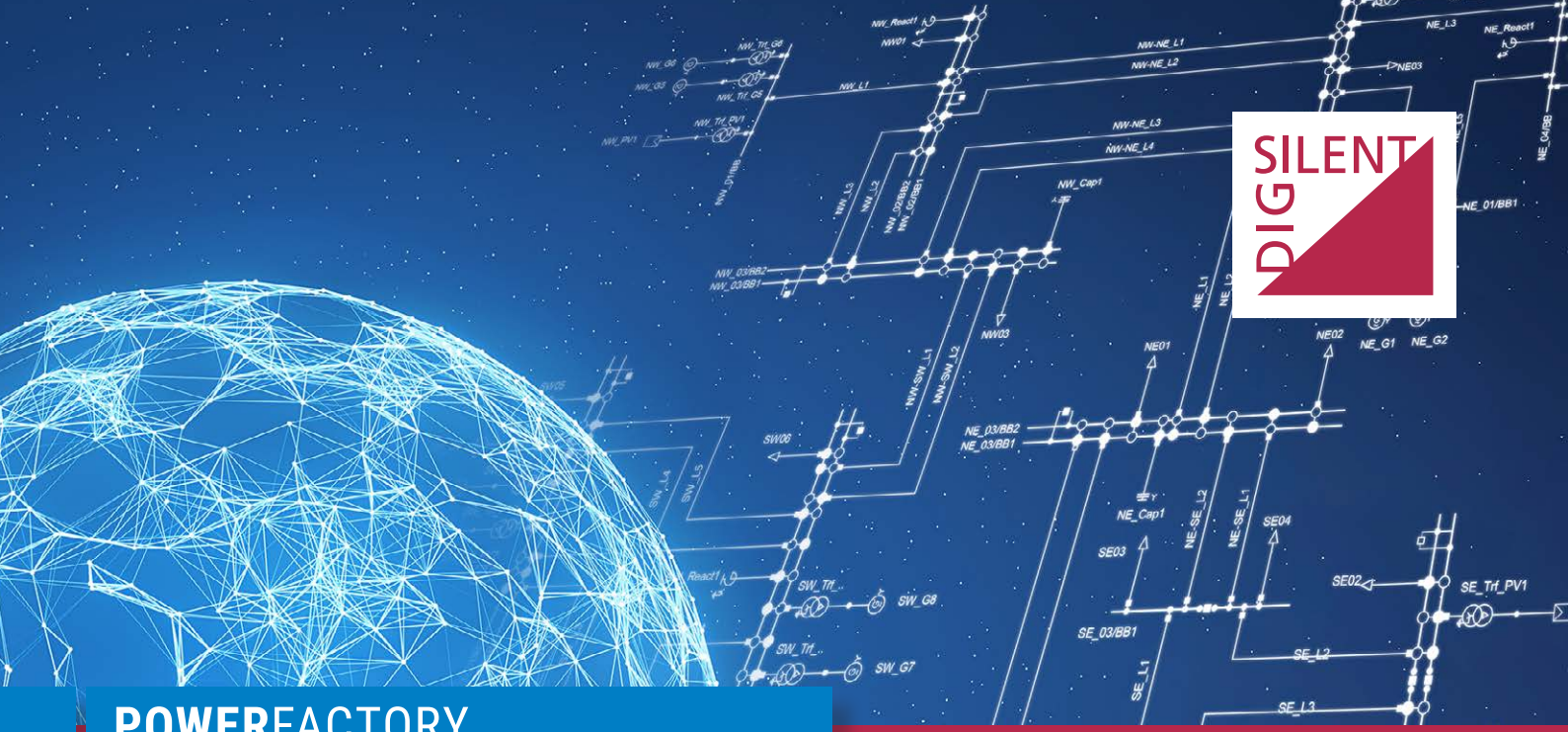

POWERFACTORY

PowerFactory 2021

Technical Reference

ABB/Westinghouse RACID

PF2021

POWER SYSTEM SOLUTIONS

MADE IN GERMANY

Publisher:
DIgSILENT GmbH
Heinrich-Hertz-Straße 9
72810 Gomaringen / Germany
Tel.: +49 (0) 7072-9168-0
Fax: +49 (0) 7072-9168-88
info@digsilent.de

Please visit our homepage at:
https://www.digsilent.de

November 15, 2019
PowerFactory 2021
Revision 924

Contents

1 Model information

Manufacturer ABB/Westinghouse

Model RACID

Variants This family of PowerFactory relay model types simulate the RACID overcurrent relays originally manufactured by Westinghouse and then by ABB;

2 General description

The ABB/Westinghouse RACID protective relays are phase and ground current microprocessor non directional inverse time overcurrent devices.

The ABB/Westinghouse RACID family of PowerFactory relay model types consists of models using three different schemes:

- RACID-x03-AA (one inverse time and one definite time overcurrent element both for the phase currents and the earth current)
- RACID-x13-AA (one phase inverse time and one phase definite time overcurrent element)
- RACID-x23-AA (one inverse time and one definite time overcurrent element both for two phase currents and the earth current)

The PowerFactory relay library tries to cover most of the ABB/Westinghouse RACID subtypes.

The PowerFactory ABB/Westinghouse RACID relay model type names have the following structure: ”RACID” + ”-x” + <a progressive number between 0 and 2> + ”3-AA”

They following PowerFactory relay model types can be found at \Library\Relays\Relays\Overcurrent Relays\ABB/Westinghouse\RACID:

- RACID-x03-AA (scheme type: RACID-x03-AA)
- RACID-x13-AA (scheme type: RACID-x13-AA)
- RACID-x23-AA (scheme type: RACID-x23-AA)

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

3 Supported features

3.1 Measurement and acquisition

It represents the interface between the power system and the relay protective elements. The currents flowing in the power system are converted by elements which simulate a 3 phases CT, a

2 phases CT and a single phase CT.

3.1.1 Available Units

- *RACID-x03-AA* scheme type
  - one 3ph current transformer measuring three phase currents (”Ct-3ph” block)
  - one 3ph current/core transformer measuring the zero sequence current (”Ct-3I0” block)
  - one 3ph measurement block calculating the phase currents (”Measure 3Ph” block)
  - one single phase measurement block calculating the earth current(”Measure 3I0” block)
- *RACID-x13-AA* scheme type
  - one 3ph current transformer measuring three phase currents (”Ct” block)
  - one 3ph measurement block calculating the phase currents(”Measure” block)
- *RACID-x23-AA* scheme type
  - one 3ph current transformer measuring two phase currents (”Ct-2ph” block)
  - one 3ph current/core transformer measuring the zero sequence current (”Ct-3I0” block)
  - one 3ph measurement block calculating two phase currents (”Measure 2Ph” block)
  - one single phase measurement block calculating the earth current(”Measure 3I0” block)

3.1.2 Functionality

The ”Ct-3ph”, ”Ct-2ph” and ”Ct-3I0” block represent an ideal CT. Using the CT default configuration the current at the primary side are 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 simulates a second order low pass analog filter with DC component filter; its time constant is 1 ms.

3.1.3 Data input

The relay secondary rated current (1 or 5 A) must be set in measurement blocks.

3.2 Protective elements

A set of inverse time characteristic and definite time overcurrent elements is modeling the relay protective functions.

3.2.1 Available Units

- *RACID-x03-AA* scheme type
  - one three phase inverse time overcurrent element(”I>” block) with external input blocking signal (”I> block” relay signal) using as input current the greater current of three phase currents
  - one three phase definite time overcurrent element(”I>>” block) with external input blocking signal (”I>> block” relay signal) using as input current the greater current of three phase currents
  - one zero sequence inverse time overcurrent element(”Io>” block) with external input blocking signal (”block51N” relay signal)
  - one zero sequence definite time overcurrent element(”Io>>” block) with external input blocking signal (”block50N” relay signal)
- *RACID-x13-AA* scheme type
  - one three phase inverse time overcurrent element(”I>” block) with external input blocking signal (”I> block” relay signal)
  - one three phase definite time overcurrent element(”I>>” block) with external input blocking signal (”I>> block” relay signal)
- *RACID-x23-AA* scheme type
  - one single phase inverse time overcurrent element(”I>” block) with external input blocking signal (”I> block” relay signal) using as input current the greater current of two phase currents
  - one single phase definite time overcurrent element(”I>>” block) with external input blocking signal (”I>> block” relay signal) using as input current the greater current of two phase currents
  - one zero sequence inverse time overcurrent element(”Io>” block) with external input blocking signal (”block51N” relay signal)
  - one zero sequence definite time overcurrent element(”Io>>” block) with external input blocking signal (”block50N” relay signal)

3.2.2 Functionality

The PowerFactory ABB/Westinghouse RACID relay model types simulate all the protective elements available in the relays.

The following tripping characteristics are available in the PowerFactory relay model types:

- Definite Time
- Extremely Inverse
- Normal Inverse
- RI - Type Inverse
- Very Inverse

The following external input blocking signals are available:

- *"I> block"* blocking the "I>" element
- *"I>> block"* blocking the "I>>" element
- *"Io> block"* blocking the "Io>" element
- *"Io>> block"* blocking the "Io>>" element

3.2.3 Data input

The relationships between the relay settings and the model parameters can be found in the following tables.

***RACID-x03-AA* and *RACID-x23-AA* scheme type** :

Address	Relay Setting	Model block	Model setting	Note
	I> k	I>	Characteristic	
	I>	I>	Current Setting	
	t>	I>	Time Dial	
	I>>	I>>	Pickup Current	
	t>>	I>>	Time Setting	
	Iearth> k	Io>	Characteristic	
	Iearth>	Io>	Current Setting	
	tearth>	Io>	Time Dial	
	Iearth>>	Io>>	Pickup Current	
	tearth>>	Io>>	Time Setting	

***RACID-x13-AA* scheme type** :

Address	Relay Setting	Model block	Model setting	Note
	I> k	I>	Characteristic	
	I>	I>	Current Setting	
	t>	I>	Time Dial	
	I>>	I>>	Pickup Current	
	t>>	I>>	Time Setting	

3.3 Output logic

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

3.3.1 Available Units

- one output logic element ("Logic" block)

3.3.2 Functionality

The ”Logic” block is collecting the trip signals coming from the protective elements and is operating the relay output contacts.

The interface for the *”S11”* and the *”S18”* dip switches is available.

The following output contacts are available in the models:

- *START* operated by the inverse time characteristic elements (”I>” and ”Io>” block) starting signals
- *TRIP* operated by the protection elements (”I>”, ”I>>, ”Io>” and ”Io>>” block) tripping signals

The *”S11”* and the *”S18”* dip switches are used to enable/disable the ”Io>” block ability to operate the ”START” and the ”TRIP” output contact.

Please notice as in the *”RACID-x13-AA”* scheme, considering that the ”Io>” and ”Io>>” block are not present, the ”I>” starting signal is directly used as relay output signal and the ”TRIP” signal is operated by the ”I>” and the ”I>> block tripping signals.

3.3.3 Data input

No user input is required. To disable the relay model ability to open the power circuit breaker simply disable the ”Logic” block.

The *”S11”* and the *”S18”* dip switches can be set in the ”DIP Settings” tab page of the ”Logic” block dialog.

4 Features not supported

The following features are not supported:

- The ”selector switch” is not present in the model; the setting ranges cover any possible position of the selector switch. So keep in mind that if a time setting (i.e. t>) has been set equal to a value which can be reached with the selector switch set to a given position, the other related time setting (i.e. t>>) must be set to a value belonging to the range allowed by the selector switch given position.

5 References

[1] ABB Relays, S-721 71, Vasteras, Sweden. *Type RACID Time-lag overcurrent and earth fault relay 1MDU07006-EN User's Guide Mars 1991*, 1991.