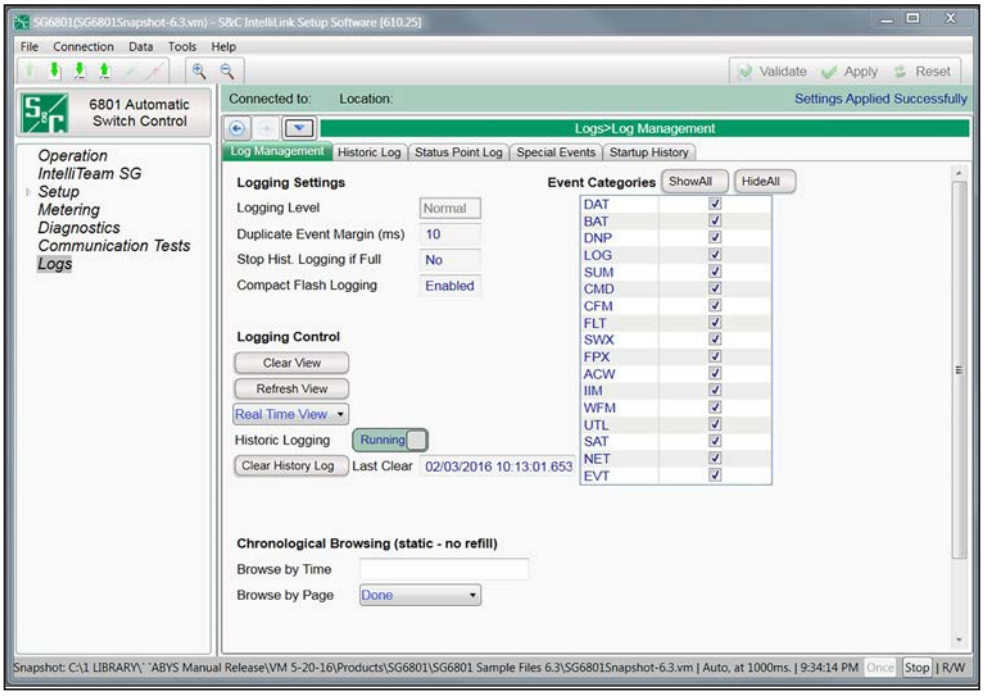

Figure 32. The *Logs>Log Management* screen.

The following parameters are shown:

Logging Settings

Logging Level

The logging level selected determines the type of data-log messages captured in flash memory and displayed on the *Logs>Historic Log* screen. Every datalog message is assigned a specific log level:

Normal—User information

Extended—User information and internal status

All—User information, internal status, and internal trace/debugging information

Duplicate Event Margin (milliseconds)

Storing identical events in a short time period can flood internal memory and does not provide useful diagnostic information. By configuring the time between duplicate-event log entries, this setpoint determines which data will be stored in the internal memory and be displayed on the *Logs>Historic Log* screen, It has no effect on an alternating sequence of events. Two events are considered duplicates when every element of their event records match. For example, when the **Duplicate Event Margin** setting is 10 ms. and the sequence of events ABABAB (where A and B are different) has every event occur 1 ms after the previous one. The identical events occur within 2 ms, well within the value of the set point, but all events will be logged because events are alternating. (Range = 0-30; increment = 1.)

Stop Historic Logging if Full

When enabled, this setting stops logging events when the Historic log is full and subsequent events are discarded without overwriting contents of the log. Flash memory logging, the Status Point log, and Special Events logging are not affected by this set point. Do not set this setting to "Yes" unless troubleshooting. Once troubleshooting is completed or new event data are desired, set this setting to "No" to ensure continued event logging.

Compact Flash Logging

When enabled, every historic event generated is written to flash memory. **Logging Level** and **Duplicate Event Margin** setpoints do not prevent an event from being written to flash memory. Flash memory logging preserves as much data as possible. Flash memory data can be retrieved with IntelliLink Setup Software. Open the **Tools** option on the menu bar and click on the **Compact Flash Access** option. Select and save any files needed. S&C strongly recommends enabling the **Compact Flash Logging** setting to simplify diagnostic and troubleshooting work.

Event Categories

Select the categories that will be displayed on the *Logs>Historic Log* screen. To display only the most important operation information, select the EVT category and click the **Refresh View** button. Utility operation data will be displayed and log information for software troubleshooting and debugging will be omitted.

Logging Control

Complete data are stored in the Historic log in flash memory. Flash memory files can be downloaded by opening the **File** option on the menu bar and clicking on the **Flash Memory Files** option. The complete Historic log (up to a million events) cannot be viewed through IntelliLink software, but a small subset of the Historic log (160 events) is displayed on the *Logs>Historic Log* screen. Event filters can be applied to the *Logs>Historic Log* screen, but these filters do not affect entry of events in the Historic log.

Clear View

This button clears all data on the *Logs>Historic Log* screen. In **Real-Time View** mode, the next qualifying event will be placed at the top of the *Logs>Historic Log* screen. In **Static View** mode, the *Logs>Historic Log* screen will remain empty until it is completely refilled.

Refresh View

This button clears the present contents of the *Logs>Historic Log* screen and loads up 160 events from the Historic log in ascending chronological order. Only events satisfying the checked **Event Categories** options are displayed on the *Logs>Historic Log* screen.

Real Time View or Static View

Use this drop-down menu to select the view mode. **Real Time View** mode loads the latest data on the screen, and **Static View** mode freezes data on the *Logs>Historic Log* screen.

Historic Logging

Running—Starts the Historic log but does not affect flash memory logging, Status Point log entries, or Special Events logging.

Stopped—This setting stops the Historic log but does not affect flash memory logging, Status Point log entries, or Special Events logging. Subsequent events will not be put into the Historic log, preventing newer events from overwriting older events. Be sure to return the **Historic Logging** mode to the **Running** setting so future events will be logged.

Clear History Log

This button clears all data in the Historic log. It does not affect flash memory logging, Status Point log entries, or Special Events logging. The date and time of the last **Clear History Log** command are displayed. Clearing the Historic log permanently deletes all event data. If the event data must be preserved, generate an HTML report of logged data before clearing the log.

Chronological Browsing (static – no refill)

Chronological browsing is only available in the **Static View** mode. It is not available in the **Real Time View** mode. Because the size of the *Logs>Historic Log* screen is only a fraction of that of the Historic log, the Historic log must be navigated chronologically, either in **Browse By Time** mode or **Browse By Page** mode.

Browse By Time

This loads up to 160 events that occurred at or after the specific time entered. Only events that satisfy the event categories criterion are placed in the *Logs>Historic Log* screen. If all events in the Historic log occurred before the specified time, the oldest-available events are placed in the *Logs>Historic Log* screen. The *Logs>Historic Log* screen is refilled as soon as the specific time is entered; the specified time is cleared when the refill is complete.

Browse By Page

Historic log pages can be browsed four ways:

Oldest 8 Pages—Loads up to 160 of the oldest qualifying events from the Historic log

Newest 8 Pages—Loads up to 160 of the newest qualifying events from the Historic log

Previous 8 Pages—Loads up to 160 previous events relative to the events currently in the *Logs>Historic Log* screen

Next 8 Pages—Loads up to 160 next events relative to the events currently in the *Logs>Historic Log* screen

When the selection is entered, the *Logs>Historic Log* screen is refilled immediately. Because the Historic log is circular, selecting the **Previous 8 Pages** option may cause the newest events to be displayed (if the *Logs>Historic Log* screen presently holds the oldest). Similarly, selecting the **Next 8 Pages** option may cause the oldest events to be displayed (if the *Logs>Historic Log* screen presently holds the newest).

Historic Log

The screen shown in Figure 33 displays the Historic log, a subset of the Historic log. It is a chronological listing of events filtered based on the criteria specified on the *Logs>Log Management* screen. In **Real-Time View** mode, when the log is full each new event overwrites the oldest event in the log. The Historic log does not show the entire Historic log, which is stored in flash memory. Flash memory files can be downloaded by opening the **Tools** option on the menu bar and clicking on the **Compact Flash Access...** option. Select and save any files needed.

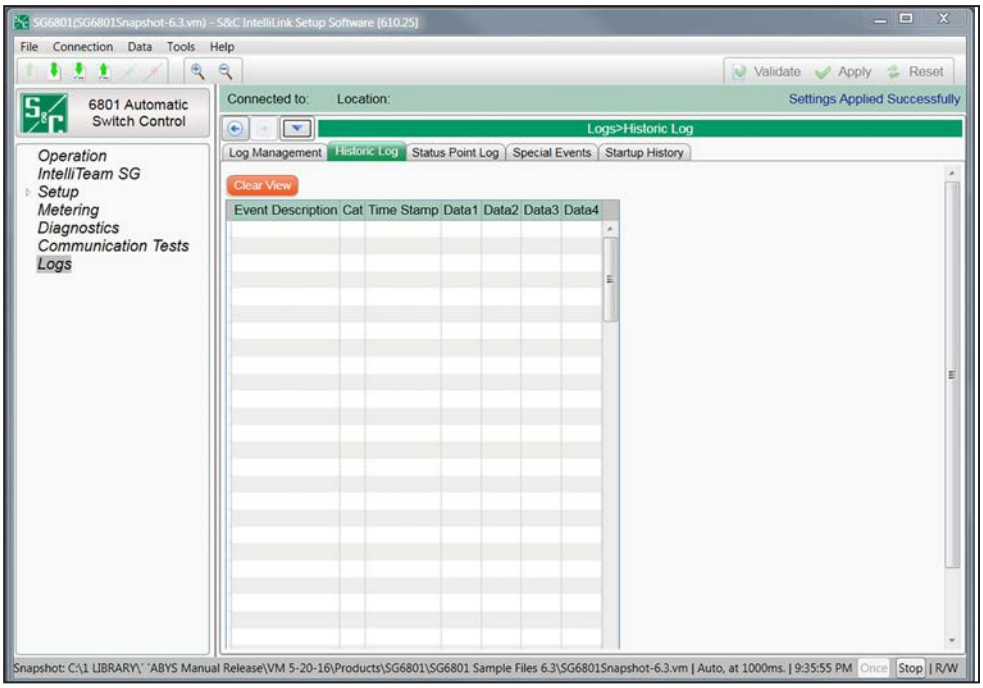

Figure 33. The *Logs>Historic Log* screen.

The following parameters are shown:

Clear View

This button empties the Historic log. In **Real Time View** mode, the next qualifying event will be placed at the top of the log. In **Static View** mode, the log will remain empty until it is refilled.

Event Description

This field provides the description for each event.

Category

Each historic event is assigned to a category to simplify filtering and sorting.

Time Stamp

This is the date and time of the event occurrence based on the **Time Source Synchronization** setting on the *Setup>General>Time* screen.

Data 1, Data 2, Data 3, Data 4

Each event message, in conjunction with the Data 1 through Data 4 code, describes the event and action(s) taken. S&C Electric Company uses any value(s) in the other data columns for diagnostic purposes if an event message refers only to Data 1.

Status Point Log

This screen indicates whether a status point is presently active or inactive, how many times it has been active, when it last became active, and when it last became inactive. See Figure 34. Two historic events are associated with each status point in the Historic log—when the status point became active and when it became inactive. For example, if a status point has been active 100 times and is active now, 199 related events are included in the Historic log—100 for the status point becoming active, and 99 for the status point becoming inactive.

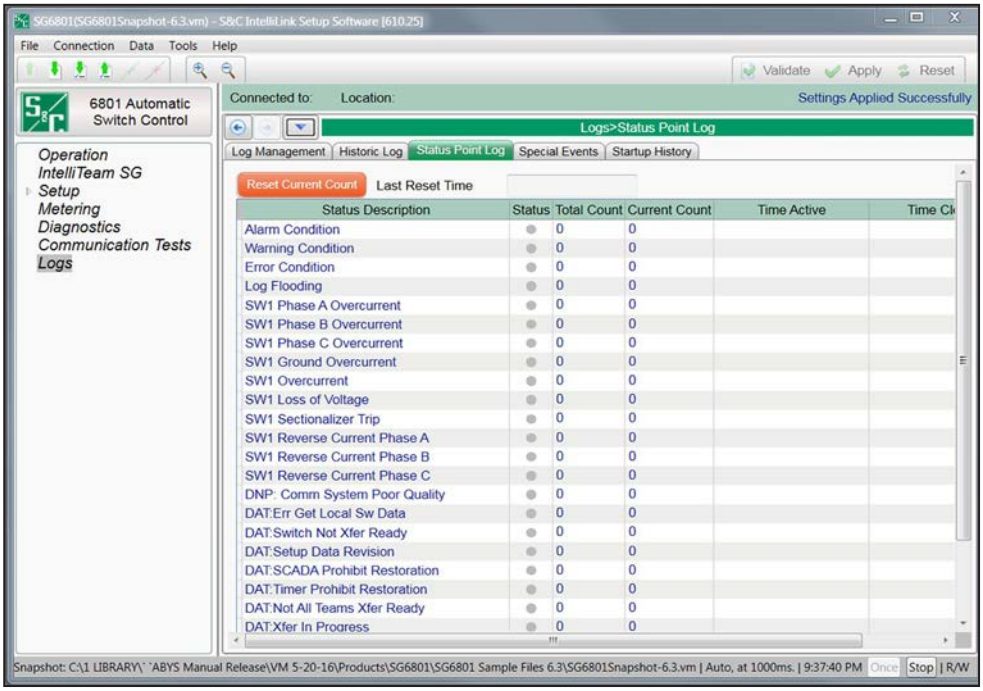

Figure 34. The *Logs>Status Point Log* screen.

The *Logs>Status Point Log* screen is a convenience; this information is also available in the Historic log. The following parameters are shown:

Reset Current Count

This button resets the Current Count column of the table displayed on the screen.

Last Reset Time

This is the date and time the current count total was reset.

Status Description

The definition of each status point is available in Instruction Sheets 1045-560, 1045-560B, 1045-560C, 1045-560D, 1045-560E, or 1045-560F: "S&C 6800 Series Switch Controls: *DNP Points List and Implementation*."

Status

This shows the state of the status point: a red dot indicates active, and a gray dot indicates inactive.

Total Count

This shows the total number of times the status point has been active.

Current Count

This shows the number of times the status point has been active after a **Reset Current Count** button command.

Time Active

This shows the date and time the status point last became active after a **Reset Current Count** button command.

Time Cleared

This shows the date and time the status point last became inactive after a **Reset Current Count** button command.

Double Status Point Log

This screen displays when the **Double Binary Inputs** mode is set to the **Enabled** state on the *Setup>Communications>DNP* screen. It indicates the state of a double-bit status point, how many times it has been in the **Closed** (conducting) state, when it was last in the **Closed** state, and when it was last in the **Open** (not conducting) state.

Double-bit status points report more detailed monitoring of switch position. Single status points assigned to switches (for example: SW1 Open, SW1 Closed, and SW1 Position Inconsistent) provide information about a switch, but double-bit status points consolidate the switch information represented by the multiple status points into one double-bit status point.

The *Logs>Double Status Point Log* screen is a convenience. See Figure 35. The information it provides is also shown on the *Logs>Status Point Log* screen and in the Historic log.

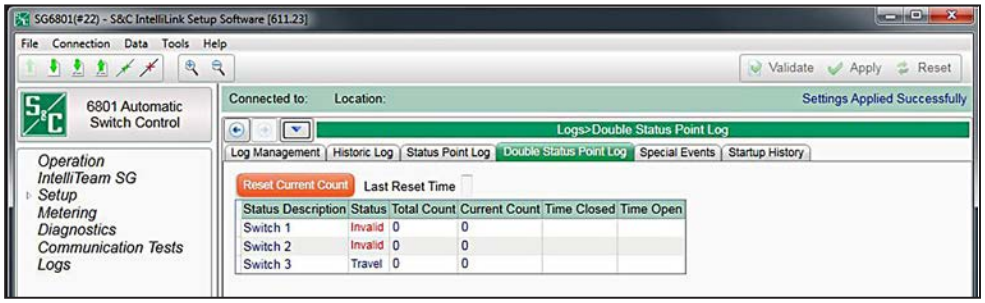

Figure 35. The *Logs>Double Status Point Log* screen.

There are four possible values for a **Double-bit** status point (two bits yield four values):

- **Travel (Value 0)—**The switch is traveling between positions. (Both the SW1 Open sensor and the SW1 Closed sensor are not indicated active by the appropriate single Binary status point.)
- **Open (Value 1)—**The switch is in the **Open** position. The corresponding single Binary status points are **SW1 Open** (active) or **SW1 Closed** (inactive)
- **Closed (Value 2)—**The switch is in the **Closed** position. The corresponding single Binary status points are **SW1 Open** (inactive) or **SW1 Closed** (active).
- **Invalid (Value 3)—**The switch is in an inconsistent position. The switch is in travel for more than several seconds (stuck) or there is a sensor error (both the **SW1 Open** and **SW1 Closed** status points are active), and the single inconsistent binary status point will also be active.

When a switch changes state, single-bit binary status points and logs will always show a state change on the *Logs>Status Point Log* and the *Logs>Historic Log* screens. When the **Double Binary Input** mode is enabled on the *Setup>Communications>DNP* screen, Double-bit status points will also show a change on this screen, but no additional logs are entered in the *Logs>Historic Log* screen.

Reset Current Count

This button resets the current count totals.

Last Reset Time

The date and time the counters were reset.

Status Description
The switch for which the status is reported.

Status
The present condition of the status point displayed as: **Open**, **Closed**, **Travel**, or **Invalid**.

Total Count
Total number of times the status point has been in the **Closed** state.

Current Count
The number of times the status point has been in the **Closed** state since status point counters were last reset using the **Reset Current Count** button on this screen.

Time Closed
Date and time the status point last was in the **Closed** state since the status point counters were reset.

Time Open
Date and time the status point last was in the **Open** state since the status point counters were reset.

Special Events Counters

Some historic events are special events, such as when a flash memory failure will adversely impact operation. The screen shown in Figure 36 indicates how many times each special event has occurred, the last time it occurred, and the last time it cleared.

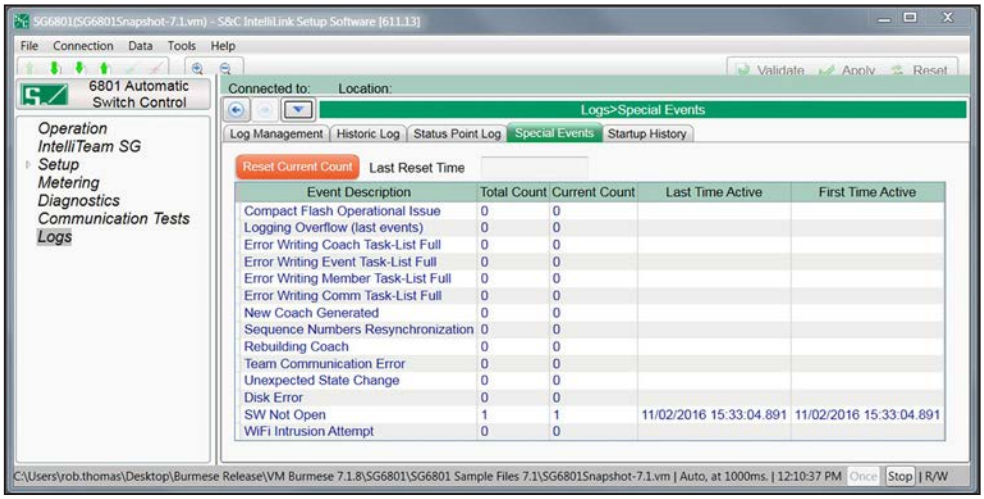

Figure 36. The *Logs*>*Special Events* screen.

The following parameters are shown:

Reset Current Count

This button resets the Current Count column of the table displayed on the screen.

Last Reset Time

This shows the date and time the current count totals were reset.

Event Description

This is the definition of each event.

Total Count

This shows the total number of times the special event has occurred.

Current Count

This shows the number of times the special event has occurred since the last reset using the **Reset Current Count** button on this screen.

Last Time Active

This is the date and time the special event last became active since the Current Count column was reset.

First Time Active

This is the date and time the special event first became active since the Current Count column was reset.

System Startup History

The screen shown in Figure 37 tracks system start and stop time stamps, in ascending order. The following parameters are shown:

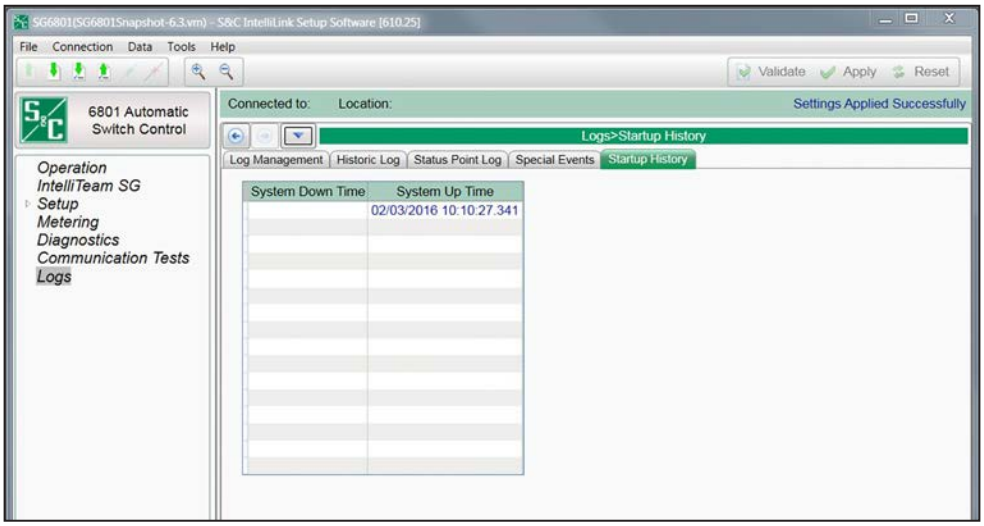

Figure 37. The *Logs>Startup History* screen.

System Down Time

This shows the date and time power to the control was lost.

System Up Time

This shows the date and time power to the control was restored.

Compact Flash Log

When **Compact Flash Logging** mode is enabled (from the *Logs>Log Management* screen), every historic event generated by the 6800 Series switch control application is written to flash memory, even if historic logging has been stopped for the Historic log or the event does not satisfy logging criteria.

Only the IntelliNode™ Interface Module has a removable CompactFlash® Memory Card. The 6800 Series Automatic Switch Controls, the 6801M Automatic Switch Operators and the IntelliRupter® PulseCloser® Fault Interrupters use flash memory that cannot be removed. However, the screens and descriptions refer to the permanent flash memory as "Compact Flash" memory.

The 6800 Series control uses 100 pre-allocated fixed-size files to store historic event data in the compact flash memory and stores over 1,000,000 events. The files are named LOG00.VM, LOG01.VM…LOG98.VM, LOG99.VM and are all a very similar size. Files are continuously reused. When data logging fills all 100 files, LOG00.VM will be opened again, and new events written, starting at the beginning of the file and replacing the oldest events. This means that after all 100 files have been used, at any given moment, one of the files is circular, without a fixed beginning.

Note: The number of event entries in a full file is about 10,000, but this is not a precise count and varies slightly for each file. This means that a reused file is likely to contain a small amount of very old data at the end. The older events are identified by their time stamp. Sometimes data being stored to a file are interrupted, usually by a power loss or CompactFlash Memory Card removal in the IntelliNode Interface Module. In this case, data logging assumes that the file is corrupted, saves it under a unique name such as "AABBCCDD.err", and creates a new file for future use. A corrupted file like this can still be useful because usually only a small amount of data has been corrupted.

Viewing Compact Flash Data

The flash memory logs cannot be viewed using IntelliLink software; they must be downloaded to the computer. See Figure 38. Follow these steps to download the log files:

STEP 1. In the **Tools** pull-down menu, select the **Compact Flash Access...** option to open the Compact Flash Access dialog box.

STEP 2. In the Local File System section of the screen, select the target directory for the file download.

STEP 3. In the "Remote File System" section of the screen, select the HISTLOG folder.

STEP 4. Select the file to download.

STEP 5. Right click the selected file and select the **Download** option.

The download progress will display in the lower right corner of the Compact Flash Explorer dialog box. Wait until the download has completed and navigate to the downloaded file to view it. An .xml and an .html version of the file will be created in the target directory.

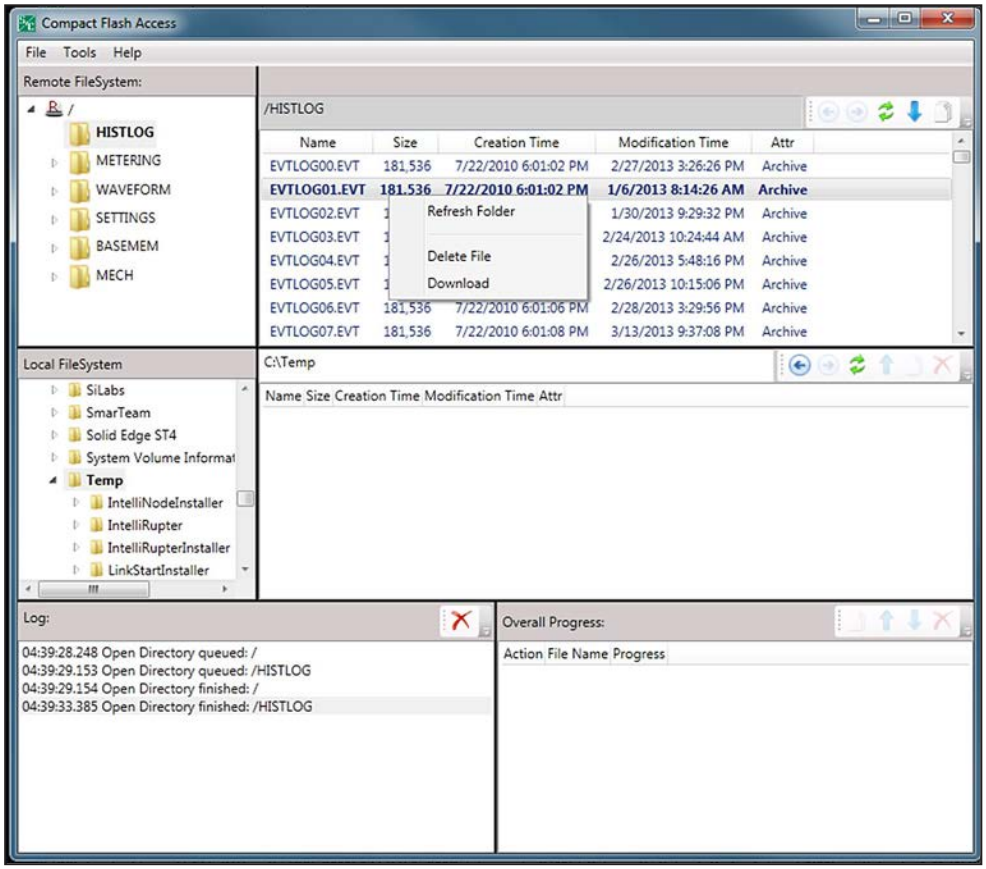

Figure 38. The Compact Flash Access dialog box.