



Frontier Technical Services
Z'Analyze[®] Software

User Manual for Windows Operating Systems

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Introduction

What is Z'Analyze Software?

Welcome to *Z'Analyze* and thank you for choosing this product! In conjunction with a Trewmac RF Impedance Analyzer, this software will enable the following:

- Manual collection of impedance data at a single frequency or over a frequency range, with averaging for improved precision and an easy-to-use interface.
- Processing and importing of AE *Z'Scan* .zsd or Bird BDS2 .csv RF sensor data.
- Saving of impedance data as a .csv data or RF sensor data as set as a .csv or a .zsd file set.
- Saving program startup parameters for use in multiple scenarios. *Z'Analyze* also saves items such as match computations, including impedance ranges and match transition timing.
- View data sets in various formats including, but not limited to, Smith chart, R/X, Z mag/phase, Gamma re/im, Gamma mag/phase, VSWR, V/I/phase, and P (Power).
- Additionally, data sets can be enhanced visually through the Zoom function, its fit-to-screen function, its ability to tile data sets either horizontally or vertically, and much more.
- Review previously collected data sets: when viewed graphically, *Z'Analyze* allows different data sets to be viewed simultaneously by overlaying a new data plot with a saved reference plot.
- Export gathered data as a .csv file.

Helpful Resources

Z'Analyze comes with a set of useful resources to help you navigate, understand, and troubleshoot the software.

User Manual

The User Manual explains how to install the software, set up supporting hardware, navigate the interface, use the software to run impedance tests, change display/scaling functions, import data from Advance Energy's *Z'Ware* software, and measure the impedance range of a connected matching network.

Readme File

The "Z'Analyze Readme" file installs with the software and contains information about the current version, quick-install instructions, and contact for technical support.

Direct Help/Support

If you require additional support not covered in the accompanying documents, there is direct support available. To ask a question, report a problem with *Z'Analyze*, or notify Frontier Technical Services of any improvements that can be made to the accompanying manual, please contact technical support at crtech@ftsplasma.com.

Setup

For a complete setup, the correct software and hardware must be configured.

Installing *Z'Analyze* Software

System Requirements

In order to run *Z'Analyze*, your personal computer must meet the following requirements:

- ✓ Windows XP or Newer (PC Only)
- ✓ A processor with at least 1 GHz
- ✓ Approximately 5 MB of hard disk space
- ✓ Color Monitor
- ✓ Windows-compatible mouse

Download Instructions

To download *Z'Analyze*, follow the link below and select “Z'Analyze 1.10”.

<https://www.ftsplasma.com/software>

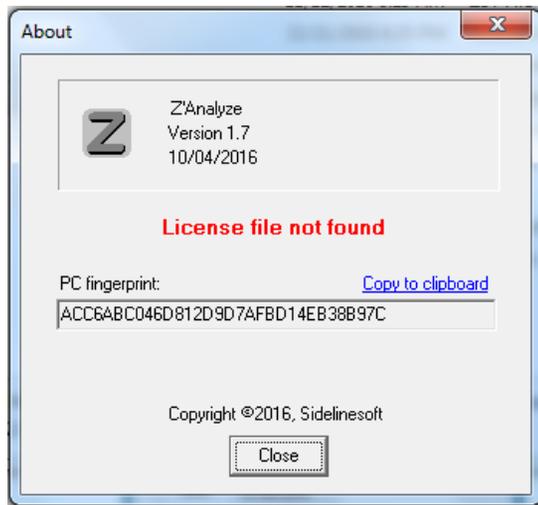


Figure 1



Figure 2

Windows Installation Procedure

1. *Z'Analyze* will be saved as a .zip file – proceed to UNZIP this file after it is saved to your directory.
2. Double-click on *Z'Analyze.exe*. An 'About' window will open a prompt, "License file not found", which displays a PC fingerprint (see Figure 1).
3. Click on "Copy to clipboard".
4. Compose an email to crtech@ftsplasma.com and paste in the PC fingerprint that was copied in step 3.
5. FTS technical support will reply with the license code in a file named "license.txt".
6. Save the license.txt file into the same folder as *Z'Analyze.exe*.
7. Once the license file has been recognized, you will now be able to open *Z'Analyze* and view your level of access and license expiration date by selecting the 'About' option from the 'Help' dropdown menu (see Figure 2).

Hardware Installation

In order to carry out operations such as testing a Matching Network with *Z'Analyze*, an RF Impedance Analyzer must first be connected to your PC, while your Matching Network must simultaneously be connected to this same RF Impedance Analyzer.

Using Z'Analyze with an RF Impedance Analyzer and Matching Network:

IMPORTANT: READ EVERY STEP BEFORE BEGINNING INSTALLATION!

1. TE3000 series and later models of Network Analyzers can be connected using either a USB to Serial Adapter cable or the custom Network Analyzer to USB cable provided with the system.
2. TE1000 must use a USB to Serial Adapter cable.
3. To connect your PC to a Network Analyzer using the Serial Adapter cable, first insert your USB to Serial Adapter cord into your computer's USB port.



USB Network Analyzer



USB to Serial Adapter



Power Supply



TE1000 Network Analyzer Back –
DB9 RS232 port only



TE300X Network Analyzer has both
USB and Serial ports.

4. Insert the end of your Serial Adapter Cable into the RS232 slot located on the backside of your Network Analyzer. Securely fasten the connection by first inserting the Serial Adapter Cable into the RS232 slot, and then rotating its knobs clockwise.

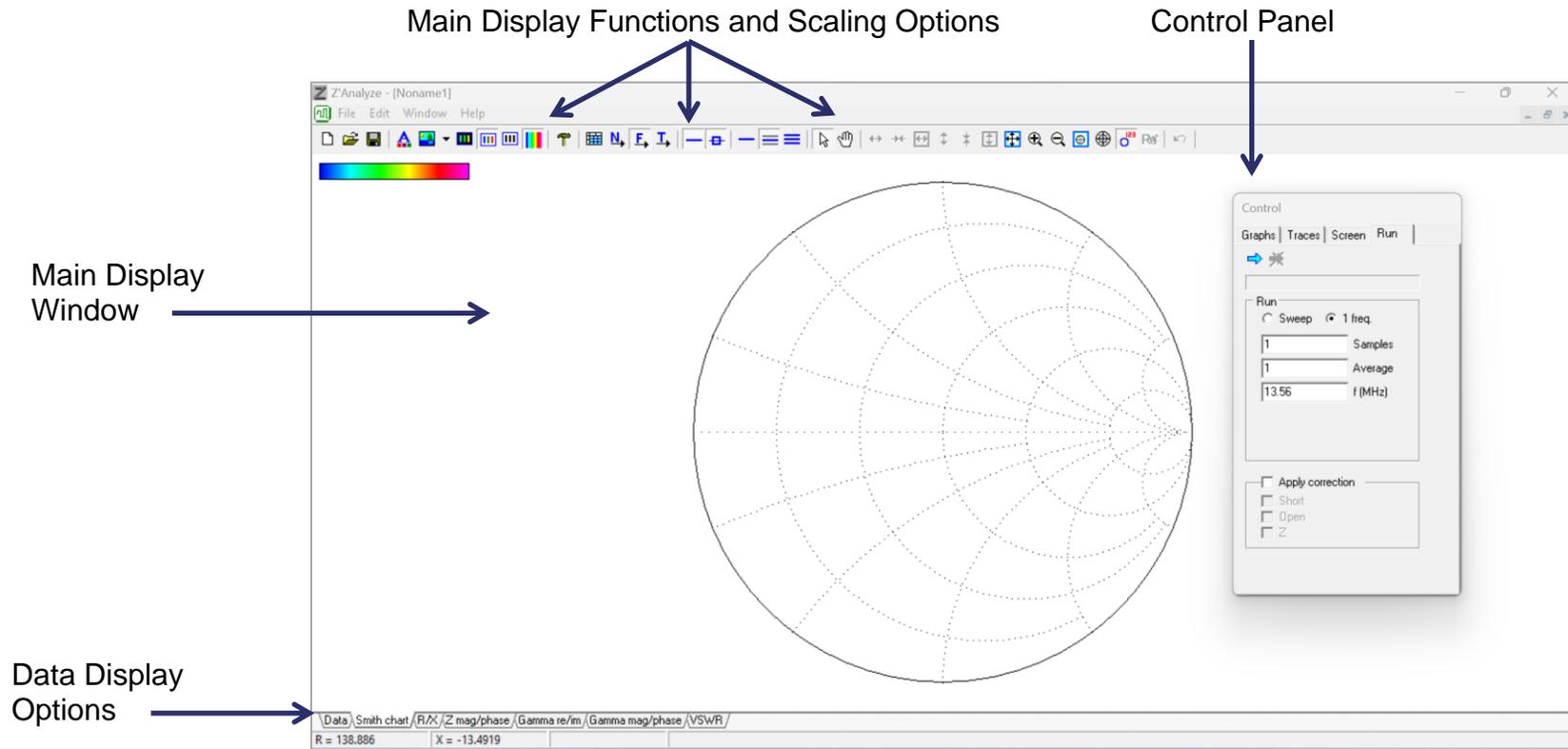
5. To connect your PC to the Network Analyzer using the A-to-B USB cable, first insert your USB cord into your computer's USB port. Then insert the other end into the slot labeled USB on the back of the Network Analyzer.

6. Note that the driver may not install properly, as Windows often chooses a default driver not compatible with the TE300X. The Trewmac driver included with your software must be used instead and will require a reinstall of the correct driver file.

7. Plug the Power Supply into the DC IN slot in the back of the RF Impedance Analyzer. At this point in the installation process, your PC has been successfully connected to your RF Impedance Analyzer.

Understanding the Interface

When you first open Z'Analyze, you will see a blank window and a control panel, with only the Run tab available. Click on File and select either New (to begin a new file) or Open (to choose an existing file).

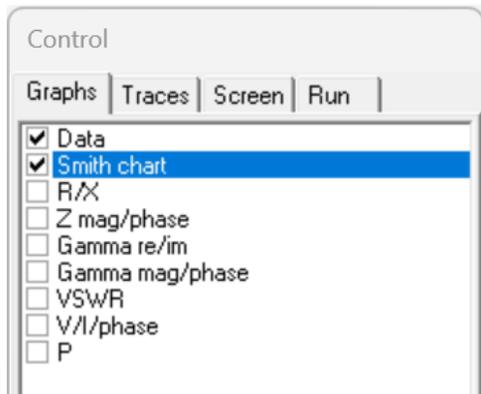


Control Panel Functions

Once a file is open, the Control Panel will now have four tabs: **Graphs**, **Traces**, **Screen/Data**, & **Run**.

Graphs

The Graphs tab allows the user to select which display types are accessible. The options are:

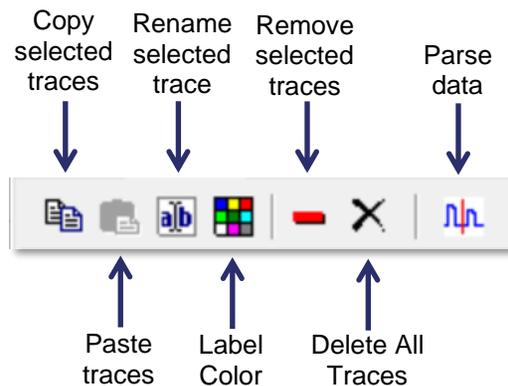
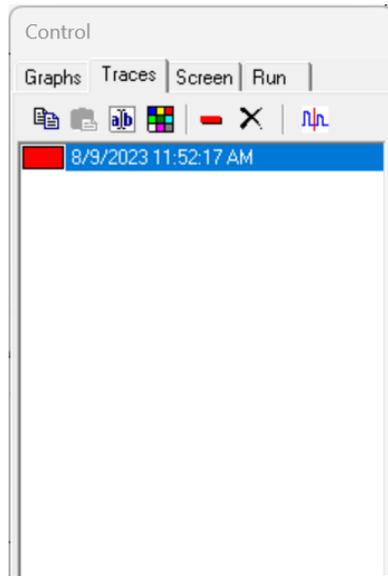


- **Data**
- **Smith chart**
- **R/X**
- **Z mag/phase**
- **Gamma re/im**
- **Gamma mag/phase**
- **VSWR**
- **V/I/phase**
- **P (Power)**

Checking the box to the left of each option allows the user to view that particular display type (Note: Data and Smith chart cannot be unchecked). Clicking on a display type will bring up that display in the main display window.

Traces

The Traces tab displays the name of each trace that is present in the current file. To select an individual trace, click on its name in the Traces tab. To select multiple traces at the same time, hold Shift or Control and click on additional trace names.



- Selected traces can be copied using the **Copy** button on the far-left button of Traces tab.
- Copied traces can then be pasted into different files using the **Paste** button.
- To **Rename** a trace, ensure a trace is selected, and click on the 'ab' button. This will allow you to enter the new name. Select 'OK' to accept changes.
- Traces in this tab have a colored label box to the left of each trace. To change this label color, select the **Label Color** button and click on a desired color. This can be useful for keeping track of files with large numbers of traces.
- To **Remove** a trace from the file, select the trace and click on the red dash.
- To **Delete all** the traces from a file, click on the black 'X'.
- The **Parse Data** function is enabled only if the file being viewed has data containing voltage, current, or phase information. Selecting one or more traces to be parsed will open a configuration window, wherein the threshold type, either Power or Voltage, threshold value, and a 'Stop After' delay value (Measured in seconds) can be input. If the 'Keep original trace' option is not checked in this configuration window, the original trace selected will be deleted after parsing (even if no parsing was done); otherwise, an original trace will not be deleted.

Screen

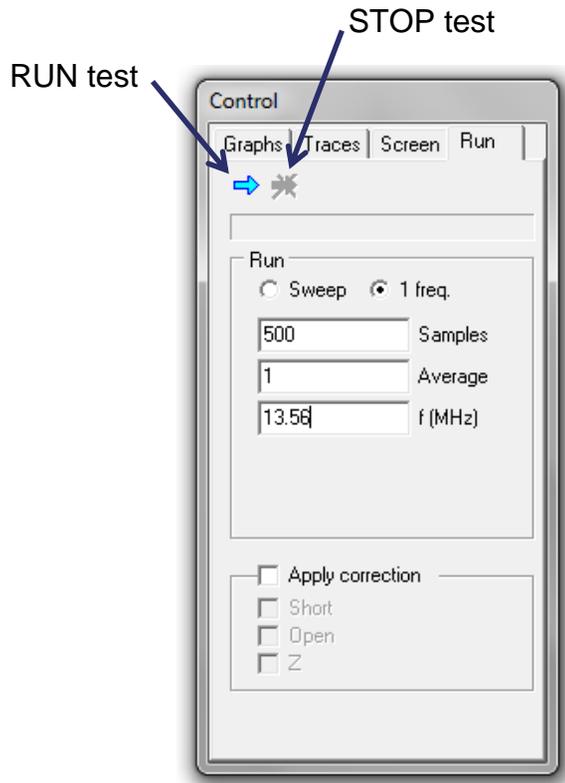
The Screen tab provides the user with the ability to alter the graph or chart being displayed by zooming in or out, fitting the chart to the screen size, or resetting the chart to the default scale. With the Smith chart selected, the user may alter the grid type. With other graph types selected, the user may zoom or fit the vertical and horizontal axes separately (Note: Screen tab is not available when viewing the “Data” format).

Run

The Run tab controls the actual test using the Network Analyzer. Clicking the blue ‘Run’ arrow begins the test sequence. Once a test is running, clicking the blue arrow with the red ‘X’ over it will stop it.

The run settings allow the user to select either a single frequency for the test or to sweep across a range of frequencies. With “1 freq” selected, enter the number of samples to be taken, the average number of samples per data point, and the frequency at which the test is to be performed.

With “Sweep” selected, the user must additionally enter the starting and ending frequency and choose either a linear (Lin) or logarithmic (Log) scale.



Main Window Functions

Edit Settings

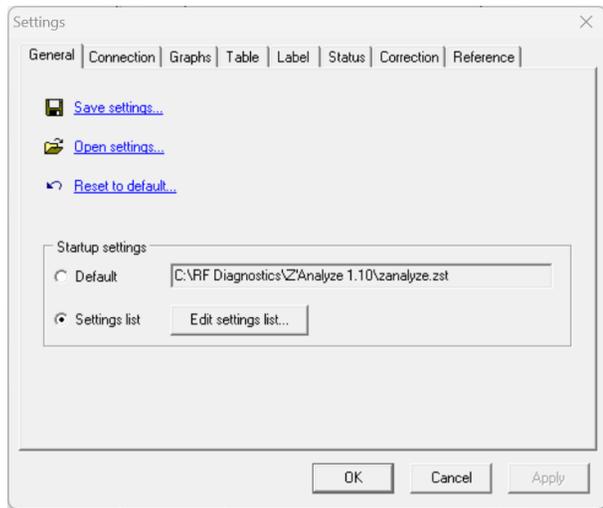


Clicking on the Edit Settings button brings up the Settings Panel with the following tabs: **General, Connection, Graphs, Table, Label, Status, Correction, and Reference.**

General

The General tab allows the user to select default locations to save and open files.

Additionally, the 'Settings list' under 'Startup settings' can be configured such that specific .zst files will be opened at the startup screen by default.



- Selecting **Default** will load the default settings file, "zanalyze.zst" while not displaying any of the files that have been saved to the selection list (See Figure 3 below for the 'Select Settings' prompt viewed at startup of Z'Analyze' when 'Settings list' has been selected from the General Tab).

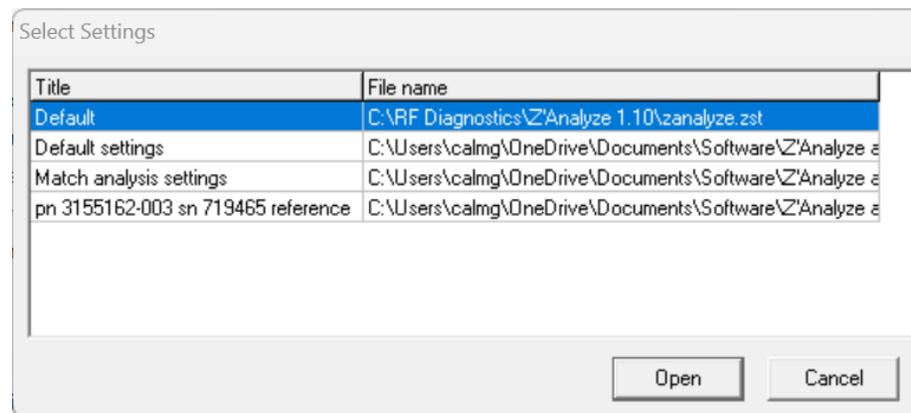


Figure 3

- Selecting **Edit Settings list** enables the user to change which .zst files will be shown upon startup of Z'Analyze (See Figure 4 below). Click 'OK' to confirm a new list or 'Cancel' to discard any changes made.
 - This list will be automatically saved into the file "zanalyze.zsl" in the ZAnalyze.exe directory.

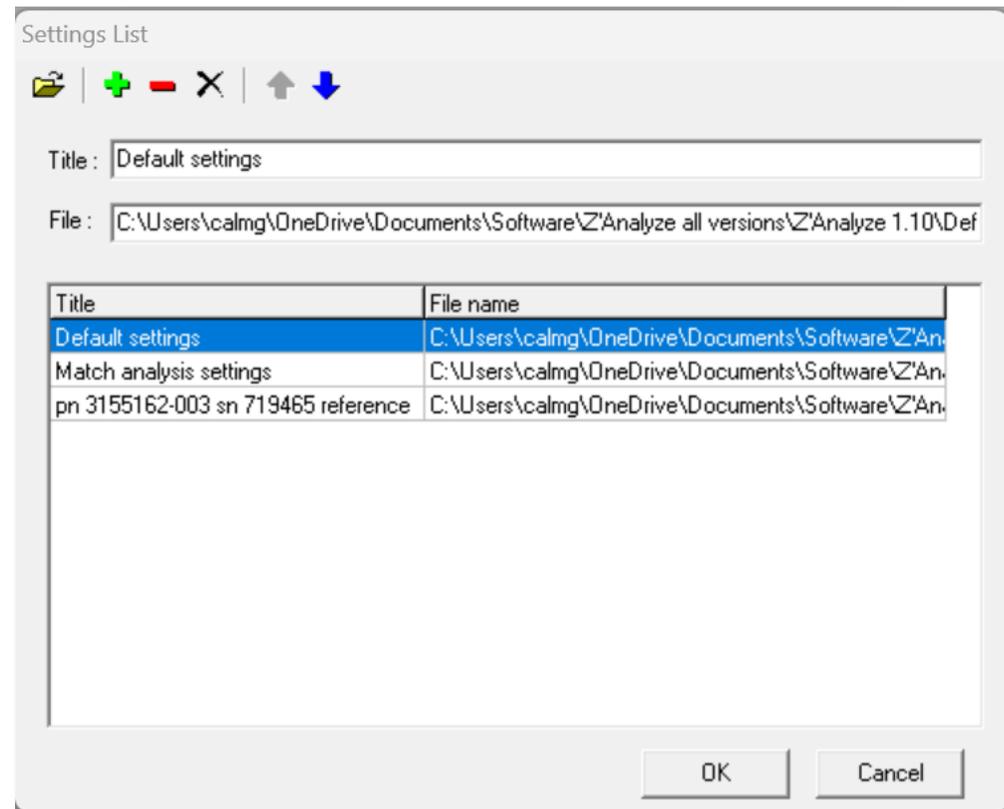
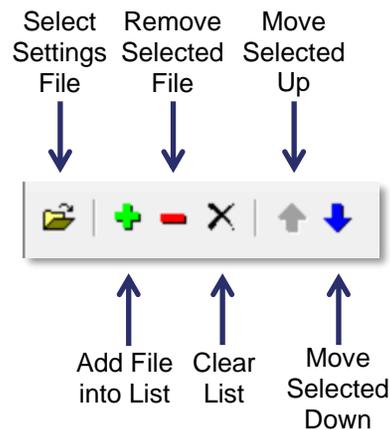


Figure 4

Connection

The Connection tab allows the user to select the Com port, Baud rate, and Timeout interval used for the connection between the computer and Network Analyzer:

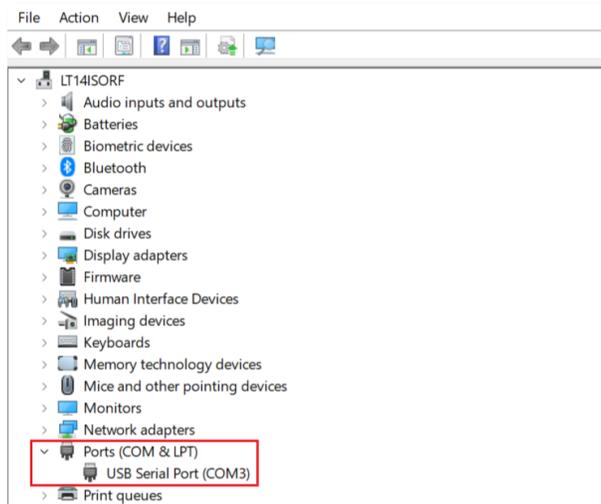
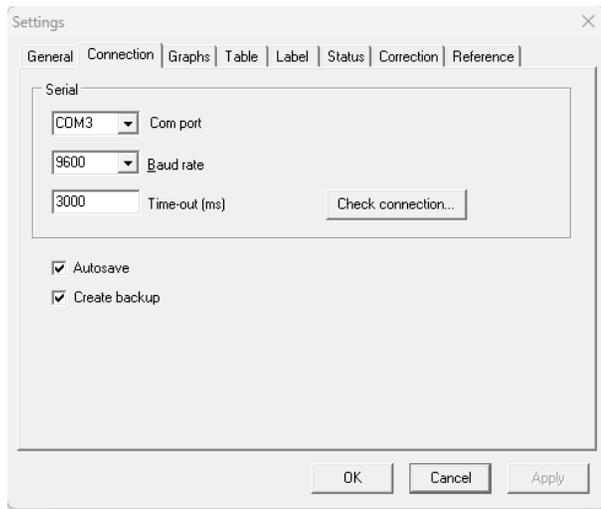
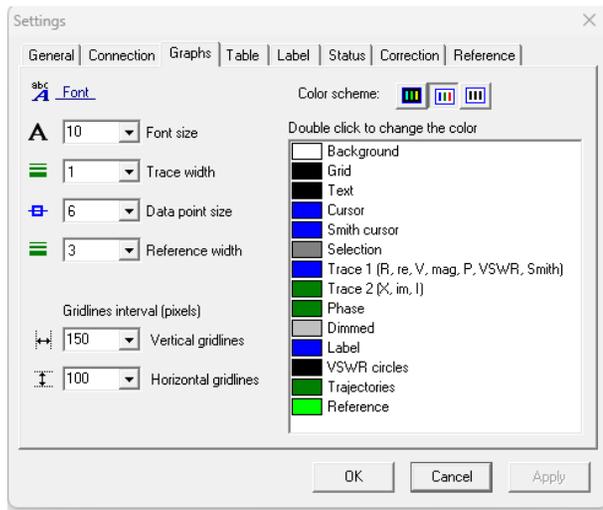


Figure 5

- To establish a connection, the **Com port** selected must match the Com port on the computer that the Network Analyzer is plugged in to. The pull-down menu contains eight COM port names. In addition to these, COM ports higher than COM8 can be manually entered by typing in the port number into the Com port box, ex. “COM17”.
 - Ensure that the listed USB Serial Port in your Device Manager for the Network Analyzer is the same as the Com port listed in *Z'Analyze* (See Figure 5).
- The **Baud rate** is the data transfer rate of the cable used to connect the computer and Network Analyzer (9600 is standard).
- **Time-out** is the length of time the Network Analyzer will attempt to connect to the computer (Measured in milliseconds).
- Click on the **Check connection** button to determine if the Network Analyzer can successfully connect to the computer.
- Check the **Autosave** box to have the .zst file saved to the *Z'Analyze* program folder after every run.
- Check the **Create backup** box to have the .csv file saved to the *Z'Analyze* program folder after every run.

Graphs



The Graphs tab allows the user to change the appearance of the selected chart by altering the width of the trace lines, the size of the data points, the size and type of font, and the color scheme. For graphs other than the Smith chart, the user may also change the intervals of the vertical and horizontal gridlines. To customize the color scheme, double-click on the item to be changed (i.e., Trace 1 or Dimmed 1) and make your selection from the color palette.

Table

The Table tab allows the user to select the font size, font type, and number of digits displayed in the table section of the chart or graph (Note: Digits is total number of digits displayed, NOT digits after the decimal point).

Label

The Label tab allows the user to select the font, font size and marker size of labels that are placed on the Smith chart. It also allows the user to select the number of digits displayed for label values, as well as choose the VSWR values for VSWR circles that are added to labels.

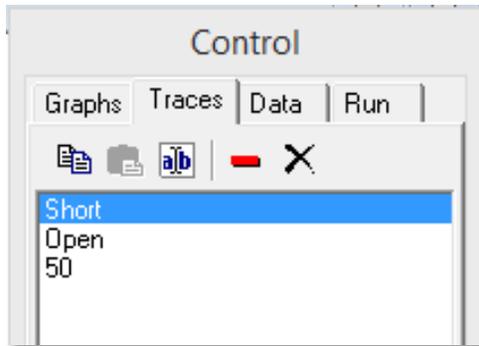
Status

The Status tab allows the user to choose which set of values are displayed in the bottom left corner of the *Z'Analyze* window. By default, scrolling over any part of the Smith chart displays the R/X value at that point. The R/X can be changed to Z magnitude and phase, gamma real and imaginary, gamma magnitude and phase, VSWR, voltage / current and phase, or power. The number of digits to display can also be selected by the user.

Correction

The Correction tab provides the user the ability to calibrate out discrepancies due to the cable or connection attached to the Network Analyzer's output. For example, alligator clips may be used to attach to a network that is not compatible with the Network Analyzer's output cable. However, they introduce an error into the measurements that should be calibrated out using the Correction function, in order to obtain the most accurate readings:

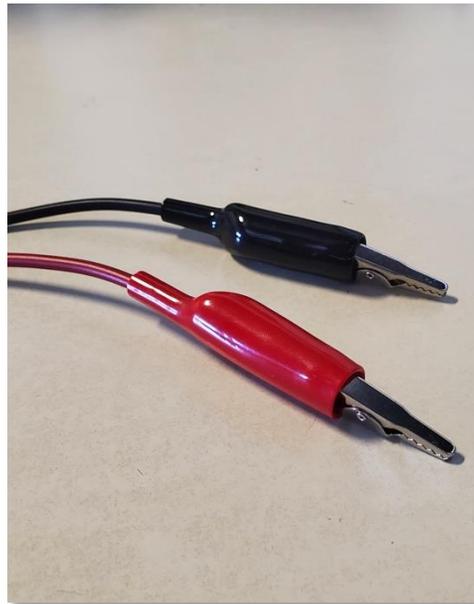
1. Create a new *Z'Analyze* file.
2. Attach the connection device to be calibrated to the Network Analyzer's output.
3. Under the Run tab of the Control Panel, select either "Sweep" or "1 freq" based on the operating conditions you will be using the connection for, and enter the required values. You will now run the three-part SOL correction of the test fixture. **Ensure that the ground connector doesn't touch anything metal during the correction or later during measurements.**



4. Test the short connection by connecting the alligator clips. Click 'Run', and when the test completes, rename the trace "Short".
5. Next, test the open connection by leaving the alligator clips disconnected. Click run, and when the test completes, rename the trace "Open".
6. Attach a 50 ohm load to the connection. Click run, and when the test completes, rename the trace "50".



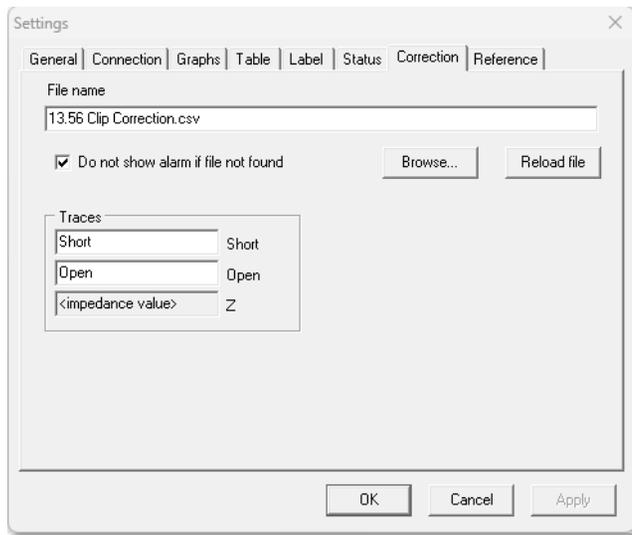
Alligator clips connected to form a 'Short'.



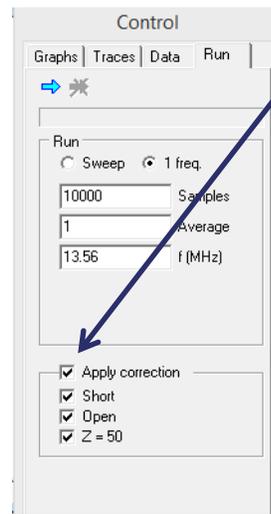
Ends of the Alligator clips do not touch for the 'Open'.



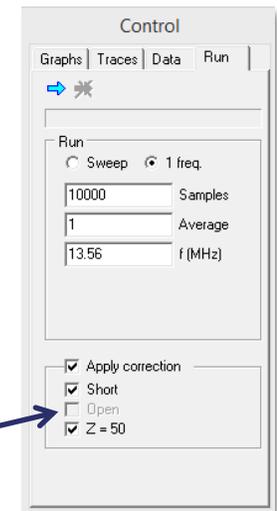
Alligator clips connected to a 50 ohm load.



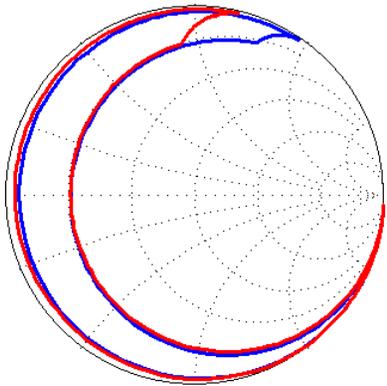
7. Determine an appropriate name for the file, ex. '13 MHz clip correction', and save the file in the folder containing Z'Analyze program files. It should now be available to use as the correction file.
8. Under the Correction tab, click **Browse** and select the newly created correction file. Hit **Reload file** and ensure that the trace names entered under Traces section are "Short" and "Open".
 - a. The trace names are case sensitive and must be referenced the same exact way in both the Traces and the Correction, otherwise the correction will not be available.
9. Once the correction file is loaded, clicking the "Apply correction" box under the Run tab will automatically adjust for the error introduced from the connection type (i.e., alligator clips). Any or all of the three corrections that were previously performed may be applied to the Smith chart, by selecting the box for that specific instance (Short, Open, and Z = 50). If there is any syntax error in entering the name, the following problem with the correction will be seen:



All labeling done correctly, check the boxes to select which corrections to apply.

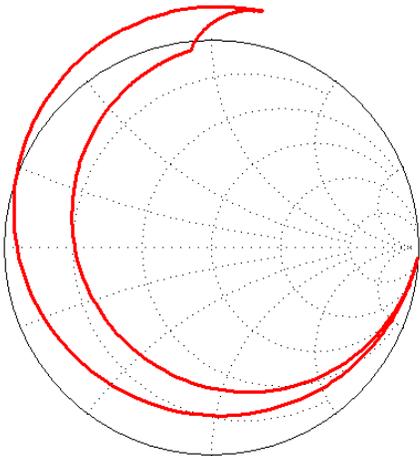


'Open' was entered incorrectly in the Trace name as "open" and is therefore grayed out and not available.



Corrected red trace using “Short” and “Open” options.

The figure to the left illustrates the difference using a correction file can make in the accuracy of your readings. In the first figure, a matching network was tested using alligator clips attached to the Network Analyzer test cable. The red trace is the trace obtained after the correction had been applied. The blue trace was obtained without using the correction option. Note that in this instance, only the Short and Open corrections were applied. Because the trace never approaches a 50 ohm purely resistive load, the $Z = 50$ correction is not required, and in fact introduces an error into the data if applied.



Applying the $Z = 50$ correction when not applicable.

The second figure illustrates the error caused by using the $Z = 50$ correction when it is not applicable. The trace is shifted outside the boundaries of the Smith chart. This implies a negative resistance, which is an impossibility and means the data are invalid.

Reference

The Reference tab allows the user to load traces from other .csv files that will overlay previously opened files for the purpose of expediently comparing data.

- Choose which data to overlay by clicking **Browse** to search for a .csv file to load. Then, from that file, highlight the desired reference trace to be viewed on the Smith chart and click **Apply**.
- **Reload file** will refresh the data being viewed and update any graphs with the chosen reference trace (Note: The selected reference file will be loaded automatically when Z'Analyze starts).
- The reference trace line's width or line thickness and its color can be edited in the Graphs tab (See Figure 6).
- From the main display window, clicking the "Show Reference" icon will toggle the selected reference trace on or off and either show or hide the data on the Smith chart accordingly:

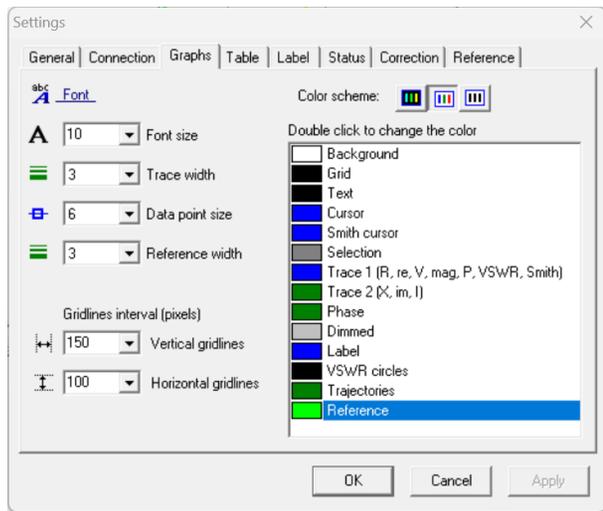
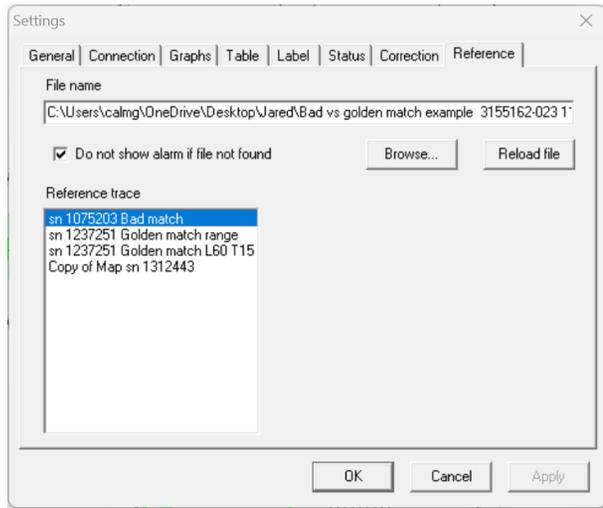
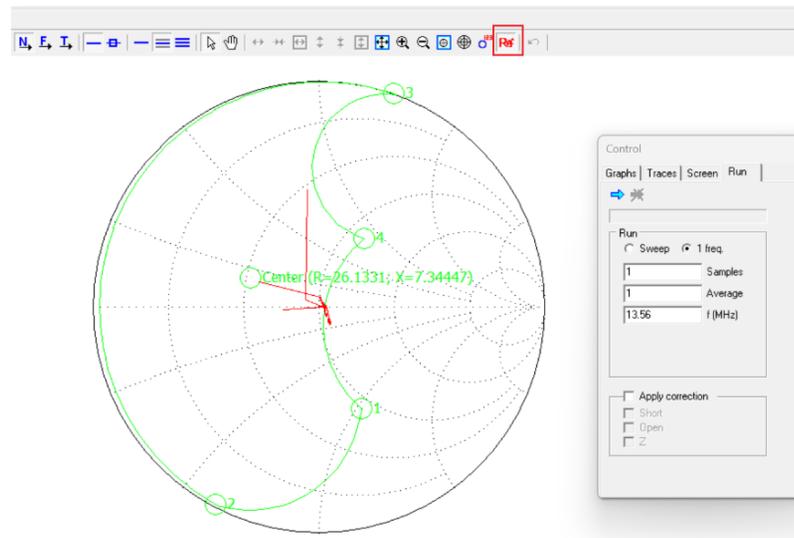


Figure 6

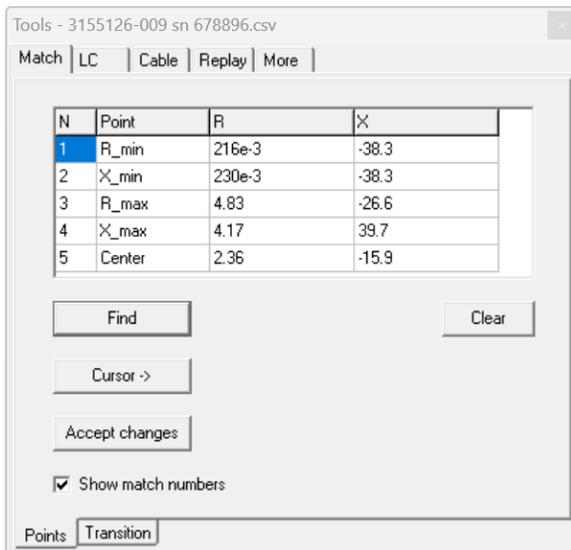


Tools



Clicking on the Tools button in the main display window brings up the Tool Panel with the following tabs: Match, LC, Cable, Replay, and More.

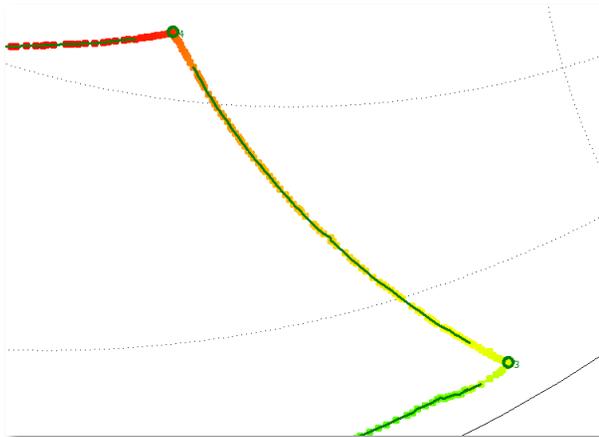
Match



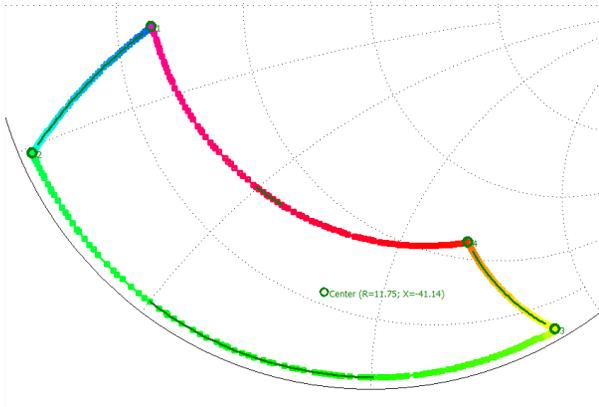
The Match tab provides the user the ability to determine certain important points of the matching network's range. Clicking the "Find" button enables an algorithm that works to find and display the values of the R-minimum, R-maximum, X-minimum, X-maximum, and center of the matching network's range, and label these points on the Smith chart. The algorithm is not perfect, and therefore, some manual adjustment may be needed using the Add Match Point feature.

Cursor: The cursor function can be used to correct or adjust the values of the impedance corners of the Smith chart. To do this, select Show Table and Sample Number from the top row of display controls. Now, moving the slide bar located between the Smith chart and table will move the cursor along the path of the trace, displaying the R and X values in the table below. When the cursor is in the desired position, select the point number (N) to be adjusted and hit the "Cursor->" button. The new value of that point will be the values listed in the table at that cursor location. Hit "Accept changes" to save the new data.

Add Match Point: Another way to designate the values of the impedance corners is by selecting a point directly on the Smith chart. With the Match tab open and the desired corner position selected, (position 1 – 4) right-click at the new location on the Smith chart and select "Add match point." The impedance of that point is now loaded into the table. Make sure that all the match points are selected in the order of measurement, or else the timing transitions calculated later will not work or will give nonsensical data.



Gamma Tolerance of 0.03: The solid green line is the trajectory of the timing.



Gamma Tolerance of 0.5: The trajectory includes only a small portion of the distance that was actually covered for two of the paths (Gamma too large).

Transition Tab: The Transition tab of the Match section allows the user to determine the time that elapsed between points listed in the table. Before finding the transition times, ensure the points in the table are in the correct order. To see the sequential path of the data points taken, use the color gradient mode (See Display and Scaling Functions). Select the Transition tab and click 'Find'. The seconds between each corner point should now be listed in the table. Selecting the "Show Trajectories" box displays a line along the path that was used to measure the time between points. Note that the Gamma tolerance is the distance from the corner point that the timing actually measures. An appropriate gamma value for most applications is about 0.03. If the gamma tolerance is too small, the application may not find an appropriate point to use and no value will be measured for that path. If the gamma tolerance is too large, the measured point will be far away from the actual corner point and result in a faulty timing metric.

| From | To | Time(s) | |
|------|----|---------|--|
| 1 | 2 | 7.66 | |
| 2 | 3 | 13.39 | |
| 3 | 4 | 6.739 | |
| 4 | 1 | 8.471 | |

Find Clear

.03 Gamma tolerance

Accept changes

Show trajectories

Points Transition

Proper Gamma value: Correct time measurements

| From | To | Time(s) | |
|------|----|---------|--|
| 2 | 3 | 2.902 | |
| 3 | 4 | 0 | |
| 4 | 1 | 562e-3 | |
| 1 | 2 | 0 | |

Find Clear

.5 Gamma tolerance

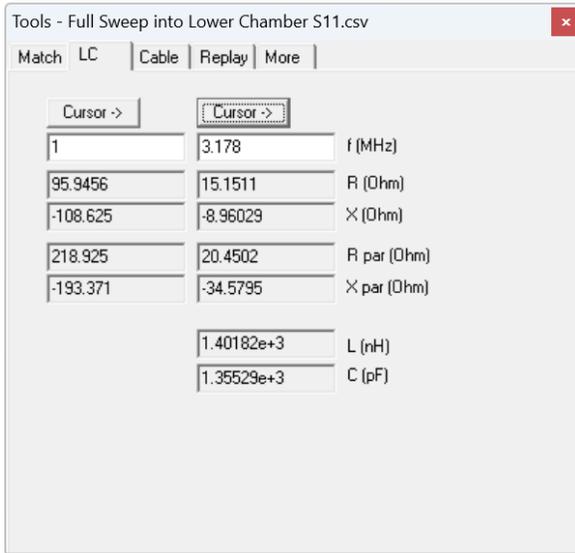
Accept changes

Show trajectories

Points Transition

Gamma too large: Faulty time measurements

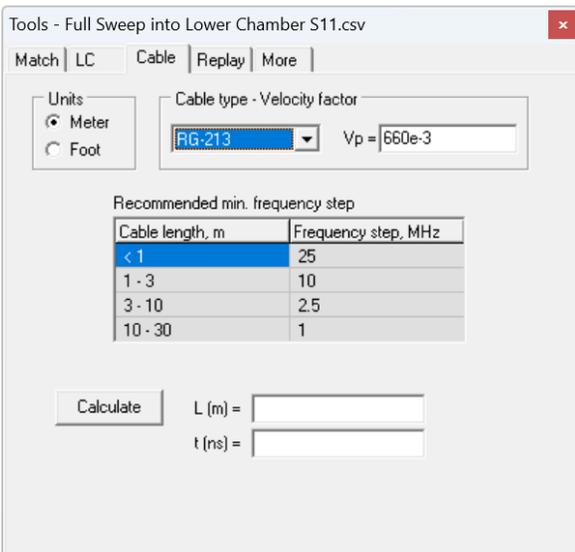
LC



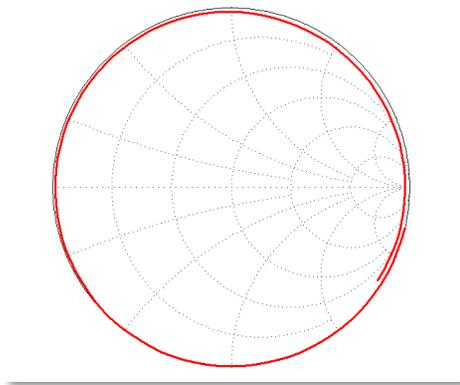
The LC tab is used to determine the series inductance and capacitance equivalent of a cable or circuit. This can be useful in troubleshooting plasma chambers, by allowing the user to isolate the chamber itself or the input into the chamber and determine where the reactance is out of tolerance.

To calculate the series inductance and capacitance equivalent values requires a data trace with at least two different frequencies. Under the Run tab of the Control Panel select "Sweep" and enter the desired values and click "Run". View the Smith chart with both "Show Table" and "Sample Number" selected. Adjust the slider bar to the first desired frequency and click the left "Cursor ->" button. Now move the slider bar to the next desired frequency and click the right "Cursor ->" button. The equivalent inductance and capacitance will be calculated and displayed at the bottom as L (nH) and C (pF).

Cable



1. To calculate the length of a cable, first select the cable type from the drop-down menu. *Z'Analyze* will automatically enter the propagation velocity (Vp) of the selected cable type (Measured as a percentage of the speed of light). If the cable type is not listed, but the cable's propagation velocity is known, enter it into the Vp field manually.
2. Next attach the cable to the Network Analyzer's test cable (Using the appropriate adapter, if required).
3. From the Control Panel, select the Run tab and the "Sweep" option. Enter the required information, using a frequency range and number of samples based on the Recommended min. frequency step shown above (The frequency step is the total frequency range divided by the number of samples).



- Click Run to provide cable data that should trace around the outer edge of the Smith chart and look similar to the figure to the left.

To ensure the most accurate measurement, the trace data should at a minimum extend past the origin of the imaginary plane on the Smith chart.

Clicking “Calculate” in the Cable Table will now provide the length of the cable (L) in the units selected, as well as the propagation time (t) for that particular cable (Measured in nanoseconds).

Replay

The Replay function in the Tools tab allows the user to capture critical data points by viewing data as they were in the process of being recorded, from the starting data point to the end data point, in various graphical representations. Only one trace can be replayed at any given time.

Data can be played back in two modes: manual replay and automatic replay.

To view data in automatic replay mode, first click **Reset**; only the first data point will be visible once this is selected. Clicking Reset will then enable the **Run** option. Once the Run arrow has been selected and the data playback is being viewed, **Stop** can be used at any point to pause the playback.

To view data in manual replay mode, simply click Reset, then manually click either end of the scroll bar; using the Left / Right keyboard arrows will also serve this same function by moving the progress bar either left or right by one data point.

Select replay speed by the trackbar: “1” corresponds to the actual speed the data were logged at. If time information is not available in the data, then “1” will correspond to 16 data points per second (See Figure 7).

Note: This function is available only if “replay” was a part of your purchased access package.

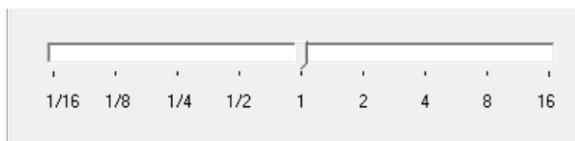
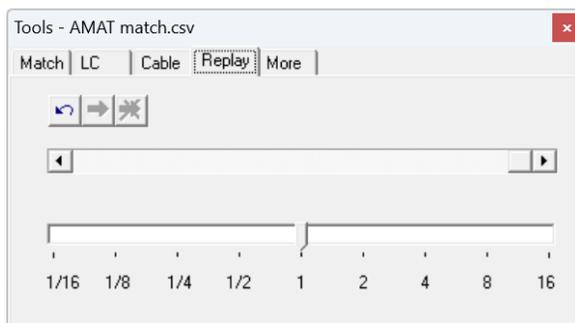
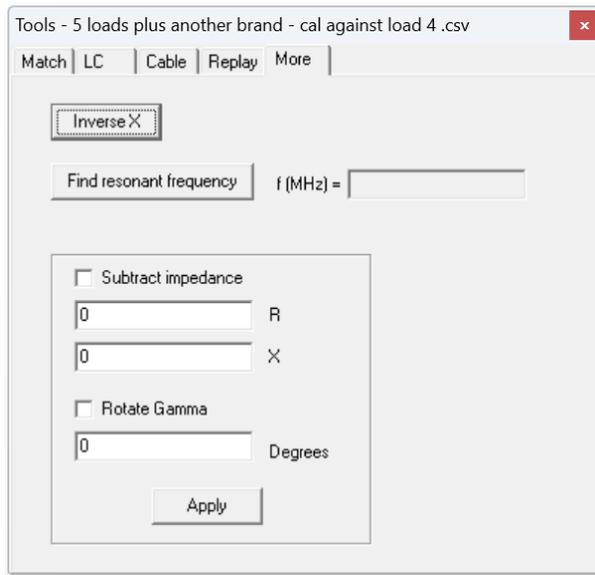


Figure 7

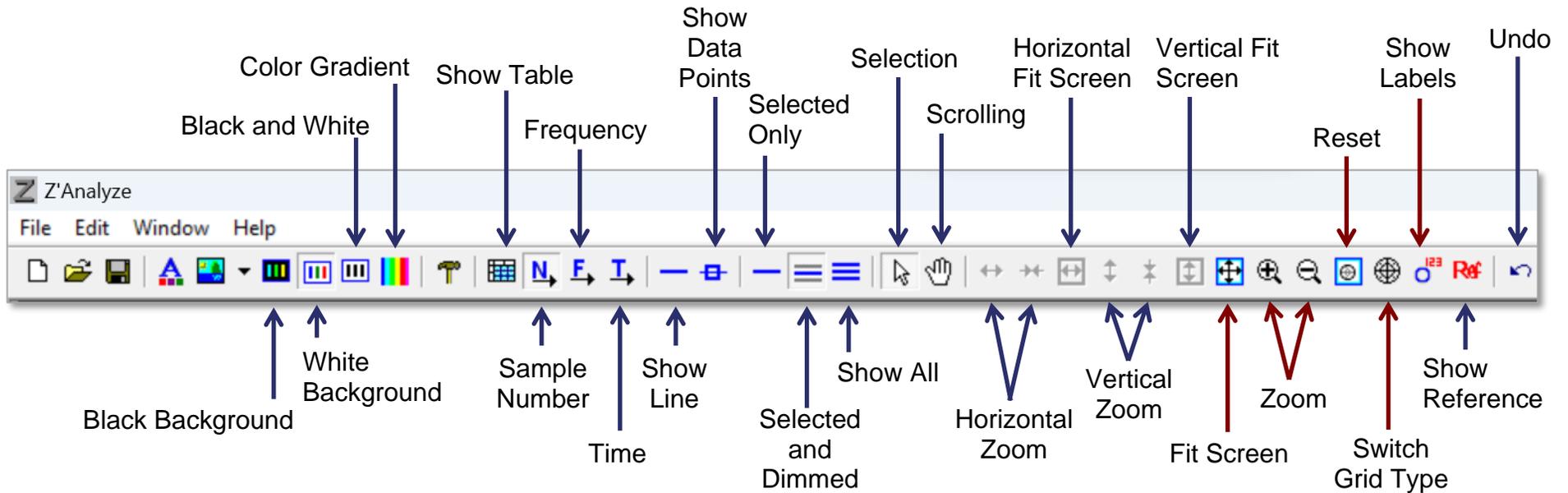
More

The More tab contains various options for measuring impedance: “Inverse X”, “Find resonant frequency”, “Subtract Impedance”, and “Rotate Gamma”:



- Clicking the **Inverse X** button flips the sign all the X values of the selected trace. With the Smith chart view selected, this shows the conjugate of the trace about the Real axis. The new trace displayed is now the range of impedance values that the matching network is capable of matching.
- Clicking the **Find resonant frequency** button displays the resonant frequency of the selected trace. If the trace was done using the “1 freq” option, the displayed frequency will simply be the frequency the trace was conducted at. If “sweep” was selected for the trace, the resonant frequency will be the frequency at which the X value is zero.
- Checking the **Subtract Impedance** box gives the user the option to offset R and X values; these changes in measurement can be applied to all data traces. Click ‘Apply’ or hit Enter to accept any changes made and to save the new R and X values to the file.
- Checking the **Rotate Gamma** box enables the user to enter a value in degrees; based on its degree of rotation, the change in Gamma of the data trace being edited will be reflected graphically on the Smith chart and in other data displays. Click ‘Apply’ or hit Enter to accept any changes made and to save the new measurement to the file.

Display and Scaling Functions



Note: Red Arrows Indicate Smith-Chart-Only Functions



Colors and Gradient

The user can choose between colored traces on a black or a white background, or a white background with black traces and labels.



In the color trace mode, the Gradient feature may be enabled for the Smith chart by selecting the Rainbow button in addition to the background option. This adds a time dimension to the graph, so that the first point measured on a trace is blue, and the last point is pink.



Show Table

Inserts a table into the bottom half of the display, with data for R and X values of each trace.



Sample Number

With the table displayed, selecting “Sample number” will highlight a cursor on the trace and provide R and X values in the table for that specific sample point. Adjust the sample number being displayed by moving the slider bar.



Frequency

With the table displayed, selecting “Frequency” will highlight a cursor on the trace and provide R and X values in the table for that specific frequency. Adjust the slider bar to move the cursor and change the frequency being highlighted. Note that this is only applicable to runs that were a frequency sweep.



Time

With the table displayed, selecting “Time” will highlight a cursor on the trace and provide the R and X values for a specific point in time. Adjust the slider bar to move the cursor and change the time.



Show Line

Toggles the line for the displayed trace(s) on or off



Show Data Points

Toggles the individual data points for the displayed trace(s) on or off.



Selected Only

Only the selected trace will be visible on the display.



Selected and Dimmed

The selected trace(s) will be displayed in the primary color. All other traces listed in the Traces window of the Control Panel will be displayed in grey (default).



Show All

Every trace listed in the Traces window of the Control Panel will be displayed in color.



Selection

Allows the user to zoom in on a specific region of the graph by dragging a box around the desired area.



Scrolling

Allows the user to drag graph in any direction by clicking and holding, then moving the mouse.



Horizontal Zoom

For all formats other than Data and Smith chart, the user can zoom in or out along the horizontal axis.



Horizontal Fit Screen

For all formats other than Data and Smith chart, the chart will center horizontally on the data trace.



Vertical Zoom

For all formats other than Data and Smith chart, the user can zoom in or out along the vertical axis.



Vertical Fit Screen

For all formats other than Data and Smith chart, the chart will center vertically on the data trace.



Fit Screen

For Smith chart only, adjust screen to center on the selected trace.



Zoom

For Smith chart only, allows the user to zoom in and out.



Reset

Centers the screen on the entire Smith chart.



Switch Grid Type

Cycles through available impedance chart formats.



Undo Scale

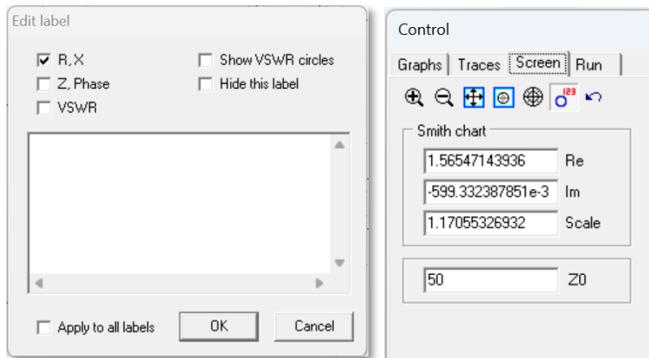
Undoes the previous zoom or fit command.



Add and Show Labels

Toggles any labels that have been added to the Smith chart on or off. Toggling the 'Show Labels' function can be done from both the main display window and the 'Screen' tab in the Control Panel.

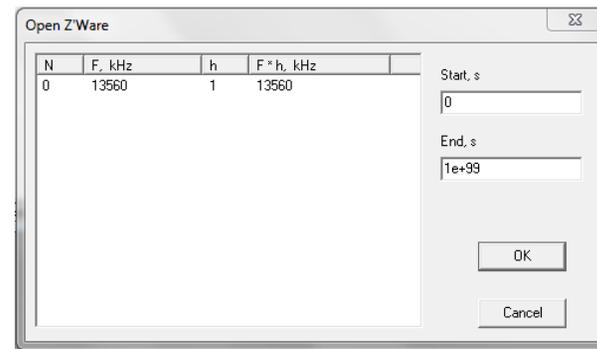
To add a label to any point on the Smith chart, right-click on the graph and select "Add Label." Additionally, labels can be edited from their location on the Smith chart by right-clicking them and selecting the desired option (i.e., Edit, Remove, Add, Hide, or Delete all labels).



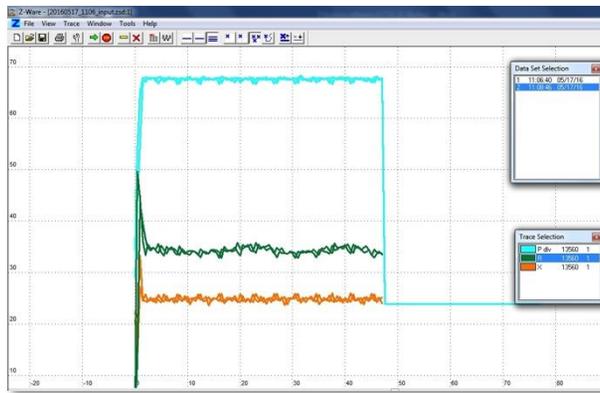
Importing Data from Z'Ware

For users who have access to Advanced Energy's *Z'Scan* technology, data can be taken from *Z'Ware* and imported into *Z'Analyze*. This allows users to create an impedance map for devices connected to a *Z'Scan* sensor. This section will provide an overview of how to import *Z'Ware* data into *Z'Analyze*.

1. Open *Z'Analyze* software.
2. Navigate to Select File → Open.
3. From the File Type drop down menu, select **Z'Ware files (*.zsd)**.
4. Choose the location that contains the saved *Z'Ware* file.
5. Select the desired file and click "Open". The following window will appear.



6. Enter the desired start and end time. You can get this most easily by reviewing the data set in *Z'Ware* and then determining the best time from that, based on what you are trying to learn from the data.

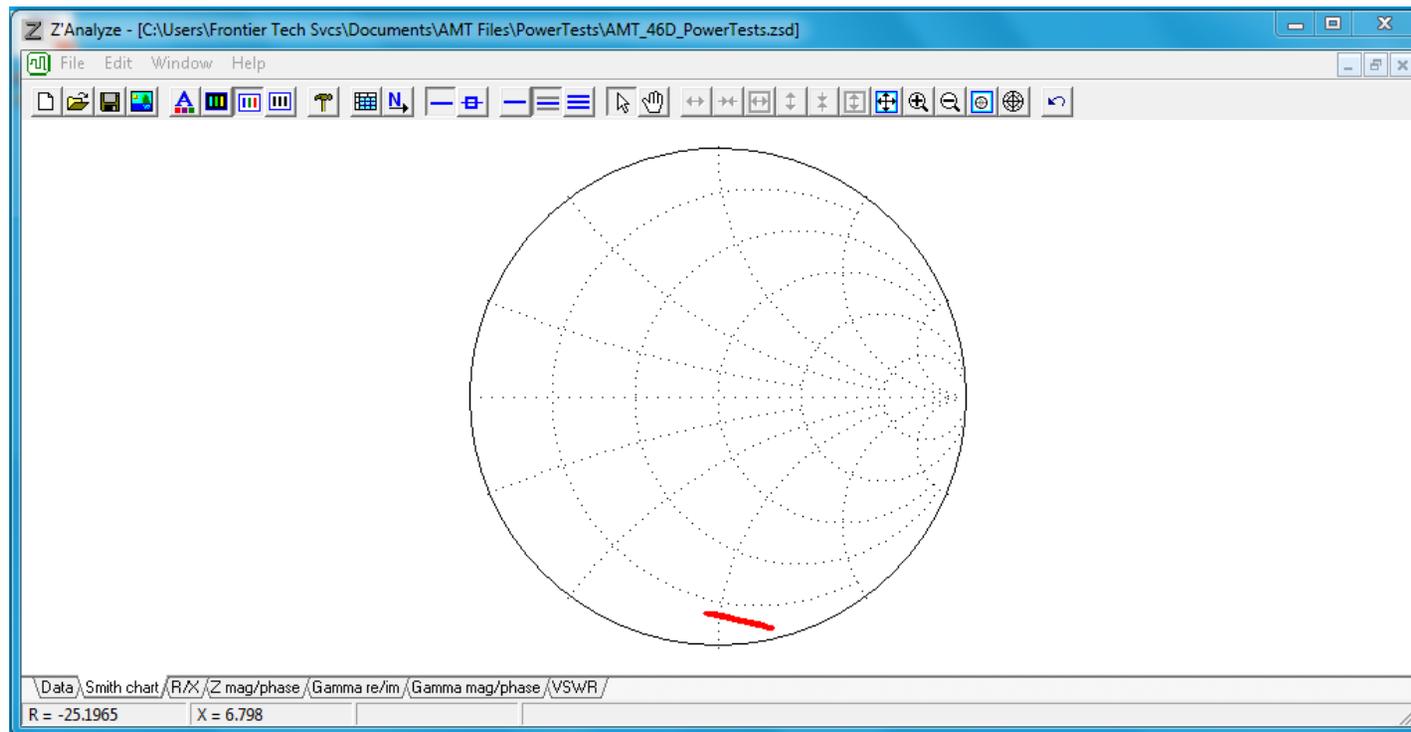


Z'Scan data in viewer

- For example, if we wanted to determine the steady-state impedance, we might want to select 10 to 40 seconds as the Start and End times. If we wanted to look at the match trajectory, we might select 0 to 5 seconds.

Select the desired frequency, and then click “OK”. Z'Analyze will import the resistance and reactance (R & X) data from the selected time for each trace from the Z'Ware file.

- Select the Smith chart view to see a plot of the chamber's impedance value over the course of the time you entered.





Matching Network's input terminal, with 50 Ohm load waiting to be attached.



Test Cable

Measuring Matching Network Impedance Range

For this exercise, we use a 13.56 MHz match, but almost any RF match can be measured with the appropriate controller and test fixture.

1. Ensure Network Analyzer is connected to computer (reference hardware installation guide).
2. Connect matching network to a control device.
3. Terminate match input with a 50 ohm load.
4. Connect an appropriate test fixture to the matching network output. In the absence of a proper test fixture, use the clip connectors and use the correction procedure.
5. Connect test cable from Network Analyzer input to matching network output.
6. Open *Z'Analyze* software on computer.
7. Select File → New to create a new file.
8. Ensure desired settings are selected under Run tab of the Control Panel (Recommended: "1 freq", Samples: 10000, Average: 1, f(MHz): 13.56).
9. Click Run (Blue Arrow).
10. Scroll capacitor from minimum to maximum values.
11. Scroll inductor from minimum to maximum values.
12. Scroll capacitor from maximum back to minimum value.
13. Scroll inductor from maximum back to minimum value.
14. Click Stop.

Document Information

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To purchase Z'Analyze®, report a problem with Z'Analyze®, or notify Frontier Technical Services of any improvements that can be made to the accompanying manual, please contact Technical Support at crtech@ftsplasma.com.

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Sidelinesoft – Alexei Smirnov
Z'Analyze Software Manual – Matthew Ferrand / Jared Almgren / Joe Cenedella
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