

Testing Tips

Testing Load Encroachment Schemes

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1 Introduction

In order to meet NERC loadability criteria for a stressed system (150% of the four-hour emergency rating at 85% of the system voltage and .867 power factor), load encroachment schemes are used to prevent load impedance from entering the distance characteristic and causing an undesired operation.

Load encroachment schemes usually incorporate a blocking zone or blinder that overlaps tripping zones +/- 35 degrees from unity power factor with a reach that corresponds to the desired level of loadability (fig 1). Most of these schemes are configured to operate for the L1-L2-L3 (or A-B-C) fault loops only.

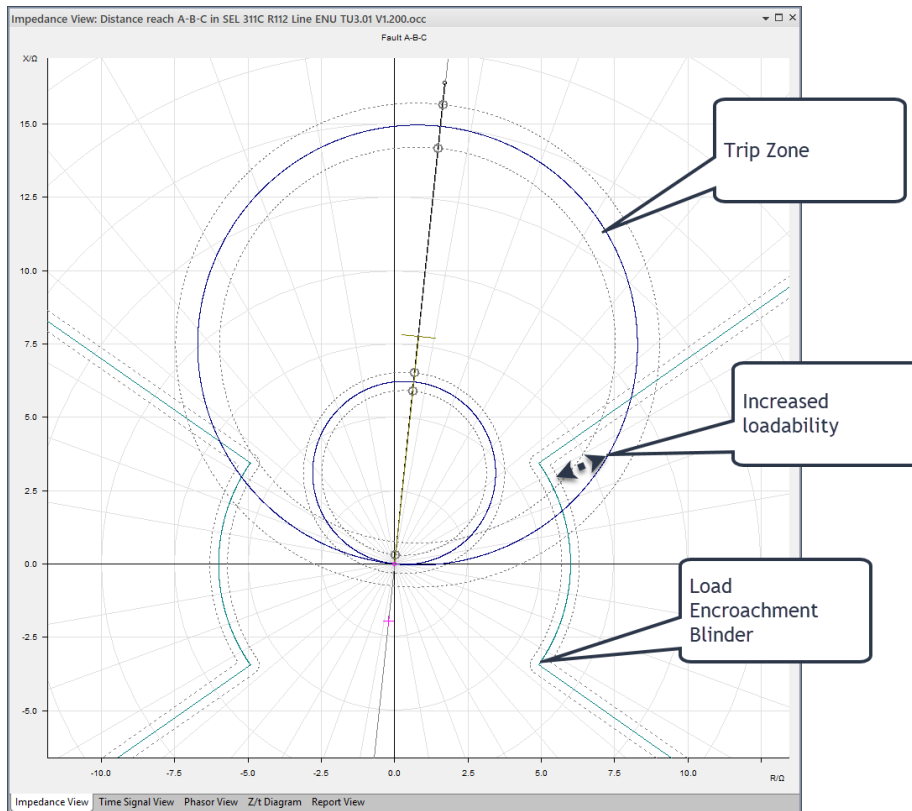


Figure 1: Distance Test Object Characteristic with a load encroachment blinder

2 Test Set Up

The best way to test this is to use the distance block in the OMICRON Test Object Parameters to program the load encroachment blinder. There are a few ways to do this:

2.1 Using a Protection Testing Library Template

OMICRON offers a library of templates for most relays within the Protection Testing Library (PTL) available in the portal. For distance relays, load encroachment characteristics are supported within the provided template. Download and open the template file for the relay under test, and open the Test Object Parameters, select File, then select Import Relay Settings. Select the appropriate settings import filter and setting file(s) (fig 2). Settings can also be entered manually, especially for relays that no import filter is available.

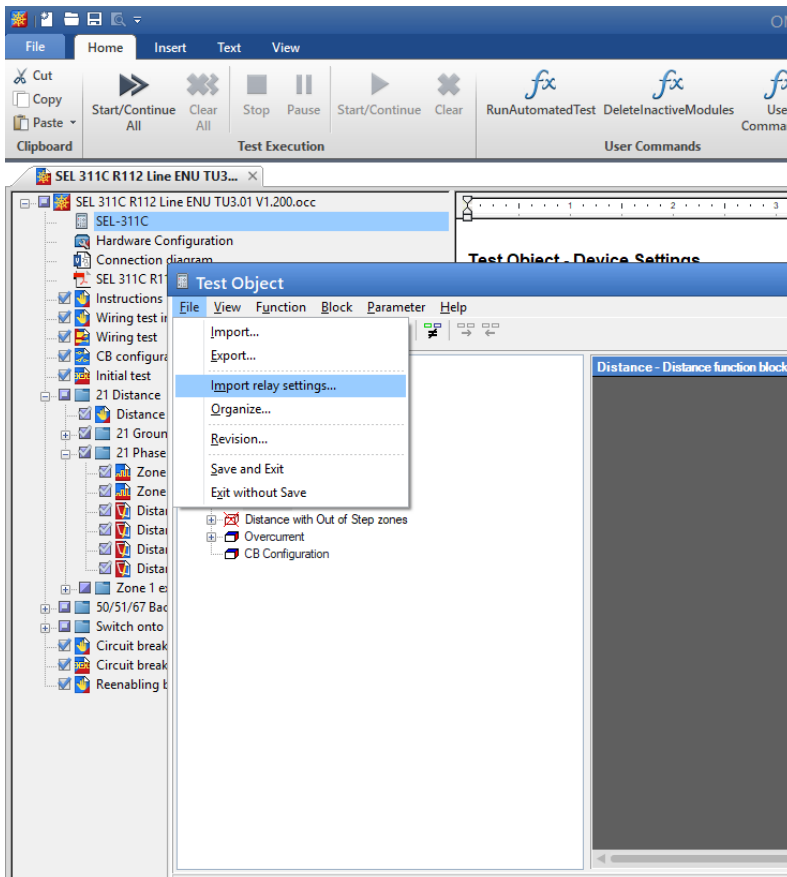


Figure 2: Importing relay settings into a PTL Test Object Characteristic

Once the settings are imported, the PTL template file will automatically configure the Distance block of the Test Object. Modules inserted below the Test Object that can display distance characteristics such as QuickCMC, State Sequencer, Ramping, Pulse Ramping, Distance, and Advanced Distance can be used for testing. Note that with QuickCMC, assessments are made manually. When using the Distance and Advanced Distance modules, test points within the load encroachment zone are automatically configured and assessed (fig 3). In the other modules, automatic assessments are configured manually.

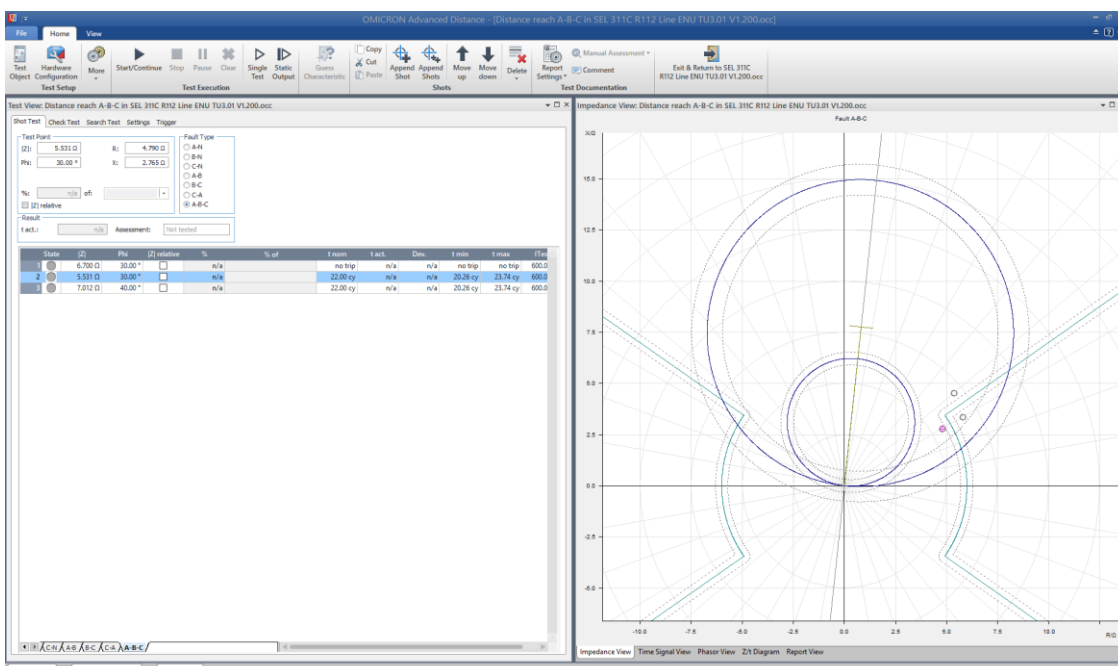


Figure 3: Advanced Distance module shot test showing test points for load encroachment feature

2.2 Manually Configuring Load Encroachment Zones within the Test Object

After adding the applicable protection zones, add two more zones for the load encroachment blinders. Set the type to “Non tripping” and the fault loop to L1-L2-L3 (or A-B-C). Edit each to draw the required shape. The basic shape requires three elements: a “Line cartesian”, an “Arc cartesian”, and another “Line cartesian”. For each element, select “Add Element”, select the element type, and configure the parameters. Once all three elements are added, use the invert each element and invert all to achieve the correct active region as indicated by the active region (shown in blue) appearing correctly (fig 4).

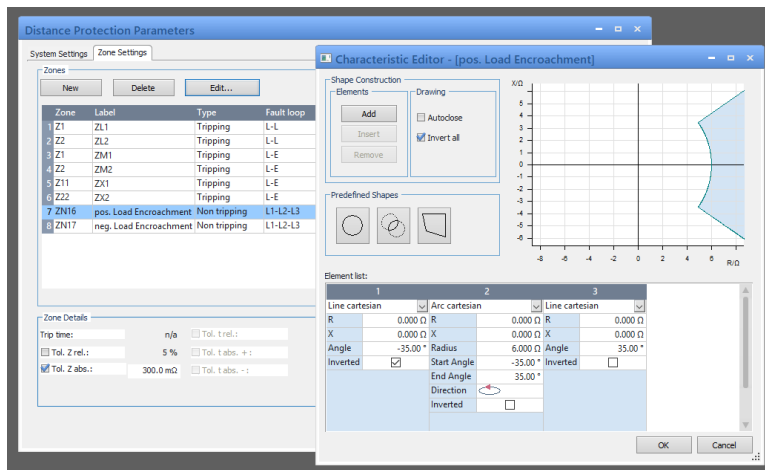


Figure 4: Manual configuration of the load encroachment blinders in the Test Object Parameters

As with the PTL method, modules inserted below the Test Object in a Control Center (.occ) file that can display distance characteristics such as QuickCMC, State Sequencer, Ramping, Pulse Ramping, Distance, and Advanced Distance can be tested using the configured characteristic.

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