

Advanced Signal Generation and Analysis System, V2.6.2



- Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz
- Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz
- Giga-tronics SRM100A AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz
- Giga-tronics AXIe System Chassis:
 - CHSIS2A AXIe System Chassis: 2-Channel or
 - CHSIS4A AXIe System Chassis: 4-Channel

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Warning, Caution, Note

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A WARNING notice calls out a hazard. It calls attention to an operating procedure or practice that if not correctly followed or adhered to, could result in either death or personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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NOTE

A NOTE emphasizes a point, reminds about something, or indicates a minor problem with the outcome because of what is being done.

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In this document...

This document describes information for the Giga-tronics Advanced Signal Generation and Analysis System when used in an AXIe system connected to a system controller (computer).

When configured together, the following four AXIe system components form the Giga-tronics Advanced Signal Generation and Analysis System:

- Giga-tronics ASGM18A AXIe Advanced Signal Generator (ASG)
- Giga-tronics ASAM18A AXIe Advanced Signal Analyzer (ASA)
- Giga-tronics SRM100A AXIe System Reference Module
- Giga-tronics AXIe System Chassis:
 - CHSIS2A AXIe System Chassis: 2-Channel
 - CHSIS4A AXIe System Chassis: 4-Channel

Select how to operate and control:

There are three different ways to operate and control the AXIe system components; they can be operated and controlled through either the GUI, Parallel Interface (Option BCD), or API.

This document focuses on operation and control through the **GUI** and the **Parallel Interface** (Option BCD):

- **GUI** –of the Advanced Signal Control (ASC) software can be used for operation and control through the PCIe or USB interface on each ASG and ASA
- **Parallel Interface** (Option BCD) – send BCD commands, from the system controller, to a custom interface box, that is connected to the Parallel Interface of each ASG and ASA
- **API** – send API commands in C# or C++ through the PCIe or USB interface on each ASG and ASA

For information on operation and control of AXIe system components through **API** commands, refer to the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396).

NOTE

In many places throughout the **GUI** software, both the ASGM18A AXIe Advanced Signal Generator (ASG) and the ASAM18A AXIe Advanced Signal Analyzer (ASA) are referred to as a “**blade**”.

Chapter 1. Using the Advanced Signal Control GUI

This chapter describes the Graphic User Interface (GUI) windows of the Advanced Signal Control (ASC) software.

NOTE

In many places throughout the **GUI** software, both the ASGM18A AXIe Advanced Signal Generator (ASG) and the ASAM18A AXIe Advanced Signal Analyzer (ASA) are referred to as a “**blade**”.

1.1 Connection Selections Window

The Connection Selections window is displayed each time the ASC software is started and displays all blades (ASG or ASA) available to the system controller (computer).

On boot-up, the ASC software scans the PCIe and USB interfaces for chassis and blades that can be connected.

NOTE

- You must select to use either PCIe or USB; the PCIe is selected by default.
- The ASC Software GUI only allows control of the AXIe system components through a PCIe connection or through search USB connections; both cannot be used at the same time.
- The ASC Software will not search for USB connections when the PCIe is connected; to use the USB, you must select USB on the Connection Selections window.
- If you don't have a PCIe connection from the system controller to the AXIe system components, you must use the USB interface.
- If you don't have a PCIe connection the system will automatically search for USB connections.

(Optional) Connecting to a Demo Blade

- If the ASC software **does not** detect any hardware connected to the PCIe or USB interfaces, the Connection Selections window displays a blade named **Demo**. Even though the Demo blade isn't a real hardware connection, it can be useful when learning about navigation and viewing of the available menus and screens in the ASC software.

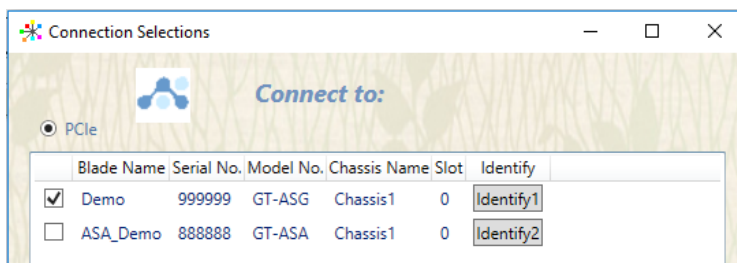


Figure 1 Connection Selections Window (1 of 2)

Connecting to a Blade

- If the ASC software **does** detect hardware connected to the PCIe or USB interfaces, the blades (ASG or ASA) are displayed on the Connection Selections window.

The Connection Selections window displays all blades available on the PCIe or USB interface. The PCIe interface can communicate with all blades in an AXIe chassis, but when the USB interface is selected, a separate USB cable is required to communicate with each individual blade.

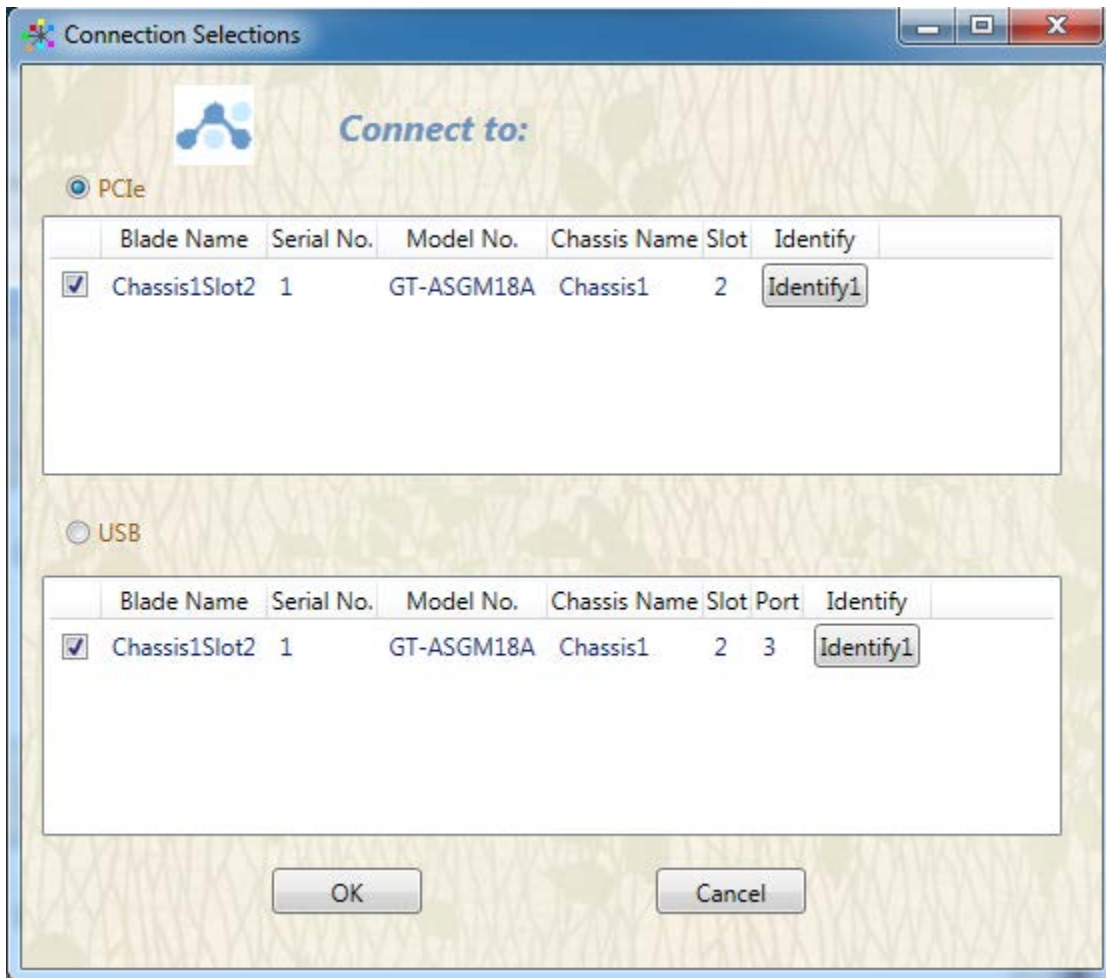
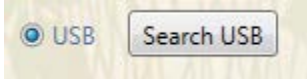


Figure 2 Connection Selections Window (2 of 2)

Name	Description
PCIe and USB radio buttons	<p>Selects a blade connection through a PCIe interface or a USB interface. The PCIe interface can communicate with all blades (ASG or ASA) in an AXIe chassis, but when the USB interface is selected, a separate USB cable is required to communicate with each individual blade.</p> <p>NOTE</p> <ul style="list-style-type: none"> • You must select to use either PCIe or USB; the PCIe is selected by default. • The ASC Software GUI only allows control of the AXIe system components

	<p>through a PCIe connection or through USB connections; both cannot be used at the same time.</p> <ul style="list-style-type: none"> • The ASC Software will not search for USB connections when the PCIe is connected; to use the USB, you must select USB on the Connection Selections window. • If you don't have a PCIe connection from the system controller to the AXIe system components, you must use the USB interface. • A separate USB cable must be connected from the system controller to each ASG or ASA in the system. • If you don't have a PCIe connection the system will automatically search for USB connections.
Search USB button	<p>The Search USB button only displays when USB cables are connected from the system controller to an ASG or an ASA.</p> 
Blade check box	Check or uncheck the check box next to the blade being connected.
Blade Identify button	<p>Click Identify to identify the connected blade position in a chassis. A flashing LED, on the blade, indicates the corresponding blade in a chassis. Click Identify again to stop the LED flashing and change it back to its normal status.</p>
OK button	Click OK to connect to the selected blades that have been checked.
Cancel button	Click Cancel to exit the ASC software.

1.2 Control Tab Windows

The Control tab is located on the bottom of the Navigation window. Use the Control tab to select basic operation windows.

1.2.1 System

1.2.1.1 Configuration Window

Clicking Configuration from the System drop-down menu opens the Configuration window; this window is used to configure instrument and blade settings for the entire system.



Figure 3 Configuration Window

Name	Description
Max Temperature of Chassis	Enter a Maximum Temperature in degrees C is used to trigger an alarm in a Monitor window.
Min Temperature of Chassis	Enter a Minimum Temperature in degrees C is used to trigger an alarm in a Monitor window.
Apply button	Click Apply to set values.
Preset button	Click Preset to reset the selected blade.
Add Chassis button	Click Add Chassis to add a chassis Ethernet connection.

1.2.1.1.1 Add Chassis Ethernet Connection

A chassis can be connected through an Ethernet connection. The following is an example to show how to connect a chassis using an Ethernet connection with Microsoft Windows 7.

- 1) Setup TCP/IP property parameters
 - Open the following window (Control Panel > Network and Internet > Network and Sharing Center).

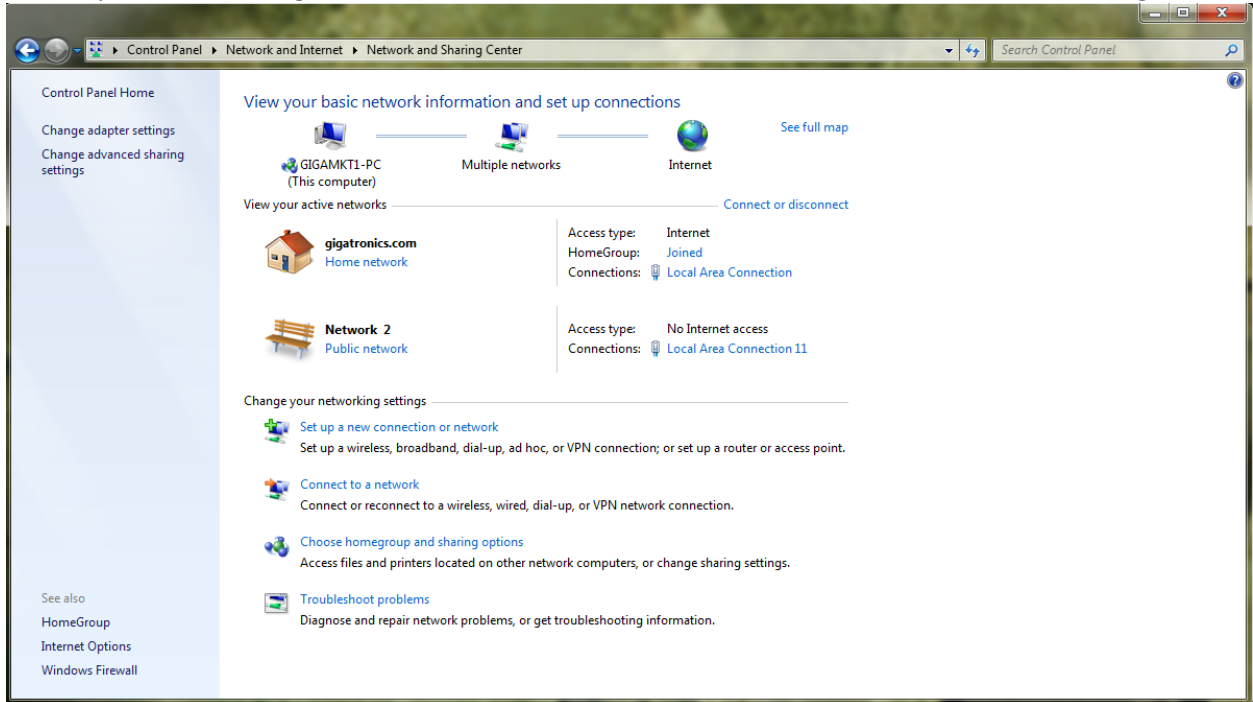


Figure 4 Network and Internet Window

- Select **Local Area Connection 11** to open the following windows.

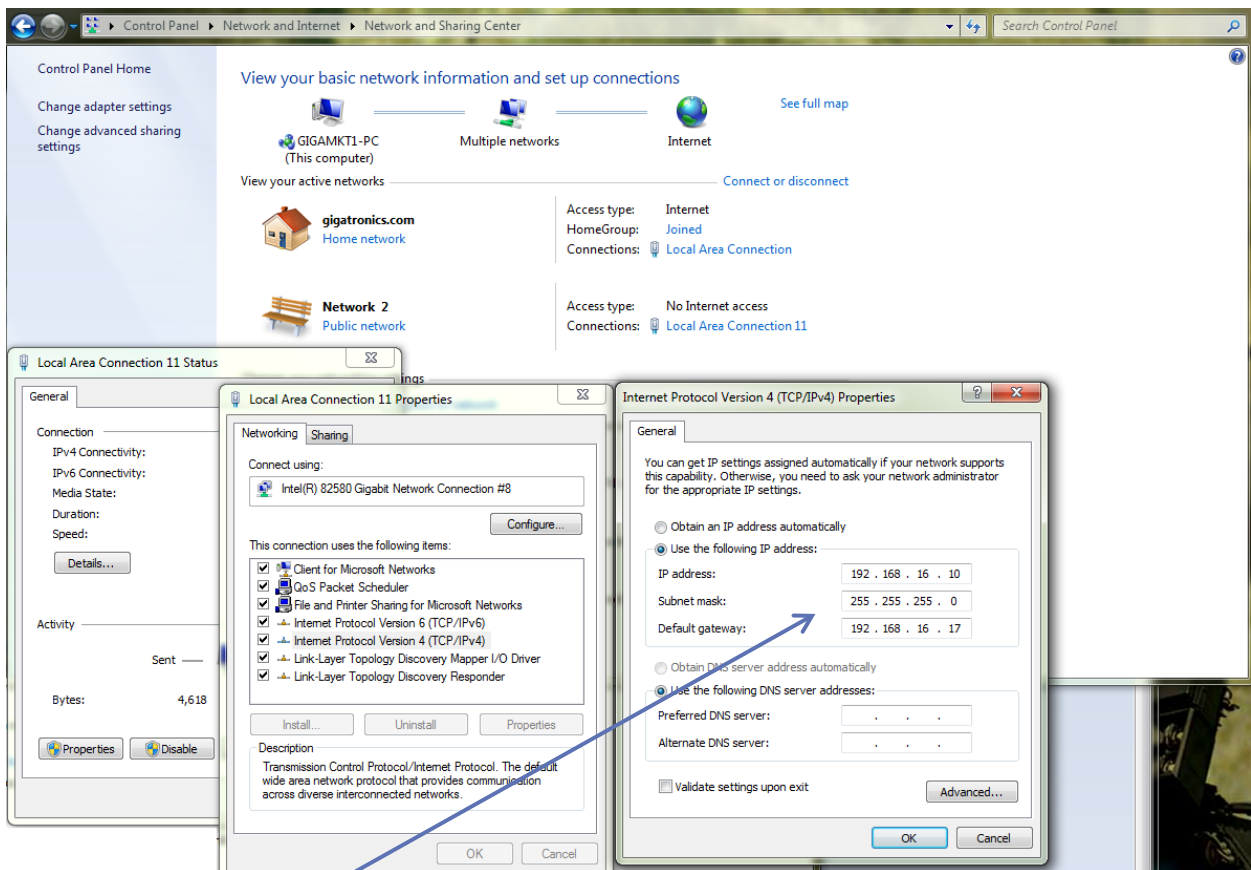


Figure 5 TCP/IP properties setting window

Assigned data example:

- 1) Select **Use the following IP address:**
The default router's LAN IP address is 192.168.16.17. Type in an IP address 192.168.16.x (x is from 2 to 253), subnet mask 255.255.255.0, and default gateway 192.168.16.17. Click the OK button to set the data.
- 2) In Advanced Signal Control software, add a chassis Ethernet connection.
 Click **Add Chassis** to display Add A Chassis dialog box under the Configuration window as shown in the following figure. Click **OK** to connect the chassis through the Ethernet connection. No error message shown means the Ethernet connection is successful.

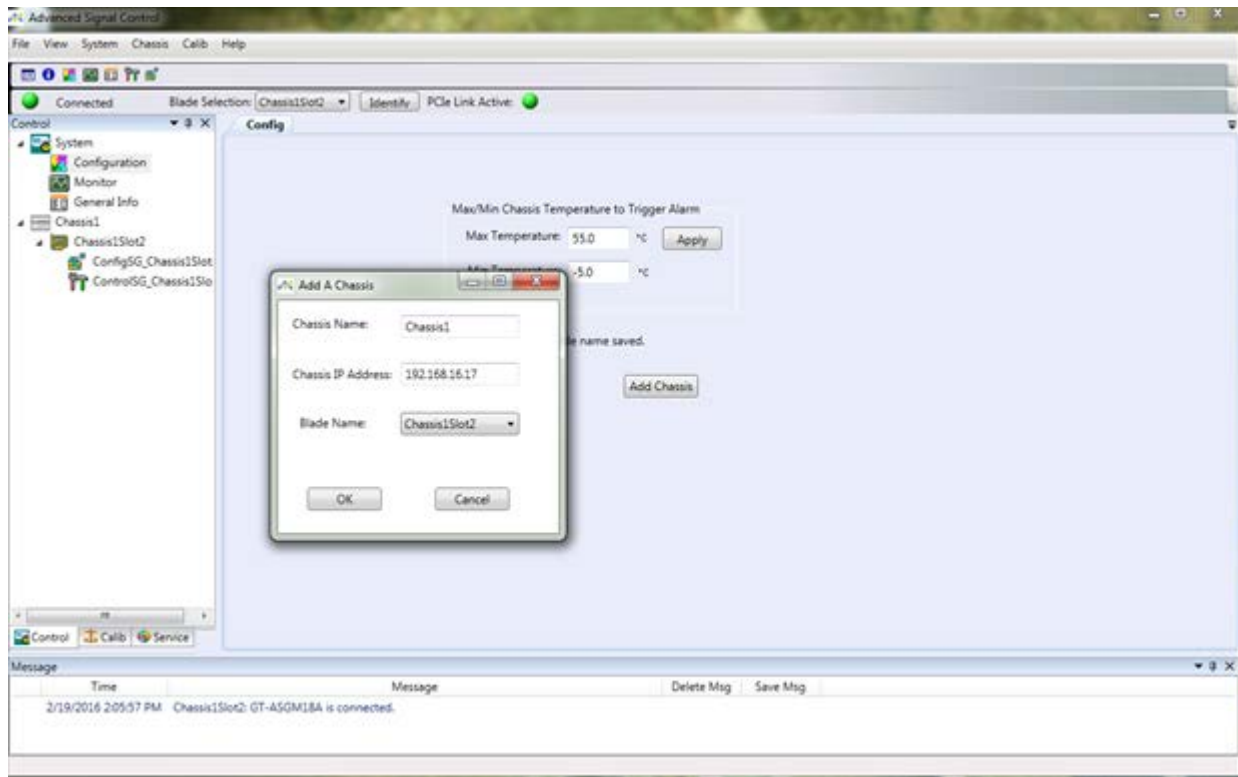


Figure 6 Add a Chassis Dialog Box

NOTE

- Ethernet cannot control Blade functions; it can only be used to read chassis status and error messages.

1.2.1.2 Monitor Window

A Monitor window is used to display blades and chassis status such as temperature, DDS alarm, chassis fan speed, locked or unlock, etc.

An alarm item shows “Off” or “On”. Off means it is normal. “On” indicates there is an alarm condition. Normally, the left status button color is green. The left status button turns Red if at least one alarm is turned “On”.

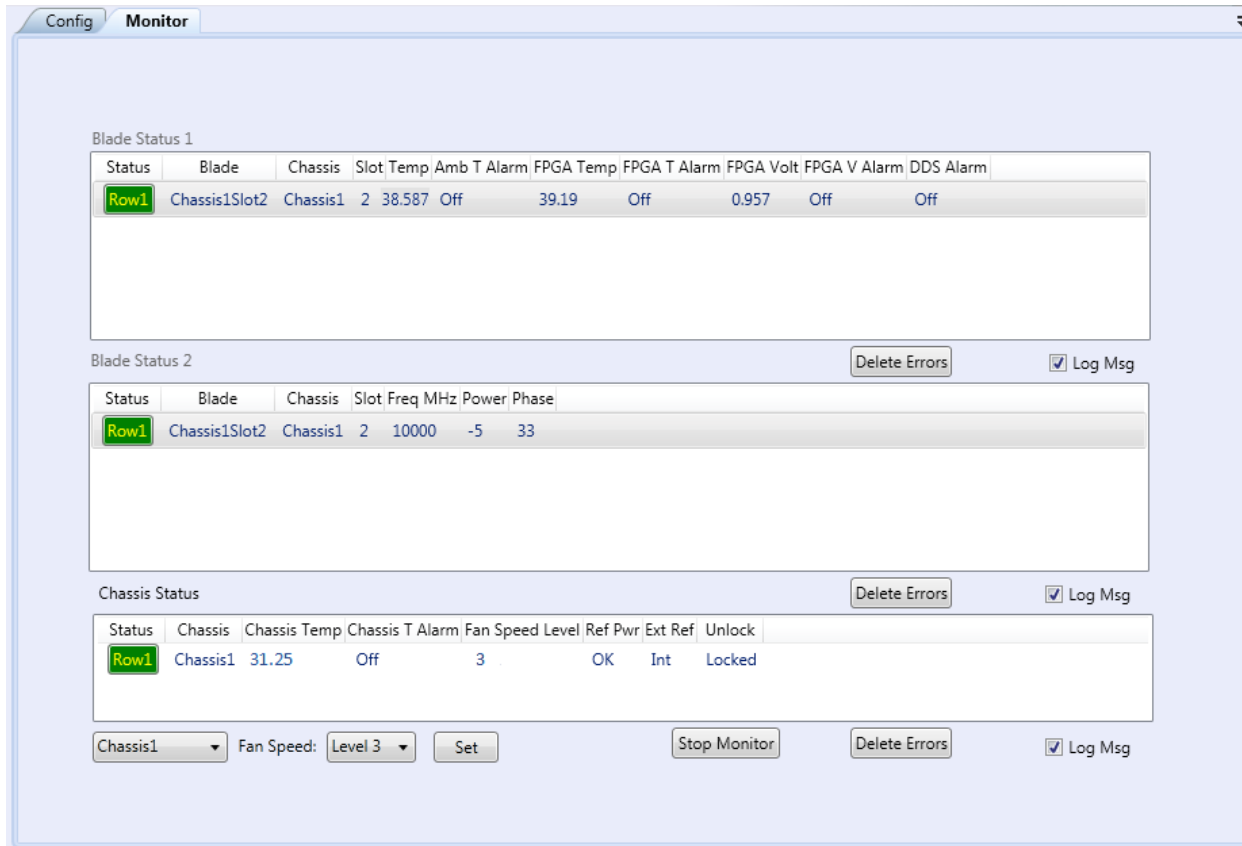


Figure 7 Monitor Window

Name	Description
Start/Stop button	Click Start/Stop to start or stop monitoring the status.
Blade Status list view box	Display all blade status.
Chassis Status list view box	Display all chassis status and the master blade of a chassis status.
Left Status button	Normally, the left status button color is green. The left status button turns Red if one alarm is turned on. Click Red Err Status to display an Error dialog box to show the detail error information.
Delete Errors button	Click Delete Errors to delete all errors shown in the list view box.
Log Msg Check box	Check the Log Msg check box to save the list box status data to a log file under C:\Giga-tronics\Config\GTConfig\DataLog folder.

Chassis drop-down list	Select a chassis from the drop-down list.
Fan Speed drop-down list	Select a chassis fan speed from the drop-down list. The range of a chassis fan speeds are 0 to 15.
Set button	Click Set to set the selected chassis fan speed.

1.2.1.2.1 Monitor Log Msg File

Check Log Msg box to save the list box status data to a log file.

Blade Status 1 data is saved to C:\Giga-tronics\Config\GTConfig\DataLog\DataLogBladeStatus1 folder.

Blade Status 2 data is saved to C:\Giga-tronics\Config\GTConfig\DataLog\DataLogBladeStatus2 folder.

Chassis Status data is saved to C:\Giga-tronics\Config\GTConfig\DataLog\DataLogChassisStatus folder.

Example of Blade Status 1 log file format:

```
Date Time BladeName Slot Temp AmbTAlarm FPGATemp FPGATAlarm FPGAVolt FPGAVAlarm DDSAlarm
11/15/2017 2:51:48 PM Chassis1Slot2 2 35.585 Off 39.605 Off 0.958 Off Off
11/15/2017 2:51:49 PM Chassis1Slot2 2 35.586 Off 39.936 Off 0.957 Off Off
11/15/2017 2:51:51 PM Chassis1Slot2 2 35.583 Off 39.374 Off 0.959 Off Off
```

Example of Blade Status 2 log file format:

```
Date Time BladeName Slot FreqMHz Power Phase
11/16/2017 2:23:05 PM Chassis1Slot2 2 10000 -5 33
11/16/2017 2:23:06 PM Chassis1Slot2 2 10000 -5 33
11/16/2017 2:23:08 PM Chassis1Slot2 2 10000 -5 33
```

Example of Chassis Status log file format:

```
Date Time ChassiseName chassisTemp ChassisTAlarm FanSpeedLevel RefPwr ExtRef Unlock
11/16/2017 2:15:36 PM Chassis1 N/A N/A N/A OK Int Locked
11/16/2017 2:15:37 PM Chassis1 N/A N/A N/A OK Int Locked
11/16/2017 2:15:39 PM Chassis1 N/A N/A N/A OK Int Locked
```

1.2.1.2.2 Monitor Status Error Dialog Box

An alarm item shows “Off” or “On”. “Off” means it is normal. “On” indicates the alarm is on. Normally, the left status button color is green. The left status button turns Red if one of alarms is turned on as showed in the following figure.

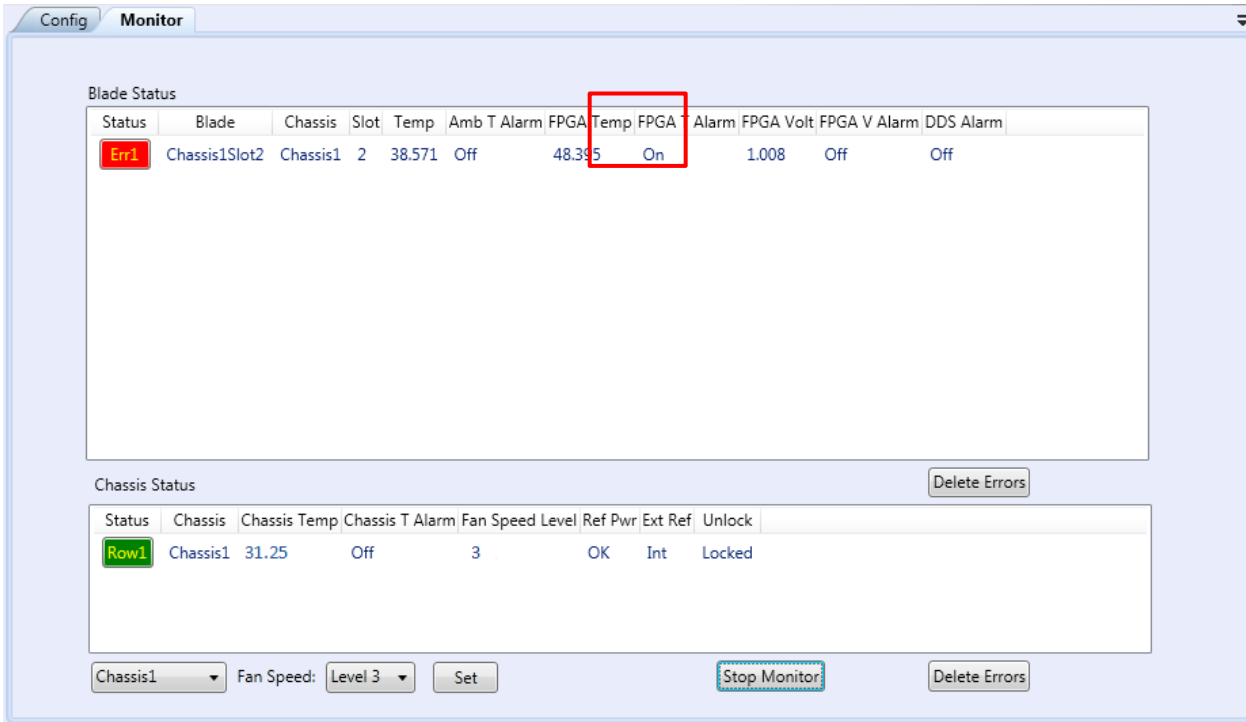


Figure 8 Monitor Window with an Alarm Condition (Temp FPGA)

Click the red status Err button to pop up the Monitor dialog box as shown in a figure below.

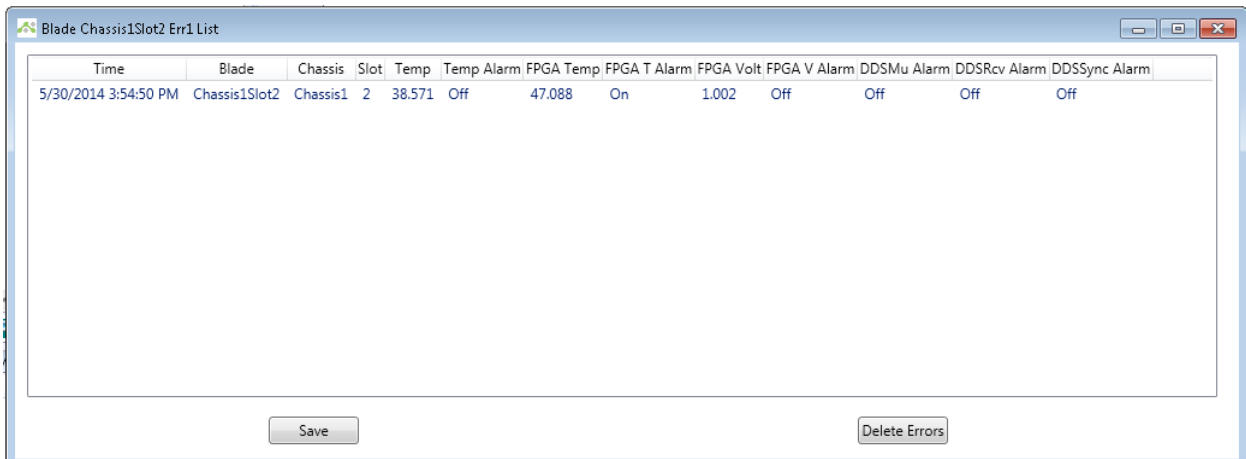


Figure 9 Monitor Status Error Dialog Box

Name	Description
Error list view box	Display detail error status information.
Save button	Click Save to save the list information to a log file.
Delete Error button	Click Delete Error to delete all items in the list box.

1.2.1.3 General Info Window

The General Info window provides the connected blade serial number, model number, DLL version, firmware version, and FPGA version as shown in the following figure.

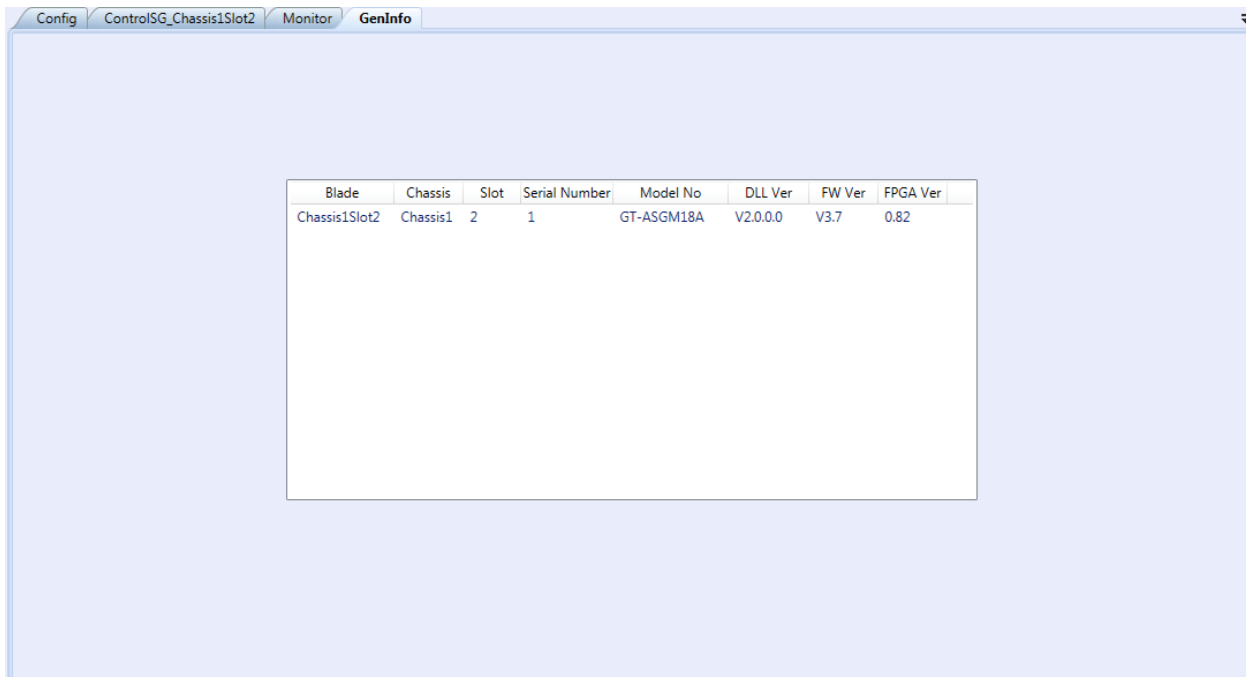


Figure 10 General Info Window

1.2.2 Chassis/Blade

1.2.2.1 Config Window

This Config window allows blade parameters to be set up.

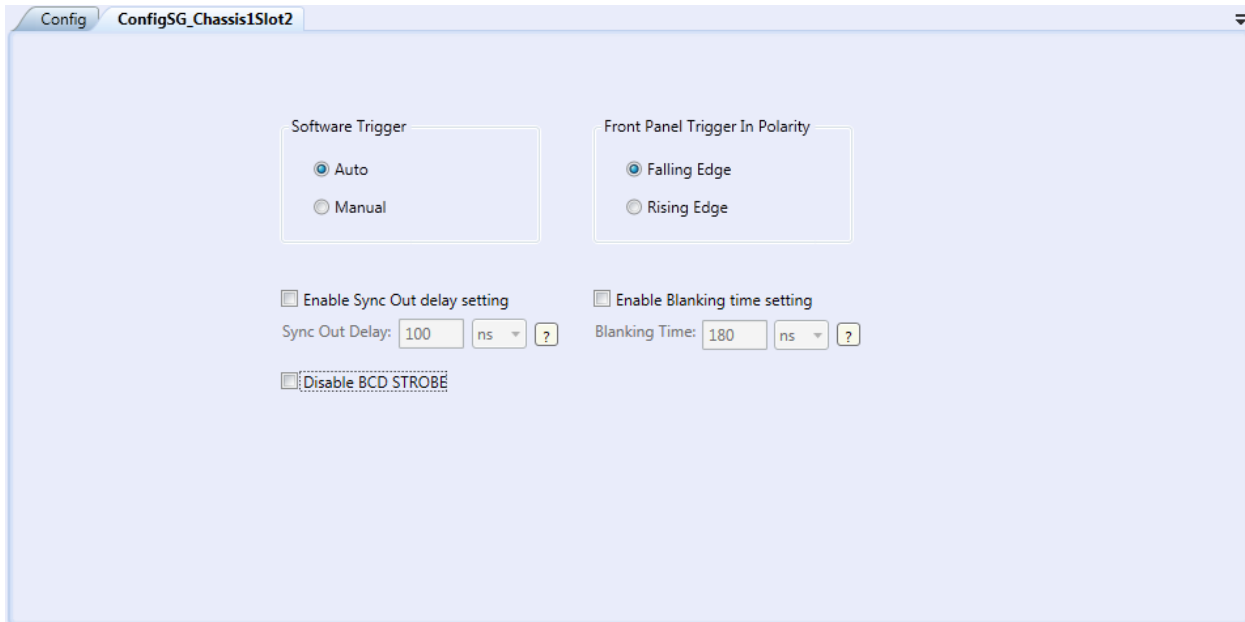


Figure 11 Config Window – Blade

Name	Description
Software Trigger - Auto radio button	Click Auto to select Software Trigger Auto mode. Auto mode means set Software trigger function is called automatically.
Software Trigger - Manual radio button	Click Manual to select Software Trigger Manual mode. A Trigger button is visible in the Control window. Click the Trigger button to set the Software trigger.
Front Panel Trigger In Polarity – Falling Edge radio button	Click Falling Edge to trigger on a falling edge.
Front Panel Trigger In Polarity – Rising Edge radio button	Click Rising Edge to trigger on a rising edge.
Enable Sync Out delay setting checkbox	Select the Enable Sync Out delay setting checkbox to enable Sync Out delay setting.
Sync Out Delay text box	Input the Sync Out Delay value in ns or us. Sync Out Delay range is 100 ns to 210 us.
Enable Blanking time setting checkbox	Select the Enable Blanking time setting checkbox to enable Blanking time setting.
Blanking Time text box	Input the Blanking Time value in ns or us. Blanking time range is 25 ns to 210 us.
Disable BCD STROBE checkbox	Select the Disable BCD STROBE checkbox to disable BCD STROBE.

Name	Description
? button	Click ? to popup the following Sync Out & Blanking Timing diagram.

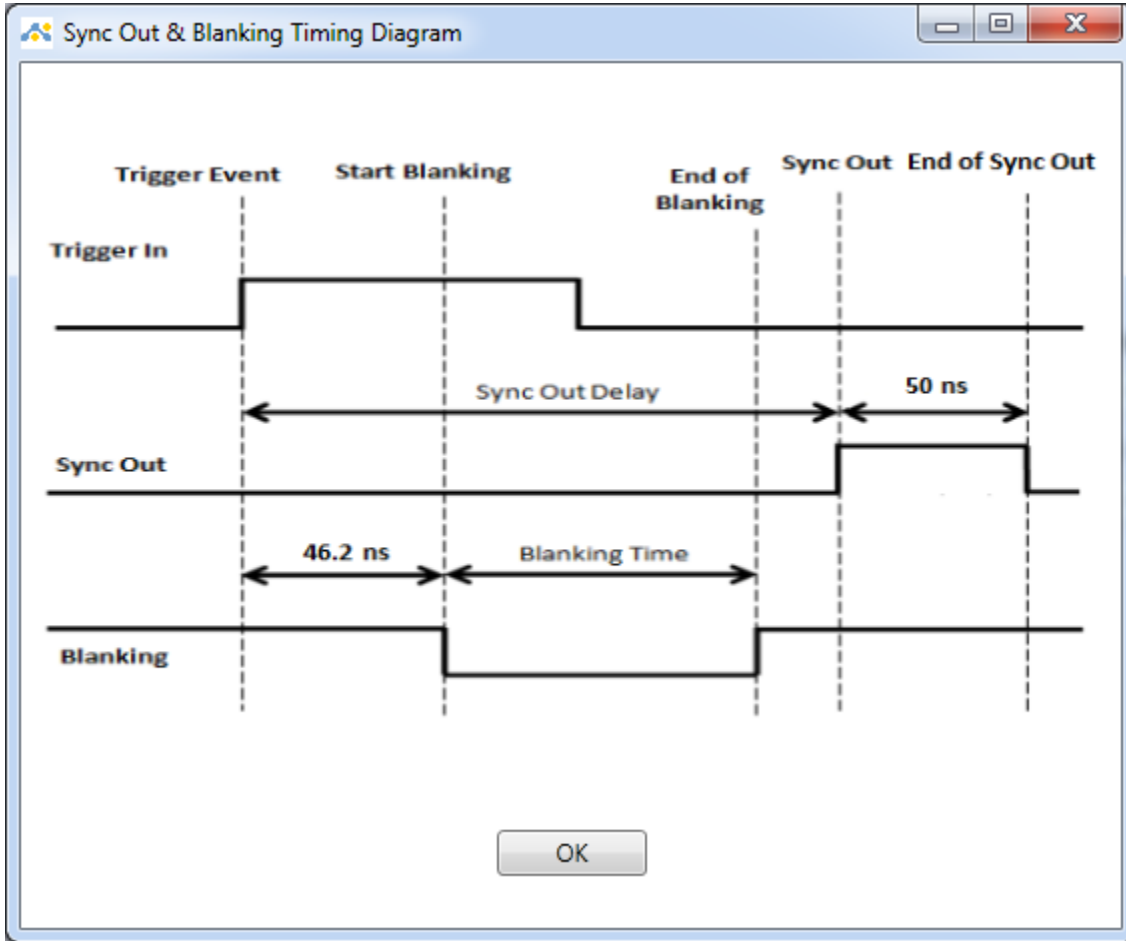


Figure 12 Sync Out & Blanking Timing Diagram

1.2.2.2 Control Window – Signal Generator

A signal generator **Control window** allows a user to set a blade frequency, a power value, a phase value, and turn a switch up or down as shown in the following figure.

The **Control window** consists of a **Menu Bar** at the top left corner. A **Tool Bar**, located directly below this Menu Bar, contains icons that can be used to toggle (On/Off) the window or tab controls available from the View, System, and Chassis menus. Below the Tool Bar is an **LED Indicator Bar** that shows blade connection status.

The **Navigation** window, on the left and under the LED Indicator Bar, changes depending on whether the Control, Calib, or Service tabs are selected. The **Work Area** also changes its content and provides an area for multiple tabbed windows to open. Located at the bottom of the Main window is the **Message** window that displays blade status messages, warning messages, and error messages.

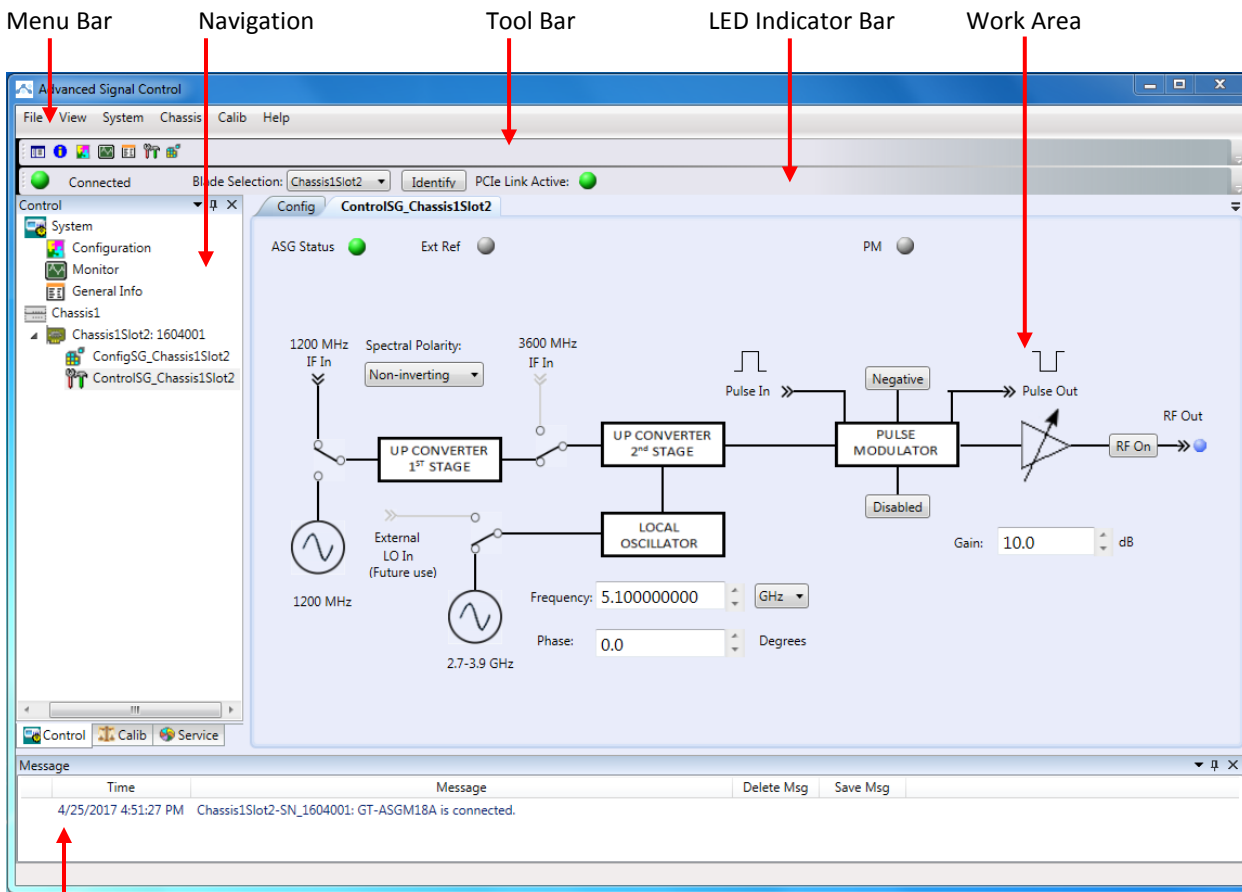


Figure 13 Main Window

Message

Top-left corner LED indicator is a blade status indicator. The following shows the meaning of the status indicator. Check the Message window for error messages.

- A green LED indicates the blade is functioning *normally*.
- A flash yellow LED indicates a warning error such as one or more blade PCIe link down. Check the Message window for error messages.
- A red LED means a hardware error has occurred.

Ext Ref LED shows the status of Ext Ref. A grey LED means it is internal and a blue LED indicates it is external.

PM LED shows the status of the Pulse Modulation. A grey LED means PM is disabled and a blue LED indicates PM is enabled.

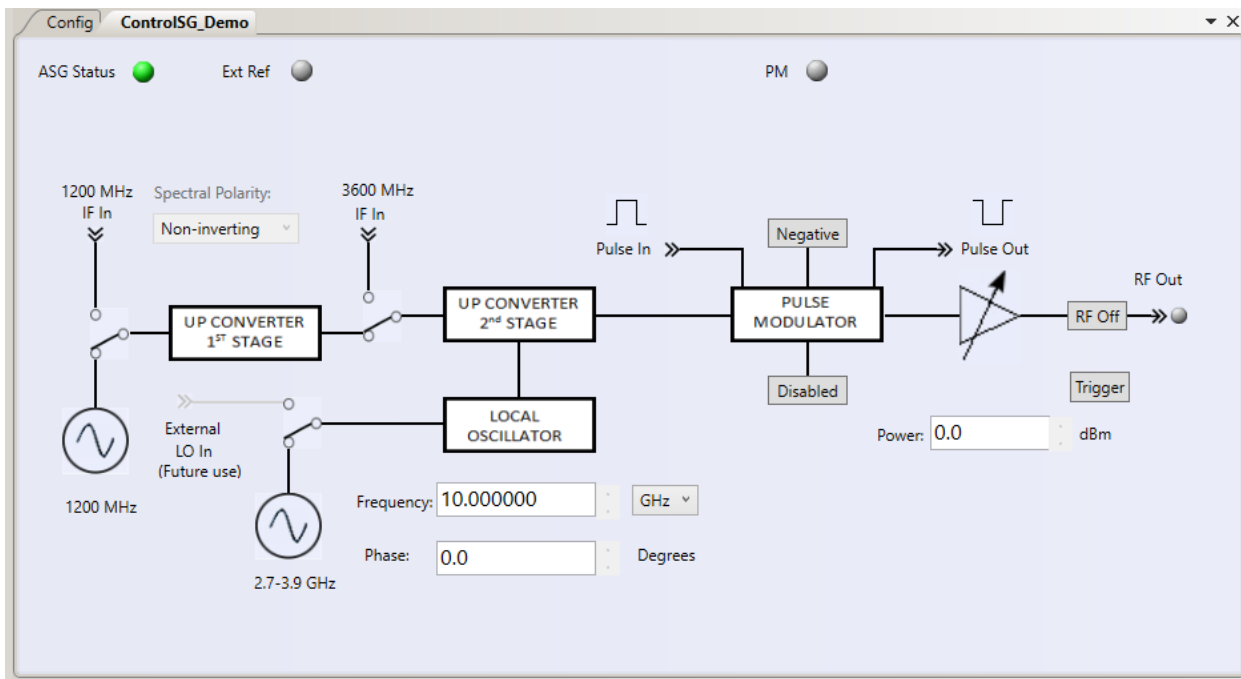


Figure 14 Control Window- Advanced Signal Generator

Name	Description
Frequency text box	Input a frequency value and click the Enter key to set the value. Click an arrow key to set the value.
Frequency unit drop-down list	Select kHz, MHz, or GHz from the drop-down list to set the frequency value.
Trigger button	Click Trigger to set the frequency software trigger. This button is enabled if the Software radio button is selected under Frequency Trigger Type in the blade Config window.
Power text box	Input a Power value and click the Enter key to set the value. Click an arrow key to set the value.
Phase text box	Input a Phase value and click the Enter key to set the value. Click an arrow key to set the value.

Name	Description
1200 MHz IF In and 1200 MHz switch	Click the 1200 MHz IF In switch to select the connection with internal 1200 MHz or the 1200 MHz switch to select the external 1200 MHz IF In. The default selection is internal 1200 MHz. The switch is enabled if the option OPT UP1 is included.
Spectral Polarity Mode Drop-down box	If external 1200 MHz IF In is selected by clicking the 1200 MHz IF In and 1200MHz switch, Spectral Polarity Mode Drop-down box is enabled. Non-inverting or Inverting can be selected.
3600 MHz IF In switch	This switch is disabled. It will be enabled in the future.
External LO In switch	This switch is disabled. It will be enabled in the future.
Enabled/Disabled button	Click Enabled/Disabled to enable or disable Pulse Modulator. <i>PM LED shows the status of the Pulse Modulation. A grey LED means PM is disabled and a blue LED indicates PM is enabled.</i>
Negative/Positive button	Click Negative/Positive to set the PM polarity. Negative is invert pulse and positive is original pulse.
External frequency IF In	It shows external IF In frequency value. The default value is 1200 MHz.
Trigger button	Click Trigger to set Software trigger. This button is visible only if the Software Trigger Manual radio button is selected in the blade Config Window.
RF On/Off button	Click RF On/Off to turn on RF or turn off RF output.

Name	Description
RSSI (Received Signal Strength Indicator) text box	This box shows the received signal value. It is read only.
Frequency text box	Input a Frequency value and click the Enter key to set the value. Click an arrow key to set the value.
Frequency unit drop-down list	Select kHz, MHz, or GHz from the drop-down list to set the frequency value.
Phase text box	Input a Phase value and click the Enter key to set the value. Click an arrow key to set the value.
Gain text box	Input a Gain value and click the Enter key to set the value. Click an arrow key to set the value.
Spectral Polarity Mode drop-down list	Non-inverting or Inverting can be selected.
IF Bandwidth drop-down list	100 MHz or 1 GHz bandwidth could be selected from the list.
External LO In switch	Future use.
3600 MHz IF Out switch	Future use.
Trigger button	Click Trigger to set a Software trigger. This button is visible only if the Software Trigger Manual radio button is selected in the blade Config Window.

1.2.3 Menu Bar

The **Menu Bar**, located at the top left corner of the Main window, contains the following drop-down menus:

- **File** (Exit)
- **View** (Navigation window, Message window)
- **System** (Configuration, Monitor, General Info)
- **Chassis** (Config, Control)
- **Calib** (User Table, Auto Calibration)
- **Help** (About)

1.2.3.1 File

Name	Description
Exit	Exits the Advanced Signal Control software.

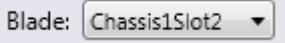
1.2.3.2 View

Name	Description
Navigation window	Show/Hide the Navigation window.
Message window	Show/Hide the Message window.

1.2.3.3 System

Name	Description
Configuration	Opens a system Configuration window.
Monitor	Opens a Monitor window.
General Info	Opens a General Information window.

1.2.3.4 Chassis

Name	Description
Config	Opens the selected blade Configuration window. The blade could be selected from the Main window blade drop-down box shown. 
Control	Opens the selected blade Control window.

1.2.3.5 Calib

Name	Description
User Table	Opens a User Table window.
Auto Calibration	Opens an Auto Calibration window.

1.2.3.6 Help

Name	Description
About	Opens the About window that displays the current version of ASC software.

1.2.4 Tool Bar

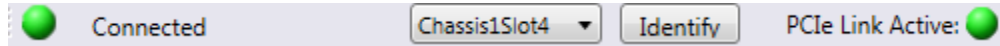
The **Tool Bar**, located directly below the Menu Bar, contains icons that can be used to toggle (On/Off) the window or tab controls available from the View, System, and Chassis menus.



Icon	Description
	Show/Hide the Navigation window.
	Opens and closes the Message window.
	Opens or selects a System Configuration tab.
	Opens a Monitor window.
	Opens a General Information window.
	Opens the selected blade Control window. The blade could be selected from the Main window Blade drop-down box shown as in right figure.
	Opens the selected blade Config window. The blade could be selected from the Main window Blade drop-down box shown as in right figure.

1.2.5 LED Indicator Bar

The LED Indicator Bar displays the connection status of the blade selected by the **Blade Selection** drop-down list. An **Identify** button allows the corresponding hardware blade in the connected AXIe chassis to be identified and the **PCIe Link Active** indicator LED gives a visual that the selected blade is functioning normally.



NOTE

The **PCIe Link Active** indicator LED works only when it detects an active link. In actual use, the ASC software continuously checks on the status of the PCIe link and changes to **No Connection** if the link drops.

If the USB is being used, this **PCIe Link Active** indicator LED is “grayed out”. When using the USB, the ASC software does not continuously check the connection because this action slowed down the responsiveness of the software significantly. There is no **USB Link Active** indicator LED.

Name	Description
Connected/ No Connection indicators	A green LED indicates that Advanced Signal Control has established communication with a blade. A red LED indicates that Advanced Signal Control is not communicating with the selected blade.
Blade Selection Drop-down List	Select a blade from the drop-down list.
Identify Button	Click Identify to check the selected blade position in a chassis. The flashing LED indicates the corresponding blade in a chassis.
PCIe Link Active indicator	This is the blade status indicator. Review the Message window for error messages if any. This indicator is enabled if the blade connected through a PCIe bus. <ul style="list-style-type: none"> • A green LED indicates all blades are functioning <i>normally</i>. • A flashing yellow LED indicates a warning error. Check the Message window for error messages. • A red LED means a hardware error has occurred.

1.2.6 Message Window

The Message window displays blade status messages, warning messages, and error messages.

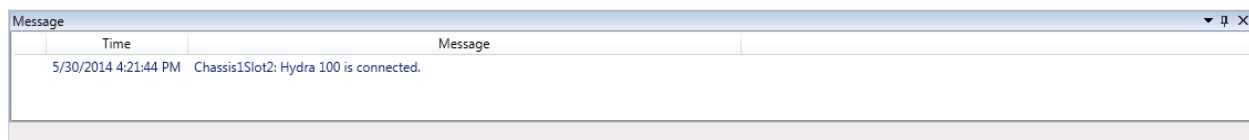


Figure 15 Message Window

1.2.7 Navigation Window

The **Navigation** window provides a tree structure of Advanced Signal Control software and enables navigation between the different windows.

The Navigation window consists of three separate tabs: Control, Calib, and Service.

The Control, Calib, and Service tabs are arranged by functionality. When an item is selected from the Navigation window, the corresponding window opens in the main work area. The Navigation window can be toggled (On/Off) at any time by selecting **VIEW > Navigation window**.

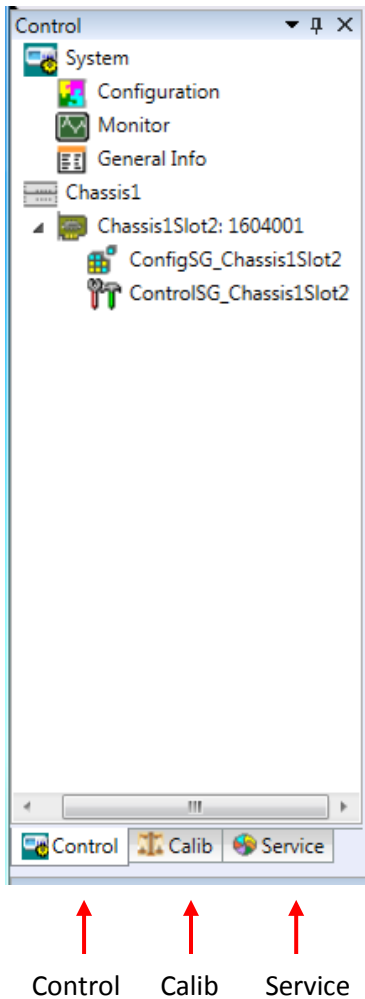


Figure 16 Navigation Window (Control, Calib, and Service Tabs)

1.2.7.1 Control Window – Signal Analyzer

A signal analyzer Control window allows a user to set a blade frequency, a gain and a phase value as shown in the following figure.

CAUTION

NOMINAL OPERATING POWER LEVEL FOR LINEAR OPERATION

- 0 dB is the maximum gain with the Input Range -19.5 to 0 dBm
- 20 dB is the maximum gain with the Input Range -39.5 to -20 dBm
- 40 dB is the maximum gain with the Input Range -60 to -40 dBm

Top-left corner LED indicator is a blade status indicator. The following shows the meaning of the status indicator. Check the Message window for error messages.

- A green LED indicates the blade is functioning *normally*.
- A flash yellow LED indicates a warning error such as one or more blade PCIe link down. Check the Message window for error messages.
- A red LED means a hardware error has occurred.

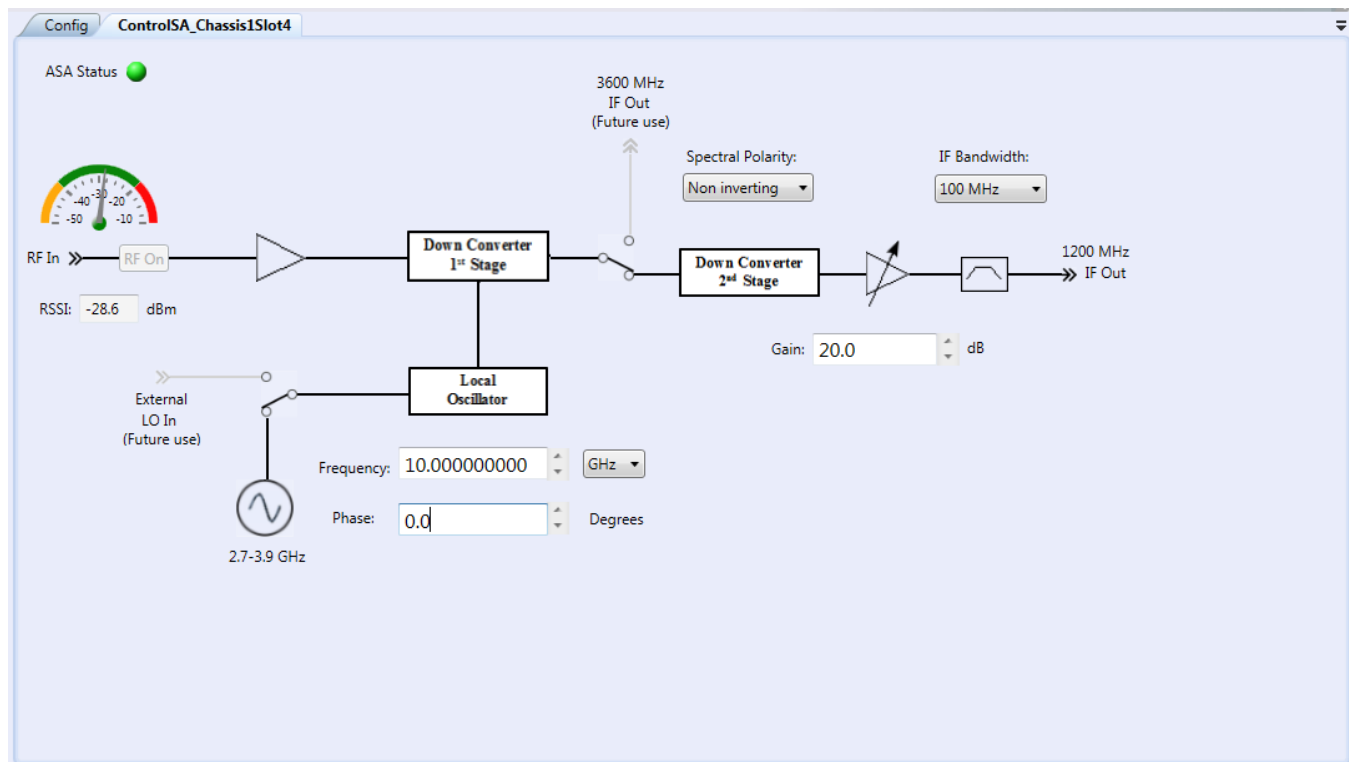


Figure 17 Control Window - Advanced Signal Analyzer

1.3 Calib Tab Windows

Select the Calib tab. Calibration window selections are shown in the left navigation window. User Table and Auto Calibration features are supported for an Advanced Signal Generator blade only.

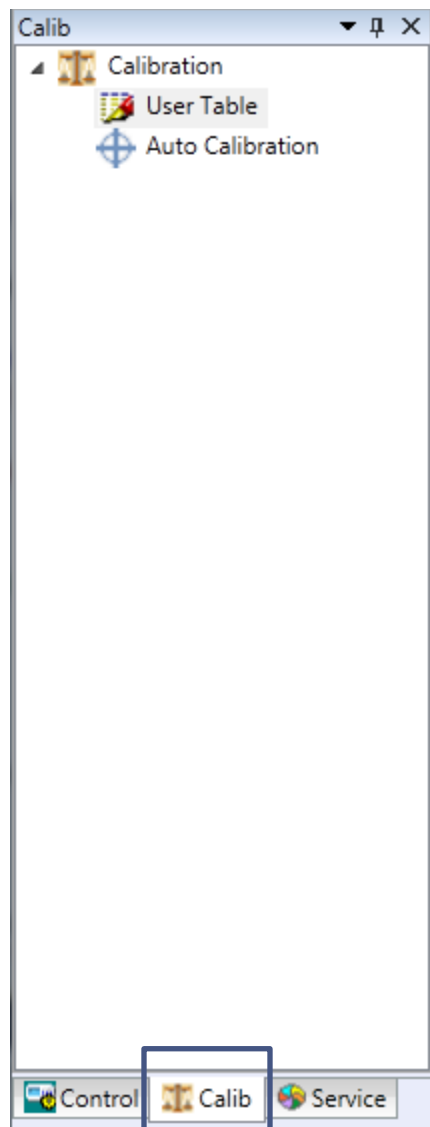


Figure 18 Calib Tab

1.3.1 User Table

Frequency correction and phase correction can be set using user table window. The frequency correction is used for amplitude loss correction. The following figure shows the relationship between frequency and amplitude loss.

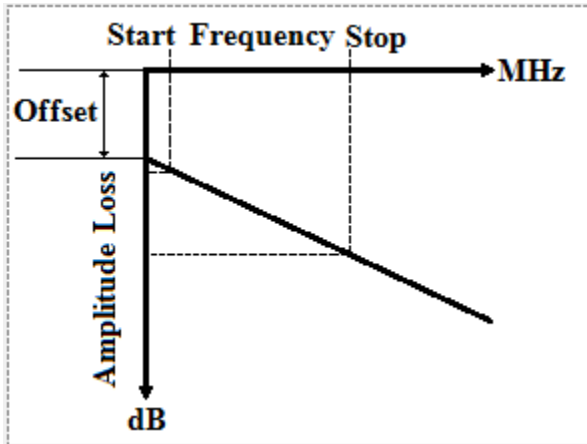


Figure 19 User Table Amplitude Loss

The phase correction is used for phase shift correction.

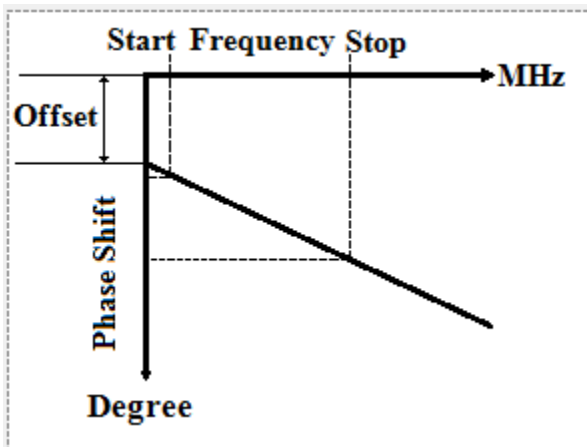


Figure 20 User Table Phase Shift

1.3.1.1 User Table Window

A User Table window is used to download a user table file to an advanced signal generator. The file extension is csv. Frequency correction and phase correction can be set using user table window. The frequency correction is used for amplitude loss correction. Its unit is dB. The phase correction is used for phase shift correction. Its unit is degree.

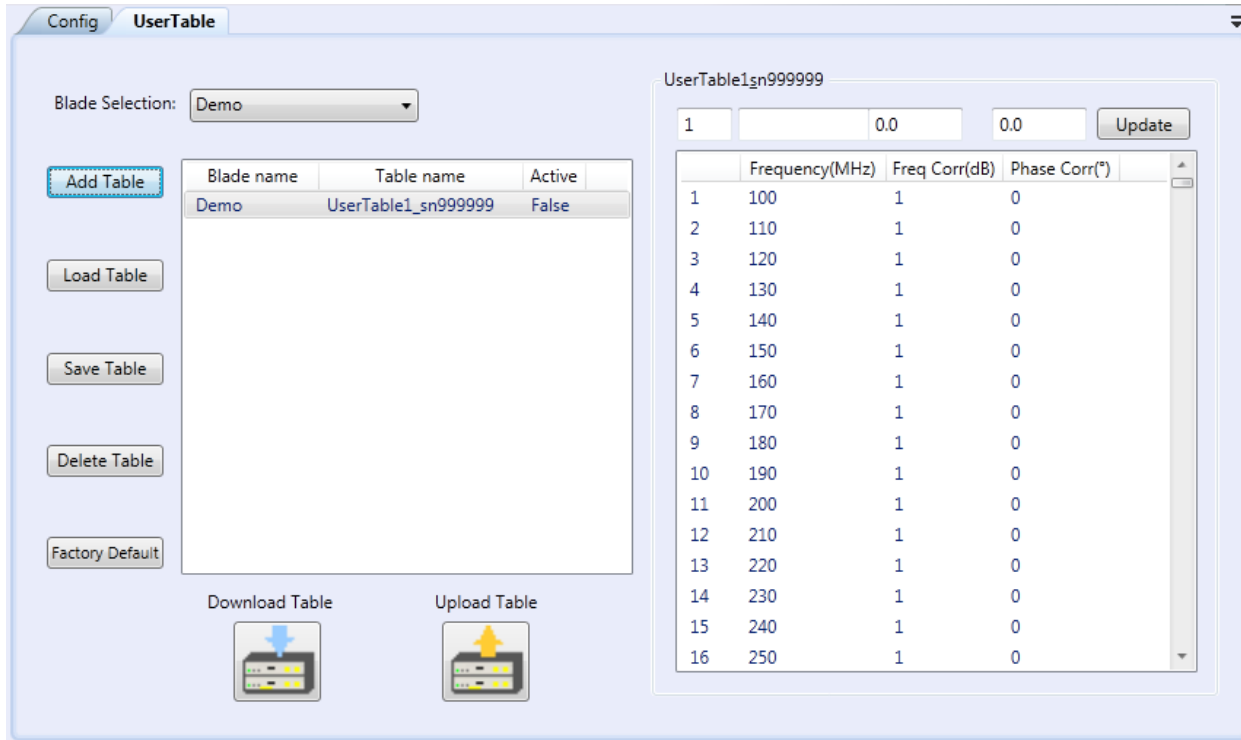


Figure 21 User Table Window

Name	Description
Blade Selection Drop-Down List Box	Select a blade to download a user table file.
Add Table Button	Click Add Table to display the Add User Table window.
Load Table Button	Click Load Table to open a user table file with extension csv Refer to User Table File Format for details.
Save Table Button	Click Save Table to save a user table to a file with extension csv. Refer to User Table File Format for details.
Delete Button	Click Delete to delete a selected user table.
Factory Default Button	Click Factory Default to change the selected user table to the factory default user table in a device.
Download Table Button	Click Download Table to download the selected user table to a device.
Upload Table Button	Click Upload Table to upload the device user table.
Left List Box	The list box is used to display user table names. Active is True if the user table is downloaded. Active is False if the user table isn't downloading.
Update Button and Right List Box	The list box is used to show the detail information of the selected user table. It contains Frequency in MHz, Frequency correction in dB, and Phase correction in degree.

Name	Description
	<p>Click Update to update the modified data to the user table. Select one line or multi-lines from the right list box. Change value in the text boxes which are above the list box and click Update to set the values in the selected lines. Frequency values are read only. Frequency step is 10 MHz.</p>

1.3.1.2 Add User Table Window

Add User Table window is a user table editor. It allows a user to input frequency and phase correction numbers to generate a user table. A constant number or a slope number could be selected to build a user table. A linear equation is used to generate a user table if the slope number selected.

NOTE

A linear equation: $y = mx + b$ (m is the slope. b is the offset.)

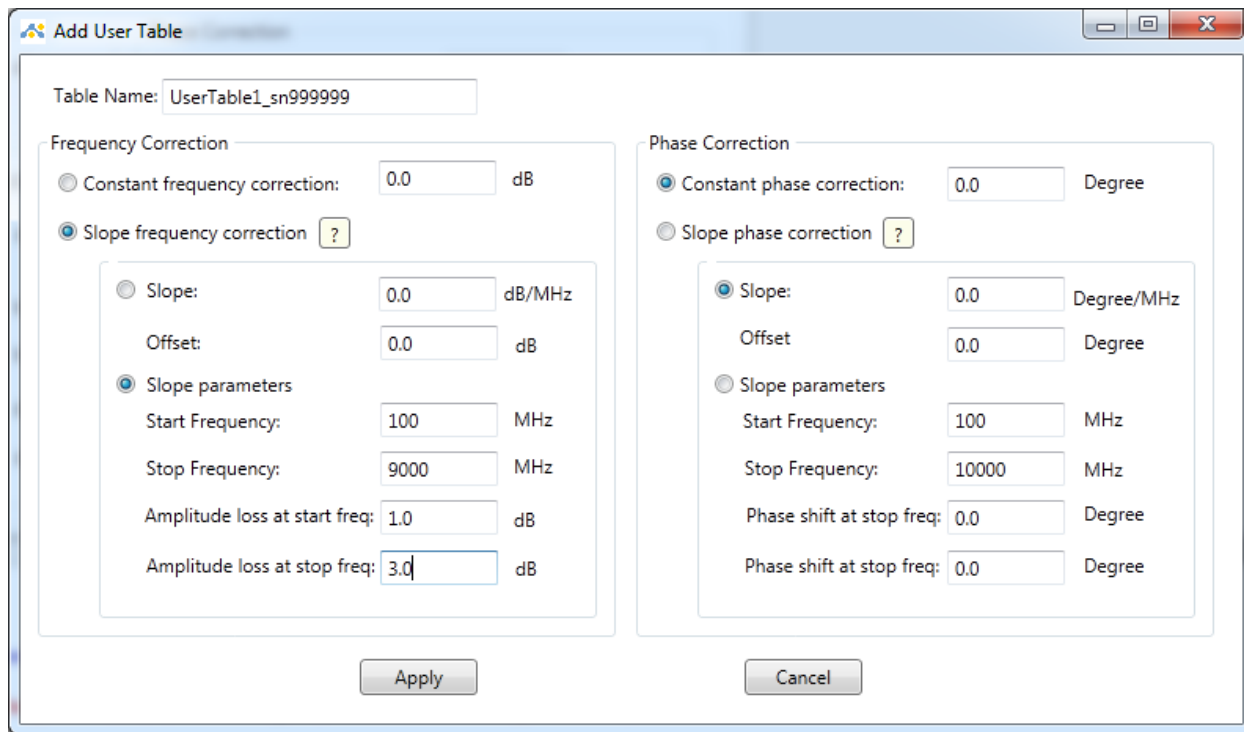

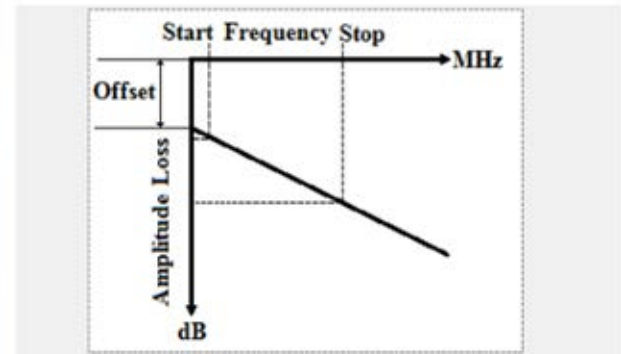
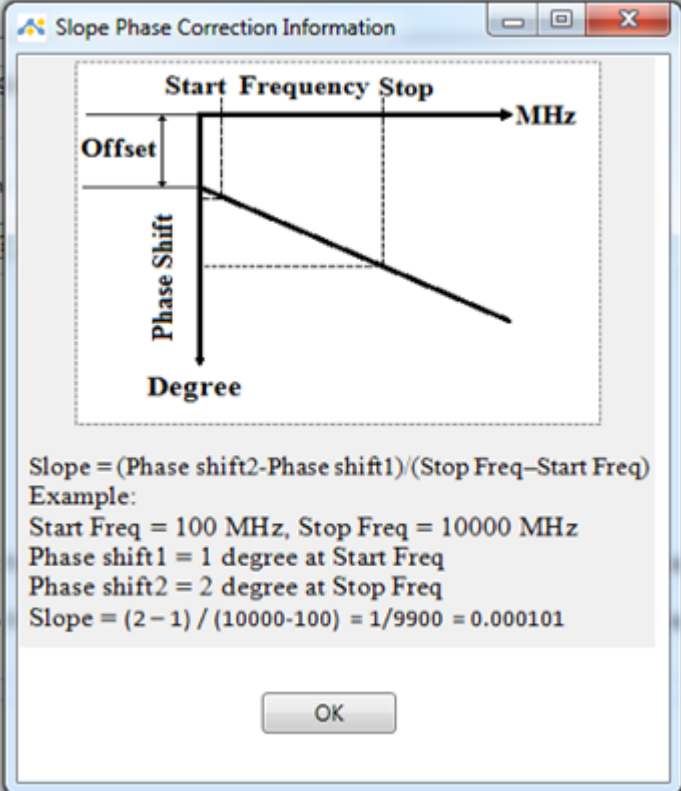


Figure 22 Add User Table Window

Name	Description
Blade Selection Drop-Down List Box	Select a blade to download a user table file.
Constant Frequency Correction Radio Button	Select Constant Frequency to input a fixed number for all frequency corrections.
Constant Frequency Correction Text Box	Input a Constant Frequency Correction number for all frequency corrections.
Slope Frequency Correction Radio Button	Select Slope to use a linear equation with slope and offset to generate a user table data.
 Button	Click button to display the following dialog box. It shows you how to calculate a slope for a linear equation. <div data-bbox="467 600 1146 1234" style="border: 1px solid gray; padding: 10px; margin: 10px 0;">  <p style="text-align: center;">Slope = (Amp Loss2 - Amp Loss1) / (Stop Freq - Start Freq)</p> <p style="text-align: center;">Example: Start Freq = 100 MHz, Stop Freq = 9000 MHz</p> <p style="text-align: center;">Amp Loss1=1 dB at Start Freq, Amp Loss2=3 dB at Stop Freq</p> <p style="text-align: center;">Slope = (3-1) / (9000 - 100) = 1/4450 = 0.000225</p> </div>
Slope Radio Button	Select Slope to input a slope and an Offset number.
Slope Text Box	Input a slope number.
Offset Text Box	Input an offset number.
Slope Parameters Radio Button	Select Slope Parameters to input frequency and amplitude loss at the frequency parameters to generate a user table data using a linear equation based on start and stop points values.
Start Frequency Text Box	Input start frequency.
Stop Frequency Text Box	Input stop frequency.
Amplitude loss at start frequency Text Box	Input Amplitude loss at start frequency value.
Amplitude loss at stop frequency Text Box	Input Amplitude loss at stop frequency value.
Apply Button	Click Apply to generate a user table and exit the window.
Cancel Button	Click Cancel to exit the window and without user table generated.

Name	Description
Constant Phase Correction Radio Button	Select the button to input a fixed number for all phase correction.
Constant Phase Correction Text Box	Input a number for all phase correction.
Slope Phase Correction Radio Button	Select Slope Phase Correction to use a linear equation with slope and offset to generate a user table data.
<input type="button" value=" ? Button"/>	<p>Click button to display the following dialog box. It shows you how to calculate a slope for a linear equation.</p>  <p>Slope = $(\text{Phase shift2} - \text{Phase shift1}) / (\text{Stop Freq} - \text{Start Freq})$ Example: Start Freq = 100 MHz, Stop Freq = 10000 MHz Phase shift 1 = 1 degree at Start Freq Phase shift 2 = 2 degree at Stop Freq Slope = $(2 - 1) / (10000 - 100) = 1/9900 = 0.000101$</p>
Slope Radio Button	Select the button to input a slope and an offset number.
Slope Text Box	Input a slope number.
Offset Text Box	Input an offset number.
Slope Parameters Radio Button	Select the button to input frequency and phase shift at the frequency parameters to generate a user table data using a linear equation based on start and stop points values.
Start Frequency Text Box	Input start frequency.
Stop Frequency Text Box	Input stop frequency.
Phase Shift at Start Frequency Text Box	Input phase shift at start frequency value.
Phase shift at Stop Frequency Text Box	Input phase shift at stop frequency value.

1.3.1.3 User Table File Format

A user table file is a csv file. It means the file extension is .csv.

Total point of a user table = (Maximum frequency – Minimum frequency) / Step frequency + 1.

Frequency is in MHz. Step frequency is 10 MHz.

Frequency correction is in dB. Phase correction is in degree.

Example:

Minimum frequency = 100 MHz. Maximum frequency = 18000 MHz

Total point of a user table = (18000 - 100) / 10 + 1 = 1791

Data format:

Index,frequency,freqCorrection,phaseCorrection

.....

.....

Total point, frequency,freqCorrection,phaseCorrection

Example:

Minimum frequency = 100 MHz, Maximum frequency = 18000 MHz,

freqCorrection = 1.0, phaseCorrection = 0.0

Total point = 1791

1,100.0,1.0,0.0

2,110.0,1.0,0.0

3,120.0,1.0,0.0

4,130.0,1.0,0.0

5,140.0,1.0,0.0

6,150.0,1.0,0.0

7,160.0,1.0,0.0

8,170.0,1.0,0.0

9,180.0,1.0,0.0

10,190.0,1.0,0.0

11,200.0,1.0,0.0

12,210.0,1.0,0.0

13,220.0,1.0,0.0

14,230.0,1.0,0.0

15,240.0,1.0,0.0

16,250.0,1.0,0.0

17,260.0,1.0,0.0

18,270.0,1.0,0.0

19,280.0,1.0,0.0

20,290.0,1.0,0.0

.....

1789,17980.0,1.0,0.0

1790,17990.0,1.0,0.0

1791,18000.0,1.0,0.0

1.3.2 Auto Calibration Window

Auto Calibration window is used to correct the factory default calibration data.

Connect a 50 Ω load to the RF Output before the auto calibration. The following window shows amplitude accuracy in dB based on a frequency. Log files are saved to C:\Giga-tronics\Config\GTConfig\DataLog\AutoCal folder.

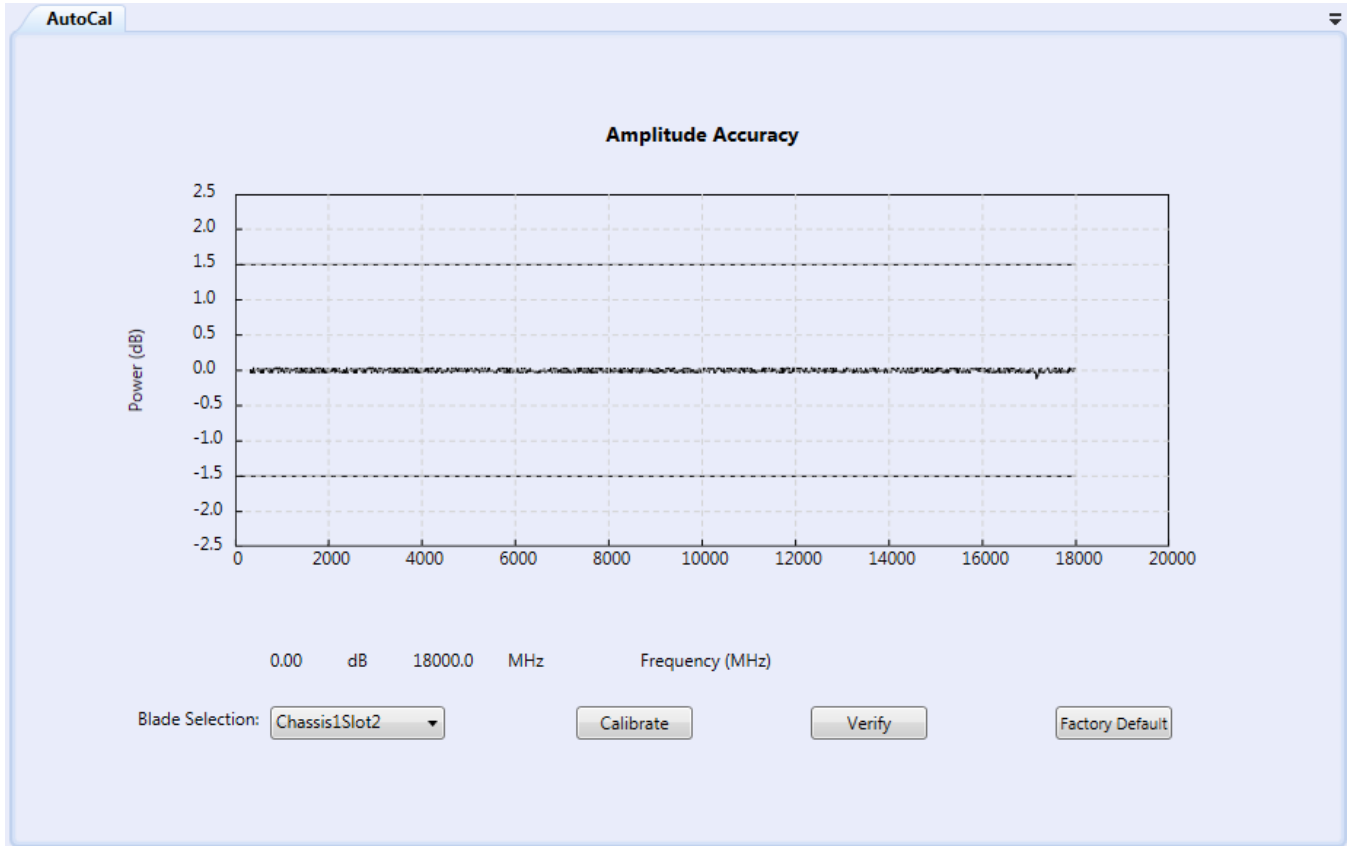
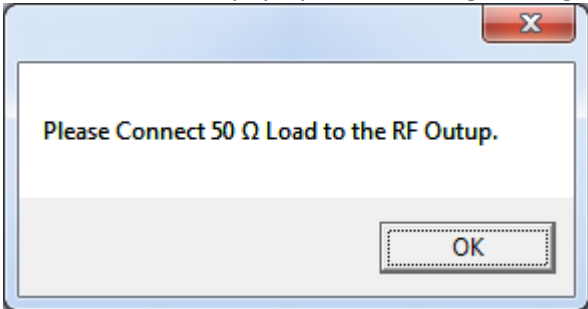
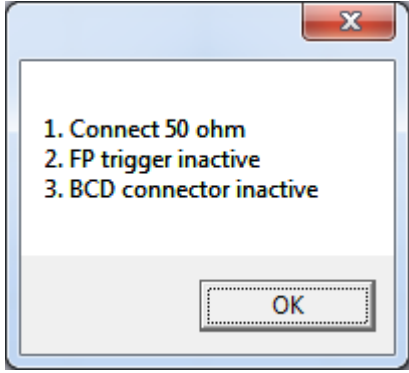


Figure 23 Auto Calibration Window

Name	Description
Blade Selection Drop Down-list Box	Select a blade from the drop-down list box
Calibrate Button	Click the button to pop up the following message box. 
Verity Button	Click the button to display the following message box.

	<p>Complete the steps listed in the message box.</p>  <p>Click OK button to start the calibration data verification.</p>
Factory Default Button	Click the button to change the calibration data to the factory default calibration data.

Click Calibration button. The following steps show auto calibration procedure for each frequency from 100MHz to 18000MHz.

- 1) Read power output;
- 2) Compare the output with the standard factory calibration power level, such as 0dBm or 5dBm
- 3) Adjust the power output if necessary
- 4) Repeat step 1,2,3 Until power output is in the correct power level range
- 5) Save the adjustment into the auto calibration VVA table
- 6) Send the adjusted power value and VVA values from firmware to ASC software for display. VVA value is used to adjust power output for each frequency.
- 7) ASC displays a chart. The chart shows the amplitude accuracy in dB based on a frequency.

Click Verify button. The following steps are checked for each frequency from 100 MHz to 18000 MHz during Verification.

- 1) Read power output value.
- 2) Compare the output value with the saved factory calibration power output value.
- 3) Display a chart. The chart shows the amplitude accuracy in dB based on a frequency.

Click **Restore**. System will reset the entire auto calibration VVA table to 0. It means the factory calibration data is used.

1.4 Service Tab Functions

Service Tab functions are performed using Advanced Signal Control software through a **PCIe interface** or a **USB interface**. The PCIe interface can communicate with all blades (ASG or ASA) in an AXIe chassis, but when the USB interface is selected, a separate USB cable is required to communicate with each individual blade.

NOTE

- To use these Service Tab functions, select to use either PCIe or USB; the PCIe is selected by default.
- The ASC Software GUI only allows control of the AXIe system components through a PCIe connection or through USB connections; both cannot be used at the same time.
- The ASC Software will not search for USB connections when the PCIe is connected; to use the USB, you must select USB on the Connection Selections window.
- If you don't have a PCIe connection from the system controller to the AXIe system components, you must use the USB cables.

The Service Tab functions are shown in the left navigation window.

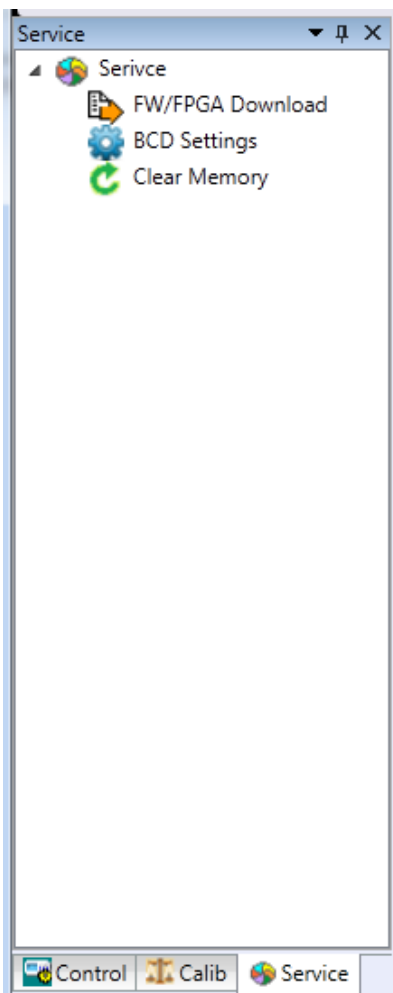


Figure 24 Service Tab

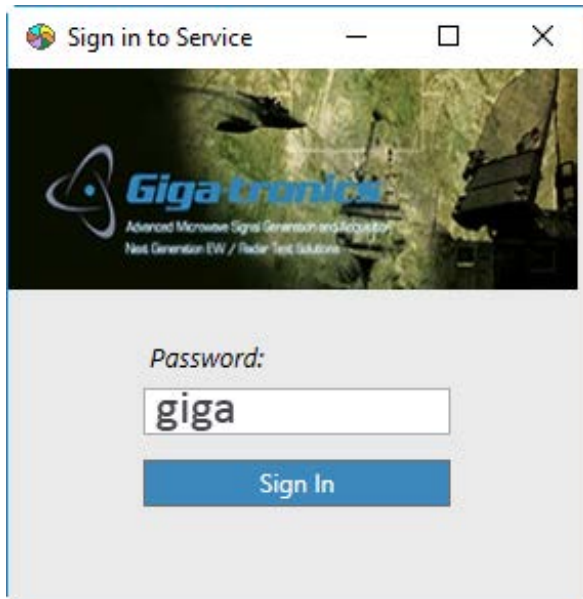


Figure 25 Sign In to Service Dialog Box

1. Select the **Service** tab from the Advanced Signal Control software.
Before accessing service functions, a sign in password is required.
2. Enter the **Password: giga**.
3. From the Service navigation menu, double-click one of the following:
 - FW/FPGA Download – This allows updating ASG / ASA Firmware or FPGA.
 - BCD Settings – This allows changing ASG / ASA default BCD settings.
 - Clear Memory – This allows instrument security and memory clearing of the ASG / ASA memory.

1.4.1 FW/FPGA Download Window

Double-click FW/FPGA Download to open a FW/FPGA download window as follows. This window allows a user to download a Firmware or FPGA file to the ASG or ASA. The blue status box displays the download status.

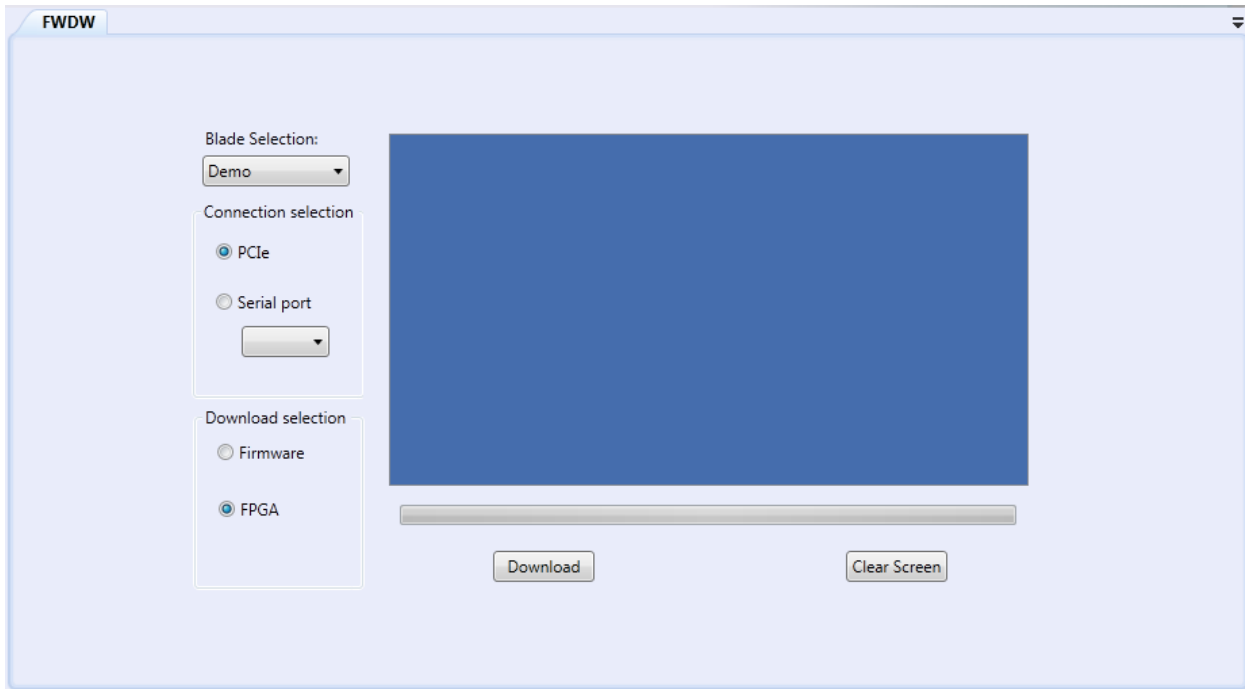


Figure 26 FW/FPGA Download Window

Name	Description
Blade Selection Drop-down List Box	Select a blade from the drop-down list box
PCIe Radio Button	Select PCIe to choose the PCIe bus to download a file.
Serial Port Radio Button	Select Serial Port to choose a serial port to download a file.
Firmware Radio Button	Select Firmware to download a firmware file to a blade. The file extension is srec .
FPGA Radio Button	Select FPGA to download a FPGA file to a blade. The file extension is bin .
Download Button	Click Download to download a selected file to a device.
Clear Screen Button	Click Clear Screen to clear the blue status box text.

NOTE

The Advanced Signal Generation and Analysis System and system controller (computer) **MUST** be rebooted for FW/FPGA changes to take effect.

1. Shut down system controller (computer).
2. Power off all AXIe chassis being used.
 - a. Power on 1st chassis.
 - b. Power on 2nd chassis.
 - c. Power on 3rd chassis, and so on...
3. Power on the system controller (computer).

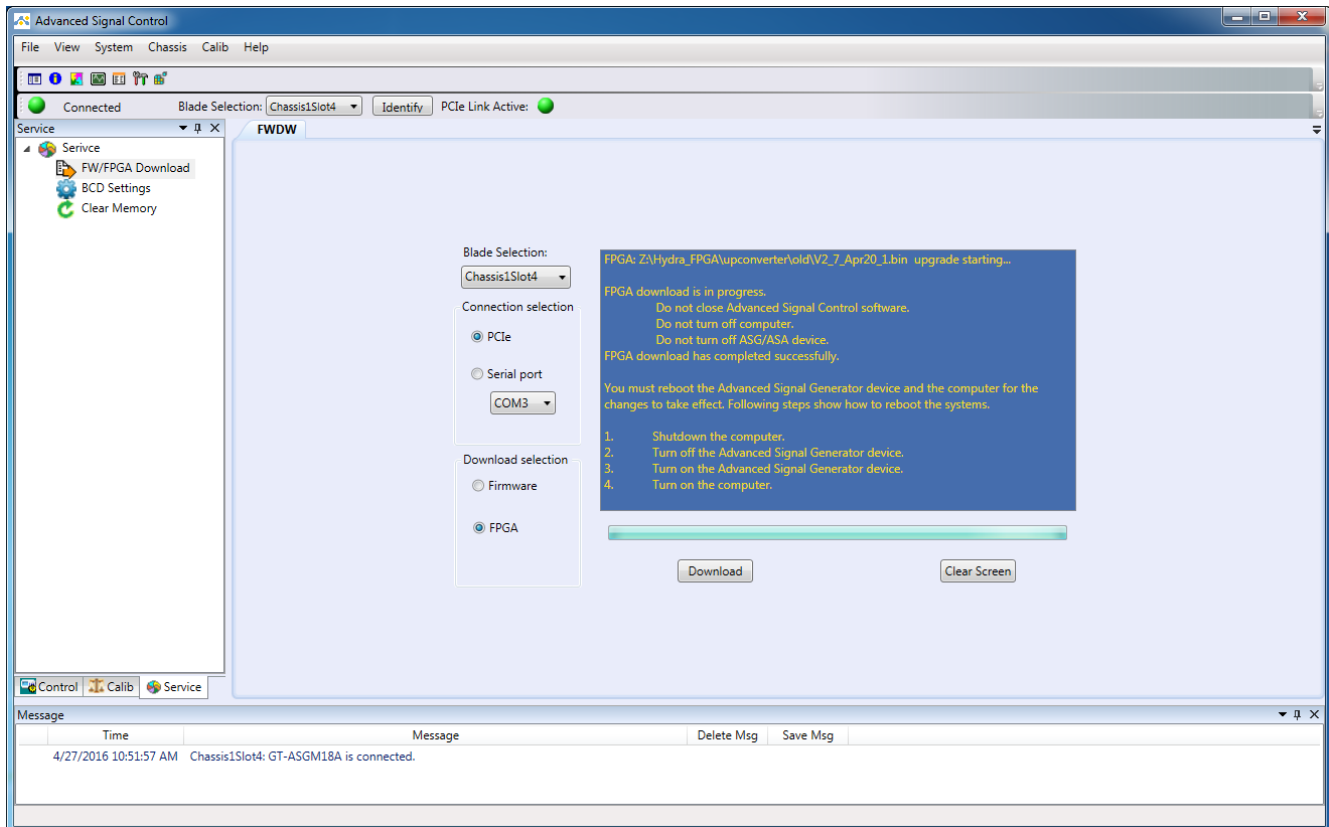


Figure 27 FPGA Download Complete Window

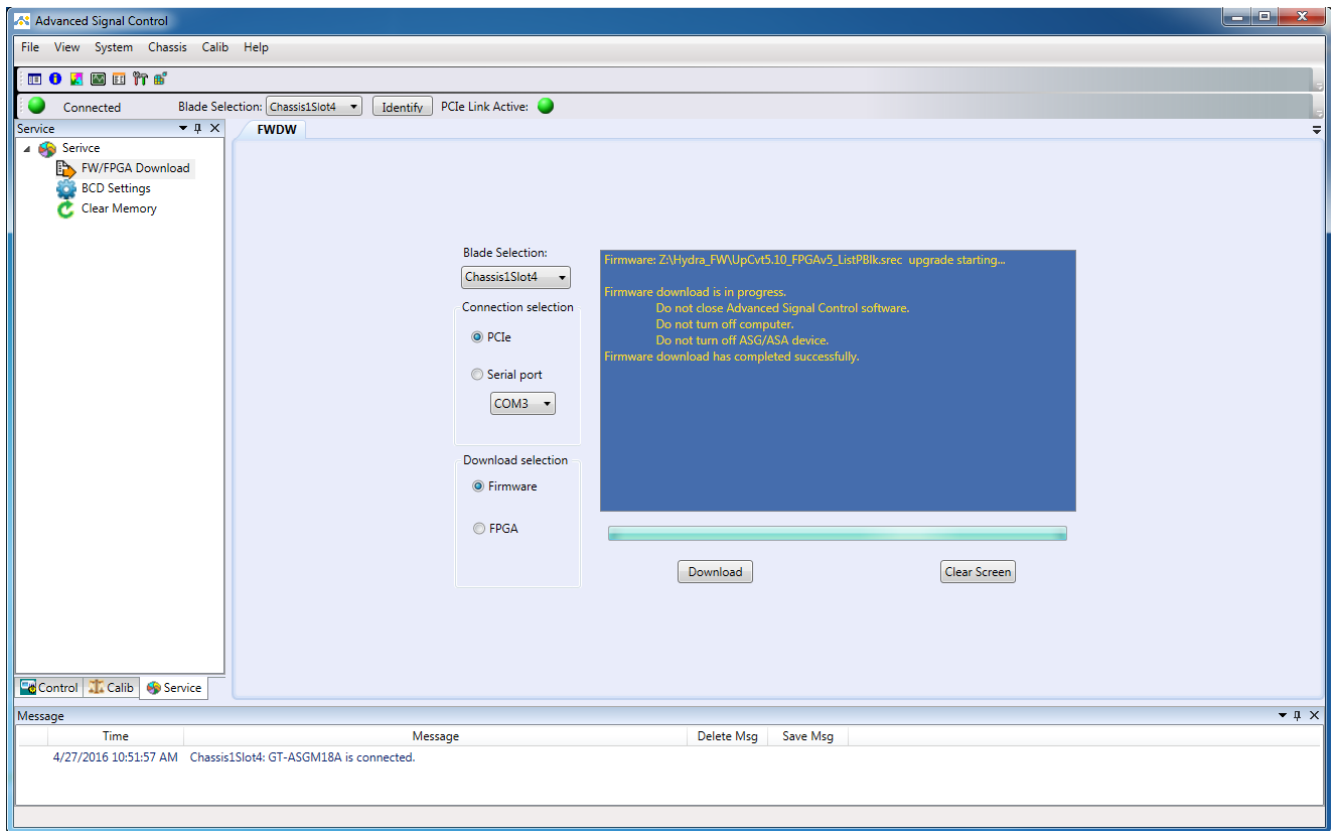


Figure 28 FW Download Complete Window

1.4.2 BCD Settings Window – Advanced Signal Generator

Select BCD Settings for Advanced Signal Generator item to open a BCD settings window as shown below. This window is used to set initial data for BCD power-up conditions for the selected blade.

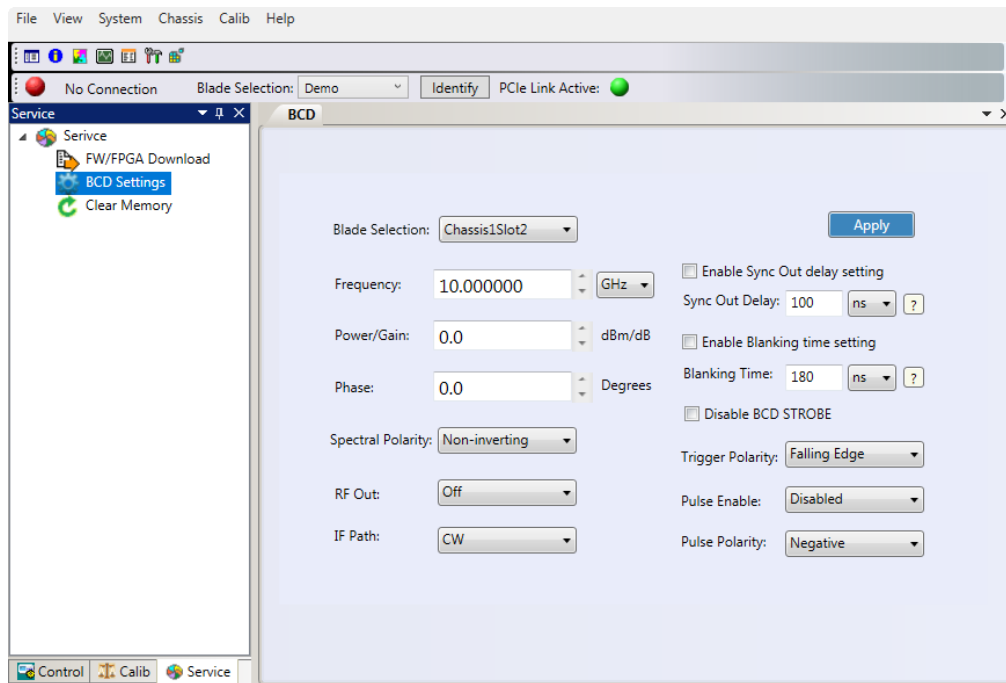


Figure 29 BCD Settings Window – Advanced Signal Generator

NOTE

Make appropriate change then use the **Apply** button.


Name	Description
Blade Selection Drop-down List Box	Select a blade from the drop-down list box.
Apply Button	Click Apply to set initial data at power-up for the selected blade. The data is set after the software closed.
Frequency Text Box	Input a frequency value.
Power/Gain Text Box	Input a power/gain value.
Phase Text Box	Input a phase value.
RF Out Drop-down Box	Select Off or On.
IF Path Drop-down Box	Select CW, Ext 1200 if Opt UP1 supported, or Ext 3600 if Opt UP2 supported.
Spectral Polarity Drop-down Box	Select Non-inverting or Inverting.
Trigger Polarity Drop-down Box	Select Falling Edge or Rising Edge.
Pulse Enable Drop-down Box	Select Disable or Enable.
Pulse Polarity Drop-down Box	Select Negative or Positive.
Enable Sync Out Delay	Select the checkbox to enable Sync Out delay setting.

Specifications subject to change without notice.

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Name	Description
Setting Checkbox	
Sync Out Delay Text Box	Input Sync out delay in ns or us. Sync out delay range is 100 ns to 200 us.
Enable Blanking Time Setting Checkbox	Select the checkbox to enable Blanking Time setting.
Blanking Time Text Box	Input Blanking Time in ns or us. Blanking Time range is 25 ns to 200 us.
 Button	Click the button to popup the following Sync Out & Blanking Timing diagram.
Disable BCD STROBE Checkbox	Select the checkbox to disable BCD STROBE.

1.1.1 BCD Settings Window – Advanced Signal Analyzer

Select BCD Settings for Advanced Signal Analyzer item to open a BCD settings window as shown below. This window is used to set initial data for BCD power-up conditions for the selected blade.

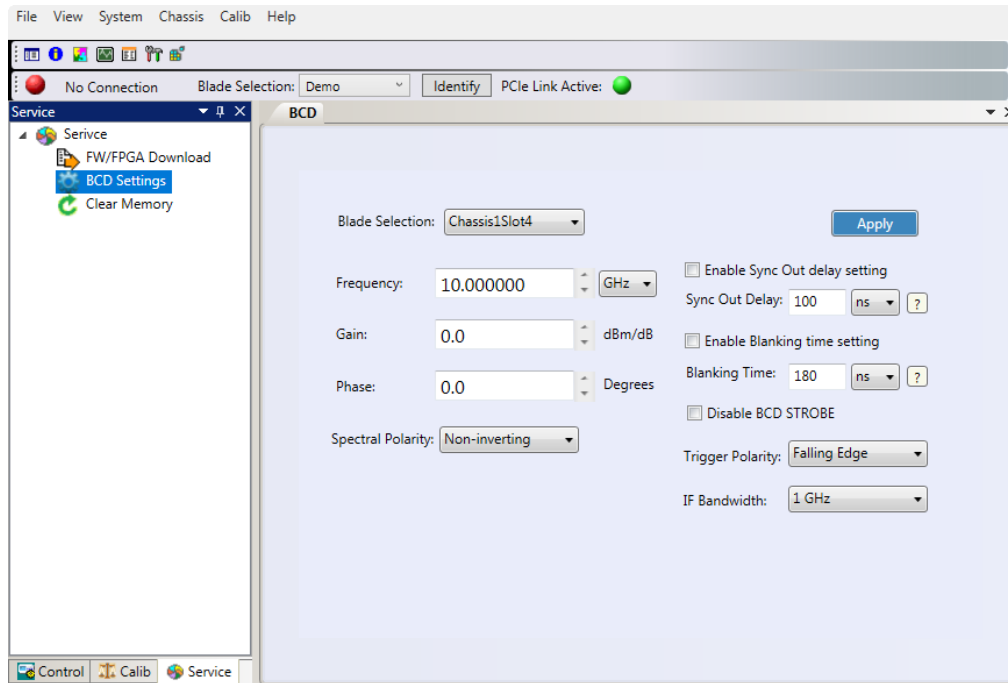



Figure 30 BCD Settings window – Advanced Signal Analyzer

NOTE

Make appropriate change, then use the **Apply** button.

Name	Description
Blade Selection Drop-down-list Box	Select a blade from the drop-down list box.
Apply Button	Click Apply to set initial data at power-up for the selected blade. The data is set after the software is closed.
Frequency Text Box	Input a frequency value.
Power/Gain Text Box	Input a power/gain value.
Phase Text Box	Input a phase value.
Gain Mode Drop-down Box	Select Auto or Manual.
Spectral Polarity Drop-down box	Select Non-inverting or Inverting.
Trigger Polarity drop-down Box	Select Falling Edge or Rising Edge.
IF Bandwidth drop-down Box	Select 100 MHz or 1 GHz.
Enable Sync Out Delay Setting Checkbox	Select the checkbox to enable Sync Out delay setting.

Name	Description
Sync Out Delay Text Box	Input Sync Out Delay in ns or us. Sync out delay range is 100 ns to 200 us.
Enable Blanking Time Setting Checkbox	Select the checkbox to enable Blanking Time Setting.
Blanking Time Text Box	Input Blanking time in ns or us. Blanking time range is 25 ns to 200 us.
 Button	Click the button to popup the following Sync Out & Blanking Timing diagram.
Disable BCD STROBE Checkbox	Select the checkbox to disable BCD STROBE.

1.1.2 Clear Memory Window

Double-click Clear Memory to open a Clear Memory window as follows. This window is used to clear memory data to the factory default.



Figure 31 Clear Memory Window

Name	Description
Blade Selection Drop-down List Box	Select a blade from the drop-down box
Clear Memory Button	Click Clear Memory to clear memory and reset the following items to factory defaults in the selected blade. Advanced Signal Generator (ASG): <ul style="list-style-type: none"> Reset User table to factory defaults. Reset Auto calibration data to factory defaults. Advanced Signal Generator (ASG) and Advanced Signal Analyzer (ASA): <ul style="list-style-type: none"> Reset BCD settings to factory defaults.

Chapter 2. Using the Parallel Interface (Opt BCD)

This chapter describes the use of the Parallel Interface (Option BCD) to control and operate the ASGM18A AXIe Advanced Signal Generator (ASG) and the ASAM18A AXIe Advanced Signal Analyzer (ASA) in an AXIe system.

The Parallel Interface (Option BCD), located on the front of each ASG and ASA, is used to send TTL digital words (48 inputs plus 2 GROUND) that can implement real-time control of frequency, phase, and amplitude.

2.1.1 Parallel Interface (Option BCD) Command Signals are Different for the ASG and ASA

NOTE

Different BCD commands are used for the ASG and the ASA.

The 2 control bits (Control-1 and Control-2) set the mode:

Control bits	Function
Control = 00	Set Frequency
Control = 01	Set Amplitude and Phase
Control = 10	Set Function (States and Parameters)
Control = 11	Future Use

Multiple “LOAD” commands load the data for each control (mode) setting. The trigger (strobe) then activates the set.

2.1.2 Parallel Interface (Option BCD) Programming Definitions for the ASG

2.1.2.1 Parallel Interface Programming Input, Set Frequency, Control = 00

Set Frequency Control = 00

Pin Number	Signal
1	GROUND
2	10 KHz-2
3	10 KHz-1
4	10 KHz-4
5	10 KHz-8
6	10 GHz-8
7	CONTROL-2
8	100 KHz-4
9	100 KHz-8
10	1 Hz-8
11	1 Hz-2
12	LOAD
13	1 GHz-1
14	STROBE
15	100 MHz-8
16	100 MHz-4
17	100 MHz-2
18	10 Hz-8
19	10 Hz-1
20	10 MHz-2
21	10 MHz-4
22	100 Hz-4
23	100 Hz-1
24	1 GHz-2
25	10 GHz-2

Pin Number	Signal
26	1 KHz-2
27	1 KHz-1
28	1 KHz-4
29	1 KHz-8
30	10 GHz-1
31	10 GHz-4
32	CONTROL-1
33	100 KHz-2
34	100 KHz-1
35	1 Hz-4
36	1 Hz-1
37	1 GHz-8
38	1 GHz-4
39	1 MHz-2
40	1 MHz-1
41	1 MHz-4
42	1 MHz-8
43	10 Hz-4
44	10 Hz-2
45	100 MHz-1
46	10 MHz-1
47	10 MHz-8
48	100 Hz-2
49	100 Hz-8
50	GROUND

NOTE

TTL Level. Ground unused pins.

2.1.1.2.2 Parallel Interface Programming Input, Set Amplitude and Phase, Control = 01

Set Amplitude & Phase Control = 01

Pin Number	Signal
1	GROUND
2	10 Deg-2
3	10 Deg-1
4	10 Deg-4
5	10 Deg-8
6	---
7	CONTROL-2
8	100 Deg-4
9	100 Deg-8
10	---
11	---
12	LOAD
13	---
14	STROBE
15	10 dB-8
16	10 dB-4
17	10 dB-2
18	---
19	---
20	1 dB-2
21	1 dB-4
22	0.1 Deg-4
23	0.1 Deg-1
24	---
25	---

Pin Number	Signal
26	1 Deg-2
27	1 Deg-1
28	1 Deg-4
29	1 Deg-8
30	---
31	---
32	CONTROL-1
33	100 Deg-2
34	100 Deg-1
35	---
36	---
37	SIGN
38	---
39	0.1 dB-2
40	0.1 dB-1
41	0.1 dB-4
42	0.1 dB-8
43	---
44	---
45	10 dB-1
46	1 dB-1
47	1 dB-8
48	0.1 Deg-2
49	0.1 Deg-8
50	GROUND

NOTE

TTL Level. Ground unused pins.

2.1.2.3 Parallel Interface Programming Input, Set Function, Control = 10

Parallel Programming Input (Option BCD)			
Control set to 10 (Set Function)			
Pin Number	Signal	Pin Number	Signal
1	Ground	26	---
2	---	27	---
3	---	28	---
4	---	29	---
5	---	30	---
6	Int/Ext LO	31	---
7	Control - 2	32	Control - 1
8	---	33	---
9	---	34	---
10	Pulse Polarity	35	RF On/Off
11	Pulse Enable	36	---
12	Load	37	---
13	---	38	---
14	Strobe	39	Trigger Polarity
15	---	40	---
16	---	41	---
17	---	42	---
18	---	43	---
19	---	44	---
20	---	45	---
21	---	46	---
22	Spectral Inversion	47	---
23	IF Path - 1	48	IF Path - 2
24	---	49	---
25	---	50	Ground

NOTE

TTL Level. Ground unused pins.

2.1.3 Parallel Interface (Option BCD) Programming Definitions for the ASA

2.1.3.1 Parallel Interface Programming Input, Set Frequency, Control = 00

Set Frequency Control = 00

Pin Number	Signal
1	GROUND
2	10 KHz-2
3	10 KHz-1
4	10 KHz-4
5	10 KHz-8
6	10 GHz-8
7	CONTROL-2
8	100 KHz-4
9	100 KHz-8
10	1 Hz-8
11	1 Hz-2
12	LOAD
13	1 GHz-1
14	STROBE
15	100 MHz-8
16	100 MHz-4
17	100 MHz-2
18	10 Hz-8
19	10 Hz-1
20	10 MHz-2
21	10 MHz-4
22	100 Hz-4
23	100 Hz-1
24	1 GHz-2
25	10 GHz-2

Pin Number	Signal
26	1 KHz-2
27	1 KHz-1
28	1 KHz-4
29	1 KHz-8
30	10 GHz-1
31	10 GHz-4
32	CONTROL-1
33	100 KHz-2
34	100 KHz-1
35	1 Hz-4
36	1 Hz-1
37	1 GHz-8
38	1 GHz-4
39	1 MHz-2
40	1 MHz-1
41	1 MHz-4
42	1 MHz-8
43	10 Hz-4
44	10 Hz-2
45	100 MHz-1
46	10 MHz-1
47	10 MHz-8
48	100 Hz-2
49	100 Hz-8
50	GROUND

NOTE

TTL Level. Ground unused pins.

2.1.3.2 Parallel Interface Programming Input, Set Amplitude and Phase, Control = 01

Set Amplitude & Phase Control = 01

Pin Number	Signal
1	GROUND
2	10 Deg-2
3	10 Deg-1
4	10 Deg-4
5	10 Deg-8
6	---
7	CONTROL-2
8	100 Deg-4
9	100 Deg-8
10	---
11	---
12	LOAD
13	---
14	STROBE
15	10 dB-8
16	10 dB-4
17	10 dB-2
18	---
19	---
20	1 dB-2
21	1 dB-4
22	0.1 Deg-4
23	0.1 Deg-1
24	---
25	---

Pin Number	Signal
26	1 Deg-2
27	1 Deg-1
28	1 Deg-4
29	1 Deg-8
30	---
31	---
32	CONTROL-1
33	100 Deg-2
34	100 Deg-1
35	---
36	---
37	---
38	---
39	0.1 dB-2
40	0.1 dB-1
41	0.1 dB-4
42	0.1 dB-8
43	---
44	---
45	10 dB-1
46	1 dB-1
47	1 dB-8
48	0.1 Deg-2
49	0.1 Deg-8
50	GROUND

NOTE

TTL Level. Ground unused pins.

2.1.1.3.3 Parallel Interface Programming Input, Set Function, Control = 10

Control set to 10 (Set Function)			
Pin Number	Signal	Pin Number	Signal
1	Ground	26	---
2	Input Gain - 2	27	---
3	Input Gain - 1	28	---
4	IF Bandwidth	29	---
5	---	30	---
6	Int/Ext LO	31	---
7	Control - 2	32	Control - 1
8	---	33	---
9	---	34	---
10	---	35	---
11	Gain Auto/Man	36	Preset
12	Load	37	---
13	---	38	---
14	Strobe	39	---
15	---	40	---
16	---	41	---
17	---	42	---
18	---	43	---
19	---	44	---
20	---	45	---
21	---	46	---
22	Spectral Inversion	47	---
23	IF Path	48	---
24	---	49	---
25	---	50	Ground

NOTE

TTL Level. Ground unused pins.

Chapter 3. BCD and Triggers

3.1 Binary Coded Decimal (BCD) Definition

Decimal Number	Code
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Frequency, Amplitude, and Phase decades are binary coded decimal (BCD) with valid numbers 0 to 9. Values out of range or non-BCD numbers are ignored, but the front panel STATUS LED will flash red to indicate a bad command was received.

3.2 Control Source

There are two sources of control information:

- Software
- BCD

Switching the control source between the Software and BCD input happens automatically.

- When the user launches Advanced Signal Control (ASC) software or issues the “open connection” API command using a function call to the GTSigGen DLL, the control source is set to Software.
- When the user issues a “close connection” API command using a function call to the GTSigGen DLL or if they simply shut down the ASC software, the control source is set to the BCD input.

3.3 Trigger Operation

There are three choices for trigger:

- Software
- BCD
- Front Panel Trigger In

All three triggers are active, all the time.

- If the control source is set to Software, a BCD strobe, Software, or a Front Panel Trigger In will trigger an event.
- If the control source is set to BCD, the Front Panel Trigger In, BCD strobe, and Software will all trigger an event.

When using the software GUI interface, there are certain changes that can be made that need to happen immediately (no trigger required – the change would happen when the user “hits the enter button”). Things like RF On or Off, changing the polarity of the IF, or switching between CW and the external IF input.

For other changes such as frequency, power, or phase, the user has a choice between the change happening immediately and the change happening synchronously (occurring at the same time, simultaneously) through the use of a trigger.

This choice is made by selecting either “auto” trigger mode or “manual” trigger mode. It only applies to the use of the GUI and the DLL interfaces.

The GUI supports changing the polarity of the front-panel trigger in signal – either on the rising or falling edge. The BCD “strobe” will always use the falling edge for compatibility with past practice. The BCD interface also supports selecting rising or falling edge polarity for the front-panel trigger-in signal.

Chapter 4. Glossary

Giga-tronics Advanced Signal Generation and Analysis System – is a high-performance signal source / up-converter and analyzer / down-converter platform optimized for applications requiring coherent multiple channels of sophisticated wide instantaneous bandwidth microwave signals. The Advanced Signal Generation and Analysis System is an ideal tool for advanced EW threat simulation, RADAR target generation, emulation of Satellite communication links, and calibration of receivers in direction finding systems.

When configured together, the following four AXIe system components form the Giga-tronics Advanced Signal Generation and Analysis System:

1. Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz
2. Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz
3. Giga-tronics SRM100A AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz
4. Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel
or Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel
(Giga-tronics CHSISBK AXIe Blank Module: 2-Slot must be used when there are empty slots; they are used to maintain proper air flow management and backplane termination.)

ASG (Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz) – is one of four major components that when configured together, form the Giga-tronics Advanced Signal Generation and Analysis System.

The ASG combines an agile, low-noise, phase-coherent local oscillator (LO) with a state-of-the-art millimeter-wave up-converter to generate high spectral purity microwave signals over the 100 MHz to 18 GHz frequency range. The optional up-converting input (Option UP1) allows the ASG to generate signals with wide bandwidth complex modulation for testing RADAR and modern communication systems.

ASA (Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz) – is one of four major components that when configured together, form the Giga-tronics Advanced Signal Generation and Analysis System.

The ASA combines an agile, low-noise, phase-coherent local oscillator (LO) with a state-of-the-art millimeter wave down-converter to receive high spectral purity microwave signals. The standard down-converting input allows the ASGM18A AXIe Advanced Signal Generator to receive signals with wide bandwidth complex modulation. Using the frequency reference signals from one SRM100A AXIe System Reference Module to 2, 3, or 4 ASAM18A AXIe Advanced Signal Analyzer modules allows for phase coherent multi-channel systems. ASGM18A AXIe Advanced Signal Generators and ASAM18A AXIe Advanced Signal Analyzers can be combined to create “closed loop” transmit - receive configurations.

The RF input features a high sensitivity low noise microwave amplifier (LNA). The LNA bypass is set when the input power range is selected.

SRM (Giga-tronics SRM100A AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz) – is one of four major components that when configured together, form the Giga-tronics Advanced Signal Generation and Analysis System.

The SRM provides precision frequency references for one to four ASGM18A AXIe Advanced Signal Generator modules. The SRM accepts 10 MHz or 100 MHz external frequency reference signals for phase locking the ASGM18A AXIe Advanced Signal Generator to external equipment or frequency standards. The System Reference Module provides 10 MHz and 100 MHz frequency reference outputs for phase locking multiple CHSIS2A and CHSIS4A AXIe System Chassis in high channel count applications.

CHSIS2A (Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel) – may be one of four major components that when configured together, form the Giga-tronics Advanced Signal Generation and Analysis System.

CHSIS4A (Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel) – may be one of four major components that when configured together, form the Giga-tronics Advanced Signal Generation and Analysis System.

CHSIS2A and CHSIS4A are based on the AXIe industry standard. Available in 2 channel (4U) and 4 channel (7U) configurations, chassis make use of the AXIe standard's Zone3 provision to implement a coherent analog synchronization bus for sharing frequency reference signals and critical timing clocks from the Giga-tronics SRM100A AXIe System Reference Module with up to four ASG / ASA (Giga-tronics ASGM18A AXIe Advanced Signal Generator / Giga-tronics ASAM18A AXIe Advanced Signal Analyzer) in a single chassis. This arrangement eliminates a host of inter-module front panel cabling and allows the signal generators and analyzers to exhibit superior phase stability and coherence between channels compared to stacking traditional bench-top sources.

Each chassis incorporates an active backplane for implementing Zone 1 and Zone 2 requirements of the AXIe standard permitting a more desirable rear-chassis location for the external PCIe and ethernet interfaces. The chassis can also accept products from 3rd parties designed to the AXIe specification and can support modules requiring up to 100 W per slot. For ease of maintainability, the chassis' power supply, fan, and filter assemblies are removable for service or replacement. The chassis can report its status over the PCIe or ethernet interfaces and signals a fault condition through a front-panel LED.

CHSISBK (Giga-tronics CHSISBK AXIe Blank Module: 2-Slot) – must be used when there are empty slots in an AXIe system; CHSISBK are used to maintain proper air flow management and backplane termination.

10 GbE - 10 Gigabit Ethernet

1 GbE - 1 Gigabit Ethernet

ADC - Analog to Digital Converter

ADE (application development environment) – is an integrated suite of software development programs. ADEs may include a text editor, compiler, and debugger, as well as other tools used in creating, maintaining, and debugging application programs. Example: Microsoft Visual Studio.

AdvancedTCA - The Advanced Telecom Computing Architecture (AdvancedTCA® or ATCA®) is a series of open standard computing platform specifications originally developed to meet the needs of communications equipment.

<http://www.axiestandard.org/files/AXIe%20Overview%20-%202016.pdf>

API (application programming interface) - An API is a well-defined set of software routines through which application program can access the functions and services provided by an underlying operating system or library.

agile signal generators - switch frequency and settle amplitude in the hundreds of nanoseconds used to simulate all radar threat-emitters in the environment at different ranges and frequencies with their respective antenna scans

AWG - Arbitrary Waveform Generator

baseband - refers to the original frequency range of a transmission signal before it is converted, or modulated, to a different frequency range.

BCD - ability of the source to switch between frequency, amplitude, and modulation quickly.

Big-Endian - Byte ordering where the most significant byte is first.

Byte Order - See Endianness

C# (pronounced “C sharp”) — C-like, component-oriented language that eliminates much of the difficulty associated with C/C++.

Cat5e/Cat6a/Cat7. - A rating for unshielded twisted pair networking cable, commonly used for 1 GbE (Cat5e) or 10 Gi-gabit (Cat6a/Cat7) network connections

Cat5 - supports speeds up to fast Ethernet (100 Mbps) at up to 100 MHz bandwidth; Cat5 is considered obsolete and has been replaced by either Cat5e, Cat6, Cat6a, Cat7, or Cat7a.

Cat5e - supports speeds up to a Gigabit Ethernet (1,000 Mbps) at up to 100 MHz bandwidth; Cat5e is Cat5 enhanced.

Cat6 - supports speeds up to 10 Gigabit Ethernet (10,000 Mbps) at up to 250 MHz bandwidth; this can only be achieved with a distance of 37 to 55 meters or less. Cat6 cable has an internal separator that isolates pairs from one another.

Cat6a - supports speeds up to 10 Gigabit Ethernet (10,000 Mbps) at up to 500 MHz bandwidth; this can be achieved with a distance of 100 meters or less.

Cat7 & Cat7a - support speeds up to 10 Gigabit Ethernet (10,000 Mb/s) at up to 1000 MHz bandwidth; this can be achieved with a distance of 100 meters or less.

clearing memory - The ASGM18A AXIe Advanced Signal Generator and ASAM18A AXIe Advanced Signal Analyzer were designed with the capability of storing instrument states; the current instrument state settings are stored as each instrument is powered down. These instrument states store various parameters pertaining to the configuration and settings for the frequency, amplitude, and phase. The instrument states and all data, including: frequency, amplitude, and phase are erased by using the “Clear Memory” function in the Service Menu of the Advanced Signal Control Software.

Control Network - Network carrying data between the SigInspector-Omni

DAC - Digital to Analog Converter

Digital Downconverter (DDC). - Performs downconversion and decimation by means of digital signal processing

Digital Upconverter (DUC). - Performs up conversion and interpolation by means of digital signal processing

Direct I/O - commands sent directly to an instrument, without the benefit of, or interference from a driver (or device driver) — a collection of functions resident on a computer and used to control a peripheral device.

DLL (dynamic link library) - is an executable program or data file, that contains a collection of routines that can be called by applications and by other DLLs, that is bound to an application program and loaded only when needed, thereby reducing memory requirements. The functions or data in a DLL can be simultaneously shared by several applications.

Downconverter (DCON) - Analog downconverter that converts an RF input to an IF output.

DSP (digital signal processor) - is a specialized microprocessor with its architecture optimized for the operational needs of digital signal processing. The goal of DSPs is usually to measure, filter, or compress continuous real-world analog signals.

EW receivers - EW systems measure AoA and estimate distance using amplitude comparison, differential Doppler, interferometry (phase difference), and Time Difference of Arrival (TDOA).

Endianess. - The ordering of bytes within a multi-byte value. See Little Endian and Big Endian

Fast Fourier Transform (FFT) - An algorithm for computing the Fourier transform quickly. Often used as an alias for Fourier Transform.

Field-Programmable Gate Array (FPGA) - An integrated circuit providing reconfigurable logic. Used for glue logic, inter- facing and signal processing.

Input/Output (I/O) - The software that collects data from and issues commands to peripheral devices. The VISA function library is an example of an I/O layer that allows application programs and drivers to access peripheral instrumentation.

interferometry AoA methods - calculated using the arcsine of a ratio the EW receiver is measuring the phase difference between apertures

wavelength - is measured by the EW receiver using an instantaneous frequency

measurement receiver (IFM) which gives the frequency of a pulse to ± 1 to 3 MHz. The

distance between apertures, called a baseline, is known with some uncertainty level

- longer baselines are used since this provides better accuracy and less sensitivity to uncertainties

- at long distances, the phase difference will wrap, leaving ambiguities in this measurement

- most modern systems use more than one baseline or a shorter baseline to resolve ambiguities

Internet Protocol (IP). - A common networking protocol IP Address A network address used on IP networks

I/Q - Binary Complex Data format (16-bit Interleaved)

Interface Control Document (ICD) - A document which describes the control interface between two systems or sub- systems.

IVI (Interchangeable Virtual Instruments) - a standard instrument driver model defined by the IVI Foundation that enables engineers to exchange instruments made by different manufacturers without rewriting their code. www.ivifoundation.org

IVI COM drivers (also known as IVI Component drivers) - IVI COM presents the IVI driver as a COM object in Visual Basic. You get all the intelligence and all the benefits of the development environment because IVI COM does things in a smart way and presents an easier, more consistent way to send commands to an instrument. It is similar across multiple instruments.

Little-Endian See Endianness - The frequency provided as a local input to an RF mixer when performing up or down conversion. Alternately, the oscillator used to provide such a frequency.

Local Oscillator (LO) - An electronic oscillator used with a mixer to change the frequency of a signal.

Microsoft COM (Component Object Model) - The concept of software components is analogous to that of hardware components: as long as components present the same interface and perform the same functions, they are interchangeable. Software components are the natural extension of DLLs. Microsoft developed the COM standard to allow software manufacturers to create new software components that can be used with an existing application program, without requiring that the application be rebuilt. It is this capability that allows test and measurements instruments and their COM-based IVI-Component drivers to be interchanged.

Mode 1A - Multi-Channel Narrowband Highband (500 MHz to 18 GHz) AWG (200 MHz BW)

Mode 1B - Multi-Channel Narrowband Lowband (125 MHz to 375 MHz) AWG (200 MHz BW)

Mode 2 - Open Loop Simulator Operation

Mode 3A - Single-Channel Wideband Highband (500 MHz to 18 GHz) AWG (500 MHz BW)

Mode 3B - Single-Channel Wideband Lowband (400 MHz) AWG (450 MHz BW)

Mode 4 - Single-Channel UltraWideband Highband (500 MHz to 18 GHz) AWG (1000 MHz BW)

MSSG - Multi-Ship Radar Signal Generator, Application Software

.NET Framework - The .NET Framework is an object-oriented API that simplifies application development in a Windows environment. The .NET Framework has two main components: the common language runtime and the .NET Framework class library.

Naval EW - safely patrol and protect the seas that provide real-time situational awareness, enabling the intercept of signals that identify both imminent and potential threats. Adding another layer to ship defense, these countermeasure technologies use EW to protect vessels from anti-ship missile attacks.

Numerically Controlled Oscillator - Used to create a sine wave digitally at a programmable frequency.

OLS - Open Loop Simulator Application

performance verification tests – are used to verify that a product is operating within its specifications; the process of running these tests is referred to as *Performance Verification*.

During each test, a comparison is made with the results of each performance verification test against the appropriate section in a product's Datasheet.

Performance Verification is recommended at least every two years or more often when required to ensure proper operation of a product. Each piece of test equipment must be warmed up according to its specifications prior to testing. The minimum warm-up time before testing a product is 30 minutes unless specified otherwise.

Phase-Locked Loop (PLL) - Used for frequency-generation, usually with a VCO.

Pulse Per Second (PPS) - A pulse-stream used as a time reference. Usually 50% duty cycle

RAID0 - RAID 0 (also known as a stripe set or striped volume) splits ("stripes") data evenly across two or more disks, without parity information, redundancy, or fault tolerance. Since RAID 0 provides no fault tolerance or redundancy, the failure of one drive will cause the entire array to fail; as a result of having data striped across all disks, the failure will result in total data loss. This configuration is typically implemented having speed as the intended goal.

System 23A - MultiChannel AWG 200 MHz BW: DTA 5000W Server DTA 3380 DAC

System 95A - SingleChannel AWG 500 MHz BE, DTA 1000R Server DTA 9500AC DAC

Temperature-Controlled Crystal Oscillator (TCXO) - An oscillator used as a clock source temperature control provides increased stability.

Test Set File (TSF) - ASCII XML file used in Mode 1A, 1B containing operational information

time difference of arrival (TDOA) - TDOA derives AoA based on the delta time difference an RF pulse is seen at two antennas. Knowing that a signal will travel at the speed of light (c) over a distance equal to the distance between the two antennas, we can take the arcsine of the ratio $(TDOA \times c)/d$ to determine the AoA. Although this method does not depend directly on wavelength, it does require precise knowledge of delays through each receive channel, which vary with frequency.

Transmission Control Protocol (TCP) - A stream-based network protocol used with IP.

Upconverter (UCON) - Converts an IF input to an RF output.

User Datagram Protocol (UDP) - A message-based network protocol used with IP.

User PC - User-supplied computer used to run the D-TA Recorder GUI.

VISA (Virtual Instrument Software Architecture) - The VISA standard was created by the VXIplug&play Foundation. Drivers that conform to the VXIplug&play standards always perform I/O through the VISA library. Therefore, if you are using Plug and Play drivers, you will need the VISA I/O library. The VISA standard was intended to provide a common set of function calls that are similar across physical interfaces. In practice, VISA libraries tend to be specific to the vendor's interface.

Voltage-Controlled Oscillator (VCO) - An oscillator used as a clock source at a variable frequency. Normally used with a PLL.

Chapter 5. References

5.1 Related Giga-tronics Documents

- Advanced Signal Generation and Analysis System, Datasheet (Document 35652)
- ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz, Datasheet (Document 36195)
- ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz, Datasheet (Document 36196)
- SRM100A AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz, Datasheet (Document 35522)
- CHSIS2A and CHSIS4A AXIe System Chassis: 2-Channel and 4-Channel, Datasheet (Document 35536)

- Advanced Signal Generation and Analysis System, Installation Manual (Document 35397)
- Advanced Signal Generation and Analysis System, Programming Manual (Document 35396)
- Advanced Signal Generation and Analysis System, User Manual (Document 35984)

- Real-Time Threat Emulation System (TEMS-101), User Manual (Document 36183)
- Real-Time Threat Emulation System (TEMS-103), User Manual (Document 36206)

- CHSIS2A and CHSIS4A AXIe System Chassis: 2-Channel and 4-Channel, Shelf Manager Manual (Document 35977)

5.2 Related Websites

- <http://www.axiestandard.org>
- <https://go-asg.gigatronics.com>

