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Instruction Manual

DELTA Control
User Interface

Megger.

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User Interface

The information presented in this manual is believed to be adequate for the intended use of the product. If the product or its individual instruments are used for purposes other than those specified herein, confirmation of their validity and suitability must be obtained from Megger. Refer to the warranty information below. Specifications are subject to change without notice.

WARRANTY

Products supplied by Megger are warranted against defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair must be shipped prepaid and insured. Contact your MEGGER representative for instructions and a return authorization (RA) number. Please indicate all pertinent information, including problem symptoms. Also specify the serial number and the catalog number of the unit. This warranty does not include batteries, lamps or other expendable items, where the original manufacturer's warranty shall apply. We make no other warranty.

The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

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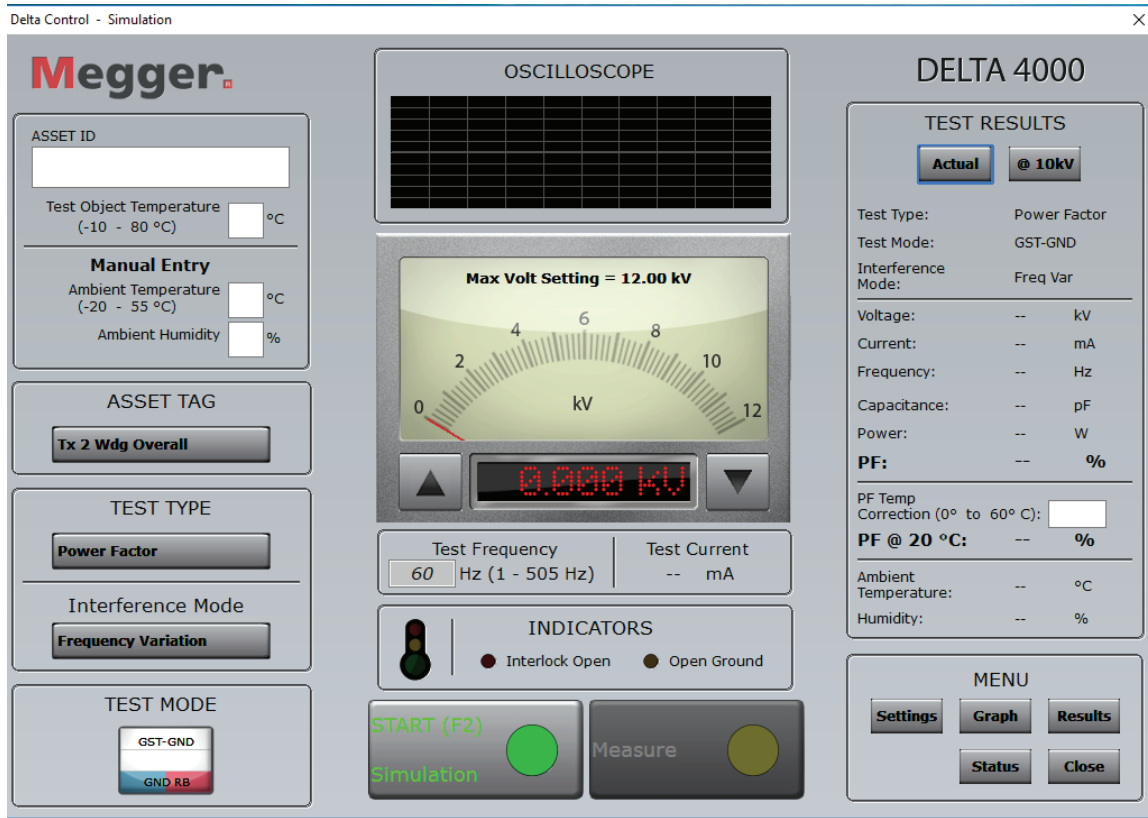
Delta Manual Control User Interface

Introduction

The Delta Manual Control software is designed for users who want an instrument panel control experience combined with a simple asset based guided tool. The software is operated using a touch screen or mouse control. All regular test functions are executed from this main screen/ panel. When **not** connected to a DELTA instrument, the PC software version allows operator to practice and prepare for actual testing while in an office or test shop, or for training purposes of new operators. When used in the DELTA4310A Onboard version, simulation is also possible.

DELTA Manual Control software can be used within many of the PowerDB PF/DF forms as a manual test function or started as a separate program in place of PowerDB.

Download
Before you begin, download and install the latest version of Delta Manual Control found here:

https://bit.ly/37c0QUl

Operation

Getting Started

Installation of DELTA Manual Control is an automated process where operator is asked to confirm verious conditions, including whether this software will be used with POWER DB. Once installed, operator will be presented with a window as follows:
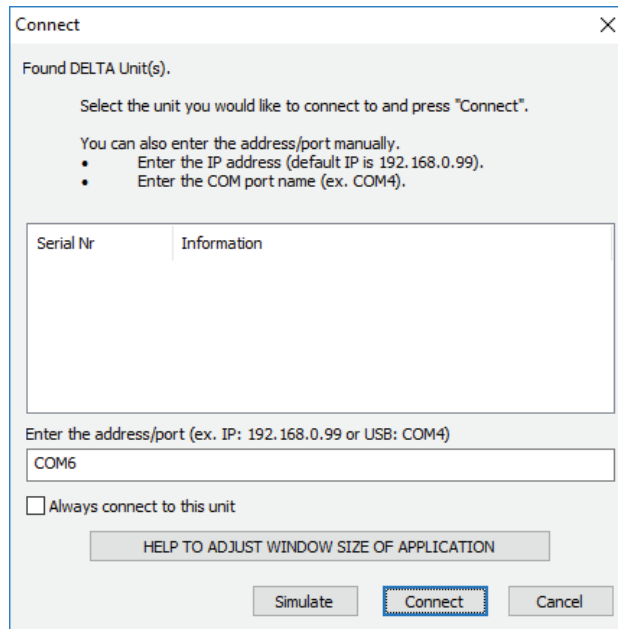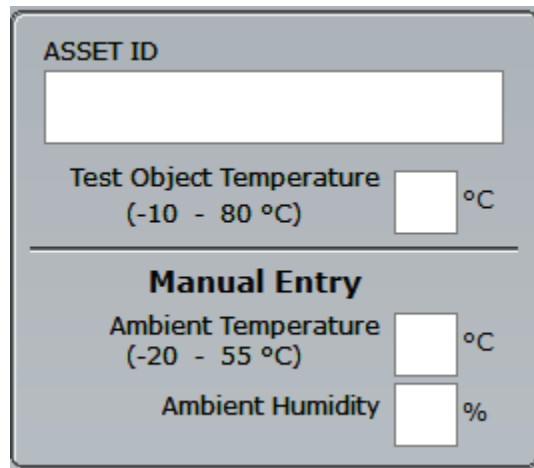

If connected to an instrument, the Serial Nr and communication address is displayed above. For this example, no instrument is connected. A commonly connected address can be input as shown in this example "COM6" where upon selecting "Always connect to this unit" helps simplify the connection process.

"Simulate" allows operator to become familiar with DELTA Manual Control without the need to connect to an DELTA4000. If operator attempts to "Connect" to an instrument and no instrument is detected, the operation will fail and display the following:
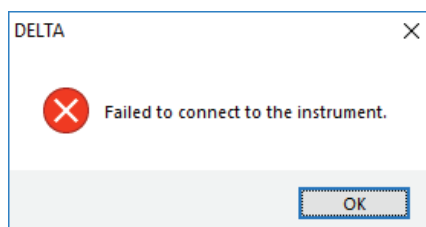
Asset/Test Conditon Entry

ASSET ID: Input identifying the test object and recorded in the Results Log for downloading or viewing

Test Object Temperature: Used for both Results Log records AND for ITC (Individual Temperature Correction) or manual temperature correction tables. (Mandatory for ITC feature operation)

Ambient Temperature: Entered manually by operator, or if left blank entered automatically via built in temperature sensor within DELTA unit OR via an optional EXTERNAL Temperature Sensor

Ambient Humidity: Entered manually by operator, or if left blank entered automatically via built in humidity sensor within DELTA unit OR via an optional EXTERNAL Humidity Sensor

ASSET TAG

Selection allows for labelling and only valid TEST TYPE (next section) modes to be available for specific assets.

Asset Tag allows operator to choose commonly tested assets for use in both labelling and common tests associated with the asset. If testing outside common tests are desired, one can select "Miscellaneous" which allows all Test types to be selected.

TEST TYPE
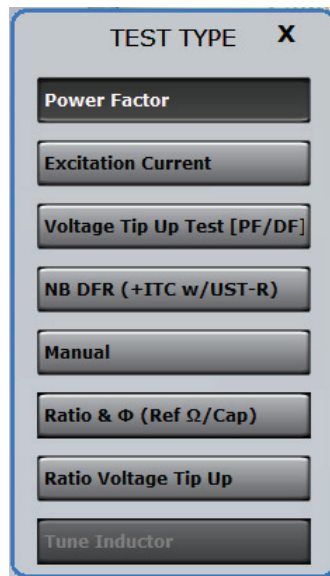
Commonly used tests are available once an ASSET is selected. Each test is specific to meeting a need to validate an parameter of the ASSET.

Power Factor/Dissipation Factor: Performs an AC insulation integrity test on an asset. Is used in conjunction with Test Mode below. Power Factor or Tan-Delta test is a semi-automatic test sequence performed at a preset voltage and line frequency (called Frequency Variation) or at any test frequency between 1 and 505 Hz (called No Suppression). The system will ramp up the voltage to the set voltage and measure the Power Factor or Tan-Delta and after the completed test, ramp voltage down and stop the test and present the result.

Excitation Current: Performs a single phase AC test across a selected winding to determine the characteristics of a transformer core plus winding.

Voltage Tip Up Test (PF/DF): Performs automated AC insulation test versus test voltage across a selected voltage range (selected within Settings)

NB DFR (+ITC w UST-R): Performs automated AC insulation test versus test frequency across a selected frequency range (selected within Settings). When testing specific Assets (2 Winding Tx, 3 Winding Tx, Bushing C1), and UST-R Test Mode selected, also performs and display ITC (Individual Temperature Correction) calculation for correction to 20°C. NOTE: Asset Temperature must be entered for proper operation, and Ambient Temperature required for Bushing C1 tests)

Manual: Performs testing while maintaining test voltage. This allows customers to perform

multiple tests, record results without turning off test voltage. An example application would be a manual voltage tip up test where results are captured at various intervals until results show a change in the asset characteristics. This would prevent a premature failure if we approach maximum asset voltage limit.

Ratio & Ø (Ref Ω/Cap): Performs a Ratio+ Phase test (when using an optional Resistive or Capactive Reference Box). Once depressed, following will appear:

Operator selects reference device and enters calibration parameters from reference device OR depresses "Measure Reference" which allows performance of reference measurement test (operator must select test voltage) after which the results populate this screen.

Ratio Voltage Tip Up Test: Performs same testing as Ratio & Ø (Ref Ω/Cap) above but allows trending results at various test voltages as defined in Settings tab. Once complete, a graph of results is available under "Graph" tab.

Tune Inductor: Special mode used with a variable reactor (sold separately), where display allows "tuning" of reactor until optimum (minimal test current) is achieved.

TEST MODE
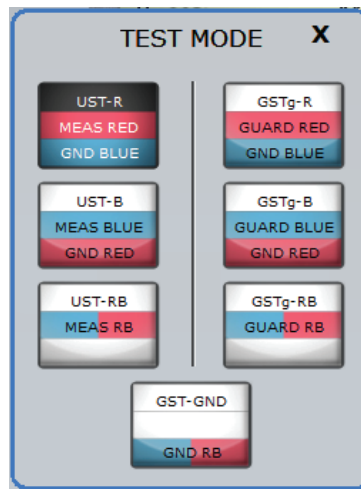
When performing tests with the DELTA4000, operator can select where measurements are taken from with three different inputs – CxRed, CxBlue and Ground. When performing testing, operator must understand where a measurement is to be taken. Delta Manual Control does apply a default TEST MODE for each of the tests from TEST TYPE (section above). This reduces the required knowledge of the operator, but it is good practice to understand each TEST MODE described.

The top line (UST-R in this case) defines and describes the selected test mode.

The second and third lines explain how the instrument is configured for the measurement. They have a different designation depending on if UST (Ungrounded Specimen Test) or GST (Grounded Specimen Test) measurements are conducted.

UST mode

Ground and Guard are internally connected. Red and Blue terminals are either internally connected to be measured or internally connected to Ground (and Guard). In UST mode, the center line refers to the terminal or terminals that are measured and the lower line refers to the terminal that is internally connected to Ground and therefore excluded from the measurement.

GST mode

The current returning from Ground is measured. The Red and Blue terminals are either connected to Ground to be included in measurement or Guard to be excluded from the measurement.

Test Mode Examples

Two winding transformer test
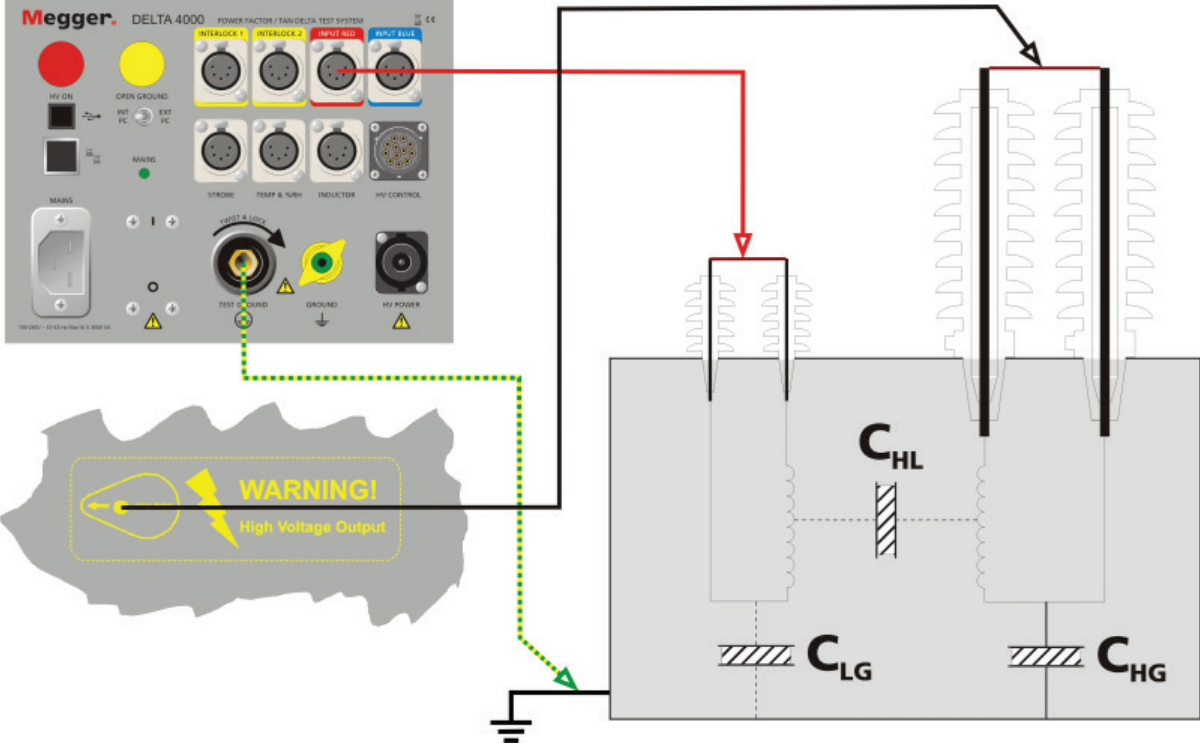
When UST-R is used for the CHL test, the HV output terminal is to be connected to the primary winding and the red terminal to the secondary winding. The blue terminal does not have to be connected in this case.

Three winding transformer test

When UST-R is selected for a CHL test, the HV output terminal is to be connected to the primary winding, the red terminal to the secondary winding and the blue terminal to the tertiary winding. The blue terminal is in this case grounded/guarded.
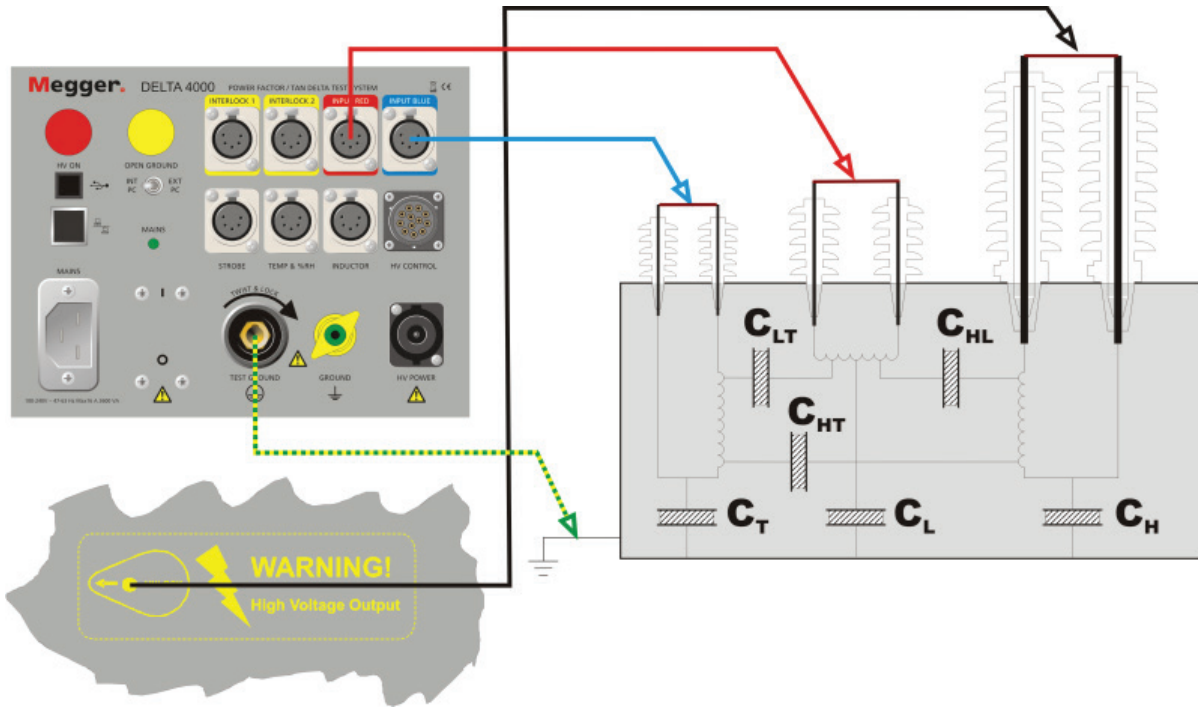
For CHT measurement UST-B should be selected. The blue terminal is now measured and the red is grounded. The time saving benefit is that the transformer can be tested without the need for reconnections.

Test Voltage & Frequency Control Panel
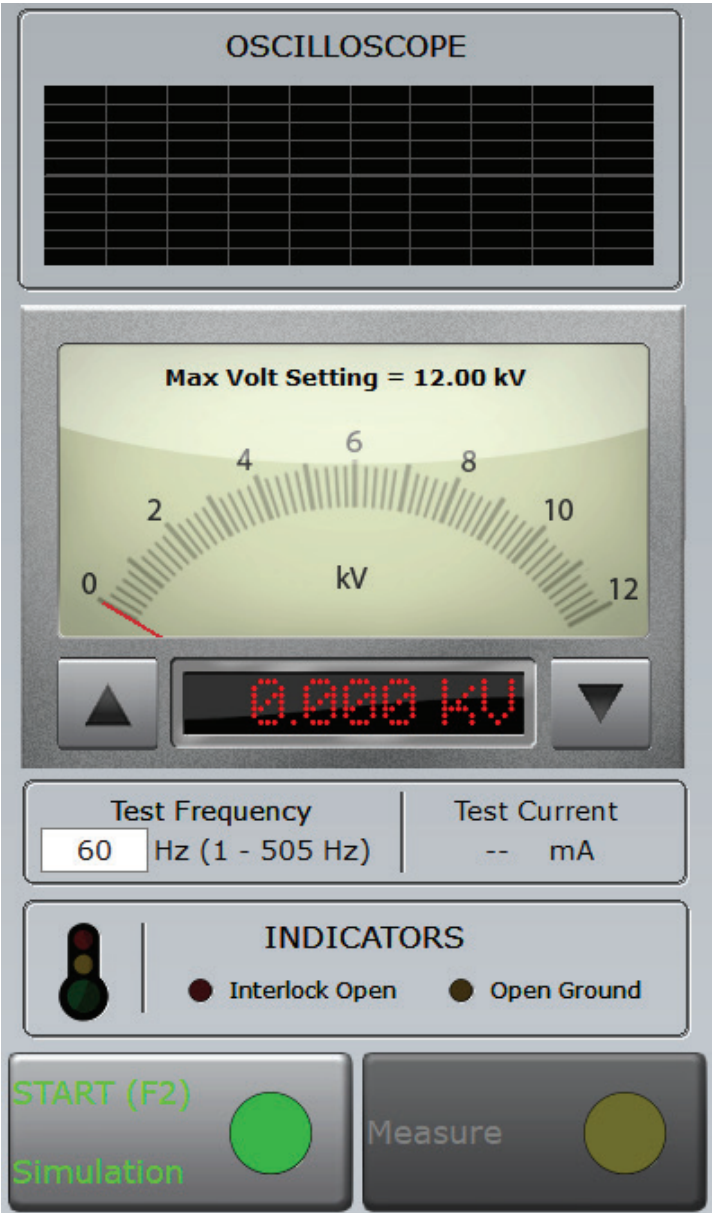
Oscilloscope

In the oscilloscope you can follow applied voltage (red) and a voltage proportional to measured current (white).

Note: This feature is designed to be a signal monitor and not intended to be a measurement device. The display has an auto scaling of amplitude and time axis.

Test Voltage Meter

<u>Analog Meter</u> (0-12kV) providing operator with a visual display of the test voltage applied. Above the meter, Max Voltage Setting is displayed, and is changed with Settings

<u>Test Voltage Control</u> allows operator to select a test voltage when required (Voltage Tip Up has pre-selected test voltages) using the up/down arrows or numeric entry from PC or onboard key-pad display.

<u>Test Frequency</u> allows change of test frequency when Interference Mode is set to "No Suppression". When "Frequency Variation" is selected, this selection is greyed out.

<u>Test Current</u> displays the total current drawn from the power supply. It may not be the same current as displayed in the results screen.

<u>Indicators</u> displays the safety state of the 2 interlocks as well as the required ground interlock. When all are properly closed and the safety conditions met, the indicator to the left changes from RED display to a GREEN color.

<u>Start</u> button enables test to commence, applying test voltage to Asset under test. Display begins as green, and changes to red once test begins. Same button is used to "STOP" test (toggle operation)

<u>Measure</u> button is only enabled when "TEST TYPE – Manual" is selected. This allows measurements to be taken at various test voltages or test frequencies. All results are stored in RESULTS log.

TEST RESULTS

```
                  TEST RESULTS

Test Type:            Ratio & Φ
Test Mode:            UST-R
Interference
Mode:                 No Suppression

Voltage:          --       kV
Current:          --       mA
Frequency:        --       Hz

Nameplate Ratio:  --
Measured Ratio:   --


Ratio Error:      --       %


Phase:            --       min

Ambient
Temperature:      --       °C
Humidity:         --       %
```

Test Type: displays the type of the test conducted on an asset

Test Mode: displays the measurement mode selected for the test type above

Interference Mode: displays whether interference rejection mode is selected

Voltage: displays test voltage applied during test

Current: displays test current measured for this specific test. Does not reflect the total test current applied, and may be misleading if test object draws excessive power which is not shown in this display. Test Current from middle window should be used to ensure excessive current is not drawn.

Frequency: displays test frequency at which test was conducted

Nameplate Ratio: Calculated from input parameters as set in Settings

Measured Ratio: As measured when selecting Ratio & Ø Test or last result when selecting Ratio Voltage Tip Up Test
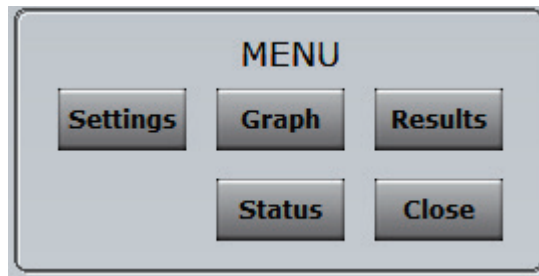
Ratio Error: Calculated error of Measured Ratio/Nameplate Ratio displayed as a %

Phase Error: Measured phase deviation of asset under test.

Ambient Temperature: As input or measured from Test Condition Input

Ambient Humidity: As input or measured from Test Condition Input

Menu

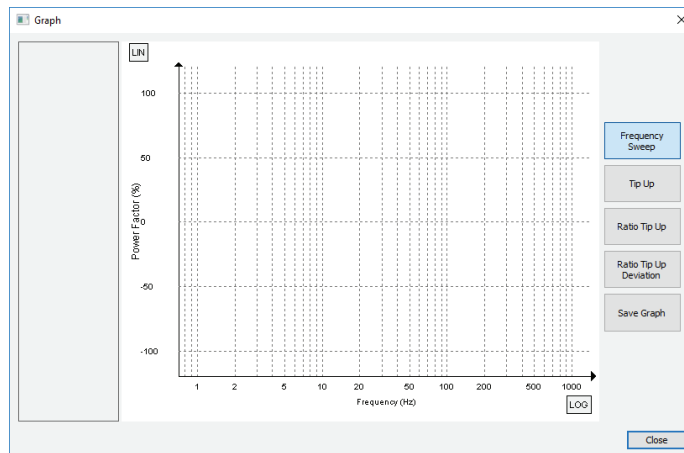**Settings**   View/change the default settings used for testing.

Graph   Shows graph of performed PF/DF Voltage Tip-Up, Frequency Sweep (DFR) and Ratio Voltage Tip-Up measurements. Also allows live update of graph as testing is conducted.
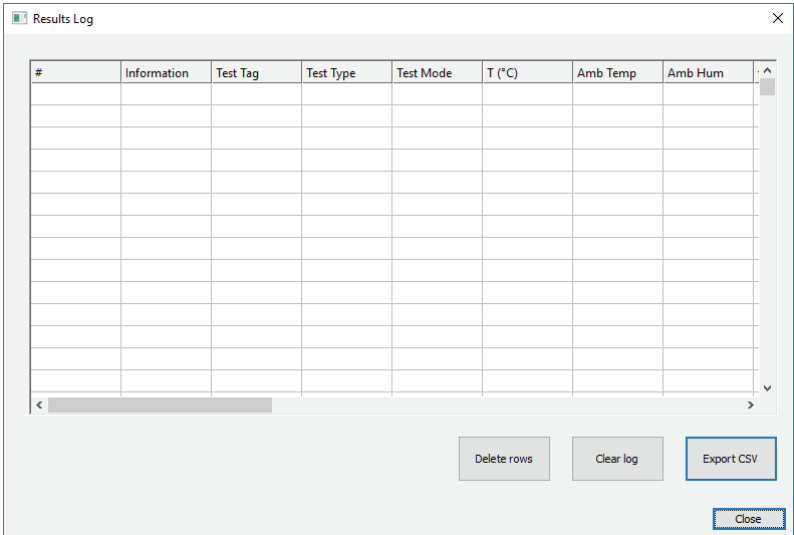

Graphs can be exported as images "Save Graph"

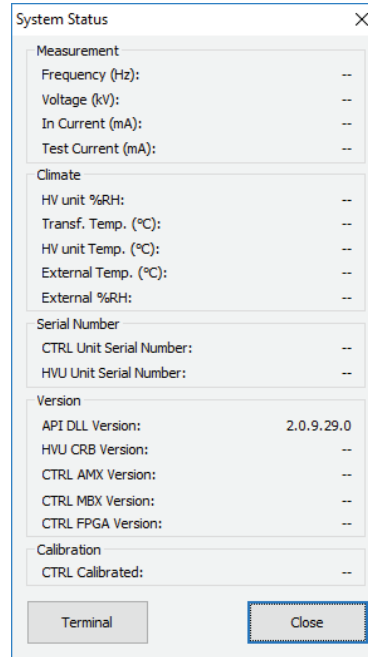Graphs can also be expanded and multiple graphs shown on same display

Results

Show a log of measured values. This includes multiple readings test such as shown in Graphs.

Results can be exported to a CSV file for use in customer reports.

Status

When connected to a DELTA4000, accesses information about internal %RH, temperatures , serial numbers and SW/Firmware version.

System Status	×
Measurement	
Frequency (Hz):	--
Voltage (kV):	--
In Current (mA):	--
Test Current (mA):	--
Climate	
HV unit %RH:	--
Transf. Temp. (°C):	--
HV unit Temp. (°C):	--
External Temp. (°C):	--
External %RH:	--
Serial Number	
CTRL Unit Serial Number:	--
HVU Unit Serial Number:	--
Version	
API DLL Version:	2.0.9.29.0
HVU CRB Version:	--
CTRL AMX Version:	--
CTRL MBX Version:	--
CTRL FPGA Version:	--
Calibration	
CTRL Calibrated:	--
Terminal	Close

Close

Shutdowns DELTA Manual Control

Settings

General

Line Frequency : **(50/60Hz)**. Specify if you want to display the values

Power Factor /Tan-Delta(DF).

Integration Time: **3-200 seconds/Automatic**. (used to improve results accuracy or to reduce test time)

Number Format: Set to country format is either a ",", or a ".".

Max Test Voltage: **0.25 – 12 kV** Used as a safety limit – customer specified

Factory Settings: Applies original factory settings

Language: Allows language changes

Help to Adjust Window Size: Allows operator to change PC display settings to optimize the window of this software program for proper sizing.

Voltage Tip-up Test
Enables multiple tests to be conducted with automatic voltage increase and readings taken.

kV/Step: Equal Voltage change per step (in kV) plus a Max Voltage to stop testing before voltage level is exceeded.

Individual Steps: Operator can set multiple individual test voltage steps with each voltage setting separated by a space. Enables a custom voltage tip up test.

Frequency Sweep
Enables operator to set test frequencies at which the frequency sweep will be conducted. The default frequencies are set to (470 220 110 70 40 20 10 4.6 2 1 Hz) which allows optimum sweep results for ITC calculations (Individual Temperature Correction) Test voltage can be changed as well, but default voltage is 0.25kV (250V). Note that maximum test voltage is limited depending on frequency selected – see Specifications for details.

Test Tag
Enables operator to change the "Miscellaneous" Test to a custom name. – typically used for specialized test labelling.

Nameplate Ratio (Asset Info)
Used with optional **Ratio Testing** accessory (Ratio and CVT box). This input allows operator to select an E**xpected Ratio** for comparison to a ratio result. If input properly, the Results Screen will include a "Ratio Error" versus Expected Ratio.

Simulation Settings
Allows operator to input simulation testing with preset results. Typically used for training purposes.

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