RFSpecTest User Manual

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Overview

RFSpecTest is a software suite that was developed using National Instrument's LabVIEW. It may be used to automate the testing of Supported RF and Microwave components as well as sub assemblies. RFSpecTest allows data to be automatically extracted in a fraction of the time that it would take to do so manually. The tester can set up the desired frequency points and input the power level. RFSpecTest includes a calibration routine that provides data accuracy to 0.1 dB. The eight included test routines work across a variety of frequency conversions. This allows data to be extract from mixers and conversion chipsets.

Compatible with most RF components
- Amplifiers
- RF Switches
- Mixers
- RF Receiver Integrated Circuits with Down Conversions
- RF Transmitter Integrated Circuits with Up Conversions
- Variable Attenuators
- Filters
- Isolators
- Couplers
- Power Dividers
- Higher level RF modules and subsystems

Overview Cont.

Test RF components quickly with any of the eight included RF Tests in manual or automated mode.
- Gain Test
- Gain Compression Test
- Isolation, Relative Attenuation Test
- IMD Test
- Leakage Test
- Amplitude / Frequency Measurement Test
- Return Loss / VSWR Test
- Retrieve Trace Data
- Other Tests will be Added Here

Test Configurations
- 3 Signal Generators and Spectrum Analyzer: For Testing Two Tone Measurements though a frequency conversion
- 2 Signal Generators and Spectrum Analyzer: For Testing Two Tone Measurements without a frequency conversion, or testing through a frequency conversion without Two Tone Measurements
- 1 Signal Generator and Spectrum Analyzer: For Testing Single Tone Measurements without a frequency conversion

Highly accurate calibration routine
- Input Calibration from each signal source to the Device Under Test (DUT)
- Output Calibration from the DUT to your measurement source
- Uses power meters for more accurate absolute power calibration
- Calibration accuracy to 0.1 db

Works for up conversions, down conversions, and same input/output frequencies.

Save data electronically to retrieve at a later time.

Easy to use graphical interfaces with network analyzer style sweep across band.

Context-sensitive help for all controls.

Trial Version Limitations and System Requirements

- Trial Version
  - The trial version of RFSpecTest has all the features of the full version with the following limitations:
    - Cannot acquire data from test equipment.
    - All other features work only with simulated data.
  - The full version is available for purchase for $1995 (US Dollars). Buy now to unlock all program features.

- System Requirements
  - RFSpecTest was designed to operate in the Windows NT, 2000, and XP environment.
  - A computer with a GPIB card is required to take full advantage of RFSpecTest's capabilities. The trial version will work with or without a GPIB card.

Thank you for choosing RF Spectral Test Executive!

__ Current Version 1.5.1 __

__ Changes in Version 1.5.1 __

> The calculation of IMD intercept points was fixed when loading an IMD test file in automated or script mode. The greater of the two sidebands is used when calculating intercept points.

> Small cosmetic changes to the Gain Test panel were made.

__ Changes in Version 1.5 __

> A Return Loss Test Panel has been added.

> A Retrieve Trace Test Panel has been added.

> Capability to set pulse and trigger parameters for signal generators and spectrum analyzers was added.

> Improved the scripting capability, including: The capability to call a user defined executable file, the capability to add additional calibration files, and the option to leave the RF signal generators on at the end of the RFSpecTest call for subsequent measurements.

__ Changes in Version 1.3 __

Enhanced the registration process.

Added support for step sizes less than 1 and greater than 0.1.

__ Changes in Version 1.2 __

Enhanced the registration process.

__ Changes in Version 1.1 __

Enhanced the registration process.

RFSpecTest is a software suite that controls test equipment to perform computer automated testing of RF and Microwave components as well as sub assemblies. The software was developed using National Instruments LabVIEW. RFSpecTest allows technicians and engineers to take test data in a fraction of the time it would take to do by hand. The tester can set up the frequency points, input power levels, and other test parameters. The included calibration routine provides measurement accuracies within tenths of a dB. The test routines work across a variety of frequency conversions, allowing the user to take data on mixers, and RF frequency conversion chip sets.

As always, we appreciate your feedback. We continually strive to improve our software packages based on your suggestions.

We would like to thank you for choosing our product and for your continued support.

Enjoy RF Spec Test!

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Installing RFSpecTest

- To check out RFSpecTest for yourself, visit the R.A. Wood software download page at:
  http://rawood.com/software_products/download_software_page.html#rfspectest_anchor

- Select Download Now! next to the RFSpecTest _ 1 _ 5 _ Installer.exe

- Click Save File to save the installer.

- After the installer download is complete, double click on the RFSpecTest Installer icon to start the installation process.

- Work through the user prompts to install RFSpecTest.
  - Select a folder to save the RFSpecTest setup files to and select OK.
  - Select Next> on the Installation Wizard
  - Browse to select a location to save the RFSpecTest program files to, and Select Next>.
  - Select Next> again to continue with the installation process.
  - Select Finish to exit and complete the installation.

- Once the installation is complete, go to Start>>All Programs>> RFSpecTest to load the program.

- An Electronic End User License Agreement will appear. Read the agreement and select Agree to continue.

- The Change Log will appear next. This document describes the software changes and improvements by version. Click Continue to start the program.

- On the start up screen, create a user name. This name will only be used for registration purposes.
  - Select Register to pay for the full version of RFSpecTest. You may pay through paypal or contact us with other arrangements.
  - Select Continue to use the trial version. Each time you open the trial version you will have the opportunity to register for the full version. In the trial version you are unable to change the frequency.

- Click Continue again to use the trial version of RFSpecTest or enter the Registration number and click Unlock Software to access the full version.

- For detailed screen shots of the installation process visit:
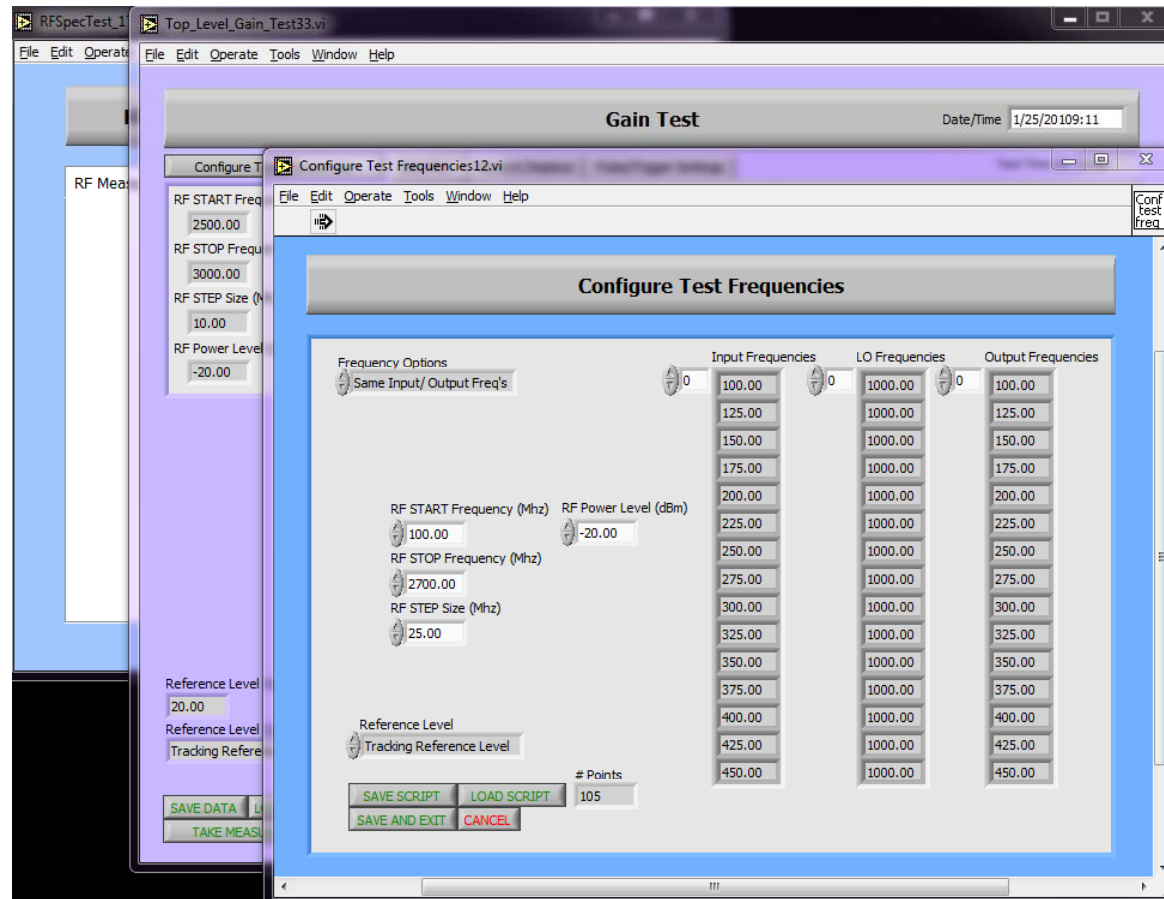 http://www.rawood.com/rfspectest/tiki-index.php?page=Downloading+and+Installing+the+Program

Automated Mode

RFSpecTest has two modes of operation: Manual and Automated. In automated mode, a script file controls the actions of the program. To create a script file to run automated tests go to the Example RFSpecTest Programming panel.

After a script file has been created, open the Multi Call RFSpecTest program. The default automated mode panel is displayed to the right.

In RFSpecTest, each RF Test and Utility is displayed in its own window or panel. Throughout the program operation, only the current panel is active (i.e. the panel that was last opened). Buttons and operations on other panels **will not be accessible** until the active panel is closed. For example, suppose the Configure Test Frequencies panel was opened from with in the Gain Test panel. In this case, the RFSpecTest - RF Spectral Measurement Toolkit, the Gain Test panel, and the Configure Test Frequencies panel would be open. Only the Configure Test Frequencies panel is active. To activate another panel, you must exit the current panel.

Supported Test Equipment

Test Equipment	Gain	Gain Compression	Isolation Relative Attenuation	IMD	Leakage	Amplitude Freq Measurement	Return Loss / VSWR	Retrieve Trace Data	Continuous Wave (CW)	Internal (Pulse Mod)	External (Pulse Mod)	Line (Trigger)	Video (Trigger)	External Pos Edge (Trigger)	External Neg Edge (Trigger)	Line (PM)	Video Pos Edge (PM)	Video Neg Edge (PM)	External Pos Edge (PM)	External Neg Edge (PM)
Signal Generators																				
HP 836xxa	X	X	X	X	X	X	X		X	X	X									
HP 836xxa Pulse	X	X	X	X	X	X	X		X											
HP 8671B	X	X	X	X	X	X	X		X											
HP 8648C	X	X	X	X	X	X	X		X											
HP 837xx	X	X	X	X	X	X	X		X											
HP 865xx	X	X	X	X	X	X	X		X											
HP 8673M	X	X	X	X	X	X	X		X											
Agilent E4423B	X	X	X	X	X	X	X		X											
Agilent E4423B Pulse	X	X	X	X	X	X	X		X	X	X									
Fluke 606x	X	X	X	X	X	X	X		X											
SG1DLL	X	X	X	X	X	X	X		X	X	X									
SG2DLL	X	X	X	X	X	X	X		X	X	X									
SG3DLL	X	X	X	X	X	X	X		X	X	X									
Spectrum Analyzers																				
NI 5660																				
HP 8566B/8593E	X	X	X	X	X	X	X		X											
Agilent E4443	X	X	X	X	X	X	X		X											
Agilent E4443 Ext Trig	X	X	X	X	X	X	X		X					X						
Agilent E4443 Pulse	X	X	X	X	X	X	X	X	X			X	X	X	X					
Agilent E4407	X	X	X	X	X	X	X	X	X											
Agilent E4407 Pulse	X	X	X	X	X	X	X	X	X			X	X	X	X					
SpectrumAnalyzerDLL	X	X	X	X	X	X	X	X	X			X	X	X	X					
Power Meters																				
HP 438A	X	X	X				X		X											
Boonton 4532	X	X	X				X		X											
Boonton 4400A	X	X	X				X		X											
Boonton 4400A Pulse	X	X	X				X		X							X	X	X	X	X
HP 436A	X	X	X				X		X											
Agilent 441x	X	X	X				X		X											
PowerMeterDLL	X	X	X				X		X							X	X	X	X	X

RFSpecTest – RF Spectral Measurement Toolkit

This is the main panel for RFSpecTest. This panel will appear after the Set Up Test Equipment window has been closed. From this panel, navigate through the program by selecting from two tabs:
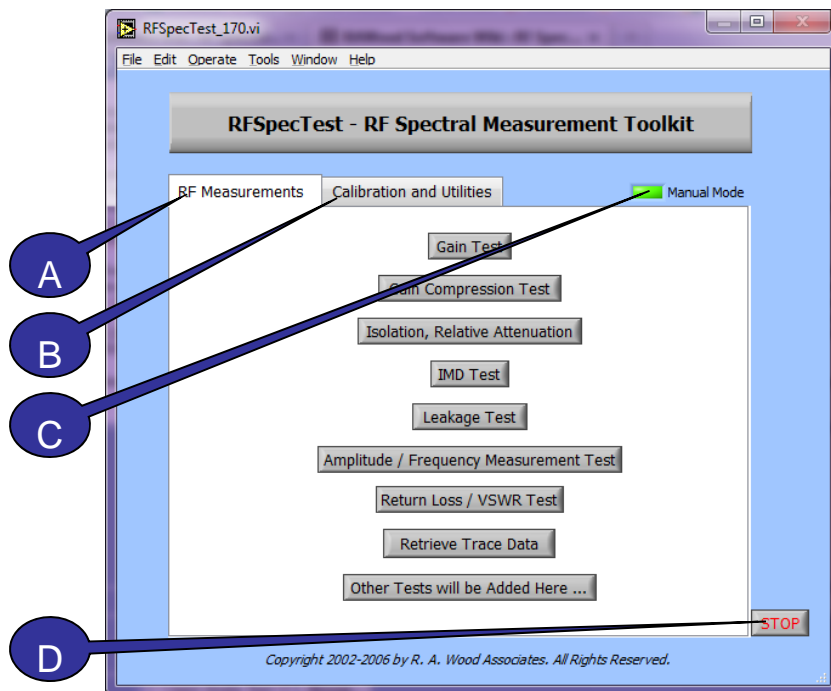
A. **RF Measurements** – Gives access to RFSpecTest's built in tests.
- Gain Test
- Gain Compression Test
- Isolation, Relative Attenuation Test
- IMD Test
- Leakage Test
- Amplitude / Frequency Measurement Test
- Return Loss / VSWR Test
- Retrieve Trace Data
- Other Tests will be Added Here

B. **Calibration and Utilities** – Select calibration or other options for testing accuracy.
- Run Calibration
- Set Up Test Equipment
- Set Active Calibration Files
- Set Up Power Sensor Head File
- Example RFSpecTest Programming
- Show RF Test Setup Diagram

C. RFSpecTest will run in **manual** or **automated mode**. In the manual mode, you open RFSpecTest as usual and setup the test equipment as desired to execute any of the RF Tests. While in manual mode a green light will appear on the RFSpecTest - RF Spectral Measurement Toolkit. In the automated mode, a script file is created to quickly and automatically run through the desired RF Tests.

D. To **exit** the program, select Stop in the lower right hand corner and then go to File>>Exit.

RF Measurements

This is the RF Measurements tab of the RFSpecTest-RF Spectral Measurement Toolkit.

Select from the following tests to proceed to the test environment. Once a test has been selected a new window will open. This window is now the active panel. All other open panels are not active. To activate another panel you must exit the current panel.
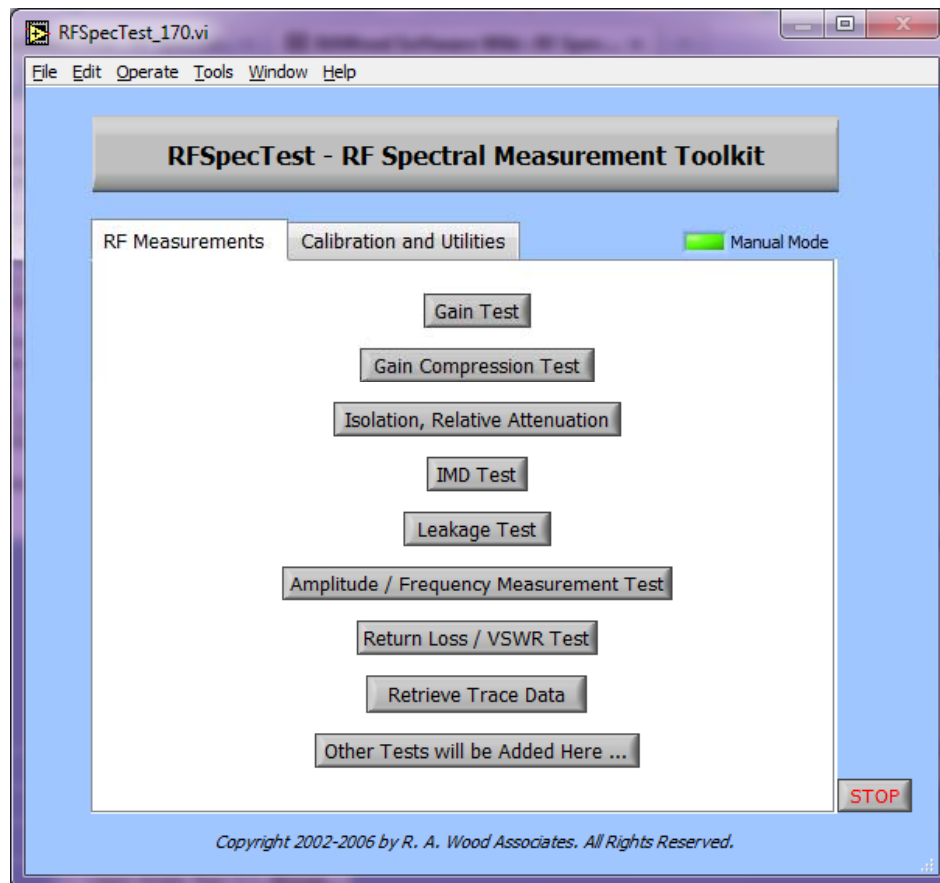
- Gain Test

- Gain Compression Test

- Isolation, Relative Attenuation Test

- IMD Test

- Leakage Test

- Amplitude / Frequency Measurement Test

- Return Loss / VSWR Test

- Retrieve Trace Data

- Other Tests will be Added Here

Test Panel Operations

Throughout RFSpecTest, all test panels are setup in a similar manner. See the next two pages for definitions of each function.
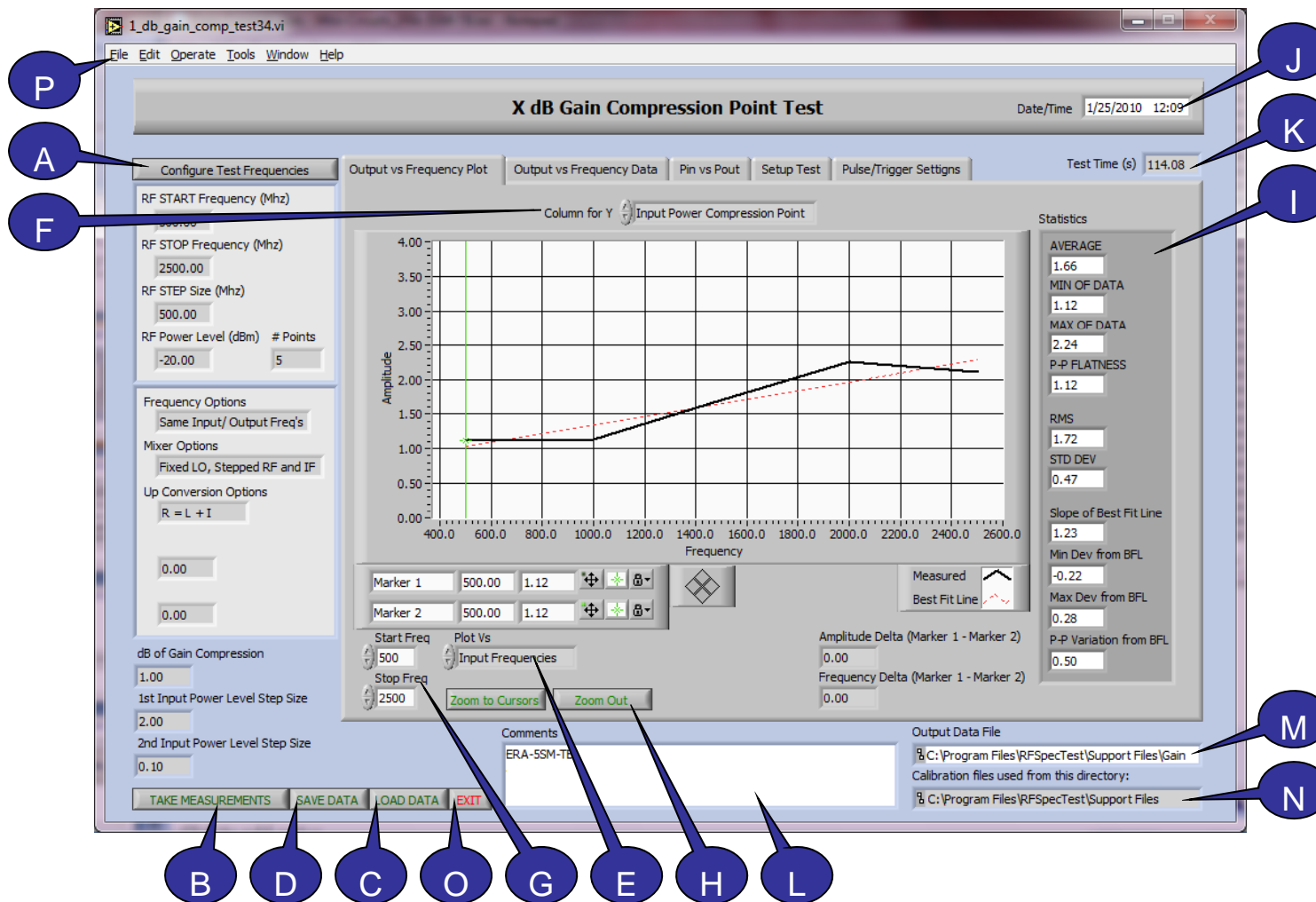
Test Panel Operations Cont.

A. **Configure Test Frequencies** – Before running a test it is important to set up the test frequencies. The frequency parameters on the test panel are simply a display. To change these parameters, click on the Configure Test Frequencies button.

B. **Take Measurements–** To extract data from the test equipment go to the Set Up Test Equipment panel. You must exit the current panel before opening the Set Up Test Equipment panel. On the Set Up Test Equipment panel, set the appropriate options for the equipment configuration and select Save and Exit. To assure testing accuracy, use the Run Calibration utility. Once the test equipment settings have been configured and the calibration is complete, return to the desired RF Test panel. On the test panel, set up the testing parameters (Start Frequency, Stop Frequency, Step Size, Power Level, Number of Points, and Pulse/Trigger Settings). Finally, after all parameters are set as desired, click on the Run Test button.

C. **Load Data** – The Data File is a tab delineated text file that contains a column for the each of the tables on the Numeric Displays tab. This file may be opened in RFSpecTest, Excel, Notepad, or Word Pad. To load data from an existing file simply click on the Load Data button.

D. **Save Data** – Click on the Save Data button to save the extracted data to a file.

E. **X Axis** - After data has been extracted or loaded into the test, the graphical display may be configured to view the results. Left click on the **X Axis** button to change the data that is displayed on the X Axis. A pop up menu with three choices will appear: Output Frequency, LO Frequency, and Input Frequency.

F. **Y Axis** – The Y Axis pull down menu allows you to select the data that will be plotted on the Y axis Vs the Frequency data on the X axis. Use the arrows next to the Y Axis field or click in the field box to select the desired data. This option is only available on the Gain Compression Test, the IMD Test, the Leakage Test, the Amplitude Frequency Measurement Test, and the Return Loss / VSWR Test.

G. **Graph Start Stop Frequencies –** The frequency range that is displayed on the graph is adjustable. To change the visible range, enter the desired start and stop frequencies in the respective fields. This frequency range will be used to calculate the statistical values. This frequency range does not, however, affect the range of data extracted from the Device Under Test. To change the test frequency range, go to Configure Test Frequencies.

H. **Zoom –** Click on the Zoom to Cursor button to enlarge the section of the graph between the Marker Lines. Click on the Zoom Out button to display all data between the graph start and stop frequencies.

Test Panel Operations Cont.

I. **Statistics** are calculated over the graph start stop frequencies.
- Average - arithmetic mean of the gain data across the frequency range
- Min OF Data - minimum gain value
- Max OF Data - maximum gain value
- P-P Flatness - peak to peak flatness
- RMS - root mean square
- STD Dev - standard deviation
- Slope of Best Fit Line
- Min Dev from BFL - minimum deviation from best fit line
- Max Dev from BFL - maximum deviation from best fit line
- P-P Variation from BFL -peak to peak variation from best fit line

J. **Date / Time** – Displays the real date and time.

K. **Test Time** – Duration of the test in seconds.

L. **Comments** – Enter text to document the test.

M. **Output File Path** – Displays the location of the loaded or saved data file.

N. **Calibration files used from this directory** – Displays the location of the current calibration files. To change this directory, go to the Set Active Calibration Files panel.

O. **Exit** - Clicking on the Exit button will bring you back to the RFSpecTest - RF Spectral Measurement Toolkit. Any unsaved data from the current test **will be available** until RFSpecTest has been closed completely. This option does not Save Data to a file for future recall.

P. **File>>Exit** - To exit RFSpecTest directly from the current test panel go to File>>Exit. Save data before exiting the panel.

Graph Display Options

To change the display options or visible items on the graph, right click any where in the graphical display window to view a pop up menu.

- **Reinitialize to Default Value** – This option will return the graphical display back to its original settings. This includes clearing the data line. Using this option will make it appear as though the data was erased. To retrieve the data, change the Graph Start Stop Frequencies and then Zoom Out.

- **Copy Data** – Makes a copy of the entire graphical display in its original form. Use this feature to create presentations of the results.

- **Export Simplified Image...** – This option will copy the graphical display in a simplified black and white version.

- **Visible Items** – Use the Visible Items menu to hide parts of the graphical display. Although this will simplify the display, it will also hide valuable information.

- **Clear Graph** – Clear Graph is similar to Reinitialize to Default Value. This option clears the Measured and Best Fit line from the graph. To retrieve the data, change the Graph Start Stop Frequencies and then Zoom Out.

- **Other** – The remaining options (Autoscale X, Autoscale Y, Smooth Updates, and Autosize Plot Legend) should be left on their default settings.
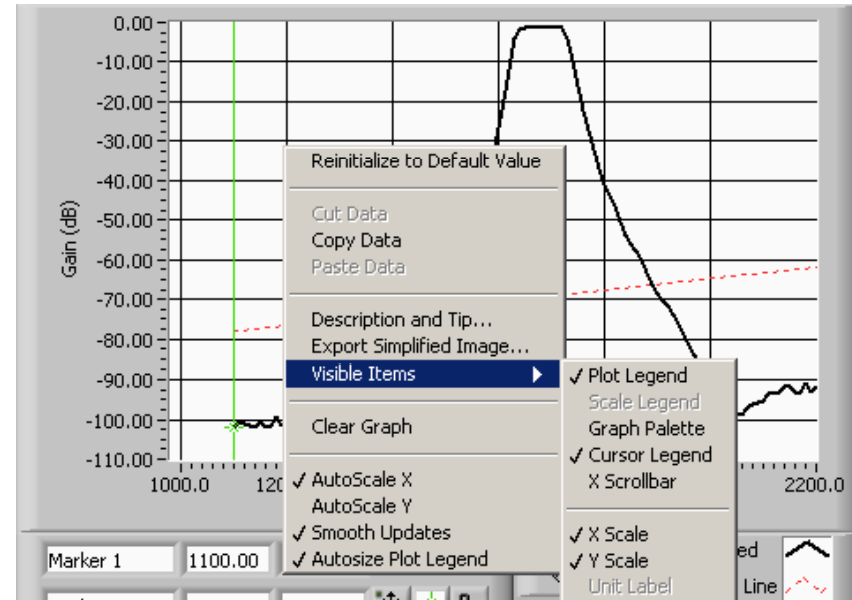
Line Display Options

The color and style of the Measured and Best Fit line on the graphs throughout RFSpecTest may be customized. Left click on the Measured or Best Fit Line field to view an options menu.

- **Common Plots** – The common plots menu may be used to change the data display options. These options change the way in which the data points are connected and delineated. By default the standard line without individual data points is selected.

- **Color** – Select a custom color for the data line to make a bold presentation. This option may be especially useful on the IMD Test and the Isolation Relative Attenuation Test to differentiate between the data lines. By default the Measured line is black and the Best Fit line is red.

- **Line Style** – Use the Line Style menu to select between dashed and solid lines. By default the Measured line is solid and the Best Fit line is dashed.

- **Line Width** – The Line width may be adjusted to accentuate the Data or Best fit line.

- **Point Size** – Use the Point Size menu to visually define the individual data points. Selecting any of the options in this menu will create bullets at each of the extracted frequencies on the graph

- **Other** – The remaining options (Anti-Aliased, Bar Plots, Fill Baseline, Interpolation, X Scale, and Y Scale) should be left on their default values. Although no harm will come in changing these options, they do not apply to the tests and presentation realm of RFSpecTest.
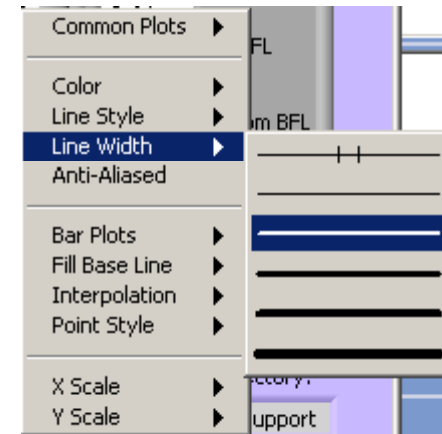
Marker Line Properties

On the graph there are two green marker lines. These lines may be used to specify a region of focus on the graph. You may move these lines to any location by clicking and dragging them to a position or by entering a coordinate (Frequency, Amplitude) in the appropriate field. You may change the color and style of the marker lines by left clicking on the green star shaped button next to the desired marker line.

- **Color** – Select a custom color for the marker lines to make them stand out or allow them to hide in the background.

- **Cursor Style** – The cursor style option changes the look of the marker lines. You may choose between a single vertical line, cross hairs, or a single horizontal line.

- **Point Style** – Use the Point Size menu to visually define the point at which the marker line crosses the data line.

- **Line Style** – Use the Line Style menu to select between dashed and solid lines. By default the marker lines are solid.

- **Line Width** – The Line width may be adjusted to accentuate or deemphasize the marker lines.

- **Show Name** – The Show Name option will display the name of the marker line on the graph.

- **Bring to Center** – Bring to Center moves the marker line to the center of the graph.

- **Go to Cursor** – Go to Cursor shifts the graph to be centered around the current location of the marker line.

- **Lock Position** – To lock the marker lines to a fixed location, left click on the button with the lock next to the appropriate marker line.

- **Measured or Best Fit Line** – The Measured or Best Fit Line option determines which line the marker line will lock to. The cursor on the marker line will lock on the appropriate line.

- **Amplitude Delta and Frequency Delta** – The marker lines may be used to determine the difference in measurement between any two points. The Amplitude Delta and Frequency Delta fields display the difference in magnitude of Marker 1 - Marker 2. Make sure that both marker lines are locked to the same line on the graph (Measured or Best Fit) to assure accuracy.
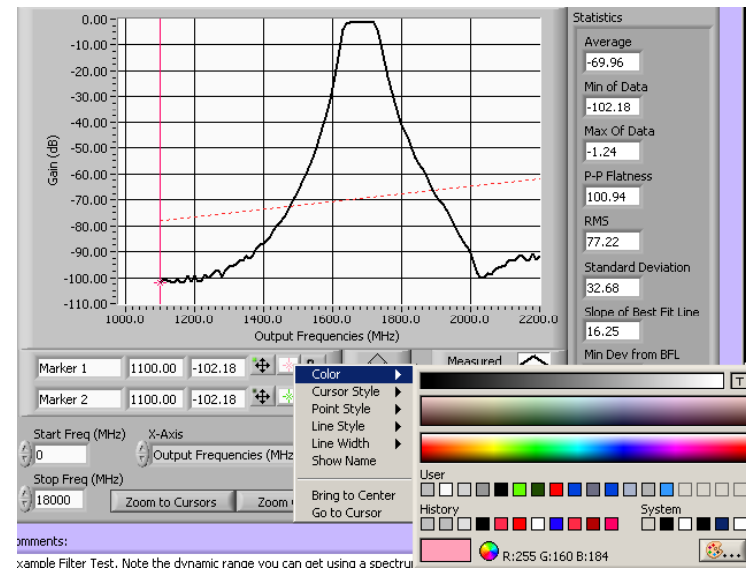
Gain Test – Gain Plot Tab
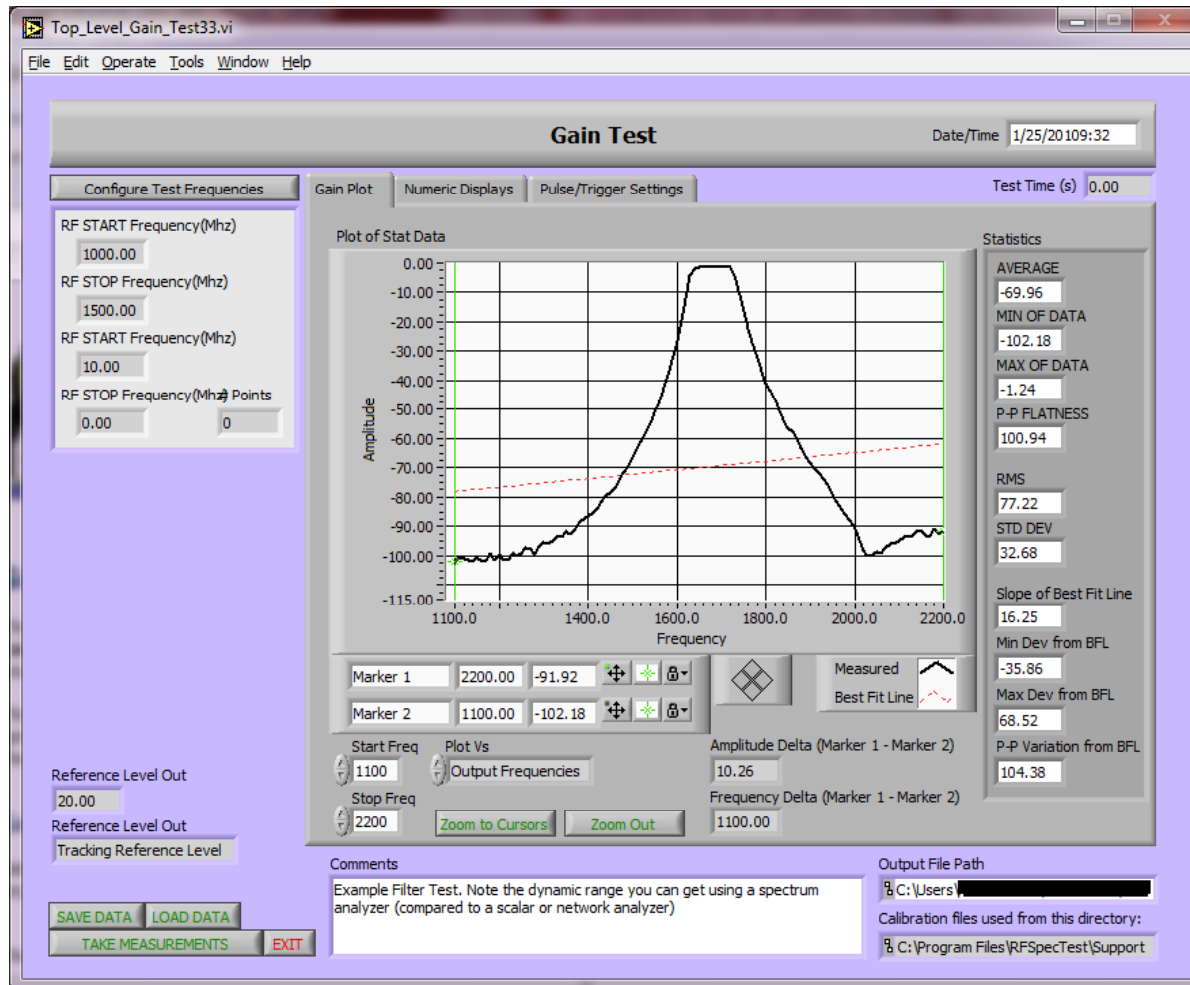
The Gain Test automatically extracts the electrical gain from the Device Under Test (DUT) across a specified frequency range. To access this test, click on the **Gain Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit. All tests in the RFSpecTest package are customizable with a wide range of control options. If you find a need for an option that is not built in, please contact us so that we may improve our software to better suit your needs.

The Gain Test panel is broken up into three tabs: Gain Plot, Numeric Displays, and Pulse/Trigger Settings. From these tabs you may set the necessary specifications to perform a Gain Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

The screen shot to the left is of the default tab for the Gain Test. The Gain Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

See the following pages for detailed information about each of the tabs on the Gain Test panel.

Gain Test – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Output Frequency, the LO Frequency, the Input Frequency, and the Gain Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows. The index origin of the table is zero. In other words, the first data point is in cell zero and the second data point is in cell one.

Gain Test – Pulse / Trigger Settings Tab

The Pulse/Trigger Settings tab displays the current pulse and trigger parameters for the test equipment in use. Before adjusting the pulse and trigger parameters, make sure the test equipment is configured accurately. First, exit the current test panel and then click on the Set Up Test Equipment button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. After the test equipment is set up as desired, return to the test panel. The fields on Pulse/Trigger Settings tab are simply displays and may not be manipulated. To change the settings, click on the Configure Pulse Trigger Settings button located in the lower left hand corner of the tab.

Gain Compression Test – Output vs. Frequency Plot Tab
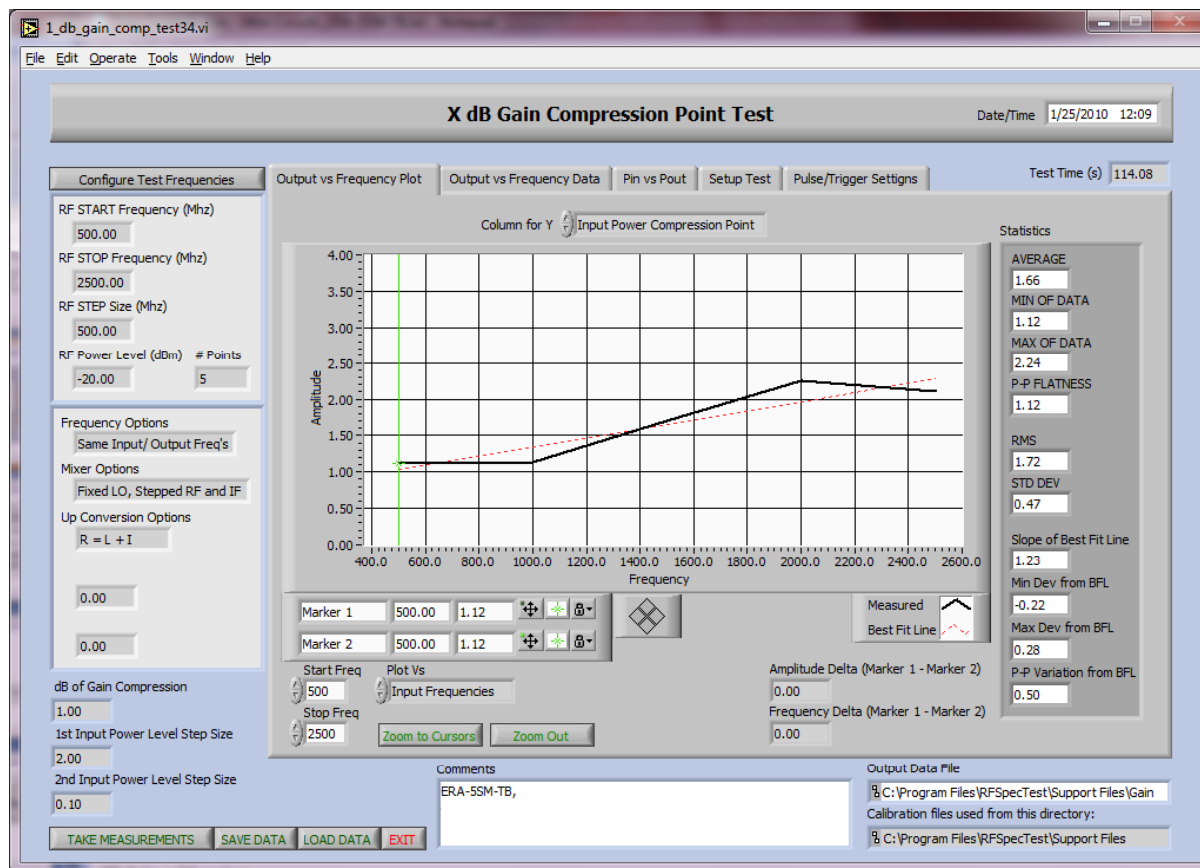
The Gain Compression Test finds the power level where the gain has gone into a specified amount of compression across a frequency band. To access this test, click on the **Gain Compression Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Gain Compression Test panel is broken up into five tabs: Output Vs Frequency Plot, Output Vs Frequency Data, Pout Vs Pin, Set Up Test, and Pulse/Trigger Settings. From these tabs you may set the necessary specifications to perform a Gain Compression Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

This is the default tab for the Gain Compression Test. The Output Vs Frequency Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

See the following pages for detailed information about each of the tabs on the Gain Compression Test panel.

Gain Compression Test – Output vs. Frequency Data Tab

The Output Vs Frequency Data tab displays the test results in tabular form. To scroll through the data, click and hold the arrows next to the table or enter a cell number in the box next to the arrows.
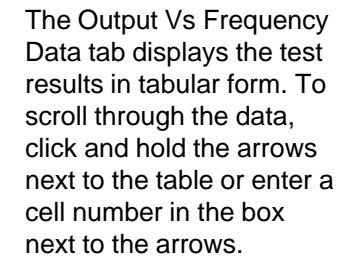
Gain Compression Test – Pout vs. Pin Tab

X dB Gain Compression Point Test

Date/Time 1/25/2010 1:18

Test Time (s) 114.08

Configure Test Frequencies | Output vs Frequency Plot | Output vs Frequency Data | Pin vs Pout | Setup Test | Pulse/Trigger Settigns

RF START Frequency (Mhz)
500.00

RF STOP Frequency (Mhz)
2500.00

RF STEP Size (Mhz)
500.00

RF Power Level (dBm)   # Points
-20.00   5

Pin Vs Pout Array

Pin	Gain	GC	Pout	Ideal
-18.00	17.41	0.00	-0.59	-0.59
-16.00	17.43	-0.02	1.43	1.41
-14.00	17.49	-0.08	3.49	3.41
-12.00	17.44	-0.03	5.44	5.41
-10.00	17.44	-0.03	7.44	7.41
-8.00	17.32	0.09	9.32	9.41
-6.00	17.30	0.11	11.30	11.41
-4.00	17.28	0.13	13.28	13.41
-2.00	17.24	0.17	15.24	15.41
0.00	17.09	0.32	17.09	17.41
2.00	16.47	0.94	18.47	19.41
4.00	15.06	2.35	19.06	21.41
1.00	16.89	0.52	17.89	18.41
1.10	16.87	0.54	17.97	18.51
1.20	16.83	0.58	18.03	18.61
1.30	16.79	0.62	18.09	18.71
1.40	16.75	0.66	18.15	18.81
1.50	16.72	0.69	18.22	18.91
1.60	16.67	0.74	18.27	19.01
1.70	16.62	0.79	18.32	19.11
1.80	16.57	0.84	18.37	19.21
1.90	16.52	0.89	18.42	19.31
2.00	16.46	0.95	18.46	19.41
2.10	16.41	1.00	18.51	19.51
2.20	16.35	1.06	18.55	19.61

Plot

Frequency Options
Same Input/ Output Freq's

Mixer Options
Fixed LO, Stepped RF and IF

Up Conversion Options
R = L + I

0.00

0.00

dB of Gain Compression
1.00

1st Input Power Level Step Size
2.00

2nd Input Power Level Step Size
0.10

TAKE MEASUREMENTS | SAVE DATA | LOAD DATA | EXIT

Marker 1   4.00   19.06
Marker 2   4.00   19.06

Measured
Best Fit Line

Input Frequency
<9>

Pin Delta (Marker 1 - Marker 2)
0.00

Pout Delta (Marker 1 - Marker 2)
0.00

Comments
ERA-5SM-TB,

Output Data File
C:\Program Files\RFSpecTest\Support Files\Gain
Calibration files used from this directory:
C:\Program Files\RFSpecTest\Support Files

The Pout Vs Pin tab provides a graphical and numerical display of the Power out Vs the Power in. To scroll through the data in the table, click and hold the arrows next to the table or enter a cell number in the box next to the arrows.

The Input Frequency is the specific frequency point at which the Pin and Pout data is taken. To view data at a different frequency, click on the Input Frequency field to select a frequency point from the menu.

Gain Compression Test – Set Up Test Tab

Before a test is preformed, use the Set Up Test tab to configure the testing parameters. After the parameters have been entered, this test setup may be saved for recall at a later time.

A Setup File is a tab delineated text file that contains all Set Up Test Parameters. This file may be opened in RFSpecTest, Excel, Notepad, or Word Pad. After a setup file has been opened or saved the file location will be displayed in the **Compression Setup File Path** field.

To load setup parameters from an existing file simply click on the **Load Compression Setup File** button on the bottom of the Setup Test tab.

To save a setup script file, click on the **Save Compression Setup File** button on the bottom of the Set Up Test tab.

Gain Compression Test – Pulse/Trigger Settings Tab

This is the Gain Compression Pulse/Trigger Settings tab. The features on this tab are the same as the features on the Gain Test Pulse/Trigger Settings tab.

Isolation, Relative Attenuation Test – A Measurement Plot Tab
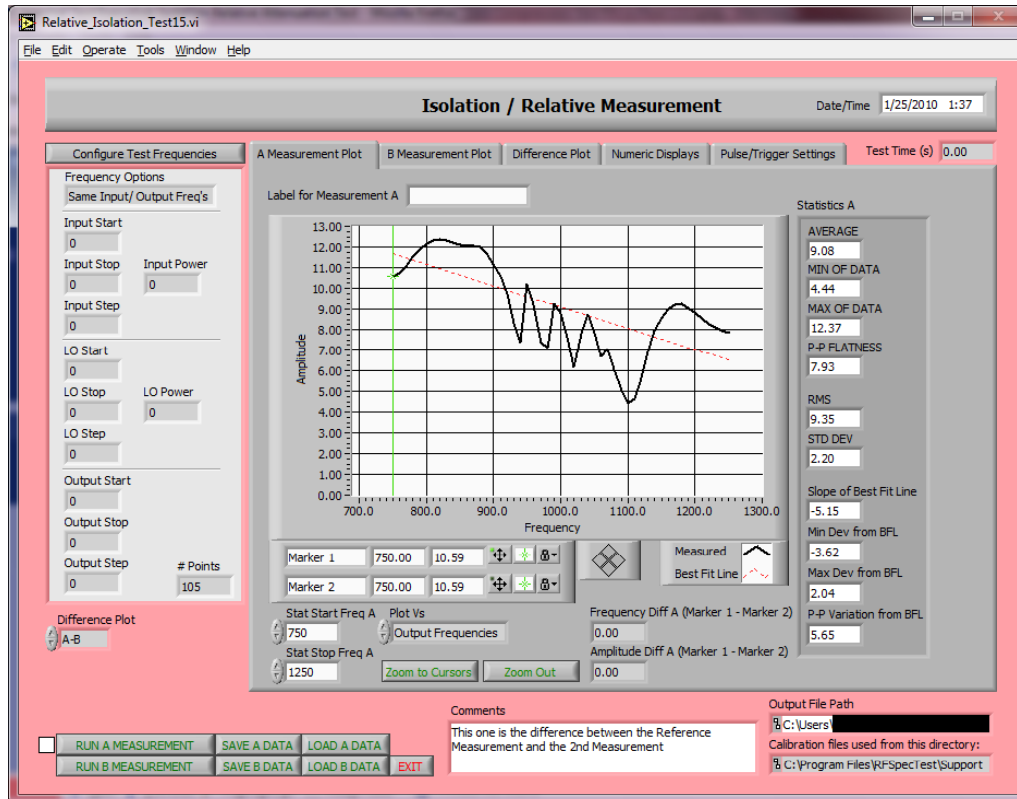
The Isolation Relative Attenuation test extracts two separate data measurements (A and B) and calculates the difference in their relative attenuation. To access this test, click on the **Isolation, Relative Attenuation Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Isolation, Relative Attenuation test panel is broken up into five tabs: A Measurement Plot, B Measurement Plot, Difference Plot, Numeric Displays, and Pulse/Trigger Settings. From these tabs you may set the necessary specifications to perform an Isolation Relative Attenuation Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

This is the default tab for the Isolation Relative Attenuation Test. The A Measurement Plot tab displays the graphical results from the first test as well as pertinent statistical values.

For the Isolation Relative Attenuation Test you may label the extracted data for documentation and clarity. On the A Measurement Plot tab and the B Measurement Plot tab there is a Label for Measurement field just above the graphs. Click in this field to type a descriptive name.

See the following pages for detailed information about each of the tabs on the Isolation, Relative Attenuation Test panel.
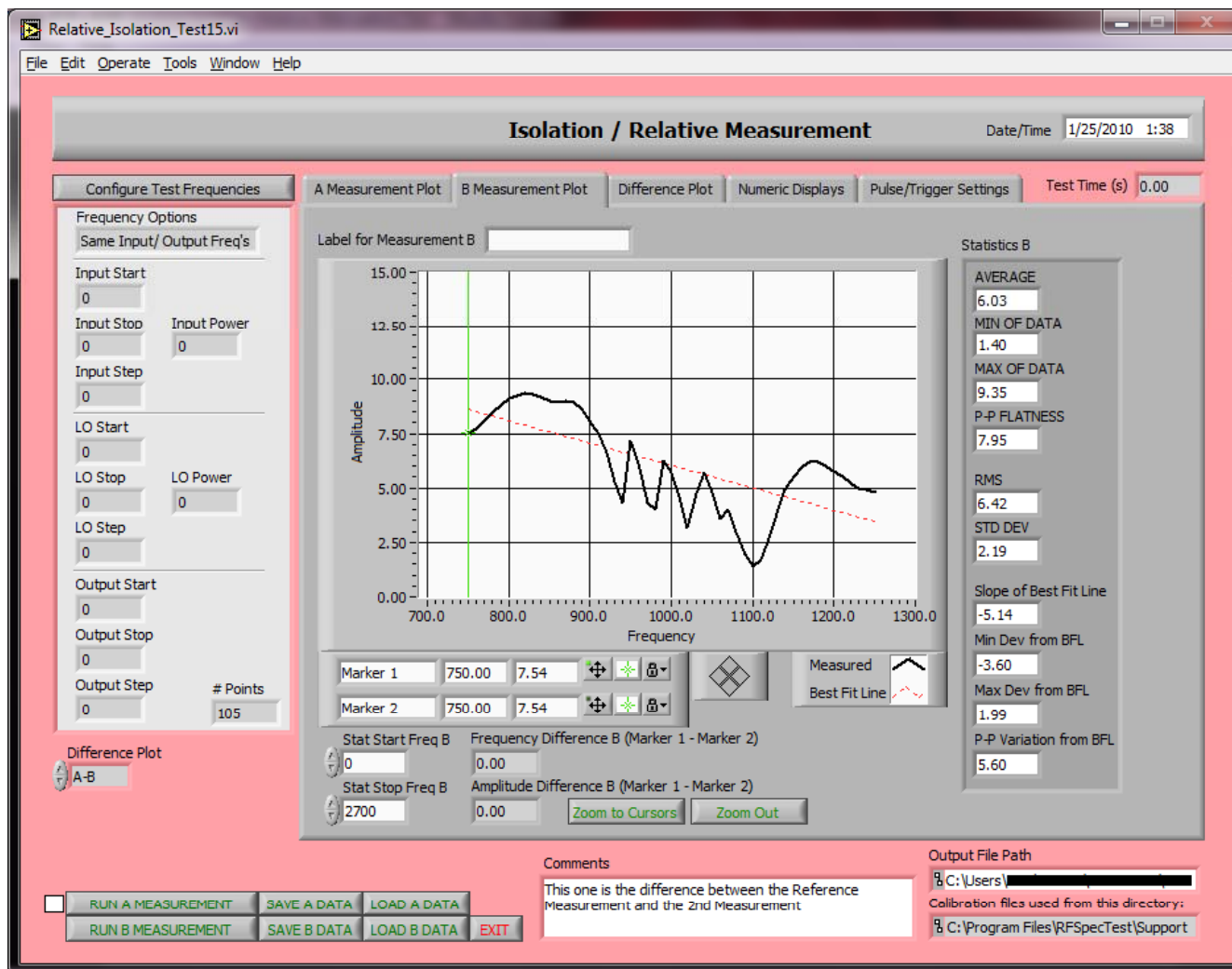
The B Measurement Plot tab graphically displays the second set of measurements.
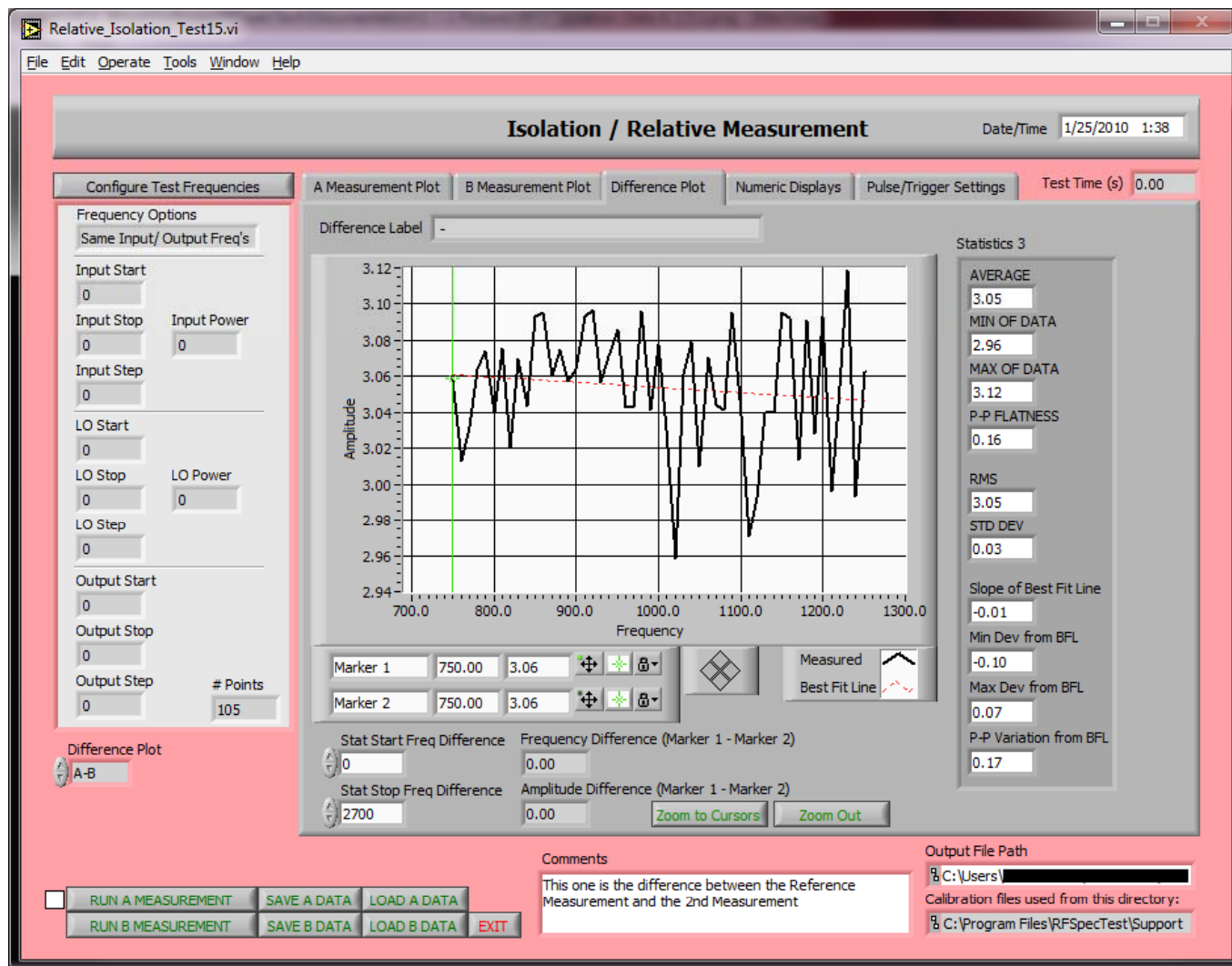
The Difference Plot may be used to graphically view the differences between the first set (A Measurements) and the second set (B Measurements) of data. The difference data may be configured to represent A Measurements - B Measurements, or B Measurements - A measurements. To change the configuration, click on the Difference Plot Options menu.

Isolation Test – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Input Frequency, the LO Frequency, the Output Frequency, the Gain A Data, the Gain B Data, and the Difference Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.

Isolation Test – Pulse/Trigger Settings Tab

This is the Pulse/Trigger Settings tab on the Isolations, Relative Attenuation Measurement Test panel. The features on this tab are the same as the features on the Gain Test Pulse/Trigger Settings tab.

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IMD Test – Intermod Measurement Plot Tab
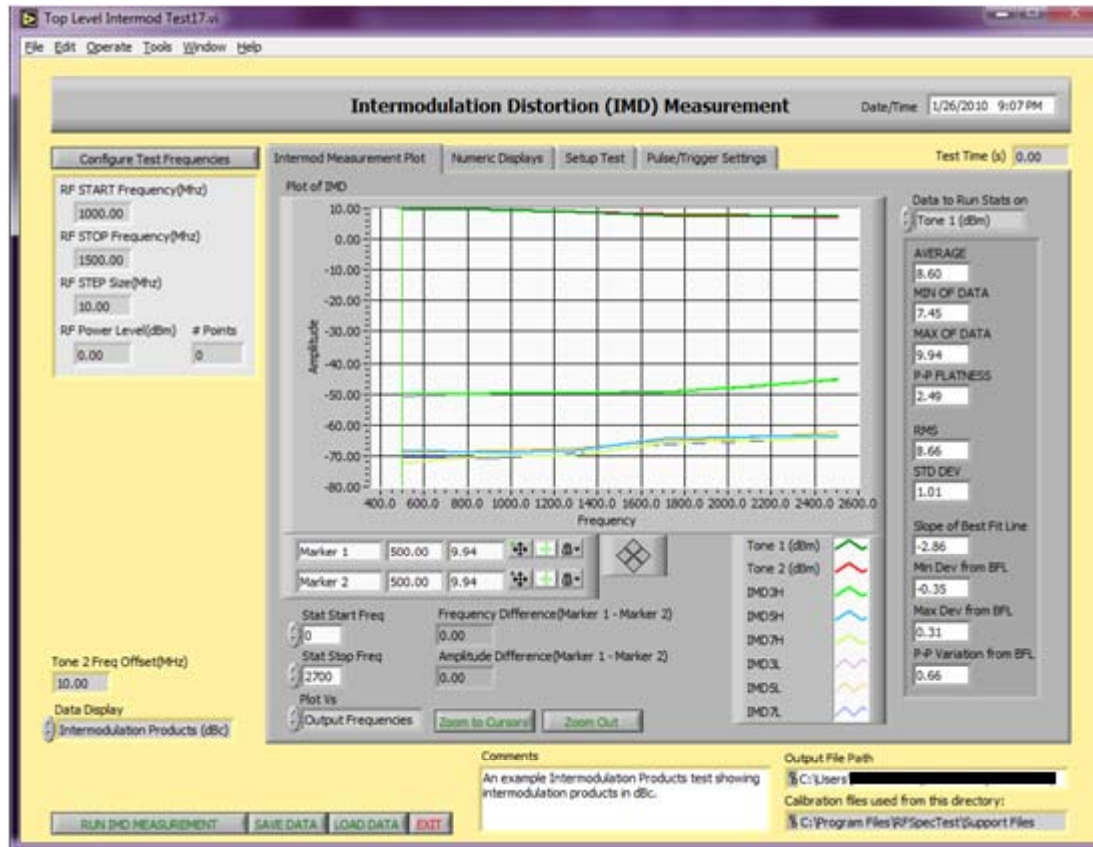
The IMD Test automatically extracts the multi-tone distortion from the Device Under Test (DUT) across a specified frequency range. To access this test, click on the **IMD Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The IMD Test panel is broken up into four tabs: Intermodulation Measurement Plot, Numeric Displays, Set Up Test, and Pulse/Trigger Settings. From these tabs you may set the necessary specifications to perform an IMD Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.
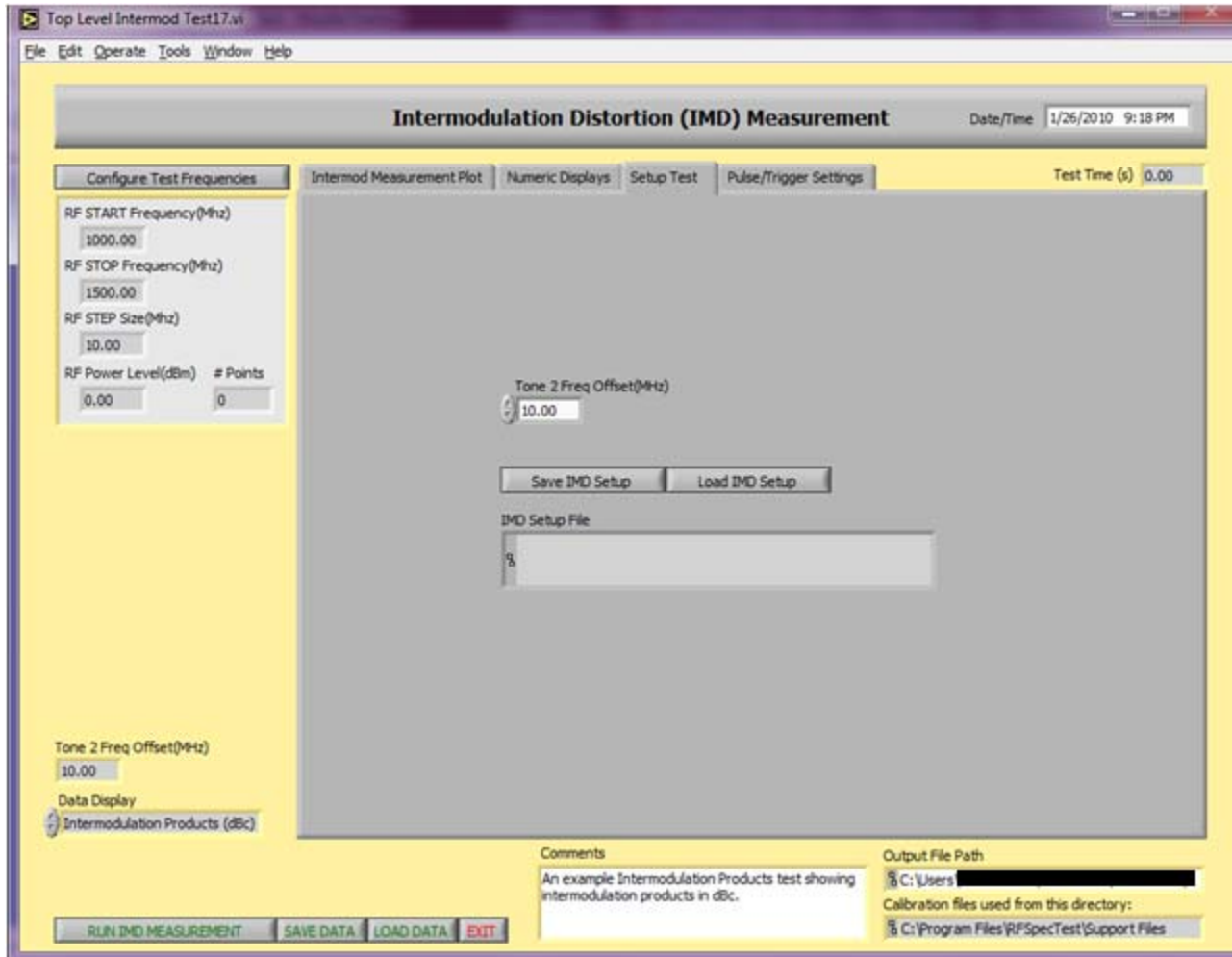
The Intermod Measurement Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

For the IMD test, statistics may only be displayed for one set of data at a time. To display statistics for a different set of data, click on the **Data to Run Stats On** field and select the desired data from the menu.

See the following pages for detailed information about each of the tabs on the IMD Test panel.

IMD Test – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Input Frequency, the LO Frequency, the Output Frequency, and the Output Data. To scroll through the data, click and hold the arrows next to the table or enter a cell number in the box next to the arrows.

Before a test is preformed, use the Set Up Test tab to configure the testing parameters. After the parameters have been entered, this test setup may be saved for recall at a later time.

A Setup File is a tab delineated text file that contains all Set Up Test Parameters. This file may be opened in RFSpecTest, Excel, Notepad, or Word Pad. After a setup file has been opened or saved the file location will be displayed in the **IMD Setup File Path** field.

To load setup parameters from an existing file simply click on the **Load IMD Setup File** button on the bottom of the Setup Test tab.

To save a setup script file, click on the **Save IMD Setup File** button on the bottom of the Set Up Test tab.

IMD Test – Pulse/Trigger Settings Tab

This is the IMD Test Pulse/Trigger Settings tab. The features on this tab are the same as the features on the Gain Test Pulse/Trigger Settings tab.

Leakage Test – Spur Plot Tab
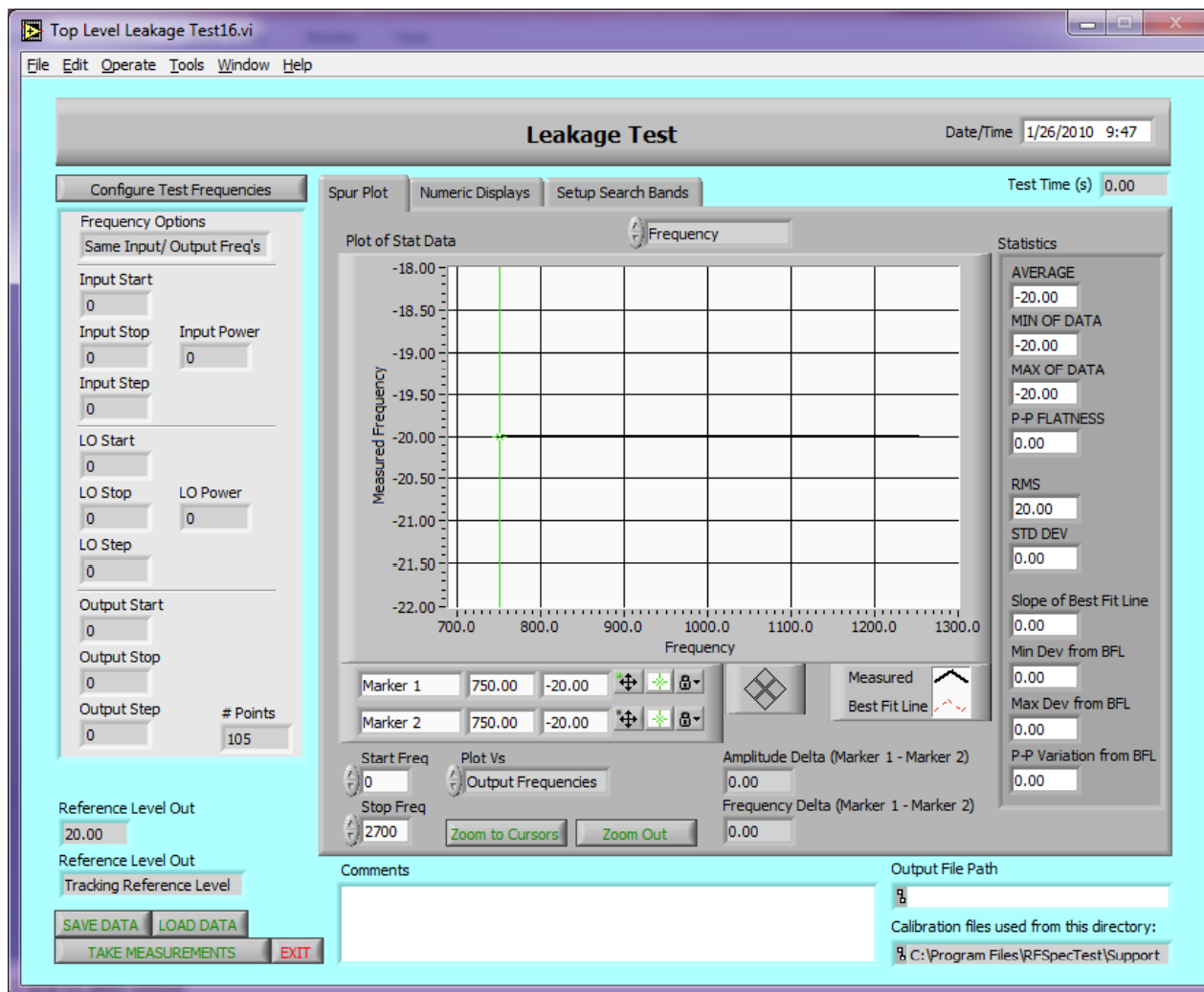
To access this test, click on the **Leakage Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Leakage Test panel is broken up into three tabs: Spur Plot, Numeric Displays, and Set Up Search Bands. From these tabs you may set the necessary specifications to perform a Leakage Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

The Spur Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

See the following pages for detailed information about each of the tabs on the Leakage Test panel.

Leakage Test – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Input Frequency, the LO Frequency, the Output Frequency, and the Measured Frequency Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.

Leakage Test – Set Up Search Bands Tab

Before a test is preformed, use the Set Up Search Bands tab to configure the testing parameters. After the parameters have been entered, this test setup may be saved for recall at a later time.

A Setup File is a tab delineated text file that contains all Set Up Test Parameters. This file may be opened in RFSpecTest, Excel, Notepad, or Word Pad. The file location will be displayed in the **Leakage Setup File Path** field after a setup file has been opened or saved .

To load setup parameters from an existing file simply click on the **Load Leakage Setup File** button on the bottom of the Setup Test tab.

To save a setup script file, click on the **Save Leakage Setup File** button on the bottom of the Set Up Test tab.

Amplitude / Frequency Measurement Test – Plot Tab
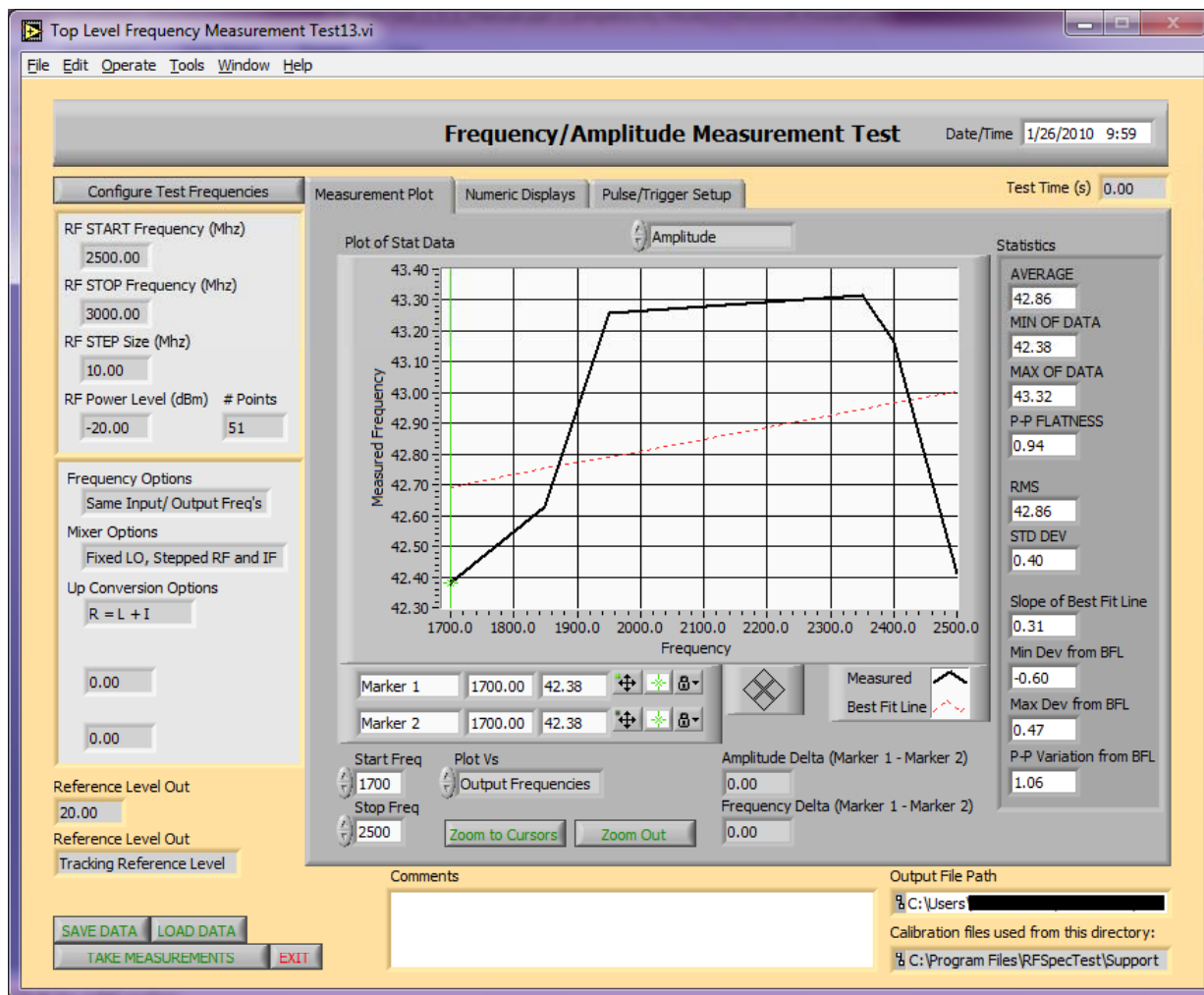
To access this test, click on the **Amplitude/Frequency Measurement Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Amplitude Frequency Measurement Test panel is broken up into three tabs: Measurement Plot, Numeric Displays, and Pulse/Trigger Settings. From these tabs you may set the necessary specifications to perform an Amplitude Frequency Measurement Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

This is the default tab for the Amplitude Frequency Measurement Test. The Measurement Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

See the following pages for detailed information about each of the tabs on the Amplitude / Frequency Measurement Test panel.

Amplitude Test – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Input Frequency, the LO Frequency, the Output Frequency, and the Measured Frequency Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.

This is the Pulse/Trigger Settings tab on the Amplitude Frequency Measurement Test panel. The features on this tab are the same as the features on the Gain Test Pulse/Trigger Settings tab.

Return Loss / VSWR Test – Output vs. Frequency Plot Tab
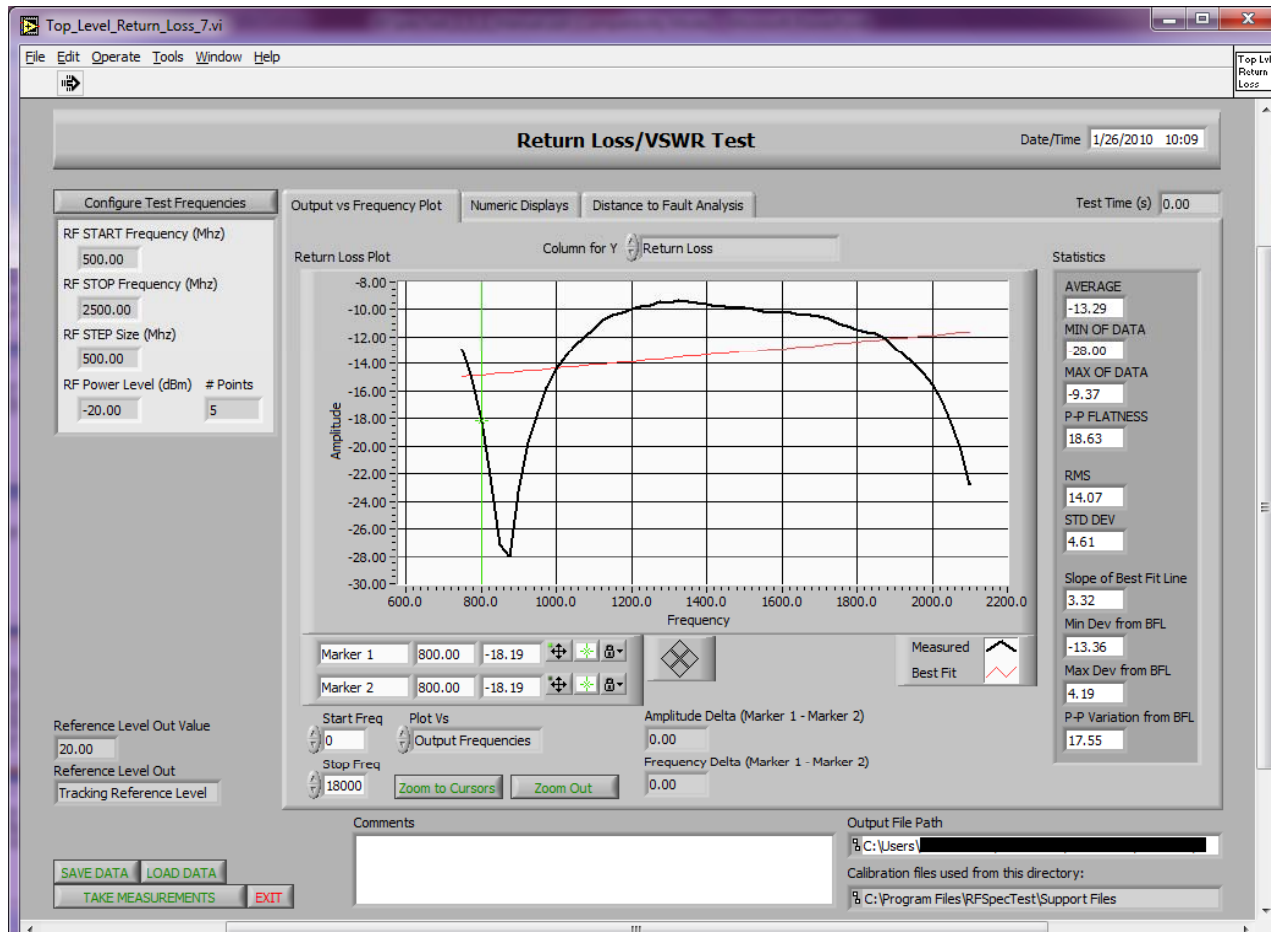
This test will automatically extract the Return Loss and calculate the Voltage Standing Wave Ratio from the Device Under Test across a specified frequency range. To access this test, click on the **Return Loss/ VSWR Test** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Return Loss / VSWR Test panel is broken up into three tabs: Output Vs Frequency Plot, Numeric Displays, and Distance to Fault Analysis. From these tabs you may set the necessary specifications to perform a Return Loss / VSWR Test or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

This is the default tab for the Return Loss / VSWR Test. The Output Vs Frequency Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.
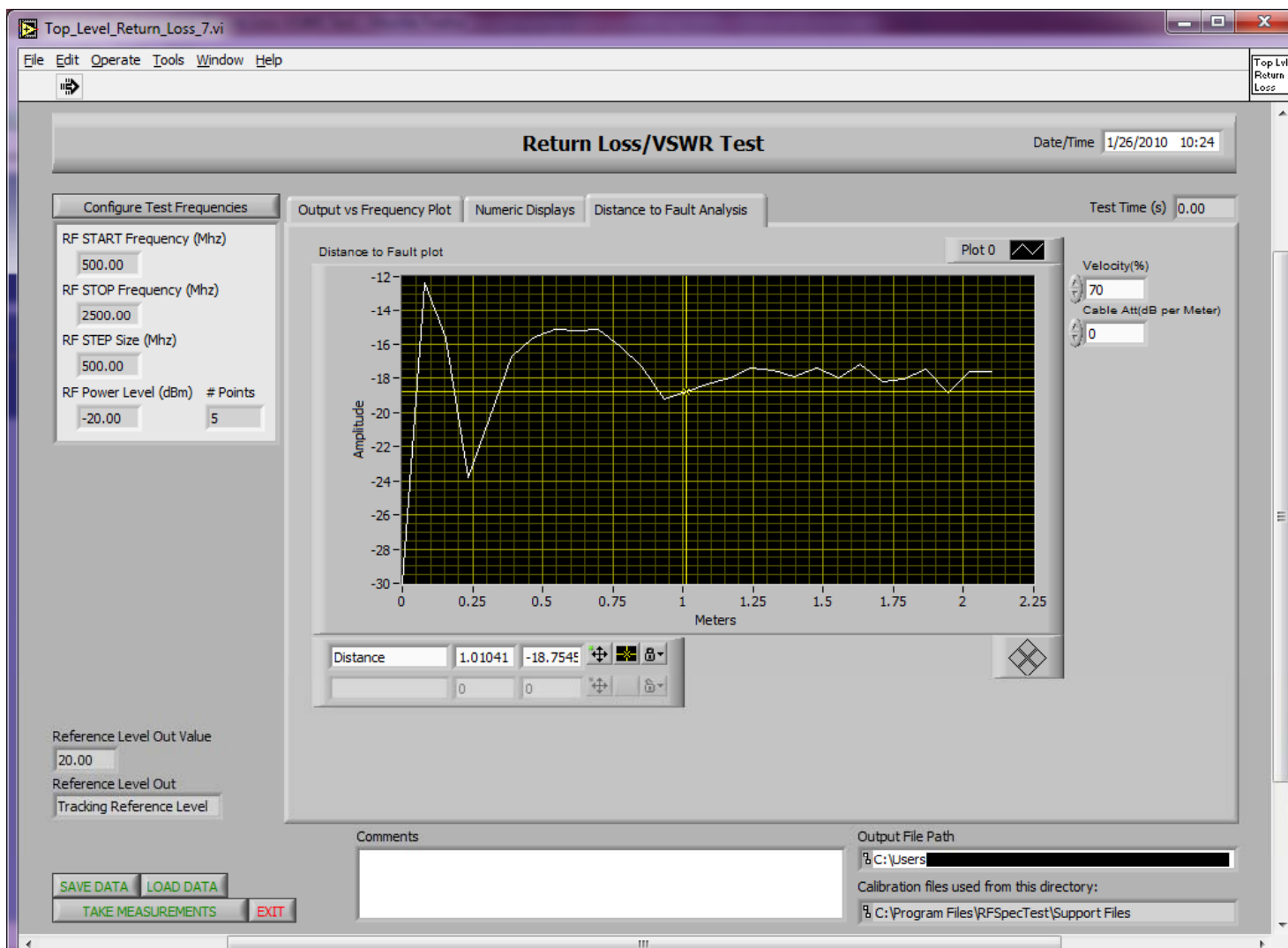
Return Loss – Numeric Displays Tab
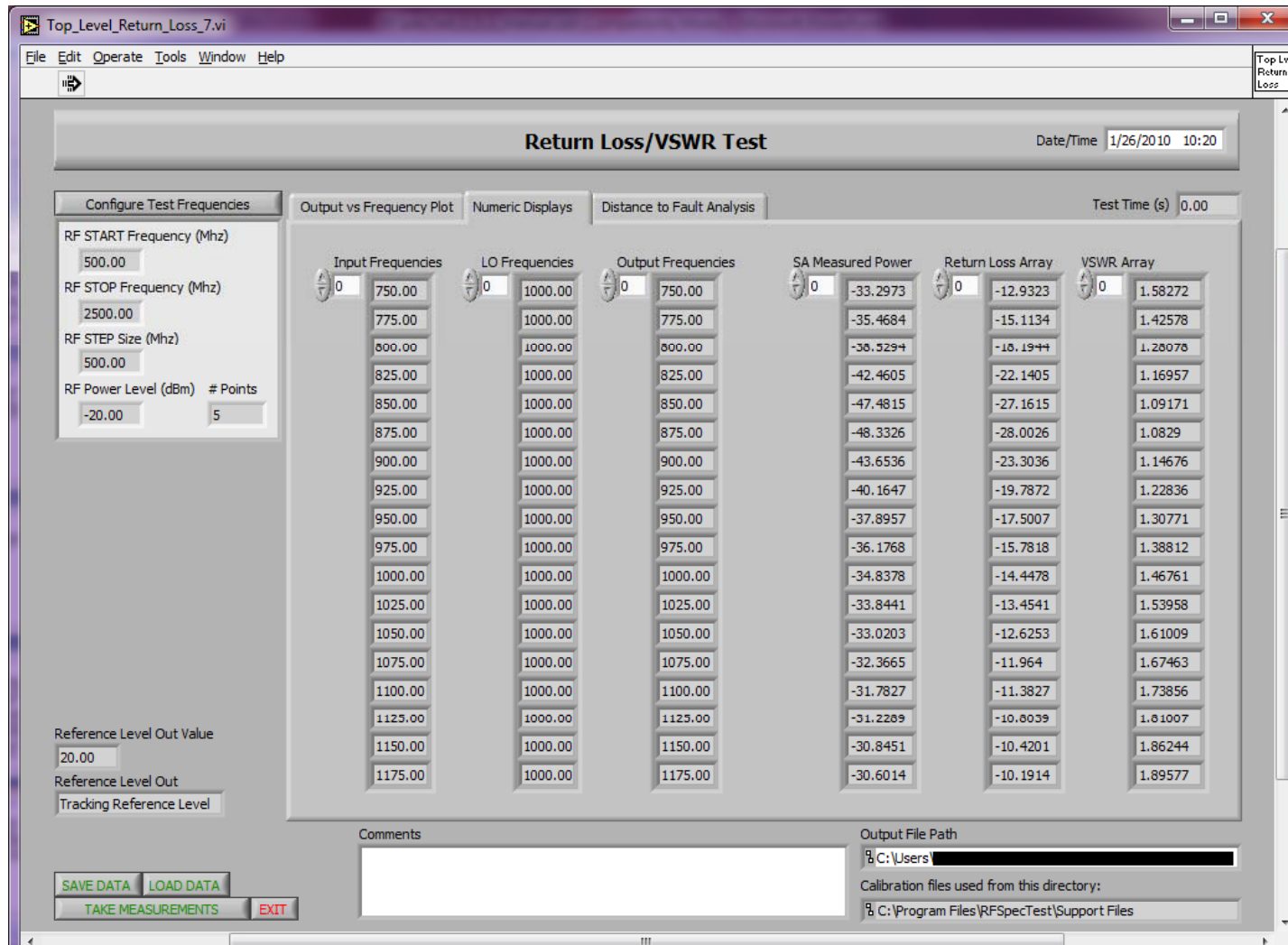
The Numeric Displays tab allows you to view numeric tables of the Output Frequency, the LO Frequency, the Input Frequency, and the Gain Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.
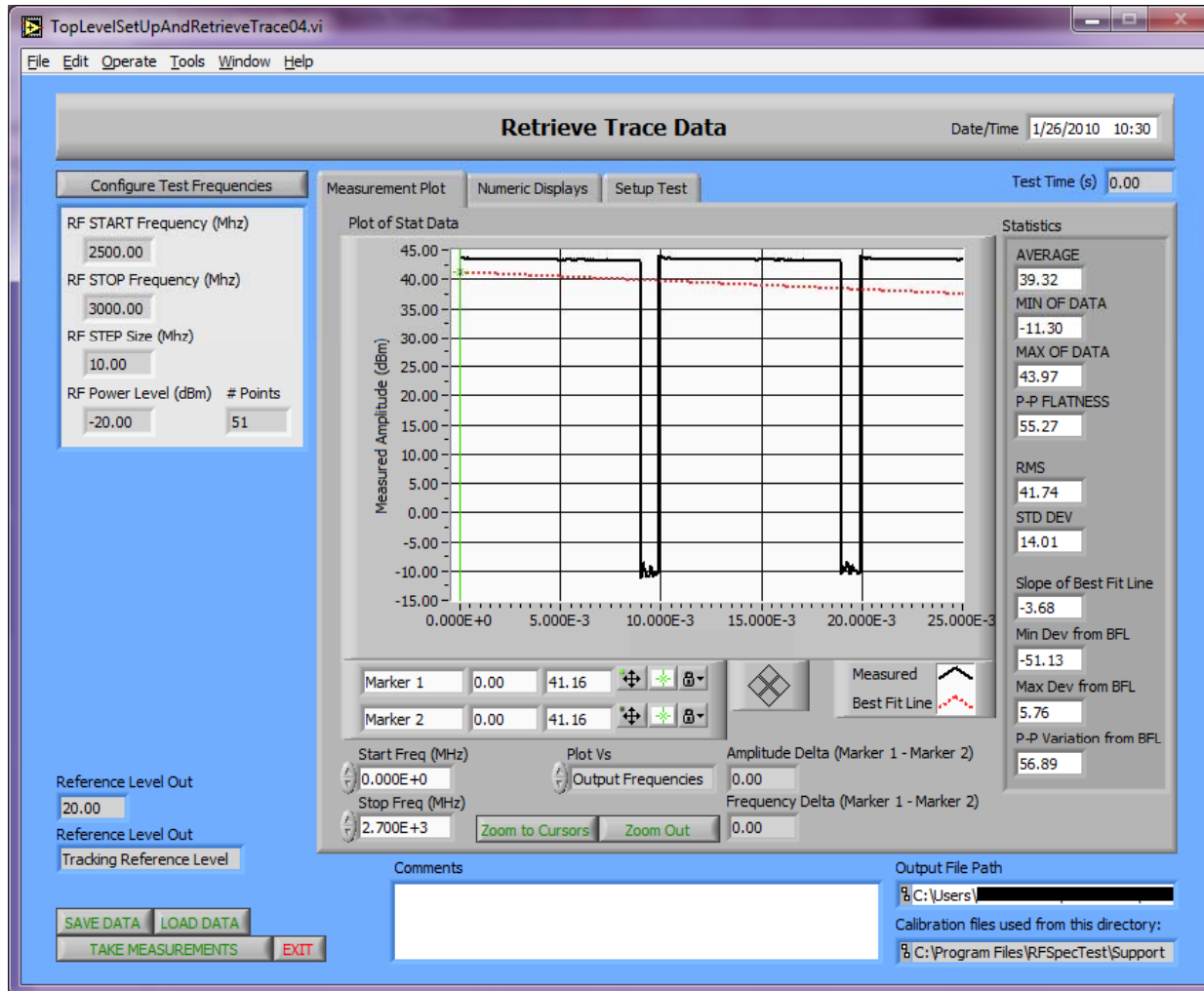
Return Loss – Distance to Fault Analysis Tab

Retrieve Trace Data – Measurement Plot Tab

The Retrieve Trace Data test was developed as a custom testing environment. This test will pull any set of data from the test equipment. Use this capability to perform a test that is not directly supported in RFSpecTest. For more information on customizing tests to suit your needs please contact us. To access this test, click on the **Retrieve Trace Data** button on the RF Measurements tab of the RFSpecTest - RF Spectral Measurement Toolkit.

The Retrieve Trace Data panel is broken up into three tabs: Measurement Plot, Numeric Displays, and Set Up Test. From these tabs you may set the necessary specifications to Retrieve Trace Data or to load existing data from a file. The graphical and analytical displays may be configured to analyze, present, and print the results.

The Measurement Plot tab displays the test results graphically and calculates pertinent statistical values for analysis.

Retrieve Trace Data – Numeric Displays Tab

The Numeric Displays tab allows you to view numeric tables of the Input Frequency, the LO Frequency, the Output Frequency, the X Data, and the Trace Data. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.

Retrieve Trace Data – Set Up Test Tab

Before a test is preformed, use the Set Up Test tab to configure the testing parameters. After the parameters have been entered, this test setup may be saved for recall at a later time.

A Setup File is a tab delineated text file that contains all Set Up Test Parameters. This file may be opened in RFSpecTest, Excel, Notepad, or Word Pad. The file location will be displayed in the **Setup File Path** field after a file has been opened or saved.

To load setup parameters from an existing file simply click on the **Load Setup File** button on the bottom of the Setup Test tab.

To save a setup script file, click on the **Save Setup File** button on the bottom of the Set Up Test tab.

Configure Test Frequencies

This is the default Configure Test Frequencies Panel. To access this panel, click on the Configure Test Frequencies button on any of the RF Test panels.
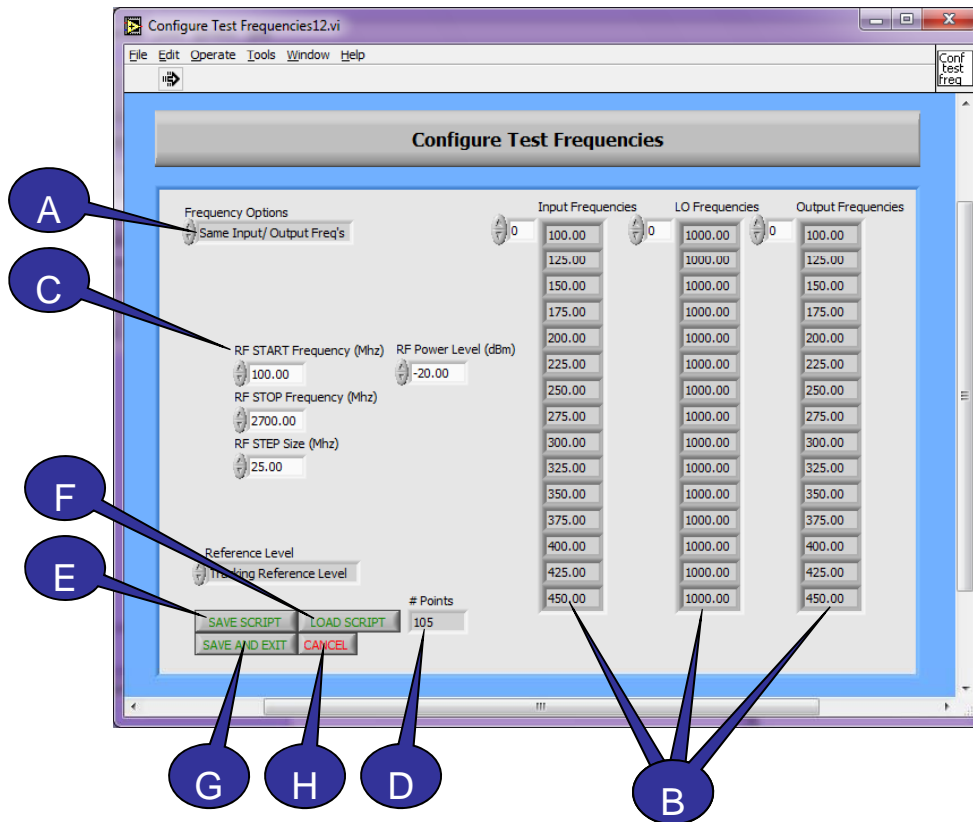
A. **Frequency Options** – Use the Frequency Options pull down menu to select the desired type of frequency.

B. **Frequency Tables** – The Frequency Tables display numeric tables of the Input Frequency, the LO Frequency, and the Output Frequency. To scroll through the data, click and hold the arrows next to the desired table.

C. **Frequency Parameters** – The Frequency Parameters control the number of frequency points and the power level at which they are taken.

D. **Number of Points** – The Number of Points field displays the length of the frequency tables. To adjust the number of frequency points, change the Start Frequency, Stop Frequency, or Set Size accordingly.

E. **Save Script** – The Test Frequency File is a tab delineated text file that contains all parameters from the Configure Test Frequencies panel. The Test Frequency File is **not** the same as the Cal Frequency File. To save a Test Frequency File that may be recalled at a later date, click on the **Save Script** button.

F. **Load Script**–To load an existing Test Frequency File, click on the **Load Script** button.

G. **Save and Exit** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file.

H. **Cancel** - Clicking on the Cancel button will cause the current panel to close. This will bring you back to the previous panel. Any changes made to the current utility **will not be saved**.

Configure Test Frequencies Cont.

I. Selecting **Custom User Input** in the Frequency Options field allows the user to configure the test Input, LO, and Output frequencies in a free form environment. It is important, however, to keep in mind that each table must be of equal length or the program will not be able to save the results. The current length of each table is displayed directly below the respective table in the **# Points** field.

J. **Custom Frequency Parameters** – The Custom Frequency Parameters allows you to set up each frequency table independently. The Input, LO, and Output frequency points may have separate Start Frequencies, Stop Frequencies, and Step Sizes. It is important to remember, however, that the total number of points for each table must be the same. To add additional points to the end of one of the tables to even out the lengths, select the manual entry option.

K. **Manual Entry** – The Manual Entry selection boxes allow the user to manually type in any desired frequency point(s) or to overwrite any of the automatic points. Select the check box for the desired frequency (Input, LO, Output) to enable this option. After the check box has been selected, simply click in the desired cell to type a frequency point. If any cells are skipped between frequency points, these cells will have a value of zero.

Configure Pulse Trigger Settings

Pulse and Trigger Settings are only available for select pieces of test equipment (see Supported Test Equipment). Before the pulse and trigger settings are configured, go to the Set Up Test Equipment panel and make sure that the test equipment is configured properly.
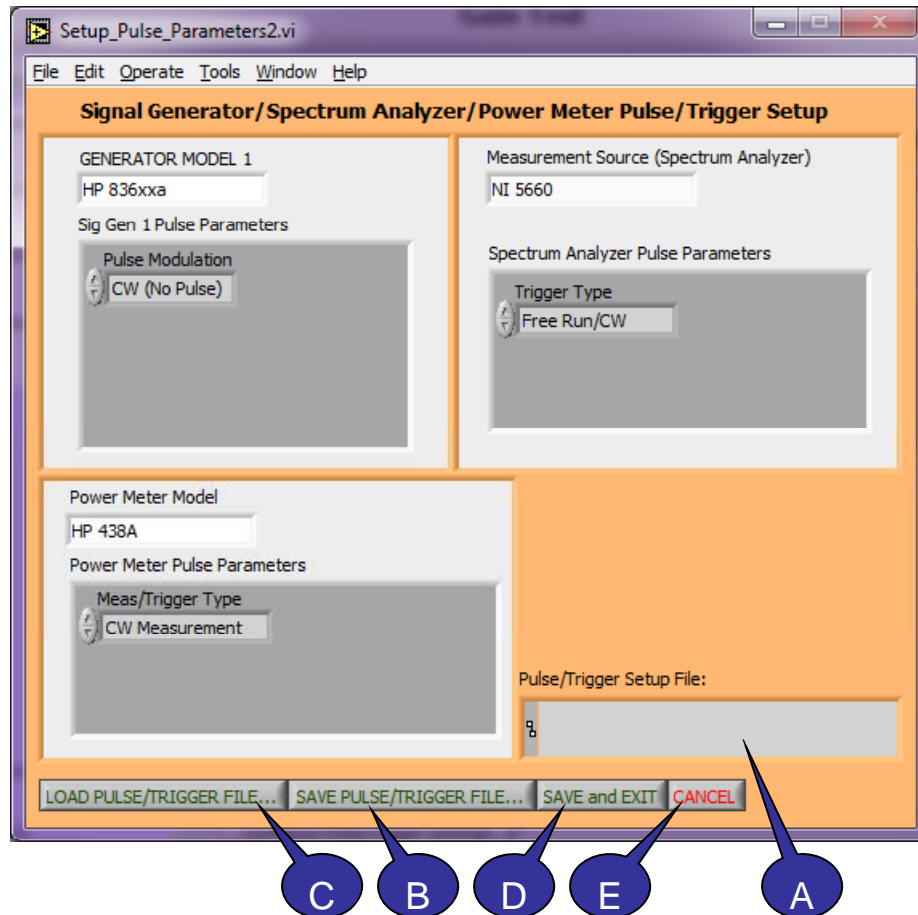
A. **Pulse/Trigger File Path** – The Pulse Trigger Setup File is a custom pattern text document that contains all the parameters from the Configure Pulse Trigger Settings panel **except** the test equipment setup. Before a Pulse Trigger Setup File is loaded it is important to Set Up Test Equipment or load the corresponding Test Equipment Setup File. After a Pulse Trigger Setup File is saved or loaded, the file path is displayed here.

B. **SAVE PULSE/TRIGGER FILE…** – To save a Pulse / Trigger Setting File that may be recalled at a later date, click on the **Save Setup File** button.

C. **LOAD PULSE/TRIGGER FILE… –** To load an existing Pulse / Trigger Setup File, click on the Load Setup File button.

D. **SAVE and EXIT** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file for retrieval after the program has been closed.

E. **CANCEL**- Clicking on the Cancel button will cause the current panel to close. This will bring you back to the previous panel. Any changes made to the current utility **will not be saved**.

Other Tests will be Added Here

At R.A. Wood Associates we are always looking to improve our software to better suit your needs. This panel lists a number of possible future additions to the RFSpecTest software package. We are also able to add drivers for additional test equipment. We have experiences working with Signal Generators (Agilent, Rohde and Schwarz, etc), Spectrum Analyzers (Agilent/HP, Rohde and Schwartz, etc), and RF Power Meters (Agilent, Boonton, etc). If you are interested in any of these additions or have a need for other additions please contact us for quotes.

To exit this panel click the Save and Exit button. This will bring you back to the RFSpecTest – RF Spectral Analysis Toolkit.

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Calibration and Utilities
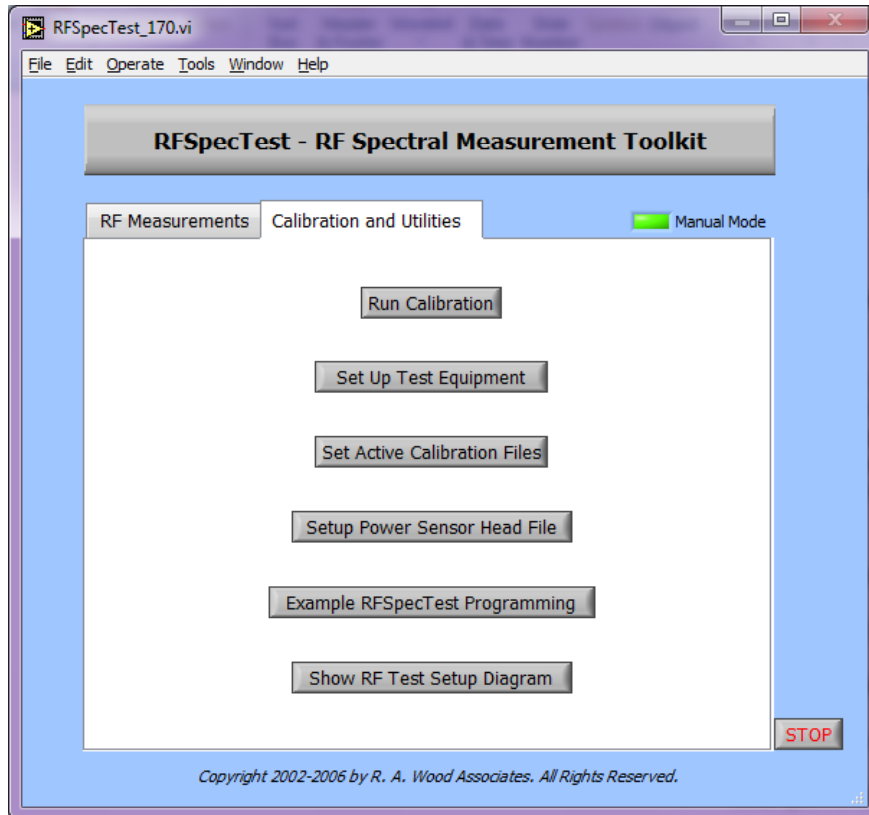
This is the Calibration and Utilities tab on the RFSpecTest - RF Spectral Measurement Toolkit.

From this tab you may select from the following utilities. Once a utility has been selected a new window will open. This window is now the active panel. All other open panels will not be active. To activate another panel you must exit the current panel.

- Run Calibration

- Set Up Test Equipment

- Set Active Calibration Files

- Set Up Power Sensor Head File

- Example RFSpecTest Programming

- Show RF Test Setup Diagram

Run Calibration
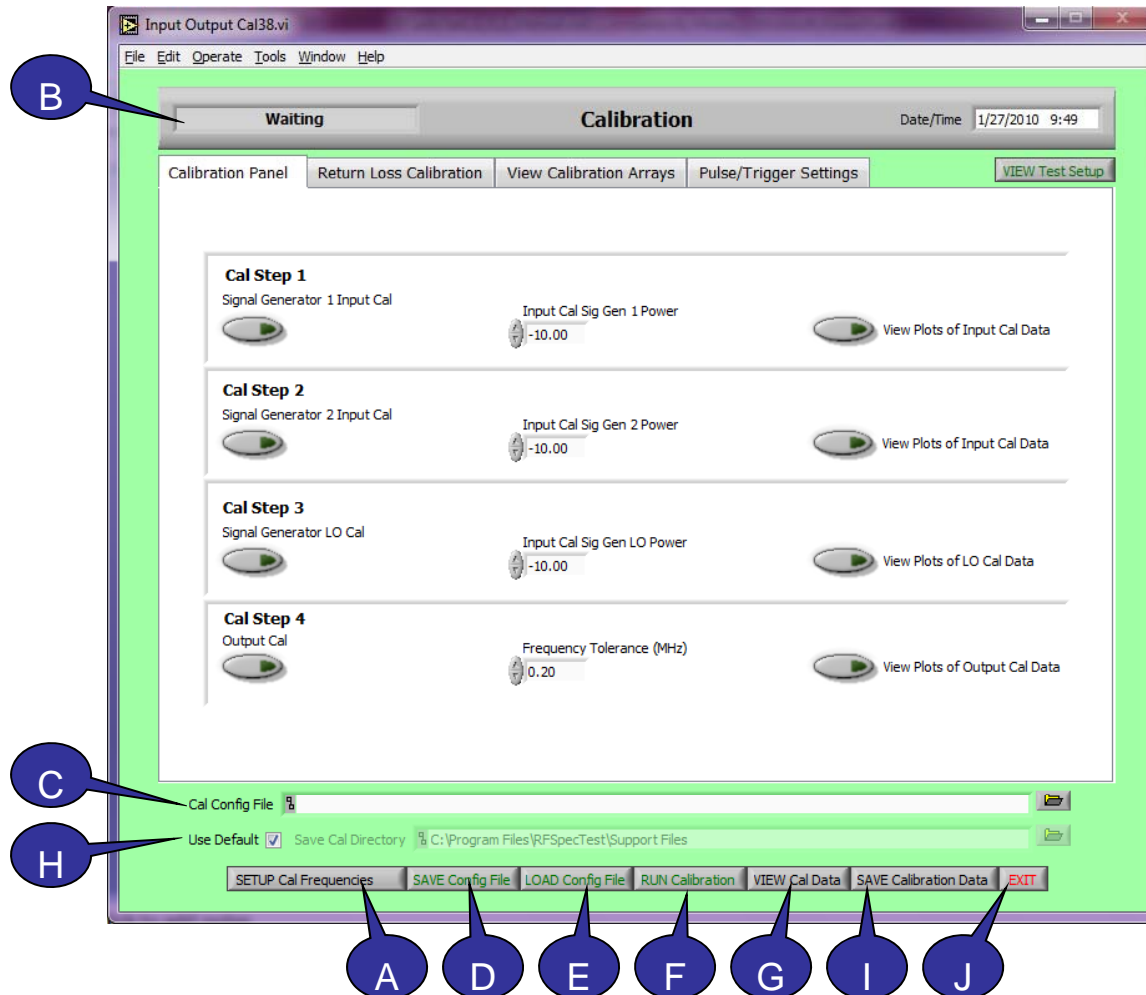
The Run Calibration panel provides an organized step-by-step approach to calibrating the test equipment that will be used for the RF Tests. RFSpecTest uses an RF power meter to calibrate signal generators, RF cabling, and Spectrum Analyzers. Power measurements with RFSpecTest are generally more accurate than those taken with network analyzers. This calibration routine ensures accurate test results to 0.1 db. Separate input and output calibration files allow measurements to be made through frequency conversions. To access the Run Calibration routine, click on the **Run Calibration** button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. The calibration routine is customizable with six possible calibration steps.

Step 1 - Signal Generator 1 Input Calibration
Step 2 - Signal Generator 2 Input Calibration
Step 3 - Signal Generator LO Calibration
Step 4 - Output Calibration
Step 5 - Return Loss Open Calibration
Step 6 - Return Loss Short Calibration

See the following two pages for information about the options available on the Run Calibration Panel.

A. **Setup Cal Frequencies** – To access the Set Up Calibration Frequencies panel, click on the **Set Up Cal Frequencies** button. The calibration frequencies must be set up before the calibration is preformed. After the calibration frequencies have been successfully set up, an X will appear on the Set Up Cal Frequencies button..

B. **Status Bar** – Displays the program's progress during the calibration routine. If the program appears to be inactive, look at the status bar to determine the current action.

C. **Calibration Configuration File Path** – The Configuration File is a tab delineated text file that contains all six calibration step parameters. The Configuration File **does not contain the calibration frequency information**. After a Configuration File has been saved or loaded, the file path will be displayed in the field below the tab panels.

D. **Save Config File** – To save a Calibration Configuration File, click on the Save Config File button.

E. **Load Config File** – To load an existing Calibration Configuration File, click on the Load Config File button.

F. **Run Calibration** – Before starting the calibration routine you must Setup the Calibration Steps and the Setup the Calibration Frequencies. After these parameters are configured click on the Run Calibration button.

G. **View Cal Data** – The View Calibration Data panel will open throughout the calibration routine for any calibration step where the view plot option was selected during the Calibration Setup. This panel may also be accessed at any time by clicking on the **View Cal Data** button.

H. **Save Cal Directory** – The Calibration Data Files are tab delineated text files that may be opened in RFSpecTest, Excel, Notepad, and Word Pad. A separate file will be created for each of the calibration steps with the following names: CAL_SG1_to_DUT ; CAL_SG2_to_DUT ; CAL_LO_to_DUT ; CAL_DUT Output to PM2B_SA ; CAL_Return_Loss . Before saving the calibration data, determine which directory to store the files in. If no changes are made, the Calibration Data Files will be saved in the default directory (C:\Program Files\RFSpecTest\Support Files). To select a different directory for the Calibration Data Files, uncheck the box next to the Use Default field. This will activate the Save Cal Directory field. Click on the **File** button next to the file path. In the Browsing Window locate the desired directory and click **Select Cur Dir**. The new directory **must be a subdirectory of the Support Files**. A directory that is stored in any other location will not load properly.

I.   **Save Calibration Data** - After the desired directory has been selected, click on the **Save Calibration Data** button. If a directory with existing calibration files was selected, a series of dialog boxes will pop up to ensure that you intended to overwrite the existing files. If it is OK to replace the existing calibration data, click **Replace** in each of the dialog boxes. If you do not want to replace the files, click **Cancel** in each of the boxes. To save the calibration data without replacing existing files you must change the save directory.

J.   **Exit** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file for retrieval after the program has been closed.

Set Up Calibration Frequencies

This panel allows you to select the start frequency, the stop frequency, and the step size for each of the calibration steps. The calibration frequencies must be set up before the calibration is preformed. After the calibration frequencies have been successfully set up, an X will appear on the Set Up Cal Frequencies button on the Run Calibration panel.

See the next page for details about the options available from this panel.

A. **Selecting Calibration Frequencies -** To set the Input, Output, Lo, and Return Loss frequency ranges, simply type the desired value in the appropriate field. Separate frequency ranges may be used for each of the four arrays (Input, Output, LO, Return Loss). Regardless of the step size, the start and stop point will be included in the frequency array. For example, if the Start Frequency was 1 MHz, the Stop Frequency was 10 MHz, and the Step Size was 2 MHz, the following frequency array would be produced: 1, 3, 5, 7, 9, 10.

B. You may scroll through the frequency data by clicking and holding the arrows next to the desired table or by entering a cell number in the box next to the arrows. The index origin of the table is 0 (zero). In other words, the first data point is in cell 0 (zero) and the second data point is in cell 1 (one).

C. It is important to note that the Input Frequency Array is the union of its own values, and the values of the other three arrays (Output, LO, Return Loss). For example, suppose the Input frequency was set to be between 100 MHz to 2000 MHz and the Output Frequency was set to between 100 MHz to 3200 MHz. This setup would cause the Input Frequency Array to range from 100 to 3200 MHz.

D. **Calibration Frequency File Path** – The Cal Frequency File is a tab delineated text file that contains all parameters from the Set Up Calibration Frequencies panel. The Cal Frequency File is not the same as the Test Frequency. After a Cal Frequency File is saved or loaded, the file path is displayed here.

E. **Save Cal Frequency File** – To save a Calibration Frequency File click the Save Cal Frequency File button.

F. **Load Cal Frequency File** – To load a Calibration Frequency File click the Load Cal Frequency File button.

G. **Save and Exit** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file for retrieval after the program has been closed.

H. **Cancel** - Clicking on the Cancel button will cause the current panel to close. This will bring you back to the previous panel. Any changes made to the current utility **will not be saved**.

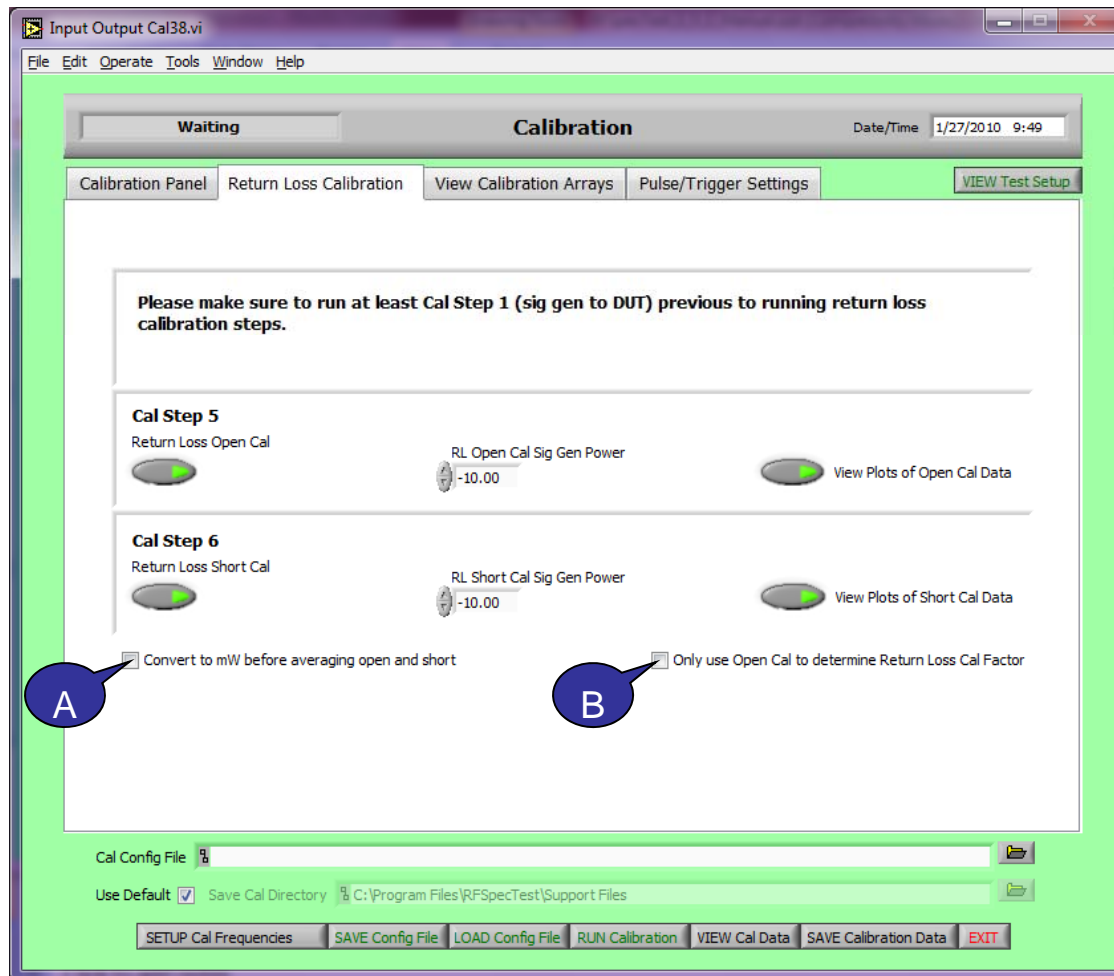# Run Calibration – Calibration Tab

The Calibration tab enables you to Set Up Calibration Steps and navigate through the process of calibrating the test equipment. Calibration is performed at the Device Under Test (DUT). RFSpecTest includes six built in calibration steps. The first four steps are displayed on the Calibration Panel tab, and the last two are on the Return Loss Calibration tab. It is important to note that calibration Step 1 (Signal Generator 1 Input Calibration) **must** run before running Step 5 and Step 6 (Return Loss Calibration). This procedure allows the program to establish a loss from the signal generator to the Device Under Test before the return loss steps.
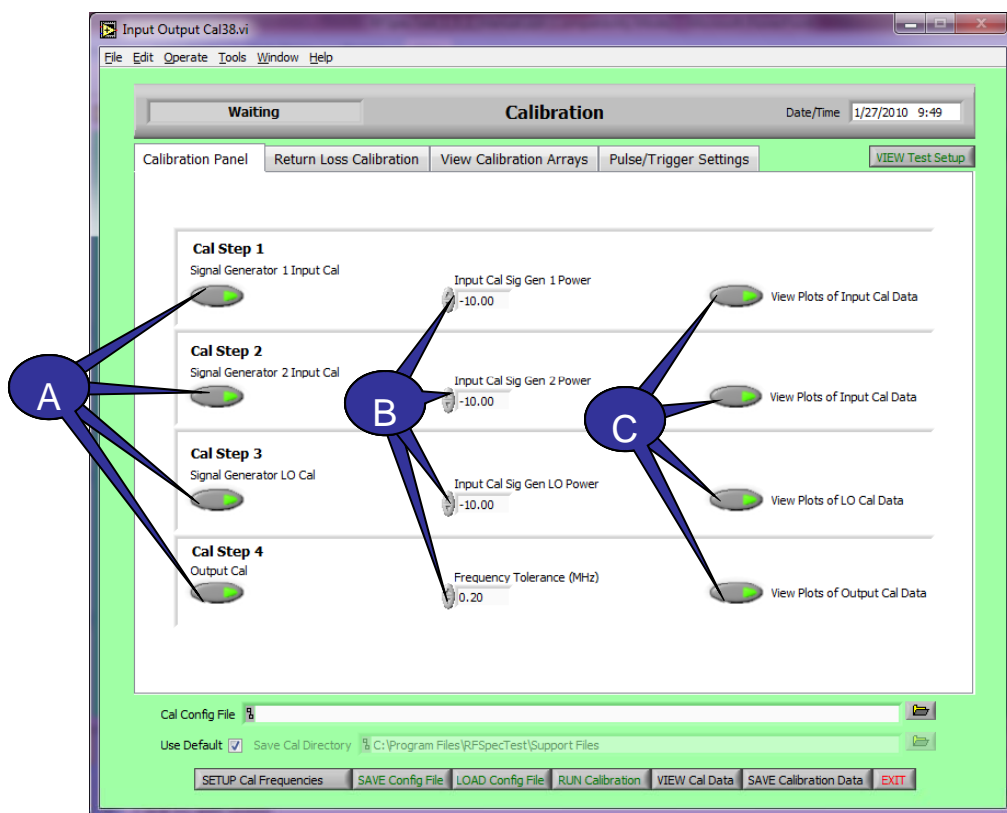
A. To select which steps to run, click on the toggle switch below the desired step. A green light will turn on. Only the steps with a green light will be preformed during the calibration.

B. Next, enter the desired power level for each step that was chosen. Either use the arrows next to the appropriate field to scroll to a desired value or enter a number in field directly by clicking and typing.

C. Finally, you may select to view plots of each calibration step. Click on the toggle switch to the right of each step to view the respective plot. Only plots with green lights will be automatically displayed. After the calibration is complete, however, it is possible to look at any of the plots by going to the View Calibration Data panel.

Run Calibration – Return Loss Calibration Tab

The Return Loss Calibration tab is used to set up calibration steps 5 and 6 (Return Loss Open Cal and Return Loss Short Cal). Select which steps to run in the same way as on the Calibration Tab.

A. **Convert to mW before averaging open and short-** Check this option to convert the open and short measured power to mW before averaging them. The result will then be converted back to dB.

B. **Only use Open Cal to determine Return Loss Cal Factor** – Select this option to only use the open measured power to determine the Return Loss Cal Factor. This may be useful if no short is available to attach during the calibration.

The View Calibration Arrays tab allows you to look at numeric tables of the Input Cal Frequency, the Output Cal Frequency, the LO Cal Frequency, and the Return Loss Frequency. These arrays are simply displays and may not be changed on this tab. To configure the frequency arrays go to Set Up Calibration Frequencies. To scroll through the data, click and hold the arrows next to the desired table or enter a cell number in the box next to the arrows.

The Pulse/Trigger Settings tab displays the current pulse and trigger parameters for the test equipment in use. Before adjusting the pulse and trigger parameters, make sure the test equipment is configured accurately. First Exit the Current Utility Panel and then click on the Set Up Test Equipment button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. After the test equipment is set up as desired, return to the utility panel. The fields on Pulse/Trigger Settings tab are simply displays and may not be manipulated. To change the settings, click on the Configure Pulse Trigger Settings button located in the lower left hand corner of the tab.

Cal Step 1 Diagram

At the start of each step, a calibration diagram will pop up to display the test equipment configuration. After the test equipment has been setup accordingly, click the **Continue** button in the lower right corner. At the end of each step the selected calibration plots will pop up. To continue on to the next step, exit the calibration plot by clicking on the **Exit** button in the lower left hand corner. You may revisit these plots at any time by clicking on the View Calibration Data button.
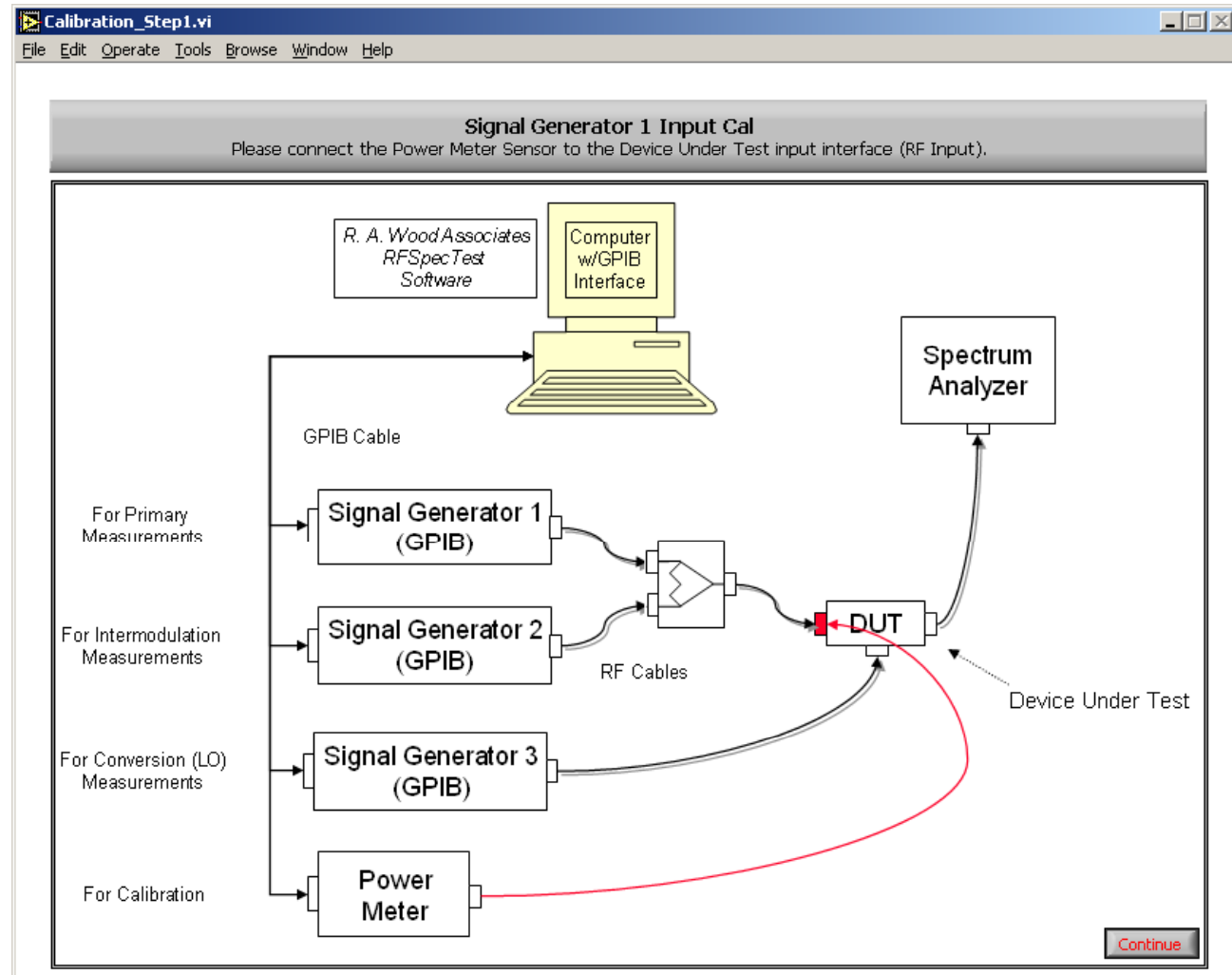
Cal Step 2 Diagram
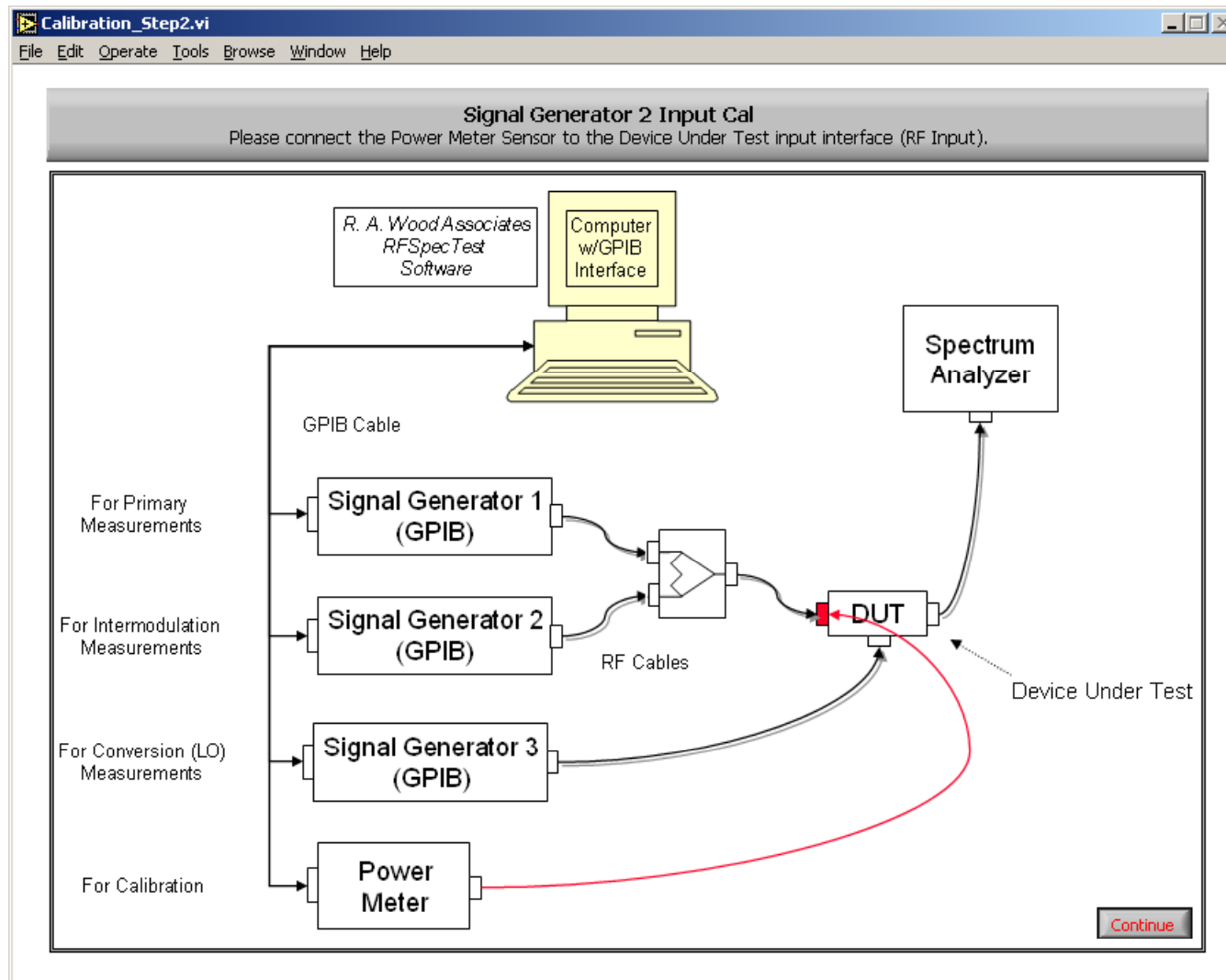
Cal Step 3 Diagram
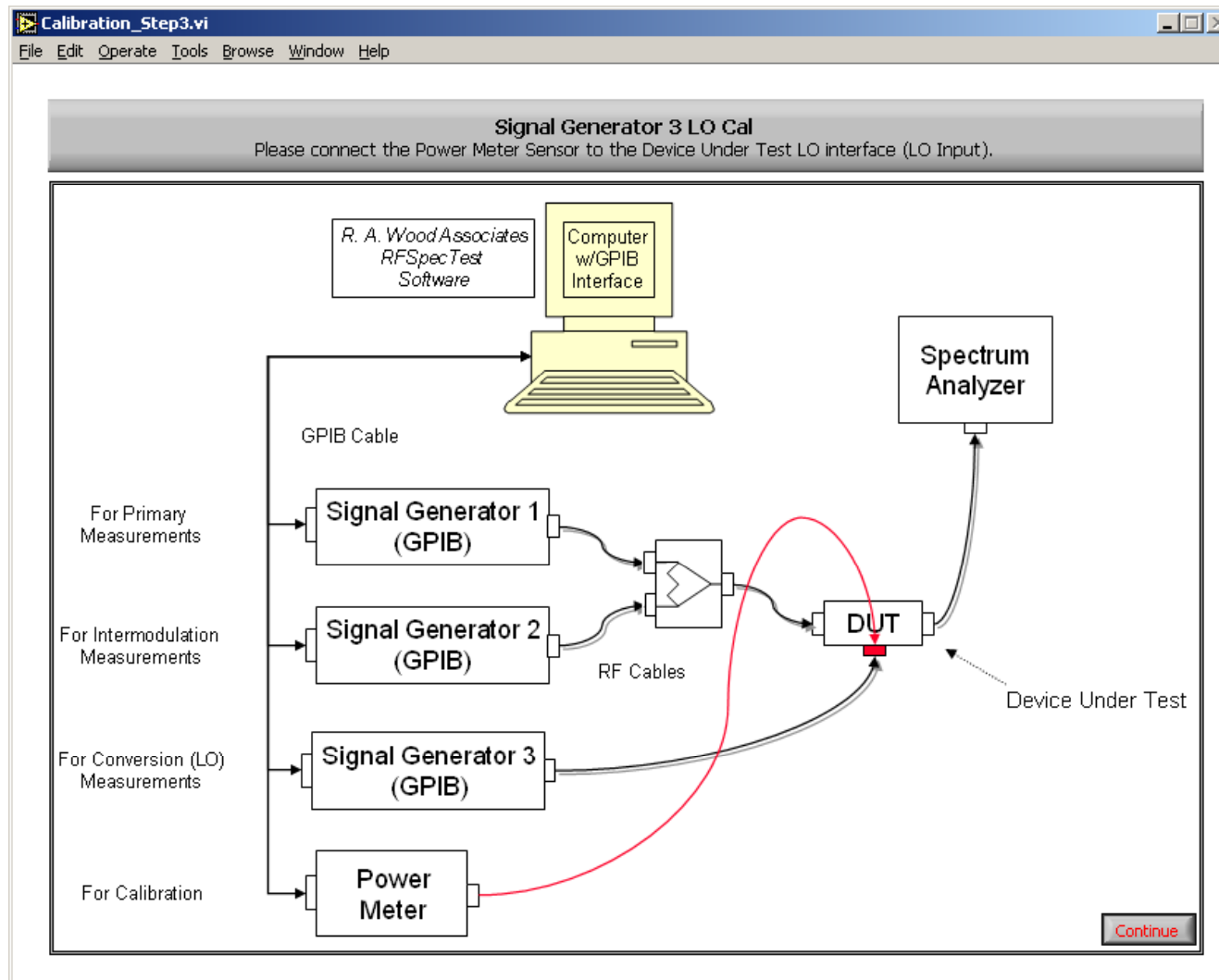
Cal Step 4 Diagram

Cal Step 5 Diagram

Cal Step 6 Diagram

View Calibration Data

On this panel you may view graphs of each of the calibration steps and pertinent statistical values. For details on the options available on this panel see the following page.

View Cal Data Cont.

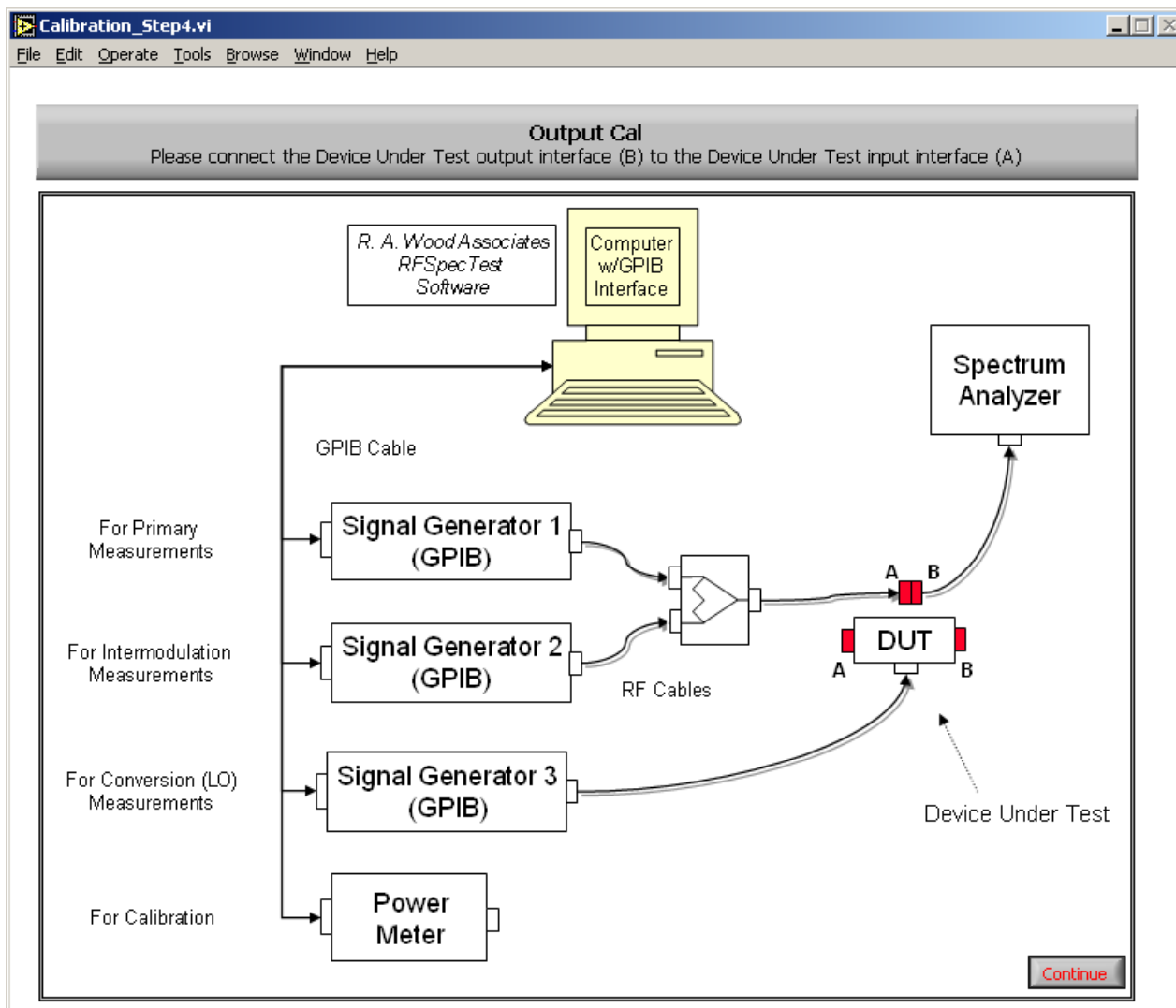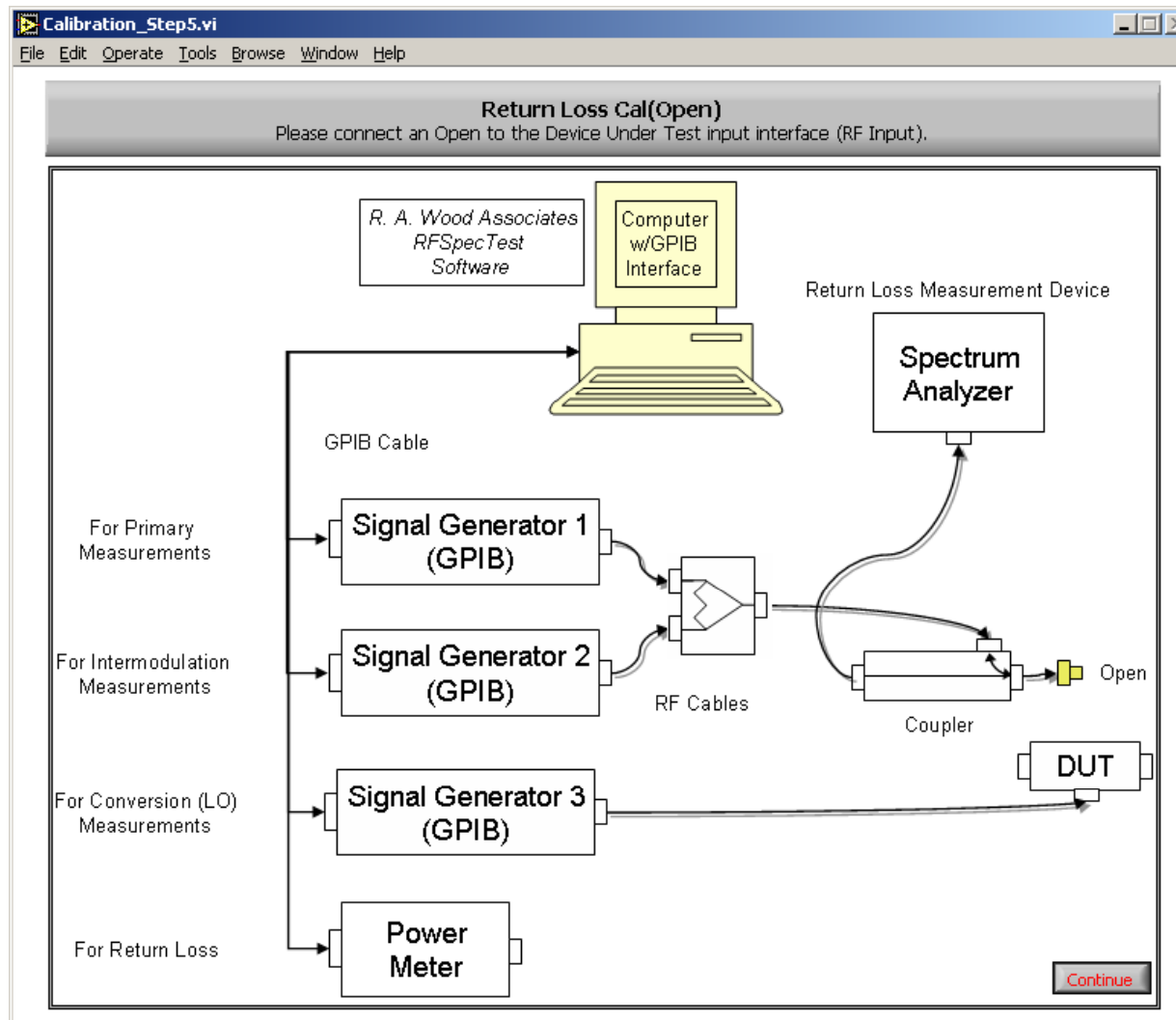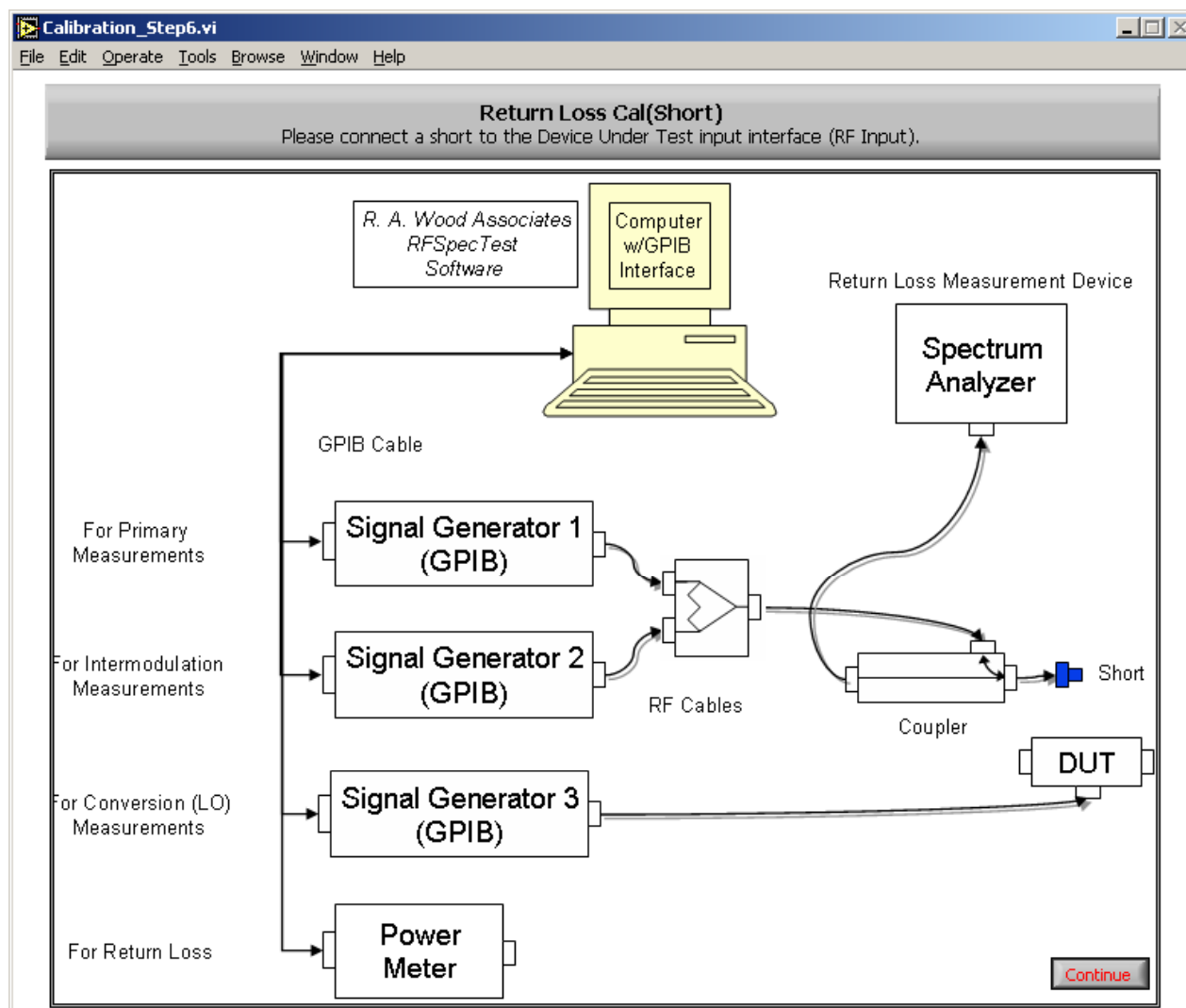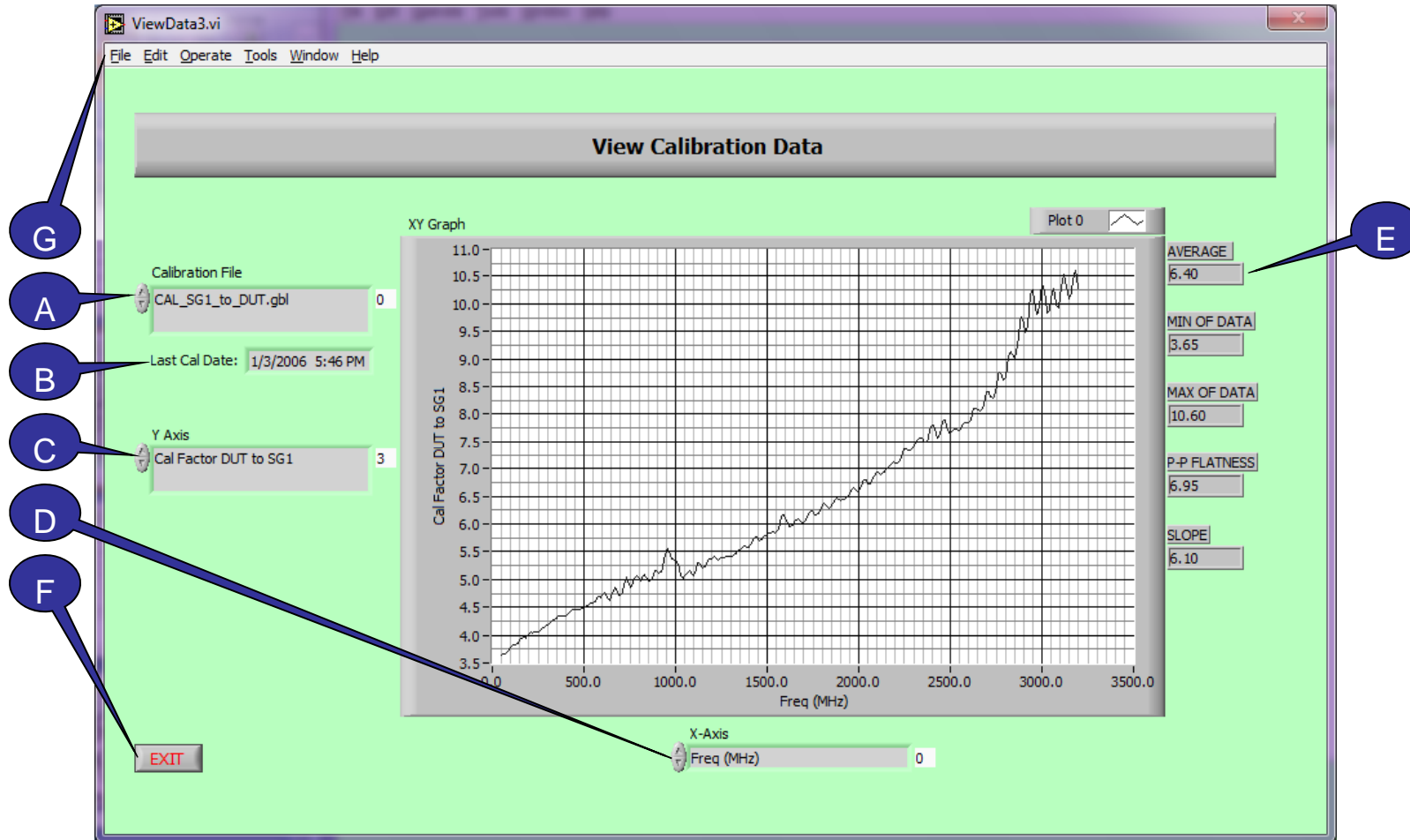**A.** **Calibration File –** This field is used to select the calibration data file that will be used for analysis. Only files in the active directory are available. To change the active directory, go to Set Active Calibration Files. To select a file for analysis click on the gray field and highlight the file name in the pop up menu. Changing the calibration file will change which options are available in the **Y-Axis** and the **X-Axis** fields.

B. **Last Cal Date** – The Last Cal Date field displays the most recent date and time that the calibration files were saved in the active directory. If files were saved in a different directory, this field will not reflect the latest calibration date. To change the active directory, go to Set Active Calibration Files.

C. **Y-Axis –** The Y Axis field displays which set of data is plotted on the dependent axis. To view a different dependent variable, click on the gray field and select an option from the pop up menu.

D. **X-Axis –** The X Axis field displays which set of data is plotted on the independent axis. To view a different independent variable, click on the gray field and select an option from the pop up menu.

E. **Statistics** – The following statistical parameters are displayed for the calibration data plots.
- Average - arithmetic mean of the gain data across the frequency range
- Min OF Data - minimum gain value
- Max OF Data - maximum gain value
- P-P Flatness - peak to peak flatness
- Slope of Best Fit Line

F. **Exit** - Clicking on the Exit button will cause the current panel to close. This will bring you back to the previous panel. Save data before exiting the panel.

G. **File>>Exit** - To exit RFSpecTest directly from the current utility panel go to File>>Exit. Save data before exiting the panel.

Set Up Test Equipment

The default Set Up Test Equipment panel is displayed below. This is the first panel that opens at the start of the program. It may also be accessed by clicking on the **Set Up Test Equipment** button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. This utility is used to identify which pieces of Supported Test Equipment will be used and what their corresponding GPIB addresses are. Before setting up the test equipment it may be useful to view the test setup diagram.

Setup Test Equipment Cont.

A. For each RF Test that will be preformed select a piece of test equipment by clicking on the desired field and highlighting the equipment model number in the pop up menu. It is also important to set the correct GPIB address for each piece of equipment. An incorrect GPIB address may cause an unrecognizable error. For any tests that will not be preformed, set the test equipment model to **Not Used**.

B. **Measurement Source (Spectrum Analyzer)** – If the **Power Meter** is selected for the Spectrum Analyzer source or the Return Loss source, the GPIB address field will be grayed out. The power meter settings must be configured under the Calibration Source.

C. **Calibration Source** – For the Calibration Source, in addition to selecting the power meter model number and the GPIB address, a Power Meter Sensor Head File must be specified. This file may be created using the Set Up Power Sensor Head File utility. To load a file that has already been created, click on the **File** button next to the Power Meter Sensor Head File path.

D. **Show RF Test Setup Diagram** – Click this button to view the test equipment configuration.

E. **Comments** – Type any pertinent notes or comments in this field to document the current setup.

F. **Test Equipment Setup File Path** - The Setup Test Equipment File is a custom patterned text file that contains all fields from the Set Up Test Equipment panel. After a Setup Test Equipment File has been saved or loaded, the file path will be displayed here.

G. **Save Setup As Default** – Click the Save Setup As Default button to save the current setup to the program support files. Each time the program is opened this default setup will automatically load into the Set Up Test Equipment panel. Be careful when selecting this option because the existing default file will be replaced. A series of dialog boxes will pop up to ensure that it is OK to replace the existing files. Click **Replace** to continue with the save.

H. **Save Setup** – To save a Setup Test Equipment File that may be recalled at a later date, click on the Save Setup File button.

I. **Load Setup** – To load an existing Setup Test Equipment File, click on the Load Setup File button.

J. **Save and Exit** – Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file for retrieval after the program has been closed.

K. **File>>Exit** - To exit RFSpecTest directly from the current utility panel go to File>>Exit. Save data before exiting the panel.

Set Active Calibration Files

The default Set Active Calibration Files panel is displayed below. To access this panel, click on the **Set Active Calibration Files** button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. This panel is used to select a directory for the calibration files to be saved to or loaded from. This is also the directory that the Power Sensor Head File must be located. Calibration files may only be located in the Support Files directory or one of its subdirectories. You may create additional subdirectories as needed.

A.   To create a new subdirectory in the Support Files, locate the Support Files directory. Go to **Start>>My Computer>>Program Files>>RFSpecTest>>Support Files**. Right click in the Support Files folder and select **New>>Folder**.

B.   To change the active calibration directory, **uncheck** the **Use Default Calibration Directory** box.

C.   In the pull down menu select the desired subdirectory.

D.   **Save and Exit** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely.

E.   **Cancel -** Clicking on the Cancel button will cause the current panel to close. This will bring you back to the previous panel. Any changes made to the current utility will not be saved.
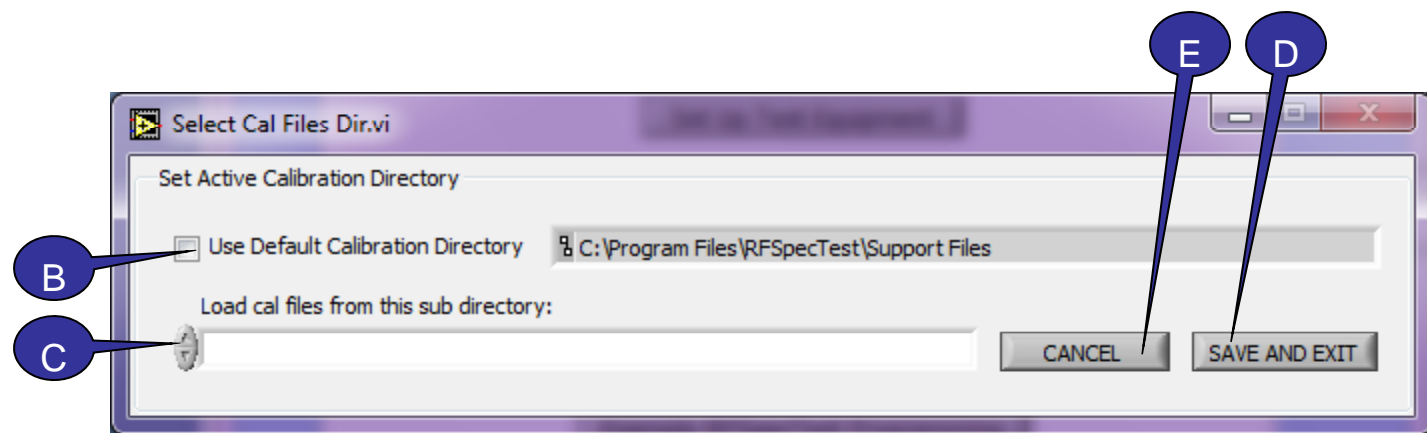
Set Up Power Sensor Head File

This is the default Set Up Power Sensor Head File panel. To access this utility click on the **Set Up Power Sensor Head File** button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. This panel is used to input the calibration data for a power sensor.
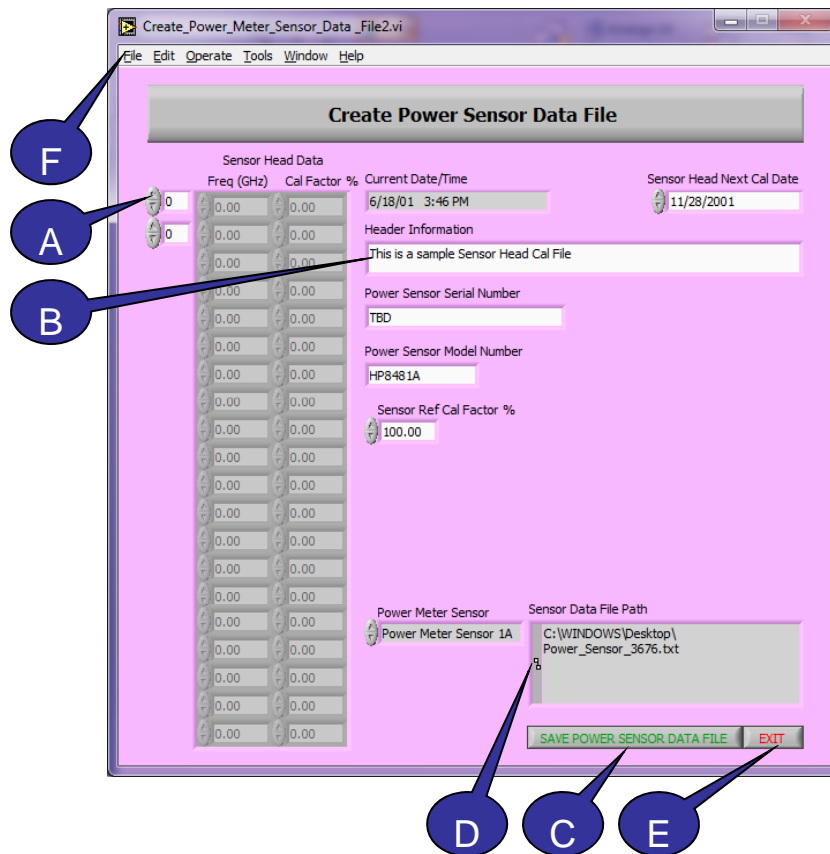

A. Enter the calibration data points.

B. Enter the identification information.

C. The Power Sensor Data File is a tab delineated text file that contains all parameters from the Set Up Power Sensor Head File panel. To **save** a Power Sensor Data File that may be recalled at a later date, click on the **Save Power Sensor Data File** button located in the lower left corner of the panel. In the pop up window browse to the desired save location, name the file, and click **OK**.

D. After a Power Sensor Data File is saved, the file path is displayed here.

E. **Exit** - Clicking on the Save and Exit button will cause the current panel to close. This will bring you back to the previous panel. Any unsaved data from the current utility **will be available** until RFSpecTest has been closed completely. This option does not save information to a file for retrieval after the program has been closed.

F. **File>>Exit** - To exit RFSpecTest directly from the current utility panel go to File>>Exit. Save data before exiting the panel.

Example RFSpecTest Programming

RFSpecTest has two operation modes, manual and automated. In the automated mode, a script file controls the actions of the program by defining all of the test parameters and procedures. Before a script file may be programmed, supporting setup files must be created and saved in manual mode. These files include the Test Frequency File, the Pulse/Trigger Setup File, and the Measurement Setup File. It is also recommended that the test equipment be calibrated. After the support files have been created it is easy to develop a custom program to automate any or all of the RF Tests.

A script file may be created in RFSpecTest or Excel. To create a script file in RFSpecTest click on the **Example RFSpecTest Programming** button on the Calibration and Utilities tab of the RFSpecTest - RF Spectral Measurement Toolkit. This will bring up the default programming panel displayed below. See the following pages for descriptions of the features on this panel. After the script file is complete, save and exit the panel.
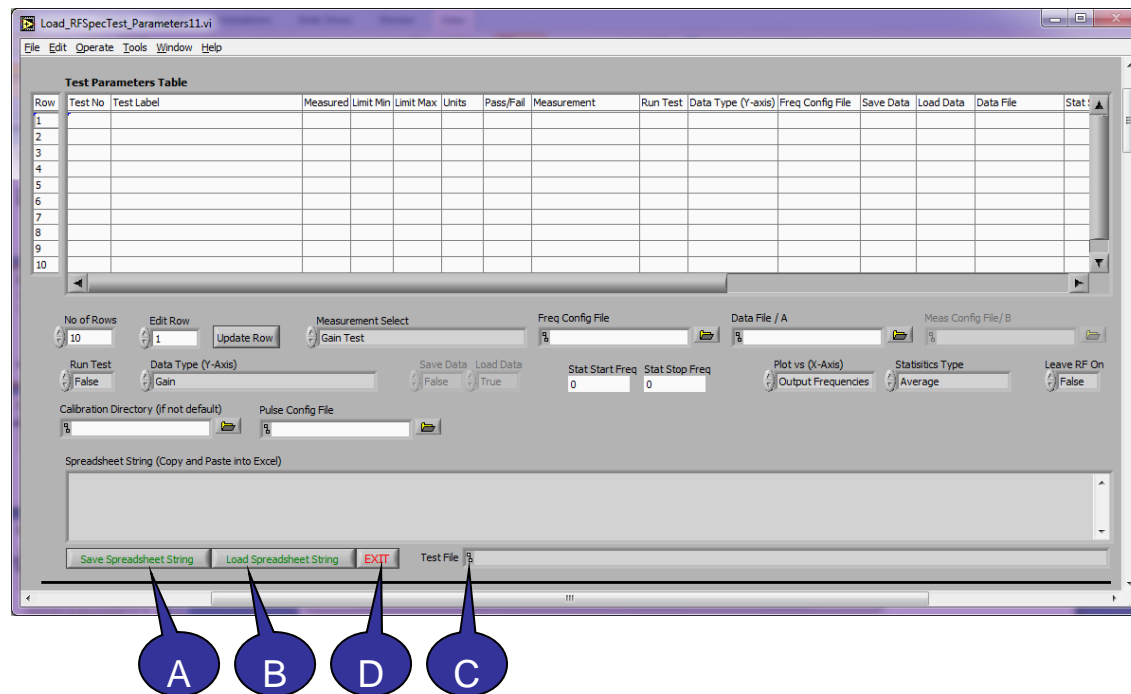
A. **Save Spreadsheet String**– After all test parameters are set as desired, click the Save Test Script File button to save the file for future recall in automated mode.

B. **Load Spreadsheet String** – To edit an existing script file click the Load Test Script File button.

C. **Test File** – After a script file has been saved or loaded the file location will be displayed here.

D. **Exit** - Clicking on the Exit button will cause the Example RFSpecTest Programming panel to close. This will bring you back to the RFSpecTest – RF Spectral Measurement Toolkit. Save data before exiting the panel.

A. Each row in the **Test Parameters Table** represents one test in the script file. In the automated operation of RFSpecTest, the script file will run each test line by line. This table is in a listbox format that allows the user to select rows from it, but not edit it directly. To edit an existing row or add a new row select from the appropriate options below. After the rows have been edited as desired, you may drag and drop rows to reorder them.

B. **Update Row** – Applies the current test parameters to the selected row.

Show RF Test Setup Diagram

Click on the **Show RF Test Setup Diagram** button on the Run Calibration panel, the Set Up Test Equipment panel, or the Calibration and Utilities panel to view the test setup diagram.

The RF Test Setup Diagram displays the testing configuration that corresponds to the selected test equipment. This equipment configuration will be used for all of the RF Tests.

To Exit this panel click on the Exit button in the lower right hand corner. This will bring you back to the previous panel.
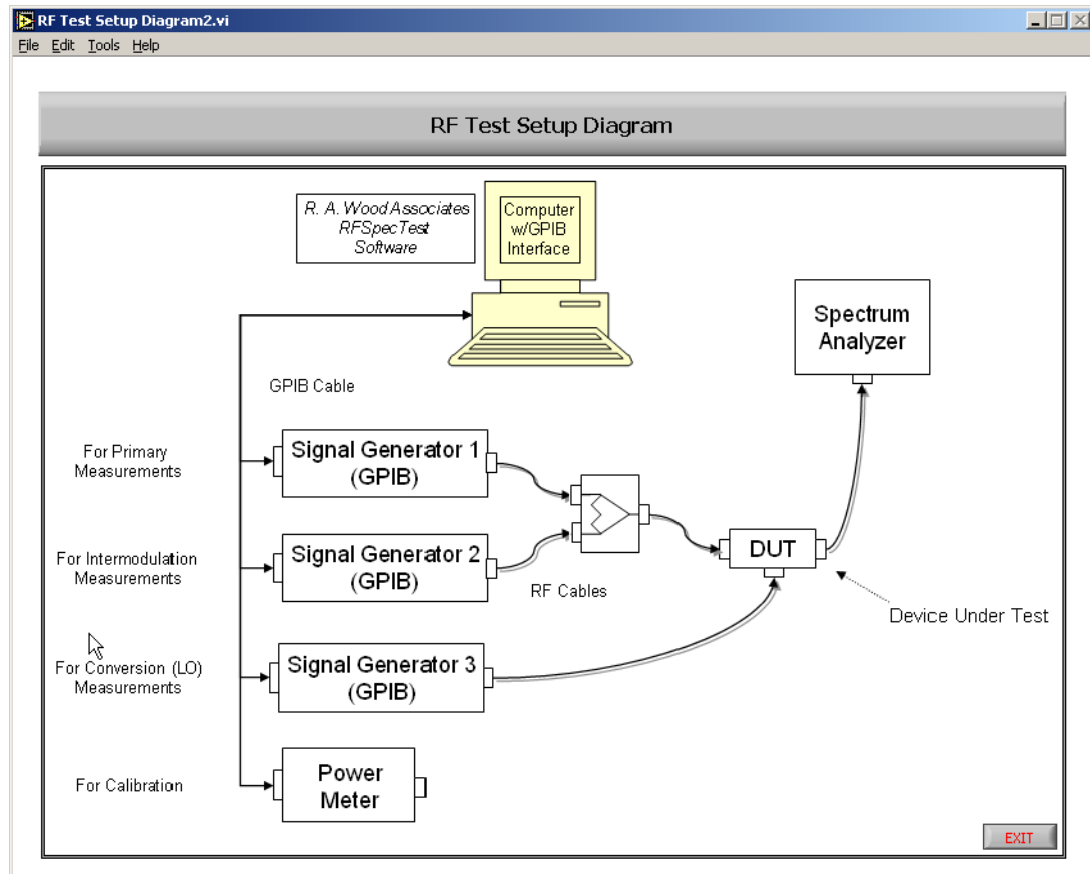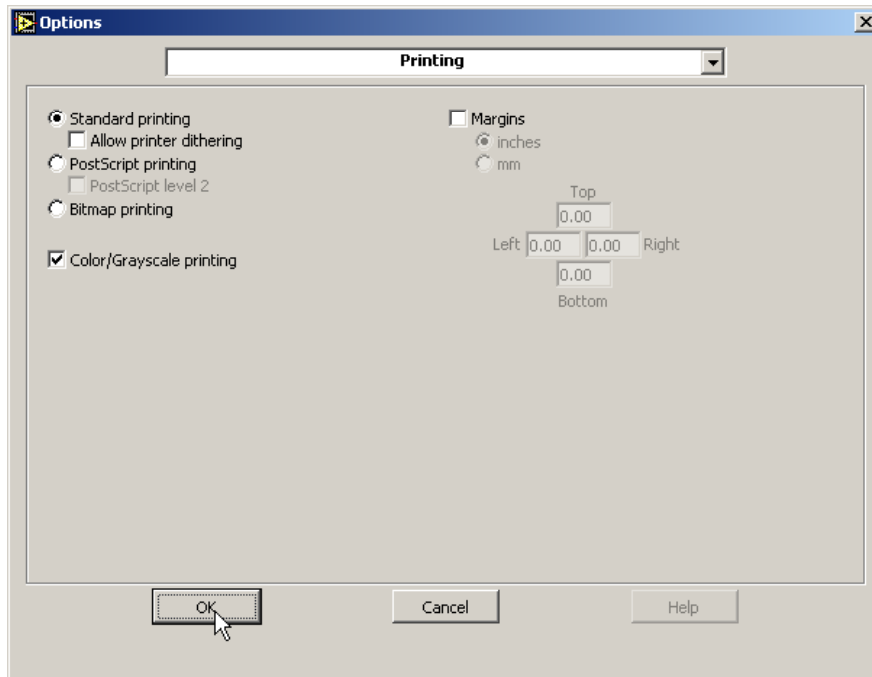
Printing

- The default printer is set for a postscript type printer.
- To print on an ink jet printer go to **Tools>>Options**. In the pop up window, click on the arrow next to Paths and select **Printing**.
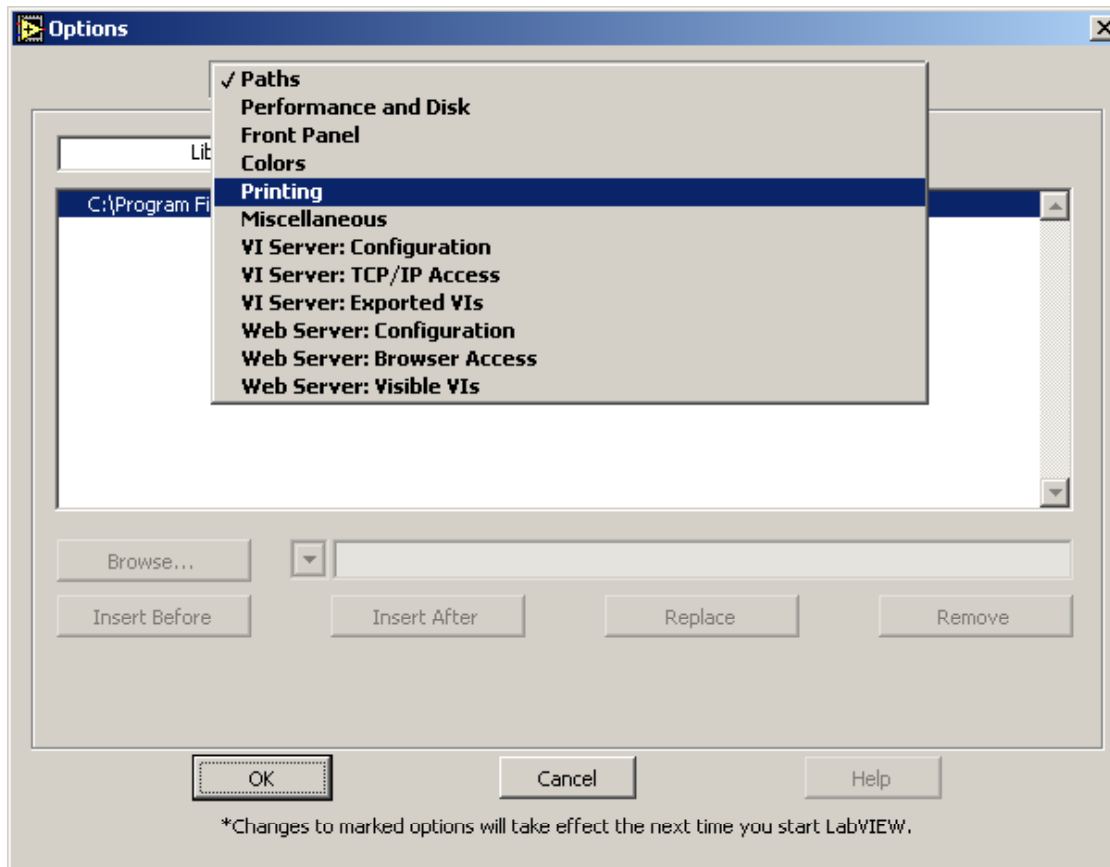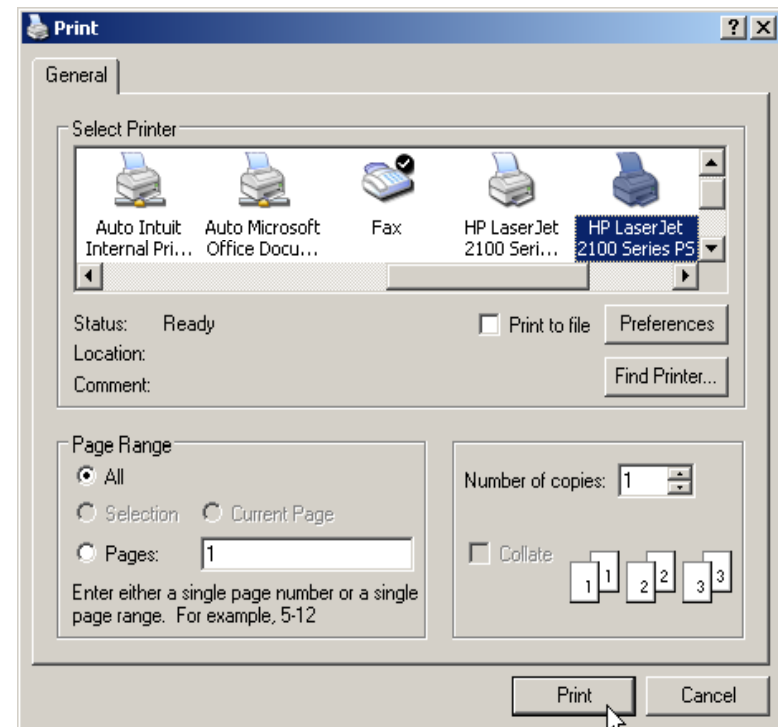
Printing Cont.

- Set the printing options to **Standard Printing** and click **OK**.

- On the panel that you want to print, go to **File>>Print Window....** In the dialog box select the ink jet printer and click **Print**

Help Menu

For help on functions while RFSpecTest is running, go to Help >> Show Context Help. This will bring up a window with helpful tips that change according to the location of your mouse. Drag your mouse over buttons, graphs, or tables to view detailed descriptions of their functions (see example below). As always, if you run into problems, don't hesitate to contact us at any time.

Click on Show Context Help to bring up the Help window.
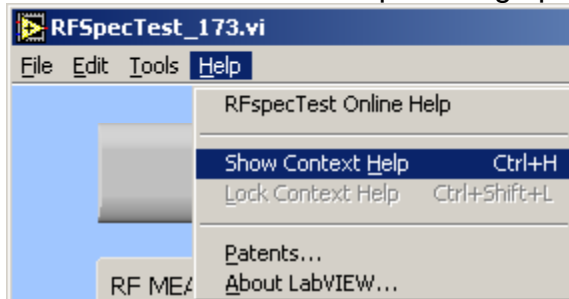
This is an example Context Help Window that is displayed when the mouse button hovers over the Gain Test button on the RFSpecTest - RF Spectral Measurement Toolkit. Move the mouse to hover over different buttons, graphs, or tables to view help on other functions.
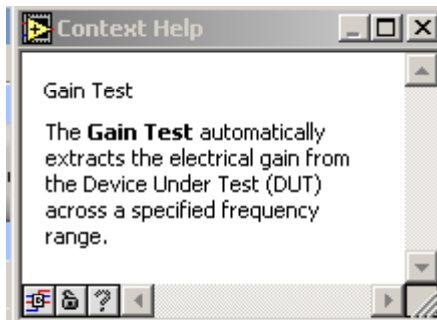
Purchasing Information

- We currently offer several methods for purchasing our software products:
    1. Select the desired method from within the program itself (recommended for single purchases)
    2. Use the PayPal Forms on our software download page :
       http://rawood.com/software_products/purchase_software.html (useful for purchasing multiple programs)
    3. Fill out the WWW form
    4. Contact us directly so we can contact you for payment arrangements
- When purchasing, please double check that both your User Name and Registration Key are correct.