Remote Transfer Trip Setup and Configuration

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March 11, 2024

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 4. 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 IntelliTeam SG Automatic Restoration System. Designate a location where users can easily retrieve and refer to this publication.

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.

Warranty

The warranty and/or obligations described in S&C's Price Sheet 150, "Standard Conditions of Sale–Immediate Purchasers in the United States," (or Price Sheet 153, "Standard Conditions of Sale–Immediate Purchasers Outside the United States"), plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of the seller's entire liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to the immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150 (or Price Sheet 153), and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 (OR PRICE SHEET 153) IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150 (OR PRICE SHEET 153).

End User License Agreement

The end user is granted a nontransferable, non-sublicensable, nonexclusive license to use the IntelliTeam Designer software, IntelliLink Setup Software, IntelliTeam SG Automatic Restoration software, and/or other software furnished with the IntelliTeam SG Automatic Restoration System only upon acceptance of all the terms and conditions of the seller's end-user license agreement set forth in Price Sheet 155.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet. 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 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 or operating 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.

The IntelliTeam SG Automatic Restoration System supports the ability to send **Transfer Trip** messages to S&C and third-party devices. A **Transfer Trip** message, also called **Direct Transfer Trip** command, is an existing and common method of preventing distributed generation from interfering with utility protection schemes. It energizes the utility circuit when the primary source is disconnected for anti-islanding.

This feature is not intended to meet IEEE 1547 requirements, including the requirement to take the distributed generation offline within 2 seconds. It is primarily used to ensure distributed generation is switched offline during an IntelliTeam SG system restoration event. It is also supported in standalone applications where the IntelliTeam SG system is disabled.

Remote Transfer Trip Support

S&C devices using firmware version 7.3 or later that trip open because of a protection or automatic sectionalizing event can send **Transfer Trip** messages to remote devices. Devices that receive the **Transfer Trip** message will issue an **Open** command to the associated switch. If received by an S&C control, the message will be put into a **Transfer Trip Prohibit Restoration** state. It will not reclose unless a user manually closes it or enables the new **Reconnect DG on RTN** option, which will reconnect the distributed generation when the device teamed with the control in the **Transfer Trip Prohibit Restoration** state returns to the **Normal** state and has good voltage.

A **Transfer Trip** command is supported in IntelliTeam SG systems running in any supported **ITSG** mode of operation. A **Transfer Trip** command is also supported in standalone applications where the IntelliTeam SG system is disabled.

Supported S&C devices with the ability to send and receive **Transfer Trip** messages include IntelliRupter® fault interrupters, 6800 Series Automatic Switch Controls, and IntelliNode™ Interface Modules. Third-party controls that support the DNP3.0 protocol can also receive **Transfer Trip** commands. A **Transfer Trip** message is not supported in IntelliTeam® II Automatic Restoration Systems because there are no runners.

Sending Device Using Firmware Version 7.3.x

Follow these steps to configure the device sending the **Transfer Trip** messages using firmware version 7.3.x:

STEP 1. Launch IntelliLink Setup Software and establish a connection to the device sending the **Transfer Trip** messages.

STEP 2. Go to the *Setup>Restoration>External Device* screen and click on the down arrow next to "Remote Transfer Trip List" section to display the table. See Figure 1.

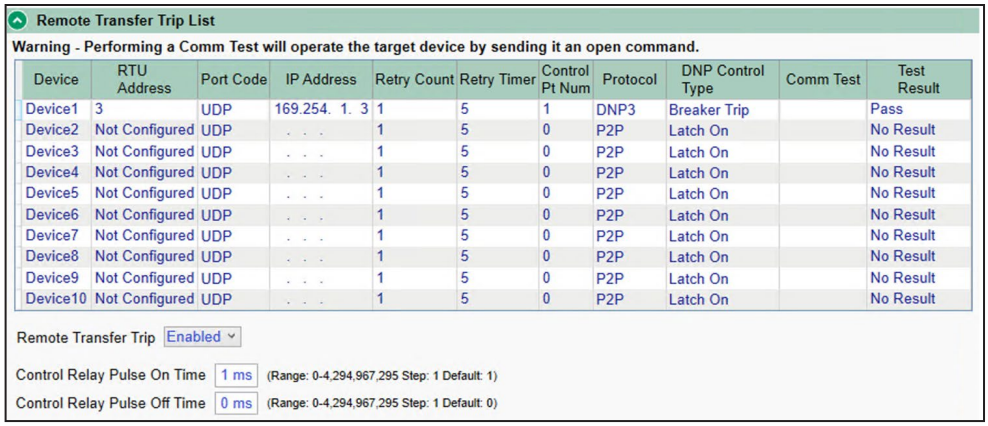

Figure 1. The Remote Transfer Trip List table.

STEP 3. Enter the following information for each remote device that will receive a **Transfer Trip** message from the control being configured:

(a) **Device**—This is the Device ID of the remote device and is not configurable.

(b) **RTU Address**—Enter the DNP RTU address of the remote device. (Range: 0-65519; Step: 1; Default: Not Configured)

(c) **Port Code**—Select the port for transmitting to the remote device. (Default: UDP)

(d) **IP Address**—When the **Port Code** setting is "UDP," enter the IP address here.

(e) **Retry Count**—Enter the number of retries to perform on any timeout event. (Range: 0-255; Step: 1; Default: 1)

(f) **Retry Timer**—Enter the amount of time in seconds to wait before a retry is attempted. (Range: 0-255; Step: 1; Default: 5)

(g) **Control Point Number**—Enter the DNP control point number that activates the **Transfer Trip** mode in the remote device. (Range: 0-255; Step: 1; Default: 0)

Note: If the remote device is a non-S&C device, it may not have a control point specific to a **Transfer Trip** command. In this case, assign this to the **Trip** or **Open** command DNP control point.

(h) **Protocol—**When the remote device is an S&C device, select P2P (peer-to-peer) as the protocol. The P2P protocol allows the remote S&C device to report the actual opening of the remote device to the sending device. This allows the IntelliTeam SG system to proceed with restoration events. If the device is a non-S&C device, select DNP3 for the protocol. (Default: P2P)

Note: If the device is a non-S&C device, the sending device will send a DNP3 message and only confirm the message was received. It will not confirm whether the device actually tripped open before proceeding with restoration events.

(i) **DNP Control Type—**Enter the appropriate control type for the configured **Control Point Number** setpoint. When the protocol is set to **P2P** mode, options include: **Pulse On**, **Latch On** or **Breaker Close**. When set to **DNP3** mode, options include: **Pulse On**, **Pulse Off**, **Latch On**, **Latch Off**, **Breaker Close**, or **Breaker Trip**. When received, the remote control will issue an **Open** command to the distributed generation switch. (Default: Latch On)

(j) **Commission Test—**Selecting the **Execute** command from the drop-down menu sends a **Transfer Trip** command to the target device in the exact same manner the command is sent during a normal operation.

NOTICE

A **Commission Test** command will operate the target device by sending it an **Open** command. A **Close** command must be sent to the device and any alarms cleared to put the device back in the **Ready** state.

(k) **Test Result—**This indicates "Pass," "Pending," "Bad Response," or "No Result" for the sent **Commission Test** message. "Pass" means the local device received an acknowledgement from the remote device before the **Retry** timer expired. "Pending" means the local device sent the **Commission Test** command but is still waiting for a response. "Bad Response" means either the remote device rejected the message or the **Retry** timer expired before the local device received an acknowledgement. "No Result" means no tests have been performed yet.

STEP 4. Below the table, select the **Enabled** state in the **Remote Transfer Trip** field. This allows commands from this device to be sent to all non-zero RTU addresses listed on the Remote Transfer Trip List. **Transfer Trip** messages are sent, no matter what state the distributed generation switch is in at the time, to ensure it is disconnected from the system. When the trip is prompted by a protection event, the **Transfer Trip** messages will be sent following the initial trip. A **Lockout** state is not necessary.

Note: Sending **Transfer Trip** messages does not require enabling the IntelliTeam SG system. A standalone S&C device can send a **Transfer Trip** command.

STEP 5. Set the **Control Relay Pulse On Time** setpoint and **Control Relay Pulse Off Time** setpoint for the distributed generation devices that receive DNP3 **Transfer Trip** control requests. Each count is 1 ms. (Range: 0-4,294,967,295; Step: 1; Default: 10)

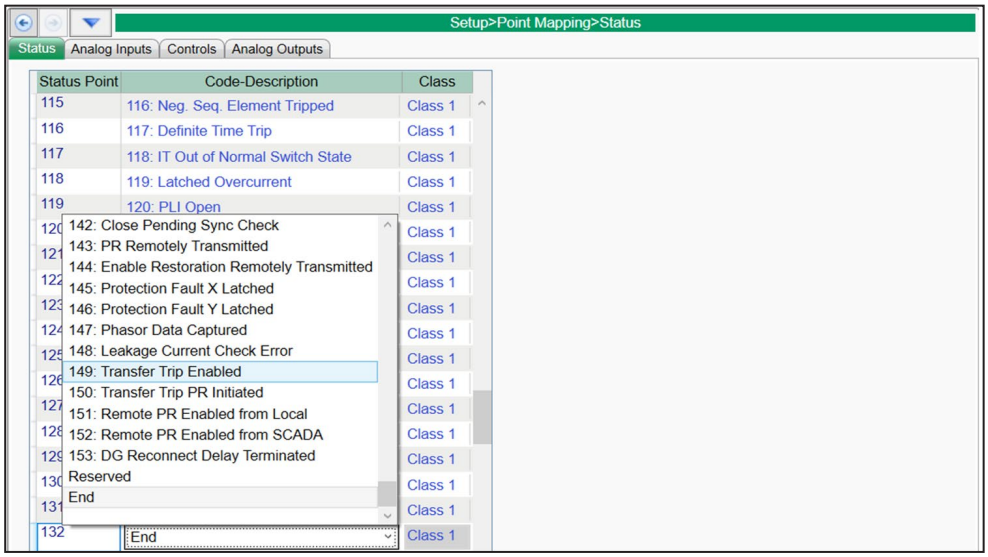

Figure 2. Mapping the Transfer Trip Enabled DNP Status Point.

STEP 6. Go to the *Setup>Point Mapping>Status* screen and configure the **Transfer Trip Enabled** DNP status point. This point is active when the **Remote Transfer Trip** setting is enabled. See Figure 2.

STEP 7. Click on the **Validate** button and then the **Apply** button.

Receiving Device Using Firmware Version 7.3.x

Follow these steps to configure the remote device using firmware version 7.3.x:

STEP 1. Make sure the remote device is configured to receive remote commands. For an IntelliRupter fault interrupter, set **Remote Operation** mode to "Enabled." For a 6800 series control, set **SCADA Control** mode to "Remote." No setting changes to enable remote commands are necessary for IntelliNode modules.

STEP 2. Go to *Setup>Point Mapping>Controls* screen and configure the **Initiate Transfer Trip** DNP control point. The **Control Point** and **Object Type** settings must match those configured in the Remote Transfer Trip List table of the sending device. Otherwise, the sending device will never receive a response and the transfer will never complete. See Figure 3 on page 9.

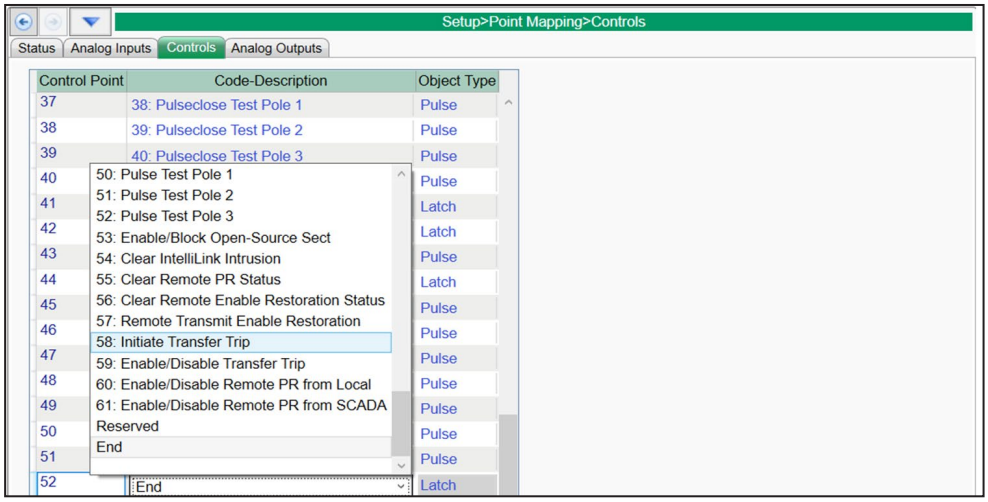

Figure 3. Mapping the Initiate Transfer Trip DNP control point.

STEP 3. Go to the *Setup>Point Mapping>Status* screen and configure the **Transfer Trip Prohibit Restoration Initiated** DNP status point. This point is active when the **Initiate Transfer Trip** command is received and executed. See Figure 4.

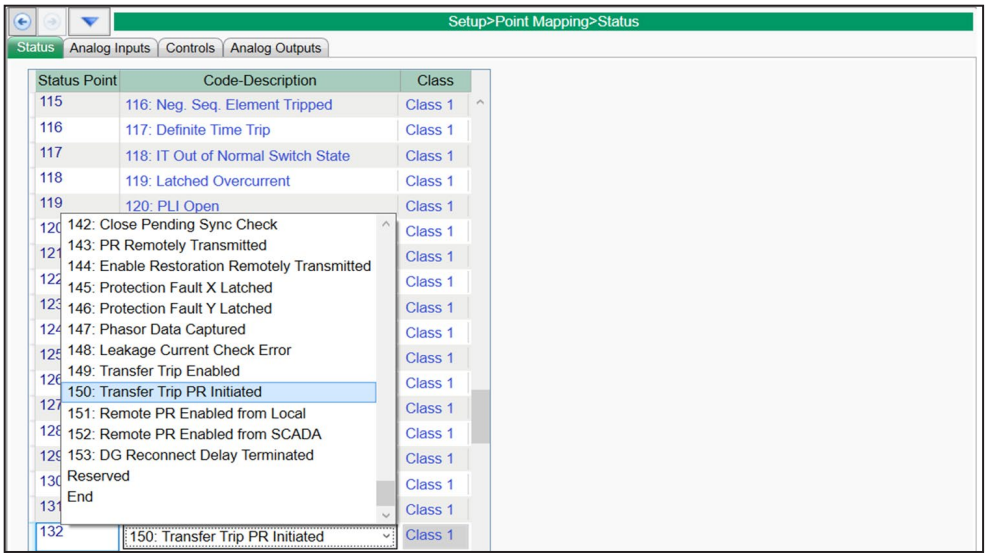

Figure 4. Mapping the Transfer Trip Prohibit Restoration Initiated DNP status point.

STEP 4. When configuring an IntelliNode/Info-Only module, the external device must be configured to receive the **Transfer Trip** command. Go to the *Setup> External Device>DNP Control Point Map* screen and configure the **Trip** DNP control point. See Figure 5.

Also, if the IntelliNode/Info-Only module is teamed with the distributed generation and the **DG Reconnect** feature is activated, users must also map the **Close** DNP control point.

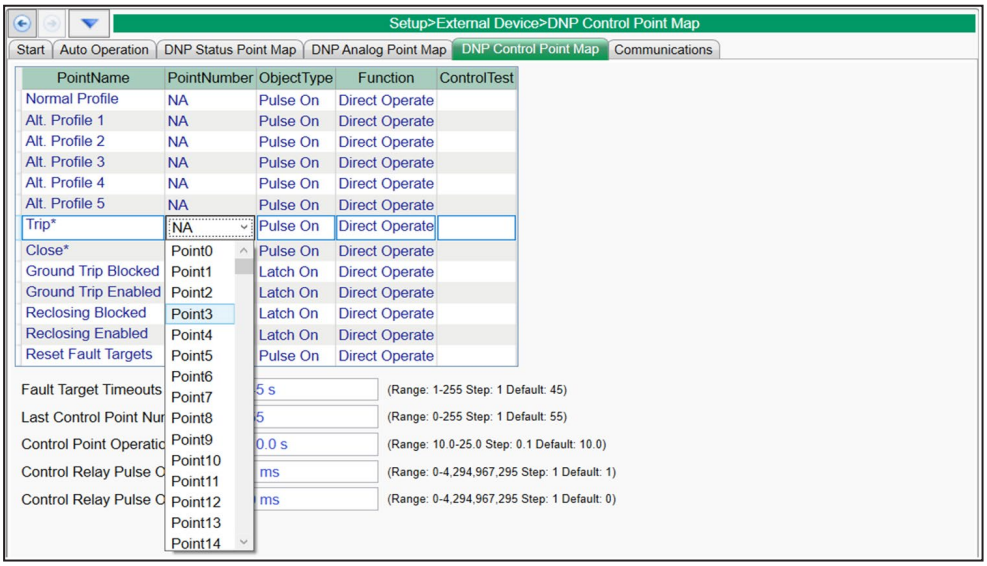

Figure 5. Mapping the Transfer Trip command to the external device.

STEP 5. S&C devices teamed with distributed generation have an option to automatically reconnect the distributed generation to the grid after the circuit returns to its **Normal** state. This option is enabled using IntelliTeam Designer software. Users can verify the setting was applied correctly by going to the *Setup> Restoration>IntelliTeam SG>Distributed Generation* screen. When applied correctly, the **DG Reconnect Delay Time Timer** setting is not set to "Disabled." See Figure 6.

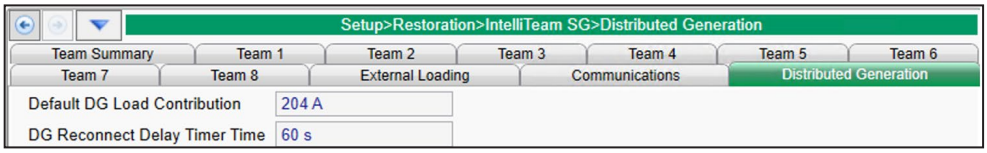

Figure 6. The *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen.

Note: Only devices teamed with distributed generation can display an active setting. All other devices on the circuit will indicate the setting is "Disabled" even though the setting is technically active in all the controls.

STEP 6. On the *Setup>Validate/Apply* screen, click on the **Validate** button and then on the **Apply** button.

Sending Device Using Firmware Version 7.5.x or Later

Follow these steps to configure the device sending the **Transfer Trip** messages using firmware version 7.5.x or later:

STEP 1. Launch IntelliLink® Setup Software and establish a connection to the device sending the **Transfer Trip** messages.

STEP 2. Go to the *Setup>Restoration>External Device* screen and the Remote Transit List table will be displayed. See Figure 7.

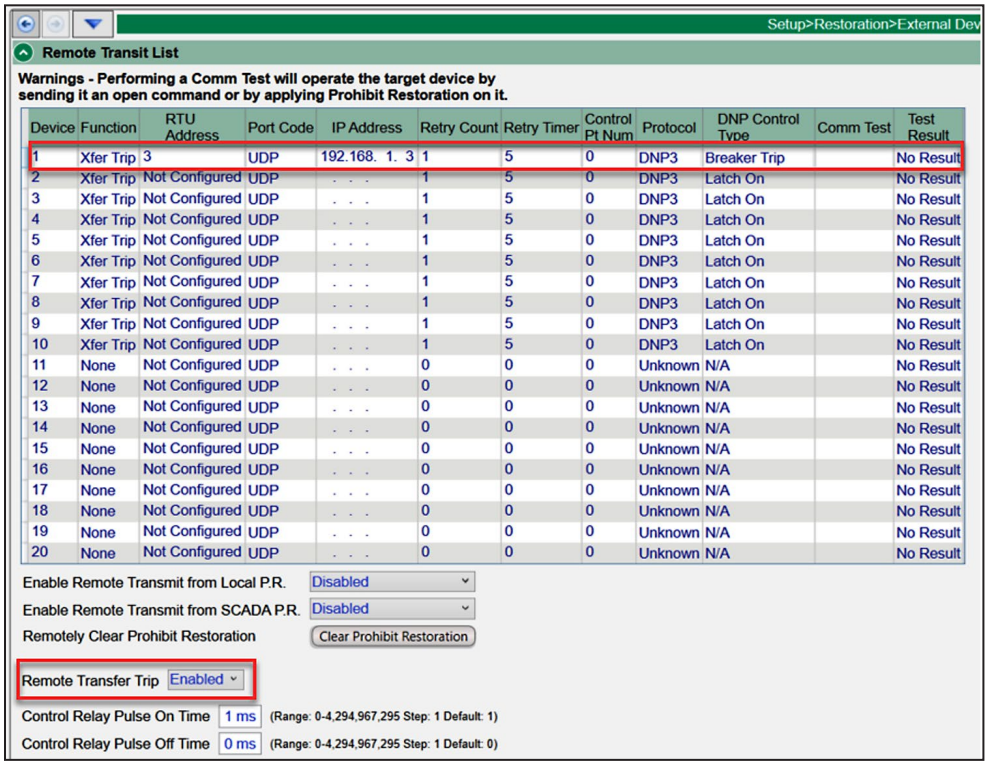

Figure 7. The Remote Transit List table.

STEP 3. Enter the following information for each remote device that will receive a **Transfer Trip** message from the control being configured:

(a) **Device**—This is the Device ID of the remote device and is not configurable.

(b) **RTU Address**—Enter the DNP RTU address of the remote device. (Range: 0-65519; Step: 1; Default: Not Configured)

(c) **Port Code—**Select the port for transmitting to the remote device. (Default: UDP)

(d) **IP Address—**When the **Port Code** setting is "UDP," enter the IP address here.

(e) **Retry Count—**Enter the number of retries to perform on any timeout event. (Range: 0-255; Step: 1; Default: 1)

(f) **Retry Timer—**Enter the amount of time in seconds to wait before a retry is attempted. (Range: 0-255; Step: 1; Default: 5)

(g) **Control Point Number—**Enter the DNP control point number that activates the **Transfer Trip** mode in the remote device. (Range: 0-255; Step: 1; Default: 0)

Note: If the remote device is a non-S&C device, it may not have a control point specific to a **Transfer Trip** command. In this case, assign this to the **Trip** or **Open** command DNP control point.

(h) **Protocol—**When the remote device is an S&C device, P2P (peer-to-peer) will automatically be selected as the protocol. The P2P protocol allows the remote S&C device to report the actual opening of the remote device to the sending device. This allows the IntelliTeam SG system to proceed with restoration events. If the device is a non-S&C device, DNP3 will automatically be selected for the protocol. (Default: P2P)

Note: If the device is a non-S&C device, the sending device will send a DNP3 message and only confirm the message was received. It will not confirm whether the device actually tripped open before proceeding with restoration events.

(i) **DNP Control Type—**Enter the appropriate control type for the configured **Control Point Number** setpoint. When the protocol is set to **P2P** mode, options include: **Pulse On**, **Latch On** or **Breaker Close**. When set to **DNP3** mode, options include: **Pulse On**, **Pulse Off**, **Latch On**, **Latch Off**, **Breaker Close**, or **Breaker Trip**. When received, the remote control will issue an **Open** command to the distributed generation switch.

Note: When configuring the **Transfer Trip** function to an S&C device, the receiving device will only respond to **Pulse On**, **Latch On**, or **Breaker Close** options. Do not use the **Pulse Off**, **Latch Off**, or **Breaker Trip** options because the remote device will not operate properly.

(j) **Commission Test—**Selecting the **Execute** command from the drop-down menu sends a **Transfer Trip** command to the target device in the exact same manner the command is sent during a normal operation.

NOTICE

A **Commission Test** command will operate the target device by sending it an **Open** command. A **Close** command must be sent to the device and any alarms cleared to put the device back in the **Ready** state.

(k) **Test Result**—This indicates "Pass," "Pending," "Bad Response," or "No Result" for the sent **Commission Test** message. "Pass" means the local device received an acknowledgement from the remote device before the **Retry** timer expired. "Pending" means that the local device sent the **Commission Test** command but is still waiting for a response. "Bad Response" means either the remote device rejected the message or the **Retry** timer expired before the local device received an acknowledgement. "No Result" means no tests have been performed yet.

STEP 4. Below the table, select the **Enabled** state in the **Remote Transfer Trip** field. This allows commands from this device to be sent to all non-zero RTU addresses listed on the Remote Transfer Trip List. **Transfer Trip** messages are sent, no matter what state the distributed generation switch is in at the time, to ensure it is disconnected from the system. When the trip is prompted by a protection event, the **Transfer Trip** messages will be sent following the initial trip. A **Lockout** state is not necessary.

Note: Sending **Transfer Trip** messages does not require enabling the IntelliTeam SG system. A standalone S&C device can send a **Transfer Trip** command.

STEP 5. Set the **Control Relay Pulse On Time** setpoint and **Control Relay Pulse Off Time** setpoint for the distributed generation devices that receive DNP3 **Transfer Trip** control requests. Each count is 1 ms. (Range: 0-4,294,967,295; Step: 1; Default: 10)

STEP 6. Go to the *Setup>Point Mapping>Status* screen and configure the **Transfer Trip Enabled** DNP status point. This point is active when the **Remote Transfer Trip** setting is enabled. See Figure 8.

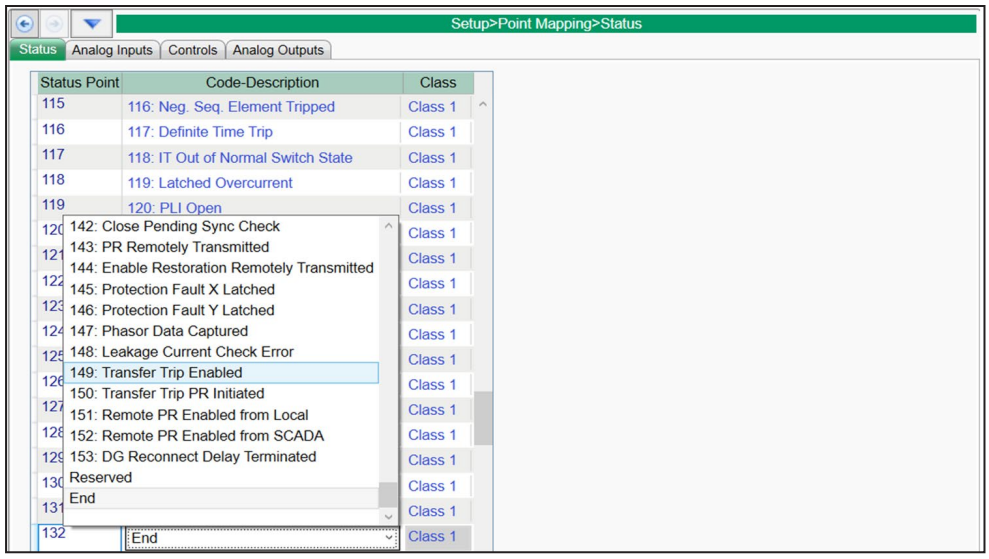

Figure 8. Mapping the Transfer Trip Enabled DNP status point.

STEP 7. Configure the **Transfer Trip Sent** DNP status point. This point goes active when a device sends a **Remote Transfer Trip** message via the Remote Transit list. See Figure 9.

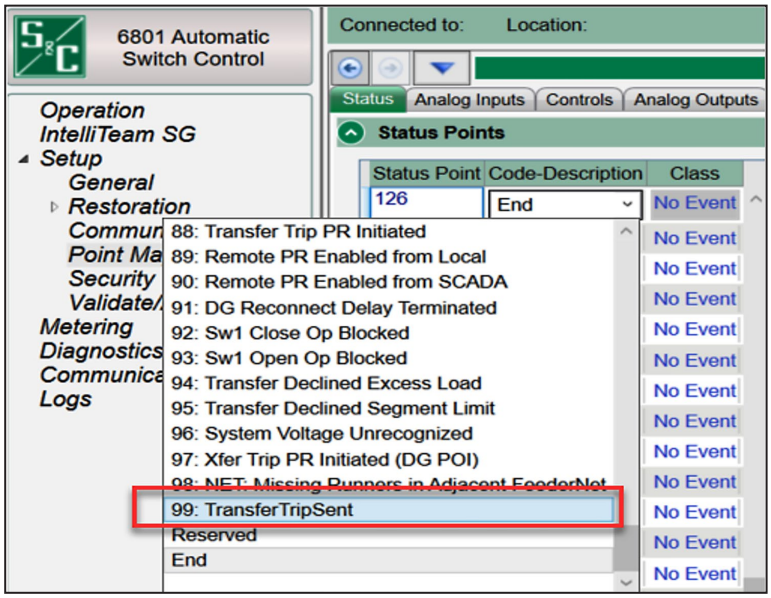

Figure 9. Mapping the Transfer Trip Enabled DNP status point.

STEP 8. Click on the **Validate** button and then the **Apply** button.

Receiving Device Using Firmware Version 7.5.x or Later

Follow these steps to configure the device receiving the **Transfer Trip** messages using firmware version 7.5.x or later:

STEP 1. Make sure the remote device is configured to receive remote commands. For an IntelliRupter fault interrupter, set **Remote Operation** mode to "Enabled." For a 6800 Series control, set **SCADA Control** mode to "Remote." No setting changes to enable remote commands are necessary for IntelliNode modules.

STEP 2. Go to *Setup>Point Mapping>Controls* screen and configure the **Initiate Transfer Trip** DNP control point. The **Control Point** and **Object Type** settings must match those configured in the Remote Transmit List table of the sending device. Otherwise, the sending device will never receive a response and the transfer will never complete. See Figure 10.

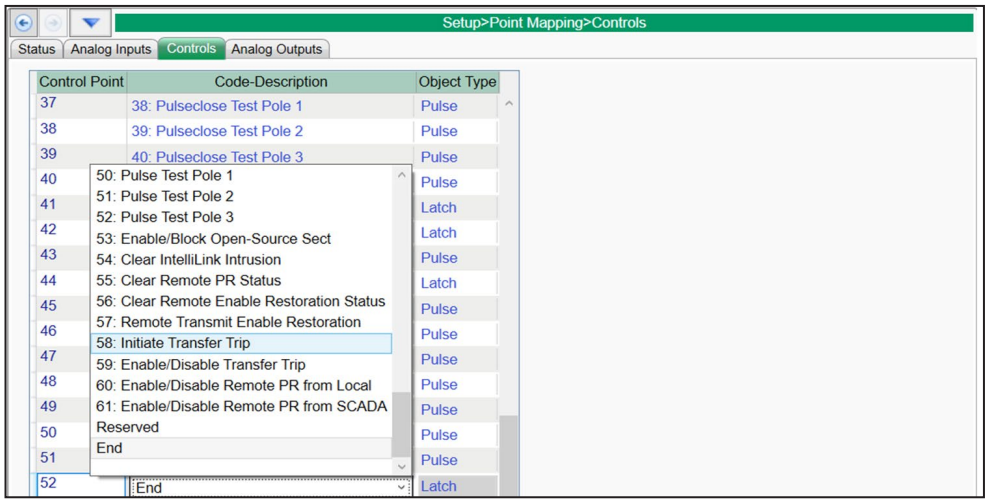

Figure 10. Mapping the Initiate Transfer Trip DNP control point.

STEP 3. If the receiving device is not teamed with a distributed generation point-of-interconnect, go to the *Setup>Point Mapping>Status* screen and configure the **Transfer Trip Prohibit Restoration Initiated** DNP status point. This point is active when the **Initiate Transfer Trip** command is received and executed. See Figure 11.

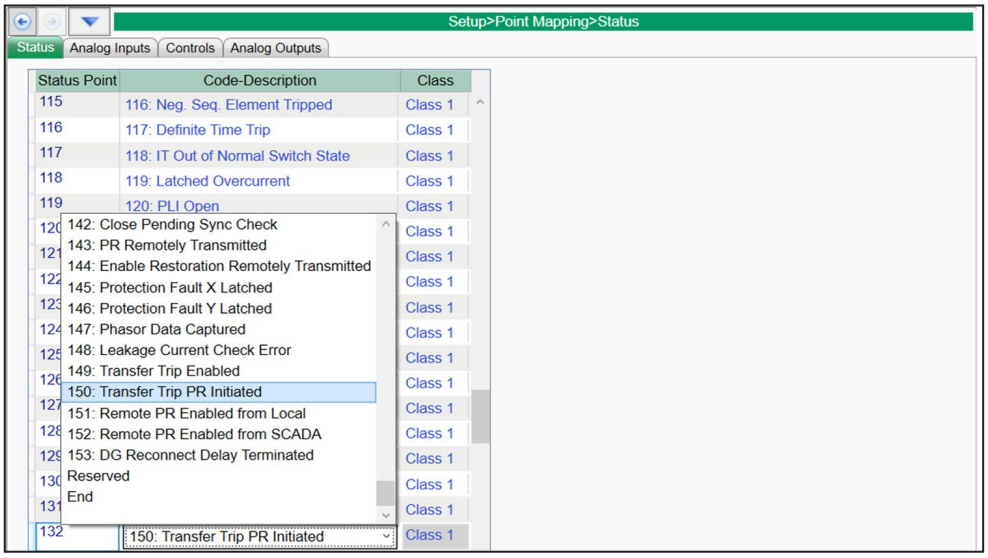

Figure 11. Mapping the Transfer Trip Prohibit Restoration Initiated DNP status point.

STEP 4. If the receiving device is teamed with a distributed generation point-of-interconnect, go to the *Setup>Point Mapping>Status* screen and configure the **Transfer Trip Prohibit Restoration Initiated** DNP status point. This point is active when the **Initiate Transfer Trip** command is received and executed by a device teamed with a distributed generation point-of-interconnect device. See Figure 12.

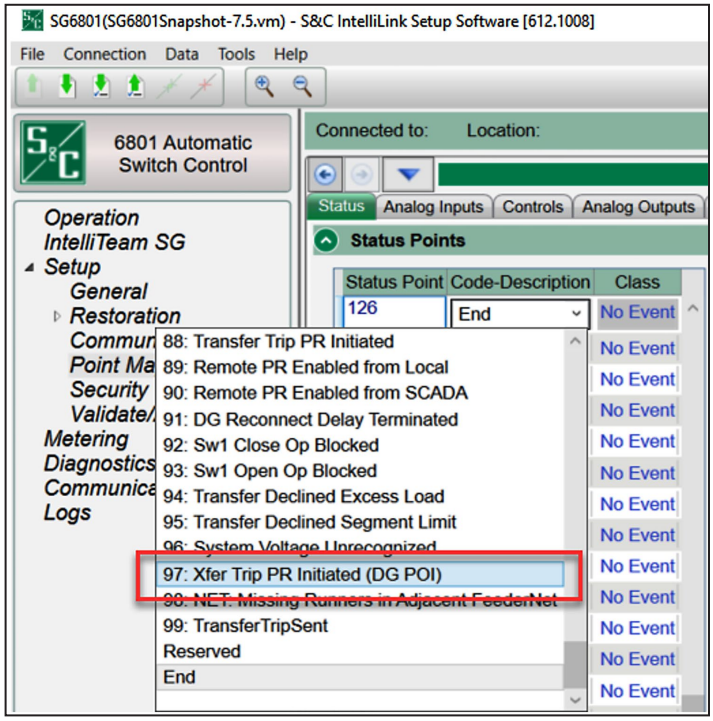

Figure 12. Mapping the Transfer Trip PR Initiated (DG POI) status point.

STEP 5. When configuring an IntelliNode/Info-Only module, the external device must be configured to receive the **Transfer Trip** command. Go to the *Setup>External Device>DNP Control Point Map* screen and configure the **Trip** DNP control point. See Figure 13.

Also, if the IntelliNode/Info-Only module is teamed with the distributed generation and the **DG Reconnect** feature is activated, users must also map the **Close** DNP control point.

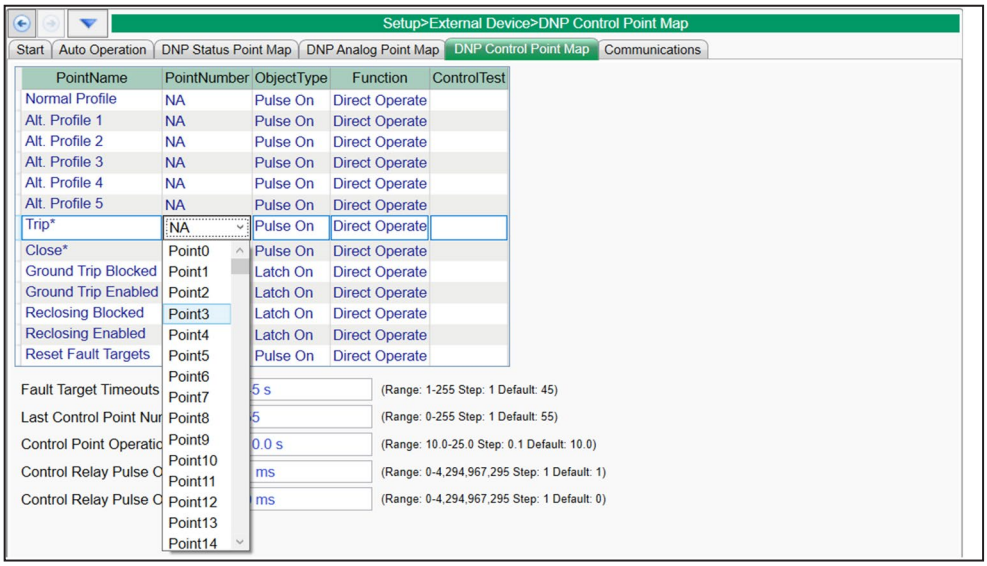

Figure 13. Mapping the Transfer Trip Command to the external device.

STEP 6. S&C devices teamed with distributed generation have an option to automatically reconnect the distributed generation to the grid after the circuit returns to its **Normal** state. This option is enabled using IntelliTeam Designer software.

Users can verify the setting was applied correctly by going to the *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen. When applied correctly, the **DG Reconnect Delay Time Timer** setting is not set to "Disabled." See Figure 14.

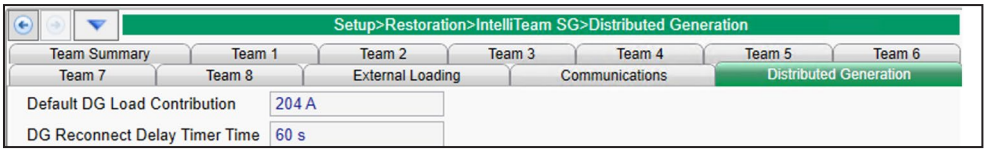

Figure 14. The *Setup>Restoration>IntelliTeam SG>Distributed Generation* screen.

Note: Only devices teamed with distributed generation can display an active setting. All other devices on the circuit will indicate the setting is "Disabled" even though the setting is technically active in all the controls.

STEP 7. On the *Setup>Validate/Apply* screen, click on the **Validate** button and then on the **Apply** button.

Example 1

Before configuring an IntelliTeam system to send and receive **Transfer Trip** messages, it is important to understand the different use cases. These are typical examples of how **Transfer Trip** messages are used in circuits with distributed generation.

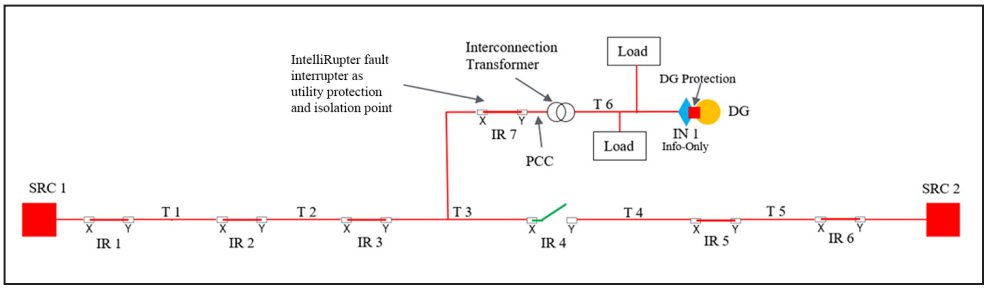

Figure 15. A circuit with an IntelliNode/Info-Only module at distributed generation.

Below are the circuit setup and configuration steps for Example 1. See Figure 15.

STEP 1. An IntelliNode/Info-Only module (IN 1) is installed at the distributed generation and is configured to operate the distributed generation protection relay when a **Transfer Trip** message is received.

STEP 2. An IntelliRupter fault interrupter (IR 7) is installed at the utility protection and isolation point. It is configured to send a **Transfer Trip** message to IN 1 when tripped because of a fault. The utility does not want to unnecessarily drop the load in team T 6, so IR 7 is not configured to receive a **Transfer Trip** message from an upstream device.

STEP 3. IN 1 is also configured to automatically reconnect the distributed generation after a fault is repaired and the circuit is returned to the **Normal** state.

STEP 4. IR 1, IR 2, and IR 3 are also configured to send **Transfer Trip** messages to IN 1 when tripped because of a fault.

STEP 5. IR 4 is also configured to send a **Transfer Trip** message to IN 1 before attempting to close to restore load on the SRC 2 feeder. In this case, the utility requires all distributed generation sources to be offline for any restoration event, even for faults on adjacent feeders.

STEP 6. IR 5 and IR 6 are not configured to send **Transfer Trip** messages.

Example 1—Fault in Team T 2

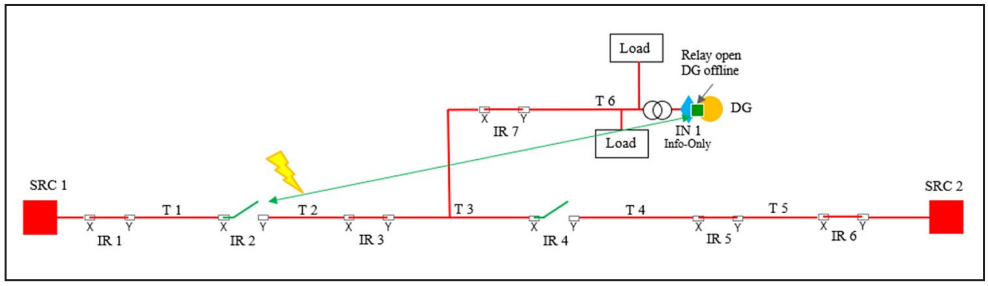

Figure 16. Example 1 showing a fault in Team T 2.

These are the steps the IntelliTeam system takes to isolate the fault, trip the distributed generation offline, and restore the dropped load for Example 1. See Figure 16.

STEP 1. A fault in Team T 2 causes IR 2 to trip on overcurrent. The fault contribution from the distributed generation is too low to trip IR 3, IR 7, or the distributed generation relay.

Note: For systems where bi-directional fault contributions may trip more than one IntelliRupter fault interrupter, S&C recommends adjusting the **Test Sequence Loss-of-Source Timeout** setpoint default from 300 seconds to a shorter value. Otherwise, IntelliTeam system restoration may be delayed by 5 minutes until the test sequence of downstream devices is cancelled.

STEP 2. IR 2 sends a **Transfer Trip** message to IN 1 which in turn sends an **Open** command to the distributed generation relay.

Note: Regardless of the type of system (IntelliTeam SG system or stand-alone), a normally closed (NC) device will always send **Transfer Trip** messages to all devices configured in the Remote Transmit Trip List.

STEP 3. IR 2 stops further restoration activity until IN 1 replies with an acknowledgement the **Transfer Trip** command was completed successfully.

Note: If completed successfully, IN 1 will remain open until the switch is closed manually or automatically after the circuit is returned to the **Normal** state and the **DG Reconnect Delay Time** timer expires if enabled (see "Example 1—Fault in Team T 5" section on page 1922). If the operation is unsuccessful or a reply indicating success is never received, IR 2 will continue its testing sequence but will not proceed with restoration following a **Lockout** state. If IR 3 or IR 7 subsequently trip because of extended voltage loss (if configured), another **Transfer Trip** message will be sent to IN 1. If successful, the restoration process will resume.

STEP 4. IR 2 continues its test sequence and eventually goes to the **Lockout** state.

Note: The **First Test Delay After Initial Trip** setting must be greater than the time it takes the remote device to act on the **Transfer Trip** message and respond with an acknowledgement. Otherwise, the distributed generation may remain online during the first test and would affect the IntelliTeam system's ability to properly identify the fault location if the distributed generation provides sufficient fault current and it is flagged by an IntelliTeam system device.

STEP 5. With the distributed generation offline, the **IntelliTeam SG System** logic continues with the restoration by opening IR3 to further isolate the fault in Team 2 after IR 2 goes to the **Lockout** state.

STEP 6. The IntelliTeam SG system updates its loading and capacity information, confirms availability, and then closes IR 4 to restore load up to the open distributed generation breaker.

Note: Because the IntelliNode/Info-Only module collects data (status, loading, voltage, direction, and fault) from the distributed generation relay, the IntelliTeam SG system can accurately calculate load and distributed generation contributions, thus preventing potential overload conditions.

These are the steps the IntelliTeam SG system takes to return the circuit back to the **Normal** state and automatically bring the distributed generation back online. See Figure 8 on page 13.

STEP 1. The fault in Team T 2 is repaired and IR 2 is manually closed to initiate the IntelliTeam SG system **Return to Normal** process, if enabled.

STEP 2. The **IntelliTeam SG System** logic closes IR 3 and opens IR 4 after the **Return to Normal Timer** expires. SRC1 is now feeding the load all the way up to the open distributed generation breaker.

STEP 3. IN 1 recognizes Team T 6 is being fed by the normal source and activates the **DG Reconnect Delay Time** timer.

Note: If any instability occurs or a new fault or loss of voltage event begins, the timer aborts and the distributed generation must be reconnected manually from that point forward.

STEP 4. After the **DG Reconnect Delay Time** timer expires, IN 1 sends a **Close** command to the distributed generation relay.

STEP 5. The distributed generation relay verifies good source voltage has returned and closes the distributed generation breaker.

Example 1—Fault in Team T 5

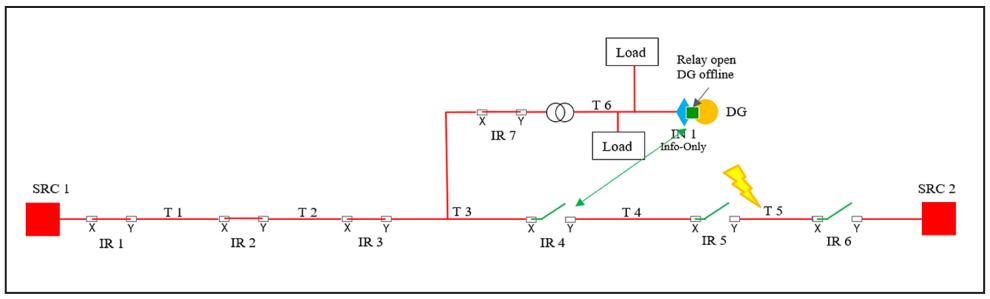

Figure 17. Example 1 showing a fault in Team T 5.

Below are the steps the IntelliTeam SG system takes to isolate the fault, trip distributed generation offline, and restore the dropped load. See Figure 17.

STEP 6. A fault in Team T 5 causes IR 6 to trip on overcurrent. Because the distributed generation is on a different feeder, there is no fault contribution from the distributed generation.

STEP 7. IR 6 continues its test sequence and eventually goes to the **Lockout** state.

STEP 8. The **IntelliTeam SG System** logic opens IR 5 to further isolate the fault in Team T 5 after IR 6 goes to the **Lockout** state.

STEP 9. IR 4 verifies capacity.

Note: S&C recommends sending the **Transfer Trip** message from the normally open (NO) switch to the distributed generation on the alternate feeder because the normally open switch can make the necessary adjustments to load calculations before proceeding with the transfer, thus preventing a potential overload condition.

Note: Another benefit is the normally open switch will send the **Transfer Trip** message during the restoration process instead of after the initial fault, ensuring the distributed generation will remain online should there be any reason for the transfer not to complete.

STEP 10. When verified, IR 4 sends a **Transfer Trip** message to IN 1.

Note: If configured for IntelliTeam SG system restoration, the normally open (NO) switch will only send **Transfer Trip** messages to distributed generation sources on the alternate feeder. If configured for a standalone application, the normally open switch will never send a **Transfer Trip** message.

STEP 11. IN 1 sends the **Open** command to the distributed generation relay, the distributed generation goes offline, and IN 1 replies with an acknowledgement the **Transfer Trip** command was completed successfully.

Note: If a reply indicating success isn't received, the **IntelliTeam SG System** logic will continue to look for an alternate source and re-attempt the **Transfer Trip** command until it is either successful or the **Prohibit Restoration** timer expires (when enabled).

STEP 12. IR 4 continues the restoration process by closing to restore load on Team T 4.

Example 2

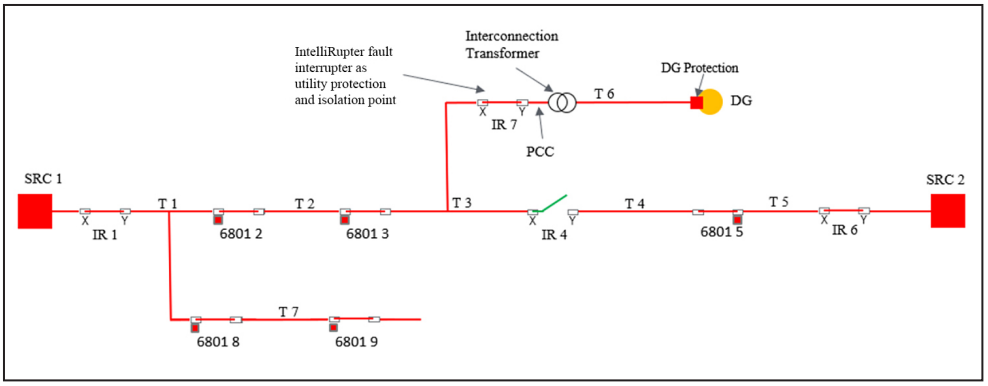

Figure 18. A circuit with a mixed system and no IntelliNode/Info-Only module at the distributed generation.

Below is the circuit setup and configuration for Example 2. See Figure 18.

(a) An IntelliNode/Info-Only module is not installed at the distributed generation. Instead, **Transfer Trip** commands will be sent directly to the distributed generation protection relay using DNP3.0 protocol.

Note: Because there is no polling of the distributed generation relay for data, the real-time distributed generation load contribution may not be known. In this example, IR 7 is able to accurately measure the distributed generation load contribution because no load exists between it and the distributed generation source. If load did exist, a **Default DG Load Contribution** value must be set to allow the **IntelliTeam SG System** logic to accurately update the team loading information before restoration.

(b) An IntelliRupter fault interrupter (IR 7) is installed at the utility protection and isolation point. Without direct knowledge of the distributed generation breaker status, and with no load between IR 7 and the distributed generation source, the utility has decided to isolate the distributed generation from the utility grid by opening IR 7, and taking the distributed generation offline. IR 7 is configured to receive a **Transfer Trip** command and trip open. IR 7 is not configured to automatically reconnect the distributed generation source.

(c) IR1 is configured to send **Transfer Trip** messages to both IR 7 and the distributed generation relay when tripped because of a fault.

(d) The 6801 controls have **Sectionalizing** mode enabled and configured to open on three fault counts or two voltage-loss counts.

Note: Because the sensors are all pointing toward the normal source, the **Normal Current Direction** setpoint must be set to the **Sensor to Non-sensor** setting. Otherwise, the **IntelliTeam SG System** logic may not accurately determine team loading.

Note: Also, the **Disregard First Overcurrent** option on the *Setup>Restoration>IntelliTeam SG* screen in the 6800 Series controls must be set to "Yes."

(e) The 6801 controls are not configured to send a **Transfer Trip** command to the distributed generation relay.

(f) IR 4, IR 5, and IR 6 are not configured to send a **Transfer Trip** command to the distributed generation relay. In this case, the utility doesn't require taking the distributed generation offline when restoring load on adjacent feeders.

(g) 6801 8 and 6801 9 are not configured to send a **Transfer Trip** command to the distributed generation relay because they are on a radial tap with no restoration options.

Example 2—Fault in Team T 2

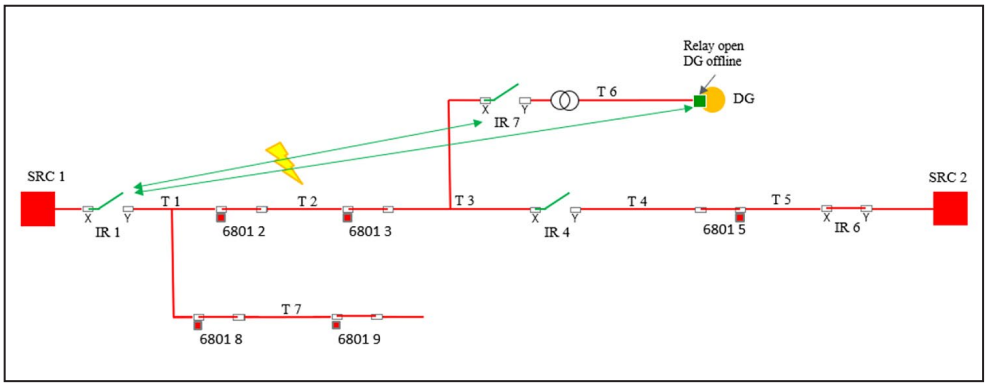

Figure 19. Example 2 showing a fault in Team T 2.

Below are the steps the IntelliTeam SG system takes to isolate the fault, trip the distributed generation offline, and restore the dropped load for Example 2. See Figure 19.

STEP 1. A fault on Team T 2 causes IR 1 to trip on overcurrent. IR 7 doesn't detect overcurrent and remains closed.

Note: In a mixed system of IntelliRupter fault interrupters and 6800 Series controls, the **IntelliTeam SG System** logic isn't able to accurately determine fault location if an IntelliRupter fault interrupter trips open because of distributed generation fault contribution. To avoid issues, the IntelliRupter fault interrupter's **Reverse Direction Overcurrent** threshold must be set higher than the maximum fault current contribution of the distributed generation as is the case with IR 7 above.

STEP 2. IR 1 sends **Transfer Trip** messages to both IR 7 and the distributed generation relay.

STEP 3. Both the IR 7 and the distributed generation relay trip open and reply to IR 1 indicating successful operation.

Note: A response is needed from all devices receiving the **Transfer Trip** message before the restoration process can continue.

Note: The distributed generation relay only sends an acknowledgement that the message was received. The **IntelliTeam SG System** logic has no way of knowing whether the distributed generation breaker actually tripped open.

STEP 4. IR 1 continues its test sequence. The 6801 2 and 6801 3 controls trip open on sectionalizing counts. IR 1 closes and remains in the **Closed** state.

Note: Because the 6800 Series controls are on the same circuit with an IntelliRupter fault interrupter, the first IntelliRupter fault interrupter test must be programmed for a hard close so the **IntelliTeam SG System** logic can correctly determine the fault location.

STEP 5. The IntelliTeam SG system updates its loading and capacity information, confirms availability, and then closes IR 4 to restore load up to IR 7.

Note: Because IR 7 isn't configured to automatically reconnect the distributed generation source after the circuit returns to the **Normal** state, the utility must manually close the switch and clear the **Manual** operation to place the team back into the **Ready** state.

Example 2—Fault in Team T 5

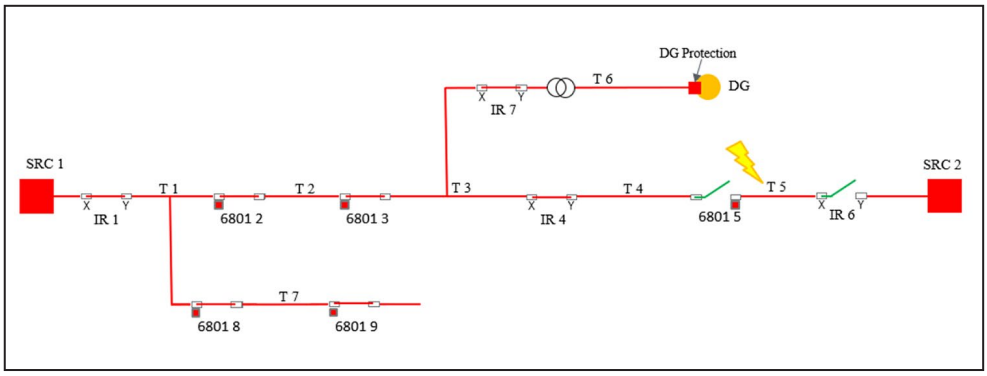

Figure 20. Example 2 showing a fault in Team T 5.

Below are the steps the IntelliTeam SG system takes to isolate the fault and restore the dropped load for Example 2. See Figure 20.

STEP 1. A fault in Team T 5 causes IR 6 to trip on overcurrent and go to the **Lockout** state after the test sequence completes. Because the distributed generation is on a different feeder, there is no fault contribution from the distributed generation source.

STEP 2. IR 6 isn't configured to send **Transfer Trip** messages and the distributed generation stays online.

STEP 3. The **IntelliTeam SG System** logic opens the 6801 5 control to further isolate the fault in Team T 5.

STEP 4. IR 4 verifies capacity and closes to complete the restoration.

Note: The normally open switch takes into account that distributed generation continues to contribute load and increases the capacity of SRC 1.

Example 3

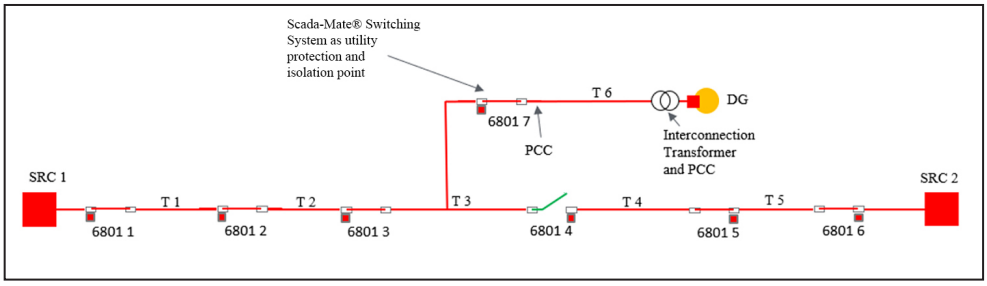

Figure 21. A circuit with all 6801 controls and no IntelliNode/Info-Only module at the distributed generation source.

Below is the circuit setup and configuration for Example 3. See Figure 21.

(a) Because an IntelliNode/Info-Only module is not installed at the distributed generation, the feeder breaker at SRC 1 will send a non-IntelliTeam-generated **Transfer Trip** command directly to the distributed generation protection relay to ensure it is switched offline.

Note: For circuits with only 6800 Series controls, the user must take the distributed generation offline using other means (external **Transfer Trip** commands or distributed generation relay protection) after initial trip to ensure the 6800 Series controls are able to accurately sectionalize the fault and determine the fault location.

(b) A Scada-Mate® Switching System with a 6801 control (6801 7) is installed at the utility protection and isolation point. The 6801 7 control is configured to receive a **Transfer Trip** message and trip open. To ensure the distributed generation gets switched offline, **Sectionalizing** mode is enabled in the control and the sectionalizing counts are set to one fault count and one voltage loss count. It is also configured to automatically reconnect distributed generation after the fault is repaired and the circuit is returned to the **Normal** state.

Note: Sending a **Transfer Trip** command in this case serves two purposes. It enables the **Reconnect DG on RTN** feature on the 6801 7 control. Only devices that receive a **Transfer Trip** message can automatically reconnect the distributed generation after the fault is repaired and the circuit is returned to the **Normal** state. It also ensures the distributed generation is isolated from the alternate source after restoration, if so configured.

(c) The 6801 1, 6801 2, and 6801 3 controls are configured to send a **Transfer Trip** message to the 6801 7 control when tripped open on sectionalizing counts.

(d) The 6801 4, 6801 5, and 6801 6 controls are not configured to send a **Transfer Trip** message to the distributed generation relay.

(e) All the 6801 controls (except for the 6801 7 control) have **Sectionalizing** mode enabled and configured to open on three fault counts or two voltage-loss counts.

Note: As noted before, all the controls also have the **Normal Current Direction** setting set to a **Sensor to Non-sensor** state and the **Disregard First Overcurrent** feature set to "Yes."

Example 3—Fault in Team T 2

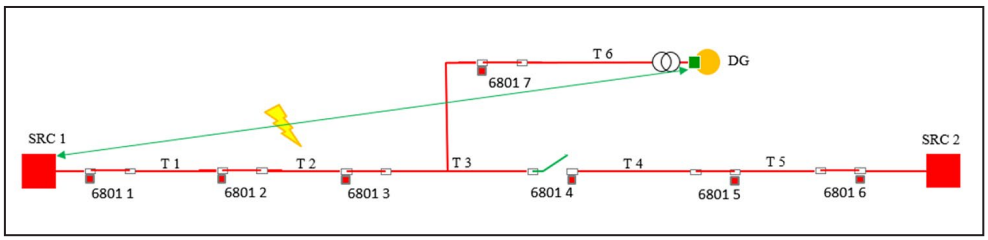

Figure 22. Example 3 showing a fault in Team T 2.

Below are the steps the IntelliTeam SG system takes to isolate the fault and restore dropped load for Example 3. See Figure 22.

STEP 1. A fault on Team T 2 causes the SRC 1 feeder breaker to trip on overcurrent.

STEP 2. The SRC 1 feeder breaker sends a **Transfer Trip** message to the distributed generation relay causing it to trip offline.

STEP 3. The 6801 7 control trips open on sectionalizing counts.

STEP 4. The SRC 1 feeder breaker continues its test sequence. The 6801 1, 6801 2, and 6801 3 controls trip open on sectionalizing counts.

STEP 5. The 6801 1, 6801 2, and 6801 3 controls send a **Transfer Trip** message to control 6801 7, which enables the **Reconnect DG on RTN** feature on the control. Because the 6801 7 control is already open, no switch operation occurs.

STEP 6. The 6801 7 control replies to the controls indicating successful operation.

STEP 7. The **IntelliTeam SG System** logic begins the restoration process by closing the 6801 1 control to pick up the dropped load on Team T 1.

STEP 8. The IntelliTeam SG system updates its loading and capacity information, confirms availability, and then closes IR 4 to restore load to the 6801 7 control.

Below are the steps the IntelliTeam SG system takes to return the circuit back to the **Normal** state and automatically bring the distributed generation online. See Figure 14.

STEP 1. The fault in Team T 2 is repaired and the 6801 2 control is manually closed to initiate the **ITSG Return to Normal** process, if enabled.

STEP 2. The **IntelliTeam SG System** logic closes the 6801 3 control and opens the 6801 4 control after the **Return to Normal (RtN) Timer** expires. SRC 1 is now feeding the load all the way to the 6801 7 control.

STEP 3. The 6801 7 control recognizes that Team T 3 is being fed by the normal source and activates the **DG Reconnect Delay Time** timer.

STEP 4. When the **DG Reconnect Delay Time** timer expires, the Scada-Mate switch is closed.

STEP 5. The distributed generation relay verifies good source voltage has returned and closes the distributed generation breaker.