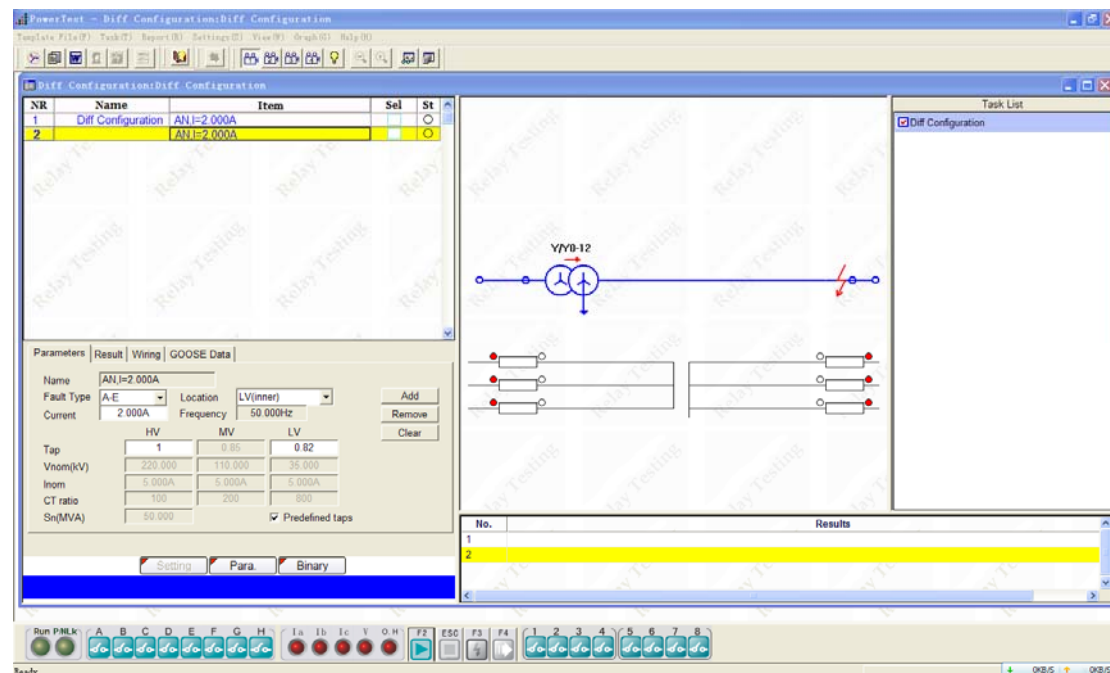


Differential Test

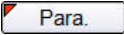
This module aims to analog in-area and out-area faults of differential relay. The in-area fault current (is more than switch value) protection trips and the out-area fault cross current doesn't trip.

The single phase in-area fault of analog differential relay: Add fault current in the single winding of differential relay and simulate the fault, the circuit breaker should trip off instantaneously. The two tripping coils of circuit breaker are required to verify.

The out-area fault of analog differential relay: According to the above differential balance test method, the bigger balance currents (5 or more is recommended.) are added in the sides of high, middle voltage and high-low voltage. When the out-area fault is simulated, the relay doesn't trip.

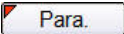


Set group parameters

Click  button to enter into group parameter page. Group test parameter page along with default settings is shown bellow

Note: Please contact the manufacture for more information about the optional **Circuit Breaker Simulator** and its application

Set group test parameters

Click  button to enter into group parameter page. Group test parameter page along with default settings is shown bellow

Name	Value	consider in matching factor
Tprefault	0.500S	PreFaultTime
Tfault	0.500S	FaultTime
CB Simu.	No	BCSIMULATION
Topen	100ms	
Tclose	100ms	CloseTime
Tested Winding	Side1-Side3	Winding
phase shifting(Clock Notation tested windings)	12	WindingSide
AxisDef	name	Axis
Ref. Winding	HV-Winding	RefWinding
Side1:CT starpoint	tow.Prot.Obj	IdEq
Side2:CT starpoint	tow.Prot.Obj	IdEqu
Equation	IR=max(I1 , I2)	Equation
Uz	0.000V	Uz
Star-Connection Type	Y	Side1 Connect

Wiring Factor in Tap

- Select **No** if wiring factor has already been considered in matching factor
- Select **Yes** if wiring factor is not considered in matching factor

Tested Winding

Select windings to be tested.

- **Side 1-Side 3:** test HV-LV winding
- **Side 1-Side 2:** test HV-MV winding
- **Side 2-Side 3:** test MV-LV winding

TPrefault

Prefault time setting

Side 2

Vector group for winding 2

Tfault

Fault time setting

Side 3

Vector group for winding 3

CB Sim.

When optional **Circuit Breaker Simulator** is used we can need to select **Yes** here.

Conversion

Here we define from where we normalize the current to the reference side. This setting available from relay instruction manual

Open Time

Related to **CB Sim.**

Phase shifting

This refers to vector group number with winding 1 as the reference side.

Close Time

Related to **CB Sim.**

Example:

For Y-D-11 connection we need to select 11 here

AsisDef

This setting will only influence the scale of display

- **name:** display in **nominal** value
- **pu:** display in **pu** value

Inom

This is the nominal current setting

RefWinding

The reference side of test setting is used for current value calculation.

There are three methods available

- **HV-winding** High voltage of transformer
- **MV-winding** Middle voltage of transformer
- **LV-winding** Low voltage of transformer

CT starpoint

Here we define the direction of CT

Normally we can determine the direction by looking at the bias equation in relay instruction manual

Example:

Equation $I_d = I_A + I_B$ indicates that CT direction is toward the protective device. Thus we need to select **tow.prot.obj**

Example:

Equation $I_d = I_A - I_B$ indicates that CT direction is toward the transmission line. Thus we need to select **tow.line**

Bias. Equ.

Here we select the equation which defines I_r/I_d characteristic. This equation is available from relay instruction manual.

Available bias equations include

- $I_r = (|I_1 - I_2|)/K_1$ or $I_r = (|I_1 + I_2|)/K_1$
- $I_r = (|I_1| + |I_2| * K_2)/K_1$
- $I_r = \max(|I_1|, |I_2|)$
- $I_r = (|I_d - |I_1| - |I_2||)/K_1$
- $I_r = |I_2|$

K1, K2

They are bias quantities in the bias equation and can be found in relay instruction manual

Uz

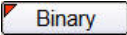
Uz stands for output voltage amplitude. It provides one voltage source to relay and judge if the transformer runs or not.

Star-Connection Type

This setting includes two selections: Y0 and Y.

Y0-connection type: the zero sequence current should be taken into calculation.
Y-connection type: zero sequence is unnecessary.

Configure binary inputs

Click  button to enter into binary input configuration page

Name	Value	Variable
In.A	Enable	KA
In.B	Enable	KB
In.C	Enable	KC
In.D	Enable	KD
In.E	Enable	KE
In.F	Enable	KF
In.G	Enable	KG
In.H	Enable	KH
Logic	OR	Logic

Example: **OR** logic

Name	Value	Variable
In.A	Enable	KA
In.B	Enable	KB
In.C	Enable	KC
In.D	Disable	KD
In.E	Disable	KE
In.F	Disable	KF
In.G	Disable	KG
In.H	Disable	KH
Logic	OR	Logic

In this example any tripping from A, B, or C will terminate the test process.

Example: **AND** logic

Name	Value	Variable
In.A	Enable	KA
In.B	Enable	KB
In.C	Enable	KC
In.D	Disable	KD
In.E	Disable	KE
In.F	Disable	KF
In.G	Disable	KG
In.H	Disable	KH
Logic	AND	Logic

In this example when tripping for A, B, or C all comes then test process will be terminated and the tripping time for all three phase will be recorded.