



VEBKO ONLINE HELP

Drawing the Distance Characteristics and Practical Example of Drawing the Quad Characteristic in Siemens 7SA522 Relay

Category	tester
Section	Testing of relays protection functions
Language	English
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Protection relays with Distance function are used to protect lines against faults in the network. In order to test this function, we must first draw its characteristic. Using Rio or Xrio is a simple solution to transfer settings and configure this function from relay and simulation of the distance characteristic in the test device. Using digital relays such as Import Rio and Xrio to draw protection characteristic will surely simplify the process of testing functions, including Distance.

However, in the case of older relays such as static samples, in some cases, we still have to use step-by-step drawing and manual impedance characteristic. In addition, in some cases, we may not be able to get relay output in the form of files such as Xrio, CSV and Text for reasons such as software restrictions.

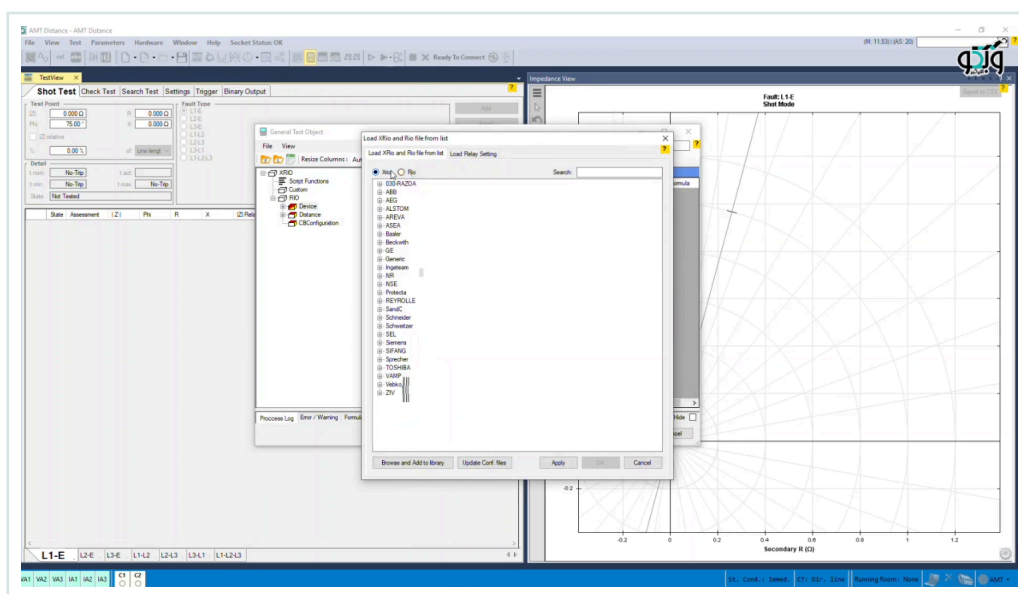


Figure 1

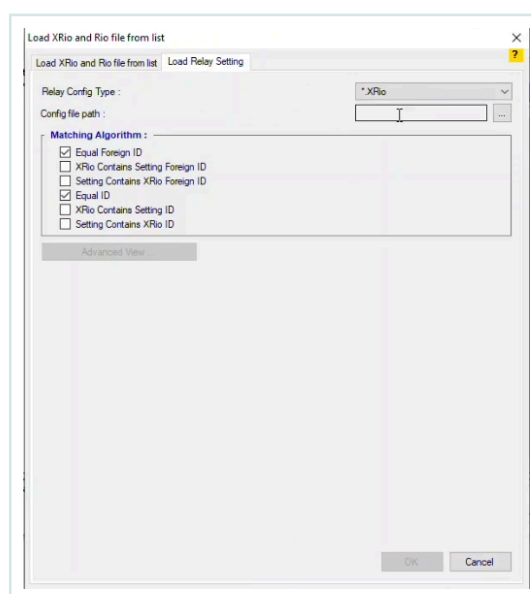


Figure 2

In these cases, it is enough to open the Distance block from the Test Object Parameters section and use the Zone Settings header to draw the distance characteristic. At the top of the table, the New, Edit, Delete and Add duplicate options allow creating new zones, editing zones, deleting zones, and overwriting the zone, respectively. You can also have complete management over each zone using navigation options. In zone Details, you can also see details about trip time, impedance and values related to the duration of the operation and see the tolerance value.

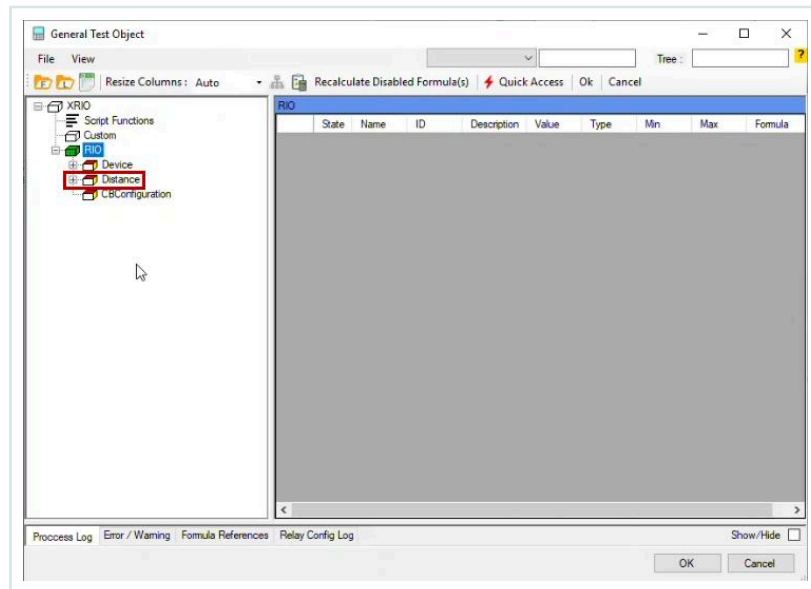


Figure 3

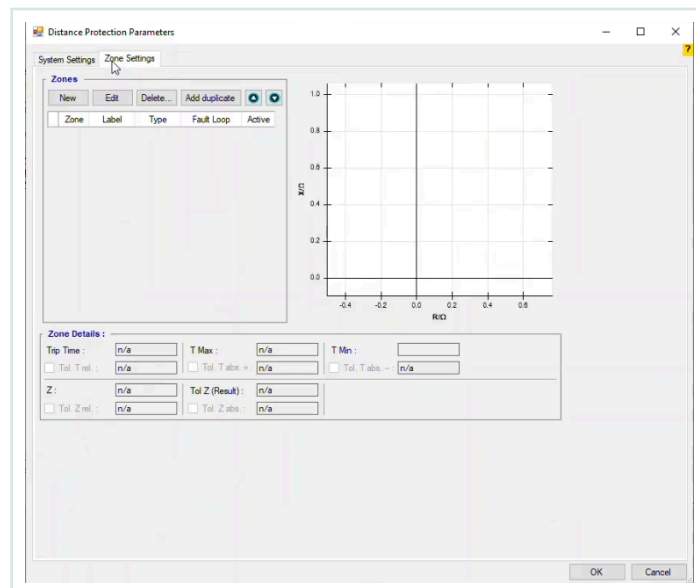


Figure 4

To get started, simply click on the New option to create a new zone. By default, this zone is marked as the tripe area for all fault loops.

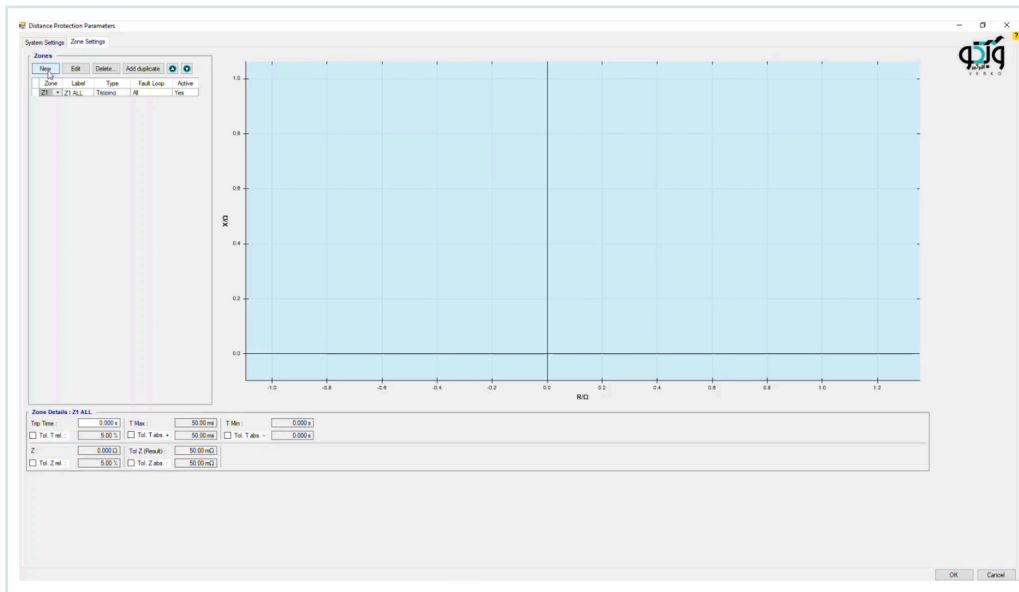


Figure 5

By selecting each zone and clicking on edit option, you can have a complete management of the type of distance element or specify the Trip and No Trip area.

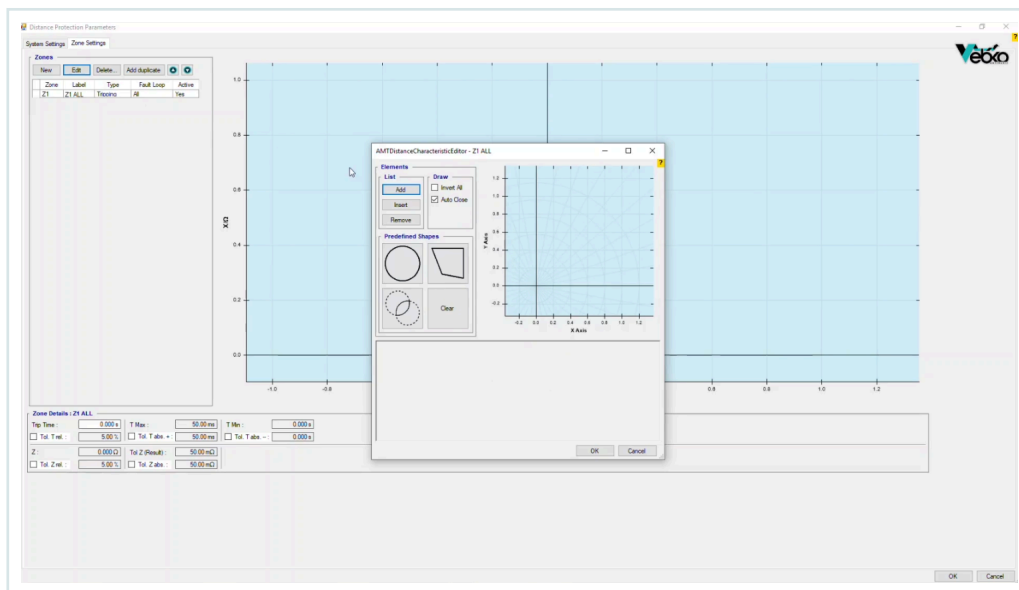


Figure 6

Impedance characteristics can be adjusted in the form of Quad and Mho type or lens in the relay. You can also use the default shapes for these three characteristics.

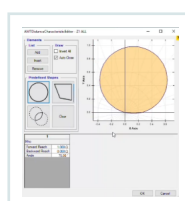


Figure 7

Any added element can be a line or arc. Each element can be drawn by entering a point and angle. In the case of the Mho characteristic, the circle drawing is performed using the central point, radius and angle.

After adding zones using different elements, you can specify the number, label, zone type and loop fault for it. Keep in mind that four different type can be specified for zones as follows:

Tripping: It is used for zones that based on the relay settings, points inside trips.

Starting: Used for zones that only lead to pickup of distance function. This pickup can lead to tripe after a certain time.

Extended: This zone is only activated under certain conditions (for example enabling recloser or teleprotection schemes)

Non-Tripping: In these zones, the relay will not issue trip command.

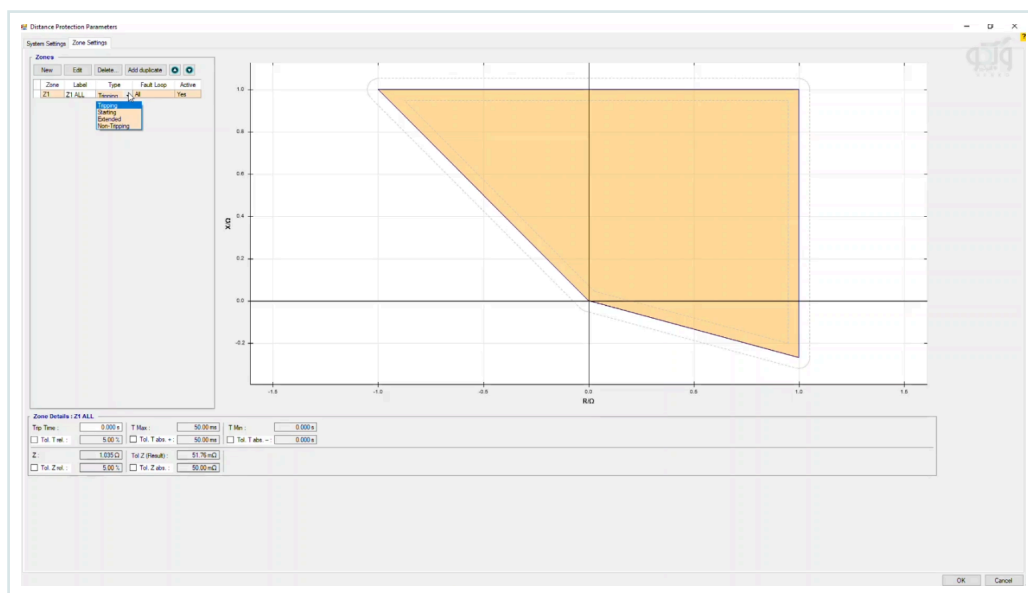


Figure 8

It is also possible to disable the zones created in this list. After drawing the zones, trip time and related faults can be entered for each zone.

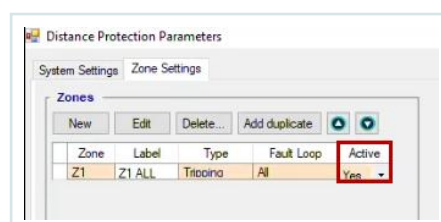


Figure 9

1 Drawing the distance characteristic (zone 1 forward direction) in siemens 7SA522 relay

For example, we will review drawing the Quad characteristic of a Siemens 7SA522 relay sample here. Keep in mind that by going to the Setting Group section in Digsig 4 software and choosing Distance Protection and then,

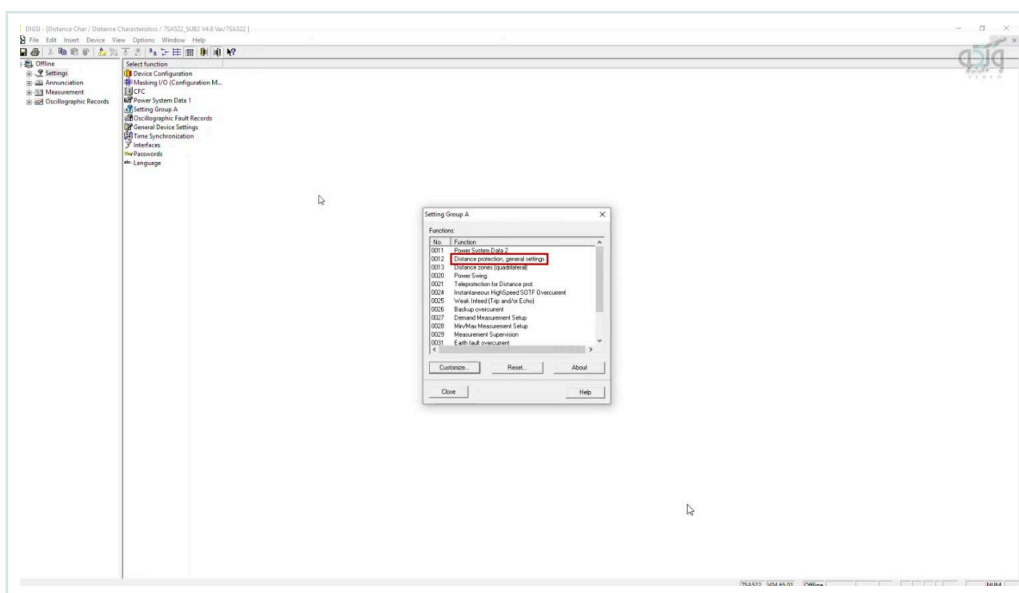


Figure 10

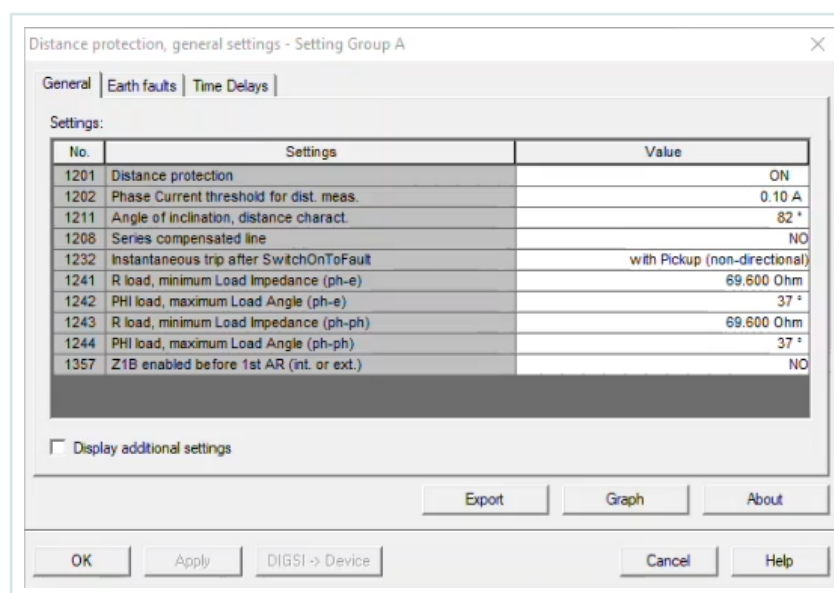


Figure 11

General Settings you can view the distance characteristic of the relay by selecting the Graph option.

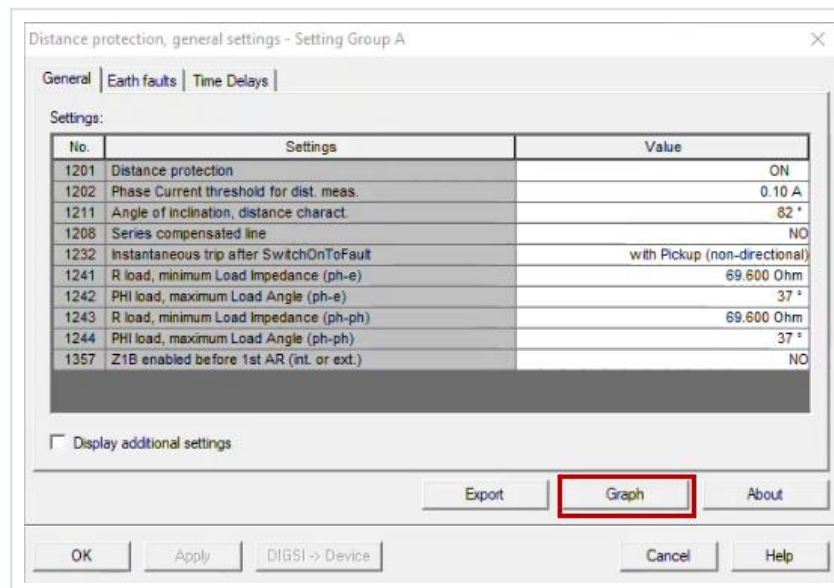


Figure 12

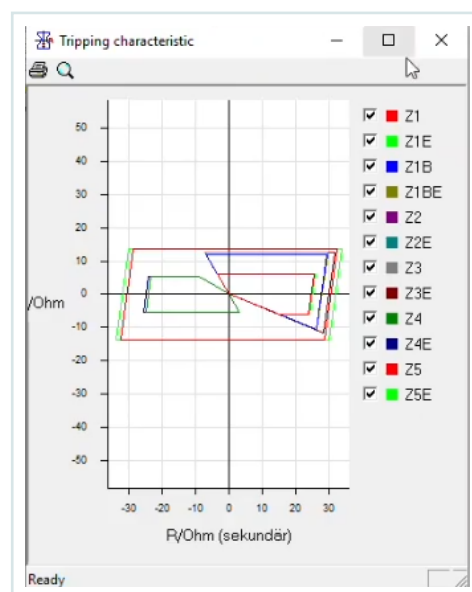


Figure 13

In the Distance Zones section, you can see the values related to different parameters of the Distance characteristic in different zones. Here, zones 1 to 3 in forward direction, zone 4 in reverse direction and finally zone 5, is non-directional.

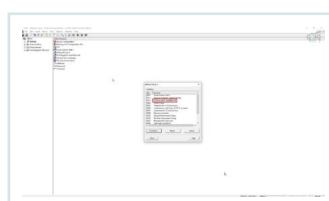


Figure 14

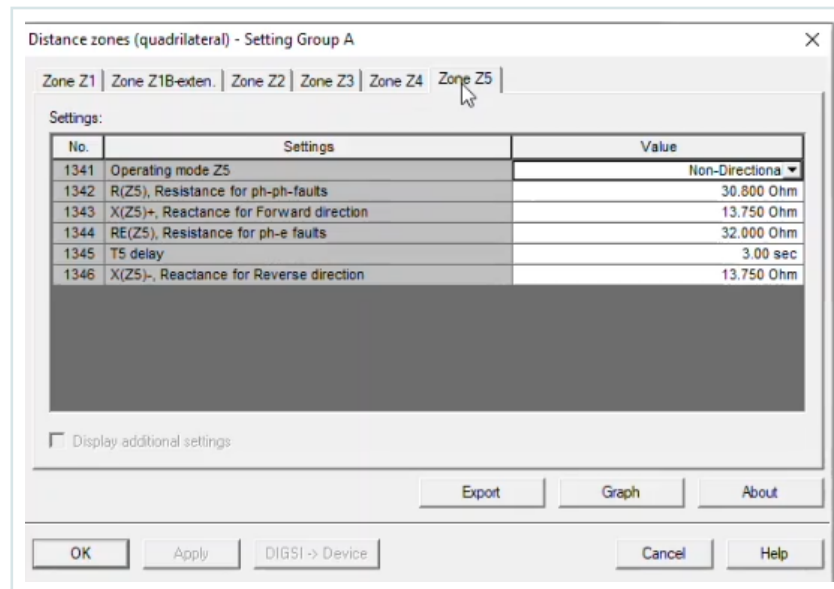


Figure 15

Considering the overall characteristic of distance for this relay, which is as follows, as well as the directional characteristic in page R and X, it is necessary to pay attention to the following points:

- In general, six independent zones and one extra control zone are defined for each impedance fault loop in this relay.
- The process of defining lines is based on the parameters R, X and ϕ_{Dist} .
- It is possible to include a cut area to define Load Encroachment.
- Reach element R value can be defined separately for phase-to-phase and phase-to-ground faults so that we can see wider coverage of faults for ground faults.
- For zone 1, another angle α can also be defined to avoid overreach caused by changing angles or more. This angle is not applicable to other zones.
- ϕ_{Dist} , defined in the relay address 1211 and referred to as Distance Angle or Distance angle, shows the rotation angle in the Distance component. This element is used for both Quad and MHO characteristics and can be adjusted to the same value as the line angle (element 1105).

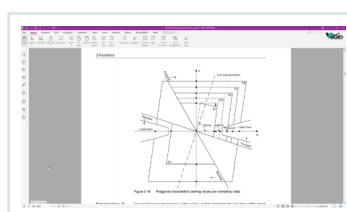


Figure 16

Now it's time to drawing the distance characteristic.

By revisiting the Zone Settings section and clicking on the New option, we select the Quad characteristic for the relay. Here, the value R moves the center of the line over the horizontal axis and the X value moves the center of the line over the vertical axis. The specified angle is also cause the line to rotate.

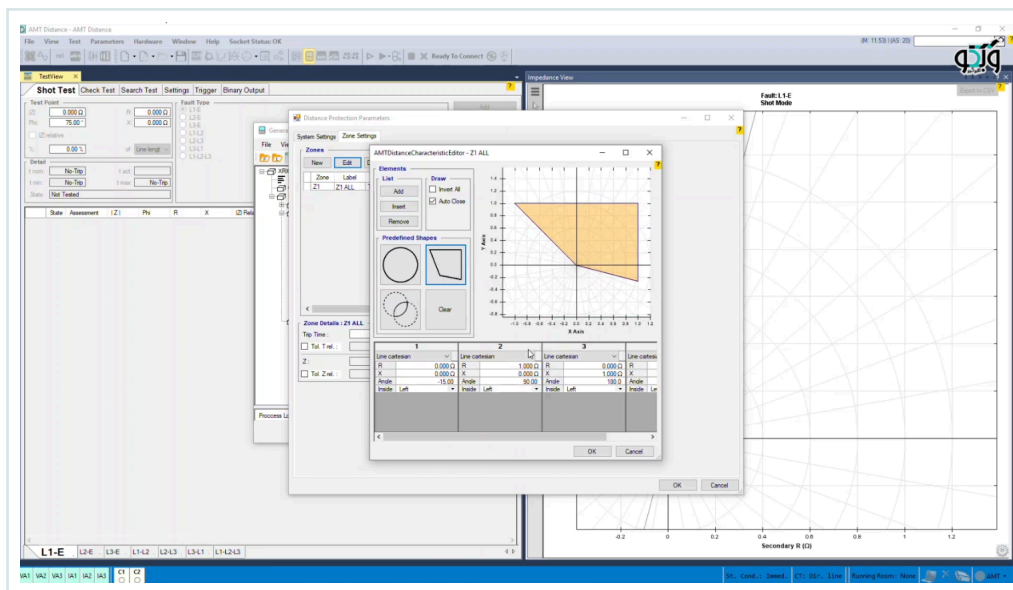


Figure 17

The first line, while passing through the R axis with the value R1, that is, the resistance of zone 1 passes., has a ϕ Dist angle, which here is equal to the load angle of 82 degrees. In this way, we enter the value R equal to 24.899, X value equal to 0 and the angle value is 82 degrees.

The second line is the horizontal line (taking alpha equal to zero degrees) with the specifications R=0, the value X is 6.211 and the angle is 180 degrees.

The third line that passes through the source is also draw by the specifications R=0, X=0 and the angle derived from the manual, that is 300 degrees.

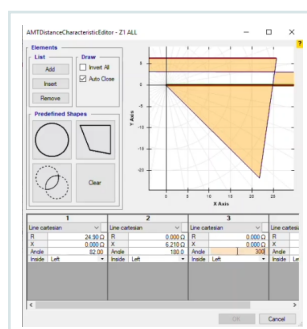


Figure 18

The fourth line that passes through the source has a 22-degree angle in according to the manual. For this purpose, we enter the value $R=0$, $X=0$ and the angle at 338 degrees.

The fifth line is draw by considering the value R equal to zero, X equal to -6.211 and the angle equal to zero.

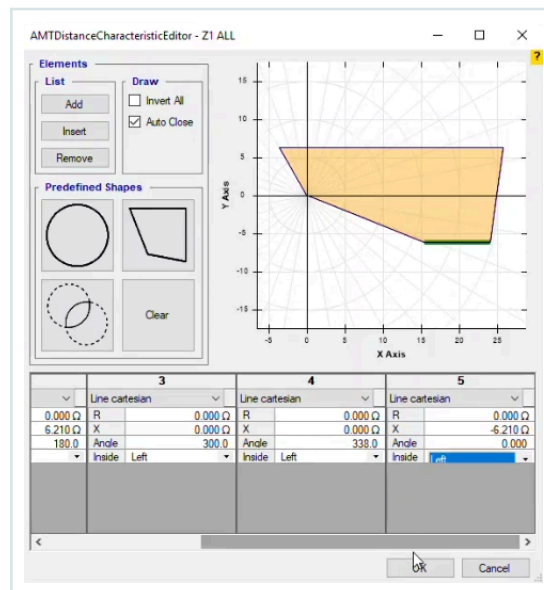


Figure 19

By entering the above coordinates, zone 1 is created as Forward. Creating characteristics for reverse and non-directional zones also follows this process.

By drawing the distance characteristic, it is possible to start the Shot Test and Search Test process in order to ensure the accuracy of the graphical characteristic.

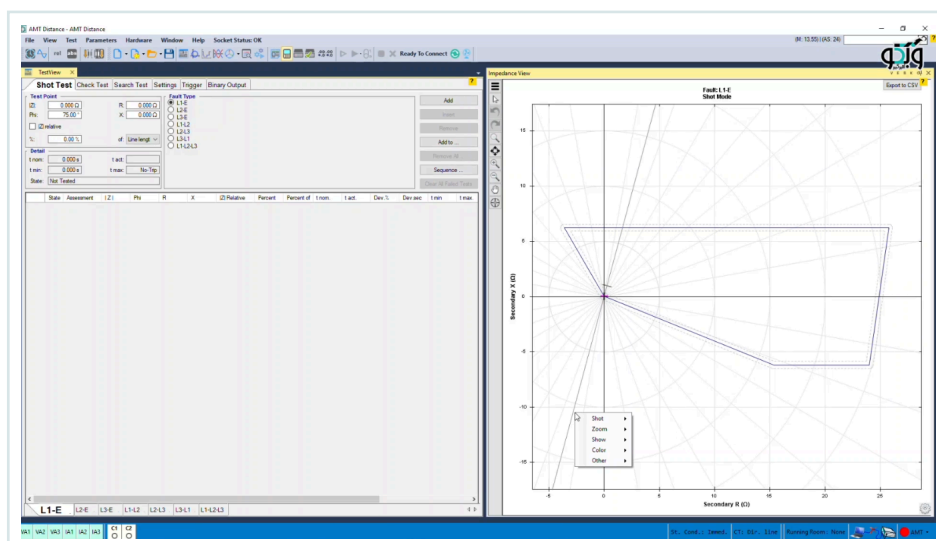


Figure 20

[jg1]Drawing_the_distance_characteristics