



VEBKO ONLINE HELP

Directional Overcurrent Protection Function Test in MICOM P141 Relay

Category	tester
Section	Testing of relays protection functions
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1 Imported Content

If a fault current is able to rotate on both sides in the relay protection zone, the directional overcurrent (DOC) is required to detect the direction, allowing it to trip or block depending on the situation. For this purpose, the relay uses a comparison of phase angle and fault current with reference values. In addition, RCA (Relay Characteristic Angle) is used to provide maximum sensitivity to performance in the relay protection zone.

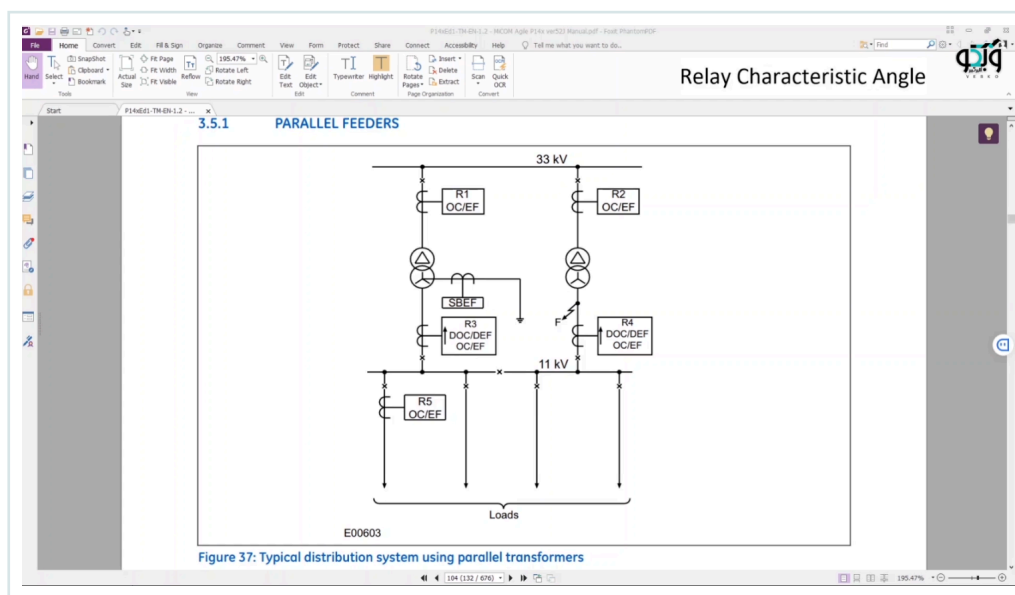


Figure 1

In the MiCOM P141 relay, the RCA value is in the range of -95 to +95 degrees using the Char Angle" parameter.

In general, the following formula is established in the mentioned relay:

Directional forward $-90^\circ < (\text{angle}(I) - \text{angle}(V) - \text{RCA}) < 90^\circ$

Directional reverse $-90^\circ > (\text{angle}(I) - \text{angle}(V) - \text{RCA}) > 90^\circ$

The DOC function (function 67) test is performed based on the settings of the first stage in setting group number 1.

In "Setting" section and in the "Group 1 Overcurrent" subset, the forward element is activated with a current of 1 amp and a time setting of 250 milliseconds. Other current stages are disabled.

It is possible to use the voltage transformer supervision (VTS), to block DOC element. This is done in "I Blocking" cell so that if it's set to 1, the VTS blocks the DOC function and if it's set to zero, the stage

becomes a non-directional function if the VTS function operates.

Finally, it's important to pay attention to the 45-degree characteristic in the current section.

For example, to test the operation of phase A in the 1-amp mode, if element 35.24, the first stage of the directional overcurrent, is set to "Directional Fwd", the current should flow out of terminal C2 but into C2 if set to "Directional Rev".

Note that terminals C3 and C2 are used for the 1-amp mode of phase A test and terminals C1 and C2 are used for the 5-amp mode of phase A test.

If cell 35.52 (V Deo OC Status) isn't in Disabled mode, there is an overcurrent function for operation mode with voltage control, or if the element of cell 3502, the first stage of overcurrent, is in "Directional Fwd" or "Directional Rev" mode, voltage input is required. For example, directional overcurrent testing on phase A, a nominal voltage is injected into terminals C20 and C21.

Before considering each case, it is checked which output and LED are used for the DOC protection function. Thus, Programmable Scheme Logic (PSL) is used. It's possible that a specific contact is provided for the operation of each phase. Activating trigger which records error, is also checked for these two functions.

If you want to manually test the overcurrent function without using "XRIO" or "CSV" files, just double-click on the "Overcurrent" block in "General Test Object" and select the directional in "Relay Parameters" tab,

the relay's setting is written in "Elements" tab.

The characteristic angle is entered in "Define Element Directional Behavior" section. Note that RCA is in relay and to convert it to Maximum Torque Angle (MTA), you need a 90 degree clockwise shift.

In the first step of the test, at the best characteristic angle inject a current, twice as many as the current value is in cell 3503 into the relay and compare the operating time with what the software predicted. Continue this operation by injecting the quadruple current. You can also select the shot points to ensure that the relay doesn't work in the blocking zone and follow this test at the angular boundaries of the directional characteristic.

Note that for fixed and reverse time characteristics, a delay of 0.02 to 0.08 seconds must be considered for the acceptable relay operating range, respectively.

If you run the test on fault type L1, L2 and L3, the setting current should not act in a way that its reversal from the other two phases causes tripping.

The next step is to enter the current and angle settings in "PickUp-DropOff". You can use "Medium

Detail View” to display the characteristic curve completely.

By making settings in the “Trigger” tab, you can select contacts or other elements to record test results.

[jg1]MICOMP141_DIRECTIONAL_OVER_CURRENT

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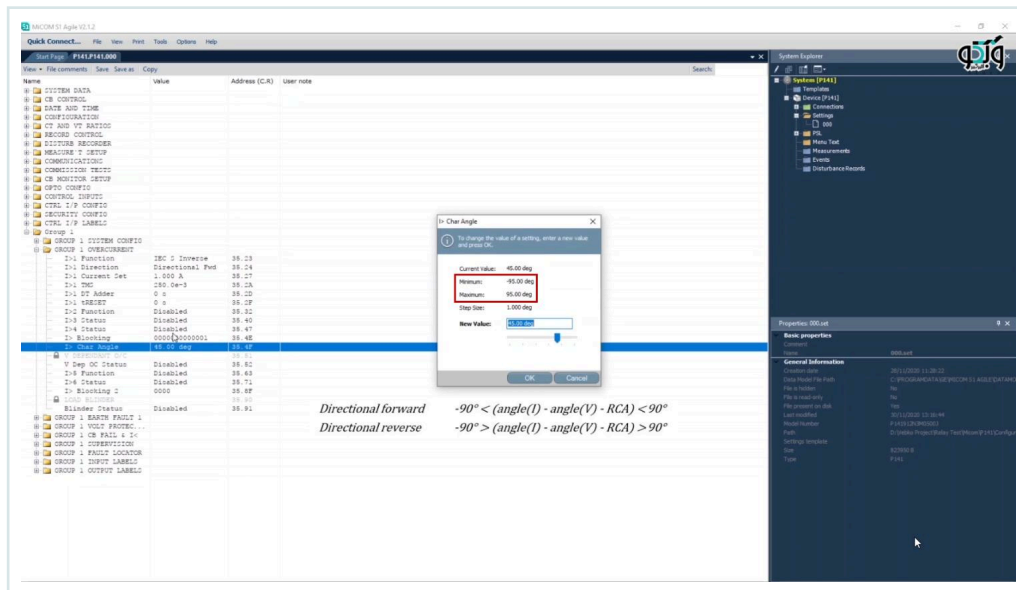


Figure 2

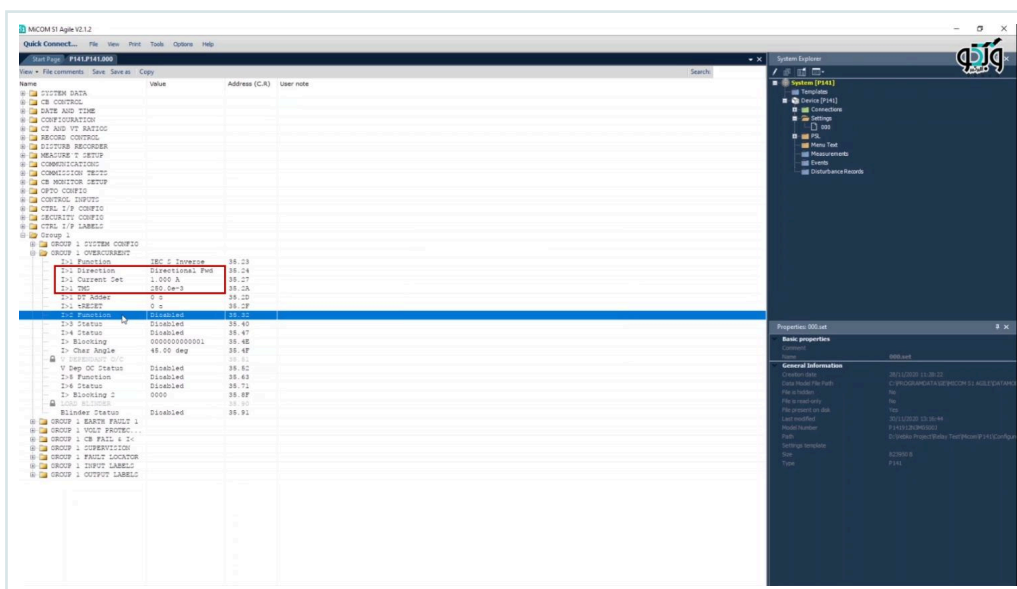


Figure 3



Figure 4

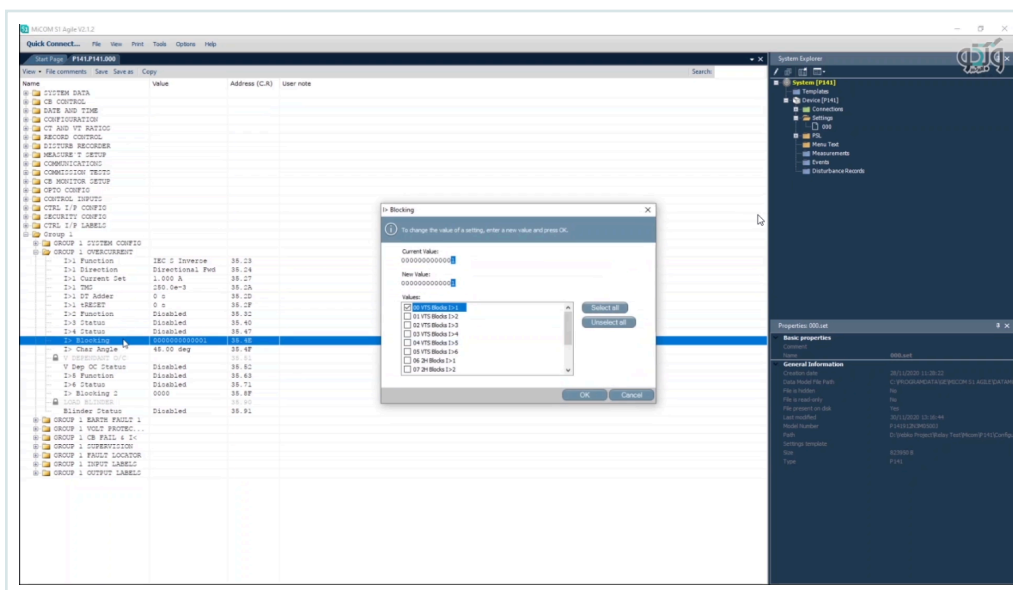


Figure 5

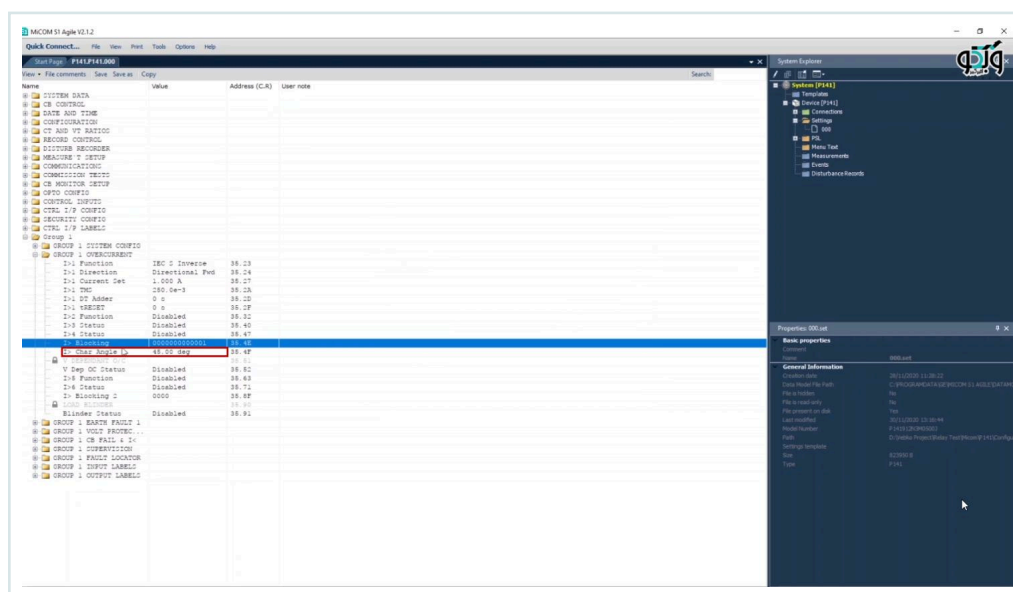


Figure 6

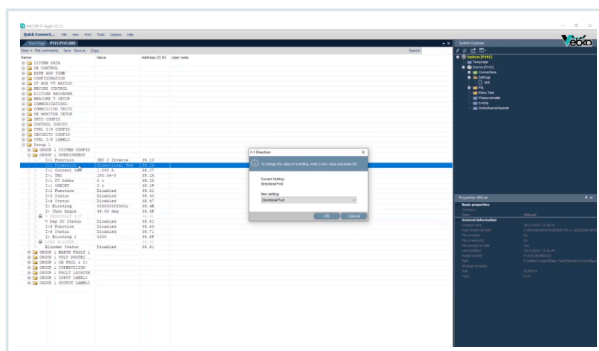


Figure 7

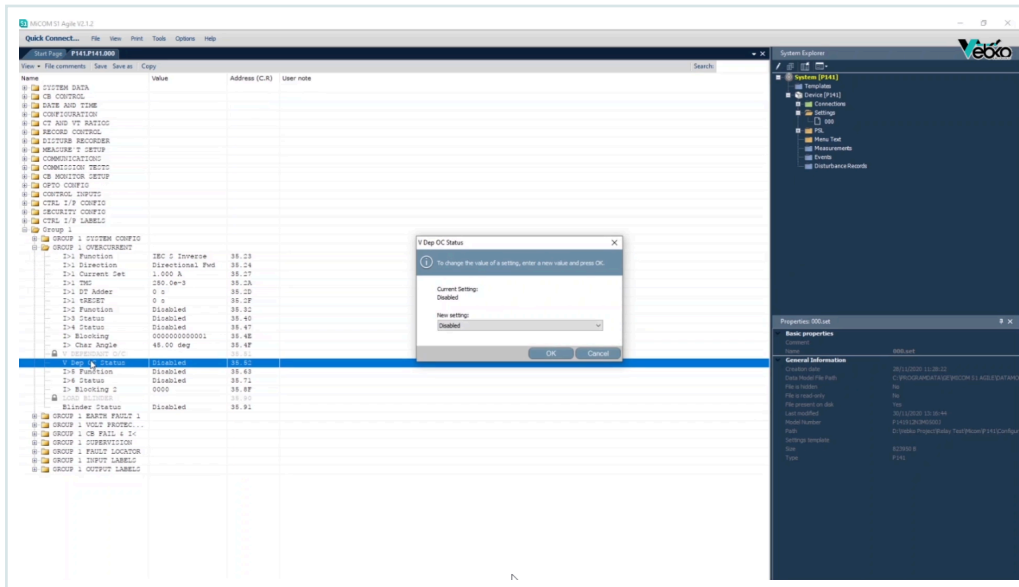


Figure 8

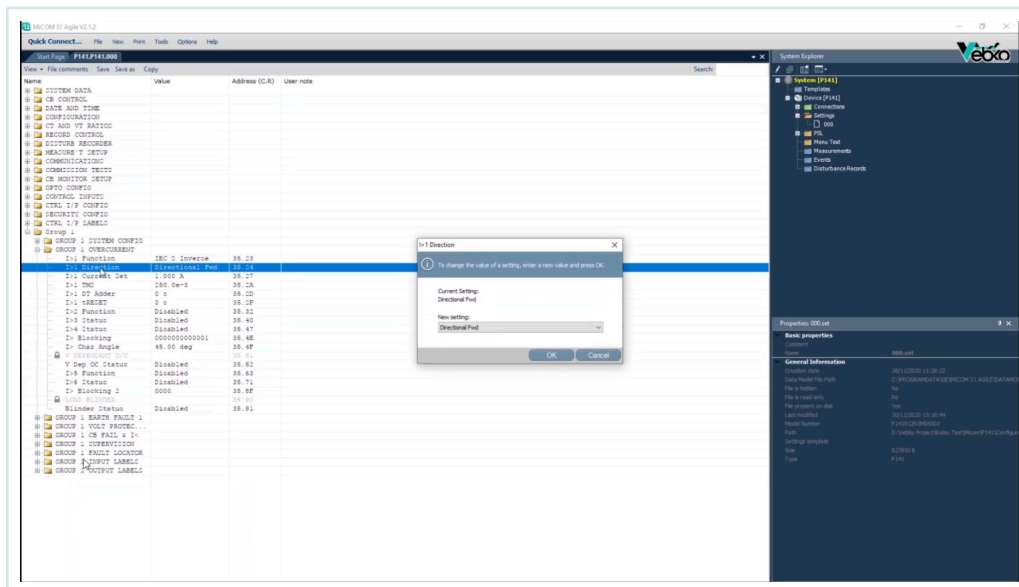


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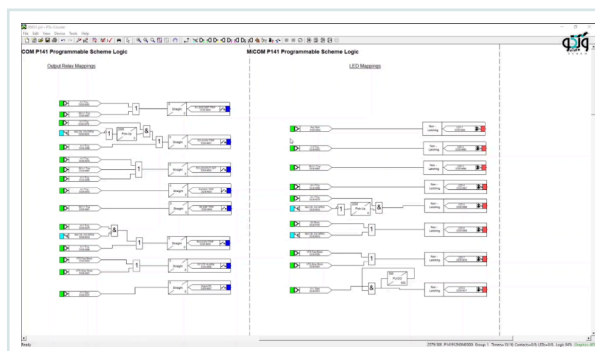


Figure 10

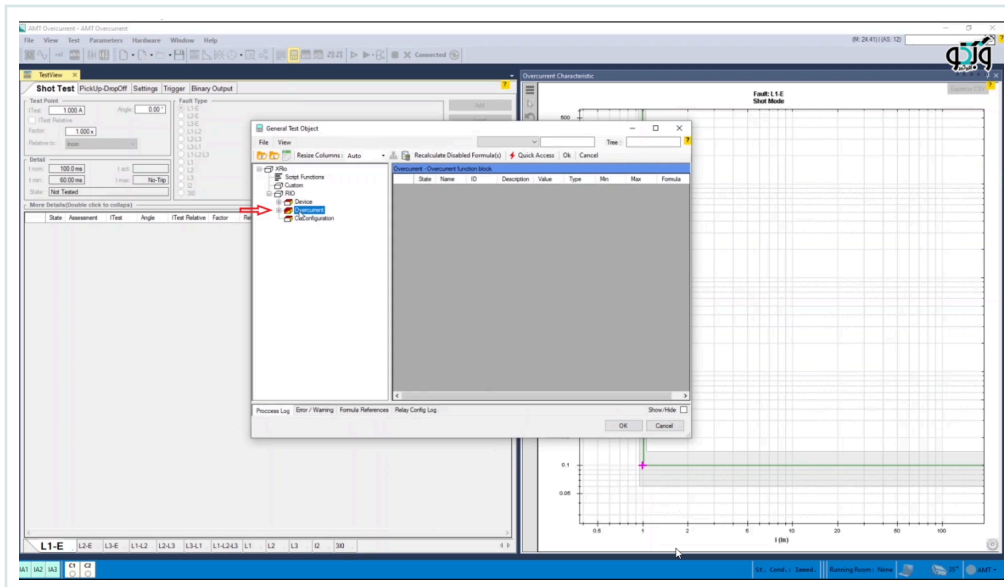


Figure 11

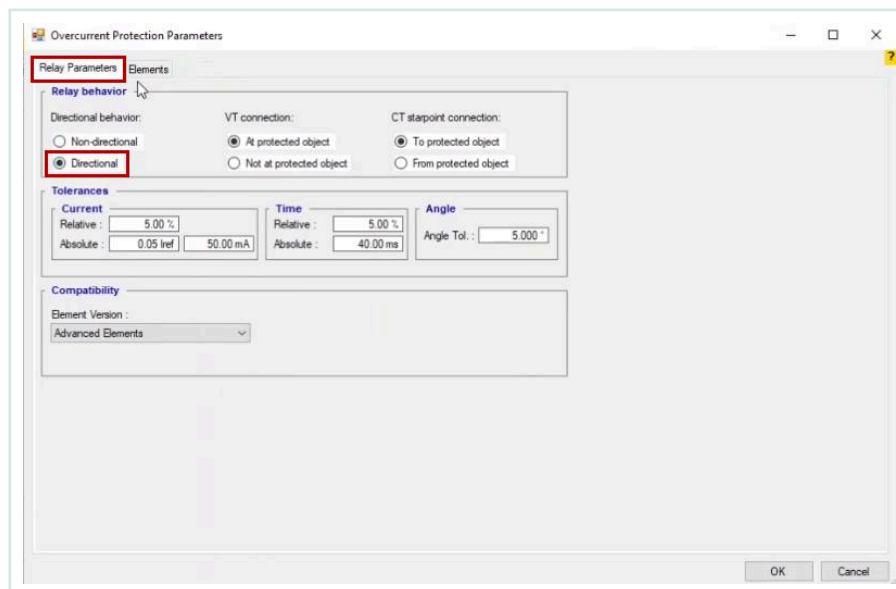


Figure 12

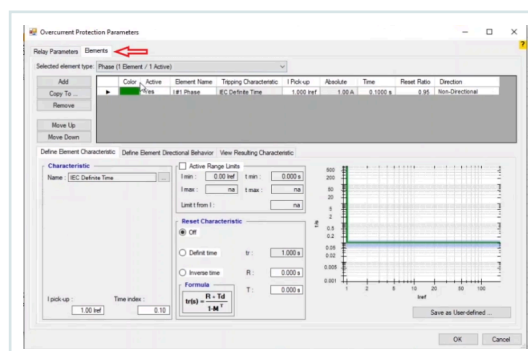


Figure 13

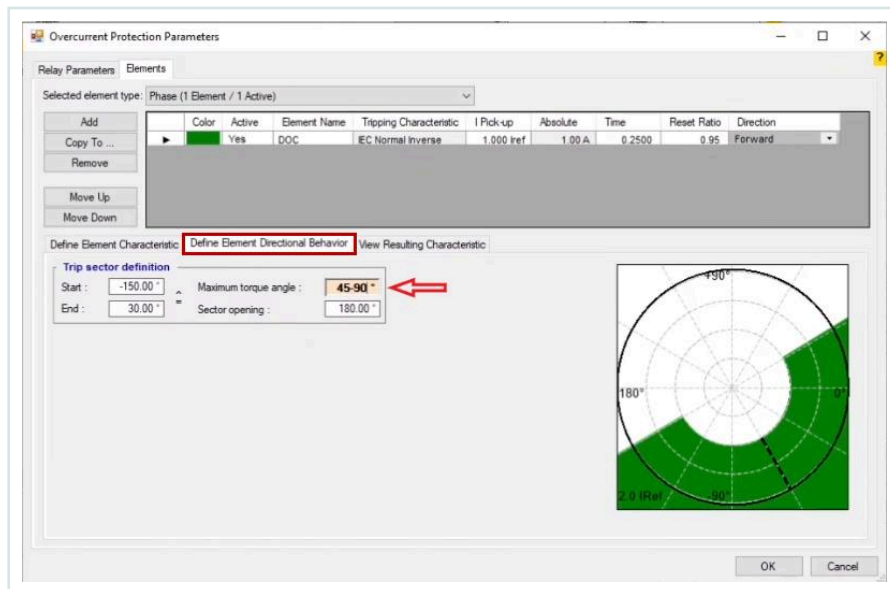


Figure 14

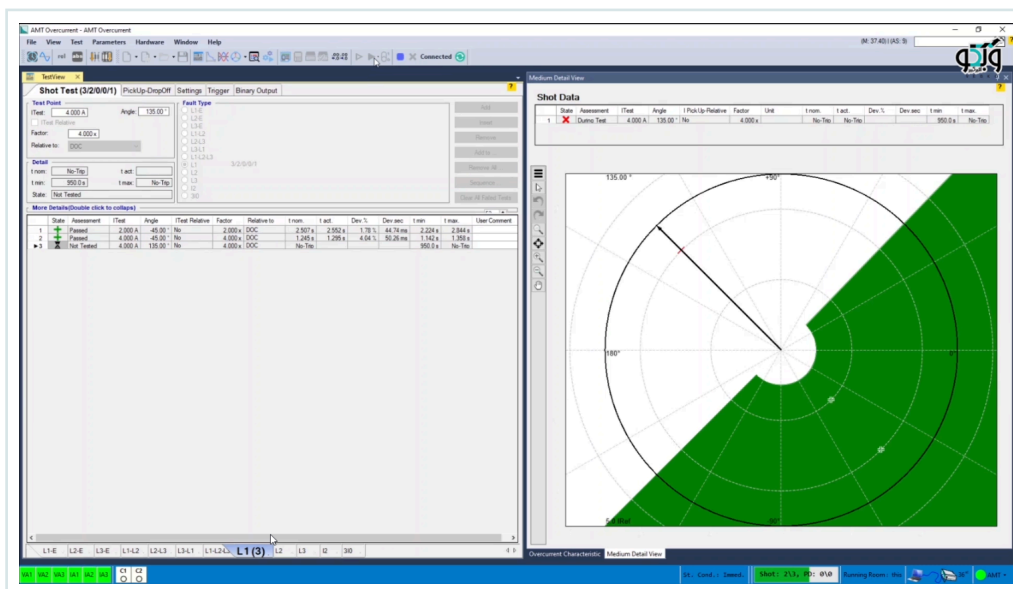


Figure 15

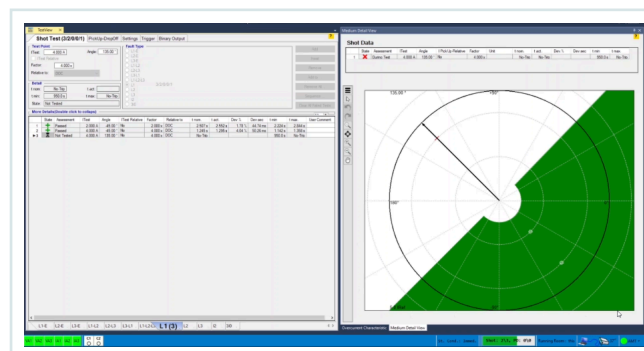


Figure 16

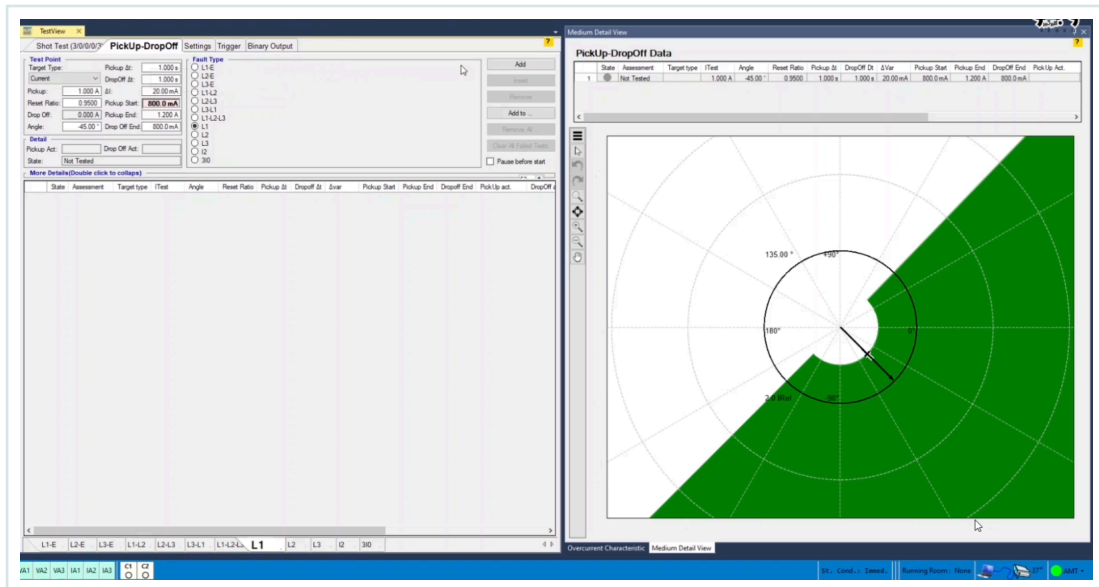


Figure 17

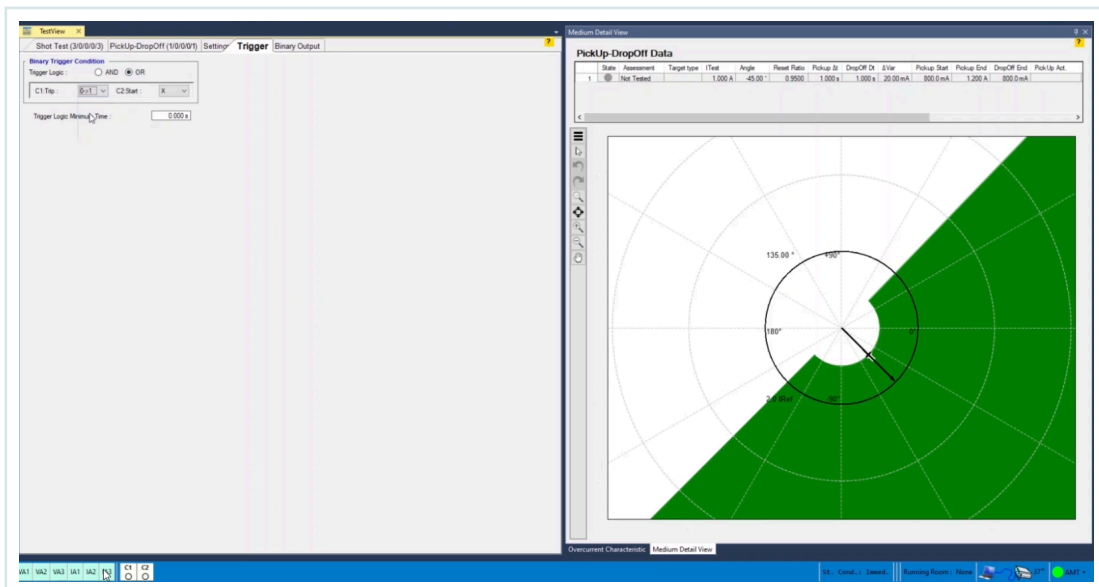


Figure 18