



3000 Series PXI Modules

PXI Studio User Guide

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About this manual

Intended audience

Users who need to configure 3000 Series PXI modules to create logical instruments for signal generation and analysis.

Structure

Chapter 1	Common plugin control
Chapter 2	System configuration
Chapter 3	Signal generator front panel
Chapter 4	Digitizer front panel
Chapter 5	Combiner
Chapter 6	Spectrum analysis

Associated documentation

If you want to...	Refer to...
Find information about soft front panels, drivers, application software, data sheets, getting started and user manuals for this and other modules in the 3000 Series.	PXI Modules CD-ROM Part no. 46886/028 Supplied with the module
Install modules into a rack, interconnect them, power up and install drivers.	3000 Series PXI Modules Common Installation Guide Part no. 46882/663 On the CD-ROM and at www.aeroflex.com
Set up a populated chassis ready for use.	3000 Series PXI Modules Installation Guide for Chassis Part no. 46882/667 On the CD-ROM and at www.aeroflex.com
Set up and use the signal generator application for 3010 Series and 3020 Series modules.	Getting Started with afSigGen Part no: 46892/678 On the CD-ROM and at www.aeroflex.com
Set up and use the digitizer application for 3010 Series and 3020 Series modules.	Getting Started with afDigitizer Part no: 46892/676 On the CD-ROM and at www.aeroflex.com

Acknowledgements

PXI Studio is based in part on the work of the Qwt project (<http://qwt.sf.net/>)

PXI Studio is based in part on the work of the Xerces project (<http://xerces.apache.org/>) licensed under the Apache 2.0 license (a copy of which can be found in the install folder).

System requirements

Intel-based PC with 1.5 GHz Pentium processor or equivalent

Microsoft Windows NT 4.0, 2000 / XP / Vista (32 bit)

512 MB RAM Minimum (Windows NT 4.0, 2000 / XP) -1024 MB RAM recommended

1024 MB RAM Minimum (Windows Vista)

Aeroflex PXI hardware drivers version 5.4.0 or later

Screen and graphics card capable of displaying 1024 x 768 pixels

PXI Studio overview

Introduction

PXI Studio is an application that is designed to bring all Aeroflex PXI measurement and control functionality under the control of one easy-to-use application.

Plugins

PXI Studio uses a number of different application plugins, which provide functionality for controlling hardware settings, making measurements, or configuring your hardware system.

By default, PXI Studio is supplied with five plugins:

System Configuration

This helps you to set up your PXI hardware.

Signal Generator front panel

This allows you to directly manipulate and control a PXI 3020 Series module, together with a 3010 Series module if required.

Digitizer front panel

This allows you to directly manipulate and control a PXI 3030 Series module, together with a 3010 Series module if required.

Combiner plugin

This allows you to set up and control a PXI 3060 Series RF combiner.

Spectrum analysis plugin

This allows you to perform spectral measurements using a Digitizer Instrument consisting of PXI 3030 Series and 3010 Series modules.

This document contains information about how to launch these plugins. Other optional plugins are available - for information about how to launch and use other plugins, please refer to the documentation supplied with the plugin.

File menu

Saving a plugin's settings

All measurement and instrument control plugin windows provide the ability to save their settings to a file for re-use at a later date. To save the current active plugin's settings to a file, click the File->Save As top-level menu. This asks you to specify the filename you wish to save. Once you have selected a file, click the **Save As** button and the file is saved.

Alternatively, to cancel the save, click **Cancel**. By default, all plugin save files are stored in a .PXS format.

Alternatively, if you have already saved the plugins settings to a file, click the **File->Save** button on the top-level menu and this stores the plugin's settings to the previously saved file.

Opening plugin settings

If you have previously stored a plugin's settings, you can open the file by clicking File->Open on the top level menu. Once you have selected the file you wish to open, click **Open**.

If the file is a valid PXI Studio settings file (.PXS), the plugin is recalled with the settings stored in the file. Note that in the cases of plugins that make use of PXI hardware, opening a settings file automatically attempts to boot and load the hardware.

Closing the application

To close the application, you can either click the close window icon at the top right-hand side of the application window, or click File->Exit.

Window menu

PXI Studio uses a MDI interface, which means you can have multiple windows open together. To allow easy manipulation of these, PXI Studio provides a windows menu:

Close

Closes the currently active plugin.

Close all

Closes all open plugins.

Cascade

Stacks all open plugins on top of each other in a standard windows cascade.

Arrange Icon

Aligns all minimized windows.

Next

This moves to the next active plugin.

Previous

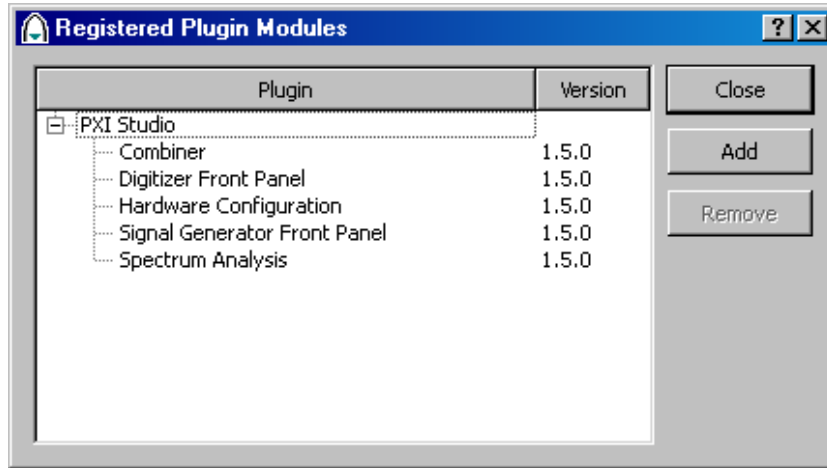
This moves to the previous active plugin.

Tools Menu

The tools menu provides the ability to view and modify the configuration of PXI Studio plugins.

Registered plugins

To view, add or remove plugins from your system, click Tools -> Registered Plugins to view the registered plugins screen:



This screen shows you an overview of the registered plugins in your system, as well as their version number.

Removing a plugin

To remove a plugin, first select the plugin you wish to remove, then click **Remove**.

Adding plugins

To add a plugin, or plugins, click the **Add** button and select the plugin library that you wish to register.

Note that if you do not have sufficient administration privilege on the machine to write to the HKEY_LOCAL_MACHINE registry key, you are not able to add or remove plugins.

Colors of controls

References to colors in this document assume that your desktop is set to display the Classic Windows color theme. If you have set a different desktop color theme, colors may vary in descriptions throughout this document.

Chapter 1

Common plugin control

Overview

Most Plugin screens consist of a number of different panels that allow you to modify settings and display information. Each of these panels can be independently moved, rearranged and stacked in order to create a customized layout for each Plugin.

By default; each Plugin contains a pre-defined layout that is automatically loaded whenever a default Plugin screen is activated.

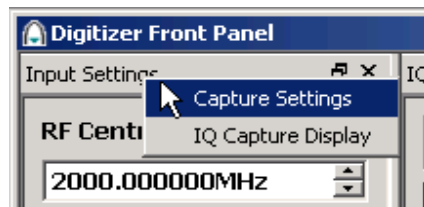
This section describes how to manipulate these panels in order to customize your Plugin layout.

While this document uses the Digitizer Front Panel Plugin as an example, the methods of customizing your layout are the same for all Plugins.

Creating a new panel

Once you have opened the Plugin you wish to use, right-click on one of the existing panels' title bars to activate the Plugin menu. This displays a list of new panels that can be created. To create the panel, simply click on the menu item of the panel you wish to create.

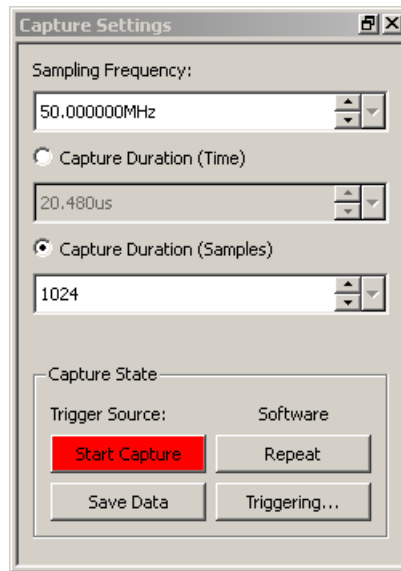
Documentation about the what panels can be created, and how to control them, can be found within the documentation for the Plugin you are using.



COMMON PLUGIN CONTROL

Note that some panels can only be created once, meaning that only one can be displayed at a time. If the panel you want to create does not exist, check to make sure that the panel is not already on your layout.

Once you have clicked on an item, a new floating panel is created:



By default, all panels are created as top-level floating windows.

Closing a panel

If there is a window that you wish to remove from the main Plugin screen, click on the panel's title bar, and select the close button:



This removes the panel from the main Plugin screen.

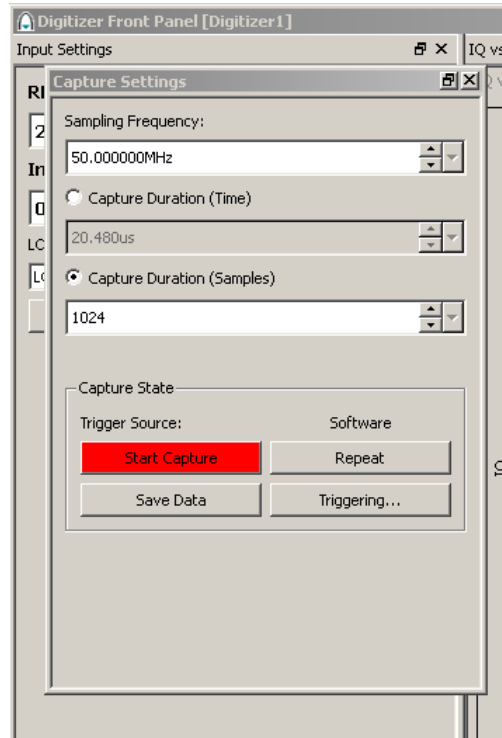
Popping out a panel

All panels can either be part of the main Plugin screen, or can exist as separate top-level floating windows.

To change a panel that is part of the main Plugin screen into a floating screen, click on the 'restore' button on the title bar of the panel you wish to pop out.



Clicking this button moves the panel out into a floating window.



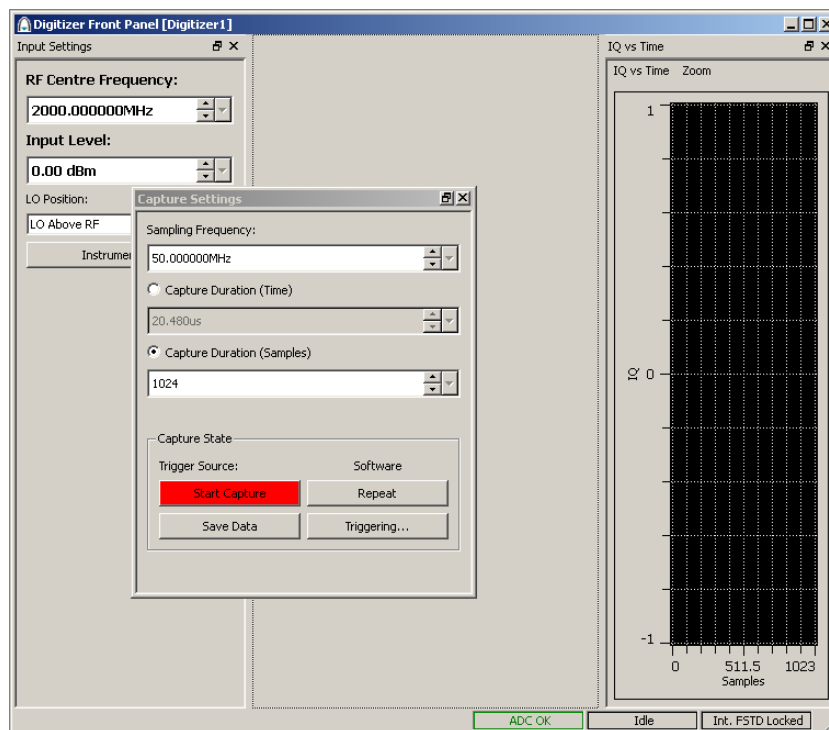
Restoring a panel

If you want to restore a window to its original location, click again on the restore button at the top of the window's title bar; this pops the floating window back into the main Plugin screen.

Docking a panel

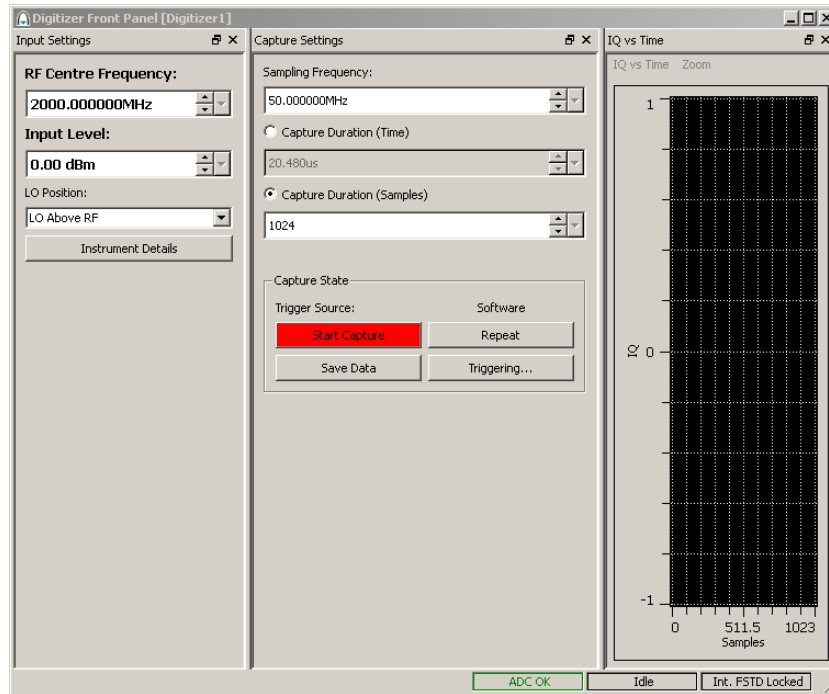
Alternatively, if you want to place a floating window in a new position within the main Plugin screen, you are able to dock this window into any available location within the main Plugin screen, provided that there is enough space available to do so.

To dock a floating window, simply drag the window to the edge of an existing panel using the left mouse button. If there is enough room available, the other panels in the main Plugin window resize to indicate that you can place this window at this location.



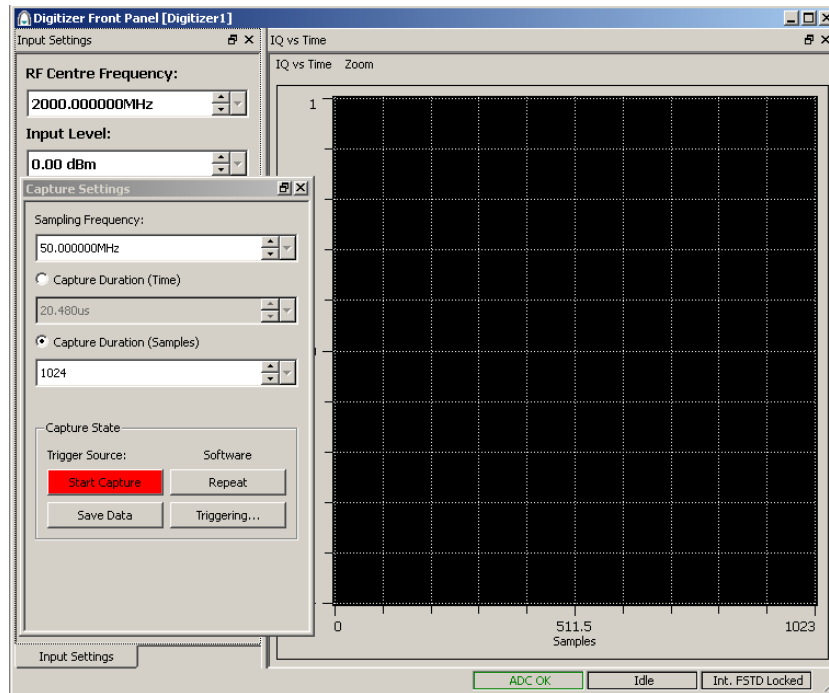
COMMON PLUGIN CONTROL

Then simply release the left mouse button to drop the window into that location.



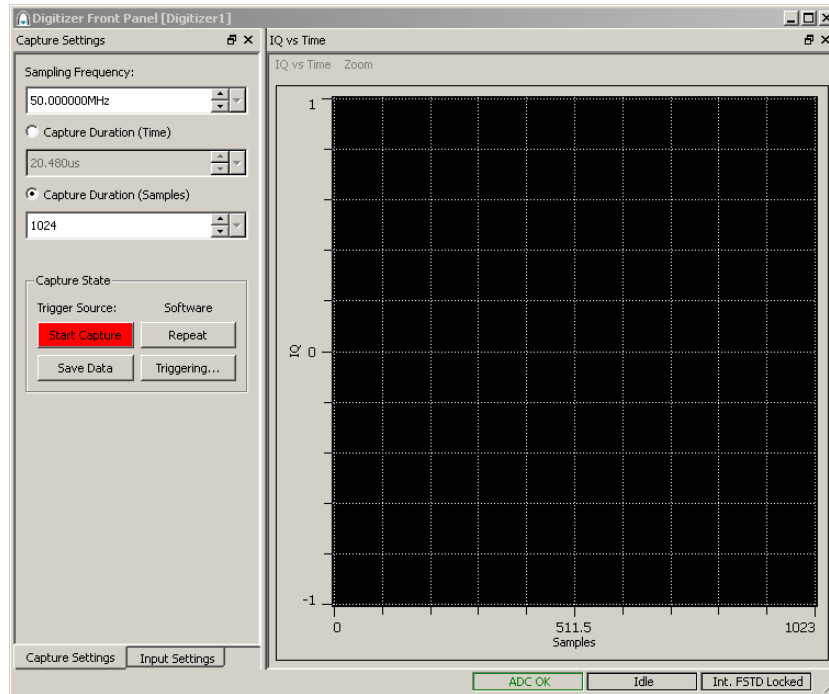
Stacking panels

As well as being able to drop in, you also have the ability to stack panels with other existing panels in the main Plugin screen. To do this, instead of moving the floating window to the edge of an existing panel, move it to the center. If there is enough space, the panel you are stacking now shows a tab at the bottom of its window, indicating that the window you are dragging can be stacked.



COMMON PLUGIN CONTROL

Then, as before, release the mouse button to drop this window into the selected panel:

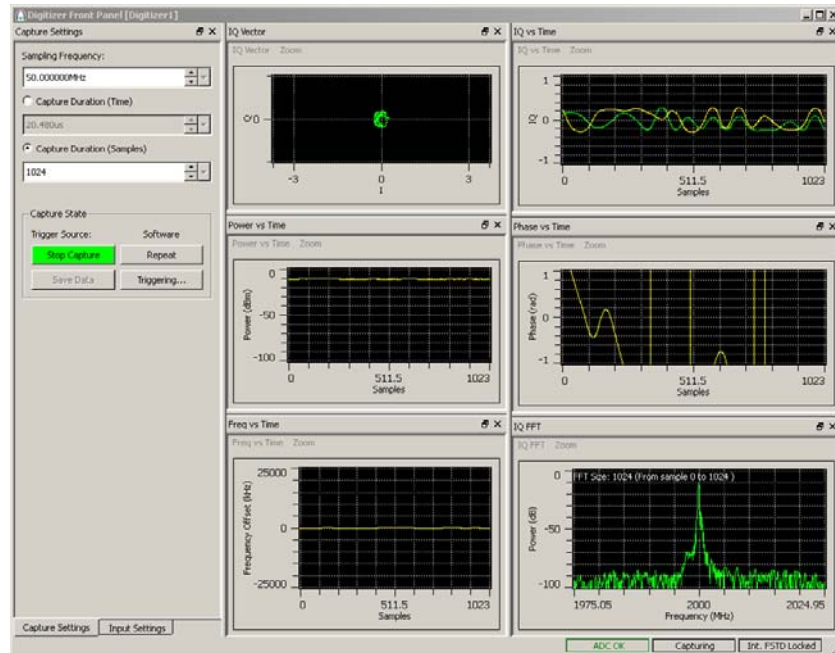


Each Plugin supplies a number of different panels that allow you to modify settings and display information

Resizing a panel

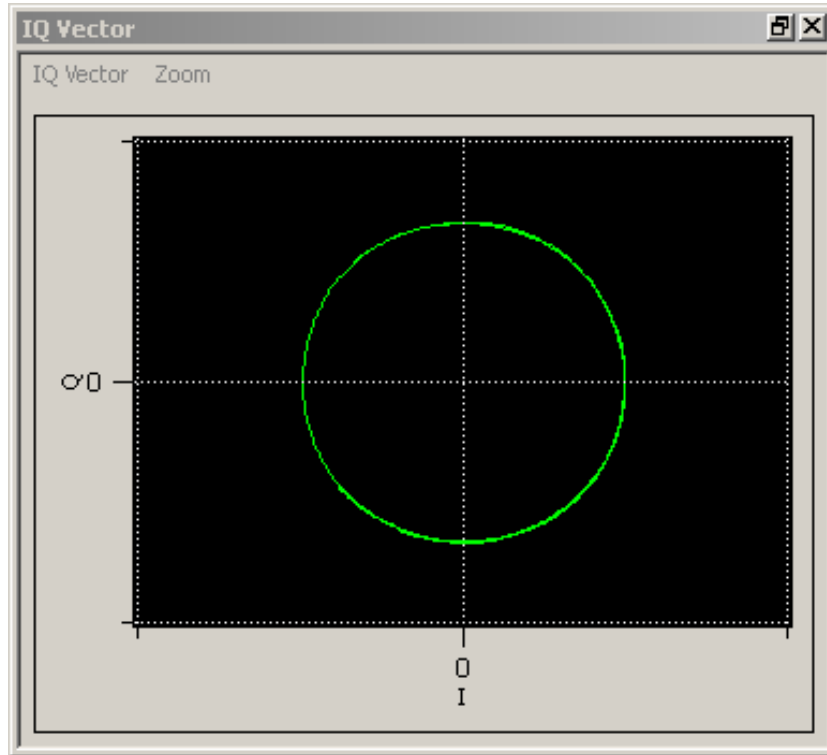
Each panel that has been created can also be resized. To do this, click on the boundary bars between panels and drag them in order to achieve the required size.

Using this drop-in and out mechanism, it is possible to create complex Plugin windows that can display a large amount of graphical information:



Note: if there is not enough room on the screen for a new panel to be inserted into the main window, then you are not able to drop a new panel into it. Each window has a minimum size requirement, which means that large windows, such as the IQ Capture Display panel, cannot be dropped into small locations. In order to drop in extra windows, it may be necessary to resize your main Plugin window in order to make enough room for them to fit.

Graph output display



Some Plugins allow you to display the resulting measurement information in a graphical format. This section describes the common functionality of the graphical output window. While this document uses the Digitizer Front Panel Plugin as an example, the methods of controlling and manipulating your graphical output is the same for all Plugins.

The graph has two modes of operation:

Zoom mode

This mode allows you to perform a rubber-band style selection on the graticule.

Selection mode

This allows you to manipulate markers, and perform bar selections of the graph.

Graph output display control bar



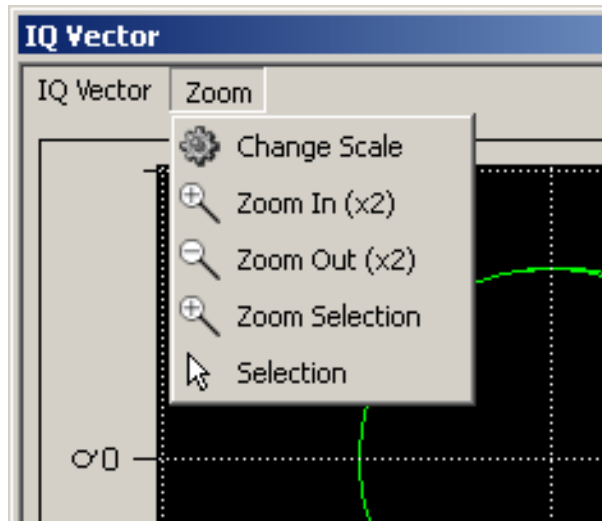
This part of the graphical output display allows you to change the information you are displaying.

Changing the graph type

Most Plugins provide the ability to display more than one measurement type. To change the measurement type displayed, click on the name of the current graph at the top left of the graphical display, and a menu of available measurement types is displayed. To change to a new measurement, simply select the desired measurement, and the graph updates automatically.

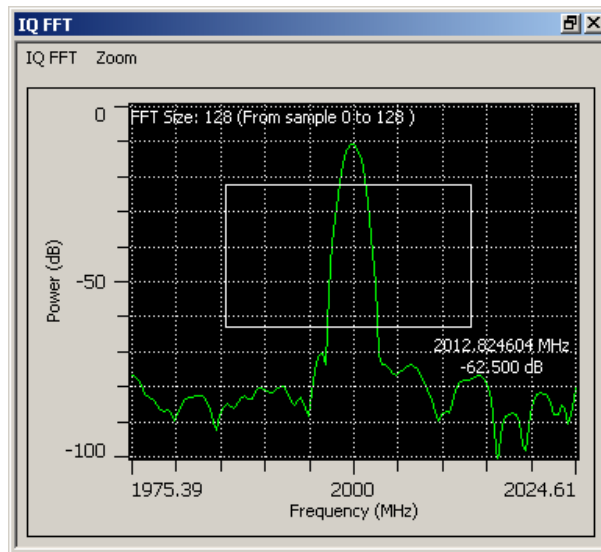
Zooming in

To zoom in on the information displayed on the Graph display panel, click on the zoom menu at the top of the panel and select the *Zoom In* option to zoom in by a factor of 2.



COMMON PLUGIN CONTROL

To select a region to zoom, click on the Zoom menu at the top of the panel and select the Zoom Selection option. Notice that the graph now displays the co-ordinates of the mouse cursor. To zoom in on a region of the display graph, click and hold the left mouse button and drag it to select the region of the graph you want to zoom into.



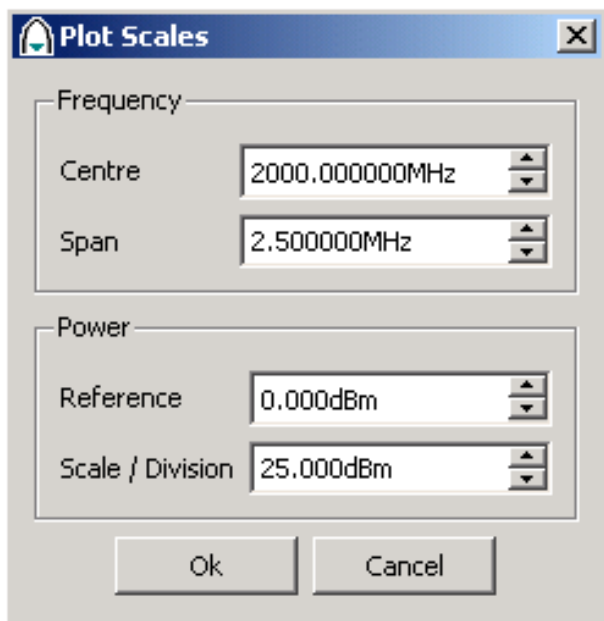
Once the zoom has been completed, the Graph display reverts to its default selection mode.

Zooming out

To zoom out, click on the zoom menu at the top of the panel and select the Zoom Out option. This causes the Graph display to zoom out on the x-axis by a factor of 2, maintaining the current central point. If the Graph display cannot achieve this zoom factor, as doing so exceeds the graph's maximum scale limits, the maximum possible scale is set instead.

Changing the graph scale

To change the X and Y axis scales for a given graph, click on the zoom menu at the top of the panel and select the Change Scale option. This displays the scaling screen:



The way you specify the scale of the X and Y axis depends on the type of data that the active graph is displaying. The different methods are as follows:

Centre, Span

This allows you to specify a scale in terms of a center point and a span.

Reference, Scale/Division

This allows you to specify a scale in terms of a reference, which is the maximum value of the display, and value for each division of the graph.

Minimum/Maximum

This allows you to specify a scale in terms of a start and stop limit.

Changing the scale

Whenever you modify the scale using this screen, the new scale limits are automatically applied to the graph display, allowing you to see the new scale immediately. However, these changes are only permanently applied when you click **Ok**. If you click **Cancel** at any time, the Graph display scales are reset to their original values.

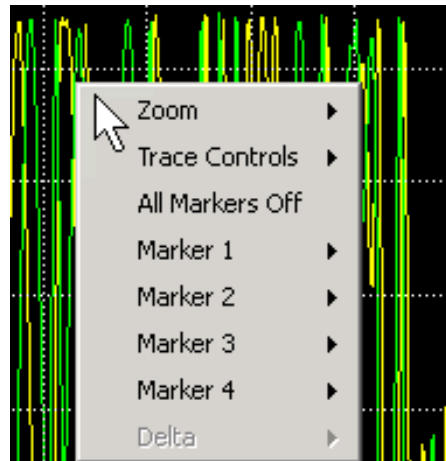
Axis limits

There are normally limits on the scales you are allowed to enter on this screen. These are generally dependent on the measurement that is being made.

Graph Display menu

As well as the standard control buttons that comprise the control bar, the Graph Display panel provides extra capabilities for adjusting and analyzing your measurement data.

Many of these can be accessed by right-clicking on the graph graticule to display the graph popup-menu:



By default, this menu provides the following functions:

Zoom sub menu

This sub menu the ability to modify the X axis zoom factor.

Zoom In (x 2)

This increases the zoom of the current graph's X axis by a factor of 2, retaining the current center point.

Zoom Out (x 2)

This decreases the zoom of the current graph's X axis by a factor of 2, retaining the current center point. If the IQ Capture Display graph cannot achieve this zoom factor, as doing so exceeds the maximum limits for samples or frequency, the maximum possible scale is set instead.

Reset Zoom

This resets the zoom factor of the current graph's X and Y axes to their default values.

Trace Controls sub-menu

Trace enable/disable

This gives you the ability to turn on and off different traces within the graph independently. This option is only available if there is more than one independent trace running for the given graph, for instance I and Q traces.

Markers sub-menu

The Markers sub-menu allows you to control how markers are displayed on the graph. You have the ability of enabling up to four markers and a delta marker. For more information about markers, see the markers section of this document.

All Markers Off

This function allows you to turn off all markers that are currently enabled.

Enabled

This function allows you to turn a marker on or off. The first time a marker is enabled; it is automatically moved to the location you initially right-clicked.

Move to here

This function allows you to move the specified marker to the location at which you initially right-clicked.

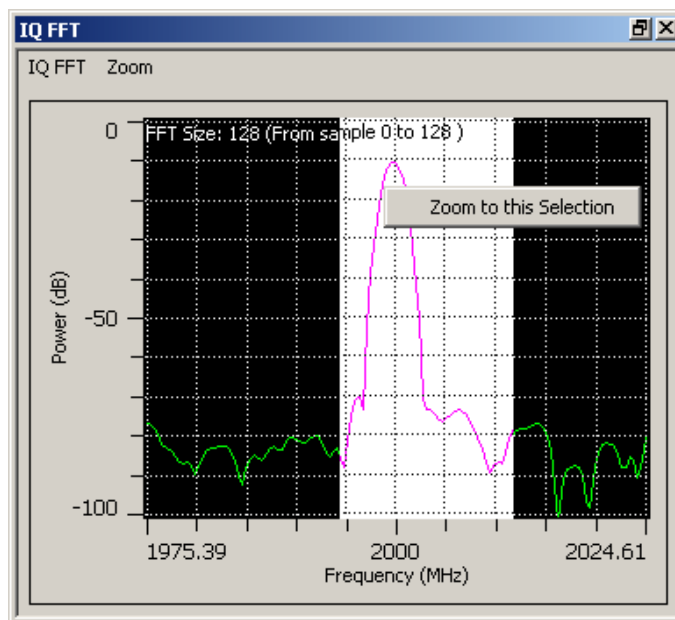
Graph display selection mode

Selection mode allows you to manipulate graph information using the mouse pointer. Using the mouse, it is possible to select a full region of X axis data, as well as moving markers to different locations.

Selecting a region of data

The data selection mechanism in the Graph display allows powerful control of the data that is being displayed.

To make a selection, click and hold the left mouse button at the start of the section you want to select, then drag the mouse to the end of this section:

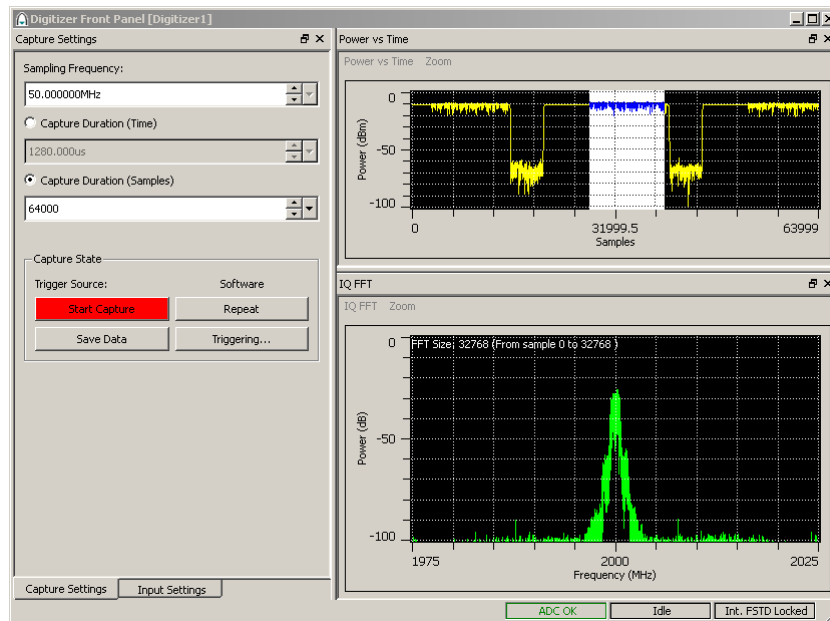


Zooming to the selection you have made

To zoom in on the selection you have made, right-click the mouse button over the selection and select 'Zoom to this selection' from the resulting popup menu.

Applying the selection to another graph

If more than one graph is being displayed, it is possible to use the selection mechanism to set the data that other graphs are displaying. Take the following Digitizer Plugin screen as an example:

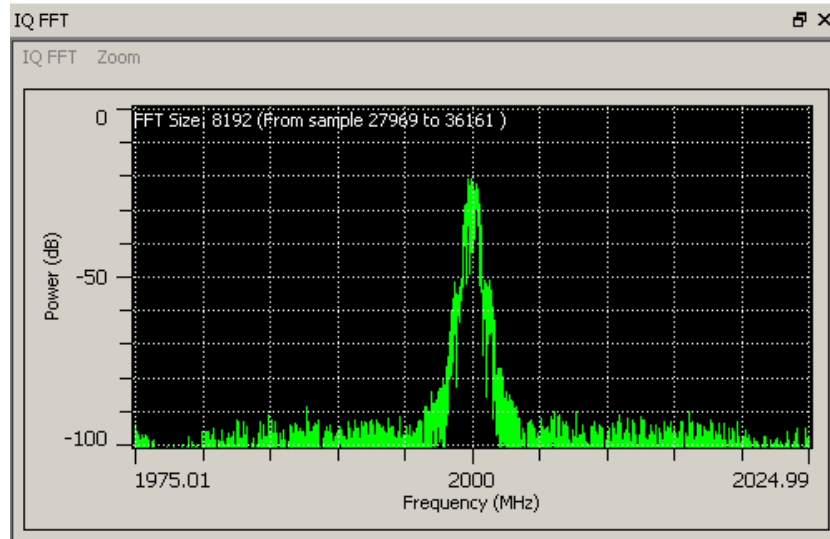


In this situation, you may want to analyze the spectrum of the selected region in the top Graph display panel.

To do this, click and hold the left mouse button over the selection you want to apply to the spectrum measurement, and drag the mouse over to the IQ FFT window:

COMMON PLUGIN CONTROL

When a selection is being dragged, you see the mouse cursor change into a small picture of the selection you have made. Then, to apply this selection to the second graph, simply release the left mouse button and drop the new selection in:



In this example, after you release the selection, the Spectrum graph window displays the FFT of the selection you dropped in.

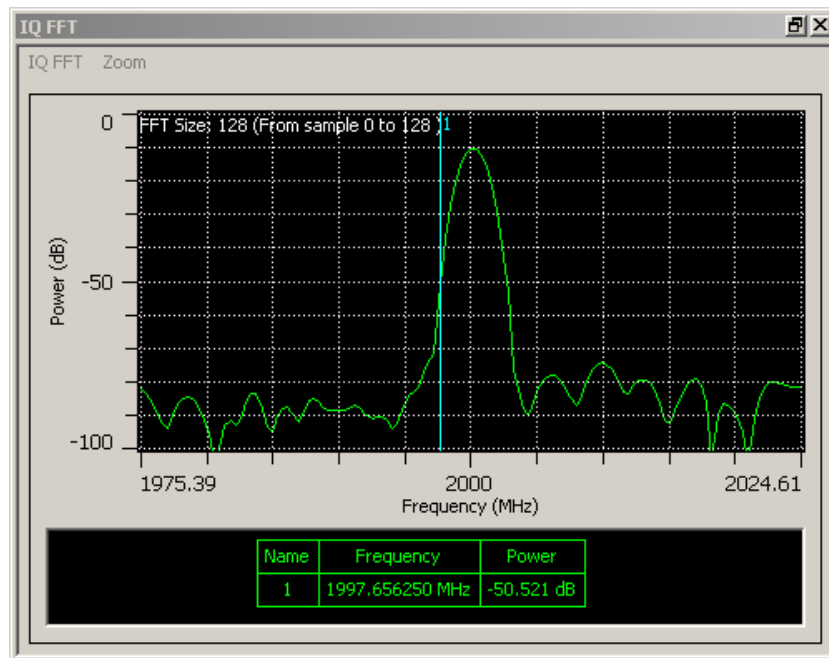
You can select and drag any selection onto another graph that can work in terms of the data domain of the original selection. This means that you can drag a selection from any graph that is displayed in terms of samples onto any graph that can process a selection of samples. It is not possible to drag a selection from a graph that is displayed in frequency onto a graph that is displayed in terms of time.

Markers

The graph display panel allows you to display up to four markers and a delta marker. The information of each marker, such as X and Y values and delta values are displayed in the marker table, which is located beneath the main graticule when more than one marker is enabled.

Enabling a marker

To enable a marker, click on the location where you wish to place the marker, and use the Graph display menu to enable the marker. This displays the marker on the screen; if there were previously no markers displayed, the marker display table is displayed:



Removing a marker

To remove a marker, right-click on the graph graticule to display the Graph display menu, select the marker you wish to remove and click Enabled.

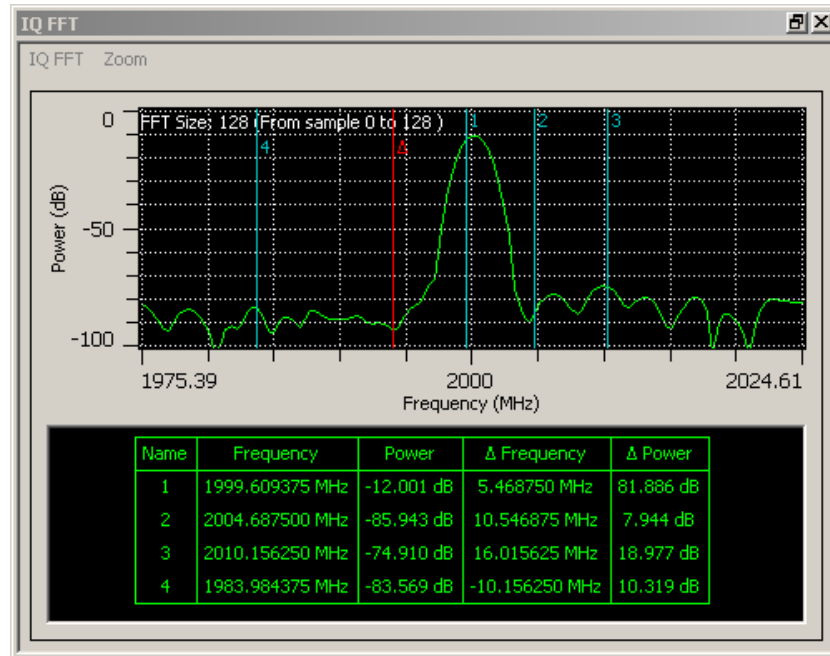
Moving a marker

To move a marker to a new location, hover your mouse over the marker until the cross-hair changes to the resize cursor, then simply hold the left mouse button and drag the marker to the desired location, and release the mouse.

Delta marker

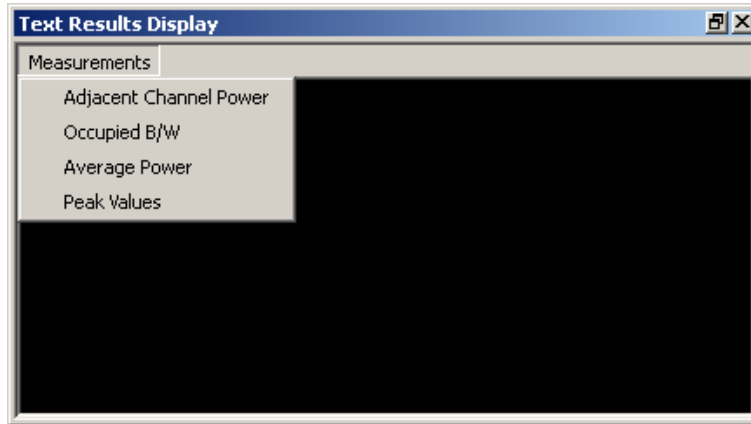
The delta marker is manipulated in exactly the same way as normal markers. However, you can only display a delta marker if a normal marker is enabled.

When a delta marker is enabled, the marker table is updated with delta values:



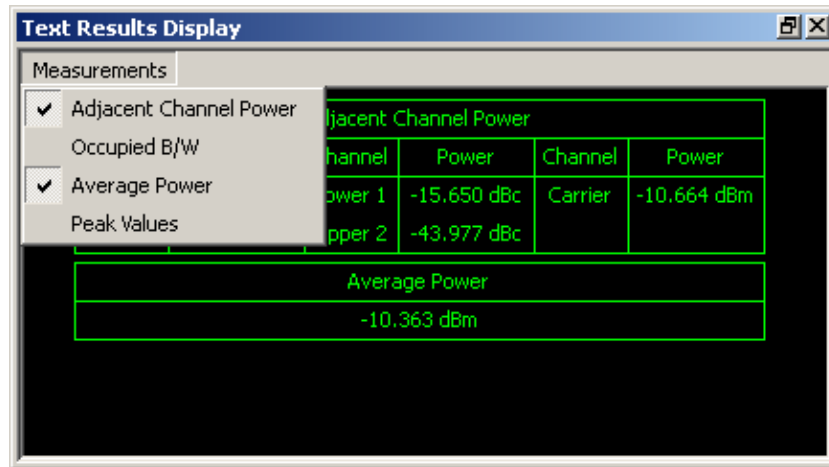
Text results panel

Some Plugins allow you to display measurement results in a text format using a standard text results panel. For details on what text measurements a Plugin can display, consult the relevant documentation for that Plugin.



Showing a measurement

To show the text for measurement, select the item in the menu. This causes the text display to start displaying the measurement.



COMMON PLUGIN CONTROL

You can also use the right mouse button to display the menu.

The screenshot shows a window titled "Text Results Display" with a "Measurements" section. It displays a table of Adjacent Channel Power measurements. A context menu is open over the table, listing options: Adjacent Channel Power (checked), Occupied B/W, Average Power (checked), and Peak Values.

Adjacent Channel Power					
Channel	Power	Channel	Power	Channel	Power
Lower 2	-58.309 dBc	Lower 1	-37.933 dBc	Carrier	-10.125 dBm
Upper 1	-46.827 dBc	Upper 2	-58.407 dBc		

Average Power: 24 dBm

- Adjacent Channel Power
- Occupied B/W
- Average Power
- Peak Values

Chapter 2

System configuration

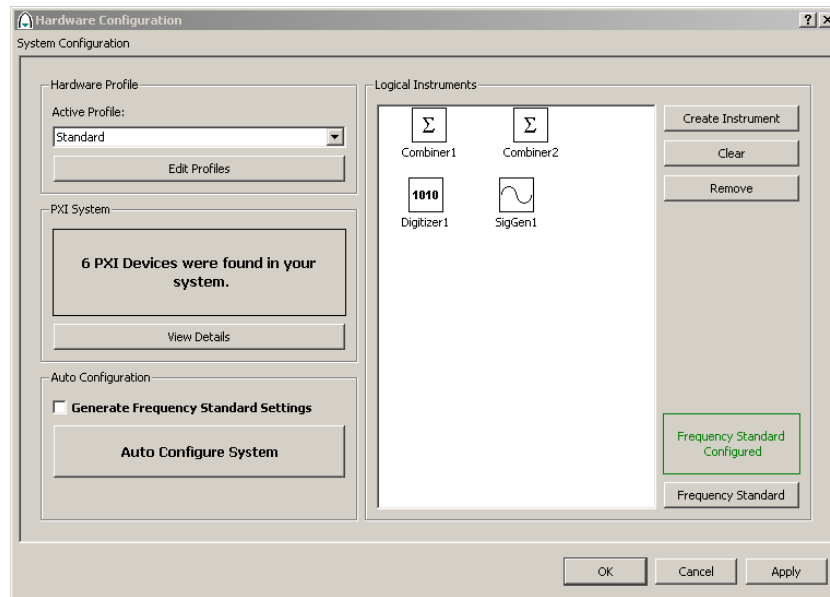
Overview

The System Configuration Screen allows you to define and manage how your PXI modules are used within PXI Studio.

Referencing multiple PXI modules by their VISA resource ID can be difficult and non-intuitive, so the System Configuration Screen allows you to group PXI modules together to form unique ‘logical instruments’ that can then be used by PXI Studio plugins.

The unique name given to the instrument, rather than the VISA resource ID, is then used when requesting PXI hardware. This makes it simple to select what hardware you want to use within PXI Studio plugins.

SYSTEM CONFIGURATION



The logical instruments that can be created are as follows:

Signal generator:

Requires one 3010 Series and one 3020 Series PXI module.

Digitizer:

Requires one 3010 Series and one 3030 Series PXI module.

Combiner:

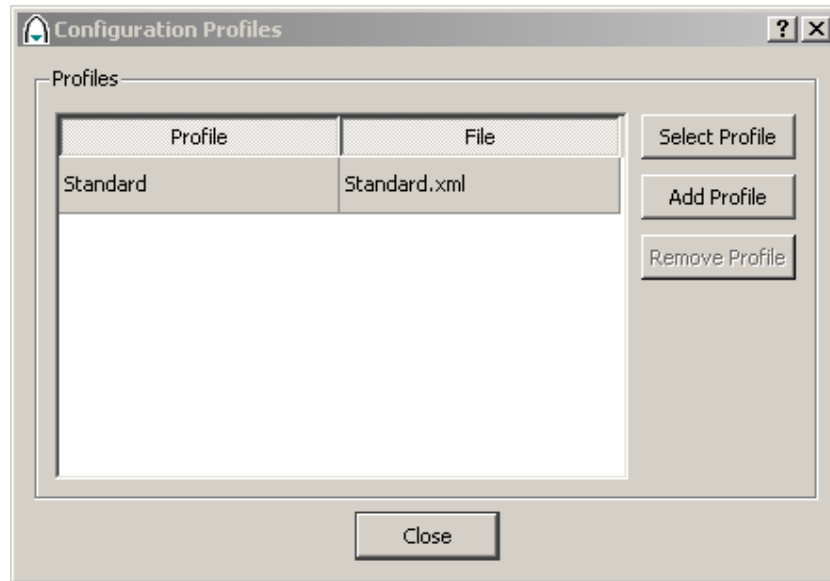
Requires one 3060 Series PXI module

Note that if a PXI module has been assigned to a logical instrument, it cannot be assigned to another.

Hardware Profile

PXI Studio allows you to store a number of different hardware profiles, and select the active profile to use. Any changes that you make to the system configuration are applied to the active profile, and do not affect any other profile that has been saved.

If you press the **Edit Profile** button, the following form is displayed, allowing you to add, remove or select a profile.

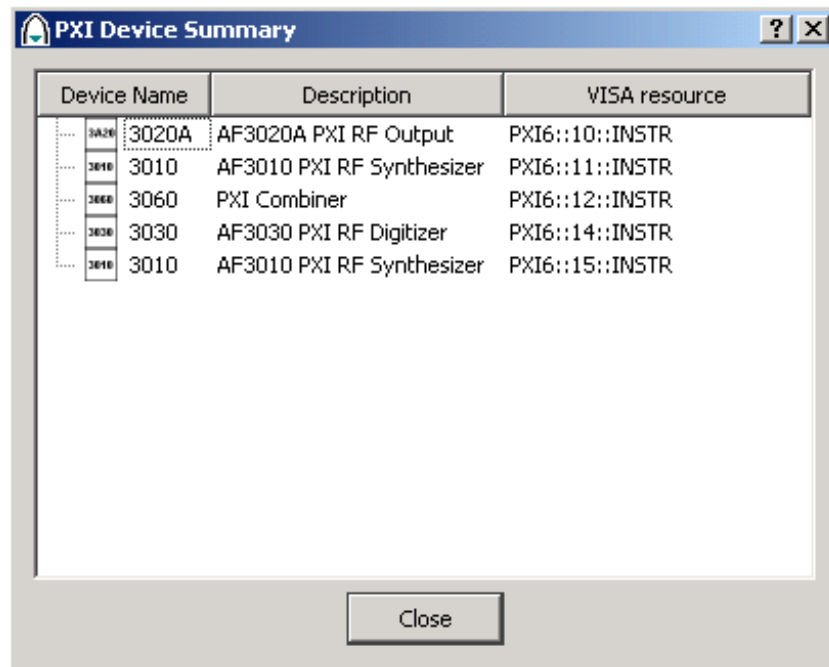


PXI System

This part of the System Configuration screen gives a brief overview of the devices that have been found in the system, as well as providing the ability to automatically configure your entire system.

View Details

To view the details of any PXI modules that have been found in your system, click the **View Details** button; this displays the PXI Device Summary screen.



Generate Frequency Standard Settings

This check box allows you to specify whether frequency standard connection information is automatically generated when you perform an automatic configuration.

Auto Configure

The **Auto Configure System** button automatically creates as many logical instruments as can be created from discovered PXI devices in your system. If a logical instrument requires more than one device (for example, a signal generator device requires a 3010 Series module and a 3020 Series module), it tries to use devices that are closest together in the PXI rack.

Logical Instruments

This part of the System Configuration Screen lets you view and modify the logical instruments that have been defined.

Creating an instrument

To create an instrument, click on the **Create Instrument** button. This displays the [Instrument configuration wizard](#).

Removing an instrument

To remove an instrument that has been defined; first select the instrument you wish to remove from the Logical Instruments list, and click the **Remove** button. Alternatively, you can right-click on the instrument you wish to remove and select **Remove** from the popup menu.

Clearing all instruments

To remove ALL defined instruments, click the **Clear** button.

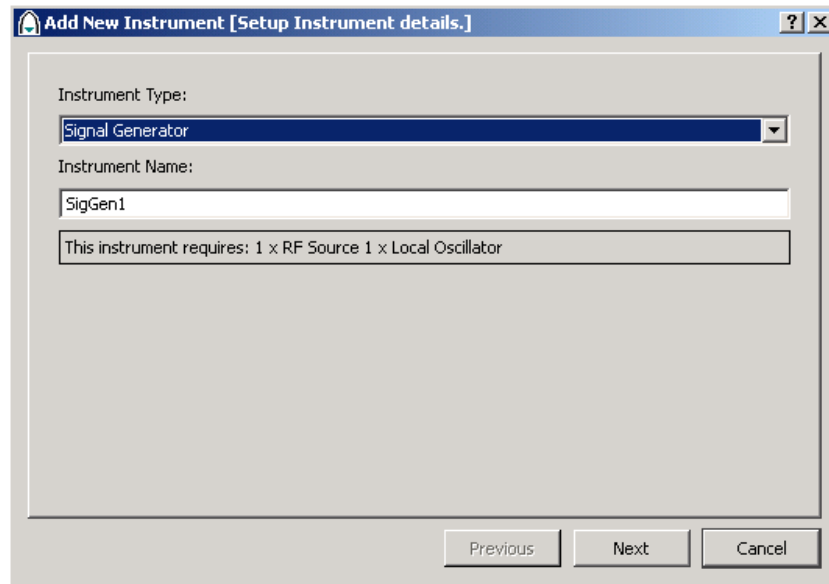
Configuring the frequency standard

To manage how your PXI devices and instruments use their frequency standard, click on the **Frequency Standard** button to display the [Frequency standard configuration manager](#).

Instrument configuration wizard

The instrument Configuration Wizard allows you to create a logical instrument in a series of simple steps. Each step gives basic information about what you need to define in order to create your instrument.

When first entering the wizard, you are asked to define basic information about the instrument you want to create:



Instrument type

This is the type of logical instrument you want to create, which can be one of the following:

Signal Generator (requires an available 3020 Series module and 3010 Series module)

Digitizer (requires an available 3030 Series and 3010 Series module)

Combiner (requires an available 3060 Series module)

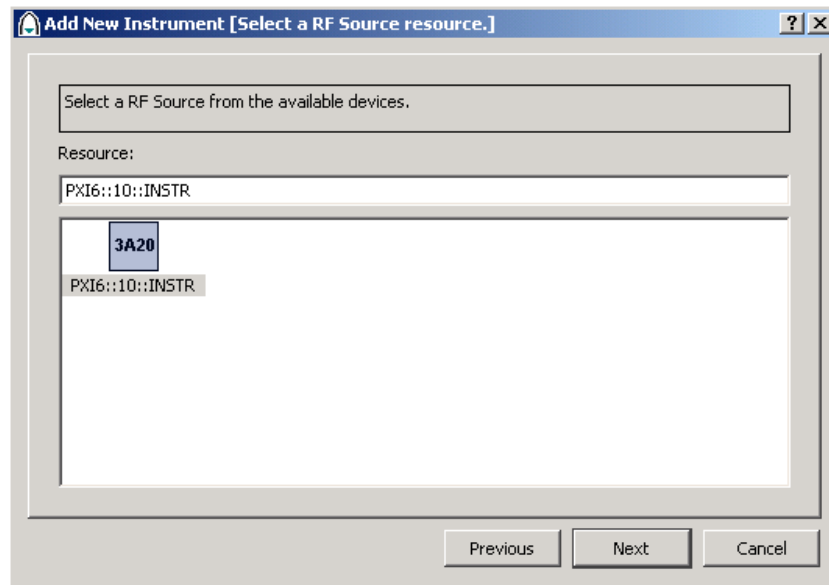
If you do not have the required PXI devices in order to create a particular type of logical instrument, then that instrument type is removed from the list.

Instrument name

This is a descriptive name that is given to the instrument. Whenever you want to control PXI hardware through PXI Studio, this descriptive name is used to differentiate between instruments.

If you are happy with the instrument type and the name you want it to have, click **Next**. To close the instrument configuration wizard without applying your changes, click **Cancel**.

After setting up basic information about your instrument, you are asked to specify the individual PXI devices that this instrument uses:

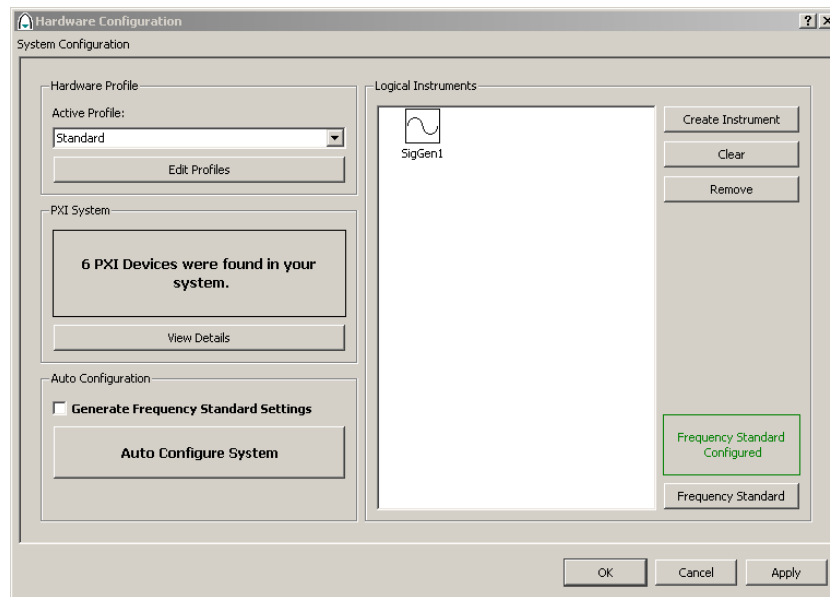


SYSTEM CONFIGURATION

This section allows you to specify the PXI devices that this instrument uses. The type of PXI device that this instrument requires is displayed at the top of the screen; a list of available devices is presented below. Simply select the PXI device you want this instrument to use, then click **Next**. Once all PXI devices that this instrument type requires have been selected, click **Finish**.

If you wish to cancel all your modifications, click **Cancel**.

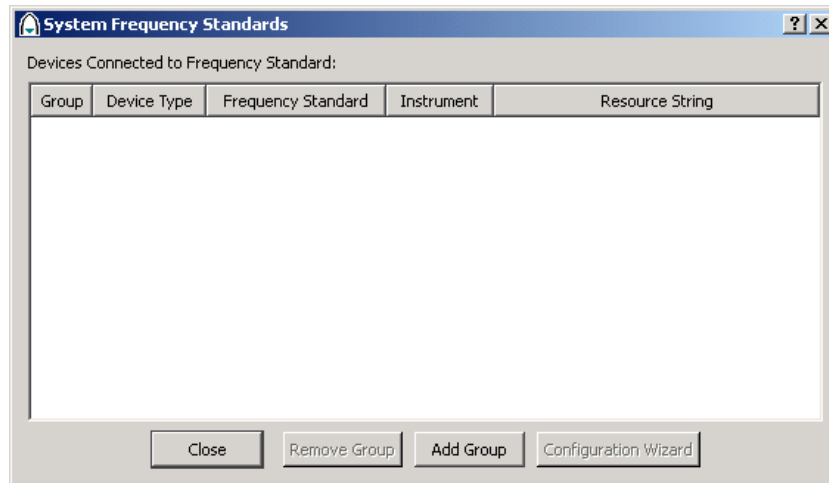
Once your settings have been applied, the newly-created instrument appears in the Logical Instruments list in the main Hardware Configuration screen.



Frequency configuration manager

The System Configuration screen allows you to define how all devices use their frequency standard. This definition is then used to automatically configure your instruments' frequency standard whenever they are in use.

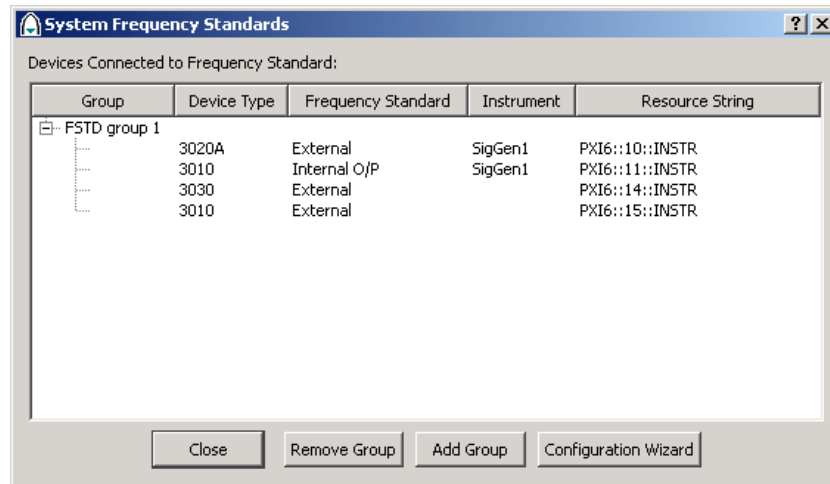
To bring up the Frequency Configuration Manager, click on the **Frequency Standard** button in the main System Configuration screen.



This manager allows you to define how many different frequency standards are present in your system, as well as what devices are using it.

SYSTEM CONFIGURATION

This manager gives basic information about how each device is configured. This example is of a configured FSTD summary screen:



Device Type

This specifies what type of PXI module this device is.

Frequency Standard

This specifies how the module's frequency standard is configured.

Instrument

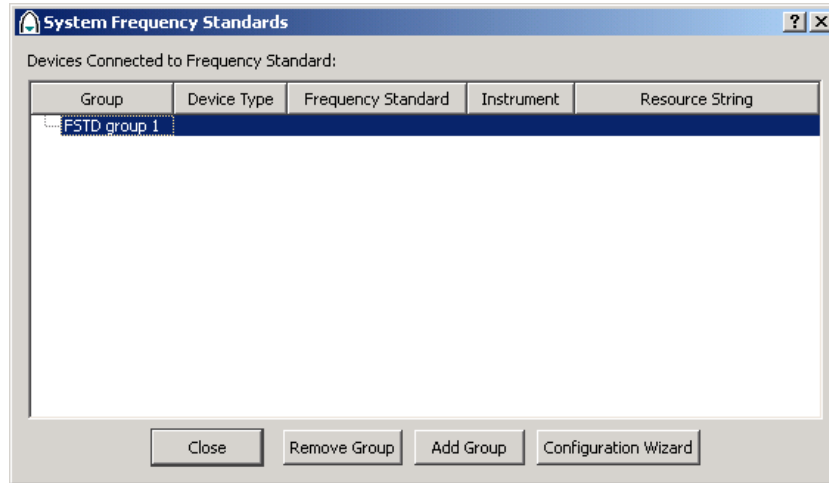
This specifies the logical instrument that this module is a part of, if applicable.

Resource String

This is the VISA resource of the specified module.

SYSTEM CONFIGURATION

To create a new frequency standard, click on **Add Group**. This adds a new Frequency Standard group to the list.

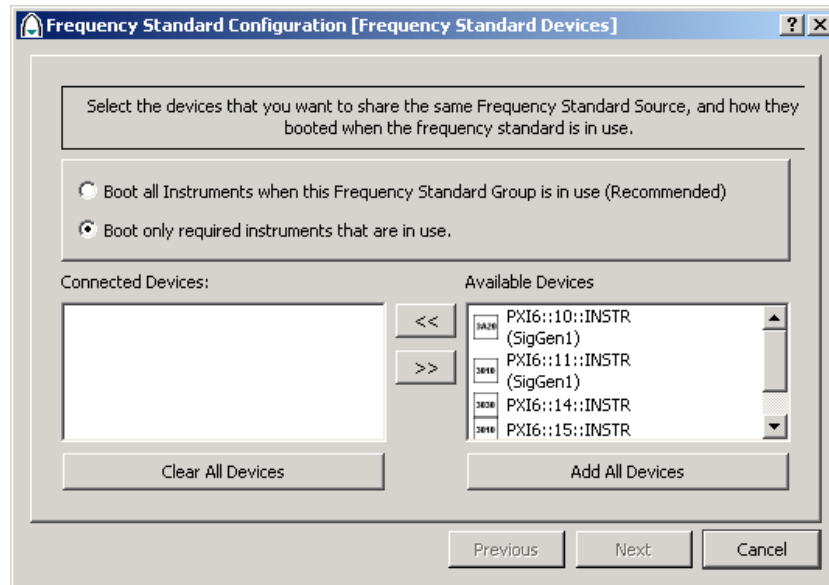


To remove this group, click on the **Remove Group** button.

To configure or edit what devices use this frequency standard, and what device supplies the frequency standard source, select the group and click the **Configuration Wizard** button.

Frequency standard configuration wizard

The first screen of the Frequency Standard Configuration wizard allows you to select what instruments are connected to this frequency standard, and the booting policy.



The Connected Devices section lists the devices that will use the frequency standard, the Available Devices section lists the devices that have not yet been assigned to a frequency standard.

You can move devices to and from these lists by clicking on the << and >> buttons. To move all the devices, click **Clear All Devices** or **Add All Devices**.

Boot policy

As a frequency standard may have several different devices in different frequency standard states, especially if you are using these devices externally to PXI Studio, it is necessary to specify how the frequency standard is set up if it is in use.

Boot all Instruments when this Frequency Standard Group is in use

If this policy is selected, whenever you try and use a device connected to this frequency standard, all devices that are configured as using this frequency standard are booted and have their frequency standard initialized. While this ensures that there is no frequency standard contention, as all devices are explicitly configured, it can mean extended boot times in racks with a large number of devices.

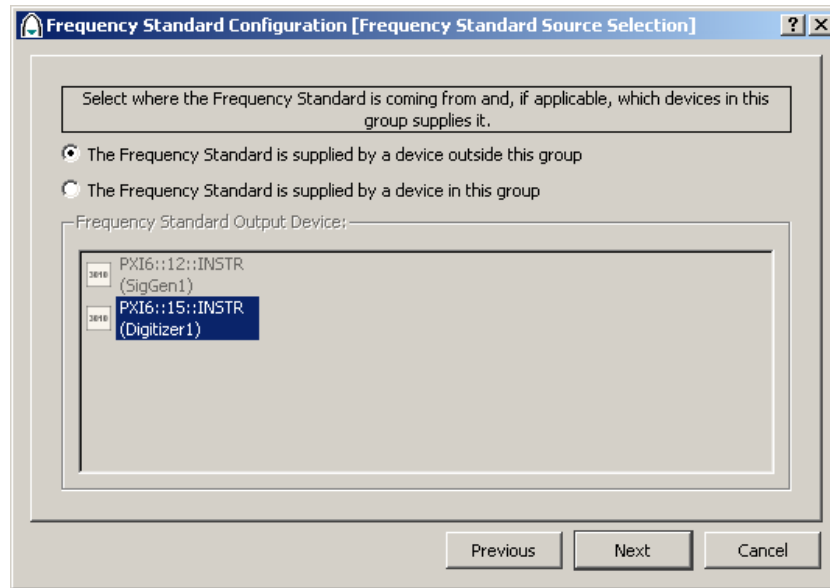
Boot only required instruments that are in use

If this policy is selected, whenever you try and use a device connected to this frequency standard only this device, and any device that provides the frequency standard source, is booted. All other devices using the frequency standard are not modified. While this means that as few instruments are booted as possible, it means there is a potential for frequency standard contention if one of the unused devices is currently configured as a frequency standard output.

Once you have selected the boot policy, and the devices that use the frequency standard, you can either click on **Next** to continue to the source selection page if your frequency standard group contains more than one 301x or if your frequency standard group contains no 301x devices, you can click Finish to apply your changes. If you want to cancel your changes, click **Cancel**.

SYSTEM CONFIGURATION

The next screen of the Frequency Standard Configuration wizard is the source selection screen. This allows you to specify where the frequency standard comes from.



The Frequency Standard is supplied by a device outside this group

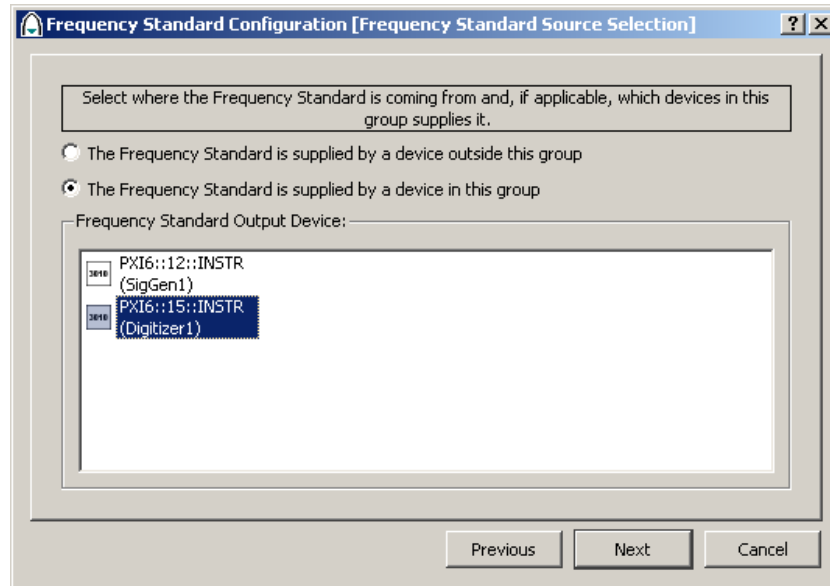
Selecting this option means the frequency standard source is supplied by a device outside the control of PXI Studio. Selecting this option means that you must manually configure your frequency standard source.

The Frequency Standard is supplied by a device in this group

Selecting this option means that one of the instruments in this frequency standard provides the frequency standard source.

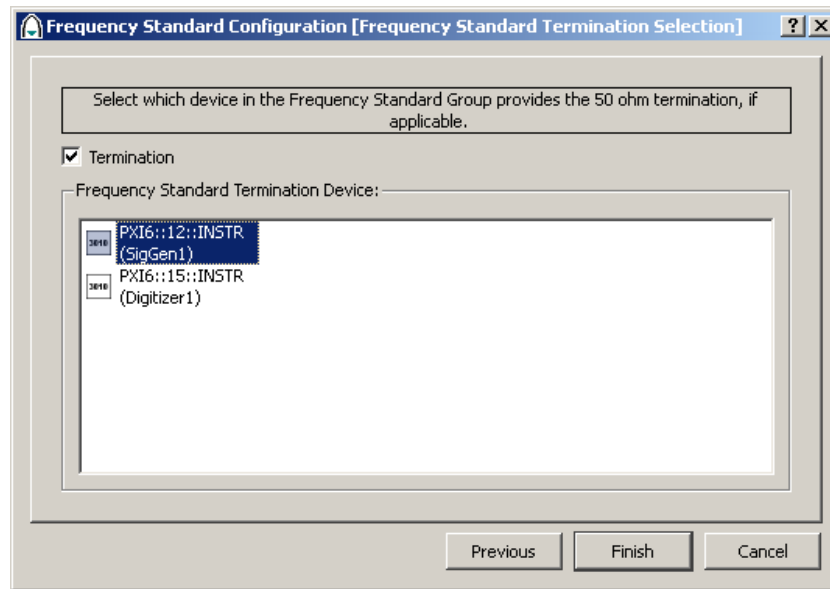
Selecting the frequency standard source

If you have specified that a device in this group supplies the frequency standard source, you must specify the device that provides it. To do this, simply click on one of the available devices in the list.



Once you have selected your frequency standard source and you there are more than one 301x's that have not been configured as a frequency standard source, click **Next** to select how this frequency standard is terminated. Otherwise, you can click **Finish** to apply your settings. If you wish to cancel the changes you have made, select **Cancel**.

If you have more than one 301x in your group that has not been specified as a frequency standard source, the next screen in the frequency standard wizard is displayed. This screen allows you to specify the device that provides the 50 ohm termination for your frequency standard group.



Termination

This control allows you to specify whether the frequency standard group is terminated or not. If this is cleared, no device in this group provides termination for the frequency standard. If this control is checked, you must specify the device that is to provide the termination.

Selecting the frequency standard termination

If you have specified that a device in this group provides the termination for your frequency standard, you must specify the device that provides it. To do this, simply click on one of the available devices in the list.

Chapter 3

Signal generator front panel

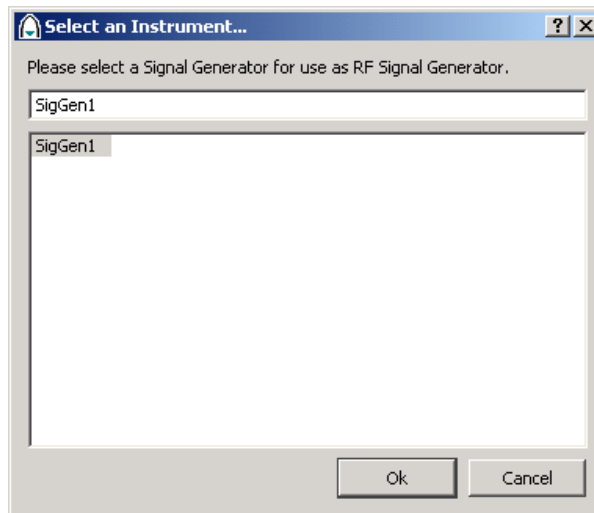
Overview

The Signal Generator Front Panel plugin allows you to set up and control a Signal Generator Instrument (3020 Series and 3010 Series PXI modules).

To open the Signal Generator front panel, click **Instrument Control** on the top-level PXI Studio menu, and select Signal Generator Front Panel.

If this entry does not appear on the top level menu, select Tools -> Registered Plugins and add the plugin *afSigGenPlugin.dll*.

When opening the Signal Generator front panel, if there is only one signal generator instrument available in your system, it is automatically selected and booted. Otherwise, you are asked to select which instrument you wish to control:



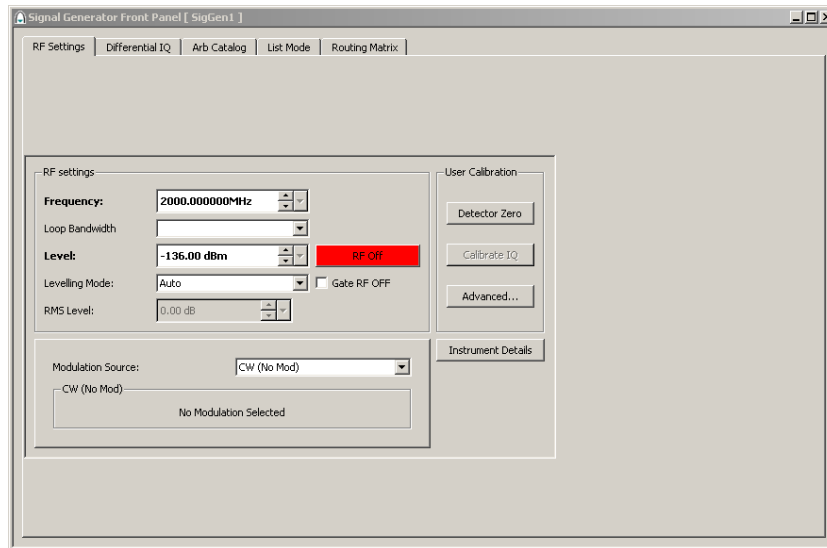
SIGNAL GENERATOR FRONT PANEL

This screen provides a list of ‘logical instruments’ that you have defined in your System Configuration, which match the type you have requested. Note that instruments that are currently in use by other plugins do not appear in this list.

Click on the name of the instrument you wish to use, and click **Ok**. Alternatively, if you do not wish to proceed to the Signal Generator front panel, or the hardware you wish to control is not present in the list, click **Cancel**.

Once you click **Ok**, the instrument and other instruments that comprise your frequency standard (depending on the frequency standard configuration defined in System Configuration) are booted if required. If this instrument has already been booted since PXI Studio was started, then the device is only reset.

Once the instrument has been booted, you should see the following main screen:



The Signal Generator front panel has tabs for RF Settings, Differential IQ, Arb Catalog, List Mode and Routing Matrix.

RF Settings tab

RF settings

Frequency: 2000.000000MHz

Loop Bandwidth: Normal

Level: -136.00 dBm **RF Off**

Levelling Mode: Auto Gate RF OFF

RMS Level: 0.00 dB

Modulation Source: CW (No Mod)

CW (No Mod)

No Modulation Selected

User Calibration

Detector Zero

Calibrate IQ

Advanced...

Instrument Details

This section of the Signal Generator front panel allows you to modify the basic RF and modulation state of the Signal Generator selected.

RF Settings

RF settings

Frequency: 2000.000000MHz

Loop Bandwidth: Normal

Level: -136.00 dBm

Levelling Mode: Auto

RMS Level: 0.00 dB

RF Off

Gate RF OFF

This section is concerned only with basic CW operation parameters. It consists of the following controls:

Frequency

This control allows you to modify the current RF frequency of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the frequency you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Valid units for this control are:

GHz

MHz

kHz

Hz

Level

This control allows you to modify the current RF level of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the level you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Leveling Mode

This control allows you to modify the current RF leveling mode of the Signal Generator. The available options are Auto, Frozen, Peak and RMS.

RMS Level

This control allows you to modify the current RF level RMS of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the level RMS you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Note that this parameter is only valid if the leveling mode is set to RMS.

RF On/Off

The RF State button allows you to toggle the RF output of the Signal Generator. To enable or disable the RF output, click on this button. Its state and color change to reflect the current state of the Signal Generator.

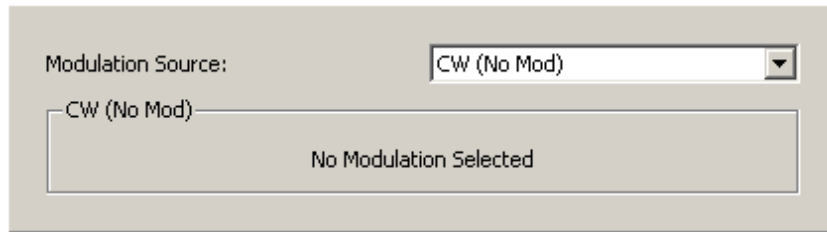
Gate RF Off

This check box allows you to specify whether RF gating is on or off. To change the current state, simply check or uncheck the box; changes are applied to the hardware immediately.

SIGNAL GENERATOR FRONT PANEL

RF gating is used to turn off the modulator when the modulation input level $\sqrt{I^2 + Q^2}$ is near to zero. This is particularly useful for bursted signals (for example, GSM) as the modulator's natural carrier leak is removed for inactive timeslots.

Modulation



This section allows you to specify the modulation mode, and settings of the Signal Generator.

Modulation Source

This control specifies the modulation source of the Signal Generator, the allowed options are:

CW (No Mod)

LVDS

ARB

Internal AM

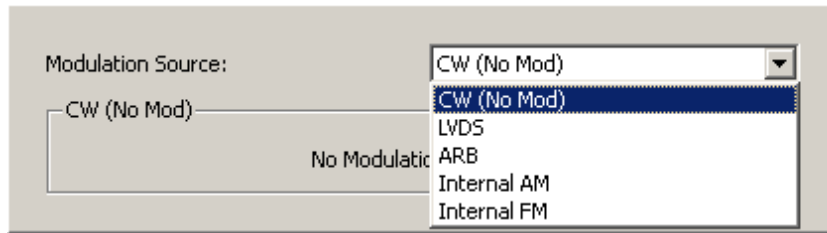
Internal FM

External Analog

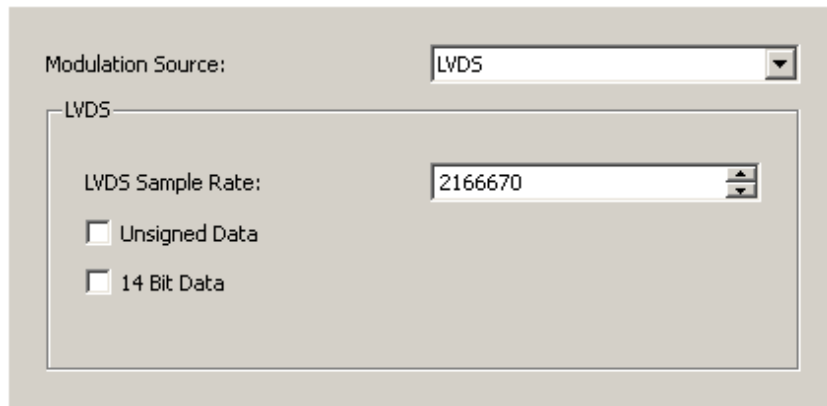
Note that External Analog modulation is available only if you are using a 3020 Series module with the Differential IQ option enabled.

To change the modulation source, use the drop down combo box and select the desired source:

SIGNAL GENERATOR FRONT PANEL

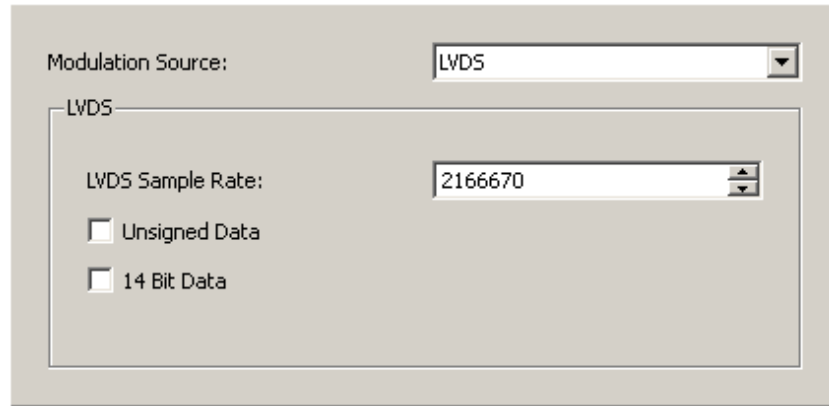


When changing the modulation source, the settings for that modulation are now displayed in the modulation group box. For instance, if you select a modulation source of LVDS, the modulation group looks like this:



The control of each modulation is as follows:

LVDS modulation



LVDS modulation is activated when changing the Modulation Source control to LVDS, and consists of the following controls:

LVDS Sample Rate

This control allows you to modify the current LVDS sample rate of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the LVDS sample rate you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

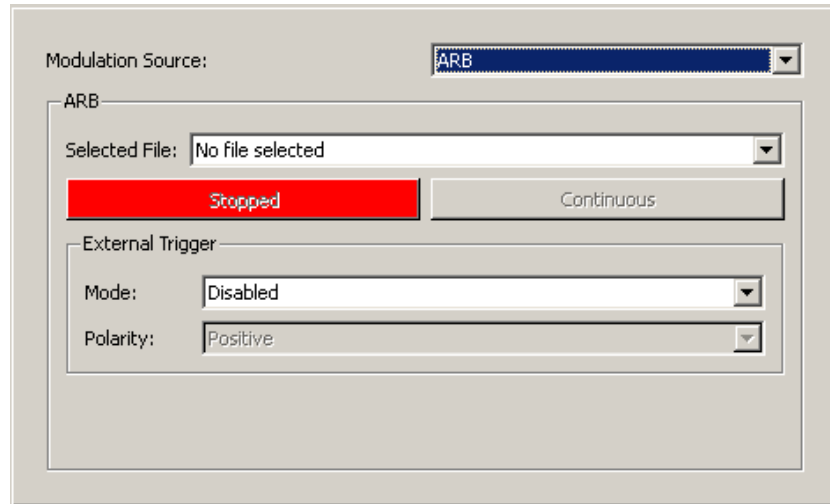
Unsigned Data

This check box allows you to specify whether LVDS data is signed or unsigned. To change the current state, simply check or uncheck the box; the changes are applied to the hardware immediately.

14 Bit Data

This check box allows you to specify whether LVDS data is 14 or 16 bits. To change the current state, simply check or uncheck the box; the changes are applied to the hardware immediately.

ARB Modulation



ARB modulation is activated when changing the Modulation Source control to ARB, and consists of the following controls:

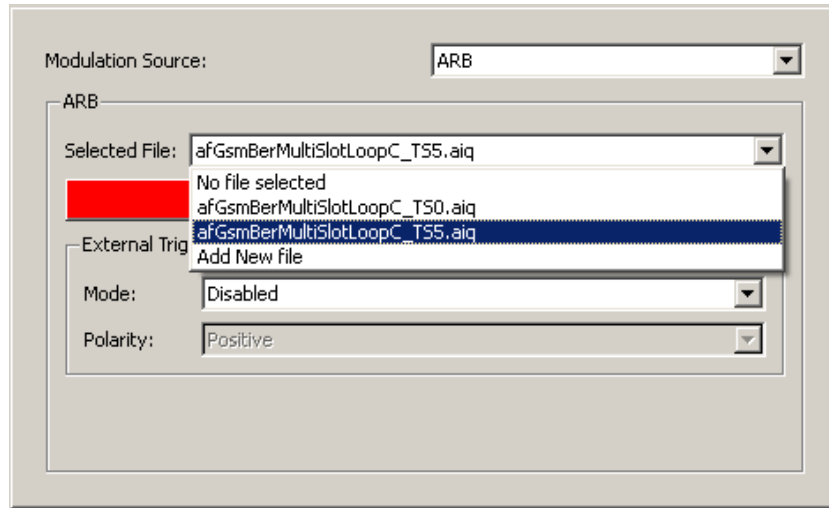
Selected File

This drop down combo box allows you to specify what Arb file you wish to play.

Selecting a file

To select a file, simply activate the dropdown box and select the file from the list, which contains the contents of the Arb catalog.

SIGNAL GENERATOR FRONT PANEL



Adding a file

If no files are currently present in your Arb catalog, you can activate the drop-down box and select Add New file. This allows you to select and download an Arb file contained on a local drive. Once the file has been loaded, it is then selected.

Play

The **Play** button allows you to toggle the Arb play state of the Signal Generator. To start or stop an Arb file in continuous mode, click on this button. Its state and color then change to reflect the current playing state. To play an Arb file once in single-shot mode, click on this button.

Note that this control is not available if there is no currently selected Arb file

Single Shot/Continuous

This button toggles the current Arb repeat mode of the Signal Generator. This can be either single-shot or continuous. Single-shot repeat mode indicates that the selected Arb file is played once; if in continuous mode, the Arb file is played continuously.

Note that this control is not available if there is no currently selected Arb file.

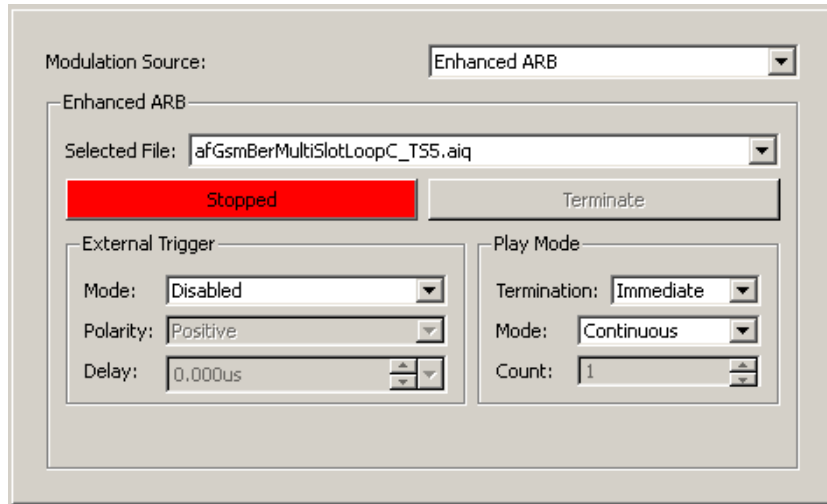
External Trigger Mode: Disabled/Edge/Gate

This control allows you to specify whether an Arb trigger is used and whether the Arb trigger is used solely for starting the Arb file (Edge) or whether an Arb trigger toggles the Arb playing state (Gated). To change the current state, simply select the desired trigger type; the changes are applied to the hardware immediately.

External Trigger Polarity: Positive/Negative

This control allows you to specify whether the Arb is triggered by a positive or negative trigger transition. To change the current state, simply select the desired edge type; the changes are applied to the hardware immediately.

Enhanced ARB Modulation



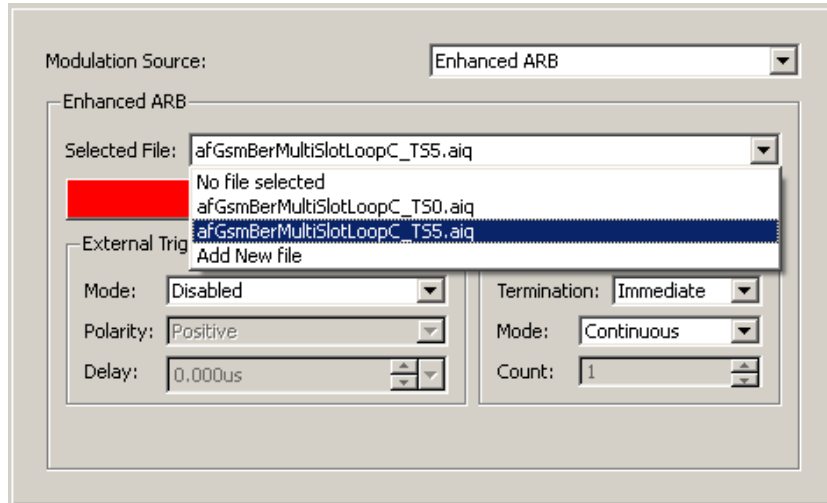
ARB modulation is activated when changing the Modulation Source control to Enhanced ARB, and consists of the following controls:

Selected File

This drop down combo box allows you to specify what Arb file you wish to play.

Selecting a file

To select a file, simply activate the dropdown box and select the file from the list, which contains the contents of the Arb catalog.



Adding a file

If no files are currently present in your Arb catalog, you can activate the drop-down box and select Add New file. This allows you to select and download an Arb file contained on a local drive. Once the file has been loaded, it is then selected.

Play

The **Play** button allows you to toggle the Arb play state of the Signal Generator. To start or stop an Arb file in continuous mode, click on this button. Its state and color then change to reflect the current playing state. To play an Arb file once in single-shot mode, or the required number of times in N-Times mode, click on this button. Clicking this button when the Arb is playing or waiting for a trigger stops the Arb playing immediately.

The display of this button indicates what is actually happening on the Arb:



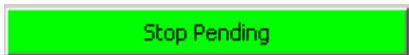
The Arb is not playing. Clicking the button starts it playing (or starts it waiting for an external trigger).



The Arb is waiting for an external trigger before starting to play the selected file. Clicking the button cancels the Waiting for Trigger and returns the Arb to the stopped state.



The Arb is currently playing the selected file. Clicking the button stops the Arb file playing immediately and returns the Arb to the stopped state.



The Arb is currently playing the selected file but it will stop playing at the end of the current file. Clicking the button stops the Arb file playing immediately and returns the Arb to the stopped state.

Note that this control is not available if there is no currently selected Arb file.

Terminate/Re-Start

This button stops the Arb playing either immediately (when termination mode is set to Immediate) or when the current file has finished playing (when the termination mode is set to At End). If an external trigger is being used, the Arb then waits for a trigger before starting again. Otherwise, once the Arb is stopped, the Play button can be used to start it.

External Trigger – Mode

This control sets the way in which the external trigger is used. The following table describes the states that are available and their behavior:

Play Mode	Single/N Times	Continuous
Disabled	The waveform starts playing immediately the Play button is pressed and stops when the file has been played the requisite number of times or the Play button is pressed again or the Terminate button is pressed.	The waveform starts playing immediately the Play button is pressed and stops when the Play button is pressed again or the Terminate button is pressed.
Gate	The waveform starts playing, from the beginning when the trigger is asserted and plays the number of times specified. If it is still playing when it is aborted according to the termination mode.	The waveform starts playing, from the beginning when the trigger is asserted and plays continuously. It is aborted according to the termination mode when the trigger is de-asserted.
Start Only	The waveform starts playing from the beginning when the trigger is asserted, plays the number of times specified, then stops, waiting for another trigger. Subsequent triggers are ignored until the waveform has finished playing.	The waveform starts playing from the beginning when the trigger is asserted playing continuously. Subsequent triggers are ignored.
Start Stop	The waveform starts playing from the beginning when the trigger is asserted waiting for the trigger to be asserted a second time. If it is still playing when another trigger is detected playback is aborted according to the termination mode.	The waveform starts playing from the beginning when the trigger is asserted, plays continuously until another trigger is detected at which point play is aborted according to the termination mode.
Start Re-Trig	The waveform starts playing from the beginning when a trigger is detected, plays the number of times specified, then stops, waiting for another trigger. Subsequent triggers terminate the waveform immediately, if playing, and the waveform starts playing from the beginning.	The waveform starts playing from the beginning when a trigger is detected, and then plays continuously. Subsequent triggers terminate the waveform immediately, if playing, and the waveform starts playing from the beginning.

External Trigger – Polarity

Positive

A positive edge of the external trigger signal asserts the trigger.

Negative

A negative edge of the external trigger signal asserts the trigger.

Any

Any edge of the external trigger signal asserts the trigger.

External Trigger – Delay

This control is used to delay the trigger signal by up to 60 seconds. Both edges of the trigger signal are effected equally.

Changing the delay results in the loss of any trigger edges already being delayed.

Play Mode – Termination

Immediate

When requested, either by the external trigger line, or by the Terminate/Re-Start button, the Arb terminates any playing file immediately.

At End

When requested, either by the external trigger line, or by the Terminate/Re-Start button, the Arb continues to play the current file until the end of the file is reached, at which point it stops playing.

Play Mode – Mode

Single

When requested to play, the Arb plays the selected file once and then stops.

N Times

When requested to play, the Arb plays the selected file the required number of times and then stops.

Continuous

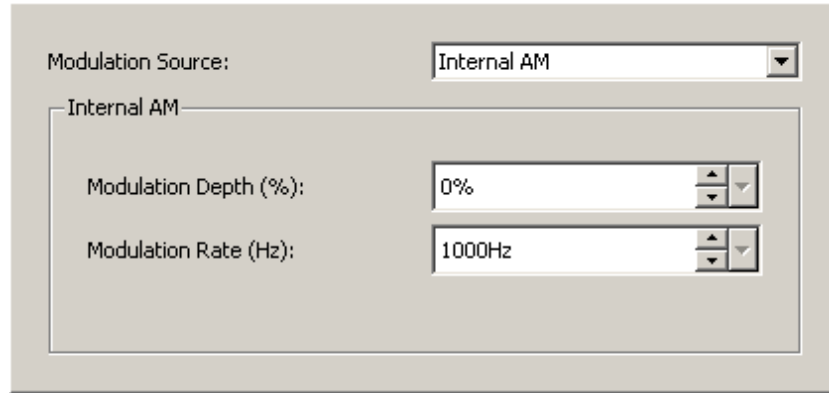
When requested to play, the Arb starts playing the selected file repeatedly.

Play Mode – Count

This control is used to specify the number of times the Arb file is played when the play mode is set to N-Times.

If the play mode is not set to N-Times, this control is not available.

Internal AM modulation



Internal AM modulation is activated when you change the Modulation Source control to Internal AM, and consists of the following controls:

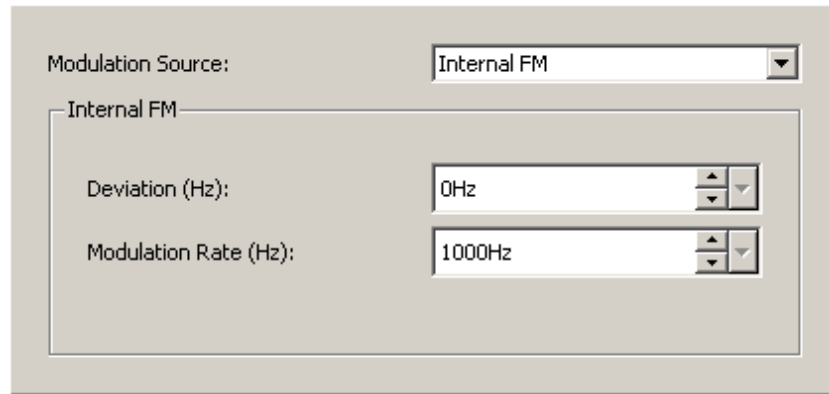
Modulation Depth

This control allows you to modify the current AM Modulation Depth of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the AM modulation depth you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Modulation Rate

This control allows you to modify the AM Modulation Rate of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the AM modulation rate you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Internal FM modulation



Internal FM modulation is activated when you change the Modulation Source Control to Internal FM, and consists of the following controls:

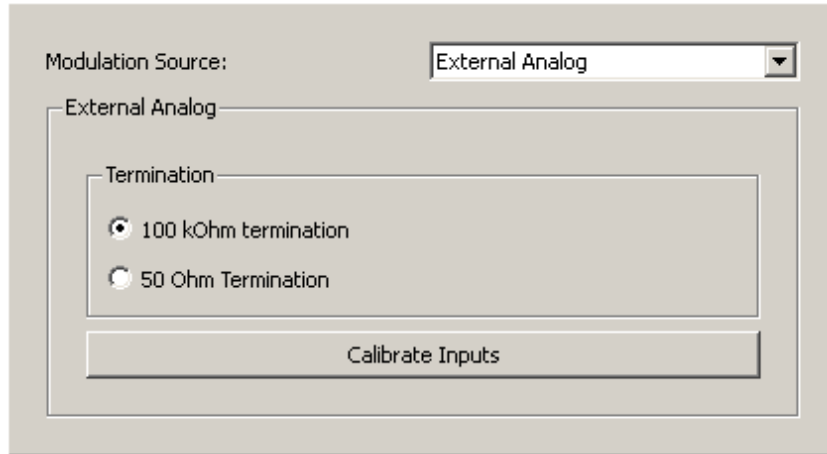
Deviation

This control allows you to modify the current FM Deviation of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the FM deviation you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Modulation Rate

This control allows you to modify the FM Modulation Rate of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the FM modulation rate you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

External Analog modulation



External Analog Modulation is activated when you change the Modulation Source Control to External Analog, and consists of the following controls:

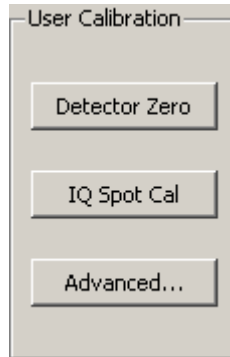
100 kOhm Termination / 50 Ohm Termination

This group allows you to specify the termination resistance of the external analog inputs. To change the current state, simply check the desired termination box. The changes are applied to the hardware immediately.

Calibrate Inputs

This button allows you to perform a user calibration of the external analog inputs.

User Calibration



This part of the RF Settings tab controls user calibration settings. It consists of the following controls:

Detector Zero

Clicking this button performs a detector zero cal on the Signal Generator.

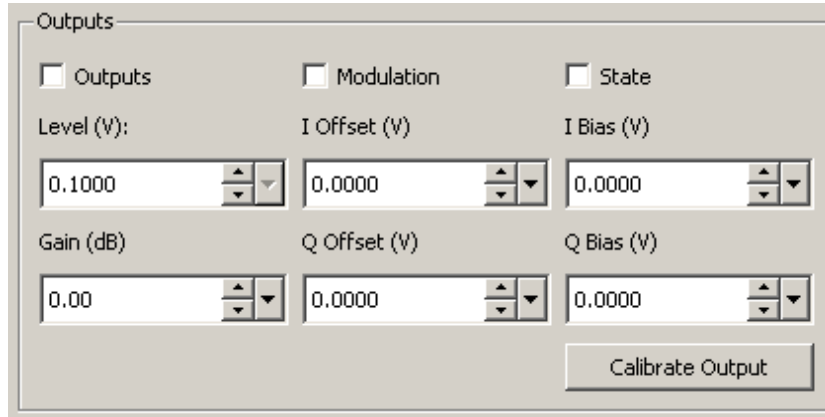
IQ Spot Cal

Clicking this button performs an IQ spot cal at the current frequency. Note that this button is available only if the instrument is in an internal-IQ-based mode.

Advanced...

Clicking this button launches the advanced calibration screen, which allows you to calibrate different IQ bands individually.

Differential IQ tab



The screenshot shows a control panel titled "Outputs" with the following elements:

- Three checkboxes: "Outputs", "Modulation", and "State", all currently unchecked.
- Three numerical input fields with up/down arrows:
 - Level (V): 0.1000
 - I Offset (V): 0.0000
 - I Bias (V): 0.0000
- Three numerical input fields with up/down arrows:
 - Gain (dB): 0.00
 - Q Offset (V): 0.0000
 - Q Bias (V): 0.0000
- A "Calibrate Output" button located at the bottom right.

This tab allows you to modify the Differential IQ settings of the instrument. Note that these settings are not available if the Signal Generator does not have the Differential IQ Option fitted, and are not available if the modulation source is set to External Analog.

Outputs

This check box defines whether the differential IQ module is activated.

Modulation

This check box defines whether the IQ modulation source is connected to the differential IQ module.

State

This check box defines whether the differential IQ parameters are applied to the differential IQ module.

Level

This control allows you to modify the differential IQ Level of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the differential IQ level you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Gain

This control allows you to modify the differential IQ gain of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the differential IQ gain you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

I Offset/Q Offset

This control allows you to modify the differential IQ offset of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the differential IQ offset you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

I Bias/Q Bias

This control allows you to modify the differential IQ bias of the Signal Generator. To edit the value, you can either use the step up and down arrows, or enter the differential IQ bias you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that once a change has been applied, the new settings are applied to the hardware.

Calibrate Output

Clicking this button performs a calibration of the differential IQ outputs.

Arb Catalog tab



The Arb Catalog tab allows you to modify and manage the Arb files that are loaded into your Signal Generator instrument.

Adding file or files

To add a file, or files, click the **Add File** button. This brings up a file selection dialog where you can select the files that you want to load into the Signal Generator. These files are then loaded into the Arb.

Reloading a file

To reload a file into your Signal Generator, select the file to reload from the Arb list, then click the **Reload** button.

Removing a file

To remove a file from your Signal Generator, select the file to remove from the Arb list, then click the **Delete** button.

Removing all files

To remove all files within the Signal Generator, click the **Delete All** button to clear the Arb catalog.

Reload All files

To reload all files present within the Signal Generator, click the **Reload All** button.

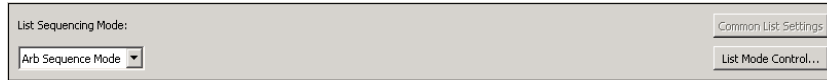
List Mode tab

The screenshot shows the 'List Mode' tab interface. At the top, there is a 'List Sequencing Mode:' label with a dropdown menu set to 'Arb Sequence Mode'. To the right are two buttons: 'Common List Settings' and 'List Mode Control...'. Below this is a table with 8 rows and 8 columns. The columns are: Index, Frequency, Level, Level Mode, Level (RMS), RF State, Arb Play Count, and Arb File. The table contains 8 rows of identical data. At the bottom, there are four checkboxes: 'Train to Peak' (unchecked), 'Train on List Start' (checked), and 'Freeze after Train' (unchecked). To the right of these are two buttons: a red 'Start List' button and a 'Restart Sequence' button.

	Frequency	Level	Level Mode	Level (RMS)	RF State	Arb Play Count	Arb File
0	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
1	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
2	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
3	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
4	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
5	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
6	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected
7	2000.000000 MHz	-136.00	Auto	0.00	RF Off	1	No File Selected

The List Mode tab is concerned with setting up and running the Signal Generator in list mode. It is divided up into three sections.

List mode configuration



This section allows you to modify the type of list mode used, common list parameters and control modes.

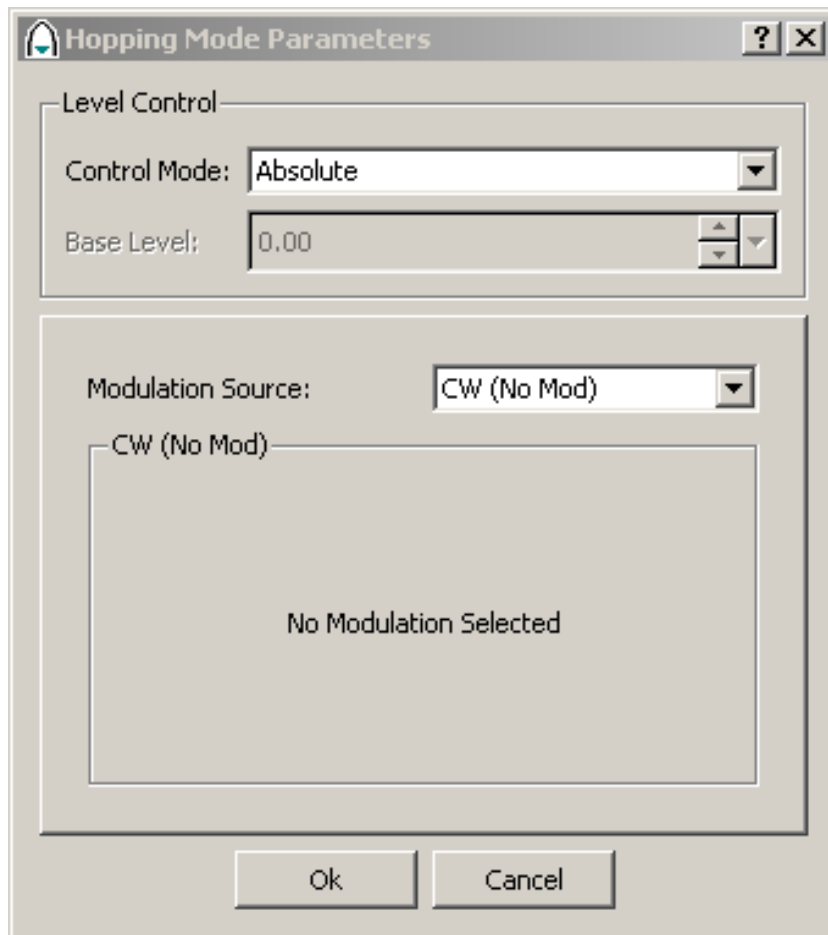
Changing the list sequence mode

To change the list sequence mode, select the required mode from the **List Sequencing Mode** down combo box. When a selection has been made, the list parameters and settings are refreshed to the screen. The available modes of operation are Arb Sequence Mode and Hopping Mode. For detailed information on the individual modes, please refer to the afSigGenDll library documentation.

Note that all separate modes of operation have their own individual settings, which means that changes made to one have no effect on the other.

Common list settings

In Hopping Mode, there are a number of parameters that are generic across an entire sequence. To modify these parameters, click on the **Common List Settings** button, if available. This brings up the Common List Settings screen. Note that this option is not available in Arb Sequencing mode.



Level Control

This section dictates how level parameters are applied in the list. The available control modes are Absolute and Relative.

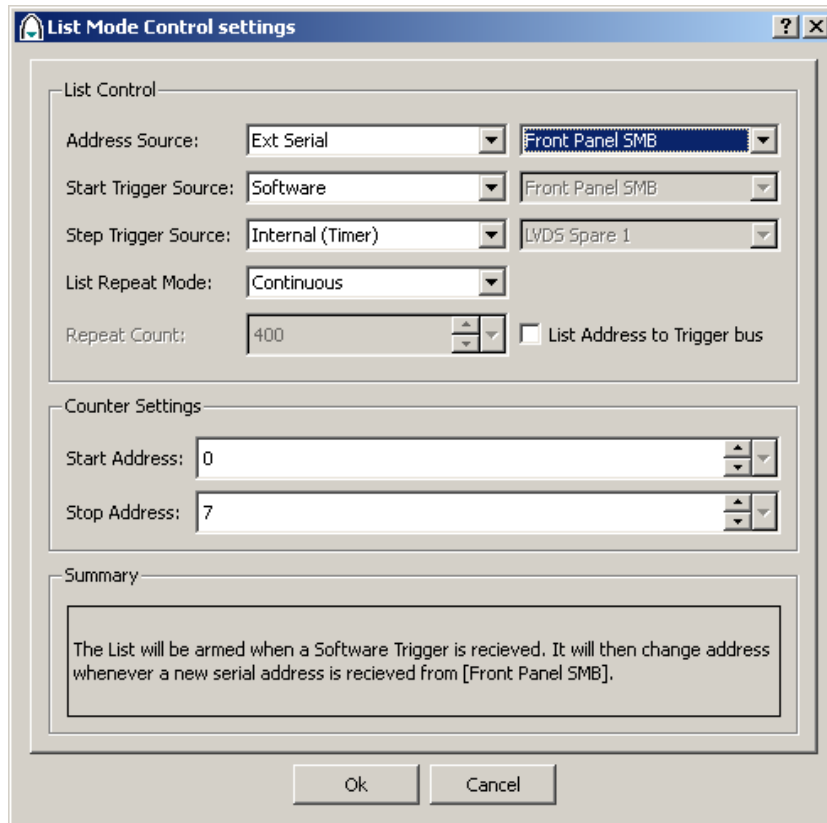
In Absolute control mode, the list level is in absolute dBm terms. In Relative mode, the list level is relative (from 0 to -6 dB) to the base level entered in the **Base Level** edit box.

Modulation Source

This allows you to specify the modulation that is enabled when the list is running. The available options are CW, ARB, Internal AM and Internal FM. These modulation modes are edited in the same way as in the [Modulation section](#) of the RF Settings tab.

List mode control settings

To modify the way the list is triggered and iterates, click on the **List Mode Control** button to bring up the List Mode Control dialog.



This dialog consists of the following controls:

Address Source

This control dictates what supplies the current list address; the options are Internal, Software and External.

If the Address Source is set to Internal, the current list address is set by the internal counter, meaning that the list can only iterate sequentially.

If the Address Source is set to Software, the current list address is set manually in the main List Mode tab

If the Address Source is set to External, the current list address is set by a set of routing matrix signals. If you select this address source, you have to specify exactly where the address comes from. The available options for this are: LVDS, PXI Trigger Bus and Arb Markers.

If the Address Source is set to Ext Serial, you have to specify which routing matrix signal is connected to the Serial Address signal. The Signals available for this purpose are the PXI Trigger bus signals 0 to 7, the LVDS Marker signals 1 to 4, the LVDS Aux signals 0 to 4, the LVDS Spare signals 0 to 2 and the Front Panel SMB connector.

Note that this control is not available in Arb Sequence mode.

Start Trigger Source

Before your list can iterate, it must first be issued with a start trigger. Where that trigger comes from is specified here. The available options are Software or External.

If External Start trigger is set, you also have to specify exactly where the trigger comes from. The available options for this are PXI Star or Front Panel SMB.

Step Trigger Source

If you have Address Source: Internal selected, you need to specify where the trigger that causes the list to step to the next address comes from. The available options are Software and Internal (Timer).

In Internal (Timer) mode, the list is stepped after a certain timer period. You enter this timer period in the [List Parameter Entry](#) section.

In Software mode, the list is stepped manually from when the List Mode tab command is received.

Note that this control is not available in Arb Sequence mode.

List Repeat Mode

This control specifies what the list does once it has completed iterating. The available options are Once, N * Repeat and Continuous.

In Once mode, the list halts after one iteration.

In N * Repeat mode, the list halts after N iterations. The value of N can be modified by using the **Repeat Count** control.

Continuous means that the list iterates continuously.

Start Address

This control specifies the first address that is used in the sequence.

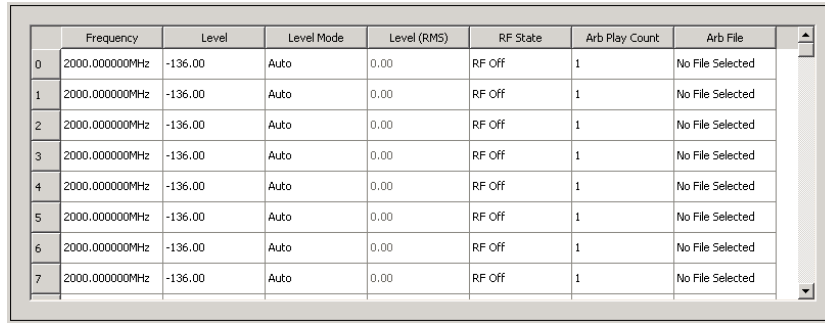
Stop Address:

This control specifies the last address that is used in the sequence.

List Summary

List Summary provides a basic description of how the list control you have defined works.

List parameter entry



	Frequency	Level	Level Mode	Level (RMS)	RF State	Arb Play Count	Arb File	
0	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	▲
1	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
2	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
3	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
4	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
5	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
6	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	
7	2000.000000MHz	-136.00	Auto	0.00	RF Off	1	No File Selected	▼

This section allows you to create and modify each individual channel's parameters. Each parameter can be individually edited by using either the mouse or the keyboard. As well as basic in-line editing facilities, the list table also provides a number of more powerful features to ensure that creating or modifying a list is as simple as possible.

The list itself consists of a total of 128 list addresses, with a number of parameters that are specific to each one. The settable parameters available are as follows:

In Arb sequence mode:

Frequency

This is the RF frequency at a given address.

Level

This is the RF level at a given address.

Level Mode

This is the RF leveling mode at a given address.

Level RMS

This is the RMS dbc level at a given address. This parameter is enabled only when the list address level mode is RMS.

RF State

This is the current RF enabled state for the given address.

Arb Play Count

This is the number of times the Arb plays before moving on to the next address.

Arb File

This is the Arb file that will be playing at the current address.

In hopping mode:

Frequency

This is the RF frequency at a given address.

Level

This is the RF level at a given address. Note that this parameter is available only if absolute control mode is selected.

Relative Level

This is the RF level relative to a base level at a given address. Note that this parameter is available only if relative control mode is selected.

Level Mode

This is the RF leveling mode at a given address.

RF State

This is the current RF enabled state for the given address.

Dwell Time

This is the amount of time (in μs) that this list address is active before moving to the next address. This parameter is valid only when in Internal list mode, using an Internal Timer step trigger.

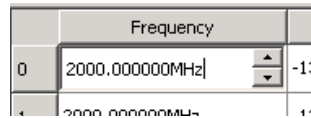
Arb Modulation State

This specifies whether the Arb modulation is enabled for this list address. It is valid only if the list modulation mode is ARB.

Editing a list address parameter

It is important to note that the parameters being edited are not applied directly to the hardware at this time. Applying values to the hardware only occurs when activating the list.

To edit a list address parameter, press the enter key, space key or double-click on the item you want to edit in the list table. This activates the edit mode for this item:

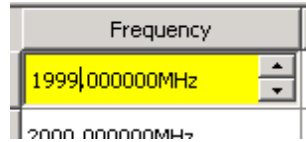


The image shows a screenshot of a software interface with a table titled 'Frequency'. The table has three columns: an index column, a value column, and a range column. The first row is highlighted, and the value '2000.000000MHz' is being edited in the value column. The range column shows '-13'. The second row is partially visible below, showing '2000.000000MHz' and '13'.

	Frequency	
0	2000.000000MHz	-13
1	2000.000000MHz	13

You can then set the parameter to the desired value. Once you are happy with your selection, press the enter key or click to apply the changes. Alternatively, to reject the changes you have made, press the escape key to return the parameter to its original value.

Editing the frequency of a list address



Once you have entered edit mode, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the frequency you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Valid units for this control are:

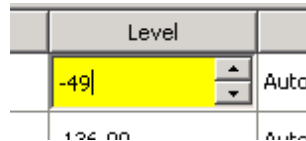
GHz

MHz

kHz

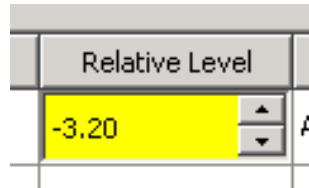
Hz

Editing the level of a list address



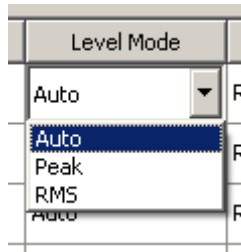
Once you have entered edit mode, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the level you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Editing the relative level of a list address



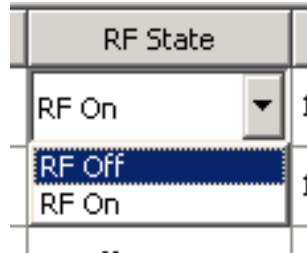
Once you have entered edit mode, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the level you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Editing the level mode of a list address



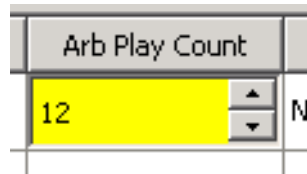
Once you have entered edit mode, you can either use the up and down arrow keys to cycle through the available modes, or drop down the list of available options to cycle to the appropriate level mode. The available modes are Auto, Peak and RMS.

Editing the RF state of a list address



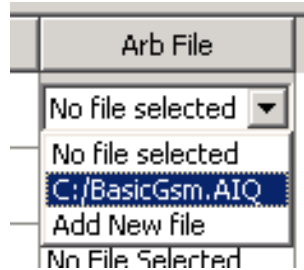
Once you have entered edit mode, you can either use the up and down arrow keys to cycle through the available modes, or drop down the list of available options to cycle to the appropriate RF state. The available modes RF Off and RF On.

Editing the Arb play count of a list address



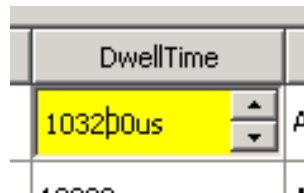
Once you have entered edit mode, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the play count you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Editing the Arb file used by a list address



Once you have entered edit mode, you can either use the up and down arrow keys to cycle through the available Arb files, or drop down the list of available options to cycle to the appropriate files. If no files are currently present in your Arb catalog, you can activate the drop-down box and select Add New File. This allows you to select and download an Arb file contained on a local drive. Once the file has been loaded, it is then selected.

Editing the dwell time of a list address



Once you have entered edit mode, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the dwell time you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

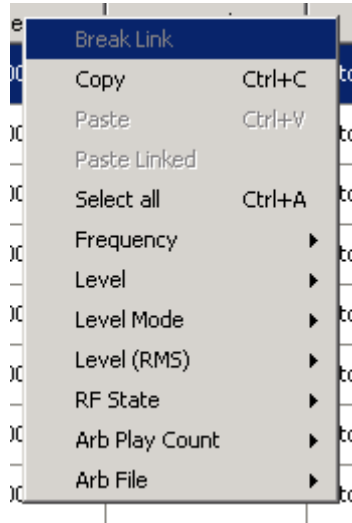
Editing the Arb state of a list address



Once you have entered edit mode, you can either use the up and down arrow keys to cycle through the available modes, or drop down the list of available options to cycle to the appropriate Arb state. The available modes are Arb Off and Arb On.

Advanced list mode editing

As well as basic parameter entry, the list table also provides you with the ability to perform more complicated editing tasks. Most of these features can be accessed via right-clicking on the list table.



This menu is split up into two parts. The generic section is always displayed when you right-click on the table. The parameter-specific part only displays options for parameters that have been selected. For instance, if you select a frequency and a level, only frequency and level sub-menus are available. The above menu has ALL parameters selected.

Generic menu functions

Copy

This copies the selected list parameters and address into the clipboard. Note that the format of the data pasted into the clipboard is compatible with text applications, as well as Microsoft Excel.

Paste

This pastes the contents of the clipboard into the list at the selected position. Note that if the clipboard data is not valid for this list, paste is not available.

Paste Linked

It is sometimes useful to have the ability to make a parameter of a particular address taking the value of another; so that if you change the value of one cell, both are updated. Performing a linked paste ties the value of the location from which you copied to the location to which you paste. This means that whenever you change the former, the latter takes the same value.

Break Link

Breaks the link mentioned above.

Select all

Selects ALL list addresses for the selected parameters.

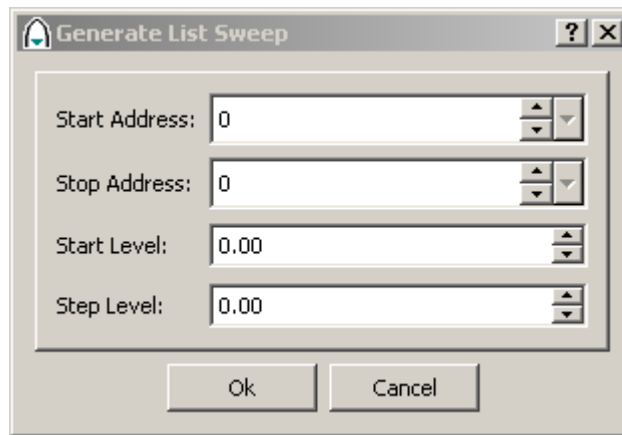
Parameter-specific menu functions

Setting all addresses to a value

This takes the selected parameter value and applies it to all 128 channels.

Create Sweep

It is sometimes useful to increase or decrease the values of a list parameter sequentially. Clicking this menu item displays the following screen that allows you to do this:



The screenshot shows a dialog box titled "Generate List Sweep". It has a standard Windows-style title bar with a question mark icon and a close button (X). The dialog contains four input fields, each with a small spinner control to its right. The fields are: "Start Address" with the value "0", "Stop Address" with the value "0", "Start Level" with the value "0.00", and "Step Level" with the value "0.00". At the bottom of the dialog are two buttons: "Ok" and "Cancel".

Start Address

This specifies the first address to which the sweep is applied.

Stop Address

This specifies the last address to which the sweep is applied.

Start Level

This specifies the first level of the sweep.

Step Level

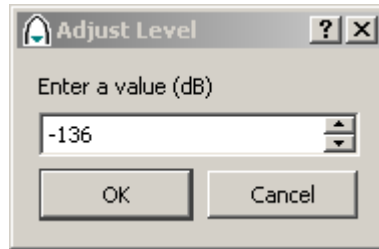
This specifies the step value of the sweep.

Once you have entered the values you want, click Ok to apply the changes into the list, or Cancel to reject the changes and return to the list table.

Note: Create Sweep is only available for frequency and level parameters.

Adjust All Values

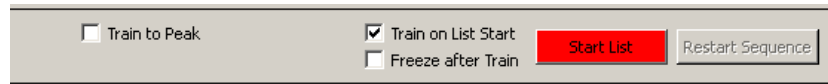
It is sometimes useful to increase or decrease the values of a list parameter by a given amount. The Adjust All Values menu item displays the following screen that allows you to do this:



The value you enter in this screen is added to all selected addresses for the given parameter.

List mode control

Once you have set up all your list parameters and control settings, this section allows you to actually start your list playing.



Before you start the list, you need to select how the list is initialized.

Train to Peak

This specifies whether the list is trained using RMS or Peak leveling mode.

Train on List Start

This specifies whether the list will be trained before it is started. Training initializes the hardware for fast-level transitions.

Freeze after Train

This specifies whether the list is frozen after it has been trained. This ensures that the level is frozen once it has initialized. This is recommended if you are using an Arb file that contains long periods with no IQ.

Starting your list

Once you have selected how to initialize your list, you can then click the **Start List** button, which first updates all of the parameters you have entered to the hardware and then, if specified, trains and freezes the hardware.

If you have specified a software start trigger, starting the list automatically issues the first step trigger, meaning that the list starts iterating immediately.

The following screen demonstrates a running list:

The screenshot shows the 'List Sequencing Mode' interface. At the top, there is a dropdown menu set to 'Hopping Mode' and two buttons: 'Common List Settings' and 'List Mode Control...'. Below this is a table with the following data:

	Frequency	Level	Level Mode	RF State	DwellTime
0	2000.000000 MHz	0.00	Auto	RF On	10000
1	2000.000000 MHz	-1.00	Auto	RF On	10000
2	2000.000000 MHz	-2.00	Auto	RF On	10000
3	2000.000000 MHz	-3.00	Auto	RF On	10000
4	2000.000000 MHz	-4.00	Auto	RF On	10000
5	2000.000000 MHz	-5.00	Auto	RF On	10000
6	2000.000000 MHz	-6.00	Auto	RF On	10000
7	2000.000000 MHz	-7.00	Auto	RF On	10000

At the bottom of the interface, there are four checkboxes: 'Train to Peak' (unchecked), 'Train on List Start' (checked), and 'Freeze after Train' (unchecked). To the right of these checkboxes are two buttons: a green 'Stop List' button and a 'Restart Sequence' button.

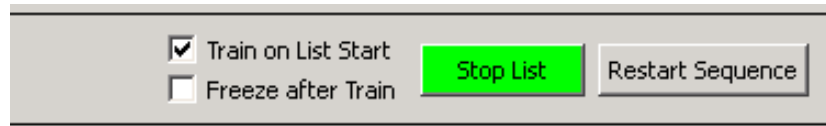
When the list is activated, you are still able to modify both common list settings and list mode control settings; however, these values are not applied to the hardware until you restart the list. Also, when the list is activated, the list table is disabled.

As the list iterates, the table automatically selects the current address of the hardware. However, if the list iterates rapidly, not all address transitions are captured, meaning that the address may appear to jump over one or more addresses.

Stopping the list

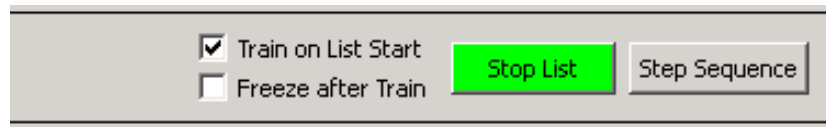
To stop the list, simply press the green **Stop List** button, which returns the list to its idle state and allows you to continue editing list parameters.

Restarting the sequence



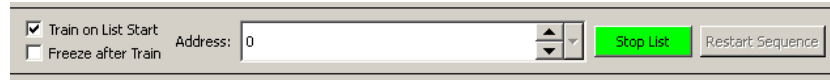
If you are in single or N * repeat mode in combination with Internal Arm trigger, the list stops iterating after the specified number of list repeats. At this time, the list is still active, but not currently iterating. To retrigger the list, click the **Restart Sequence** button.

Stepping the sequence



If you are in Internal Step trigger mode, the list does not automatically iterate to the next address in the sequence. To step the sequence, click the **Step Sequence** button, which causes the sequence to move to the next address. Note that once the list has completed all of its iterations (as specified by repeat mode), clicking **Step Sequence** restarts the list.

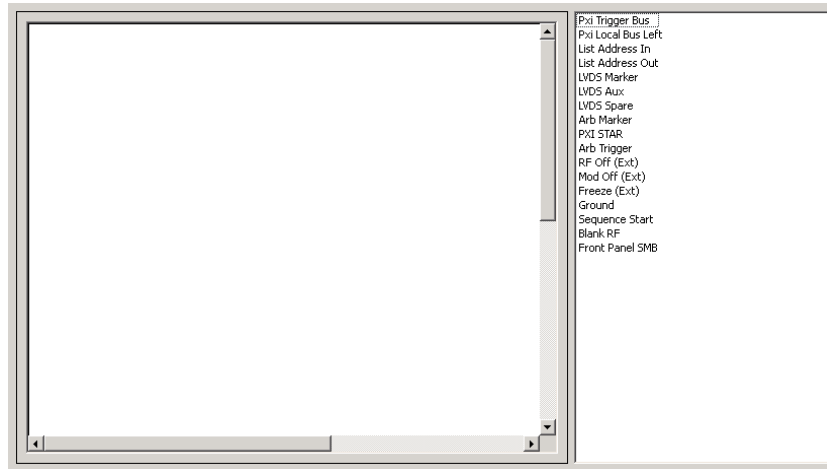
Setting the current address



If you have specified Software Address source in your List Control settings, you are able to specify the current active address once the list has been started. This can be done by modifying the Address control.

Once you have selected this control, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the address you require. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key. Note that this address is immediately set in the hardware.

Routing Matrix tab

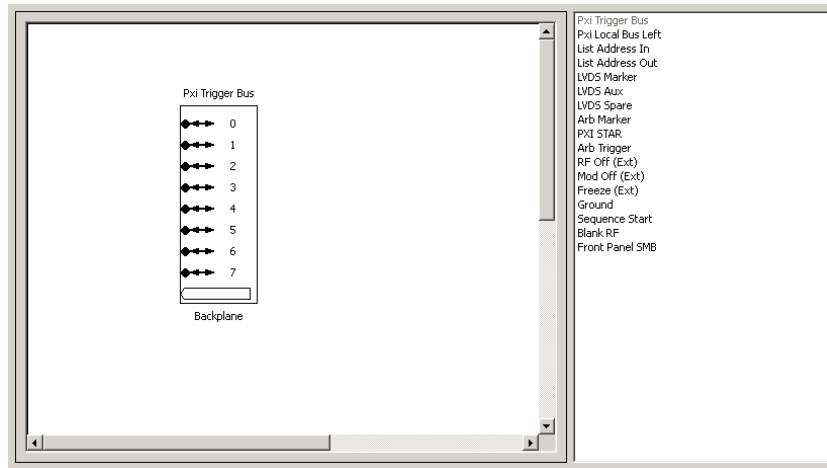


The Routing Matrix tab provides a graphical way of controlling how the internal routing matrix of the instrument is configured. It allows you to view, add, or modify how all the internal routing is connected.

The screen consists of two parts. On the left is the routing canvas, where all your connections are edited and displayed; on the right is a list of available groups that you can route.

Adding a group

To add a routing group to your routing canvas, simply select the item you wish to add from the routing list. Then hold down the left mouse button and drag the item onto the routing canvas. When you release the left mouse button, the graphical representation of this group appears on the routing canvas.



Each routing group contains one or more connection points, which represent the individual routing matrix signals to which or from which you can connect. These signals can have three types:

A routing line that can only be used to drive another line is represented like this:



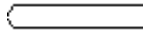
A routing line that can only be driven from another line is represented like this:



A routing line that is bidirectional, in that it can drive or be driven by another line, is represented like this:



If the routing group has more than one line (for example, the PXI Trigger bus group has eight individual lines) then the group will contain a master bus connection point, represented like this:



Moving a group

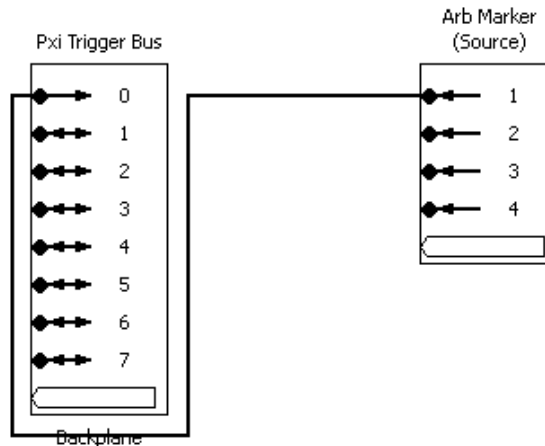
Once you have placed a group on the routing canvas, you can move it around by left-clicking on the top of the control, and dragging it to the desired location.

Removing a group

To remove a group that has been added to the routing canvas, you can right-click on the top of the control, and select Delete; this removes the item from the routing canvas, as well as deleting any connections that have been made.

Connecting two signals

To connect two signals together, first move your mouse over the connection point you wish to connect; the graphical representation should now highlight in green to show that it is selected. Next, left-click on this. You should now see a line joining this connection point to your mouse cursor. Finally, left-click on the connection point to which you want to connect. Once you have done this, the routing canvas should now show the connection between the two points:



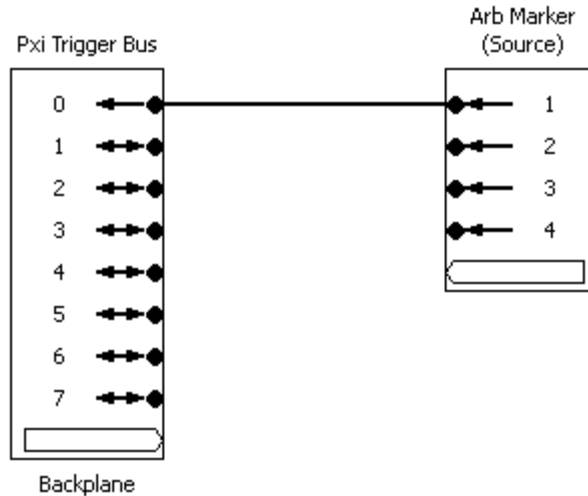
This connection shows that PXI Trigger Bus 0 is now connected to Arb Marker1. Once the connection is made, the hardware is automatically updated to reflect the change.

You may also note that as PXI Trigger Bus 0 is now connected to an output signal (Arb Marker1), the signal type has changed from 'bidirectional' to 'input'.

As you can see, however, the position of the individual connection points makes the route a little cluttered. In order to make a cleaner connection, you can change the orientation of the connection points within the routing group.

Changing the position of all ports

To change the position of all the connection point in the routing group, right-click on the top of the routing group, and select Flip ports from the drop-down menu. This moves all ports on the left of the routing group to the right, and vice versa:



Alternatively, to change the position of an individual connection point, right-click on the connection point and select Flip port.

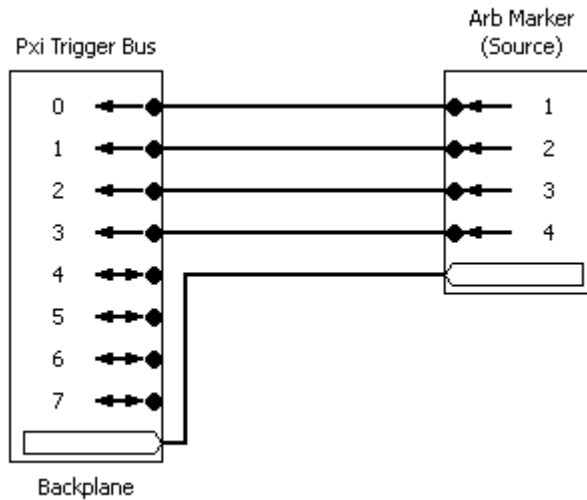
Removing a connection

To remove a connection you have previously made, right-click on the connection point you want to disconnect and select Clear connections. Alternatively, if you want to remove all connections from a routing group, right-click at the top of the routing group and select Clear all connections. This disconnects all ports within this group.

Bus connections

In some cases, you may want to connect entire groups together. The routing canvas allows you to do this by using the master bus signal.

If you want do a bulk connection, connect the two master bus connection points of the two routing groups you want to connect in the same way as you connected individual routing points mentioned earlier.



As you can see, the two master bus connection points are now connected, as are the individual lines. Connecting in this way causes as many lines to be connected as possible from top to bottom. Note that disconnecting the master bus connection point causes all other connections to be cleared too.

Hiding connection points

When a routing group contains a master bus connection point, it is possible to hide all other connection points in order to simplify the routing canvas. To do this, simply right-click on the routing group and check the Show as single line item. Alternatively, to show all lines that are available, uncheck this Show as single line item.

Note that if you have two groups connected together using the master bus connection point, and all of its connection points are shown, the connections are only drawn to and from the master bus connection points; individual lines are shown as unconnected.

Other symbols

Route overlap:



This indicates that a connection line crosses over another.

Route connection



This indicates that the two routing lines are connected together at this point.



This indicates that while there is a hardware connection from this line, there is not enough available space to draw it on the routing canvas.

Connection errors

It is not always possible to connect two connection points together. In these situations, an error message box is displayed, showing you what went wrong.

The reasons for being unable to make a connection are as follows:

- You are trying to connect an input to an input.

- You are trying to connect an output to an output.

- You are trying to connect multiple output signals to an input.

- You are attempting use a PXI backplane signal (PXI Trigger bus / PXI Star / PXI LBL) as an input (that is, you are trying to drive the PXI backplane), but there is already another device that has ownership of the backplane.

In cases where you are trying to connect a bidirectional connection point to another bidirectional routing point, you are asked to specify which you want to configure as an output and which as an input.

Chapter 4

Digitizer front panel

Overview

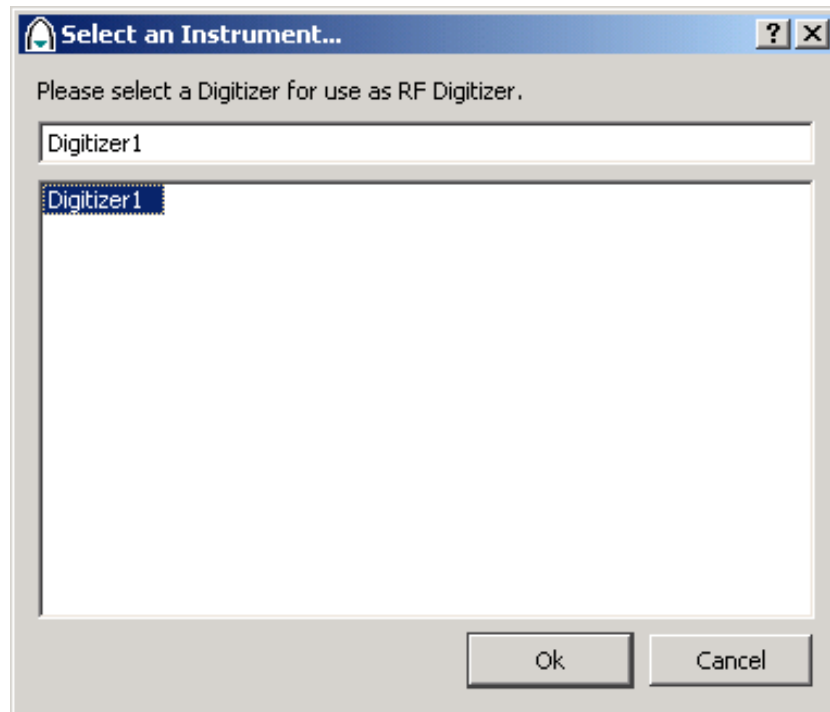
The Digitizer Front Panel plugin allows you to set up and control a Digitizer Instrument (3030 Series and 3010 Series PXI modules).

To open the Digitizer front panel, click **Instrument Control** on the top-level PXI Studio menu, and select Digitizer Front Panel.

If this entry does not appear on the top level menu, select Tools -> Registered Plugins and add the plugin *afDigitizerPlugin.dll*.

When opening the Digitizer Front Panel, if there is only one digitizer instrument available in your system, it is automatically selected and booted. Otherwise, you are asked to select which instrument you wish to control:

DIGITIZER FRONT PANEL



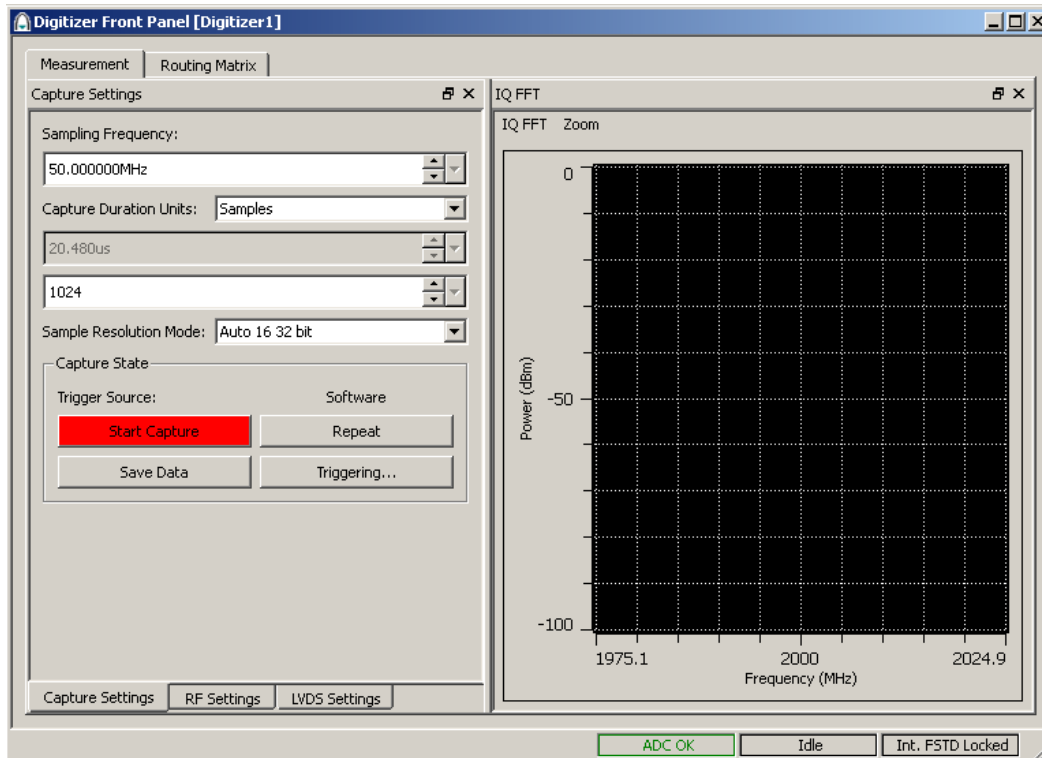
This screen provides a list of ‘logical instruments’ that you have defined in your System Configuration, which match the type you have requested. Note that instruments that are currently in use by other plugins do not appear in this list.

Click on the name of the instrument you wish to use, and click **Ok**. Alternatively, if you do not wish to proceed to the digitizer front panel, or the hardware you wish to control is not present in the list, click **Cancel**.

Once you click **Ok**, the instrument and other instruments that comprise your frequency standard (depending on the frequency standard configuration defined in System Configuration) are booted if required. If this instrument has already been booted since PXI Studio was started, then the device is only reset.

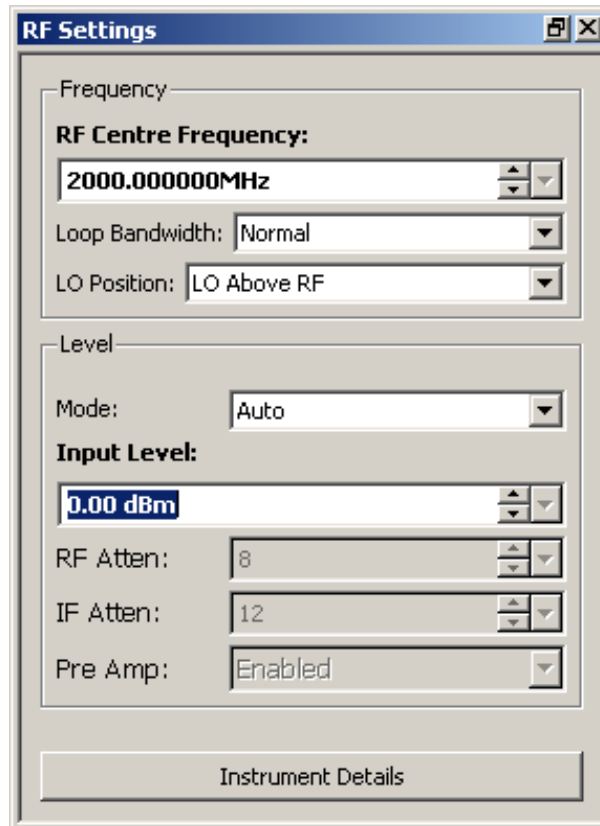
DIGITIZER FRONT PANEL

Once the instrument has been booted, you should see the following main screen:



This front panel screen contains panels for Input Settings, Capture Settings and IQ Capture Display. For information about how to manipulate these panels in order to create a customized layout, see [Common Plugin Control](#).

The RF Settings panel



This panel is responsible for setting the basic RF Input settings of the Digitizer instrument. It consists of the following controls:

RF Centre Frequency

This control allows you to modify the current RF center frequency of the Digitizer. To edit the value, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the frequency you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Valid units for this control are:

GHz

MHz

kHz

Hz

Loop Bandwidth

Specifies whether the LO is in Normal or Narrow loop bandwidth mode.

LO Position

This control allows you to specify whether the 3010 Series module's local oscillator supplies a frequency that is above or below the RF center frequency. If an RF center frequency is specified that the LO cannot provide using its current position, the LO Position is changed.

Mode

Specifies the input level setting mode. The available options are:

Auto

The attenuation and, on modules that support it, the Pre-Amp settings are automatically set based on the specified input level.

Auto IF

The IF attenuation is automatically set from the specified input level, taking into account the specified RF attenuation and Pre-Amp state.

Manual

The IF attenuation, the RF attenuation and, on modules that support it, the Pre-Amp state are all manually set. The Input level control indicates the approximate maximum power level that can be applied to the input without overloading the input.

Input Level

This control allows you to modify the current input level of the Digitizer. To edit the value, you can use the up and down keys or arrow button to increase or decrease the value.

Alternatively, you can type the reference level you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

RF Atten

This control sets the RF Attenuation when the level mode is set to Auto IF or Manual. When the level mode is set to Auto, the control can not be used but it indicates the current attenuation value.

IF Atten

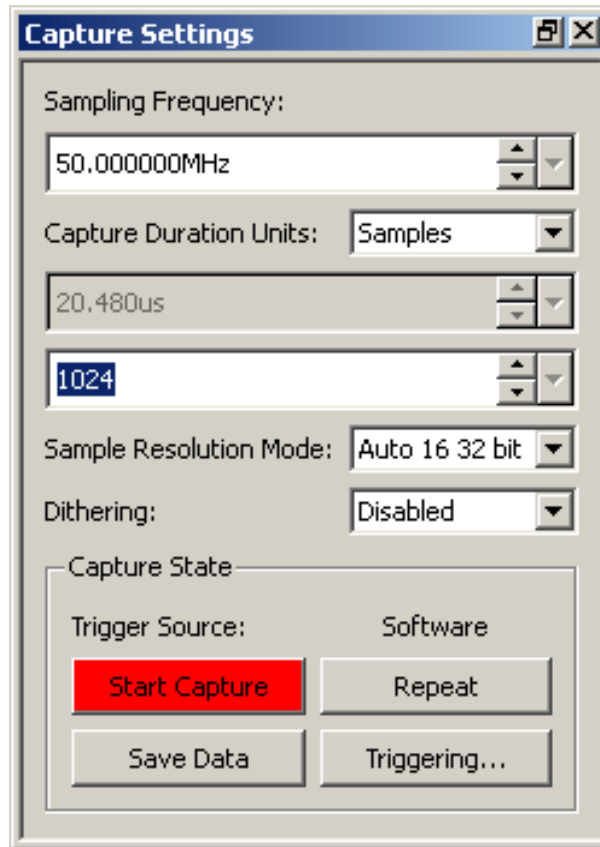
This control sets the IF Attenuation when the level mode is set to Manual. When the level mode is set to Auto or Auto IF, the control can not be used but it indicates the current attenuation value.

Pre Amp

This control sets the RF Pre-Amp state when the level mode is set to Manual or Auto IF. When the level control mode is set to Auto, this control can not be used but it indicates the current pre-amp state.

This control does not appear when the module employed does not allow RF Pre Amp control.

The Capture Settings panel



This panel allows you to set up and perform capture as well as providing the ability to store the resulting data. This panel consists of the following controls:

Sampling Frequency

This control allows you to modify the current sampling frequency of the Digitizer. To edit the value, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the sampling frequency you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Valid units for this control are:

MHz

kHz

Hz

Capture Duration (Time)

If you want to specify your capture length in terms of time, you need to enable this check box. Doing so enables the time duration entry box.

The time duration entry box allows you to modify the current capture duration of the capture with respect to time. To edit the value, you can use the up and down keys, or arrow button to increase or decrease the value. Alternatively, you can type the time you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

***Note:** if you specify a capture duration in terms of time and then change your sampling frequency, the duration of the capture remains unchanged, but the capture duration in samples changes.*

Capture Duration (Samples)

If you want to specify your capture duration in terms of samples, you need to enable this check box. Doing so enables the Sample duration entry box.

The Sample duration entry box allows you to modify the current capture duration of the capture with respect to samples. To edit the value, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the number of samples you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Note: if you specify a capture duration in terms of samples and then change your sampling frequency, the duration of the capture in samples remains unchanged, but the capture duration in time does change.

Sample Resolution Mode

This control allows the control of the capture resolution. It can either be set to Auto 16 32 Bit, in which case the capture resolution is automatically set according to the sample rate, or Fixed 16 Bit. High sample rates dictate 16-bit captures while low sample rates can utilize 32-bit transfers. When supported, 32-bit transfers give better noise and dynamic range at the expense of a higher transfer time.

Dither

This control enables or disables the use of Dithering on modules that support it. The control does not appear if the module does not support control over dithering.

Dither is a technique where a noise-like signal, uncorrelated with the wanted signal, is added to the Analog-to-Digital Converter (ADC) input. This has the effect of smoothing out the nonlinearities and can give improvements in ADC noise floor, distortion products and level linearity.

Start/Stop Capture

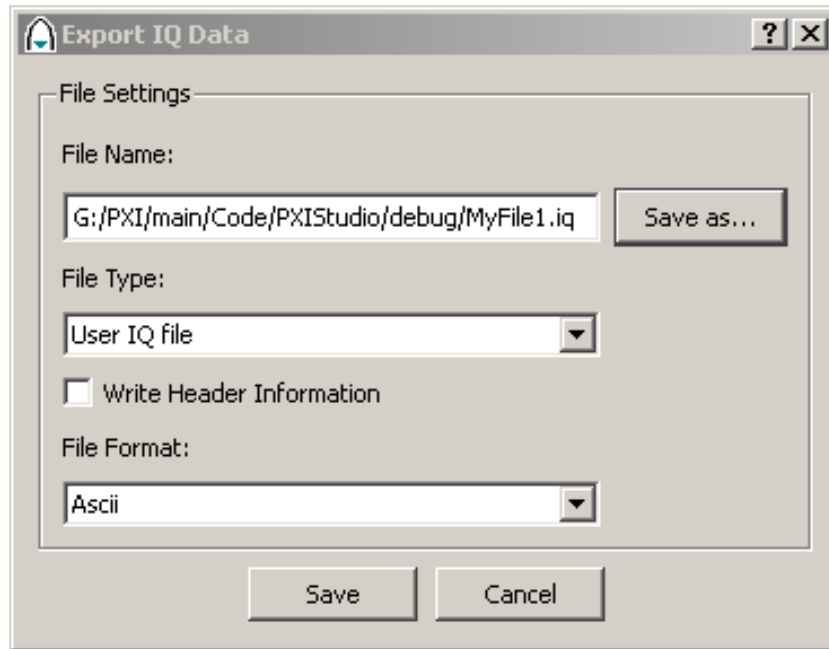
This button toggles the current state of your capture. If you are not capturing, this control is colored red and labeled **Start Capture**; if you are capturing, this control is colored green and labeled **Stop Capture**. To toggle the state, simply click on this button, and the capture starts and stops accordingly.

Repeat/Single

This button toggles the current repeat state of your capture. This can either be single, or repeated. Single repeat mode indicates that only one capture is performed; if in repeat mode, the Digitizer is immediately re-armed after a capture, allowing you to capture continuously until you decide to stop.

Save Data

If you have capture information available and provided you are not in continuous capture mode, you have the ability to export the data you have captured to a file. To export the data, click **Save Data**, and the following screen is displayed:



Selecting a file

To select a file, click the **Browse** button. This allows you to specify the filename and location to save your data to.

File Types

This control specifies the type of file that is exported. The Digitizer front panel can export IQ in two separate types:

User IQ File: this IQ data format is compatible with **IQCreator**[®] user files.

VSA IQ File: this format is compatible with Agilent VSA software.

As well as this, there are a number of sub formats available; these are applicable only when in User IQ File type. These are the standard file formats supported by **IQCreator**[®].

In either mode, you have the option to write header information. This specifies whether extra information about the IQ data, such as sample rate and adjustment factor, is included in the file.

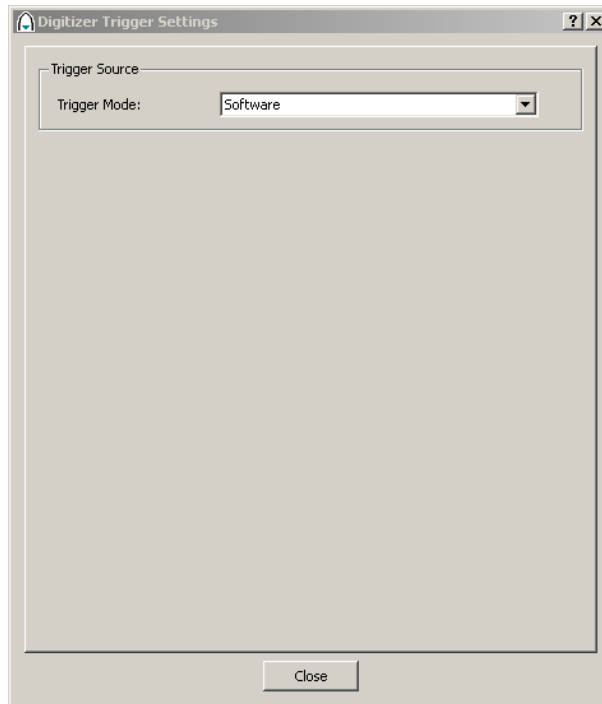
You need to check this option if you want to export data for use with the Agilent VSA software.

If you are using a User IQ File format with the intention of exporting the data into **IQCreator**[®], you should not check this box.

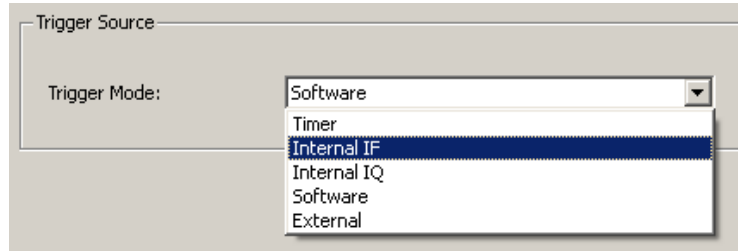
If you click **Save** the IQ file is immediately saved to file.

Triggering

This button displays the trigger settings screen, which allows you to modify how your capture is triggered:



Trigger Mode



To change the mode, simply activate the drop-down combo box labeled Trigger Mode, and select the desired trigger mode:

This control allows the selection of the Trigger Mode. There are either four or five trigger modes available depending on the af303x variant used:

Software

In Software trigger mode, the capture is automatically triggered whenever a request for a new capture is made.

External

In External trigger mode, the capture is triggered by a predefined routing matrix signal.

Internal IF

In Internal IF trigger mode, the capture is triggered by an internal trigger mechanism based on the IF data from a user-specified threshold. This is always a wide-bandwidth trigger.

Internal IQ

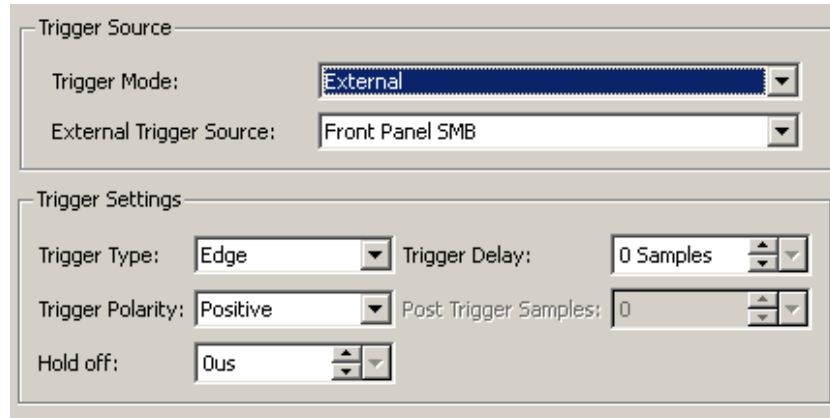
In Internal IQ trigger mode, the capture is triggered by an internal trigger mechanism based on the IQ data from a user-specified threshold. The bandwidth of the signal from which the trigger is obtained will never exceed the sampling rate. IQ Triggering will only be available on modules that support it.

Timer

In Timer trigger mode, the capture is triggered by an internal trigger mechanism derived from a hardware timer.

External Trigger Mode

Changing to External trigger mode provides more triggering options as shown below:



The screenshot shows a control panel with two main sections: "Trigger Source" and "Trigger Settings".

Trigger Source:

- Trigger Mode: External (selected in a dropdown menu)
- External Trigger Source: Front Panel SMB (selected in a dropdown menu)

Trigger Settings:

- Trigger Type: Edge (selected in a dropdown menu)
- Trigger Delay: 0 Samples (spin box)
- Trigger Polarity: Positive (selected in a dropdown menu)
- Post Trigger Samples: 0 (spin box)
- Hold off: 0us (spin box)

For External trigger mode, the following controls are available:

External Trigger Source

This controls where the external trigger comes from. The options are:

- PXI Trigger Bus 0–7
- PXI Star
- PXI Local Bus Left 0–12
- LVDS Aux 0–4
- LVDS Spare 0
- LVDS Marker 0–4
- Front Panel SMB

External Trigger Settings

The Trigger settings section is available whenever you use a non-software trigger. It consists of the following controls:

Trigger Type

This specifies how the trigger is processed. The available options are Gated and Edge.

Edge mode causes a capture to start when the trigger is received, and captures the number of samples you specify in the main capture settings panel.

Gated mode causes a capture to start when the trigger is received and stops capturing when a second trigger is received, or when the number of samples specified in the main capture settings panel have been captured.

Trigger Polarity

This specifies what type of edge is used to trigger on. The options are Positive and Negative.

Trigger Delay:

This control allows you to specify the number of samples between when a trigger is received and when the capture is started. If this value is negative, the capture includes the specified number of samples before the trigger point.

Post-Trigger Delay:

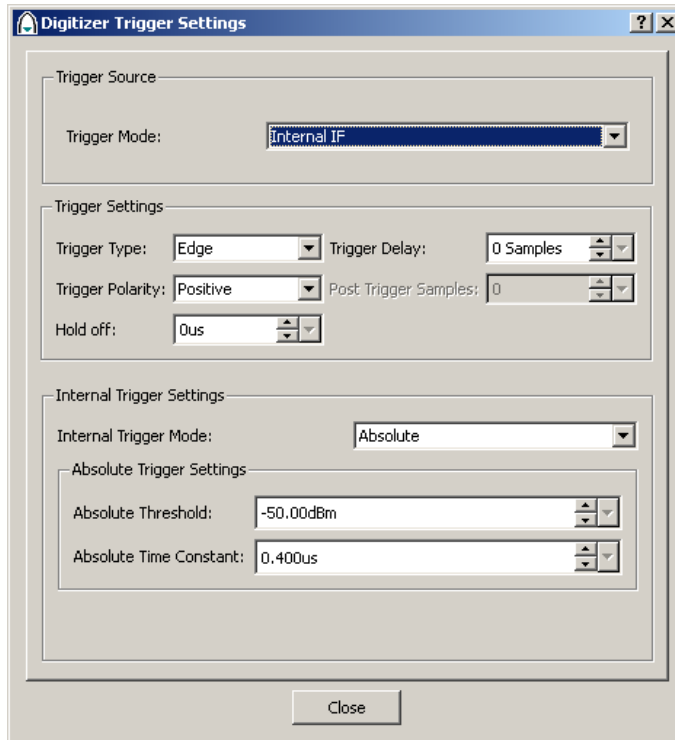
In gated trigger type, this control allows you to specify how many samples to capture after the stop trigger is received.

Hold off

Hold off controls the rate at which triggers are handled. Once a capture is triggered, the hold off period specifies an amount of time before any more triggers can be accepted.

Internal IF Trigger Mode

Changing to Internal IF trigger mode shows more triggering options as shown below:



For Internal Trigger mode, the following controls are available:

Internal Trigger Source

This specifies what internal trigger to use.

Internal Trigger

This specifies that the Digitizer is triggered by an internal threshold.

Internal Timer

This specifies that the Digitizer is triggered by an internal timer trigger.

Trigger Settings

The Trigger settings section is available whenever you use a non-software trigger. For details on the Trigger Settings section, refer to [External Trigger Mode](#).

Internal Trigger Settings

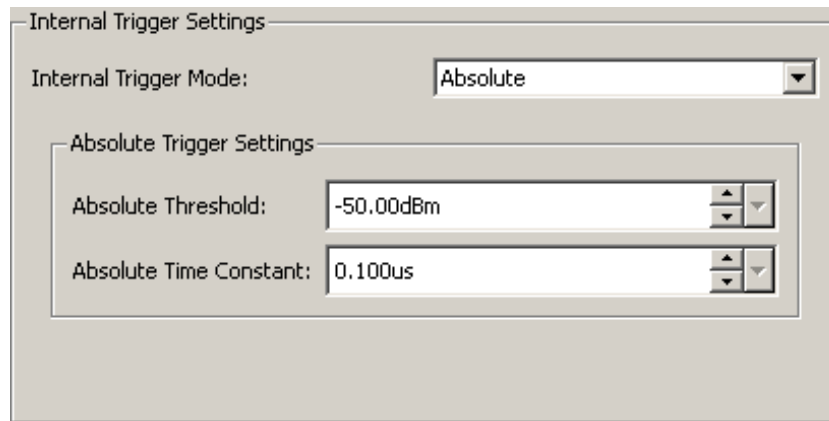
When using an internal trigger source, this section allows you to specify the settings of the internal threshold triggering system.

Internal Trigger Mode

This control specifies whether you use a relative or absolute triggering mode.

Internal Trigger Absolute

In Absolute mode, if the input level of the Digitizer rises above the absolute threshold specified, a trigger is issued and a capture begins.



The screenshot shows a dialog box titled "Internal Trigger Settings". It contains a dropdown menu for "Internal Trigger Mode" set to "Absolute". Below this is a sub-section titled "Absolute Trigger Settings" which contains two spinners: "Absolute Threshold" set to "-50.00dBm" and "Absolute Time Constant" set to "0.100us".

Absolute Threshold

This specifies the level to trigger at.

Absolute Time Constant

In order to prevent minor blips from setting off a trigger, or if you want to trigger when the signal is above a particular threshold for a moment in time, there is a time constant applied to the threshold. Increasing this time constant increases the amount of time the input level has to exceed the threshold in order to activate the trigger.

Internal Trigger Relative

In Relative mode, if the input level of the Digitizer changes by more than the relative threshold, a trigger is issued and a capture begins.

Internal Trigger Settings

Internal Trigger Mode:

Relative Trigger Settings:

Relative Threshold:

Fast Time Constant:

Slow Time Constant:

Relative Threshold

This control specifies the change in level required to activate a trigger.

Fast Time Constant/Slow Time Constant

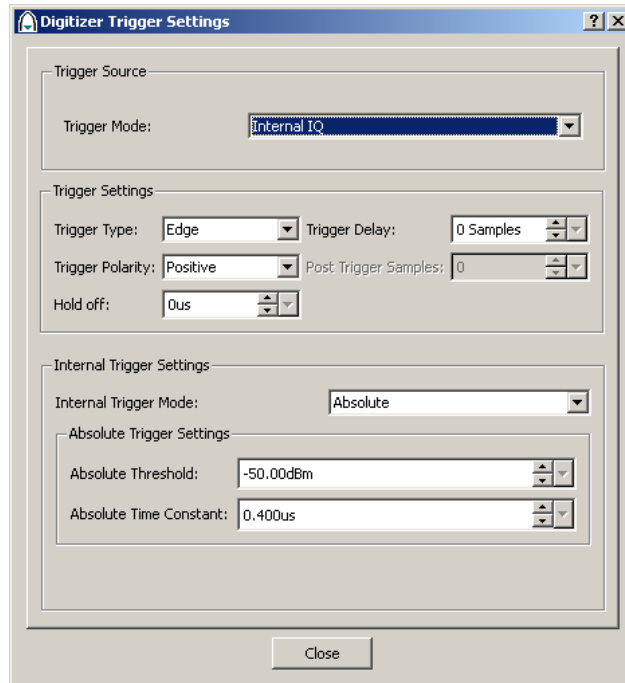
As in Absolute threshold mode, it may be necessary to prevent minor blips from setting off a trigger, or if you want to trigger when the signal is above a particular threshold for a moment in time.

To do this, the Digitizer compares the RF input level through two different filters, one with a fast time constant, one with a slow time constant. If the difference between the two is greater than the threshold specified, the trigger is activated.

Internal IQ Trigger Mode

Internal IQ Trigger Mode is only available on af303xC variants.

Changing to Internal IQ trigger mode shows more triggering options as shown below:



For Internal Trigger mode, the following controls are available:

Internal Trigger Source

This specifies what internal trigger to use.

Internal Trigger

This specifies that the Digitizer is triggered by an internal threshold.

Internal Timer

This specifies that the Digitizer is triggered by an internal timer trigger.

Trigger Settings

The Trigger settings section is available whenever you use a non-software trigger. For details on the Trigger Settings section, refer to [External Trigger Mode](#).

Internal Trigger Settings

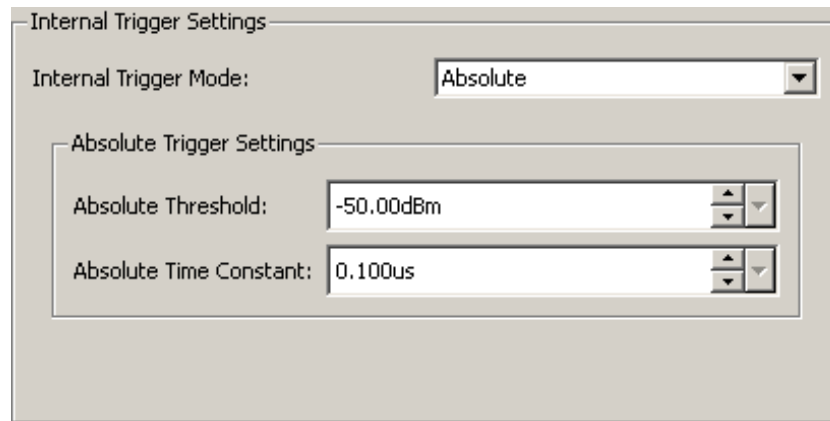
When using an internal trigger source, this section allows you to specify the settings of the internal threshold triggering system.

Internal Trigger Mode

This control specifies whether you use a relative or absolute triggering mode.

Internal Trigger Absolute

In Absolute mode, if the input level of the Digitizer rises above the absolute threshold specified, a trigger is issued and a capture begins.



The screenshot shows a dialog box titled "Internal Trigger Settings". It contains the following elements:

- A label "Internal Trigger Mode:" followed by a dropdown menu currently set to "Absolute".
- A sub-dialog box titled "Absolute Trigger Settings" containing:
 - A label "Absolute Threshold:" followed by a text field containing "-50.00dBm" and a spin button.
 - A label "Absolute Time Constant:" followed by a text field containing "0.100us" and a spin button.

Absolute Threshold

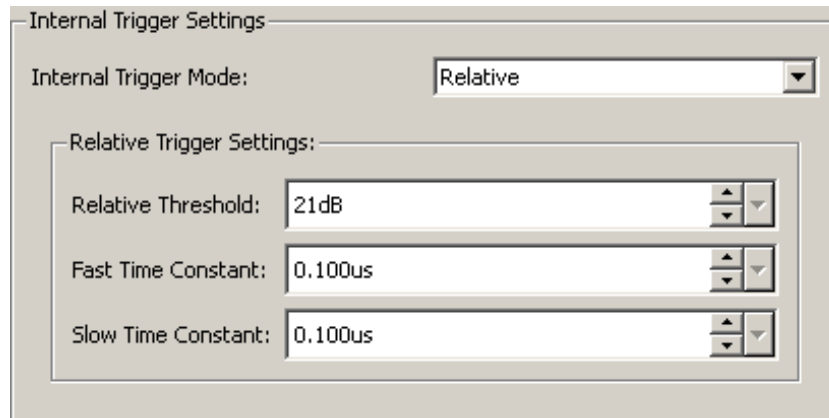
This specifies the level to trigger at.

Absolute Time Constant

In order to prevent minor blips from setting off a trigger, or if you want to trigger when the signal is above a particular threshold for a moment in time, there is a time constant applied to the threshold. Increasing this time constant increases the amount of time the input level has to exceed the threshold in order to activate the trigger.

Internal Trigger Relative

In Relative mode, if the input level of the Digitizer changes by more than the relative threshold, a trigger is issued and a capture begins.



The screenshot shows a software dialog box titled "Internal Trigger Settings". At the top, "Internal Trigger Mode:" is set to "Relative" in a dropdown menu. Below this, a sub-section titled "Relative Trigger Settings:" contains three adjustable parameters, each with a text input field and a vertical spinner control:

- Relative Threshold: 21dB
- Fast Time Constant: 0.100us
- Slow Time Constant: 0.100us

Relative Threshold

This control specifies the change in level required to activate a trigger.

Fast Time Constant/Slow Time Constant

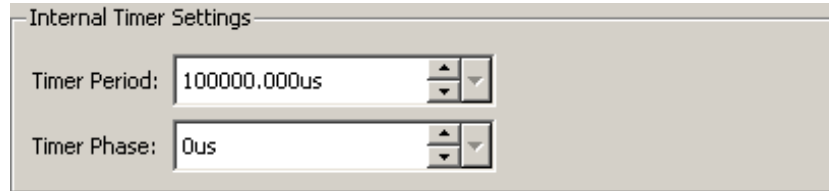
As in Absolute threshold mode, it may be necessary to prevent minor blips from setting off a trigger, or if you want to trigger when the signal is above a particular threshold for a moment in time.

To do this, the Digitizer compares the RF input level through two different filters, one with a fast time constant, one with a slow time constant. If the difference between the two is greater than the threshold specified, the trigger is activated.

Timer

If you set the internal trigger source to Internal Timer, it means that a trigger is issued according to the internal timer settings you specify.

If you set the internal trigger source to Internal Timer, the following section becomes active:



Internal Timer Settings

Timer Period: 100000.000us

Timer Phase: 0us

This section consists of the following controls:

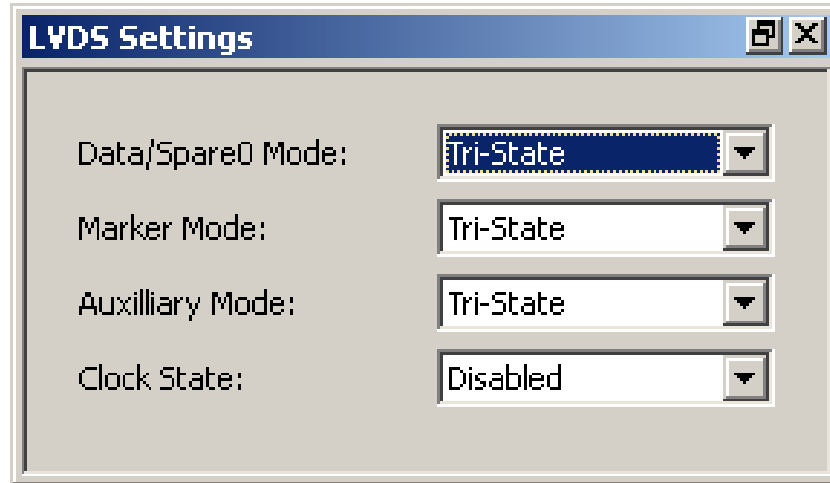
Timer Period

This control specifies the time (in μs) between triggers being issued

Timer Phase

This control adjusts the phase of the internal timer signal in multiples of the re-sampled sample clock periods.

The LVDS Settings Panel



This panel allows you to control the LVDS signaling. This panel consists of the following controls:

Data/Spare0 Mode

Controls the signaling on the LVDS data lines and the LVDS Spare0 line. Valid states are Tri-State, Input and Output.

Marker Mode

Controls the signaling on the four LVDS marker lines. Valid states are Tri-State, Input and Output.

Auxiliary Mode

Controls the signaling on the five LVDS auxiliary lines. Valid states are Tri-State, Input and Output.

Clock State

This control is used to enable and disable the LVDS data clock when used with hardware driver versions that support this feature.

If the installed drivers do not support the functionality to set the LVDS clock state, this control is not present.

Measurement toolbar



The Measurement toolbar allows you to view the overall status of the measurement or measurements that are currently in progress. It consists of the following sections:

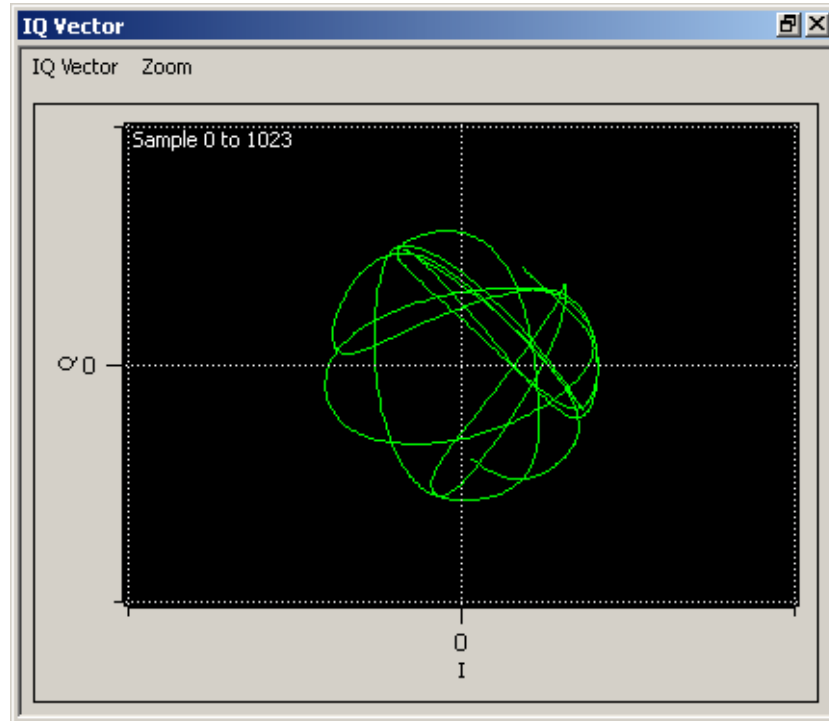
ADC Status

This section displays whether the ADC of the Digitizer in use was flagged as being overloaded at any stage of the measurement. If the ADC was overloaded, this section changes color to red.

Measurement Status

This section of the tool bar displays the current status of the digitizer.

IQ Capture Display



This panel is responsible for displaying the results of any IQ capture that is performed using a Graph Display panel. For more details on the standard control of Graph Display Panels, see [Common Plugin Control](#).

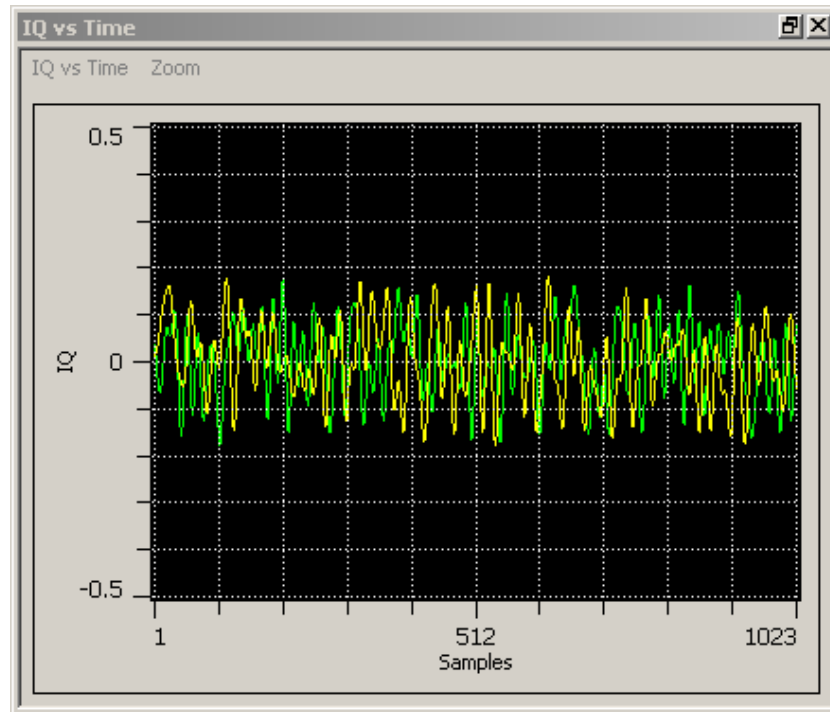
Resetting the Displayed Samples

As it is possible to display different sections of IQ samples in the IQ vector display; this function allows you to reset the display so that it uses all of the available IQ samples. To reset the samples being displayed, access the Trace Controls menu by right-clicking on the graticule and select Reset Samples.

Display Types

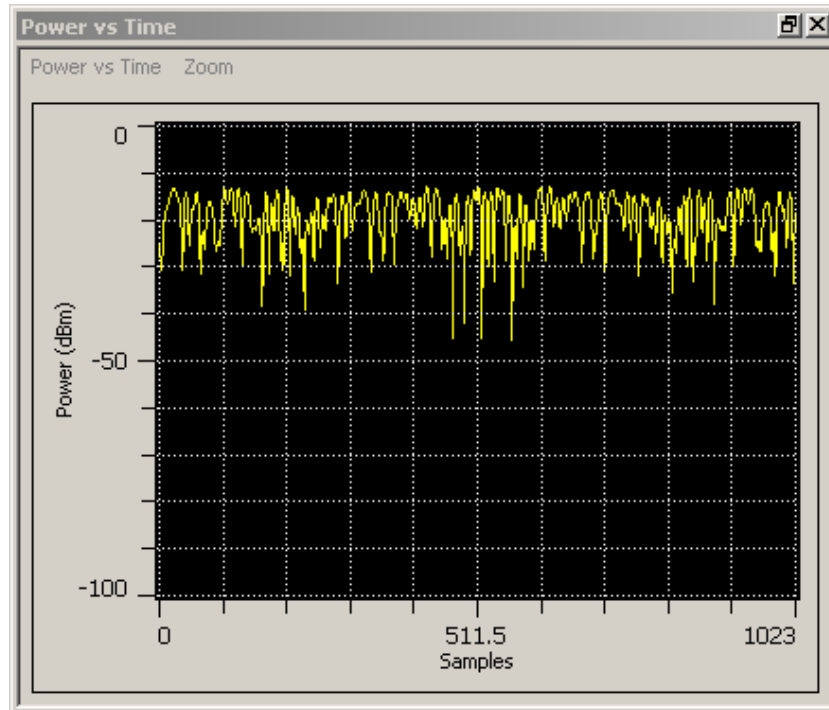
As well as being able to display a simple IQ vector as shown above, a number of different graph types are available. To change the display type, click on the menu at the top of the graphical display, which shows a number of different options:

IQ vs Time



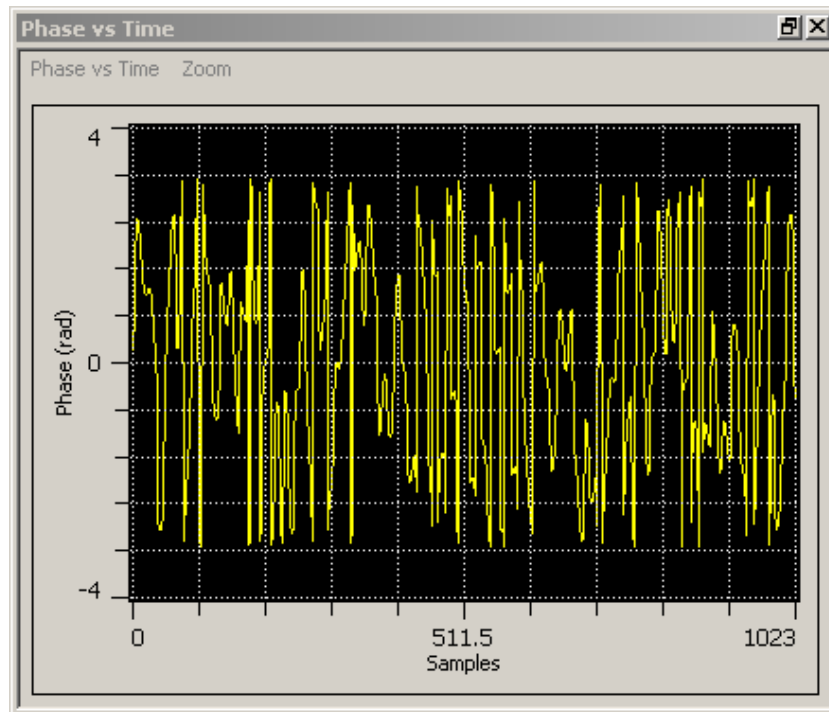
This mode displays the I and Q parts of the captured data overlaid on the same plot.

Power vs Time



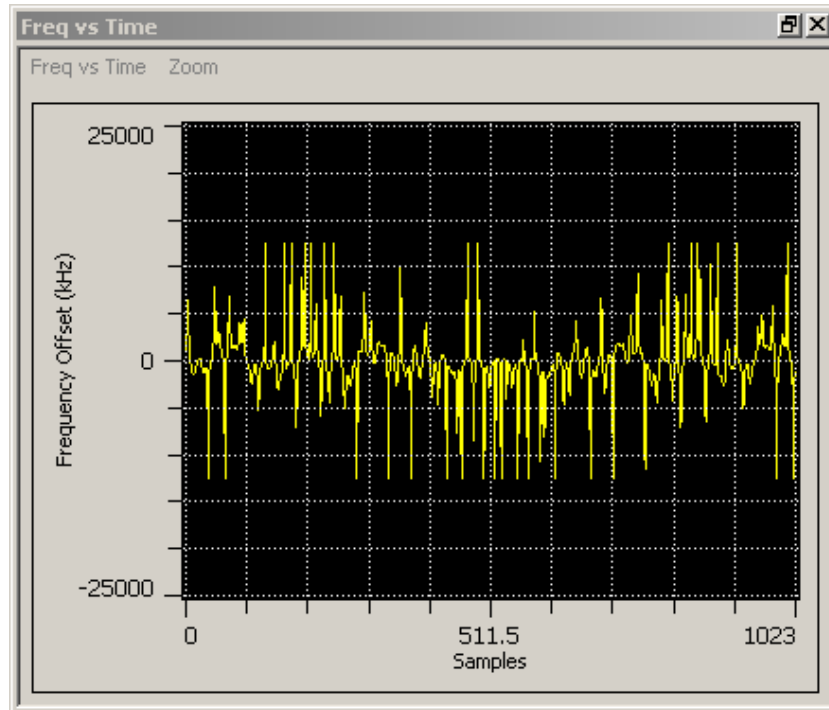
This mode displays the power of the captured data versus time.

Phase vs Time



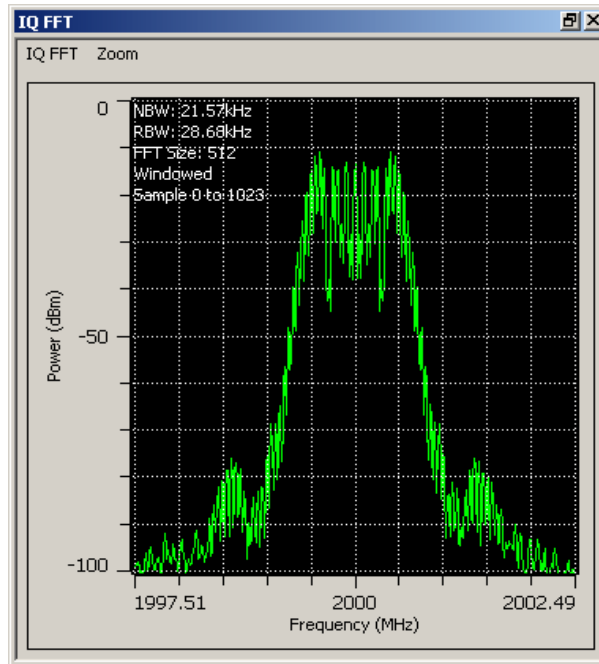
This mode displays the phase of the captured data vs time.

Freq vs Time



This mode displays the frequency offset of the captured data versus time.

IQ FFT



This mode displays a spectral analysis of the captured data. When in this mode, the FFT size is the closest power of 2 that is less than, or equal to the number of samples you have specified; up to a maximum of 65536. If the number of samples available is greater than the FFT size, then multiple FFTs are performed and the results are averaged together. Thus all of the presented samples contribute to some degree to the generated spectrum display.

When the display area is large enough, the display is annotated with the Equivalent Noise Bandwidth (NBW), the 6 dB Resolution Bandwidth (RBW), the FFT size employed, the Windowing state and the sample range presented to the FFT analysis.

Resetting the FFT

As it is possible to FFT different sections of IQ samples; this function allows you to reset the FFT so that it uses the default IQ Samples. To reset the samples being FFT'ed, access the Trace Controls menu by right-clicking on the graticule and select Reset FFT.

Selecting the FFT window

If is possible to choose between a windowed and a non-windowed FFT. To choose whether or not to use windowing, access the Trace Controls menu by right-clicking on the graticule and select or deselect Apply Window.

Other points of note for the IQ Capture Display panel

Changing the sampling frequency.

If you change the sampling frequency whilst performing a capture; the sample zoom factor of all graphs is reset.

Changing the number of samples

If you change the number of capture samples, in time or in samples, the zoom factor of all graphs is reset.

Changing the way large captures are displayed

You can choose how very large captures are displayed. By default all selected samples are displayed. However, this can result in poor display performance when the number of samples becomes very large because of the amount of work that has to be done and the amount of memory that has to be employed. Consequently, there is an option on all trace types except IQ FFT to decimate the samples before display such that only every Nth sample is displayed, where N is chosen to give no more than 10000 display points.

Sample decimation should not be used when viewing signals with short duration bursts since the decimation may hide the burst. Conversely, enabling sample decimation on older, resource-limited computers may help improve the usability of the digitizer front panel when working with signals that do not have such short duration pulses.

To choose whether or not to use windowing, access the Trace Controls menu by right-clicking on the graticule and select or deselect 'Decimate Samples'

***Note:** Earlier versions (1.8.0 and prior) of the digitizer front panel always used sample decimation to limit the displayed points to no more than 3000.*

Routing Matrix tab

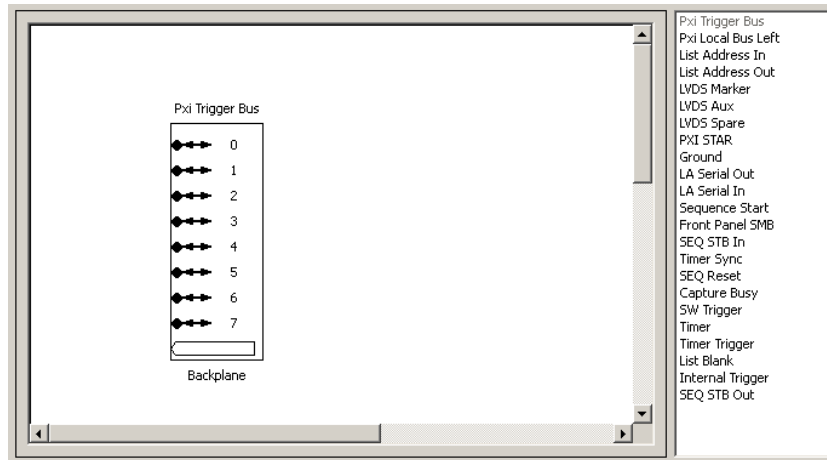


The Routing Matrix tab provides a graphical way of controlling how the internal routing matrix of the instrument is configured. It allows you to view, add, or modify how all the internal routing is connected.

The screen consists of two parts. On the left is the routing canvas, where all your connections are edited and displayed; on the right is a list of available groups that you can route.

Adding a group

To add a routing group to your routing canvas, simply select the item you wish to add from the routing list. Then hold down the left mouse button and drag the item onto the routing canvas. When you release the left mouse button, the graphical representation of this group appears on the routing canvas.



Each routing group contains one or more connection points, which represent the individual routing matrix signals to which or from which you can connect. These signals can have three types:

A routing line that can only be used to drive another line is represented like this:



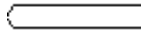
A routing line that can only be driven from another line is represented like this:



A routing line that is bi-directional, in that it can drive or be driven by another line, is represented like this:



If the routing group has more than one line (for example, the PXI Trigger bus group has eight individual lines) then the group will contain a master bus connection point, represented like this:



Moving a group

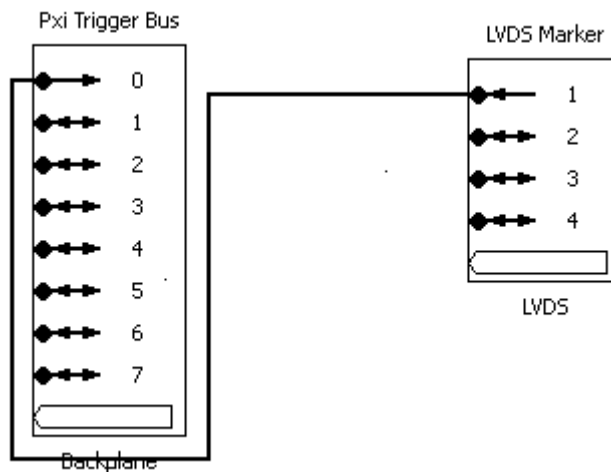
Once you have placed a group on the routing canvas, you can move it around by left-clicking on the top of the control, and dragging it to the desired location.

Removing a group

To remove a group that has been added to the routing canvas, you can right-click on the top of the control, and select Delete; this removes the item from the routing canvas, as well as deleting any connections that have been made.

Connecting two signals

To connect two signals together, first move your mouse over the connection point you wish to connect; the graphical representation should now highlight in green to show that it is selected. Next, left-click on this. You should now see a line joining this connection point to your mouse cursor. Finally, left-click on the connection point to which you want to connect. Once you have done this, the routing canvas should now show the connection between the two points:



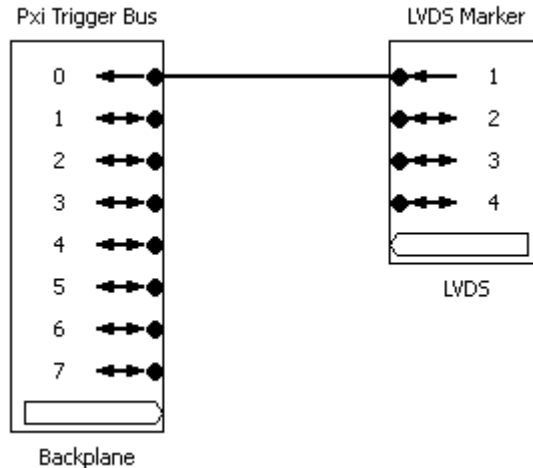
This connection shows that PXI Trigger Bus 0 is now connected to Arb Marker1. Once the connection is made, the hardware is automatically updated to reflect the change.

You may also note that as PXI Trigger Bus 0 is now connected to an output signal (Arb Marker1), the signal type has changed from 'bidirectional' to 'input'.

As you can see, however, the position of the individual connection points makes the route a little cluttered. In order to make a cleaner connection, you can change the orientation of the connection points within the routing group.

Changing the position of all ports

To change the position of all the connection point in the routing group, right-click on the top of the routing group, and select Flip ports from the drop-down menu. This moves all ports on the left of the routing group to the right, and vice versa:



Alternatively, to change the position of an individual connection point, right-click on the connection point and select Flip port.

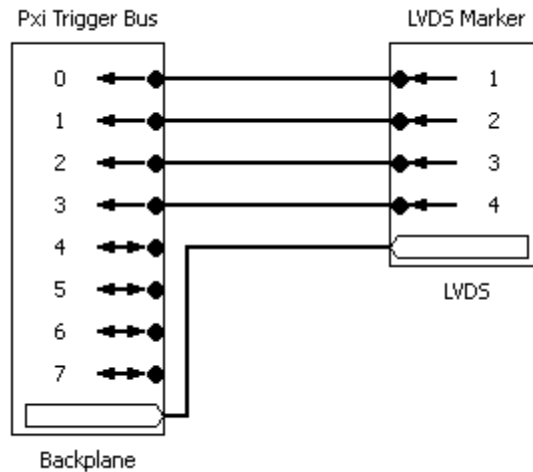
Removing a connection

To remove a connection you have previously made, right-click on the connection point you want to disconnect and select Clear connections. Alternatively, if you want to remove all connections from a routing group, right-click at the top of the routing group and select Clear all connections. This disconnects all ports within this group.

Bus connections

In some cases, you may want to connect entire groups together. The routing canvas allows you to do this by using the master bus signal.

If you want do a bulk connection, connect the two master bus connection points of the two routing groups you want to connect in the same way as you connected individual routing points mentioned earlier.



As you can see, the two master bus connection points are now connected, as are the individual lines. Connecting in this way causes as many lines to be connected as possible from top to bottom. Note that disconnecting the master bus connection point causes all other connections to be cleared too.

Hiding connection points

When a routing group contains a master bus connection point, it is possible to hide all other connection points in order to simplify the routing canvas. To do this, simply right-click on the routing group and check the Show as single line item. Alternatively, to show all lines that are available, uncheck this Show as single line item.

Note that if you have two groups connected together using the master bus connection point, and all of its connection points are shown, the connections are only drawn to and from the master bus connection points; individual lines are shown as unconnected.

Other symbols

Route overlap:



This indicates that a connection line crosses over another.

Route connection



This indicates that the two routing lines are connected together at this point.



This indicates that while there is a hardware connection from this line, there is not enough available space to draw it on the routing canvas.

Connection errors

It is not always possible to connect two connection points together. In these situations, an error message box is displayed, showing you what went wrong.

The reasons for being unable to make a connection are as follows:

- You are trying to connect an input to an input.

- You are trying to connect an output to an output.

- You are trying to connect multiple output signals to an input.

- You are attempting use a PXI backplane signal (PXI Trigger bus / PXI Star / PXI LBL) as an input (that is, you are trying to drive the PXI backplane), but there is already another device that has ownership of the backplane.

In cases where you are trying to connect a bi-directional connection point to another bi-directional routing point, you are asked to specify which you want to configure as an output and which as an input.

Chapter 5

Combiner front panel

Overview

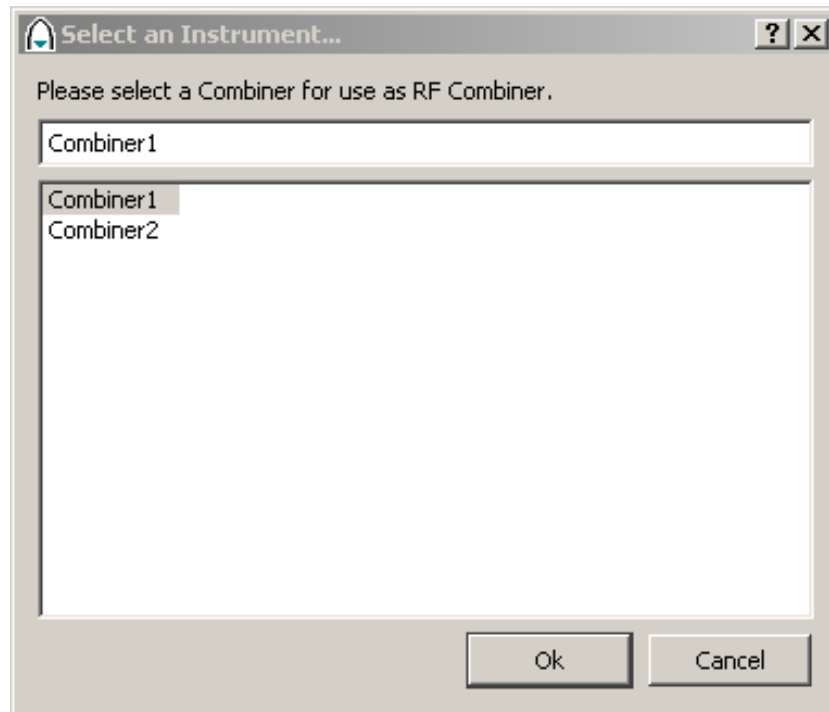
The Combiner Front Panel plugin allows you to set up and control a combiner instrument (3060 Series).

To open the combiner front panel, click **Instrument Control** on the top-level PXI Studio menu, and select Combiner Front Panel.

If this entry does not appear on the top level menu, select Tools -> Registered Plugins and add the plugin *afCombinerPlugin.dll*.

When opening the combiner front panel, if there is only one combiner instrument available in your system, it is automatically selected and booted. Otherwise, you are asked to select which instrument you wish to control:

COMBINER FRONT PANEL



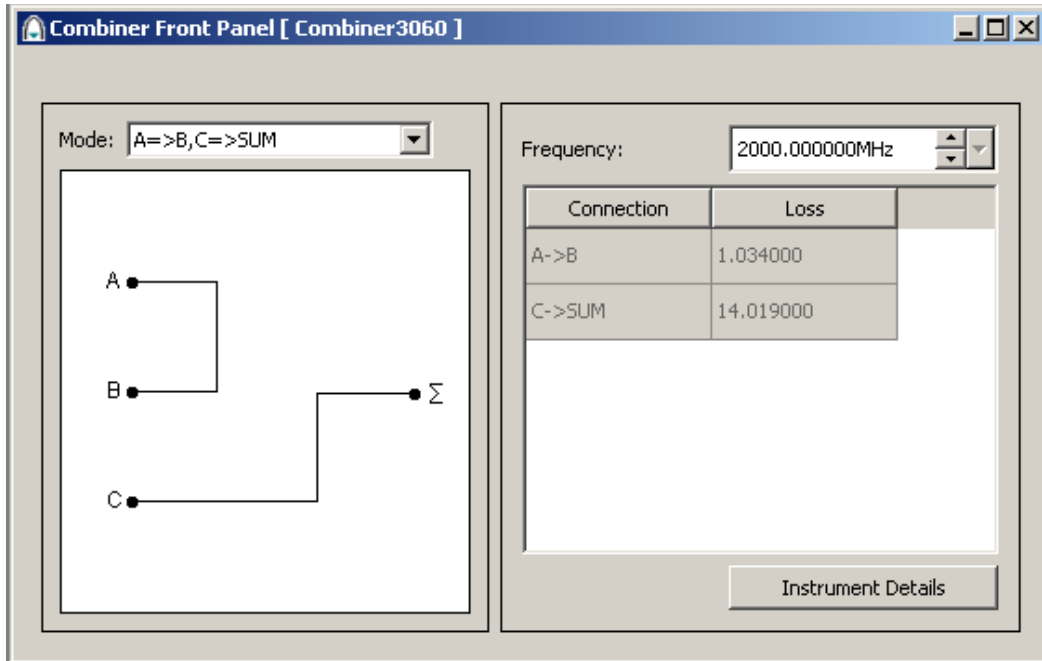
This screen provides a list of ‘logical instruments’ that you have defined in your System Configuration, which match the type you have requested. Note that instruments that are currently in use by other plugins do not appear in this list.

Click on the name of the instrument you wish to use, and click **Ok**. Alternatively, if you do not wish to proceed to the Signal Generator front panel, or the hardware you wish to control is not present in the list, click **Cancel**.

Once you click **Ok**, the instrument and other instruments that comprise your frequency standard (depending on the frequency standard configuration defined in System Configuration) are booted if required. If this instrument has already been booted since PXI Studio was started, then the device is only reset.

COMBINER FRONT PANEL

Once the instrument has been booted, you should see the following main screen:



This screen provides all the settings required to control the Combiner, and consists of the following controls:

Mode:

- This control specifies the current mode of the combiner. The modes available will depend upon the model of the combiner being used.

Switch graphic:

The switch graphic provides a graphical representation of the combiner's internal connections for a given combiner mode. Whenever you change the combiner mode, this graphic is updated with the new settings.

Frequency:

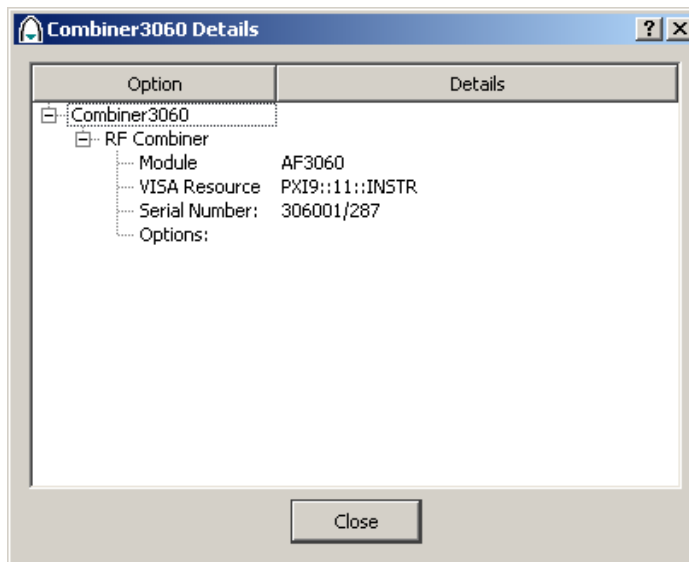
The frequency control allows you to retrieve the calibration factors of combiner's connections for a given frequency. Changing this control automatically updates the calibration factors control.

Calibration Factors:

The Calibration Factors table displays the calibration factor associated with all the connections associated with the current combiner mode.

Instrument Details

This button allows you to view the hardware details of the instrument that is currently in use by this plugin.



Chapter 6

Spectrum Analysis plugin

Overview

The Spectrum Analysis Plugin allows you to perform spectral measurements using a digitizer instrument (303x and 301x PXI Modules).

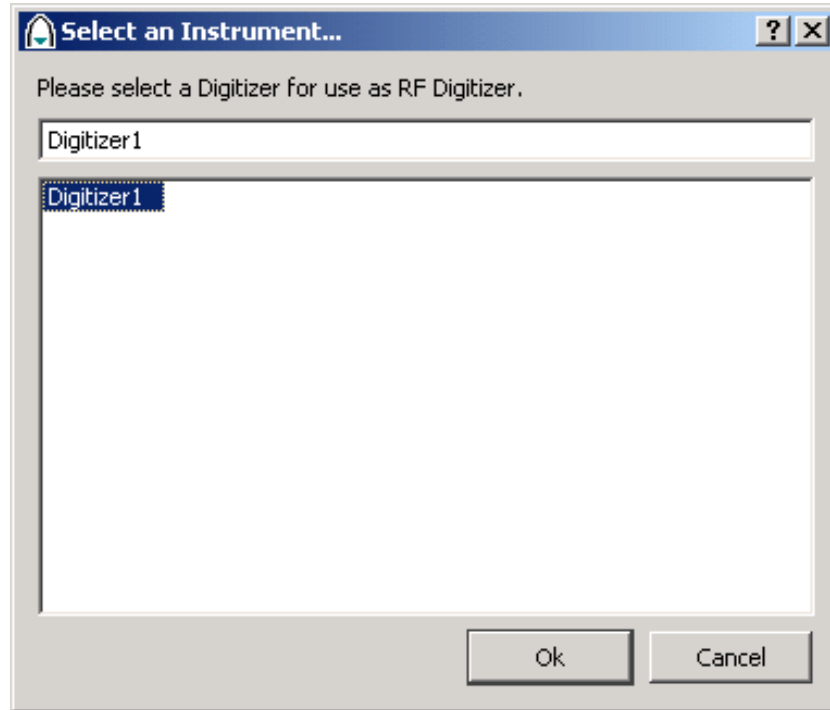
This plugin provides a graphical front end for the Spectrum Measurement Library (*afMeasureSpectrumDll.dll*), which must be installed if you intend to use this plugin.

To open a spectrum analysis measurement, click 'Measurements' on the top-level PXI Studio menu and select Spectrum Analysis.

If this entry does not appear on the top level menu, select Tools -> Registered Plugins and add the plugin *afSpectrumPlugin.dll*.

Note: this plugin is supplied with PXI Studio, but has its own separate installer. This chapter assumes that the PXI Studio and Spectrum installers have been run from the same distribution. If a different version of the Spectrum plugin is installed, the functionality may differ.

When opening a Spectrum Analysis measurement, if there is only one Digitizer instrument available in your system, it is automatically selected and booted. Otherwise, you are asked to select which instrument you wish to control:



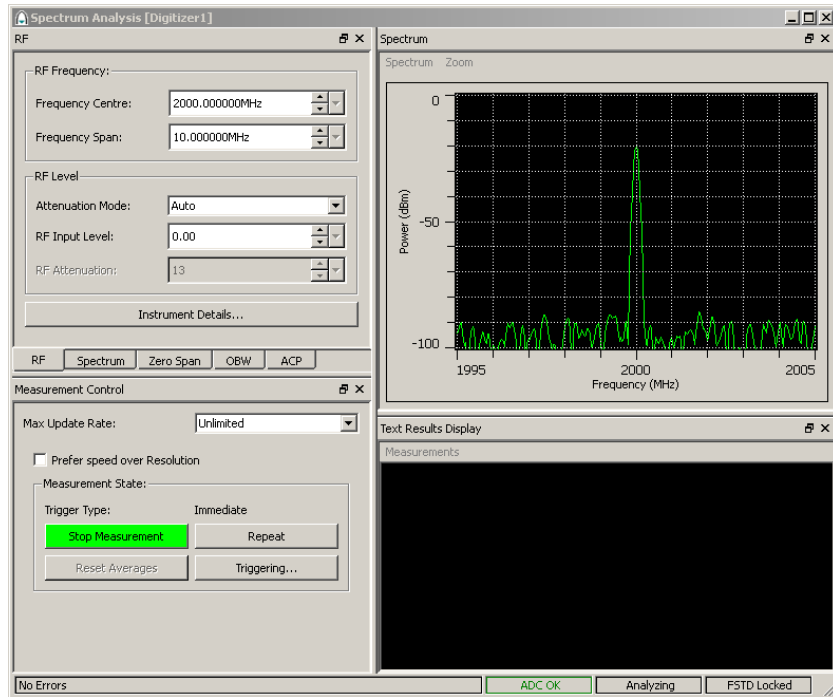
This screen provides a list of Logical Instruments (that you have defined in your System Configuration) that match the type you have requested. Note that instruments that are currently in use by other plugins do not appear in this list.

Click on the name of the instrument you wish to use, and click **Ok**. Alternatively, if you do not wish to proceed to the Spectrum Analysis measurement, or the hardware you wish to control is not present in the list, click **Cancel**.

SPECTRUM ANALYSIS PLUGIN

Once you click **Ok**, the instrument and (depending on your frequency standard configuration defined in System Configuration) other instruments that comprise your frequency standard are booted if required. If this instrument has already been booted since PXI Studio was started, then the device is only reset.

Once the instrument has been booted, you should be presented with the following main screen:



This screen contains panels for Spectrum, RF, Zero Span, Occupied Bandwidth (OBW) and ACP settings, as well as panels for Measurement settings, Text and graphical results.

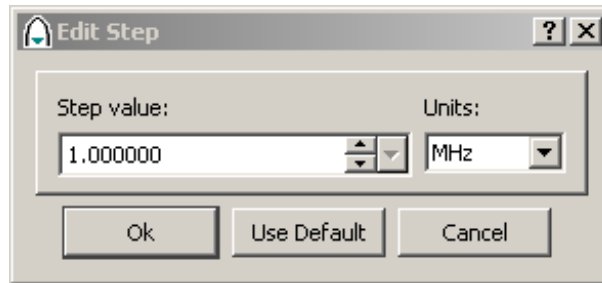
For information about how to manipulate these panels in order to create a customized layout, see [Common Plugin Control](#).

Parameter entry

To edit a numeric value, you can use the up and down keys or arrow button to increase or decrease the value. Alternatively, you can type the value you require with appropriate units. When editing the value, the background color of the control turns yellow to indicate that it has changed. To apply any manual changes, press return. To cancel your changes, press the escape key.

Changing the Step

Numeric entry boxes allow you to step the value entered up or down by a given value. To edit the value the numeric entry is stepped by, right-click on the edit box, and click Edit Step.



To edit the step, simply select the step value and units (if applicable) and click **Ok**. To reject your changes, select **Cancel**. Note that this only modifies the step of the numeric entry you have clicked on, and no others. If the window containing the numeric entry is closed, the user step value you have entered is not remembered when you come to reopen it.

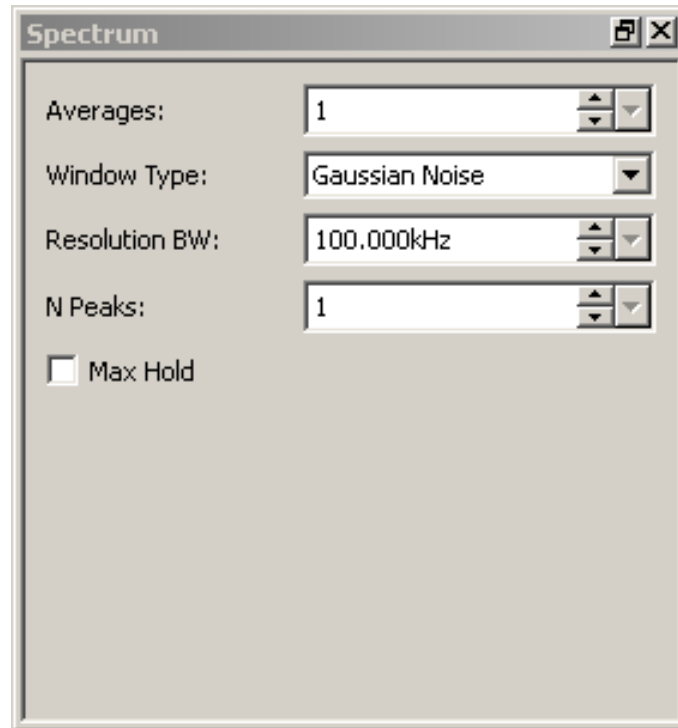
Conflicts

As not all parameters values can be valid, (either limited by hardware constraints such as the center frequency, or limited by the values of one or more other parameters, such as center frequency and span) all parameter entry fields highlight any conflict by showing the conflicted parameter in red. A warning message is displayed, indicating the nature of the error. If a measurement is in progress, it is stopped.

SPECTRUM ANALYSIS PLUGIN

To view the conflict that has occurred, move the mouse cursor over the parameter entry box for a moment to show the context-sensitive tool tip for that item. This shows any errors that occurred when trying to set the value you have entered.

The Spectrum settings panel



Averages / Repeat Count

This control allows you to specify the number of averages that are performed on the spectral measurements being made. Averages are unavailable when max hold is enabled.

However, when using N * repeat in max hold mode, this control specifies the number of measurements that are made.

Window Type

This control allows you to specify the window type used when performing a spectral measurement. The options are Gaussian 3dB, Gaussian Noise and Blackman-Harris.

Resolution BW (resolution bandwidth)

This control allows you to specify the resolution bandwidth of the measurement.

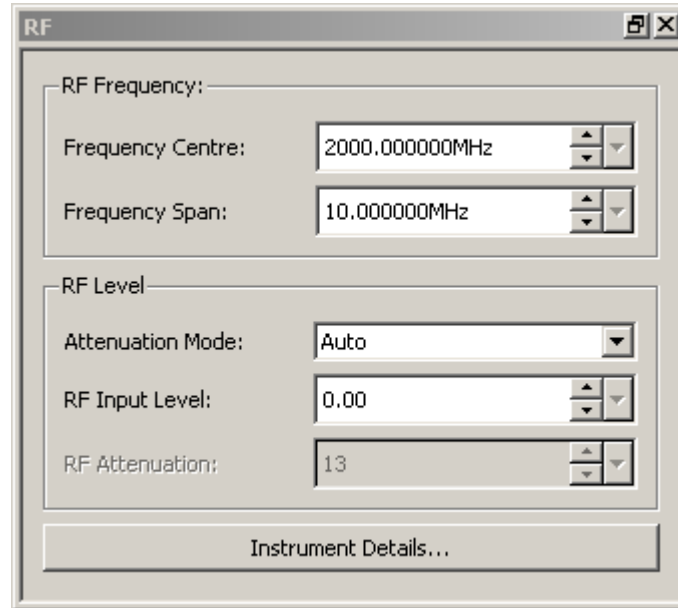
Max Hold

This control allows you to turn max hold on and off. When this control is checked, the spectral measurements being made accumulate the maximum value over subsequent measurements.

N Peaks

The Spectrum Analysis plugin provides the ability to continuously measure a given number of the highest peaks within a spectral measurement. This control allows you to specify how many peaks are measured. The peak values are displayed in the [Text Display Panel](#).

The RF Settings panel



This panel sets the basic RF parameters of the spectral measurement you want to make. It consists of the following controls:

Frequency Center

This control allows you to set the center frequency of the spectral measurement.

Frequency Span

This control allows you to set the span of a spectral measurement.

Attenuation Mode

This control allows you to specify how the RF Attenuation of the digitizer hardware is applied. This can either be Auto or manual.

In auto mode, the RF attenuation is automatically calculated from the reference level.

In Manual mode, you are able to directly specify the amount of RF attenuation that the digitizer hardware uses.

RF Input Level

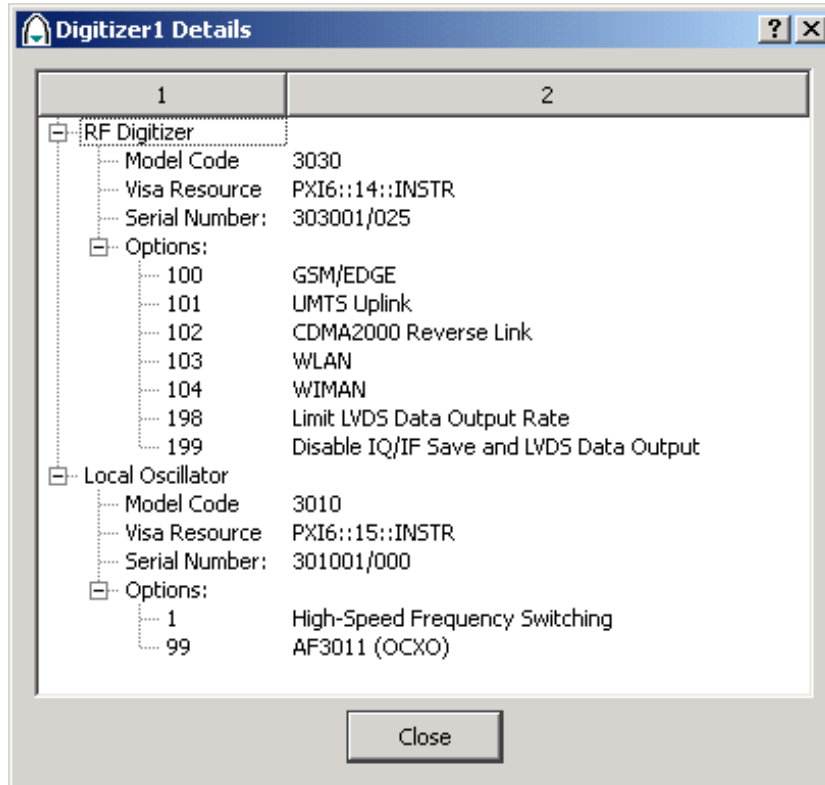
This control allows you to specify the RF Input level for the measurements you are making.

RF Attenuation

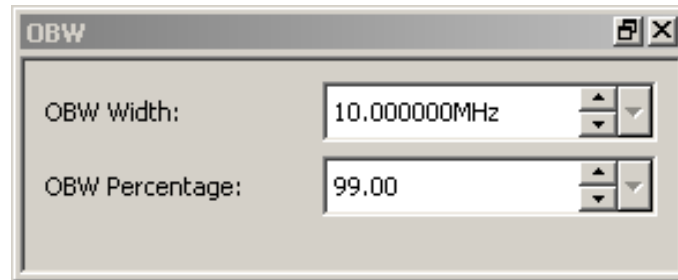
This control allows you to specify the amount of RF Attenuation that is used for the specified measurement. When in automatic mode, this control automatically reflects the current amount of RF attenuation that has been configured on your digitizer instrument.

Instrument Details

This button allows you to view the hardware details of the instrument that is currently in use by this plugin.



The Occupied Bandwidth (OBW) settings panel



This panel sets the parameters for an Occupied Bandwidth (OBW) measurement. The occupied bandwidth measurement measures the frequency within which some percentage of a signal lies. The panel consists of the following controls:

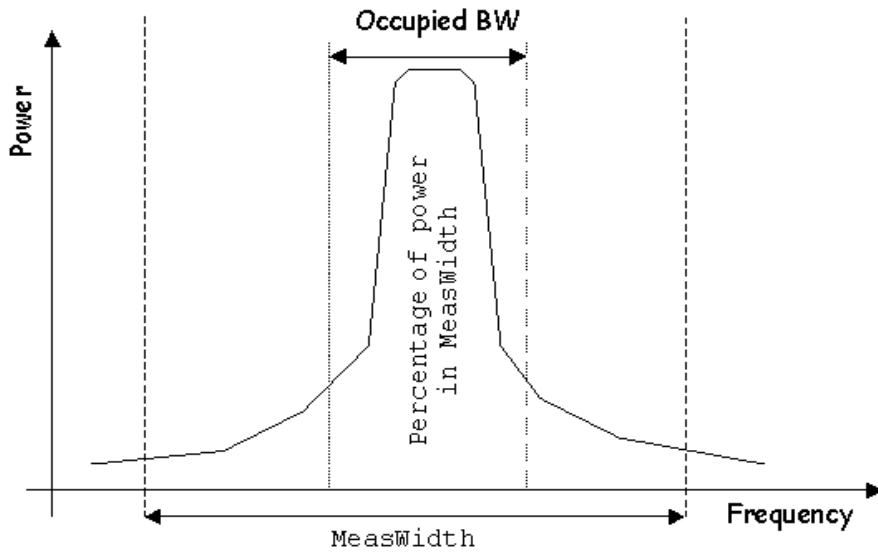
OBW Width

This control sets the width over which the occupied bandwidth is measured.

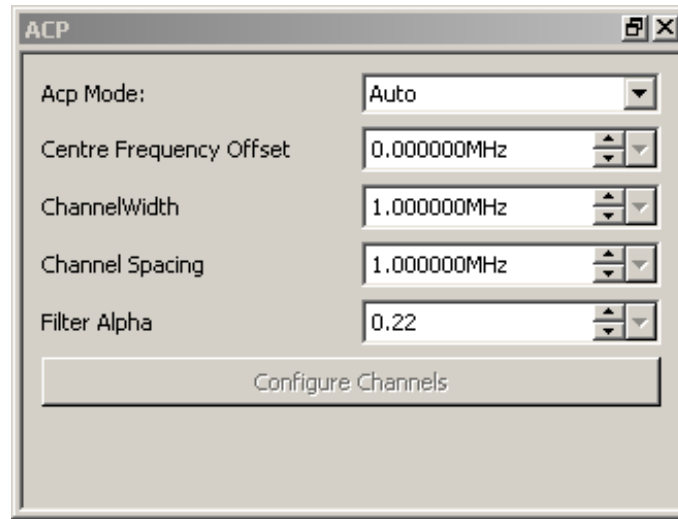
OBW Percentage

This control sets the percentage of signal power that is used to calculate the occupied bandwidth

SPECTRUM ANALYSIS PLUGIN



The Adjacent Channel Power (ACP) settings panel



This panel sets the parameters for an Adjacent Channel Power (ACP) measurement.

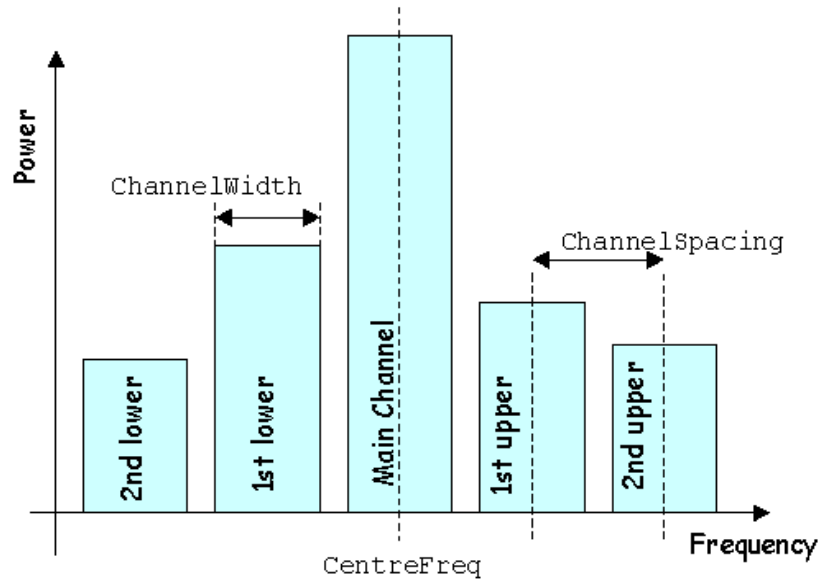
ACP Mode

This control allows you to specify how the ACP information is set up when making ACP measurements. The possible values are User and Auto.

In Auto ACP mode, there is a fixed number of ACP channels that are measured, as well as a common measurement width and spacing for each of those channels.

In User ACP mode, you can define any number of ACP channels as well as independently setting each channel's spacing and width.

ACP Channel definition



Offset Frequency

This control allows you to specify the position of the carrier channel relative to the RF Centre frequency specified. If you want the carrier channel to be centered around the RF center frequency, this parameter should be zero.

Channel Width

This control allows you to specify the width of all automatic ACP channels. This control is only enabled in Automatic ACP mode.

Channel Spacing

This control allows you to specify the channel spacing of all automatic ACP channels. This control is only enabled in Automatic ACP mode.

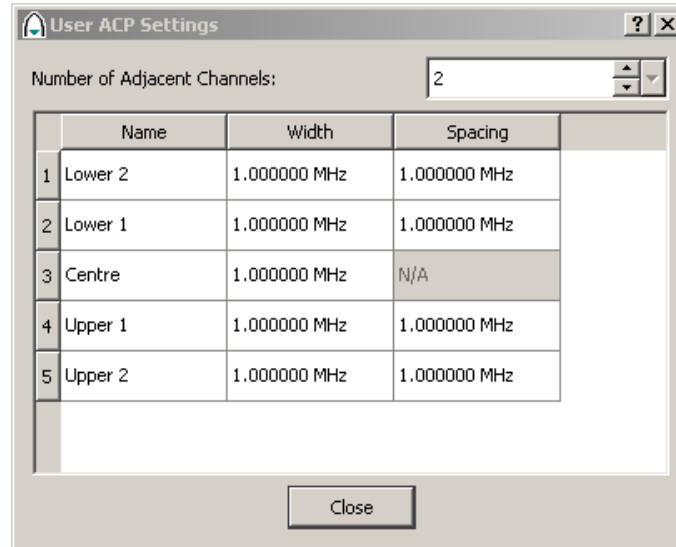
Filter Alpha

This control allows you to specify the Filter Alpha of the ACP measurement.

Configure Channels

Clicking this button allows you to define customized channel settings when in User ACP mode. For more information, see [User ACP Channel settings](#).

User ACP channel settings



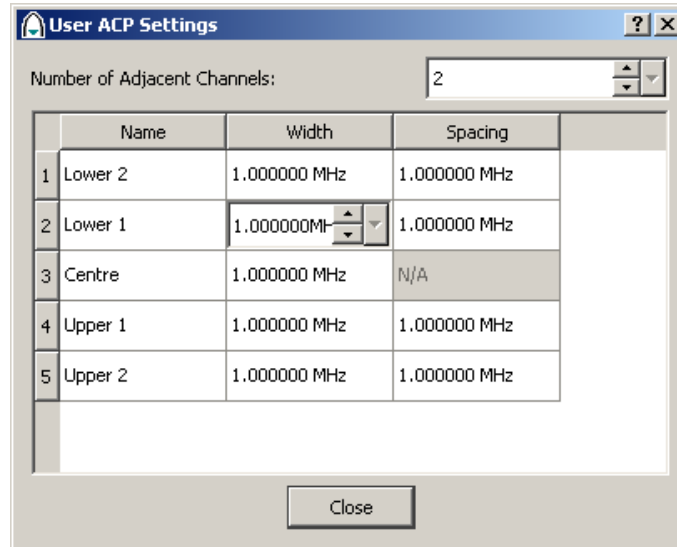
This window allows you to modify the user-defined channels used when making an ACP measurement.

Number of Adjacent Channels

This defines how many channels there are on either side of the carrier. For instance, if you set the number of adjacent channels to two, two upper and two lower channels are defined.

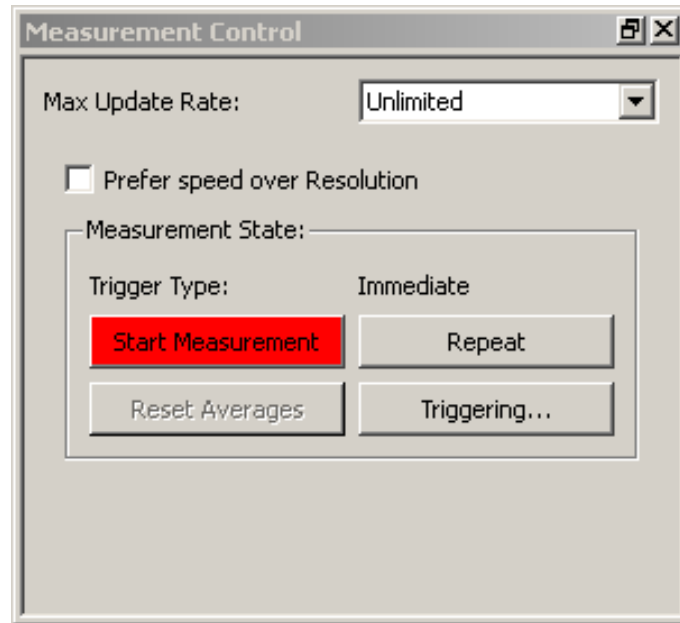
Editing an item

To edit an item, either select the item and press the space key, or double-click on the item to bring up an edit box:



Then simply press the enter key to apply the changes.

The Measurement settings panel



This panel allows you to set up and control measurements that are being made. It consists of the following controls:

Maximum Update Rate:

This control allows you to limit the screen update rate. As the spectrum measurement library is optimized for speed, on some faster machines screen updates may occur too quickly to make some text and graphical measurement easily readable. This control limits the graphical update rate of the Spectrum Measurement Plugin, to make it easier to see updates that occur. It is important to note that this update rate is limiting only the display of measurements, rather than limiting the number of measurements themselves.

Prefer speed over resolution

This control allows you to specify whether to increase the speed of the measurement at the detriment of measurement resolution at low sample rates.

Start/Stop Measurement

This button toggles the current state of your measurements. If you are not performing a measurement, this control is colored red and labeled 'Start Measurement'; if you are capturing, this control is colored green and labeled 'Stop Measurement'. To toggle the state, simply click on this button, and your measurements start and stop accordingly.

Repeat / N * Repeat / Single

This button toggles the current repeat state of your measurement. This can either be single N * repeated, or repeated.

Single repeat mode indicates that only one set of measurements is performed. If in N * repeat mode, the measurement is repeated the number of times specified by the number of averages / repeat count in the Spectrum Settings Panel. If in repeat mode, the measurements are performed continuously until you decide to stop.

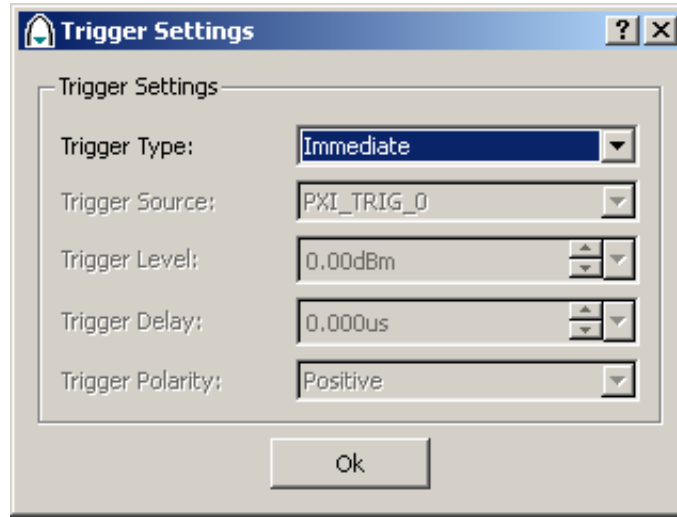
Reset Averages

This button resets the accumulated average where applicable. This button is only enabled if you are in continuous run mode and have a number of averages greater than one.

Triggering

This button displays a popup window that allows you to edit or modify how the measurements are triggered.

Trigger Settings



This screen allows you to specify how your measurements are triggered:

Trigger Type

This specifies what triggers your measurement:

Immediate

Selecting this trigger type means that the measurement is triggered automatically when you click on Start Measurement.

Video

Selecting this trigger type means that the measurement is triggered whenever the RF level rises above a given level.

External

Selecting this trigger means that the trigger is supplied by an external device.

Trigger Source

This selects which hardware line to trigger from when using an external trigger type.

Trigger Level

This selects the level at which to trigger when in video trigger mode.

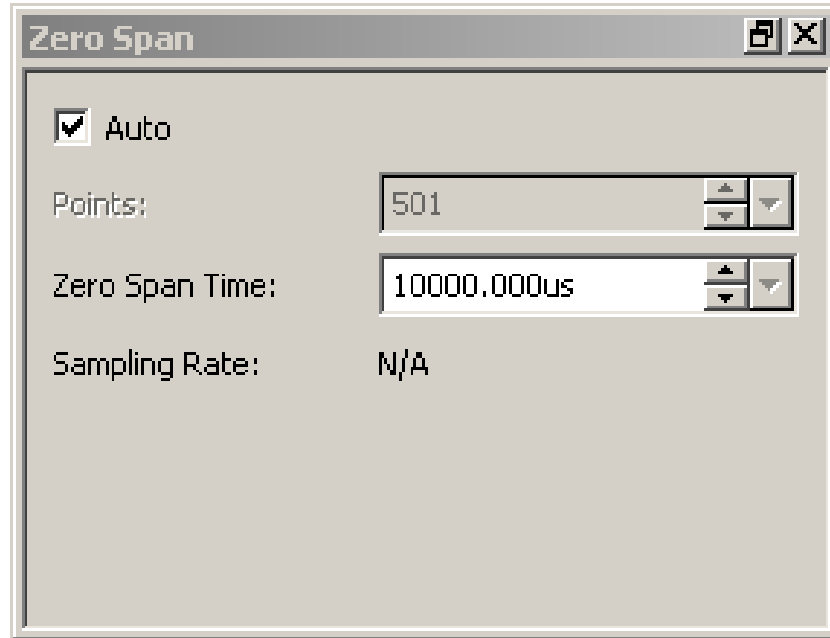
Trigger Delay

It is possible that you may want to perform measurements on acquired data that occurs some time before or after the digitizer has been triggered. This property allows you to specify the amount of time between receiving the trigger and the start of data acquisition. This can be a positive number, indicating that data is acquired some time after a trigger, or a negative number, indicating that the data is acquired for a portion of time before the trigger is received.

Trigger Polarity

This selects the polarity of the trigger when in video trigger mode.

The Zero Span settings panel



This panel sets the parameters for all Zero Span measurements. It consists of the following controls:

Auto

This control allows you select whether to perform a spectral measurement and a zero span measurement on the same data from the digitizer. If this control is checked, the zero span and spectral measurements use the same sampling rate, and the number of points is automatically generated. Note that if you have a spectral measurement that has a high sampling rate, the auto button causes a large zero span measurement to be made, which may decrease the update rate and performance of PXI Studio.

Points

This control allows you to specify the number of points that are captured and displayed on the screen when the measurement is made. Note that specifying a high number of sample points to be captured and displayed may use a large amount of memory and can lower the update rate of the application.

Time

This control allows you to specify the total amount of time that the zero span measurement encompasses.

Sampling Frequency

This control displays the sampling rate of the zero span measurement that is being made.

Making a measurement

When you click the **Start Measurement** button to start the analysis of your signal, the measurements you have currently selected to display in either a text, or graphical representation are made. The measurements you are not currently displaying are not made in order to keep optimal update speeds.

If you are in continuous run mode, and you change the measurement you want to display by, for instance, selecting a new item in the Text display panel, or changing graph types in the Graph Control panel, any measurements in progress are aborted, and a new measurement is started.

If you are in single run mode, and you change the measurement you want to display, you have to restart the analysis by clicking **Start Measurement** again.

It is also important to note that changing any settings parameter in this plugin also aborts any measurements that are currently in progress and automatically restarts them.

Measurement toolbar



The Measurement toolbar allows you to view the overall status of the measurement or measurements that are currently in progress. It consists of the following sections:

Errors

This section displays any errors that occurred when making a measurement. If an error has occurred, this section changes color to red, and displays the most recent error:



If a warning has occurred, this section changes color to yellow, and displays the most recent warning. To view details of all the errors that have occurred while processing the measurement, double-click on the error section, and an error summary window is displayed.

ADC Status

This section displays whether the ADC of the digitizer in use was flagged as being overloaded at any stage of the measurement. If the ADC was overloaded, this section changes color to red.

Measurement Status

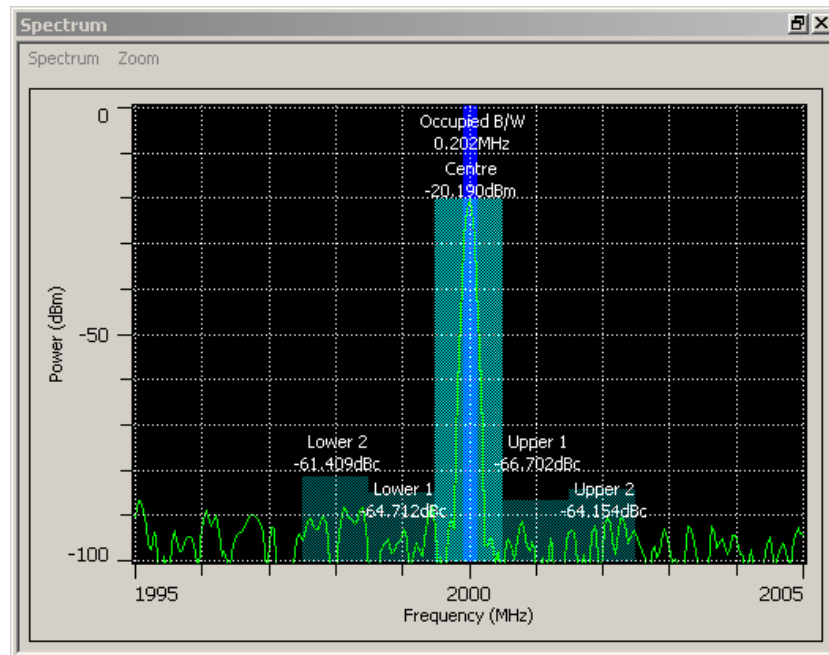
This section of the tool bar displays the current status of the measurement library.

The Output Display panel

This panel displays the results of measurements in a graphical format. It uses the standard Graph Output Display panel described in [Common Plugin Control](#).

The available graph types are as follows:

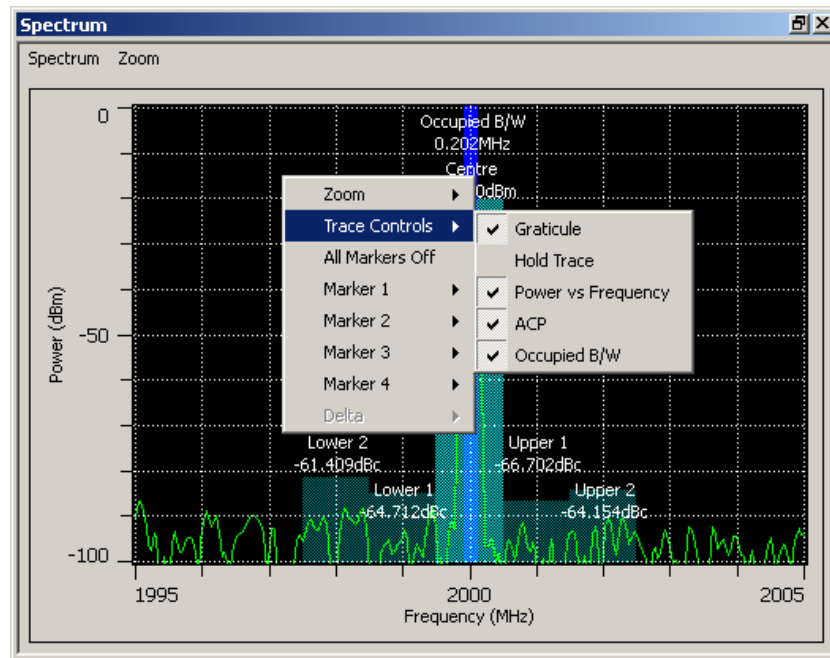
Spectrum



This graph type allows you to display the spectrum of the signal you are measuring, as well as the Occupied Bandwidth (OBW) and Adjacent Channel Power (ACP).

SPECTRUM ANALYSIS PLUGIN

By default, ACP and Occupied Bandwidth are disabled. However, you can enable them through the Graph Control Menu, which can be accessed by right-clicking on the graticule. To enable or disable ACP, Occupied Bandwidth or Power vs Frequency traces, select the 'Trace Controls' menu item, and select the graph type from the item list:



Holding the trace

You can freeze the current set of measurement data in the spectrum trace by accessing the Trace Controls menu item in the Graph Control menu, and checking the 'Hold Trace' item. This freezes the trace until you decide to uncheck this item.

Spectrum marker functions

As well as the standard marker functions described in [Common Plugin Control](#), the spectrum trace also provides extra functionality for markers.

These functions can be found within the Marker section of the Graph Control menu, which is accessible by right-clicking on the Graph Display.

Find Peak

Selecting this menu item moves the marker to the peak of the current spectrum trace.

Next Peak

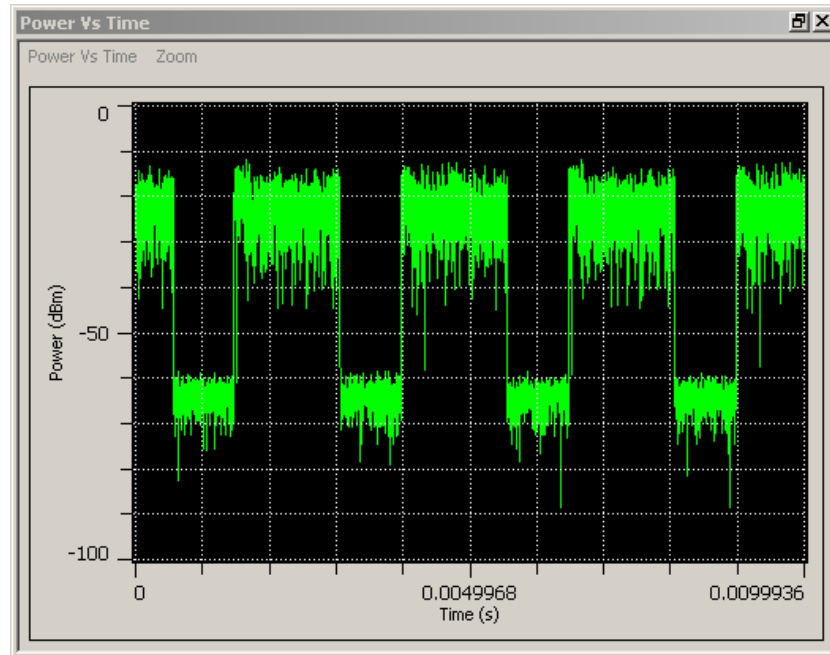
Selecting this menu item moves the marker to the next peak of the current spectrum trace.

Note: Next Peak is enabled only if there is no measurement running, or the trace has been held and if a Find Peak has already been selected.

Track Peak

Checking this menu item causes the marker to move automatically to the peak of the spectrum whenever an update occurs.

Power vs Time

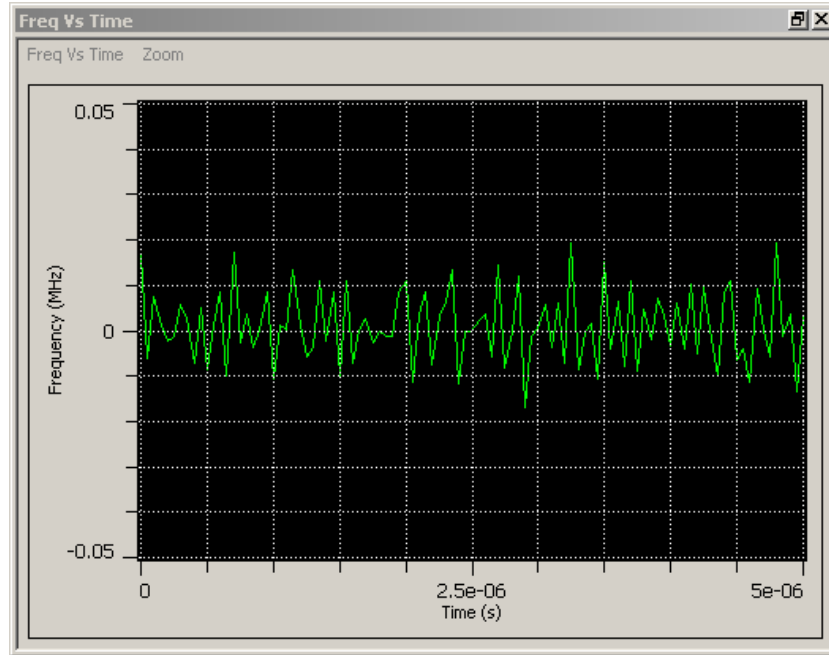


This plot type allows you to display a power vs time trace of the signal you are measuring.

Holding the trace

You can freeze the current set of measurement data in the spectrum trace by accessing the Trace Controls menu item in the Graph Control menu, and checking the 'Hold Trace' item. This freezes the trace until you decide to uncheck this item.

Frequency vs Time

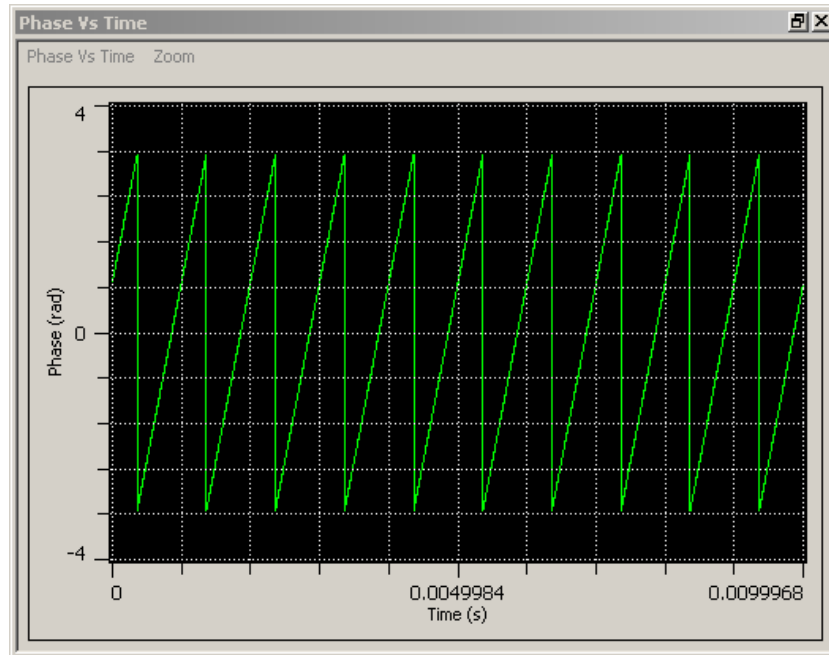


This plot type allows you to display a frequency vs time trace of the signal you are measuring.

Holding the trace

You can freeze the current set of measurement data in the frequency vs time trace by accessing the Trace Controls menu item in the Graph Control menu, and checking the 'Hold Trace' item. This freezes the trace until you decide to uncheck this item.

Phase vs Time



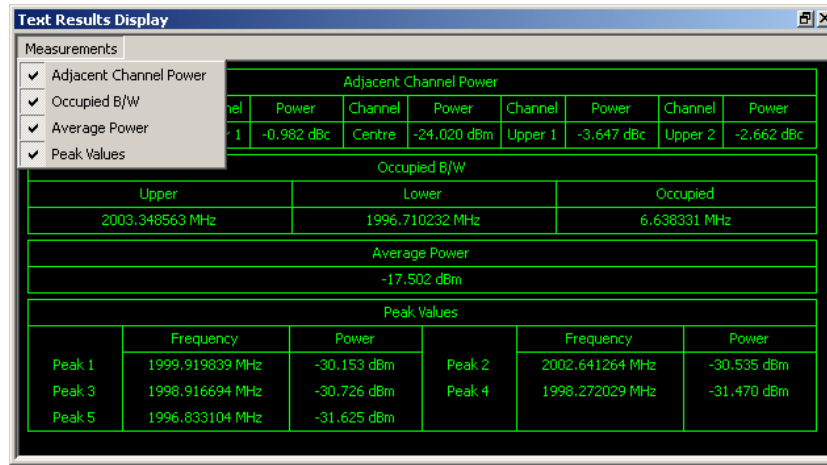
This plot type allows you to display a phase vs time trace of the signal you are measuring.

Holding the trace

You can freeze the current set of measurement data in the phase vs time trace by accessing the Trace Controls menu item in the Graph Control menu, and checking the 'Hold Trace' item. This freezes the trace until you decide to uncheck this item.

The Text Results Display panel

This panel displays the results of measurements in a text format.



The measurements that can be displayed here are Adjacent Channel Power, Occupied Bandwidth, Average Power and Peak Values. To enable each measurement, simply select the item on the Measurements menu and the measurement appears in the main panel. To disable a measurement, select it again in the menu.

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1. DEFINITIONS

The following expressions will have the meanings set out below for the purposes of this Agreement:

Add-In Application Software	Licensed Software that may be loaded separately from time to time into the Designated Equipment to improve or modify its functionality
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