Single-Phase Trip and Lockout

Overview

The IntelliTeam® SG Automatic Restoration System software can now restore loads following a **Single-Phase Trip and Lockout** operation performed by an IntelliRupter® PulseCloser® Fault Interrupter caused by a permanent single-phase-to-ground fault. This functionality is available in the 7.1.x and later software versions. Follow these instructions to set up and configure an IntelliTeam SG system with the IntelliTeam® Designer software and IntelliLink® Setup Software to support **Single-Phase Trip and Lockout** operation with IntelliRupter fault interrupters.

Single-Phase Trip/Lockout

The IntelliRupter fault interrupter can perform a **Single-Phase Trip and Lockout** operation on individual phases to isolate single-phase-to-ground faults when they occur. This capability helps improve reliability because it does not trip and lock out the other unfaulted phases, and this keeps power on for customers served by the unfaulted phases. With IntelliTeam SG software revisions before 7.1.x, the IntelliTeam SG system could not support **Single-Phase Trip and Lockout** operation with IntelliRupter fault interrupters because the earlier software required **Three-Phase** operation to fully isolate and restore circuits. The 7.1.x software revision now allows **Single-Phase Trip** operation and can isolate and restore around a **Single-Phase** operation.

This example shows how the IntelliTeam SG system now can isolate and restore service when an IntelliRupter fault interrupter trips and locks out a single phase because of a single-phase-to-ground fault condition.

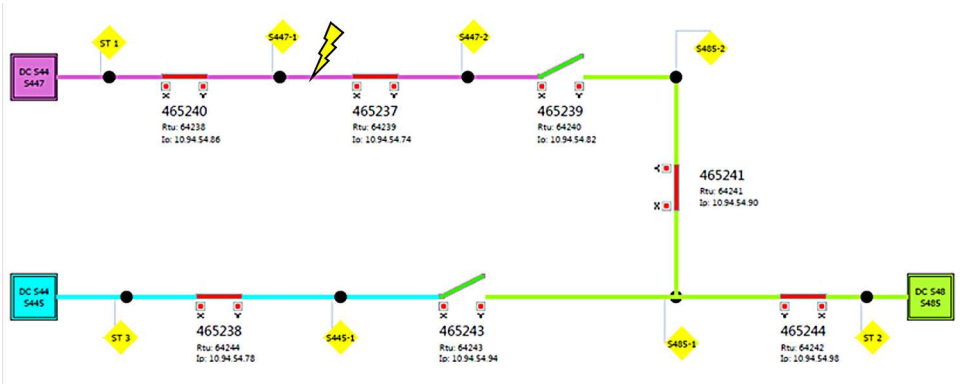

Figure 1. A single-phase fault occurs on the feeder.

Figure 1 shows a Phase-B-to-Ground (B-G) fault between IntelliRupter fault interrupters 465240 and 465237. The system takes these steps to isloate the single phase:

STEP 1. IR 465240 sees the permanent B-G fault, goes through its PulseClosing® Technology sequence (2sec, 10sec, 20sec), and locks out B-phase (leaving A-phase and C-phase live).

STEP 2. The IntelliTeam SG software communicates between the IntelliRupter fault interrupters to determine where the fault is and opens all three phases of the normally-closed IntelliRupter fault interrupter 465237 to further isolate the fault.

STEP 3. The IntelliTeam SG software restores load to the unfaulted section by closing all three phases of IntelliRupter fault interrupter 465239, if loading does not exceed the allowable transfer limit.

STEP 4. IntelliRupter fault interrupter 465240 (B-phase) and IntelliRupter fault interrupter 465237 (three-phase) remain open to isolate the faulted section. See Figures 2 and 3 on page 2.

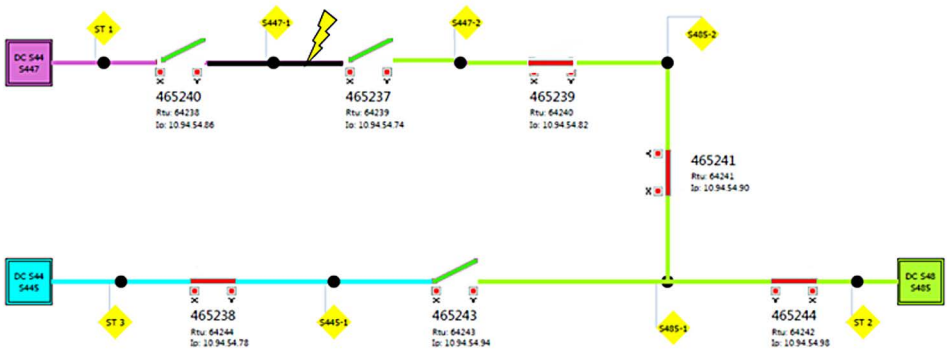

Figure 2. The IntelliTeam SG restoration result after the single-phase trip and lockout event.

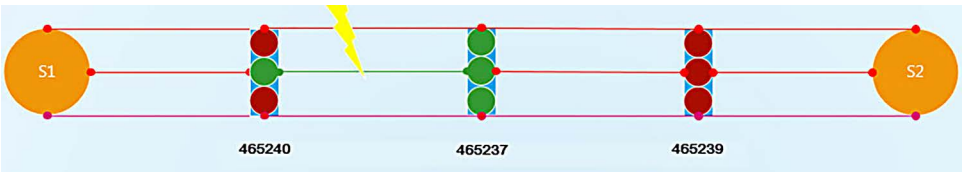

Figure 3. This shows the single-phase lockout when restoration is complete.

Setup and Configuration

Follow these steps to configure an IntelliTeam SG system with IntelliRupter fault interrupters for **Single-Phase Trip and Lockout** operation:

STEP 1. Draw the circuit using the IntelliTeam Designer application. For information about drawing circuits, see Instruction Sheet 1044-570, "S&C IntelliTeam® Designer: *User's Guide*."

STEP 2. Enter the necessary attributes for the circuit.

STEP 3. Validate and save the circuit drawing. Correct validation errors if any occur.

STEP 4. After validation, open the Communication Manager and push the netlist to the controls. See Instruction Sheet 1044-570, "S&C IntelliTeam® Designer: *User's Guide*," for information about the Communication Manager and pushing a netlist.

STEP 5. Open the IntelliLink® Remote Setup Software, connect to each IntelliRupter fault interrupter (one at a time), and verify they are configured for a **Single-Phase Trip and Lockout** operation by going to the *Setup>Protection>General Profiles* screen(s) and reviewing all the profiles that will be activated and used. See Figure 4 on page 3.

Note: It is highly recommended that you set up all **General Profiles** with **Single-Phase Trip** mode, if a single-phase trip is desired across all scenarios and conditions. The other settings for **Three-Phase Trip for Multiple-Phase Faults**, **Single-Phase Current Restraint, Phase**, and **Single-Phase Current Restraint, Ground** operations should be reviewed to check whether they should be changed from their defaults based on the desired operation.

Note: It is also recommended to set the **Three-Phase Trip for Multiple Phase Faults** feature to the **No** state. When enabled, it will trip all three phases for any fault that results in timing of multiple-phase elements, regardless of whether they are phase-to-phase faults or phase-to-ground faults. In a scenario where there are only two phases affected, this feature will trip all three phases instead of tripping just the two phases and keeping the third phase powered.

Note: The **Single-Phase Protection and Sectionalizing** and **Trip on Single-Phase Voltage** setpoints should be disabled. However, if they are used they should be configured to use **IntelliTeam SG** mode, and both the **Single-Phase Time to Trip** and **Unbalanced Time to Trip** setpoints should be configured to 90 seconds or more to allow the IntelliTeam SG system to close and restore before an IntelliRupter fault interrupter downstream of an event trips during a single-phase fault or loss-of-voltage event.

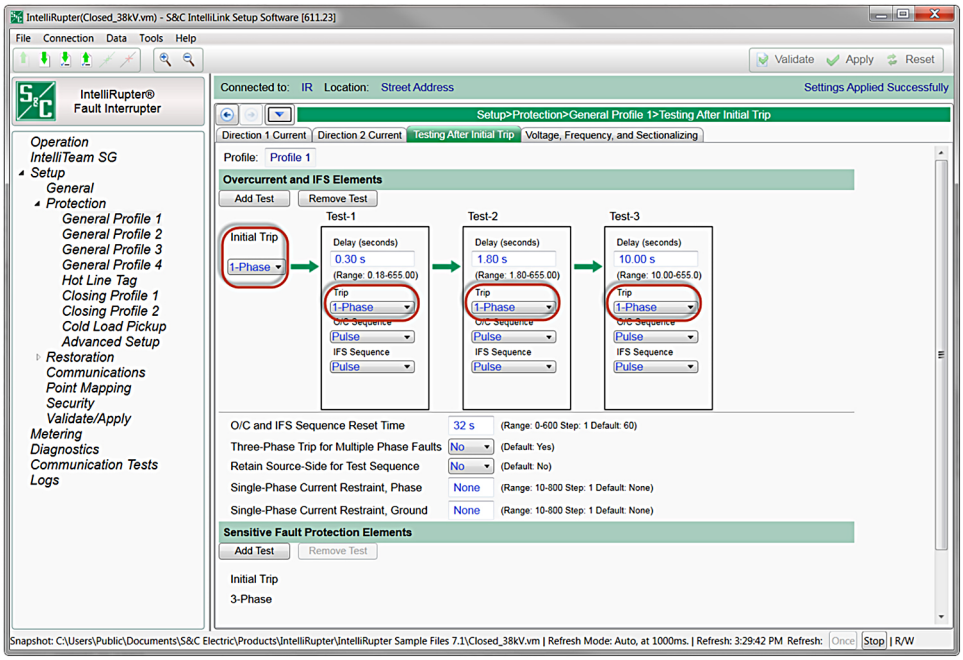

Figure 4. The *Setup>Protection>General Profiles* screen.

Limitations

The single-phase trip and lockout application with IntelliTeam SG software can only be used in systems that have IntelliRupter fault interrupters on the circuit. A mixed system with 6800 Automatic Switch Controls or IntelliNode™ Interface Modules is not supported and configuration should not be attempted.

Also, for the IntelliTeam SG system to properly identify a fault location and perform proper isolation and restoration, all the IntelliRupter fault interrupters on the circuit must be properly coordinated. This is a standard requirement for an IntelliTeam SG system but becomes even more important with this application because the desired end state after restoration is to keep as many phases powered as possible. Therefore, a detailed coordination study is recommended for circuits that will be using single-phase trip-and-lockout applications with the IntelliTeam SG software application.