Setup and Configuration

Table of Contents

Instruction Sheet 1044-578

Introduction

Qualified Persons

⚠ WARNING
Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone trained and competent in: ● The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment ● The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed ● The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

NOTICE
Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating an IntelliTeam SG Automatic Restoration System.. Become familiar with the Safety Information on page 3 The latest version of this publication is available online in PDF format at **sandc.com/en/contact-us/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the IntelliTeam SG Automatic Restoration System. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING
The equipment in this publication is only intended for a specific application. Refer to Specification Bulletin 1044-31.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet for the IntelliTeam SG Automatic Restoration System.. Become familiar with these types of messages and the importance of these signal words:

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing the IntelliTeam SG Automatic Restoration System.

Replacement Instructions and Labels

If additional copies of this instruction sheet are required, 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.

Overview

The IntelliTeam SG Automatic Restoration System application now supports the ability to add distributed generation devices to a circuit and incorporate them into the IntelliTeam SG system in an anti-islanding application. This functionality is available in the 7.3.x and later software versions and is only available in the **IntelliTeam SG** mode of operation.

Follow the instructions in this document to set up, configure, and verify an IntelliTeam SG system with distributed generation devices using the IntelliTeam Designer software and IntelliLink Setup Software applications.

Distributed Generation Support

Several changes have been made to the IntelliTeam SG system to include large distributed generation systems on circuits where the IntelliTeam SG system is used. The main changes allow the IntelliTeam SG system to properly calculate team loading and identify the fault location when large distributed generation systems are deployed.

These include:

- Bidirectional load-flow calculation enhancements

- The new **Disregard First Overcurrent** option

- Adding a distributed generation device to a circuit with IntelliTeam Designer software

- Removing distributed generation devices from the circuit when necessary with a **Transfer Trip** command

Follow these steps to configure the IntelliTeam SG system using IntelliTeam Designer software with distributed generation on the circuit:

STEP 1. Draw a circuit using the IntelliTeam Designer software application. Refer to S&C Instruction Sheet 1044-570, "IntelliTeam® Designer: User's Guide," for information about drawing circuits. The sensors must be shown in the correct orientation, matching the physical installation in the field.

For an IntelliRupter® fault interrupter, the X->Y or Y->X orientation should be used in terms of the normal current-flow direction. The normal current-flow direction in this case is from the normal utility source to the open point/end loads. Use the **Toggle Terminal** icon in the drawing area to flip the sensor orientation when necessary.

STEP 2. Place the distributed generation device on the circuit where it is deployed in the field by selecting the Add DG icon in the drawing area, as shown in Figure 1.
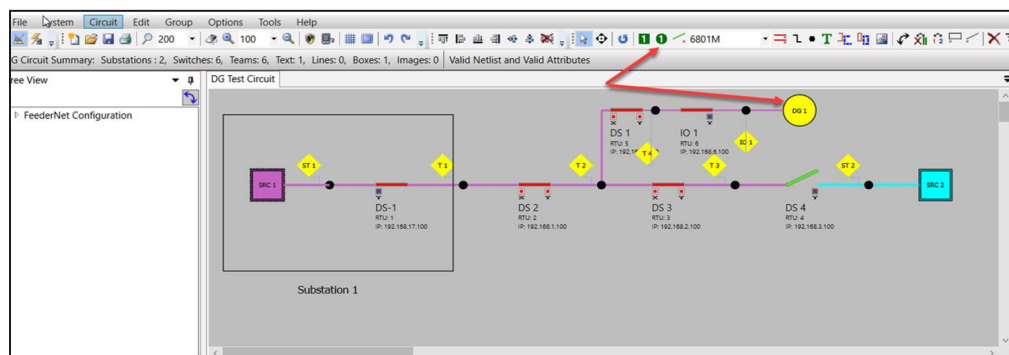

Figure 1. Adding a distributed generation device to the circuit.

STEP 3. Tie the distributed generation device to an IntelliTeam system device (e.g. IntelliRupter fault interrupter, 6800 Series Automatic Switch Control, IntelliNode™ Interface Module, or IntelliNode/Info-Only device) by connecting them with a wire, as shown in Figure 2.
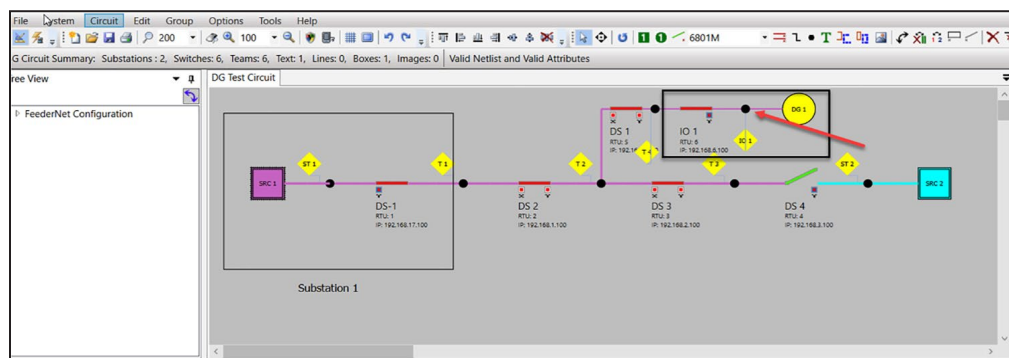

Figure 2. Tying a distributed generation device to the device using the IntelliTeam system.

Note: A distributed generation device must be connected to one and only one IntelliTeam system device. It cannot be placed between two or more IntelliTeam system devices because the IntelliTeam system does not presently support this. The distributed generation device must also be a normally closed device and cannot be excluded from the circuit.
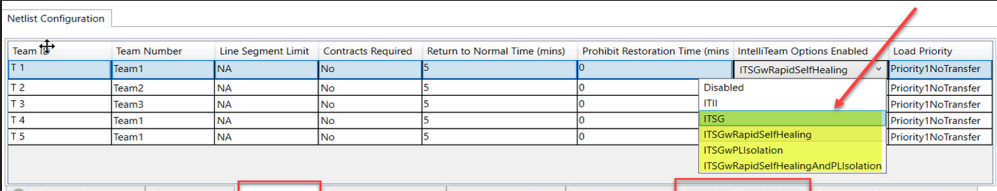
Note: Only use the new IntelliNode/Info-Only device when a device is needed to poll information from a distribution generation protection device and/or receive **Transfer Trip** commands to knock the distributed generation device offline but is not needed for IntelliTeam system restoration. If the device is needed to close back to restore load during IntelliTeam system restoration, then the normal IntelliNode module is required.

Note: When a third-party recloser is used as the distributed generation isolating device, a normal IntelliNode Interface Module must be used with it.

For more information about the IntelliNode/Info-Only device, see S&C Instruction Sheet 1044-570, "IntelliTeam® Designer: *User's Guide.*"

STEP 4. In the **Team Attributes** and **Substation Team Attributes** tabs, select either the **ITSG**, **ITSGwRapidSelfHealing**, **ITSGwPLIsolation**, or **ITSGwRapid SelfHealingAndPLIsolation** mode from the IntelliTeam Options Enabled column. See Figure 3.
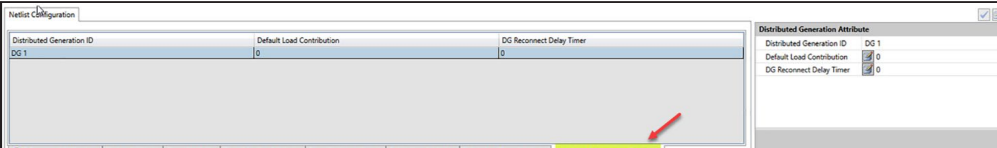
Note: The **ITII** mode does not support distributed generation on a circuit. This option should not be used when setting up a circuit with distributed generation devices on it.

Figure 3. The IntelliTeam Option Enabled setting in the Team Attributes and Substation Team Attributes tab.

STEP 5. Enter the distributed generation attribute information in the Netlist Configuration table. See S&C Instruction Sheet 1044-570, "IntelliTeam® Designer: *User's Guide*," for more information. See Figure 4.

Figure 4. The Distributed Generation Attributes tab.

There are two user-configurable settings in the **Distributed Generation Attributes** tab:

Default Load Contribution: This setting should only be used when no real-time loading data are available from a distributed generation device. (Range: 0–1000 A; Default = 0, meaning this is disabled and not used by the IntelliTeam system.)

When set to a non-zero value, the IntelliTeam system uses this as the amount of current flowing from the distributed generation (DG) device into the distribution grid. When set to zero (the default) and the DG device is teamed with an IntelliNode/Info-Only module, the IntelliTeam system uses loading polled by the IntelliNode/Info-Only module from the DG device as the current it's contributing to the distribution grid.

But, if a normal IntelliTeam system device is teamed with the DG device, it will assume there are zero amperes flowing into the distribution grid from the DG device when this value is set to zero. The IntelliTeam system will then calculate the DG load contribution by using the direction and magnitude of current flow into or out of the IntelliTeam device.

Note: If this value is set to a non-zero value and the DG device is teamed with a normal IntelliTeam system device (i.e., not an IntelliNode/Info-Only module), the IntelliTeam system will use this value as the DG load contribution if the device teamed with the DG device measures less current than what is configured for the **DG Load Contribution** value. For example, if the device measures 20 A but the DG load contribution is configured for 80 A, the IntelliTeam system will use 80 A as the DG load contribution. Otherwise, if the device measures more current than what is configured for the DG load contribution then the IntelliTeam system will use the measured current from the device as the DG load contribution.

DG Reconnect Delay Timer: This is the amount of time delay that occurs to reconnect the DG device back to the grid when the **Return to Normal** (RTN) process is complete or the normal source returns following a momentary fault. When this setpoint is a non-zero value and the **Transfer Trip Prohibit Restoration** (TTPR) mode on the device is enabled after the normal source is returned and the portion of the circuit feeding the DG device is otherwise in the normal configuration with good voltage, the **IntelliTeam System** logic will start this timer.

After the timer expires, the **IntelliTeam System** logic removes the **Transfer Trip Prohibit Restoration** (TTPR) mode on the device and will then close the device to bring the DG device back online. (Range: 0-900 seconds; Default = 0 seconds, meaning the **Reconnect DG on Return to Normal** mode is disabled)

Note: If for any reason the **DG Reconnect Delay Time** timer is aborted, the timer will not restart automatically and the DG device must be manually put online.

Note: When an IntelliNode/Info-Only module is not directly associated with the DG device, it is up to the DG device's own protection/control device (e.g. breaker, inverter, etc.) to reconnect the DG device because the IntelliTeam system has no control over the device or the reconnection process. However, it should be put online when good voltage, current, and frequency are seen by the DG protection/control device.

When the IntelliTeam system control is an IntelliNode/Info-Only module directly associated with the DG device, if it was sent the initial **Transfer Trip** command it will control the reconnection process and issue a **Close** command to the DG device's protection/control device when the **DG Reconnect Delay Time** timer expires.

If a **Transfer Trip** command is programmed to be sent to a device on an alternate circuit, set the **DG Reconnect Delay Timer** setpoint to a value greater than 30 seconds. This provides the IntelliTeam system enough time to close the tie-point device before the **DG Reconnect Delay** timer expires, which would allow the distributed generation device to reconnect prematurely.

STEP 6. Validate the circuit drawing and correct any validation errors. Then, save the drawing file.

STEP 7. When the circuit is successfully validated, open the communication manager and push the Netlist to the controls. Refer to S&C Instruction Sheet 1044-570, "S&C IntelliTeam® Designer: *User's Guide*," for information about configuring the communication manager and pushing the Netlist.

System Configuration

Complete the following steps to check and complete the system configuration when using firmware version 7.3.x:

STEP 1. Open the IntelliLink Setup Software and go to the *Setup>General>Site-Related* screen.

IntelliRupter Fault Interrupter: Make sure the setting for the IntelliRupter fault interrupter **Direction 1/Direction 2** setpoint reflects how the sensors are installed in the field. For example, if the X terminal on the IntelliRupter fault interrupter is facing the normal-duty source and the Y terminal is facing the DG/open point/end loads, and then set the **Direction 1/Direction 2** setpoint to X/Y. See Figure 5.

For normally open devices, it doesn't matter how this setting is configured unless it is a **TieSub** switch, in which case it should reflect how the sensors are installed in the field. For example, if the X terminal of the normally open IntelliRupter fault interrupter is facing the alternate (backup) source, then set the **Direction 1/Direction 2** setpoint to X/Y.
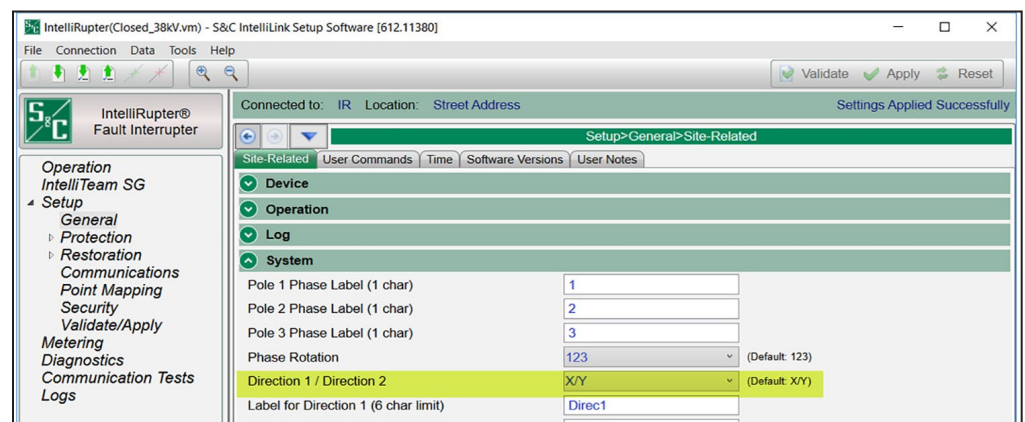
Figure 5. The IntelliRupter fault interrupter *Site-Related* screen.

IntelliNode Interface Module and S&C 6800 Series Switch Controls: Make sure the **Normal Current Direction** setpoint reflects how the sensors are installed in the field. For example, if the voltage sensor terminal is facing the normal-duty source and the non-voltage sensor terminal is facing the DG/open point/end loads, then set the **Normal Current Direction** state to the **Sensor to Non-sensor Side** setting.

For normally open switches, make sure this setpoint is left at the default Sensor to Non-sensor Side value. If current polarity is reversed, which is common in underground switchgear applications, then this setpoint must to be changed to the Non-sensor to Sensor Side value. See Figure 6 on page 10
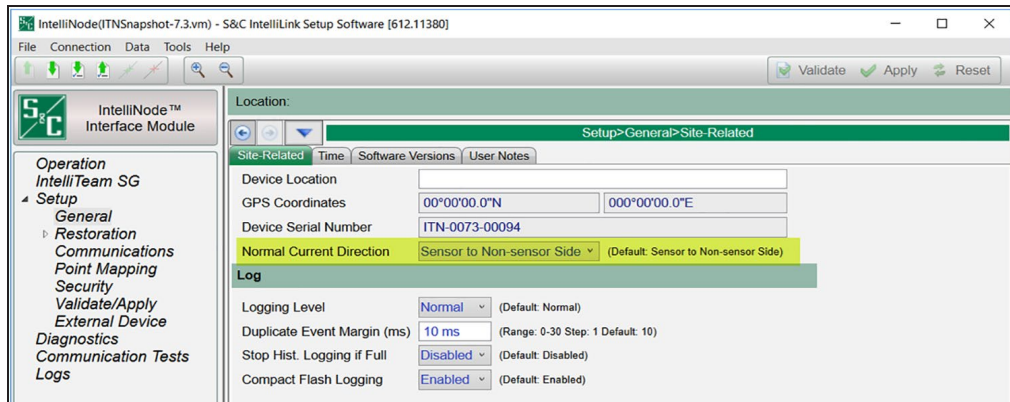
Figure 6. The IntelliNode Interface Module *Site-Related* screen.

Depending on how the voltage and current sensors are installed in the field, users may need to add phase angle offsets to a 6800 Series Switch Control. Refer to the "6800 Series Switch Controls" section of Step 3 on page 18 for more information on configuring the phase angle offsets. See Figure 7.

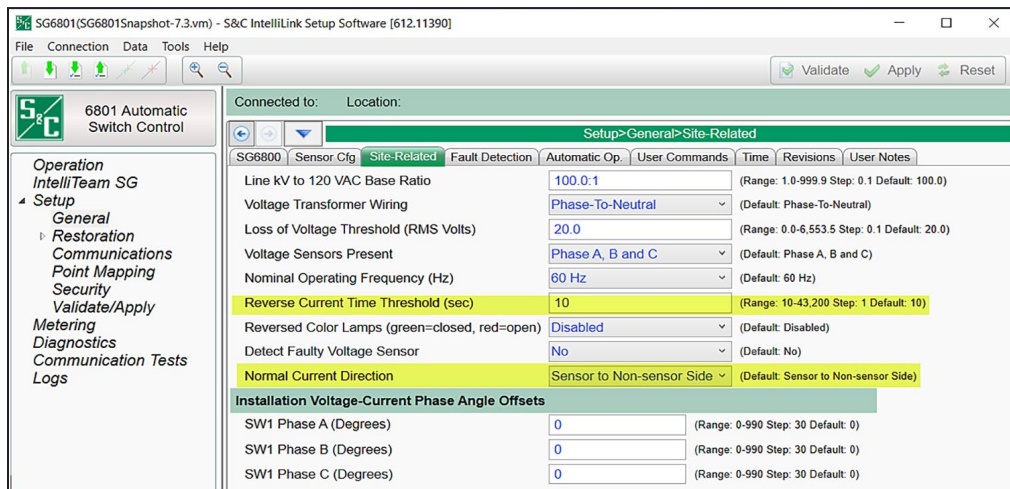Also, for 6800 Series Switch Controls, make sure the **Reverse Current Time Threshold** setpoint is set to the default of 10 seconds.

Figure 7. The 6801 Automatic Switch Control *Site-Related* screen.

Note: This configuration must match the field-installation orientation and must be correctly indicated in the IntelliTeam Designer circuit drawing. If any device does not match, correct the sensor orientation in IntelliTeam Designer and restart the procedure at Step 1 on page 5. Then, push the **Netlist** button.

STEP 2. For IntelliNode modules, go to the *Setup>External Devices>Auto Operation* screen and select one of the options for the **Current Direction Detection Method** setpoint shown in Figure 8.

Figure 8. The IntelliNode module Current Direction Detection Method setpoint on the *Setup>External Device>Auto Operation* **screen.**

Note: When configured for **Status Points** mode, go to the *Setup>External Devices>DNP Status Point Map* screen **Normal Direction Current Flow** and **Reverse Direction Current Flow** setpoints and properly map these points between the IntelliNode module and the external device control. See Figure 9 on page 12. Otherwise, no other configuration is required when using the **Current Polarity** mode because direction is determined using the measured current polarity from the external device.
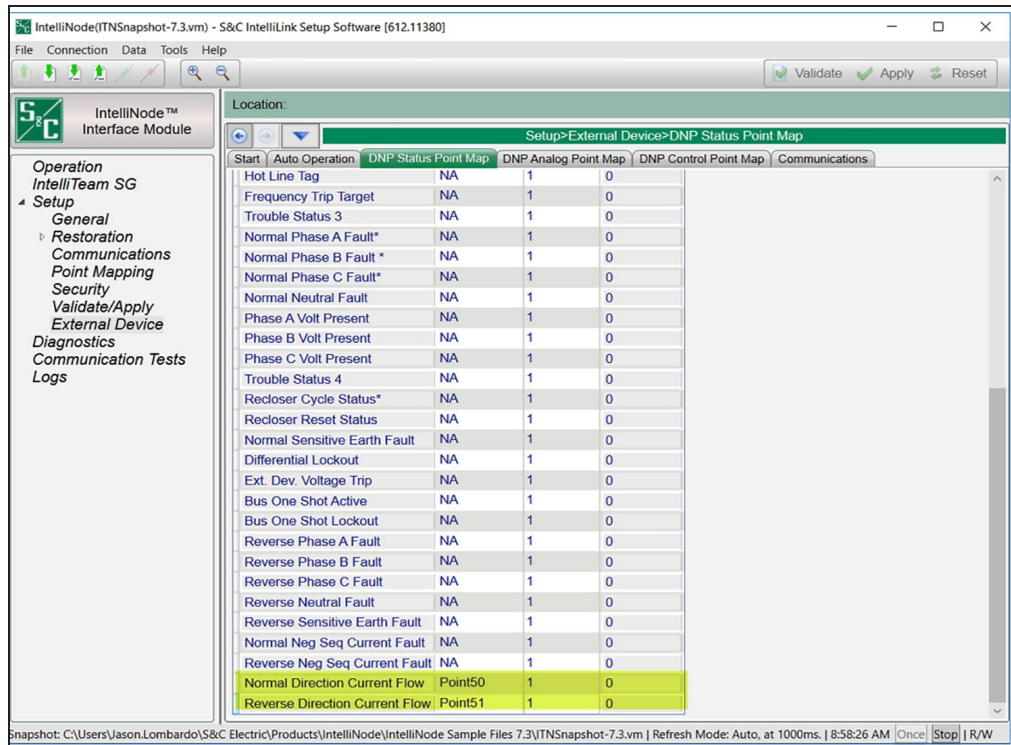
Figure 9. The Current Direction Detection setpoint on the *Setup>External Device>Auto Operation* **screen.**

Note: If the **Current Direction Detection Method** mode is set to the **Status Points** state and the user assigns a point number to **Normal Current Flow** status point but sets the **Reverse Current Flow** status point to the **N/A** value, the IntelliNode module will only use the **Normal Current Flow** status point to determine the direction of current flow. If the point is active, current is flowing in the normal direction. If the point is inactive, current is flowing in the reverse direction. The opposite is true when setting the **Reverse Current Flow** status point instead.

STEP 3. If a 6800 Series switch control is teamed with the distributed generation device and there are no other means of tripping the distributed generation offline, including a **Transfer Trip** command or distributed generation protection, then the 6800 control must trip after the initial fault or loss of voltage event to take the distributed generation offline.

Go to the *Setup>General>Automatic Op.* screen and set the **Recloser Counts to Sectionalizer Trip**, **Fault Detected and Recloser Counts to Sectionalizer Trip**, and **Voltage Loss Only** setpoints to "1." This is required for the IntelliTeam software to determine fault location in the event the distributed generation device is contributing fault current to the system. See Figure 10 on page 13.
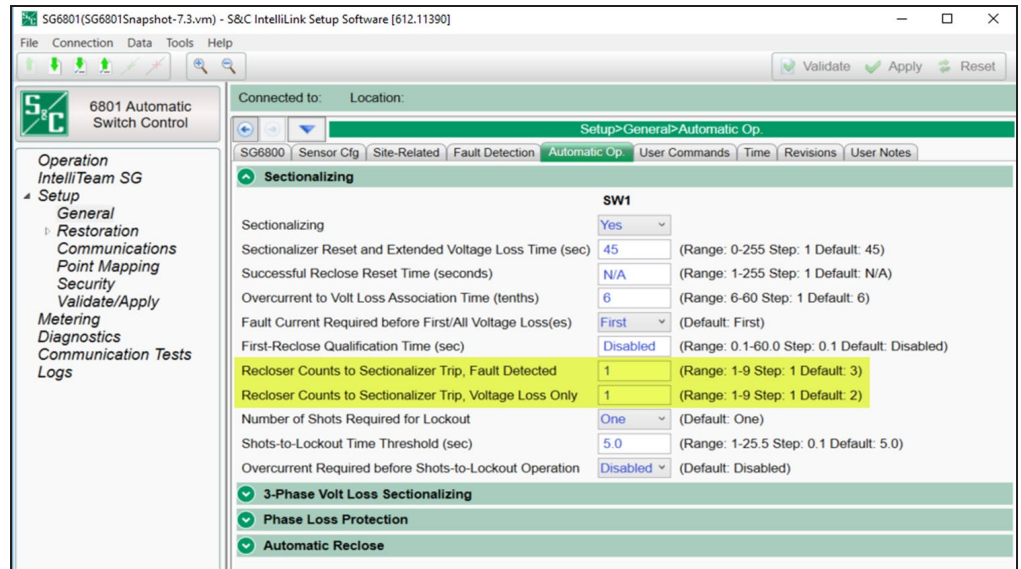
Figure 10. The Recloser Counts to Trip on Fault or Voltage Loss Only setpoints on the *Setup>-General>Automatic Operation* screen.

STEP 4. Go to the *Setup>Restoration>External Device* screen for the devices that will be required to send a **Transfer Trip** command to the IntelliTeam system device teamed with the distributed generation device. Make sure the Remote Transfer Trip List is configured so the DNP address and the IP address of the IntelliTeam system device(s) teamed with the distributed generation device is programmed in these controls and the **Remote Transfer Trip** option is in the **Enabled** state, as shown in Figure 11.
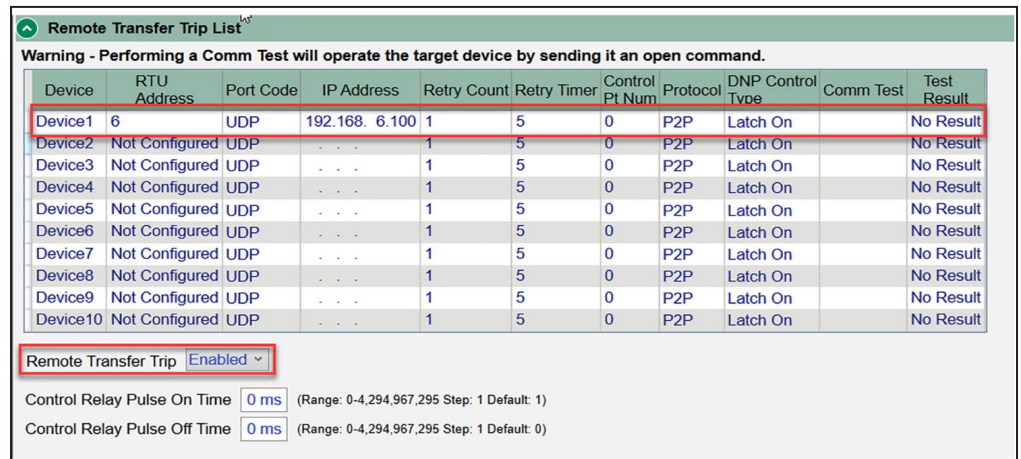

Figure 11. The Remote Transfer Trip List on the *Setup>Restoration>External Device* screen.

For more information on the Remote Transfer Trip List table and how to configure it for different use cases, refer to S&C Instruction Sheet 1044-579, "S&C IntelliTeam® SG Automatic Restoration System: *Transfer Trip Setup.*"

STEP 5. For the IntelliRupter fault interrupter that will send the **Transfer Trip** command to the device teamed with the distributed generation, go to the *Setup> Protection>General Profile 1>Testing After Initial Trip* screen and make sure the **Delay for Test-1** setpoint is set to something longer than the amount of time it will take to send and acknowledge the **Transfer Trip** command.

This will allow the **Transfer Trip** command to be received by the remote device and acted upon before the test commences. This allows the distributed generation device to be put offline so it will no longer feed into the fault. On feeders with 6800 controls and/or IntelliNode modules, the **O/C Sequence Test** setpoint must be set to the **Close** state so the other devices on the system register the fault when this test is performed. See Figure 12.
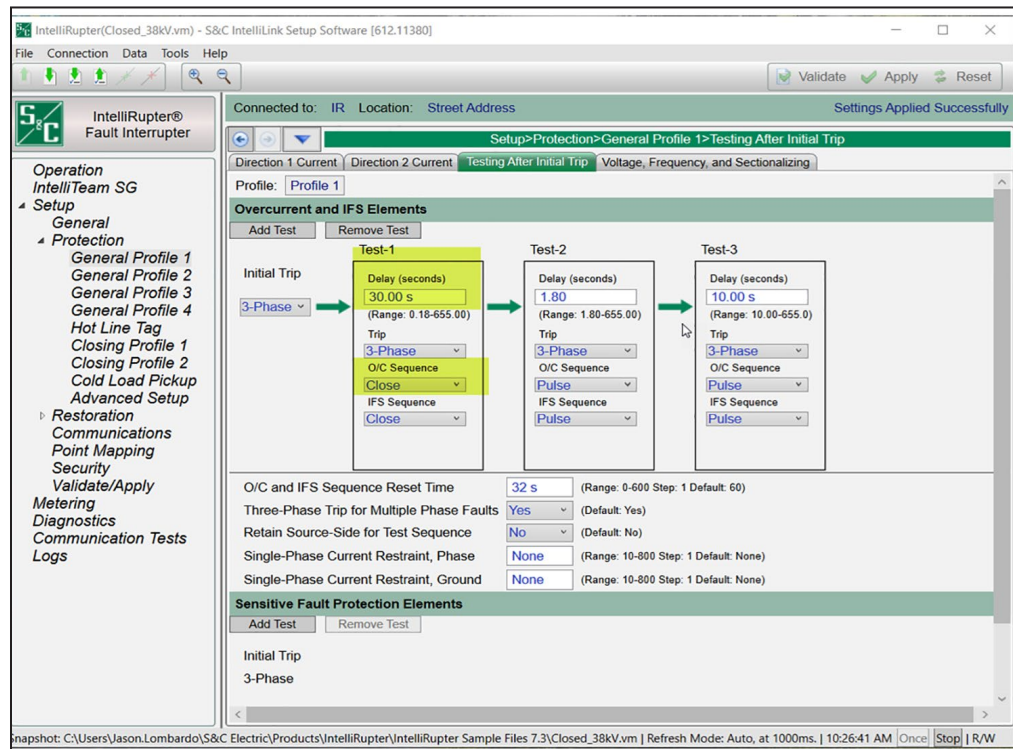

Figure 12. The Testing After Initial Trip Settings on the *Setup>Protection>General Profile1> Testing After Initial Trip* screen.

STEP 6. For systems that have a mix of IntelliRupter fault interrupters, 6800 Series controls or IntelliNode modules used with third-party devices, some IntelliRupter fault interrupters or third-party devices may need the protection settings modified to ensure they do not flag a fault to the IntelliTeam system until the distributed generation is tripped offline because this could lead to the IntelliTeam system incorrectly determining fault location.

This is only a recommendation because each installation will be somewhat unique. Therefore a detailed protection study should be done to determine how best to coordinate the IntelliRupter fault interrupters or third-party devices on these mixed systems with the distributed generation protection device (e.g. relay, breaker, inverter, etc.).

For example, if the distributed generation protection device can be properly coordinated so it trips offline before the IntelliRupter fault interrupter or third-party device responds, it may not be necessary to adjust the IntelliRupter fault interrupter or third-party device's protection settings. Another example is where the distributed generation protection device is sent a **Transfer Trip** command by a high-speed communication and is tripped before an IntelliRupter fault interrupter or third-party device picks up the fault and trips on its own protection settings.

Note: If the IntelliRupter fault interrupter or IntelliNode module with third-party device cannot be properly coordinated with the distributed generation protection device in these mixed systems, any IntelliRupter fault interrupter or third-party device that could detect a fault from a distributed generation device and potentially trip will need its protection settings modified to avoid tripping and flagging a fault. To do this in the IntelliRupter fault interrupter, go to the *Setup>Protection Settings* screen and modify the **Min Trip** setpoint for any profile, **TCC** setting, or enabled element used on the IntelliRupter fault interrupter so it is set higher than the fault contribution the distributed generation device can generate. For example, if the distributed generation device can generate 500 A of fault current, this setting must be higher than 500 A. This must be done for the direction (Direction 1 or Direction 2) facing the distributed generation device, so the IntelliRupter fault interrupter does not trip in that direction if the distributed generation device contributes fault current. See Figure 13 on page 16.

Note: For a system with all IntelliRupter fault interrupters, where bi-directional fault contribution trips more than one IntelliRupter fault interrupter, adjust the test sequence **Loss-of-Source Timeout** setpoint default from 300 seconds to a shorter value.
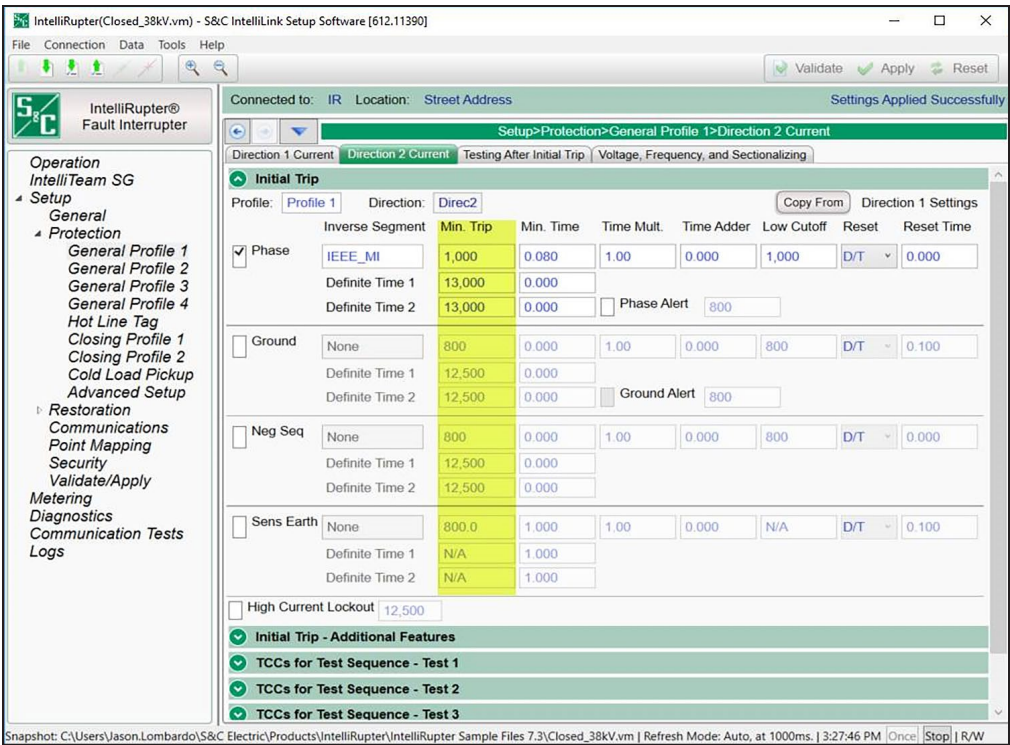
Figure 13. Example of an IntelliRupter fault interrupter Min Trip setting.

STEP 7. For all devices in the IntelliTeam system, go to the *Setup>Restoration> IntelliTeam SG>Communications* screen and verify the **Data Runner Start Delay** setpoint is set to the default of 3 seconds. This is to ensure the data runners are sent at a frequency to get the loading data updated quickly if the current direction changes because of system events or during restoration. See Figure 14 on page 17.
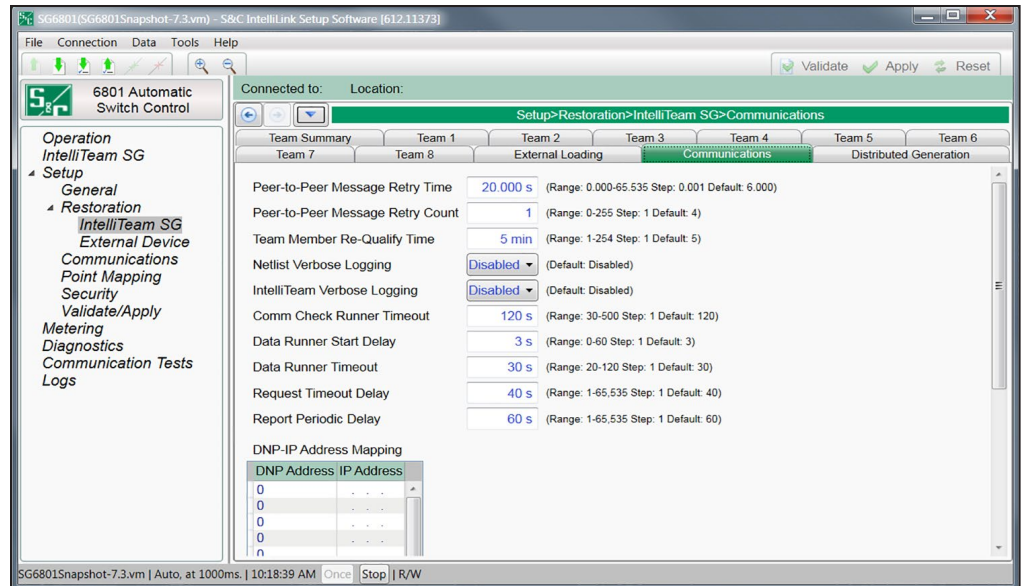
Figure 14. The *Setup>Restoration>IntelliTeam SG>Communications* screen.

System Verification

When the devices are successfully configured and the Netlist has been successfully pushed using the previous steps, the final task is to verify the teams are in the **Ready** state, the new distributed generation options are enabled, and all devices show accurate current-flow direction. Follow these steps to perform the verification process on all devices:

STEP 1. Verify the teams associated with a device are in the **Ready** state by going to the *Setup>Restoration>IntelliTeam SG>Team Summary* screen. See Figure 15.

Team	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8	Ready Status
Team 1	130	134	150	0	0	0	0	0	Ready
Team 2	134	138	0	0	0	0	0	0	Ready
Team 3	0	0	0	0	0	0	0	0	
Team 4	0	0	0	0	0	0	0	0	
Team 5	0	0	0	0	0	0	0	0	
Team 6	0	0	0	0	0	0	0	0	
Team 7	0	0	0	0	0	0	0	0	
Team 8	0	0	0	0	0	0	0	0	

Figure 15. The Ready status shown on the *Setup>Restoration>IntelliTeam SG>Team Summary* screen.

STEP 2. Verify the new DG attributes are set correctly in the IntelliTeam system device teamed with the distributed generation device by going to the *Setup> Restoration>IntelliTeam SG>Distributed Generation* screen. See Figure 16 on page 18.
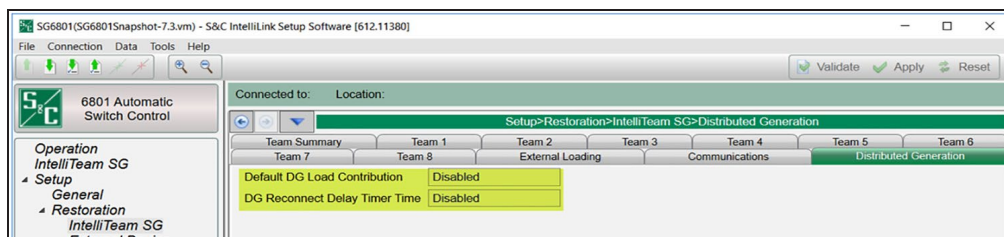
Figure 16. The *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen.

STEP 3. These settings should reflect how they were enabled in the IntelliTeam Designer software either **Disabled** state (default) or **Enabled** state with actual configuration settings shown. If any discrepancies are seen here, go back to Step 4 on page 6 in the configuration procedure, check the settings entered, correct any incorrect entries and push the Netlist again.

IntelliRupter Fault Interrupter: During normal current flow where current is flowing from the normal (non-DG) source to the load the **Current Direction** field in the *Metering* screen should indicate "Normal." If it's indicating "Reverse," then go to the *Setup>General>Site-Related* screen and change the **Direction 1/Direction 2** setpoint to the opposite value. Return to the *Meeting* screen and verify the **Current Direction** setpoint is now indicating "Normal." See Figure 17.
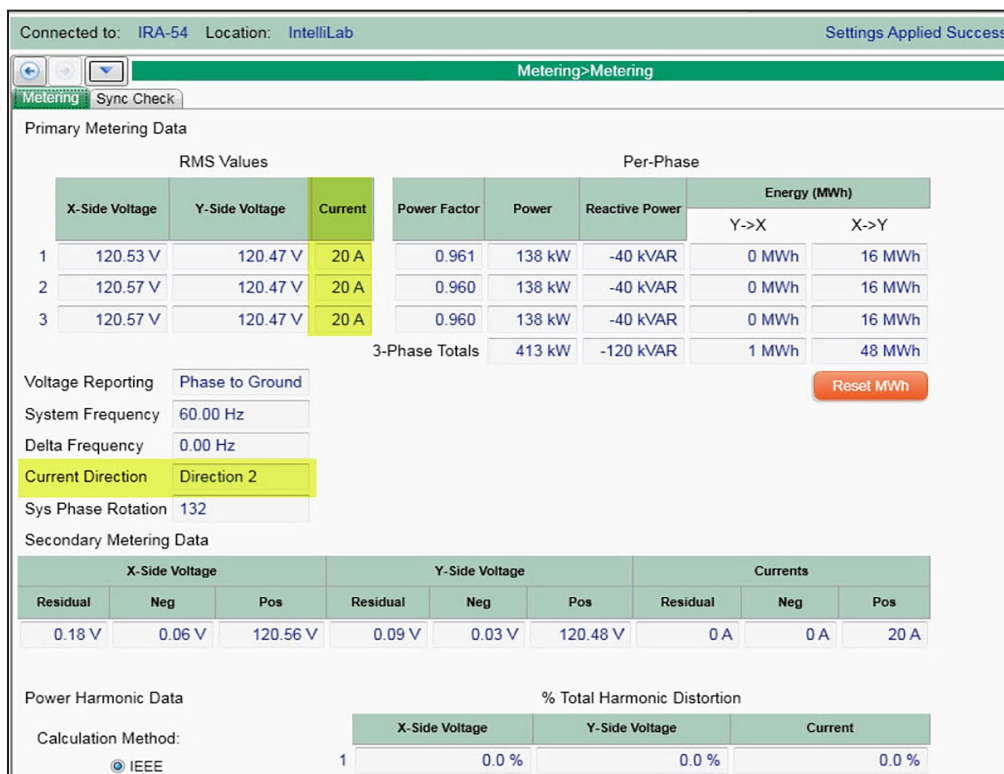
Figure 17. The IntelliRupter fault interrupter *Metering* screen.

6800 Series Switch Controls: During normal current flow where current is flowing from the normal (non-DG) source to the load the **SW Current Direction** field in the *Metering* screen should indicate "Normal." If it's indicating "Reverse," then go to the *Setup>General>Site-Related* screen and change the **Phase Angle Offsets** setpoints for all three phases to 180 degrees. If it's already set to 180 degrees, then change the setpoint to 0. Return to the *Metering* screen and verify the **SW Current Direction** setpoint is now indicating "Normal."

For normally open switches used in underground switchgear applications the polarity of the current sensors may be reversed. To verify if configured correctly, close the switch when the system is live so current is flowing through the switch.

If the *Metering* screen is indicating a **SW Current Direction** setpoint of "Normal" when current is flowing from the sensor side terminal to the non-sensor side terminal of the switch, then return to the *Site-Related* screen and verify the **Normal Current Direction** setpoint is set to the **Sensor to Non-sensor Side** setting. Otherwise, set the opposite. See Figure 18.

Note: For a 6800 Series control to determine directionality, at least 6 A of current must be measured by its sensors. If at least 6 A of current is not measured, it will determine current is flowing in the normal direction.
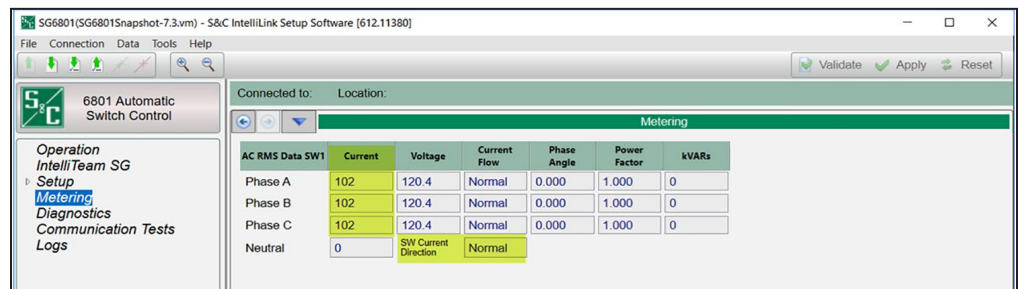
Figure 18. The 6801 Switch Control *Metering* screen.

IntelliNode Interface Module: During normal current flow where current is flowing from the normal (non-DG) source to the load the **Current Direction** field in the *Operation* screen should indicate "Normal." If it's reporting "Reverse" or "No Dir," check the *Setup>External Devices>Auto Operation* screen for the **Current Direction Detection Method** setting. Confirm it is set to something other than the **None** setting.

When this is set to the **Status Points** setting, go to the *Setup>External Devices>DNP Status Point Map* screen and check the **Normal Direction Current Flow** and **Reverse Direction Current Flow** setpoints. Confirm they are properly mapped between the IntelliNode module and the external device. Also, verify only one of the status points is active at a time. See Figure 19 on page 20 and Figure 9 on page 12.
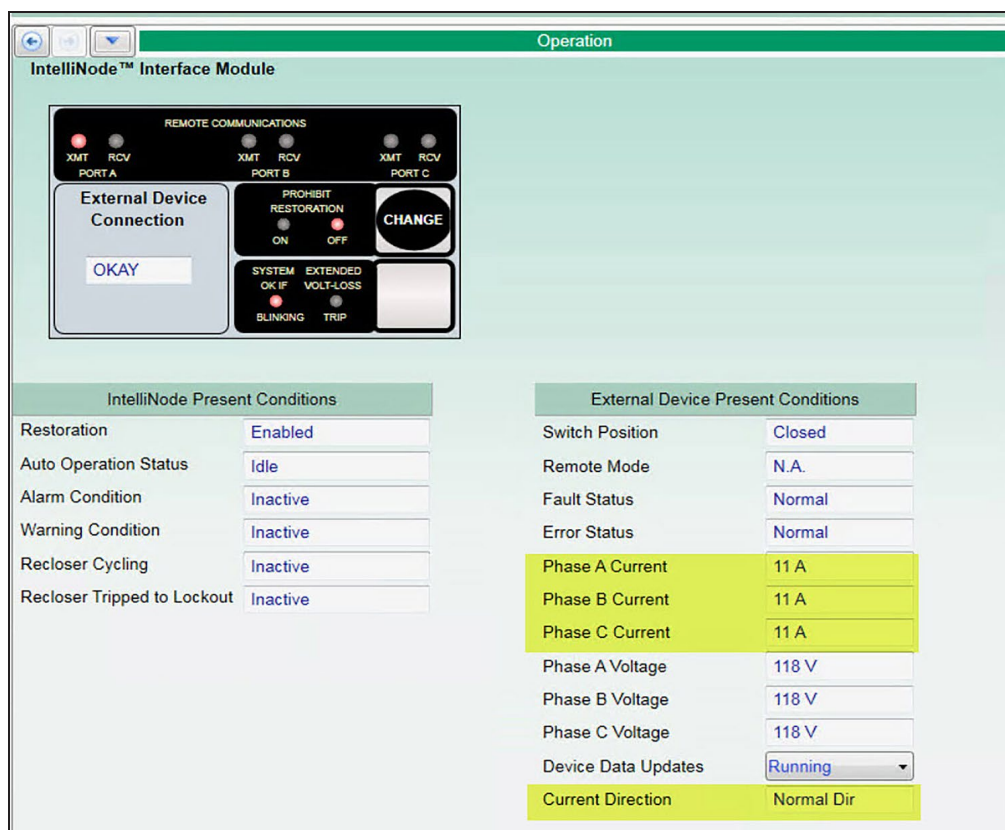
Figure 19. The IntelliNode Interface Module *Operation* screen.

STEP 4. Go to the *IntelliTeam SG>Team x* screen for each device on the circuit and verify the **Load Current Dir** indication is displaying the correct "Into Team" or "Out of Team" direction for the teams it is associated with. S&C recommends using the IntelliTeam Designer software circuit drawing to provide a visual reference to map these directions. See Figure 20.

Figure 20. The *IntelliTeam SG>Team x* screen showing the Load Current Dir indication.

System Configuration

Complete the following steps to check and complete the system configuration when using firmware version 7.5.x and later:

STEP 1. Open the IntelliLink Setup Software and go to the *Setup>General>Site-Related* screen.

IntelliRupter Fault Interrupter: Make sure the setting for the IntelliRupter fault interrupter **Direction 1/Direction 2** setpoint reflects how the sensors are installed in the field. For example, if the X terminal on the IntelliRupter fault interrupter is facing the normal-duty source and the Y terminal is facing the DG/open point/end loads, set the **Direction 1/Direction 2** setpoint to X/Y. See Figure 21.

For normally open devices, it doesn't matter how this setting is configured unless it is a Tie/Sub switch, in which case it should reflect how the sensors are installed in the field. For example, if the X terminal of the normally open IntelliRupter fault interrupter is facing the alternate (backup) source, then set the **Direction 1/Direction 2** setpoint to X/Y.
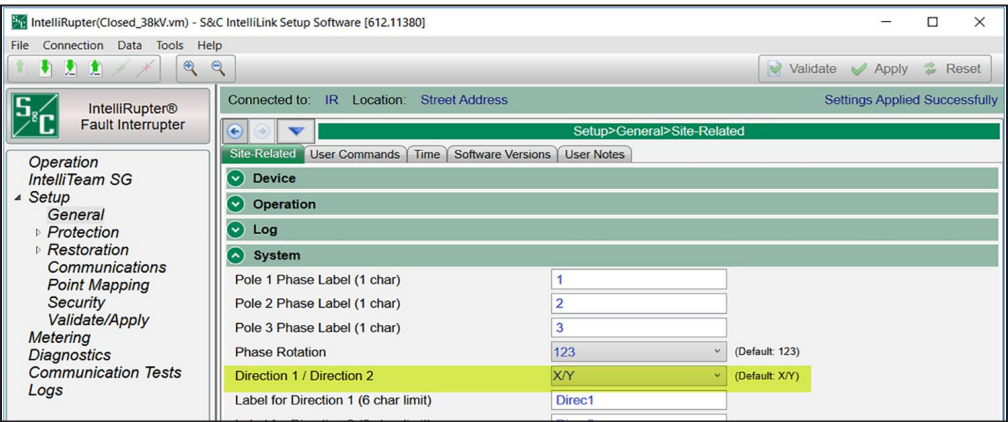

Figure 21. The IntelliRupter fault interrupter *Site-Related* screen.

IntelliNode Interface Module and 6800 Series switch controls: For IntelliNode Interface Modules, if current polarity will be used to determine current flow direction, go to the *Setup>External Device>Auto Operation* screen and select "Current Polarity" for the **Current Direction Detection Method** setting. See Figure 22.
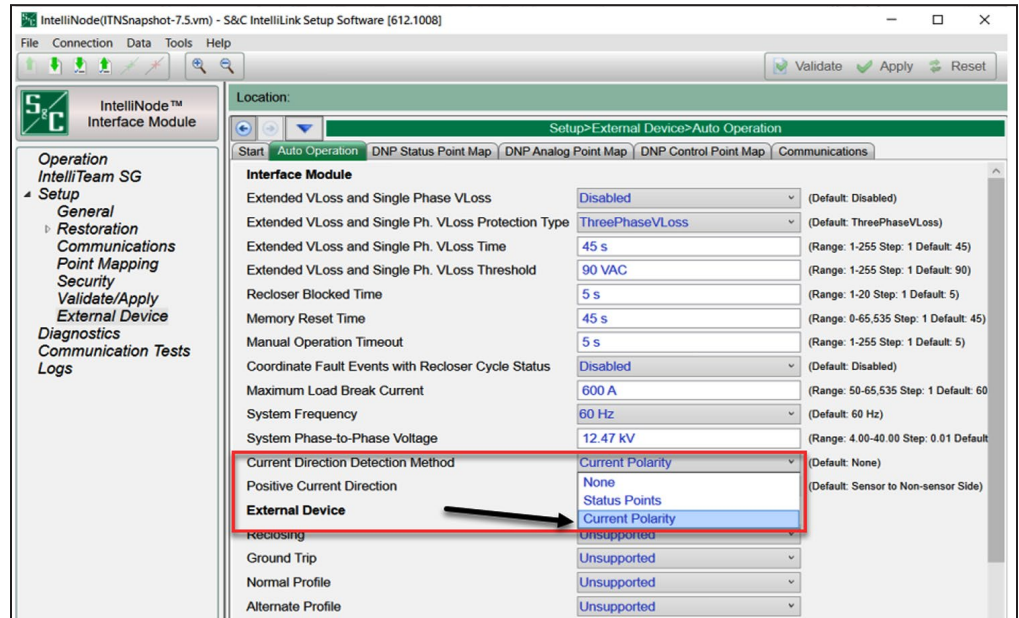

Figure 22. The IntelliNode Interface Module Current Direction Detection Method setting.

Next, select "Sensor to Non-sensor Side" or "Non-sensor to Sensor Side" for the **Positive Current Direction** setting based on how the device is installed in the field and the direction in which "positive" current is expected to flow through the device. For example, in terms of where the sensor is located if the voltage sensor terminal is facing the normal-duty source and the non-voltage sensor is facing the distributed generation/open point/end loads, set the **Positive Current Direction** setting to "Sensor to Non-sensor Side." See Figure 23 on page 24.

Note: For normally open IntelliNode Interface Modules, make sure the **Positive Current Direction** setpoint is left at the default **Sensor to Non-sensor Side** value.
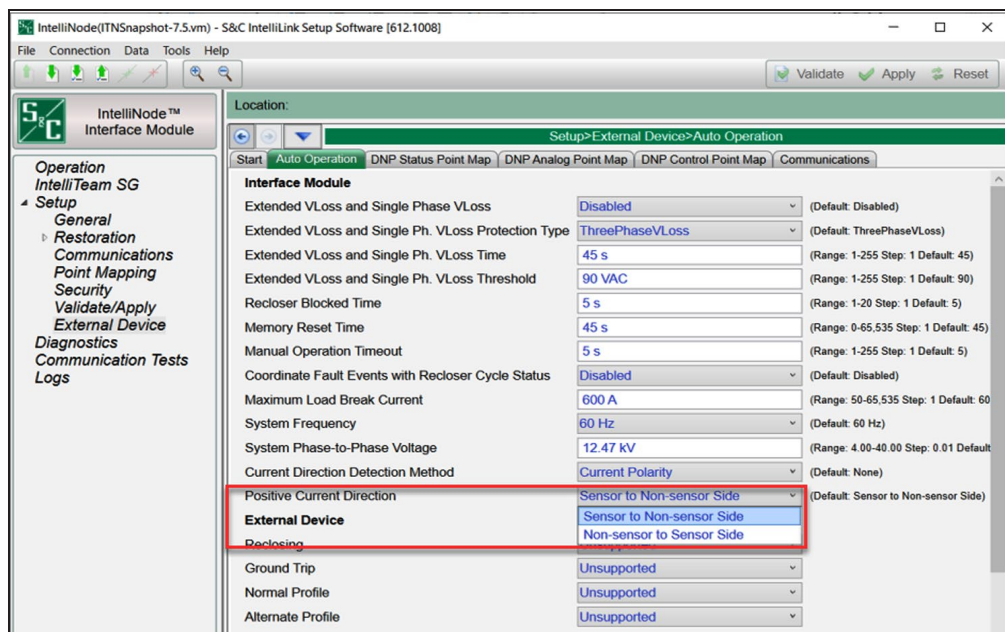
Figure 23. The IntelliNode Positive Current Direction setting.

For 6802/3 controls, go to the *Setup>General>Site Related* screen and configure the **SW1 CT Polarity Inverted** and **SW2 CT Polarity Inverted** settings correctly to match the actual field installation of the devices in terms of where the current sensors are located and how the device is drawn in the IntelliTeam Designer circuit. Also, make sure the **Reverse Current Time Threshold** setting is set for the default of 10 seconds. See Figure 24 on page 24.

Note: If this setting is set to "No," the normal current flow is assumed to be from the sensor side of the switch to the non-sensor side of the switch. If this setting is set to "Yes," the normal current flow is assumed to be from the non-sensor side of the switch to the sensor side of the switch.

Note: This configuration must match the field-installation current sensor orientation and must be correctly indicated in the IntelliTeam Designer circuit drawing. If any device does not match, correct the sensor orientation in IntelliTeam Designer and restart the procedure at Step 1 on page 24.

For all other 6800 series controls, go to the *Setup>General>Site-Related* screen and make sure the **Reverse Current Time Threshold** setting is set for the default of 10 seconds. See Figure 24 on page 25.

STEP 2. When using the **Status Points for Current Direction Detection Method** feature with IntelliNode modules, go to the *Setup>External Devices>Auto Operation* screen and select "Status Points." See Figure 25 on page 25.
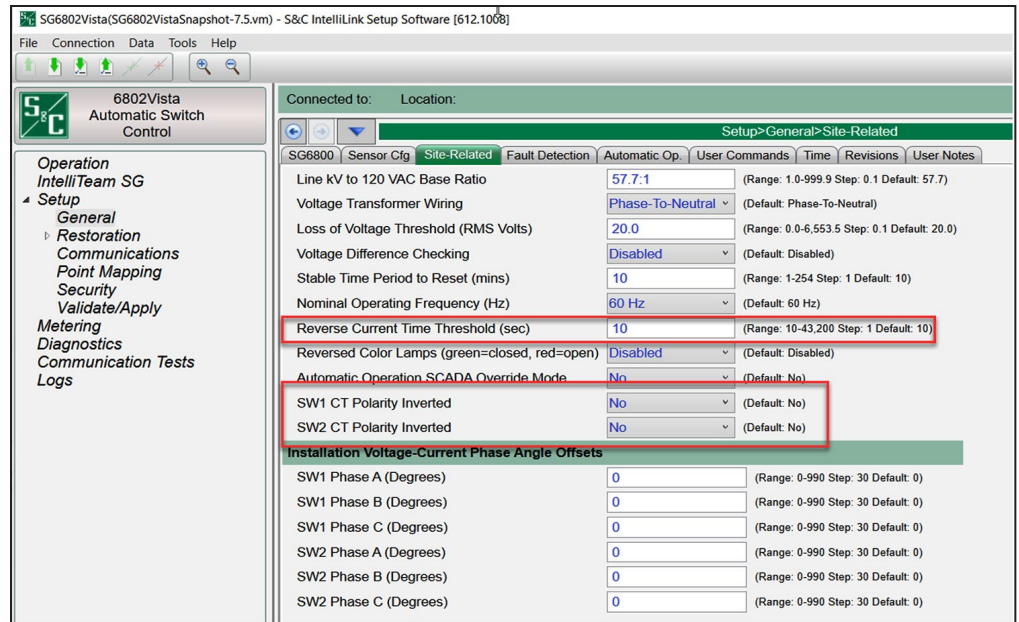
Figure 24. The 6802 Vista® Underground Distribution Switchgear software *Setup>General> Site-Related* screen.
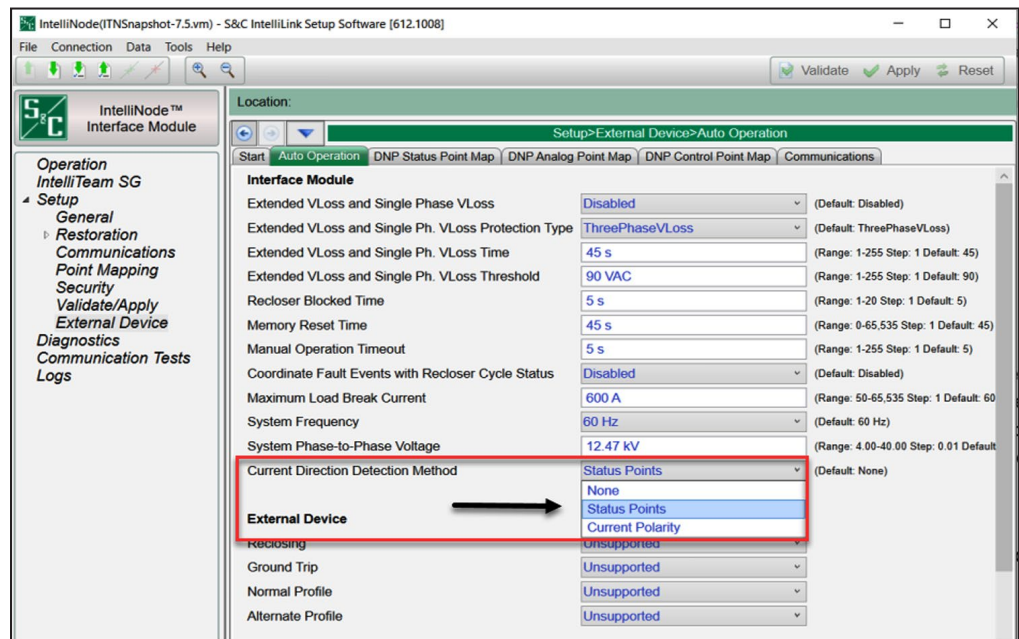

Figure 25. The IntelliNode Module *Setup>External Device>Auto Operation* screen.

STEP 3. Go to the *Setup>External Devices>DNP Status Point Map* screen and properly map the required points between the IntelliNode module and the external device control. See Figure 26.

Figure 26. The Current Flow Direction setpoints on the *Setup>External Device>DNP Status Point Map* screen.

Note: If the **Current Direction Detection Method** setting is set to "None," neither the **Direction1 Current Flow** nor the **Direction2 Current Flow** settings must be configured. However, all **Direction1 Fault** status points must be mapped (but no **Direction2 Fault** status points have to be) to the external device to identify faults in the system.

Note: If the **Current Direction Detection Method** setting is set to "Status Points," both **Direction1/Direction2 Current Flow** settings must be configured, and all **Direction1 Fault** status points and all **Direction2 Fault** status points must be mapped.

The mapping of the **Direction1** and **Direction2** status points must be based on the location of the sensor of the IntelliNode module in the field deployment. If the sensor is facing away from the normal utility source and normal current flow is from the non-sensor side of the IntelliNode module to the sensor side, map the **Direction2 Current Flow** status point of the IntelliNode module to the **Normal/Positive Current Flow** status point of the external device.

Also, map the **Direction1 Current Flow** status point of the IntelliNode module to the **Reverse/Negative Current Flow** status point of the external device. Then, map all the **Direction2 Fault** status points of the IntelliNode module to the **Normal/Positive Fault Current** status points of the external device and map all the **Direction1 Fault** status points of the IntelliNode module to the **Reverse/Negative Fault Current** status points of the external device.

Otherwise, if the sensor is facing toward the normal utility source and normal current flow is from the sensor side of the IntelliNode module to the non-sensor side, map the **Direction1 Current Flow** status point of the IntelliNode module to the **Normal/Positive Current Flow** status point of the external device.

Also, map the **Direction2 Current Flow** status point of the IntelliNode module to the **Reverse/Negative Current Flow** status point of the external device. Then, map all the **Direction1 Fault** status points of the IntelliNode module to the **Normal/Positive Fault Current** status points of the external device and map all the **Direction2 Fault** status points of the IntelliNode module to the **Reverse/Negative Fault Current** status points of the external device.

Note: If the **Current Direction Detection Method** setting is set to "Polarity," neither the **Direction1 Current Flow** nor the **Direction2 Current Flow** status points must be configured, but all **Direction1 Fault** status points and all **Direction2 Fault** status points still must be mapped.

STEP 4. For the distributed generation point-of-interconnect IntelliTeam system device, go to the *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen. For devices where the **DG Reconnect Delay Timer Time** setting has been enabled and configured, determine whether IntelliTeam software will disqualify the **DG Reconnect** command if a fault is experienced on the distributed generation side of the device when no fault directionality is provided.

If the **Disqualify DG Reconnect On Fault** setting is set to "No", the IntelliTeam software will attempt to close the IntelliTeam device when the **DG Reconnect Delay Timer Time** setting time has expired and the device has no other conditions active that would block a **Close** operation, even when that device detected a fault but does not provide fault direction.

If the **Disqualify DG Reconnect On Fault** setting is set to "Yes" and the **DG Reconnect Delay Timer Time** setting is set to a non-zero value, the IntelliTeam software will disqualify the **DG Reconnect** command if the device that received the Transfer Trip command detected a fault but that device is not providing fault direction.

If the **DG Reconnect** command is disqualified, on return of the normal source users must manually close the device that opened because of the **Transfer Trip** command to bring the distributed generation back online. See Figure 27.
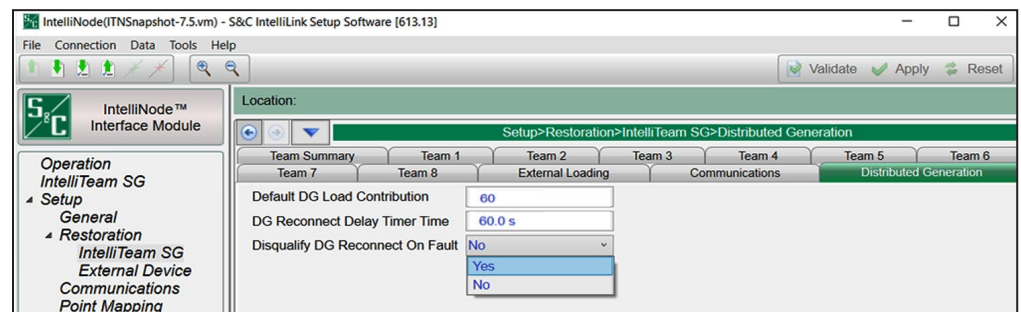

Figure 27. The Disqualify DG Reconnect on Fault setting on the *Setup>Restoration> Intelli-Team SG>Distributed Generation* screen.

STEP 5. If a 6800 Series switch control is teamed with the distributed generation device and there are no other means of tripping the distributed generation offline, including a **Transfer Trip** command or distributed generation protection, then the 6800 control must trip after the initial fault or loss of voltage event to take the distributed generation offline.

Go to the *Setup>General>Automatic Op.* screen and set the **Recloser Counts to Sectionalizer Trip**, **Fault Detected and Recloser Counts to Sectionalizer Trip**, and **Voltage Loss Only** setpoints to "1." This is required for the IntelliTeam software to determine fault location in the event the distributed generation device is contributing fault current to the system. See Figure 28.
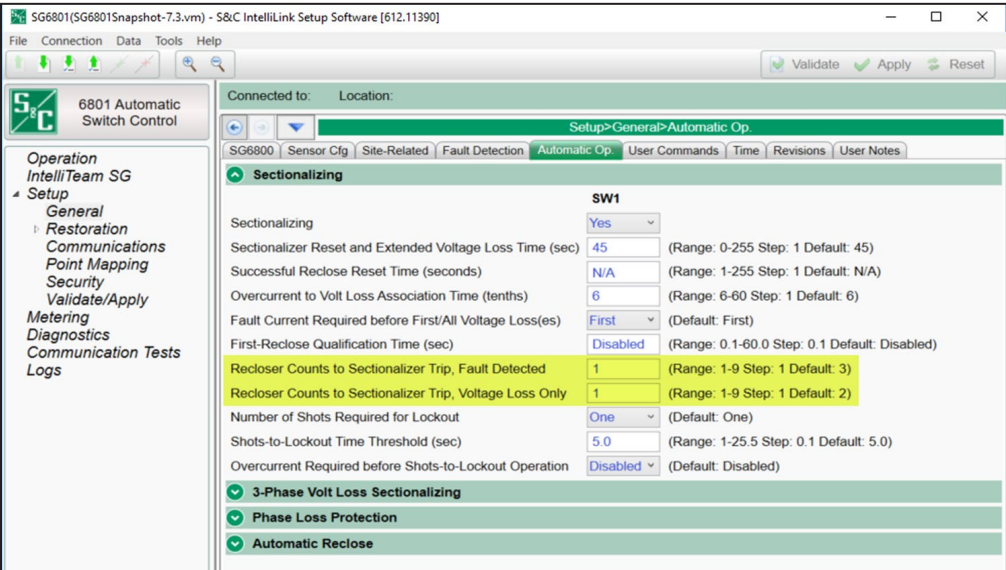

Figure 28. The Recloser Counts to Trip on Fault or Voltage Loss Only setpoints on the *Setup>-General>Automatic Operation* **screen.**

STEP 6. Go to the *Setup>Restoration>External Device* screen for the devices that will be required to send a **Transfer Trip** command to the IntelliTeam system device teamed with the distributed generation device. Make sure the Remote Transmit List is configured so the DNP address and the IP address of the IntelliTeam system device(s) teamed with the distributed generation device are programmed in these controls, the function is set for "Xfer Trip," and the **Remote Transfer Trip** option is in the **Enabled** state, as shown in Figure 29.

For more information on the Remote Transfer Trip List table and how to configure it for different use cases, refer to S&C Instruction Sheet 1044-579, "S&C IntelliTeam® SG Automatic Restoration System: *Transfer Trip Setup.*"

Figure 29. The Remote Transmit List on the *Setup>Restoration>External Device* screen.

STEP 7. For the IntelliRupter fault interrupter that will send the **Transfer Trip** command to the device teamed with the distributed generation, go to the *Setup>Protection>General Profile 1>Testing After Initial Trip* screen and make sure the **Delay for Test-1** setpoint is set to something longer than the amount of time it will take to send and acknowledge the **Transfer Trip** command. This will allow the **Transfer Trip** command to be received by the remote device and acted upon before the test commences.

This allows the distributed generation device to be put offline so it will no longer feed into the fault. On feeders with 6800 controls and/or IntelliNode modules, the **O/C Sequence Test** setpoint must be set to the **Close** state so the other devices on the system register the fault when this test is performed. See Figure 30.
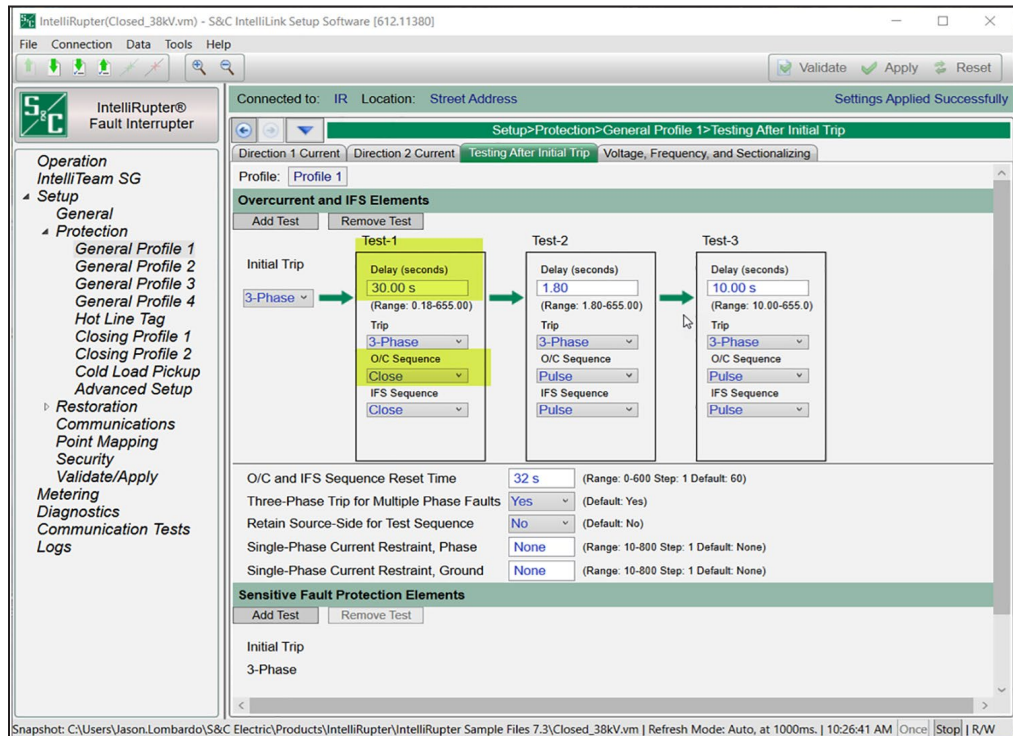

Figure 30. The Testing After Initial Trip Settings on the *Setup>Protection>General Profile1> Testing After Initial Trip* screen.

STEP 8. For systems that have a mix of IntelliRupter fault interrupters, 6800 Series controls or IntelliNode modules used with third-party devices, some IntelliRupter fault interrupters or third-party devices may need the protection settings modified to ensure they do not flag a fault to the IntelliTeam system until the distributed generation is tripped offline because this could lead to the IntelliTeam system incorrectly determining fault location.

This is only a recommendation because each installation will be somewhat unique. Therefore, a detailed protection study should be done to determine how best to coordinate the IntelliRupter fault interrupters or third-party devices on these mixed systems with the distributed generation protection device (e.g. relay, breaker, inverter, etc.).

For example, if the distributed generation protection device can be properly coordinated so it trips offline before the IntelliRupter fault interrupter or third-party device responds, it may not be necessary to adjust the IntelliRupter fault interrupter or third-party device's protection settings. Another example is where the distributed generation protection device is sent a **Transfer Trip** command by a high-speed communication and is therefore tripped before an IntelliRupter fault interrupter or third-party device picks up the fault and trips on its own protection settings.

Note: If the IntelliRupter fault interrupter or IntelliNode module with third-party device cannot be properly coordinated with the distributed generation protection device in these mixed systems, any IntelliRupter fault interrupter or third-party device that could detect a fault from a distributed generation device and potentially trip will need its protection settings modified to avoid tripping and flagging a fault.

To do this in the IntelliRupter fault interrupter, go to the *Setup>Protection Settings* screen and modify the **Min Trip** setpoint for any profile, **TCC** setting, or enabled element used on the IntelliRupter fault interrupter so it is set higher than the fault contribution the distributed generation device can generate. For example, if the distributed generation device can generate 500 amps of fault current, this setting must be higher than 500 amps.

This must be done for the direction (Direction 1 or Direction 2) facing the distributed generation device, so the IntelliRupter fault interrupter does not trip in that direction if the distributed generation device contributes fault current. See Figure 31 on page 32.

Note: For a system with all IntelliRupter fault interrupters, where bi-directional fault contribution trips more than one IntelliRupter fault interrupter, adjust the test sequence **Loss-of-Source Timeout** setpoint default from 300 seconds to a shorter value.

STEP 9. ***For all devices in the IntelliTeam system***: go to the *Setup>Restoration> IntelliTeam SG>Communications* screen and verify the **Data Runner Start Delay** setpoint is set to the default of 3 seconds. This is to ensure the data runners are sent at a frequency to get the loading data updated quickly if the current direction changes because of system events or during restoration. See Figure 32 on page 32.
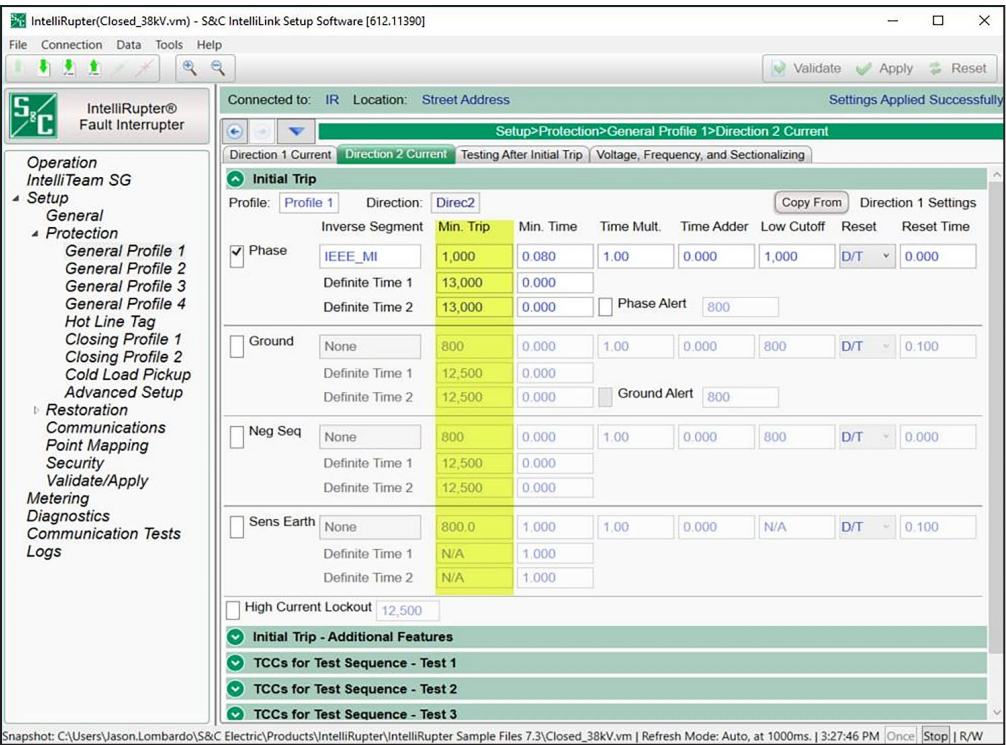
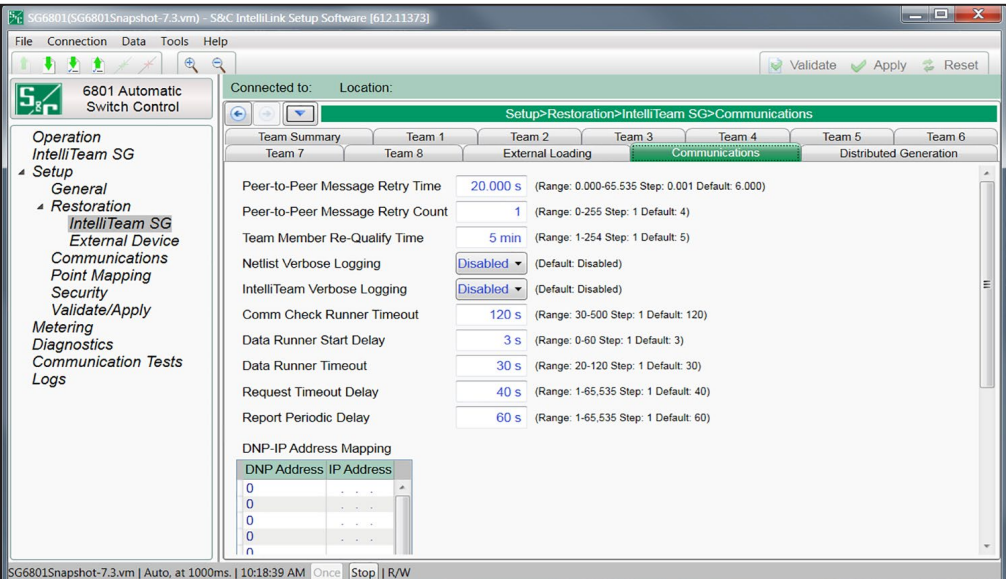**Figure 31. Example of an IntelliRupter fault interrupter Min Trip setting.**

Figure 32. The *Setup>Restoration>IntelliTeam SG>Communications* screen.

System Verification

When the devices are successfully configured and the Netlist has been successfully pushed using the previous steps, the final task is to verify the teams are in the **Ready** state, the new distributed generation options are enabled, and all devices show accurate current-flow direction. Follow these steps to perform the verification process on all devices:

STEP 1. Verify the teams associated with a device are in the Ready state by going to the *Setup>Restoration>IntelliTeam SG>Team Summary* screen. See Figure 33.

Team	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8	Ready Status
Team 1	130	134	150	0	0	0	0	0	Ready
Team 2	134	138	0	0	0	0	0	0	Ready
Team 3	0	0	0	0	0	0	0	0	
Team 4	0	0	0	0	0	0	0	0	
Team 5	0	0	0	0	0	0	0	0	
Team 6	0	0	0	0	0	0	0	0	
Team 7	0	0	0	0	0	0	0	0	
Team 8	0	0	0	0	0	0	0	0	

Figure 33. The Ready Status shown on the *Setup>Restoration>IntelliTeam SG>Team Summary* screen.

STEP 2. Verify the new DG attributes are set correctly in the IntelliTeam system device teamed with the distributed generation device by going to the *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen. See Figure 34.

These settings should reflect how they were enabled in the IntelliTeam Designer software, either in a **Disabled** state (default) or an **Enabled** state with actual configuration settings shown. If any discrepancies are seen here, go back to Step 4 on page 7 in the configuration procedure, check the settings entered, correct any incorrect entries, and push the Netlist again.
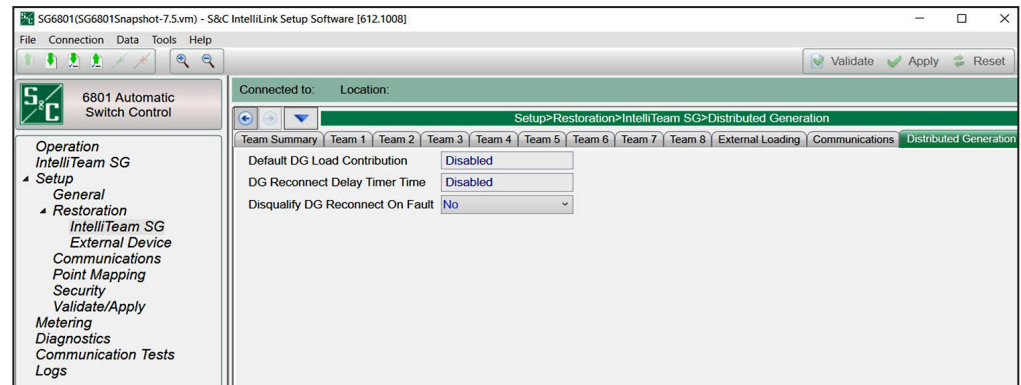

Figure 34. The *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen.

IntelliRupter Fault Interrupter: During normal current flow where current is flowing from the normal (non-DG) source to the load, the **Current Direction** field in the *Metering* screen should indicate "Normal." If it's indicating "Reverse," then go to the *Setup>General>Site-Related* screen and change the **Direction 1/Direction 2** setpoint to the opposite value. Return to the *Meeting* screen and verify the **Current Direction** setpoint is now indicating "Normal." See Figure 35.
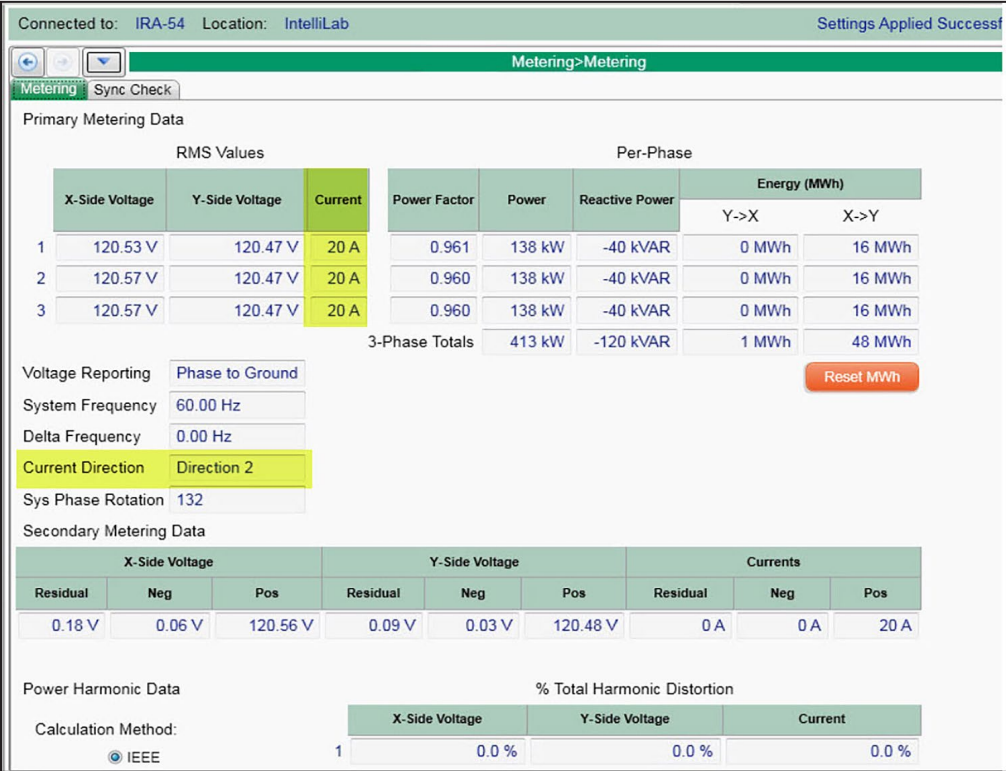

Figure 35. The IntelliRupter fault interrupter *Metering* screen.

IntelliNode Interface Module: During normal current flow where current is flowing from the normal (non-DG) source to the load, the **Current Direction** field in the *Operation* screen should indicate "Normal." See Figure 36.

If it's reporting "Reverse" or "No Dir," check the *Setup>External Devices>Auto Operation* screen for the **Current Direction Detection Method** setting. Confirm it is set to something other than the **None** setting. When this is set to the **Status Points** setting, go to the *Setup>External Devices>DNP Status Point Map* screen and check the **Direction1 Current Flow** and **Direction2 Current Flow** setpoints.

Confirm they are properly mapped between the IntelliNode module and the external device. Also, verify only one of the status points is active at a time.

Figure 36. The IntelliNode Interface Module *Operation* screen.

STEP 3. Go to the *IntelliTeam SG>Team x* screens for each device on the circuit and verify the **Load Current Dir** indication is displaying the correct "Into Team" or "Out of Team" direction for the teams with which it is associated. S&C recommends using the IntelliTeam Designer circuit drawing to provide a visual reference to map these directions. See Figure 37.

Connected to: IRA-54 Location: IntelliLab								Settings Applied Successfull

IntelliTeam SG>Team 1

Team Summary | **Team 1** | Team 2 | Team 3 | Team 4 | Team 5 | Team 6 | Team 7 | Team 8 | Activity Monitoring

Team ID	T 1	Ready Status	Ready	
Local Real-Time Load	10	Operation Status	None	
Real Capacity	570	Configuration Status	None	
Transfer State	Idle	Line Segment Status	Good	

	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8
DNP/RTU Adr	53	54	0	0	0	0	0	0
SW/Pos Num	Sw1	Sw1	Sw1	Sw1	Sw1	Sw1	Sw1	Sw1
Normal State	Closed	Closed	----	----	----	----	----	----
Present State	Closed	Closed	----	----	----	----	----	----
Auto Mode	----T---	----T---	--------	--------	--------	--------	--------	--------
Internal Error	None	None	None	None	None	None	None	None
Event Status	--------	--------	--------	--------	--------	--------	--------	--------
Average Load	20	10	0	0	0	0	0	0
Load Current Dir	Into Team	Out of Team	N/A	N/A	N/A	N/A	N/A	N/A
Fault Current Dir	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 37. The *IntelliTeam SG>Team x* screen showing the Load Current Dir indication.

6800 Series Switch Controls: For switches used in underground switch-gear applications, the polarity of the current sensors may be reversed. To verify they are configured correctly, close the switches when the system is live so current is flowing through the switch.

If the *IntelliTeam SG>Team X* screen is indicating "Into Team for SW1" and "Out of Team for SW2" when current is flowing from the sensor side terminal to the non-sensor side terminal of the switch, it is working as desired. However, if either switch is reporting the opposite of the above, go to the *Site-Related* screen for the device and change the **SWx CT Polarity Reversed** setpoint to "Yes" and re-verify this step.

Note: For a 6800 Series control to determine directionality, its sensors must measure at least 6 amps of current. If it does not measure at least 6 amps of current, it will determine current is flowing in the normal direction. Therefore, if the into team and out-of-team indication is not accurate, make sure there is at least 6 amps of current flowing through the device.