



# POWERFACTORY

# PowerFactory 2021

## Technical Reference

## ABB/Westinghouse Hi-Lo CO

**POWER SYSTEM SOLUTIONS**  
MADE IN GERMANY

F2021

**Publisher:**

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

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

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# Contents

<b>1 Model information</b>	<b>1</b>
<b>2 General description</b>	<b>1</b>
<b>3 Supported features</b>	<b>6</b>
3.1 Measurement and acquisition . . . . .	6
3.1.1 Available Units . . . . .	6
3.1.2 Functionality . . . . .	6
3.1.3 Data input . . . . .	6
3.2 Protective elements . . . . .	6
3.2.1 Available Units . . . . .	7
3.2.2 Functionality . . . . .	7
3.2.3 Data input . . . . .	8
3.3 Output logic . . . . .	9
3.3.1 Available Units . . . . .	9
3.3.2 Functionality . . . . .	9
3.3.3 Data input . . . . .	9
<b>4 Features not supported</b>	<b>10</b>
<b>5 References</b>	<b>11</b>

## 1 Model information

**Manufacturer** ABB/Westinghouse

**Model** Hi-Lo CO

**Variants** This family of PowerFactory relay model types simulates the following overcurrent relays originally manufactured by Westinghouse and then by ABB;

- Hi-Lo CO2
- Hi-Lo CO5
- Hi-Lo CO6
- Hi-Lo CO7
- Hi-Lo CO8
- Hi-Lo CO9
- Hi-Lo CO11

## 2 General description

The ABB/Westinghouse Hi-Lo CO protective relays are single phase non directional ac overcurrent devices. For the user convenience the relevant PowerFactory relay models have been implemented including some 3 phase overcurrent elements which can be used to mock a set of 3 Hi-Lo CO devices. Moreover some single phase elements are present and can be used if the model is used to simulate a single Hi-Lo CO device. The ABB/Westinghouse Hi-Lo CO family of PowerFactory relay models consists of models using six different schemes (defined as "Internal schematic" in the relay documentation [1]):

- *Toc Phase and Earth* scheme type: One inverse time characteristic element("Toc") both for phase and for earth ("Toc Phase" and "Toc Earth" block)
- *Toc Earth + loc Phase and Earth* scheme type: One earth current inverse time characteristic element("Toc") and one instantaneous element("loc") both for phase and earth ("Toc Earth", "loc Phase" and "loc Earth" block)
- *Toc + loc Phase and Earth* scheme type: One phase inverse time characteristic element("Toc") and one instantaneous element("loc") both for phase and for earth ("Toc Phase", "loc Phase", "Toc Earth" and "loc Earth" block)
- *Toc Earth* scheme type: One earth current inverse time characteristic element("Toc") ("Toc Earth" block)
- *Toc Phase and Earth + loc Earth* scheme type: One inverse time characteristic element("Toc") both for phase and earth and one instantaneous element("loc") for earth ("Toc Phase", "Toc Earth" and "loc Earth" block)
- *Toc + loc Earth* scheme type: One inverse time characteristic element("Toc") and one instantaneous element("loc") for earth ("Toc Earth" and "loc Earth" block)

These relays have been manufactured for decades and many sub type have been delivered. The PowerFactory relay library cannot cover all subtypes manufactured during the long life of the ABB/Westinghouse Hi-Lo CO relays but a large set of subtype covering most of the "style numbers" is available.

The PowerFactory ABB/Westinghouse Hi-Lo CO relay model type names have the following structure: <type name>(i.e. "CO-2") + "\_" + "<style number>" (i.e. "265C195A03")

They following PowerFactory relay model types can be found at \Library\Relays\Relays\Overcurrent Relays\ABB\Westinghouse\Hi-Lo:

- Hi-Lo CO-2
  - Hi-Lo CO-2\_265C195A01\_Spst (scheme type: Toc Earth)
  - Hi-Lo CO-2\_265C195A02\_Dpst (scheme type: Toc Earth)
  - Hi-Lo CO-2\_265C195A03\_Spst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-2\_265C195A04\_Dpst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-2\_265C195A05\_Spst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A06\_Dpst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A07\_Spst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A08\_Dpst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-2\_265C195A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-2\_265C195A41\_Spst(2) (scheme type: Toc Earth)
  - Hi-Lo CO-2\_265C195A43\_Spst(2) (scheme type: Toc+loc Earth)
  - Hi-Lo CO-2\_265C195A45\_Spst(2) (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-11
  - Hi-Lo CO-11\_265C047A01\_Spst (scheme type: Toc Earth)
  - Hi-Lo CO-11\_265C047A02\_Dpst (scheme type: Toc Earth)
  - Hi-Lo CO-11\_265C047A03\_Spst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-11\_265C047A04\_Dpst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-11\_265C047A05\_Spst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-11\_265C047A06\_Dpst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-11\_265C047A07\_Spst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-11\_265C047A08\_Dpst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-11\_265C047A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-11\_265C047A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-11\_265C047A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-11\_265C047A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-11\_265C047A41\_Spst(2) (scheme type: Toc Earth)
  - Hi-Lo CO-11\_265C047A43\_Spst(2) (scheme type: Toc+loc Earth)

- Hi-Lo CO-11\_265C047A45\_Spst(2) (scheme type: Toc Ph and Earth)
- Hi-Lo CO-11\_265C047A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-11\_265C047A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-11\_265C047A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-8
  - Hi-Lo CO-8\_264C900A01\_Spst (scheme type: Toc Earth)
  - Hi-Lo CO-8\_264C900A02\_Dpst (scheme type: Toc Earth)
  - Hi-Lo CO-8\_264C900A03\_Spst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-8\_264C900A04\_Dpst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-8\_264C900A05\_Spst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-8\_264C900A06\_Dpst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-8\_264C900A07\_Spst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A08\_Dpst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-8\_264C900A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-8\_264C900A41\_Spst(2) (scheme type: Toc Earth)
  - Hi-Lo CO-8\_264C900A43\_Spst(2) (scheme type: Toc+loc Earth)
  - Hi-Lo CO-8\_264C900A45\_Spst(2) (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-8\_264C900A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-8\_264C900A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-5
  - Hi-Lo CO-5\_264C897A01\_Spst (scheme type: Toc Earth)
  - Hi-Lo CO-5\_264C897A02\_Dpst (scheme type: Toc Earth)
  - Hi-Lo CO-5\_264C897A03\_Spst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-5\_264C897A04\_Dpst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-5\_264C897A05\_Spst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-5\_264C897A06\_Dpst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-5\_264C897A07\_Spst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A08\_Dpst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-5\_264C897A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-5\_264C897A41\_Spst(2) (scheme type: Toc Earth)
  - Hi-Lo CO-5\_264C897A43\_Spst(2) (scheme type: Toc+loc Earth)
  - Hi-Lo CO-5\_264C897A45\_Spst(2) (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-5\_264C897A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-5\_264C897A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)

- Hi-Lo CO-7

- Hi-Lo CO-7\_264C899A01\_Spst (scheme type: Toc Earth)
- Hi-Lo CO-7\_264C899A02\_Dpst (scheme type: Toc Earth)
- Hi-Lo CO-7\_264C899A03\_Spst (scheme type: Toc+loc Earth)
- Hi-Lo CO-7\_264C899A04\_Dpst (scheme type: Toc+loc Earth)
- Hi-Lo CO-7\_264C899A05\_Spst (scheme type: Toc Ph and Earth)
- Hi-Lo CO-7\_264C899A06\_Dpst (scheme type: Toc Ph and Earth)
- Hi-Lo CO-7\_264C899A07\_Spst (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A08\_Dpst (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-7\_264C899A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-7\_264C899A41\_Spst(2) (scheme type: Toc Earth)
- Hi-Lo CO-7\_264C899A43\_Spst(2) (scheme type: Toc+loc Earth)
- Hi-Lo CO-7\_264C899A45\_Spst(2) (scheme type: Toc Ph and Earth)
- Hi-Lo CO-7\_264C899A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-7\_264C899A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)

- Hi-Lo CO-2 (50 Hz)

- Hi-Lo CO-2\_265C195A01\_Spst (scheme type: Toc Earth)
- Hi-Lo CO-2\_265C195A02\_Dpst (scheme type: Toc Earth)
- Hi-Lo CO-2\_265C195A03\_Spst (scheme type: Toc+loc Earth)
- Hi-Lo CO-2\_265C195A04\_Dpst (scheme type: Toc+loc Earth)
- Hi-Lo CO-2\_265C195A05\_Spst (scheme type: Toc Ph and Earth)
- Hi-Lo CO-2\_265C195A06\_Dpst (scheme type: Toc Ph and Earth)
- Hi-Lo CO-2\_265C195A07\_Spst (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A08\_Dpst (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-2\_265C195A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-2\_265C195A41\_Spst(2) (scheme type: Toc Earth)
- Hi-Lo CO-2\_265C195A43\_Spst(2) (scheme type: Toc+loc Earth)
- Hi-Lo CO-2\_265C195A45\_Spst(2) (scheme type: Toc Ph and Earth)
- Hi-Lo CO-2\_265C195A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
- Hi-Lo CO-2\_265C195A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)

- Hi-Lo CO-2 (60 Hz)

- Hi-Lo CO-2\_265C195A01\_Spst (scheme type: Toc Earth)
- Hi-Lo CO-2\_265C195A02\_Dpst (scheme type: Toc Earth)
- Hi-Lo CO-2\_265C195A03\_Spst (scheme type: Toc+loc Earth)

- Hi-Lo CO-2\_265C195A04\_Dpst (scheme type: Toc+loc Earth)
  - Hi-Lo CO-2\_265C195A05\_Spst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A06\_Dpst (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A07\_Spst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A08\_Dpst (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-2\_265C195A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
  - Hi-Lo CO-2\_265C195A41\_Spst(2) (scheme type: Toc Earth)
  - Hi-Lo CO-2\_265C195A43\_Spst(2) (scheme type: Toc+loc Earth)
  - Hi-Lo CO-2\_265C195A45\_Spst(2) (scheme type: Toc Ph and Earth)
  - Hi-Lo CO-2\_265C195A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
  - Hi-Lo CO-2\_265C195A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)
- Hi-Lo CO-9
    - Hi-Lo CO-9\_264C901A01\_Spst (scheme type: Toc Earth)
    - Hi-Lo CO-9\_264C901A02\_Dpst (scheme type: Toc Earth)
    - Hi-Lo CO-9\_264C901A03\_Spst (scheme type: Toc+loc Earth)
    - Hi-Lo CO-9\_264C901A04\_Dpst (scheme type: Toc+loc Earth)
    - Hi-Lo CO-9\_264C901A05\_Spst (scheme type: Toc Ph and Earth)
    - Hi-Lo CO-9\_264C901A06\_Dpst (scheme type: Toc Ph and Earth)
    - Hi-Lo CO-9\_264C901A07\_Spst (scheme type: Toc + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A08\_Dpst (scheme type: Toc + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A09\_Spst (scheme type: Toc Earth + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A10\_Dpst (scheme type: Toc Earth + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A11\_Spst (scheme type: Toc Ph and Earth + loc Earth)
    - Hi-Lo CO-9\_264C901A12\_Dpst (scheme type: Toc Ph and Earth + loc Earth)
    - Hi-Lo CO-9\_264C901A41\_Spst(2) (scheme type: Toc Earth)
    - Hi-Lo CO-9\_264C901A43\_Spst(2) (scheme type: Toc+loc Earth)
    - Hi-Lo CO-9\_264C901A45\_Spst(2) (scheme type: Toc Ph and Earth)
    - Hi-Lo CO-9\_264C901A47\_Spst(2) (scheme type: Toc + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A49\_Spst(2) (scheme type: Toc Earth + loc Ph and Earth)
    - Hi-Lo CO-9\_264C901A51\_Spst(2) (scheme type: Toc Ph and Earth + loc Earth)

Please notice that different relay models using the same scheme type (i.e. "Hi-Lo CO-9\_264C901A01" and "Hi-Lo CO-9\_264C901A02" ) have the same protective elements with different setting ranges.

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 an element simulating a 3 phase CT or a single phase CT.

#### 3.1.1 Available Units

- *Toc Phase and Earth* scheme type
  - one 3ph current transformer calculating the zero sequence current ("Ct" block)
  - one 3ph measurement block ("Measurement" block)
- *Toc Earth + loc Phase and Earth, Toc + loc Phase and Earth and Toc Phase and Earth + loc Earth* scheme type
  - one 3ph current transformer calculating the zero sequence current ("Ct-3P/3xI0" block)
  - one 3ph measurement block ("Measure" block)
- *Toc Earth and Toc + loc Earth* scheme type
  - one 3ph/single phase current transformer calculating the zero sequence current ("Ct-3P/3xI0" block)
  - one single phase measurement block ("Measure 3I0" block)

#### 3.1.2 Functionality

The "Ct" and the "Ct-3P/3xI0" 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 simulate a second order low pass analog filter with DC component filter; its time constant is 1 ms.

#### 3.1.3 Data input

No user input is required

### 3.2 Protective elements

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

### 3.2.1 Available Units

- *Toc Phase and Earth* scheme type
  - one 3 phase inverse time overcurrent element("Toc Ph" block)
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
- *Toc Earth + loc Phase and Earth* scheme type
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
  - one 3 phase instantaneous overcurrent element("loc Ph" block)
  - one zero sequence instantaneous overcurrent element("loc Earth" block)
- *Toc + loc Phase and Earth* scheme type
  - one 3 phase inverse time overcurrent element("Toc Ph" block)
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
  - one 3 phase instantaneous overcurrent element("loc Ph" block)
  - one zero sequence instantaneous overcurrent element("loc Earth" block)
- *Toc Earth* scheme type
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
- *Toc Phase and Earth + loc Earth* scheme type
  - one 3 phase inverse time overcurrent element("Toc Ph" block)
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
  - one zero sequence instantaneous overcurrent element("loc Earth" block)
- *Toc + loc Earth* scheme type
  - one zero sequence inverse time overcurrent element("Toc Earth" block)
  - one zero sequence instantaneous overcurrent element("loc Earth" block)

### 3.2.2 Functionality

Each protective relay of the ABB/Westinghouse Hi-Lo CO family support an unique tripping characteristics. The following tripping characteristics are available in the PowerFactory relay model types:

- Short time ("Hi-Lo CO-2" 50Hz and 60Hz model types)
- Long time ("Hi-Lo CO-5" model types)
- Definite ("Hi-Lo Co-6" model types)
- Moderately Inverse ("Hi-Lo CO-7" model types)
- Inverse ("Hi-Lo CO-8" model types)
- Very Inverse ("Hi-Lo CO-9" model types)
- Extremely Inverse ("Hi-Lo CO-11" model types)

### 3.2.3 Data input

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

*Toc Phase and Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Ph	Current Setting	
	Time Dial	Toc Earth	Current Setting	
		Toc Ph	Time Dial	
		Toc Earth	Time Dial	

*Toc Earth + loc Phase and Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Earth	Current Setting	
	Time Dial	Toc Earth	Time Dial	
	Instantaneous Pickup	loc Ph	Pickup Current	
		loc Earth	Pickup Current	

*Toc + loc Phase and Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Ph	Current Setting	
	Time Dial	Toc Earth	Current Setting	
		Toc Ph	Time Dial	
		Toc Earth	Time Dial	
	Instantaneous Pickup	loc Ph	Pickup Current	
		loc Earth	Pickup Current	

*Toc Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Earth	Current Setting	
	Time Dial	Toc Earth	Time Dial	

*Toc Phase and Earth + loc Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Ph	Current Setting	
	Time Dial	Toc Earth	Current Setting	
		Toc Ph	Time Dial	
		Toc Earth	Time Dial	
	Instantaneous Pickup	loc Earth	Pickup Current	

*Toc + loc Earth* scheme type:

Address	Relay Setting	Model block	Model setting	Note
	Pickup	Toc Earth	Current Setting	
	Time Dial	Toc Earth	Time Dial	

Address	Relay Setting	Model block	Model setting	Note
	Instantaneous Pickup	loc Earth	Pickup Current	

### 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

- *Toc + loc Ph and Earth* scheme:  
two output logic elements ("Logic Ph" and "Logic Earth" block)
- *Any other scheme*:  
one output logic element ("Logic" block)

#### 3.3.2 Functionality

- *Toc + loc Ph and Earth* scheme:  
The "Logic Ph" block is collecting the trip signals coming from the phase protective elements and is operating the relay output contact. The "Logic Earth" block is collecting the trip signals coming from the earth protective elements and is operating the relay output contact. In both output blocks the output contact is named "yout".
- *Any other scheme*:  
The "Logic" block is collecting the trip signals coming from the protective elements and is operating the relay output contact.

#### 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. In the scheme where two output blocks are available please disable both blocks or disable only the "Logic Ph" block to disable the phase elements or the "Logic Earth" block to disable the earth elements.

## **4 Features not supported**

The following features are not supported:

- Delayed reset time of the inverse time characteristic

## 5 References

- [1] ABB Power T&D Company Inc Relay Division, Coral Springs, FL 33065 USA. *Type HI-LO CO Overcurrent Relay Descriptive Bulletin 41-102E, September 1990, 1990.*