

## Breaker Fail Logic for SEL 387E Relays

**BACKGROUND:** Breaker fail logic is added to a SEL 387E relay. When the primary breaker is commanded to open but fails, the secondary back-up breaker needs to open clearing the fault. Breaker fail logic is needed in many cases. Breaker failures can happen due to flash over or trip coil failure. Breaker fail circuits typically surround the primary breaker circuits and encompass a larger equipment outage.

**SOLUTION:** When the primary breaker is commanded to open with a trip signal, a breaker fail timer is started. The timer setting is typically double the time it takes for the standard trip to occur. The timer value is in the order of 15 cycles. If current in the primary breaker circuit goes below a low threshold value, the timer is reset, and no breaker fail is initiated. If the current in the primary breaker continues due to a breaker pole not opening or a flash over event, the breaker fail timer times out and opens the secondary breaker circuit.

**SYSTEM:** Standard internal relay timers and status variables are used to implement the breaker fail logic.

BF-TIMER-INPUT=(TRIP OR BF-TIMER-INPUT) AND (PRIMARY BREAKER AMPS STILL FLOWING);

BF-TIMER-OUT = BF-TIMER-INPUT FOR 15 CYCLES;

BF-TRIP=BF-TIMER-OUT;

**RESULT:** Testing of the breaker fail logic involves blocking the primary breaker open signal so that current flows after the TRIP signal is present. Testing shows this logic works as designed. Typically a 15 cycle timer is used. Longer timer values can be used to increase security but will potentially cause more fault damage. The TRIP signal forces the BF-TIMER-INPUT to logical 1, BF-TIMER-INPUT then latches itself logical 1 until PRIMARY BREAKER AMPS STILL FLOWING goes to logical 0. If BF-TIMER-INPUT continues at logical 1 for greater than 15 cycles, BF-TRIP is forced to logical 1 and trips open the secondary breaker fail circuit.

