Troubleshooting

Table of Contents

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

Read this instruction sheet thoroughly and carefully before installing or operating an IntelliNode Interface Module. 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 intellNode Interface Module. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the selected equipment. Refer to S&C Specification Bulletin 1043-31.

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 IntelliNode Interface Module, 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 IntelliNode Interface Module 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 IntelliNode Interface Module 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 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 attached to the IntelliNode Interface Module. Become familiar with these types of messages and the importance of these various signal words:

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

Following Safety Instructions

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

NOTICE

Read this instruction sheet thoroughly and carefully before installing or operating an IntelliNode Interface Module.

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

IntelliNode Interface Modules operate devices at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

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

1. **QUALIFIED PERSONS.** Access to an IntelliNode Interface Module 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. Always maintain proper clearance from energized components.
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

These instructions were prepared for use with IntelliNode Software installer versions ITNInstaller-7.6.x and later. References in this manual to the IntelliTeam SG Automatic Restoration System apply for IntelliTeam SG software revision 7.6.x, as indicated in S&C Instruction Sheet 1044-570, "IntelliTeam® Designer: *User's Guide*."

Find the revision number on the *Setup>General>Revisions* screen. For questions regarding the applicability of information in this chapter to previous software releases or future versions later than 7.6.x, contact S&C Electric Company.

⚠ 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 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 IntelliNode Interface Module is connected to switchgear operating at primary voltage levels. High voltage may be present in the wiring to the switch control or the switch control itself during certain failures of the switchgear wiring or grounding system, or because of a failure of the switch itself. For this reason, access to the switch control 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 control.

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 control 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 control and associated mounting hardware, as though they were elevated to primary (high) voltage.

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

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

Troubleshooting Overview

The following tools and IntelliNode module features are used to diagnose and correct problems:

LCD Screen

The LCD screen on the faceplate provides information about the present state of the team. For an explanation of the faceplate and the LCD display, refer to Instruction Sheet 1043-541, "S&C IntelliNode™ Interface Module: *Operation*." See Figures 1 and 2.

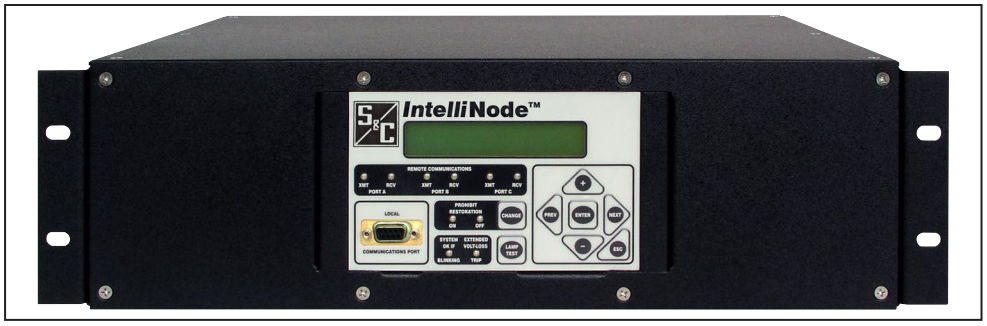

Figure 1. Rack-mounted IntelliNode Interface Module.

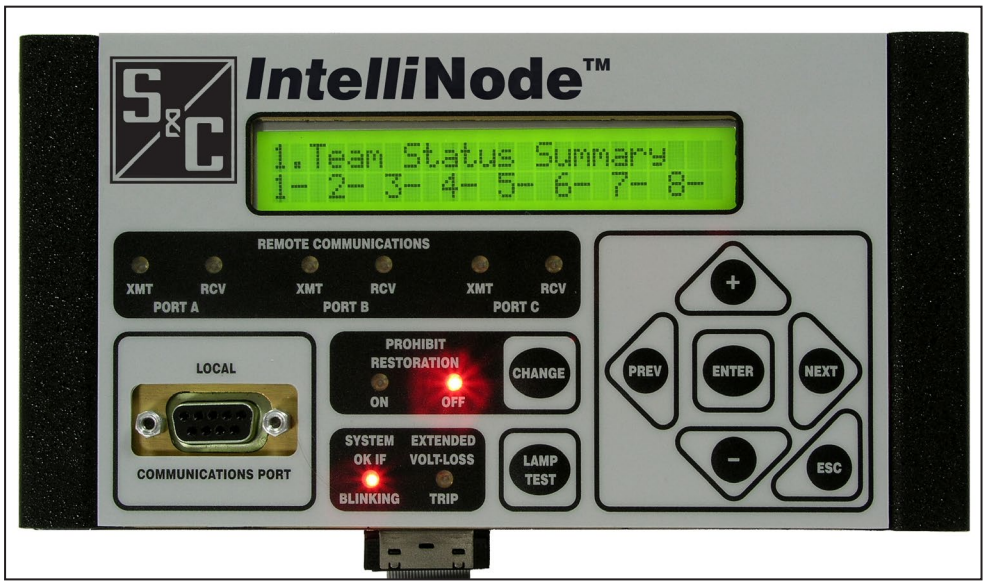

Figure 2. Panel-mounted IntelliNode Interface Module.

LEDs

The LEDs on the IntelliNode module faceplate provide information about the state of the control. For an explanation of the faceplate LEDs, see D&C Instruction Sheet 1043-541, "IntelliNode™ Interface Module: *Operation*."

NOTICE

With software 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 1043-531, "IntelliNode™ Interface Module: *Setup,*" for more information.

IntelliLink® Setup Software

The *Operation* screen and troubleshooting screens display information about the IntelliNode Interface Module and its operation.

To view these screens, a PC computer, a serial or USB cable, and the IntelliLink software version for the IntelliNode module are needed. For more information about the equipment required and how to use the IntelliLink software, refer to S&C Instruction Sheet 1043-541, "IntelliNode™ Interface Module: *Operation*."

NOTICE

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

Display Problems

If the LCD screen is blank, LCD data cannot be scrolled on the display or it is not illuminated, follow these steps:

STEP 1. Check the LEDs. When all the IntelliNode module LEDs are off, the module is not receiving power.

STEP 2. Check control power. Following utility-approved work procedures and safety practices, verify correct voltage is on the line providing control power.

Error Messages

The IntelliLink Setup Software may display an error message while trying to establish communication with the IntelliNode module or a snapshot file. When an error message appears, follow these corrective actions:

"IntelliLink software won't start"

Follow these steps to start the IntelliLink software program:

STEP 1. Close other software programs. Some software applications may interfere with the IntelliLink software being able to access the computer's serial port. Exit any program that might take control of a serial port while using the IntelliLink software.

STEP 2. Reinstall the IntelliLink software on the computer. There may be a problem with one of the files. See the "Install Software on The Computer" section in S&C Instruction Sheet 766-571, "IntelliRupter® PulseCloser® Fault Interrupter: *Software Installation*."

"Could not connect to control on COM1"

See the "Opening port COM1... Trying 38400 BAUD... Connection Failed" section on page 9.

"Incompatible Ident"

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

STEP 1. Use the correct screenset. To close the open screenset, in the **File** drop-down menu select the **Close Screenset** option.

STEP 2. In the **File** drop-down menu select the **Open Snapshot** option.

STEP 3. In the Open Controller Data File dialog box, select a snapshot to view, then 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 or a newer version of the IntelliNode Software Installer may be needed to load the software on the computer.

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 IntelliNode module. Follow these steps to establish a connection:

STEP 1. Check that the IntelliNode module has power. If the LCD screen is blank, the IntelliNode module may have no power and cannot communicate with the computer. See the "Display Problems" section on page 8.

STEP 2. Check the serial cable connections. Check that the serial cable is plugged into the LOCAL COMM port on the IntelliNode module faceplate. Make sure the cable is plugged in to the correct port on the computer (usually COM1 on portable computers). Also make sure the protocol is ICP for IntelliNode module versions at or earlier than 3.4.x and DNP for IntelliNode module versions later than version 3.5.x.

STEP 3. Try another communications port. The COM1 port on t he computer may be broken or assigned to a different device. Try a different port using this process:

(a) Connect the cable to another comm port.

(b) In the Connect dialog box, click on the **Change Setup** button.

(c) From the pull-down list, select the name of the port where the cable was connected.

(d) Click on the **Connect** button.

STEP 4. Use a different serial cable. The serial cable between the computer and the IntelliNode module 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 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.

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

Reinstall the IntelliLink software on the computer. Make sure to install the correct IntelliLink software for this IntelliNode module. For details, see the "To Install The IntelliLink Software" section in S&C Instruction Sheet 1043-531, IntelliNode™ Interface Module: *Setup*."

Software Troubleshooting

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

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

To use the correct screenset, follow these steps:

STEP 1. From the drop-down menu, select the **File** option and click on "Close Screenset" to close the open screenset.

STEP 2. From the drop-down menu, select the **File** option and click on "Open Screenset," and choose the correct screenset for the IntelliNode module.

STEP 3. When the screenset opens, click on the **Connection** and **Connect to Device** options.

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

Reinstall the Setup software on the computer. There may be a problem with one of the files. For details, see the "To Install The IntelliLink Software" section in S&C Instruction Sheet 1043-531, IntelliNode™ Interface Module: *Setup*."

"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 notice and uses a different font.

Team Does Not Communicate

Note: To identify the problem, 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 IntelliNode module and its team communications device. Check that the communication cabling is firmly in place at both ends and the communications device has power.

STEP 2. Make sure other communication ports being used. If the IntelliNode module is directly connected to another team member, the IntelliNode module is connected to host control device, or there is a radio or cable connection to a SCADA master station, check all those cable connections. Test communication between the IntelliNode module and the other devices.

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

STEP 4. If this IntelliNode module 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 IntelliNode module 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 manufacturer's documentation.

Team does not reconfigure the circuit

Follow these steps when the team does not reconfigure the circuit:

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

STEP 2. Check the other *Setup>Restoration>IntelliTeam SG* screen settings. Make sure the DNP address is correct for each team member. Also, make sure the **Normal Open/Close State** setpoint is correct for each switch in the team and the **Normal Switch Function** 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** mode is in "Ready." If not, on the *IntelliTeam SG>Team 1* screen, check the **Operational Status**, **Line Segment Status**, and **Configuration Status** fields for reasons the team may not be ready.

STEP 4. Check team communications. See the "Team Does Not Communicate" section on page 10.

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>Historic Log* screen to see whether the switch control detected and took action on an event.

Team does not return the circuit to normal

Follow these steps to check for a configuration problem:

STEP 1. Check the **Return to Norm Mode** setpoints. Connect the computer to the IntelliNode module and start the IntelliLink software. On the *Setup> Restoration>IntelliTeam SG>Team 1>Team Member Settings* screen, make sure the **Rtn to Norm Mode** setpoint is set properly for this team (in the Open or Cosed configuration).

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

STEP 3. Check team communications. See the "Team Does Not Communicate" section on page 10.

STEP 4. Make sure automatic operation was not disabled. If automatic operation was disabled at any team member while the circuit was reconfigured, 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 Segment Status**, and **Configuration Status** fields for the reason(s) the team is not ready.

DNP communications between PC and team members is not working

Follow these steps to check for a configuration problem:

STEP 1. Check team communications. See the "Team Does Not Communicate" section on page 10.

STEP 2. Make sure the DNP cable is connected. Make sure the serial cable from the computer is connected to the DNP port (usually Port A). Also make sure the DB9 connector is fully seated in the DNP port.

STEP 3. Check the protocol and DNP address being used by the IntelliLink software. Follow these steps to check the protocol and address:

(a) Start the IntelliLink software on the computer. In the **Tools** drop down menu, select "Options" and then select "Communication Setup."

(b) Make sure that "DNP" is the selected protocol.

(c) Also make sure the **Peer Address** setting matches the DNP address configured for the team member to be communicated with.

(d) Make sure the timeout and the baud rate are also set correctly.

STEP 4. Check for error messages on the *Logs>Historic Log* screen. To perform this check, connect directly to the faceplate Communications port and click on "ICP" in the IntelliLink Communications Setup dialog box.

SCADA commands are ignored by the IntelliNode/Host control device

Follow these steps when SCADA commands are ignored:

STEP 1. Make sure the IntelliNode module has control power.

STEP 2. Check the RTU address. At the *Setup>Communications>DNP* screen, check which Local Device DNP address this IntelliNode module is using. Make sure the SCADA master station is sending commands for this control to the correct DNP address.

STEP 3. Check the communications hardware. See the manufacturer's documentation for details.

Operation Screen

The *Operation* screen shown in Figure 3 shows the status of the module and has the following fields. See Figure 3.

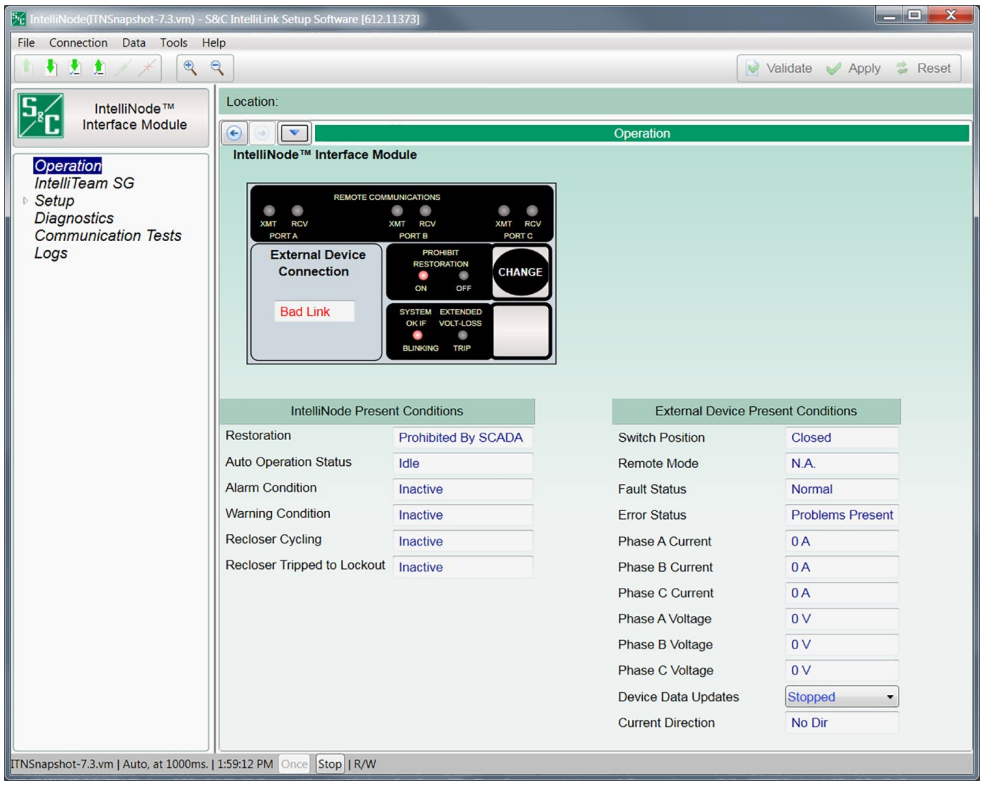

Figure 3. The *Operation* screen.

NOTICE

Starting with firmware later than 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. Please see S&C Instruction Sheet 1043-531, "IntelliNode™ Interface Module: *Setup*" for more information.

IntelliNode Present Conditions

Restoration

When the **Prohibit Restoration** mode becomes active by a front panel command from the IntelliTeam SG system or by a SCADA command, "Prohibited By Front Panel," "Prohibited By SG," or "Prohibited By SCADA" is reported. If the **Prohibit Restoration** mode is not active, "Enabled" is reported.

Auto Operation Status

When the IntelliTeam system initiates **Extended Phase Loss Open** or **Three-Phase Voltage Loss Open** commands to the external device, "Extended voltage loss trip" is reported. Otherwise, "Idle" is reported.

Alarm Condition

When the **Alarm Condition** external device status point is active, "Active" is reported. Otherwise, "Inactive" is reported.

Warning Condition

When the **Warning Condition** external device status point is active, "Active" is reported. Otherwise, "Inactive" is reported.

Recloser Cycling

When the **Recloser Cycling** external device status point is active, "Active" is reported. Otherwise, "Inactive" is reported.

Recloser Tripped to Lockout

When the **Tripped to Lockout** external device status point is active, "Active" is reported. Otherwise, "Inactive" is reported.

External Device Present Conditions

Switch Position

When the external device poll returns a Switch Position binary status point, the switch position is reported as "Open," "Closed," or "Bad Contacts."

Remote Mode

When the external device poll returns a **Remote Mode** binary status point, the remote mode is reported as "Disabled," "Enabled," or "N.A."

Fault Status

This field references the **Phase Fault** status points. "Normal" is displayed when all points are inactive; "Fault Detected" is displayed when any **Phase Fault** status point is active.

Error Status

This field references active alarms on the *Logs>Status Point Log* screen. "Normal" is displayed when all alarms are inactive; "Problems Present" is displayed when any alarm is active.

Phase A Current

This field references the *Setup>External Device>DNP Analog Point Map* screen. The polled status is displayed for Phase A Current.

Phase B Current

The polled status is displayed for Phase B Current.

Phase C Current

The polled status is displayed for Phase C Current.

Phase A Voltage

The polled status is displayed for Phase A Voltage.

Phase B Voltage

The polled status is displayed for Phase B Voltage.

Phase C Voltage

The polled status is displayed for Phase C Voltage.

Device Data Updates

Select the **Running** option to start polling the external device. Select the **Stopped** option to end polling.

Current Direction

See the **Current Direction Detection Method** setpoint on the *Setup>External Device>Automatic Operation* screen. Current direction is reported as "Normal Dir," "Reverse Dir," or "No Dir." Current direction is reported as "No Dir" when:

- The **Current Direction Detection Method** setpoint is set to "None."
- The **Current Direction Detection Method** setpoint is set to "Status Points," and both the **Normal** and **Reverse Current Flow** status points are either active or inactive at the same time.

Software Versions Screen

Data for the installed version updates whenever a new software revision is installed. The expected value is stored in the IntelliLink software, and the installed version is loaded from the connected control. See Figure 4.

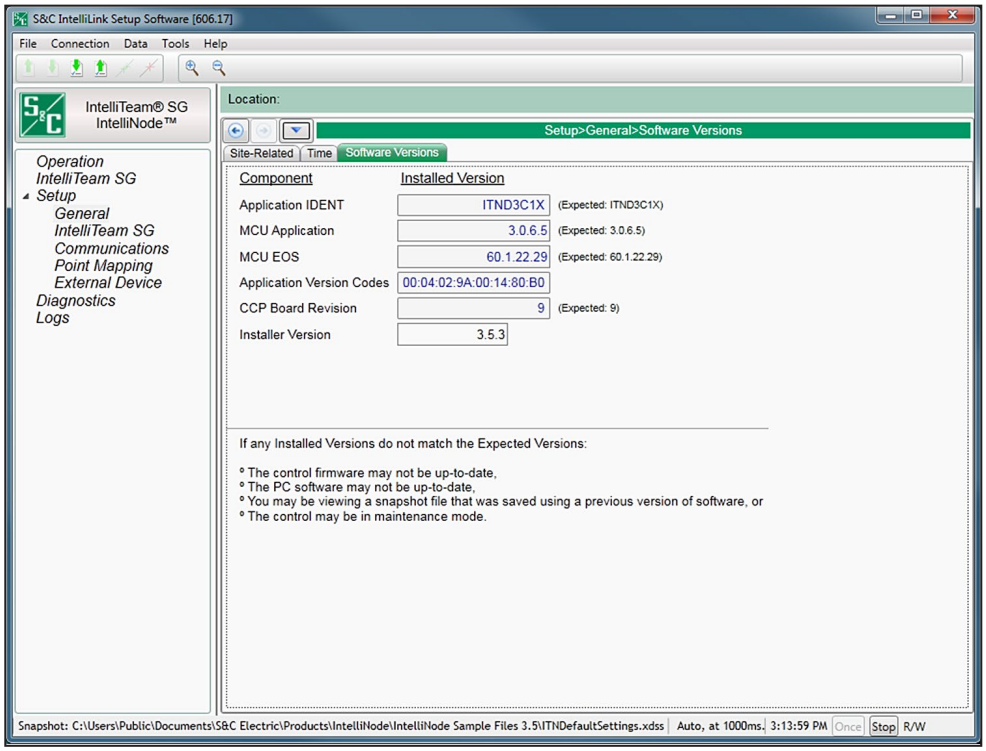

Figure 4. The *Setup>General>Software Versions* screen.

The latest control software versions are available at the S&C Automation Customer Support Portal, which requires an assigned user name and password. Go to this link: **www.sandc.com/en/support/sc-customer-portal/.**

Register for portal access at this link.

Communication Tests

Diagnostic communication tests determine whether nodes are responding to communication and how quickly they respond. Periodically scheduled tests run for one hour and record response time, failure, and retry statistics. Any network node can send tests to other network nodes. Test messages (Connection IDs) do not contain real data, but they can be configured to mimic a typical coach or runner message. See Figure 5.

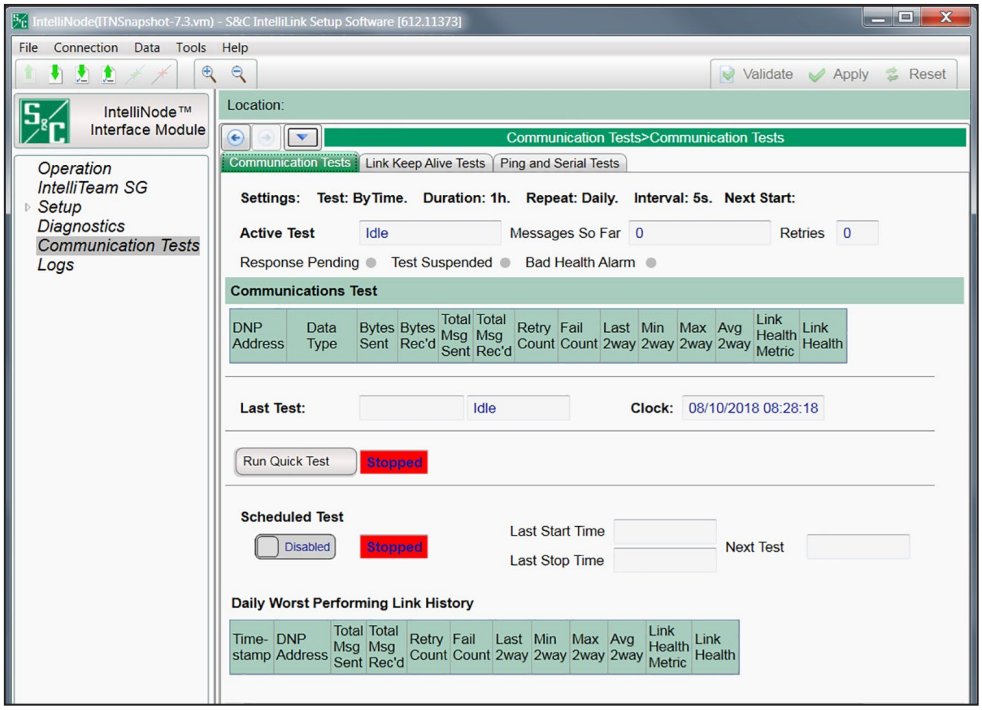

Figure 5. The *Communication Tests>Communications Tests* screen.

These parameters are reported:

Settings

These settings are configured on the *Setup>Communication Tests>Communication Tests* 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.

Communications Test

This test reports statistics for each message type sent to each node. The report sequence follows this example if there are two nodes and three 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

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

Gray–Less than 100 transmissions have been sent.

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

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

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

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

Last Test:

This is the timestamp 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 event. The indicator shows the Quick Test **Running, Stopped, or Suspended states.** A quick test event 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 **Running**, **Stopped**, or **Suspended** states.

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

Last Stop Time
This is the timestamp 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:

Timestamp
This is the time of the scheduled test.

DNP Address
This is the RTU address of the node.

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

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

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

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

Last 2way

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

Min 2way

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

Max 2way

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

Avg 2way

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

Link Health Metric

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

Link Health

This shows a color indication for Link Health Metric:

Gray–Less than 100 transmissions have been sent.

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

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

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

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

Link Keep Alive Tests

The **Link Keep Alive** process periodically sends a single message to every node to keep all links active because an idle TCP connection may be shut down. When more than one message is configured for a scheduled test, the **Link Keep Alive** process only sends the first configured message and records statistics for the message transmissions. See Figure 6.

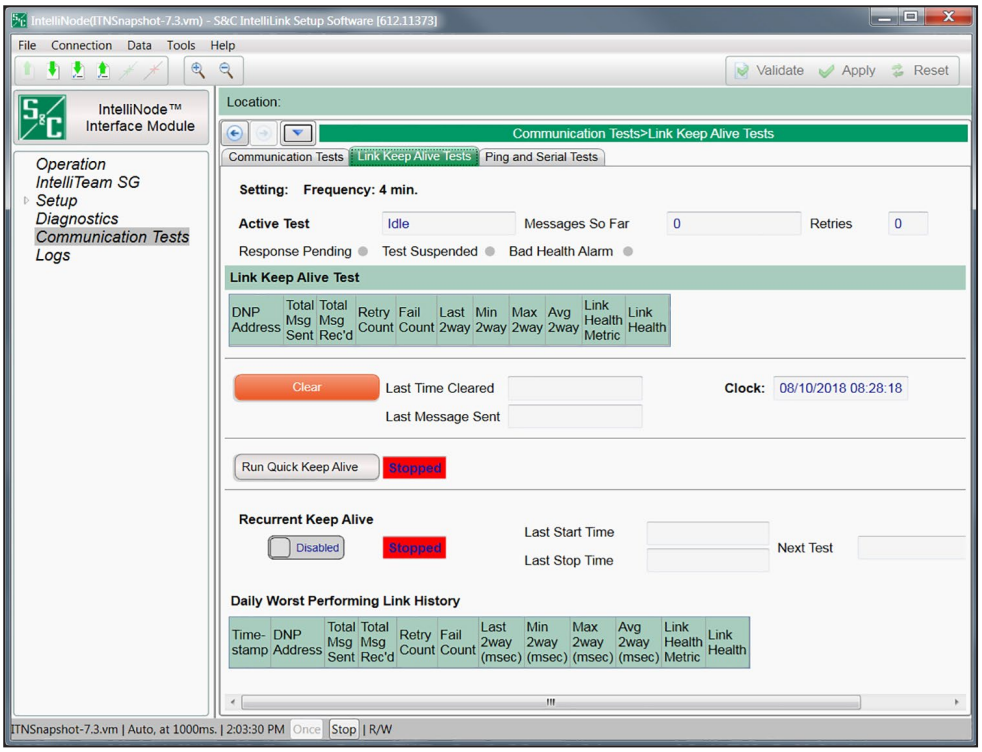

Figure 6. The *Communication Tests>Link Keep Alive Tests* screen.

These parameters are reported:

Settings

These settings are configured on the *Setup>Communications>Communication Test* screen and 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 field **Number of Retries for Confirm** 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 two-way statistics.

Min 2way

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

Max 2way

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

Avg 2way

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

Link Health Metric

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

Link Health

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

Green—The last keep alive message was received successfully without any retries.

Yellow—The last keep alive message was received successfully with retries.

Red—The last keep alive message was not received successfully.

Note: For keep alive tests, the link-health calculations are based on the last message. But for the diagnostic tests and worst performing link history, the calculations are based on averages.

Clear Button

This clears link keep alive data.

Last Time Cleared

This is the timestamp of the last time statistics were cleared, either manually or automatically at midnight.

Last Message Sent

This is the timestamp 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 **Running**, **Stopped**, or **Suspended** states. 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 **Running**, **Stopped**, or **Suspended** states.

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

Last Stop Time
This is the timestamp 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:

Timestamp
This is the time of the node transmission.

DNP Address
This is the DNP address of the node.

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

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

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

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

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

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

Max 2way (msec)

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

Avg 2way (msec)

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

Link Health Metric

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

Link Health

This shows a color indication for the link health metric:

Gray–Less than 100 transmissions have been sent.

Red–Bad; link health metric is less than 25%.

Yellow–Marginal; link health metric is 25% or greater and less than 95%.

Green–Good; link health metric is 95% or greater.

Note: Link health in this table indicates the average of all messages, but link health in the link keep alive table indicates the health for the last message sent.

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

Ping and Serial Tests

User-Initiated Ethernet Ping or Serial Link Status Request

The user can manually ping a node at the network level to test response time. This is useful when statistics indicate a node is not responding at the messaging level and one needs to check whether the node is responding at the network level. See Figure 7.

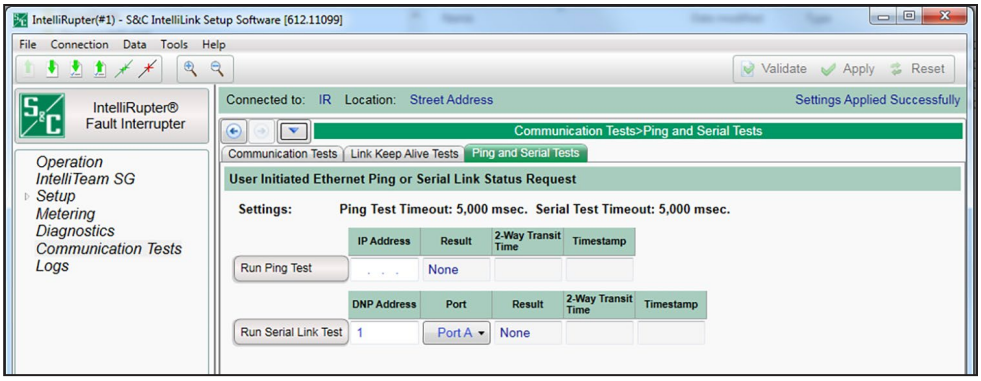

Figure 7. The *Communication Tests>Ping and Serial Tests* screen.

These parameters are reported:

Settings
These settings are configured on the *Setup>Communications>Communication Tests* 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.

Timestamp
This is the timestamp of the last ping sent or the response received.

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

DNP Address
This is the address of the tested node.

Port
This is the serial port used for transmission.

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

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

Timestamp
This is the timestamp of the last serial link test or the response received.

Communication Diagnostics

Clear Button

This button clears all data on the *Diagnostics>Comm* screen and enters a timestamp in the **Last Time Cleared** field. See Figure 8.

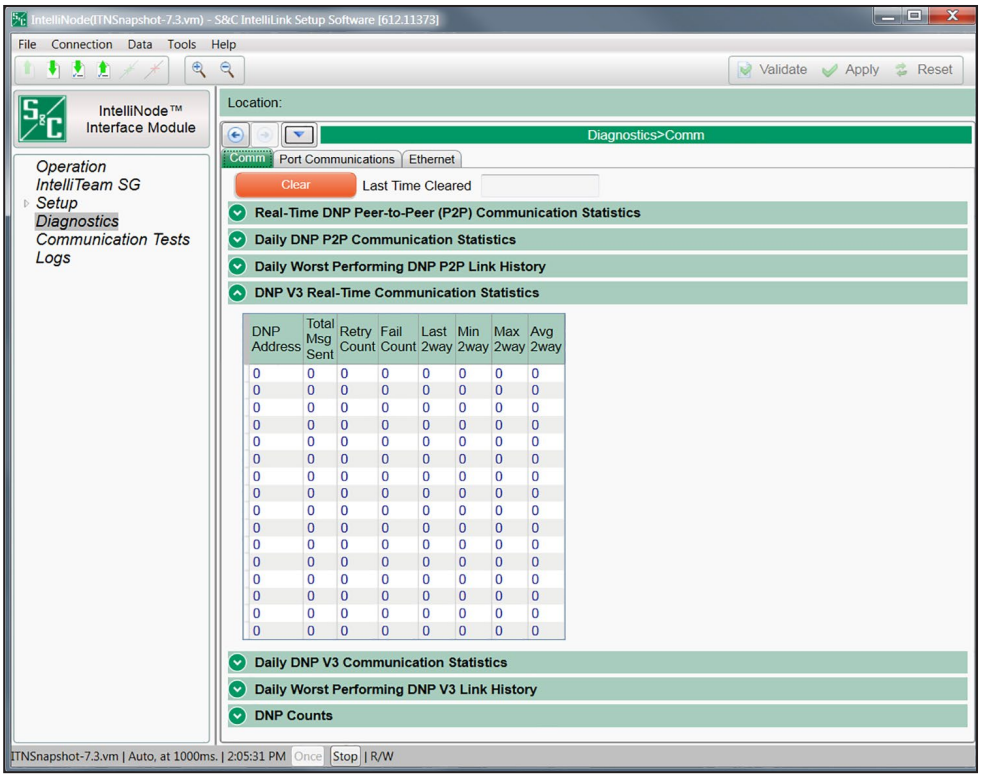

Figure 8. The *Diagnostics>Comm* screen.

These parameters are reported:

Last Time Cleared

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

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

This report shows 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

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

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.

Last 2way

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

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

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

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

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

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

Gray–Less than 100 transmissions have been sent.

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

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

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

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

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

Timestamp
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
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" section of the *Setup>Communications>DNP Diagnostics* screen.

DNP V3 Real-Time Communication Statistics

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

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

This report shows 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.

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

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

Link Health

This shows a color indication for the link health metric:

Gray–Less than 100 transmissions have been sent.

Red–Bad; link health metric is less than 25%.

Yellow–Marginal; link health metric is 25% or greater and less than 95%.

Green–Good; link health metric is 95% or greater.

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

Peer-SCADA Master Communication Statistics

These parameters are reported:

Master

This is the master station identifier.

DNP Address

This is the DNP address of the master station associated with the counts shown.

Total 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.

Avgd 2way

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

Daily Worst Performing DNP V3 Link History

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

Timestamp

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 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.

Link Health Metric

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

Link Health

This shows a color indication for the link health metric:

Gray–Less than 100 transmissions have been sent.

Red–Bad; link health metric is less than 25%.

Yellow–Marginal; link health metric is 25% or greater and less than 95%.

Green–Good; link health metric is 95% or greater.

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

DNP Counts

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

Transport Function Receive List

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

Transport Function Transmit List

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

Application Layer Message List

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

Peer Device List

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

Special Function List

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

URBE Function List

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

Binary Input Point List

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

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

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

Analog Input Point List

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

Counter Input Point List

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

Control Input Point List

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

Analog Output Point List

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

Route Table List

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

Master Event Counts

Binary Inputs

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

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

This is the number of Double-Bit Binary Input events queued and ready to be sent in the next event data request or in the next unsolicited event report.

Analog Inputs

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

Counters

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

Ethernet Diagnostics

Clear Button

The **Clear** button clears both Ethernet ports statistics and the DNP link and transport statistics. It also enters a timestamp in the **Last Clear Time** field. Link status statistics are not cleared. See Figure 9.

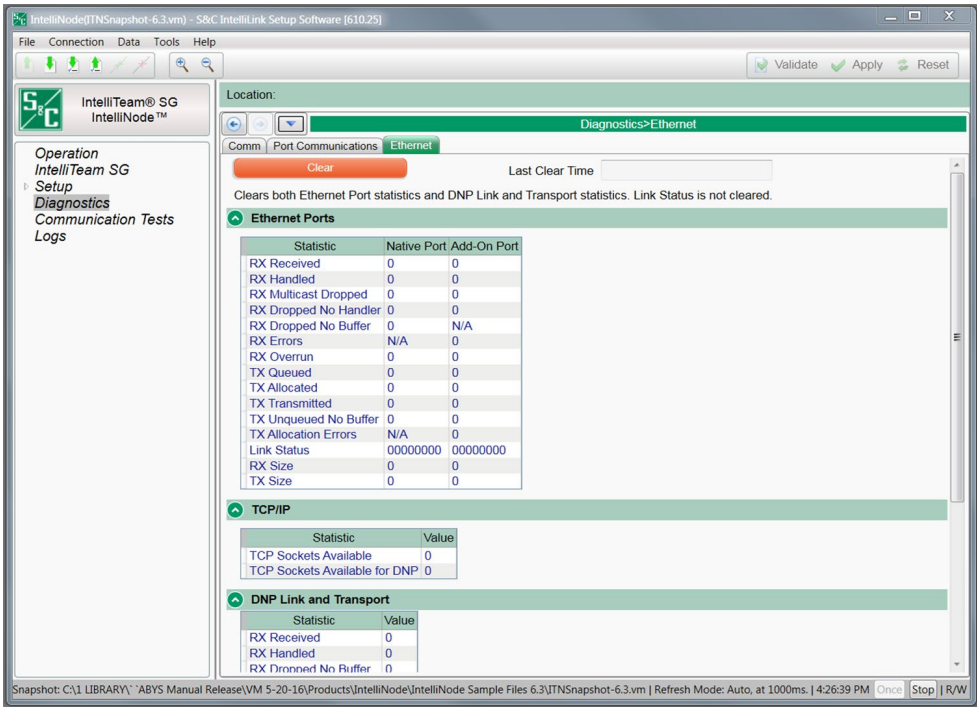

Figure 9. The *Diagnostics>Ethernet* screen.

The following parameters are reported:

Last Clear Time

This timestamp 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 Add-On Ethernet Port.

RX Overrun

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

TX Queued

This is the total number of packets queued for sending.

TX Allocated

This is the total number of allocation requests.

TX Transmitted

This is the total number of successfully transmitted packets.

TX Unqueued No Buffer

This is the total number of packets not queued because of a lack of buffer space.

TX Allocation Errors

This is the total number of allocation request failures. This statistic is only available for the Add-On Ethernet Port.

Link Status

This report shows the PHY Link Status Registers:

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

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

RX Size

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

TX Size

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

TCP/IP

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

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

RX Dispatch Local

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

RX Dispatch Remote

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

RX Dispatch Broadcast

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

RX Dispatch Application

This is the packet is dispatched to the application layer.

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

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

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

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

TX Transmitted
This is the packets have been successfully sent.

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

OOB Size
This is the out-of-bound data and skipped traffic.

RX Size
This is the received packet bytes.

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

Port Communications Diagnostics

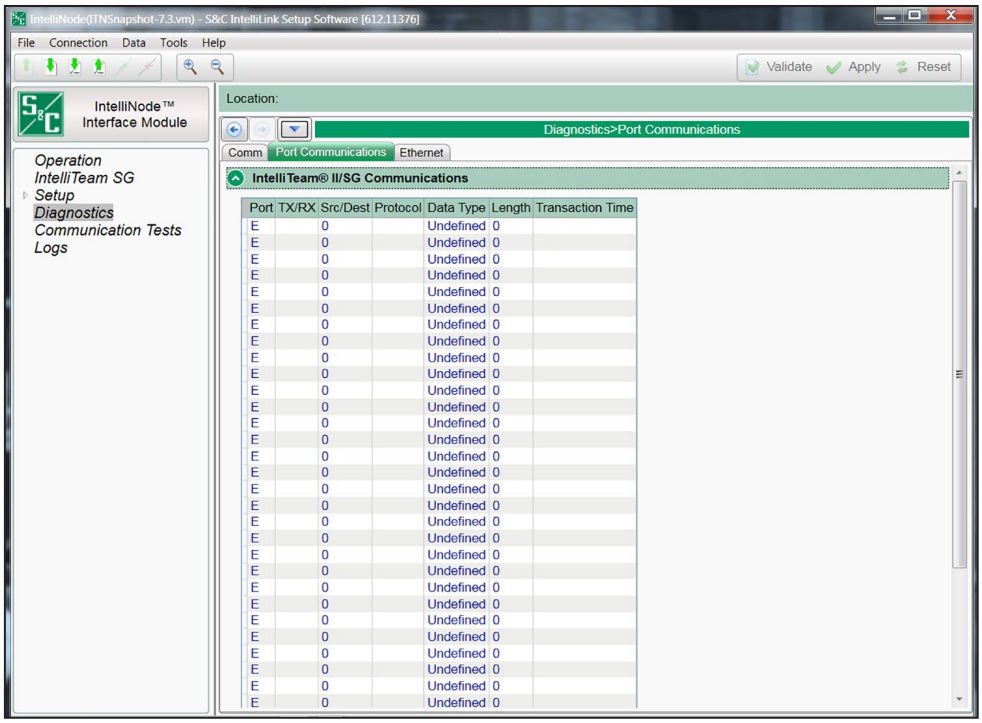

Figure 10. The *Diagnostics>Port Communications* screen.

IntelliTeam II/SG Communications

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

The following counters and statistics, shown in Figure 10, 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 is the destination address for a transmitted message and the source address for a received message.

Protocol

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

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

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

Transaction Time
This is the timestamp 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
The counters and statistics associated with peer communications for each SCADA Master.

Port
The port connected to the control.

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

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

Application Control
This is part of the DNPV3 message header.

Function Control
This is part of the DNPV3 message header.

IIN 1
This is part of the DNPV3 message header.

IIN 2
This is part of the DNPV3 message header.

Length
This is the packet length in number of bytes.

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

Application Control
This is part of the DNPV3 message header.

Function Control
This is part of the DNPV3 message header.

IIN 1
This is part of the DNPV3 message header.

IIN 2
This is part of the DNPV3 message header.

Length
This is the packet length in number of bytes.

Transaction Time
This is the timestamp 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

The **Ready** state 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 11.

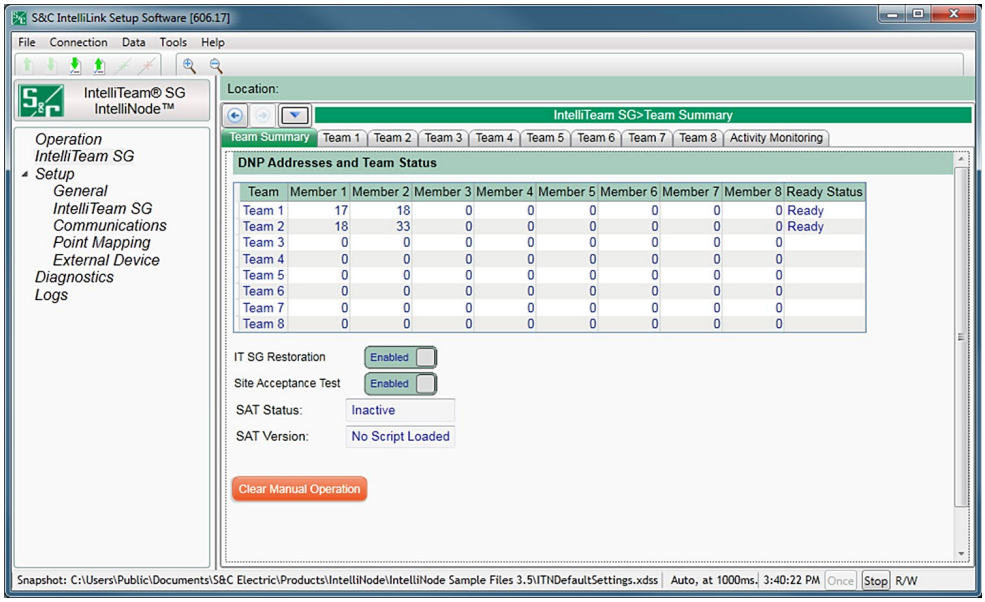

Figure 11. The *IntelliTeam SG>Team Summary* screen.

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** state of the team.

IntelliTeam SG Restoration

This slide control is used to enable or disable the IntelliTeam SG restoration system from this screen.

NOTICE

Starting with software versions 7.6.x and later, the **Site Acceptance Test**, **SAT Status**, and **SAT Version** fields are no longer available.

Site Acceptance Test

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

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

The *Team Information* screen shown in Figure 12 displays team-related parameters and information about each team member.

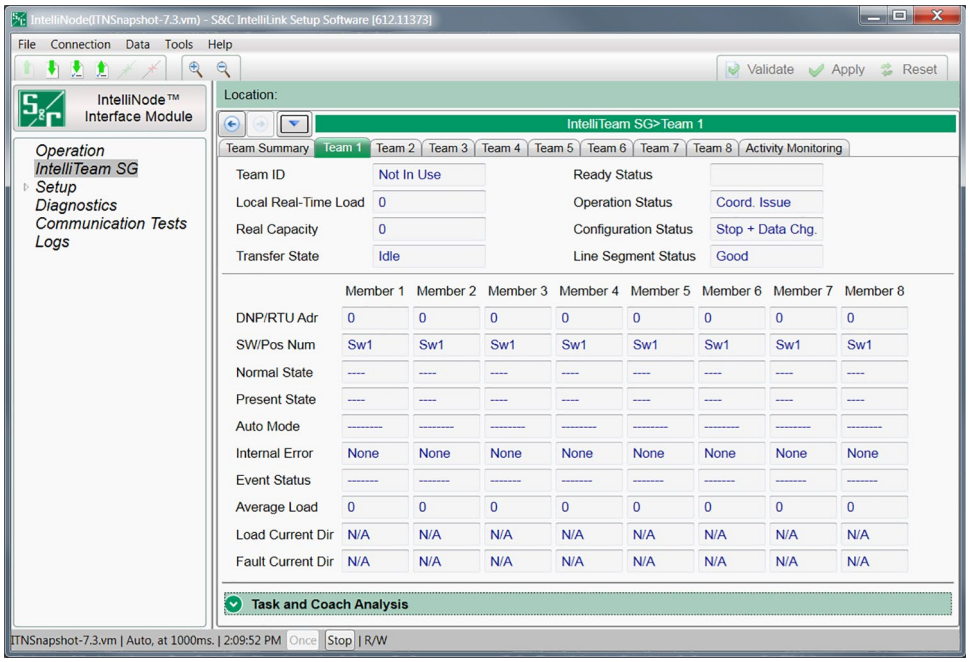

Figure 12. The *IntelliTeam SG>Team 1* screen.

The following parameters are reported:

Team ID

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

Local Real-Time Load

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

Real Capacity

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

Transfer State

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

Idle—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 the **Operation** status, **Configuration** status, and **Line Segment** status all indicate no errors are present.

Alarm—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—The 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—The 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 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 is enabled.

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

Internal Error

Possible values displayed:

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

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

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

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

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

Note: For all IntelliTeam SG devices, a **ManOR** and **No Op** state can be cleared on the *IntelliTeam SG>Team Summary* screen by clicking on 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

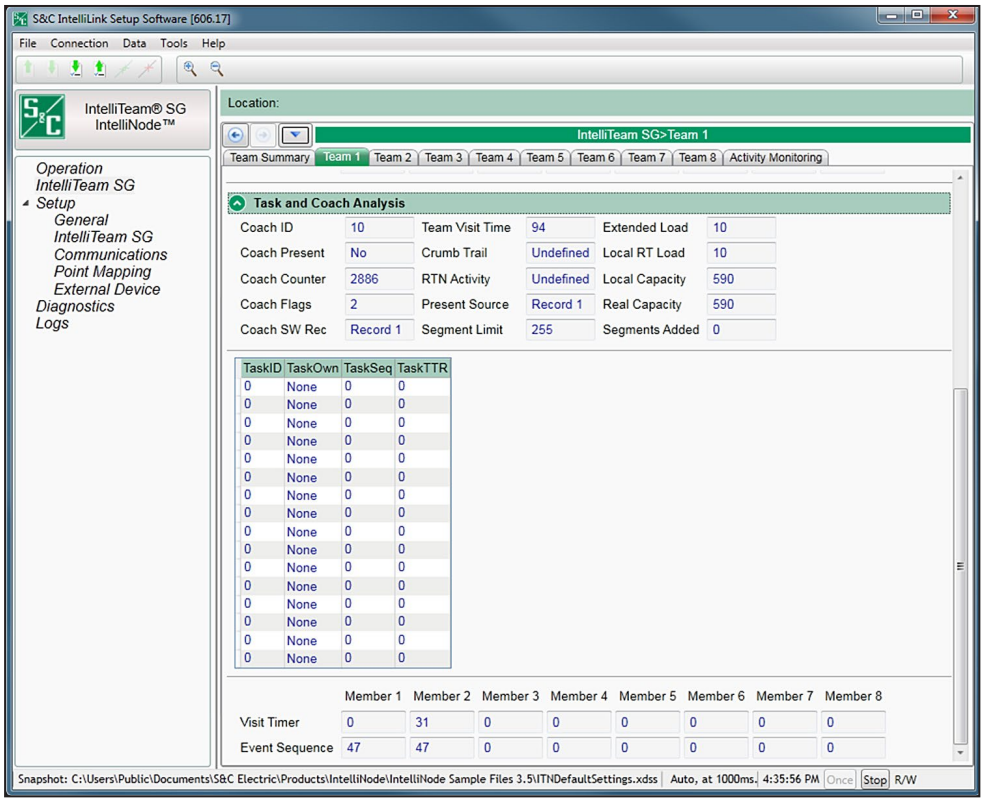

Figure 13. The *IntelliTeam SG>Team 1>Task and Coach Analysis* screen.

The screen depicted in Figure 13 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, it indicates where the coach is executing.

Team Visit Time

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

Crumb Trail

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

RTN Activity

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

Present Source

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

Segment Limit

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

Extended Load

This 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 screen information 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

The screen shown in Figure 14 shows tasks presently being executed by the team member. S&C Electric Company uses this information for diagnostic purposes.

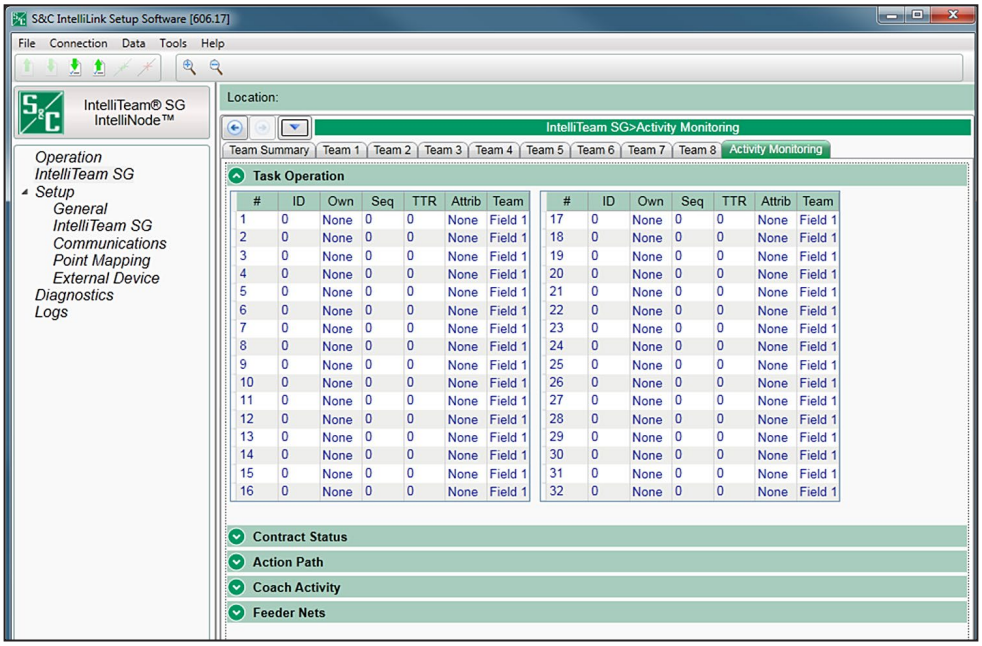

Figure 14. The *IntelliTeam SG>Activity Monitoring>Task Operation* screen.

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

The *Contract Status* screen shows information about contracts associated with the contract agent at this control. This information is used for diagnostic purposes when working with S&C support engineers.

When a contract is required for a particular line segment, a contract agent is used to track and secure the contract. Every contract request is uniquely identified by the requesting agent, the originating segment, and the timestamp when the request was made.

Figure 15 shows information about contracts associated with this team member. S&C Electric Company uses this information for diagnostic purposes.

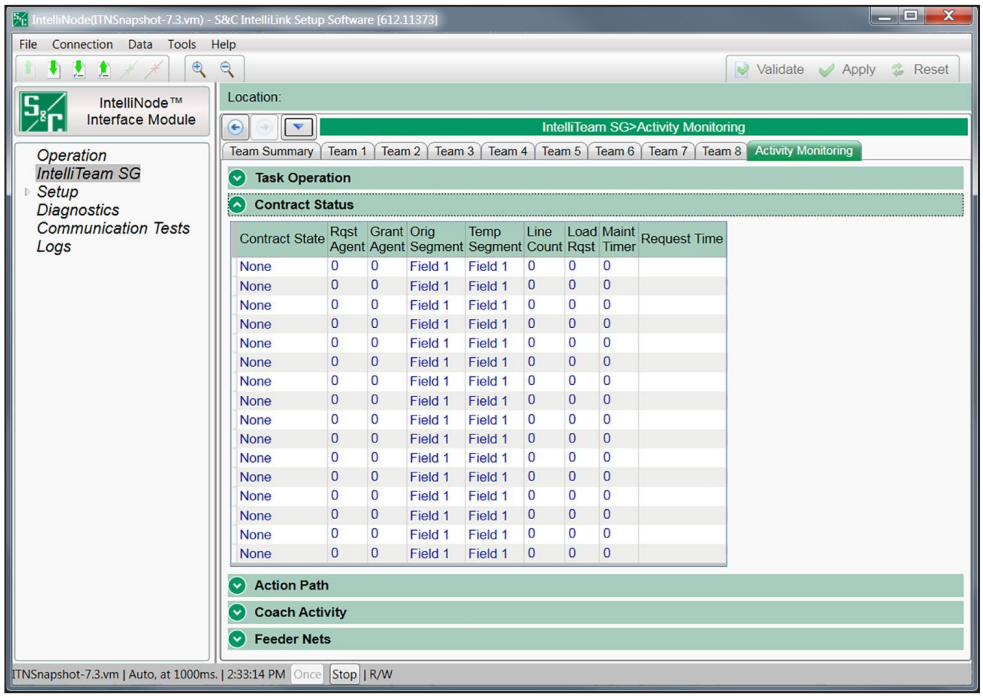

Figure 15. The *IntelliTeam SG>Activity Monitoring>Contract Status* screen.

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 timestamped 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 *Team Member 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.

The screen shown in Figure 16 reports the actions taken during execution of a team member operation. S&C Electric Company uses this information for diagnostic purposes.

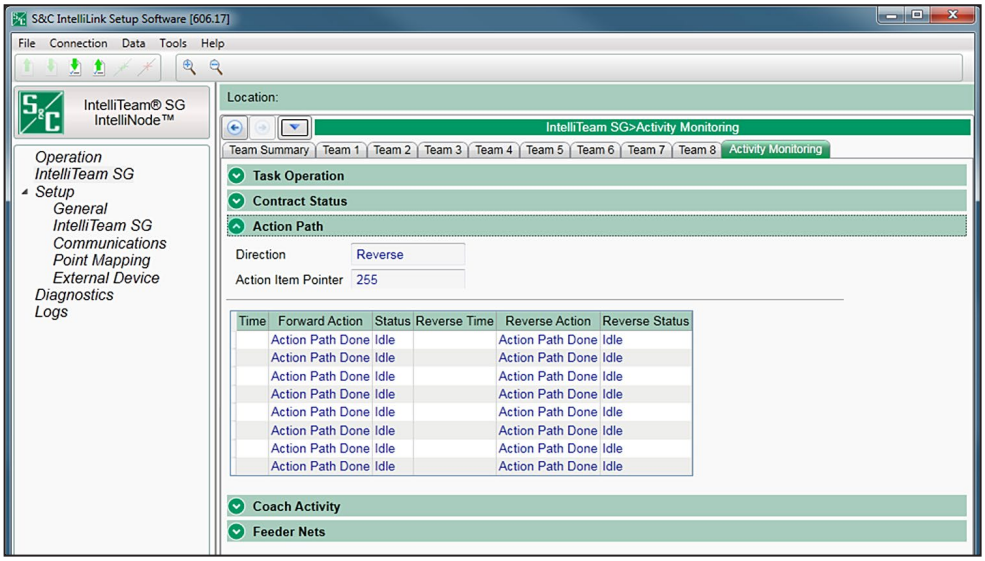

Figure 16. The *IntelliTeam SG>Activity Monitoring>Action Path* screen.

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 timestamp 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 timestamp at the start of that step. Step names that may be displayed include:

- Action path done
- Close for xfer
- Contract request
- Contract terminate
- Block recloser
- Unblock recloser
- Block ground trip
- Unblock ground trip
- Alternate settings
- Normal settings
- Status

Status

This is the status of the associated step in the action path and the relative time at which this step occurred. This can be reported as: “Idle,” “Running,” “Failed,” or “Success.”

Coach Activity

The screen in Figure 17 shows timestamps for basic coach activities and the counter for each team's coach.

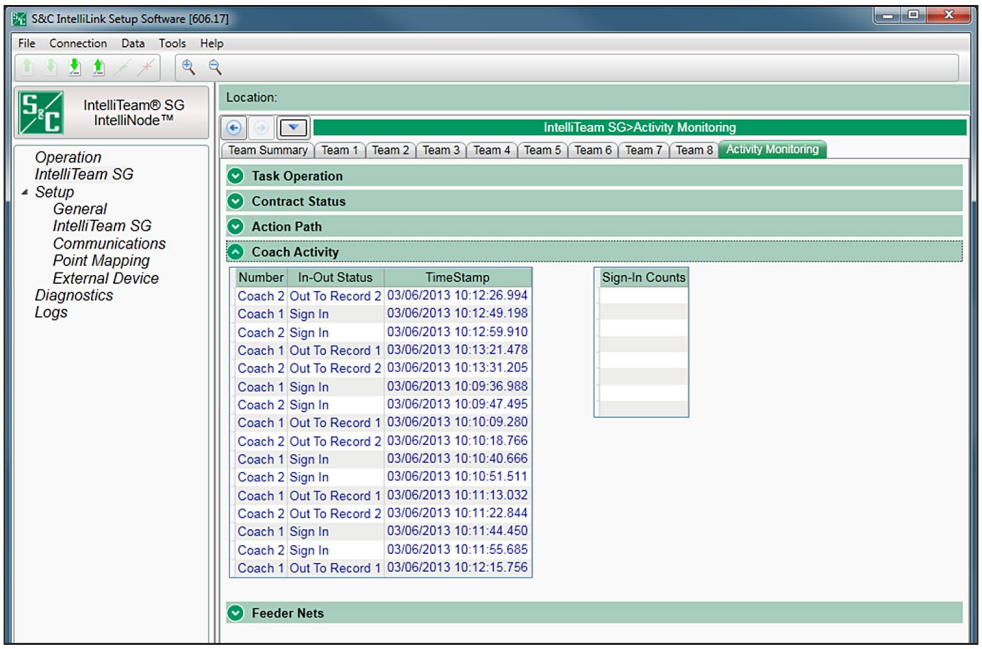

Figure 17. The *IntelliTeam SG>Activity Monitoring>Coach Activity* screen.

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

The screen shown in Figure 18 contains data associated with the Feeder Netlists.

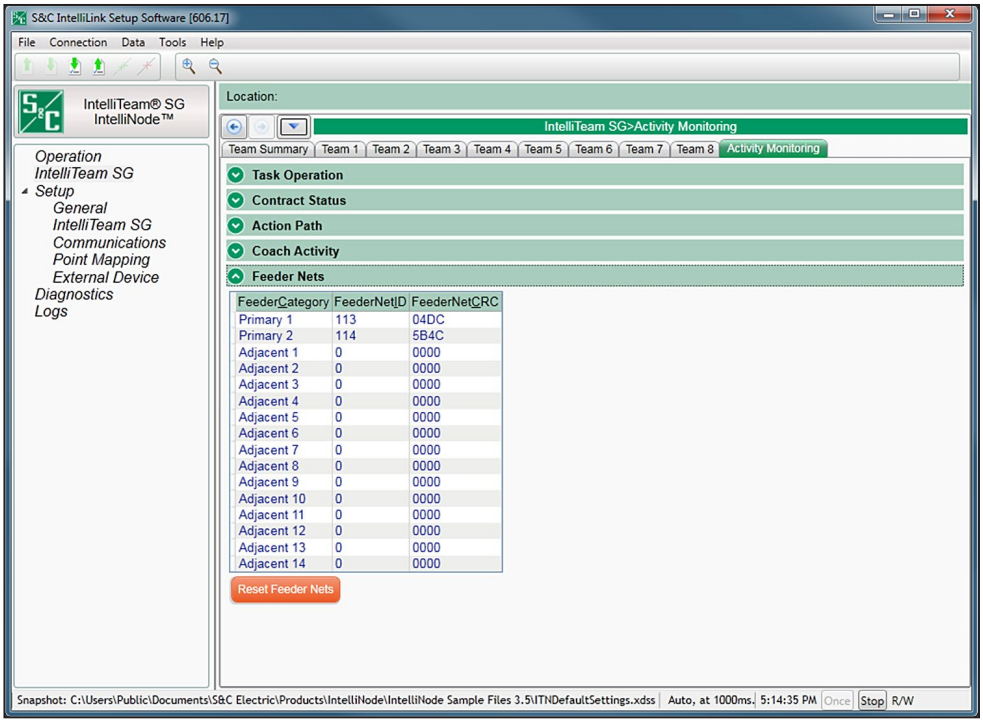

Figure 18. The *IntelliTeam SG>Activity Monitoring>Feeder Nets* screen.

The following parameters are displayed:

Feeder Category

The FeederNet is a database of the teams and controls that use the same breaker at a substation (or equivalent source) as their primary power source. These categories may be displayed:

Primary 1—Every switch has a Primary 1 FeederNet associated with its primary substation breaker.

Primary 2—Only a tie-point control will have a Primary 2 FeederNet associated with the adjacent substation breaker for this tie point.

Adjacent—This is the FeederNet on the other side of the tie point. These are listed for every tie point on the primary feeder. There will generally be as many adjacent FeederNets listed as there are alternate sources for the primary feeder.

FeederNet ID

This is the unique identifier assigned by the IntelliTeam Designer system that defines a specific substation breaker (or equivalent) and the circuit it supplies out to the end loads and/or open tie points.

FeederNet CRC

This is the cyclic redundancy check (CRC), a value calculated for a specific FeederNet configuration. The CRC changes when any FeederNet data are changed. It is used to identify a specific FeederNet configuration version.

Reset Feeder Nets Button

This command clears the stored FeederNet data. When cleared, a new Feeder NetList must be pushed.

Data Logging Setup

The screen shown in Figure 19 configures the filter settings for viewing log screens. The Administrative login is required to execute any of the log-control functions.

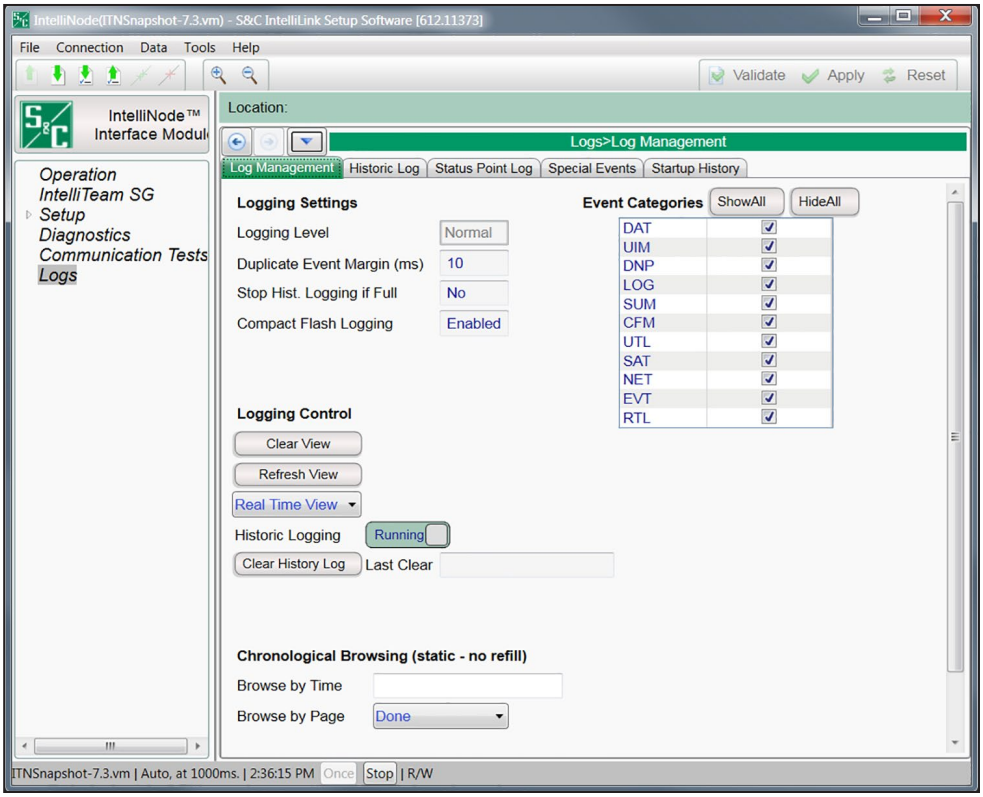

Figure 19. The *Logs>Log Management* screen.

The following parameters are shown:

Logging Settings

Logging Level

The logging level selected determines the type of data-log messages captured in 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 set point 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 set point, 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 Setup Software or IntelliLink Remote Setup Software. Open the **Tools** option on the menu bar and choose "Compact Flash Access." Select and save any files needed. S&C strongly recommends enabling the **Compact Flash Logging** setting to simplify diagnostic and troubleshooting work.

Event Categories

Select the categories that will be displayed on the *Logs>Historic Log* screen. To display only the most important operation information, select the EVT category and click the **Refresh View** button. Utility operation data will be displayed and log information for software troubleshooting and debugging will be omitted.

Logging Control

Complete data are stored in the Historic 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—Starts the Historic log but does not affect flash memory logging, **Status Point Log** entries, or **Special Events** logging.

Stopped—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 "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. If the event data needs to be preserved, generate an HTML report of logged data before clearing the log.

Chronological Browsing (static – no refill)

Chronological browsing is only available in the **Static View** mode. It is not available in the **Real Time View** mode. Because the size of the *Logs>Historic Log* screen is only a fraction of that of the Historic 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 criterion 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 the **Previous 8 Pages** option may cause the newest events to be displayed (if the *Logs>Historic Log* screen presently holds the oldest). Similarly, selecting the **Next 8 Pages** option may cause the oldest events to be displayed (if the *Logs>Historic Log* screen presently holds the newest).

Historic Log View

The screen shown in Figure 20 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 choosing "Compact Flash Access…." Select and save any files needed.

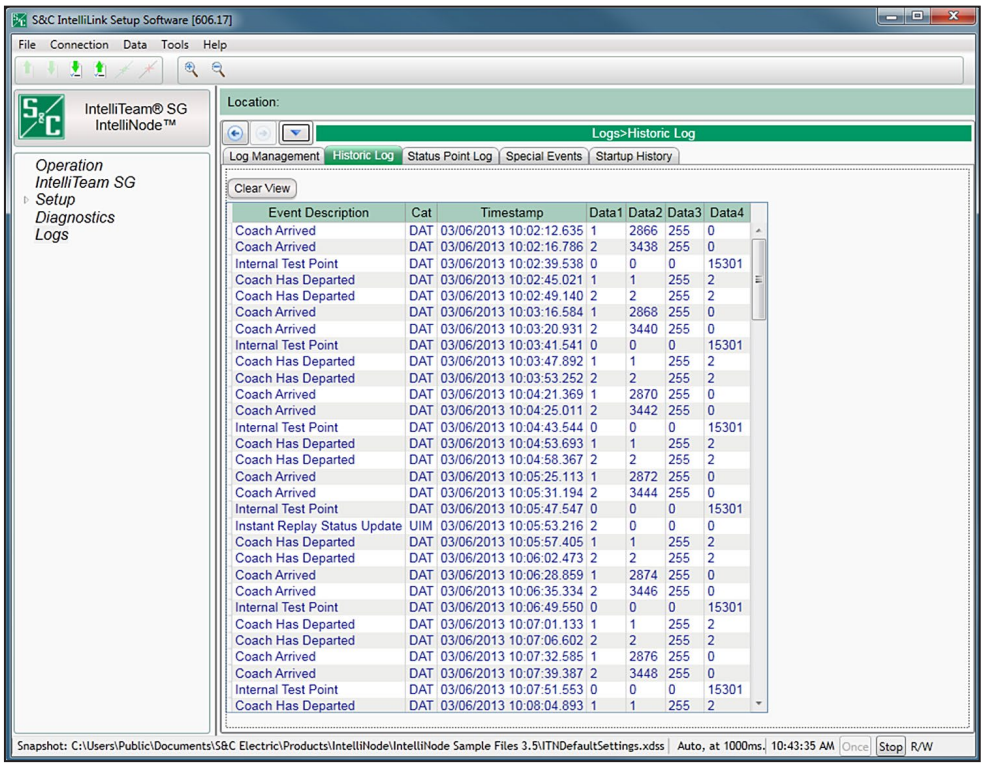

Figure 20. The *Logs>Historic Log* screen.

The following parameters are shown:

Clear View

This button empties the Historic log. In **Real Time View** mode, the next qualifying event will be placed at the top of the log. In **Static View** mode, the log will remain empty until it is refilled.

Event Description

This field provides the description for each event.

Category

Each Historic event is assigned to a category to simplify filtering and sorting.

Time Stamp

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

The screen shown in Figure 21 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.

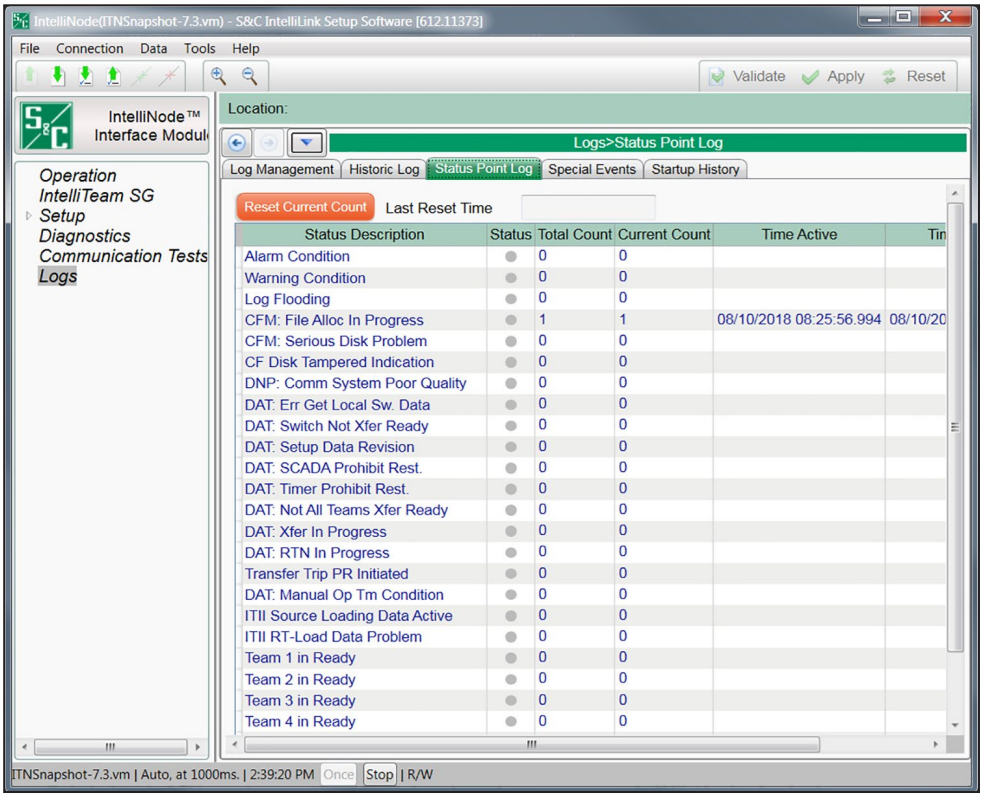

Figure 21. The *Logs>Status Point Log* screen.

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 Sheet 1043-561, "IntelliNode™ Interface Module: *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

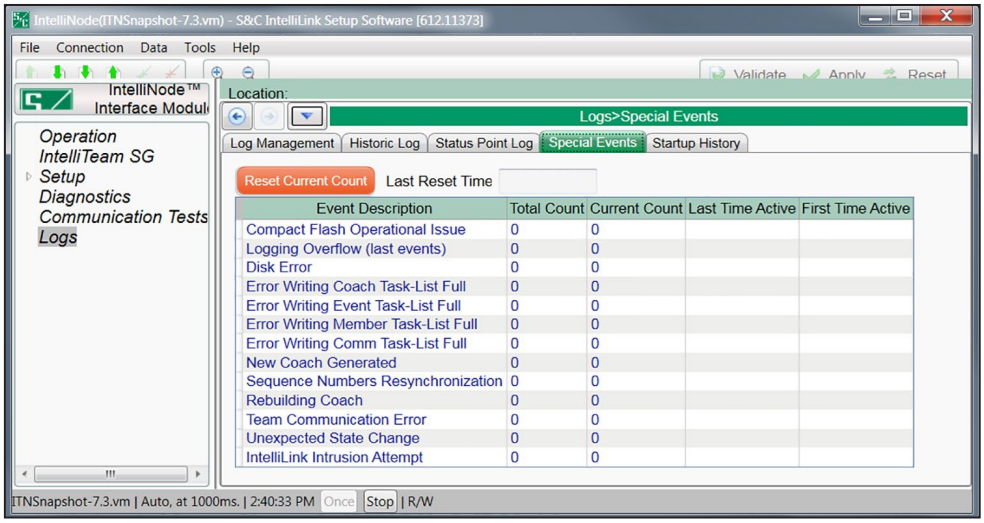

Figure 22. The *Logs>Special Events* screen.

Some Historic events are special events, such as when a flash memory failure will adversely impact operation. The screen shown in Figure 22 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

The date and time the current count totals were reset.

Event Description

Refer to S&C Instruction Sheet 1043-562, "IntelliNode™ Interface Module: *Data Log Messages*," for the definition of each event.

Total Count

This shows 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 was reset.

First Time Active

This is the date and time the special event first became active since the current count was reset.

System Startup History

The screen shown in Figure 23 tracks system start and stop timestamps, in ascending order.

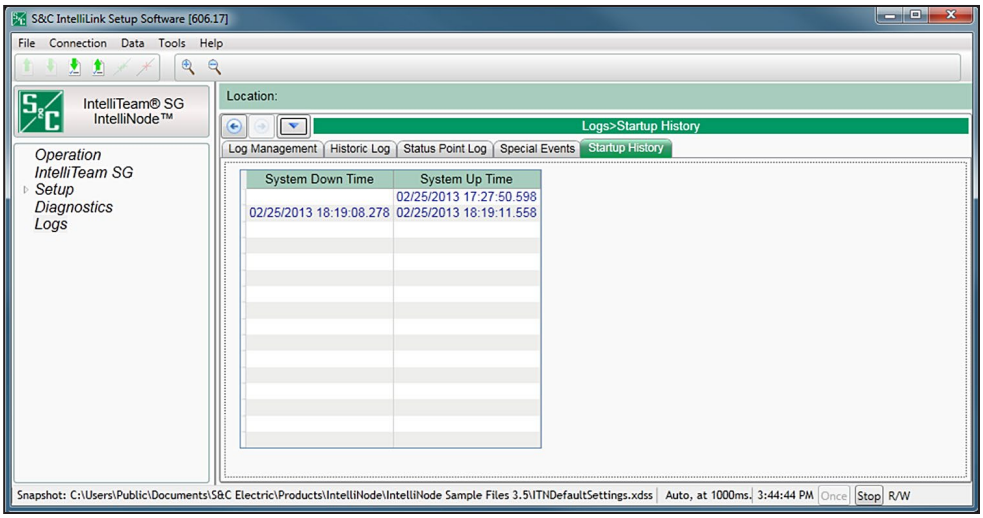

Figure 23. The *Logs>Startup History* screen.

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.

Historic Log Screen

The screen shown in Figure 24 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 choosing "Compact Flash Access…." Select and save any files needed.

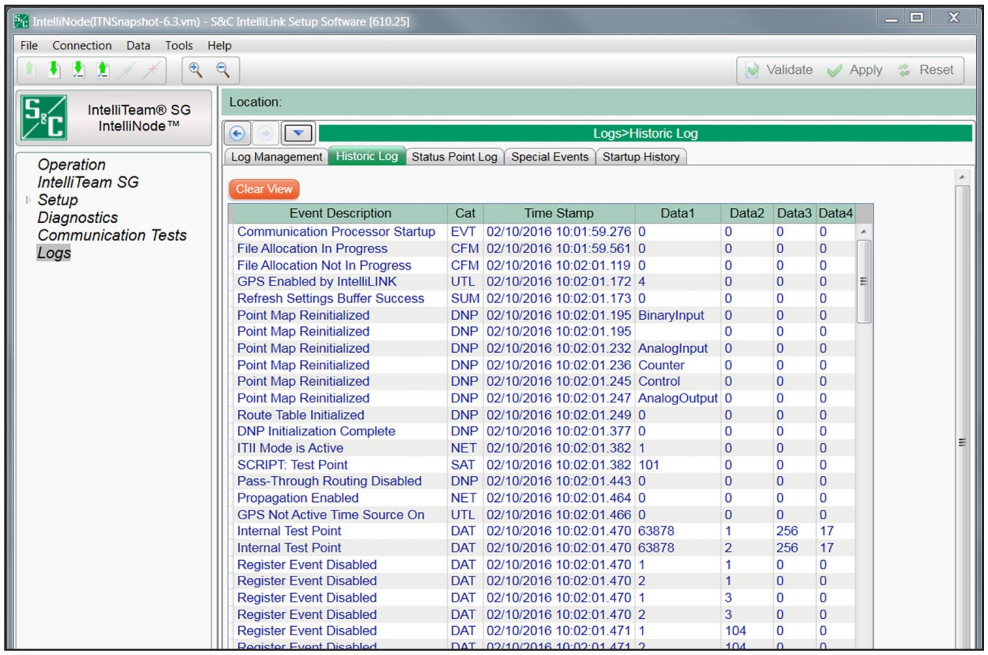

Figure 24. The Select Reports dialog box.

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

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.

Compact Flash Log

Compact flash logging requires a 1-GB capacity CompactFlash® card. S&C supplies and recommends the Transcend 1G or Swissbit 1G Compact Flashcards. The CF card must be formatted using the IntelliLink Compact Flash Explorer. All cards shipped by S&C Electric Company have been correctly formatted.

When **Compact Flash Logging** mode is enabled (from the *Logs>Log Management* screen), every Historic event generated by the IntelliNode module application is written to the Compact Flash, even if Historic event logging has been stopped for the Historic Log or the event does not satisfy logging criteria.

The IntelliNode module uses 100 pre-allocated fixed-size files to store historic event data in the Compact Flash and stores over 1,000,000 events. The files are named LOG00.VM, LOG01.VM…LOG98.VM, LOG99.VM and are all a very similar size. Files are continuously reused.

When data logging fills all 100 files, LOG00.VM will be opened again, and new events written, starting at the beginning of the file and replacing the oldest events. This means that after all 100 files have been used, at any given moment, one of the files is circular, without a fixed beginning.

Note: The number of event entries in a full file is about 10,000, but this is not a precise count and varies slightly for each file. This means 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.

NOTICE

Do not remove the Compact Flash card when the **Compact Flash Logging** mode is enabled. Doing so may corrupt the card and cause loss of data. Disable the **Compact Flash Logging** mode first by using the **Compact Flash Logging** mode's **Enable/Disable** pull-down menu item found on the *Logs>Log Management* screen.

Viewing Compact Flash Data

Compact Flash logs cannot be viewed with IntelliLink software; they must be downloaded to the computer. See Figure 25.

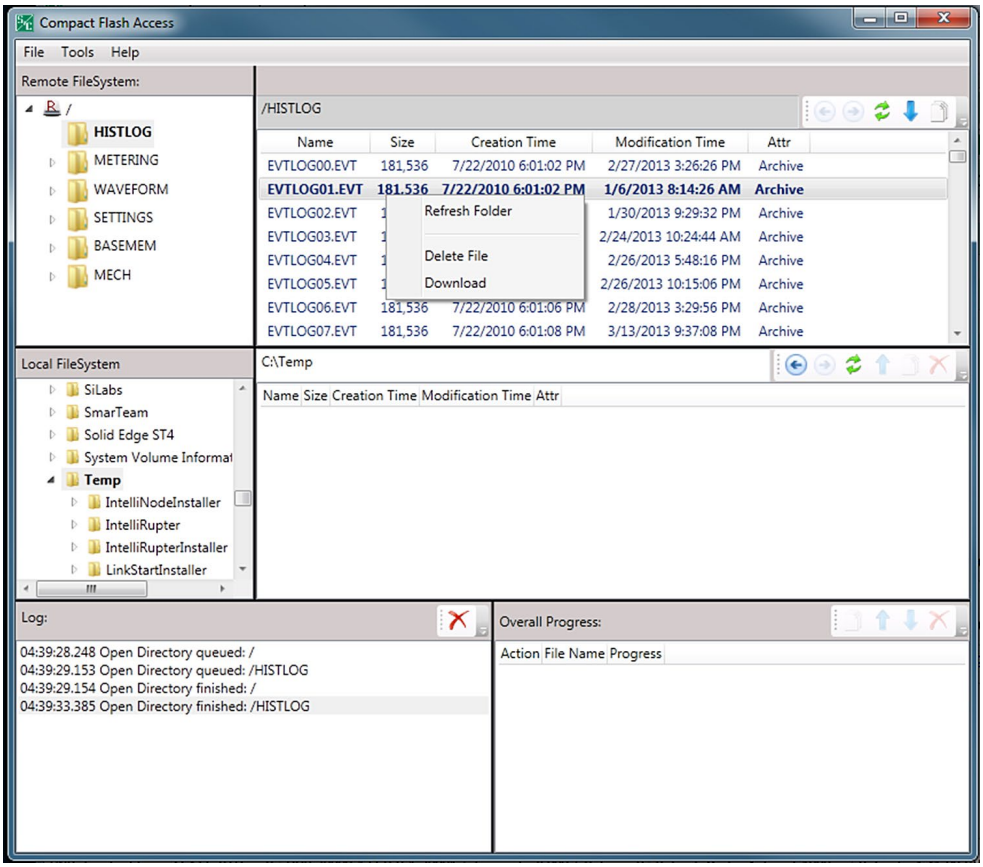

Figure 25. The Compact Flash Access dialog box.

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.

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

STEP 3. In the "Remote File System" section of the screen, select the HISTLOG folder.

STEP 4. Select the file to download.

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

The download progress will display in the lower right corner of the Compact Flash Explorer dialog box. Wait until the download has completed and navigate to the downloaded file to view it. An .xml and an .html version of the file will be created in the target directory.