Understanding Sequence Coordination

TripSaver II Cutout-Mounted Reclosers with firmware version 1.8 or later are equipped with an optional **Sequence Coordination Protection** feature users can configure to improve service continuity. Sequence coordination decreases the number of nuisance trips of the upstream (closer to the source) device when coordinating with downstream reclosers using a combination of fast and slow curves.

When the downstream recloser operates, the upstream recloser will switch (without operating) to a user-configured (usually slower) Sequence Coordination TCC curve. The upstream recloser will maintain the **Sequence Coordination** setting until the user-configured **Coordination Reset** timer expires.

As an example, consider typical settings of two reclosers on a long lateral. Figure 1 shows Recloser 1 (R1) in red is the upstream recloser set with a fast curve (A) and a slow curve (C). Each time current characteristic (TCC) curve represents two operations of the recloser. The A curve is the recloser's initial trip (TCC0) and TCC1. The C curve is the recloser's TCC2 and TCC3.

In Figure 2, Recloser 2 (R2) in black is the downstream recloser. It is also set with a fast (A) curve and a slow (C) curve. These curves are set so the downstream device will operate before the upstream (closer to the source) device.
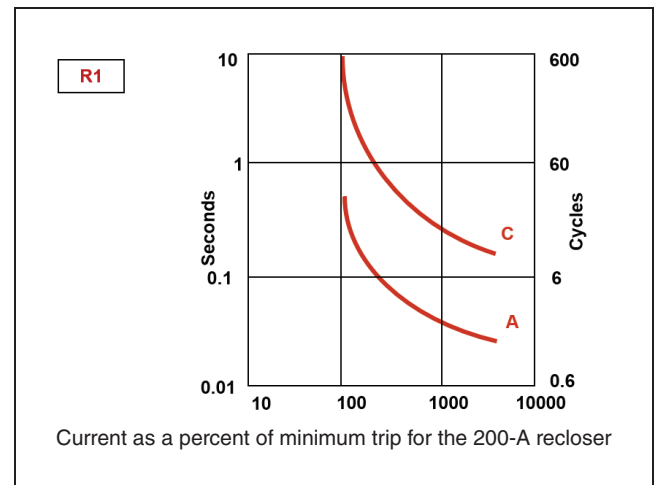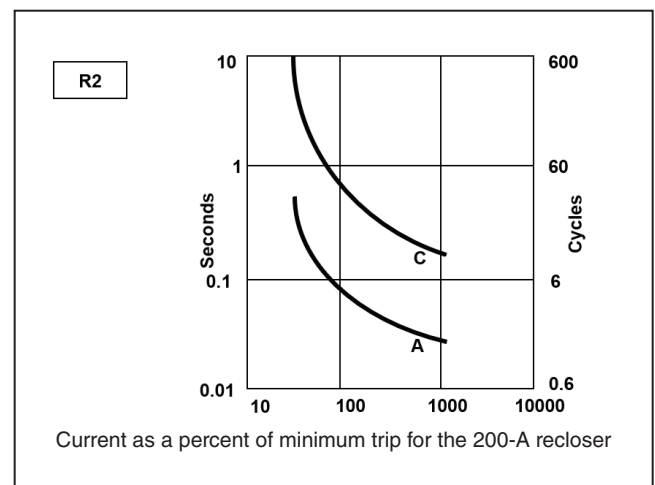

Figure 1. Recloser 1's TCC curve settings.

Figure 2. Recloser 2's TCC curve settings.

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Figure 3 shows a one-line representation of the reclosers on the lateral and the two reclosers' fast and slow sequences on the same graph together.
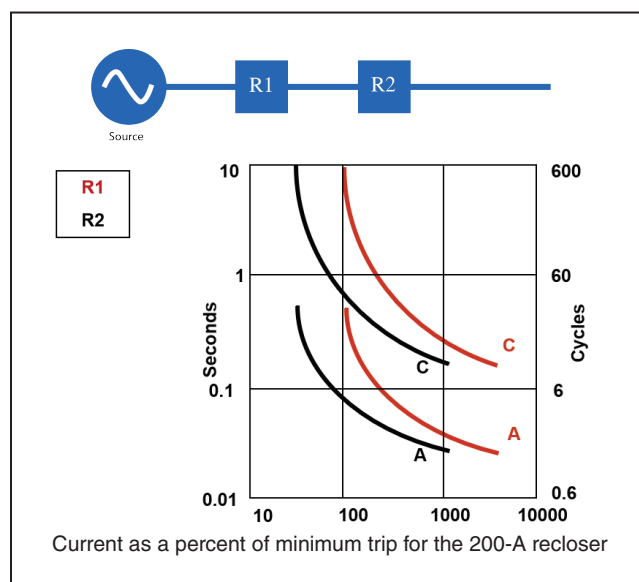

Figure 3. Recloser 1 and Recloser 2 curve settings

Faulted Circuit Without Sequence Coordination

When a fault happens downstream of R2, shown in Figure 4 as the dashed line, the R2's fast curve will operate twice using TCC0 and TCC1. Customers downstream of R2 will experience two operations.

As the fault persists, R1's fast curve (TCC0 and TCC1) will then pick up, and customers located between R1 and R2 will also experience two reclosing operations. See Figure 5. Customers downstream of R2 will have experienced four reclosing operations.

As the fault continues, the slow C curve of R2 will then pick up and operate (TCC2 and TCC3) to lockout.
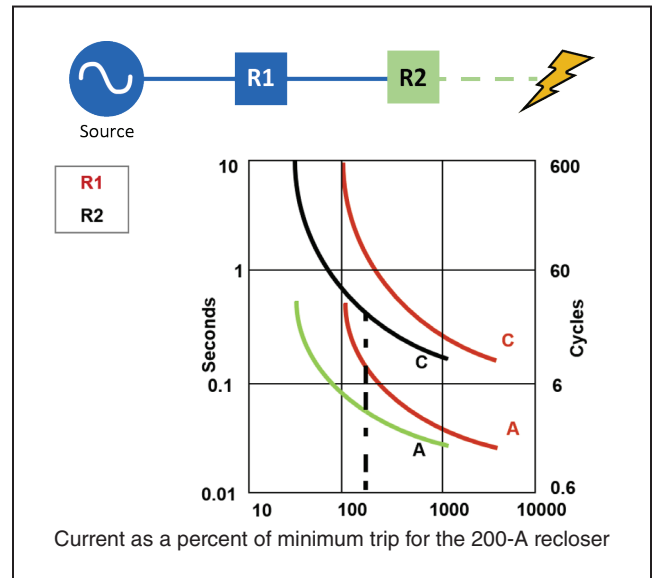

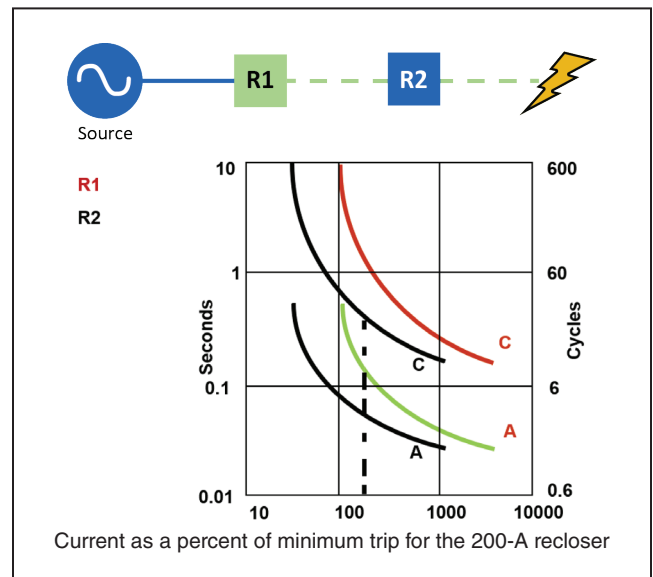**Figure 4. Recloser 2's A curve operation, shown in green.**

Figure 5. Recloser 1's A curve operation, shown in green

Customers downstream of R2 will have experienced
six operations. Customers between R1 and R2 will have
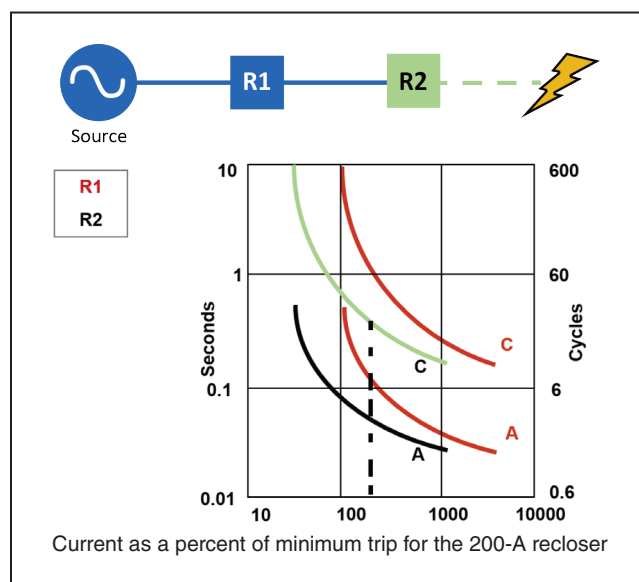experienced two. See Figure 6.

Figure 6. Recloser 2's C curve operation, shown in green

Faulted Circuit with Sequence Coordination

In the example shown in Figure 7, R1 is set with a Sequence Coordination TCC curve slightly slower than the R1 recloser's C curve for easy visibility on the graph. R1 will switch to this curve upon sensing a current-level drop from the fault level to a level below pickup. Figure 7 shows the A and C curves and the sequence coordination curve setting.

Note: It's perfectly acceptable to set the Sequence Coordination TCC curve to the same settings as the slow C curve.

Figure 8 shows the two reclosers fast and slow sequences and R1's Sequence Coordination TCC curve (in yellow) on the same graph.
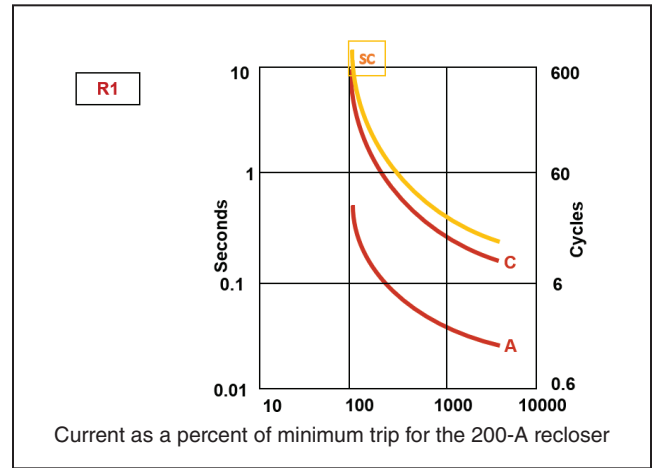

Current as a percent of minimum trip for the 200-A recloser

Figure 7. Recloser 1's A and C curves and the Sequence Coordination TCC curve (in yellow)

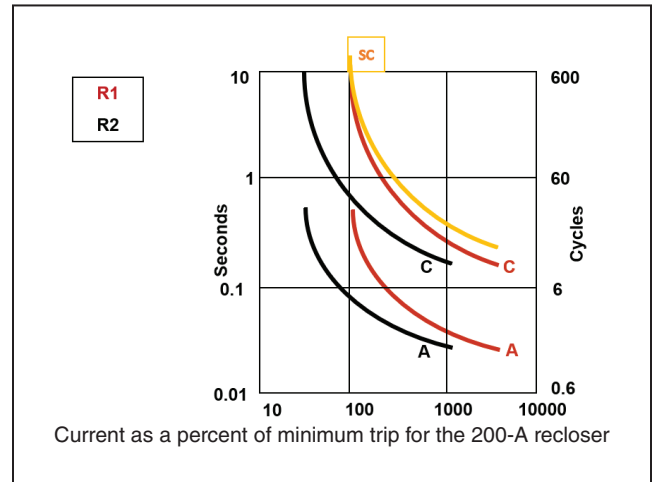Current as a percent of minimum trip for the 200-A recloser

Figure 8. Curves for Reclosers 1 and 2, including the Sequence Coordination TCC curve (in yellow).

Now, when a fault occurs downstream of R2, shown as the dashed line in Figure 9, R2's fast A curve will operate on TCC0 and TCC1. Customers downstream of R2 will have experienced two operations.

On the first operation on TCC0 of the downline recloser (R2), R1 sees the current level drop from a fault level to a level below pickup and switches to its slower Sequence Coordination TCC curve.

As the fault persists, R2's slower C curve will operate to lockout. Customers downstream will have experienced four operations. Customers between R1 and R2 will have experienced no operations. See Figure 10.
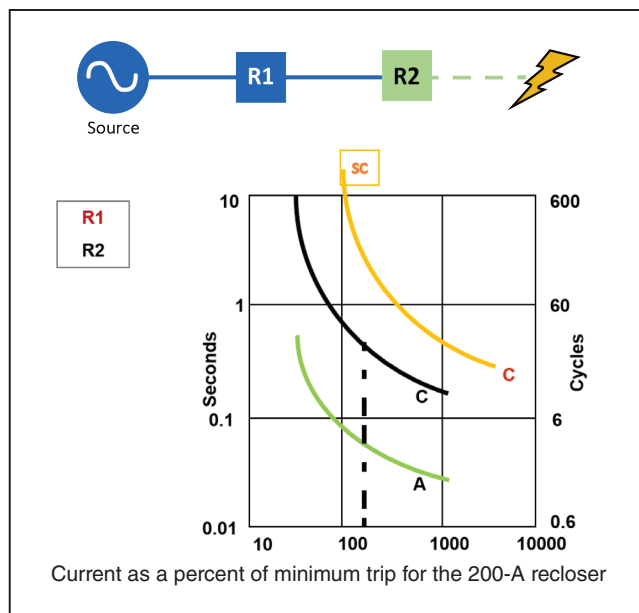

Figure 9. Recloser 2 operating on an A curve setting and Recloser 1 switching to the Sequence Coordination TCC curve (in yellow) without operating.
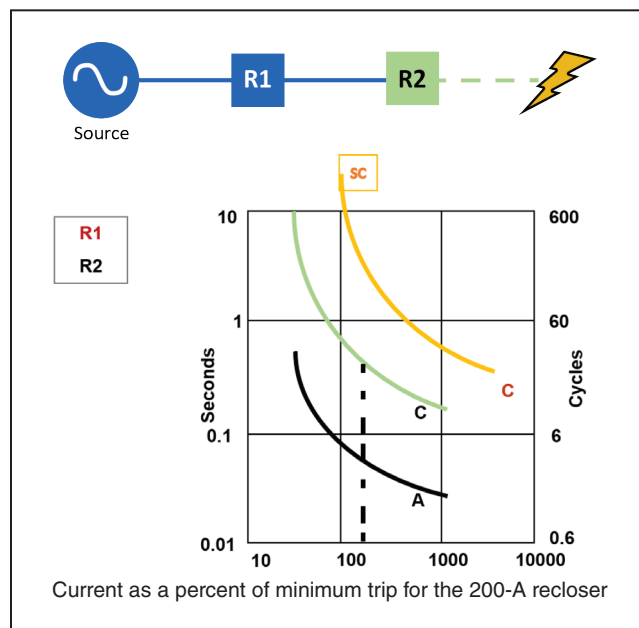

Figure 10. Recloser 2 operating to lockout, as shown in the Sequence Coordination TCC curve (in yellow)