Multilin 8 Series – Application Note

GE's Multilin 850 Feeder Protection System is part of the Multilin 8 Series platform of protection relays that share common hardware, firmware and PC Setup Software. Other relays in this platform include the Multilin 869 Motor Protection System, Multilin 845 Transformer Protection System, Multilin 889 Generator Protection System, and will include other protection devices in the future.

Benefits of the new Multilin 8 Series platform of relays are as follows

Fast, Secure and Accurate protection powered by superior signal processing

- **Larger CTs conversion range**, up to 46xrated current compared with a typical 24xrated range as used by similar class of protection relays. Having this wide CT range gives a user better awareness of fault currents at particular instances because the relay will measure and report high fault currents which are common in LV and MV applications. It also gives more flexibility, improving coordination with upstream and downstream protection devices.

- **High accuracy, high sampling rate** at 128 samples per cycle for oscillography and 64 samples per cycle for protection, compared with a typical 16 samples per cycle that has been traditionally offered by industrial protection relays. This level of accuracy and sampling ensures that even minute distortions in currents and voltages will be recorded and is available for analysis, making it possible to track transient phenomenon in the system.

- **Enhanced digital signal processing** delivered through enhanced filtering techniques and a protection pass of 8 times a cycle, provides more accurate, faster and more sensitive protection for critical feeder applications. This improves protection coordination and allows for a faster and more reliable fault clearance without sacrificing the security of the relay operation.

- **Improved response to CT saturation and other system transient conditions.** CT saturation in MV and LV installations presents a real problem: CT ratios are chosen per feeder load, which can be relatively low while fault current level can be very high. Additionally, space within switchgear sections for CTs is often limited, calling for a smaller size CTs, which in turn means smaller iron core and therefore lower knee point voltage. As a result, severe CT saturation often occurs and can be expected in these types of conditions. CTs subjected to a primary fault current hundreds of times its rated current will saturate severely - only relatively short duration peaks of limited current will be observed from the secondary of the CT. These peaks can be as low as 5-10% of the ideal (saturation free) secondary fault current, and will last a small fraction of a half-cycle, down to 1-2ms in extreme cases. To operate reliably during such conditions, the Multilin 850 offers an option to operate IOC based on either the fundamental or from the RMS quantity, with the later providing more reliable and faster operation.

Figure 1 (top right) shows the 850's operating curves, demonstrating capabilities of the relay to operate correctly with very small ratio and knee point voltage CTs, which traditionally may present application challenges when high level fault currents occur.

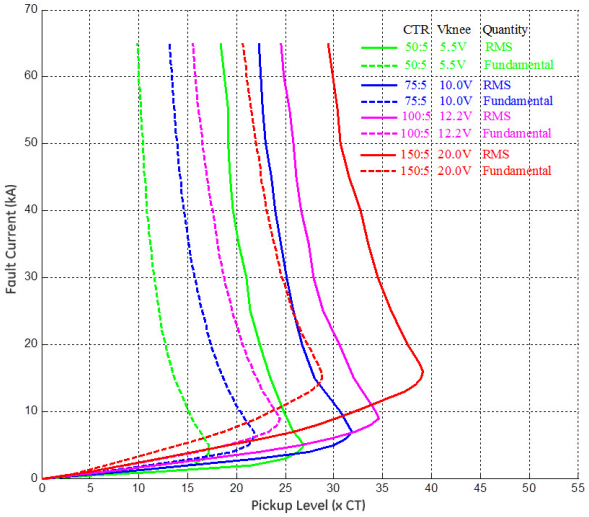

Figure 1.
Curves illustrating 850 IOC operate range for lower ratio CTs with fundamental phasor or RMS input.

Figure 2 compares the response and operation timing of the 850 as compared to a 16-samples per cycle protection relay when under a saturated current condition. In this example, a 10kA primary fault current with full DC offset is applied to a 75/5 CT with an IOC pickup setting of 10 x CT rated in both relays.

It can be observed that Multilin 850 offers better resolution due to the higher sampling rate of 64 samples per cycle. In addition, it can be observed that the 850's IOC fault detection occurs 16 ms faster than the IOC detection of the 16-samples per cycle protection device.

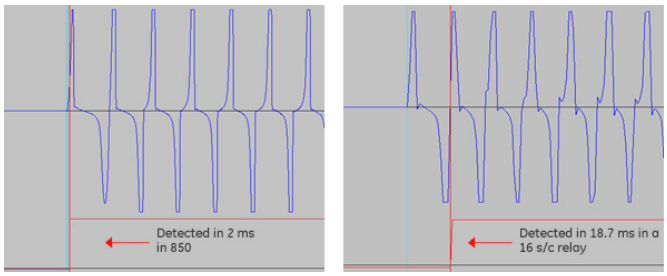

Figure 2.
10kA fault current 75/5 CT with saturation.

Comparison of the operate times including contact output time for the tested relays (850, Relay 1 and SR 750) is given in the table below. These tests were performed with different CT ratios and different fault current thus causing different CT saturation effects.

IOC operate time with CT saturation			
	850	Relay 1	SR750
Minimum	10.20	12.20	18.00
Maximum	12.60	17.40	22.30
Average	11.39	14.46	20.17

Table 1.
Comparison of the different relay operate time for saturated CTs tests.