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| Model Name: Fast Load Shedding Circuit Breaker | | |
| Name and affiliation of author or POC:  Reynaldo Salcedo, MIT Lincoln Laboratory | Model Symbol: | Accreditation (TRL?):  SimPowerSystems standard |
| Date of Publication:  3/15/2017 |
| Version Information:  1.0 |
| Model accessibility (open source, license, …):  Open source |
| Model Description and Theory of Operation:  Three single-phase circuit breaker with user defined open/close mechanical delays. There are two methods to open this breaker model. First, as the regular circuit breaker using a relay signal, and second, using a discrete signal representing fast load shedding (FLS) trip command (trip only). For MIT-LL Banshee model, the fast load shedding discrete signal is generated via hardware controlled SEL-2440. The logic of operation using a relay (1-closed; 0-open) is provided externally via a bus\_creator block with label “Logic\_trip”. The breaker model also facilitates the system measurements for relays or user defined functions. The fast load shedding trip signal supersedes all relay commands and operated on a rising edge.  List of References:   * See SimPowerSystems documentation * See Circuit Breaker documentation | | |
| Model Specifications:  The circuit breaker is implemented using the default SimPowerSystems ideal switch units, function blocks, and delays from Simulink. Additionally, multiple resistors were added to reduce numerical stability issues; the values of these resistors should not affect simulation results.  The connectivity convention adopted for this block is as follows: ABC indicates the “entry-point” or line, and the abc indicates the “exit-point” or bus.  Assumptions and Limitations   * Nominal frequency is assumed to be 60Hz * Mechanical delay for open and close operations are approximately of same value * The initial condition as defined by “Logic\_trip” is held for 6 cycles of 60 Hz * Circuit breaker parasitic parameters are not modeled | | |
| Interfacing Information (platform, input requirements, possible outputs):   1. Inputs:   “Logic\_trip” from a relay or a manual control  “FLS trip signal”, discrete signal to disconnect load   1. Outputs:   Measurements of voltage, current, and breaker status.   1. Electrical connections:   A, B, C phase connections are the primary.  a, b, c phase connections are the secondary.   1. Parameters:   Ts (seconds) – Simulation sample time  Mechanical Delay (seconds) – Breaker mechanical delay | | |
| Diagrammatic Representation of Model Internals: | | |
| Model Validation (technique used, evidence):  The model is not validated against actual hardware. The model’s operations proved suitable for demonstrations and selected slow transient studies. | | |
| Simulation Platform, Solvers:  Matlab 2013a with Simscape. A discrete Tustin solver with 100us time step was used. | | |
| Known Issues:  Model operates on single contact trigger signal combining ANSI 52a/52b. | | |
| Models which use this block:  Basic element for numerous distribution systems. | | |