



VEBKO ONLINE HELP

An Introduction to AMT Synchronizer

Category	tester
Section	AMT Synchronizer Module
Language	English
Generated	2026-10-18

1 Imported Content

To test synchronizer relays, “AMT-Synchronizer” room can be used. The synchronizer is a piece of equipment that is used to connect the generator to the grid that is being used and uses the voltage of both sides to examine the state of frequency and voltage and if the difference between the generator voltage range and frequency, and the grid is less than the specified limit, the connect command is issued. If the mentioned difference is more than the specified limit, the relay will not issue the command for the connection. In this case, the relay examines the generator frequency and voltage state compared to the grid. If any of these two parameters is lower or higher than the specified limit, the relay synchs the two systems by giving the command for an increase or decrease in the “AVR” and the governor.

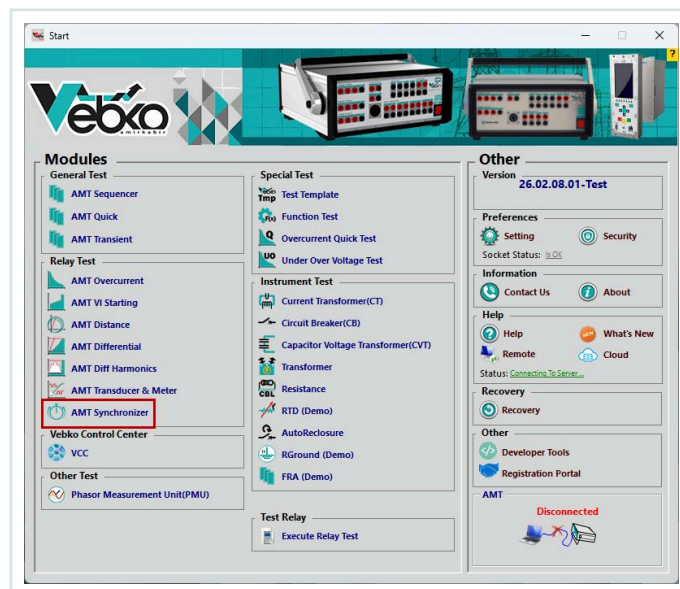


Figure 1

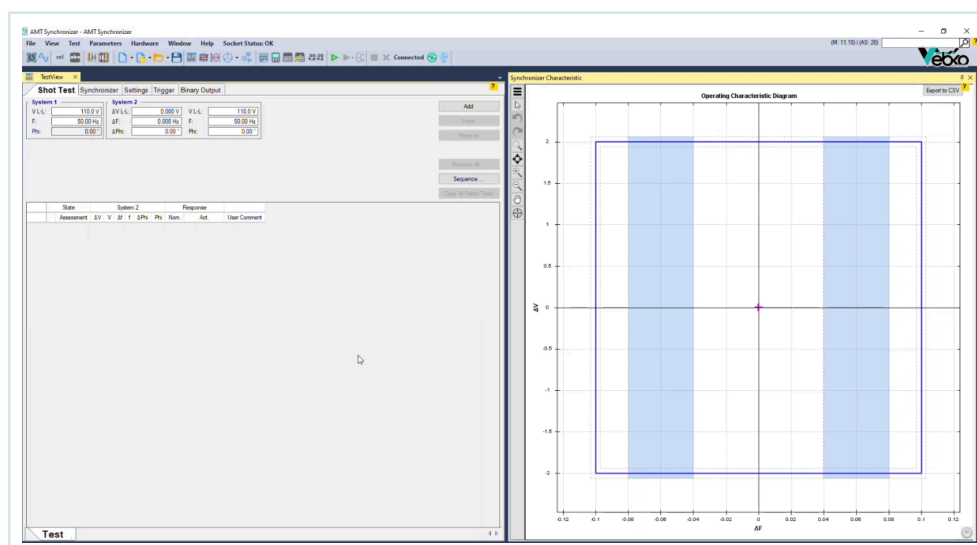


Figure 2

The synchronizer room has several pages and exclusive windows. The two main windows of this room are “Test View” and “Synchronizer Characteristic”.

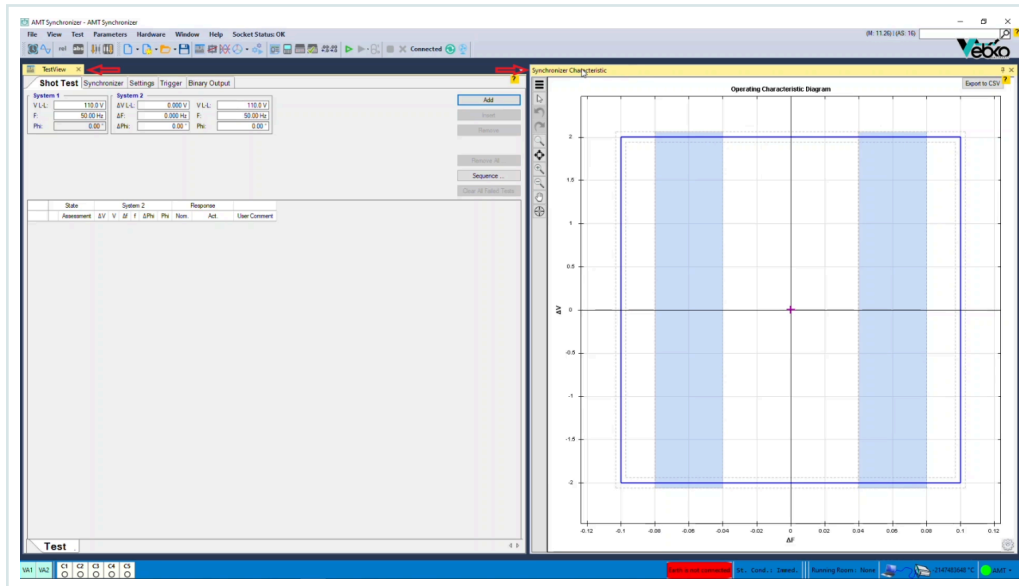


Figure 3

The “Shot Test” and “Synchronizer” tests are done in the “Test View” window. To perform a “Shot test” in this room, like the other rooms, the user only needs to specify a test point and perform the test.

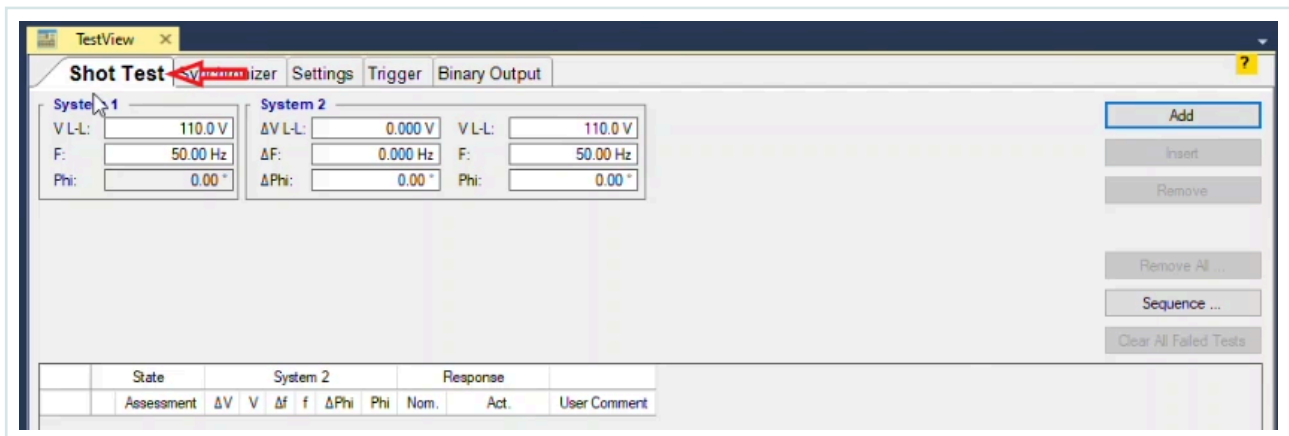


Figure 4

Also, the performance of the relay in synchronizing the two systems is tested in the “Synchronizer” tab.

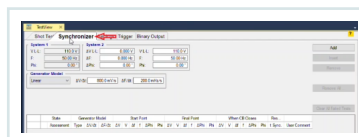


Figure 5

Also, the performance of the relay in synchronizing the two systems is tested in the “Synchronizer” tab. The synchronizer characteristic is displayed in the “Synchronizer Characteristic” in accordance with the information entered in the “Test Object” of this room.

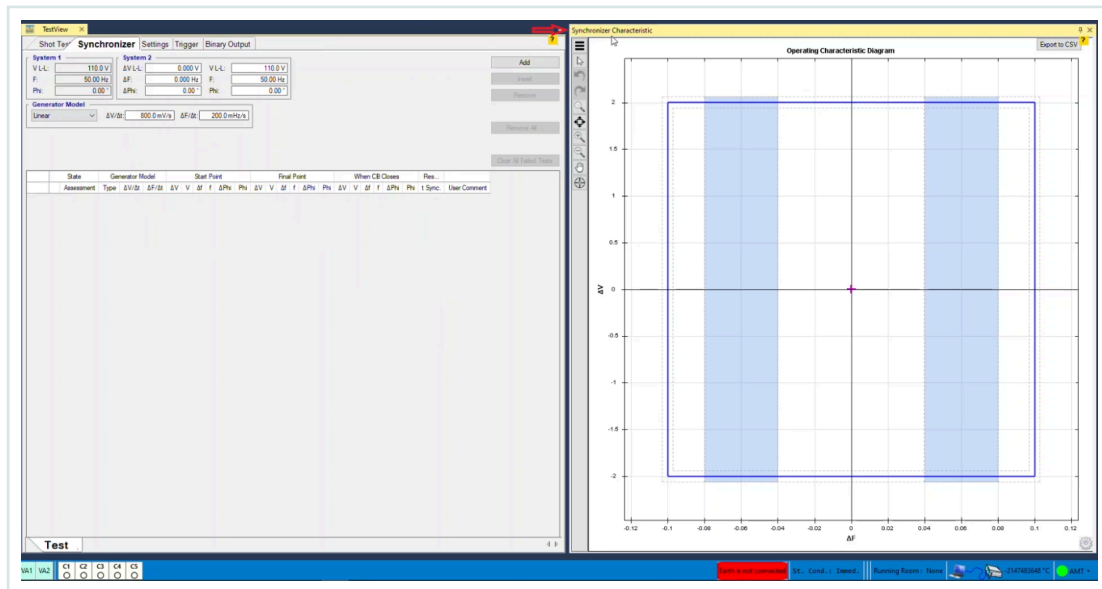


Figure 6

The tools available by right-clicking or left-clicking in this window and the cog at the bottom are common in all rooms.

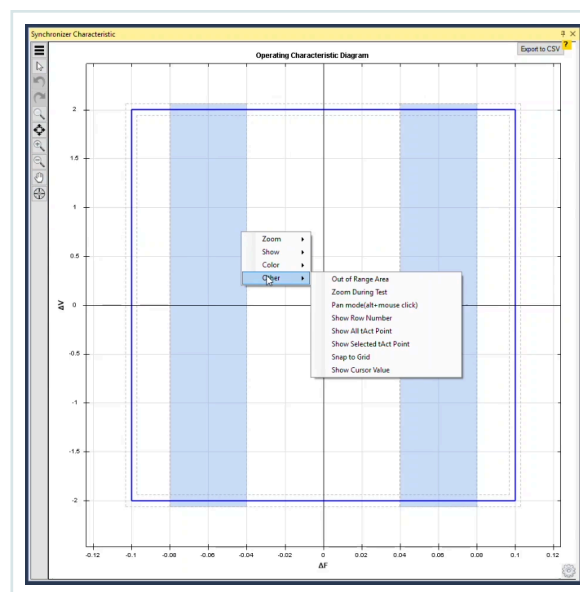


Figure 7

To enter the relay information for the test, the first thing is to enter the nominal information of the

relay in "Device". In this section, it is necessary to enter characteristics such as "PT" turns ratio and frequency.

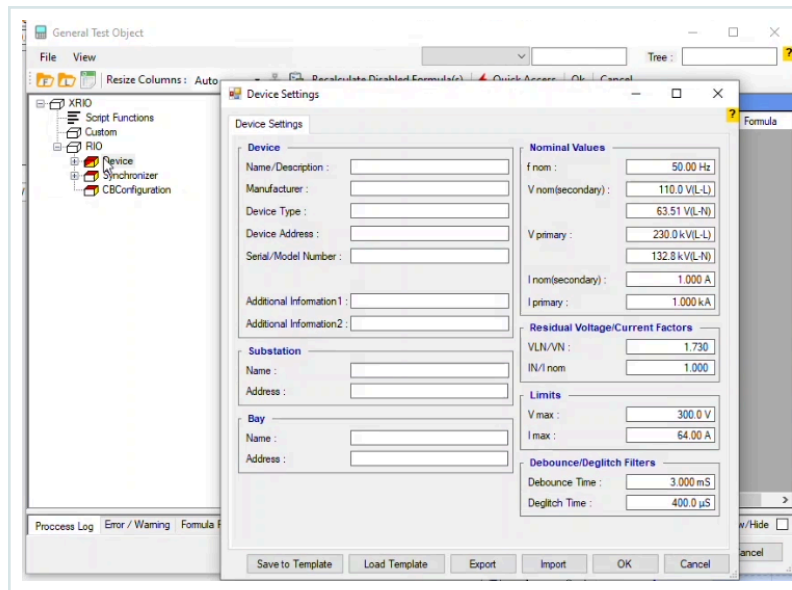


Figure 8

In the next step, the relay characteristics are entered after double-clicking on "Synchronizer".

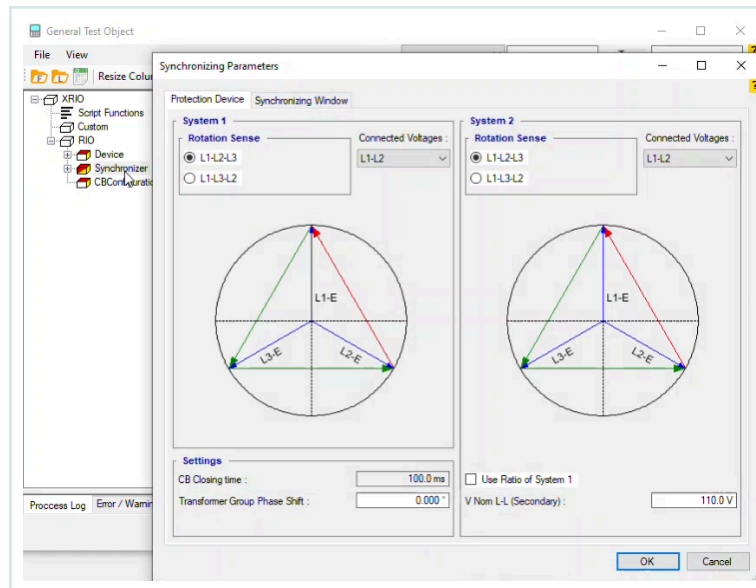


Figure 9

Since these relays use voltage, in "Protection Device" tab,

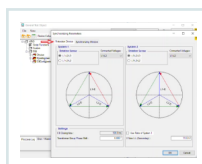


Figure 10

it is necessary to select the sequence of phases and the phases that are connected to the relay in "Rotation sense" and "Connected Voltages" for systems 1 and 2.

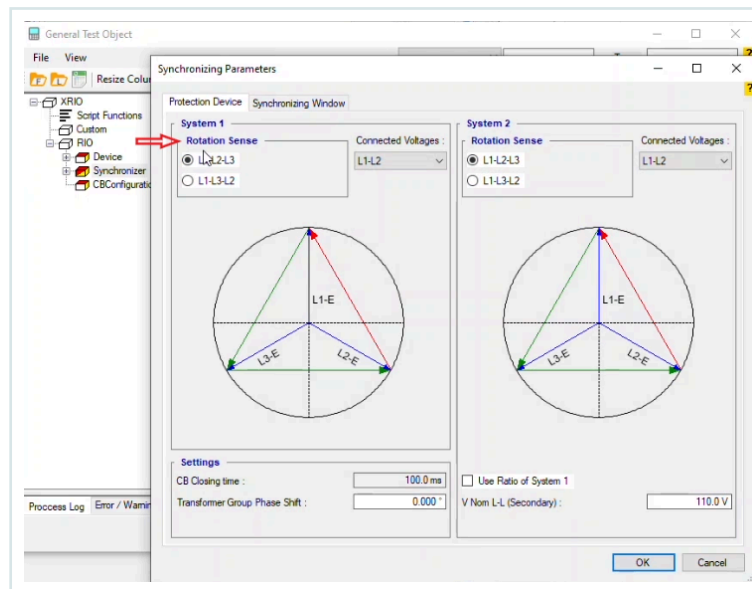


Figure 11

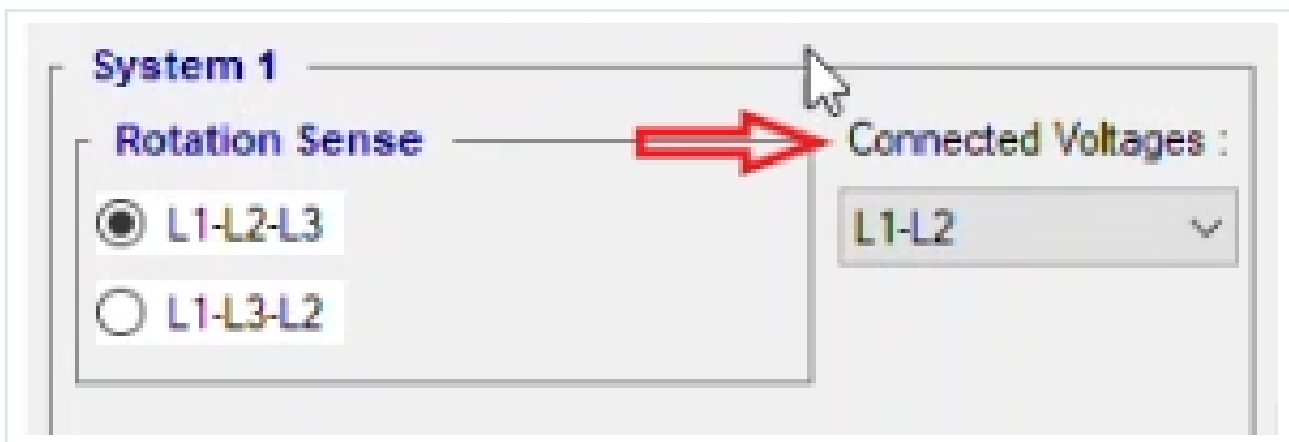


Figure 12

Note that system number one is an infinite bus and system number two is a generator that needs to be connected to the grid. An important point is that when the system phases are wired as ACB, it is necessary to select L1-L3-L2 radiobutton. Also, if "Connected Voltage" on any of the phase-to-ground states is selected, the voltages of systems one and two are displayed in "Test View" in form of phase-to-ground.

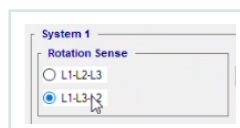


Figure 13

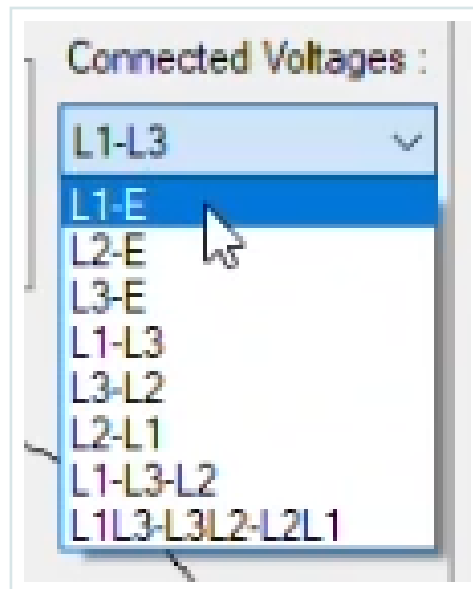


Figure 14

The key performance time is entered in the "Setting" section of this part and in the "CB Closing time" field and the phase shift that can come from intermediate equipment or a coupling transformer is specified in the "Transformer Group Phase Shift".

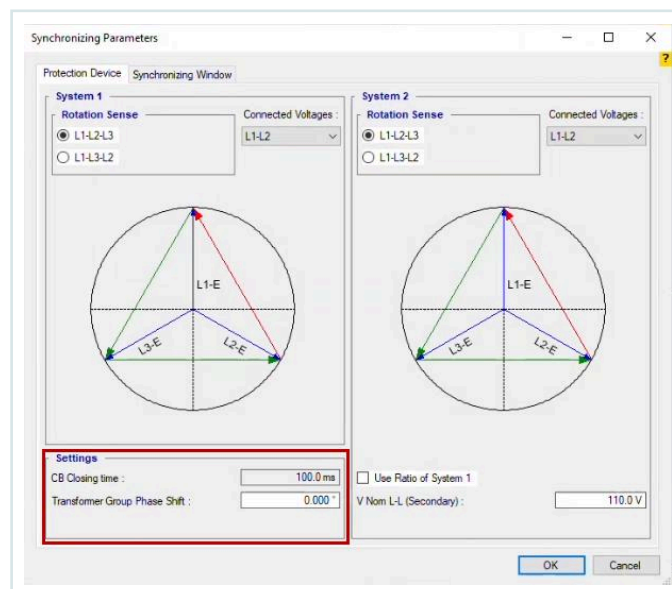


Figure 15

The nominal voltage of the system number two is entered in "VNom L-L(Secondary)" field and if this value is different from that of system number one, it needs to be specified. By specifying this value, the voltage difference that is resulted from the test will be in relation to nominal voltage of system number two and not the voltage of system number one. This means that if the nominal voltage of

system number one is 110 volts and the nominal voltage of system number two is 100 volts and the allowed difference of these systems is specified to be 2 volts, the minimum and maximum voltage of system number two must be 98 and 102 volts, respectively.

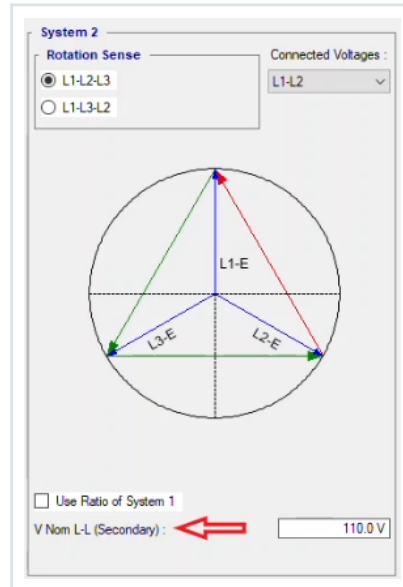


Figure 16

When the PT secondary turns ratio of the grid and the generator are the same, “Use Ratio of System 1” is to be used. For example, if the PT turns ratio of the grid is 400KV/110V and the turns ratio of the generator is 15.75KV/100V, since the secondary turns ratio of the two systems is not the same, the user needs to enter the PT secondary voltage of the generator or system number two in the “VNom L-L(Secondary)” field.

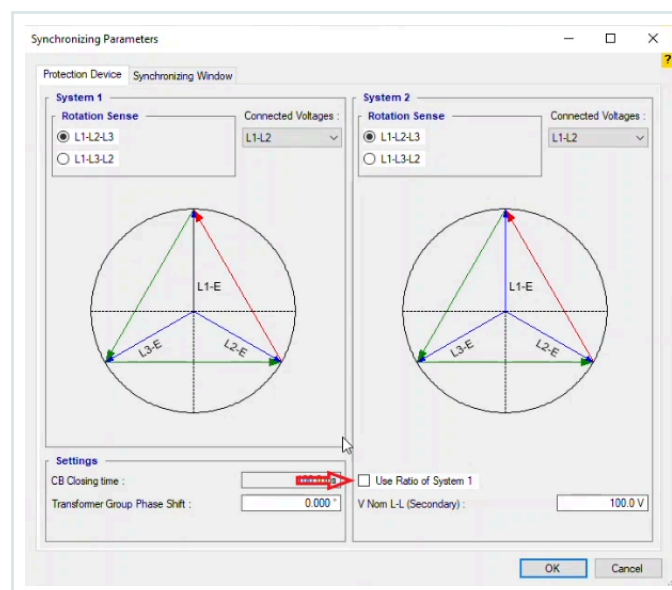


Figure 17

The characteristic related to the relay is entered in "Synchronizing Window". The characteristic entered in this section needs to be in accordance with the relay settings.

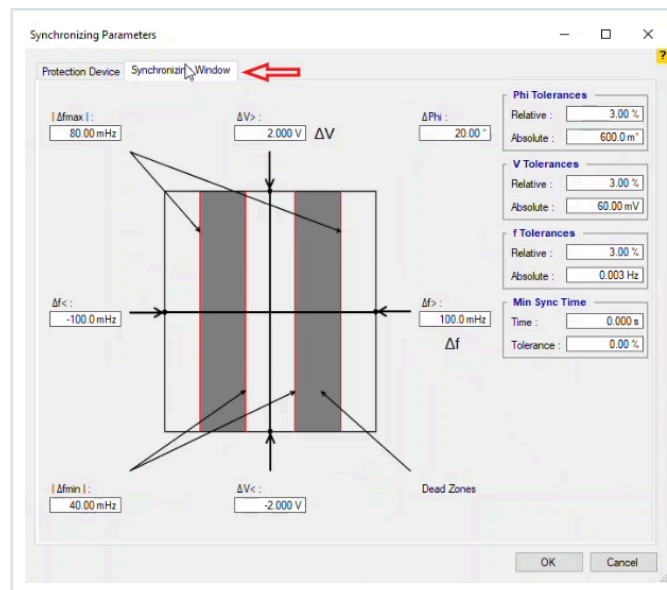


Figure 18

The upper and lower limits of voltage difference and the upper and lower limits of frequency difference are entered in $\Delta V>$, $\Delta V<$, " $\Delta f>$ " and " $\Delta f<$ " fields, respectively.

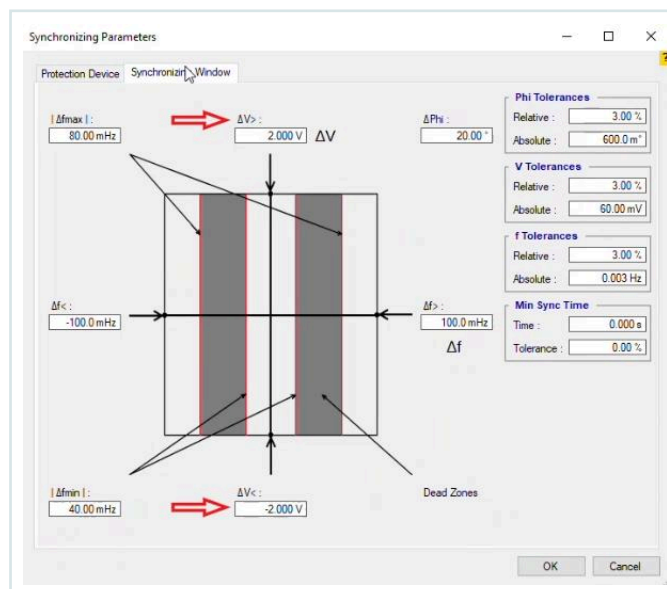


Figure 19

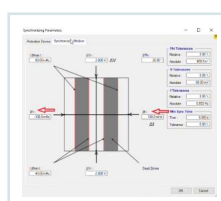


Figure 20

The relays mostly tend to issue a connect command in the “Dead Zone” range that is located between “deltaFmin” and “deltaFmax” parameters.

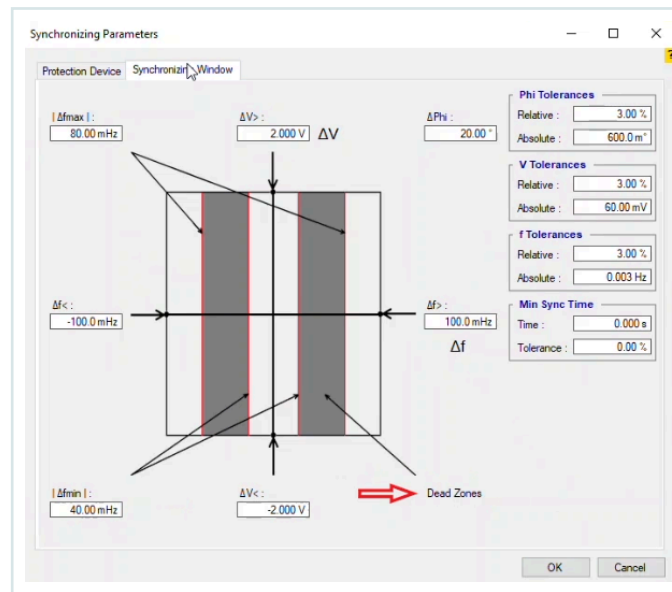


Figure 21

The allowed angle difference of the system number 2 is entered in “deltaPhi” Nom field and is entered in delta Phi.

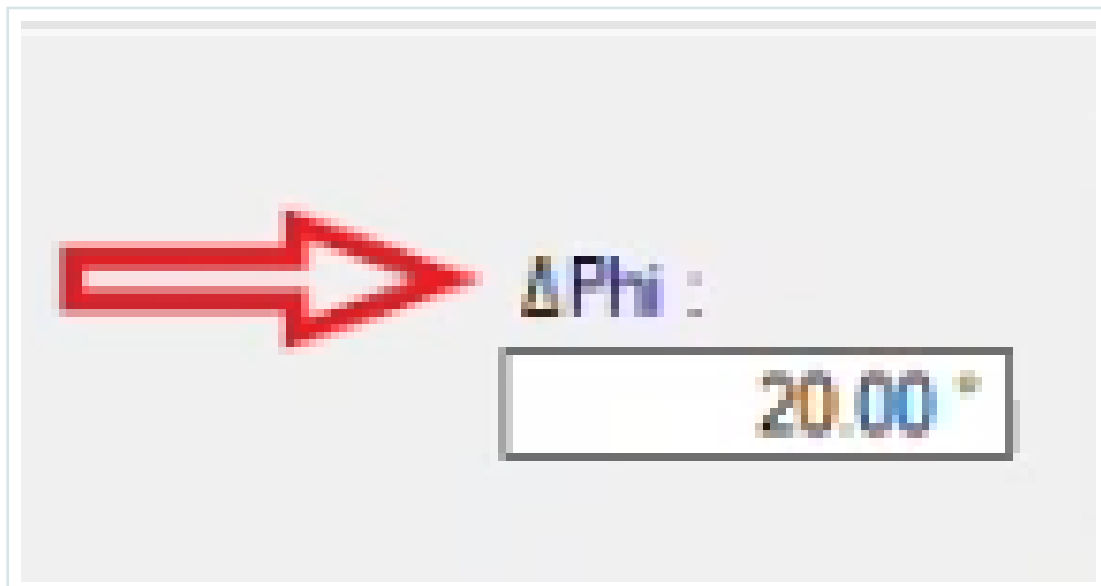


Figure 22

For example, if the nominal angle of system number 2 is 30 degrees and the allowed difference is 20 degrees, by going to Vector View window, the user can see that the allowed connection range is

determined to be between 10 to 50 degrees.

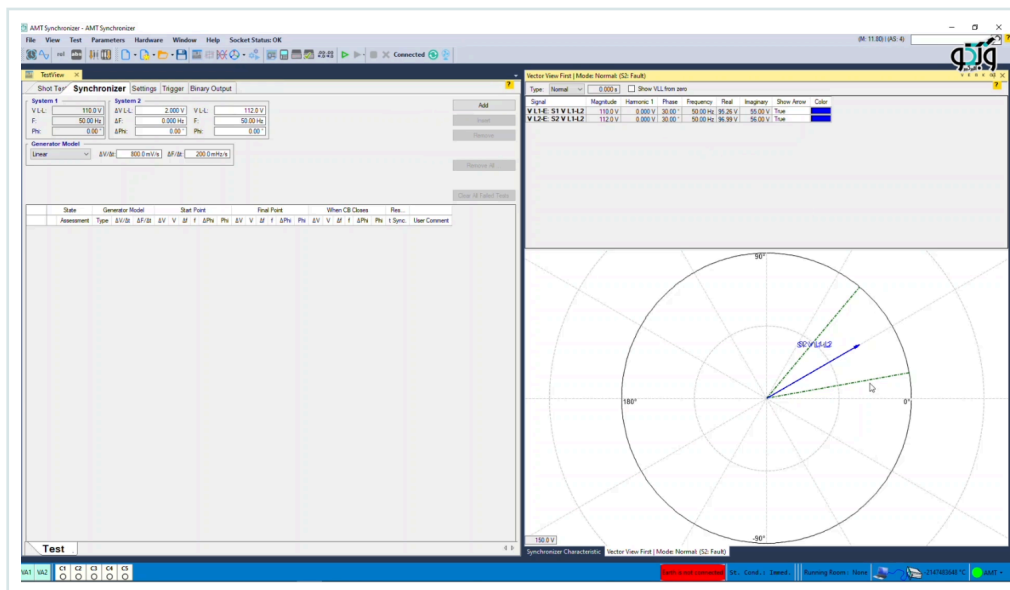
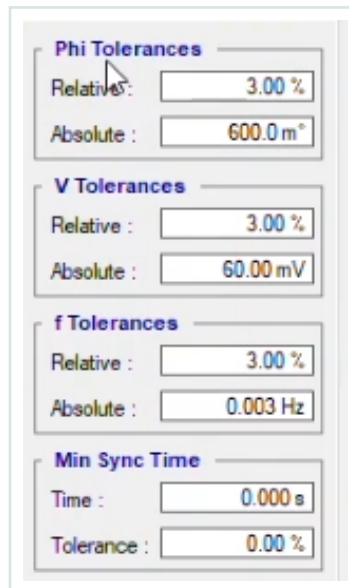


Figure 23

Also, the allowed tolerances for different parameters and the minimum allowed connection time are entered in the fields on the right side.



The screenshot shows the settings for the AMT Synchronizer, specifically the tolerances and minimum sync time. The settings are organized into four sections:

- Phi Tolerances:**
 - Relative: 3.00 %
 - Absolute: 600.0 m°
- V Tolerances:**
 - Relative: 3.00 %
 - Absolute: 60.00 mV
- f Tolerances:**
 - Relative: 3.00 %
 - Absolute: 0.003 Hz
- Min Sync Time:**
 - Time: 0.000 s
 - Tolerance: 0.00 %

Figure 24

About the voltage that is being used for the test, it should be noted that the relays measure the applied voltage and if the nominal voltage is as much as 110 (or 100), the user only needs to apply "VL1-E" and "VL2-E" for systems number 1 and 2 with the same value to the relay and this can be viewed in the "Hardware Configuration".

For example, if in the “Protection Device” in the “Connected Configuration” tab the two systems are set at “L1-L2” mode, by going to the “Hardware Configuration” window and in the “Analog Output” section,

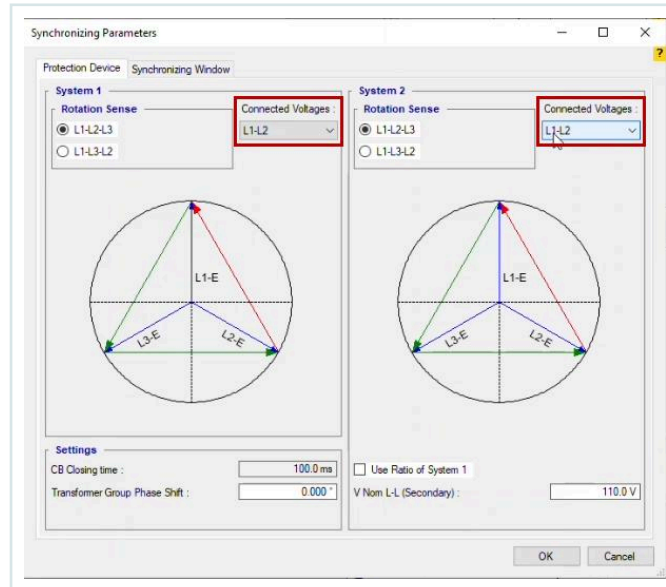


Figure 25

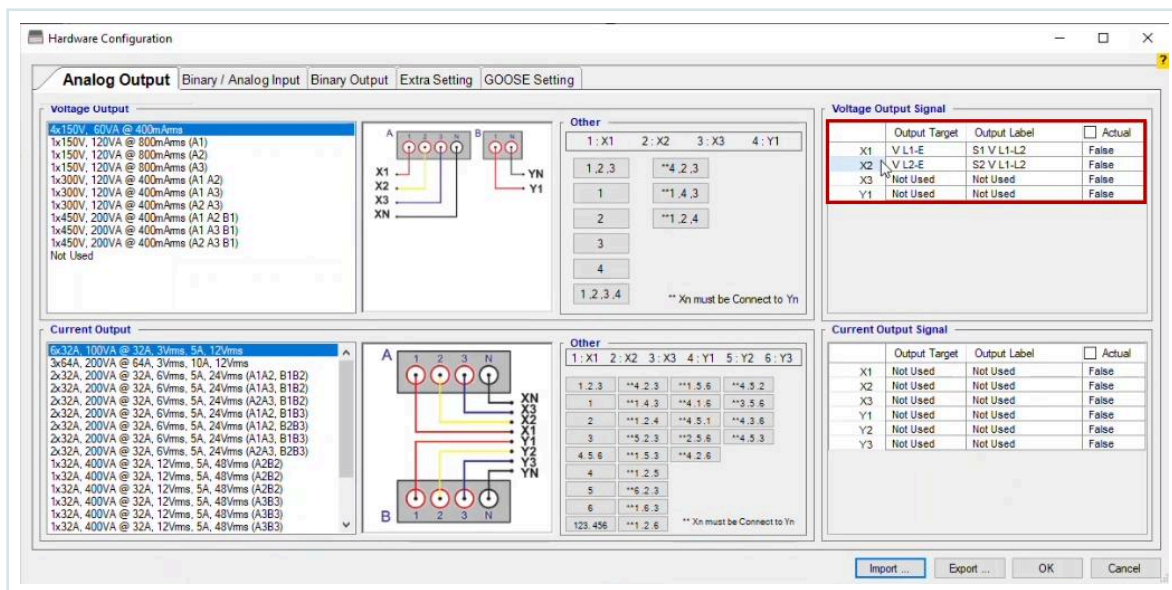


Figure 26

it can be seen that considering the selected mode, two sources are specified for the voltage that is being used for the test and that in fact, VL1_E plays the same role as “VL1-L2” of system number one and “VL2-E” plays the same role as “VL1-L2” of system number two. To better understand this, suppose that a 110 volts line-to-line voltage is used for system number 1 and for system number two, a 63.5 volts “VL1-E” phase voltage is used. To enter the information of such a system, it is necessary to enter “L1-L2” and “L1-E” as the Connected Voltage for systems number one and two, respectively.

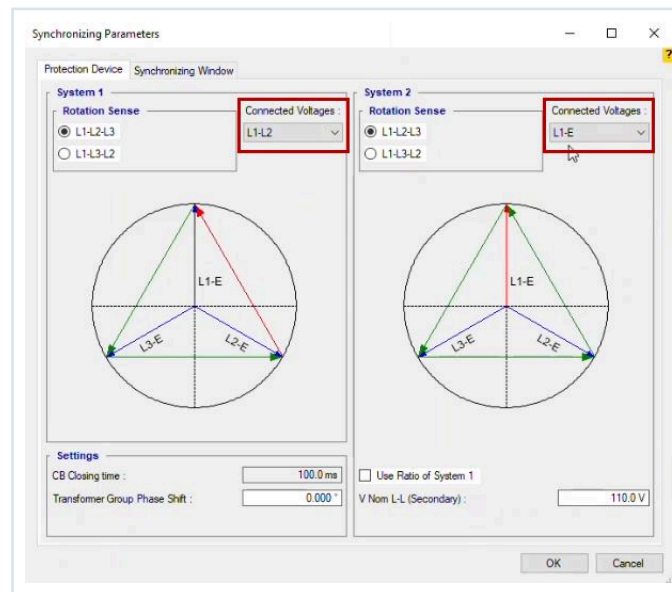


Figure 27

Also, $63.5 \times \sqrt{3}$ or 110 volts is entered as the “Vnom L-L” for system number two. Now, by opening the “Test View” and “Vector View” pages, it can be seen that 63.5 and 110 volts are entered as the nominal voltage for systems number two and one, respectively.

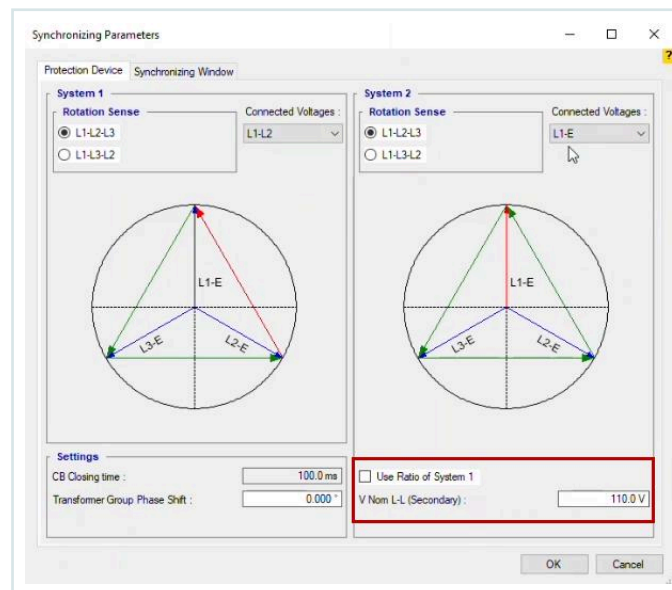


Figure 28

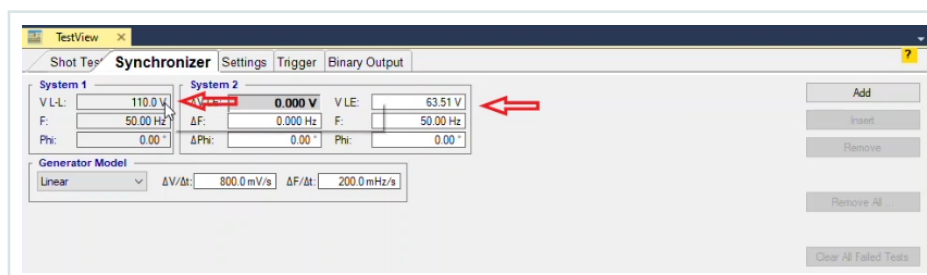


Figure 29

The next point is that only for system number one it is possible to select a three-phase voltage because only the Voltage groupA of the device is three-phase and as for system number two it is only possible to select a single-phase or line-to-line voltage.

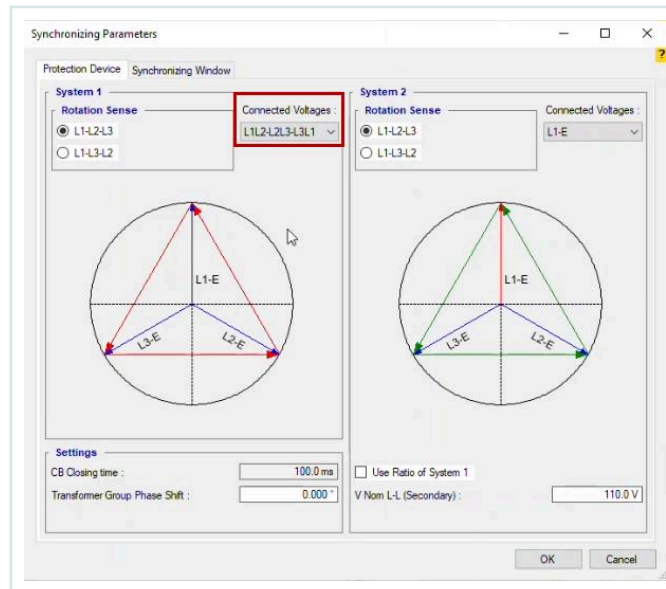


Figure 30

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