DO-160E Current Distortion Test Software Specification

This software is a fully distributable executable developed in LabVIEW 7.0. It operates via RS232 communication with the Voltech PM6000 power analyzer. It will make fundamental measurements that are viewable “live” on your PC screen, as well as taking a sample of the 2nd to 40th Harmonics measurements. Once all readings have been taken, they will be recorded to a CSV spreadsheet compatible file. A drawing of all 40 harmonics will be displayed on relevant result graph tabs.

The program is split into 4 sections: 1 Phase measurements, and 1 phase result graph, and 3 phase measurements and the respective result graph. The results graphs are populated once all measurements are completed and testing has finished.

This help document is split into 4 chapters to represent the aforementioned sections. Each one will give an overview of the screen, and directions for its use.

Installation.

The software is designed to run on 32 bit operating systems including Windows XP and Windows 7. The software will operate on Windows 7 64-bit if default installation directories are used.

The software communicates with the PM6000 power analyzer via a standard RS232 cable. Most USB to RS232 adapters will work with the software, all that you will need to know is the COM port number allocated to the RS232 adapter.

To install the software:

1. The software is distributed as a “.exe” file. Save the file on the PC that will be used to make the measurements.

2. Double click the file and follow the on screen instructions.

For any assistance during installation or use of this software, please do not hesitate to contact us. Details of your local Voltech office may be found at www.voltech.com.

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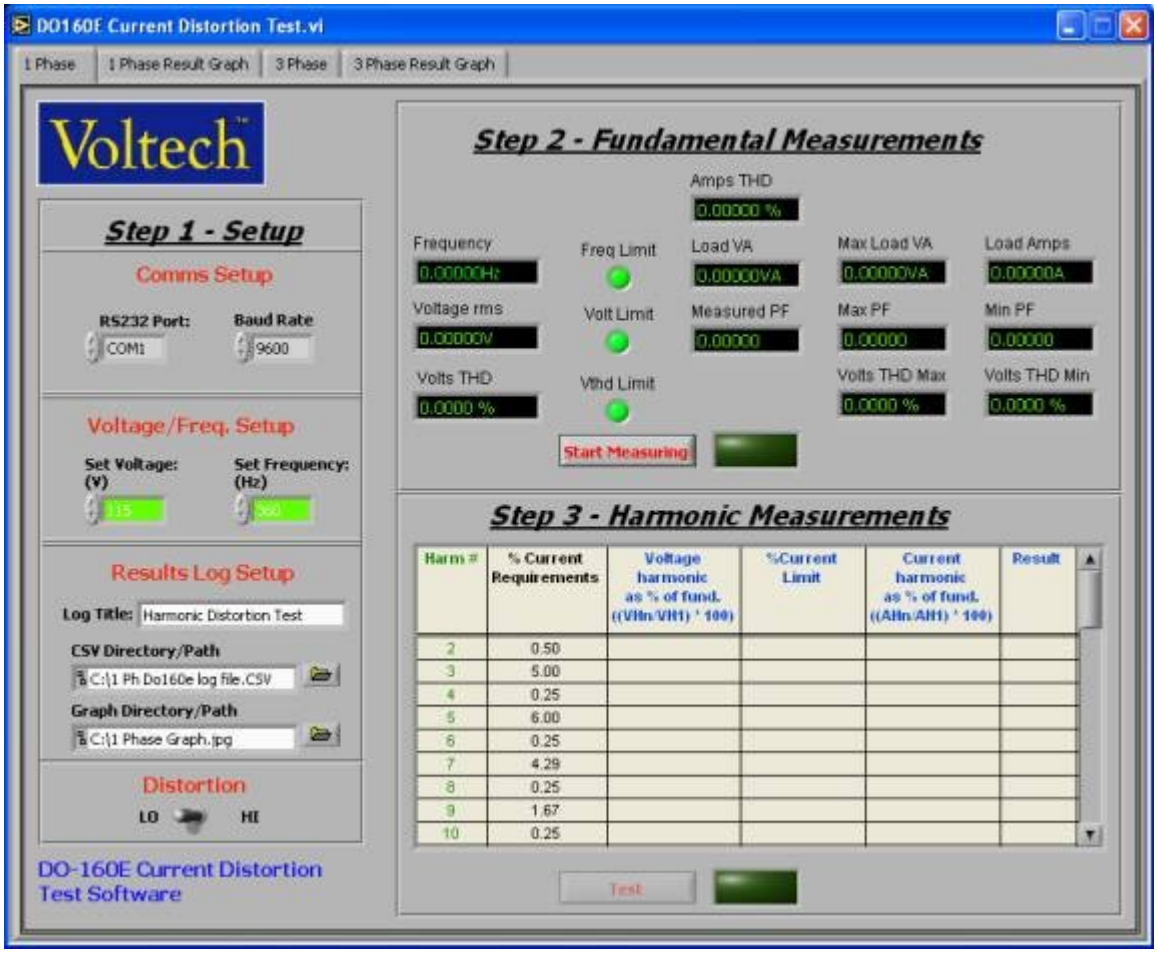
Chapter 1: Current Distortion Test 1 phase with low voltage distortion.



Step 1:

Controls in this step are used to set up the power analyzer communications and electrical inputs, then the computer filenames for the data log file and graph image outputs.

- ***Comms Setup***: Choose the port on your PC to which your PM6000 will be connected, and the baud rate you wish to use. Make sure that the PM6000 is set to the same transmit speed.
- ***The recommended baud rate is 57600.***
- *Volt/Freq. Setup:* Select the input voltage from possible selections of 115 and 230 Vrms, and the frequency from possible selections of 360, 400, 650, 800 Hz.
- ***Results Log Setup:*** Enter a title for the results log CSV. This will be added as the first line of the CSV, for easy results recognition later. Also, you should select the path and filename that you would like to write the log files to.
- ***Test conditions for High Distortion of the Input Voltage:*** **[HI]** In this separate test the input voltage is deliberately distorted to simulate real life conditions. In this case the Voltage distortion lamp should come on if the Volt THD < 8% when the test frequency = 360Hz, or 400Hz or 650Hz,

and come on only when Volt THD < 10% when the test frequency = 800Hz. **[LO]** This is the default case. In this case, the LED will turn red, if the volts thd is greater than 1.25% when the measured load VA is between 0 and 2kVA. When a reading is within limits, the LED will be green.

Step 2:

This step is used to make fundamental measurements, and will display the results "live", allowing you to see when the circuit has stabilized.

- To start taking readings click on the *Start Measuring* button
- PM6000 will measure all the following items displays them on the screen:

  Frequency, Voltage rms, Volts THD, Amps THD, Load VA, Max Load VA, Load Amps,

  Measured PF, Max PF, Min PF, Volts THD Max, Volts THD Min

- The three LED's are used to indicate if the frequency, volts rms, or volts thd are beyond the required limits. (+/- 1% for frequency, +/-2% for volts rms, and volts thd is greater than 1.25% when the measured load VA is between 0 and 2kVA. For a reading that is beyond the limits, the LED should turn red. When a reading is within limits, the LED should be green.
- The readings will continue to be displayed as fast as possible, until the *Test* button (in Step 3) is clicked.

Step 3:

Once you are ready to make individual harmonic readings, move onto this step.

- Once the first full set of readings has been returned from the PM6000 and displayed on the screen, the *Test* button in step 3 will be enabled.
- Once you click the *Test* button, measurements from step 2 are stopped, and measurements are made on each of the harmonics, following the rules from the following table.
- Once all harmonic measurements are completed, the results should be written to the CSV log file, along with a header that includes the title that you has selected (if you has selected one), and all the information recorded in *Step 2*, and then all the results listed in the grid in *Step 3*.

Table 1

I1= Max Fundamental Current; H= Harmonic Order;

IH= Max harmonic current of order H

Harmonic Order	Limits
Odd Non Triplen Harmonics (H=5,7,11,13,……37)	(IH)=30/H
Odd Triplen harmonics (H=3,9,15,21……39)	(IH)=15/H
Even Harmonics 2 & 4	(IH)=1/H
Even Harmonics>4(H=6,8,10…….40)	(IH)=0.25

Table 2 Harmonic Measurements

Harm # (n)	% Current Requirements	Voltage harmonic as % of fund. ((VHn/VH1) * 100)	Voltage harmonic as % of fund. ((VHn/VH1) * 100)	Current harmonic as % of fund. ((AHn/AH1) * 100)	Result
2	0.500	0.040	0.550	0.510	PASS
3	5.000	3.490	9.360	11.72	FAIL
. . . 40					
A	B	C	D=(B+C*1.25)	E	F

Column A is Harmonic order.

B is from Table 1.

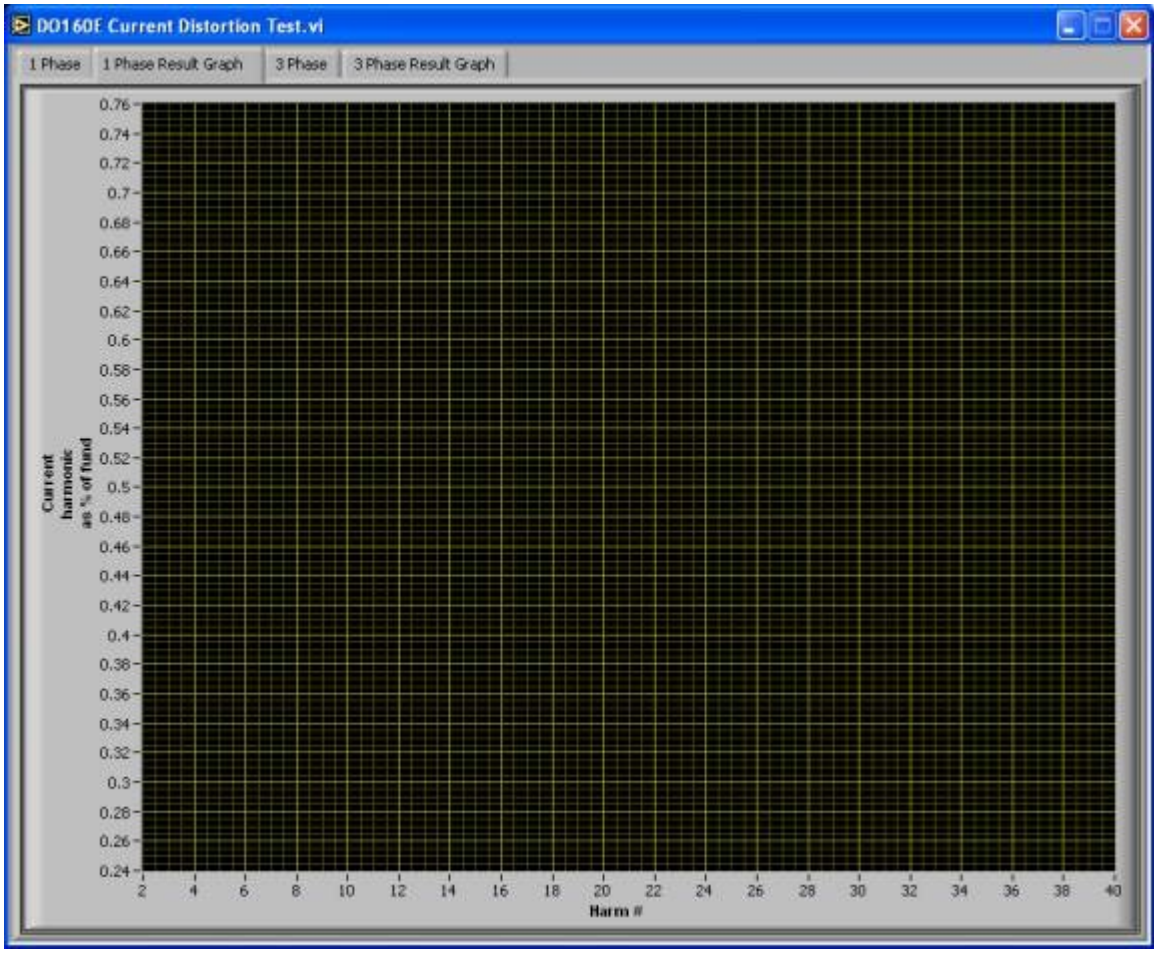
C is the percentage of the maximum voltage harmonic as a percentage of the maximum fundamental voltage.

The calculation for D is given in the above table.

E is the maximum current harmonic as a percentage of the maximum fundamental voltage

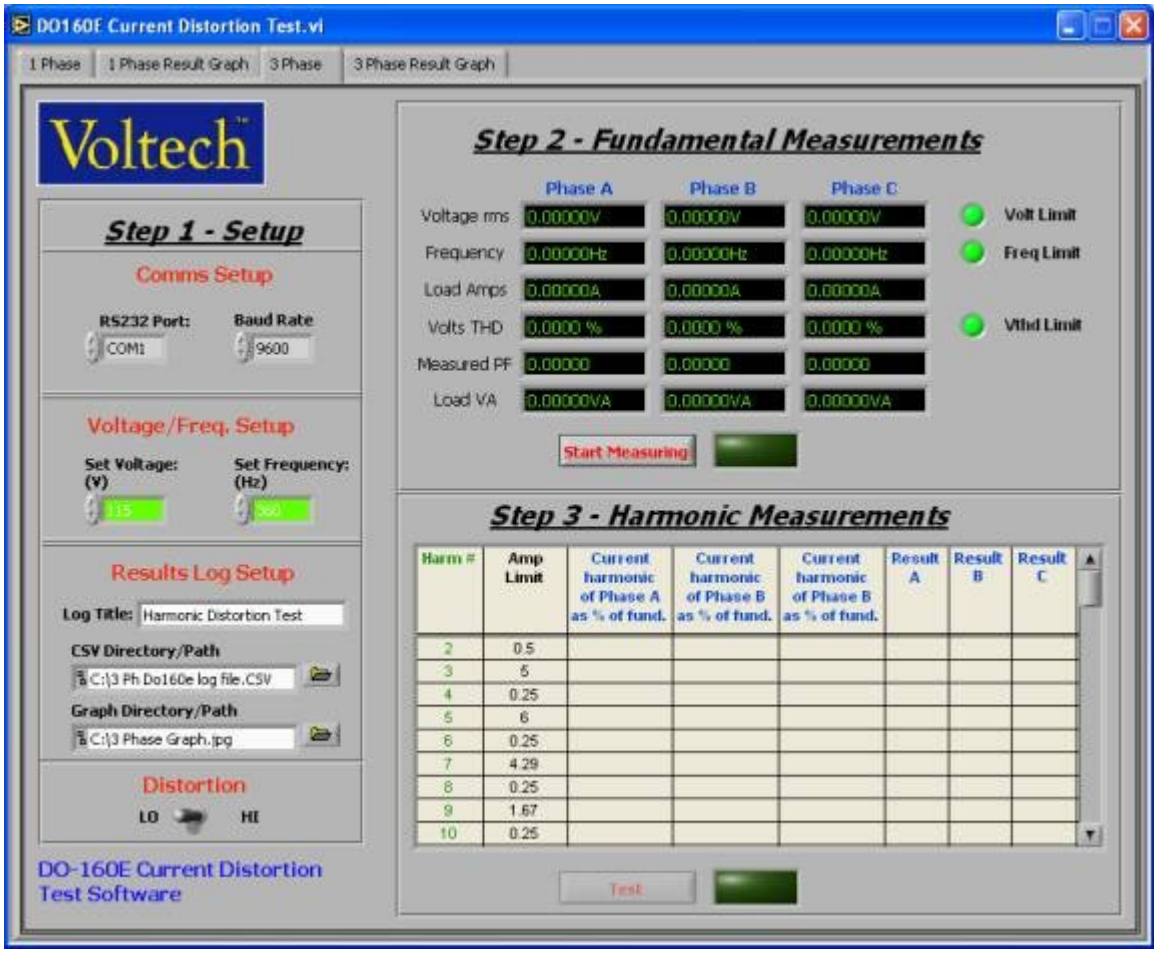
F is a FAIL if E is greater than D, otherwise it is a PASS.

Chapter 2: Current Distortion Test 1 phase Test Result Graph



- Once all the measurements have been completely stored into log file. Measurements made on each of the harmonics will be displayed in the 1 Phase Result Graph tab. After that, the program stops.

Chapter 3: Current Distortion Test 3 phase with low voltage distortion



Step 1:

Controls in this step are used to set up the communications, input electrical inputs, and filenames for the log file and graph image outputs.

- ***Comms Setup***: Choose the port on your PC to which your PM6000 will be connected, and the baud rate you wish to use. Make sure that the PM6000 is set to the same transmit speed.
- *Volt/Freq. Setup:* Select the input voltage from possible selections of 115 and 230 Vrms, and the frequency from possible selections of 360, 400, 650, 800 Hz.
- ***Results Log Setup:*** Enter a title for the results log CSV. This will be added as the first line of the CSV, for easy results recognition later. Also, you should select the path and filename that you would like to write the log files to.
- ***Test conditions for High Distortion of the Input Voltage:*** **[HI]** In this separate test the input voltage is deliberately distorted to simulate real life conditions. In this case the Voltage distortion lamp should come on if the Volt THD < 8% when the test frequency = 360Hz, or 400Hz or 650Hz, and come on only when Volt THD < 10% when the test frequency = 800Hz. **[LO]** This is the default case. In this case, the LED will turn red, if the volts thd is greater than 1.25% when the measured load VA is between 0 and 2kVA. When a reading is within limits, the LED will be green.

Step 2:

- Clicks on the *Start Measuring* button
- PM6000 will measure all the following items displays them on the screen:

  Phase A Voltage rms/ Phase B Voltage rms/ Phase C Voltage rms

  Phase A Frequency/ Phase B Frequency/ Phase C Frequency

  Phase A Load Amps/ Phase B Load Amps/ Phase V Load Amps/

  Phase A Volts THD| Phase B Volts THD| Phase C Volts THD

  Phase A measured PF| Phase B measured PF| Phase C measured PF

  Phase A Load VA/ Phase B Load VA/ Phase C Load VA

- The three LED's are used to indicate if either the frequency, volts rms, or volts thd are beyond the required limits. (+/- 1% for frequency, +/-2% for volts rms, and volts thd is greater than 1.25% when the measured load VA is between 0 and 2kVA. For a reading that is beyond the limits, the LED should turn red. When a reading is within limits, the LED should be green.
- The readings will continue to be displayed as fast as possible, until the *Test* button (in Step 3) is clicked.

Step 3:

- Once the first full set of readings has been returned from the PM6000 and displayed on the screen, the *Test* button in step 3 will be enabled.
- Once you clicks the *Test* button, measurements from step 2 are stopped, and measurements are made on each of the harmonics, following the rules from the following table.
- Once all harmonic measurements are completed, the results should be written to the CSV log file, along with a header that includes the title that you has selected (if you has selected one), and all the information recorded in *Step 2*, and then all the results listed in the grid in *Step 3*.

Table 3

I1= Max Fundamental Current; H= Harmonic Order;

IH= Max harmonic current of order H

Harmonic Order	**Limits**
Odd Non Triplen Harmonics (H=5,7,11,13,……37)	(IH)=30/H
Odd Triplen harmonics (H=3,9,15,21……39)	(IH)=15/H
Even Harmonics 2 & 4	(IH)=1/H
Even Harmonics>4(H=6,8,10…….40)	(IH)=0.25

Table 4 Harmonic Measurements

Harm # (n)	Amp Limit	Current harmonic of Phase A as % of fund.	Current harmonic of Phase B as % of fund.	Current harmonic of Phase C as % of fund.	Result
2	0.500	0.040	0.550	0.510	PASS
3	5.000	3.490	9.360	11.72	FAIL
. . . 40					
A	B	C	D	E	F

Column A is Harmonic order.

B is from Table 3.

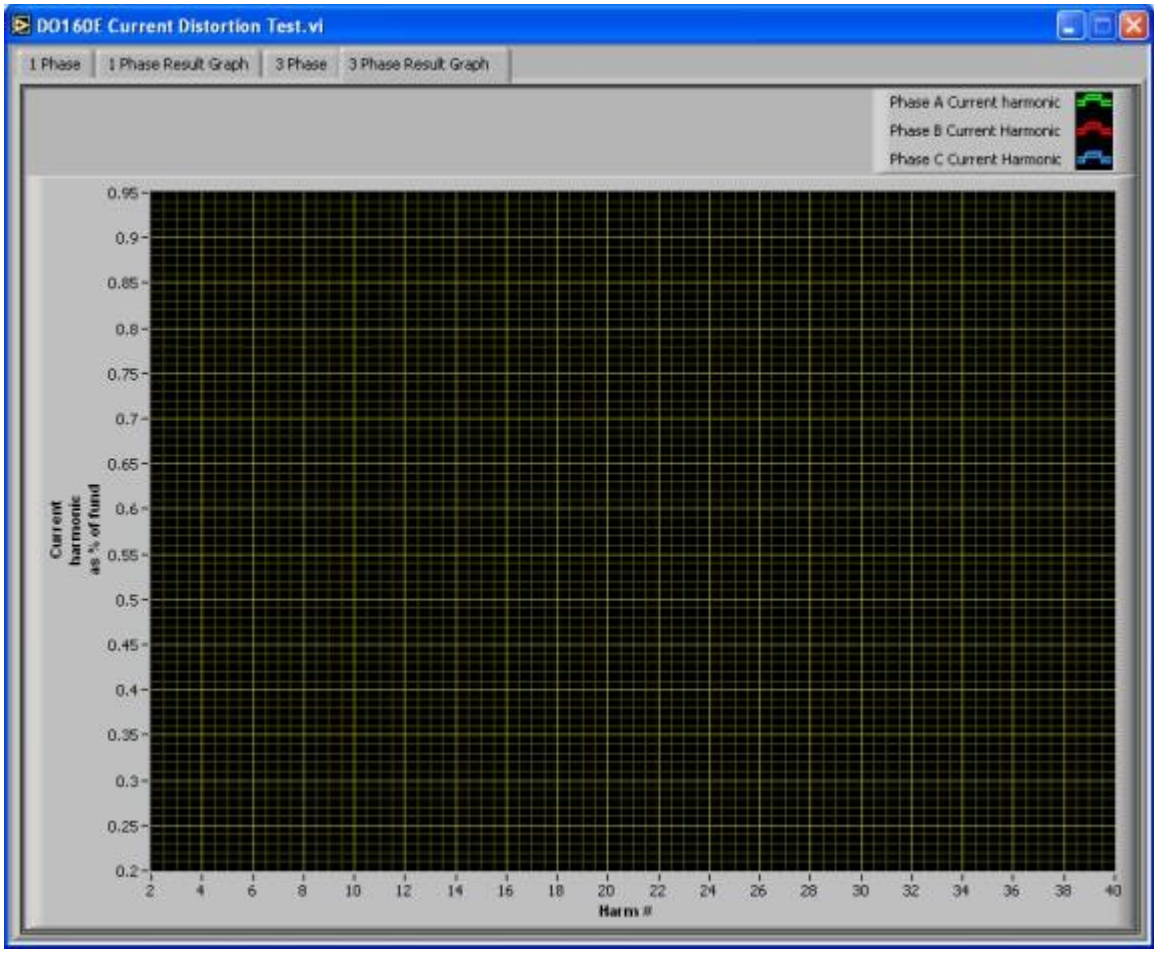
C is Current harmonic of Phase A as % of fundamental.

D is Current harmonic of Phase B as % of fundamental.

E is Current harmonic of Phase C as % of fundamental.

F is a PASS if C D E all within the limit, otherwise it is a FAIL.

Chapter 4: Current Distortion Test 3 phase Test Result Graph



- Once all the measurements have been completely stored in to log file. The measured harmonics will be displayed in the 3 Phase Result Graph tab. After that, the program stops.

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