

GE
Digital Energy

Advanced Transformer Control

8 Series Mini Paper



Comprehensive Transformer Protection with Advanced Circuit Breaker Control

Part of the Multilin 8 Series of modern Protection & Control devices, GE's Multilin 845 Transformer Management Relay offers advanced protection, control, asset health monitoring, with advanced communications for Medium and Large 2- and 3-winding power transformers. As part of this advanced platform the Multilin 845 is built from common hardware, firmware, and utilizes the same simplified device setup software as the other Multilin 8 Series devices reducing training, setup and commissioning time and effort, and maintenance requirements. Other relays in this platform include the Multilin 850 Feeder Protection System and Multilin 869 Motor Management System.

Breaker Control

The Multilin 845 Transformer Management System features a number of control functions which will help operators optimize control and interlocking of the breakers and other equipment of the power transformer.

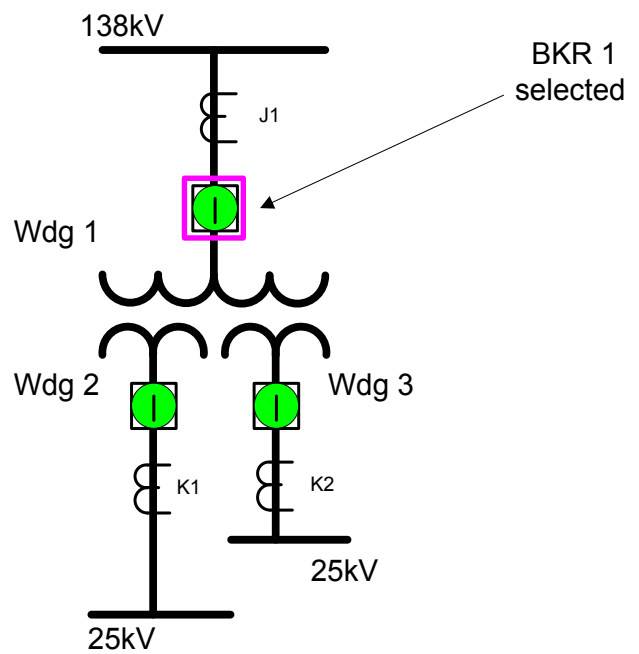
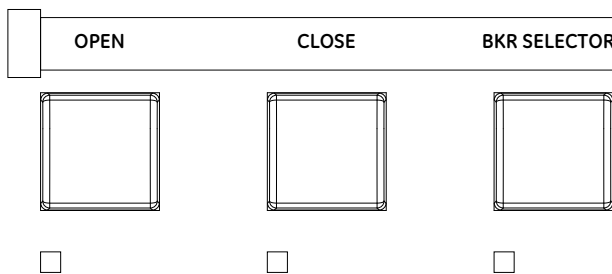
Front Panel / Remote Control

The Multilin 845 relay provides breaker control for up to three breakers either locally via control pushbuttons located on the front panel of the relay, or remotely from external contacts such as SCADA commands over supported communications media.

When in local mode, pushbutton PB3 "BRK SELECTOR" is used to select any transformer winding breaker for further operation. Once the breaker is selected, the pushbuttons PB1 "OPEN" and PB2 "CLOSE" are used to initiate breaker open and breaker close commands respectively.

Selection of the breaker and the status of the controlled breaker are displayed graphically on the relay's large, color front panel display.

This individual breaker control allows users to eliminate the need for panel control pushbuttons, thereby reducing wiring to control breakers, either locally or remotely. Operators can perform breaker control functions in both normal and emergency situations.



Protection Trip Breaker Selection

As the Multilin 845 relay is designed to protect both 2 and 3-winding transformers, the relay provides a number of transformer specific protective functions including over-current, over- and under-voltage, frequency, and power functions. Through their requirements, these functions allow for selectivity, defining which breaker should be tripped during a fault condition and which one(s) should not. For example, for some specific protection functions such as transformer differential protection, all transformer breakers are required to trip. For other functions, such as Time Over-Current protection that is used as backup protection for outgoing feeders, it may be required to trip the breaker associated with a specific winding. The Multilin 845 relay offers the flexibility to meet these different requirements with the ability to select trip per breaker from the menu of each element.

The Trip and Close relay outputs can be programmed for each breaker, from the breaker menu, as shown below:

| ..\Breakers\Breaker 1 | | |
|---------------------------|--------------------|------|
| Setpoints | Value | Unit |
| BKR 1 Name | BKR 1 | |
| BKR 1 Contact Input 52a | Off | |
| BKR 1 Contact Input 52b | Off | |
| BKR 1 Connected | Off | |
| BKR 1 Trip Output Select | Aux Relay 1 | |
| BKR 1 Close Output Select | Aux Relay 2 | |

BKR 1
BKR 2
BKR 3

| ..\Breakers\Breaker 2 | | |
|---------------------------|--------------------|------|
| Setpoints | Value | Unit |
| BKR 2 Name | BKR 2 | |
| BKR 2 Contact Input 52a | Off | |
| BKR 2 Contact Input 52b | Off | |
| BKR 2 Connected | Off | |
| BKR 2 Trip Output Select | Aux Relay 3 | |
| BKR 2 Close Output Select | Aux Relay 4 | |

BKR 1
BKR 2
BKR 3

Once programmed in the breakers menu, the Trip outputs are defaulted to "Operate" in the menu of any protection element upon "Trip" function selection. One can easily deselect the trip outputs for the breakers which do not need to trip during operation. If "Alarm" or "Configurable" function is selected for the element, the selected trip outputs will automatically revert to "Do Not Operate".

Once the protective function is selected as Trip, close Output Relays 2, 4 and 10 are excluded from the list, Trip Output Relays 1, 3 and 9 defaulted to "Operate" but, are available for modification by the user.

Trip selection provides high flexibility and programmability for the Multilin 845 relay to meet specific application and customer needs, ensuring greater asset performance and extended transformer life.

| ..\Current\Phase IOC 1 | | |
|------------------------|----------------|------|
| Setpoints | Value | Unit |
| Function | Trip | |
| Signal Input | CT Bank 1 – J1 | |
| Input | Phasor | |
| Pickup | 10.00 | x CT |
| Direction | Disabled | |
| Pickup Delay | 0.000 | s |
| Dropout Delay | 0.000 | s |
| Block | Off | |
| Output Relay 1 | Operate | |
| Output Relay 3 | Operate | |
| ... | | |
| Output Relay 9 | Operate | |
| Output Relay 11 | Do Not Operate | |
| ... | ... | |
| ... | ... | |
| Events | Enabled | |
| Targets | Self-Reset | |

PTOC 1
PTOC 2
PTOC 3
PIOC 1
PIOC 2

Breaker Failure and Synchrocheck

The Multilin 845 relay provides Breaker Failure protection which may eliminate the need for a standalone breaker failure relay. Up to three Breaker Failure elements are provided for 3-winding transformer applications. Each Breaker Failure element operates from A, B, C and N currents for the selected CT bank and has 3 different stages for greater user convenience.

For applications when it is required to check synchronism between two parts of the system before closing any winding breaker, a synchrocheck function is provided. This function will declare synchronism between parts of the system being connected if a difference in voltage magnitude, frequency and phase between 2 system voltages is within permissible limits.

| Home \BF1\BF1 Setup | | |
|---------------------------|---------------|------|
| Item Name | Value | Unit |
| Function | Disabled | |
| Signal Input | CT Bank 1 -J1 | |
| PH Retrip Superv Pickup | 1.000 | x CT |
| NTRL Retrip Superv Pickup | 1.000 | x CT |
| Supervision | Current | |
| Breaker Closed | Off | |
| T1 Pickup Delay | 0.120 | s |
| T2 Pickup Delay | 0.120 | s |
| T3 Pickup Delay | 0.120 | s |
| Phase Highset Pickup | 1.000 | x CT |
| Neutral Highset Pickup | 1.000 | x CT |
| Lowset Delay | 0.000 | s |
| Phase Lowset Pickup | 1.000 | x CT |
| Neutral Lowset Pickup | 1.000 | x CT |
| Dropout Delay | 0.100 | s |
| Block | Off | |

| Home Setpoints\Control\Synchrocheck 1 | | |
|---------------------------------------|----------|------|
| Item Name | Value | Unit |
| Function | Disabled | |
| Bus Volts Input | J2-3VT | |
| Line Volts Input | J2-Vx | |
| Max Freq Difference | 0.20 | Hz |
| Max Angle Difference | 20 | ° |
| Max Volt Difference | 2000 | V |
| Max Freq Hysteresis | 0.05 | Hz |
| Dead Source Perm | Disabled | |
| Live Bus Volts Min | 0.80 | x VT |
| Live Line Volts Min | 0.80 | x VT |
| Dead Bus Volts Max | 0.20 | x VT |
| Dead Line Volts Max | 0.20 | x VT |
| Block | Off | |

