



VEBKO ONLINE HELP

Harmonic State

Category	tester
Section	AMT Sequencer Module
Language	English
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In order to better explain this "State Type", in addition to magnifying "Detail View" window, the "Signal View" window is also magnified to observe outputs. As you are aware, based on the Fourier series expansion, a periodic signal can be expressed in terms of the sum of several sinusoidal waves with various coefficients and frequencies. In "Harmonic" State Type, the user can inject voltage signals and harmonic current by "AMT105" device. To this purpose, in "Detail View" window, "Analog Out" tab and "State Type" part, the "Harmonic" State Type is selected from dropdown field. As can be observed, in this "State Type", the user can create and inject a signal with two desired harmonics. To this purpose, first the signal data or main harmonic should be entered in "Analog Output Channels" and the other two desired harmonics in "Free-Order Harmonic #1" and "Free-Order Harmonic #2".

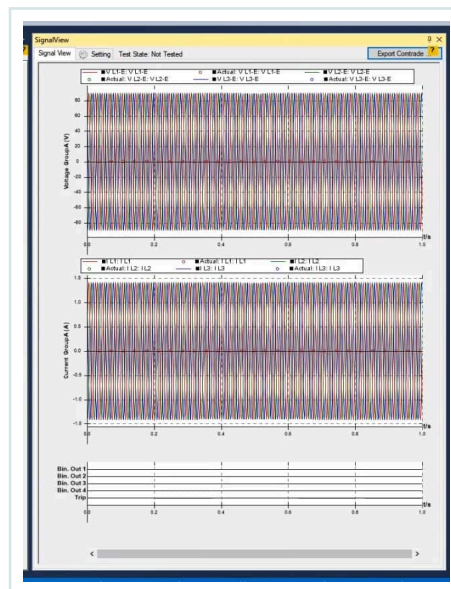


Figure 1

$$f(x) = \frac{1}{2} a_0 + \sum_{n=1}^{\infty} a_n \cos(n x) + \sum_{n=1}^{\infty} b_n \sin(n x),$$

$$a_0 = \frac{1}{T} \int_0^T f(x) dx$$

$$a_n = \frac{2}{T} \int_0^T f(x) \cos(n \omega x) dx, n = 1, 2, \dots$$

$$b_n = \frac{2}{T} \int_0^T f(x) \sin(n \omega x) dx, n = 1, 2, \dots$$

Figure 2

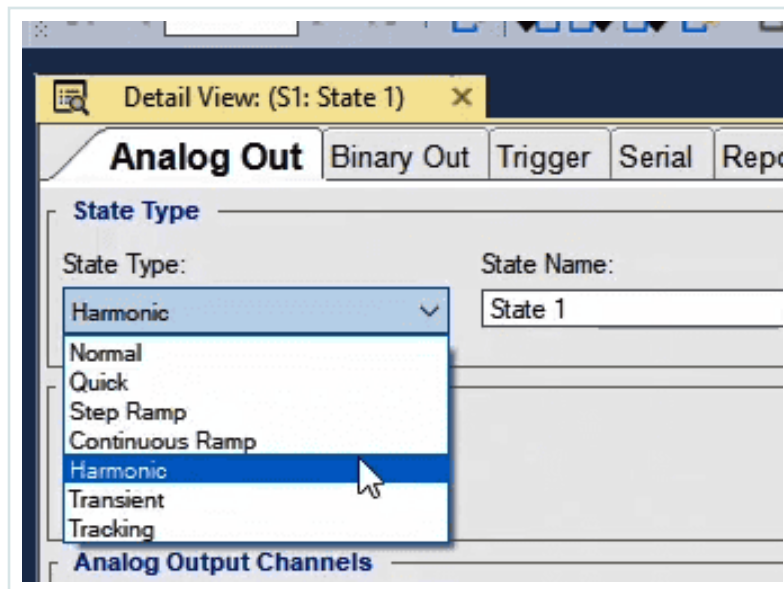


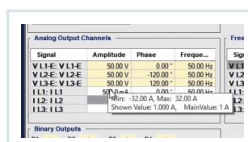
Figure 3

Free-Order Harmonic #1					Free-Order Harmonic #2				
☐ Rhythm					☐ Rhythm				
Freque...	Signal	Amplitude	Phase	Freque...	Signal	Amplitude	Phase	Frequency	
50.00 Hz	V L1-E: V L1-E	0.000 V	0.000 1/s	0.000 Hz	V L1-E: V L1-E	0.000 V	0.000 1/s	0.000 Hz	
50.00 Hz	V L2-E: V L2-E	0.000 V	0.000 1/s	0.000 Hz	V L2-E: V L2-E	0.000 V	0.000 1/s	0.000 Hz	
50.00 Hz	V L3-E: V L3-E	0.000 V	0.000 1/s	0.000 Hz	V L3-E: V L3-E	0.000 V	0.000 1/s	0.000 Hz	
50.00 Hz	I L1: I L1	0.000 A	0.000 1/s	0.000 Hz	I L1: I L1	0.000 A	0.000 1/s	0.000 Hz	
50.00 Hz	I L2: I L2	0.000 A	0.000 1/s	0.000 Hz	I L2: I L2	0.000 A	0.000 1/s	0.000 Hz	
50.00 Hz	I L3: I L3	0.000 A	0.000 1/s	0.000 Hz	I L3: I L3	0.000 A	0.000 1/s	0.000 Hz	

Figure 4

1 "Analog Output Channels" Table

As aforementioned, the main harmonic data are entered in this table. These data include the amplitude, phase, and frequency of each signal. It is noteworthy that the harmonic voltage and current signals can be simultaneously injected by device. For example, the data of three balanced voltage signals with an amplitude of "50" V and a frequency of "50" Hz, and three balanced current signals with an amplitude of "500" milliamper (mA) and a frequency of "50" Hz are entered. Other parts of this section have been explained in previous films.



Signal	Amplitude	Phase	Frequency
V L1-E: V L1-E	50.00 V	0.00°	50.00 Hz
V L2-E: V L2-E	50.00 V	120.00°	50.00 Hz
V L3-E: V L3-E	50.00 V	240.00°	50.00 Hz
I L1: I L1	500.00 mA	0.00°	50.00 Hz
I L2: I L2	500.00 mA	120.00°	50.00 Hz
I L3: I L3	500.00 mA	240.00°	50.00 Hz

Figure 5

2 Analog Output Channels Table

The data related to the desired "nth" harmonic signal are entered in this table. These data include amplitude, phase, and frequency, which are entered for voltage and current signals. It is noteworthy that the maximum allowed value for frequency is "1500" Hz. For example, the third harmonic data are entered in the table, including three voltage signals with an amplitude of "10" V and a frequency of "150" Hz and three current signals with an amplitude of "300" mA and a frequency of "150" Hz. After data were entered, the waveform corresponding to this signal containing the main and third harmonics is shown in "Signal View" window. During the test, the output waveform and the actual value of harmonic injected by the device can be observed in "Signal View".

Free-Order Harmonic #1 ☐ Rhythm

Signal	Amplitude	Phase	Frequ...
V L1-E: V L1-E	10.00 V	0.00 °	150.0 Hz
V L2-E: V L2-E	10.00 V	0.00 °	150.0 Hz
V L3-E: V L3-E	10.00 V	0.00 °	150.0 Hz
I L1: I L1	300.0 mA	0.00 °	150.0 Hz
I L2: I L2	300.0 mA	0.00 °	150.0 Hz
I L3: I L3	300.0 mA	0.00 °	150.0 Hz

Figure 6

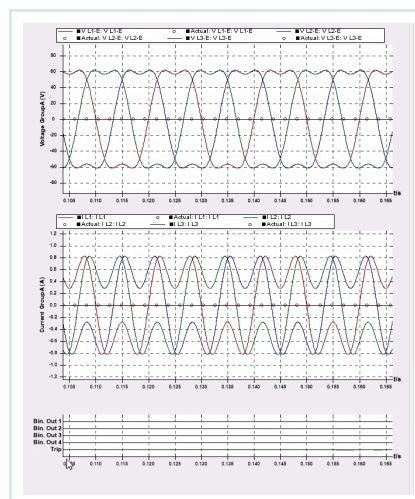


Figure 7

3 Free-Order Harmonic #1 Table

The data related to the desired nth harmonic signal are entered in this table. These data include amplitude, phase, and frequency that are entered for voltage and current signals. It should be noted that the maximum allowed value for frequency is "1500" Hz. For example, the fifth harmonic data are entered into the table, including three voltage signals with an amplitude of "5" V and a frequency of "250" Hz and three current signals with an amplitude of "200" mA and a frequency of "250" Hz. After data was entered, the waveform corresponding to this signal containing the main third and fifth harmonics is shown in "Signal View" window. During the test, the harmonic signal injected by the device can be observed in "Signal View". Please note that a decaying DC offset value can be used in this table instead of harmonic signal.

Free-Order Harmonic #2 ☐ Rhythm			
Signal	Amplitude	Phase	Frequency
V L1-E: V L1-E	5.000 V	0.00 *	250.0 Hz
V L2-E: V L2-E	5.000 V	0.00 *	250.0 Hz
V L3-E: V L3-E	5.000 V	0.00 *	250.0 Hz
I L1: I L1	200.0 mA	0.00 *	250.0 Hz
I L2: I L2	200.0 mA	0.00 *	250.0 Hz
I L3: I L3	200.0 mA	0.00 *	250.0 Hz

Figure 8

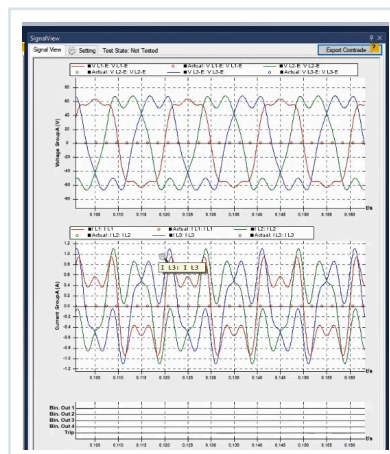


Figure 9

[jg1]Harmonic_state