

Megger[®]

DELTA4000

12 kV Insulation diagnostic system

Training Guide



DELTA4000 Training guide topics

- PowerDB Lite – New Test

- Startup
- Selecting a form
- Entering Nameplate
- Saving
- Testing
 - Test Type
 - Connection Diagram
 - Test Configuration
 - Running a Test
 - Viewing Results
- Export to Excel
- Export to DTA5/6

- PowerDB Lite – Open Previous Test

- Open (Continue) Test Result
- New Test Result
- Delete Test Result

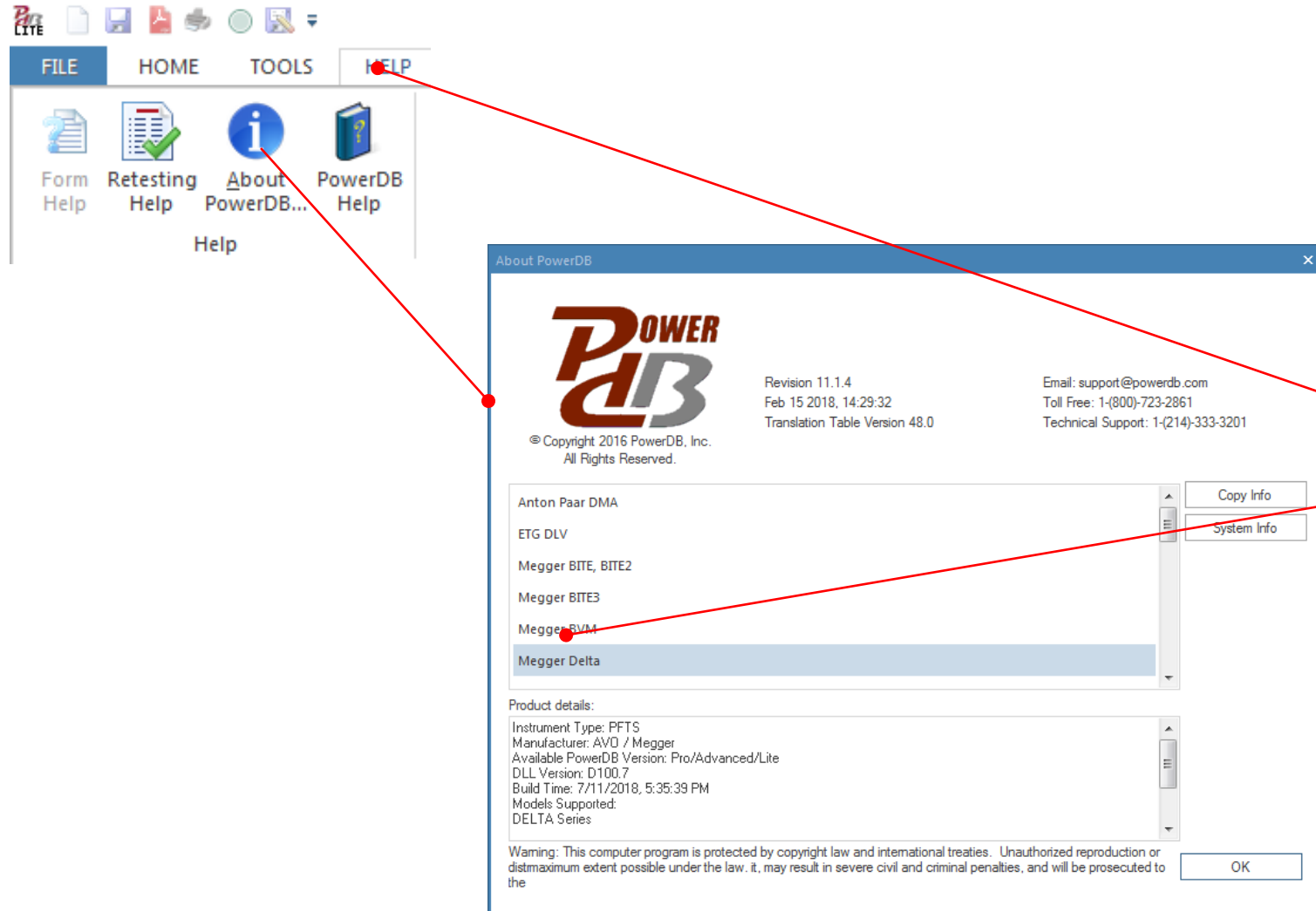
- PowerDB Pro

- Adding New Result
- Trending
- Import from DTA6

- Delta Manual Control

- Object ID
- Temperatures
- Test Tag
- Test Type
- Interference Mode
- Test Mode
- Voltage/Frequency
- Testing
 - Interlocks
 - Results
- Settings
- Graph
- Results
- Help
- Status

DELTA4000 – Checking for updates

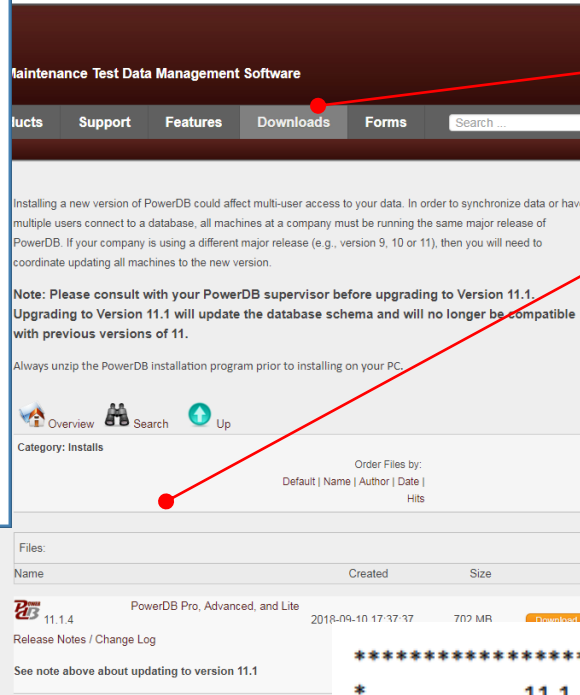
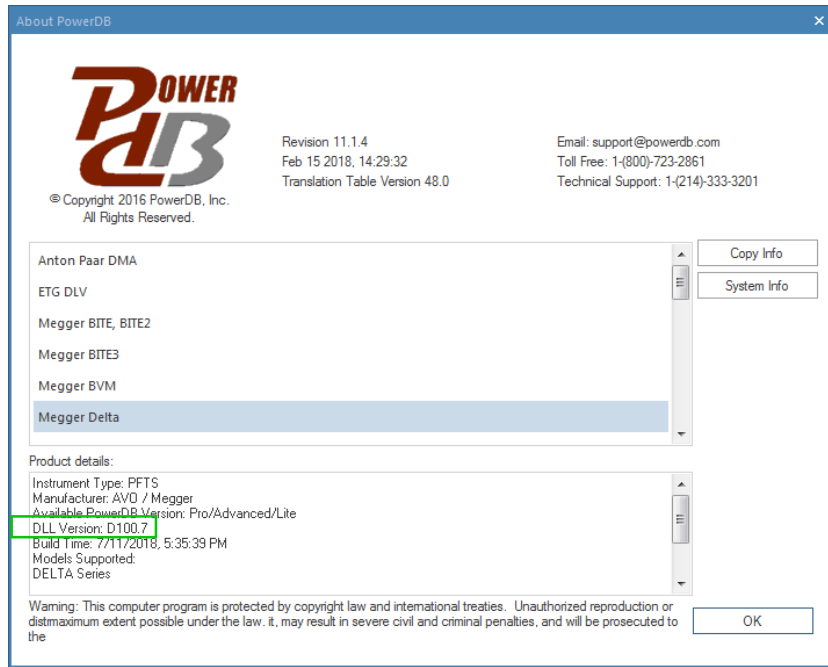


Check for PowerDB Updates

*In PowerDB Lite, go to Help
About PowerDB...*

Select Megger Delta

DELTA4000 – Checking for updates



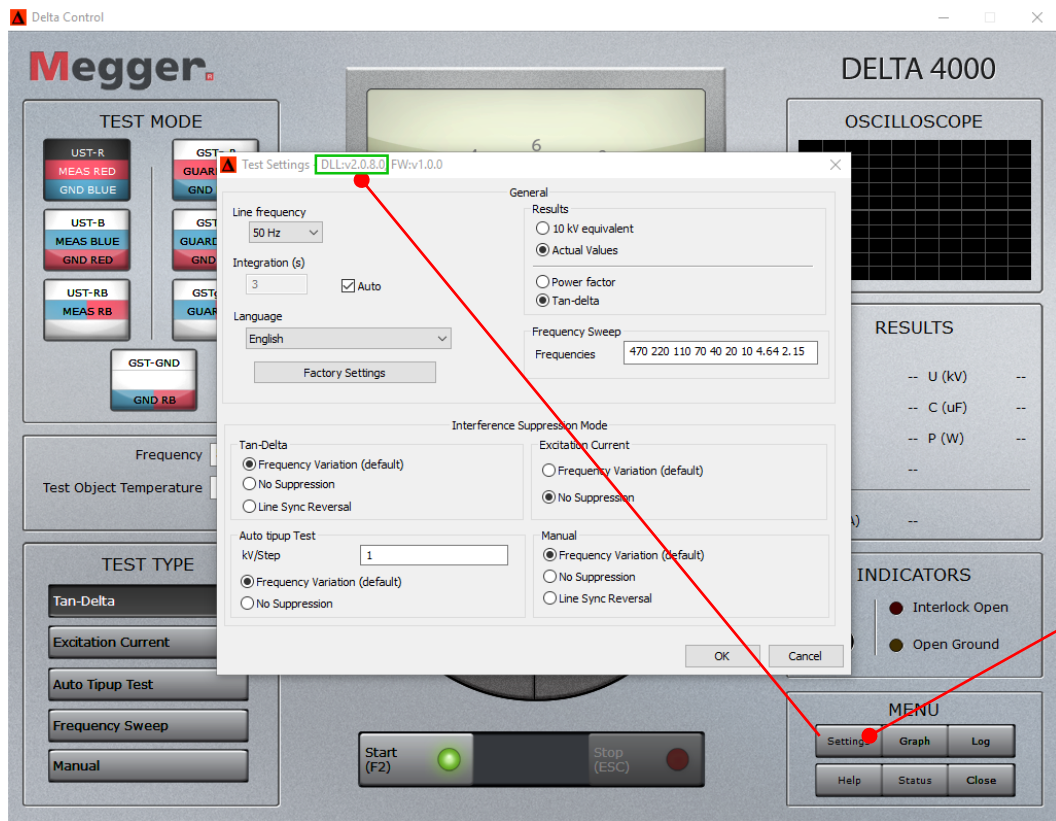
Go to www.powerdb.com
Downloads page

Open change log and see if
the Delta driver has been
updated

```

*****
*
*      11.1.4 Driver Update
*      - August 21, 2018
*      - PowerDB 11.1.4
*      - AVO_DELTA2000.D100.7
*      - AVO_MTO.D100.11
*      - AVO_TTR.D100.6
*
*      (NO CHANGE)
*      (DRIVER/FORM CHANGE)
*      (DRIVER/FORM CHANGE)
*      (DRIVER/FORM CHANGE)
*
*****
    
```

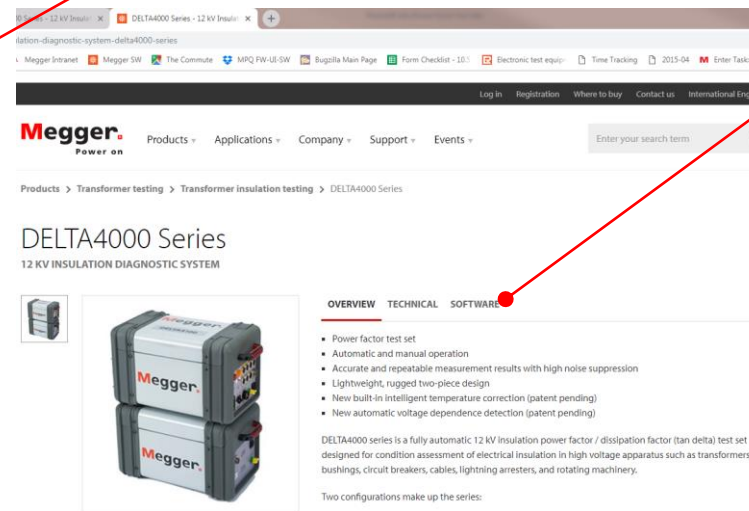
DELTA4000 – Checking for updates



Check for Delta Control Updates

Get version information

Visit <https://megger.com/12-kv-insulation-diagnostic-system-delta4000-series>



Select SOFTWARE

DELTA4000 – Checking for updates

OVERVIEW TECHNICAL SOFTWARE

Check for Delta Control Updates

DELTA41XX series firmware and software updates



Select + next to the model

DELTA43XX series firmware and software updates



Find Installer

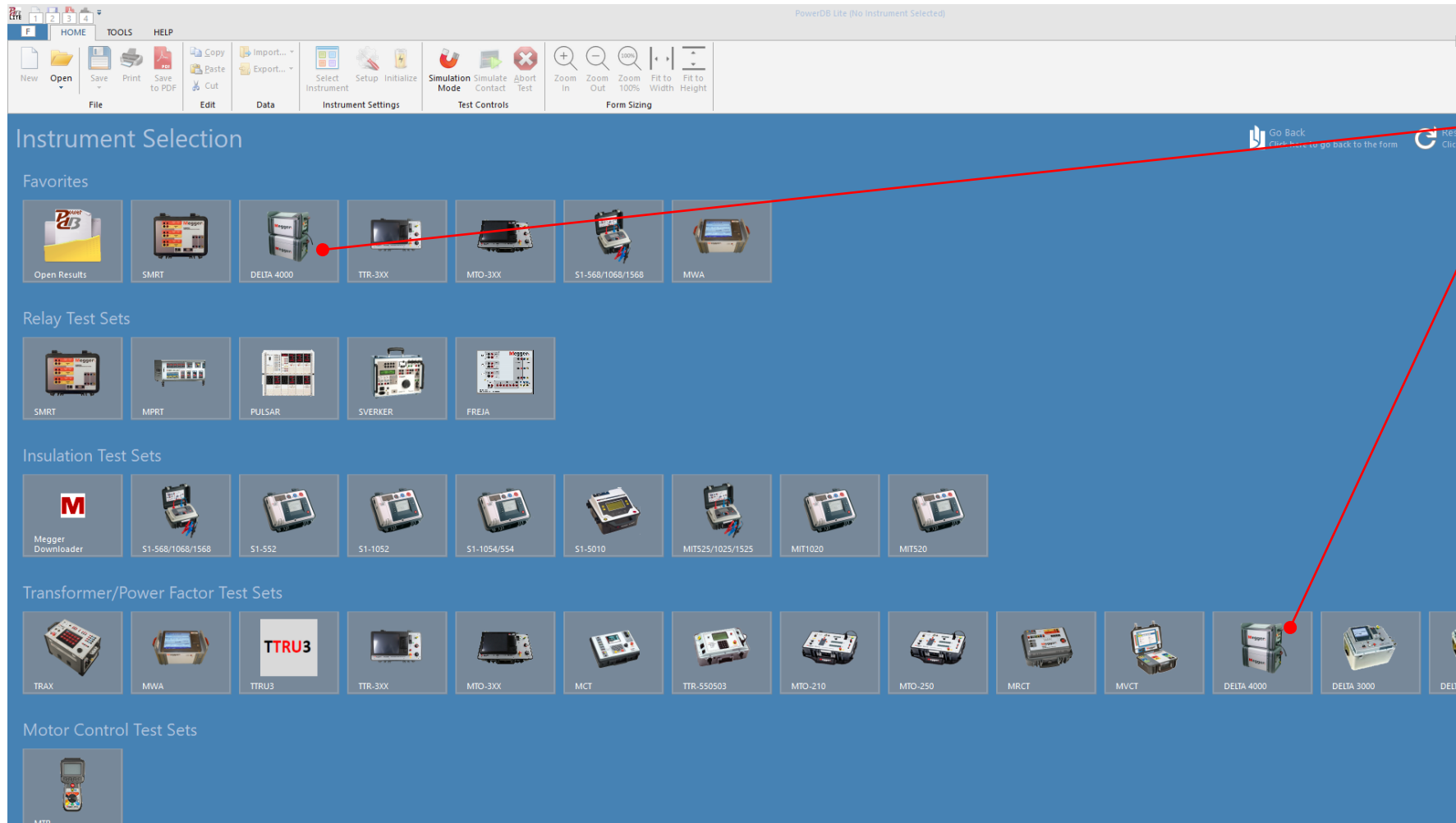
DELTAControllInstall_v2-0-9-51-0.exe

25.9 MB | 13/04/22

Download

Compare to version installed

DELTA4000 – PowerDB startup



Click on the DELTA 4000

DELTA 4000 will appear in your favorites after the first time you select it from Transformer/Power Factor Test Sets

DELTA4000 – Select form

Select A Form

RECOMMENDED

- PF TWO-WINDING TRANSFORMERS - 93500**
- PF THREE-WINDING TRANSFORMERS - 94500
- PF AUTO TRANSFORMER WITH TERTIARY - 95500
- PF AUTO TRANSFORMER WITHOUT TERTIARY - 95501
- Shunt Reactor - 95502

CABLES

- PF CABLES - 96005

CIRCUIT BREAKER

- PF AIR-MAG CIRCUIT BREAKER - 92500
- PF OIL CIRCUIT BREAKER - 92510
- PF SF6 DEAD TANK CIRCUIT BREAKER - 92520
- PF SF6 LIVE TANK CIRCUIT BREAKER - 92529
- PF VACUUM CIRCUIT BREAKER - 92530
- PF VACUUM CIRCUIT RECLOSER - 92550

GENERATORS

- PF GENERATOR TIP UP - 98000

INSTRUMENT TRANSFORMERS

- PF PT/VT TRANSFORMER - 27600

OK Cancel

Select a form and click OK

Choose a form that is appropriate for the asset you are testing.

For the purpose of this training material, we will focus on Two-Winding Transformers

DELTA4000 – Form header

Show Header 



INSULATION TESTS TWO-WINDING TRANSFORMERS



DATE 10/26/2018

PAGE 1

AMBIENT TEMP. °F

JOB #

SUBSTATION

HUMIDITY %

ASSET ID

POSITION

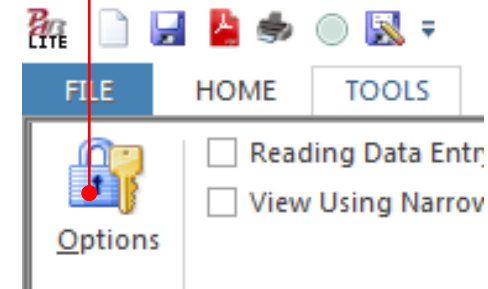
TEST STATUS

EQUIPMENT LOCATION

Fill out Header information

Not required to run tests

Tools -> Options to set logos



DELTA4000 – Nameplate

NAMEPLATE DATA

MFR _____ CLASS _____ PHASES _____

SER NO _____ COOLANT REASON _____

YEAR TANK TYPE WEIGHT

Diagram # 15 (ANSI)

Diagram 1: Dyn11 connection with terminals H₁, H₂, H₃.

Diagram 2: Star connection with terminals X₁, X₂, X₀, X₃.

WINDING MATERIAL

OIL VOLUME

OIL TEMP °C

IMPEDANCE _____ %

WEATHER _____

BIL _____ kV

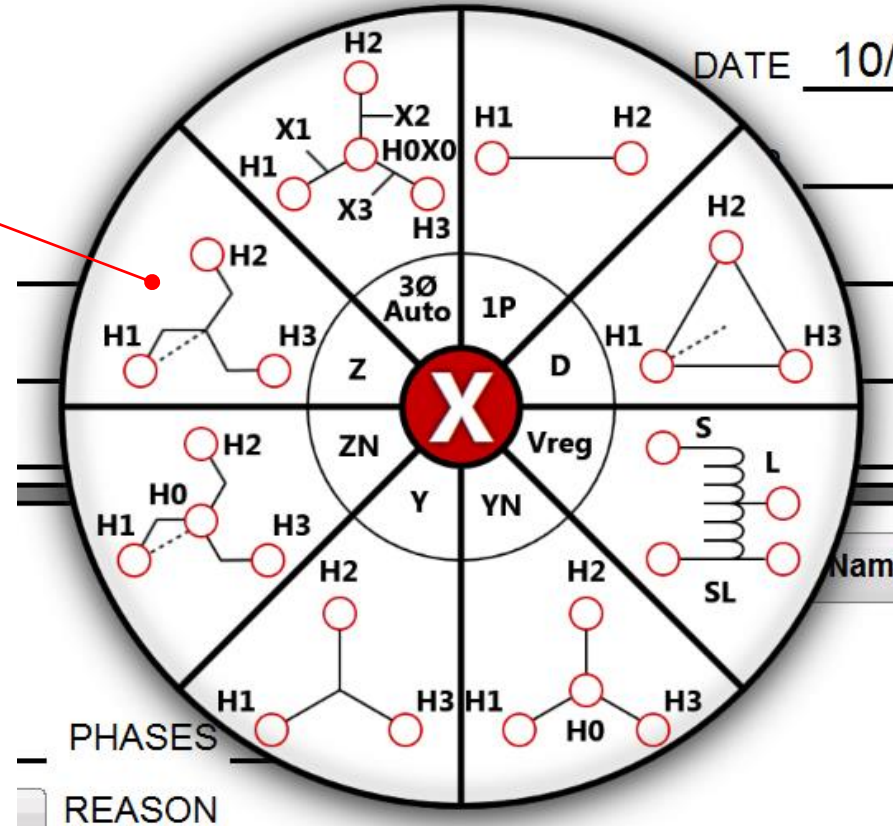
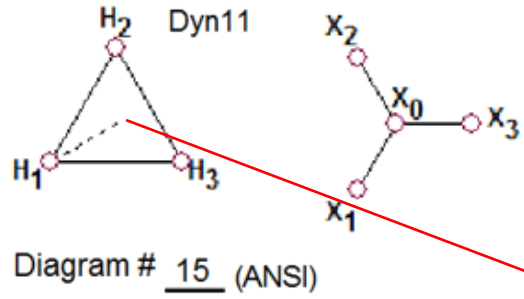
Fill out Nameplate

After saving, fields required for temperature correction will highlight red if unpopulated

	VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
	L-L	L-G						
PRIMARY:					5	3	DETC	
SECOND:					1		OLTC	

COMMENTS:

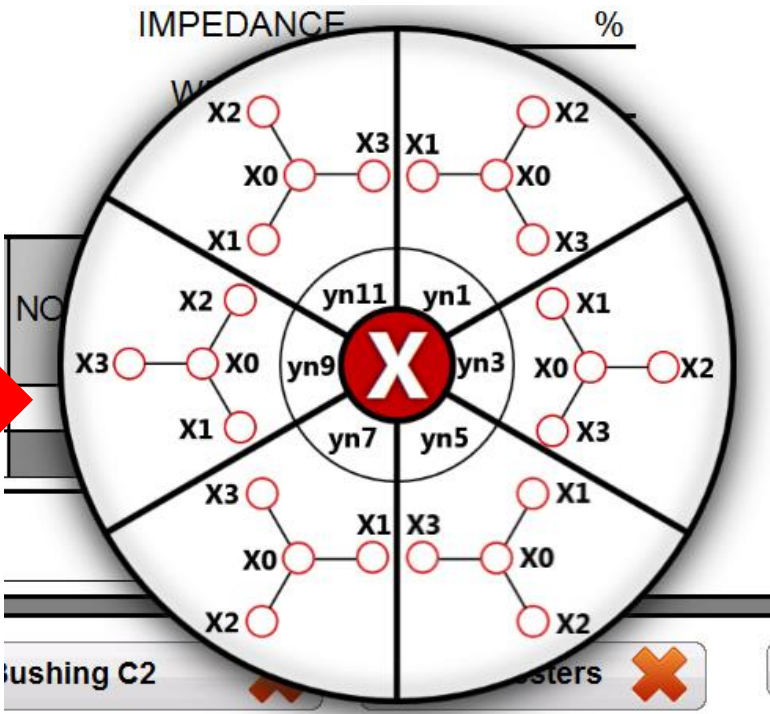
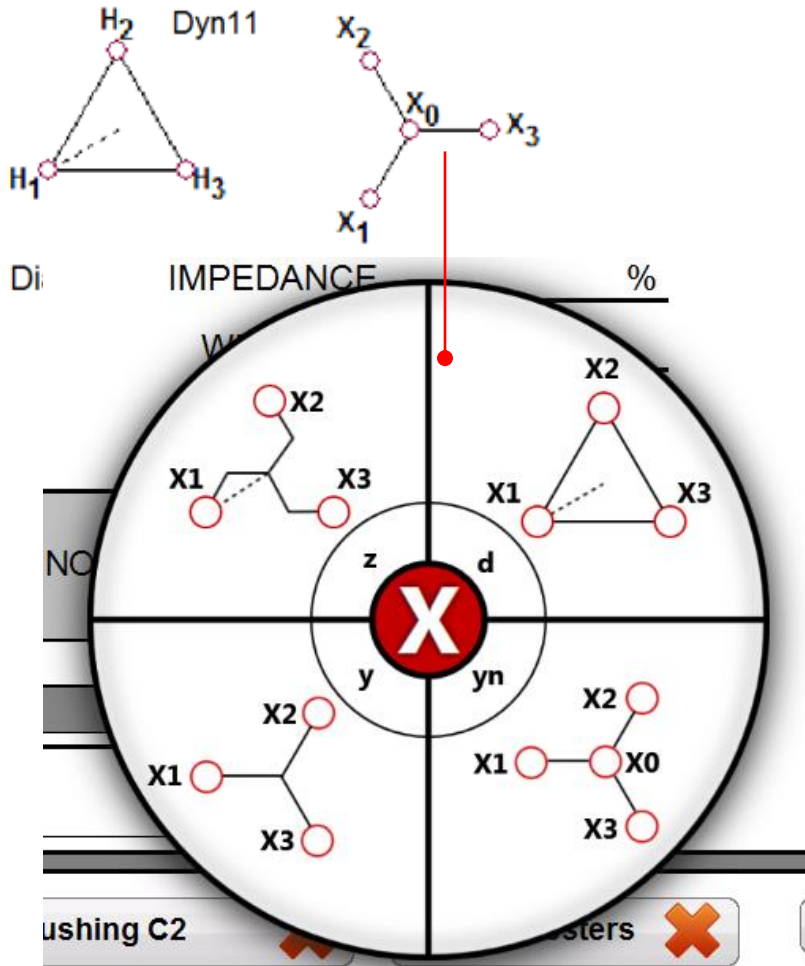
DELTA4000 – Primary vector



Select Primary Vector

Match to nameplate

DELTA4000 – Secondary vector



Select Secondary Vector

Select Secondary Vector Group, then Secondary Vector Phasing

Secondary Vector Groups and Phasing limited by Primary Vector selected

DELTA4000 – Bushing

BUSHING NAMEPLATE										
Dsg	SERIAL NUM	MFR.	TYPE/CLASS	kV	AMPS	YEAR	C1		C2	
							PF	Cap (pF)	PF	Cap (pF)
H1										
H2										
H3										
H0										
X1										
X2										
X3										
X0										

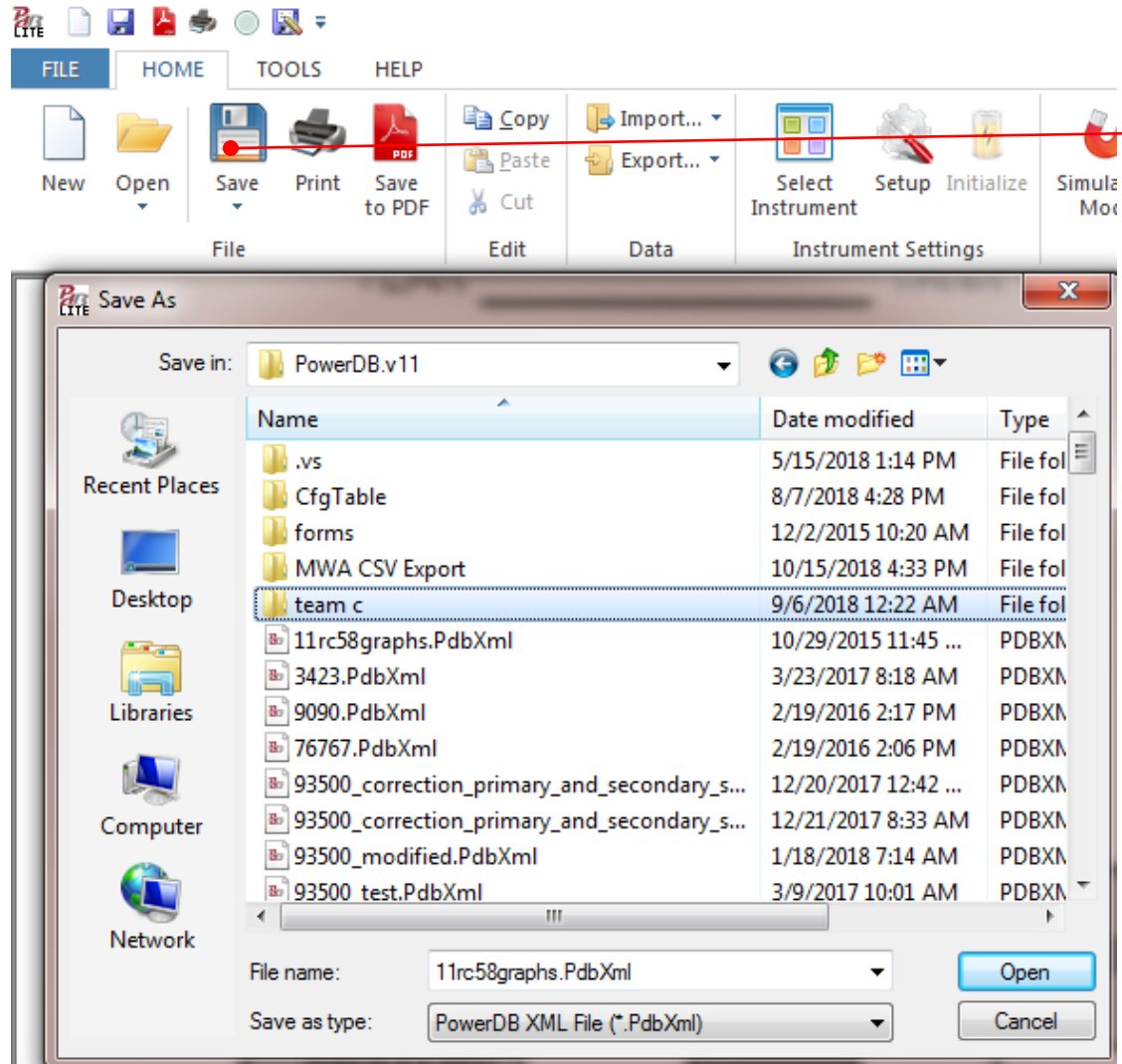
Fill out Bushing Nameplate

Designations based on Vector

MFR, Type/Class, kV, AMPS, Year copies if unpopulated

*H1 copies to H2/H3/H0
X1 copies to X2/X3/X0*

DELTA4000 – Save form



Select Save in the ribbon bar

It is recommended to save before running tests.

If you do not save before running a test, PowerDB will ask you to save after every test completes until the result is saved.

PowerDB automatically saves after every test if the form was previously saved

DELTA4000 – Test sections

Select Tests:

Overall Test

Oil Tests

Bushing C1

Bushing C2

Settings

Recalculate Test Voltages

Surge Arresters

Hot Collar Test

TTR

Exciting Current

System Status

Manual Tests

Export To Excel

Select which tests to display on the form

DELTA4000 – Settings

Settings Recalculate Test Voltages

System Status

Export To Excel

Select Line Frequency (50 or 60)

Set Power Factor or Dissipation Factor (PF or DF)

Set NB DFR Test Voltage

Set NB DFR Test Frequencies

Change Standards (ANSI/IEC/AUS)

Enable Diagram number on form

Enable/Disable color ratings

Reading display (Direct, 2.5 kV, 10 kV)

Delta 2000/3000 Settings

VDF Settings (Hide/Show, Limit)

Load settings options

Save settings options

The screenshot shows the 'Settings' dialog box with the following sections:

- %PF/%DF:** Radio buttons for 'PF or DF' (selected 'PF') and 'Line Frequency (LF)' (set to 50).
- NB DFR:** 'Test Voltage' set to 0.25 kV. 'Frequencies (i.e. 320 160 80 32 16)' list with values: 470 220 110 70 40 20 10 5 2 1.
- Form:** 'Diag Number' checked, 'Standard' set to ANSI, 'Color Ratings' checked, 'Reading' set to Direct.
- Delta 2000/3000:** 'Suppression' checked, 'Manual Mode' unchecked.
- VDF:** 'Hide' checked, 'Limit' set to 0.10 %.
- Load:** 'Current Form', 'Global Settings', 'Factory Settings' buttons.
- Save:** 'Current Form', 'All Forms - Global' buttons.
- Overall Test Mode:** Radio buttons for 'Line Frequency + 1Hz' (selected) and 'Line Frequency + 1Hz + 505Hz'.
- Bushing Test Mode:** Radio buttons for 'Line Frequency + 1Hz + 505Hz' (selected).
- %PF Evaluation:**
 - Overall %PF @ 20° C Limits:**

	Good	<	Aged	
LF	1.00	<	2.00	Investigate
1Hz	1.00	<	2.00	Investigate
 - Bushing %PF @ 20° C Limits:**

	Good	<	Aged	
LF	0.50	<	1.00	Investigate
1Hz	0.70	<	1.20	Investigate
 - Bushing %PF @ 20° C as % of Nameplate:**

	Good	<	Aged	
Hide	<input type="checkbox"/>			
	150 %	<	200 %	Investigate

Select Overall Test Mode

Select Bushing Test Mode

Set Overall %PF @ 20 °C Limits

Line Frequency

- 1 Hz

Set Bushing %PF @ 20 °C Limits

Line Frequency

- 1 Hz

Set Bushing %PF @ 20 °C as % of Nameplate limits

DELTA4000 – Overall test

VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
L-L	L-G						
PRIMARY:				5	3	DETC	
SECOND:				1		OLTC	

Settings Recalculate Test Voltages

System Status

Export To Excel

Transformer Overall Test				Test Mode: <input checked="" type="radio"/> Line Frequency + 1Hz <input type="radio"/> ITC		View Individual Temp. Correction Factors										
Multiple Test <input checked="" type="radio"/> <input type="radio"/>				Connections				50Hz			1Hz					
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %			POWER FACTOR %				
							mA	Watts	Measured	@ 20°C	IR	Measured	@ 20°C	IR		
1		C _{HG} + C _{HL}	GST-GND													
2	✗	C _{HG}	GSTg-RB													
3	✗	C _{HL}	UST-R													
4		C _{HL} '		Test 1 Minus Test 2												
5		C _{LG} + C _{HL}	GST-GND													
6	✗	C _{LG}	GSTg-RB													
7		C _{HL}	UST-R													
8		C _{HL} '		Test 5 Minus Test 6												
9		C _{HG} '		C _{HG} Minus H Bushings												
10		C _{LG} '		C _{LG} Minus L Bushings												
Oil Test 1		Overall Oil Test	UST-R													
Oil Test 2		LTC Chamber Oil Test	UST-R													

Test kV based on nameplate

Use Recalculate Test Voltages if nameplate voltage entered was incorrect

Can be manually entered

Enable/Disable multiple tests. When enabled, all high side tests or all low side tests will be run together

DELTA4000 – Overall test

VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING	Settings	Recalculate Test Voltages
L-L	L-G							System Status	
PRIMARY:				5	3	DETC		Export To Excel	
SECOND:				1		OLTC			

Transformer Overall Test				Test Mode: <input checked="" type="radio"/> Line Frequency + 1Hz <input checked="" type="radio"/> ITC <input type="radio"/> View Individual Temp. Correction Factors											
Multiple Test <input type="checkbox"/>				Connections		50Hz			1Hz						
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %			POWER FACTOR %			
							mA	Watts	Measured	@ 20°C	IR	Measured	@ 20°C	IR	
1		C _{HG} + C _{HL}	GST-GND												
2	<input checked="" type="checkbox"/>	C _{HG}	GSTg-RB												
3	<input checked="" type="checkbox"/>	C _{HL}	UST-R												
4		C _{HL'}		Test 1 Minus Test 2											
5		C _{LG} + C _{HL}	GST-GND												
6	<input checked="" type="checkbox"/>	C _{LG}	GSTg-RB												
7		C _{HL}	UST-R												
8		C _{HL'}		Test 5 Minus Test 6											
9		C _{HG'}		C _{HG} Minus H Bushings											
10		C _{LG'}		C _{LG} Minus L Bushings											
Oil Test 1		Overall Oil Test	UST-R												
Oil Test 2		LTC Chamber Oil Test	UST-R												

- Test Mode options:
- Line Frequency + 1 Hz (factory default)
- ITC (factory default)
- View individual temperature correction factors (after a test completes)
- Click connection diagrams to view detailed pictures
- Enable/Disable NB DFR if desired.

DELTA4000 – Overall test

VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
L-L	L-G						
PRIMARY:				5	3	DETC	
SECOND:				1		OLTC	

Settings Recalculate Test Voltages

System Status

Export To Excel

Transformer Overall Test				Test Mode:	Line Frequency + 1Hz	ITC	View Individual Temp. Correction Factors							
Multiple Test				Connections	50Hz					1Hz				
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %			POWER FACTOR %		
					mA	Watts	Measured	@ 20°C	IR	Measured	@ 20°C	IR		
1		C _{HG} + C _{HL}	GST-GND											
2	✗	C _{HG}	GSTg-RB											
3	✗	C _{HL}	UST-R											
4		C _{HL} '		Test 1 Minus Test 2										
5		C _{LG} + C _{HL}	GST-GND											
6	✗	C _{LG}	GSTg-RB											
7		C _{HL}	UST-R											
8		C _{HL} '		Test 5 Minus Test 6										
9		C _{HG} '		C _{HG} Minus H Bushings										
10		C _{LG} '		C _{LG} Minus L Bushings										
Oil Test 1		Overall Oil Test	UST-R											
Oil Test 2		LTC Chamber Oil Test	UST-R											

Turn on Delta 4110/4310A

Ensure the INT/EXT switch is set appropriately:

INT for control from 12" top


EXT for control from PC

If EXT, connect USB or Ethernet to PC

Run a test by selecting any of the blue Test No. buttons

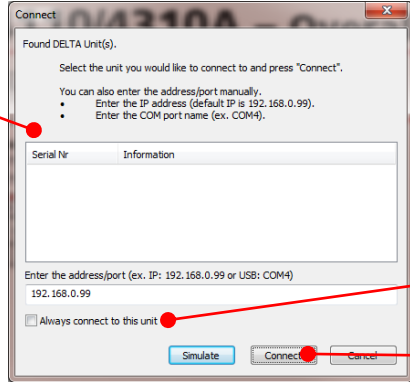
DELTA4000 – Overall test

VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING	Settings		Recalculate Test Voltages	
L-L	L-G							System Status		Export To Excel	
PRIMARY:				5	3	DETC					
SECOND:				1		OLTC					

Transformer Overall Test				Test Mode: Line Frequency + 1Hz		ITC		View Individual Temp. Correction Factors							
Multiple Test		Connections		50Hz				1Hz							
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %			POWER FACTOR %			
							mA	Watts	Measured	@ 20°C	IR	Measured	@ 20°C	IR	
1		CHG + CHL	GST-GND												

PC - Connect to the Delta

Serial Nr & information should automatically populate. If not, IP address listed can be used for Ethernet. For USB, consult Microsoft Device Manager for USB port



Select "Always connect to this unit" to skip connection step next time tests are run

Click Connect

DELTA4000 – Overall test

VOLTAGE (kV)		kVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
L-L	L-G						
PRIMARY:				5	3	DETC	
SECOND:				1		OLTC	

Settings
Recalculate Test Voltages

System Status

Export To Excel

Transformer Overall Test				Test Mode: Line Frequency + 1Hz ITC		View Individual Temp. Correction Factors									
Multiple Test		Connections		50Hz			1Hz								
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %						
							mA	Watts	Measured	@ 20°C	IR	Measured	@ 20°C	IR	
1		CHG + CHL	GST-GND												

Measurement Screen

When testing with Line Frequency + 1 Hz and ITC, you will see many frequencies for each test mode in addition to 50/60 Hz and 1 Hz. These frequencies are used for temperature correction back to 20 °C for line frequency and 1 Hz.

DELTA 4000 2.0.9.54.0

Measurement Overview

- Verify that the list below is correct. Press CANCEL to go back.
- Click on the START button to start the test(s).

For help about how to hookup, select one of the tests below and press the "Hookup Illustration" button.

Test Mode	Suppression	Frequency	Voltage	Power Factor	Current	Capacitance	Watts
<i>Frequency Sweep</i>							
GST-GND	No Suppression	90.859 Hz	0.250 kV	--	--	--	--
GSTg-RB	No Suppression	1 Hz	0.250 kV	--	--	--	--
		90.859 Hz	0.250 kV	--	--	--	--
		1.817 Hz	0.250 kV	--	--	--	--
UST-R	No Suppression	1 Hz	0.250 kV	--	--	--	--
		90.859 Hz	0.250 kV	--	--	--	--
		1.817 Hz	0.250 kV	--	--	--	--
		1.817 Hz	0.250 kV	--	--	--	--
<i>Single Frequency</i>							
GST-GND	Frequency Variation	50 Hz	10.000 kV	--	--	--	--
GSTg-RB	Frequency Variation	50 Hz	10.000 kV	--	--	--	--

Automatically close the dialog when measurement(s) completed successfully

START (F2)
Hookup Illustration
Resonance Inductor Balancing
Measurement Information
CLOSE (ESC)

Click start to begin test

Measurement Information – view details during test

DELTA4000 – Overall test

DELTA 4000 2.0.9.54.0

Measurement Overview

- Verify that the list below is correct. Press CANCEL to go back.
- Click on the START button to start the test(s).

For help about howto hookup. Select one of the tests below and press the "Hookup Illustration" button.

Test Mode	Suppression	Frequency	Voltage	Power Factor	Current	Capacitance	Watts
Frequency Sweep							
GST-GND	No Suppression	90.859 Hz	0.250 kV	--	--	--	--
GSTg-RB	No Suppression	1 Hz	0.250 kV	--	--	--	--
		90.859 Hz	0.250 kV	--	--	--	--
		1.817 Hz	0.250 kV	--	--	--	--
UST-R	No Suppression	1 Hz	0.250 kV	--	--	--	--
		90.859 Hz	0.250 kV	--	--	--	--
		1.817 Hz	0.250 kV	--	--	--	--
Single Frequency							
GST-GND	Frequency Variation	50 Hz	10.000 kV	--	--	--	--
GSTg-RB	Frequency Variation	50 Hz	10.000 kV	--	--	--	--

Automatically close the dialog when measurement(s) completed successfully

START (F2) Hookup Illustration Resonance Inductor Balancing Measurement Information CLOSE (ESC)

Interlocks & Ground

Ground must be connected and Interlocks continuously engaged to begin and run test

OPEN will change to **CLOSED** after ground and interlocks engaged

Press Interlock to start measurement

Press and hold the Interlock buttons to enable measurement mode.

Interlock 1: **OPEN**
Interlock 2: **OPEN**
Ground Loop: **OPEN**

Cancel Continue!
(Simulation mode only)

*This window will close as soon as both buttons are closed.
Releasing any of the interlock buttons during the measurement will abort the measurement immediately.*

DELTA4000 – Overall test

DELTA 4000 2.0.9.54.0

Measurement Overview

- Verify that the list below is correct. Press CANCEL to go back.
- Click on the START button to start the test(s).

For help about howto hookup, Select one of the tests below and press the "Hookup Illustration" button.

Test Mode	Suppression	Frequency	Voltage	Power Factor	Current	Capacitance	Watts
Frequency Sweep							
GST-GND	No Suppression	90.859 Hz	0.250 kV	0.328%	1.367 mA	9.578 nF	0.0005605 W
GSTg-RB	No Suppression	1 Hz	0.250 kV	0.5%	4.712 uA	3 nF	2.945e-6 W
		90.859 Hz	0.250 kV	0.5%	428.2 uA	3 nF	0.0002676 W
		1.817 Hz	0.250 kV	0.5%	8.563 uA	3 nF	5.352e-6 W
UST-R	No Suppression	1 Hz	0.250 kV	0.333%	10.59 uA	6.743 nF	4.409e-6 W
		90.859 Hz	0.250 kV	0.333%	962.4 uA	6.743 nF	0.0004006 W
		1.817 Hz	0.250 kV	0.333%	19.25 uA	6.743 nF	8.011e-6 W
Single Frequency							
GST-GND	Frequency Variation	50 Hz	10.000 kV	0.328%	30.09 mA	9.578 nF	0.4935 W
GSTg-RB	Frequency Variation	50 Hz	10.000 kV	0.5%	9.425 mA	3 nF	0.2356 W

Automatically close the dialog when measurement(s) completed successfully

START (F2)

Hookup Illustration

Resonance Inductor Balancing

Measurement Information

CLOSE (ESC)

Measurement Complete

Review measurement information

Click Close to return to PowerDB form

DELTA4000 – Overall test

DELTA 4000 2.0.9.54.0

Measurement Overview

- Verify that the list below is correct. Press CANCEL to go back.
- Click on the START button to start the test(s).

For help about howto hookup. Select one of the tests below and press the "Hookup Illustration" button.

Test Mode	Suppression	Frequency	Voltage	Power Factor	Current	Capacitance	Watts
Frequency Sweep							
GST-GND	No Suppression	90.859 Hz	0.250 kV	0.328%	1.367 mA	9.578 nF	0.0005605 W
GSTg-RB	No Suppression	1 Hz	0.250 kV	0.5%	4.712 uA	3 nF	2.945e-6 W
		90.859 Hz	0.250 kV	0.5%	428.2 uA	3 nF	0.0002676 W
		1.817 Hz	0.250 kV	0.5%	8.563 uA	3 nF	5.352e-6 W
UST-R	No Suppression	1 Hz	0.250 kV	0.333%	10.59 uA	6.743 nF	4.409e-6 W
		90.859 Hz	0.250 kV	0.333%	962.4 uA	6.743 nF	0.0004006 W
		1.817 Hz	0.250 kV	0.333%	19.25 uA	6.743 nF	8.011e-6 W
Single Frequency							
GST-GND	Frequency Variation	50 Hz	10.000 kV	0.328%	30.09 mA	9.578 nF	0.4935 W
GSTg-RB	Frequency Variation	50 Hz	10.000 kV	0.5%	9.425 mA	3 nF	0.2356 W

Automatically close the dialog when measurement(s) completed successfully

START (F2) Hookup Illustration Resonance Inductor Balancing Measurement Information CLOSE (ESC)

Data imports into PowerDB

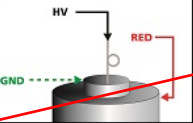
Review measurement information

IR based on settings

- Line Frequency IR
- 1 Hz IR

Transformer Overall Test				Test Mode: Line Frequency + 1Hz		ITC		View Individual Temp. Correction Factors						
Multiple Test				Connections		50Hz					1Hz			
Test No.	NB DFR	Insulation Tested	Test Mode	Click image for detailed connection information	TEST kV	Cap (pF)	DIRECT		POWER FACTOR %			POWER FACTOR %		
							mA	Watts	Measur.	@ 20°C	IR	Measured	@ 20°C	IR
1		C _{HG} + C _{HL}	GST-GND		10.0	9,578.0	30.0	0.4935	0.33	0.33	G			
2	✗	C _{HG}	GSTg-RB		10.0	3,000.0	9.42	0.2356	0.50	0.50	G	0.50	0.50	G
3	✗	C _{HL}	UST-R		10.0	6,743.0	21.1	0.3527	0.33	0.33	G	0.33	0.33	G
4		C _{HL'}		Test 1 Minus Test 2		6,578.0	20.6	0.2579			Invalid			

DELTA4000 – Overall test

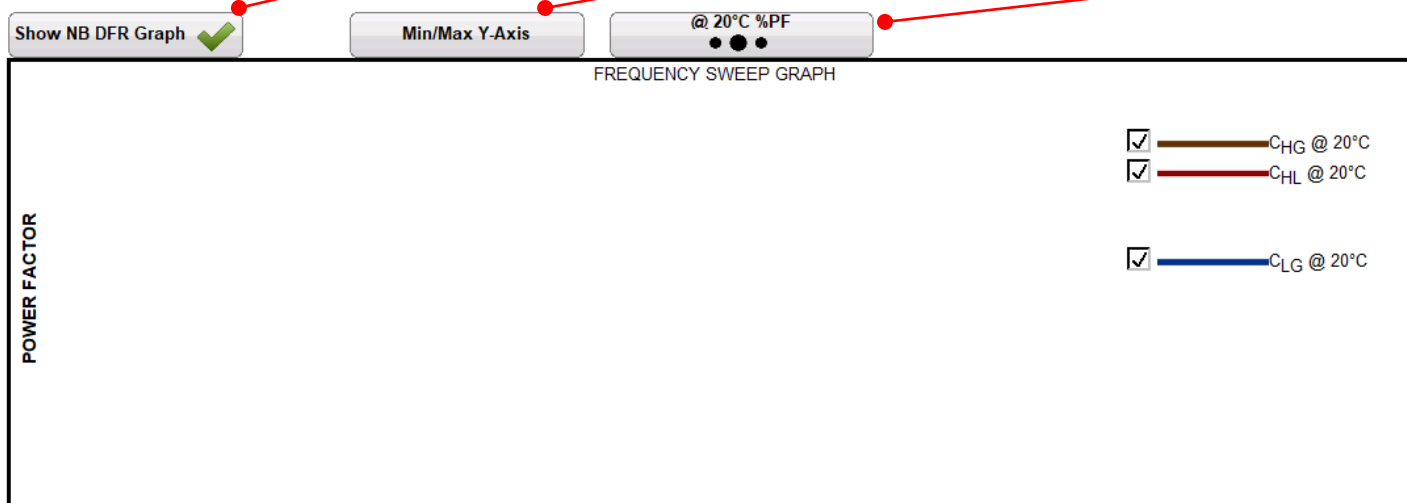
8	C _{HL}		Test 5 Minus Test 6																	
9	C _{HG}		C _{HG} Minus H Bushings																	
10	C _{LG}		C _{LG} Minus L Bushings																	
Oil Test 1	Overall Oil Test	UST-R																		
Oil Test 2	I TC Chamber Oil Test	UST-R																		

Show NB DFR graph if ran

Format Y-Axis to see more/less of the graph

Graph display options

- @ 20 °C (factory default)
- Measured
- CHL Measured vs @ 20 °C



DELTA4000 – Bushing C1 test

Bushing C1 Test				Test Mode: <input checked="" type="radio"/> Line Frequency + 1Hz + 505Hz										<input checked="" type="radio"/> ITC			<input checked="" type="radio"/> View Individual Temp. Correction Factors	
Connection Diagram				50Hz										1Hz			505Hz	
Test No.	NB DFR	Dsg	Test Mode	TEST kV	Capacitance		DIRECT		POWER FACTOR %			Δ %PF @ 20°C	POWER FACTOR %			POWER FACTOR %		
					C (pF)	Δ pF	mA	Watts	Measured	@ 20°C	IR		Measured	@ 20°C	IR	Measured	@ 20°C	
11	<input checked="" type="checkbox"/>	H1	UST-R															
12	<input checked="" type="checkbox"/>	H2	UST-R															
13	<input checked="" type="checkbox"/>	H3	UST-R															
14	<input checked="" type="checkbox"/>	H0	UST-R															
15	<input checked="" type="checkbox"/>	X1	UST-R															
16	<input checked="" type="checkbox"/>	X2	UST-R															
17	<input checked="" type="checkbox"/>	X3	UST-R															
18	<input checked="" type="checkbox"/>	X0	UST-R															
19	<input checked="" type="checkbox"/>		UST-R															

Test Mode options:

Line Frequency + 1 Hz + 505 Hz (factory default)

ITC (factory default)

View individual temperature correction factors (after a test completes)

Click connection diagrams to view detailed pictures

Enable/Disable NB DFR if desired.

Change test mode if desired

Test kV based on nameplate (can be entered manually)

Start Test (Review Overall Test in progress for info)

DELTA4000 – Bushing C2 test

Test Mode options:

ITC (factory default)

View individual temperature correction factors (after a test completes)

Connection Diagram			50Hz									
Test No.	NB DFR	Dsg	Test Mode	TEST kV	Capacitance		DIRECT		POWER FACTOR %			Δ %PF @ 20°C
					C (pF)	Δ pF	mA	Watts	Measured	@ 20°C	IR	
20	<input checked="" type="checkbox"/>	H1	GSTg-RB	0.50								
21	<input checked="" type="checkbox"/>	H2	GSTg-RB	0.50								
22	<input checked="" type="checkbox"/>	H3	GSTg-RB	0.50								
23	<input checked="" type="checkbox"/>	H0	GSTg-RB	0.50								
24	<input checked="" type="checkbox"/>	X1	GSTg-RB	0.50								
25	<input checked="" type="checkbox"/>	X2	GSTg-RB	0.50								
26	<input checked="" type="checkbox"/>	X3	GSTg-RB	0.50								
27	<input checked="" type="checkbox"/>	X0	GSTg-RB	0.50								

Click connection diagrams to view detailed pictures

Enable/Disable NB DFR if desired.

Change test mode if desired

Test kV based on nameplate (can be entered manually)

Start Test (Review Overall Test in progress for info)

DELTA4000 – Surge Arrester test

Hookup Diagram		Transformer - Surge Arresters Tests								Number of Tests: <u>8</u>			
	Location	Serial #	Mfr	Overall Catalog	Unit Catalog	Type	Rated kV	ORDER	Test Mode	Test kV	DIRECT		IR
											mA	Watts	
28									GST-GND				
29									GST-GND				
30									GST-GND				
31									GST-GND				
32									GST-GND				
33									GST-GND				
34									GST-GND				
35									GST-GND				

Select number of tests

Enter:

Location
SN
MFR
Overall Catalog
Unit Catalog
Type
Rated kV
Order

Single

Top

Middle

Bottom

+
X

Change test mode if desired

Enter test kV

Review hookup diagrams

Start Test (*Review Overall Test in progress for info*)

DELTA4000 – Hot Collar test

Bushing Hot Collar Tests								
Test No.	Dsg	Serial #	Skirt #	Test Mode	Test kV	DIRECT		IR
						mA	Watts	
37	H1			GST-GND				
38	H2			GST-GND				
39	H3			GST-GND				
40	H0			GST-GND				
41	X1			GST-GND				
42	X2			GST-GND				
43	X3			GST-GND				
44	X0			GST-GND				
45				GST-GND				
46				GST-GND				

Designation based on bushing nameplate

Serial # / Skirt #

Change test mode if desired

Test kV based on nameplate

Start Test (*Review Overall Test in progress for info*)

DELTA4000 – Exciting Current test

EXCITING CURRENT TESTS Number of Tests: 33 Hookup Diagram

CONNECTIONS:		PHASE A Enter connection					UST-R		PHASE B Enter connection					UST-R		PHASE C Enter connection					UST-R			
	DETC	LTC	TEST kV	L(H) / C (pF)	mA	EQUIV. 10 kV		TEST kV	L(H) / C (pF)	mA	EQUIV. 10 kV		TEST kV	L(H) / C (pF)	mA	EQUIV. 10 kV		TEST kV	L(H) / C (pF)	mA	EQUIV. 10 kV		IR	
						mA	Watts				mA	Watts				mA	Watts				mA	Watts		
47																								
48																								
49																								
50																								
51																								

Run on A Phase

Run on B Phase

Run on C Phase

✕

Review Hookup Diagrams

Enter phase information

Select test mode

Enter tap information

Test kV based on nameplate

Start Test (*Review Overall Test in progress for info*)

Each phase chosen separately

DELTA4000 – TTR test

URNS RATIO TEST

Reference Capacitor

Number of Tests: 5

52 kV Reference Capacitor (pF) Connection Diagram

% Error Limit: 0.5%

Pri Tap	Sec Tap	Pri V	Sec V	Calc. Ratio	kV	PHASE A			PHASE B			PHASE C				
						Cap. (pF)	Turns Ratio	% Error	Cap. (pF)	Turns Ratio	% Error	Cap. (pF)	Turns Ratio	% Error		
					53				54				55			
					56				57				58			
					59				60				61			
					62				63				64			
					65				66				67			

Enter number of tests

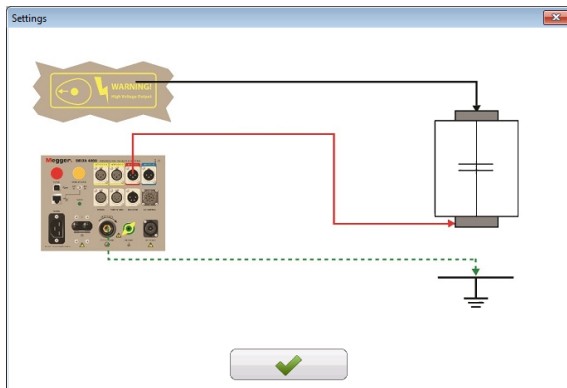
Select reference capacitor or reference resistor

Enter reference capacitor or resistor value

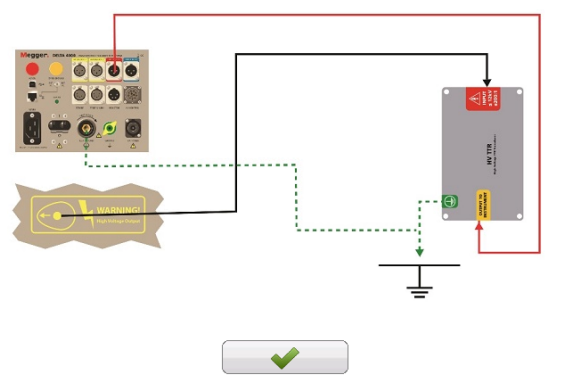
-OR-

Review connection diagram for reference and run a test

Reference Capacitor



Reference Resistor



DELTA4000 – TTR test

URNS RATIO TEST

Number of Tests: 5

Reference Capacitor

52 kV Reference Capacitor (pF)

Connection Diagram

% Error Limit: 0.5%

Review connection diagram

Pri Tap	Sec Tap	Pri V	Sec V	Calc. Ratio	kV	PHASE A				PHASE B				PHASE C			
						Cap. (pF)	Turns Ratio	% Error		Cap. (pF)	Turns Ratio	% Error		Cap. (pF)	Turns Ratio	% Error	
						53				54				55			
						56				57				58			
						59				60				61			
						62				63				64			
						65				66				67			

Enter tap information

Start Test - Select a phase to test (Review Overall Test in progress for info)

Turns ratio based on reference

% erro based on cal ratio and turns ratio

DELTA4000 – Manual test

MULTIPLE QUICK TESTS

Delta Control Add Row Remove Row

TEST NO	INSULATION TESTED	TEST MODE	SUPPRESS.	TEST kV	Test Freq	L(H) CAP.(pF)	POWER FACTOR %			DIRECT		%VDF	IR
							MEAS.	@ 20°C	CORR.	mA	Watts		
1		UST-R	Freq Variation										

Launch Delta Control to automatically add test rows as tests complete

Add/Remove test rows

Enter insulation identifier

Select test mode

Enter correction factor

Enter test frequency

Enter test kV

Select suppression mode

DELTA4000 – Export to Excel

Overall Test
Oil Tests
Bushing C1
Bushing C2
Settings
Recalculate Test Voltages

Surge Arresters
Hot Collar Test
TTR
Exciting Current
System Status

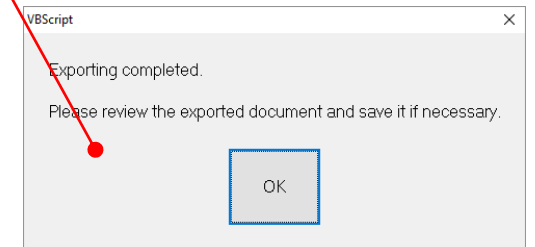
Manual Tests
Export To Excel

After completing testing, select Export to DTA6

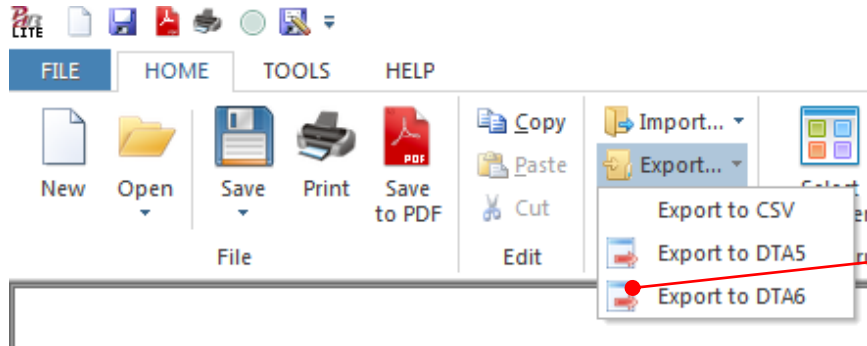
Transformer Overall Test					Test mode: Line Frequency + 1Hz & ITC										Correction Factors		
Test No.	NB DFR.	Insulation Tested	Test Mode	Connections	60Hz					1Hz					60Hz	1Hz	
					Test kV	Cap (pF)	DIRECT mA	Watts	POWER FACTOR % Measured @ 20°C	IR	%VDF	POWER FACTOR % Measured @ 20°C	IR				
69	1	CHG + CHL	GST-GND		10	5932.750488	22.284523	0.759195	0.342075	0.342075	G	0.01825			1		
70	2	CHG	GSTg-RB		10	2695.91333	10.13698	0.369161	0.365596	0.365596	G	0.016248	3.102735	3.102735	I	1	1
71	3	CHL	UST-R		10	3243.494141	12.208426	0.386399	0.31701	0.31701	G	0.016977	1.916818	1.916818	A	1	1
72	4	CHL'		Test 1 Minus Test 2		3236.837158	12.147543	0.390034			Valid						
73	5	CLG + CHL	GST-GND		7	9053.749023	23.801249	0.663059	0.399512	0.399512	G	0.0258				1	
74	6	CLG	GSTg-RB		7	5815.693848	15.35919	0.459164	0.426863	0.426863	G	0.016026	2.640939	2.640939	I	1	1
75	7	CHL	UST-R		7	3242.623291	8.523693	0.204028	0.343584	0.343584	G	0.013818				1	
76	8	CHL'		Test 5 Minus Test 6		3238.055175	8.442059	0.203895			Valid						
77	9	CHG'		CHG Minus H Bushings		1468.279602	5.516201	0.191661									
78	10	CLG'		CLG Minus L Bushings													
79	Oil Test 1	Overall Oil Test	UST-R													1	
80	Oil Test 2	LTC Chamber Oil Test	UST-R														1

Click OK to proceed

Click OK to view the Excel file

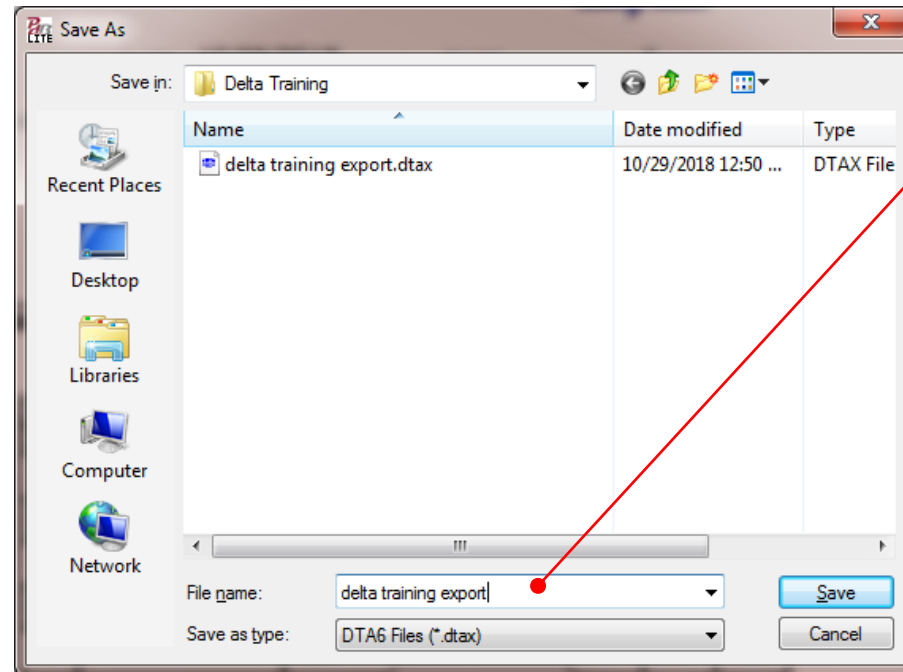


DELTA4000 – Export to DTA6

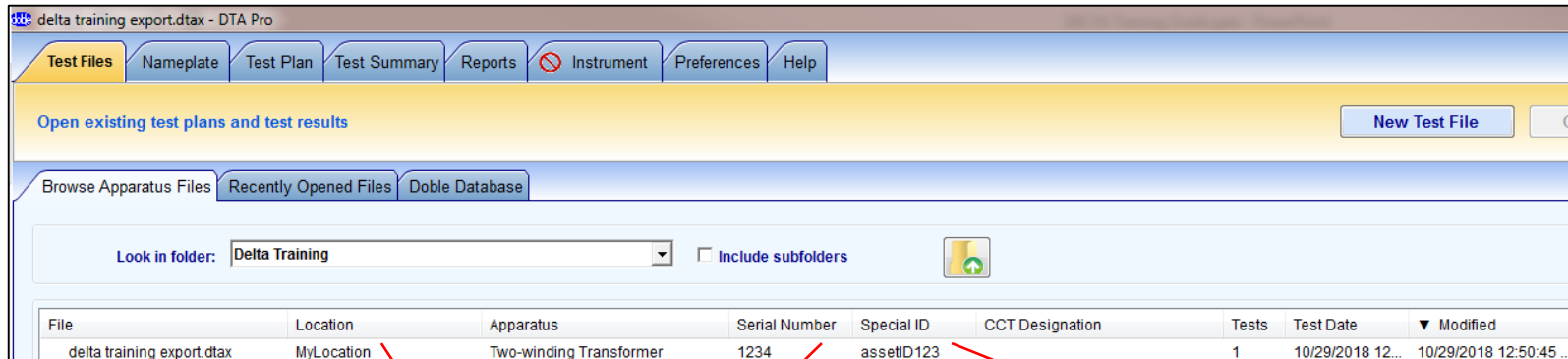


After completing testing, select Export to DTA6

Select destination directory and click save



DELTA4000 – Export to DTA6



In DTA6, select folder containing exported file

The file will appear in the list

Parameters will match exported file

DATE 10/29/2018 PAGE 1
AMBIENT TEMP. 85 °F JOB # job123
SUBSTATION MySubstation HUMIDITY 45 % ASSET ID assetID123
POSITION MyPosition TEST STATUS Pass
EQUIPMENT LOCATION MyLocation

Show Bushing Nameplate

NAMEPLATE DATA

MFR Megger CLASS OFAF PHASES 3
SER NO 1234 COOLANT OIL REASON Commission
YEAR 1999 TANK TYPE SEALED WEIGHT 1000 lb
WINDING MATERIAL Cu
OIL VOLUME 1 GAL
OIL TEMP 33 °C
IMPEDANCE 8 %
WEATHER Sunny
BIL 1000000 kV

Diagram # 3 (ANSI)

BUSHING NAMEPLATE

Dsg	SERIAL NUM	MFR	TYPE/CLASS	kV	AMPS	YEAR
H1	1	A	SOLID-PORC	1	100	1999
H2	2	A	SOLID-PORC	1	100	1999
H3	3	A	SOLID-PORC	1	100	1999
N/A	4	A	SOLID-PORC	1	100	1999
X1	5	ABB	EPOXY	2	200	1989
X2	6	ABB	EPOXY	2	200	1989
X3	7	ABB	EPOXY	2	200	1989
N/A	8	ABB	EPOXY	2	200	1989

DELTA4000 – Export to DTA6

- Overall Test ✓
- Bushing C1 ✓
- Bushing C2 ✓
- Hot Collar Test ✓
- Exciting Current ✓
- TTR ✓
- Surge Arresters ✓
- Overall Test ✓
- Manual Tests ✓

Two-winding Transformer

New Test Session Save Close

Test List Overall Administration History Notes (By Session)

Test Session		
Test Names	# Test Runs	Last Run
Overall	1	10/29/2018
Bushings	1	10/29/2018
Exciting Current	1	10/29/2018
Doble Ratio	1	10/29/2018
Leakage Reactance	0	
Surge Arrester	1	10/29/2018
Insulating Fluid	1	10/29/2018
Diagnostic	1	10/29/2018
Manually Entered Tests	0	
Manually Entered Turns Ratio	0	

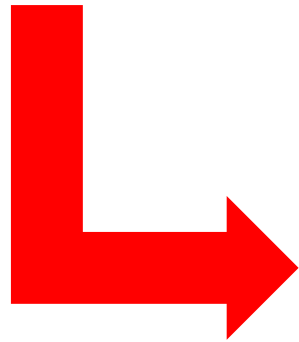
Nameplate Summary	
Item	Count
Bushings	8
Leakage Reactance	0
Surge Arresters	9

Tests will be mapped to DTA6

DELTA4000 – Export to DTA6

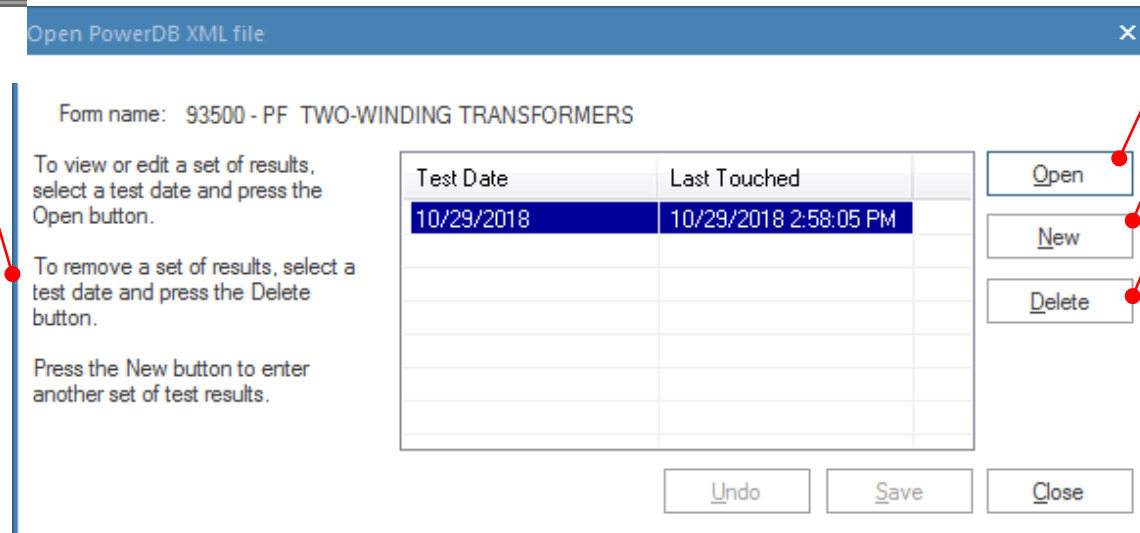
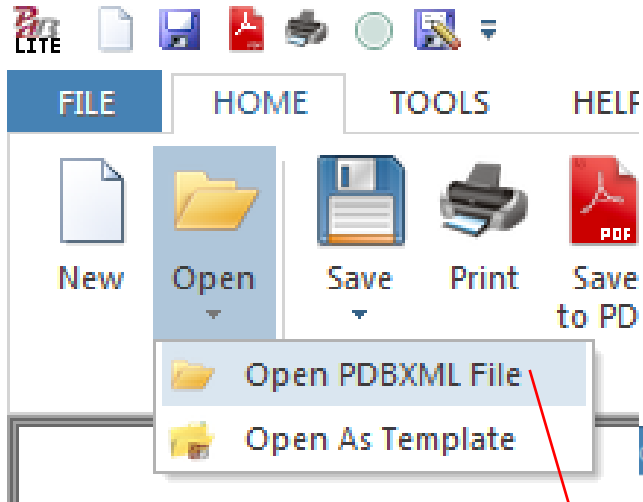
Multiple Test <input checked="" type="checkbox"/>		TRANSFORMER OVERALL TEST SET UP					Hookup Diagram		Temp Corr. Table		TRANSFORMER OVERALL TEST RESULTS					Change Temp. Corr. Table	
Test No.	Insulation Tested	Test Mode	Test Lead Connections				TEST kV	DFR	Capacitance C (pF)	POWER FACTOR %			DIRECT		%VDF	IR	
			HV	Red	Blue	Gnd				Measured	@ 20°C	Corr Factor	mA	Watts			
1	CHG + CHL	GST-GND	H	L		G	10.00		9,578.00	0.33	0.24	0.745	30.0903	0.4935	1.00	G	
2	CHG	GSTg-RB	H	L		G	10.00	✘	3,000.00	0.50	0.37	0.745	9.4249	0.2356	1.00	G	
3	CHL	UST-R	H	L		G	10.00	✘	6,743.00	0.33	0.25	0.745	21.1839	0.3527	1.00	G	
4	CHL'		Test 1 Minus Test 2						6,578.00				20.6654	0.2579		Invalid	
5	CLG + CHL	GST-GND	L	H		G	10.00		9,578.00	0.33	0.24	0.745	30.0903	0.4935	1.00	G	
6	CLG	GSTg-RB	L	H		G	10.00	✘	3,000.00	0.50	0.37	0.745	9.4249	0.2356	1.00	G	
7	CHL	UST-R	L	H		G	10.00		6,743.00	0.33	0.25	0.745	21.1839	0.3527	1.00	G	
8	CHL'		Test 5 Minus Test 6						6,578.00				20.6654	0.2579		Invalid	

Example of mapped Overall Test



Overall Test Setup													
Connections					Inputs		Test Results					Ratings	
#	HV Lead	Red Measure Lead	Blue Measure Lead	Insulation	Test kV	Corr. Factor	mA	Watts	PF (%)	PF Corr. (%)	Capacitance (pF)	Ask FRANK™	Manual
1				CH+CHL	10.000	0.75	30.090	0.493	0.328	0.244	9578.0		Good <input type="checkbox"/> G
2	HV Winding	LV Winding	Unused	CH	10.000	0.75	9.425	0.236	0.500	0.372	3000.0	<input type="checkbox"/> Unrated	... Good <input type="checkbox"/> G
3				CHL(UST)	10.000	0.75	21.184	0.353	0.333	0.248	6743.0	<input type="checkbox"/> Unrated	... Good <input type="checkbox"/> G
4	Test 1 - Test 2 (calculated)			CHL		1.00	20.665	0.258	0.125	0.125	6578.0		Unrated <input type="checkbox"/> U
5				CL+CHL	10.000	0.75	30.090	0.493	0.328	0.244	9578.0		Good <input type="checkbox"/> G
6	LV Winding	HV Winding	Unused	CL	10.000	0.75	9.425	0.236	0.500	0.372	3000.0	<input type="checkbox"/> Unrated	... Good <input type="checkbox"/> G
7				CHL(UST)	10.000	0.75	21.184	0.353	0.333	0.248	6743.0		Good <input type="checkbox"/> G
8	Test 5 - Test 6 (calculated)			CHL		1.00	20.665	0.258	0.125	0.125	6578.0	<input type="checkbox"/> Unrated	... Unrated <input type="checkbox"/> U

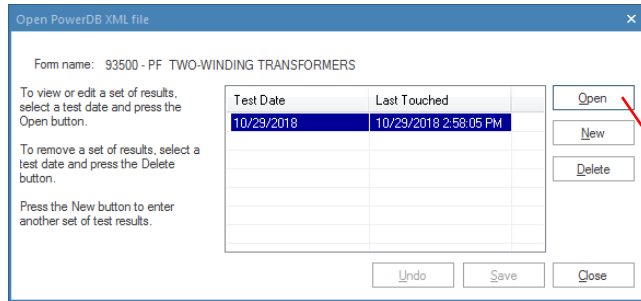
DELTA4000 – Opening a file



When you open a saved file, you have multiple options:

- Open
- New
- Delete

DELTA4000 – Opening a file



DATE 10/29/2018 PAGE 1

AMBIENT TEMP 85 °F JOB # job123

HUMIDITY 45 % ASSET ID assetID123

SUBSTATION MySubstation TEST STATUS Pass

POSITION MyPosition

EQUIPMENT LOCATION MyLocation

Show Bushing Nameplate

NAMEPLATE DATA

MFR Megger CLASS OFAF PHASES 3

SER NO 1234 COOLANT OIL REASON Commission

YEAR 1999 TANK TYPE SEALED WEIGHT 1000 (lb)

Diagram # 3 (ANSI)

Diagram:

WINDING MATERIAL Cu

OIL VOLUME 1 GAL

OIL TEMP 33 °C

IMPEDANCE 8 %

WEATHER Sunny

BIL 1000000 KV

VOLTAGE (KV)	KVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
PRIMARY 333	500	0.87	5	3	DETC	3
SECOND 444	500	0.65	33	17	OLTC	

COMMENTS

Select Tests: Overall Test Bushing C1 Bushing C2 Surge Arresters Settings Recalculate Test Voltages

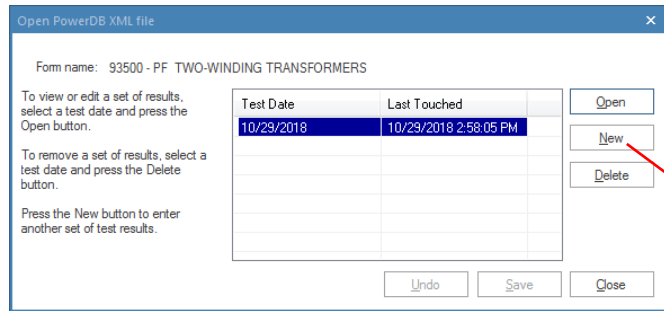
Hot Collar Test ITR Exciting Current Manual Tests Communications Log

TRANSFORMER OVERALL TEST SET UP

Test No	Insulation Tested	Test Mode	Test Lead Connections			TEST KV	DFR	Capacitance C (pF)	POWER FACTOR %			DIRECT		%VDF	IR
			HV	Red	Blue				Gnd	Measured	@ 20°C	Corr Factor	mA		
1	CHG + CHL	GST-GND	H	L	G	10.00		9,576.00	0.33	0.24	0.745	30.0903	0.4935	1.00	G
2	CHG	GSTG-RB	H	L	G	10.00	✘	3,000.00	0.50	0.37	0.745	9.4249	0.2356	1.00	G
3	CHL	UST-R	H	L	G	10.00	✘	6,743.00	0.33	0.25	0.745	21.1539	0.3527	1.00	G
4	CHL'	Test 1 Minus Test 2						6,578.00				20.6654	0.2579		Invalid
5	CLG + CHL	GST-GND	L	H	G	10.00		9,576.00	0.33	0.24	0.745	30.0903	0.4935	1.00	G
6	CLG	GSTG-RB	L	H	G	10.00	✘	3,000.00	0.50	0.37	0.745	9.4249	0.2356	1.00	G
7	CHL	UST-R	L	H	G	10.00		6,743.00	0.33	0.25	0.745	21.1539	0.3527	1.00	G
8	CHL'	Test 5 Minus Test 6						6,578.00				20.6654	0.2579		Invalid
9	CHG'	C _{HG} Minus H Bushings						-17,229.0				-54.1267	-0.8225		
10	CLG'	C _{LG} Minus L Bushings						-17,229.0				-54.1267	-0.8225		
Oil Test 1	Overall Oil Test	UST-R	L	H	G	10.00		6,743.00	0.33	0.18	0.555	21.1539	0.3527		
Oil Test 2	LTC Changer Oil Test	UST-R	L	H	G	10.00		6,743.00	0.33	0.18	0.555	21.1539	0.3527		

Open allows you to view previous results and continue testing

DELTA4000 – Opening a file



DATE 10/29/2018 PAGE 1

AMBIENT TEMP. °F HUMIDITY % ASSET ID assetID123

SUBSTATION MySubstation POSITION MyPosition TEST STATUS

EQUIPMENT LOCATION MyLocation

Show Bushing Nameplate

NAMEPLATE DATA

MFR Megger CLASS OFAF PHASES 3

SER NO 1234 COOLANT OIL REASON Commission

YEAR 1999 TANK TYPE SEALED WEIGHT 1000 WINDING MATERIAL CU

OIL VOLUME 1 GAL OIL TEMP °C IMPEDANCE 8 % WEATHER NIA

Diagram # 3 (ANSI)

Diagram showing H1, H2, H3, X1, X2, X3 connections.

VOLTAGE (KV)	kVA	RATED	# TAPS	NOMINAL	CHANGES	TAP SETTING
PRIMARY: 333	500	0.87	5	3	DETC	3
SECONDARY: 444	500	0.65	33	17	OLTC	

COMMENTS

Buttons: Overall Test, Bushing C1, Bushing C2, Surge Arresters, Settings, Recalculate Test Voltages, Hot Cooler Test, ITR, Exfoliating Current, Manual Tests, Communications Log

New creates a new test date within the file

Nameplate information is copied over

Test data is blank, ready for a new set of results

TRANSFORMER OVERALL TEST SET UP

Test No.	Insulation Tested	Test Mode	Test Lead Connections			TEST KV	DFR	Capacitance C (pF)	POWER FACTOR %		DIRECT		%VDF	IR
			HV	Red	Blue				Grd	Measured	@ 20°C	Corr Factor		
1	CHG + CHL	GST-GND	H	L	G	10.00								
2	CHG	GST-RB	H	L	G	10.00								
3	CHL	UST-R	H	L	G	10.00								
4	CHL'		Test 1 Minus Test 2											
5	CLG + CHL	GST-GND	L	H	G	10.00								
6	CLG	GST-RB	L	H	G	10.00								
7	CHL	UST-R	L	H	G	10.00								
8	CHL'		Test 5 Minus Test 6											
9	CHG'		CLG Minus H Bushings											
10	CLG'		CLG Minus L Bushings											
Oil Test 1	Overall Oil Test	UST-R	L	H	G	10.00								
Oil Test 2	LTC Chamber Oil Test	UST-R	L	H	G	10.00								

DELTA4000 – Opening a file

Open PowerDB XML file

Form name: 93500 - PF TWO-WINDING TRANSFORMERS

To view or edit a set of results, select a test date and press the Open button.

To remove a set of results, select a test date and press the Delete button.

Press the New button to enter another set of test results.

Test Date	Last Touched
10/30/2019	10/29/2018 3:08:47 PM
10/29/2018	10/29/2018 2:58:05 PM

Open

New

Delete

Undo Save Close

After a new test is saved, it will show in the list when the file is opened

Highlight a date and select Delete to remove it from the file

Basic functionality of PowerDB Pro will be covered in this section

PowerDB Pro functions similar to PowerDB Lite,
but with a database backend

*For more information about PowerDB Pro and its features, contact
Brad.Perry@powerdb.com or Mark.Meyer@powerdb.com*

DELTA4000 – PowerDB Pro

The screenshot shows the 'JOB' menu with options: New, Add to Job, Print, Save to PDF, Attach Document, Copy, Paste, Delete, Property Changes, Set Completed, Mark Result As..., Properties, View Job List, and View Job Tree. Below the menu is a table titled 'Job' with columns: Region, Job Num..., Date Cre..., Date Co..., Last Tou..., Custome..., Descripti..., and Jobl. The table contains two rows of data.

Region	Job Num...	Date Cre...	Date Co...	Last Tou...	Custome...	Descripti...	Jobl
<all>	<all>	<all>	<all>	<all>	<all>	<all>	<all>
Not Specified	Historical	10/30/2018	N/A	10/30/2018	<None>	System Job: ...	
Not Specified	H_PDBLITE	8/16/2007	N/A	10/30/2018	<None>	System Job: ...	

Open a job

or

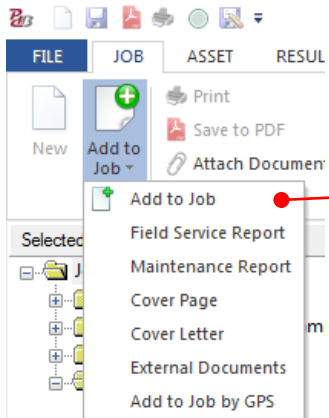
Open an asset

Double click to open

The screenshot shows the 'ASSET' menu with options: New, Open in Job, Open Latest Result, Save to PDF, Copy, Paste, Delete, Attach to Job, Assign Compliance, Attach External Doc, and Properties. Below the menu is a table titled 'Asset List' with columns: Region, Asset, Form, Asset ID, and Owner. The table contains eight rows of data.

Region	Asset	Form	Asset ID	Owner
<all>	<all>	<all>	<all>	<all>
Not Specified	93500 - PF ...	93500 - PF ...		abc
Not Specified	93500 - PF ...	93500 - PF ...		abc
Not Specified	93500 - PF ...	93500 - PF ...		abc
Not Specified	93500 - PF ...	93500 - PF ...		abc
Not Specified	93500 - PF ...	93500 - PF ...		abc
Not Specified	93500 - PF ...	93500 - PF ...		Megger
Not Specified	93500 - PF ...	93500 - PF ...		Megger
Not Specified	93500 - PF ...	93500 - PF ...		DTA 6 Import...

DELTA4000 – PowerDB Pro



Add to job

Select Owner or enter new

Select <Insert Test Form At This Level>

Select form 93500 – PF Two-Winding Transformer

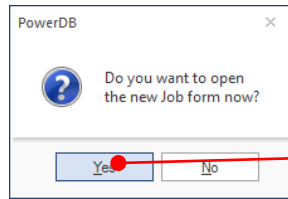
Select Finish

The dialog box is titled 'Enter or Select a Owner'. It contains a text area with the following text: 'abc', 'DTA 6 Import Example', and 'Megger'. Below the text area is an 'Owner' field with the value 'Delta Training'. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

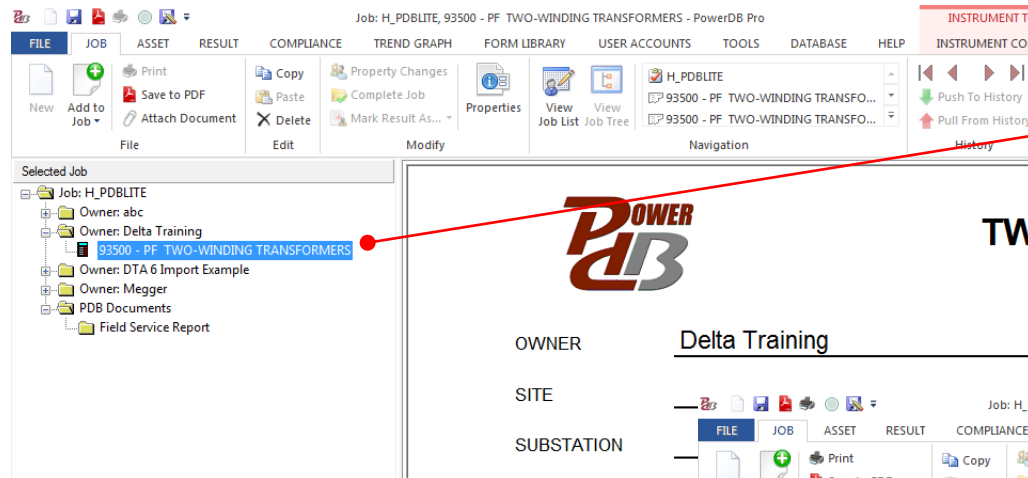
The dialog box is titled 'Enter or Select a Site'. It contains a text area with the value '<Insert Test Form At This Level>'. Below the text area is a 'Site' field with the value '<Insert Test Form At This Level>'. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

The dialog box is titled 'Select the Tests to Perform'. It contains a list of test forms with '93500 - PF Two-Winding Transformers' selected. Below the list are several controls: 'Show All for Instrument' (set to 'Current Transformer'), 'Group by Type Only', 'Normal (Grouped by Family/Type)', and a 'Show All' button. At the bottom, there is a 'Preferred Forms' checkbox (checked), an 'Asset Name' field with the value '93500 - PF Two-Winding Transfo...', and three buttons: '< Back', 'Finish', and 'Cancel'. A red dot is placed on the 'Finish' button, with a red arrow pointing to the sixth instruction on the right.

DELTA4000 – PowerDB Pro

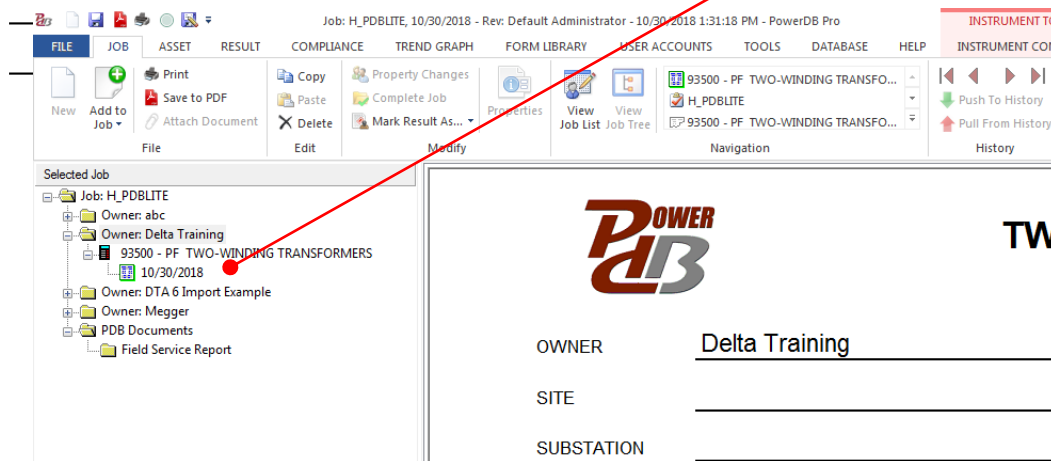


Select Yes to open the form

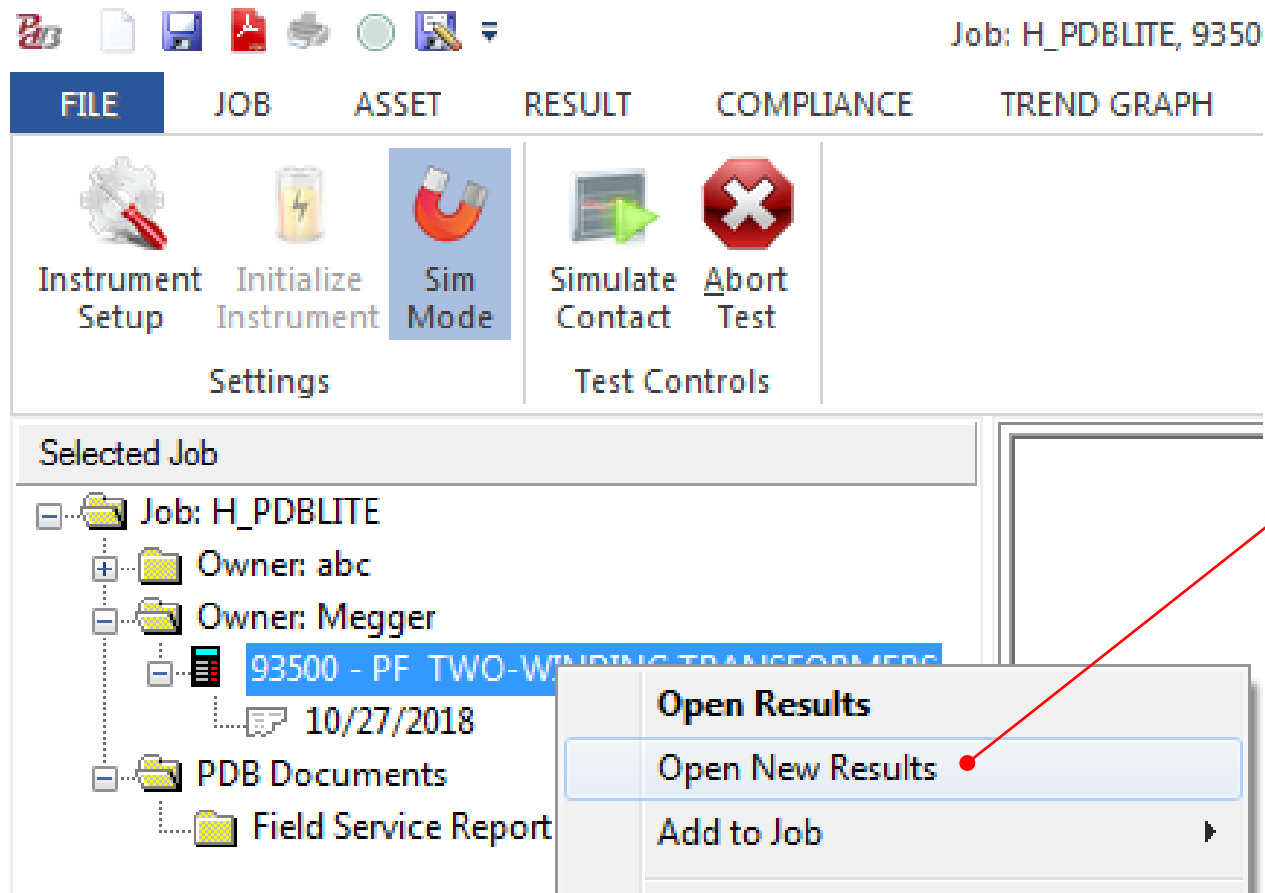


The form will appear in the list under the owner

Saving the form will show the test date in the database



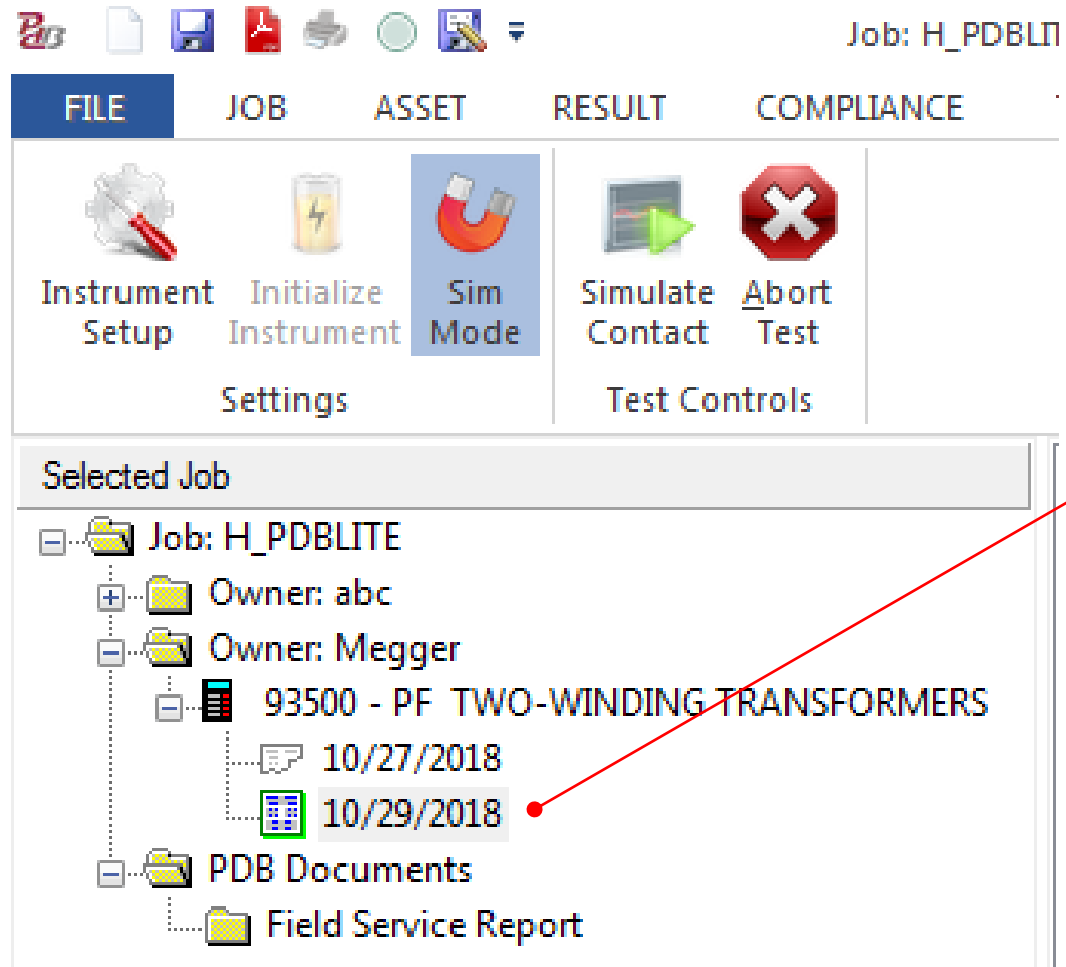
DELTA4000 – PowerDB Pro new result



To add new test data, right click on the form and select "Open New Results"

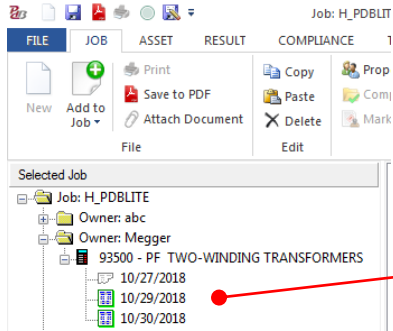
Similar to "New" in PowerDB Lite

DELTA4000 – PowerDB Pro new result



After saving, two results will appear in the database

DELTA4000 – PowerDB Pro trending



To trend a result, you need multiple tests

Open a result, find the test you want to trend, and right click

Multiple Test		TRANSFORMER OVERALL TEST SET UP					Hookup Diagram		Temp Corr. Table		TRANSFORMER OVERALL TEST RESULTS			
Test No.	Insulation Tested	Test Mode	Test Lead Connections				TEST kV	DFR	Capacitance C (pF)	POWER FACTOR %			Equivalence mA	
			HV	Red	Blue	Gnd				Measured	@ 20°C	Corr Factor		
1	C _{HG} + C _{HL}	GST-GND	H	L		G	10.00		1,000.00	0.47	0.35	0.745	10.0000	
2	C _{HG}	GSTg-RB	H	L		G	10.00							
3	C _{HL}	UST-R	H	L		G	10.00							
4	C _{HL'}		Test 1 Minus Test 2											
5	C _{HL}	GST-GND	H	L		G	10.00							

- View/Trend Historical Data
- Define Trend Comparison Filter
- Clear Trend Comparison Filter
- Toggle Flag As Error (Red Font)
- Copy Table
- Copy Partial Table
- Copy Table (CSV)
- Settings
- Paste Last Test Data

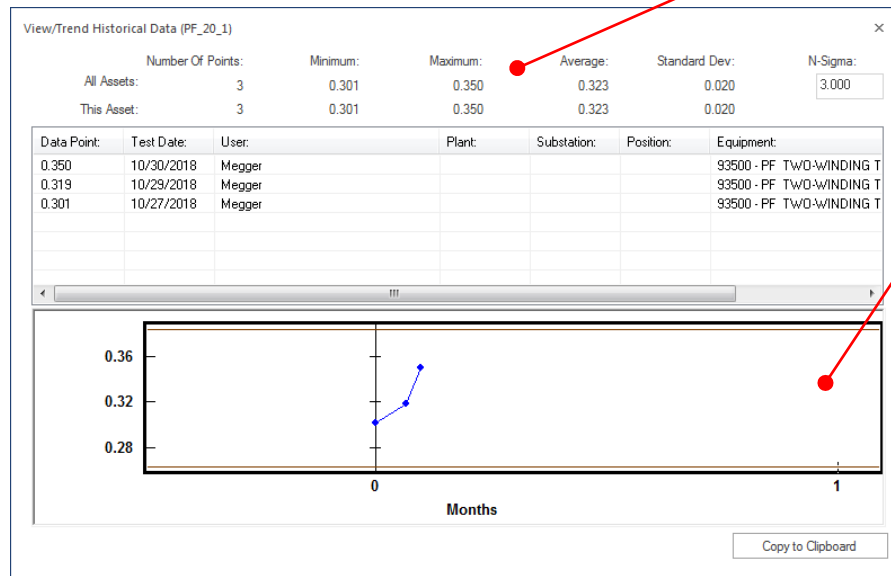
DELTA4000 – PowerDB Pro trending

Multiple Test		TRANSFORMER OVERALL TEST SET UP						Hookup Diagram		Temp Corr. Table		TRANSFORMER OVERALL TEST RESULTS		
Test No.	Insulation Tested	Test Mode	Test Lead Connections				TEST kV	DFR	Capacitance C (pF)	POWER FACTOR %			Equivalance mA	
			HV	Red	Blue	Gnd				Measured	@ 20°C	Corr Factor		
1	C _{HG} + C _{HL}	GST-GND	H	L		G	10.00		1,000.00	0.47	0.35	0.745	10.0000	
2	C _{HG}	GSTg-RB	H	L		G	10.00							
3	C _{HL}	UST-R	H	L		G	10.00							
4	C _{HL} '		Test 1 Minus Test 2											

- View/Trend Historical Data
- Define Trend Comparison Filter
- Clear Trend Comparison Filter
- Toggle Flag As Error (Red Font)
- Copy Table
- Copy Partial Table
- Copy Table (CSV)
- Settings
- Paste Last Test Data

Select View/Trend Historical Data

Historical data for this test will be displayed, with a graph



DELTA4000 – PowerDB Pro DTA6 import

The screenshot shows the PowerDB Pro software interface. At the top, there is a toolbar with various icons. Below it, a menu bar contains 'FILE', 'JOB', 'ASSET', 'RESULT', and 'COMPLIANCE'. The 'JOB' menu is open, showing options: 'New', 'Add to Job', 'Print', 'Save to PDF', 'Attach Document', 'Copy', 'Paste', 'Delete', and 'Pr'. Below the menu is a 'Selected Job' section with a tree view of assets. The tree structure is as follows:

- Job: H_PDBLITE
 - Owner: abc
 - Owner: DTA 6 Import Example
 - 93500 - PF TWO-WINDING TRANSFORMERS

Add a form that matches the asset to be imported

Two-winding
Three-winding
etc

DELTA4000 – PowerDB Pro DTA6 import

Job: H_PDBLITE, 93500 - PF TWO-WINDING TRANSFORMERS - PowerDB Pro

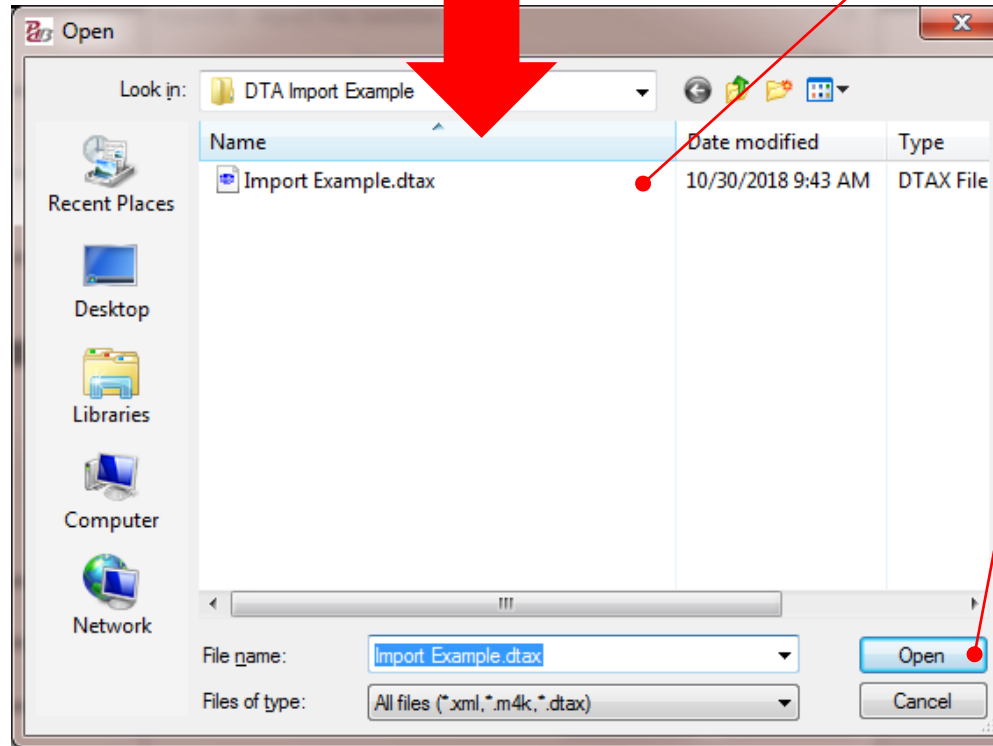
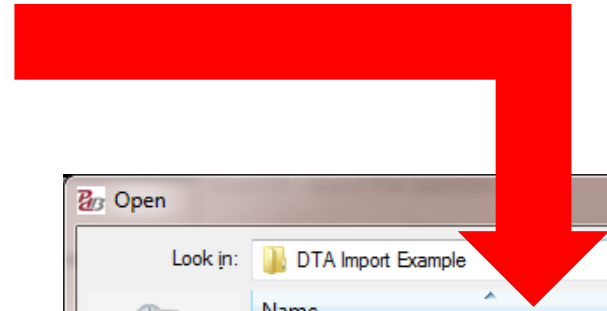
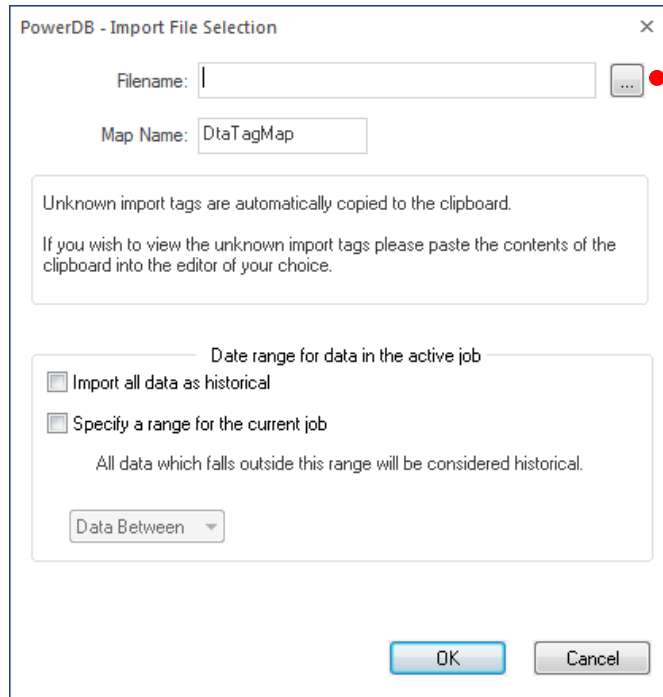
INSULATION TESTS
TWO-WINDING TRANSFORMERS

With the form open, select Import

Select Import Doble DTA 5.0/6.0 Data

- Import Onboard Files
- Import AVTS Data (Open Job)...
- Import BITE Battery Data (Open Job)...
- Import Caba Win Data (Open Job)...
- Import PdbXml (Open Job)...
- Import PdbXml (Open Form)...
- Import PDC Data (Open Job)...
- Import TJH2B Data (Open Job)...
- Import Weidmann Data (Open Job)...
- Import SDMyers (Open Job)...
- Import CSV Data (Open Form)...
- Import Doble DTA 5.0/6.0 Data (Open Form)...
- Import XML Data (Open Job)...
- Import Proactiv Data (Open Job)...
- Import Restore Data (Open Job)...

DELTA4000 – PowerDB Pro DTA6 import



Select the file you want to import

Select Open

DELTA4000 – PowerDB Pro DTA6 import

PowerDB - Import File Selection

Filename: C:\Users\kpetroff\Documents\DTA Import Example

Map Name: Dta6TagMap

Unknown import tags are automatically copied to the clipboard.
If you wish to view the unknown import tags please paste the contents of the clipboard into the editor of your choice.

Date range for data in the active job

Import all data as historical

Specify a range for the current job

All data which falls outside this range will be considered historical.

Data Between

OK Cancel

Select OK

Wait for import to complete

DELTA4000 – PowerDB Pro DTA6 import

The screenshot displays the PowerDB Pro interface. On the left, the 'Test History' table lists test dates in ascending order. A red arrow points from the top entry in this table to the corresponding entry in the 'Selected Job' list on the right.

Date
04/05/2017 09:43:39 AM
10/13/2016 12:51:30 PM
08/24/2015 09:56:34 AM
06/26/2013 07:08:00 AM
02/24/2011 08:21:48 AM
02/01/2011 09:44:33 AM
09/22/2010 09:23:25 AM
08/17/2010 10:32:06 AM
04/30/2007 12:57:58 PM
10/04/2005 12:07:49 PM
08/04/2005 08:08:15 AM
06/07/2004 09:20:57 AM
04/01/2003 08:12:36 AM
01/28/2002 10:15:01 AM
10/24/2000 12:00:30 PM
09/21/2000 09:49:11 AM
07/07/2000 03:30:00 PM
01/28/2000 08:39:05 PM
05/24/1999 03:40:00 PM
04/11/1996 10:28:19 AM

Job: H_PDBLITE, 93500 - PF TWC

FILE JOB ASSET RESULT COMPLIANCE TR

New Add to Job Print Save to PDF Attach Document Copy Paste Delete Proper Compl Mark F

Selected Job

- Job: H_PDBLITE
 - Owner: abc
 - Owner: Delta DTA6 Import
 - 93500 - PF TWO-WINDING TRANSFORMERS
 - 4/11/1996
 - 5/24/1999
 - 1/29/2000
 - 7/7/2000
 - 9/21/2000
 - 10/24/2000
 - 1/28/2002
 - 4/1/2003
 - 6/7/2004
 - 8/4/2005
 - 10/4/2005
 - 4/30/2007
 - 8/17/2010
 - 9/22/2010
 - 2/1/2011
 - 2/24/2011
 - 6/26/2013
 - 8/24/2015
 - 10/13/2016
 - 4/5/2017

Verify Test Dates were imported

PowerDB lists test dates in ascending order

DELTA4000 – PowerDB Pro DTA6 import

Two-winding Transformer Nameplate

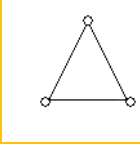
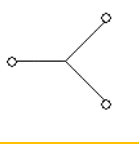
Company and Location

Company: American Electric Power Corp. Location: MOBILE WH8553
 Division: Mobile/Mobile Special ID: 13527

Transformer Details

Serial Number: _____
 # of Phases: Three
 Configuration: Δ-Y
 Class: OA/FA/FOA
 Manufacturer: Westinghouse Electric
 Mfr Location: USA
 CCT Designation: WH8553
 Oil Volume: 1964.0 UG
 Weight: 74100.0
 BIL: 450.0 kV

Windings Configuration

High Voltage Delta:  6 of 9
 Low Voltage Wye:  12 of 17

Phase Configuration based on windings: Internally Connected

Required for Expert System

Year of Mfr: 1981 Tank Type: N2 Blanket
 MVA/KVA: 20.0 * * * MVA Coolant: Oil
 Rated kV: H 139.10 X 7.57
 Windings: L-L L-L



Verify Nameplate Information

NAMEPLATE DATA

MFR Westinghouse Electric CLASS OA_FA_FOA PHASES 3
 SER NO _____ COOLANT Oil REASON _____
 YEAR 1981 TANK TYPE N2BLANKETED WEIGHT 74100 Unde
 WINDING MATERIAL Cu
 OIL VOLUME 1,964 UG
 TEMP 13 °C
 IMPEDANCE _____ %
 WEATHER Sunny
 BIL 450 kV

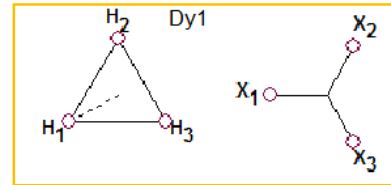


Diagram # 11 (ANSI)

	VOLTAGE (kV)		MVA	RATED I	# TAPS	NOMINAL	CHANGER	TAP SETTING
	L-L	L-G						
PRIMARY:	139.1		20	83.01	5	3	DETC	
SECOND:	7.565		20	1,526.37	1		OLTC	

DELTA4000 – PowerDB Pro DTA6 import

Test List Overall Administration History Notes (By Session) Session Date: 4/5/2017 9:43:39 AM

Overall Test Setup														
#	Connections			Insulation	Inputs		Test Results					Ratings		Notes
	HV Lead	Red Measure Lead	Blue Measure Lead		Test kV	Corr. Factor	mA	Watts	PF (%)	PF Corr. (%)	Capacitance (pF)	Ask FRANK™	Manual	
1				CH+CHL	10.024	1.00	34.115	1.146	0.336	0.337	9049.2		Unrated	U
2	HV Winding	LV Winding	Unused	CH	10.005	1.00	10.171	0.342	0.336	0.337	2697.9	Good	Unrated	U
3				CHL(UST)	10.005	1.00	23.940	0.797	0.333	0.334	6350.2	Good	Unrated	U
4	Test 1 - Test 2 (calculated)			CHL		1.00	23.944	0.804	0.336	0.337	6351.2		Unrated	U
5				CL+CHL	10.042	1.00	57.523	2.301	0.400	0.401	15258.3		Unrated	U
6	LV Winding	HV Winding	Unused	CL	10.042	1.00	33.576	1.497	0.446	0.447	8906.2	Good	Unrated	U
7				CHL(UST)	10.003	1.00	23.936	0.793	0.331	0.332	6349.1		Unrated	U
8	Test 5 - Test 6 (calculated)			CHL		1.00	23.947	0.804	0.336	0.337	6352.1	Good	Unrated	U

Winding without Attached Bushing Calculation														
CH-C1		CH'		1.00		6.183	0.143	0.232	0.233		1640.1		Unrated	U
CL-C1		CL'		1.00		31.803	1.401	0.441	0.442		8435.8		Unrated	U

Test Overall Session Date 4/5/2017 9:43:39 AM 20 of 20 FRANK™ Live

Verify Test Data

Open corresponding dates in DTA and PowerDB to verify data imported correctly



Multiple Test	TRANSFORMER OVERALL TEST SET UP							Hookup Diagram	Temp Corr. Table	TRANSFORMER OVERALL TEST RESULTS					Change Temp. Corr. Table				
	Test No.	Insulation Tested	Test Mode	Test Lead Connections						TEST kV	DFR	Capacitance C (pF)	POWER FACTOR %			Equivalent @ 10 kV		%VDF	IR Auto/Man
				HV	Red	Blue	Gnd						Measured	@ 20°C	Corr Factor	mA	Watts		
	1	CHG + CHL	GST-GND	H	L		G	10.02		9,049.17	0.34	0.34	1.003	34.1149	1.1461				
	2	CHG	GSTg-RB	H	L		G	10.00	✗	2,697.93	0.34	0.34	1.003	10.1711	0.3422		G		
	3	CHL	UST-R	H	L		G	10.01	✗	6,350.19	0.33	0.33	1.003	23.9399	0.7969		G		
	4	CHL'		Test 1 Minus Test 2						6,351.25				23.9439	0.8039		Valid		
	5	CLG + CHL	GST-GND	L	H		G	10.04		15,258.32	0.40	0.40	1.003	57.5229	2.3012				
	6	CLG	GSTg-RB	L	H		G	10.04	✗	8,906.25	0.45	0.45	1.003	33.5762	1.4974		G		
	7	CHL	UST-R	L	H		G	10.00		6,349.11	0.33	0.33	1.003	23.9358	0.7932				
	8	CHL'		Test 5 Minus Test 6						6,352.08				23.9467	0.8039		Valid		
	9	CHG'		CHG' Minus H Bushings						1,640.09				6.1830	0.1434				
	10	CLG'		CLG' Minus L Bushings						8,435.84				31.8028	1.4010				

DELTA4000 – PowerDB Pro DTA6 import

Multiple Test		TRANSFORMER OVERALL TEST SET UP				Hookup Diagram	Temp Corr. Table	TRANSFORMER OVERALL TEST RESULTS				Change Temp. Corr. Table				
Test No.	Insulation Tested	Test Mode	Test Lead Connections				TEST kV	DFR	Capacitance C (pF)	POWER FACTOR %			Equivalent @ 10 kV		%VDF	IR Auto/Man
			HV	Red	Blue	Gnd				Measured	@ 20°C	Corr Factor	mA	Watts		
1	C _{HG} + C _{HL}	GST-GND	H	L		G	10.02		9,049.17	0.34	0.34	1.003	34.1149	1.1461		
2	C _{HG}	GSTg-RB	H	L		G	10.00	✘	2,697.93	0.34	0.34	1.003	10.1711	0.3422		G
3	C _{HL}	UST-R	H	L		G	10.01	✘	6,350.19	0.33	0.33	1.003	23.9399	0.7969		G
4	C _{HL} '		Test 1 Minus Test 2						6,351.25				23.9439	0.8039		Valid
5	C _{LG} + C _{HL}	GST-GND	L	H		G	10.04		15,258.32							
6	C _{LG}	GSTg-RB	L	H		G	10.04	✘	8,906.25							
7	C _{HL}	UST-R	L	H		G	10.00		6,349.11							
8	C _{HL} '		Test 5 Minus Test 6						6,352.08							
9	C _{HG} '		C _{HG} Minus H Bushings						1,640.09							
10	C _{LG} '		C _{LG} Minus L Bushings						8,435.84							

Trending immediately available after import

Right click and select View/Trend Historical Data

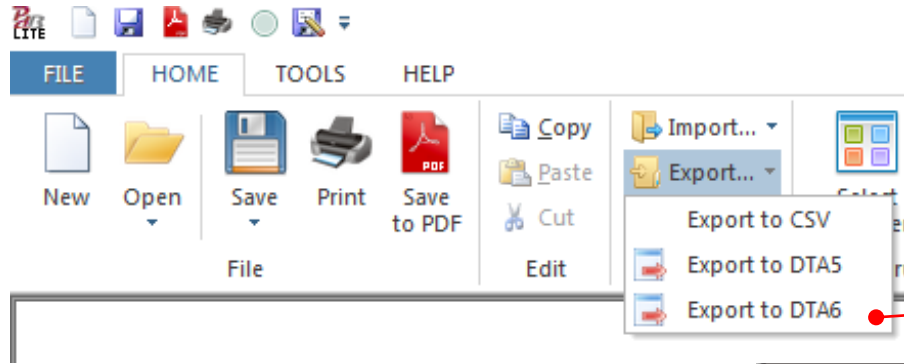
View/Trend Historical Data (PF_20_3)

	Number Of Points:	Minimum:	Maximum:	Average:	Standard Dev:	N-Sigma:
All Assets:	14	0.270	0.490	0.337	0.060	3.000
This Asset:	14	0.270	0.490	0.337	0.060	

Data Point:	Test Date:	User:	Plant:	Substation:	Position:	Equipment:
0.334	4/5/2017	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.336	8/24/2015	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.310	6/26/2013	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.310	2/1/2011	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.310	9/22/2010	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.320	8/17/2010	Delta DTA6 Import				93500 - PF TWO-WINDIN
0.300	4/30/2007	Delta DTA6 Import				93500 - PF TWO-WINDIN

Copy to Clipboard

DELTA4000 – PowerDB Pro DTA6 export

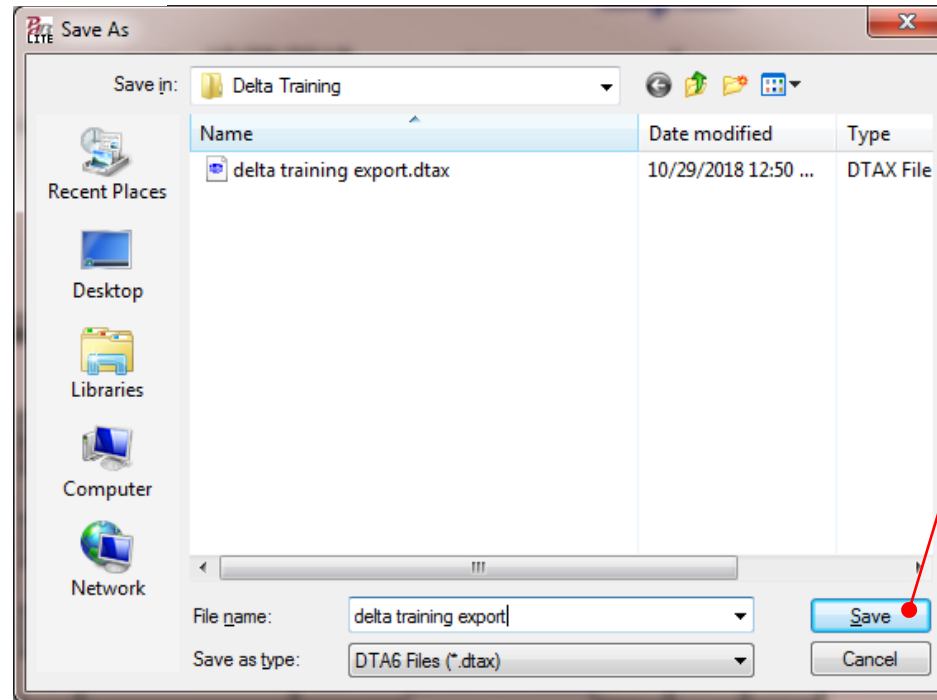


Same as Lite

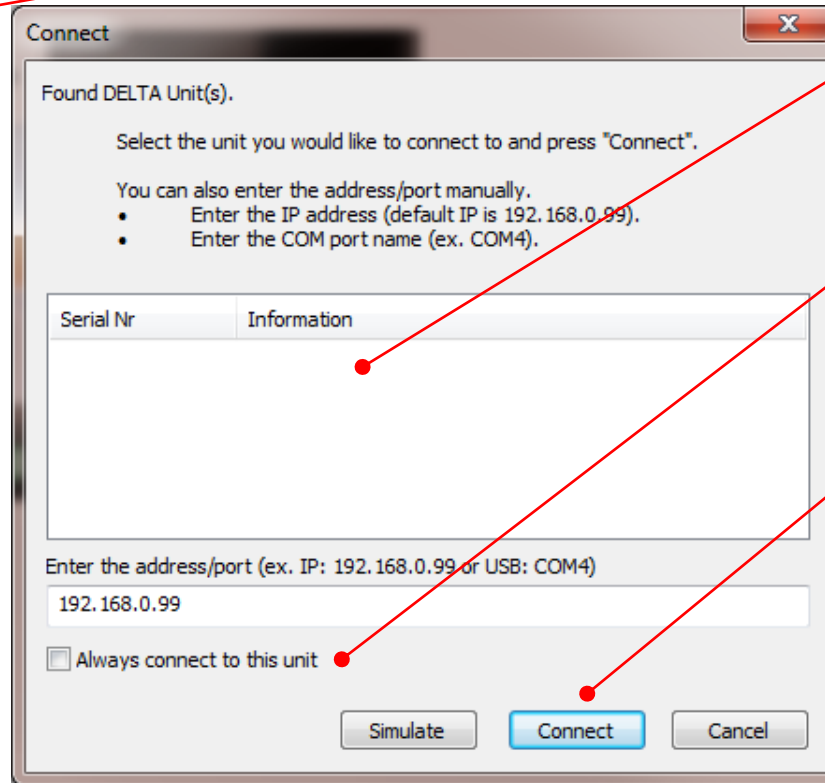
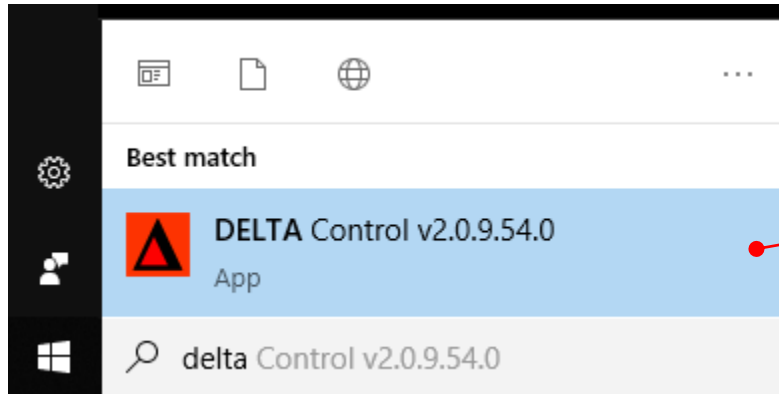
Contact PowerDB to have this feature enabled for your form

After testing is complete, select Export to DTA6

Give the file a name and click save



DELTA4000 – Delta Control



Open Delta Control

Connect

Serial Nr & information should automatically populate.

Select "Always connect to this unit" to skip connection step next time tests are run

Click Connect

DELTA4000 – Delta Control

The screenshot shows the Delta Control simulation interface for a Megger DELTA 4000. The interface is divided into several sections:

- Top Left:** Megger logo and input fields for Object ID, Test Object Temperature (-10 - 80 °C), Ambient Temperature (-20 - 55 °C), and Ambient Humidity (%).
- Top Center:** OSCILLOSCOPE display.
- Top Right:** DELTA 4000 header and TEST RESULTS section with buttons for Actual and @ 10kV.
- Middle Left:** TEST TAG (Miscellaneous), TEST TYPE (Tan-Delta), Interference Mode (No Suppression), and TEST MODE (UST-R, MEAS RED, GND BLUE).
- Middle Center:** Max Volt Setting = 12.00 kV gauge and a digital display showing 0.000 kV.
- Middle Right:** TEST RESULTS table with fields for Test Type, Test Mode, Interference Mode, Voltage, Current, Frequency, Capacitance, Power, TanD, TanD Temp Correction, TanD @ 20 °C, Ambient Temperature, and Humidity.
- Bottom Center:** INDICATORS section with a traffic light and buttons for Interlock Open and Open Ground.
- Bottom Left:** START (F2) Simulation button.
- Bottom Right:** MENU section with buttons for Settings, Graph, Results, Help, Status, and Close.

Enter Object ID (aka Test ID)

Enter test object temp (aka Oil/Winding Temp)

Enter ambient temperature and humidity

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C) °C

Ambient Temperature (-20 - 55 °C) °C

Ambient Humidity %

TEST TAG

Miscellaneous

TEST TYPE

Tan-Delta

Interference Mode

No Suppression

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

Max Volt Setting = 12.00 kV

DELTA 4000

TEST RESULTS

Actual @ 10kV

Test Type: Tan-Delta
Test Mode: UST-R
Interference Mode: No Suppression

Voltage: -- kV
Current: -- mA
Frequency: -- Hz
Capacitance: -- pF
Power: -- W

TanD: -- %

TanD Temp Correction (0 - 60):

TanD @ 20 °C -- %

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

MENU

Settings Graph Results
Help Status Close

TEST TAG

Breaker Generator/Motor
Bushing C1 Hot Collar
Bushing C2 Lightning Arrestor
Cable Oil
CT PT/VT
CVT Tx 2 Wdg Overall
Dry Transformer Tx 3 Wdg Overall
Miscellaneous

Click Test Tag

Select Test Tag

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C)

Ambient Temperature (-20 - 55 °C)

Ambient Humidity

TEST TAG

Miscellaneous

TEST TYPE

Tan-Delta

Interference Mode

No Suppression

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

Max Volt Setting = 12.00 kV

TEST TYPE

- Tan-Delta
- Excitation Current
- Voltage Tipup Test [PF/DF]
- DFR Sweep (+ITC)
- Manual
- Ratio & Φ (Ref Ω /Cap)
- Ratio Voltage Tip Up
- Tune Inductor

DELTA 4000

TEST RESULTS

Actual @ 10kV

Test Type: Tan-Delta

Test Mode: UST-R

Interference Mode: No Suppression

Voltage: -- kV

Current: -- mA

Frequency: -- Hz

Capacitance: -- pF

Power: -- W

TanD: -- %

TanD Temp Correction (0 - 60):

TanD @ 20 °C -- %

Ambient Temperature: -- °C

Humidity: -- %

MENU

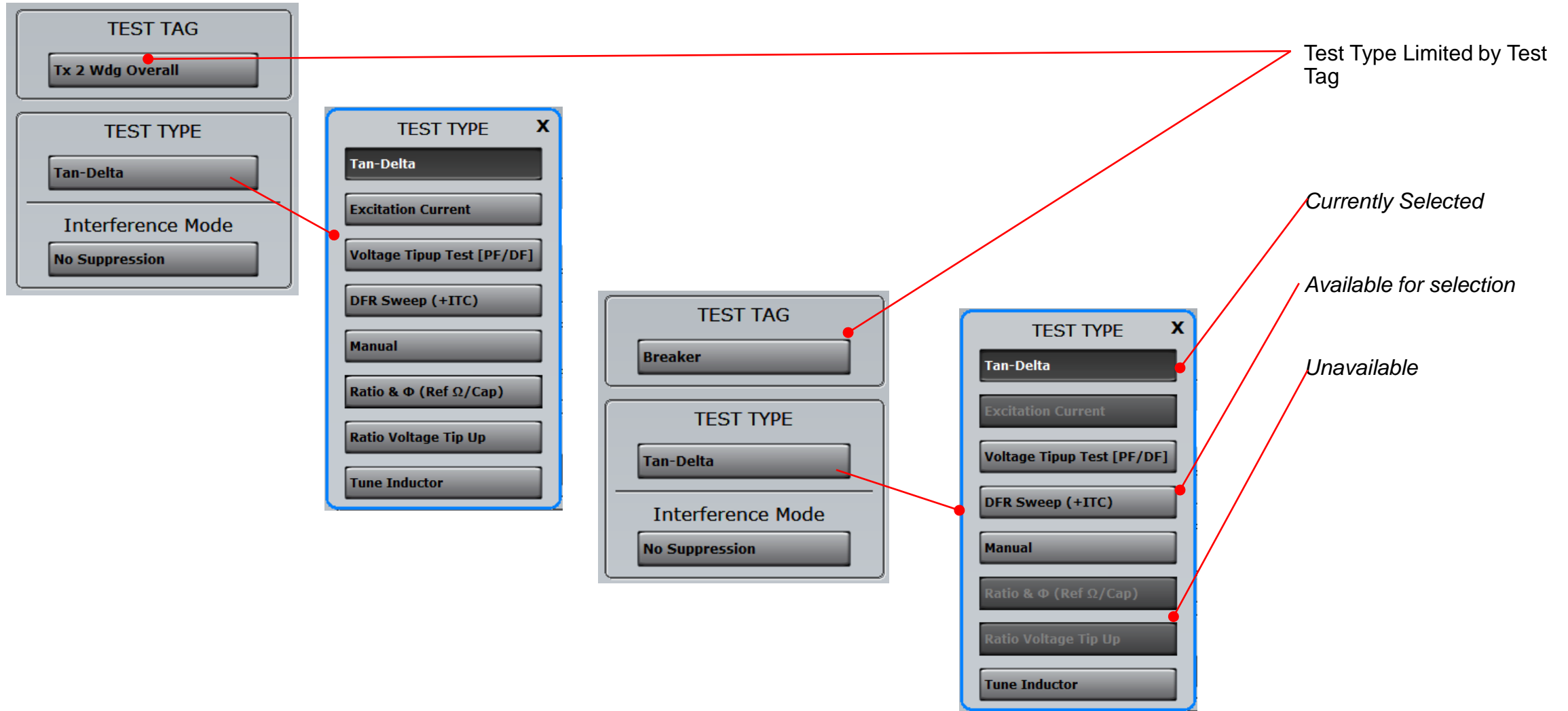
Settings Graph Results

Help Status Close

Click Test Type

Select Test Type

DELTA4000 – Delta Control



DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C)

Ambient Temperature (-20 - 55 °C)

Ambient Humidity

TEST TAG

Miscellaneous

TEST TYPE

Tan-Delta

Interference Mode

No Suppression

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

Max Volt Setting = 12.00 kV

0 2 4 6 8 10 12 kV

0.000 kV

Test Frequency: 50 Hz (1 - 505 Hz) | Test Current: -- mA

INDICATORS

Interlock Open | Open Ground

START (F2) Simulation

Measure

DELTA 4000

TEST RESULTS

Actual @ 10kV

Test Type: Tan-Delta

Test Mode: UST-R

Interference Mode: No Suppression

Voltage: -- kV

Current: -- mA

Frequency: -- Hz

Capacitance: -- pF

Power: -- W

TanD: -- %

TanD Temp Correction (0 - 60):

TanD @ 20 °C: -- %

Ambient Temperature: -- °C

Humidity: -- %

MENU

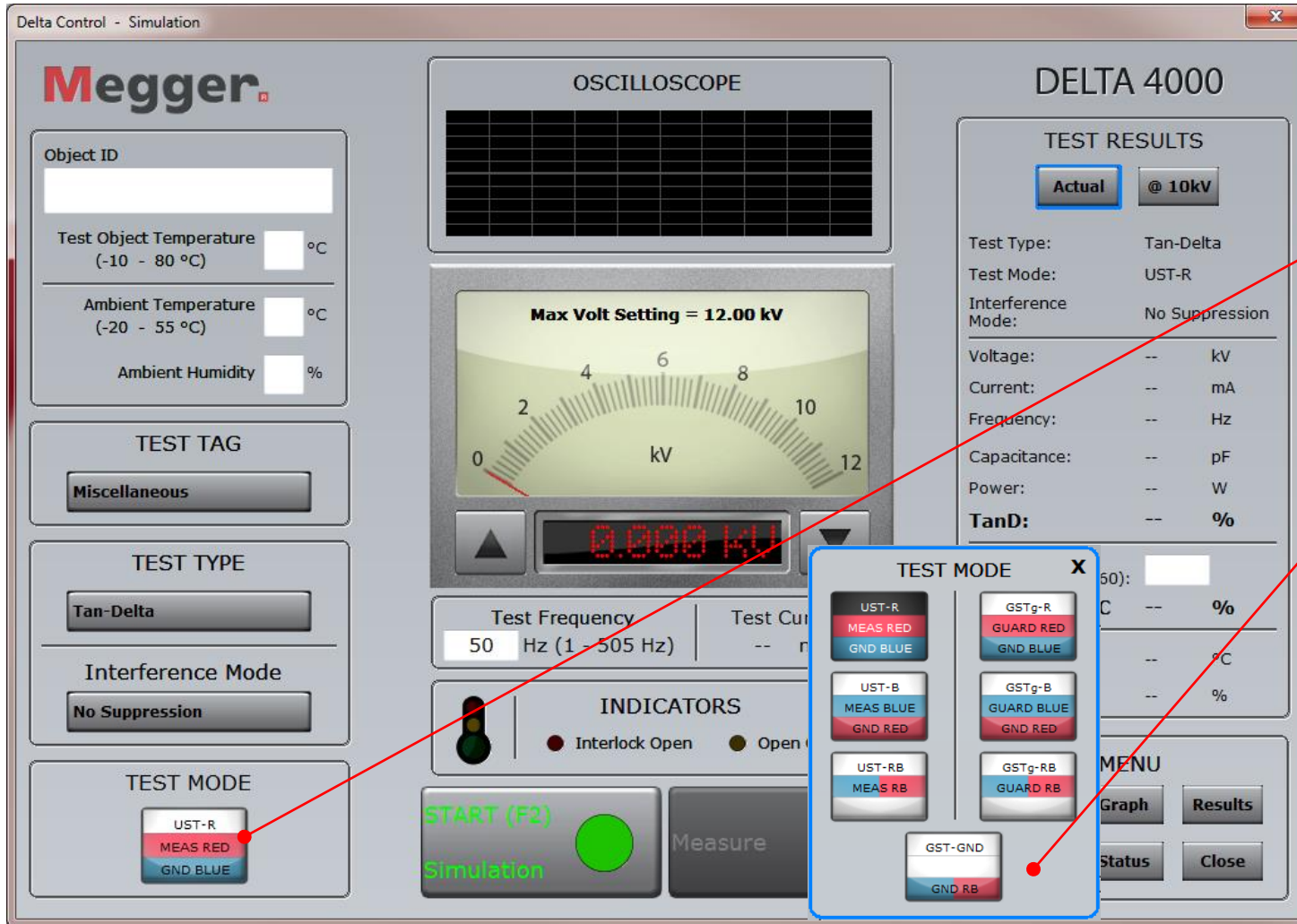
Settings Graph Results

Help Status Close

Recommended Interference Mode selected based on Test Type

Cannot be changed for some Test Types

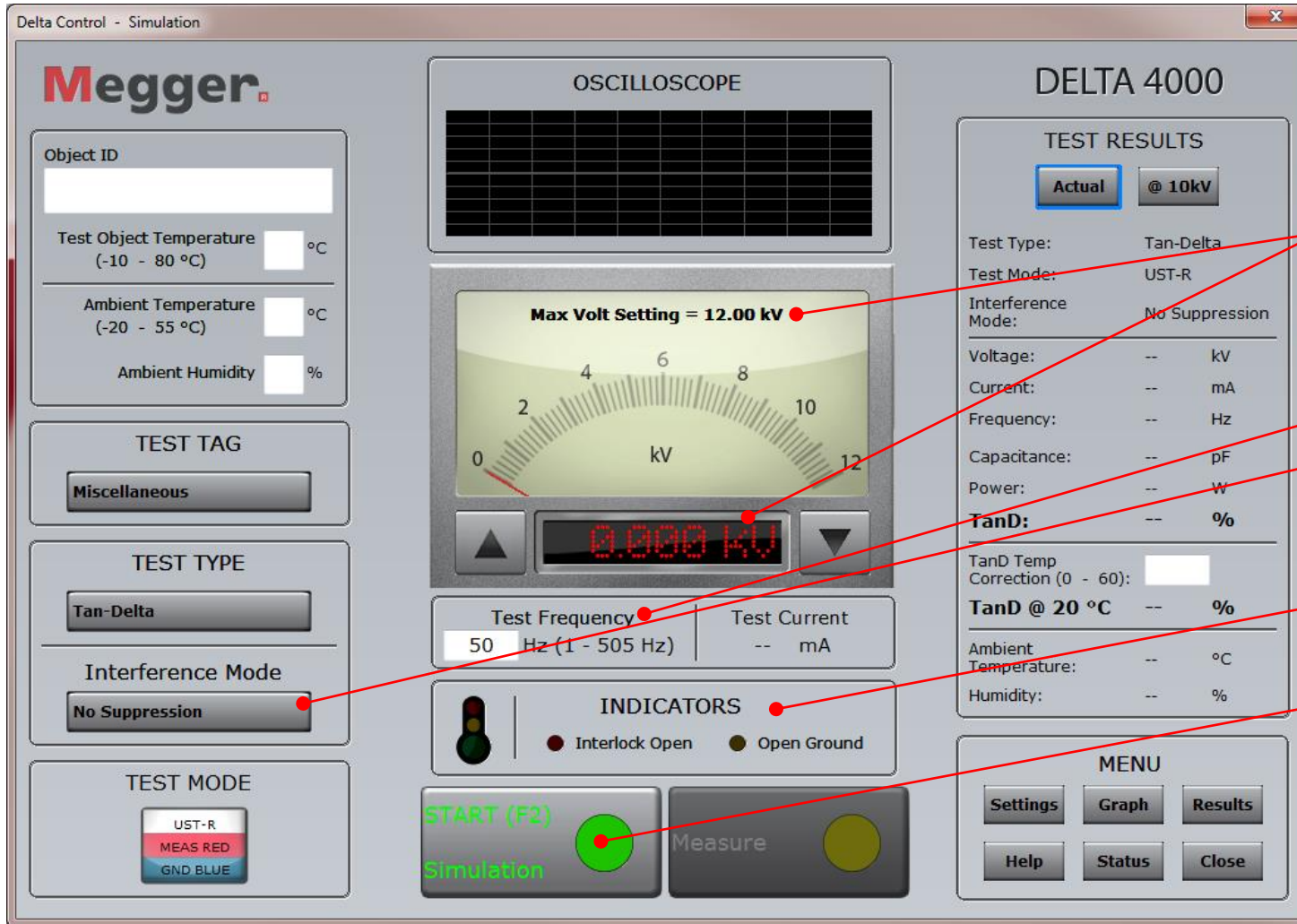
DELTA4000 – Delta Control



Click Test Mode

Select Test Mode

DELTA4000 – Delta Control



Set Test Voltage

Limited by Max Voltage Setting

Set Test Frequency

Not available in Frequency Variation Suppression mode

Check Indicators

Start test

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C) 12 °C

Ambient Temperature (-20 - 55 °C) 25 °C

Ambient Humidity 40 %

TEST TAG

Tx 2 Wdg Overall

TEST TYPE

Tan-Delta

Interference Mode

Frequency Variation

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

Max Volt Setting = 12.00 kV

2.621 kV

Test Frequency 50 Hz (1 - 505 Hz) | Test Current -- mA

INDICATORS

Interlock Open | Open Ground

START (F2) Simulation

Measure

DELTA 4000

TEST RESULTS

Actual @ 10kV

Test Type: Tan-Delta

Test Mode: UST-R

Interference Mode: Freq Var

Voltage: -- kV

Current: -- mA

Frequency: -- Hz

Capacitance: -- nF

Power: -- W

TanD: -- %

TanD Temp Correction (0 - 60): [blank]

TanD @ 20 °C: -- %

Ambient Temperature: 25 °C

Humidity: 40 %

MENU

Settings | Graph | Results

Help | Status | Close

Waveform during test

Output Voltage during test

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C) 12 °C

Ambient Temperature (-20 - 55 °C) 25 °C

Ambient Humidity 40 %

TEST TAG

Tx 2 Wdg Overall

TEST TYPE

Tan-Delta

Interference Mode

Frequency Variation

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

Max Volt Setting = 12.00 kV

2.621 kV

Test Frequency 50 Hz (1 - 505 Hz) | Test Current -- mA

INDICATORS

Interlock Open | Open Ground

START (F2) Simulation

Measure

DELTA 4000

TEST RESULTS @ 10kV

Actual | @ 10kV

Test Type: Tan-Delta
Test Mode: UST-R
Interference Mode: Freq Var

Voltage: 2.621 kV
Current @ 10 kV: 38.15 mA
Frequency: 50.0 Hz
Capacitance: 95.00 nF
Power @ 10 kV: 320.2 W

TanD: 0.378 %

TanD Temp Correction (0 - 60): 0.970

TanD @ 20 °C 0.367 %

Ambient Temperature: 25 °C
Humidity: 40 %

MENU

Settings | Graph | Results
Help | Status | Close

Review Test Results

View test results as measured or @ 10kV

Enter a temperature correction value

DELTA4000 – Delta Control settings

Line Frequency

Max Test Voltage

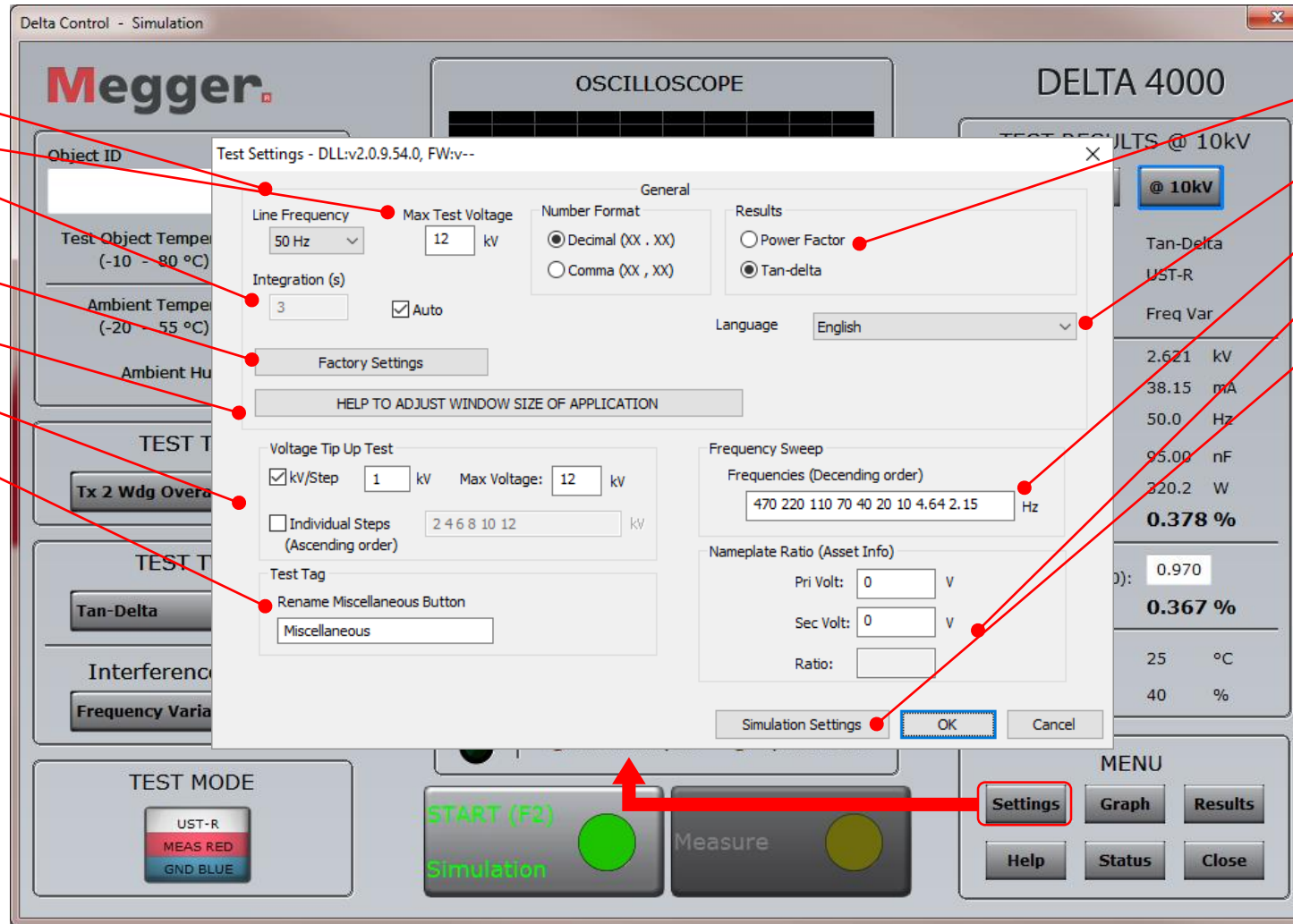
Measurement integration
(Auto recommended)

Restore factory settings

Adjust application size

Voltage tip up options

Test Tag miscellaneous
renaming option



Results display

Language

Frequency Sweep

Nameplate ratio

Simulation settings

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C) 12 °C

Ambient Temperature (-20 - 55 °C) 25 °C

Ambient Humidity 40 %

TEST TAG

Tx 2 Wdg Overall

TEST TYPE

Tan-Delta

Interference Mode

Frequency Variation

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

System Status

Measurement

Frequency (Hz): --

Voltage (kV): --

In Current (mA): --

Out Current (mA): --

Climate

HV unit %RH: --

Transf. Temp. (°C): --

HV unit Temp. (°C): --

External Temp. (°C): --

External %RH: --

Serial nr

CTRL Unit Serial nr: --

HVU Unit Serial nr: --

Version

API DLL Version: 2.0.9.19

HVU CRB Version: --

CTRL AMX Version: --

CTRL MBX Version: --

CTRL FPGA Version: --

Calibration

CTRL Calibrated: --

Terminal

Close

DELTA 4000

TEST RESULTS @ 10kV

Actual @ 10kV

Test Type: Tan-Delta

Test Mode: UST-R

Interference Mode: Freq Var

Voltage: 2.621 kV

Current @ 10 kV: 38.15 mA

Frequency: 50.0 Hz

Capacitance: 95.00 nF

Power @ 10 kV: 320.2 W

TanD: 0.378 %

TanD Temp Correction (0 - 60): 0.970

TanD @ 20 °C 0.367 %

Ambient Temperature: 25 °C

Humidity: 40 %

MENU

Settings Graph Results

Help Status Close

View System Status

DELTA4000 – Delta Control



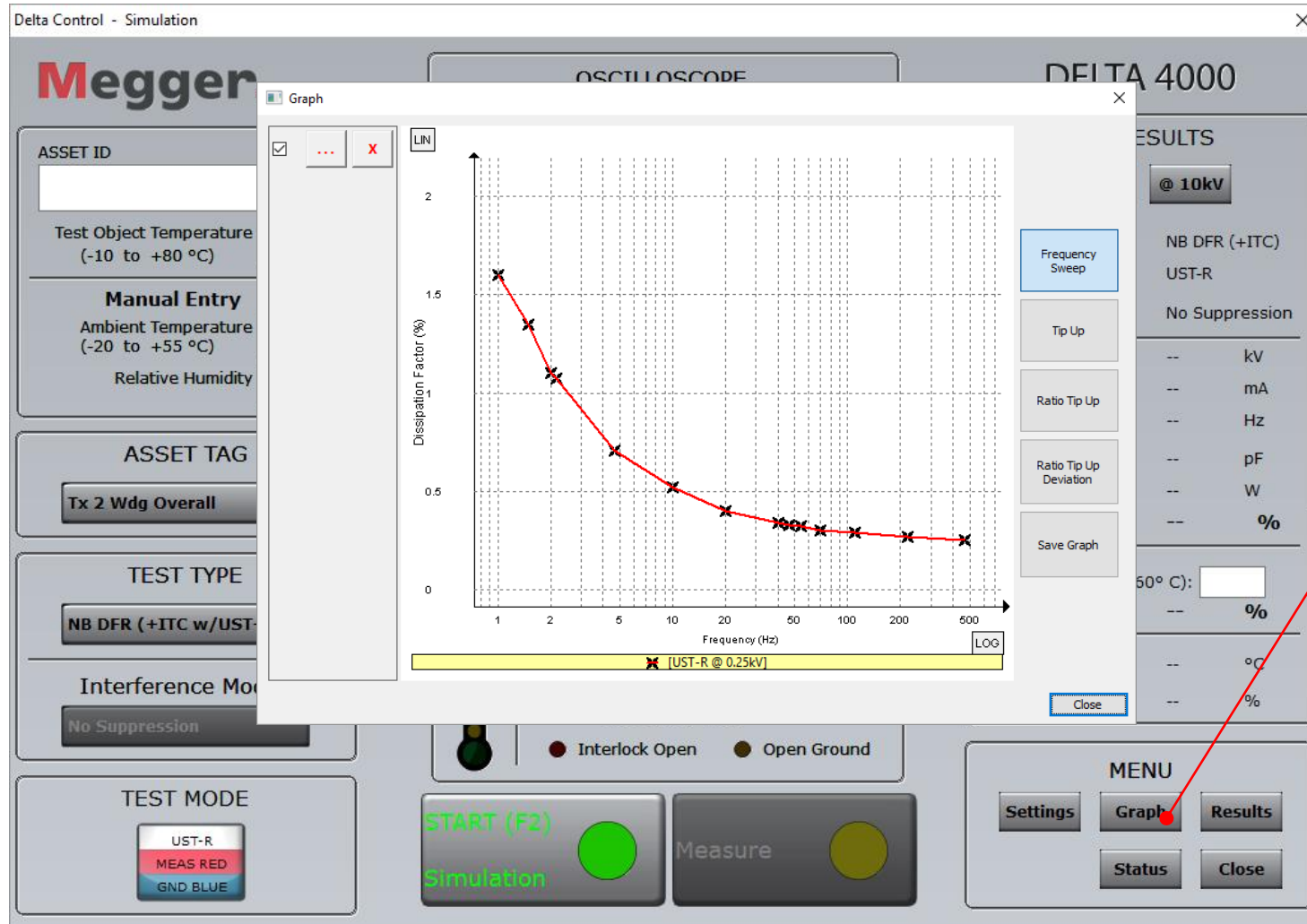
NB DFR (+ITC w/UST-R)

Test object temperature required for ITC

Pop-up will appear if test object temperature is blank after selecting NB DFR

ITC will be calculated after the test completes

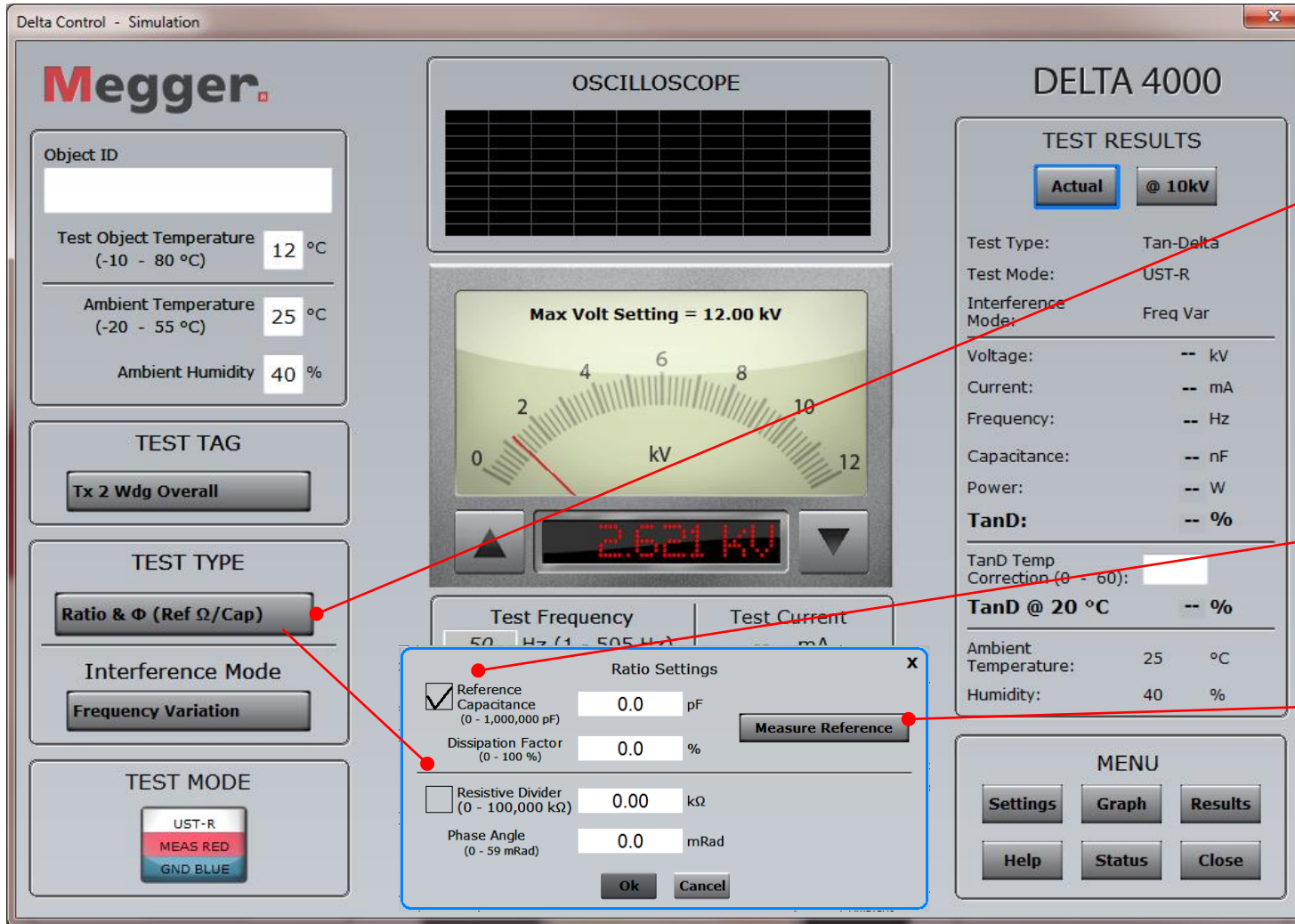
DELTA4000 – Delta Control



Select graph to view the NB DFR graph

Can be viewed during the test

DELTA4000 – Delta Control



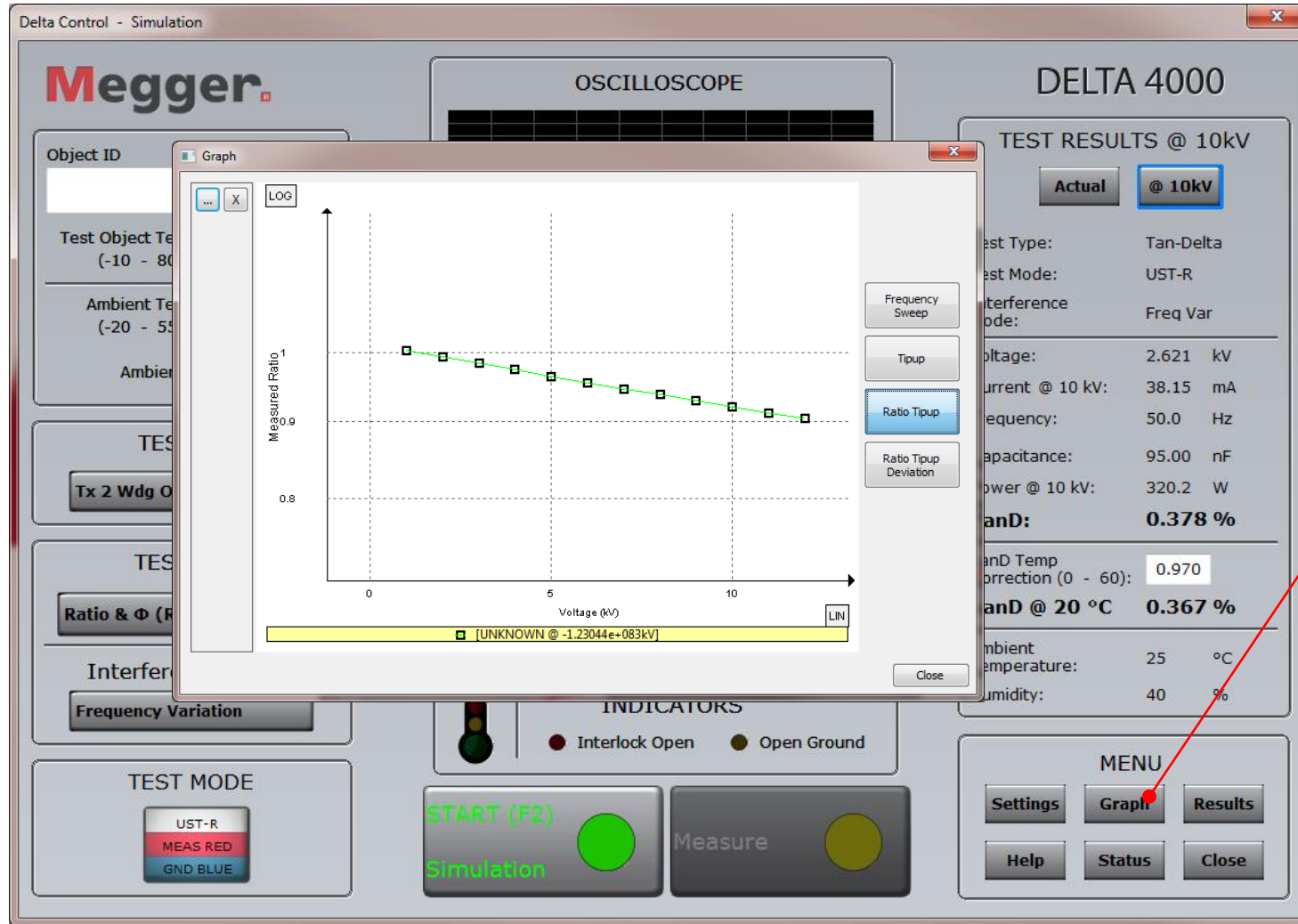
Ratio & Ø
(Ref Ω/Cap)

After selecting Ratio & Ø
(Ref Ω/Cap) a pop up will
appear asking for the
values of the Reference
Capacitor or Resistive
Divider

Select Reference
Capacitance or Resistive
Divider and enter the
values

If the values are unknown,
click Measure Reference

DELTA4000 – Delta Control



Ratio Voltage Tip up

During testing and after the test is complete, you can view a graph

DELTA4000 – Delta Control

The screenshot displays the Delta Control simulation interface. A central dialog box titled "Resonance Inductor Balancing" is open, containing instructions and a grid for monitoring. The background interface includes a Megger logo, an oscilloscope, test parameters, and a test results panel.

Resonance Inductor Balancing

- Ensure that the Resonant Inductor is connected correctly to the Delta system and to the test object. Refer to User manual for detailed instructions.
- Adjust the Core Gap to an approximate distance by manually turning the wheel of the Resonant Inductor. Either from earlier records or use Figure 4 in the Inductor User's Manual. 100nF specimen is approximately zero gap and 1uF is app. 2.2 inches gap.
- Press "START" or hit the F2 key on your keyboard to start procedure.

IOut (mA)
--

Voltage (kV)
--

NOTE: It is important to lock the Resonance Inductor before heavy load as it may drift during high load

START (F2) STOP (Esc) Close

Delta Control - Simulation

Megger

OSCILLOSCOPE

DELTA 4000

TEST RESULTS

Actual @ 10kV

Tune Inductor

UST-R

No Suppression

12.000 kV

120.0 mA

50.0 Hz

133.2 pF

22.00 W

0.388 %

TEST TAG

Tx 2 Wdg Overall

TEST TYPE

Tune Inductor

Interference Mode

No Suppression

TEST MODE

UST-R

MEAS RED

GND BLUE

START (F2)

Simulation

Measure

MENU

Settings Graph Results

Help Status Close

Selecting Tune inductor brings up the resonating inductor balancing

Follow the procedure in the text box

DELTA4000 – Delta Control

Delta Control - Simulation

Megger

Object ID

Test Object Temperature (-10 - 80 °C) °C

Ambient Temperature (-20 - 55 °C) °C

Manual Ambient Humidity %

TEST TAG

Tx 2 Wdg Overall

TEST TYPE

Voltage Tipup Test [PF/DF]

Interference Mode

Frequency Variation

TEST MODE

UST-R
MEAS RED
GND BLUE

OSCILLOSCOPE

1.000 kV

Test Frequency: 50 Hz (1 - 505 Hz) | Test Current: -- mA

INDICATORS

Interlock Open | Open Ground

START (F2) Simulation

Measure

DELTA 4000

TEST RESULTS

Actual @ 10kV

Test Type: Volt Tipup
Test Mode: UST-R
Interference Mode: No Suppression

Voltage: 12.000 kV
Current: 120.0 mA
Frequency: 50.0 Hz
Capacitance: 133.2 pF
Power: 22.00 W
PF: 0.388 %

PF Temp Correction (0 - 60):
PF @ 20 °C: -- %

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

MENU

Settings Graph Results
Help Status Close

After tuning the inductor is complete, the Test Type will be set to Voltage Tip-up Test