Single-Pole Tripping Applications using the GE 850R Recloser/Switch Control

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Firmware versions: 2.6 and 2.7

Application

The GE 850R provides single-pole tripping and reclosing functions. The single-pole trip logic that is built into the 850R treats each phase separately and trips/closes each phase as a fault occurs. Some applications require the opening of more than one phase or opening and locking out all three phases. This application note describes operating for impending faults and opening multiple phases when in single-pole mode.

Picked-up-phase (impending faults) tripping logic

Figure 1 shows an example logic that performs two separate operations. Logic Section A trips any picked-up phase(s) when the relay has selected only one phase for tripping. Logic Section B trips three pole when the relay has two phases selected for tripping.

The logic in Logic Section A forces open any other phase that is picked up, in addition to the phase(s) initiating the trip. For example, if a fault occurs where two phases are involved because of an imbalance in the fault current, on one phase the time-overcurrent (TOC) element operates first. This is the tripping phase. The other phase, with a smaller operating current, is the picked-up phase - an impending fault. This logic clears both the tripping phase(s) as well as any picked-up phase(s) at the time of the initiating trip. It does not wait for the picked-up phase element to time out.
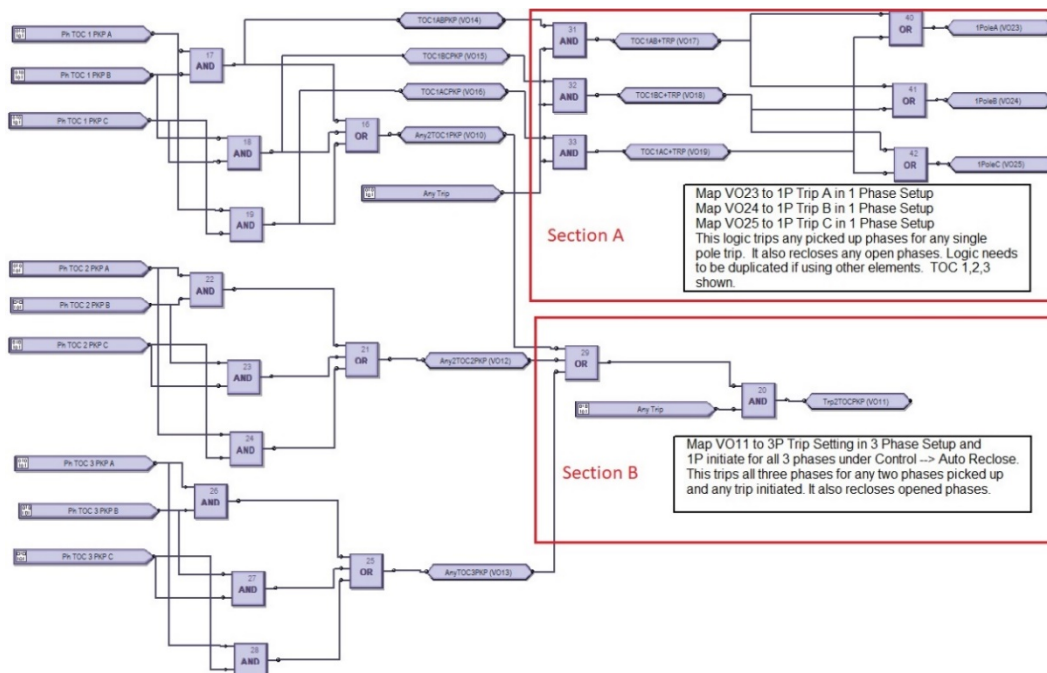

Figure 1. Picked-up-phase tripping logic

Figure 1 shows the use of TOC1, TOC2, and TOC3 elements. Duplicate this logic for additional tripping elements that are part of the scheme. Figure 2 and Figure 3 show the required settings in red to use Logic Section A (your virtual output numbers may differ).
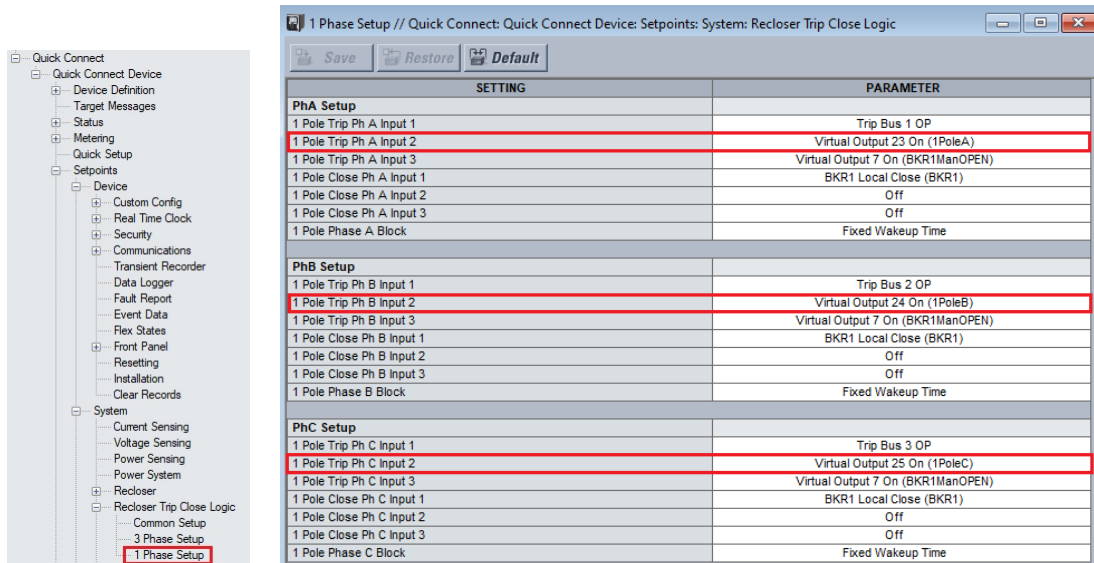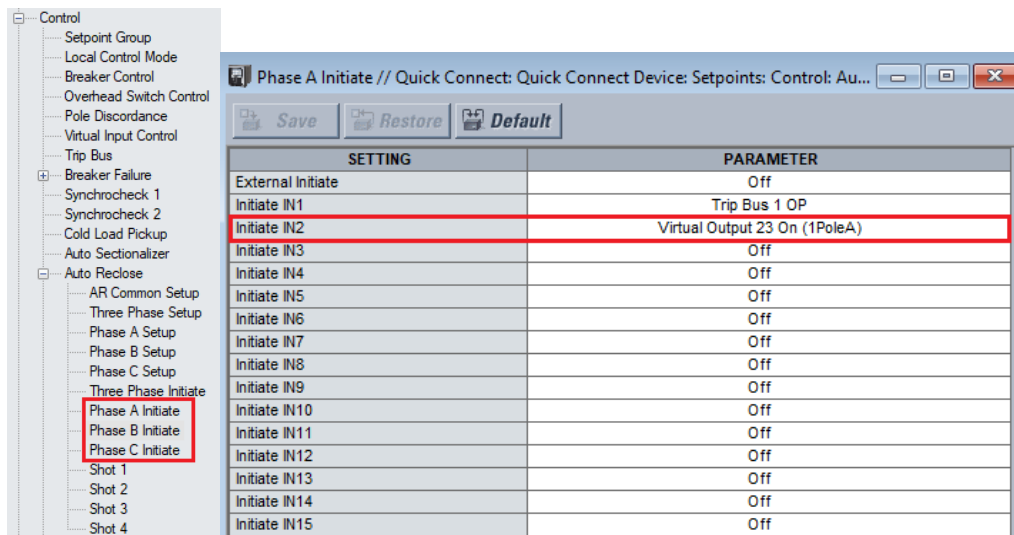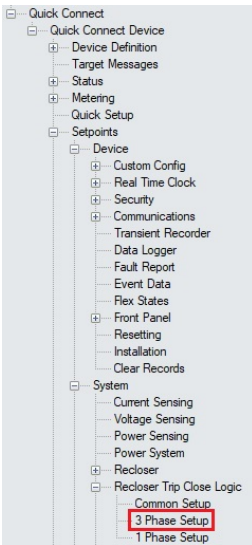

Figure 2. 1 Phase Setup settings

Figure 3. Phase Initiate settings (set Phase B and Phase C similarly)

Opening three phases when in single-pole mode

Logic Section B opens all three phases for any two phases picked up in a single-pole-tripping scheme. This is a situation where leaving a single phase closed is not allowed. VO11 takes any two picked-up phases and any issued trip to operate a three-pole trip, based on the settings shown in red in Figure 4 and Figure 5 (your virtual output numbers may differ). For the Phase Initiate settings (Figure 5) be sure to set all three phases.
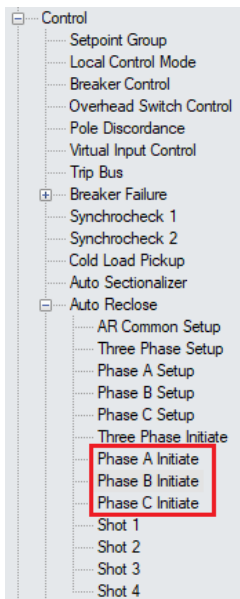
Figure 4. 3 Phase Setup, 3-Pole Trip settings for picked-up phases

Figure 5. Three-pole, Phase Initiate settings (set Phase B and Phase C similarly)

Three-phase lockout

There might be a requirement that the single phases operate separately, but for an any phase lockout condition, all three phases open and lockout. You can set the 850R to open and lock out all three phases if there is a fault on a single phase that progresses to a lockout state. This can be used to prevent extended imbalance on three-phase loads. Most faults are temporary. Most three-phase loads can withstand brief, single-phase interruptions. However, these loads cannot withstand extended single-phase or two-phase power. When a feeder has single-phase and three-phase loads, this option provides continuity for single-phase loads on temporary faults and protects three-phase loads for permanent faults. For example, three-phase loads such as motors can be damaged when

one phase drops. For these loads, it is better to open all three phases at the time of a single-phase lockout. The setting shown in red in Figure 6 performs this operation.
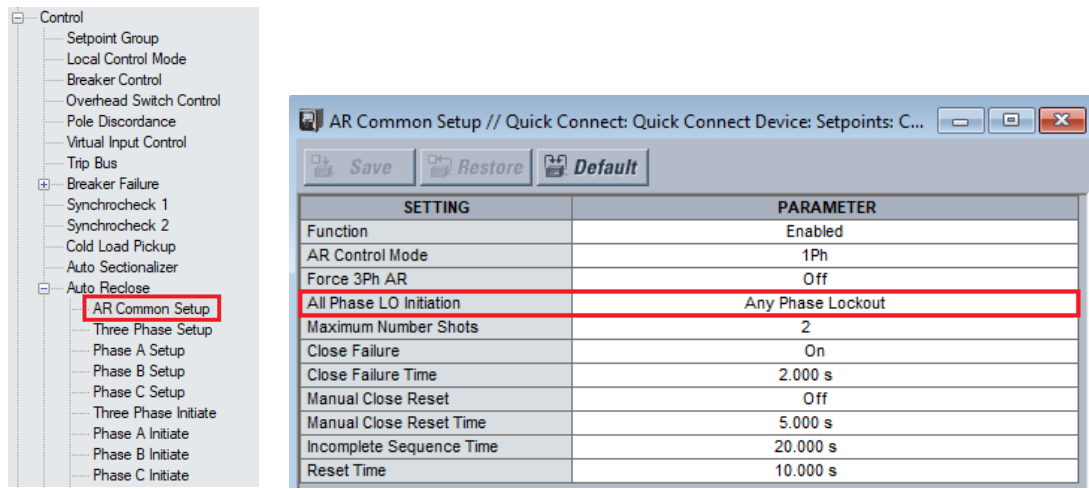

Figure 6. All Phase Lockout Initiation setting

Ground blocking

For single-pole tripping applications it might be necessary to block the ground tripping elements during reclosing. In this case, consider the zero-sequence ($3I\_0$) magnitude. An open phase causes imbalance, which increases $3I\_0$ current. A false operation could occur if $3I\_0$ magnitude rises above the setpoint for the neutral or ground elements. By factory default, programmable pushbutton PB 4 is mapped to Ground Trip Enable for all ground elements, as shown in Figure 7.
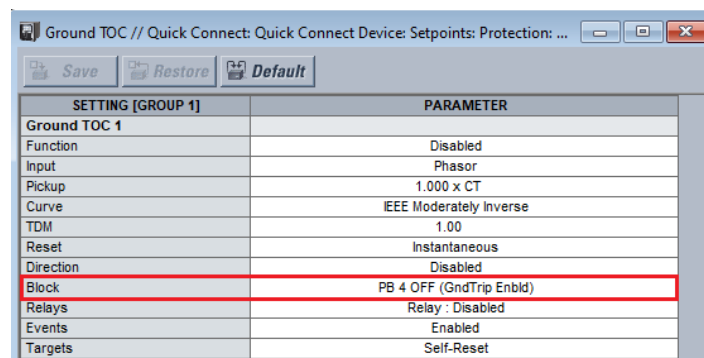

Figure 7. Factory default settings for Ground TOC1 Block

To retain pushbutton PB 4 functionality, as well as block the ground elements for any phase open, create the logic shown in Figure 8 and apply the settings shown in red in Figure 9 (your virtual output numbers may differ).
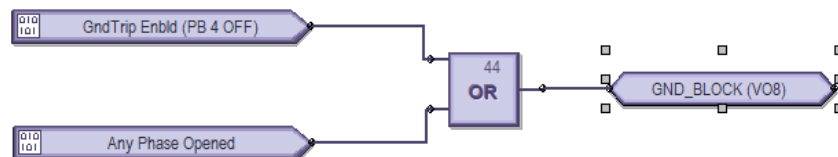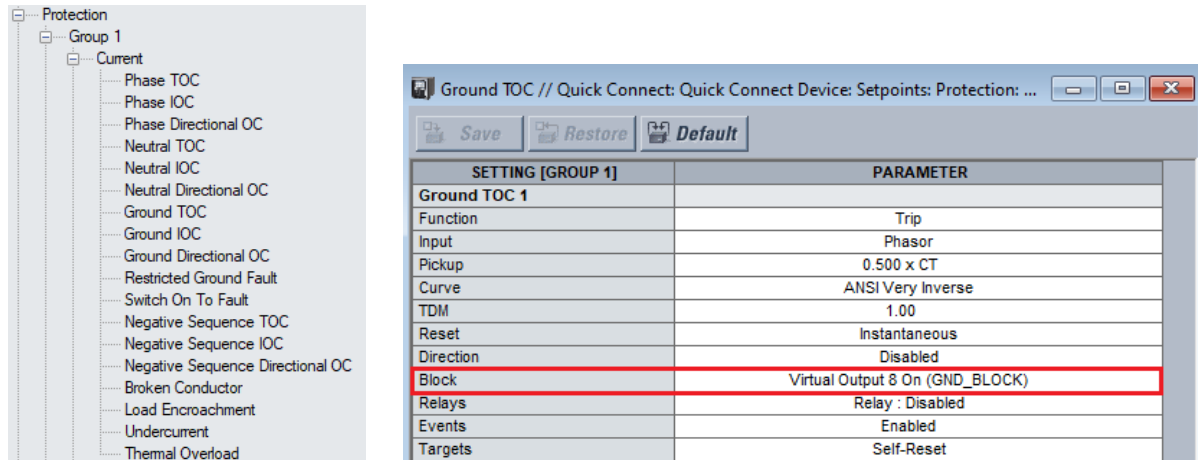

Figure 8. Ground-block logic

Figure 9. Ground Block settings using pushbutton PB 4

If pushbutton PB 4 functionality is not needed, apply the Block settings shown in red in Figure 10.
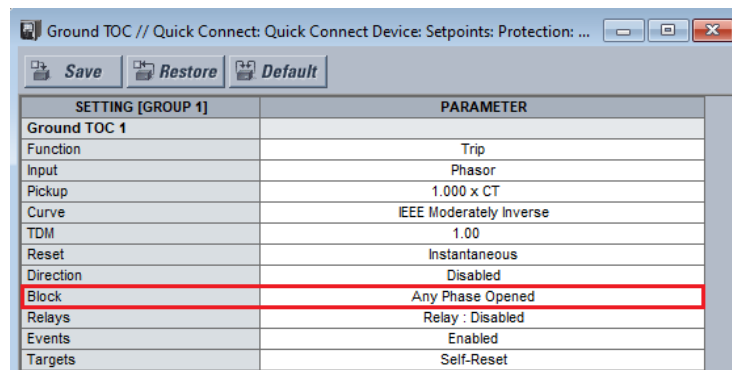

Figure 10. Ground Block settings, no pushbutton-PB4 functionality

Summary

The application and settings in this application note are a guide to help you design your single-pole tripping schemes. If you want to include other functionality, please contact your technical support representative. Factory technical support can be reached at 1-800-547-8629, or email: multilin.tech@ge.com.