



Newton4th Ltd

SFRAComm2

Software User Manual

The screenshot shows the SFRAComm v1.5 software window. The title bar indicates the file path: USB:SFR445,410-01024,2,16. The menu bar includes Configure, Display, SFRA, Impedance, and Capture. The Data Mode is set to MEASURE. The SETTINGS section includes buttons for READ SFRA, SET UP SFRA, and HIDE SETTINGS. The Configuration: Acquisition Control section contains various controls: Mode (Impedance Meter), Speed (Fast), Minimum Cycles (1), Delay (0), Filter (Normal), Computation (Ch2/Ch1), and Bandwidth (Auto). The SFRA View section has buttons for REALTIME, GRAPH, and TABLE. The SFRA Control section has a START button. The SFRA Data section has an Add To Database button. The main display area shows a table of measurement data:

Frequency	Magnitude 1	Magnitude 2
1.0000 kHz	1.3905 V	1.3907 V
Gain	Phase	Delay
0.001dB	-0.000°	1.0001 s

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ABOUT THIS MANUAL

N4L SFRAComm2 Software is a self-contained executable software program for use with N4L the SFRA45 (Sweep Frequency Response Analyzer).

Accordingly, this manual first describes the general features and specification of the software as a whole; and then describes the individual functions in detail.

Each function is described in turn, in its own chapter, with details of the principles on which it is based, how to use it, the options available, display options etc.

Note: Newtons4th Ltd. shall not be liable for any consequential damages, losses, costs or expenses arising from the use or misuse of this product however caused.

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1 Introduction

1.1 Introduction to SFRAComm2

N4L SFRAComm2 is a self-contained executable software program written in C++ using the Microsoft win32 graphics set.

SFRAComm2 has the ability to connect to the instrument via RS232, USB and LAN. The software includes all measurement modes to reflect instrument operation.

The instrument features FRA and LCR test modes. The data for these tests can be displayed in the software in Real-Time, Graph and Table viewing modes.

SFRAComm2 includes a Database for the storage of sweep data. The database can be used to view and diagnose stored sweep without the need to be connected to an instrument.

This guide was written using Software version v1_5 and SFRA45 firmware version v2_17.

1.2 Minimum Requirements

The minimum requirements to run the SFRAComm2 Software are as follows:

- Windows XP (Service Pack 3) or later
- At least 1GHz Processor
- Minimum of 1GB RAM
- 10MB of Hard Drive space.

2 Getting Started

2.1 Download

As with all N4L Software, it is available for free download from our website.

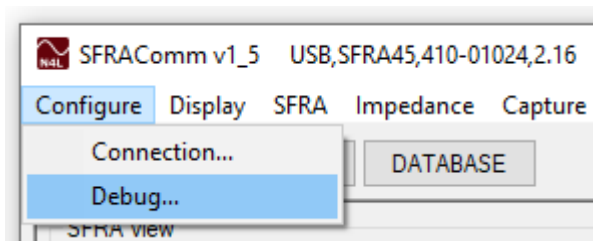
2.2 Installation

Wherever possible, at N4L we try to develop software that enables the engineer to be ready and performing tests as soon as possible. With this in mind, we have made SFRAComm2's installation method as simple as possible.

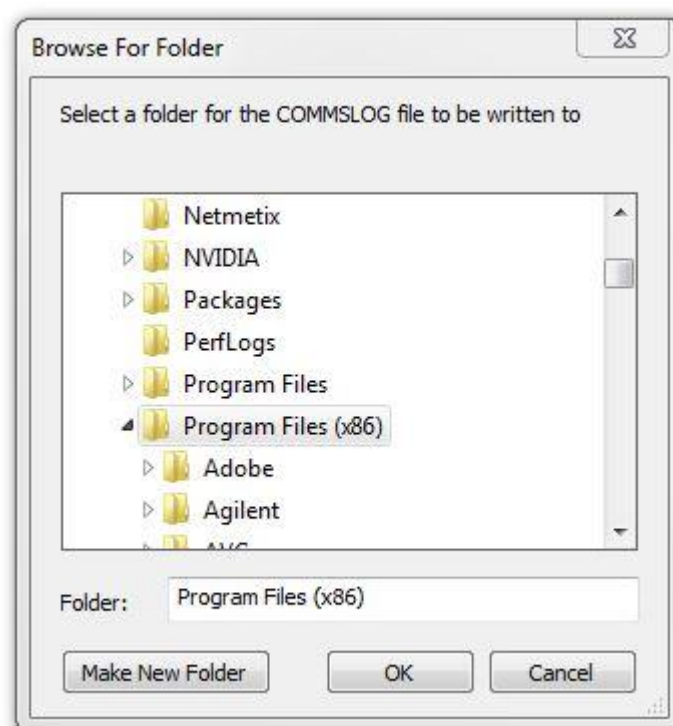
To install SFRAComm2, simply download the .exe file onto your PC's hard drive or an external drive such as a USB memory stick and run it straight away.

2.3 Debug Mode

SFRAComm2's Debug mode can be accessed from the Configure Menu:



When entering Debug Mode, SFRAComm2 will ask for a location to store the debug log file, select a file location and press OK to enter Debug Mode



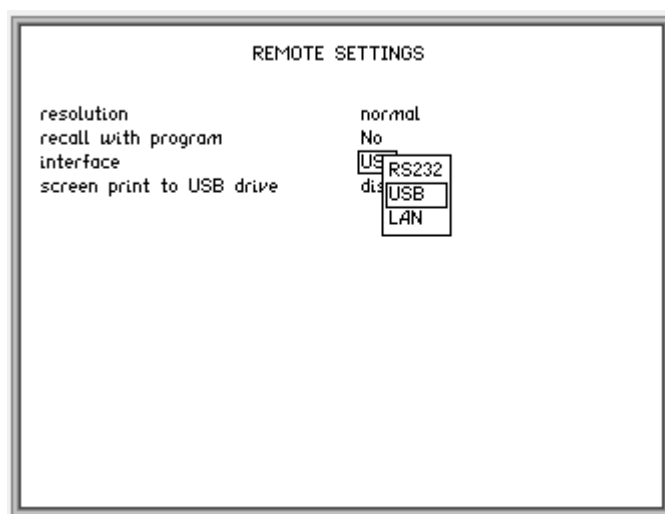
While in Debug Mode, SFRAComm2 will create a log of all communication with the connected PSM in a log file.

3 Connecting

3.1 Preparing the instrument

Before the software can connect, the instrument must be ready to accept the connection. To prepare your instrument for connection with SFRAComm2, ensure the unit is powered on and the cables are connected.

Next, you must ensure the Instrument is correctly set up to reflect the type of connection you are using. To do this, access the COMMS menu on the unit; navigate to the Interface option and select the interface you are using to connect to the software: RS232, USB, or LAN.



If you select RS232, you will need to additionally set the Baud Rate of the cable you intend to use.

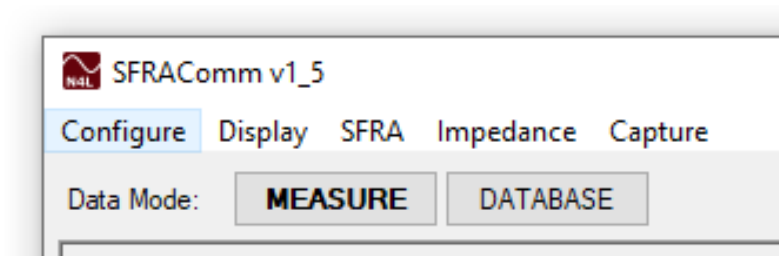
REMOTE SETTINGS	
resolution	normal
recall with program	No
interface	RS232
baud rate	19200
screen print to USB drive	disabled

For LAN you'll need to set an IP Address for the Instrument.

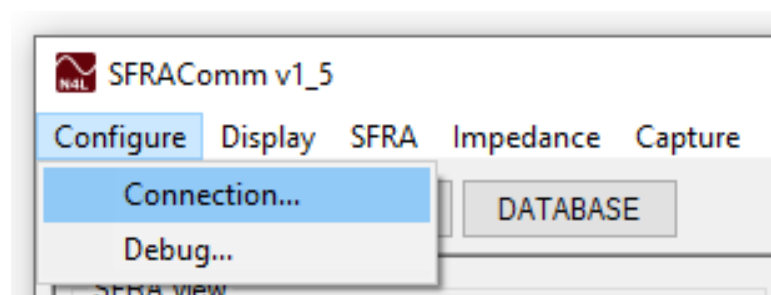
REMOTE SETTINGS	
resolution	normal
recall with program	No
interface	LAN
IP address	192.168.0 .118
screen print to USB drive	disabled

3.2 Connecting to your Instrument

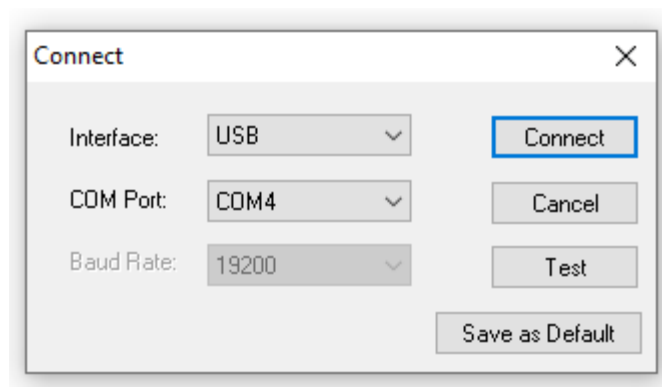
To begin connecting to the instrument, click on [Configure](#):



Now click in [Connection](#):



This brings up the communications window where you'll set up how you're connecting to the instrument:



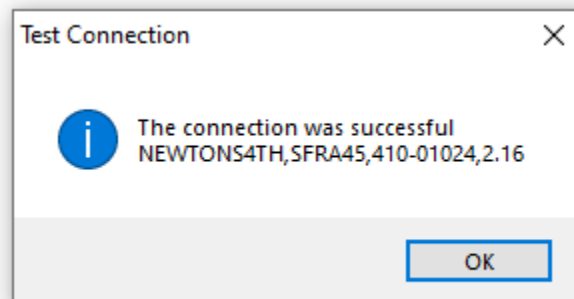
Note: When first opening the software the *Connect* window is displayed automatically.

Enter the instruments communication details by selecting the communication method (Serial, USB or LAN).

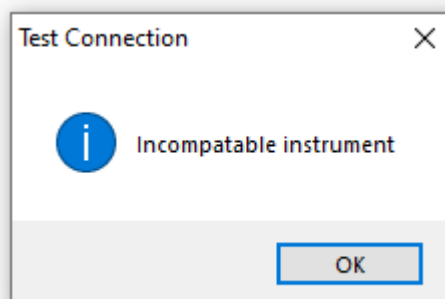
If you selected *LAN* you'll need to enter the same IP as you set your unit to.

If you selected *USB* or *Serial* you'll need to select the COM port that windows assigned to your cable. Additionally, if you select *Serial* you'll need to set your cable's Baud Rate.

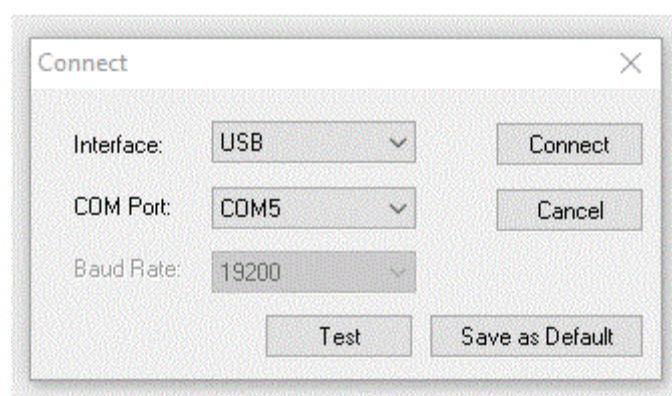
To check the connection settings are correct, press the *Test* button to attempt a connection. This will then bring up a message telling you if the connection was successful.



A warning message will appear if the connection process failed:



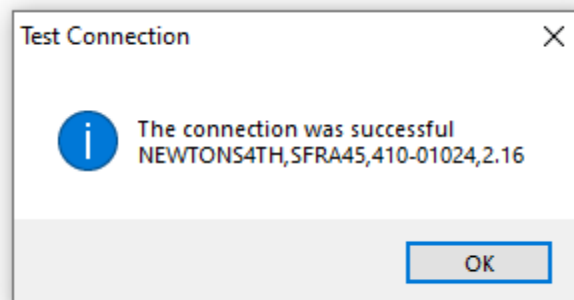
Check that the details entered on the *Connect* screen are correct and that the instrument is connected correctly to the PC etc. Repeat the above steps to obtain a successful connection.



Note:

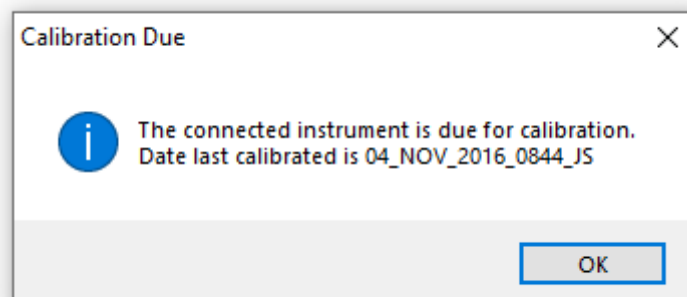
If you want SFRAComm2 to remember your current connection settings and reload every time you open the connection window, you can do so by pressing the *Save as Default* button.

Press the *Connect* button to connect with the instrument.



Click *OK* to connect to continue.

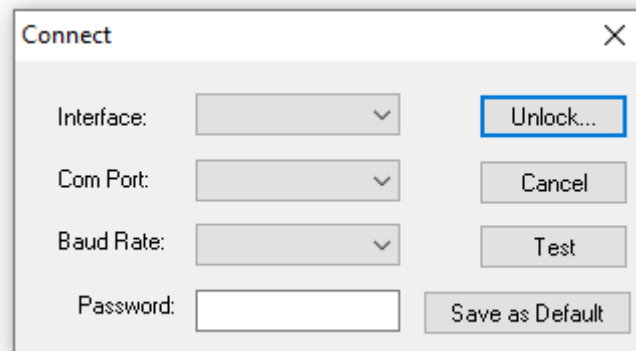
The following window will appear displaying the date when the instrument was last calibrated:



Click *OK* to connect to the instrument.

3.3 First Time Users

When opening the software for the first time after installation on the PC the connect window will appear slightly different:



If this is the first time you've used SFRAComm2 since it was installed, you will need to enter an [Unlock Code](#).

Please contact your local Newtons4th Distributor or go to the Newtons4th Ltd website to obtain the 4-digit password to unlock the software.

Enter the 4-digit code in the [Password](#) box and press [Unlock](#).

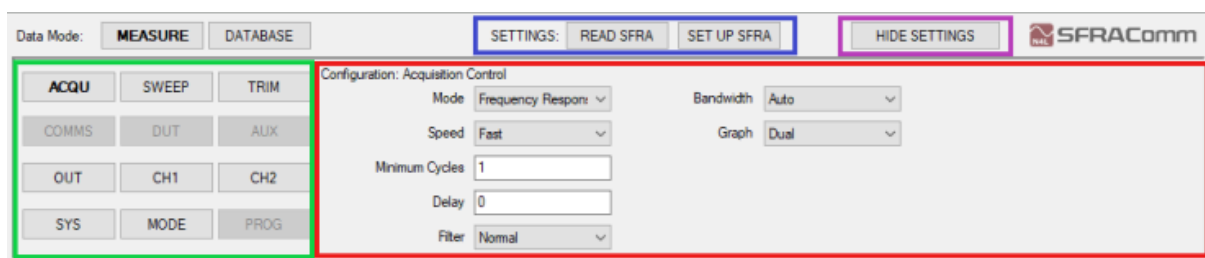
The software will then connect to the instrument as described in the previous section.

Note: You will only need to unlock the software the first time it is used. In future when you open the software no unlock code will be requested.

4 Configuration Panel

4.1 Using the Configuration Panel

The connected instrument's settings are stored in the configuration panel and can be edited and sent back to the instrument.



Before changing any settings in the Control Panel, you should always press **READ SFRA** this enables the software to download that SFRA's settings to ensure the software is configured with any changes that have been made to the SFRA's settings on the instrument's front panel.

Then choose which **settings menu** to look at and edit, the individual instruments settings can be modified in the **Configuration Acquisition Control Panel**.

The menus in SFRAComm2 are designed to mimic the Instrument's settings panels. For more information on what each setting does, check the Instrument's User Manual.

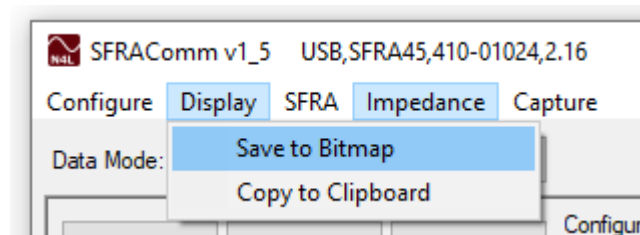
Finally, the changes you made need to be communicated to the Instrument; any amended settings are sent by pressing the **SET UP SFRA** button. **The changes must be sent to the instrument for the instrument to be configured correctly.**

Additionally, you can hide and show the Configuration Panel by pressing the **Hide Settings** and **Show Settings** button.

5 The Display Menu

5.1 Using the Display Menu

The Display menu is used to save the displayed screen as a picture. The picture can be saved to a Bitmap (.bmp) or copied to the clipboard.

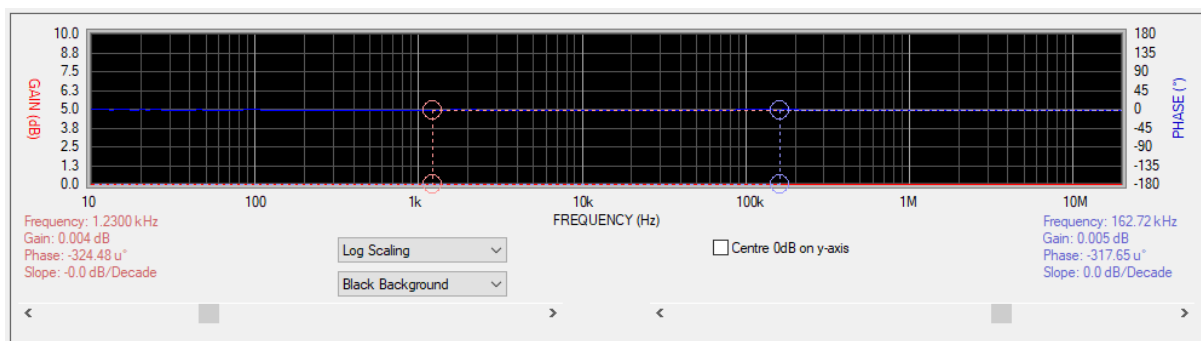


The following are examples of saved screenshots of the software's display:

SFRA mode Real time Display:

Frequency	Magnitude 1	Magnitude 2
1.0000 kHz	6.8197 V	6.8228 V
Gain	Phase	Delay
0.004dB	-0.000°	1.0005 s

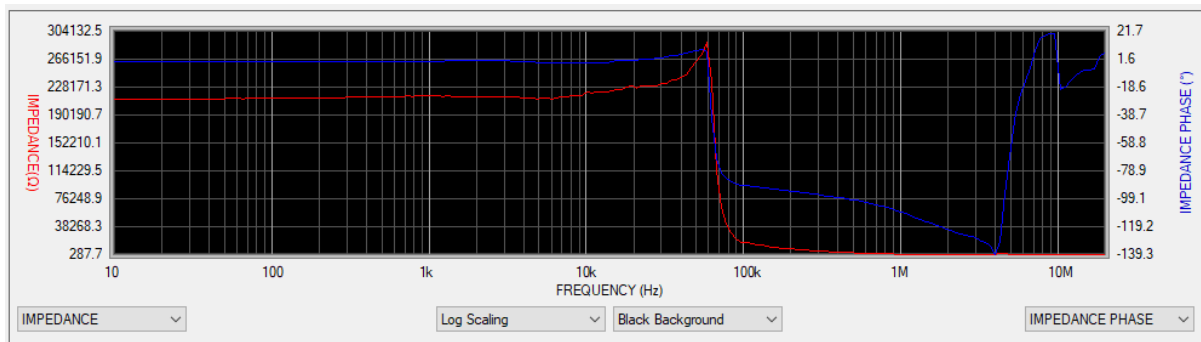
SFRA mode Graph:



Impedance Mode Real Time Display:

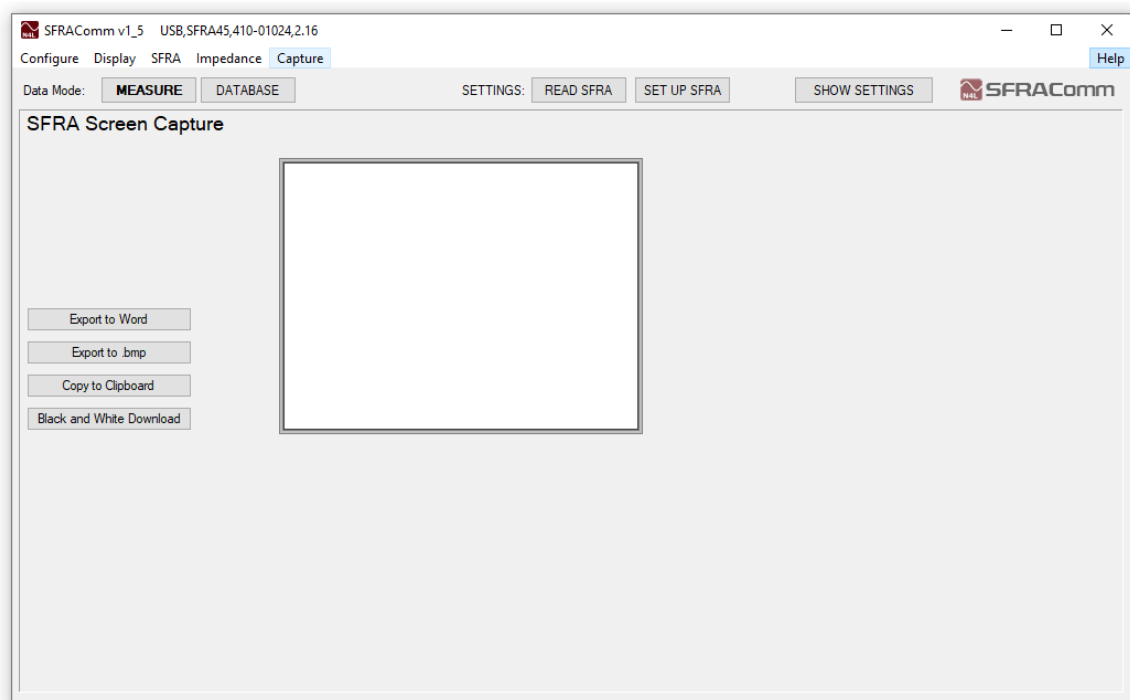
Frequency	Magnitude 1	Magnitude 2	Impedance	Phase
1.0000 kHz	6.8223 V	4.6152 uA	216.66 kΩ	595.01 m°
Series R	Series L	Series C	Parallel R	Parallel L
0.0000 Ω	0.0000 H	0.0000 F	216.68 kΩ	3.3212 kH
Parallel C	Tanδ	Q	Reactance	
0.0000 F	96.309	10.383 m	20.868 MΩ	

Impedance Mode Graph:

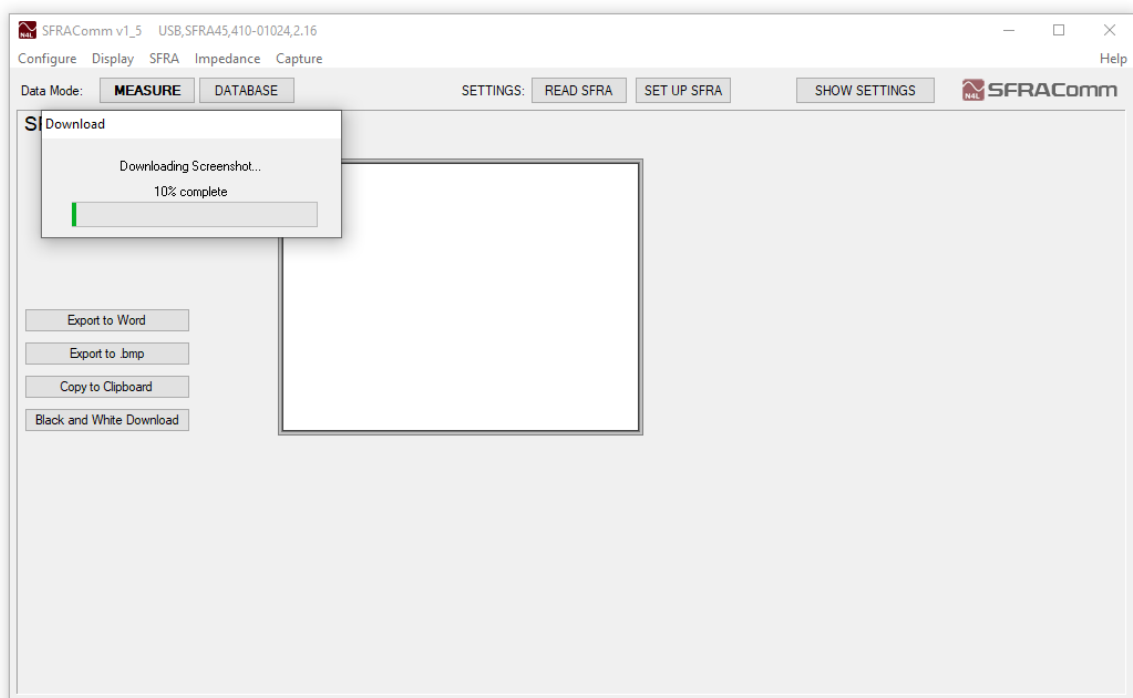


6 Capture mode

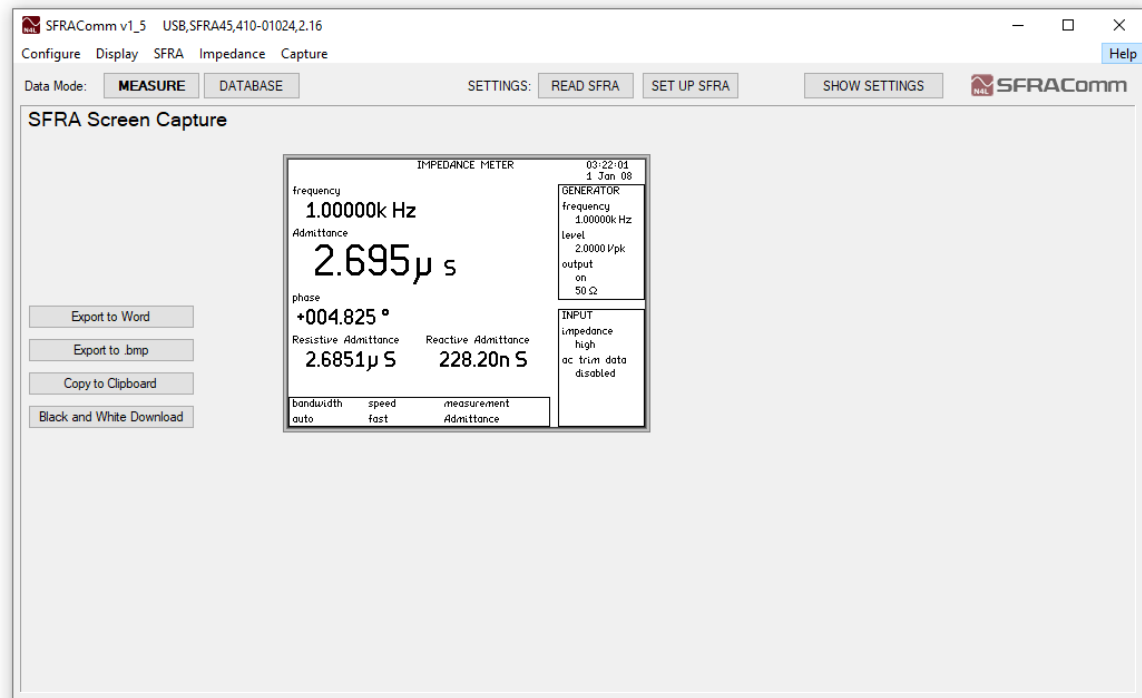
Press the *Capture* button to display the capture options:



A black and white image of the instrument display can be viewed in the software by clicking on the Black and White download button. A download window will appear showing the status of the download.



On completion of the download the image will be displayed in the software window:



To the left of the image, there are 3 options to save the data:

- Export the image into a word document.
- Export the image to a bitmap (.bmp).
- Copy the image to the Clipboard.

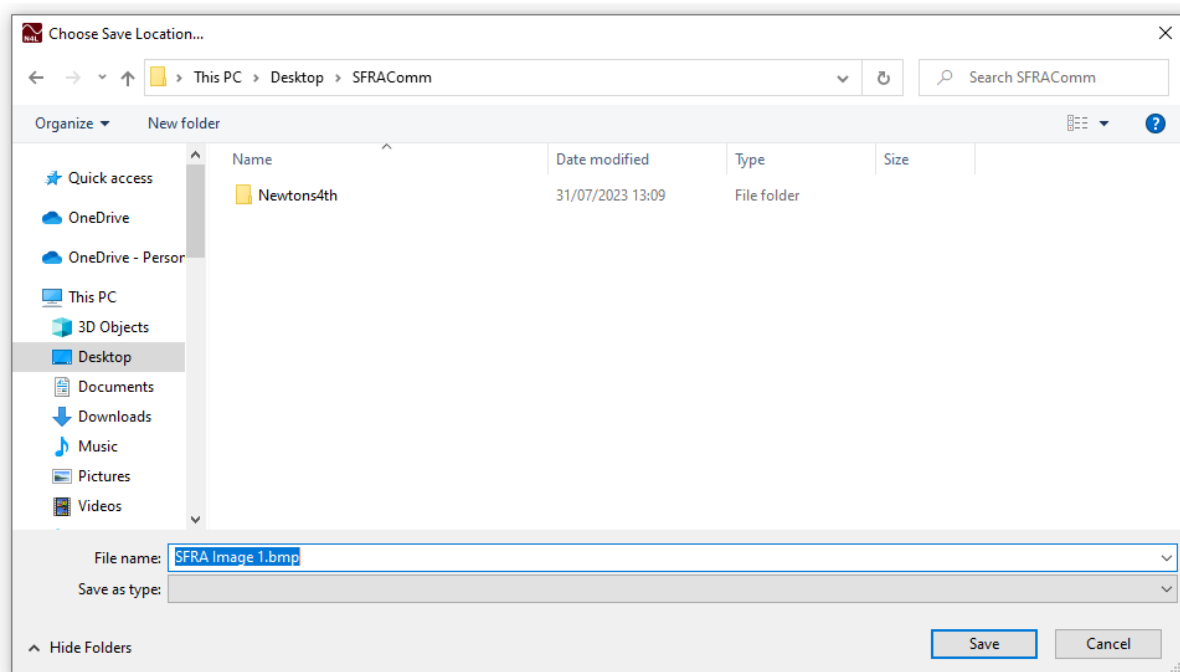
6.1 Export the image into a word document.

A word document will automatically open on the PC containing the image. The user must name and save the word document to prevent the data being lost.

6.2 Export the image to a bitmap (.bmp).

Save to Bitmap allows you to save the current screen as a .bmp image.

Click on [Save to Bitmap](#), the SFRAComm2 ask the use to choose a location to save the image to:



*Note: to save your .bmp file, remove the * and replace with your file name before clicking on save.*

Once a location has been selected, press the Save button to save the screenshot.

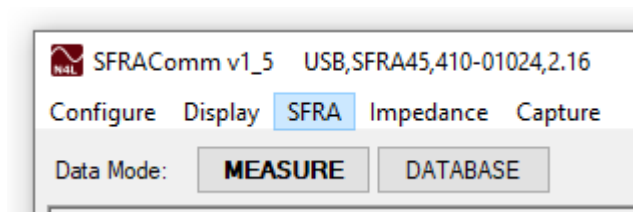
6.3 Copy the image to the Clipboard.

Copy to clipboard saves the image in your windows clipboard. The screenshot can then be pasted anywhere that you'd normally use an image such as an Email, a Picture Editor (e.g., MS Paint, Microsoft Word, Microsoft Excel, etc.).

7 SFRA Mode

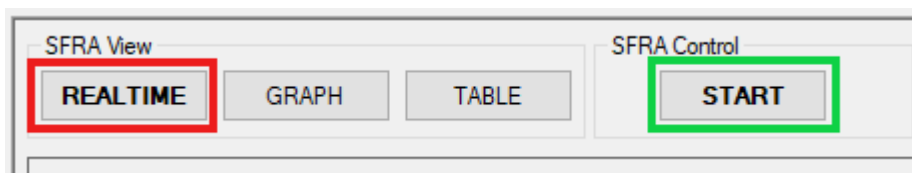
7.1 Real-Time SFRA Measurements

To see the real-time data gathered by the SFRA45, ensure you're in SFRA Mode by pressing the SFRA button at the top of SFRAComm2.



SFRAComm2 will reload all the settings from the connected SFRA45.

To read in data from the SFRA45 in real-time, change the view mode to **REALTIME**

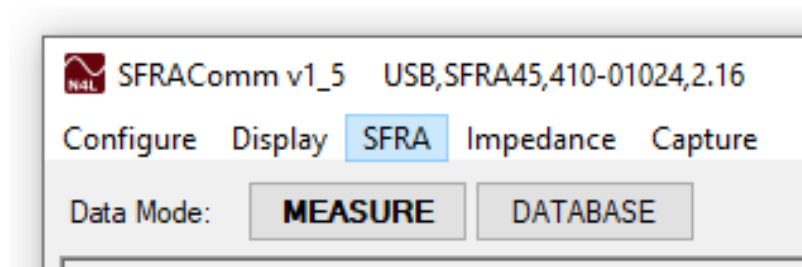


Press **START** to begin logging and SFRAComm2's data display will start updating with the latest values read from the connected SFRA45.

Frequency	Magnitude 1	Magnitude 2
1.0000 kHz	363.33 mV	363.25 mV
Gain	Phase	Delay
-0.002dB	-0.002°	999.81 ms

7.2 Performing a SFRA Sweep

To perform an SFRA45 sweep, ensure you're in SFRA Mode by pressing the SFRA button at the top of SFRAComm2.

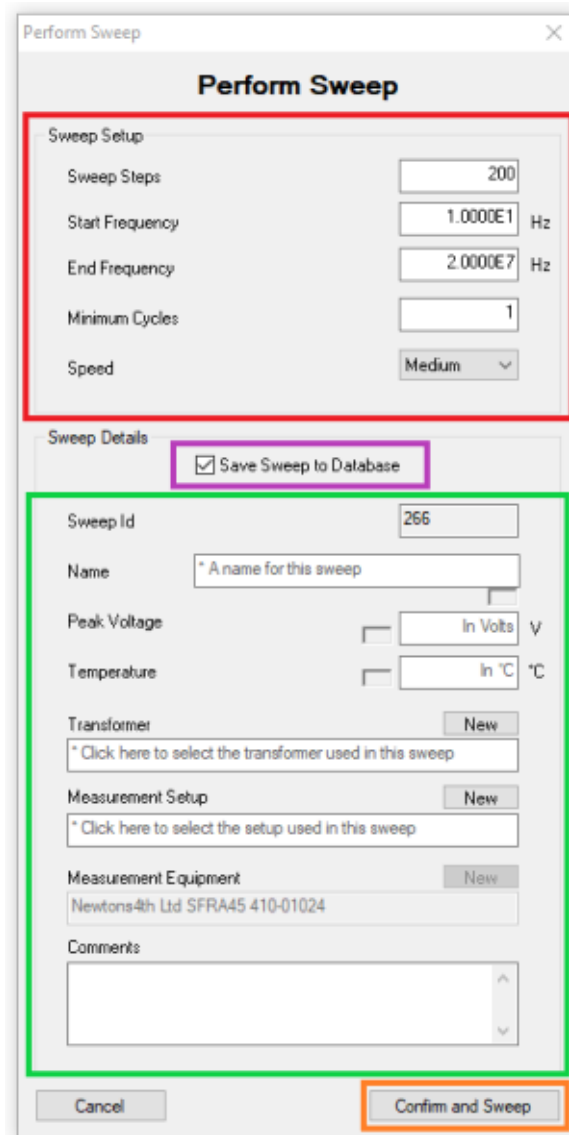


SFRAComm2 will reload all the settings from the connected SFRA45.

To start a sweep, change the view mode to **GRAPH** or **TABLE** by clicking on the appropriate button.



Click on **SWEEP** to display the Perform Sweep window:

The image shows a 'Perform Sweep' dialog box with a title bar and a close button. It is divided into three main sections. The top section, 'Sweep Setup', is enclosed in a red border and contains fields for 'Sweep Steps' (200), 'Start Frequency' (1.0000E1 Hz), 'End Frequency' (2.0000E7 Hz), 'Minimum Cycles' (1), and 'Speed' (Medium). The middle section, 'Sweep Details', is enclosed in a purple border and contains a checked checkbox for 'Save Sweep to Database'. The bottom section, enclosed in a green border, contains fields for 'Sweep Id' (266), 'Name' (A name for this sweep), 'Peak Voltage' (In Volts V), 'Temperature' (In °C °C), 'Transformer' (New), 'Measurement Setup' (New), 'Measurement Equipment' (Newtons4th Ltd SFRA45 410-01024), and a 'Comments' text area. At the bottom of the dialog are 'Cancel' and 'Confirm and Sweep' buttons, with the latter highlighted by an orange border.

The **Sweep Setup** options can be setup on the instrument and read into the software or selected here and transferred to the instrument prior to the sweep being performed.

Selecting "**Save Sweep to Database**" allows the user to perform the sweep and save it directly to the SFRA Database.

If "**Save Sweep to Database**" is not selected the User will still have the option to save it to the database once the sweep is completed. This option will be described in more detail later.

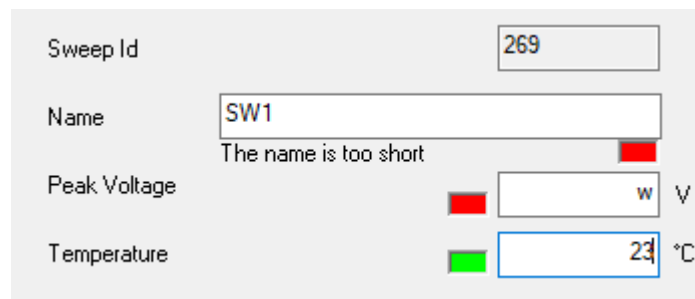
When “Save Sweep to Database” is selected, the Sweep Details will need to be entered into the Perform Sweep window.

Click on Name and enter a name for the sweep to be performed.

Click on Peak Voltage and Temperature and enter the appropriate values.

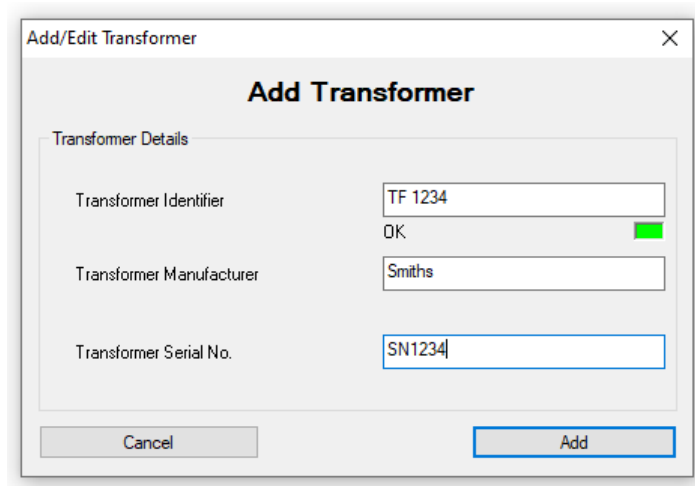
The Sweep id is a reference number allocated by the software.

There are small boxes at the side of each of the above parameters. They will turn RED if an invalid name, or value are entered. They will turn GREEN when a valid name or value is entered.



A screenshot of a software window titled 'Sweep Details'. It contains four input fields: 'Sweep Id' with the value '269', 'Name' with the value 'SW1', 'Peak Voltage' with a unit 'V' and a red status indicator, and 'Temperature' with the value '23' and a unit '°C' and a green status indicator. Below the 'Name' field, there is a red status indicator and the text 'The name is too short'.

The transformer details will need to be added. Click on New to display the Add/Edit Transformer window:



A screenshot of a software window titled 'Add/Edit Transformer'. It contains a section titled 'Add Transformer' with a sub-section 'Transformer Details'. There are three input fields: 'Transformer Identifier' with the value 'TF 1234' and a green status indicator, 'Transformer Manufacturer' with the value 'Smiths', and 'Transformer Serial No.' with the value 'SN1234'. At the bottom, there are 'Cancel' and 'Add' buttons.

Enter the required details, click on ADD to update the Perform Sweep window with the transformer details.



A screenshot of a software window showing a 'Transformer' field. The field contains the text 'TF 1234 Smiths SN1234'. To the right of the field is a 'New' button.

Transformer Setup details:

Identifier – sequence of letters and/or numbers to identify the unit under test (typically customer serial number or location identifier of the transformer or reactor).

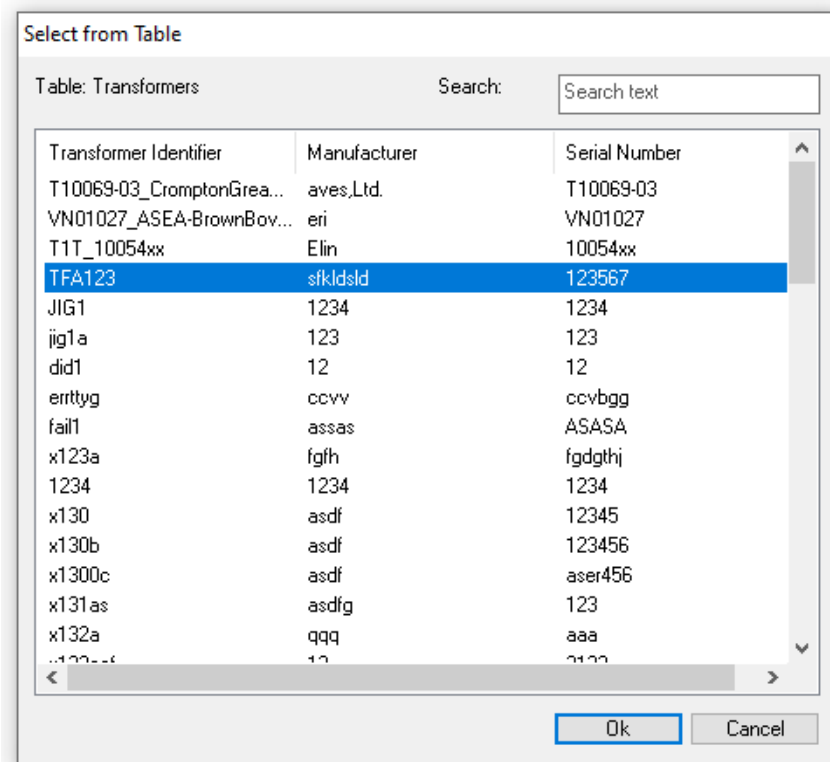
Manufacturer – DUT manufacturer, i.e., the manufacturer of the transformer or reactor by the manufacturer.

Serial Number – DUT Serial Number.

Alternatively Click on "[Click here to select the transformer used in this sweep](#)".

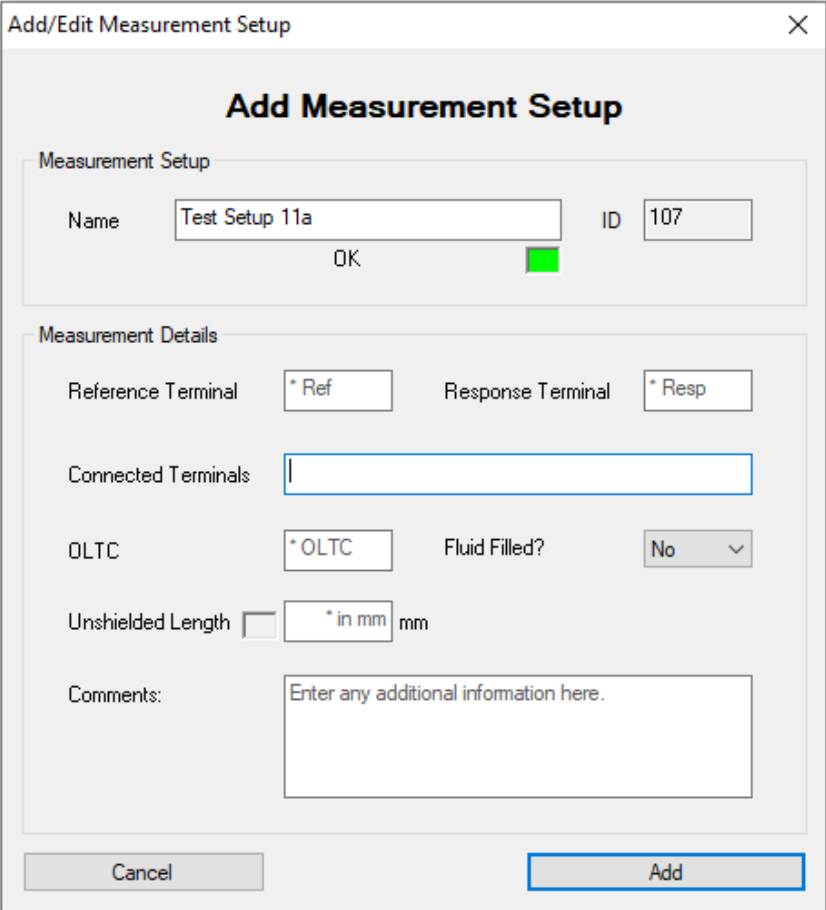


This will display a Table of Transformers that are already saved in the software. Any one of these can be selected from the table.



Highlight the required transformer and Click **OK** to enter the details into the Perform Sweep window.

Next, the Measurement Setup details need to be entered. Click on **New** to display the Add Measurement Setup window:



The image shows a dialog box titled "Add/Edit Measurement Setup" with a close button (X) in the top right corner. The dialog is divided into two main sections: "Measurement Setup" and "Measurement Details".

Measurement Setup

- Name:** A text field containing "Test Setup 11a".
- ID:** A text field containing "107".
- OK:** A green button located below the Name field.

Measurement Details

- Reference Terminal:** A dropdown menu showing "* Ref".
- Response Terminal:** A dropdown menu showing "* Resp".
- Connected Terminals:** An empty text field.
- OLTC:** A dropdown menu showing "* OLTC".
- Fluid Filled?:** A dropdown menu showing "No".
- Unshielded Length:** A checkbox followed by a text field containing "* in mm" and the unit "mm".
- Comments:** A large text area with the placeholder text "Enter any additional information here."

At the bottom of the dialog, there are two buttons: "Cancel" on the left and "Add" on the right.

Enter the required details, click on **ADD** to update the Perform Sweep window with the Measurement Setup details.



The image shows a snippet of a window titled "Measurement Setup". It features a "New" button in the top right corner. Below the title bar, there is a text field containing the text "12345 1-23".

Measurement Setup details:

Reference Terminal – identification of the DUT terminal to which the reference and source leads were connected.

Response Terminal – Identification of the DUT terminal to which the response lead is connected.

Connected Terminals – Identification of all terminals which were connected together during the measurement, for eg a1-b1-c1, a2-b2-c2 would indicate that a1, b1 and c1 are connected together and a2, b2, c2 were separately connected together.

OLTC – the tap position indicated on the DUT during measurement.

Temperature - the temperature of the DUT during measurement (specified in degrees Celsius).

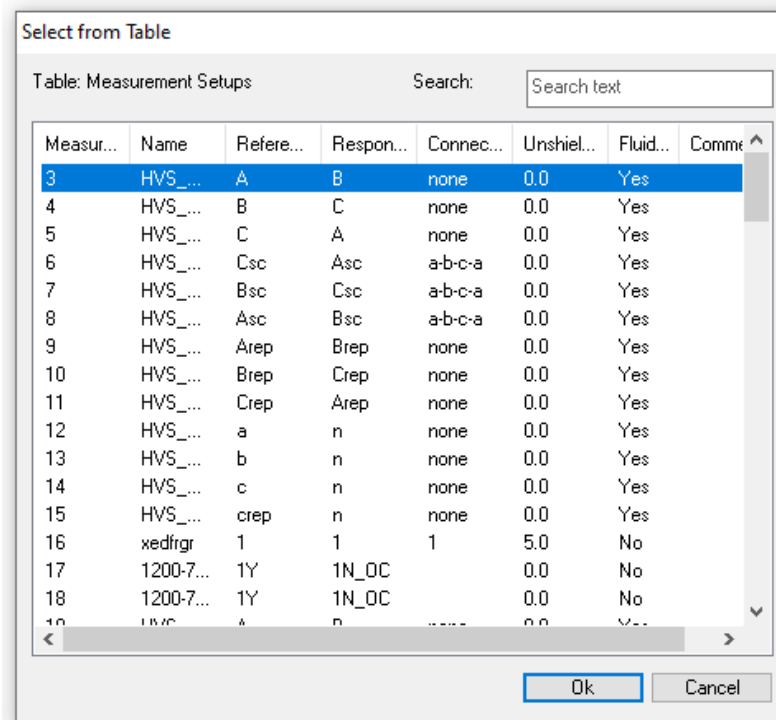
Unshielded Length – Length of the unshielded connection for each lead.

Fluid Filled – Has two options – “yes” or “no”. Yes or No, depending on whether the test object was fully filled with normal operating fluid during measurement.

Alternatively Click on “[Click here to select the setup used in this sweep](#)”.

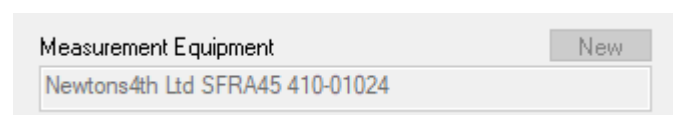


This will display a Table of Measurement Setups that are already saved in the software. Any one of these can be selected from the table.



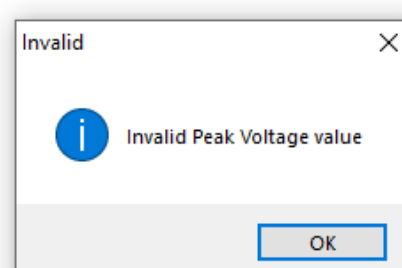
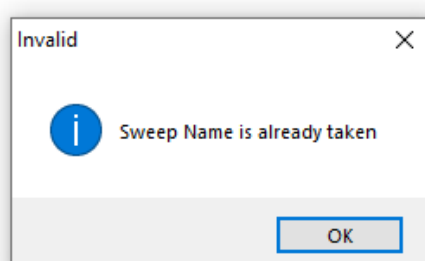
Highlight the required Measurement Setup and Click **OK** to enter the details into the Perform Sweep window.

Measurement Equipment:

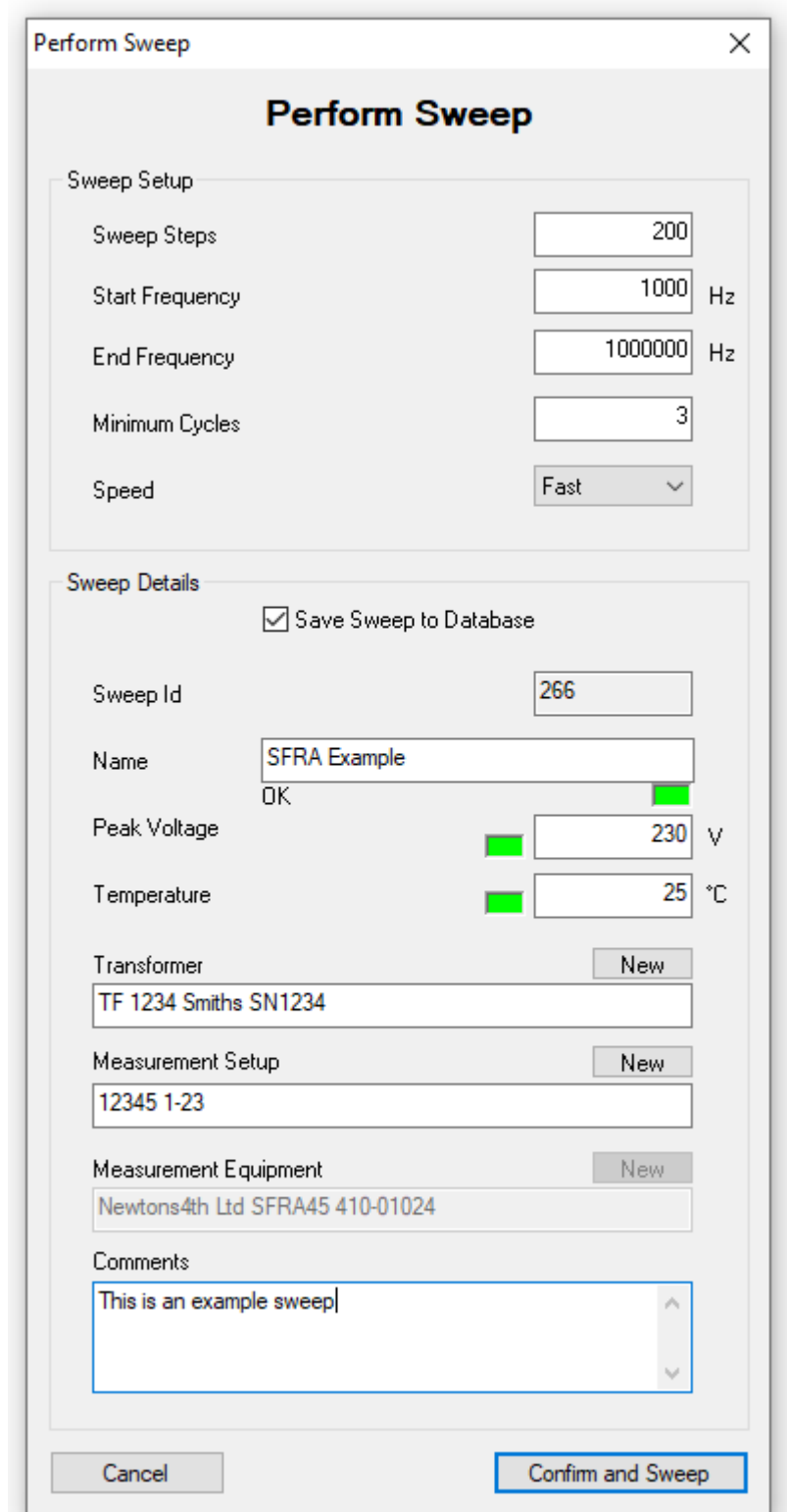


This displays the details of the instrument connected to SFRAComm2.

Error Messages: Here are examples of messages that may be displayed if invalid information is entered. Click OK and re-enter valid information.



The Perform Sweep window should now be fully populated with all of the required settings and data:

The image shows a 'Perform Sweep' dialog box with two main sections: 'Sweep Setup' and 'Sweep Details'. The 'Sweep Setup' section contains input fields for 'Sweep Steps' (200), 'Start Frequency' (1000 Hz), 'End Frequency' (1000000 Hz), 'Minimum Cycles' (3), and a 'Speed' dropdown menu set to 'Fast'. The 'Sweep Details' section includes a checked checkbox for 'Save Sweep to Database', a 'Sweep Id' field (266), a 'Name' field ('SFRA Example') with an 'OK' button, 'Peak Voltage' (230 V) and 'Temperature' (25 °C) fields each preceded by a green progress bar, and three fields for 'Transformer' ('TF 1234 Smiths SN1234'), 'Measurement Setup' ('12345 1-23'), and 'Measurement Equipment' ('Newtons4th Ltd SFRA45 410-01024'), each with a 'New' button. A 'Comments' text area at the bottom contains the text 'This is an example sweep'. At the bottom of the dialog are 'Cancel' and 'Confirm and Sweep' buttons.

Perform Sweep

Sweep Setup

Sweep Steps: 200

Start Frequency: 1000 Hz

End Frequency: 1000000 Hz

Minimum Cycles: 3

Speed: Fast

Sweep Details

☒ Save Sweep to Database

Sweep Id: 266

Name: SFRA Example
OK

Peak Voltage: 230 V

Temperature: 25 °C

Transformer: New
TF 1234 Smiths SN1234

Measurement Setup: New
12345 1-23

Measurement Equipment: New
Newtons4th Ltd SFRA45 410-01024

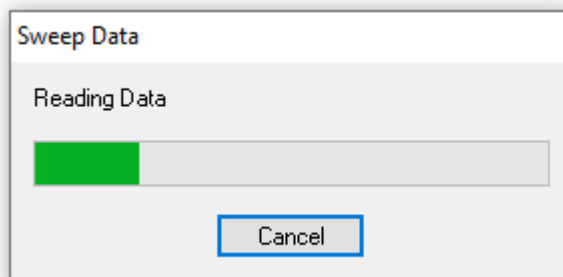
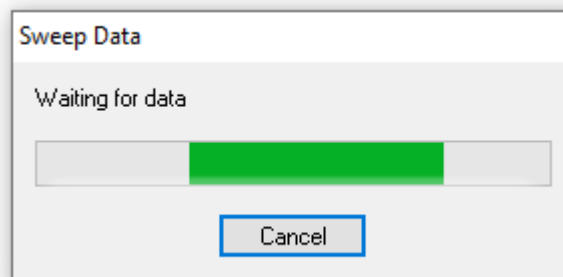
Comments: This is an example sweep

Cancel Confirm and Sweep

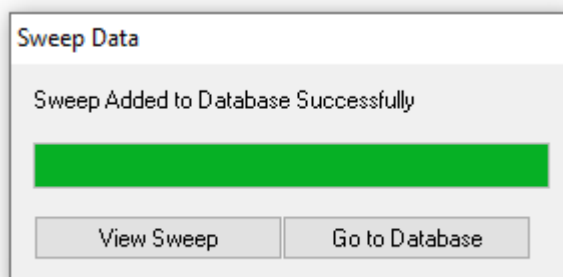
Click on **Confirm and Sweep** to begin the SFRA Sweep.

The Sweep will now begin it will take several minutes to complete. This depends on the selected sweep speed and the number of sweep steps that was selected.

The following message will appear whilst the sweep is being performed:

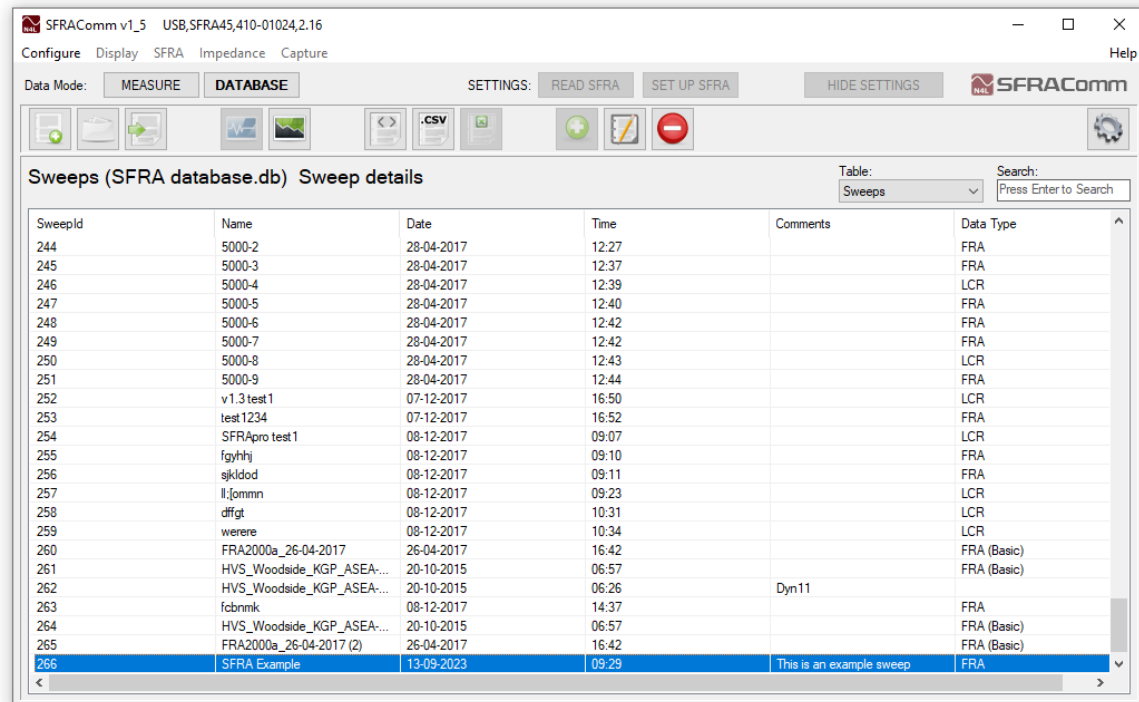


The following message is displayed once the sweep is complete:



Go To Database:

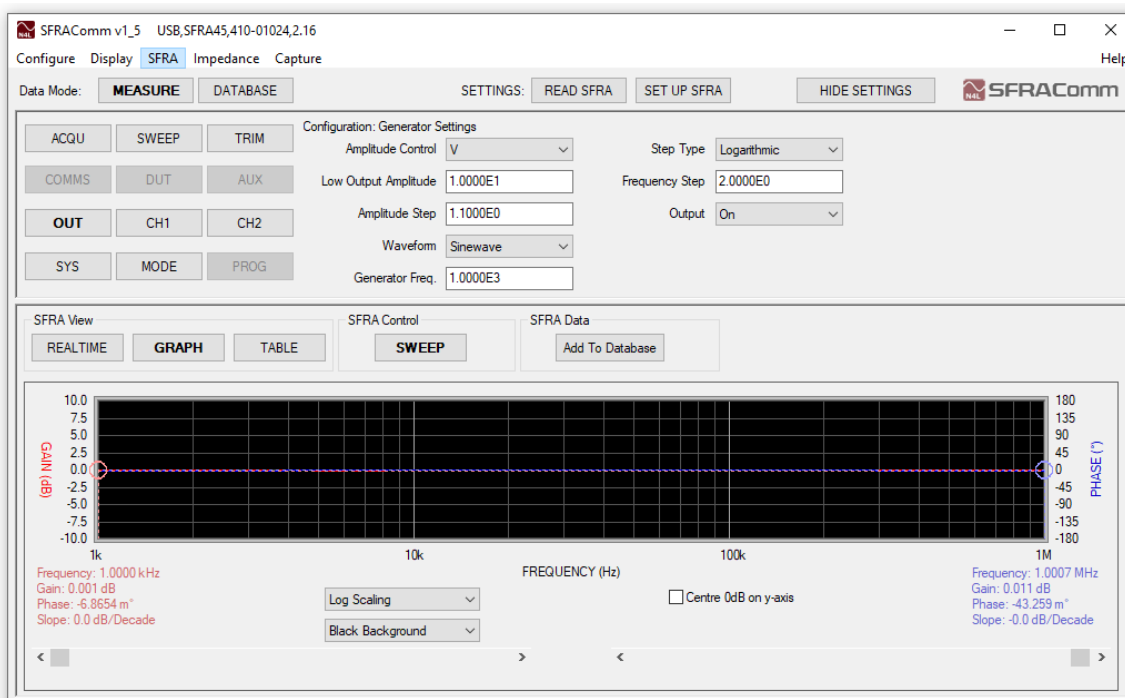
The Sweep details are added to the end of the list of sweeps in the database. The sweep can then be viewed using the database functions. This will be discussed in more detail in section 9.



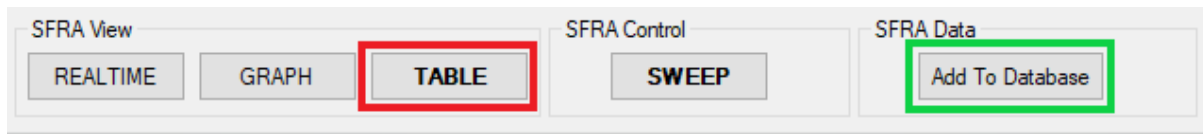
SweepId	Name	Date	Time	Comments	Data Type
244	5000-2	28-04-2017	12:27		FRA
245	5000-3	28-04-2017	12:37		FRA
246	5000-4	28-04-2017	12:39		LCR
247	5000-5	28-04-2017	12:40		FRA
248	5000-6	28-04-2017	12:42		FRA
249	5000-7	28-04-2017	12:42		FRA
250	5000-8	28-04-2017	12:43		LCR
251	5000-9	28-04-2017	12:44		FRA
252	v1.3 test1	07-12-2017	16:50		LCR
253	test1234	07-12-2017	16:52		FRA
254	SFRApro test1	08-12-2017	09:07		LCR
255	fgyhjhj	08-12-2017	09:10		FRA
256	sjkldod	08-12-2017	09:11		FRA
257	lljommn	08-12-2017	09:23		LCR
258	dffgt	08-12-2017	10:31		LCR
259	werere	08-12-2017	10:34		LCR
260	FRA2000a_26-04-2017	26-04-2017	16:42		FRA (Basic)
261	HVS_Woodside_KGP_ASEA...	20-10-2015	06:57		FRA (Basic)
262	HVS_Woodside_KGP_ASEA...	20-10-2015	06:26	Dyn11	FRA (Basic)
263	fcbrnkn	08-12-2017	14:37		FRA
264	HVS_Woodside_KGP_ASEA...	20-10-2015	06:57		FRA (Basic)
265	FRA2000a_26-04-2017 (2)	26-04-2017	16:42		FRA (Basic)
266	SFRA Example	13-09-2023	09:29	This is an example sweep	FRA

View Sweep:

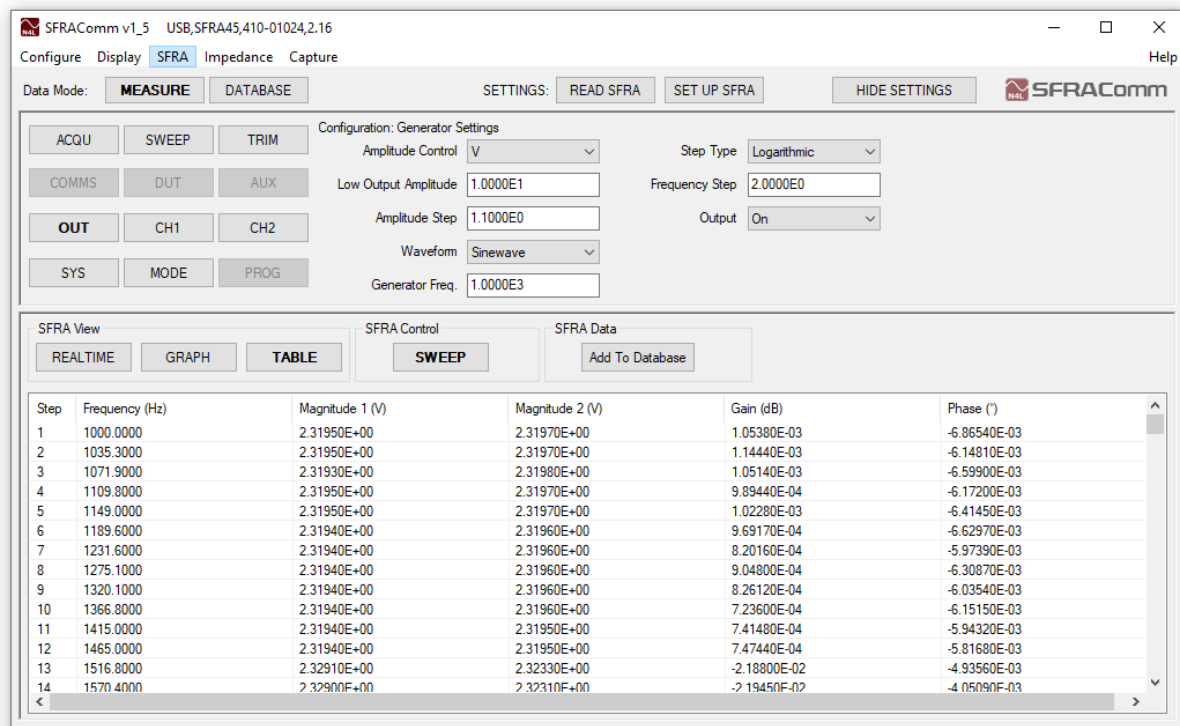
The graph view in the software will display the sweep waveform.



Other SFRA Options:



Click on **TABLE** to view the data in table format:



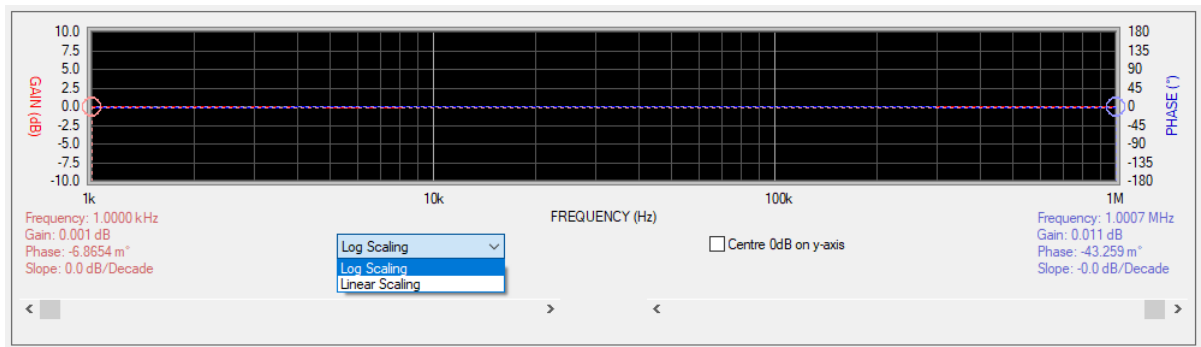
Click on **Add To Database** to save the sweep to the SFRAcomm2 Database.

The Edit Sweep Window will appear.

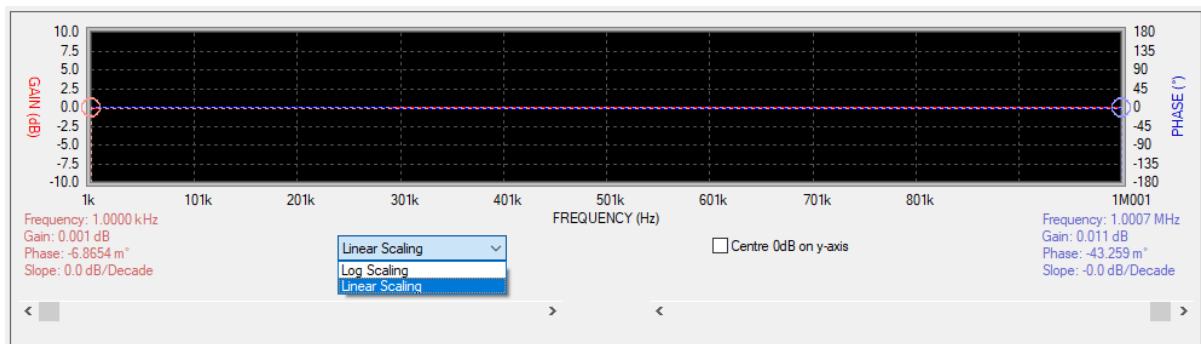
Enter the required details, see section 7.2.

Log / Linear Scaling & Background Colour options:

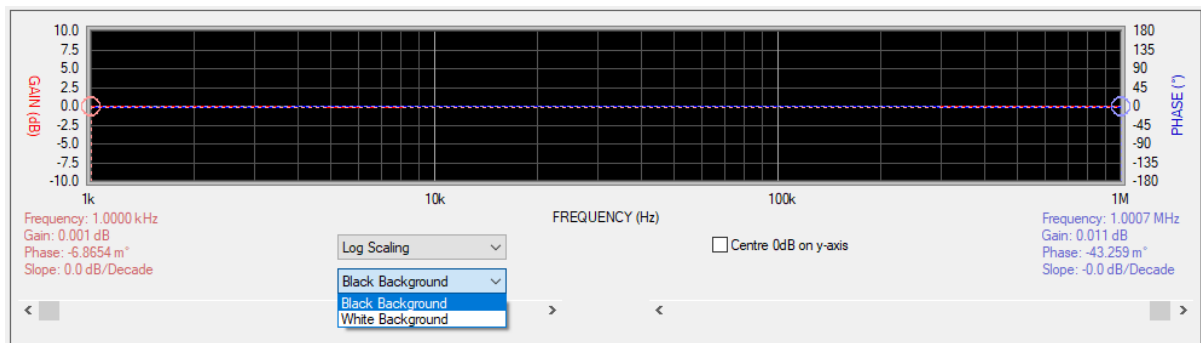
Sweep waveform with Log scaling selected:



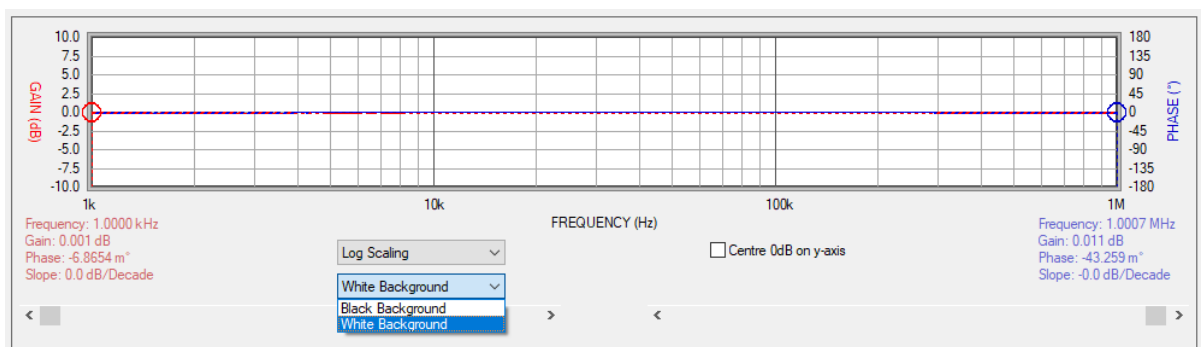
Sweep waveform with Linear scaling selected:



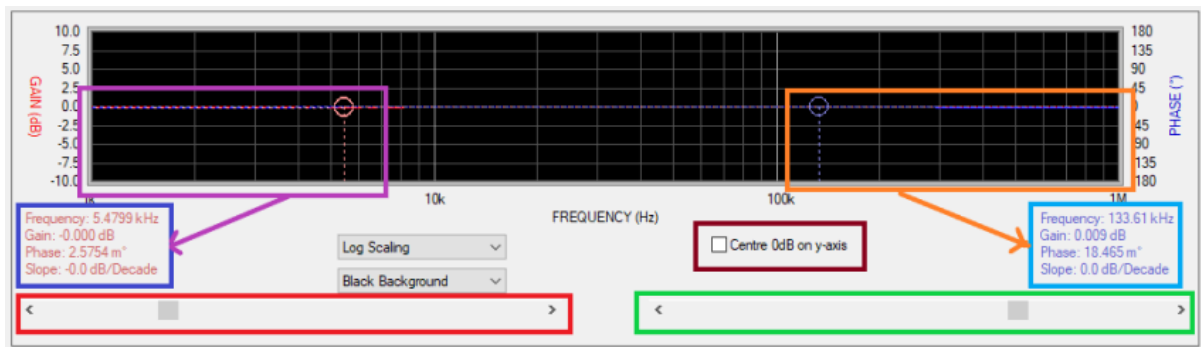
Sweep waveform with a black background selected:



Sweep waveform with a white background selected:



Gain and Phase Data displayed below the Sweep waveform:



The **Gain data** is displayed in the bottom left-hand corner of the graph window.

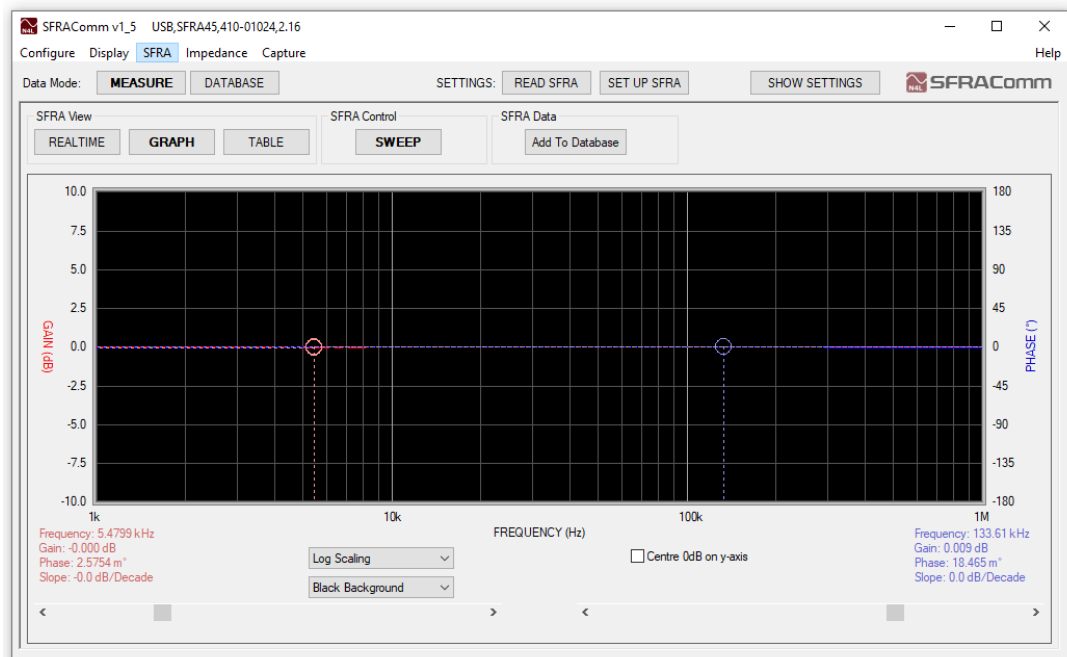
Dragging the **horizontal bar** to the left and right will move the **Gain cursor** in the same direction along the sweep waveform. The **Gain Data** will then be updated to represent the **Gain data** in the new cursor position.

The **Phase data** is displayed in the bottom right-hand corner of the graph window.

Dragging the **horizontal bar** to the left and right will move the **Phase cursor** in the same direction along the sweep waveform. The **Phase Data** will then be updated to represent the **Phase data** in the new cursor position.

Ticking the **Centre 0dB on y-axis** box will centre 0dB on the Waveform to the centre point of the y-axis if it is not in that position already.

Show / Hide Settings:

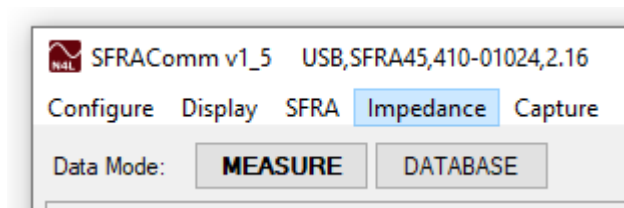


This hides the settings which enlarges the graph area.

8 Impedance Mode

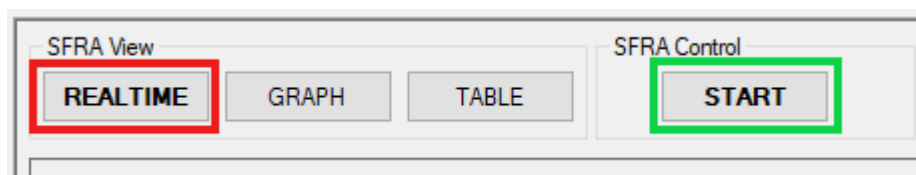
8.1 Real-Time SFRA Measurements

To see the real-time data gathered by the SFRA45, ensure you're in Impedance Mode by pressing the **Impedance** button at the top of SFRAComm2.



SFRAComm2 will reload all the settings from the connected SFRA45.

To read in data from the SFRA45 in real-time, change the view mode to **REALTIME**

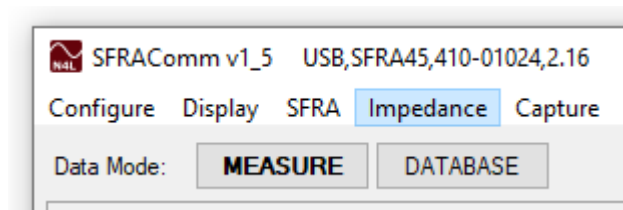


Press **START** to begin logging and SFRAComm2's data display will start updating with the latest values read from the connected SFRA45.

Frequency	Magnitude 1	Magnitude 2	Impedance	Phase
1.0000 kHz	2.3330 V	39.752 mA	25.156 Ω	4.1534 m°
Series R	Series L	Series C	Parallel R	Parallel L
0.0000 Ω	0.0000 H	0.0000 F	25.156 Ω	55.218 H
Parallel C	Tan δ	Q	Reactance	
0.0000 F	13.792 k	72.508 u	346.94 k Ω	

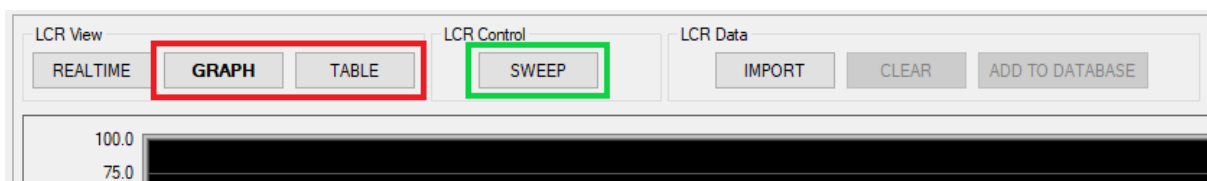
8.2 Performing an Impedance Sweep

To perform an Impedance sweep, ensure you're in Impedance Mode by pressing the **Impedance** button at the top of SFRAComm2.



SFRAComm2 will reload all the settings from the connected SFRA45.

To start a sweep, change the view mode to **GRAPH** or **TABLE** by clicking on the appropriate button.



Click on **SWEEP** to display the Perform Sweep window:

Perform Sweep

Sweep Setup

Sweep Steps: 2000

Start Frequency: 1.0000E1 Hz

End Frequency: 2.0000E7 Hz

Minimum Cycles: 1

Speed: Medium

Sweep Details

☒ Save Sweep to Database

Sweep Id: 271

Name: * A name for this sweep

Peak Voltage: ☐ In Volts V

Temperature: ☐ In °C °C

Transformer: New
* Click here to select the transformer used in this sweep

Measurement Setup: New
* Click here to select the setup used in this sweep

Measurement Equipment: New
Newtons4th Ltd SFRA45 410-01024

Comments:

Cancel Confirm and Sweep

The **Sweep Setup** options can be setup on the instrument and read into the software or selected here and transferred to the instrument prior to the sweep being performed.

Selecting **"Save Sweep to Database"** allows the user to perform the sweep and save it directly to the SFRA Database.

If **"Save Sweep to Database"** is not selected the User will still have the option to save it to the database once the sweep is completed. This option will be described in more detail later.

When “Save Sweep to Database” is selected, the Sweep Details will need to be entered into the Perform Sweep window.

Click on Name and enter a name for the sweep to be performed.

Click on Peak Voltage and Temperature and enter the appropriate values.

The Sweep id is a reference number allocated by the software.

There are small boxes at the side of each of the above parameters. They will turn RED if an invalid name, or value are entered. They will turn GREEN when a valid name or value is entered.

The screenshot shows a window with four input fields. The first field is 'Sweep Id' with the value '269'. The second field is 'Name' with the value 'SW1'; below it is the text 'The name is too short' and a red status box. The third field is 'Peak Voltage' with a red status box and a unit 'V'. The fourth field is 'Temperature' with a green status box and a unit '°C'.

The transformer details will need to be added. Click on New to display the Add/Edit Transformer window:

The screenshot shows a window titled 'Add/Edit Transformer' with a sub-header 'Add Transformer'. It contains three input fields: 'Transformer Identifier' with the value 'TF 1234' and a green status box, 'Transformer Manufacturer' with the value 'Smiths', and 'Transformer Serial No.' with the value 'SN1234'. At the bottom are 'Cancel' and 'Add' buttons.

Enter the required details, click on ADD to update the Perform Sweep window with the transformer details.

The screenshot shows a window with a 'Transformer' field containing the text 'TF 1234 Smiths SN1234' and a 'New' button.

Transformer Setup details:

Identifier – sequence of letters and/or numbers to identify the unit under test (typically customer serial number or location identifier of the transformer or reactor).

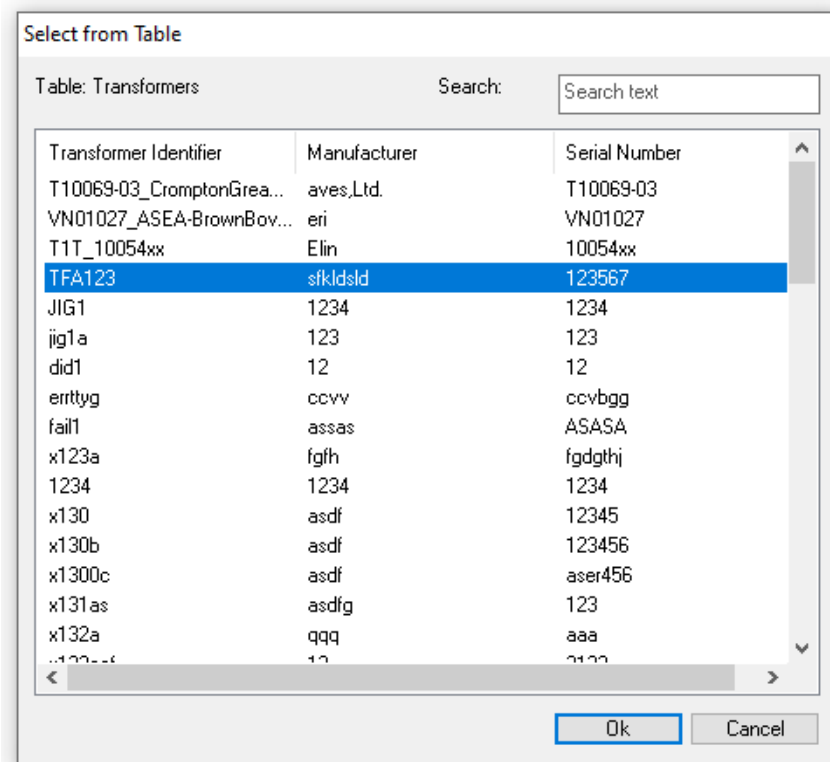
Manufacturer – DUT manufacturer, i.e., the manufacturer of the transformer or reactor by the manufacturer.

Serial Number – DUT Serial Number.

Alternatively Click on "[Click here to select the transformer used in this sweep](#)".

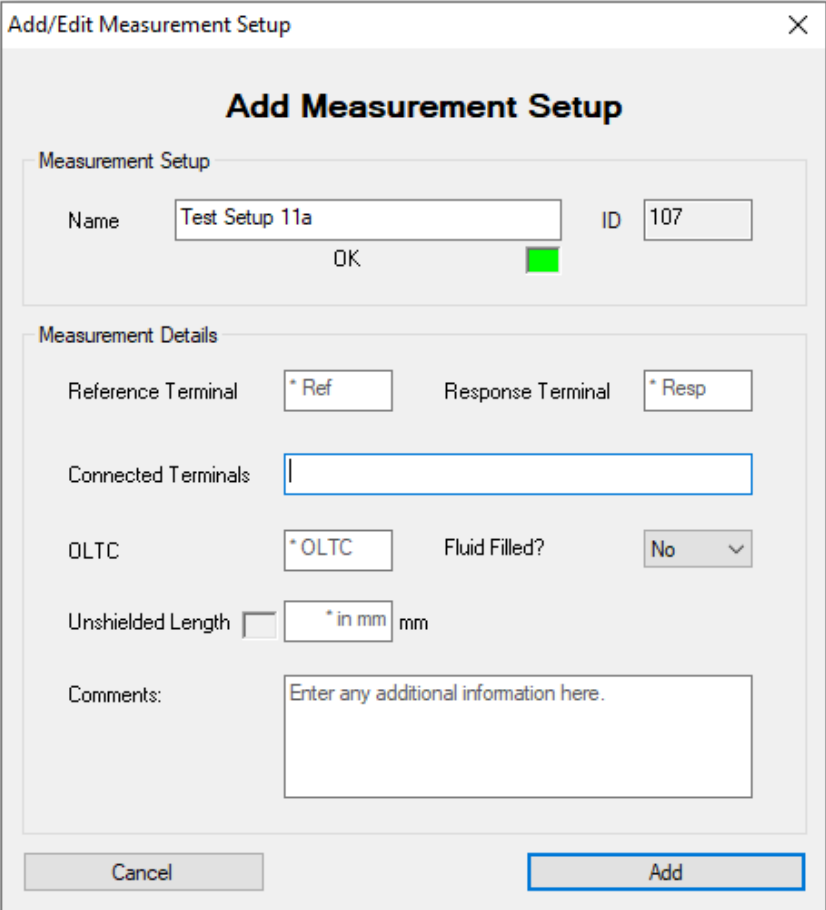


This will display a Table of Transformers that are already saved in the software. Any one of these can be selected from the table.



Highlight the required transformer and Click **OK** to enter the details into the Perform Sweep window.

Next, the Measurement Setup details need to be entered. Click on **New** to display the Add Measurement Setup window:



The image shows a software window titled "Add/Edit Measurement Setup" with a close button (X) in the top right corner. The window is divided into two main sections: "Measurement Setup" and "Measurement Details".

Measurement Setup

- Name:** A text box containing "Test Setup 11a".
- ID:** A text box containing "107".
- OK:** A green button located below the Name field.

Measurement Details

- Reference Terminal:** A dropdown menu showing "* Ref".
- Response Terminal:** A dropdown menu showing "* Resp".
- Connected Terminals:** An empty text box.
- OLTC:** A dropdown menu showing "* OLTC".
- Fluid Filled?:** A dropdown menu showing "No".
- Unshielded Length:** A checkbox followed by a text box containing "* in mm" and the unit "mm".
- Comments:** A large text area with the placeholder text "Enter any additional information here."

At the bottom of the window, there are two buttons: "Cancel" on the left and "Add" on the right.

Enter the required details, click on **ADD** to update the Perform Sweep window with the Measurement Setup details.



The image shows a snippet of a software window titled "Measurement Setup". It features a "New" button in the top right corner. Below the title bar, there is a text box containing the text "12345 1-23".

Measurement Setup details:

Reference Terminal – identification of the DUT terminal to which the reference and source leads were connected.

Response Terminal – Identification of the DUT terminal to which the response lead is connected.

Connected Terminals – Identification of all terminals which were connected together during the measurement, for eg a1-b1-c1, a2-b2-c2 would indicate that a1, b1 and c1 are connected together and a2, b2, c2 were separately connected together.

OLTC – the tap position indicated on the DUT during measurement.

Temperature - the temperature of the DUT during measurement (specified in degrees Celsius).

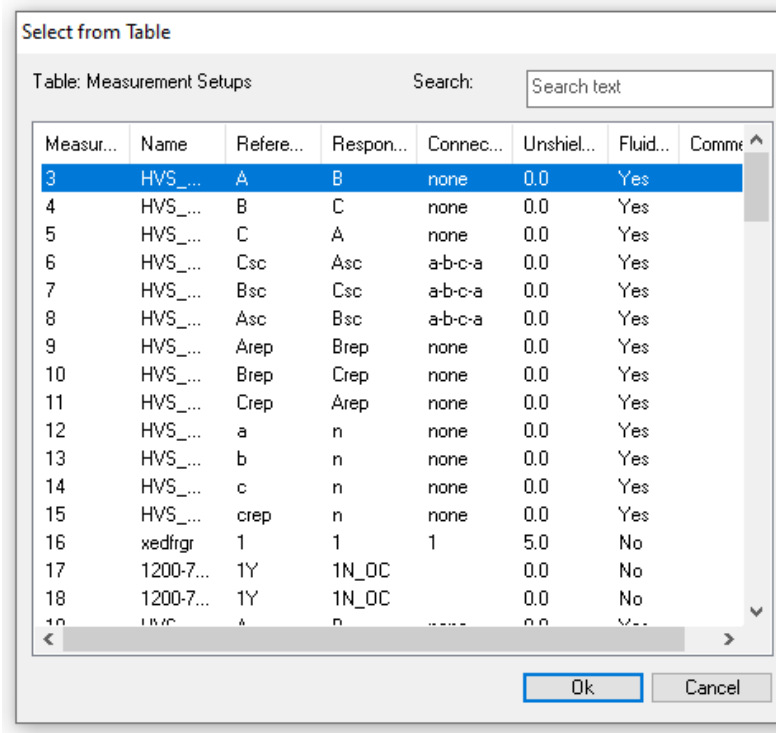
Unshielded Length – Length of the unshielded connection for each lead.

Fluid Filled – Has two options – “yes” or “no”. Yes or No, depending on whether the test object was fully filled with normal operating fluid during measurement.

Alternatively Click on “[Click here to select the setup used in this sweep](#)”.

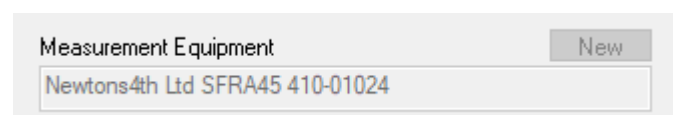


This will display a Table of Measurement Setups that are already saved in the software. Any one of these can be selected from the table.



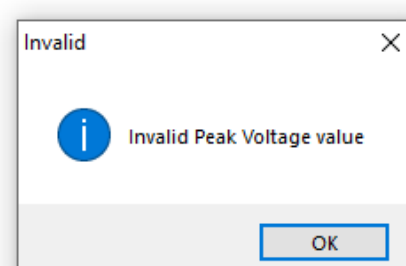
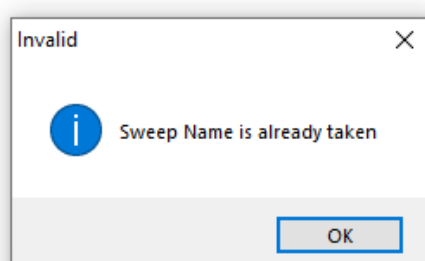
Highlight the required Measurement Setup and Click **OK** to enter the details into the Perform Sweep window.

Measurement Equipment:

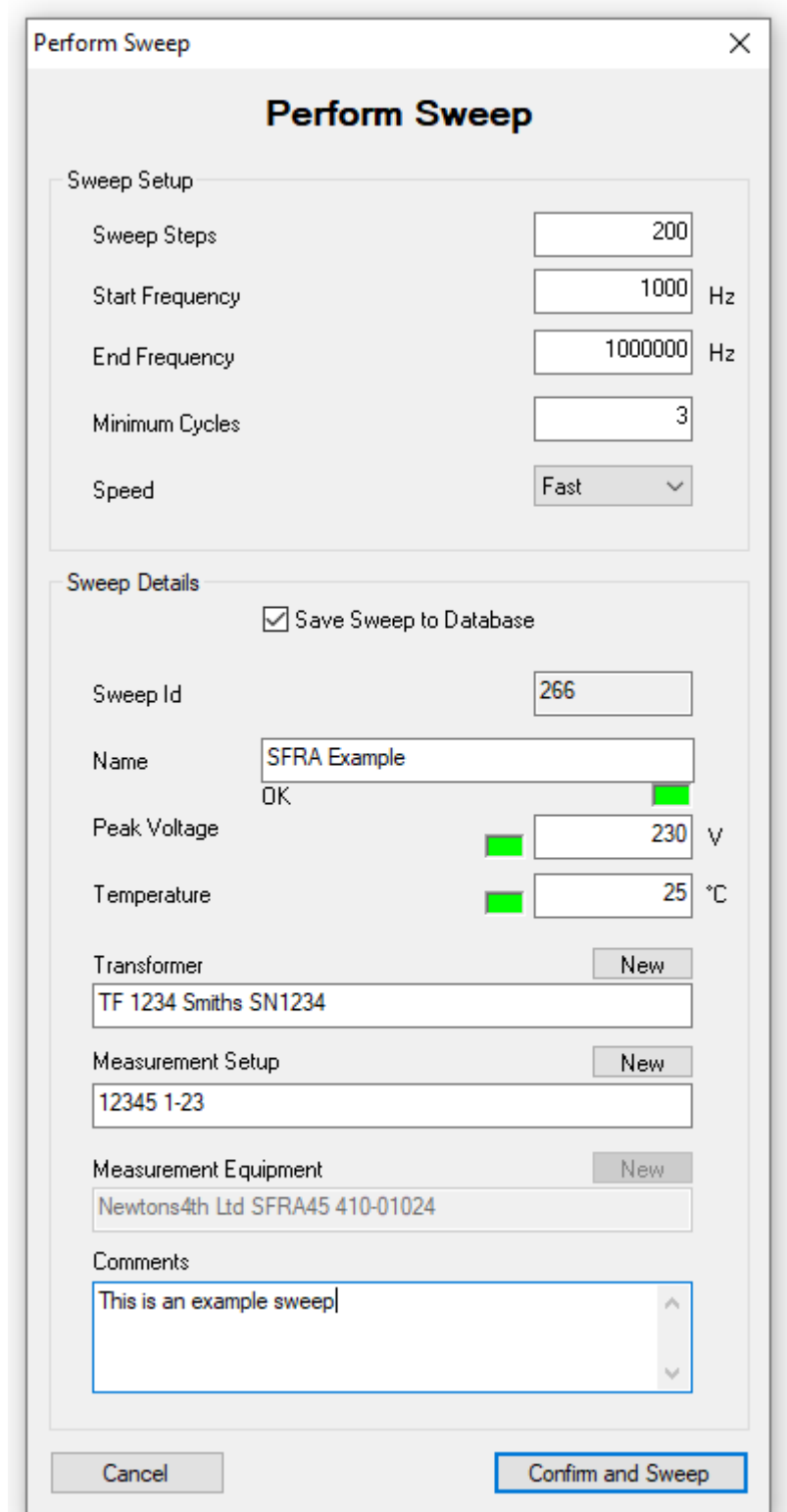


This displays the details of the instrument connected to SFRAComm2.

Error Messages: Here are examples of messages that may be displayed if invalid information is entered. Click OK and re-enter valid information.



The Perform Sweep window should now be fully populated with all of the required settings and data:

The image shows a 'Perform Sweep' dialog box with two main sections: 'Sweep Setup' and 'Sweep Details'. The 'Sweep Setup' section includes input fields for 'Sweep Steps' (200), 'Start Frequency' (1000 Hz), 'End Frequency' (1000000 Hz), 'Minimum Cycles' (3), and a 'Speed' dropdown menu set to 'Fast'. The 'Sweep Details' section features a checked checkbox for 'Save Sweep to Database', a 'Sweep Id' field (266), a 'Name' field ('SFRA Example') with an 'OK' button, 'Peak Voltage' (230 V) and 'Temperature' (25 °C) fields each preceded by a green progress bar, and three fields for 'Transformer' ('TF 1234 Smiths SN1234'), 'Measurement Setup' ('12345 1-23'), and 'Measurement Equipment' ('Newtons4th Ltd SFRA45 410-01024'), each with a 'New' button. A 'Comments' text area at the bottom contains the text 'This is an example sweep'. At the bottom of the dialog are 'Cancel' and 'Confirm and Sweep' buttons.

Perform Sweep

Sweep Setup

Sweep Steps: 200

Start Frequency: 1000 Hz

End Frequency: 1000000 Hz

Minimum Cycles: 3

Speed: Fast

Sweep Details

☒ Save Sweep to Database

Sweep Id: 266

Name: SFRA Example
OK

Peak Voltage: 230 V

Temperature: 25 °C

Transformer: New
TF 1234 Smiths SN1234

Measurement Setup: New
12345 1-23

Measurement Equipment: New
Newtons4th Ltd SFRA45 410-01024

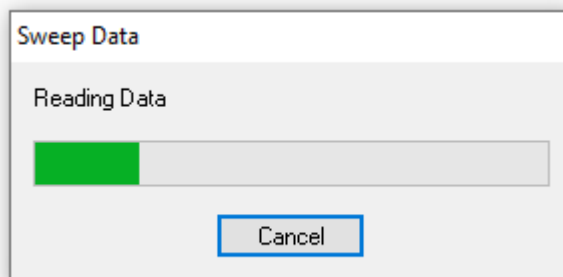
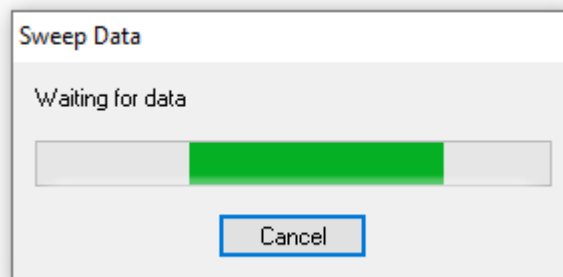
Comments: This is an example sweep

Cancel Confirm and Sweep

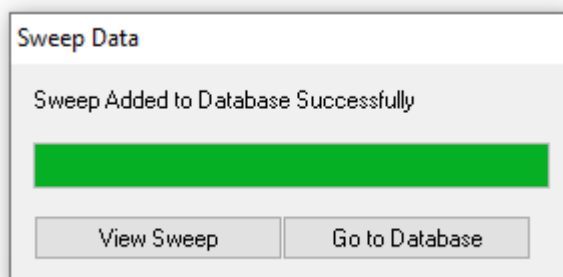
Click on **Confirm and Sweep** to begin the SFRA Sweep.

The Sweep will now begin it will take several minutes to complete. This depends on the selected sweep speed and the number of sweep steps that was selected.

The following message will appear whilst the sweep is being performed:

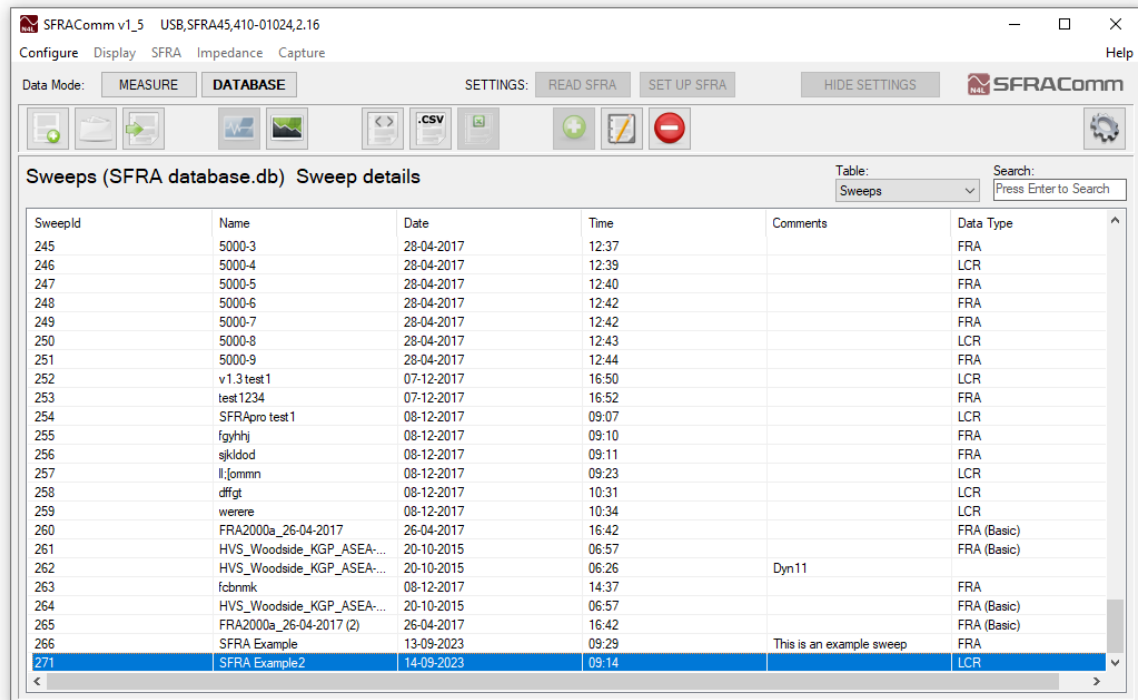


The following message is displayed once the sweep is complete:



Go To Database:

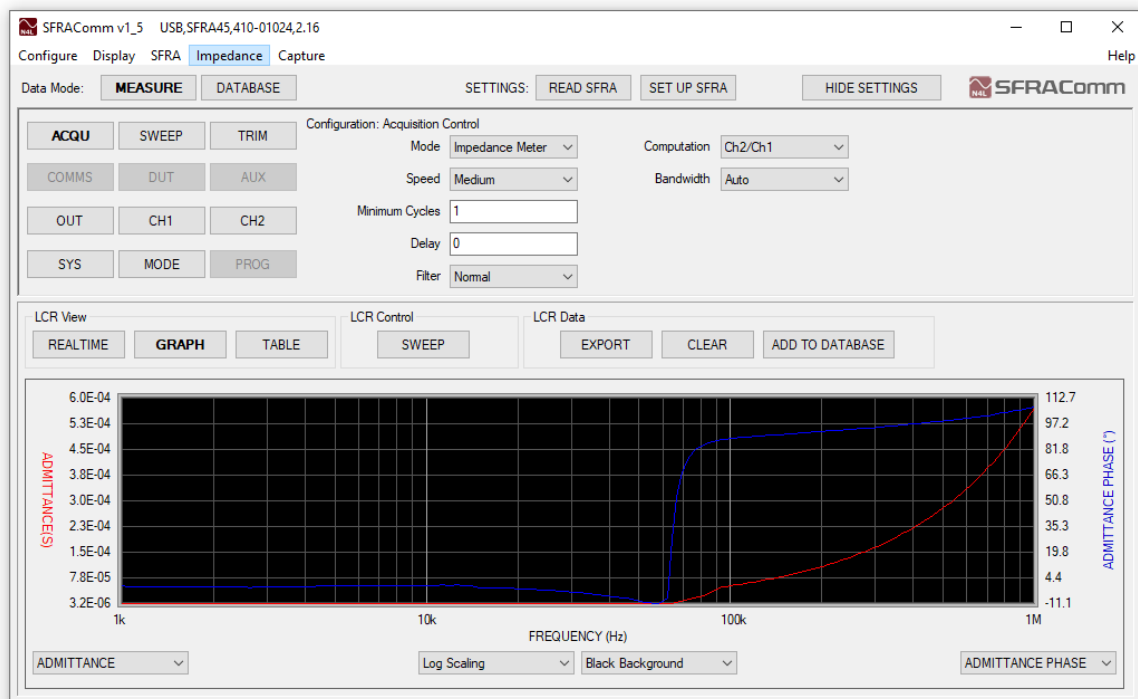
The Sweep details are added to the end of the list of sweeps in the database. The sweep can then be viewed using the database functions. This will be discussed in more detail in section 9.0.



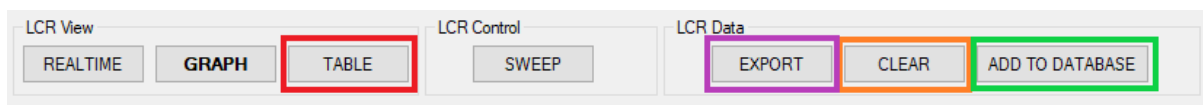
SweepId	Name	Date	Time	Comments	Data Type
245	5000-3	28-04-2017	12:37		FRA
246	5000-4	28-04-2017	12:39		LCR
247	5000-5	28-04-2017	12:40		FRA
248	5000-6	28-04-2017	12:42		FRA
249	5000-7	28-04-2017	12:42		FRA
250	5000-8	28-04-2017	12:43		LCR
251	5000-9	28-04-2017	12:44		FRA
252	v1.3 test1	07-12-2017	16:50		LCR
253	test1234	07-12-2017	16:52		FRA
254	SFRApro test 1	08-12-2017	09:07		LCR
255	fgyhjh	08-12-2017	09:10		FRA
256	sjkldod	08-12-2017	09:11		FRA
257	lljomin	08-12-2017	09:23		LCR
258	dfgt	08-12-2017	10:31		LCR
259	werere	08-12-2017	10:34		LCR
260	FRA2000a_26-04-2017	26-04-2017	16:42		FRA (Basic)
261	HVS_Woodside_KGP_ASEA...	20-10-2015	06:57		FRA (Basic)
262	HVS_Woodside_KGP_ASEA...	20-10-2015	06:26	Dyn11	FRA
263	fcbrmk	08-12-2017	14:37		FRA (Basic)
264	HVS_Woodside_KGP_ASEA...	20-10-2015	06:57		FRA (Basic)
265	FRA2000a_26-04-2017 (2)	26-04-2017	16:42		FRA (Basic)
266	SFRA Example	13-09-2023	09:29	This is an example sweep	FRA
271	SFRA Example2	14-09-2023	09:14		LCR

View Sweep:

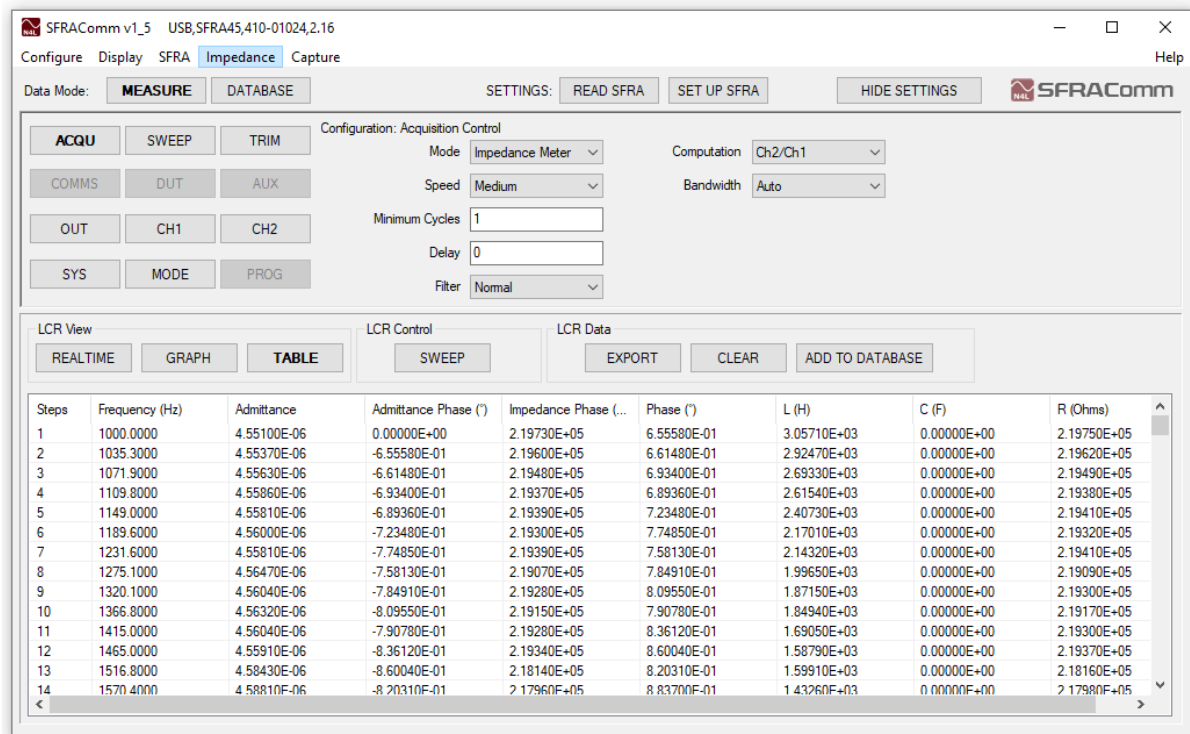
The graph view in the software will display the sweep waveform.



Other Impedance Mode (LCR) Options:



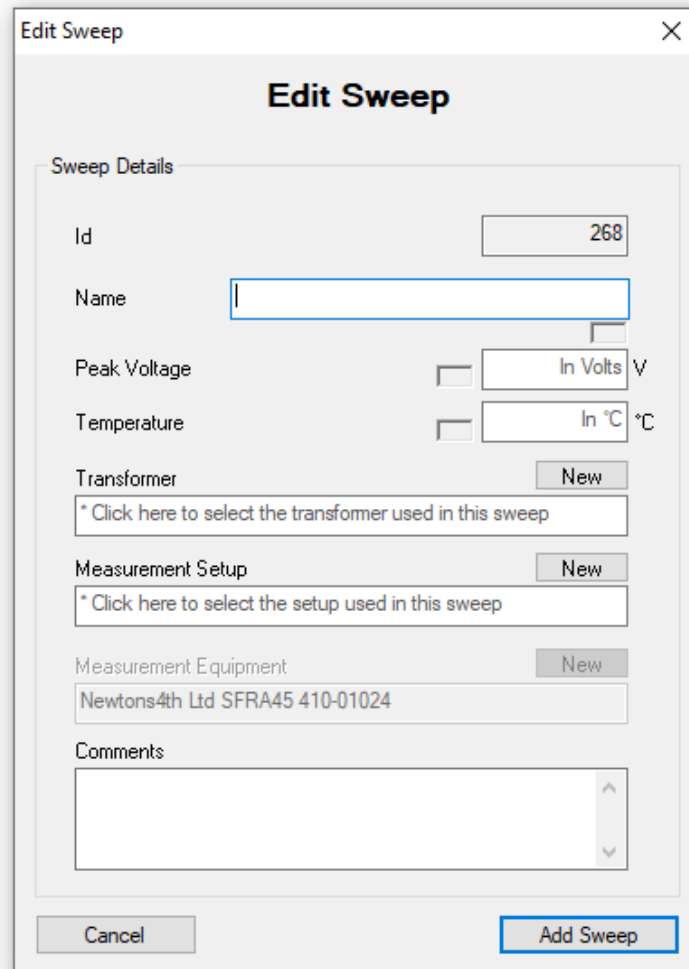
Click on **TABLE** to view the data in table format:



Click on **Add To Database** to save the sweep to the SFRAComm2 Database.

The Edit Sweep Window will appear.

Enter the required details, see section 7.2.



Edit Sweep

Sweep Details

Id: 268

Name:

Peak Voltage: ☐ In Volts V

Temperature: ☐ In °C °C

Transformer:
 * Click here to select the transformer used in this sweep

Measurement Setup:
 * Click here to select the setup used in this sweep

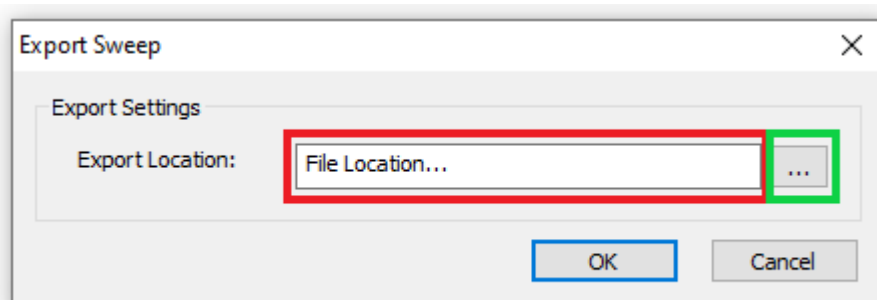
Measurement Equipment:
 Newtons4th Ltd SFRA45 410-01024

Comments:

Click on Add Sweep once all the details have been entered. The database will not open, but the sweep will have been saved.

Click on **EXPORT** to export the sweep data to a .csv file.

The Export Sweep window appears:



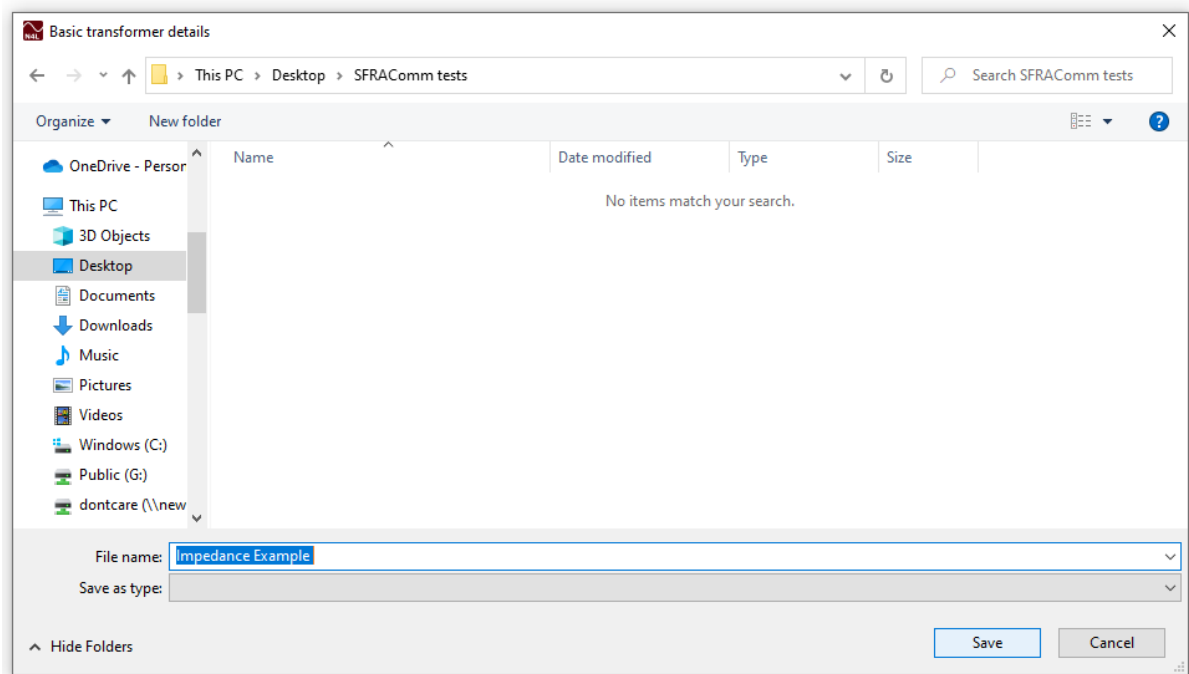
Export Sweep

Export Settings

Export Location:

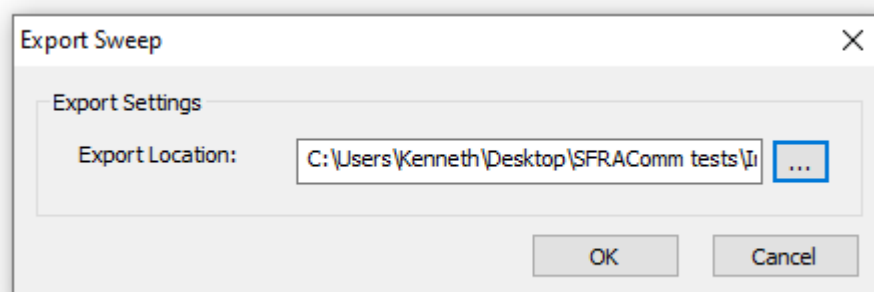
Click On **File Location** or the **box** to the right.

Clicking on either option opens the following window. Use the menus to select the location where the .csv file is to be saved.



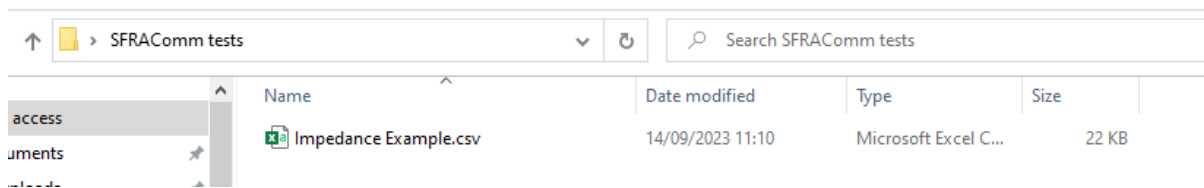
Click on SAVE.

The Export Settings Window is updated with the location where the file is to be saved:



Click on OK.

The file is then saved to the selected location.

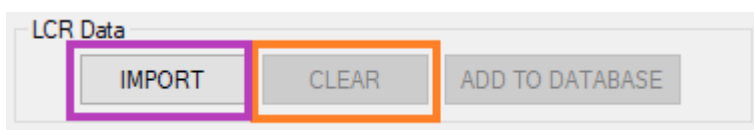


Example saved .csv file:

	A	B	C	D	E	F	G	H	I
1	File Version	1							
2	Steps	200							
3									
4	Sweep Data								
5	=====								
6	Step	Frequency (Hz)	Admittance (S)	Admittance Phase (Deg)	Impedance (Ohm)	Phase (Deg)	Inductance (H)	Capacitance (F)	Resistance (Ohm)
7	1	1000	0.00000455	0	219730	0.65558	3057.1	0	219750
8	2	1035.3	0.00000455	-0.65558	219600	0.66148	2924.7	0	219620
9	3	1071.9	0.00000456	-0.66148	219480	0.6934	2693.3	0	219490
10	4	1109.8	0.00000456	-0.6934	219370	0.68936	2615.4	0	219380
11	5	1149	0.00000456	-0.68936	219390	0.72348	2407.3	0	219410
12	6	1189.6	0.00000456	-0.72348	219300	0.77485	2170.1	0	219320
13	7	1231.6	0.00000456	-0.77485	219390	0.75813	2143.2	0	219410
14	8	1275.1	0.00000456	-0.75813	219070	0.78491	1996.5	0	219090
15	9	1320.1	0.00000456	-0.78491	219280	0.80955	1871.5	0	219300
16	10	1366.8	0.00000456	-0.80955	219150	0.79078	1849.4	0	219170
17	11	1415	0.00000456	-0.79078	219280	0.83612	1690.5	0	219300
18	12	1465	0.00000456	-0.83612	219340	0.86004	1587.9	0	219370
19	13	1516.8	0.00000458	-0.86004	218140	0.82031	1599.1	0	218160
20	14	1570.4	0.00000459	-0.82031	217960	0.8837	1432.6	0	217980
21	15	1625.8	0.00000459	-0.8837	217750	0.88683	1377.5	0	217770

Clicking on the **CLEAR** button clears the graph display and erases the data from the table.

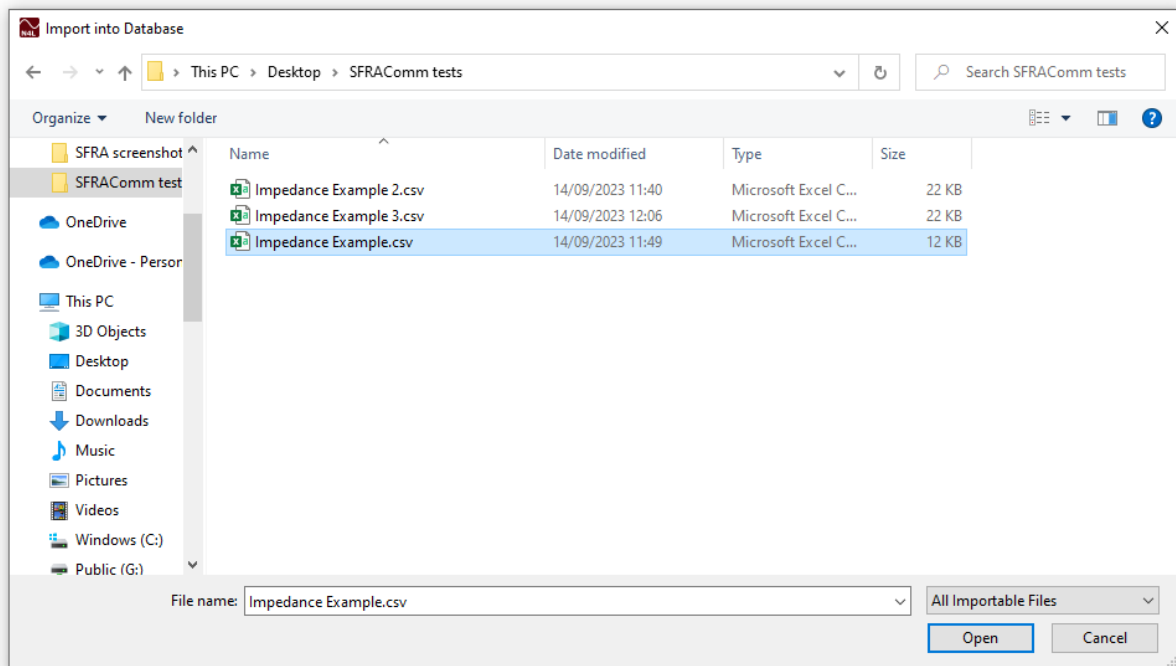
Clicking on **CLEAR** also renames the **EXPORT** button to **IMPORT**.



This allows saved .csv files to be loaded into SFRAComm2.

Click on **IMPORT**

The Import Window opens. Locate the required .csv file.



Highlight the file and click on OPEN or double click on the file.

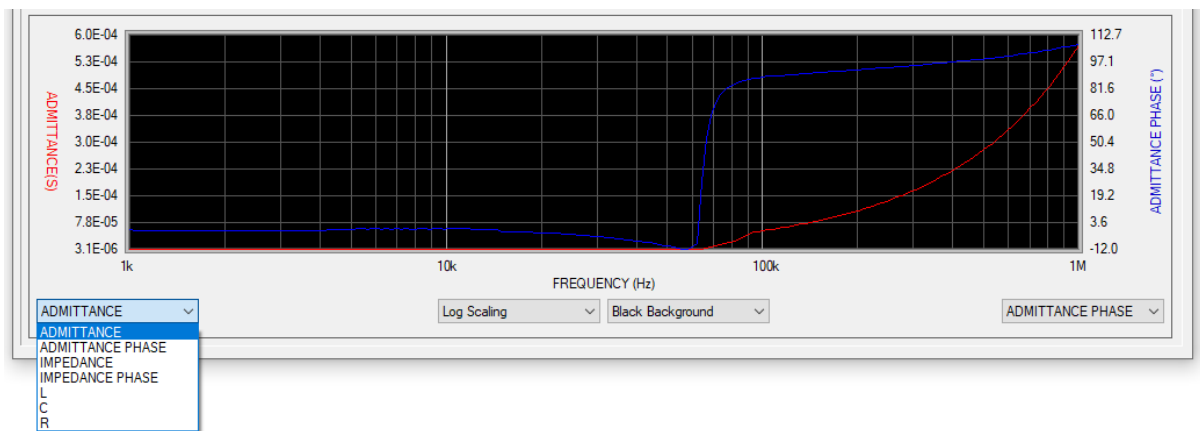
The waveform is displayed in the software graph window.

Impedance Graph Viewing options:

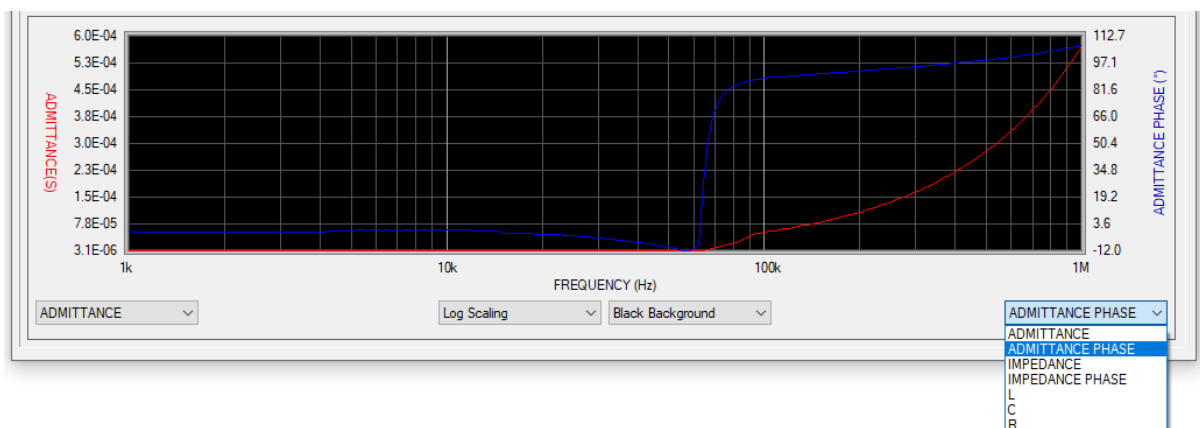
2 parameters are displayed on the graph. The red waveform is represented by the scale on the Left-hand side of the window. The blue waveform is represented by the scale on the right-hand side of the window.

It is possible to select the parameters that are displayed on the graph using the drop-down menus.

The red, Left-hand side parameter is selected using the drop-down menu in the bottom left corner of the software window:

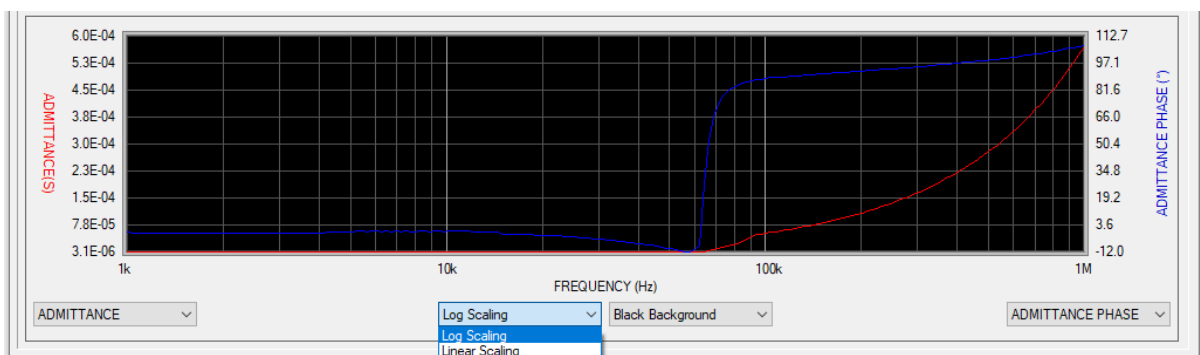


The blue, right-hand side parameter is selected using the drop-down menu in the bottom right corner of the software window.

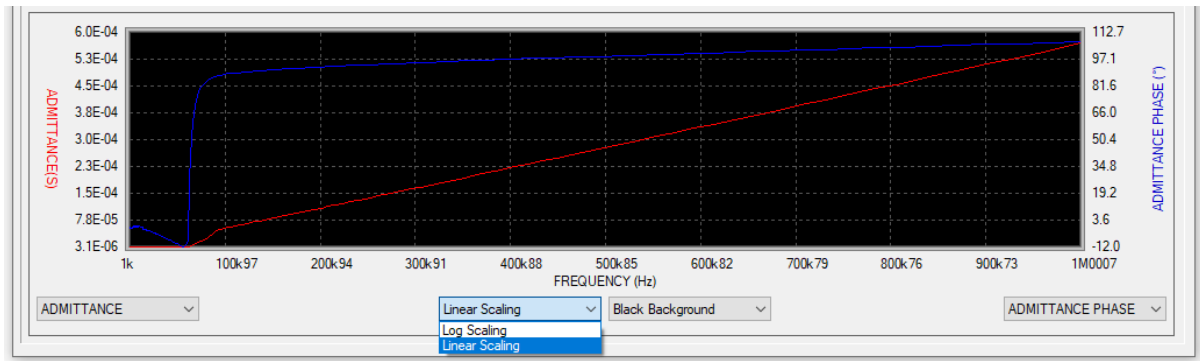


Log / Linear Scaling options:

Sweep waveform with Log scaling selected:

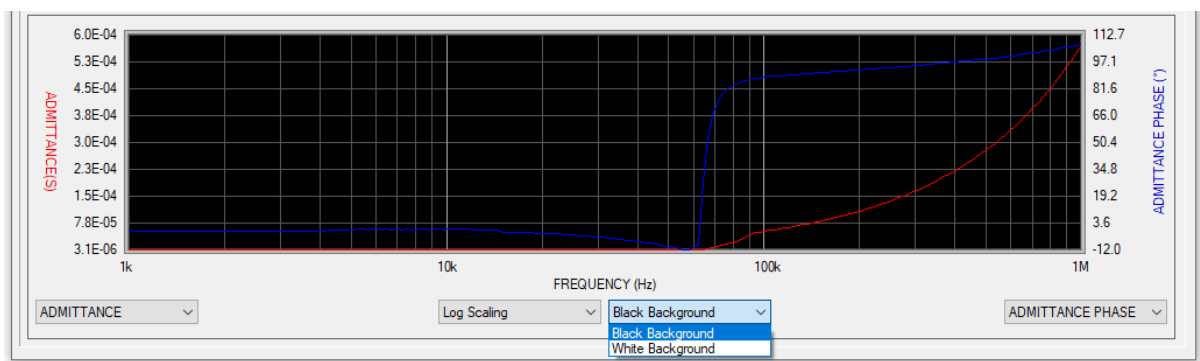


Sweep waveform with Linear scaling selected:

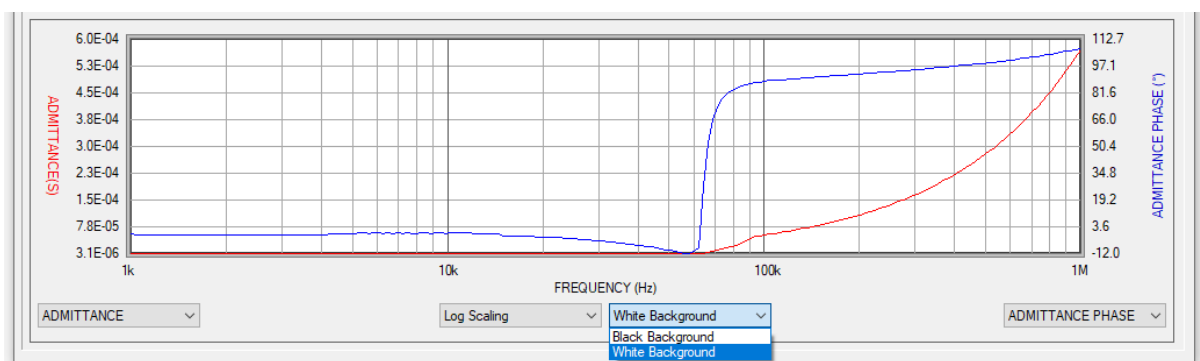


Background Colour Options:

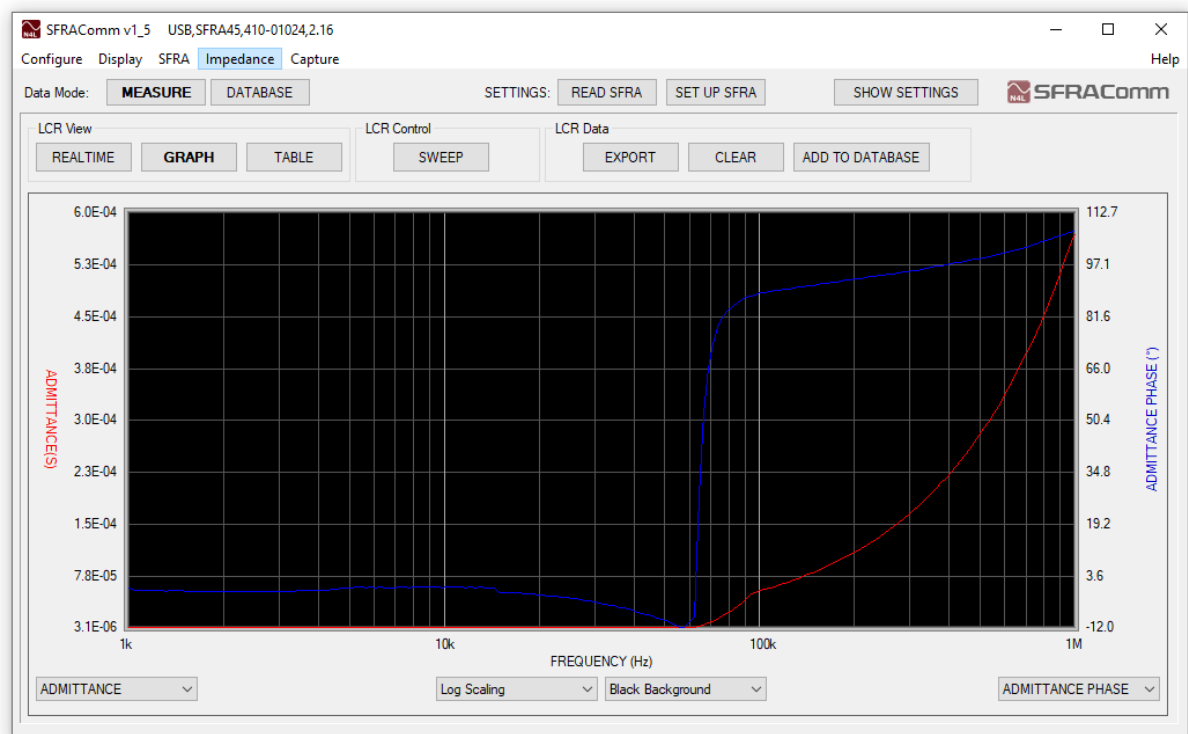
Sweep waveform with a black background selected:



Sweep waveform with a white background selected:



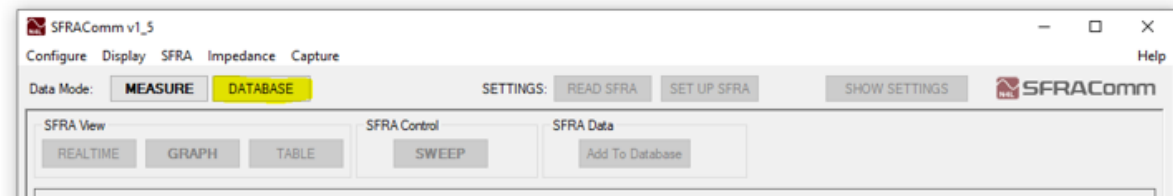
Show / Hide Settings:



This hides the settings which enlarges the graph area.

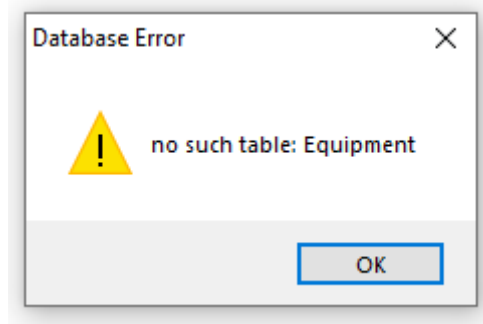
9 The SFRAComm2 Database

9.1 Using the database for the first time.

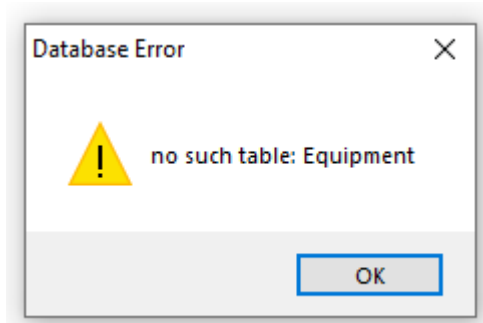


Click on **DATABASE** to open the database.

The first time you use the database after installation of the software the following messages will be displayed. Once the database is setup these messages will not appear when opening the database.

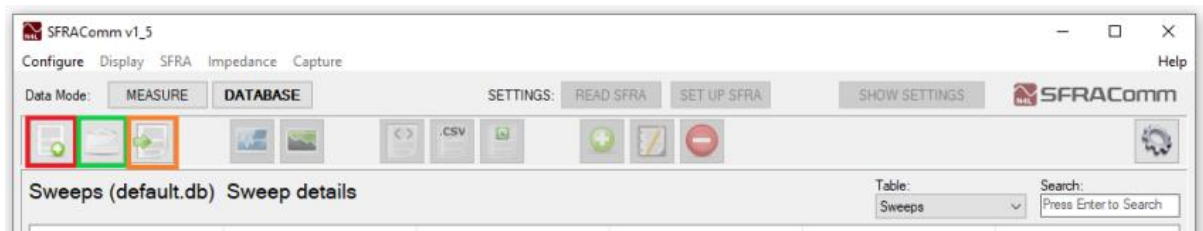


Ignore message and press Ok. The message appears again:



The main Database window appears:

There are 3 Database selection options:



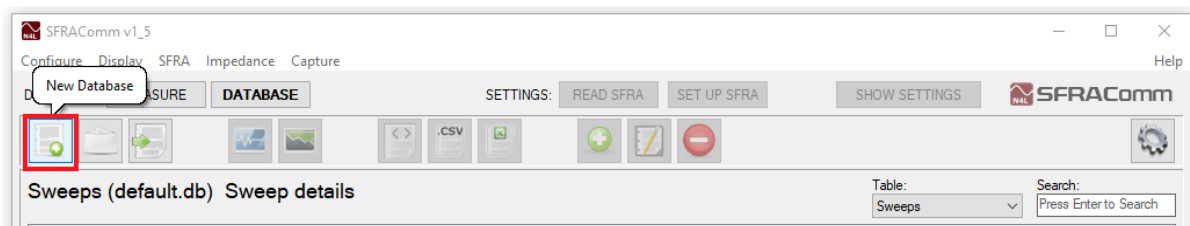
These are:

Open New Database:

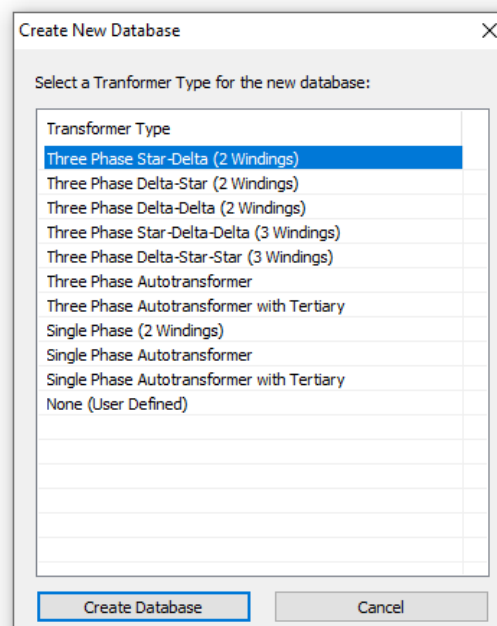
Open an old database.

Import a Sweep into a database.

Create/Open a new database.

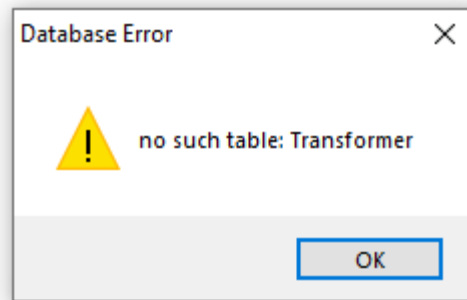


Click on **New Database** to display the transformer type options:



Select the required transformer type, Click on Create Database

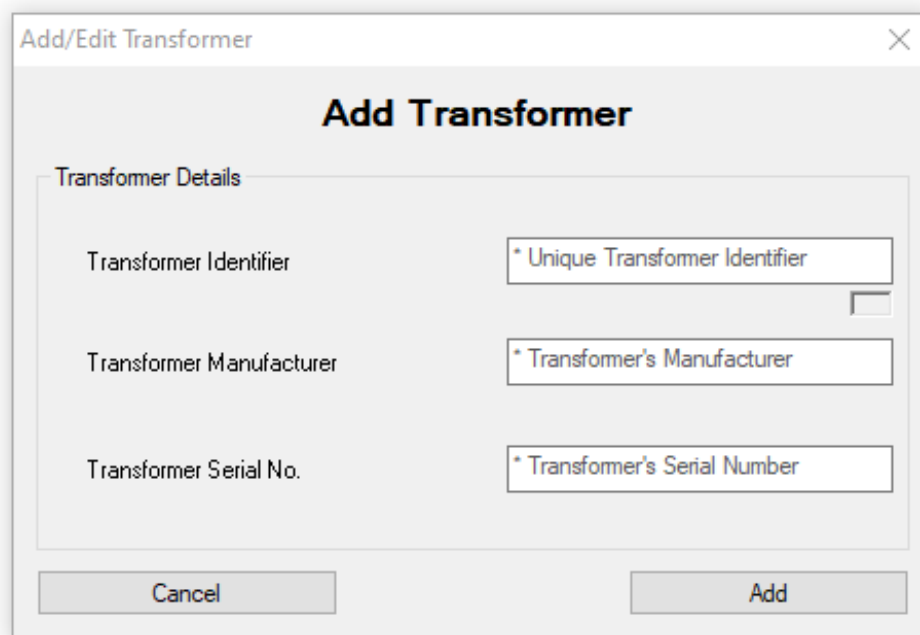
The following message appears:



This message appears because we have not created a table yet. The message will not appear in the future.

Click on OK:

The Add transformer window appears:

A screenshot of the 'Add/Edit Transformer' dialog box. The title bar says 'Add/Edit Transformer' with a close button (X). The main heading is 'Add Transformer'. Below it is a section titled 'Transformer Details' which contains three input fields: 'Transformer Identifier' with a hint '* Unique Transformer Identifier', 'Transformer Manufacturer' with a hint '* Transformer's Manufacturer', and 'Transformer Serial No.' with a hint '* Transformer's Serial Number'. At the bottom, there are two buttons: 'Cancel' on the left and 'Add' on the right.

Enter the transformer details (see section 7.2).

Add/Edit Transformer

Add Transformer

Transformer Details

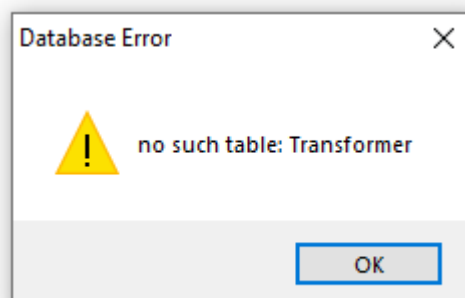
Transformer Identifier: TF 12345
OK

Transformer Manufacturer: Smiths

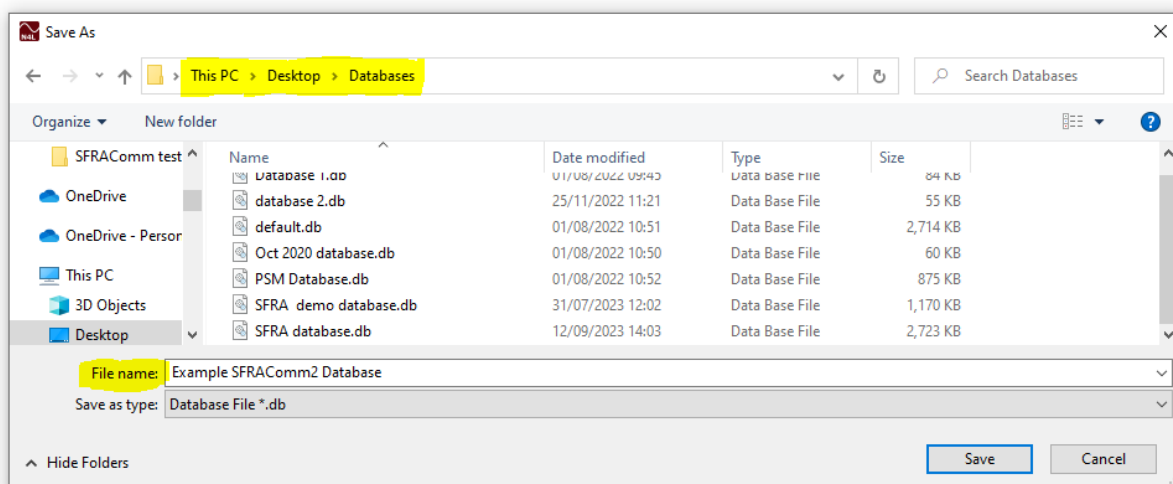
Transformer Serial No.: SN1234

Cancel Add

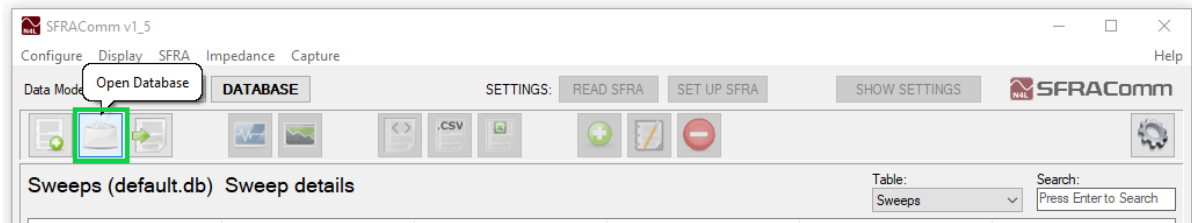
After entering the details, Click On ADD. The following message appears the first time the database is used because we are still creating the table.



Click ok to display the "Save as" window:

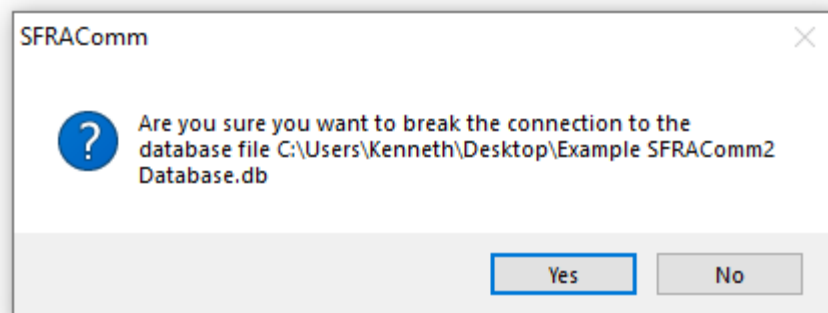


Open an old database.



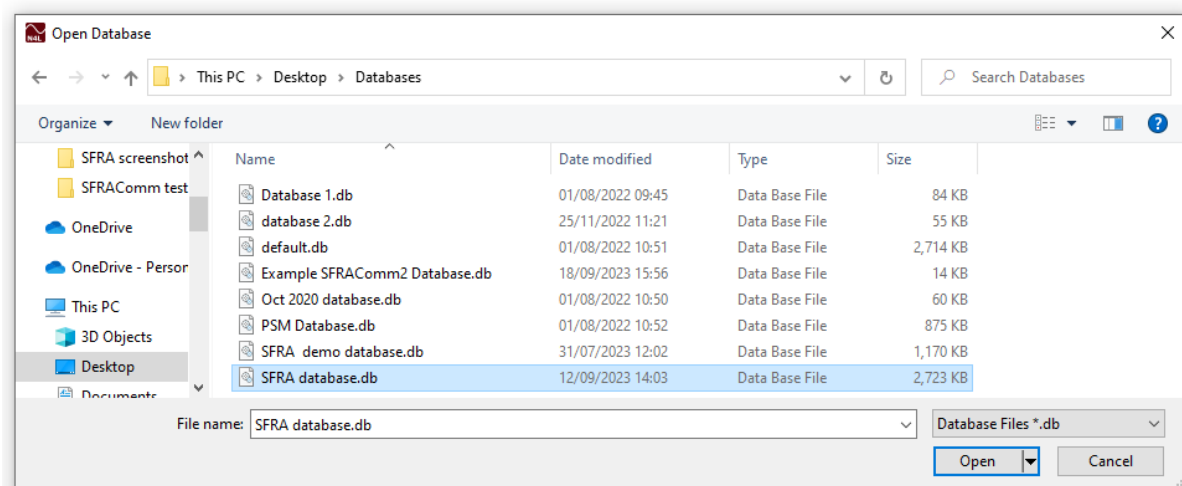
Click on **Open Database**.

The following window will appear if already connected to a database:



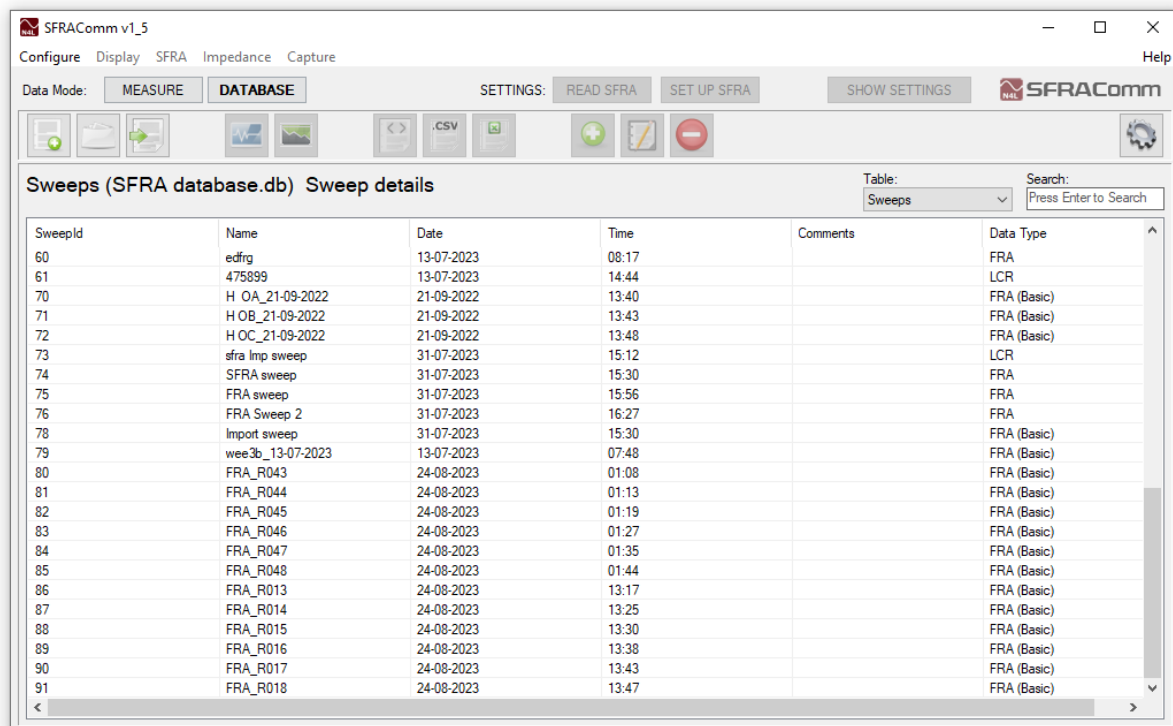
Click NO to remain connected to the present database, Click YES to connect to another database.

The Open Database window will open:



Select the new database and Click on OPEN.

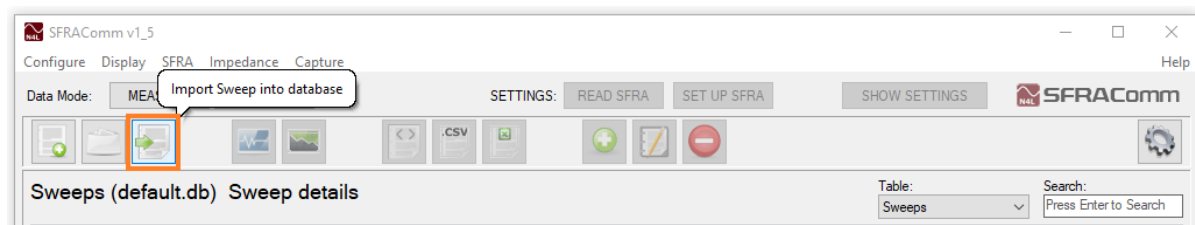
The contents of the newly selected database are displayed in the software:



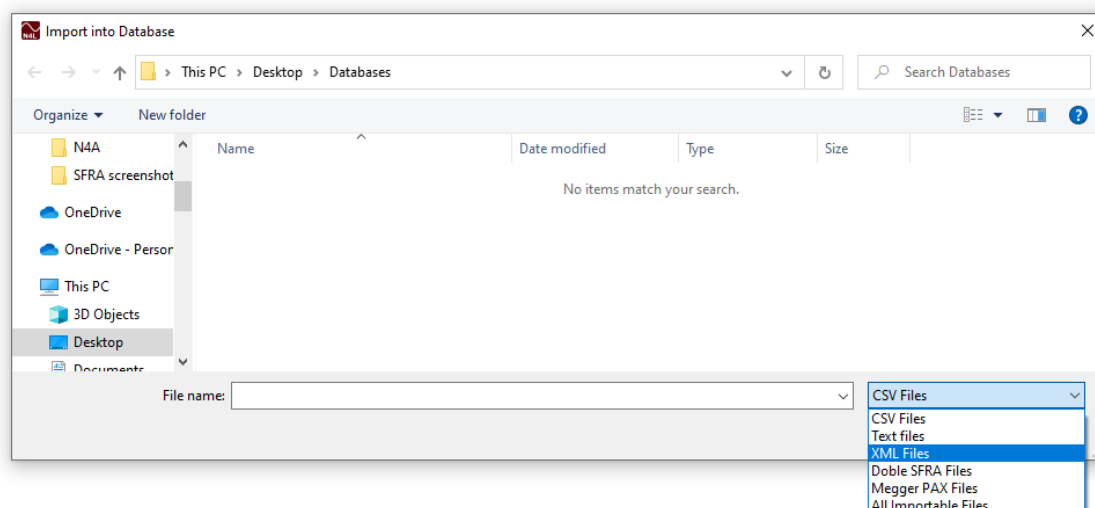
The screenshot shows the SFRAComm v1.5 software interface. The 'Data Mode' is set to 'DATABASE'. The 'Sweeps (SFRA database.db) Sweep details' table is displayed, showing a list of sweeps with columns: SweepId, Name, Date, Time, Comments, and Data Type. The table contains 18 rows of data, including sweeps like 'edfng', '475899', 'H OA_21-09-2022', 'H OB_21-09-2022', 'H OC_21-09-2022', 'sfra Imp sweep', 'SFRA sweep', 'FRA sweep', 'FRA Sweep 2', 'Import sweep', 'wee3b_13-07-2023', and various 'FRA_R043' through 'FRA_R018' sweeps.

SweepId	Name	Date	Time	Comments	Data Type
60	edfng	13-07-2023	08:17		FRA
61	475899	13-07-2023	14:44		LCR
70	H OA_21-09-2022	21-09-2022	13:40		FRA (Basic)
71	H OB_21-09-2022	21-09-2022	13:43		FRA (Basic)
72	H OC_21-09-2022	21-09-2022	13:48		FRA (Basic)
73	sfra Imp sweep	31-07-2023	15:12		LCR
74	SFRA sweep	31-07-2023	15:30		FRA
75	FRA sweep	31-07-2023	15:56		FRA
76	FRA Sweep 2	31-07-2023	16:27		FRA
78	Import sweep	31-07-2023	15:30		FRA (Basic)
79	wee3b_13-07-2023	13-07-2023	07:48		FRA (Basic)
80	FRA_R043	24-08-2023	01:08		FRA (Basic)
81	FRA_R044	24-08-2023	01:13		FRA (Basic)
82	FRA_R045	24-08-2023	01:19		FRA (Basic)
83	FRA_R046	24-08-2023	01:27		FRA (Basic)
84	FRA_R047	24-08-2023	01:35		FRA (Basic)
85	FRA_R048	24-08-2023	01:44		FRA (Basic)
86	FRA_R013	24-08-2023	13:17		FRA (Basic)
87	FRA_R014	24-08-2023	13:25		FRA (Basic)
88	FRA_R015	24-08-2023	13:30		FRA (Basic)
89	FRA_R016	24-08-2023	13:38		FRA (Basic)
90	FRA_R017	24-08-2023	13:43		FRA (Basic)
91	FRA_R018	24-08-2023	13:47		FRA (Basic)

Import a Sweep into a database.

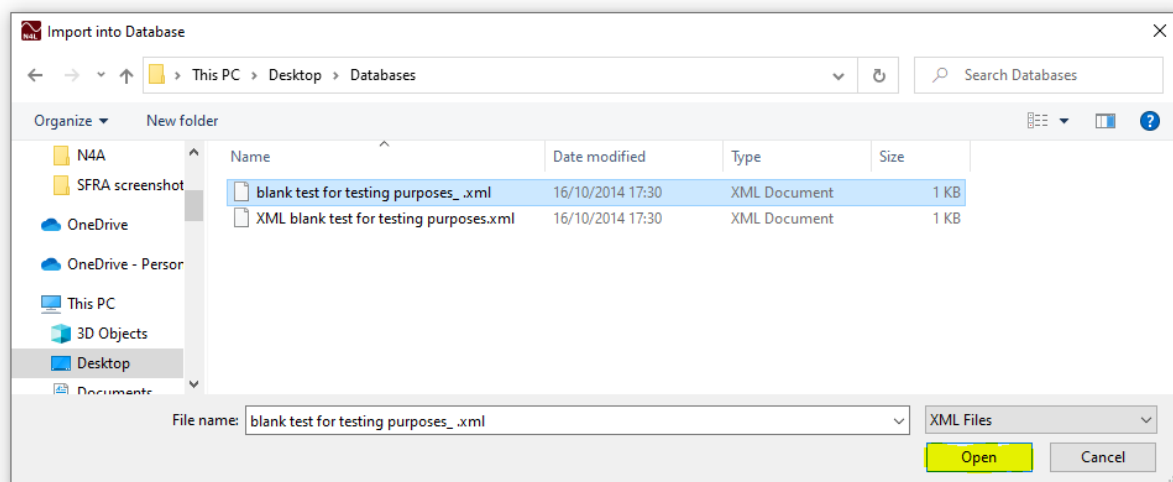


Click on **Import Sweep into Database** to save sweeps from the PC into the database. The import into database window appears:

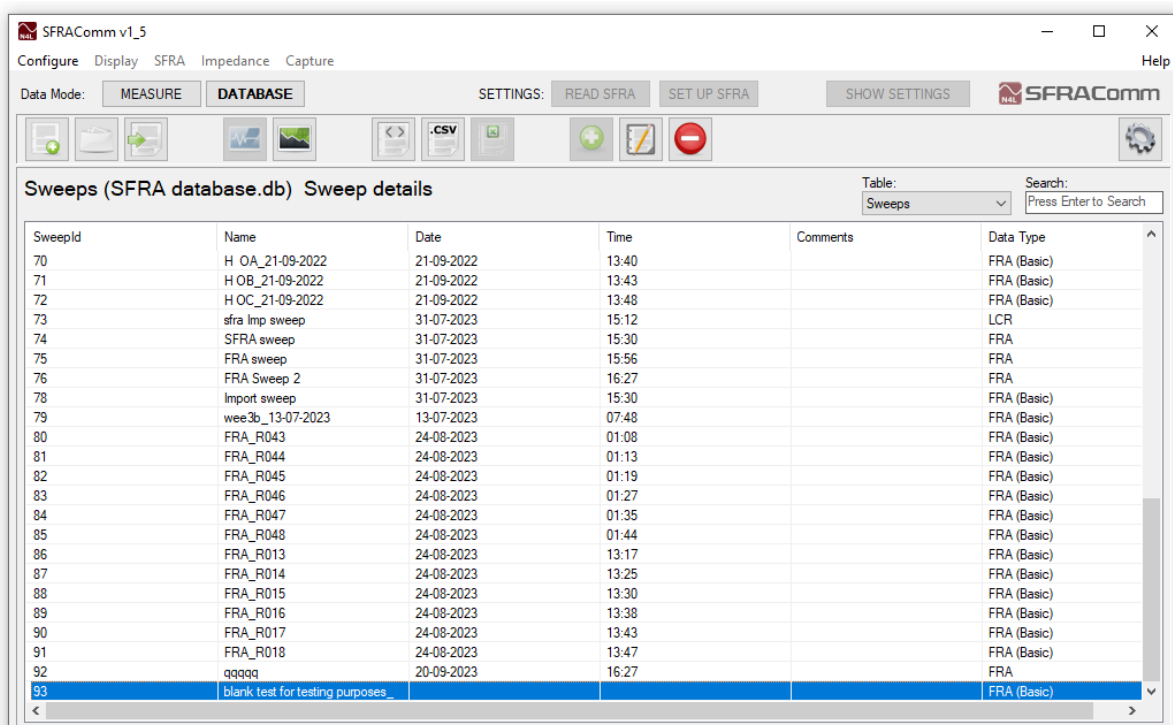


In the bottom right-hand corner of the window is a drop-down menu of file types that can be loaded into the database.

Select the required file type (in this example .xml). Select the required search location on the PC. Any valid files will then be displayed in the window as shown in the example below.

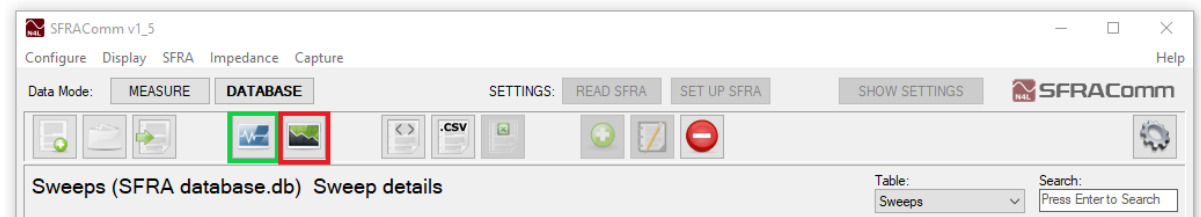


Select the required sweep file and click on OPEN or double click on the required file.



The file will be added to the end of the list of sweeps in the database. The sweep can be viewed in the database.

Graph Options

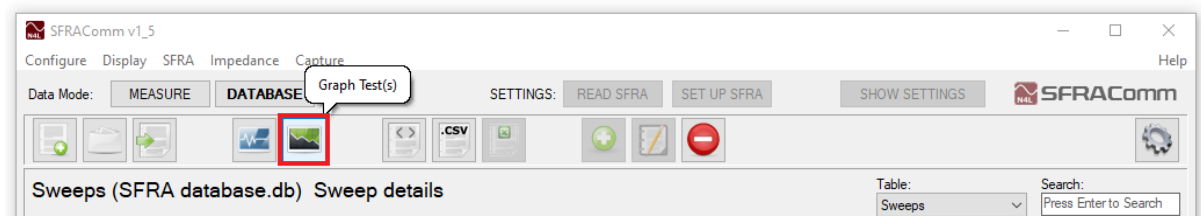


There are 2 options:

Graph Test(s)

Diagnose Transformer

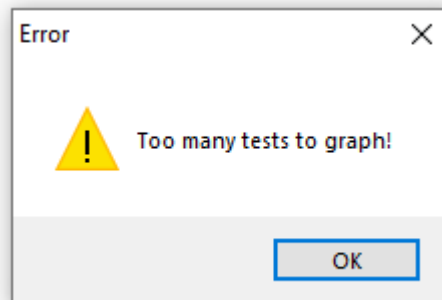
Graph Test(s)



It is possible to graph between 1 and 9 sweeps at the same time. Highlight the required sweeps in the database window and click on the Graph Test(s) button.

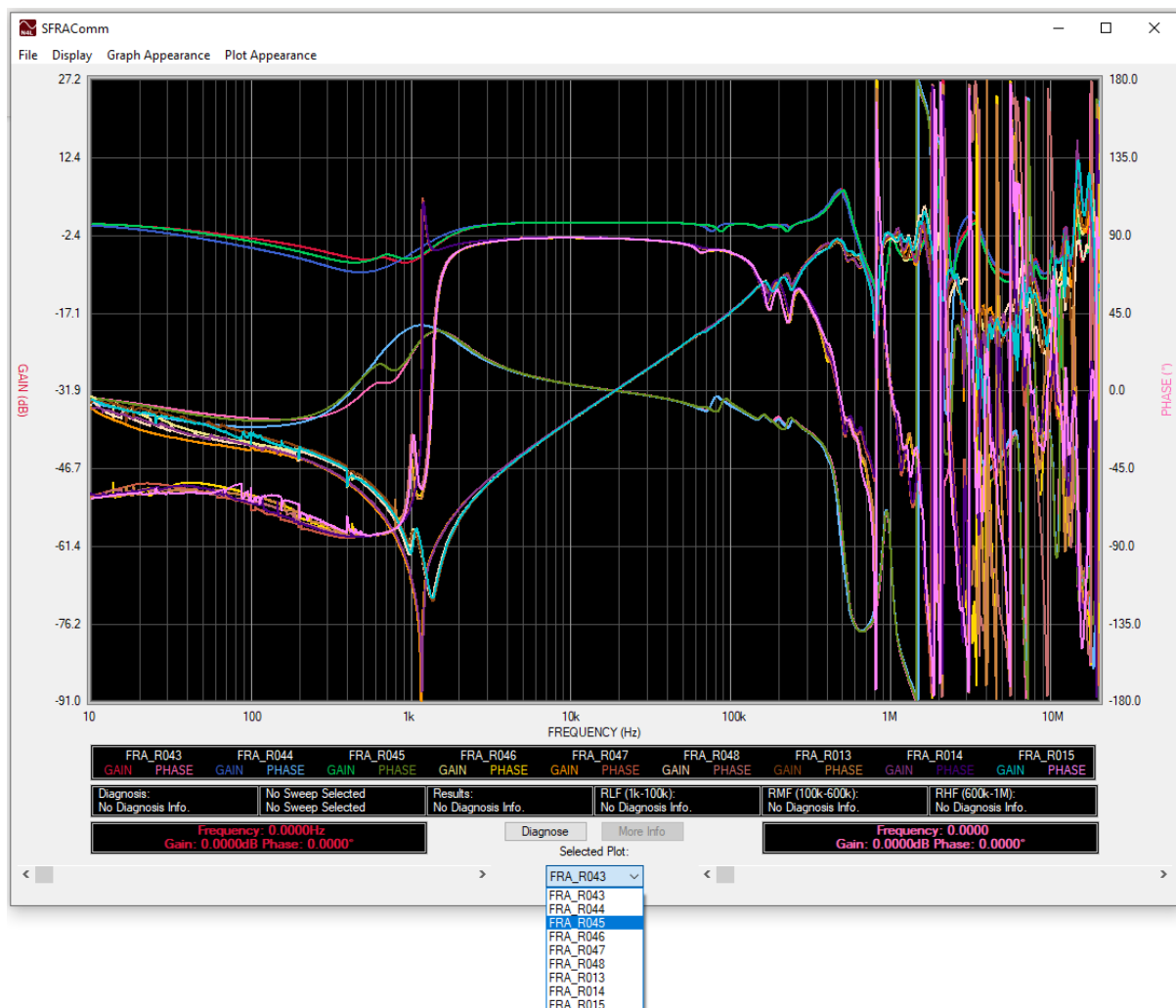
Sweeps (SFRA database.db) Sweep details					
SweepId	Name	Date	Time	Comments	Data Type
71	H OB_21-09-2022	21-09-2022	13:43		FRA (Basic)
72	H OC_21-09-2022	21-09-2022	13:48		FRA (Basic)
73	sfra Imp sweep	31-07-2023	15:12		LCR
74	SFRA sweep	31-07-2023	15:30		FRA
75	FRA sweep	31-07-2023	15:56		FRA
76	FRA Sweep 2	31-07-2023	16:27		FRA
78	Import sweep	31-07-2023	15:30		FRA (Basic)
79	wee3b_13-07-2023	13-07-2023	07:48		FRA (Basic)
80	FRA_R043	24-08-2023	01:08		FRA (Basic)
81	FRA_R044	24-08-2023	01:13		FRA (Basic)
82	FRA_R045	24-08-2023	01:19		FRA (Basic)
83	FRA_R046	24-08-2023	01:27		FRA (Basic)
84	FRA_R047	24-08-2023	01:35		FRA (Basic)
85	FRA_R048	24-08-2023	01:44		FRA (Basic)
86	FRA_R013	24-08-2023	13:17		FRA (Basic)
87	FRA_R014	24-08-2023	13:25		FRA (Basic)
88	FRA_R015	24-08-2023	13:30		FRA (Basic)
89	FRA_R016	24-08-2023	13:38		FRA (Basic)
90	FRA_R017	24-08-2023	13:43		FRA (Basic)
91	FRA_R018	24-08-2023	13:47		FRA (Basic)
92	qqqqq	20-09-2023	16:27		FRA
93	blank test for testing purposes_				FRA (Basic)
95	XML blank test for testing purp...				FRA (Basic)

A warning message will appear if too many sweeps are selected.



Click on OK if and reselect the correct number of sweeps.

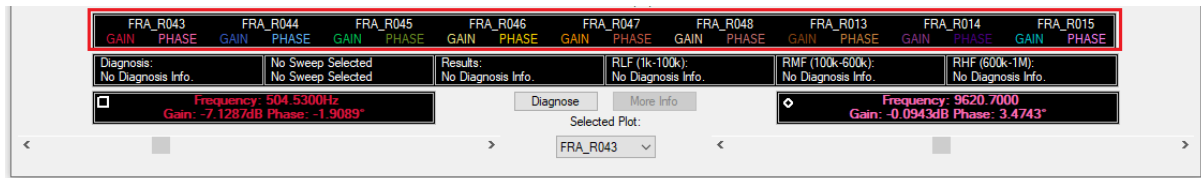
If a valid number of sweeps are selected, they will be graphed as seen in the example below:



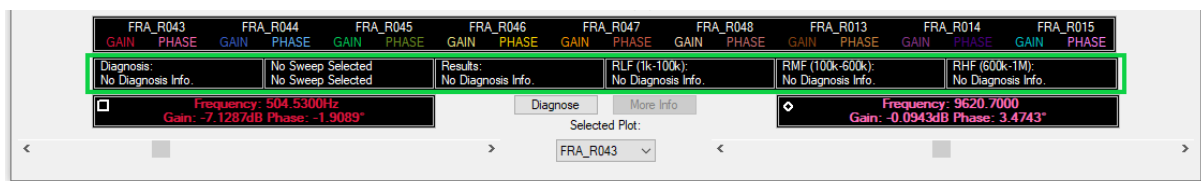
The **Select Plot** option lists all sweeps that have been graphed. The data for the selected sweep will be displayed in the boxes at the bottom of the graph window.

Information displayed below the graph display.

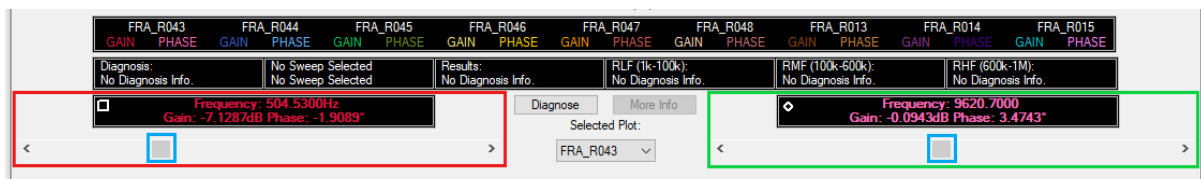
There are 3 rows of data displayed below the graph.



The first **row** shows the names of the sweeps that have been graphed. The gain and phase are colour coded for each sweep so that each waveform can be followed in the graph window.

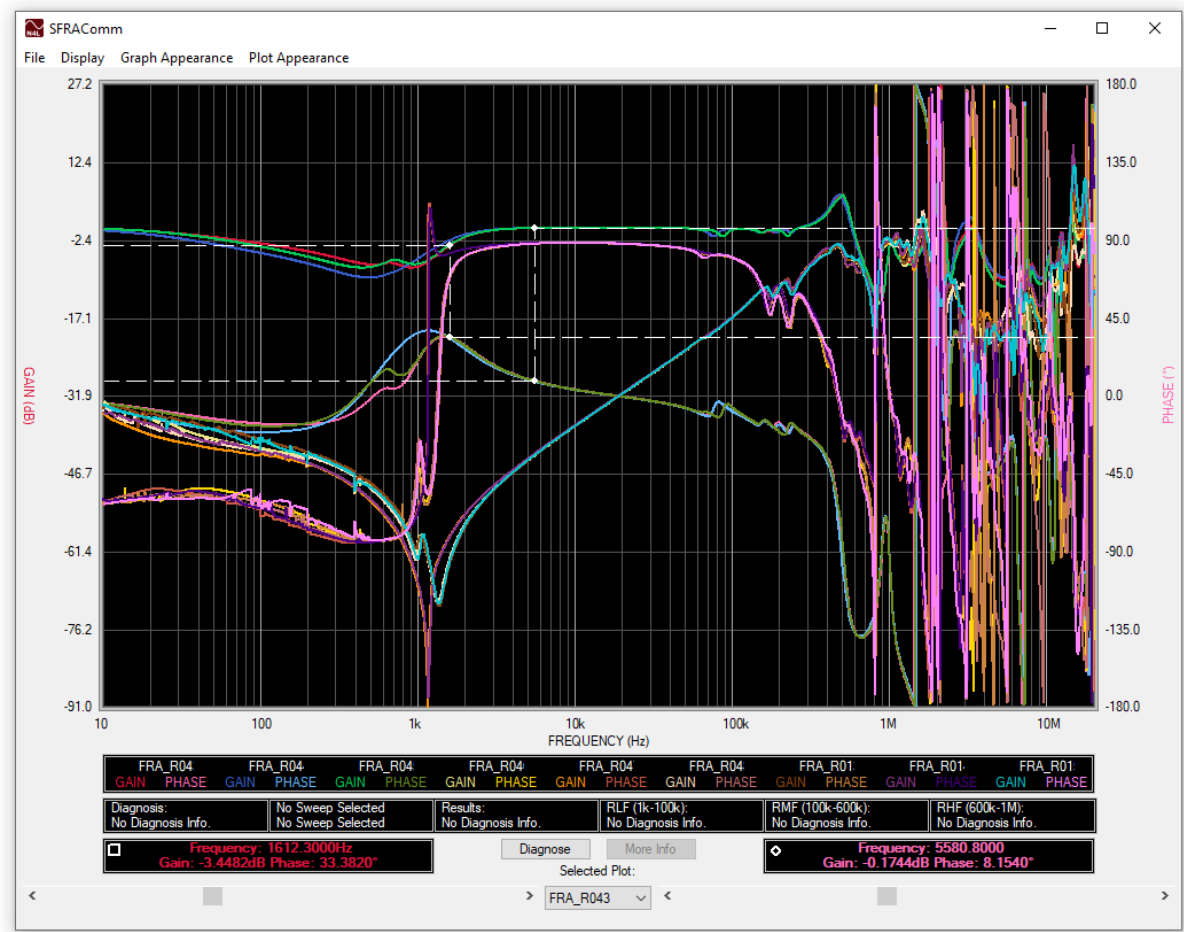


The second **row** shows the results when sweeps have been diagnosed. "No Diagnosis Info" is displayed when no sweeps have been diagnosed. This is described in more detail later.

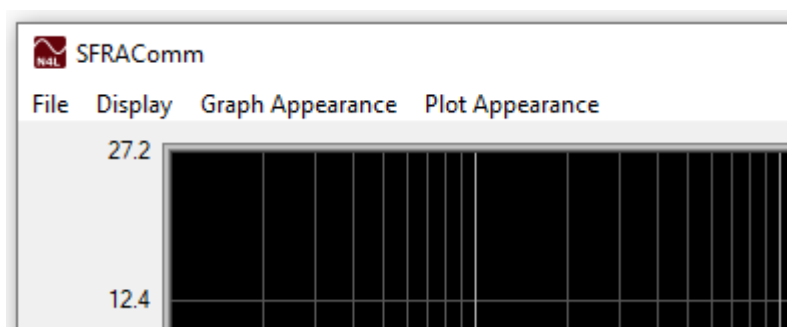


The third row displays details of the gain and phase waveforms for the selected plot. The colour coding is the same as row 1, so the data on the left represents the Gain waveform whilst the data on the right represents the Phase waveform. There is a **slider bar** that can be moved left and right between the two arrows. These move the markers on the main graph display. The data above the slider bar is also updated as the bar is moved and corresponds to the position of the marker on the waveform.

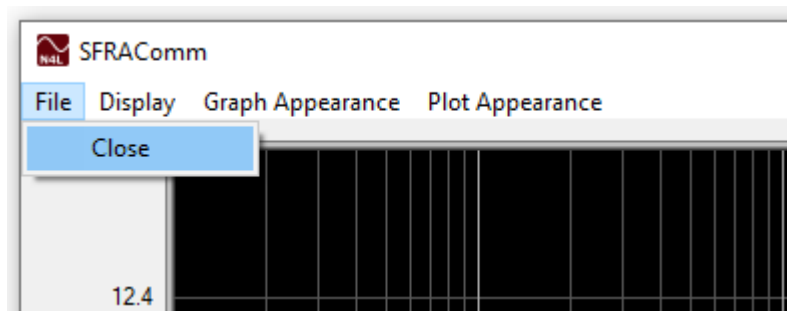
The markers can be seen on the example below. The two boxes at the base of the window displaying the data for the marker points on the waveform.



There are a number of menu options above the graph:

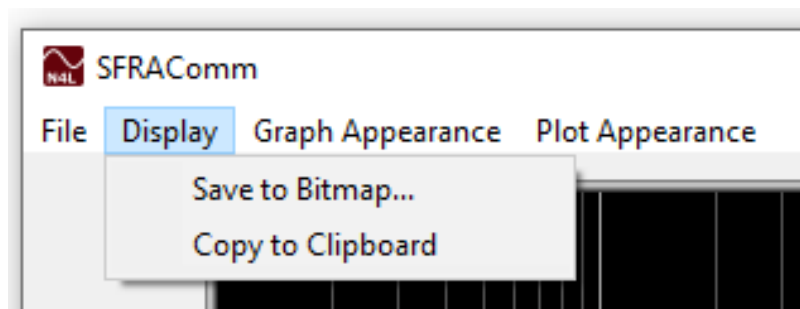


FILE Options:



Click on Graph > Close to close the Graph screen.

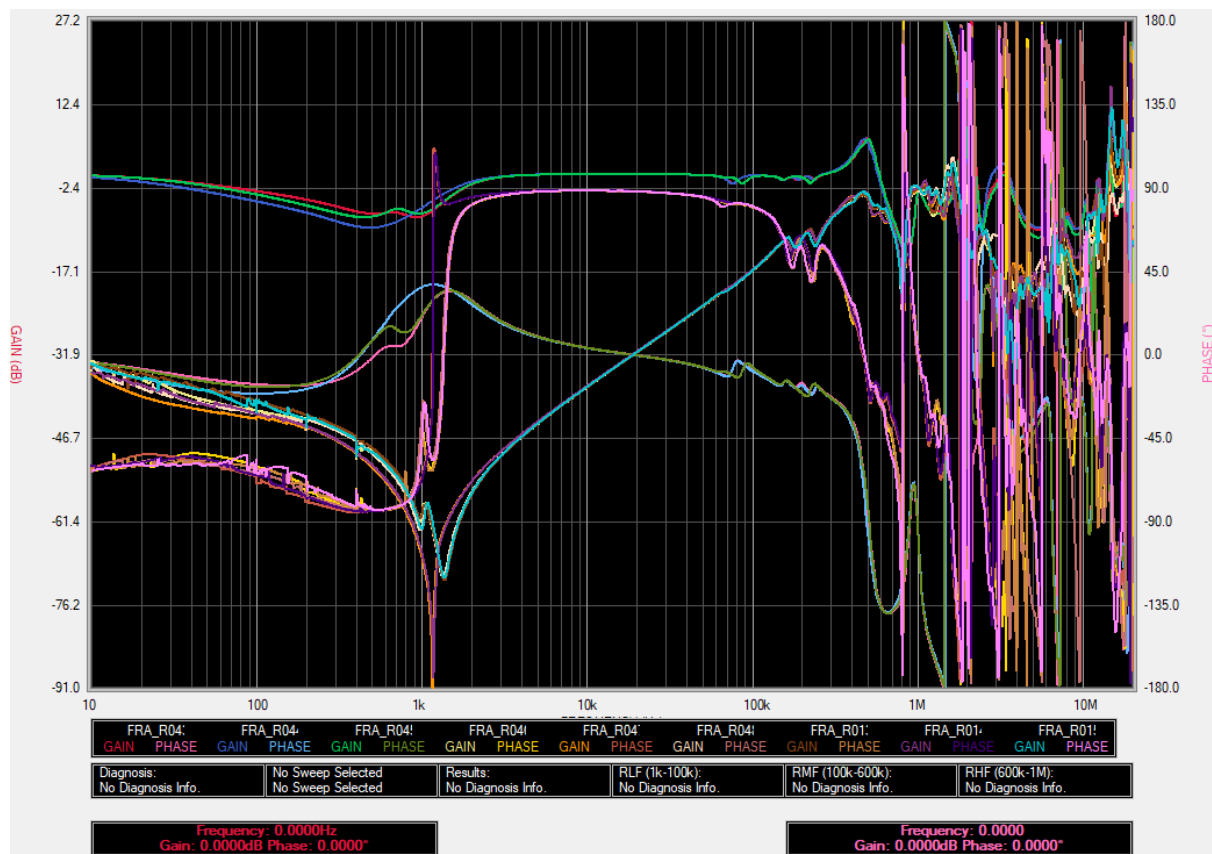
Display Options:



SAVE TO BITMAP:

This option saves a screenshot of the Graph screen to a file location of the customer's choice in bitmap (.bmp) format:

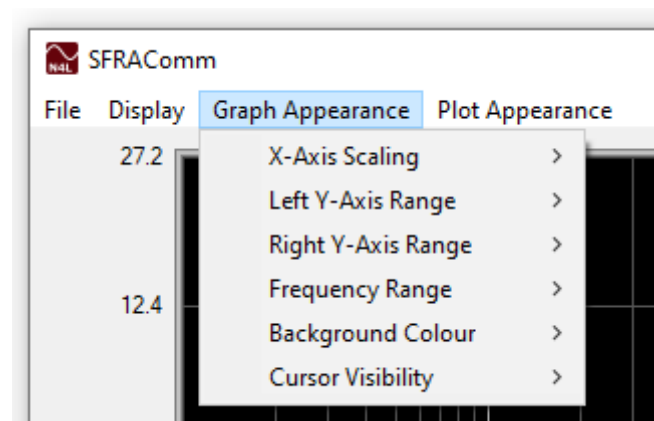
Example bitmap file of the Graph screen:



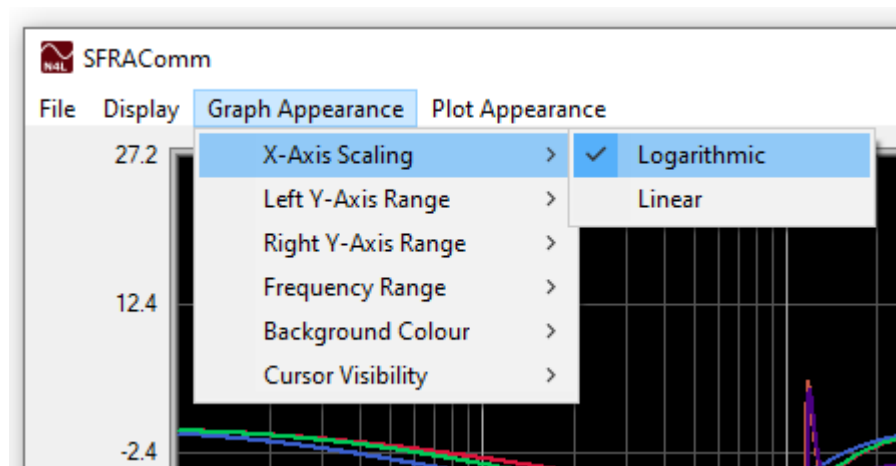
COPY TO CLIPBOARD:

This option allows you to save the graph details to the clipboard for future use.

GRAPH APPEARANCE Options:

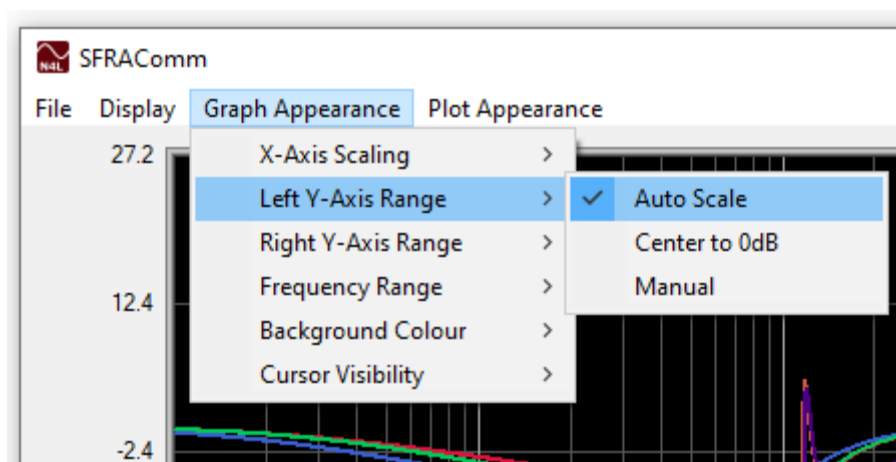


Graph Appearance > X-axis Scaling:



There are two options, these set the x-axis (horizontal) to Linear or Logarithmic scaling.

Graph Appearance > Left Y-axis Range:

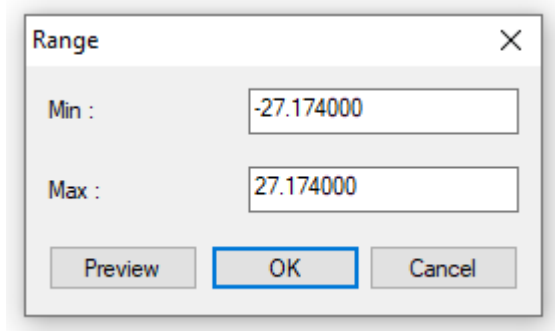


There are 3 options:

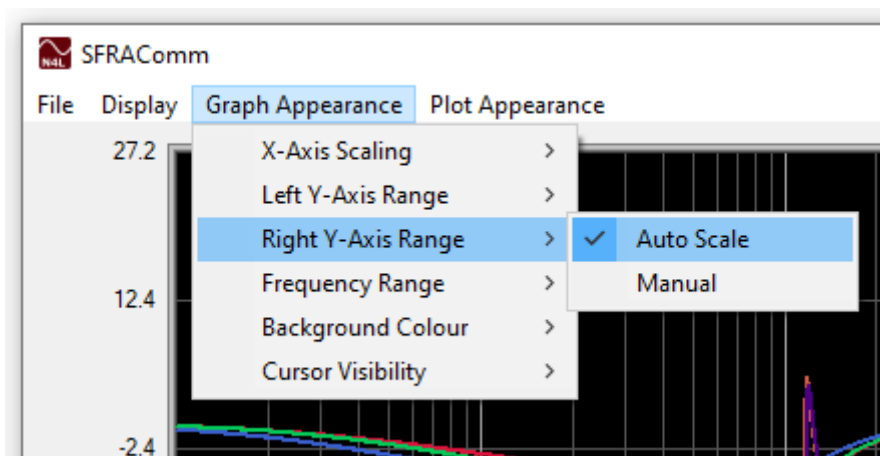
Auto Scale: The axis scale is adjusted to display the full shape of the waveforms in the software window.

Centre to 0dB: the waveforms are shifted up or down the graph window so that the midpoint of the Y-axis is 0dB.

Manual: The window below appears allowing the user to select the maximum and minimum scale values for the Y-axis. The waveforms are then scaled between these limits. The preview button allows the user to view how the waveforms will look if the settings are selected.



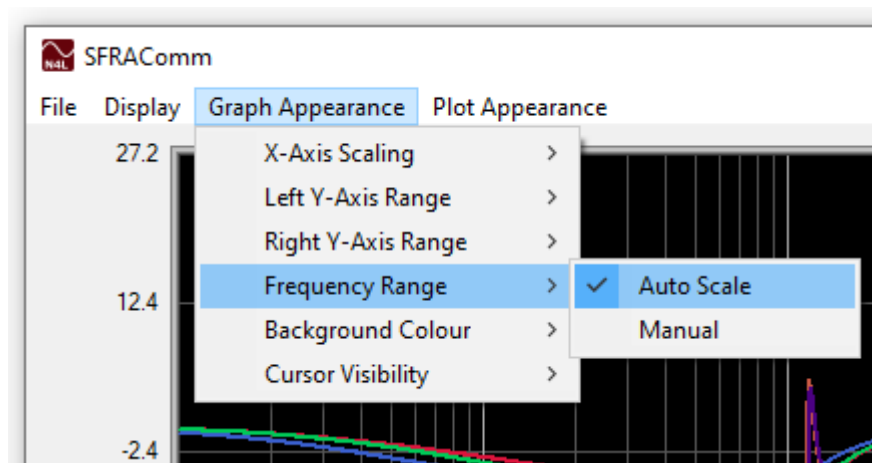
Graph Appearance > Right Y-Axis Range



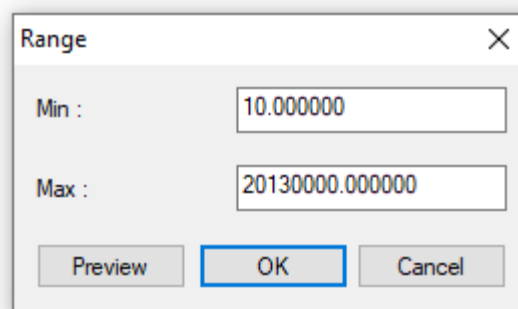
Auto Scale: The axis scale is adjusted to display the full shape of the waveforms in the software window.

Manual: The window below appears allowing the user to select the maximum and minimum scale values for the Y-axis. The waveforms are then scaled between these limits. The preview button allows the user to view how the waveforms will look if the settings are selected.

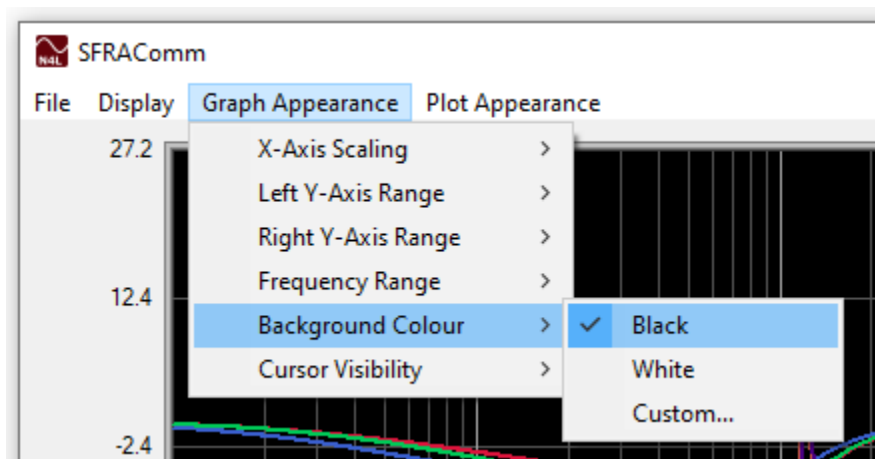
Graph Appearance > Frequency Range:



There are 2 options, Auto Scale and Manual which allows the user to rescale the waveform to view it over a smaller frequency range.

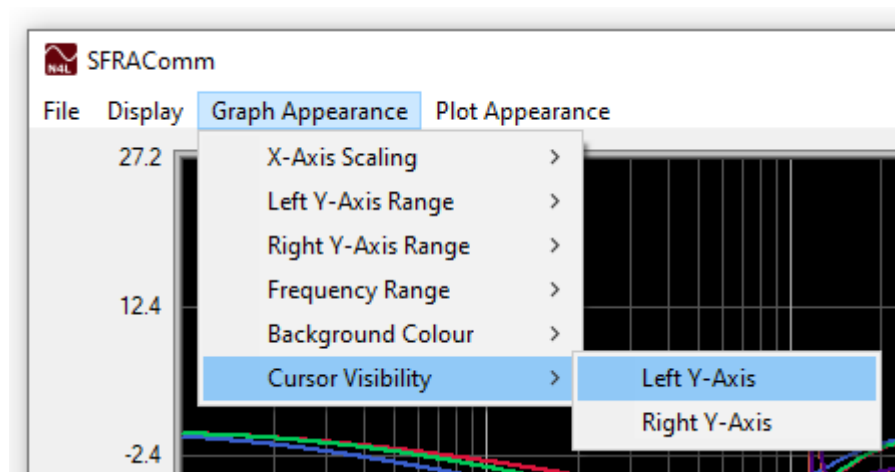


Graph Appearance > Background Colour:



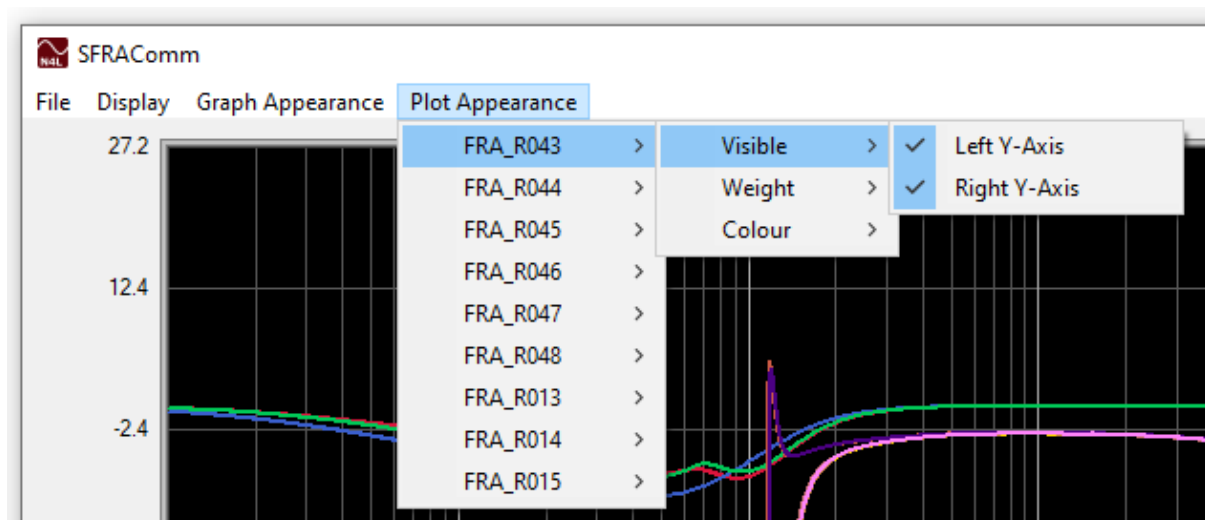
There are 3 options: Black, White, and custom. Custom allows the selection of any background colour using the colour pallet.

Graph Appearance > Cursor Visibility



These options enable / disable the cursors and markers for the left and right axis. They can be adjusted by moving the slider bars found below the graph area mentioned earlier.

Plot Appearance > Plot name > Visible

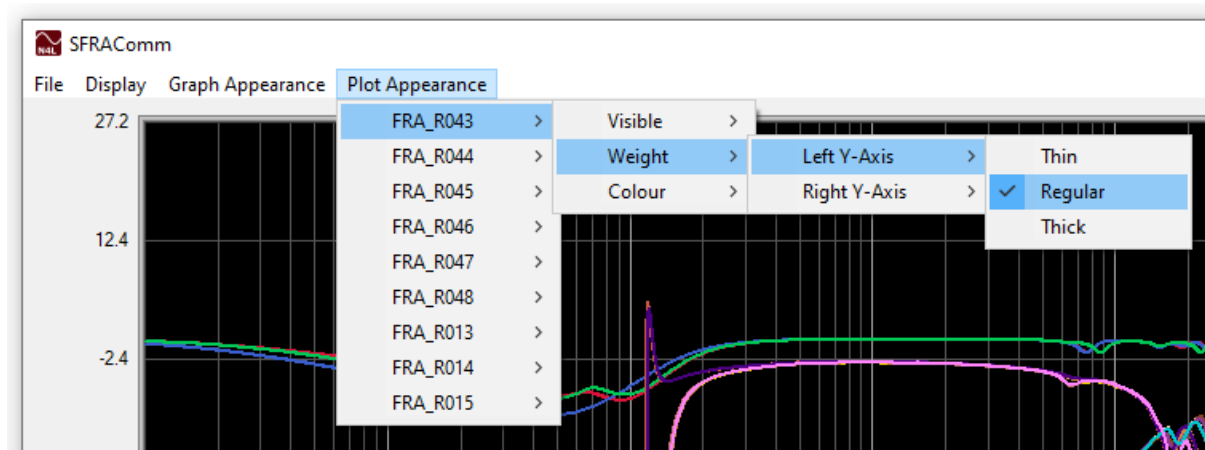


This option allows any or all of the selected gain (left axis) and phase (right axis) plots to be made invisible in the viewing window.

Each plot can be re-selected to make it visible again.

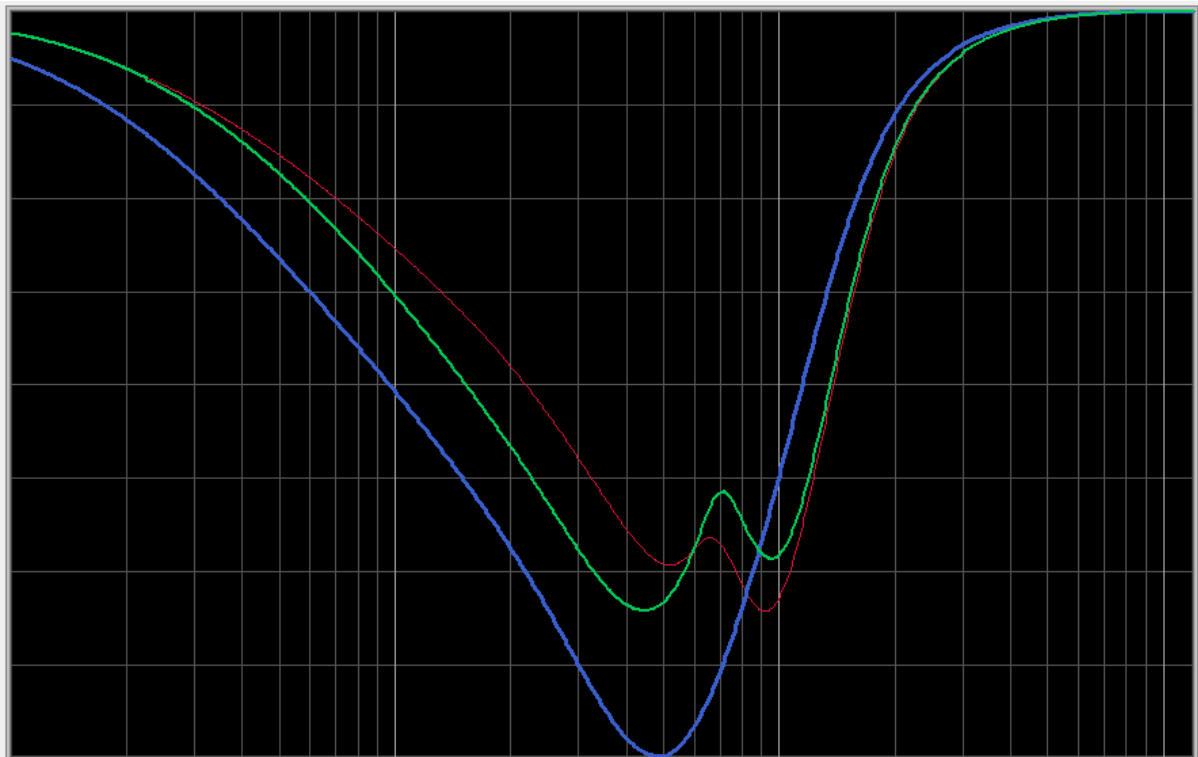
Plot Appearance > Plot name > Weight > Left Y-Axis

Plot Appearance > Plot name > Weight > Right Y-Axis



The Weight (thickness) of the waveform image can be adjusted. There are 3 options: Thin, Medium, and Thick.

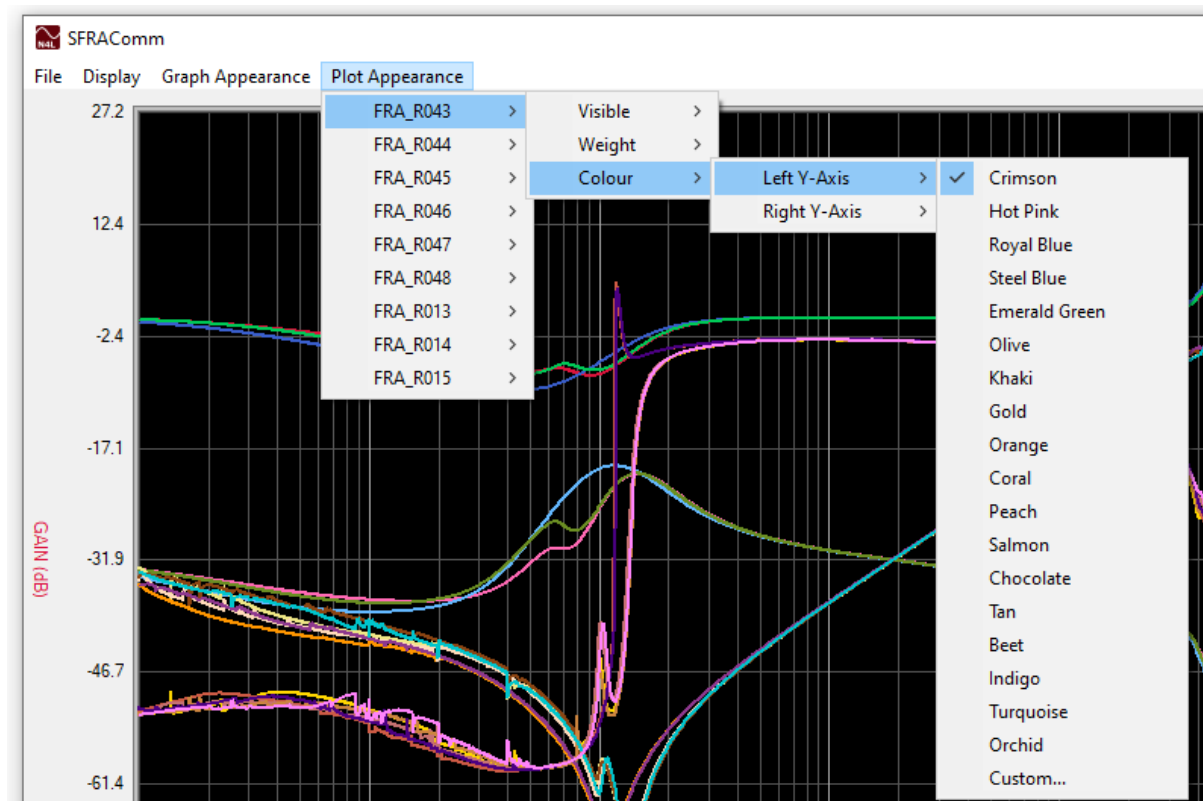
An example of each can be seen in the screenshot below:



Plot Appearance > Plot name > Colour > Left Y-axis

Plot Appearance > Plot name > Colour > Right Y-axis

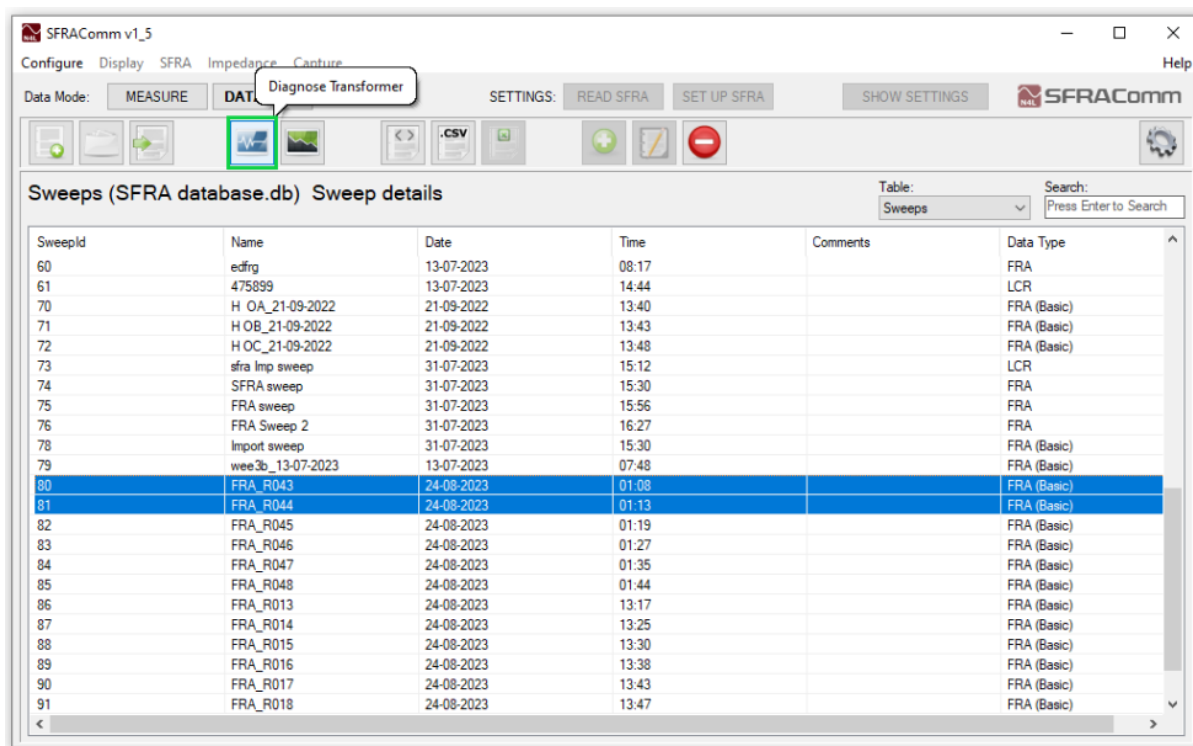
The colour of each of the Left Y-axis and Right Y-axis plots can be adjusted from the list of 18 colours listed in the screenshot below:



There is also the option for the User to customize a colour of their own choice using the colour palette.

Diagnose Transformer

This option uses frequency response analysis to test for deformation of transformer windings. Refer to Standard DL/T 911-2016 for further details.



Select any two sweeps from the database and the click on the **Diagnose Transformer** button.

The software assesses the sweep data, Table A.1 in the standard is used to determine the level of deformation that is present.

Table A.1: relation of Correlation factor and deformation extent of transformer winding (for reference)

Winding deformation extent	Correlation factor R
Severe deformation	$RLF < 0.6$
Obvious deformation	$1.0 > RLF \geq 0.6$ or $RMF < 0.6$
Gentle deformation	$2.0 > RLF \geq 1.0$ or $0.6 \leq RMF < 1.0$
Normal winding	$RLF \geq 2.0$, $RMF \geq 1.0$ and $RHF \geq 0.6$
Note:	
RLF refers to the correlation factor of the curve at low-frequency stage (1kHz ~100kHz)	
RMF refers to the correlation factor of the curve at medium-frequency stage (100kHz ~600kHz)	
RHF refers to the correlation factor of the curve at high-frequency stage (600kHz ~1000kHz)	

After analysing the transformer data, a new window opens displaying the selected sweeps.

The results of the diagnosis test are displayed below the waveforms:

PASS – Normal winding.

Warning – Gentle deformation.

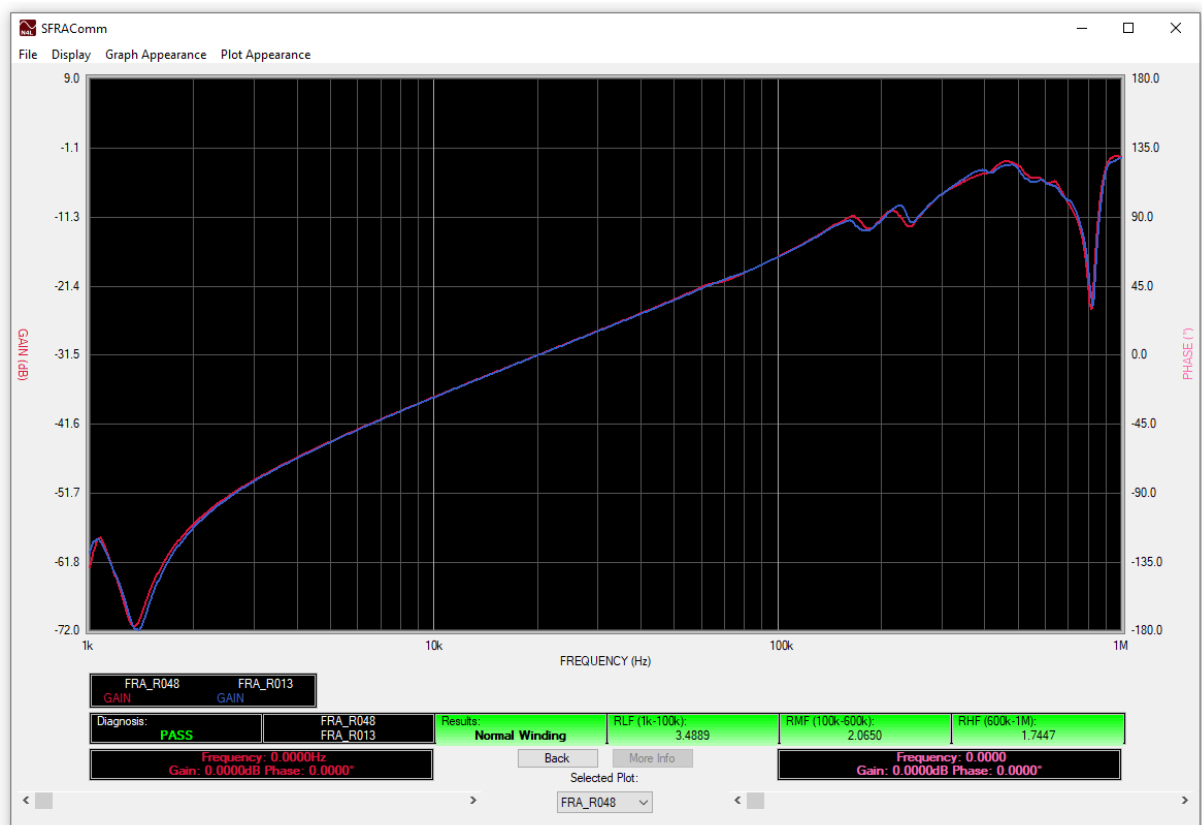
FAIL – Obvious Deformation.

FAIL – Severe Deformation.

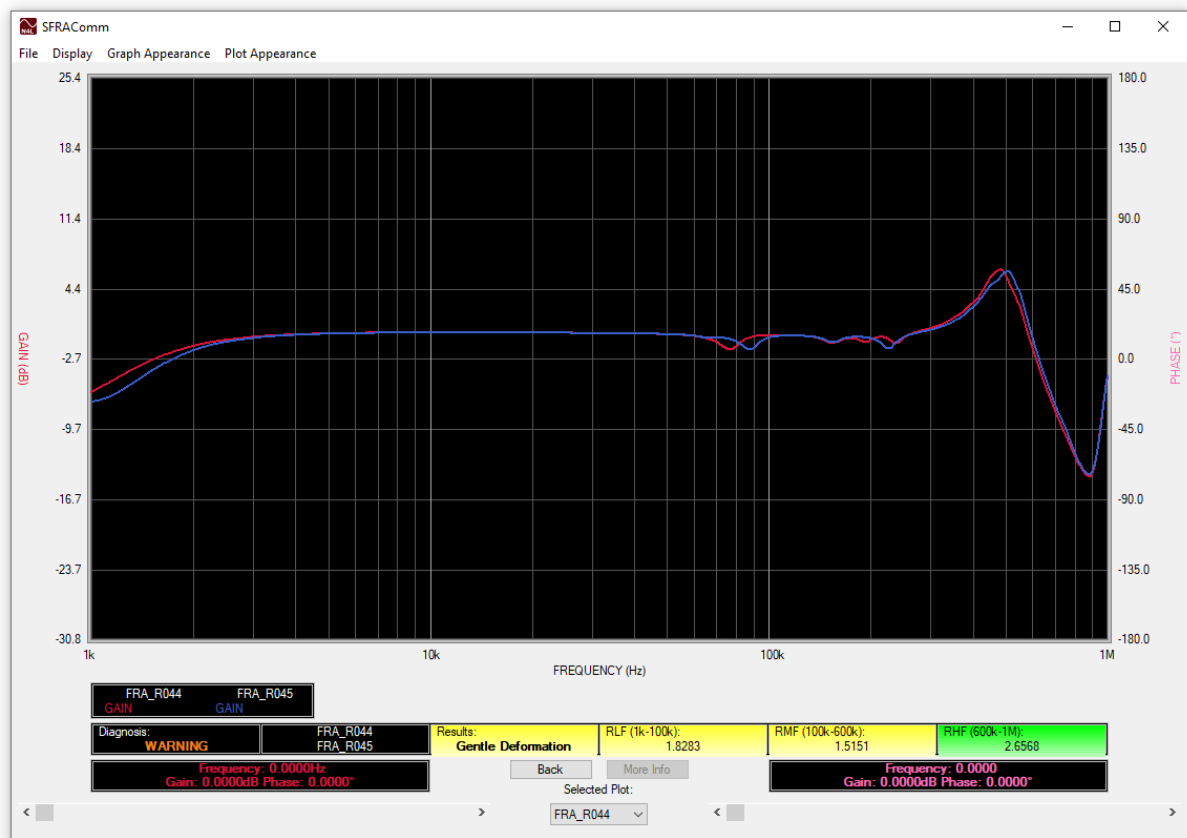
The results for R_{LF} , R_{MF} and R_{HF} are also displayed along with the pass / fail information for each of them.

The axis can be rescaled, and the waveform colours can be adjusted etc as described earlier in this document.

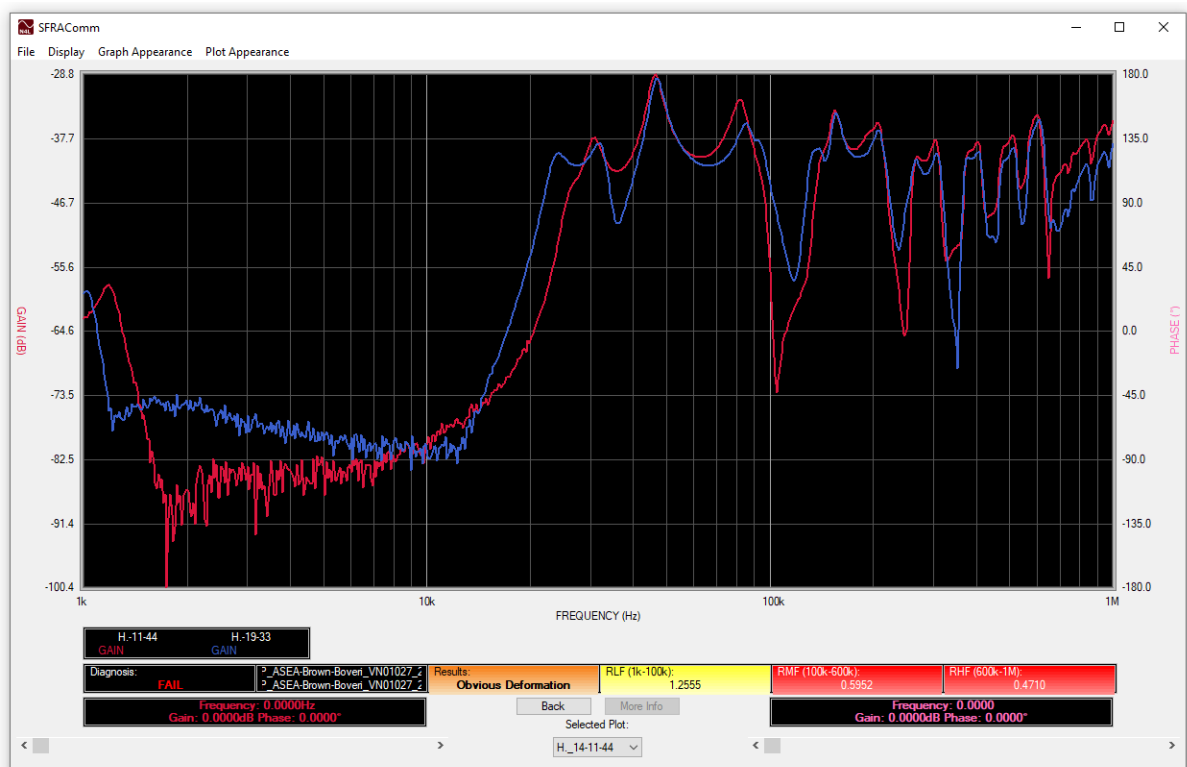
Pass – Normal Winding Example:



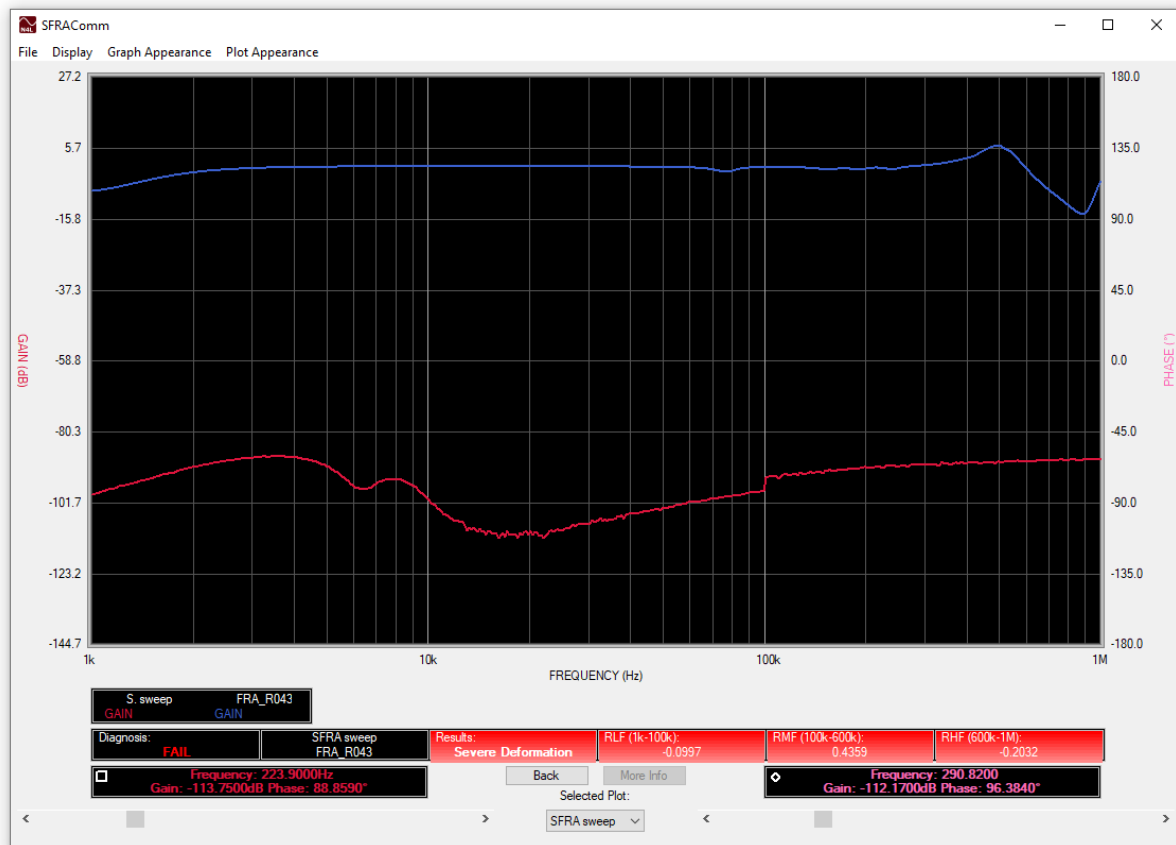
WARNING - Gentle Deformation example:



FAIL - Obvious Deformation example:



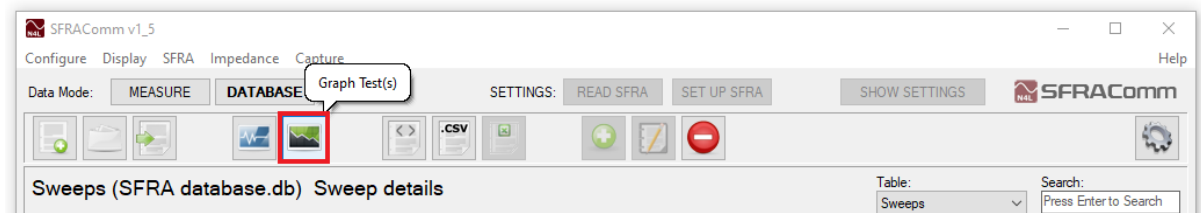
FAIL - Severe Deformation example:



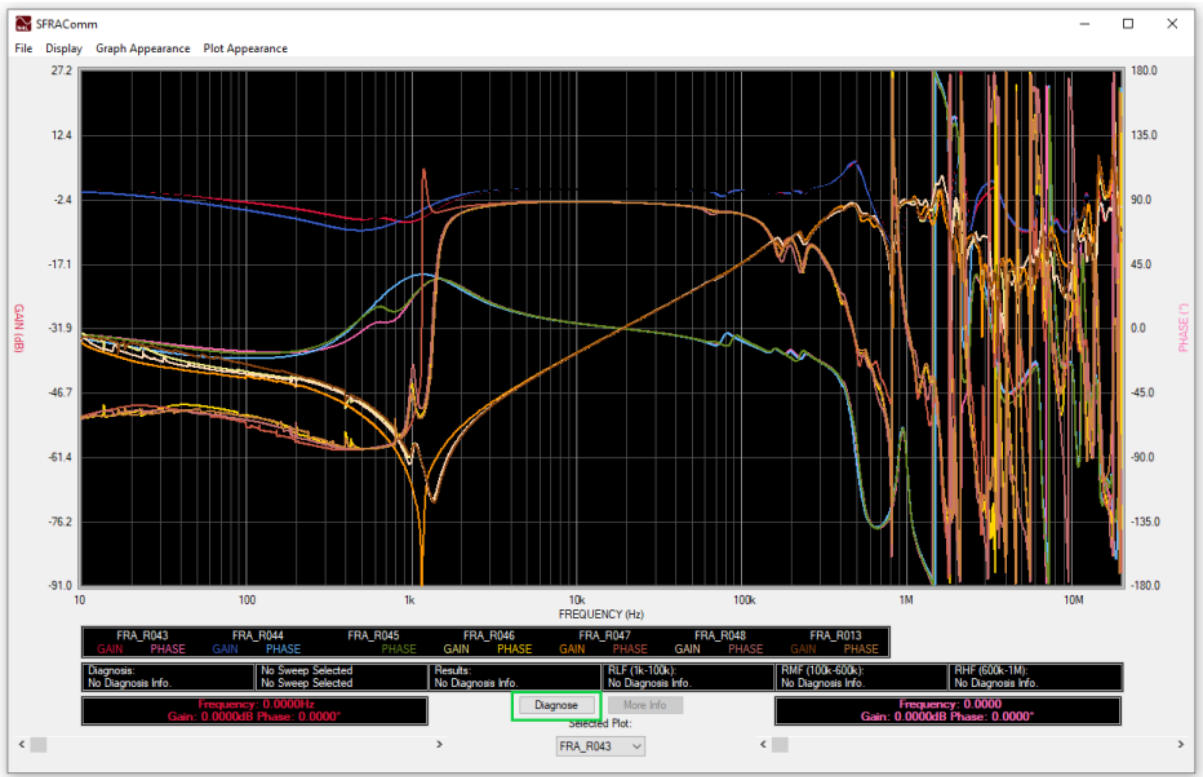
Method 2:

The above method only allows the diagnosis of any two sweeps saved on the database.

Method 2 uses the **Graph test** button to graph up to 9 sweeps.



The graph window will be displayed featuring all the selected sweeps. Below the graphed sweeps can be found a **Diagnose** button.



Click on the **Diagnose** button.

The diagnosis selection window appears:

The screenshot shows the 'Select sweeps for diagnosis' dialog box. It has a title bar with a close button (X). The dialog contains two input fields: 'Fingerprint sweep:' and 'Sweep to diagnose:'. The 'Fingerprint sweep' field is empty. The 'Sweep to diagnose' field is empty. At the bottom right, there are 'OK' and 'Cancel' buttons.

Click on the Fingerprint sweep box to select the reference sweep.

The table of selected sweeps will appear:

Select from Table

Table: Sweeps Search:

SweepId	Name	Date	Time	Comments	Data Type
80	FRA_R043	24-08-2023	01:08		FRA (Basic)
81	FRA_R044	24-08-2023	01:13		FRA (Basic)
82	FRA_R045	24-08-2023	01:19		FRA (Basic)
83	FRA_R046	24-08-2023	01:27		FRA (Basic)
84	FRA_R047	24-08-2023	01:35		FRA (Basic)
85	FRA_R048	24-08-2023	01:44		FRA (Basic)
86	FRA_R013	24-08-2023	13:17		FRA (Basic)
87	FRA_R014	24-08-2023	13:25		FRA (Basic)
88	FRA_R015	24-08-2023	13:30		FRA (Basic)

< >

Ok Cancel

Select the required sweep from the table and press ok.

Select sweeps for diagnosis

Fingerprint sweep:

Sweep to diagnose:

OK Cancel

The selected fingerprint sweep is entered into the diagnosis selection window. Click on the Sweep to diagnose box and repeat the above process to select the sweep to be diagnosed with the fingerprint sweep:

Select sweeps for diagnosis

Fingerprint sweep: FRA_R043 24-08-2023 01:08

Sweep to diagnose: FRA_R015 24-08-2023 13:30

OK

Cancel

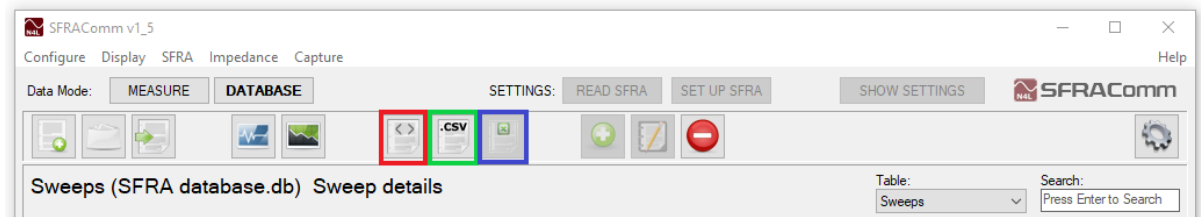
Once both sweeps have been selected click **OK** to perform the diagnosis.

The sweeps will be diagnosed using the same method as option 1. The screen will be updated to just display the selected waveforms with the diagnosis results displayed below the graphs:



The **back** button can be used to return to the main screen and select alternative sweeps from the selection to diagnose.

There are 3 export options:



These are:

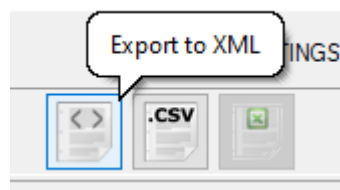
Export to **XML**

Export to **CSV**

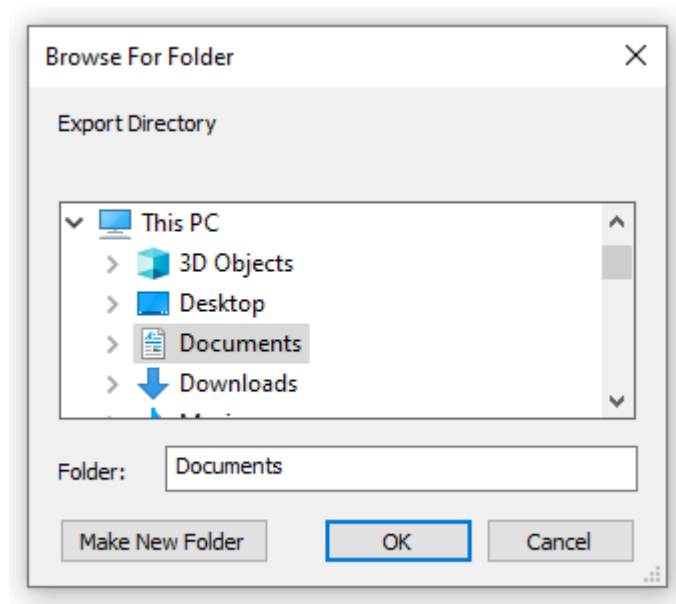
Export to **Excel**

Using the **XML** Export option.

Click on the **XML** icon:

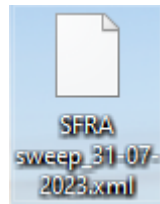


The Brower search window appears:



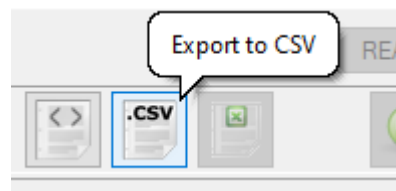
Select desktop or a folder where the file is to be saved.

The **XML** file will be saved to the selected folder or displayed on the desktop.

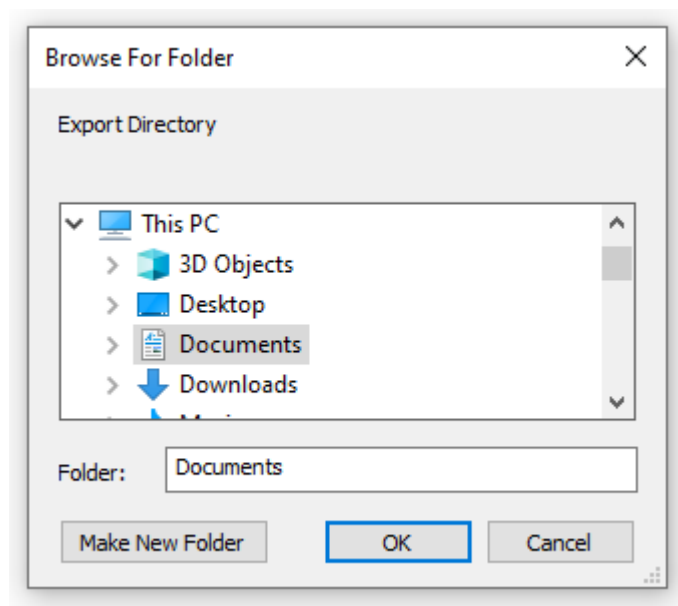


Using the export to CSV option.

Click on the **CSV** icon:

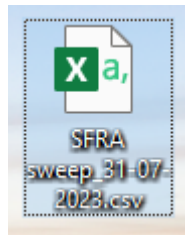


The Brower search window appears:



Select desktop or a folder where the file is to be saved.

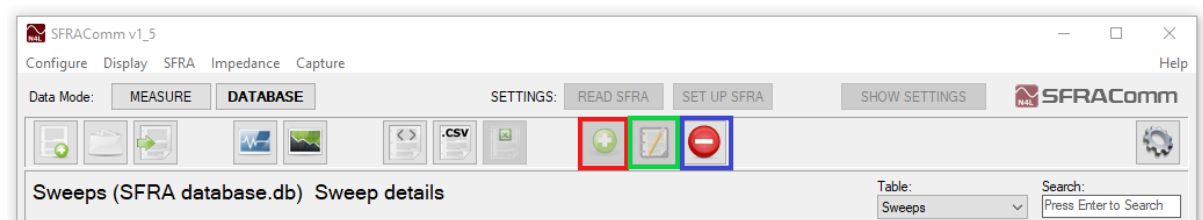
The **CSV** file will be saved to the selected folder or displayed on the desktop.



Export to Excel option.

This option is not available for selection at present.

There are 3 database editing options:



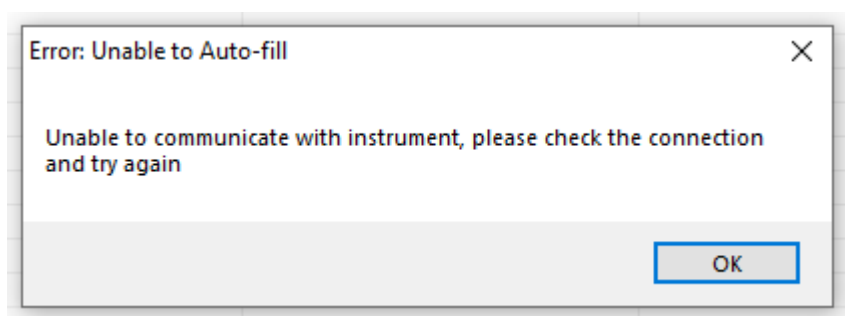
These are:

Add to Table.

Edit Row.

Delete from Table.

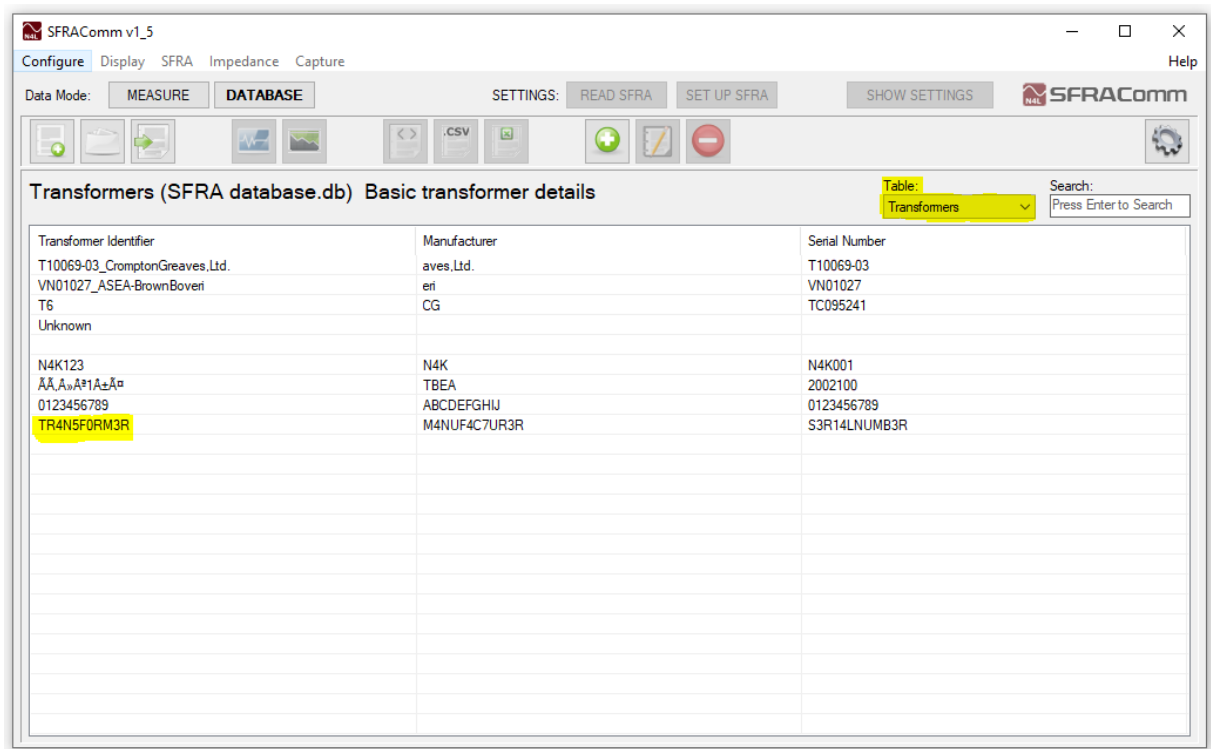
The software must be connected to the instrument to use the **Edit Row** and **Delete from Table** options. If not, the following warning message will be displayed:



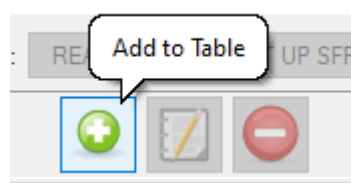
Add to Table.

This option is enabled when the Table viewing option is set to Transformers, Measurement Setups or Measurement Equipment.

The example below will add a new transformer to the table:



Click on the "Add to Table" button:



The Add/Edit Transformer window will appear.

The screenshot shows a dialog box titled "Add/Edit Transformer" with a close button (X) in the top right corner. The main heading inside is "Add Transformer". Below this is a section titled "Transformer Details" which contains three input fields:

- Transformer Identifier: * Unique Transformer Identifier
- Transformer Manufacturer: * Transformer's Manufacturer
- Transformer Serial No.: * Transformer's Serial Number

At the bottom of the dialog, there are two buttons: "Cancel" on the left and "Add" on the right. The "Add" button is highlighted with a blue border.

Enter the transformer details as described earlier:

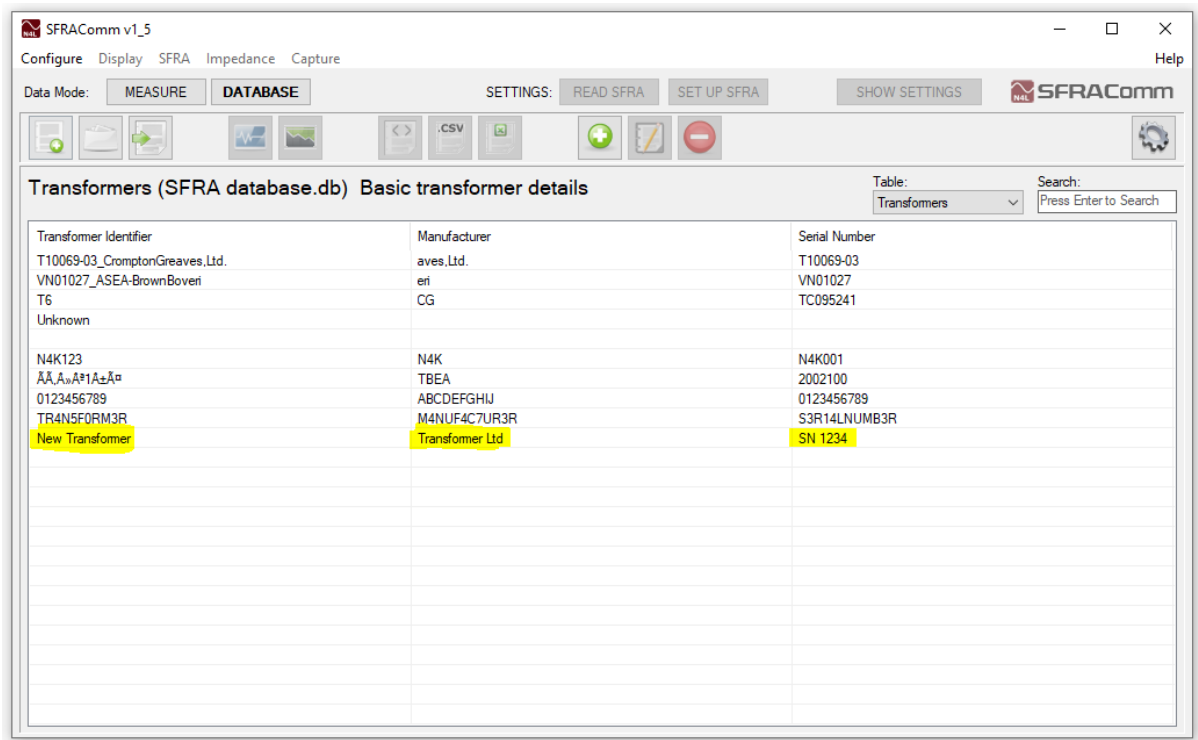
The screenshot shows the same "Add/Edit Transformer" dialog box, but now the input fields are filled with data:

- Transformer Identifier: New Transformer
- Transformer Manufacturer: Transformer Ltd
- Transformer Serial No.: SN 1234

Below the input fields, there is a green progress bar and the text "OK". At the bottom, the "Add" button is still highlighted with a blue border.

Click on Add to add the transformer to the database.

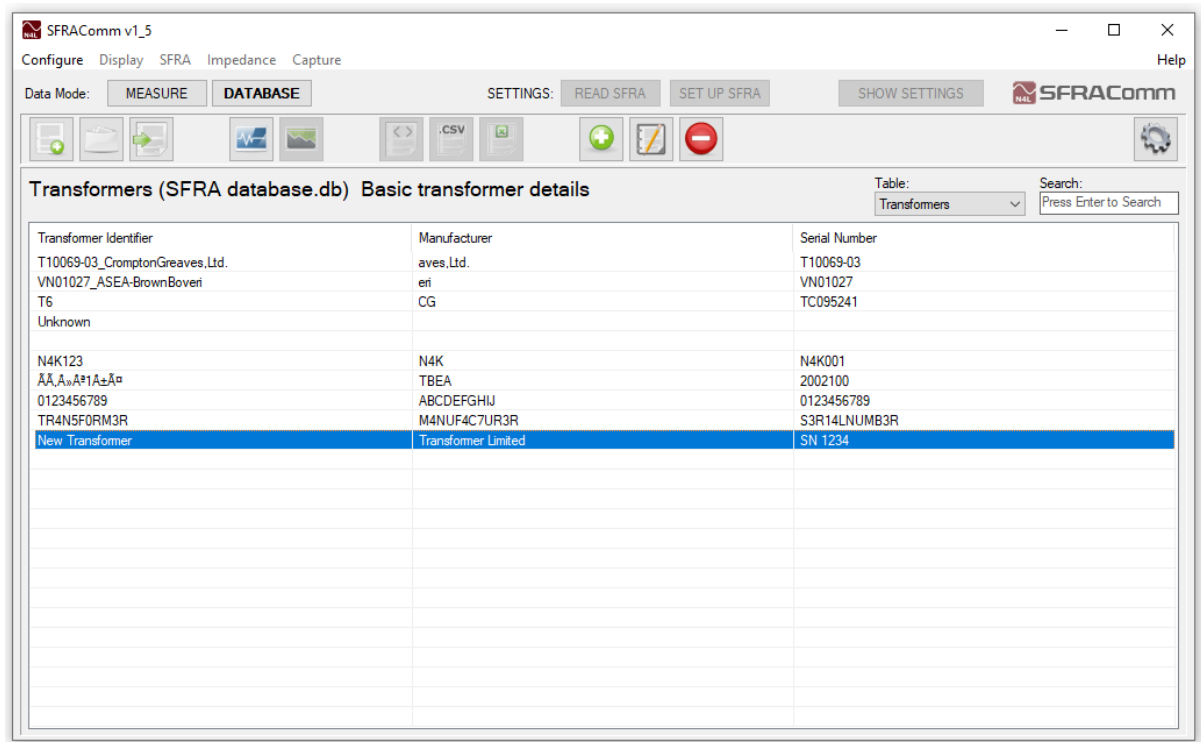
The software window is updated to include the new transformer:

[Edit Row](#)

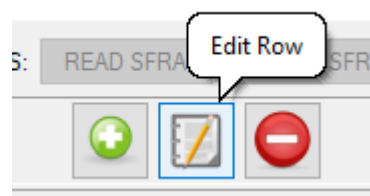
This option is enabled when the Table viewing option is set to Transformers, Measurement Setups, Measurement Equipment or Sweep.

The following example demonstrates how to edit the details of a transformer displayed in the table:

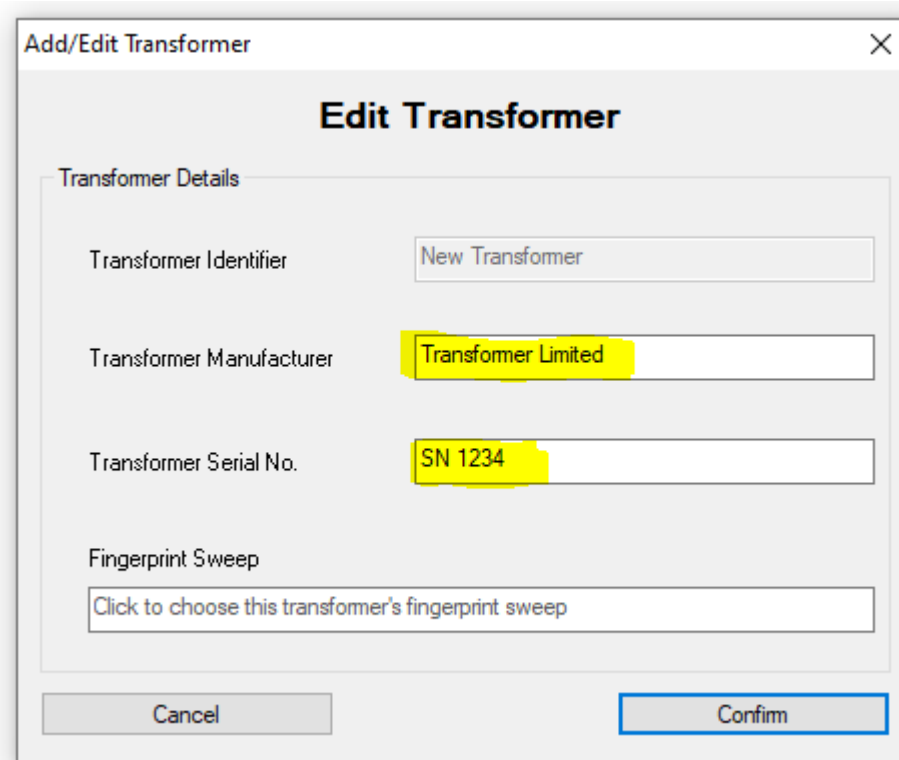
Highlight the transformer in the table to be updated:



Click on the **Edit Row** Button:



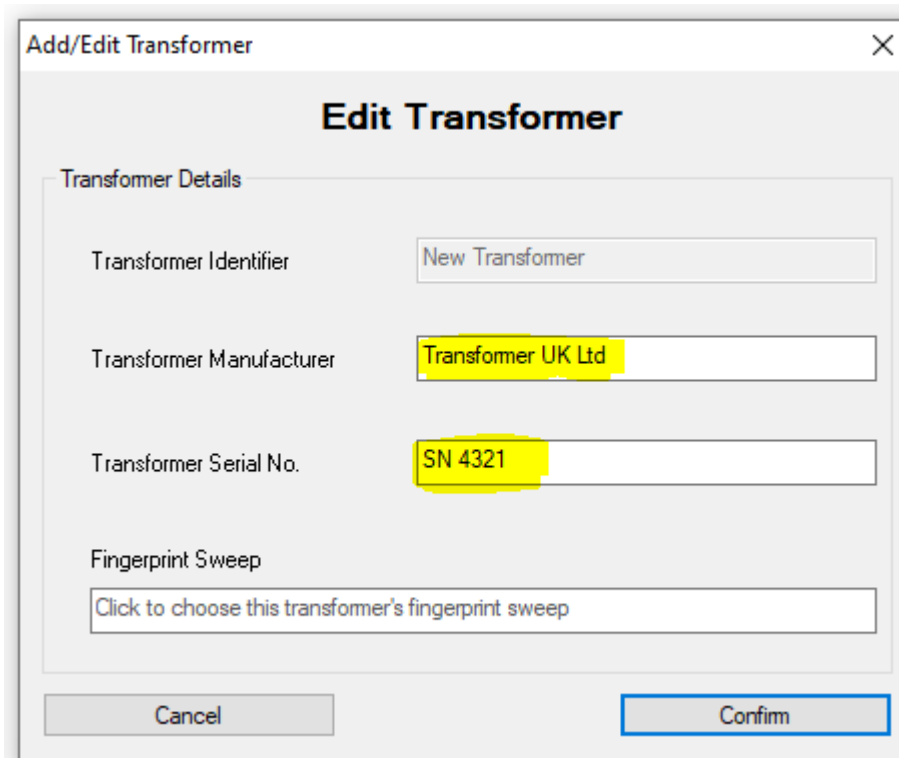
The Edit Transformer window opens displaying the same data shown in the table.



The screenshot shows a window titled "Add/Edit Transformer" with a close button (X) in the top right corner. The main heading is "Edit Transformer". Below it is a section titled "Transformer Details" which contains four input fields. The first field, "Transformer Identifier", contains the text "New Transformer". The second field, "Transformer Manufacturer", contains "Transformer Limited". The third field, "Transformer Serial No.", contains "SN 1234". The fourth field, "Fingerprint Sweep", contains the text "Click to choose this transformer's fingerprint sweep". At the bottom of the window are two buttons: "Cancel" on the left and "Confirm" on the right.

Field	Value
Transformer Identifier	New Transformer
Transformer Manufacturer	Transformer Limited
Transformer Serial No.	SN 1234
Fingerprint Sweep	Click to choose this transformer's fingerprint sweep

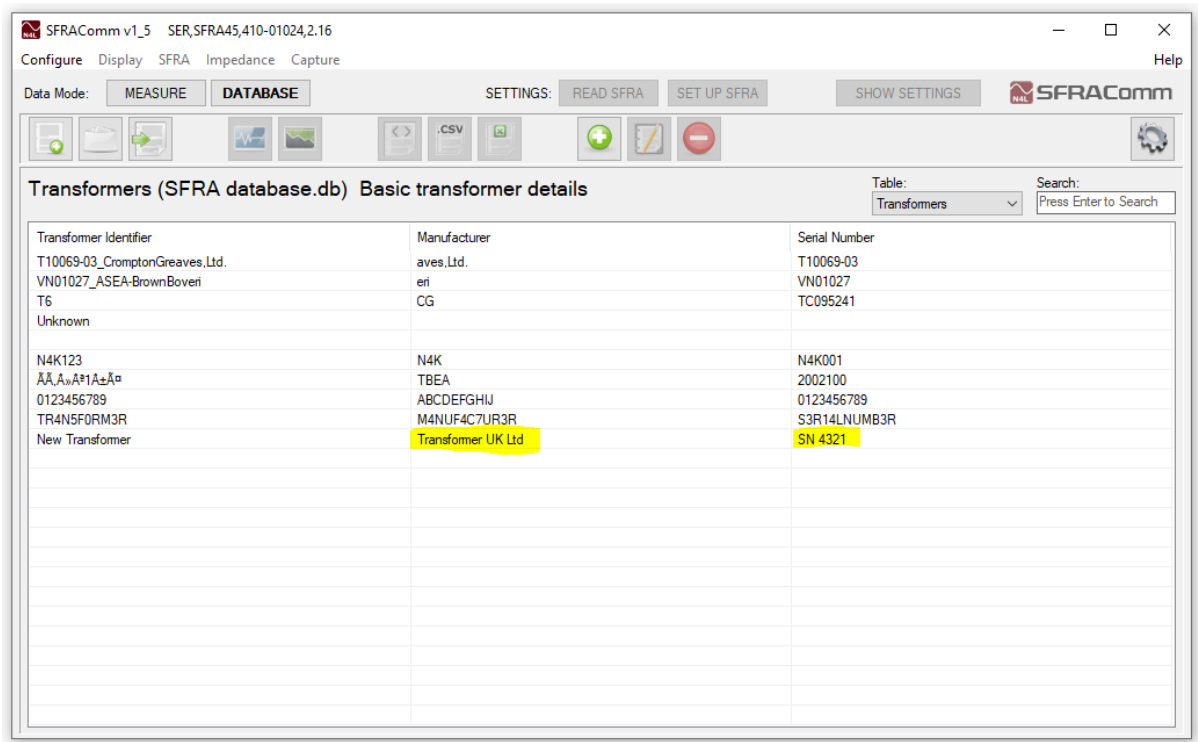
Enter the new details in the window and click the confirm button:



This screenshot shows the same "Edit Transformer" window as the previous one, but with updated data. The "Transformer Identifier" field remains "New Transformer". The "Transformer Manufacturer" field now contains "Transformer UK Ltd". The "Transformer Serial No." field now contains "SN 4321". The "Fingerprint Sweep" field remains "Click to choose this transformer's fingerprint sweep". The "Cancel" and "Confirm" buttons are still at the bottom.

Field	Value
Transformer Identifier	New Transformer
Transformer Manufacturer	Transformer UK Ltd
Transformer Serial No.	SN 4321
Fingerprint Sweep	Click to choose this transformer's fingerprint sweep

The table will be updated with the new details:

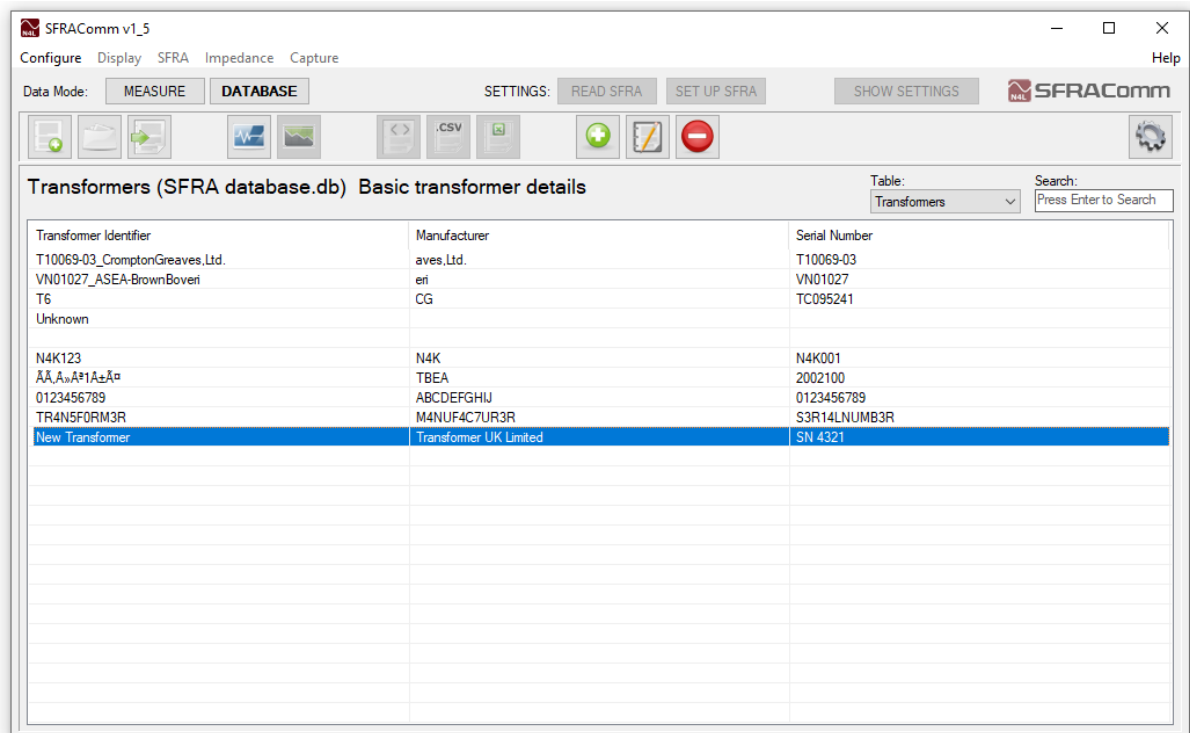


Delete from Table

This option is enabled when the Table viewing option is set to Transformers, Measurement Setups, Measurement Equipment or Sweep.

The following example demonstrates how to delete the details of a transformer displayed in the table:

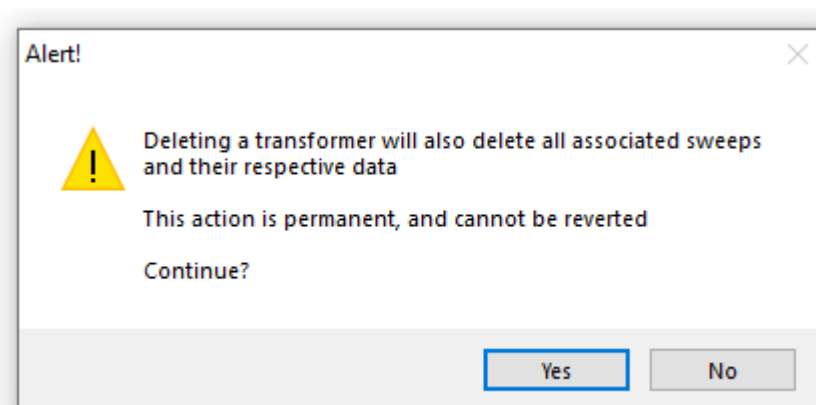
Highlight the transformer to be deleted from the table:



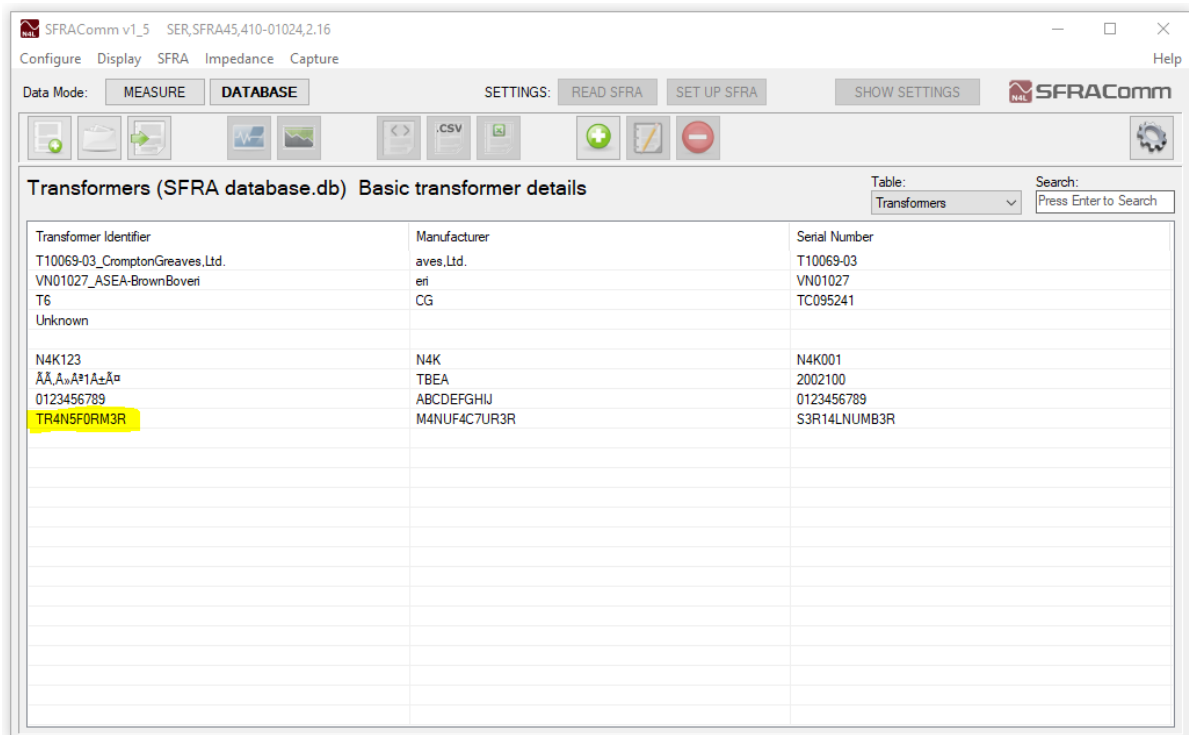
Click on the **Delete from table** button:



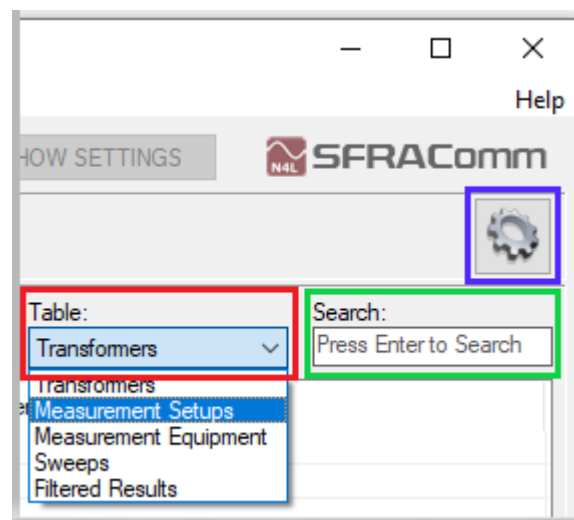
message will appear to ensure you want to permanently delete the details from the table, click the YES button to continue:



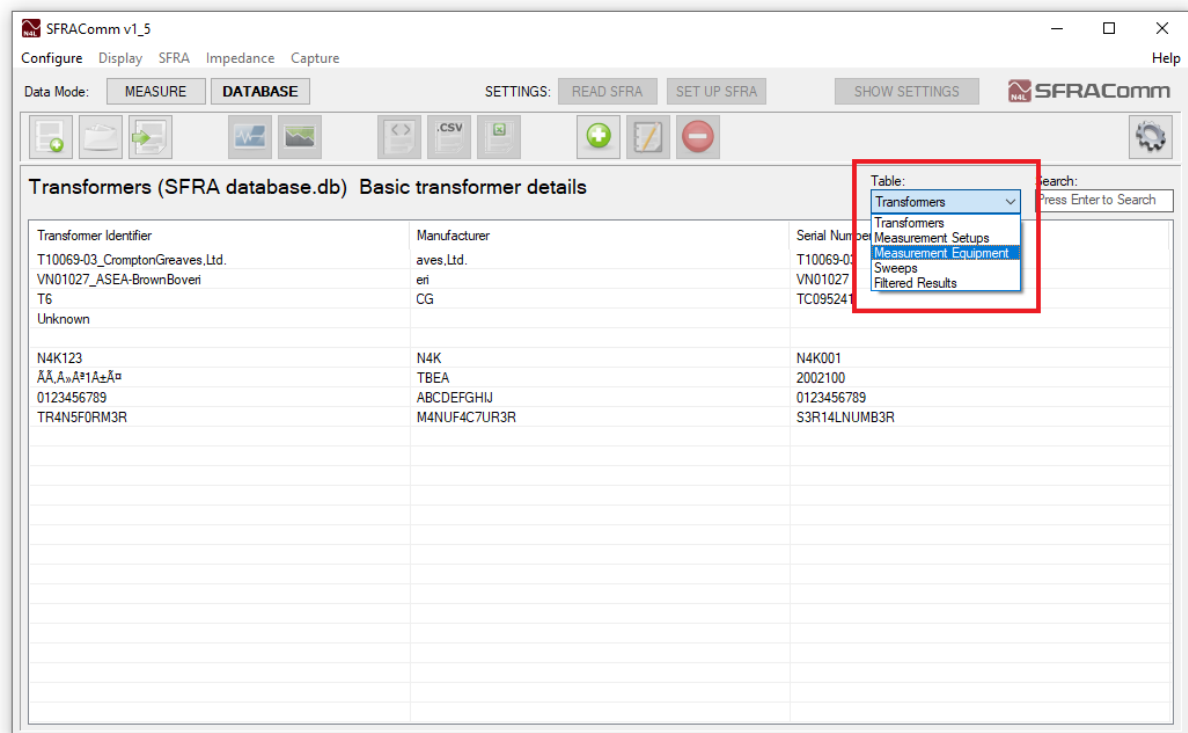
The transformer details will be removed from the table:



Other Settings:



Table



There are 5 options of what is displayed in table viewing mode in the software, these are:

Transformers

Measurement Setups

Measurement Equipment

Sweeps

Filtered Results

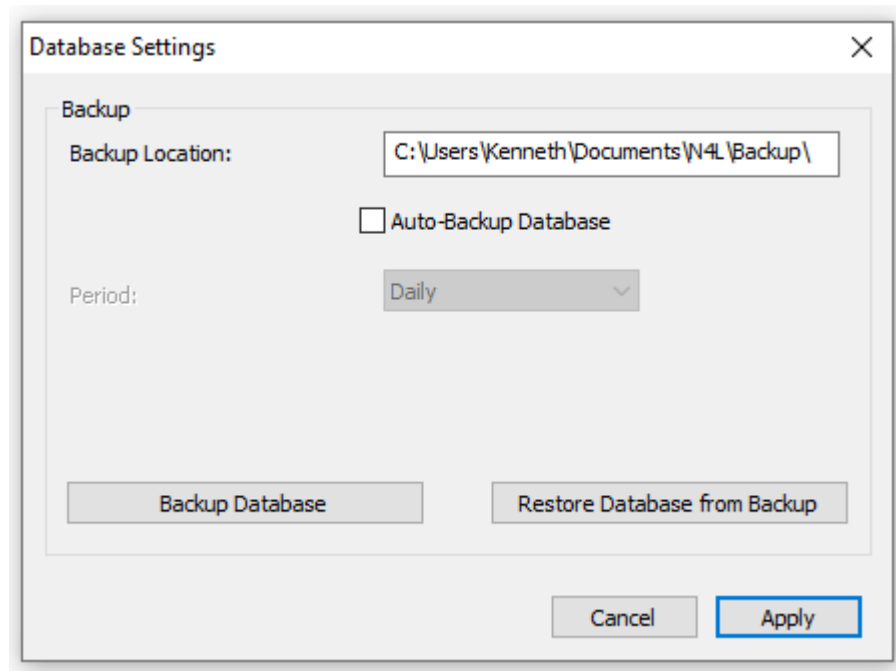
Search

This button allows a search of whichever **Table** is selected using and Table button and displayed in the software.

Settings



Clicking on **Settings** displays the Database Settings Window.

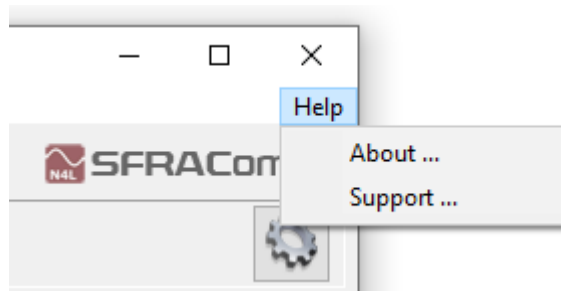


The database can be backed up to a location of the Users choice.

There are the options to Auto-Backup the database of manually perform a backup as and when required.

It is also possible to restore the database from the backup location.

The Help Button



There are 2 options:

About

Support

Selecting About:

This displays the About window which details the version number of the release and the date it was released.



Selecting Support:

For support information please go to the new N4L Website.