POWERFACTORY

PowerFactory 2021

Technical Reference

ABB REJ 523

Contents

1   Model information

Manufacturer   ABB

Model   REJ 523

Variants   This model covers the features present in the ABB REJ 523 relay.

2   General description

The phase overcurrent micrprocessor relay REJ 523 is intended for selective short-circuit protection in medium voltage distribution networks but can also be used for protection of generators, motors and transformers.

The ABB REJ 523 relay has been modeled using the PowerFactory ABB REJ 523 relay model which includes any protective element available in the relay.

The model implementation has been based on the information available in the relay manual [1].

3   Supported features

3.1   Measurement and acquisition

It represents the interface between the power system and the relay protective elements. The phase currents flowing in the power system are converted by an element simulating a 3 phases CT; the secondary currents are then measured by one element modeling the digital filter of the relay.

3.1.1   Available Units

- one 3phases current transformer ("Ct" block)
- one 3phases phase measurement element ("Measure" block)

3.1.2   Functionality

The "Ct" block represents an ideal CT. Using the CT default configuration the current at the primary side is converted to the secondary side using the CT ratio. The CT saturation and/or its magnetizing characteristic are not considered. Please set the "Detailed Model" check box in the "Detailed Data" tab page of the CT dialog and insert the data regarding the CT burden, the CT secondary resistance and the CT excitation parameter if more accurate simulation results are required.

The measurement block models the digital sampling of the relay implementing a DFT ("Discrete Fourier Transform") filter using 20 sample /cycle and operating over a full cycle. Please notice that

no info is available in the ABB REJ 523 relay manual about the sampling rate or the measuring algorithm. For this reason an implementation common in many protective relays has been used.

3.1.3   Data input

Please notice that the CT secondary nominal current value must be entered in the measurement unit.

3.2   Protective elements

A set of inverse time and definite time overcurrent elements is modeling the relay protective functions. The inverse characteristics available in the relay are available as well in the inverse time model block.

3.2.1   Available Units

- one phase current inverse time overcurrent protective element ("I>" and "I> (def time)" block)

- one phase current definite time overcurrent protective element ("I>>" block)

- a "breaker failure" element ("CBFP" and "Min I" block)

- a "start situation detector" element ("Inrushdetector", "ICalc", "0.12In", "1.5In" and "1.25In" block)

3.2.2   Functionality

Protective elements   The PF model contains all the protective elements available in the relay. The inverse time overcurrent element supports the following trip characteristics:

- Definite time

- IEC "Extremely inverse"

- IEC "Very inverse"

- IEC "Normal inverse"

- IEC "Long time inverse"

- "RI Inverse time"

- "RD Inverse time"

Breaker Failure   The "CBFP" block is a timer which is operating the relay model "PO2" output signal when the earth current is still present after *CBFP* (relay setting) seconds that the "PO1" output signal has been activated.

Start situation detector   The start situation detection logic is implemented by some overcurrent/undercurrent elements simulating the start detection logic thresholds (the "0.12In", the "1.25In" and the "1.5In" block) and by a timer ("Inrushdetector" block) which is forcing the signal reporting the start condition to remain on until the current isn't smaller than 1.25 In. The start detection signal is then used by the "ICalc" block which is dividing by two the current feeding the "I>>" element if the start situation has been declared.

A start situation is defined as a situation where the phase current rises from a value below 0.12 x I> to a value above 1.5 x I> in less than 60 ms. The start situation ends when the current falls below 1.25 x I>.

3.2.3   Data input

The relationships between the relay settings and the model parameters can be found in the following table:

Address	Relay Setting	Model block	Model setting	Note
	Stage I> start value (I>/In)	I>	Current Setting	
		I>(def time)		
	Stage I> time current characteristic	I>	Characteristic	
	Stage I> operate time t>	I>(def time)	Time Dial	
	Stage I> time multiplier k	I>	Time Dial	
	Stage I>> start value (I>>/In)	I>>	Pickup Current	
	Stage I>> operate time t>>	I>>	Time Setting	
	CBFP	CBFP	Time Setting	Breaker failure timer

Protective elements   Please enable the "I>" block and disable the "I> (def time)" block if an inverse trip characteristic should be used in the first ground element. Vice versa disable the "I>" block and enable the "I> (def time)" block if a definite time trip characteristic should be used in the first ground element. Please notice that by default when a new relay instance is created the "I>" block is disabled.

The reason why two separated blocks have been used is that the definite trip characteristic allows a start value range larger than start value range allowed by the inverse trip characteristics.

Breaker Failure   Please insert the "CBFP" relay setting as "Time setting" of the "CBFP" block in the PF relay model.

Start situation detector   No data input is required. The feature can be deactivated disabling the "Inrushdetector" block.

3.3   Output logic

It represents the output stage of the relay; it's the interface between the relay and the power breaker. Moreover it implements the breaker failure feature.

3.3.1   Available Units

- one output element ("Output Logic" block)

- one collector of the protective elements trip signals ("Trip Logic" block)

3.3.2   Functionality

The "Output Logic" block is collecting the trip signals coming from the protective elements and operating the relay output contact.

The output signal operating the breaker is "PO1"; the output signal "PO2" is available as well and is controlled by the breaker failure feature. Please notice that the power breaker is not operated by "PO2".

Two additional signals are available to simulate the behavior of the starting signals of the earth fault elements: "TStartIM" represents the starting signal of the "I>" element, "TStartIMM" represents the starting signal of the "I>>" element.

3.3.3   Data input

To disable the relay model ability to open the power circuit breaker simply disable the "Output Logic" block.

4   Features not supported

- none

5 References

[1] ABB Ltd Distribution Automation, P.O.box 699, FI-65101 Vaasa , FINLAND. *Earth-Fault Relay REJ 523 Technical Reference Manual 1MRS750940-MUM Issued: 14.09.1998 Version: D/14.11.2005*, 1998.