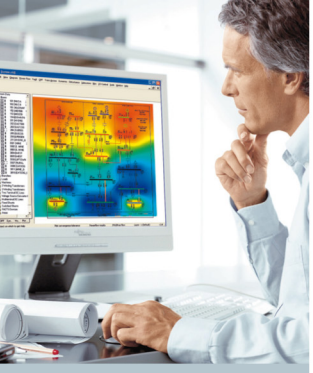

PSS®SINCAL

Protection

Protection Simulation for Electrical Transmission and Distribution Networks

PSS®SINCAL offers a wide range of procedures for the complex field of protecting or examining electrical transmission and distribution networks.

PSS®SINCAL provides the following procedures:

- Distance Protection Setting
- Protection Simulation for DI and OC Protection Devices
- Protection Route Diagrams
- Protection Documentation
- Fault Location

Distance Protection Setting

PSS®SINCAL's Distance Protection method calculates impedance settings for the three zones and the overreach zones (auto-reclosure and signal comparison) of distance protection devices in any type of meshed network.

When PSS®SINCAL calculates grading values, it gives priority to the setting that causes the protection to respond selectively regardless of how the network is connected.

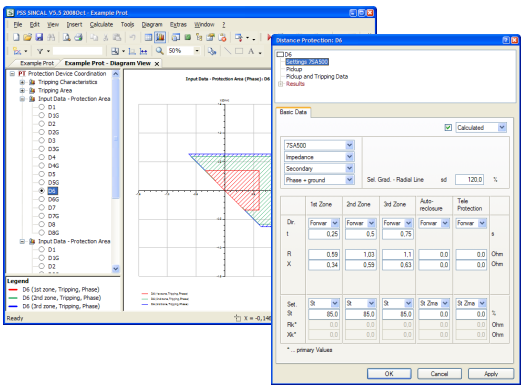

Figure 1: Settings for a 7SA500 protection device

Initially, all values are calculated for the first zones, then for all the second zones, and finally for all the third zones. Protection device settings can be varied interactively on the screen and customized with ease.

PSS®SINCAL provides the results as grading diagrams drawn to scale and a table with settings for each protection device.

Since there are different concepts or philosophies for setting protection devices, you need to implement one of the following as the solution strategy for the simulation:

- DISTAL strategy
  This strategy is based on DISTAL. The distance protection devices are set according to absolute selectivity.
- Line impedance strategy
  This strategy determines the impedance areas of protection devices and their settings from the sum of the line impedances in the protection zones.
- Line impedance strategy connected
  This strategy determines the settings for protection devices with the help of the line impedances in the network.
- Medium voltage network strategy
  This strategy determines the impedance areas of protection devices and their settings from loop impedances in protection zones.

Protection simulation for DI and OC protection devices

The PSS®SINCAL Protection Simulation module simulates the time sequence for fault clearance in networks, even in very complex, meshed networks. The program considers all the overcurrent time protection devices and impedance protection devices that have been installed in the network.

The locations of faults to be examined can be defined at nodes or anywhere on any power lines or cables. Single-phase, two-phase or three-phase faults can be simulated, arc impedances included.

The program uses as many time steps as necessary to simulate starting and triggering protection devices. The operating state of the protection devices can be visualized in the network diagram with the help of a color code. The program finds any violations to grading times and multiple tripped protection devices. Directional elements can be freely defined. Damage curves for cables, motor start behavior and transformer loadings are also displayed graphically. The system generates grading diagrams for I2t, RX, and Zt functionality.

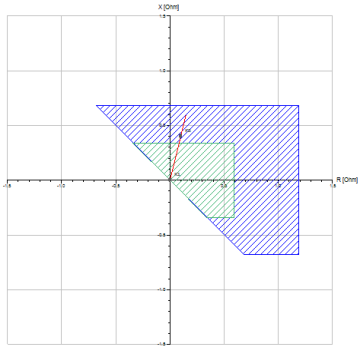

Figure 2: Grading diagram for RX functionality

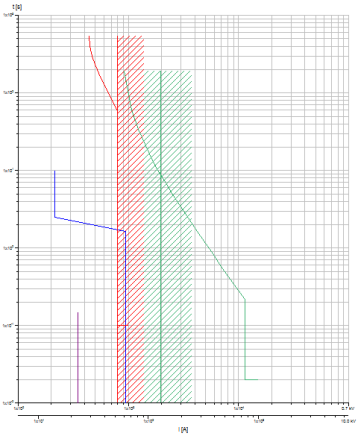

Figure 3: It Diagram for multiple OC devices with current ranges

Protection Route Diagrams

Large high and medium voltage networks are updated all the time. This means that a lot of time and effort is involved in maintaining tripping plans. Calculating second and third selective tripping levels in meshed networks is time consuming and yields calculations that are at best approximate. This simulation procedure can calculate these levels quickly and accurately.

PSS®SINCAL generates various diagrams for the network and the built-in protection devices. These diagrams can be used to check the accuracy of the protection settings.

PSS®SINCAL has the following diagrams:

- Opening behavior
- Absolute radius
- Impedance ratio
- Impedance and tripping areas

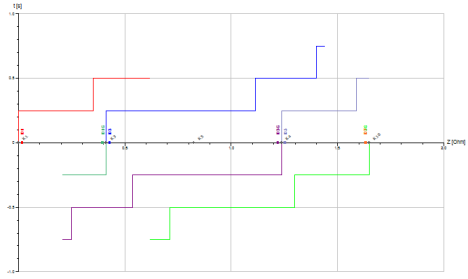

Figure 4: Grading diagrams

Protection Documentation

PSS®SINCAL protection documentation is a practical tool creating enhanced documentation for settings and results for OC protection devices. In addition to It diagrams for the protection devices, PSS®SINCAL can graphically display complete protection zones with the accompanying settings. The diagram can be edited interactively.

The protection documentation is stored directly as a view in the PSS®SINCAL network database. You can document as many protection zones as you want.

Network elements and protection devices displayed in the documentation can be edited with the same user-friendly functions as for normal network diagrams. Input data, opening data-output forms, switches, filters, etc. can be modified with ease.

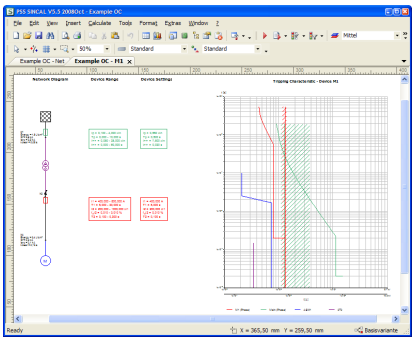

Figure 5: Documentation for a selected protection zone

Fault Location

This procedure localizes a fault at a protection device, determining the precise position of the fault within the supply network.

Modern protection devices store the impedance that caused the tripping when there is a fault. These values are then used to calculate the exact position of the fault in the network.

Published by and copyright © 2009:
Siemens AG
Energy Sector
E D SE PTI
Freyeslebenstrasse 1
91058 Erlangen, Germany

www.siemens.com/energy/power-technologies

Siemens Energy, Inc.,
Power Distribution, T&D Service Solutions
Siemens Power Technologies International
400 State Street
PO Box 1058
Schenectady, NY 12301-1058

Siemens Transmission and Distribution Ltd
PTI
Sir William Siemens House, Princess Road
Manchester, M20 2UR
United Kingdom

For more information, please contact
our Customer Support Center.
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
(Charges depending on provider)
E-mail: support.energy@siemens.com

Power Distribution Division
Printed in Germany
Printed on elementary chlorine-free
bleached paper.

SWSC01-EN-200905