

SWR Director

(Version 1.11)

SWR Director is a remote control and chart plotting of SWR and Return Loss (R_L) program written for use with the AEA SWR-121 HF and SWR-121 V/U SWR analyzers.

SWR Director Features:

Analyze an entire frequency band or just a single frequency:

- For frequency band analysis, select the start and end frequencies, and then select a step size. As the SWR values are being calculated, an SWR plot will appear in the program chart area. The individual SWR and R_L values are accessible through a scrolling data list box to the left of the SWR chart plotting area.
- For single frequency analysis, just enter a frequency. The SWR and R_L values are displayed.
- A step up/down feature assists with single frequency analysis. From an initial frequency, the step up/down feature will increment/decrement frequency by a "step size", then return the SWR value at this new frequency.

Command the SWR analyzer remotely:

- Change an analyzer's width setting using the application's zoom in/out function.
- Easily enable/disable plot smoothing.
- Easily enable/disable SWR scaling.
- Set the step size to 1kHz, 5kHz, 10kHz, 20kHz, 50kHz, 100kHz, 200kHz, or 500kHz, depending upon the analyzer model selected.
- Step the analyzer center frequency up or down based upon the step size currently set.
- Place the analyzer in the hold (freeze the display) mode.
- Re-sweep the analyzer display.
- Move the center frequency up or down to the lowest SWR value within the analyzer display.

Manipulate multiple charts:

- Display up to five SWR plots at one time. This feature allows easy comparison of different "runs" of an SWR analysis, especially handy during antenna tuning. Each of the five plots can be selectively turned on or off.
- Clear any one of the five SWR charts with a single button press. This allows you to start again from scratch.
- Designate an "Active" chart. The active chart is the only chart changed during frequency band analysis; the non-active charts will be unaffected. To differentiate between the plots, the line width of the active chart is displayed slightly thicker than the other lines.
- Zoom and pan within the SWR chart plotting area.
- Display labels showing the SWR values for the active chart.
- Enter a title to describe the SWR chart, with or without a date and/or time.
- Quickly update the date/time for a chart.
- Turn on/off the background color gradient for the SWR chart plotting area.
- View chart in 3D mode, handy for viewing slight differences between similar charts.

Create SWR charts manually:

- Can't get a PC near your antenna during analysis? SWR data can be recorded during your analysis and then, at a later time, manually entered using the SWR Director to create an SWR chart plot of your data.

Document SWR charts:

- Print the SWR plotting area to your printer. A printer setup facility is also included.
- Save SWR chart plotting area as a bitmap, meta, or enhanced meta file--useful for historical storage and incorporation into end user reports or documents.
- Save the active chart to a file for retrieval at a later date.
- View or Print a report of the active chart's raw data values.
- Export chart data as comma delimited text. Allows for subsequent import into spreadsheets for reports, etc.

Use shortcuts for frequently used commands:

- An Analyzer toolbar group's common analyzer commands.
- A Chart toolbar groups common chart features.
- Speed keys allow for quick execution of common program commands. See the **Help|Keyboard** menu for more details.

Customize program settings:

- The program settings can be customized to your environment, e.g., the comm. port used, step size, analyzer type, charts displayed, active chart, etc. These preferences can easily be saved so later sessions can continue with the same settings by pressing the **Ctrl+y** keys or select the **Settings | Save Settings** menu item.

Return Loss (R_L) values:

- During the process of gathering SWR values, SWR Director also computes a corresponding R_L values. For a frequency band analysis, the R_L values can be viewed in the data list box. These values can also be plotted. By pressing the F3 key, the plotting area changes to display R_L verses frequency pair values. All the charting features described for SWR charts apply to R_L charts, e.g. labels, panning, zooming, scaling...

System Requirements:

- Intel 486 CPU or greater
The author has tested this program with the following:
 - 486DX100 notebook with 8MB RAM (MS Windows 95),
 - Pentium Pro 200 desktop with 64MB RAM (MS Windows 98),
 - Pentium II 233 notebook with 64MB RAM (MS Windows 98)
 - Pentium III 550 desktop with 64MB RAM (MS NT 4.0)
- Microsoft Windows 95/98 and NT 4.0 operating system.
- Best results with a screen resolution of 600x800 or greater, 16-bit color. With 16/256 colors, the SWR chart plotting area background color gradient should be turned off.
- Single RS-232 serial communication port (COM 1, through COM 8).
- Cable to interface between SWR-121 analyzer and PC. See the SWR-121 operating manual for more details.

SWR Director Installation:

Note: If you have previously installed SWR Director, you MUST un-install the program before proceeding.

Installation from a self-extracting executable file.

1. Locate and then run the **swr.exe** file.

2. By default, the self-extracting executable file will place the files in the directory **c:\windows\temp\swr**.
3. Locate and then run the **Setup.exe** file.
4. Follow the instructions given during the setup phase of the SWR Director program.

Installation from floppies

1. Insert SWR Director **Disk 1 of 4** into the PC floppy drive.
2. Select the MS Windows **Start** button.
3. Select the **Settings|Control Panel** menu items.
4. Select the **Add/Remove Programs** icon.
5. Select the **Install** button.
6. Select the **Next>** button.
7. Verify the command line box contains: A:\SETUP.EXE
8. (this assumes your floppy drive designator is A:).
9. Select the **Finished** button.
10. Follow the instructions given during the setup phase of the SWR Director program.

Un-install SWR Director:

1. Select the MS Windows **Start** button.
2. Select the **Settings|Control Panel** menu items.
3. Select the **Add/Remove Programs** icon.
4. Using the scroll bar, locate the **SWR Director** entry.
5. Select the **Add/Remove...** button.
6. Select the **Yes** button to remove the SWR Director from your system.

Registering SWR Director:

The first time you start SWR Director, you'll notice the main window title bar displays "SWR Director, registered to DEMO". You must enter your registration information to enable all of the program features. Also, an unregistered copy of SWR Director will terminate after fifteen (15) minutes has elapsed.

To register your copy of SWR Director:

1. Locate your registration information. It will contain a User name and Registration number.
2. From the main program menu, select the **Help|Register...** menu. The registration box should be displayed.
3. Enter the User name and Registration number *exactly* as it appears on your registration form.
4. Select the OK button.
5. If the registration information was entered correctly, the main window title bar will now display "SWR Director, registered XXXX", where XXXX was the User name you entered.

Setup:

1. Ensure the PC RS-232 communication port is set up as follows:

9600 baud, XON/XOFF, no parity, 8 data bits, 1 stop bit

The AEA SWR-121 analyzer serial terminal has a fixed port configuration. Check your manual for more details. Make sure the communication port on your PC has been set up to match the settings of the AEA SWR-121 analyzer.

2. Start the **SWR Director** program.
3. Select the analyzer type: either SWR-121 HF or SWR-121 V/U from the **Settings|Analyzer Model** menu. Check the status bar to confirm the setting.

4. Select the serial communication port from the **Settings | Comm Port** menu. Check the status bar to confirm setting.
5. Select a step size from the **Analyzer | Step Size** menu. Check the status bar to confirm setting.

SWR Director Usage:

Select either the *single frequency analysis* option, or *frequency band analysis* option. The desired option can be selected from the **Analyzer | Frequency Analysis** menu.

A. For a *single frequency analysis*:

- Select the **Analyzer | Frequency Analysis | Single** menu:
The "Single Frequency" analysis box will be displayed to the left of the SWR chart plotting area.
- Within the status bar (bottom of the SWR Director display) verify the **Port: COMx**, and **SWR-121X** are correctly set.
- Ensure the cable between the SWR-121 analyzer and PC is connected.
- Enter a frequency:
This is entered in the "Frequency" box, just as you would from the front panel of the SWR-121 analyzer; for example, 14500.
- Press the **Analyze** button.
- The SWR and R_L values for the frequency entered will be displayed:

In the SWR analysis result box, directly under the frequency box, you should see something like; "SWR @ 144500 kHz. = 1.00" and "Return Loss = -99.99". The status bar will be updated also. Per the example, you should see "FREQUENCY: 145500 kHz.", and "SWR: 1.00".

Note: For a single frequency analysis, the SWR chart plotting area has no bearing on the current operating mode.

B. You can also use the *step up or down feature* to either increment or decrement the single frequency previously entered and then automatically query the SWR value at this new frequency.

- Follow the complete instructions from section A.
- If the analyzer toolbar is visible:
Press either the button containing a red up or down arrow. The SWR analysis result box will be updated with the result of the SWR analysis of the new frequency.
- If the analyzer toolbar is not visible:
Press **Ctrl+u** (for step up) or **Ctrl+d** (for step down). The SWR analysis result box will be updated with the result of the SWR analysis of the new frequency.
- The SWR value for the frequency entered will be displayed:
This will appear in the SWR analysis result box, directly under the frequency box. If you are using the SWR-121 V/U, you should see something like; "SWR @ 145010 kHz. = 1.45" and "Return Loss = 14.62". The status bar will be updated also. Per the example, you should see "FREQUENCY: 145010 kHz.", and "SWR: 1.50". This assumes that the step size was set to 10kHz. You should notice the original frequency entered remains unchanged.

C. For a *frequency band analysis*,

Before you start this section, ensure the chart toolbar is visible. If not, select the **Settings | Toolbar | Chart** menu item.

- Select the **Analyzer|Frequency Analysis|Multiple** menu:
The "Frequency Band" analysis box will be displayed to the left of the SWR chart plotting area.
- Select an active chart.
This can be done by pressing one of the **A1** through **A5** buttons contained in the chart toolbar, or through the **Chart|Display Chart|Chart x**. For example, make chart two active.
- Ensure you are displaying the active chart:
The second chart will be displayed automatically when you selected the A2 button. If not, this can be done by pressing the corresponding **Dx** button contained in the chart toolbar, or through the **Chart|Active Chart|Chart x**. Continuing our example, display chart two by pressing the D2 button.
- So as not to clutter the SWR chart:
Turn off the *Labels* option. Select the **Chart** menu. The **Labels** menu item *should not* have a check mark to the left of this entry.
- Enter the start frequency for the band analysis:
In the "Start:" box within the "Frequency Band" box to the left of the SWR chart plotting area. For example, enter "14400".
- Enter the end frequency for the band analysis:
In the "End:" box within the "Frequency Band" box to the left of the SWR chart plotting area. For example, enter "14800".
- Select a step size:
From the analyzer toolbar, select any one of the step size buttons (10, 20, 50, 100, 200, or 500). Confirm the settings via the status bar, "STEP SIZE: xx". For example, select the button labeled "500".
- Press the **Analyze** button:
The cursor will turn into an hourglass while the analysis is being performed.
- While the SWR Director is gathering SWR values:
You should see a number of areas updating. First, the scrolling data list box (to the left of the chart plotting area) will be updated for each frequency analyzed. Second, the curve (SWR or R_L) will also be updated for each frequency analyzed. Third, the status bar "FREQUENCY:" and "SWR:" fields will be updated continuously throughout the frequency band analysis. Last, you'll see a pop-up box containing a progress bar, indicating how far along the operation has progressed. At any time during the frequency band analysis, you may cancel the operation by pressing the **Cancel** button.
- Once the frequency band analysis is complete:
All of the SWR and R_L values will be available for viewing in the scrollable data list box within the "Frequency Band" area, and the SWR chart plotting area will be updated with the a plot of the SWR values. Pressing the F3 button will cause the plotting area to display R_L versus frequency.

D. *Manual SWR chart creation:*

You can create an SWR chart manually. Suppose you perform an analysis of an antenna, but because of the location of the antenna, you can't use a PC (and the SWR Director). Not to worry, just record the frequency/SWR values during the antenna analysis.

- Back at the SWR Director, start with a clear chart:

The SWR chart plotting area is empty, along with the frequency band Frequency/SWR scrollable list box. If this is not the case, just press the trashcan button. For example, the chart above has **A1** and **D1** selected. If a chart were visible, just press the **trashcan** button.

- Enter your data:
To the left of the SWR chart plotting area, is the "Frequency Band" box. Within this box is the Frequency/SWR chart value area.
 - Using the left mouse button, click within the empty scrolling data list box under the "Frequency" column.
 - Enter your first frequency value, and then press the TAB key. For example, "143000".
 - Enter your first SWR value, and then press the TAB key. For example, "10".
 - Continue entering your frequency/SWR values.
Use the following to create a chart as below: 143000/10, 143500/10, 144000/7.8, 144500/2.3, 145000/1.8, 145500/1, 146000/1.3, 146500/2.7, 147000/8.3, 147500/10, and finally 148000/10.
- Delete an entry:
What if you need to *Delete* an entry? Select the entry to be deleted, either the frequency or SWR value. Press the **Ctrl+Delete** keys. The entry highlighted will be removed from the list box. Now, press the **Ctrl+f** keys to refresh the SWR chart plotting area.
- Give your new chart a title:
Pressing the **Ctrl+t** keys will display the title pop-up box. Enter a suitable title (include the current date and/or time if needed) and press the **OK** button. See chart on the next page.

Chart features:

1. **Zoom in:**

Using the mouse, place the mouse within the SWR chart plotting area. Press and hold the left mouse button. Drag the mouse down and to the right. A box will be drawn highlighting the zoom area. Release the left mouse button. The chart area will zoom to the area selected. You can use the zoom in feature as many times as needed.

2. **Labels:**

View the chart SWR values within the chart plotting area by pressing the chart toolbar button with the "L" in a yellow box.

3. **Panning:**

The panning feature requires a little manual dexterity. Using the mouse, double click and hold the right mouse button within the chart area. While still holding the right mouse button, move the mouse to the left, right, up or down to pan the SWR chart within the plotting area.

4. **Zoom out:**

Using the mouse, place the mouse within the SWR chart plotting area. Press and hold the left mouse button. Drag the mouse up and to the left. A box will be drawn while dragging the mouse. The size of the box drawn isn't important. Release the left mouse button. The chart area will zoom out to reveal the entire chart area.

5. Assign a **title** to the chart, along with a **date** and **time**:
Press the **Ctrl+t** keys to display the chart title pop-up box. If the chart already has a title, the title will be displayed within the title box. Make any changes necessary. Select the **Date:** and or **Time:** box to include these entries along with the title. Select the **OK**.
6. **Update** the chart title date and time:
If you just want to quickly update the chart date and time, press the **Ctrl+z** keys.
7. **Clear** the chart:
A chart can be cleared using the **Chart/Clear Chart/Chart x** menu items.

Speed Keys:

Speed Keys are available for quick access to commonly used commands:

Speed Key	Command	Remarks
Ctrl+F1	Comm Port 1	Activates communications port 1 for program use.
Ctrl+F2	Comm Port 2	Activates communications port 2 for program use.
Ctrl+F3	Comm Port 3	Activates communications port 3 for program use.
Ctrl+F4	Comm Port 4	Activates communications port 4 for program use.
Ctrl+F5	Comm Port 5	Activates communications port 5 for program use.
Ctrl+F6	Comm Port 6	Activates communications port 6 for program use.
Ctrl+F7	Comm Port 7	Activates communications port 7 for program use.
Ctrl+F8	Comm Port 8	Activates communications port 8 for program use.
F2	SWR Plotting	Display SWR curves in the chart plotting area.
F3	Return Loss Plotting	Display Return Loss curves in the chart plotting area.
F5	Report Preview	Report preview for the active chart.
Ctrl+a	Next	Make the next chart active.
Ctrl+b	Previous	Make the previous chart active.
Ctrl+c	Chart SWR Scaling	Toggle scaling of chart SWR axis.
Ctrl+d	Step Down	Set frequency down one interval and analyze.
Ctrl+e	Freeze Display	Freeze (HOLD) the analyzer display.
Ctrl+f	Refresh Active Chart	Needed after manual deletion of a chart value entry.
Ctrl+g	Plot Frequency Range	Frequency range of chart plotting area.
Ctrl+h	Plot Maximum SWR	Maximum SWR value of the chart plotting area.
Ctrl+i	Zoom In	Reduce analyzer width setting.
Ctrl+j	Analyzer Toolbar	Display/hide analyzer toolbar.
Ctrl+k	Chart Toolbar	Display/hide chart toolbar.
Ctrl+l	Plot Labels	Display/hide chart SWR value labels.
Ctrl+m	Move Fc Up	Move center frequency up to lowest SWR in plot.
Ctrl+n	Plot Names	Display/hide plot names.
Ctrl+o	Zoom Out	Increase analyzer width setting.
Ctrl+p	Plot Smoothing	Enable/disable analyzer plot smoothing.
Ctrl+q	Move Fc Down	Move center frequency down to lowest SWR in plot.
Ctrl+r	Reset Range	Resets both SWR and R_L axis to full scale.
Ctrl+s	Analyzer SWR Scaling	Enable/disable analyzer SWR scaling.
Ctrl+t	Plot Title	Display update chart title dialog box.
Ctrl+u	Step Up	Set frequency up one interval and analyze.
Ctrl+v	Plot Values	Display/hide active chart SWR values list.
Ctrl+w	Resweep	Resweep analyzer display without changing width.
Ctrl+x	Plot Maximum R_L	Maximum R_L value of the chart plotting area.
Ctrl+y	Save Settings	Save the current program environment settings.
Ctrl+z	Update Date/Time	Update chart date/time to current.

Menu Items:

The following section describes each of the SWR Director menu items.

File

Load Active Chart ...

The active chart contents (frequency, SWR, and R_L values) can be loaded from a disk file.

Save Active Chart...

The active chart contents (frequency, SWR, and R_L values) can be saved to a disk file.

Save Plot Area As...

The chart plotting area can be saved as either a bitmap, meta file, or enhanced meta file to a disk file. This feature is useful for subsequent use of the plot within a report. For example, you could insert an SWR Director plot bitmap file into a word processing file.

Export Active Chart...

The active chart contents (both title and data) will be exported as comma delimited fields into a text file. This allows for subsequent import into a spreadsheet, for example, for reports on the raw data.

Print Setup

Allows you to change the printer properties, e.g. select the printer, properties, and orientation.

Print Plot Area...

Prints whatever is currently displayed in the chart plotting area, e.g. chart(s) displayed and the SWR or R_L plot function.

Exit

Terminates execution of the SWR Director program.

Analyzer

Frequency Analysis ->

Single

Displays the 'Single Frequency' box to the left of the chart plotting area. Only a single frequency can be analyzed at one time. Both SWR and R_L are displayed.

Multiple

Displays the 'Frequency Band' box to the left of the chart plotting area. SWR and R_L analysis is performed over a frequency range. After the analysis is complete, the raw data (frequency, SWR, and R_L values) are available for review in the scrolling data list box. Also, a curve of either SWR versus frequency, or R_L versus frequency is displayed in the chart plotting area.

Zoom In

Zoom Out

These features change the width setting of the SWR-121 analyzer.

Step Up

Step Down

These features move the center frequency up or down one step interval.

Step Size ->

1
2
5
10
20
50

100
200
500

Depending on which SWR-121 analyzer is being used, a number of step sizes are available. The step size is used when performing a 'Step Up/Down', or frequency band analysis. Once the SWR value has been determined, the analyzer center frequency will be adjusted by the Step Size value.

Move frequency up to lowest SWR value

Move frequency down to lowest SWR value

One of the difficulties with the display of the SWR-121 is determining the frequency of a point along SWR curve which is not the center frequency. These two features allow you to quickly shift the SWR curve up or down to the lowest SWR value displayed placing this point on the center frequency.

Plot Smoothing

Performs a smoothing function on the SWR curve to eliminate transient spikes or dips due to noise, etc...

SWR Scaling

Scales the SWR axis to the highest SWR value within the SWR-121 analyzer display.

Freeze Display

Places the SWR-121 analyzer in the HOLD mode.

Resweep

Performs another SWR analysis.

Chart

SWR

Plot curves displayed are SWR (vertical axis) verses frequency (horizontal axis).

Return Loss

Plot curves displayed are R_L (vertical axis) verses frequency (horizontal axis).

Active Chart ->

Chart 1
Chart 2
Chart 3
Chart 4
Chart 5

Next

Previous

The active chart is the only chart which changes during a frequency band analysis. To view the active chart, it must also be displayed. The active chart is differentiated from other displayed charts by a slightly thicker line width and the line color is bold in comparison to the non-active charts.

Display Chart ->

Chart 1
Chart 2
Chart 3
Chart 4
Chart 5

All

None

Any or all of the charts can be displayed simultaneously. If the chart has no data, nothing will be displayed.

Clear Chart ->

Chart 1
Chart 2
Chart 3
Chart 4
Chart 5

All

Any of the charts may be cleared. Clearing a chart permanently removes the data and the chart title. Once a chart has been cleared, the data cannot be restored.

Frequency Range

Allows the range of frequencies displayed across the horizontal axis to be changed. A similar feature can be performed using the chart zooming feature.

SWR Range

Similar to the SWR-121 SWR 'Scaling' feature, this allows the range of SWR values displayed across the vertical axis to be changed.

Return Loss Range

Similar to the SWR-121 SWR 'Scaling' feature, this allows the range of R_L values displayed across the vertical axis to be changed.

Reset Range

Resets both the SWR and R_L axis to full scale.

Labels

Allows viewing of the data points along the plot curve.

Legend

Aids in identification of the chart numbers verses colors.

Title

A title, date, and time can be associated with the active chart.

Update Time

A quick way to update the date and/or time included with the chart title.

Auto Scaling

Scales the vertical axis (SWR or R_L) to the largest value in the data set.

Visible

Displays or hides the chart plotting area.

3D Mode

Provides a slight offset between the displayed charts. Very useful when comparing charts with similar curves.

Background Color Scaling

Turns on/off the chart plotting area background color scaling. Background color scaling should be turned off if using 16 or 256 colors.

Report

Preview

Displays tabular view of the data values for the active chart.

Print

Prints the report to the printer.

Settings

Toolbar ->

Analyzer

Turns on/off the toolbar (left side) containing the SWR-121 analyzer command buttons.

Chart

Turns on/off the toolbar (right side) containing the chart plotting command buttons.

Analyzer Model ->

SWR-121 HF

SWR-121 V/U

Select the SWR-121 analyzer to be connected to the SWR Director.

Comm Port ->

Com 1

Com 2

Com 3

Com 4

Com 5

Com 6

Com 7

Com 8

Select the communications port which will be used to communicate to the SWR-121 analyzer.

Save Settings

Saves the current program settings so that subsequent program usage will be restored.

Help

Content

Displays the contents of this file, without the SWR Director screen snapshots.

Keyboard

Displays the list of keyboard (speed keys) commands.

Register...

Allows for program registrations.

About...

Displays program version information and the e-mail address of the author.

Contact:

SWR Director was written exclusively by **Michael A. Pawlowski**. Comments/questions can be sent to the vendor by e-mail: techsupport@aeatechnology.com. For technical assistance telephone 1-760-931-8979.

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