Troubleshooting

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Qualified Persons

⚠ WARNING

Only qualified persons 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 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 the 6801M Automatic Switch Operator. 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 6801M Automatic Switch Operator. Designate a location where this publication can be easily retrieved.

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 1045M-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 S&C 6801M Automatic Switch Operator, except 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 S&C 6801M Automatic Switch Operator 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 S&C 6801M Automatic Switch Operator 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 of S&C manufacture, 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 S&C 801M Automatic Switch Operator. 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 unclear 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 the S&C 6801M Automatic Switch Operator.

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 S&C 6801M Automatic Switch Operator 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 6801M Automatic Switch Operator 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 ST6801MSS-7.6.x and SG6801MSX-7.6.x. The "x" can indicate any number from 0 to 255. Other related software component version information is found on the *Setup>General>Revisions* screen.

The software revision is shown in the installer file name (-7.6.x) and on the *Setup>General>Revisions* screen. For questions regarding the applicability of information in this instruction sheet to future software releases, contact S&C Electric Company.

NOTICE

Several procedures in this document 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, "S&C 6800 Series Automatic Switch Controls: *Setup,*" for more information.

⚠ WARNING

Serious risk of personal injury or death may result from contact with electric distribution equipment when electrical isolation and grounding procedures are not followed. The equipment described in this document must be operated and maintained by qualified persons who are thoroughly trained and understand any hazards that may be involved. This document is written only for such qualified persons and is not a substitute for adequate training and experience in safety procedures for accessing high-voltage equipment.

⚠ WARNING

These instructions do not replace the need for utility operation standards. Any conflict between the information in this document and utility practices should be reviewed by appropriate utility personnel and a decision made as to the correct procedures to follow.

The S&C 6801M Automatic Switch Operator is connected to switchgear operating at primary voltage levels. High voltage may be present in the wiring to the switch operator or in the switch operator itself during certain failures of the switchgear wiring or grounding system because of to a failure of the switch itself. For this reason, access to the switch operator should be treated with the same safety precautions that would be applied when accessing other high-voltage lines and equipment. Follow all locally approved safety procedures when working on or around this switch operator.

Before attempting to access an existing switch installation, check carefully for visible or audible signs of electrical or physical malfunction (do this before touching or operating the switch operator or any other part of the installation). These warning signs include such things as smoke, fire, open fuses, crackling noises, loud buzzing, etc. If a malfunction is suspected, treat all components of the installation, including the switch operator and associated mounting hardware, as though they were elevated to primary (high) voltage.

Whenever manually reconfiguring the circuit (for example, during repairs), follow your company's operating procedures to disable automatic operation of the IntelliTeam SG or IntelliTeam® II Automatic Restoration System. This prevents any unexpected operation of a team member.

Disable the IntelliTeam SG Automatic Restoration System by selecting the **Prohibit Restoration** state in any team member of the team to be disabled.

Troubleshooting Overview

The following tools and switch operator features are used to diagnose and correct problems. See Figure 1 to review component locations.

LCD Screen

The alphanumeric display on the switch operator faceplate provides information about the present state of the team. For an explanation of faceplate features, see S&C Instruction Sheet 1045M-540, "S&C 6801M Automatic Switch Operators: *Operation*."

LEDs

LEDs on the switch operator circuit boards and the faceplate provide information about the present state of the switch operator. PS/IO board LEDs are shown in Figure 2 on page 8.

IntelliLink® Setup Software

The screens display information about switch operator status, switch operator operation, and switch sensor data. For an explanation of these screens, see the "Troubleshooting with IntelliLink Setup Software" section on page 18.

To view the screens, a personal computer, a USB A to B cable or serial cable, and the IntelliLink software version for the specific 6801M Switch Operator are required. For more information about the use of IntelliLink software, see S&C Instruction Sheet 1045M-530, "S&C 6801M Automatic Switch Operators: *Setup*."

Test Points

Most of the wiring in the switch operator enclosure is terminated with insulation-displacement connectors. To test a pin, gently slide the black plastic cap sideways on the connector until the pin is exposed. Test the pin, 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.

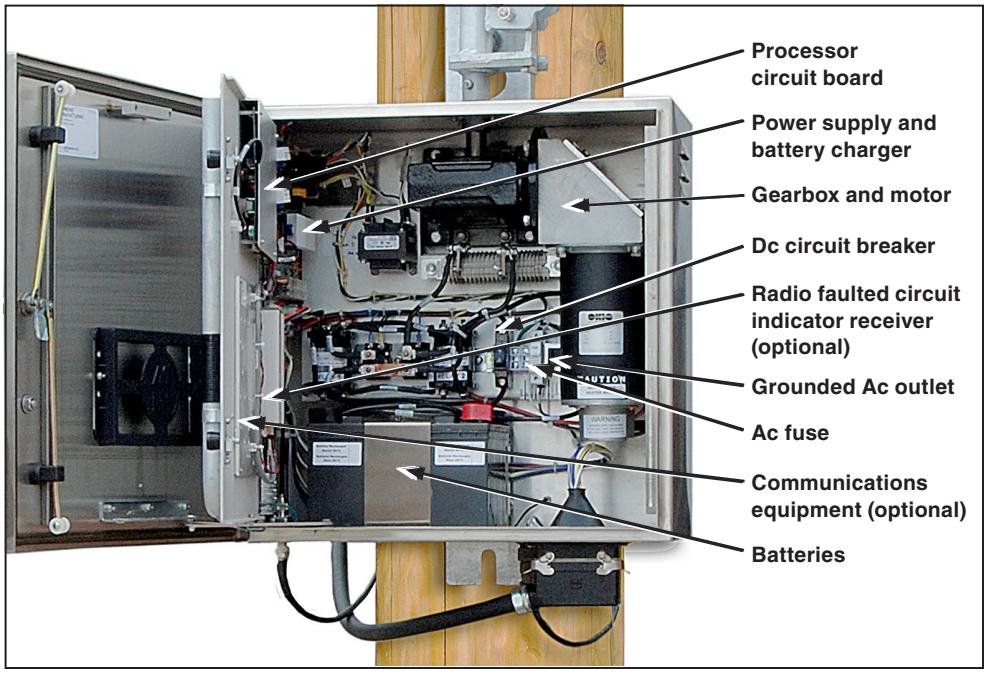

Figure 1. Switch operator with the faceplate open.

Tools Required

The following tools may be required:

- A multimeter and probes
- A 4-inch (10-cm) long, #2 Phillips screwdriver
- A 4-inch (10-cm) long, ¼-inch blade screwdriver

NOTICE

If the suggested diagnostic procedures do not resolve the problem, contact the S&C Global Support and Monitoring Center at 1-888-762-1100.

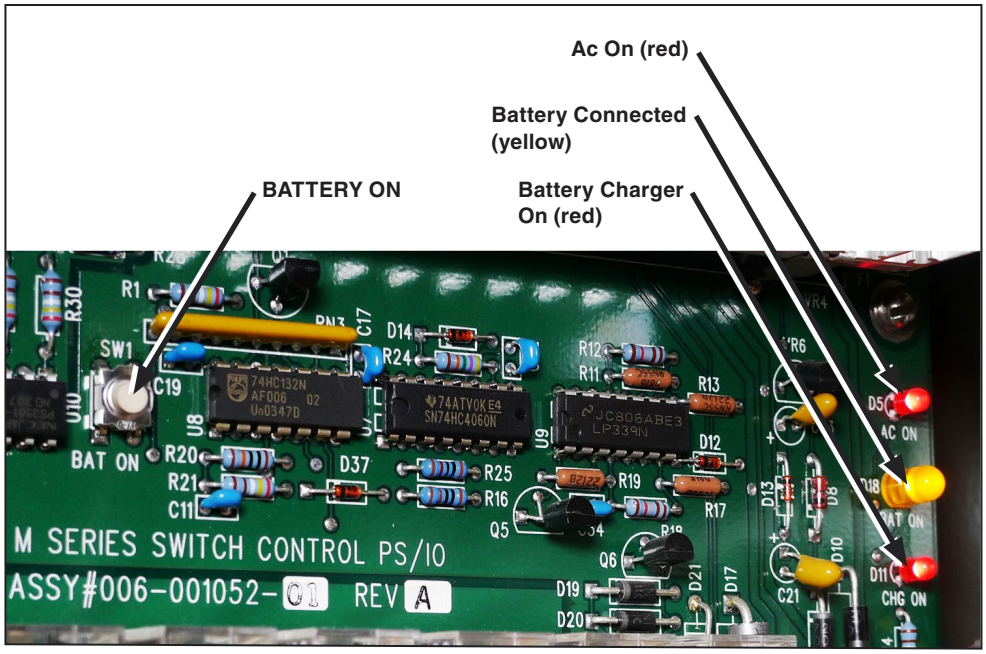

Figure 2. The PS/IO board power indicators.

Power Problems

Ac line fuse is blown

Replace the fuse. Swing open the fuse holder to replace the fuse.

Battery does not supply power when ac power is off

Refer to "BAT ON LED (on PS/IO) is off" on page 10.

Power Supply/Control I/O is not providing power

Refer to "BAT ON LED (on PS/IO) is off" on page 10.

LCD Screen Problems

LCD screen is blank or data cannot be scrolled

STEP 1. Check the LEDs. If all the switch operator LEDs (including those on the PS/IO board) are off, the switch operator is not receiving power. See the "AC ON LED (on PS/IO) is off" section 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 operator. To cycle power to the operator, remove the ac line fuse and disconnect the 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.

LED Problems

All LEDs on the faceplate are off

STEP 1. Check the LCD screen for data. If the screen contains data that cannot be scrolled, the processor is powered and functioning. The problem is the door tamper switch. Make sure the magnet is present on the top inside of the enclosure door. Make sure the wiring to the magnetically actuated reed switch is connected.

STEP 2. Check the switch operator 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 is off. If ac power is on, the battery will start recharging.

AC ON LED (on PS/IO) is off

STEP 1. Check for ac power to the switch operator. Check for ac voltage between the incoming side test point of the ac line fuse holder and the ac neutral.

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 which provides ac control power to the switch operator.

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.

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.

STEP 5. Check the connection at PS/IO J17. Check that the ac power connector is plugged into the PS/IO board at J17.

⚠ WARNING

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 wetting fuse are removed and the ac power line is de-energized. Serious risk of shock or death.

BATTERY LOW LED is on

See the "Battery Low" indication on the *Diagnostics>Warnings* screen.

BAT ON LED (on PS/IO) is off

STEP 1. Check the BATTERY LOW LED on the 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 that the batteries are connected.

STEP 3. Disconnect all power sources, and then check the wiring from the batteries. Disconnect the battery cable and the ac power line. 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 batteries.

CHG ON LED (on PS/IO) is off

STEP 1. Check that a batteries are installed and connected. The CHG ON LED is always off when a battery is disconnected.

STEP 2. Check the BATTERY LOW LED on the 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 operator. 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.

STEP 4. Check battery voltage. Disconnect the batteries. With a voltmeter, make sure the voltage is greater than 23.0 for both batteries. Replace both batteries when voltage is below this level.

STEP 5. Check the battery connections. Are the battery leads connected? 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 DETECTED LED (on the faceplate) is on

Use IntelliLink software to check for troubleshooting messages. Connect the computer to the switch operator and start the IntelliLink 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, it is certain 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. Press and hold the faceplate LAMP TEST switch to perform a lamp test. If the PROCESSOR STATUS LED goes on, it is certain a change command has not occurred.

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

Error Messages

"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 1045M-530, "S&C 6801M Automatic Switch Operators: *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 is trying to connect to a snapshot that requires a different screenset.

Use the correct screenset. To close the open screenset, select the **File** option from the drop-down menu and click on the **Close Screenset** option. Then, select the **File** option from the drop-down menu and click on the **Open Snapshot** option. In the Open Controller Data File dialog box, select the snapshot to view, and 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 S&C Instruction Sheet 1045M-530, "S&C 6801M Automatic Switch Operators: *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 operator.

STEP 1. Check that the switch operator has power. If the LCD screen is blank, the operator may have no power and cannot communicate with the computer. See the "LCD screen is blank or data cannot be scrolled" section on page 9.

STEP 2. Check the USB or serial cable connections. Make sure the USB or serial cable is plugged into the DATA PORTS access on the faceplate. Make sure 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 operator 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.

NOTICE

Use of a two-wire ungrounded extension cord to power the computer or the switch operator 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 IntelliLink software for this switch operator is being installed. For details, see the "Install IntelliLink Software" section in S&C Instruction Sheet 1045M-530, "S&C 6801M Automatic Switch Operators: *Setup*."

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

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

Use the correct screenset. To close the open screenset, select the **File** option from the drop-down menu and click on the **Close Screenset** icon. Then, select the **File** option from the drop-down menu, click on the **Open Screenset** icon, and choose the correct screenset for this switch operator. When the screenset opens, select the **Connection** option 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 1045M-530, "S&C 6801M Automatic Switch Operators: *Setup*," for details.

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

Click on the OK button to close the dialog box. If the program cannot find the desired font, it generates 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. The 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 batteries when the BATTERY LOW LED remains on after it stops blinking and the battery test has completed. When replacing the batteries, run the test again to refresh battery status.

STEP 2. Restart the switch operator. If the **Battery Low** message is still active or the BATTERY LOW LED is still on after the batteries have been replaced, remove the ac line fuse and then disconnect the battery cable. Reconnect the battery cable and then replace the ac line fuse.

"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 operator cable. The switch operator must be connected to a switch to remove this active message. Make sure the cable from the line switch is securely connected to the switch interface connector(s) on the bottom of the switch operator. Make sure the line switch and cable(s) are correctly connected and they are not damaged.

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

STEP 3. Check the red 10-ampere dc wetting fuse (on the PS/IO board). With the fuse installed, check the dc wetting 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 operator cable. Make sure the cable is securely connected to the line switch and to the connector(s) on the bottom of the switch operator. Make sure the cable is not damaged.

STEP 2. Check the sensor conditioning board connections. Carefully make sure 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. 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 switch operator.

Real-time voltage or current or kvar values are wrong

STEP 1. Restart the switch operator 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 that 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 operator.

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 operator 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. See Table 1.

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 Volts①	Phase to phase
Wye voltage reporting	Phase-to-neutral voltage / 120 Volts①	Phase to neutral

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

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 operator and its team communication device. Make sure the communication cabling is firmly in place at both ends and that the communication device has power.

STEP 2. Check all other communication ports being used. If the switch operator 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 operator and the other device.

STEP 3. Check the *Setup>Communications* screen settings. Make sure the **Baud Rate**, **RTS Active Duration**, and **Duplex** settings are correct for the installed communication hardware.

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

STEP 5. If this switch operator uses a radio, check radio connectivity. Make sure 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 operator and start IntelliLink software. On the *Setup>Restoration> IntelliTeam SG>Team 1* screen, make sure the **Team Logic** setpoint is in the **Enabled** mode for this team.

STEP 2. Check the other *Setup>Restoration>IntelliTeam SG>Team 1* screen settings. Make sure the DNP/RTU Adr entry is correct for each team member. Also, make sure 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.

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. Make sure 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 operator and start the IntelliLink software. On the *Setup>Restoration> IntelliTeam SG>Team 1* screen, make sure 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 15.

STEP 4. Be sure the **Automatic Operation** mode was not disabled. When 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 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 15.

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 make sure the six-pin IDC connector is fully seated in the COMM PORT. If using Ethernet, make sure 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, click on "Options," and select "Communication Options." Make sure the **DNP** option is the selected protocol. Also, make sure the **Peer Address** setting matches the **DNP/RTU Adr** setting of the team member to be communicated with. Make sure the **Timeout** and the **Baud Rate** setpoints are also set correctly.

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

OVERCURRENT FAULT LED 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 operator detected and took action on the fault. If it logged the fault, go to Step 2. If it did not log the fault, 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 "Remote" and the OVERCURRENT FAULT indicator is cleared by a SCADA command

Note: When reinitializing the switch operator 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 operator

STEP 1. Check for switch operator 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 "Remote."

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

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

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 S&C Instruction Sheet 1045M-530, "S&C 6801M Series Automatic Switch Operators: *Setup,*" for more information.

The *Operation*, *IntelliTeam SG*, *Metering*, *Diagnostics*, and *Logs* screens check the present status of:

- This switch operator
- Other team members
- Team operations

In addition, these screens can show the cause of various team and team member problems. For more information about events that cause problems, see the "View the Fault Events Log" section in S&C Instruction Sheet 1045M-540, "S&C 6801M Automatic Switch Operators: *Operation*."

Operation Screen

The *Operation* screen shows the present status of various switch operator settings, any existing fault and error conditions, the battery, and the power line. See Figure 3.

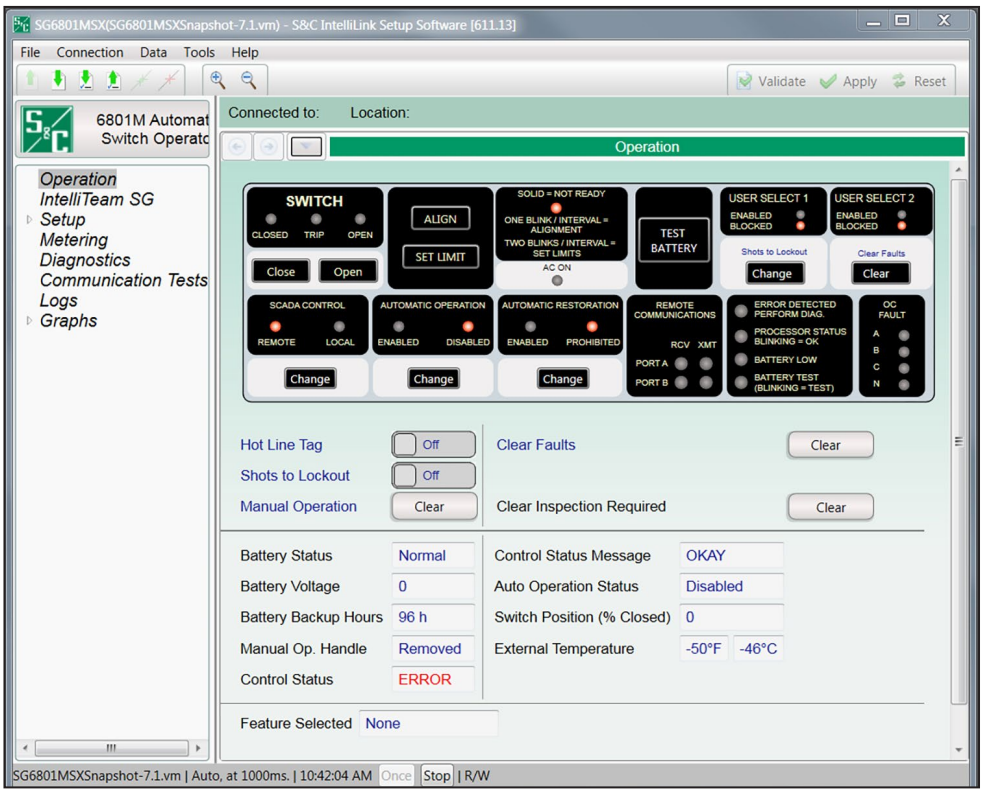

Figure 3. The *Operation* screen.

The upper part of the screen shows the status of LEDs on the faceplate. This screen also includes the following fields:

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 or may not be possible.

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

Battery Voltage

This is the battery voltage under normal operating loads, with the charger disconnected. When ac power is present, the switch operator updates this voltage only during battery testing. If ac power is not present, this is the real-time measurement of battery voltage.

Battery Backup Hours

This indicates the duration of battery backup time.

Manual Operation Handle

This indicates whether the handle is stored in the switch operator.

Control Status

This can indicate:

OKAY—The switch operator is functioning normally.

Alarm—The switch operator is functioning normally but maintenance is required. To review the alarm, go to the *Log>Alarms* screen.

Warning—The switch operator can function in a limited capacity. To review the warning, go to the *Log>Warnings* screen.

Error—The switch operator cannot function properly and may not be able to open or close. To review the error, go to the *Log>Errors* screen.

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

Control Status Message

OKAY—This displays when switch operator operation is normal.

Problem Present—To review the problem, go to the *Log>Status Points* screen or to the *Diagnostics>Errors* screen.

Auto Operation Status

This indicates **Disabled** mode when the **Automatic Operation** feature is disabled by a command from the *Operation* screen, a SCADA command, or the faceplate. This indicates **Enabled** mode when the **Automatic Operation** feature is enabled by a command from the *Operation* screen, a SCADA command, or the faceplate.

Switch Position (% Closed)

The switch position as a percentage of operation travel.

External Temperature

The temperature measured by the sensor on the bottom of the enclosure.

Features Selected

This field shows which stand-alone **Automatic Operation** features are presently enabled (for example: **Sectionalizing + Phase Loss Protection** mode). This field will also display **3 Ph. Volt Loss** mode when the team is ready. These features are enabled and disabled on the *Setup>General>Automatic Operation* screen. This field does not show whether the **Team Logic** mode or **Return to Normal** mode is enabled.

Metering Screen

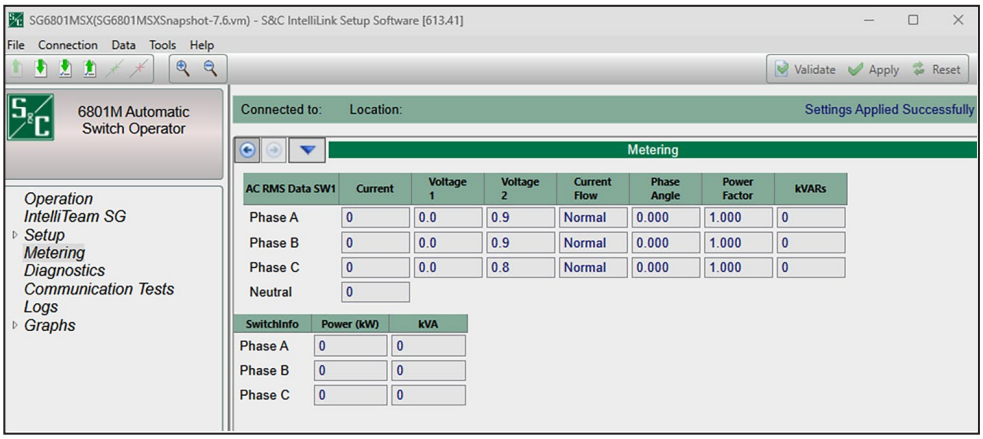

Figure 4. The *Metering* screen.

The *Metering* screen is shown in Figure 4. All values are time-averaged and reported locally and via SCADA on a one-second interval.

Current

This reports current measured by the current sensor and is scaled according to the calibration factors entered on the *Setup>Sensor Configuration* screen.

Voltage

This reports true RMS voltage for each phase; the present value of the distribution-line voltage is converted to a 120-Vac base. The switch operator uses this as the input-sensed value when calculating the primary voltage. Either a “Phase-Neutral” or “Phase-Phase” measurement can be selected on the *Setup>General>Site-Related* screen. A second voltage is displayed if the E33 option is installed.

Current Flow

When the switch control is properly set up and power is flowing through the circuit in the normal direction, these three fields all display "Normal." The value in all three fields changes to "Reverse" if unusual circuit-switching conditions cause the current-flow direction to reverse.

Phase Angle

This is the calibrated phase angle (the offset of the current waveform referenced to the voltage after all setup calibration factors have been applied). The corrected phase angles will all be 0 ± 89.9 degrees when the switch operator is properly set up.

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. Leading power factor is represented by a negative number.

kvars

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

Power (kW)

This is calculated using the instantaneous single-phase voltage and current and the cosine of the voltage-current phase angle.

kVA

This is calculated using the instantaneous single-phase voltage and current.

SW1 Current Direction

This field displays "Normal" when the switch operator 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

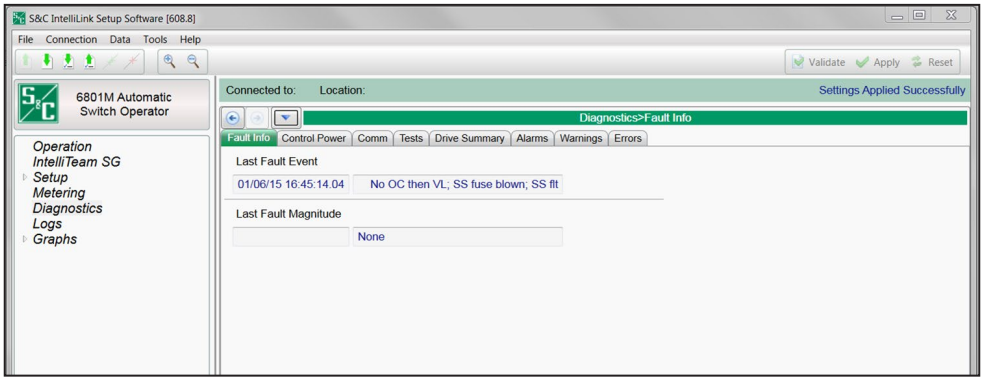

Figure 5. The *Diagnostics>Fault Info* screen.

This screen shows the last fault-related event for the switch. The left field on the screen is the timestamp (to the nearest 6.25 milliseconds) when the event was logged. The switch operator logs the event after the fault event and all described actions are complete. See Figure 5.

Last Fault Event

The left field on the screen is the date and timestamp. The right field on the screen is the event message that describes the event, the assumption the switch control made about the event, and the action(s) taken. 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 operator detected an overcurrent fault and this condition was not followed within 0.6 seconds by a loss of voltage on the same phase. The switch operator assumed a load-side fault occurred, but the condition was cleared on the load side by a fuse, recloser, etc. No timer or other action is started for this event type.

OC then VL; Source-side protective open; Counting—The switch operator detected an overcurrent fault that was followed within 0.6 seconds by a loss of voltage on all phases. The switch operator assumed a load-side fault occurred and the condition was cleared on the source side by a three-phase device such as a breaker, IntelliRupter® PulseCloser® Fault 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 and the switch operator will consider future events to be part of a different event sequence. The switch operator 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, IntelliRupter® fault interrupter, or recloser. The switch operator 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 of recloser counts with fault current detected, but it will open the switch if the configured **Recloser Counts to Trip, Voltage Loss Only** counter is reached.

VL; Load-side fault; Sectionalizing armed—The switch operator previously detected a phase or ground overcurrent fault followed within 0.6 seconds by a three-phase voltage loss. The control 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, IntelliRupter fault interrupter, or recloser. The switch operator 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 the configured **Recloser Counts to Trip, Fault Current Detected** setting.

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. The switch operator will take the appropriate sectionalizing action if the **Fault Current Required Before First/All Voltage Loss(es)** setting is "All."

Full count reached with sectional. disabled; Noted—The full count was reached on the **Recloser Operations** counter. The switch operator did not trip open the switch because sectionalizing was disabled. 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 operator 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 operator detected a three-phase voltage outage that was not preceded by an overcurrent fault. The switch operator assumed that 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 operator detected a phase or ground overcurrent fault, and this was followed within 0.6 seconds by a loss of voltage on the same phase without all other phases losing voltage. The switch operator 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 operator detected a loss of voltage on one or two phases that was not preceded by an overcurrent fault. The switch operator 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 switch operator closed the switch and started the **Shots-To-Lockout** timer. The control will trip open the switch when voltage is restored on any phase and then lost on all three phases before the timer expires. The switch operator also detected overcurrent when the **Overcurrent Required before Shots-To-Lockout Operation** feature is enabled.

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

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

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

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

Voltage OK after imbalance; Voltage restored; Waiting—Three-phase voltage returned after the switch operator tripped open the switch because of a phase imbalance. The control started the **Automatic Reclose** timer and the switch operator is waiting for the timer to expire because the **Automatic Reclose** feature was enabled. The switch operator will close the switch when the configured **Automatic Reclose Time...** value is reached.

Imbalance corrected w. reclose enabled; CLOSE executed—After the switch operator 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** feature was enabled.

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

Open operation executed on Voltage Loss Only—The **Sectionalizing on Voltage Loss Only** feature is enabled and the **Recloser Counts to Trip**, **Voltage Loss Only** setting has been reached. The switch operator opened the switch.

Sectionalizing disabled on Voltage Loss Only; None—The criteria for the **Sectionalizing on Voltage Loss Only** feature 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** timer expired without the restoration of voltage on any phase. This constitutes an extended voltage-loss condition and the switch operator opened the switch.

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

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

Last Fault Magnitude

The left field is the date and timestamp of the event. The right field includes this information:

Phase—This indicates the phase on which the overcurrent fault occurred. For example, A, C, or G.

Magnitude—This indicates the peak (maximum) overcurrent fault magnitude during the event as an RMS asymmetric number.

Control Power

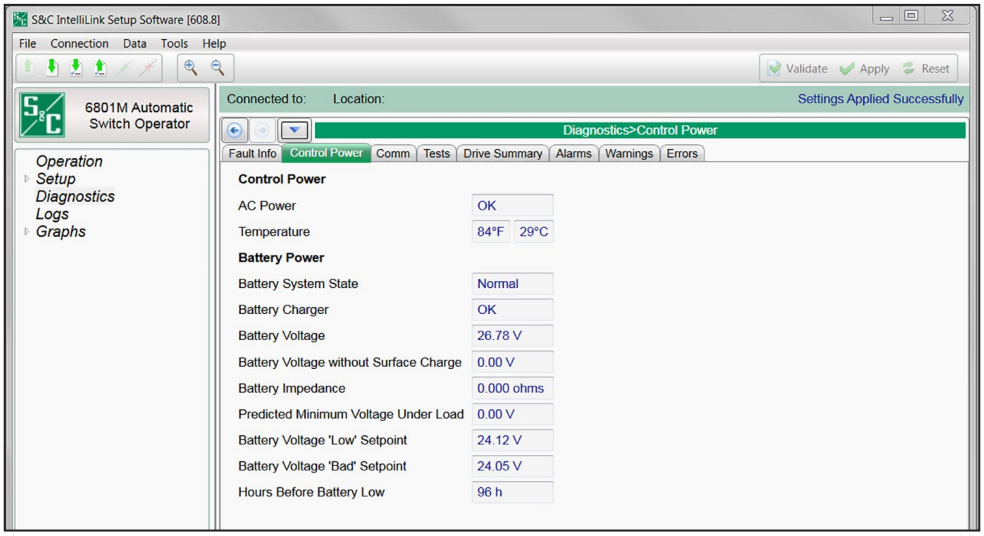

Figure 6. The *Diagnostics>Control Power* screen.

This screen shown in Figure 6 shows the status of the battery system, control power source, and cabinet temperature.

AC Power

Ac power status is indicated as “OK” or “Off.”

Temperature

This shows the internal cabinet temperature measured on the processor board.

Battery Power

Battery System State

The system state can indicate:

- **Normal**
- **Battery Low**
- **Battery Bad**
- **Low Impedance**
- **Disconnected**
- **Testing**
- **Hardware Error—**Contact S&C Electric Company if this state is active.

Battery Charger

The charger state can indicate:

- **OK**
- **Over Voltage**
- **Low Impedance**
- **Over Voltage and Low Impedance**

Battery Voltage

The voltage indication is constantly updated.

Battery Voltage without Surface Charge

The battery voltage without surface charge is measured during the last battery test.

Battery Impedance

The battery impedance is measured during the last battery test.

Predicted Minimum Voltage Under Load

This value is calculated during the last battery test.

Battery Voltage "Low" Setpoint

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

Battery Voltage "Bad" Setpoint

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

Hours Before Battery Low

This indicates the predicted time until battery voltage is indicated as "Battery Low," computed during the last battery test.

Communications

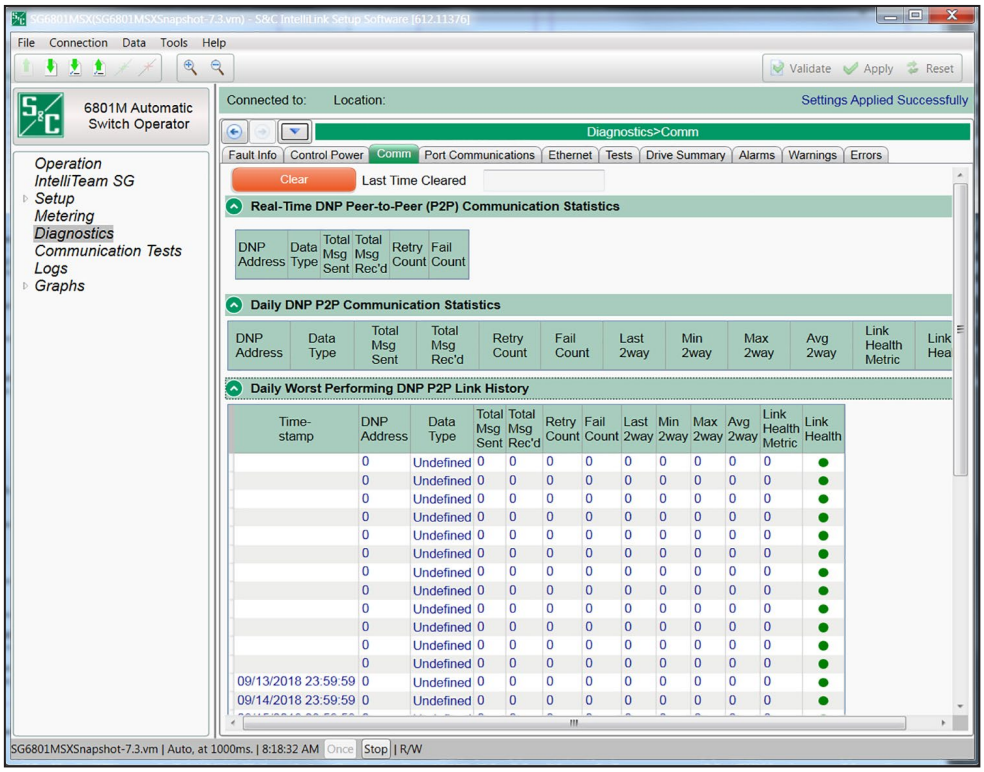

Figure 7. The *Diagnostics>Comm* screen.

Clear Button

This button clears all data on the *Diagnostics>Comm* screen and enters a timestamp in the **Last Time Cleared** field. See Figure 7.

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

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

The **Data Type** 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 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

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 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 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" panel on the *Setup>Communications>DNP Diagnostics* screen.

Daily Worst Performing DNP P2P Link History
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 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 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" panel on the *Setup>Communications>DNP Diagnostics* screen.

DNP V3 Real-Time Communication Statistics

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

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" panel on 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

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" panel on the *Setup>Communications>DNP Diagnostics* screen.

DNP Counts
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

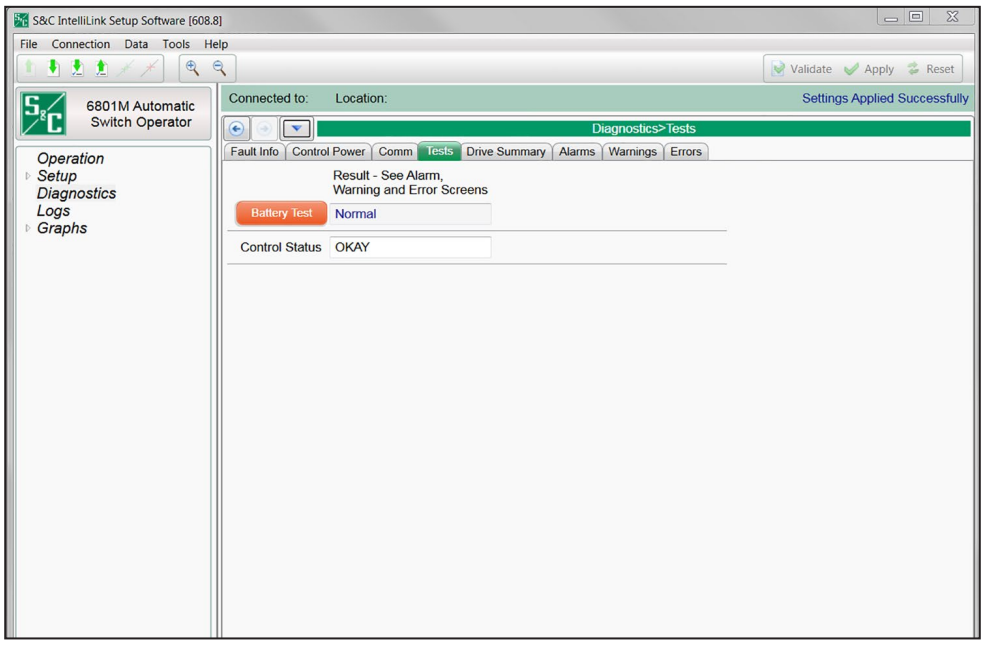

Figure 8. The *Diagnostics>Tests* screen.

The battery test is started from the screen shown in Figure 8. Test results are displayed here and may also be indicated on the *Diagnostics>Alarms*, *Diagnostics>Warnings*, or *Diagnostics>Errors* screens.

Battery Test

This button starts the test that can display one of the following results:

Normal—There is 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 below 15 milliohms.

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.

Error—An **Error** condition is active.

Maintenance Mode—The software is not running.

Alarms

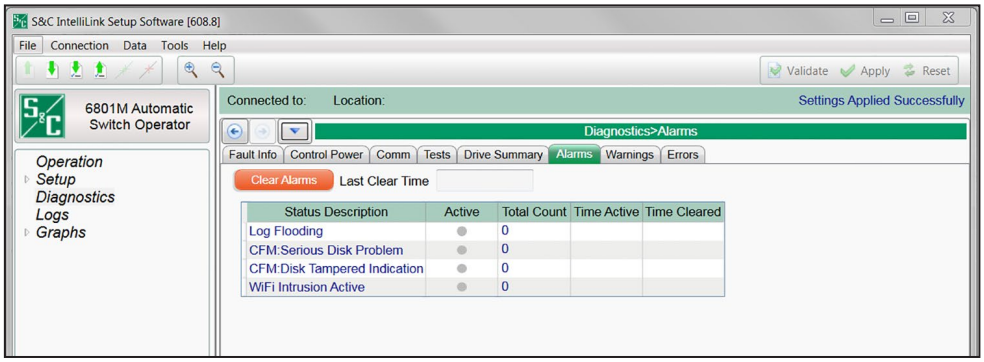

Figure 9. The *Diagnostics>Alarms* screen.

Clear Alarms

This button clears alarm statistics and enters a time stamp in the **Last Clear Time** and **Time Cleared** fields. See Figure 9.

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.

This screen shows the status of various alarms. Information about the alarms is shown in Table 2.

Table 2. Alarms

Status Description	Active When	Clear When	Impact	Recommended Action
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	Protects logs from being completely overwritten. No operational impact	Save logs and restart the control. If problem re-occurs, contact S&C Electric Company
CFM: Serious Disk Problem	Problem with compact flash memory	No problem with compact flash memory	New logs cannot be saved and existing logs may not be retrievable	Attempt to save existing logs and restart the control. If problem reoccurs contact S&C Electric Company
CFM: Disk Tampered Indication	Compact flash directory contents corruption was detected on startup. Restarting the control may correct this condition	Compact flash directory contents corruption was not detected on startup	File corruption may exist. New logs may not be saved and existing logs may not be retrievable	Verify the control was not tampered with. Attempt to save existing logs and restart the control. If problem reoccurs contact S&C Electric Company
IntelliLink Intrusion	IntelliLink software access was attempted by an unauthorized user	Manually cleared	Security violation attempt	Review software access procedures
Wi-Fi Intrusion Active	Wi-Fi Intrusion activated by attempted access by unauthorized user	Wi-Fi Intrusion cleared	No operational impact. May indicate the control was accessed without authorization	Check with field crews to see if there were legitimate access issues. Follow company protocol for a suspected cyber attack

Warnings

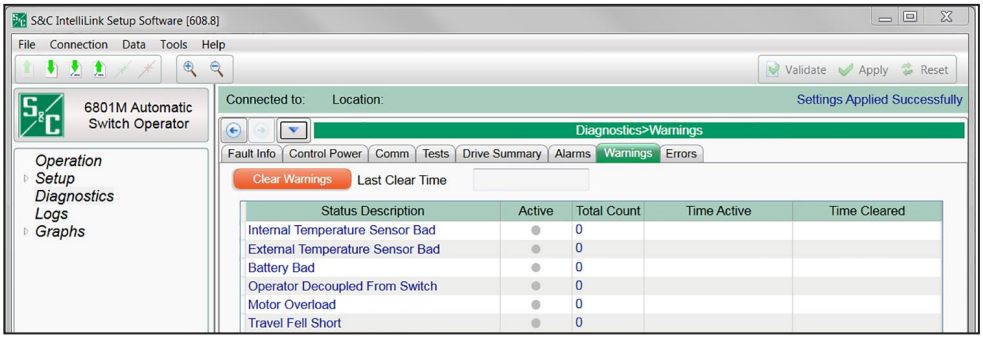

Figure 10. The *Diagnostics>Warnings* screen.

Clear Warnings

This button clears warning statistics and enters a time stamp in the **Last Clear Time** and **Time Cleared** fields. See Figure 10.

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. Information about the warnings is shown in Table 3.

Table 3. Warnings

Status Description	Active When	Clear When	Impact	Recommended Action
Battery Low	The **Predicted Battery Voltage Under Load** value is below the **Low Battery** setpoint on the *Diagnostics>Control Power* screen	The **Predicted Battery Voltage Under Load** value is above the **Low Battery** setpoint found on the *Diagnostics>Control Power* screen	The battery is approaching the point of disconnect, when the control will shut down if ac control power is not available. The **Battery Low** state is expected near the end of a dead-line event or after ac control power returns following a battery-disconnect event. When the **Battery Low** state persists after ac control power has been present for an extended time period, the battery may require replacement	Replace the battery when ac control power is present for an extended period of time and the **Battery Low** state persists. Contact S&C Electric Company when replacing the battery and allowing time for it to charge does not reset the **Battery Low** state
Control Power Not Present	Ac power to the control is not present	Ac power is restored to the control	The switch operator is operating on battery power	Verify ac control power is present at the ac input terminal block and check the fuse to be sure it is not blown. If ac power is present at the input terminal block and the fuse is not blown contact S&C Electric Company
DSP ADC Overflow	The ADC data queue overflowed because the MCU was not accepting data quickly enough	The MCU is now accepting data from the ADC	This will result in a data gap being processed by the MCU that may impact accuracy but should not have a significant operational impact unless this is a persistent occurrence	When DSP ADC overflows persist contact S&C Electric Company

TABLE CONTINUED ►

Table 3. Warnings—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
DSP Bad Address Latch	The MCU attempted to access an invalid address in the DSP address space	The Bad Address Latch error no longer exists	The analog subsystem and fault detection may not function properly	Power cycle the operator. If the problem re-occurs or persists, contact S&C Electric Company
DSP Configuration Error	The MCU attempted to configure the DSP with invalid settings	The MCU successfully configured the DSP	Invalid settings can result in improper or unexpected operation	Connect with IntelliLink Setup Software. Make a setting change and click on the **Apply** button. If apply settings is unsuccessful go to the *Setup>Validate/Apply* screen and review the troubleshooting information. If still unable to apply settings, go to the **Tools** drop-down menu, select "Device Maintenance," and restart the switch operator. If the issue persists, contact S&C Electric Company
DSP Event Overflow	The queue of messages sent from the MCU to the DSP is full, and subsequent messages are discarded	When the DSP completes processing, the message queue will operate	MCU messages to the DSP are not processed and may result in an application error	This should self-reset after the message queue is processed. If this persists contact S&C Electric Company
DSP Flash CRC Error	The DSP encountered an error during flash access	The CRC error no longer exists	The analog subsystem and fault detection are not functional	Power cycle the switch operator. If the problem re-occurs or persists, contact S&C Electric Company
DSP In Diagnostic Mode	The MCU put the DSP into **Diagnostics** mode	The DSP is not in **Diagnostics** mode	Analog and fault detection data are not available	This may self-correct in a few minutes. If this state persists beyond a few minutes, attempt to restart the control. If this state persists after restarting, attempt to reload the firmware. If the DSP remains in **Diagnostics** mode after those steps are taken or the **Diagnostics** mode is a common reoccurrence contact S&C Electric Company
DSP Not Running	The DSP is not running because it is in an **Error** state	The DSP is not in an **Error** state	Analog and fault detection data are not available	Restarting the control and reloading the firmware may correct this. If those steps do not restart the DSP or if DSP not running is a common reoccurrence, contact S&C Electric Company
DSP Operation Suspended	Operation of the DSP has been suspended by a request from the MCU	DSP operation is no longer suspended	Analog and fault detection data are not available	This may self-correct in a few minutes. If this state persists beyond a few minutes, attempt to restart the control. If this state persists after restarting, attempt to reload the firmware. If the DSP operation remains suspended after those steps are taken or the suspension is a common reoccurrence contact S&C Electric Company

TABLE CONTINUED ►

Table 3. Warnings—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
DSP Reset	The DSP was reset, either intentionally (directed by the MCU) or unintentionally (due to an error)	Cleared when the DSP is not reset	No operational impact after the reset process is complete	Restart the control
DSP XBus Comm Error	An error occurred during communication from the MCU to the DSP via the XBus interface	Communication between the MCU and DSP was successful	The analog and fault detection information may not be available	Go to the **Tools** drop-down menu, select "Device Maintenance," and restart the switch operator. If the issue persists, contact S&C Electric Company
Interlock Open	The key interlock locking bolt is in the **Extended** position	The key interlock locking bolt is in the **Retracted** position	The switch operator will not operate because it is electrically interlocked to block operation. This is valid for catalog suffix options "-L2" and "-L3"	Insert the key and move the locking bolt to the **Retracted** position
Internal Bad Encoder Drift	The software has detected ten single encoder ticks over time in the same direction when the motor is not moving	Use the **Clear Warnings** button to clear the warning	See note①	Use the **Clear Warnings** button and attempt to operate the switch. If the issue persists after taking corrective action, contact S&C Electric Company
Knife Switch Not Engaged	The knife switch is opened to visibly disconnect battery power to the motor	The knife switch is closed	The switch will not operate	Close the knife switch
Surge Suppressor Tripped	The optional lightning surge arrestor module is tripped	The surge suppressor element is replaced	The switch operator will operate, but is not protected from a lightning strike	Replace the surge suppressor element
Worn Switch	The motor operating current is above the **High Motor Torque (amps)** setpoint on the *Setup>General> Switch Operator* screen. The default value is 370 A	The motor operating current is below the **High Motor Torque (amps)** setpoint on the *Setup> General>Switch Operator* screen. The default value is 370 A	The switch may not properly make or break load and, if applicable, may not properly fault close	Inspect the switch and operating pipe joints, bearings, and connections. Make necessary repairs. After repairs, clear the warning and operate the switch to verify the issue is corrected. If the warning persists after making the repairs, contact S&C Electric Company

① This warning occurs when the accumulated drift reaches 2.0 degrees (10 ticks total) when a switch operation was not in progress. It does not cause the switch to go out of ready and may be cleared by clicking on the **Clear Warnings** button on the *Diagnostic>Warnings* screen. Clearing the warning does not clear the drift-tick count, so each subsequent drift tick causes the **Warning** condition to reactivate. A switch operation will reset the drift-tick count. When the accumulated drift reaches 3.0 degrees (15 ticks total), the **Switch Position Inconsistent**, **Unrecoverable Error**, and **Calibration Required** errors become active and cannot be dismissed without resetting travel limits. The **Travel Fell Short** error may occur when the switch is operated.

Errors

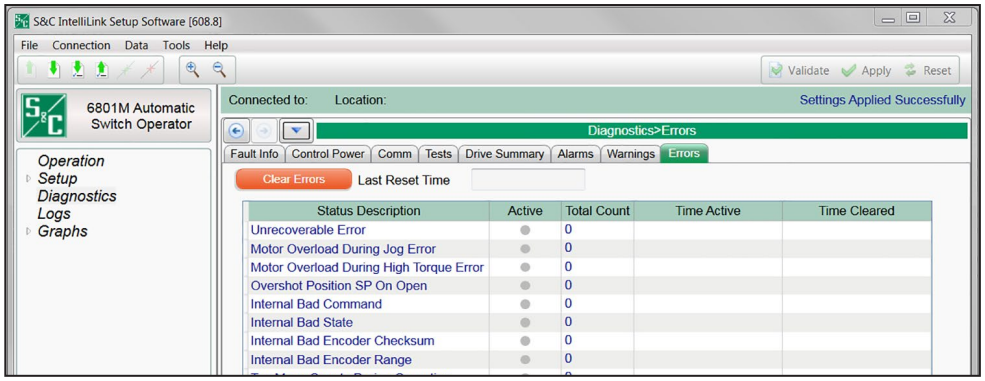

Figure 11. The *Diagnostics>Errors* screen.

Clear Errors

This button clears error statistics and enters a time stamp in the **Last Reset Time** and **Time Cleared** fields. See Figure 11.

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.

This screen shows the status of various error conditions. Information about the error conditions is shown in see Table 4.

Table 4. Errors

Status Description	Active When	Clear When	Impact	Recommended Action
Battery Bad	The **Predicted Battery Voltage Under Load** value is below the **Bad Battery** setpoint found on the *Diagnostics>Control Power* screen	The **Predicted Battery Voltage Under Load** value is above the **Bad Battery** setpoint found on the *Diagnostics>Control Power* screen	When battery voltage is at or below the point of disconnect after the battery test and ac control power is not available, the battery will be disconnected and the switch operator will be unable to operate or communicate	Replace the battery
Battery Charger Over/Under Voltage	Battery charger voltage is greater than 30.5 Vdc or less than 15 Vdc	Battery charger voltage is between 15 and 30.5 Vdc	The battery charger is not functioning properly and is not correctly charging the battery. This will result in lack of capacity when the battery is needed	Contact S&C Electric Company
Battery Test Hardware Error	The measured current during a battery test is less than 30 A or more than 250 A, or the unloaded minus loaded battery voltage difference is less than 0.5 Vdc	The measured current during a battery test is between 30 and 250 A, and the unloaded minus loaded voltage difference is greater than 0.5 Vdc	The battery charger is not functioning properly and cannot provide an assessment of battery health, which could result in lack of capacity when the battery is needed	Verify the battery test resistors are connected to the DSP board. If the test resistors are connected contact S&C Electric Company

TABLE CONTINUED ►

Table 4. Errors—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
Calibration Limits Not Set	Limits are not set	Limits have been set	The switch cannot be operated with a SCADA or local command	Set the limits. If unable to set the limits, contact S&C Electric Company
Calibration Required	Encoder calibration data are missing or are corrupted at initial switch operator start up	Valid encoder calibration data are read at initial switch operator start up	The switch operator is not able to operate the switch	Click on the **Initiate hardware Test** button on the *Setup>General>Hardware Diagnostics* screen
Encoder Sensor Detects Missing Encoder	Encoder cable is disconnected from the PS/IO board or the encoder cable is damaged	The encoder sensor has been detected	The switch operator is unable to operate the switch	Reseat the encoder cable on the PS/IO board and use the **Clear Errors** button to clear the **Error** state. If the issue persists after taking corrective action, contact S&C Electric Company
External Temperature Sensor Bad	Temperature sensor output is out of the expected range. Readings are less than -40°C (-40°F) or greater than +85°C (185°F)	Temperature sensor output is within expected range	Sensor is likely not connected, no operational impact	Verify the sensor is connected. Sensor connection is located on the MCU board. The sensor is located in the bottom of the enclosure. If the sensor appears to be properly connected and the problem persists, contact S&C Electric Company
Handle Not Stored	The manual operating handle is not stored properly	The manual operating handle is stored properly	Operation is blocked	Store the manual operations handle
Inspection Required	One or more **Not Ready** conditions are active	There are no **Not Ready** conditions active.	The operator is not able to operate the switch	Verify the operator is showing a switch position and that it is not in the **Align** or **Set Limits** mode. Verify that the manual handle is stored correctly. Verify options such as key interlocks and knife switches are properly set. Verify there are no battery or battery charger issues. Correct any issues found. If no issues are found contact S&C Electric Company
Internal Bad Command	This is an internal software error. The software issued a bad command to the low-level operator control logic	The internal commands are accepted	The operator is unable to operate the switch or the **Align** procedure cannot be completed	Power cycle the control and repeat the requested **Open**, **Close**, or **Jog** operation. If the error doesn't clear, try reloading software and repeat the operation. If the issue persists after taking corrective action, contact S&C Electric Company
Internal Bad Encoder Checksum	The encoder data stored in non-volatile memory is bad or corrupted	The encoder data is valid	The switch operator is unable to operate the switch	Reset the Open and Closed limits and use the **Clear Errors** button to clear the active error. If the issue persists after taking corrective action, contact S&C Electric Company
Internal Bad Encoder Range	The encoder position is out of the expected range of 0 to 1799 counts	The encoder position is in range	The switch operator is unable to operate the switch	Reset the Open and Closed limits and use the **Clear Errors** button to clear the active error. If the issue persists after taking corrective action, contact S&C Electric Company

TABLE CONTINUED ►

Table 4. Errors—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
Internal Bad Encoder Runaway	The software has detected a jump (increase) of two or more encoder ticks in the same direction in quick succession when the motor is not moving	Use the **Clear Errors** button to clear the error state	The switch operate is unable to operate the switch	Use the **Clear Errors** button and attempt to operate the switch. If the issue persists after taking corrective action, contact S&C Electric Company
Internal Bad State	This is an internal software error. The software detected a bad state from the low-level operator control logic	The software states are valid	The switch operator is unable to operate the switch or the **Align** procedure cannot be completed	Power cycle the control and repeat the requested **Open**, **Close**, or **Jog** operation. If the error doesn't clear, try reloading software and repeat the operation. If the issue persists after taking corrective action, contact S&C Electric Company
Internal Temperature Sensor Bad	Temperature sensor output is out of the 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	There is no operational impact. The sensor on the front panel board is bad	Return the front panel board to S&C Electric Company for service
Limits of Travel Not Set	Travel limits have not been set	Use the **Clear Errors** button to clear the error state	The switch operator is unable to operate the switch	Set travel limits
Max Limits Spacing Exceeded	The **Open-** and **Close-Position** limits are more than 180 degrees apart	The **Open-** and **Close-Position** limits are less than 180 degrees apart	The switch will not operate properly or reliably	Inspect the switch and operator couplings. Look for lose or worn universal joints and verify all connections are tight
Motor Overload	The maximum current during an **Open** or **Close** operation is greater than 400 A (Close) or 480 A (Open)	The maximum current during an **Open** or **Close** operation is less than 400 A (Close) or 480 A (Open)	The switch may require maintenance	Verify the switch is operating properly. If the switch is operating properly and this warning persists contact S&C Electric Company

TABLE CONTINUED ►

Table 4. Errors—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
Motor Overload During High Torque Error	The maximum current during an **Open** or **Close** operation is greater than 400 A (Close) or 480 A (Open) and the final position is less than 10% closed or more than 100% closed	The maximum current during an **Open** or **Close** operation is less than 400 A (Close) or 480 A (Open) and the final position is within the required ranges	The switch may not be in the proper **Open** or **Closed** position	Verify the switch is operating properly. Verify operating pipe bearings and universal joints are in good condition and properly lubricated. Change any worn or damaged parts. If the issue persists after taking corrective action, contact S&C Electric Company
Motor Overload During Jog Error	The maximum current during a **Jog Open** or **Jog Close** operation is greater than 400 A (Close) or 480 A (Open)	The maximum current during a **Jog Open** or **Jog Close** operation is less than 400 A (Close) or 480 A (Open)	The operator may not be properly aligned during the **Set Alignment** procedure	Verify the switch is operating properly. Verify there are no obstructions on the de-coupling mechanism. If the issue persists after taking corrective action, contact S&C Electric Company
Motor Overload During Low Torque Error	The maximum current during an **Open** or **Close** operation is greater than 400 A (Close) or 480 A (Open) and the final position is less than 10% closed or more than 100% closed	The maximum current during an **Open** or **Close** operation is less than 400 A (Close) or 480 A (Open) and the final position is within the required ranges	The switch may not be in the proper **Open** or **Closed** position	Verify the switch is operating properly. Verify operating pipe bearings and universal joints are in good condition and properly lubricated. Change any worn or damaged parts. If the issue persists after taking corrective action, contact S&C Electric Company
Open/Close Contacts Not Mutually Exclusive	The contacts are both open or both closed	One contact is open and one contact is closed	The switch cannot be operated with a SCADA or Local command	Clear any related warnings and errors and attempt to run the operator. If it still does not run, reset the limits. If unable to set the limits, contact S&C Electric Company
Operator Decoupled From Switch	The motor control software has determined that the operator is decoupled from the switch	The motor control software has determined that the operator is coupled to the switch	The operator is unable to open or close the switch	Recouple the switch operator and test operation. If the warning re-occurs contact S&C Electric Company
Overshot Position SP On Close	Overshot the **Close Position** setpoint by more than 12 degrees	Clears when successfully operated after the **Clear Errors** command has been issued	The **Close** position may require re-alignment	Issue the **Clear Errors** command from either the DNP control point or the **Clear Errors** button on the *Diagnostics>Errors* screen and operate the operator. When the Overshot error persists, re-align the **Close** position. If the **Overshot** error persists after re-alignment contact S&C Electric Company
Overshot Position SP On Open	Overshot the **Open Position** setpoint by more than 12 degrees	Reset the **Open Position** setpoint. Use the **Clear Errors** button and retry operation	The **Open** position may require re-alignment	Issue the **Clear Errors** command from either the DNP control point or the **Clear Errors** button on the *Diagnostics>Errors* screen and operate the switch operator. If the Overshoot error persists re-align the **Open** position. If the **Overshoot** error persists after re-alignment contact S&C Electric Company

TABLE CONTINUED ►

Table 4. Errors—Continued

Status Description	Active When	Clear When	Impact	Recommended Action
Switch Not Ready For High Speed Operation	There are one or more **Not Ready** conditions active	There are no **Not Ready** conditions active	The switch cannot be operated with a **SCADA** or **Local** command	Verify the operator is not in **Align** mode or **Set Limits** mode. Exit these modes if applicable. Verify the **Calibration Limits Not Set** status is inactive on the *Logs>Status Point Log* screen and check for any additional active issues. Verify the Variance Not Set Since Firmware Upload warning is not active
Switch Not Ready For Override Operation	There are one or more **Not Override Ready** conditions active	There are no **Not Override Ready** conditions active	Emergency **Open** and **Close** operations are blocked	Check the present *Graphs>Motor Sequence* screens and verify the **Closed Torque** and **High Motor Torque** settings have not been exceeded. Contact S&C Electric Company if they have. Verify the **Switch Position Inconsistent** status in not in the **Active** state on the *Diagnostics>Errors* screen. Clear the error and rerun the **Align** and **Set Limits** functions, if it is in the **Error** state
SW Position Inconsistent	Control is not in the **Open** or **Closed** position and an operation is not presently underway	Control is in either the **Open** or **Closed** position	The switch operator cannot operate the switch	Manually place the switch in the **Fully Open** or **Fully Closed** position. If the switch is already in the correct **Open** or **Closed** position, rerun the **Align** and **Set Limits** procedures. After setting the limits use the **Clear Errors** command and operate the switch. Contact S&C Electric Company if the error persists after taking corrective action
Too Many Counts During Operation	The software has detected a jump (increase) of two or more encoder ticks in the same direction when the motor is not moving	Use the **Clear Errors** button to clear the error state	The switch operator is unable to operate the switch	Use the **Clear Errors** button and attempt to operate the switch. If the issue persists after taking corrective action, contact S&C Electric Company
Travel Fell Short	Position after an **Open** or **Close** operation is less than the **Open** and/or **Closed Position** setpoint	Position after an **Open** or **Close** operation is more than the **Open** and/or **Closed Position** setpoint	The limits need to be reset	Run the **Align** and **Set Limit** procedures. If resetting the limits does not correct operator travel contact S&C Electric Company
Unrecoverable Error	One or more of the error conditions below are active	The errors are cleared and the switch operator operates properly	The operator will not be capable of operating the switch	Try clearing the errors with the **Clear Errors** button and repeat the operation. The switch operator may need to be power cycled and/or the software reloaded to clear the error. If the issue persists after taking corrective action, contact S&C Electric Company
Variance Not Set Since Program Load	The manufacturing variance was not re-done after a software update without the **Save/ Restore Memory** option selected	Run the Manufacturing Variance test, save the results, and use the **Clear Errors** button to clear the **Error** state	Switch operator will not run	Run the Manufacturing Variance test and the **Clear Errors** command. If the errors cannot be cleared contact S&C Electric Company

Drive Summary

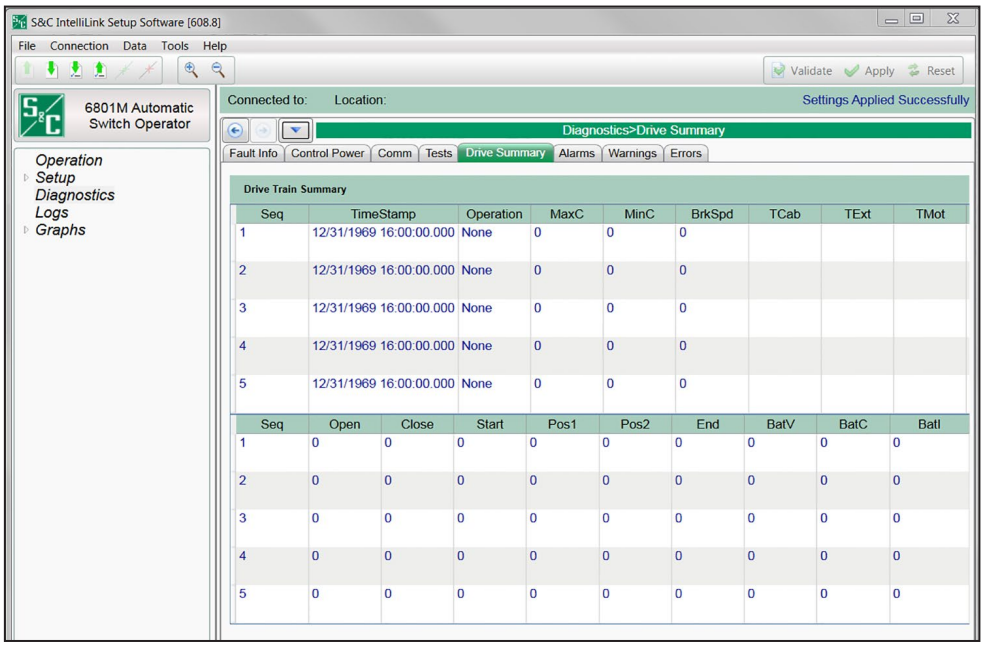

Figure 12. *Diagnostics>Drive Summary* screen.

The screen shown in Figure 12 shows operator drive train information from the last five operations. The five sequential numbers under the Seq (Sequence) column in the "Drive Train Summary" panel directly correspond to the five sequential numbers under the Seq column in the bottom half of the screen.

Drive Train Summary

Time Stamp—This is the date and time of the operation.

Operation—This is the operation command, either a **Close** or **Open** operation.

Maximum Current—This is the maximum current observed after the initial inrush current.

Minimum Current—This is the minimum current observed after the initial inrush current.

Breaking Speed—This is the last speed captured before the stop.

Cabinet Temperature—This is the internal operator temperature.

Exterior Temperature—This is the external temperature.

Motor Temperature—This is the temperature correction for the braking/stopping distance calculation.

Bottom half of Diagnostics>Drive Summary screen:

Open—The values in the Open column are the **Open Limit** setpoints established when setting up the operator. They are normally the same value for each of the last five operations unless the **Open Limit** setpoint has been reset within the last five operations.

Close—The values in the Close column are the **Close Limit** setpoints established when setting up the operator. They are normally the same value for each of the last five operations unless the **Close Limit** setpoint has been reset or the **Closed Torque** setpoint has increased within the last five operations. The displayed values in the open and close columns only update to the new corresponding setpoint value after an operation, after resetting the setpoints.

Start—The values in the start column are the positions from which the operator starts that operation. They will not necessarily match the setpoint values under the open and close columns.

Position 1—When a switch operation begins, the operator starts in the reverse direction and then moves in the direction of the operation command. This is the position encoder reading at the end of the reverse movement. The values in the pos1 column correspond to the intermediate position before the following states:

- **Decouple Check** prior to initiating high-speed operation
- **Close with Torque**
- **Override Close**
- **Override Close with No Reverse**
- **Open with Torque**
- **Override Open**
- **Override Open with No Reverse**
- **Emergency Open**

Position 2—The values in the pos2 column correspond to the intermediate position before an **Emergency Close** operation.

End—The values in the end column are the positions at which the operator ends that operation. They will not necessarily match the setpoint values under the open and close columns.

Battery Voltage—This is the battery voltage without load.

Battery Current—This is the battery current observed during a switch operation.

Battery Voltage Under Load—This is the battery voltage observed during a switch operation.

Communications Tests

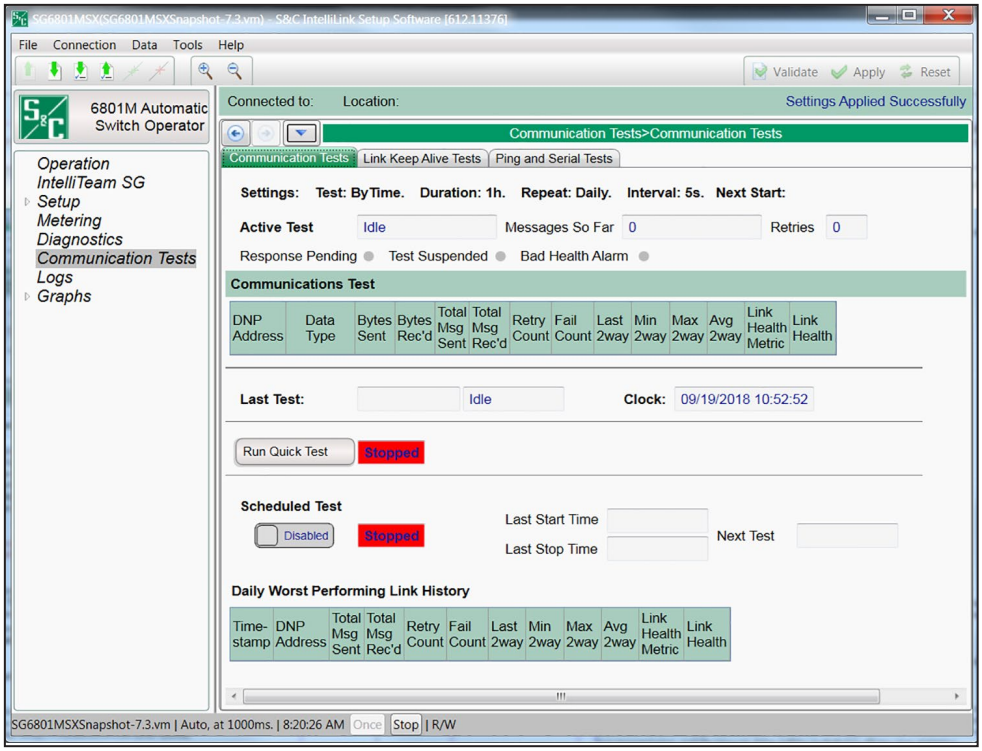

Figure 13. The *Communication Tests>Communications Tests* screen.

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 13. 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.

Communicaions Test
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

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 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 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 on 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 state: **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 state: **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

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.

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 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 2way statistics.

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

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

Avg 2way
This is the average response time, in milliseconds, for all 2way 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.

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

Link Keep Alive Tests

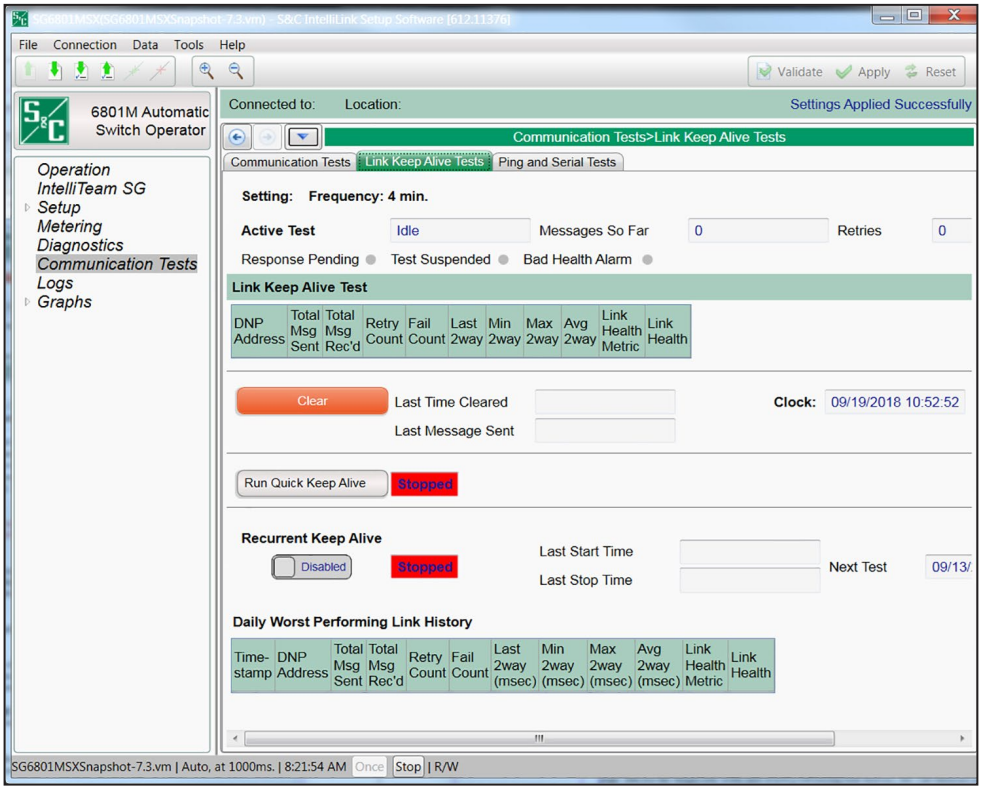

Figure 14. The *Communication Tests>Link Keep Alive Tests* screen.

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 14. 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, 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

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:

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 state: **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 state: **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
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 to 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" panel on the *Setup>Communications>DNP Diagnostics* screen.

Ping and Serial Tests

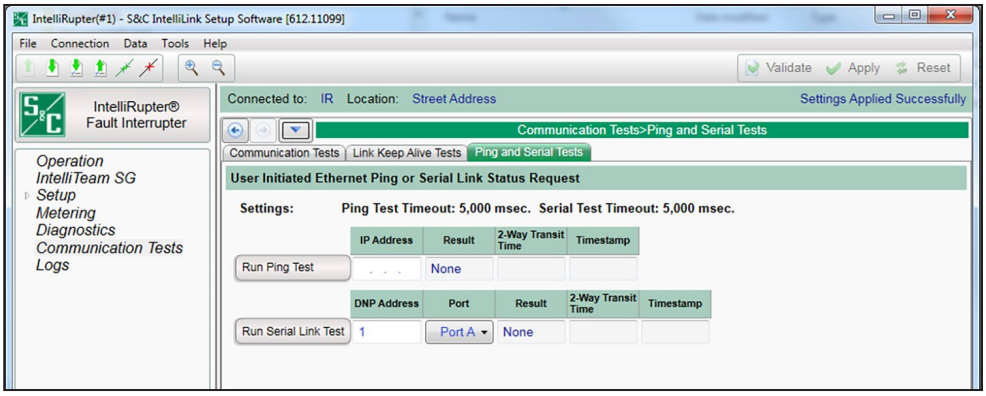

Figure 15. The *Communication Tests>Ping and Serial Tests* screen.

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 15. 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** state 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.

Ethernet

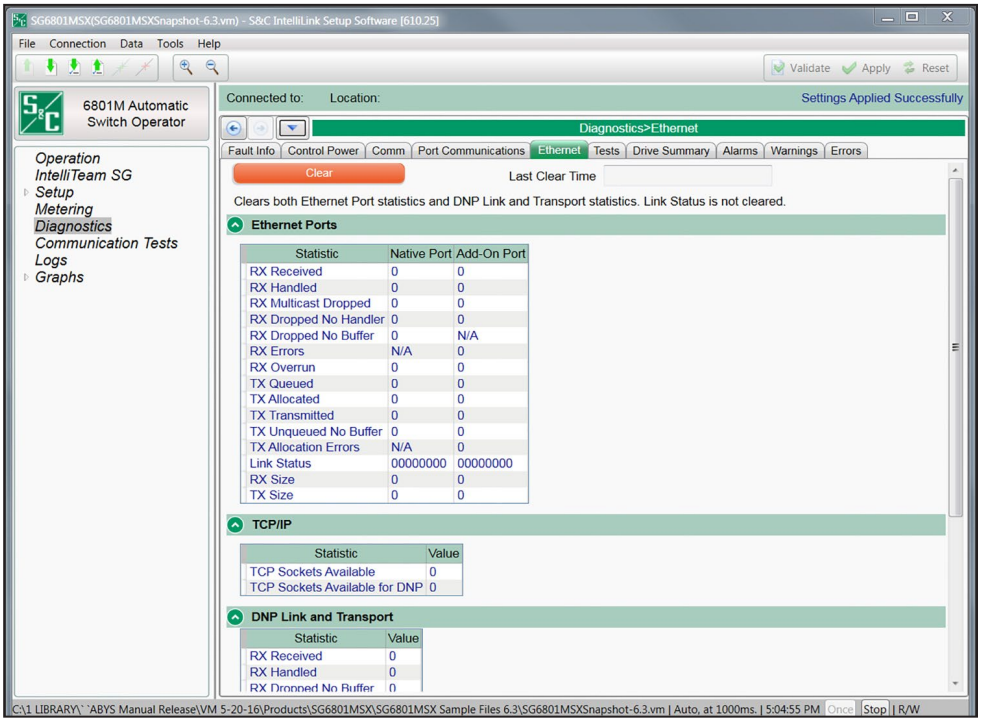

Figure 16. The *Diagnostics>Ethernet* screen.

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 16. 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

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 AddOn 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

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.

DNP Link and Transport

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

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

RX Dispatch Local

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

RX Dispatch Remote

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

RX Dispatch Broadcast

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

RX Dispatch Application

The packet is dispatched to the application layer.

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

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

RX Bad Config
The packets violate routing tables, with wrong destination ports, etc.

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

TX Transmitted
The packets have been successfully sent.

TX Failures
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

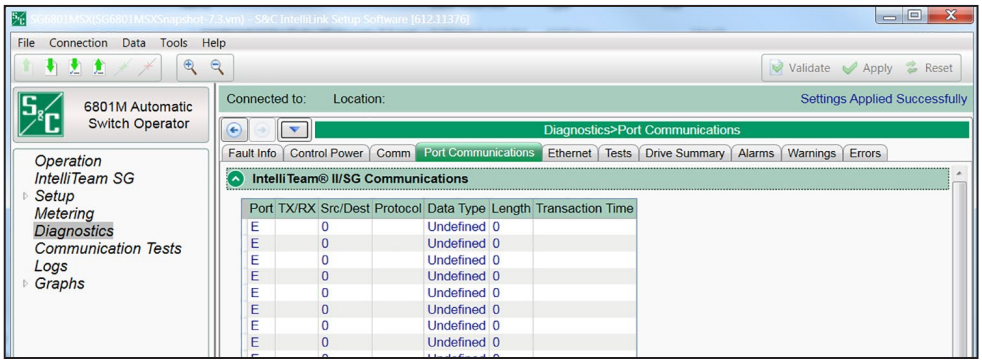

Figure 17. The *Diagnostics>Port Communications* screen.

IntelliTeam II/SG System Communications

(*only for controls using the IntelliTeam II/SG Automatic Restoration Systems*)

As shown in Figure 17, these counters and statistics are associated with peer communications for each team in which this control is a member:

Port

This is the port connected to the control.

TX/RX

This report indicates whether the packet was transmitted or received.

Src/Dest

This report notes the source or destination address. For transmission, this is the destination address; for received messages, this is the source address.

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," or "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 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

This is the counters and statistics associated with peer communications for each SCADA master.

Port
This is the port connected to the control.

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

Scr/Dest
This is the source or destination address. For a transmitted message, this is the destination address; for a received message, this is the source address.

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

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

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 report notes the source or destination address. For a transmitted message, this is the destination address; for a received message, this is the source address.

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

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

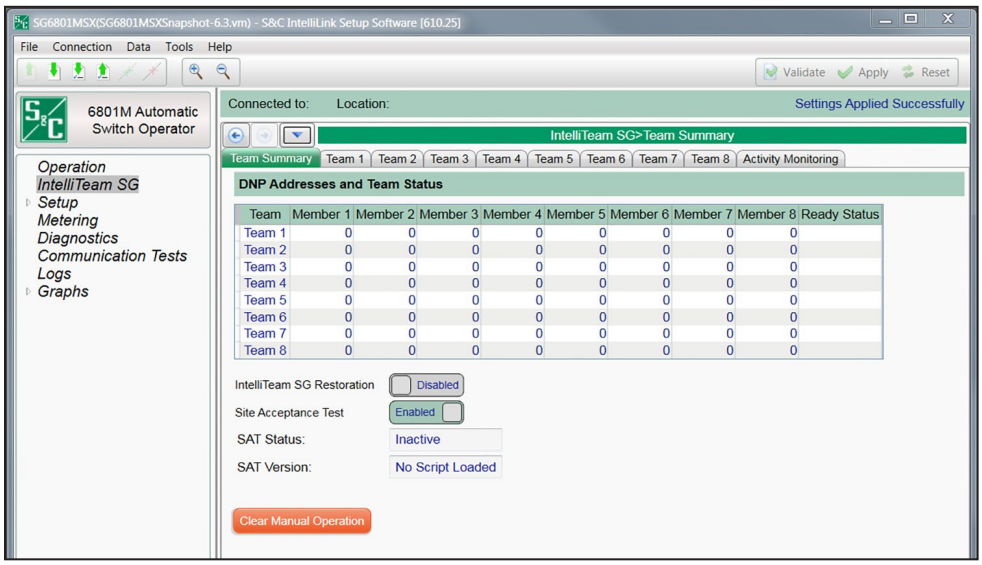

Figure 18. The *IntelliTeam SG>Team Summary* screen.

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 18.

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. 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 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** state 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 “Inactive.”

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

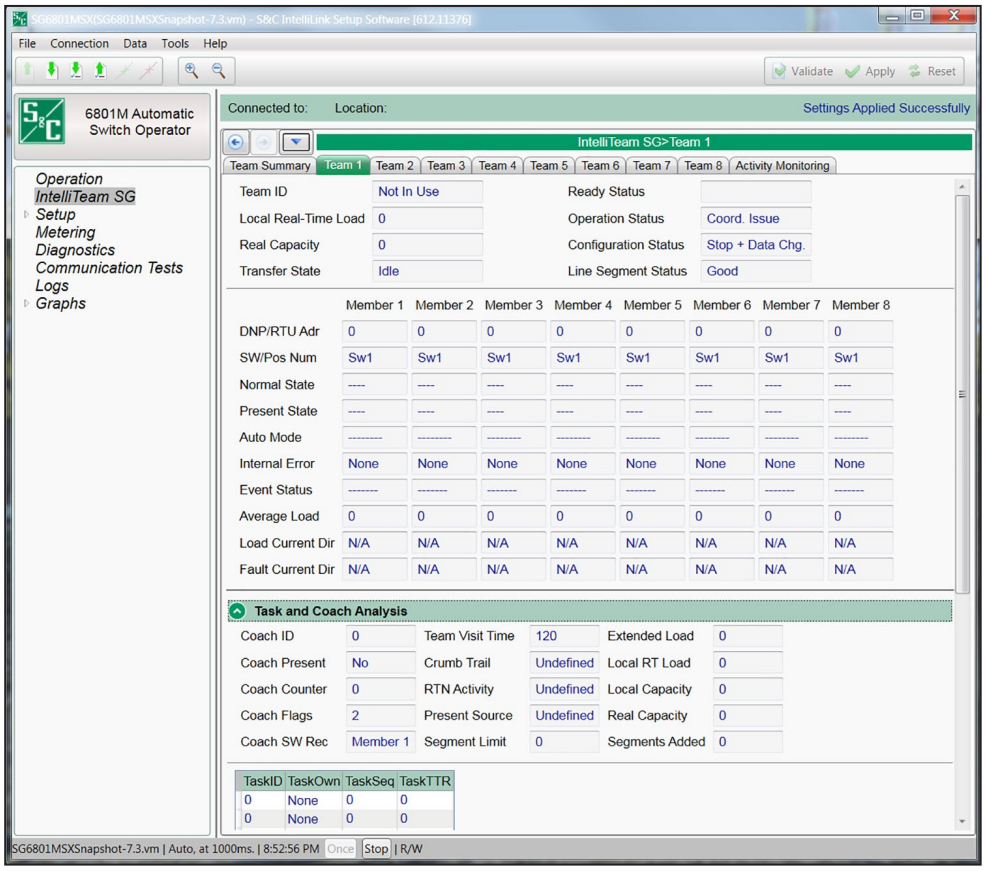

Figure 19. The *IntelliTeam SG>Team 1* screen.

The screen, shown in Figure 19, displays team-related parameters and information about each team member. 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—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—An error has occurred, stopping a **Transfer** operation.

Fault—The team is presently isolating a fault.

Hold—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—When **Operation** status, **Configuration** status, and **Line Segment** status all indicate that no errors are present.

Alarm—This shows when errors are present.

Fault—The team is isolating a faulted line segment.

PLI—The team is isolating a phase-loss event.

Operation Status

This is the system operation status. Possible values displayed:

Good—Team members can perform team operations.

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

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

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

Remote Error—An adjacent team member indicates an error condition.

Local Error—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—Team logic has been disabled on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Not In Use—This team is not in use.

No 2nd Contin.—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—No RTU address is specified on the *Setup>Communications* screen.

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

Stopped—The **Set Team** status is "Stopped" on the *Setup> Restoration>IntelliTeam SG>Team x* screen.

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

Record Count—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—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—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—No faults or voltage loss is detected on the line segment.

Segment Dead (Dd)—The line segment is de-energized.

Segment Open (Op)—All team members are in the **Open** position in preparation for a circuit reconfiguration.

Overcurrent (OC)—An overcurrent is detected on this line segment.

Voltage Loss (VL)—A voltage loss is detected on this line segment.

Team Error (Er)—An error is detected.

Alt Source (AS)—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 is the DNP/RTU address of each team member, as entered on the *Setup>Restoration>IntelliTeam SG>Team x* screen.

Sw/Pos Num

This is 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 is 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—Team member is open.

Closed—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 notes 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 **Open Transition** mode is enabled.

Rc—Return-to-Normal logic using **Closed Transition** mode is 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 6801M Automatic Switch Operators, the **ManOR** and **No Op** state can be cleared on the *Operation* screen by clicking the **Manual Operation Clear** button. For all IntelliTeam SG devices, the **ManOR** and **No Op** state can be cleared on the *IntelliTeam SG>Team Summary* screen by clicking the **Clear Manual Operation** button or with a SCADA command.

ProRes—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

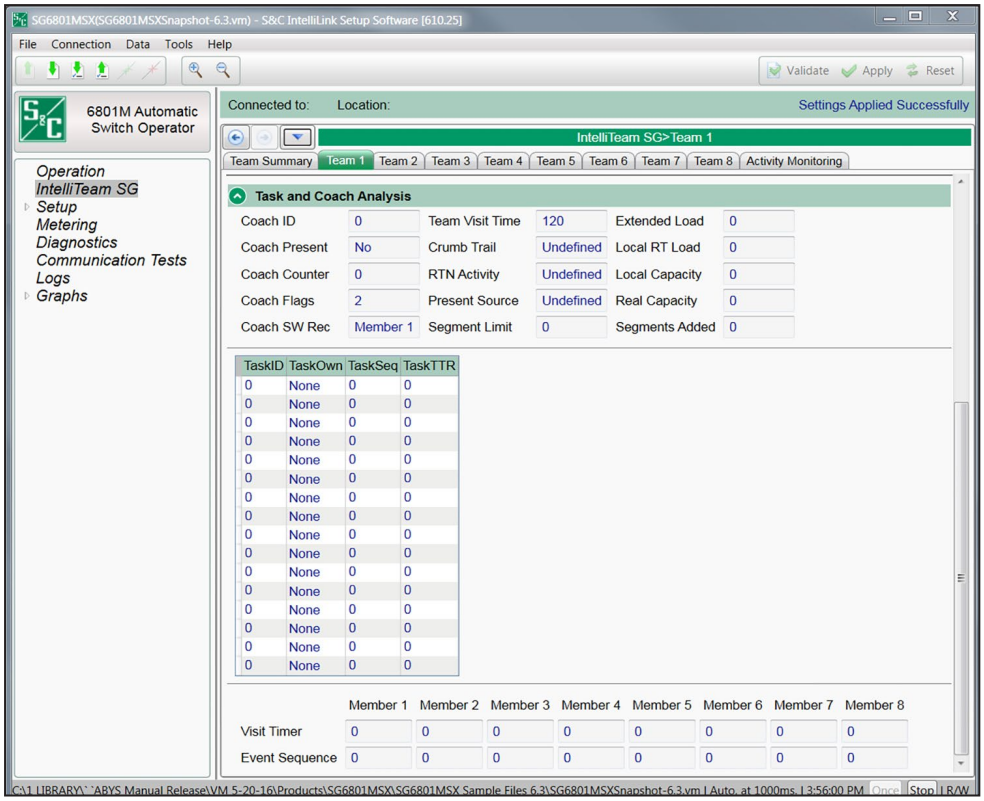

Figure 20. The *IntelliTeam SG>Team 1>Task and Coach Analysis* screen.

Task and Coach Analysis

The screen shown in Figure 20 displays team-related parameters and information about each team member. 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

This indicates the coach is present at this team and 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 is the 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

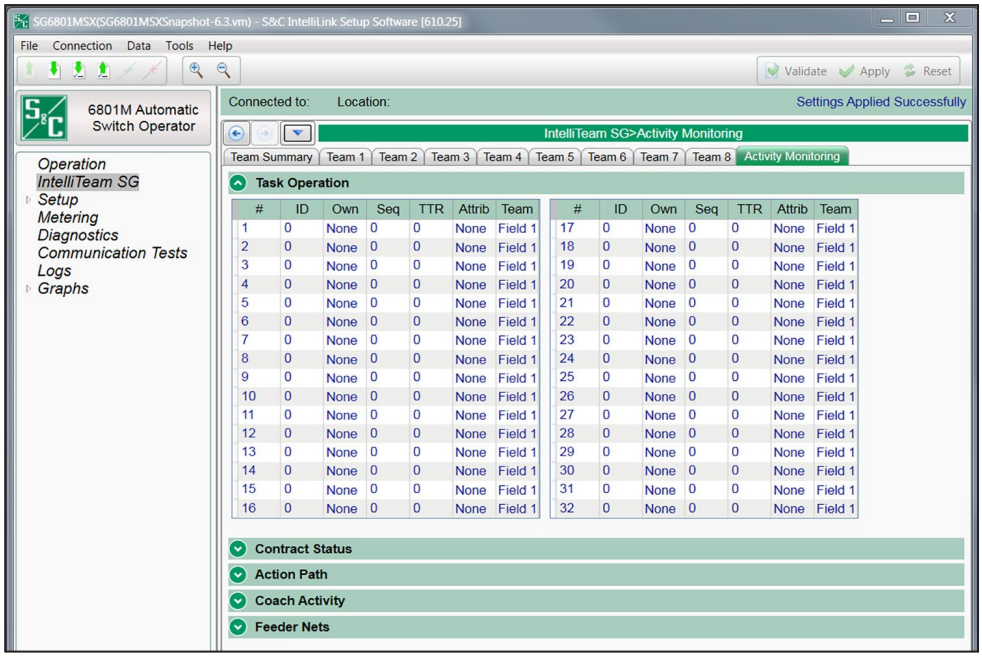

Figure 21. The *IntelliTeam SG>Activity Monitoring>Task Operation* screen.

Figure 21 shows tasks presently being executed by the team member. S&C Electric Company uses this information for diagnostic purposes. The following parameters are reported:

ID

This identifies the task being executed.

Own

This is the team database record associated with the execution of this task.

Seq

This is the sequence number of the task being executed.

TTR

This is the time to run for the task being executed.

Attrib

This is the lock and execute attributes associated with the task being executed.

Team

This is the team number associated with execution of this task.

Contract Status

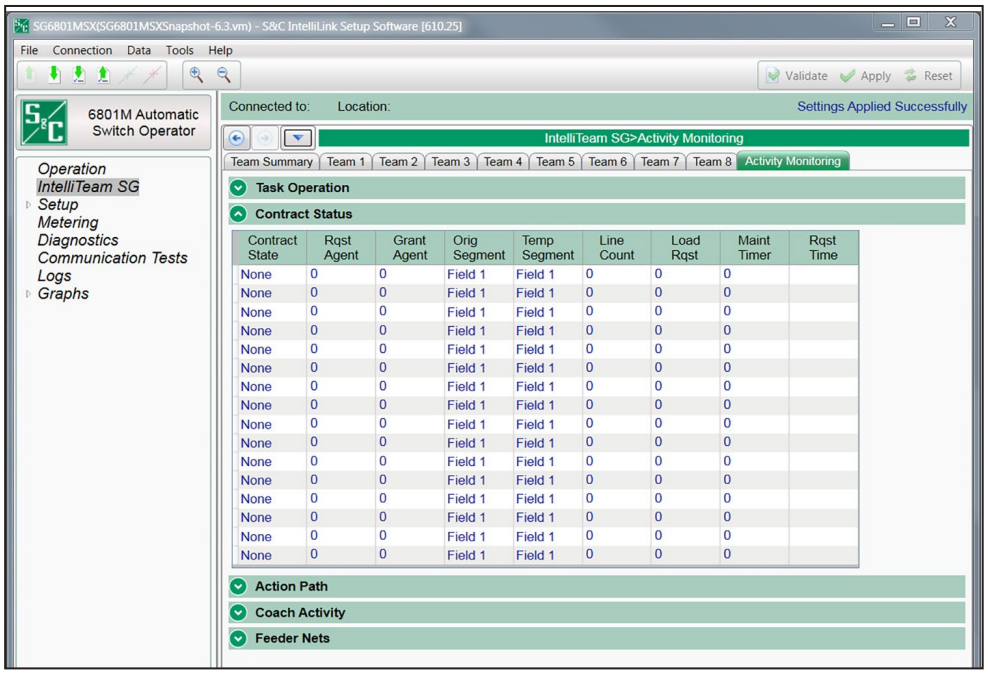

Figure 22. The *IntelliTeam SG>Activity Monitoring>Contract Status* screen.

Figure 22 shows information about contracts associated with this team member. 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—The contract has been granted and is presently active.

Rqst unsent—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—The contract request is pending.

Rqst travel—The contract agent is forwarding the contract because the decision to grant the contract cannot be made at this location.

Rqst accept—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—The contract request was declined by this agent. The request is returned to the originating agent.

Decline cont.—A declined message is being transmitted to the requesting agent.

Dissolve start—An agent (usually the requesting agent) is dissolving the contract.

Dissolve cont.—A dissolve message is being transmitted.

Maint start—The **Maintenance** timer on an active contract has expired, causing the maintenance action to occur.

Maint tickle—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—A **Maintenance** message is being transmitted from the requesting agent to other agents along the contract route.

Maint tra NF—The contract agent received a maintenance message for a contract that is not found in its list.

Maint tra NF rt—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—The contract agent received a tickle message for a contract that is not found in its list.

Maint tic NF rt—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—The requesting agent confirmed that it still needs the contract, and the **Maintenance** timer is restarted.

Maint res cont.—A **Restart** message is being passed to other agents along the contract route.

Rqst Agent

This is the agent that requested the contract.

Grant Agent

This is 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 *IntelliTeam SG>Activity Monitoring>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.

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.

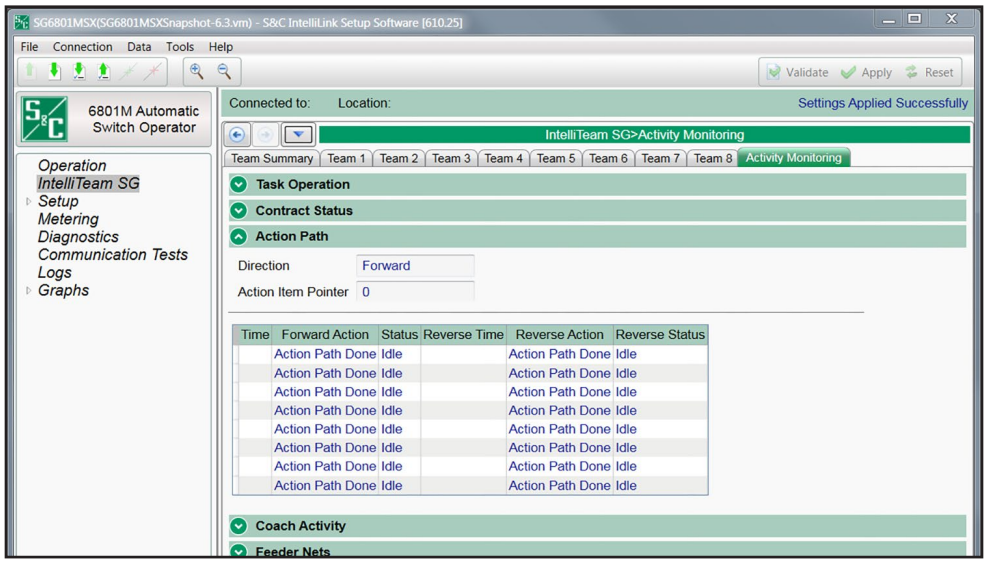

Figure 23. The *IntelliTeam SG>Activity Monitoring>Action Path* screen.

The screen in Figure 23 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

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

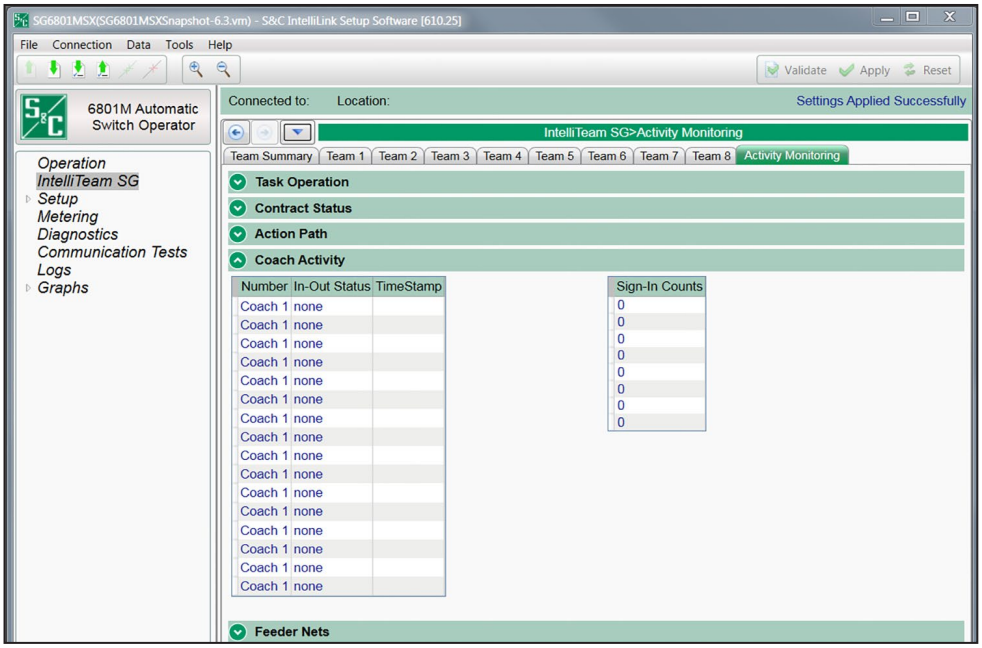

Figure 24. The *IntelliTeam SG>Activity Monitoring>Coach Activity* screen.

The screen in Figure 24 shows time stamps for basic coach activities and the counter for each team's coach. It includes the following information:

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

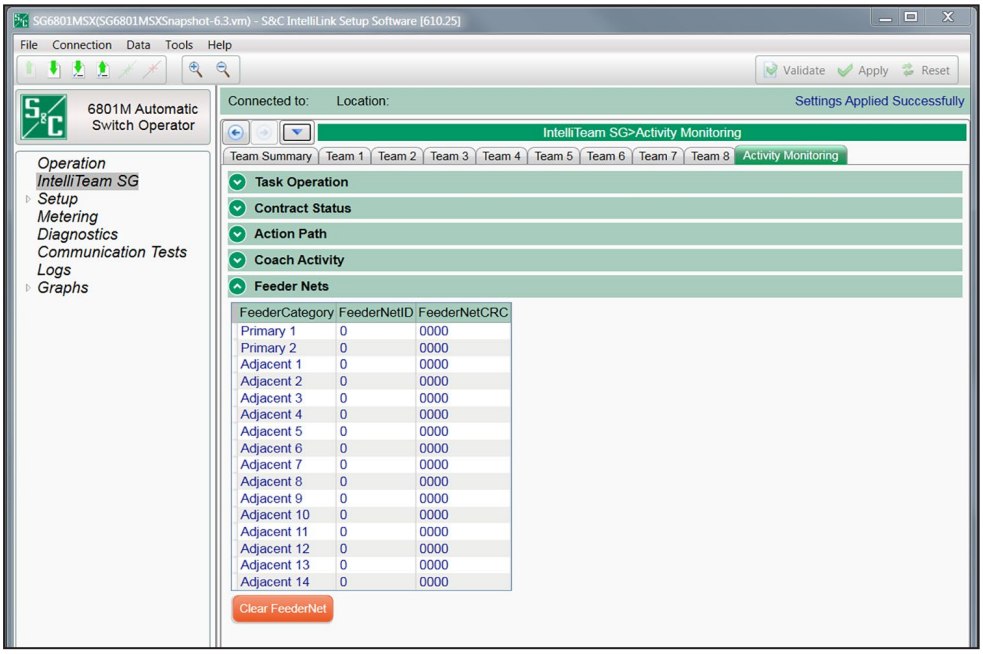

Figure 25. The *IntelliTeam SG>Activity Monitoring>Feeder Nets* screen.

The screen in Figure 25 contains data associated with the Feeder Netlists. 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 software 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.

Troubleshooting an IntelliTeam SG Automatic Restoration System

To troubleshoot an IntelliTeam system, check the following at each team member, starting with the most likely team member:

Team does not communicate

STEP 1. ***Setup>Communications*** **screen settings—**Verify the **Baud Rate**, **RTS Active Duration**, and **Duplex** settings are correct for the radio installed.

STEP 2. **Radio antenna—**Verify the radio antenna is in place and the antenna cable is attached at both ends.

STEP 3. **Radio connectivity—**Verify the radio recognizes all the other radios it should see. Refer to the manufacturer's documentation.

Team does not reconfigure the circuit

STEP 1. **Team Logic setpoint—**Connect to the 6801M Automatic Switch Operator and start the IntelliLink software. On the *Setup>Restoration>IntelliTeam SG>Team 1* screen, verify the **Team Logic** setpoint is enabled for this team.

STEP 2. **Other *Setup>Restoration>IntelliTeam SG* screen settings—**Verify the DNP/RTU Address entry is correct for each team member. Verify the **Normal Open/Close** setpoint is correct for each team member. Verify the **Normal Sw Func** setpoint is correct. Verify the **Maximum Capacity** settings are appropriate for the circuit conditions.

STEP 3. **Values on the *IntelliTeam SG>Team 1* screen—**Verify the team is in the **Ready** state. Check the **Operational Status**, **Line Status**, and **Configuration Status** fields for reasons that the team is not in the **Ready** state.

STEP 4. **Team communication—**Refer to the "Team does not communicate" section on page 15.

STEP 5. **Circuit configuration—**Verify the circuit has not been temporarily reconfigured because of construction or maintenance.

STEP 6. **An event was logged—**Check the *Logs>Historic Log* screen to see whether the team member detected and took action for an event.

Team does not return the circuit to normal

STEP 1. **Return to Norm Mode setpoints—**On the *Setup>Restoration>IntelliTeam SG>Team 1* screens, verify the **Rtn to Norm Mode Open** or **Closed** setpoint is set properly for this team.

STEP 2. **Present state of each Team member—**On the *IntelliTeam SG>Team Summary* screen, verify the team is in the **Ready** state. Check the **Operational Status**, **Configuration Status**, and **Line Segment Status** fields on the *IntelliTeam SG>Team 1* through *Team 8* screens for reasons the team may not be ready.

STEP 3. **Team communication—**Refer to the "Team does not communicate" section on page 15

STEP 4. **Automatic operation—**If automatic operation was disabled at any team member while the circuit was in its reconfigured state, the **Return to Normal** process is canceled.

Operation screen shows ALARM or FAULT

***IntelliTeam SG>Team 1 through Team 8 screens*—**Check **Operational Status**, **Line Status**, and **Configuration Status** fields for reasons the team is not ready.

DNP communication between the computer and team members is not working

STEP 1. **Team communication—**Refer to the "Team does not communicate" section on page 15.

STEP 2. **Protocol and DNP address used by IntelliLink—**Start IntelliLink software on the computer. From the drop-down menu, select the **Tools** option, select "Options" and "Connections." Check that DNP is the selected protocol. Check that the **Peer Address** setting matches the **DNP/RTU Address** setting for the team member to be communicated with. Check that the **Timeout** and **Baud Rate** settings are correct.

STEP 3. **Check for error messages—**See the *Logs>Historic Log* screen.

SCADA commands are ignored by the 6801M Switch Operator

STEP 1. **RTU address—**On the *Setup>Communications>DNP* screen, check the **Local Device RTU Address** setting used by this 6801M Automatic Switch Operator. Make sure the SCADA master station is sending commands to the correct address.

STEP 2. **Radio operation—**See the manufacturer's documentation for details.

Data Logging Setup

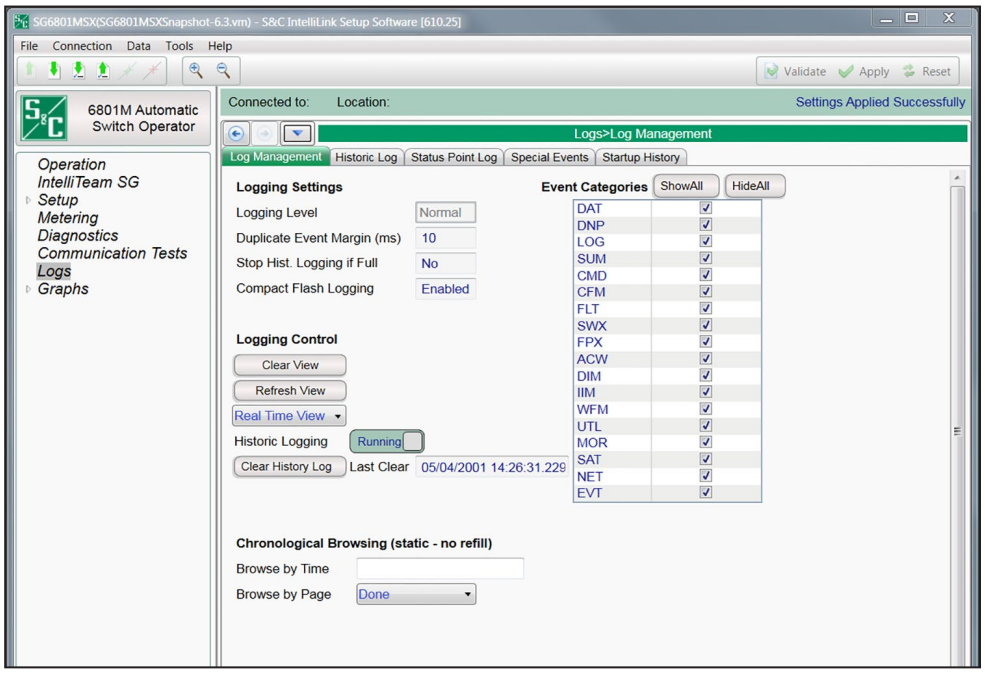

Figure 26. The *Logs>Log Management* screen.

The screen in Figure 26 configures the filter settings for viewing log screens. The Administrative login is required to execute any of the log-control functions. The following parameters are shown:

Logging Settings

Logging Level

The logging level selected determines the type of data-log messages captured in the base memory module (for an IntelliRupter fault interrupter) and is displayed on the *Logs>Historic Log* screen. Every data-log 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, such as 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 setpoint, but all events will be logged because events are alternating. (Range = 0-30; increment = 1.)

Stop Historic Logging if Full

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** counter logging are not affected by this setpoint. This setting is factory set 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 software. Open the **Tools** option on the menu bar and click on the **Compact Flash Access** option. Select and save any files needed.

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 Event log in flash memory. Flash memory files can be downloaded by opening the **File** option on the menu bar and choosing "Flash Memory Files." The complete Historic Event log (up to a million events) cannot be viewed through IntelliLink software, but a small subset of the Historic Event 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 Event 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 Event 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—This setting 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 "Running" 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. To preserve event data, 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 Event log, the Historic Event 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 criteria are placed in the *Logs>Historic Log* screen. If all events in the Historic Event 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 Event Log

Newest 8 Pages—Loads up to 160 of the newest qualifying events from the Historic Event Log

Previous 8 Pages—Loads up to 160 previous events relative to the events in the *Logs>Historic Log* screen

Next 8 Pages—Loads up to 160 next events relative to the events in the *Logs>Historic Log* screen

When the selection is entered, the *Logs>Historic Log* screen is refilled immediately. Because the Historic Event log is circular, selecting "Previous 8 Pages" may cause the newest events to be displayed (if the *Logs>Historic Log* screen presently holds the oldest). Similarly, selecting "Next 8 Pages" may cause the oldest events to be displayed (if the *Logs>Historic Log* screen presently holds the newest).

Historic Log

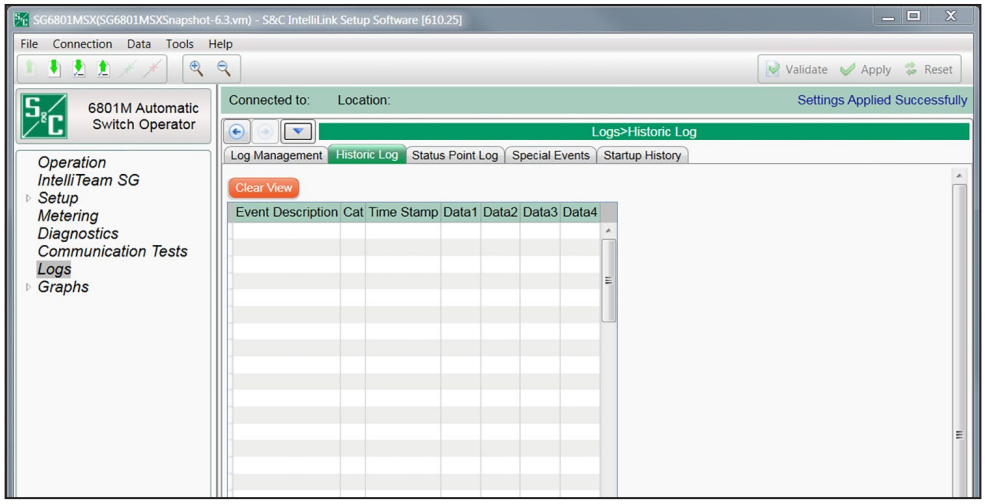

Figure 27. The *Logs>Historic Log* screen.

The screen in Figure 27 displays the Historic log, a subset of the Historic Event 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 Event 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. 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

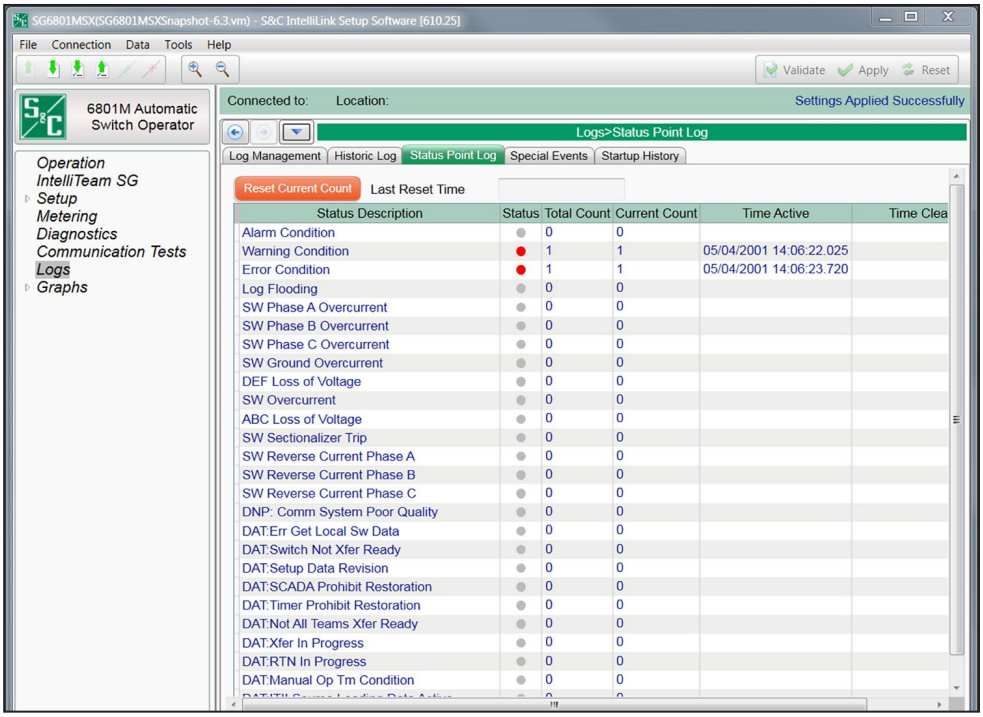

Figure 28. The *Logs>Status Point Log* screen.

The screen in Figure 28 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. Two historic events are associated with each status point in the Historic Event 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 Event log—100 for the status point becoming active, and 99 for the status point becoming inactive.

The *Logs>Status Point Log* screen is a convenience; this information is also available in the Historic Event 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 S&C Instruction Sheets 1045M-560A, and 1045M-560B, "S&C 6801M Automatic Switch Operators: *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 is the total number of times the status point has been active.

Current Count

This is the number of times the status point has been active after a **Reset Current Count** button command.

Time Active

This is the date and time the status point last became active after a **Reset Current Count** button command.

Time Cleared

This is the date and time the status point last became inactive after a **Reset Current Count** button command.

Special Event Counters

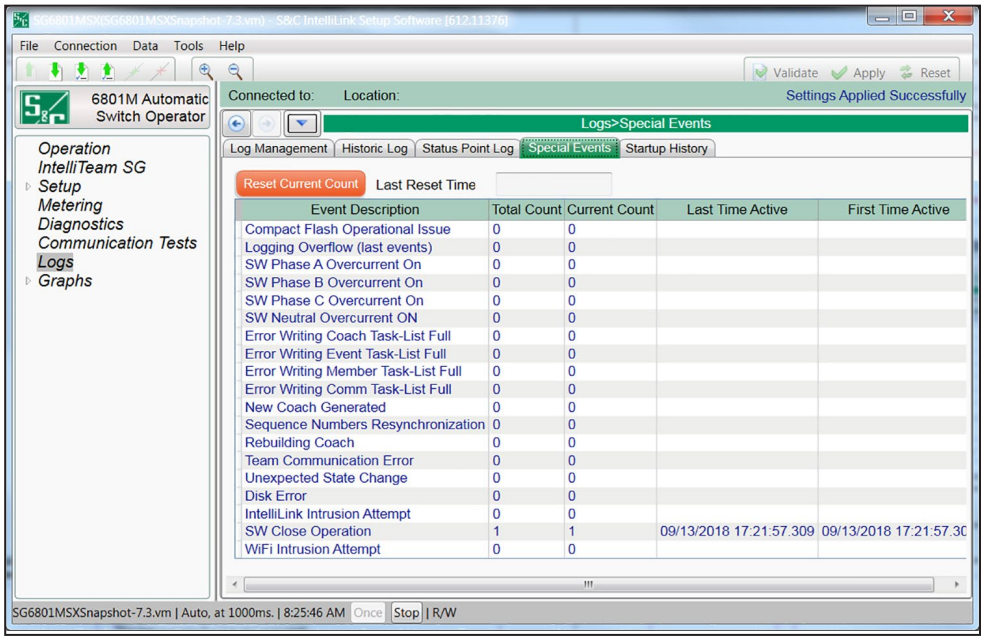

Figure 29. The *Logs>Special Events* screen.

Some historic events are special events, such as when a flash memory failure will adversely impact operation. The screen in Figure 29 indicates how many times each special event has occurred, the last time it occurred, and the last time it cleared. 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 description of each event.

Total Count

This is the total number of times the special event has occurred.

Current Count

This is 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

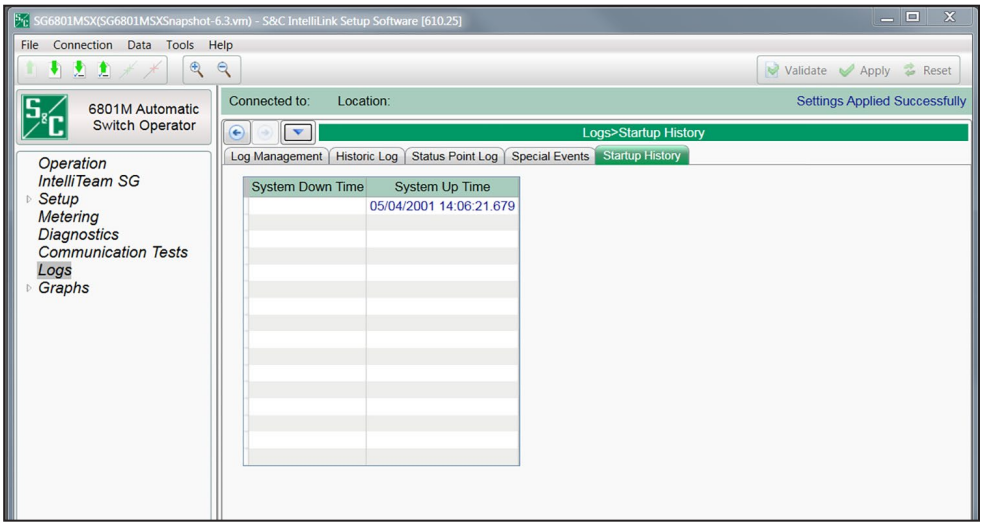

Figure 30. The *Logs>Startup History* screen.

The screen in Figure 30 tracks system start and stop time stamps, in ascending order. The following parameters are shown:

System Down Time

This is the date and time power to the control was lost.

System Up Time

This is 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 6801M Automatic Switch Operator application is written to flash memory, even if historic event logging has been stopped for the Historic Log or the event does not satisfy logging criteria.

Only the IntelliNode™ Interface Module has a removable compact flash memory card. The S&C 6800 Series Automatic Switch Controls, the S&C 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 6801M Switch Operator uses 100 pre-allocated fixed-size files to store historic event data in the compact flash memory and stores more than 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 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 Compact Flash card removal. In this case, data logging assumes 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 31. Follow these steps to download the log files:

STEP 1. In the **Tools** pull-down menu, select "Compact Flash Access..." to open the Compact Flash Access dialog box. See Figure 31.

STEP 2. In the "Local File System" panel on the screen, select the target directory for the file download.

STEP 3. In the "Remote File System" panel on the screen, select the HISTLOG folder.

STEP 4. Select the file to download.

STEP 5. Right click on the selected file and select "Download."

The download progress will display in the lower right corner of the Compact Flash Access 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.

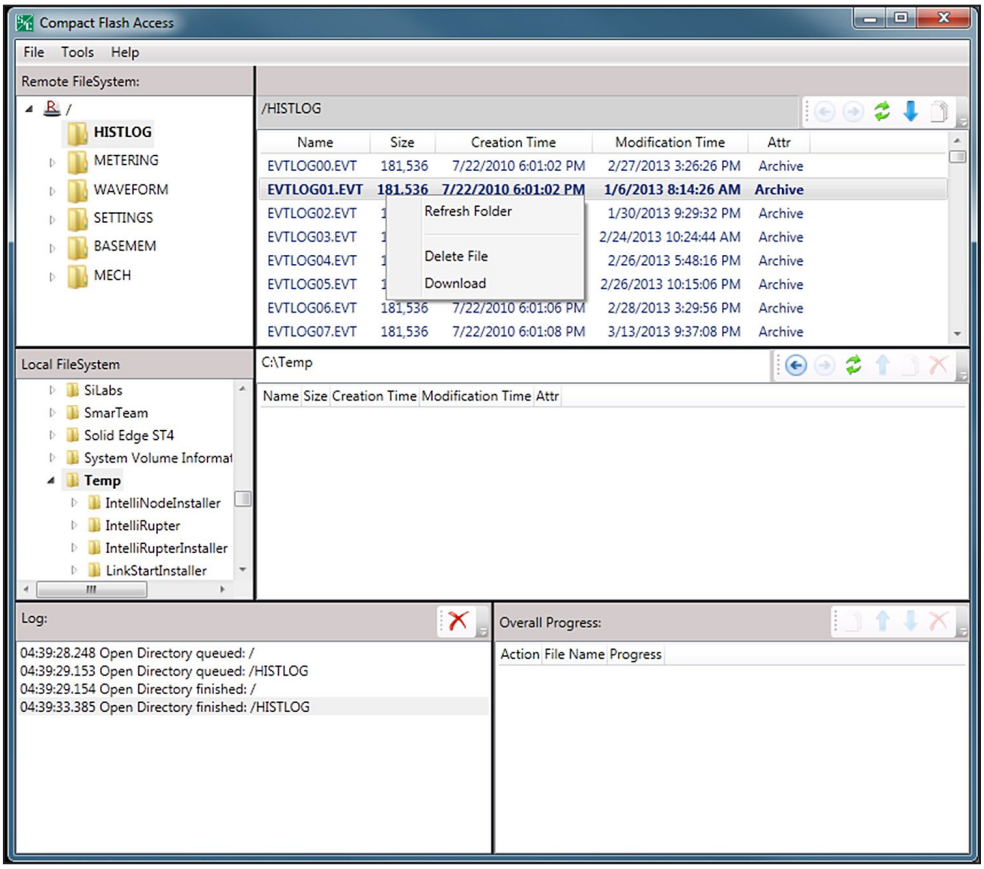

Figure 31. The Compact Flash Access dialog box.