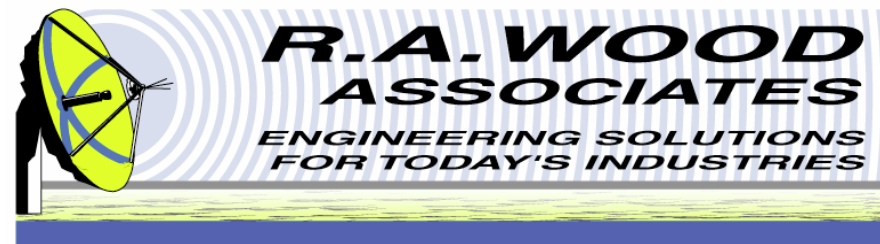

TunerHelper User Manual

Version 2.4



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Overview

TunerHelper aids in the design of a receiver or transmitter frequency conversion scheme by providing a user friendly interface for analysis. Specify the input pre-selection filter requirements, the mixer spurious requirements, the leakage requirements, and the output post - selection filter requirements to view the signals and spurious products in your design. The program allows the user to determine all output signal and spurious products for any input frequency and amplitude. All filter and mixer parameters may be saved to files for use in other conversion schemes.

Key Features

- Used to design and specify filters and mixers in a frequency conversion process.
- Select, analyze, and view spurious products for any order up to order 20R X 20L.
- Adjust the signal amplitude and frequency to view the resulting output signals and spurious products.
- Define Mixer Interface
 - Spurious Levels for each Spur Order
 - Mixer Port to Port Isolation
 - Mixer Conversion Loss
 - Mixer LO Power
 - Mixer Conversion Scheme
- View Spurious Responses for:
 - Mixer Only
 - Input Pre - Selection Filter and Mixer
 - Mixer and Output Post - Selection Filter
 - Input Pre - Selection Filter, Mixer, and Output Post - Selection Filter
- Use the pre - selection filter interface to define pass-band and rejection points for the pre-selection filter.
- Define pass-band and rejection points for the post-selection filter.
- All parameters (eg. mixer spurious and isolations, filter rejections, etc.) are configurable.
- Adjustable input pre-selection filters, mixers, and output post-selection filters.
- Works for up conversions and down conversions.
- All parameters and scenarios may be saved to and loaded from data files.
- Easy to use graphical interfaces display "spectrum analyzer" view of all signals and spurious products.
- Data and parameters from TunerHelper may be automatically transferred to SpurFinder.
 - Buy both TunerHelper and SpurFinder to take advantage of using these programs in tandem.
 - View the entire conversion scheme in SpurFinder, not just the spurious products for a given input frequency.



Trial Version Limitations and System Requirements

- Trial Version
 - The trial version of TunerHelper has all the features of the full version with the following limitation:
 - The Local Oscillator (LO) value is locked at 16.0 MHz
 - The full version is available for purchase for \$129.99 (US Dollars). Buy now to unlock all program features.
- System Requirements
 - TunerHelper was designed to operate in the Windows NT, 2000, and XP environment.



Changes by Version

Thank you for choosing TunerHelper 2.4!

We are continually striving to improve this program to meet your needs. Please let us know if you have any comments or suggestions.

Latest Version: 2.4

Changes in Version 2.4

- Enhanced the registration process.

Changes in Version 2.3

- Enhanced the registration process.

Changes in Version 2.2

- This upgrade adds some minor interface improvements. The front panel buttons work smoother, and the pre-selection and post-selection filter panels and controls work better.

Changes in Version 2.1

- Improved the registration process. You can now send payment by PayPal, WWW form, or E-mail. The user name and registration key are sent to us electronically, thereby making the registration process easier and less prone to error.

Changes in Version 2.0

- Increased max RF and LO order to 20, allowing spurious levels up to 20RX20L.
- Increases efficiency of program, calculates and generates spurs up to 50% faster.
- Added Cancel option to Filter and Mixer Dialog Boxes.



Changes by Version Cont.

- Save 'Frequency Conversion Components' in scenario files.
- Moved Save and Open Options to File Menu.
- Fixed carriage return problem when saving notes.
- Made graphical changes to User Interface.

Changes in Version 1.1.5:

- We fixed a bug in calculating spurious levels for 2RX0L, 3RX0L, 4RX0L, 5RX0L, 6RX0L, 7RX0L, 8RX0L, 9RX0L, 10RX0L spur products. These products were previously treated as "isolations", and did not decrease in dBc for lower input powers than the reference power in the mixer spur table. This has been corrected in Version 1.1.5. Now, if you decrease the mixer input level from the spur table reference level, the spur products above will be reduced according to their RF harmonic number. This was only a problem with the above listed spur products.
- The cursor locations and settings in the plots are now saved in the scenario files.
- We added ".mix" extensions for mixer files, ".flt" extensions for filters, and ".tsn" for TunerHelper scenario files. This makes finding data files easier. The files are still text files as in the previous versions.
- The mixer file name is now correctly stored and brought into the front panel and the mixer panel.
- The registration window prints to make the registration process easier.

Changes in Version: 1.1.4:

- Updated TunerHelper to remember the location of the SpurFinder Executable.

Changes in Version 1.1.3:

- Fixed a minor bug on the Registration screen. When a registration was cancelled, the program occasionally froze.

Changes in Version 1.1.2:

- Updated the TunerHelper logo, and fixed some typos on the Define Mixer Panel.



Changes by Version Cont.

Changes in Version 1.1.1:

- Revised the "Define Pre-selection Filter" and "Define Post-selection Filter" panels to remove the cursor display. This improves the printout of the panel displays.

Changes in Version 1.1:

- Added the capability to dynamically switch to SpurFinder, using the TunerHelper parameters.
- Improved the Input Pre-selection Filter user interface
- Improved the Output Post-selection Filter user interface
- Improved the Mixer user interface, changing terms as appropriate, depending on whether the mixer is used as a Down Converter or as an Up Converter.

Changes in Version 1.03:

- Improved registration process.
- Improved Gain Compression calculation in the Mixer.

Changes in Version 1.02:

- Improved Graphics and Logo for better printing and viewing.
- Improved error handling when loading and saving scenario files, mixer files, and input and output filter files.
- Added a warning light to indicate when the mixer signal is going into gain compression.

Changes in Version 1.01:

- Removed two numbers that showed up on the right hand side of the display.

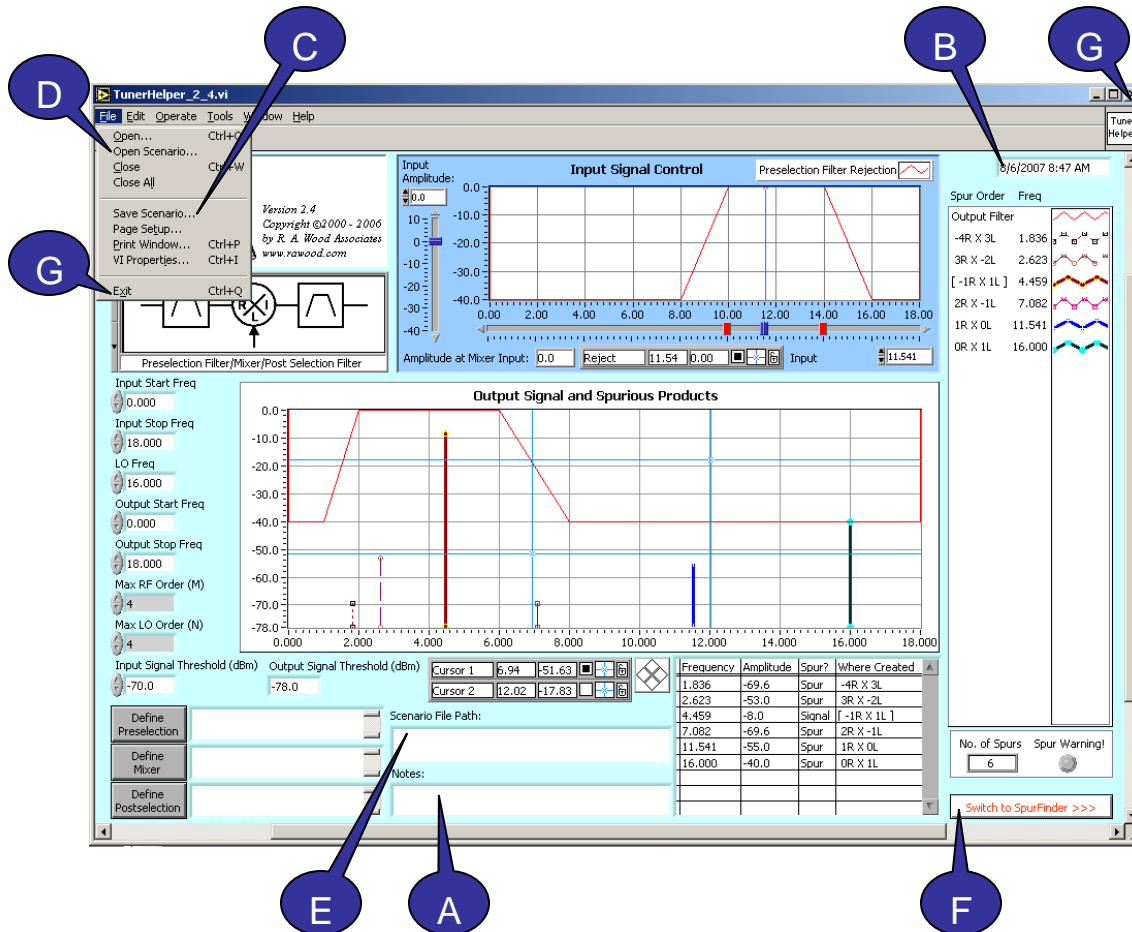


Installing TunerHelper

- To check out TunerHelper for yourself, visit the R.A. Wood software download page at:
http://rawood.com/software_products/download_software_page.html#tunerhelper_anchor
- Select Download Now! next to the RAWOOD _ Software _ 3 _ 9 _ Installer.exe
- Click __Save File__ to save the installer.
- After the installer download is complete, double click on TunerHelper Installer icon to start the installation process.
- Work through the user prompts to install TunerHelper.
 - Select a folder to save the TunerHelper setup files to and select OK.
 - Select Next> on the Installation Wizard.
 - Browse to select a location to save the TunerHelper 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>>R.A. WOOD Software>> Tuner Helper 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 TunerHelper. 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 the Local Oscillator (LO) value is locked at 16.0 MHz.
- Click Continue again to use the trial version of TunerHelper or enter the Registration number and click Unlock Software to access the full version.
- For detailed screen shots of the installation process visit:
<http://helprawoodsoftware.rawood.com/tiki-index.php?page=TurnerHelper+Downloading+and+Installing+the+Program>

Program Operation

This is the main panel in TunerHelper. Use this panel to enter the input parameters to view the signals and spurious products in your design.



The screenshot shows the TunerHelper 2.4.vi software interface. Callouts A through G point to specific features:

- A:** Points to the 'Notes' field at the bottom of the interface.
- B:** Points to the date and time display '6/6/2007 8:47 AM' in the top right corner.
- C:** Points to the 'Save Scenario...' option in the File menu.
- D:** Points to the 'Open Scenario...' option in the File menu.
- E:** Points to the 'Define Preselection' button.
- F:** Points to the 'Switch to SpurFinder >>>' button.
- G:** Points to the 'Exit' option in the File menu.

The interface includes several key components:

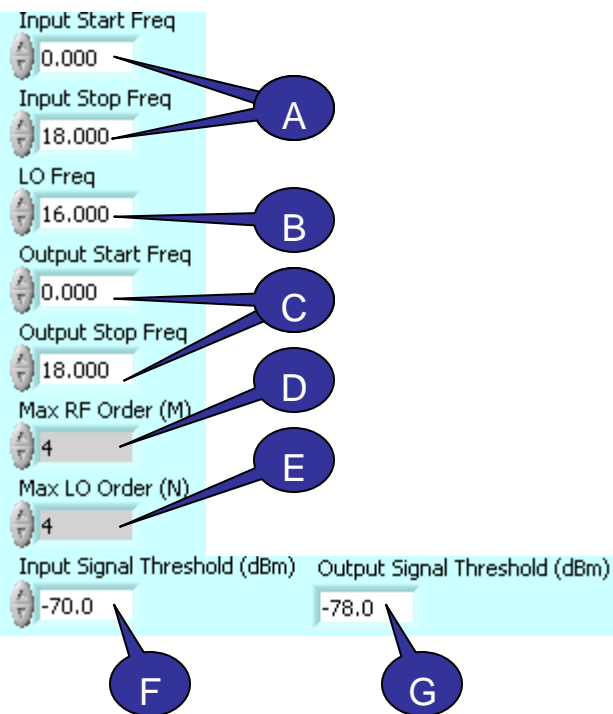
- Input Signal Control:** A graph showing the input signal amplitude over time, with a peak at 11.541 MHz.
- Output Signal and Spurious Products:** A graph showing the output signal and various spurious products.
- Spur Finder Table:** A table listing spurious products with columns for Frequency, Amplitude, Spur?, and Where Created.
- Parameters:** Input Start/Stop Freq, LO Freq, Output Start/Stop Freq, Max RF Order (M), Max LO Order (N), Input Signal Threshold (dBm), and Output Signal Threshold (dBm).
- Buttons:** Define Preselection, Define Mixer, Define Postselection, and Switch to SpurFinder >>>.

- A. The **Notes** field allows the user to document the current setup. Notes are saved with the scenario file.
- B. The real **Date** and **Time** are displayed at the top of the screen.
- C. **Save Scenario** – A scenario file is a tab delimited text file that contains all input parameters from the main panel. To save a scenario file go to **File>>Save Scenario...**
- D. **Open Scenario** – To open an existing setup file go to **File>>Open Scenario...**
- E. **Scenario File Path** – After a scenario has been opened or saved the file location will be displayed here.
- F. **Switch to SpurFinder** - Click this button to open SpurFinder. All input parameters from TunerHelper will automatically transfer to SpurFinder.
- G. To **exit** the program click the 'X' in the upper right corner of the panel or go to **File>>Exit**.



Input Parameters

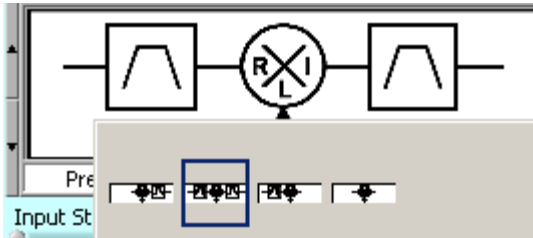
To calculate the Output Signals and Spurious Products, input the following parameters:



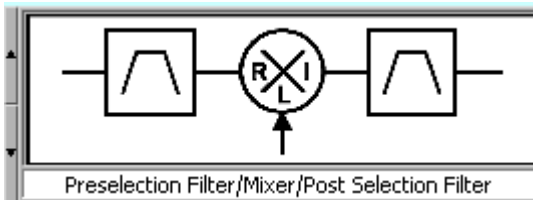
- A. Input Start & Stop Frequency** – Enter the Input Frequency band where you would like to view spurious products. For a down conversion, the input frequencies are RF frequencies. For an up conversion, the input frequencies are IF frequencies. This frequency band corresponds to the X axis scale on the Input Signal Control plot.
- B. LO Frequency** – Enter the fixed LO Frequency used for the frequency conversion process. The LO could be a high side LO (above the input frequency) or a low side LO (below the input frequency).
- C. Output Start & Stop Frequency** – Enter the Output Frequency band where you would like to view spurious products. For a down conversion, the output frequencies are the IF frequencies. For an up conversion, the output frequencies are the RF frequencies. This frequency band corresponds to the X axis scale on the Output Signals and Spurious Products plot.
- D. Max RF Order (M)** – Enter the maximum harmonic for the input RF signal you would like to see on the spurious plot. For example, to see up to 4th order RF harmonics by $N \times LO$ spur products, enter 4. Generally, the spurious signals due to higher order terms (4 and above) are lower in amplitude than spurious signals due to lower order terms (below 4).
- E. Max LO Order (N)** – Enter the maximum harmonic for the LO signal you would like to see on the spurious plot. For example, to see up to the 4th order LO harmonics by $M \times RF$ spur products, enter 4. Generally, the spurious signals due to higher order LO terms (5 and above) are lower in amplitude than spurious signals due to lower order terms (below 5).
- F. Input Signal Threshold** – Set the lowest Input Signal level to look at. This will filter out signals below the threshold that may be negligible.
- G. Output Signal Threshold** – Indicates the lowest Output Signal level that is returned from the tuner circuit.



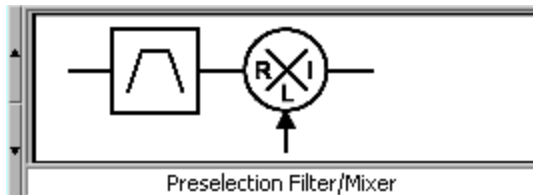
Setup Frequency Conversion



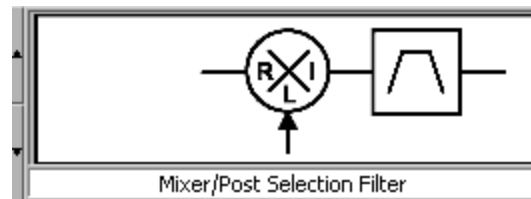
Click on the frequency conversion icon to select a frequency conversion setup from the pop up menu. After a setup has been selected, be sure to define each of the components (see Support Files).



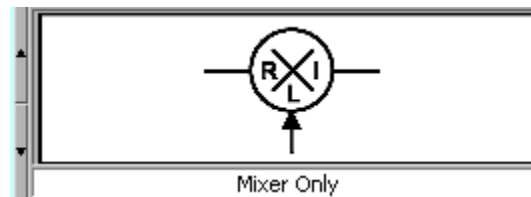
Pre-selection Filter / Mixer / Post-selection Filter



Pre-selection Filter / Mixer

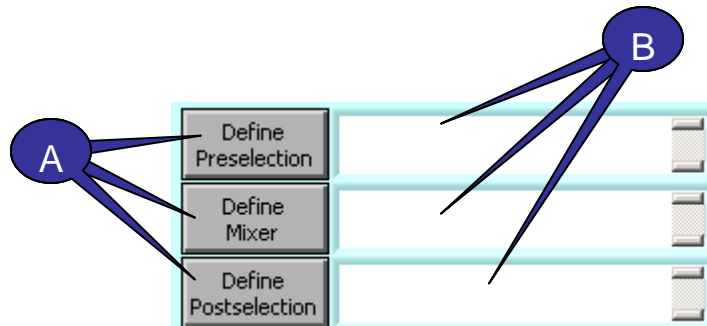


Mixer / Post-selection Filter



Mixer Only

Support Files



After the frequency conversion setup has been selected, it is necessary to define each of the components in use.

- A. Click on the Define Pre-selection, Define Mixer, or Define Post-selection buttons to setup the component specifications. Selecting any of these buttons will open a new window with all the parameters necessary to create, save, or load a component setup file.
- B. If a component setup file was opened or saved, the location will be displayed here.

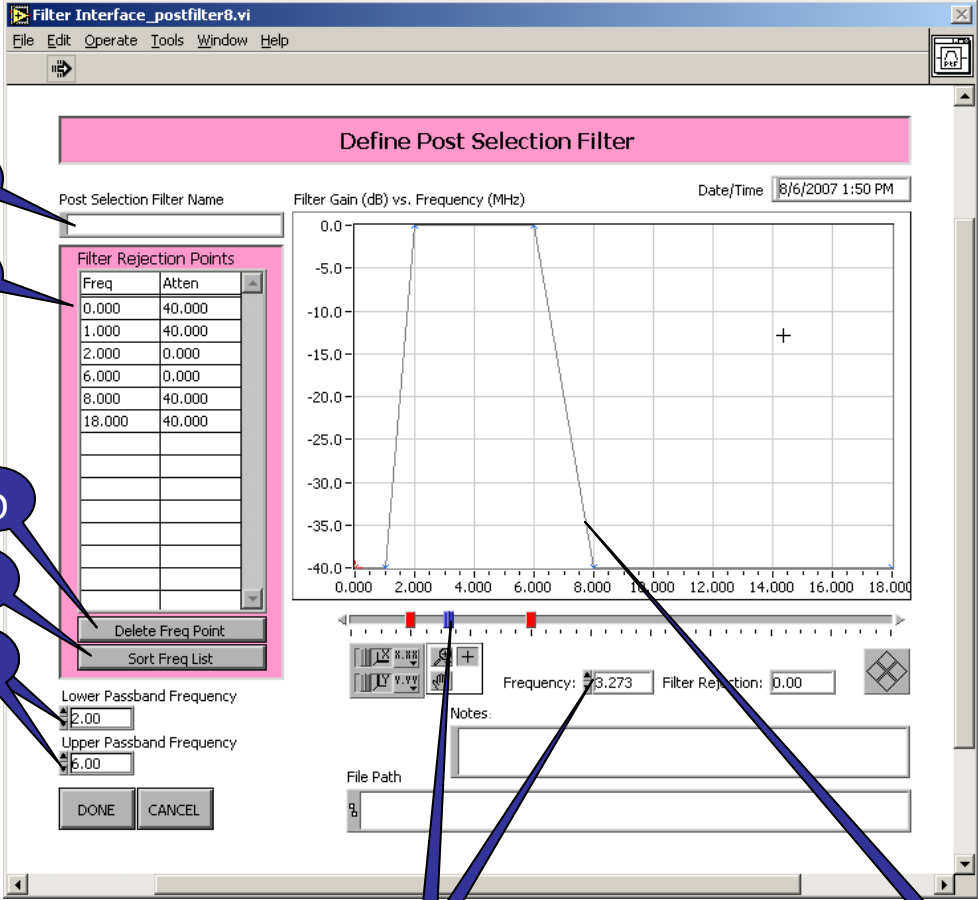
Define Pre-selection and Post-selection Filter

The screenshot shows the 'Define Preselection Filter' window. The title bar reads 'Filter Interface - refilter8'. The menu bar includes 'File', 'Edit', 'Operate', 'Tools', 'Window', and 'Help'. The 'File' menu is open, showing options: 'Open...', 'Open Filter...', 'Close', 'Close All', 'Save Filter...', 'Page Setup...', 'Print Window...', 'VI Properties...', and 'Exit'. A table with frequency points is visible, with callout H pointing to it. A graph plots 'Filter Gain (dB) vs. Frequency' from 0.000 to 18.000. Below the graph are controls for 'Frequency' (11.333) and 'Filter Rejection' (0.00). A 'Notes' field and a 'File Path' field are at the bottom, with callouts E and C pointing to them. 'DONE' and 'CANCEL' buttons are at the bottom left, with callouts F and G pointing to them. Callout D points to the 'Date/Time' field showing '8/6/2007 1:39 PM'. Callout A points to 'Open Filter...' and callout B points to 'Save Filter...'.

8.000	40.000
10.000	0.000
14.000	0.000
16.000	40.000
18.000	40.000

- A. Open Filter File** – A filter file is a tab delineated text file. It contains all filter setup parameters that are displayed on the Define Pre-selection Filter or Define Post-selection Filter panel. To open an existing filter file go to **File>> Open Filter...**
- B. Save Filter File** – To save the filter setup parameters to a text file go to **File>> Save Filter...**
- C. Notes** – Enter comments about the filter here. These comments will be saved with the filter file.
- D. Date/Time** – Displays the current date and time.
- E. File Path** – Displays the location of the filter file that was saved or loaded.
- F. Done** – Closes the current panel and saves changes to the programs memory. This will return you to the TunerHelper main panel. Changes are not saved to a file for future recall. To save the setup parameters to a file go to **File>>Save Filter...**
- G. Cancel** – Closes the current panel without saving changes. This will return you to the TunerHelper main panel.
- H. File>>Exit** may be used to exit TunerHelper from any panel. This will close the entire program. Be sure to save changes before exiting.

Define Pre-selection and Post-selection Filter Cont.



Define Post Selection Filter

Post Selection Filter Name: _____ Date/Time: 8/6/2007 1:50 PM

Filter Rejection Points	Freq	Atten
	0.000	40.000
	1.000	40.000
	2.000	0.000
	6.000	0.000
	8.000	40.000
	18.000	40.000

Buttons: Delete Freq Point, Sort Freq List

Lower Passband Frequency: 2.00
Upper Passband Frequency: 6.00

Buttons: DONE, CANCEL

Graph: Filter Gain (dB) vs. Frequency (MHz)

Frequency: 3.273 Filter Rejection: 0.00

Notes: _____

File Path: _____

- A. Filter Name** – Enter a descriptive name for the filter.
- B. Filter Rejection Points** – Use this table to define the filter by entering the filter rejection data points. Data points may be entered in any order. The Gain vs. Frequency plot will automatically update as data points are entered.
- C. Sort Freq List** – The Filter Rejection Points table may be sorted by clicking the Sort Freq List button. It is important to not leave any rows blank between ordered pairs.
- D. Delete Freq Point** – This button will delete the frequency point that is currently highlighted.
- E. Filter Gain vs. Frequency** – Plot of the Filter Envelope. You may reshape the Filter by clicking on any data point and dragging it to a new location. The new filter definition will automatically update the Filter Rejection Points table to the left.
- F. Pass-band Frequency** – Set the upper and lower ends of the filter's pass-band frequency. These values are displayed on the graph by the red bars. The pass-band region on the Input Signal Level graph on TunerHelper's main panel will automatically update.
- G. Input Frequency Slider** – Click and drag the Blue Bar to change the Input Frequency or enter a numeric value in the field below the graph.

Define Mixer

Mixers are used to translate an RF signal down to a lower frequency (down conversion) or up to a higher frequency (up conversion).

The screenshot shows the 'Define Mixer Parameters' dialog box. Callout A points to the 'Open Mixer...' menu item. Callout B points to the 'Save Mixer...' menu item. Callout C points to the 'Notes' text area. Callout D points to the 'Date/Time' field. Callout E points to the 'Path' field. Callout F points to the 'DONE' button. Callout G points to the 'CANCEL' button. Callout H points to the 'Exit' menu item. The dialog includes a 'Define Mixer Parameters' title bar, a menu bar (File, Edit, Operate, Tools, Window, Help), a 'Date/Time' field showing '8/6/2007 1:46 PM', a 'Conversion Scheme' dropdown set to 'IF=LO-RF (down)', a diagram of a mixer with 'Input', 'Output', and 'Down Conversion' labels, a 'Spur Chart [+/-M X RF +/-N X LO] (dBc)' table, a table of 'LO Harmonics to Output Isolation (dB)', and 'DONE' and 'CANCEL' buttons at the bottom.

	0	1	2	3	4	5	6	7	8	9	10
1	7.0	0	20	25	30	35	40	45	50	50	70
2	40	40	40	43	50	55	60	60	60	60	70
3	43	45	45	50	50	55	58	60	60	60	70
4	50	50	48	55	60	65	70	75	80	80	80
5	55	55	55	55	54	55	56	57	58	80	80
6	60	61	62	63	64	65	66	67	68	80	80
7	65	71	72	73	74	75	76	77	78	79	80
8	70	81	82	83	84	85	86	87	88	89	90
9	90	90	90	90	90	90	90	90	90	90	90
10	90	90	90	90	90	90	90	90	90	90	90

	(dB)
1L - I Isolation	20
2L - I Isolation	30
3L - I Isolation	40
4L - I Isolation	50
5L - I Isolation	60
6L - I Isolation	70
7L - I Isolation	80
8L - I Isolation	90
9L - I Isolation	100
10L - I Isolation	100

- A. Open Mixer File** – A mixer file is a tab delineated text file. It contains all filter setup parameters that are displayed on the Define Mixer panel. To open an existing mixer file go to File>> Open Mixer...
- B. Save Mixer File** – To save the mixer setup parameters to a text file go to File>> Save Mixer...
- C. Notes** – Enter comments about the mixer here. These comments will be saved with the mixer file.
- D. Date/Time** – Displays the current date and time.
- E. File Path** – Displays the location of the mixer file that was saved or loaded.
- F. Done** – Closes the current panel and saves changes to the programs memory. This will return you to the TunerHelper main panel. Changes are not saved to a file for future recall. To save the setup parameters to a file go to File>>Save Mixer...
- G. Cancel** – Closes the current panel without saving changes. This will return you to the TunerHelper main panel.
- H. File>>Exit** may be used to exit TunerHelper from any panel. This will close the entire program. Be sure to save changes before exiting.

Define Mixer Cont.

- A. Mixer Name** – Enter a descriptive name for the mixer.
- B. Conversion Scheme** – Select the Conversion Scheme to define how the mixer is used. Click on this field to make a selection from a pull down menu.
- C. Conversion Loss** – Enter the power loss to the RF signal inherent to the up / down conversion process.
- D. LO Power** – Enter the power that the Local Oscillator signal is set at.
- E. Input 1dB Comp Point** – Enter the top end of the mixer's dynamic range, indicating the input power level where the conversion loss increases by 1dB. As a rule of thumb, the 1dB Compression Point is typically 5dB below the LO Power.
- F. R-I Isolation** – Enter the isolation across the mixer, from RF to IF.
- G. Spur Chart** – Intermodulation chart that displays LO vs. RF. The columns denote the harmonics of the Local Oscillator, from the LO Frequency input to the right of it. The rows indicate the harmonics of the RF being received. Spur Chart data is entered in terms of dBc, indicating the power level of that intermodulation relative to the carrier. Contents should be filled in to the highest applicable harmonic, but must be done symmetrically for proper results. For example, to calculate spurs to the 5th harmonic intermodulation, data for all harmonics must be entered out to column 5 and row 5. Cell (0,1) is filled in automatically. This cell contains the difference between the Conversion Loss and the R-I Isolation. To edit this cell, change the conversion loss and R-I Isolation.
- H. LO Harmonics to Output Isolation** – This chart displays how the output is isolated from the harmonics of the LO independent of the RF input. Data is entered in terms of power (dB). The highest harmonic entered should equal the highest value on the Spur Chart.
- I. RF Input level for this Spur Table** – RF input level for which the above Spur Chart is valid.

Define Mixer Parameters

Mixer Name: _____ Date/Time: 8/6/2007 1:46 PM

Conversion Loss (dB): 6.00

LO Power (dBm): 20.00

Input 1dB Comp Point: 15.00

R-I Isolation: 15.00

LO Harmonics to Output Isolation (dB)

	(dB)
1L - I Isolation	20
2L - I Isolation	30
3L - I Isolation	40
4L - I Isolation	50
5L - I Isolation	60
6L - I Isolation	70
7L - I Isolation	80
8L - I Isolation	90
9L - I Isolation	100
10L - I Isolation	100

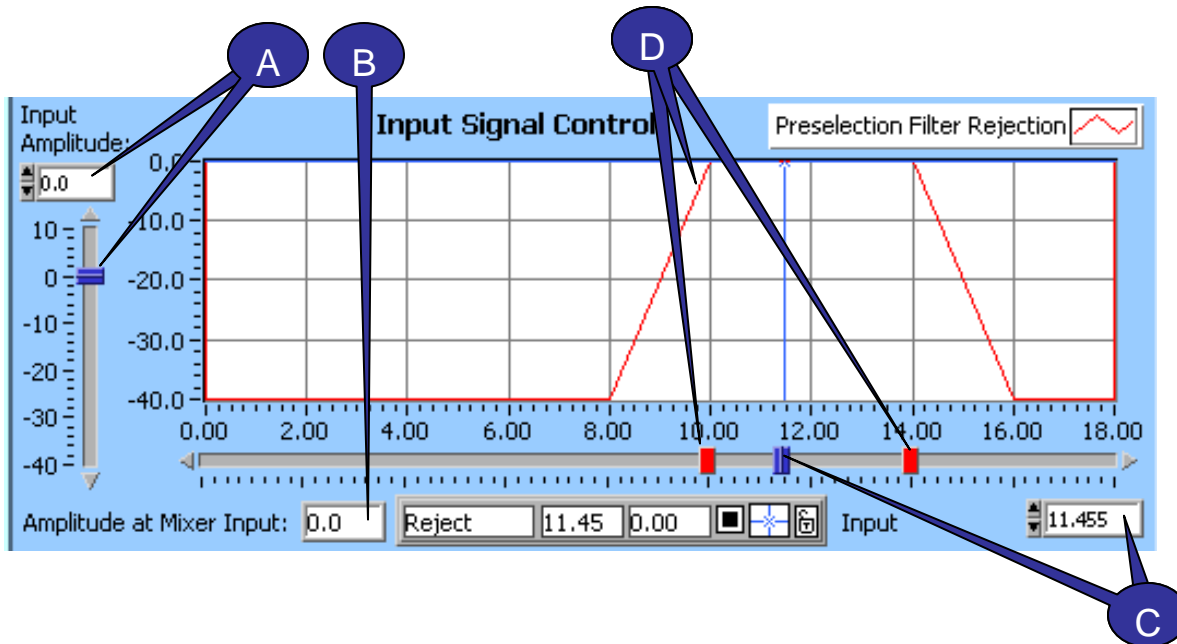
Spur Chart [+/-M X RF +/-N X LO] (dBc)

		LO ORDER (N)										
		0	1	2	3	4	5	6	7	8	9	10
R F O R D E R (M)	1	7.0	0	20	25	30	35	40	45	50	50	70
	2	40	40	40	43	50	55	60	60	60	60	70
	3	43	45	45	50	50	55	58	60	60	60	70
	4	50	50	48	55	60	65	70	75	80	80	80
	5	55	55	55	55	54	55	56	57	58	80	80
	6	60	61	62	63	64	65	66	67	68	80	80
	7	65	71	72	73	74	75	76	77	78	79	80
	8	70	81	82	83	84	85	86	87	88	89	90
	9	90	90	90	90	90	90	90	90	90	90	90
	10	90	90	90	90	90	90	90	90	90	90	90

RF Input level for this Spur Table: 0.00

Buttons: DONE CANCEL

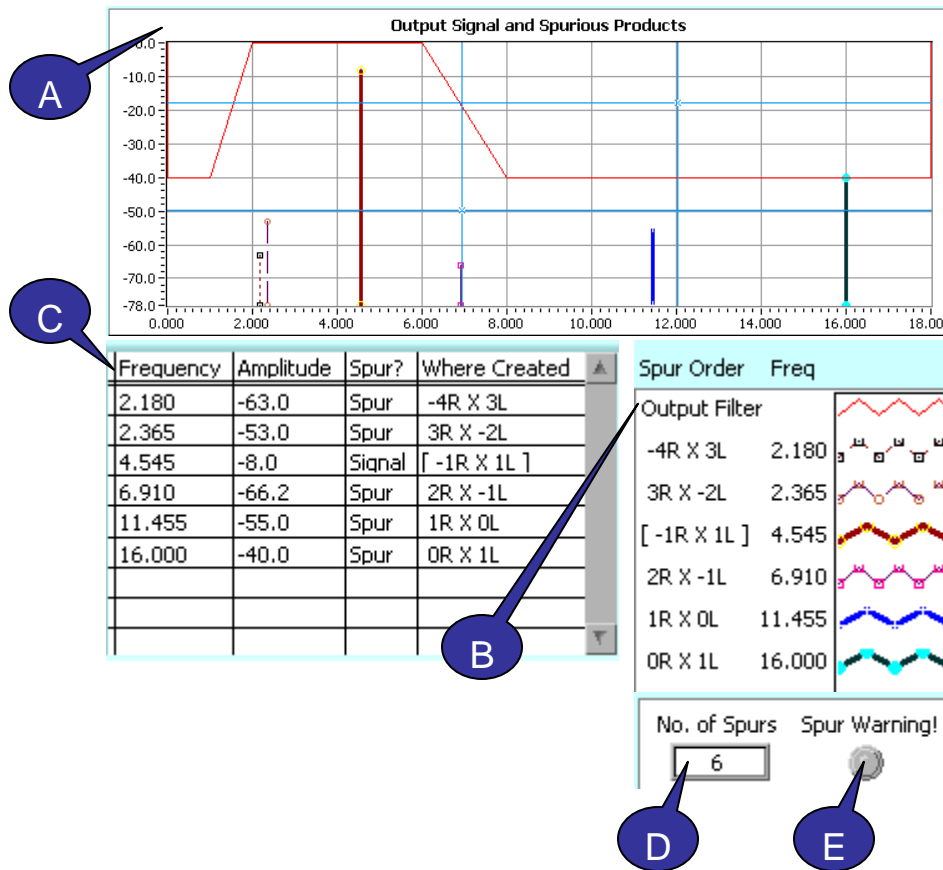
Input Signal Control



This plot displays the Input Signal Control for the selected input parameters.

- A. Input Amplitude** – Enter a numeric value or adjust the slider to the desired Input Amplitude for the RF Signal.
- B. Amplitude at Mixer Input** – Displays the RF Signal Power at the Mixer's Input port. Accounts for a Pre-selection Filter if one has been specified and defined.
- C. Frequency Slider** – This is the Input Frequency Slider. Click and drag the blue bar to adjust the Input Frequency. A numeric value may also be entered to set the input frequency.
- D.** The Red Bars are indicators of the pre-filter pass-band. To edit the pass-band region, go to the Define Pre-selection Filter panel and adjust the Lower Pass-band Frequency and Upper Pass-band Frequency accordingly.

Output Signal and Spurious Products

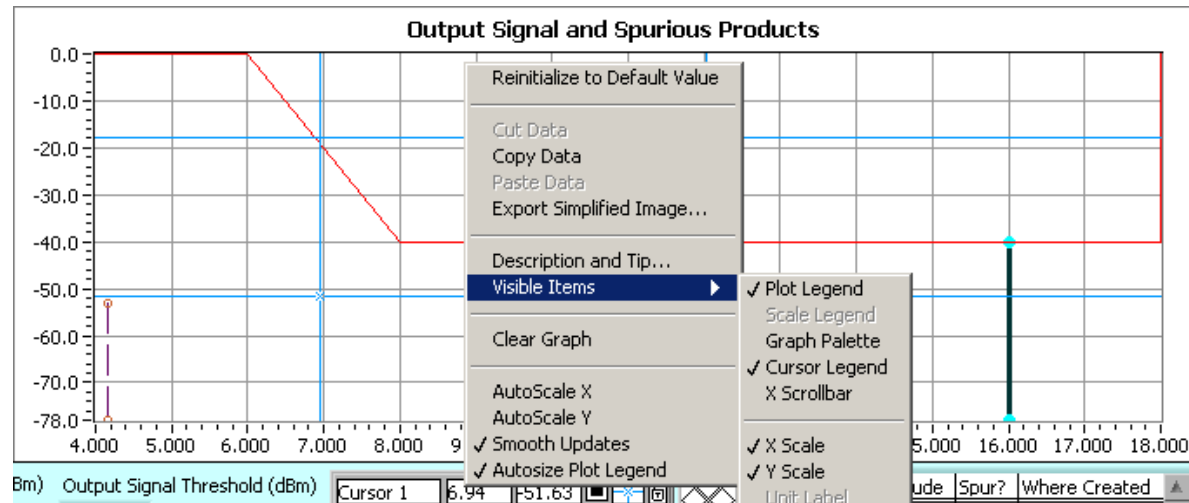


- A. Spur Plot** – Each line on this graph represents the location of a Spurious Frequency. These spurs are calculated based on the input parameters and frequency conversion type. The Post-selection Filter is also displayed on this Plot.
- B. Spur Order Key** – Displays the line type and color code for each of the spurs.
- C. Spur Table** – This table displays all of the Spurs and Signals plotted on the Output Signal and Spurious Products plot. The table displays the frequency, amplitude, type of element (spur or signal), and the Spur Order for each line displayed.
- D. No. of Spurs** – Indicates the number of spurs in the calculated range of Input Frequencies, Output Frequencies, Max RF Order, and Max LO Order. The Spur Order Key will display up to 24 Spurious Frequencies.
- E. Warning!** – The Spur Order Key will display up to 24 Spurious Frequencies. If the number of Spurious Frequencies exceeds 24, the warning light will turn red. This indicates that not all spurious products are displayed in the Spur Order Key.

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 spur lines. Using this option will make it appear as though the spurs were erased. To retrieve the spurs, adjust the Output Start Frequency.



- Copy Data:** Copy Data will make 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 spur lines from the graph. To retrieve the spurs, adjust the Output Start Frequency.
- 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 spur lines on the graph may be customized. Left click on the Spur Order Key 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 points are connected and delineated. By default the standard line without individual points is selected.
- **Color:** Select a custom color for the lines to make a bold presentation. This may be useful to distinguish between particular spurs.
-
- **Line Style:** Use the Line Style menu to select between dashed and solid lines.
-
- **Line width:** The Line width may be adjusted to accentuate the spurs.
-
- **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 points 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 TunerHelper.

Spur Order	Freq	
Output Filter		
3R X -2L	1.999	
-4R X 3L	2.668	
[-1R X 1L]	4.667	
2R X -1L	6.666	
1R X 0L	11.333	
0R X 1L	16.000	

Common Plots ▶

Color ▶

Line Style ▶

Line Width ▶

Anti-Aliased

Bar Plots ▶

Fill Base Line ▶

Interpolation ▶

Point Style ▶

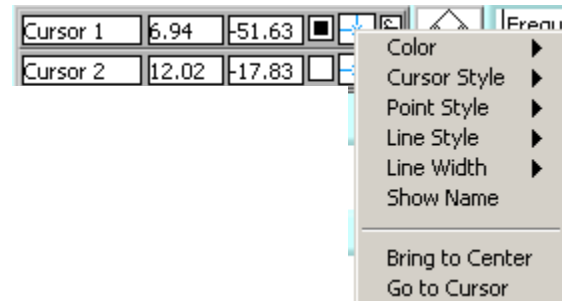
X Scale ▶

Y Scale ▶



Cursor Line Properties

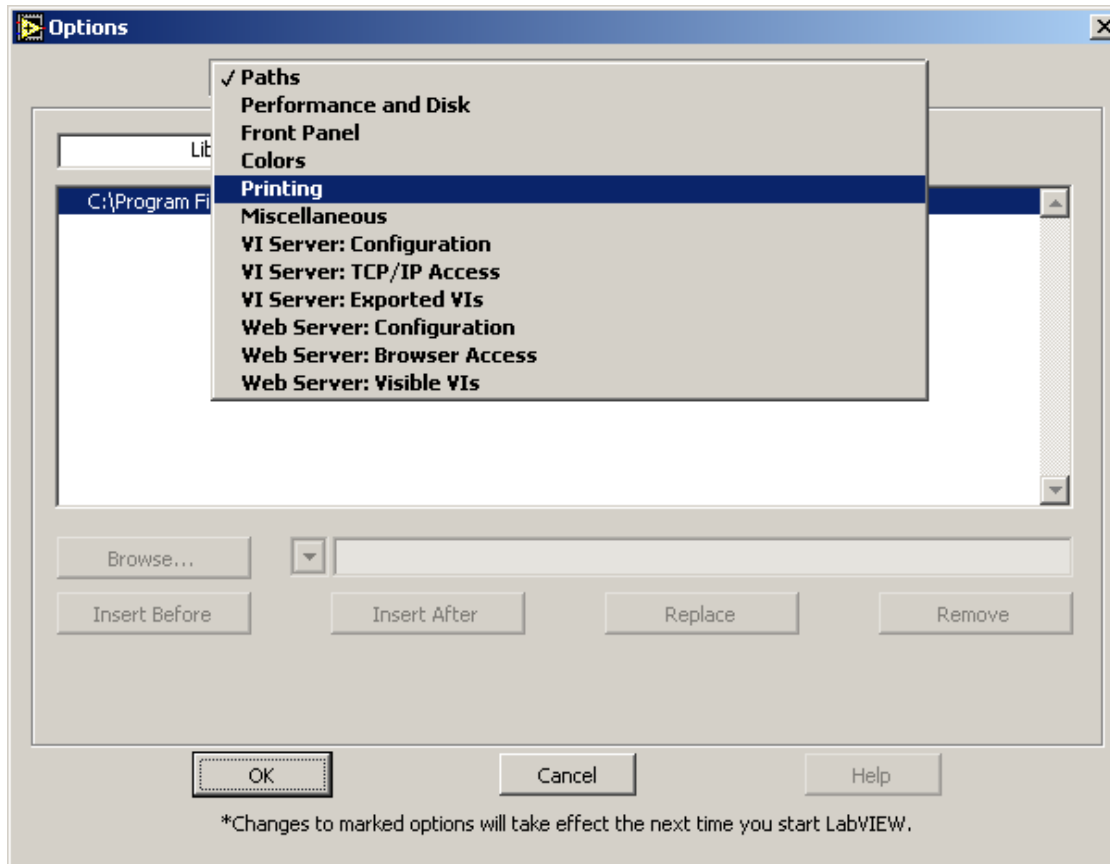
On the graph there are two blue cursor lines. These lines may be used to specify a region of focus on the graph. You may move these lines to any location by clicking and dragging them to a position or by entering a coordinate (Input, Output) in the appropriate field. You may change the color and style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



- **Color:** Select a custom color for the cursor 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 cursor 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 cursor line crosses the spur lines.
- **Line Style:** Use the Line Style menu to select between dashed and solid lines. By default the cursor lines are solid.
- **Line width:** The Line width may be adjusted to accentuate or deemphasize the cursor lines.
- **Show Name:** The Show Name option will display the name of the cursor line on the graph.
- **Bring to Center:** Bring to Center moves the cursor 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 cursor line.
- **Lock Position:** To lock the cursor lines to a fixed location, left click on the button with the lock next to the appropriate cursor line.

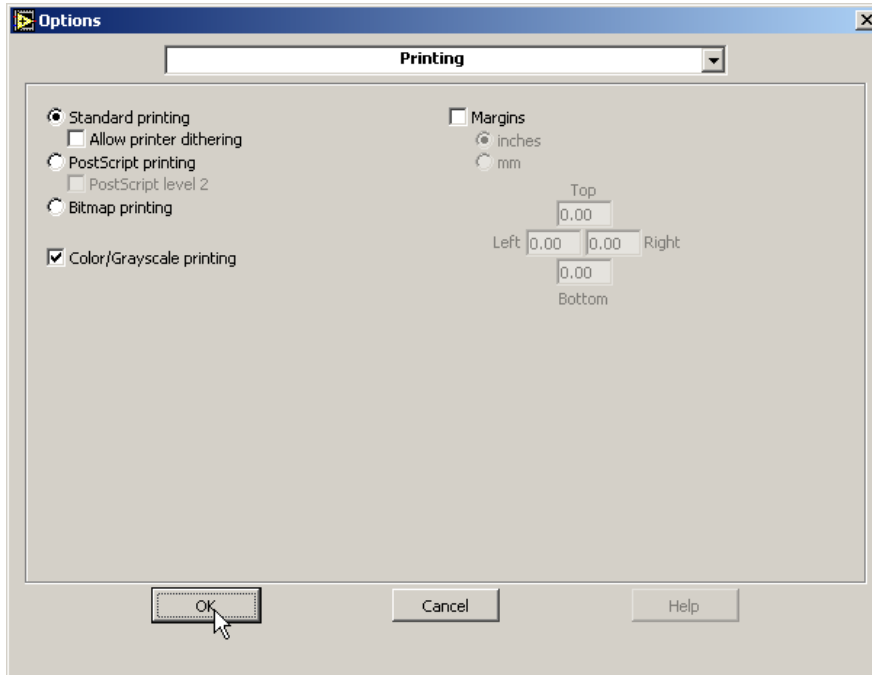
Printing

- 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 arrows next to Paths and select **Printing**.

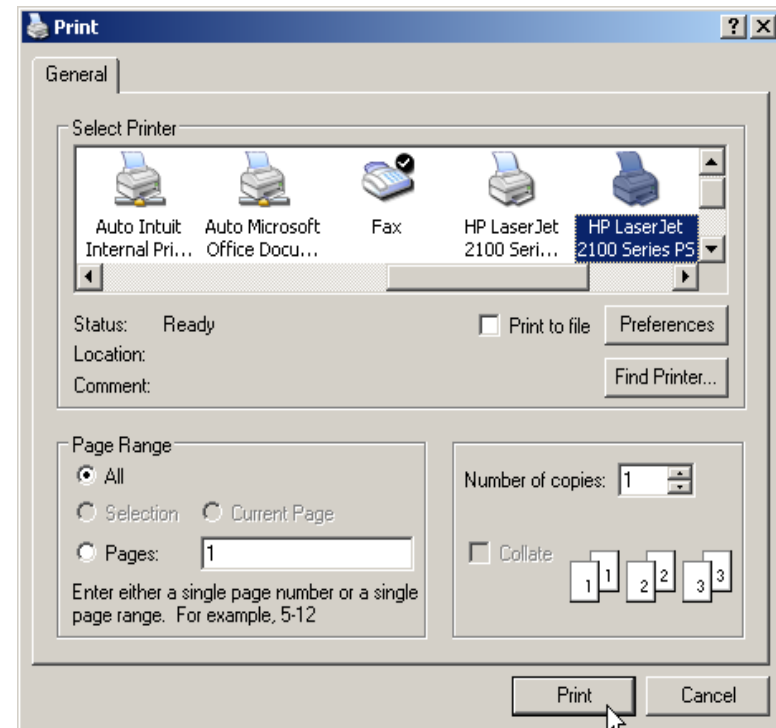


Printing Cont.

- 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**

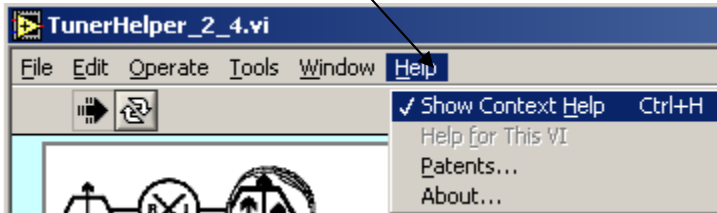




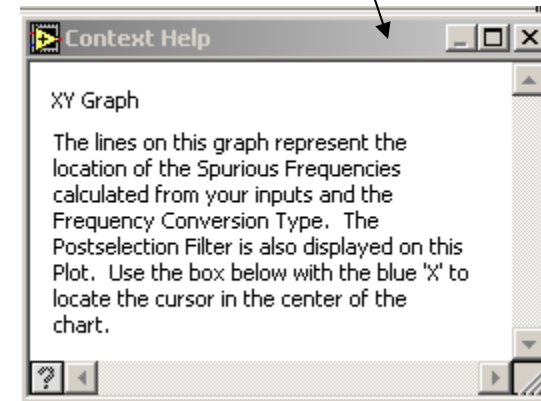
Help Menu

- For help on functions while TunerHelper 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.
- For additional Help resources please visit our Software Support Forum at: <http://rawood.com/support3/index.php>
- As always, if you run into problems, don't hesitate contact us any time at 315-735-4217 or rawood@rawood.com

Click on Show Context Help to bring up Help window.



This is an example Context Help Window that is displayed when the mouse button hovers over the Output Signal and Spurious Products plot. 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.

