INSTALLATION MANUAL

Advanced Signal Generation and Analysis System

- 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:
    - o CHSIS2A AXIe System Chassis: 2-Channel or
    - o CHSIS4A AXIe System Chassis: 4-Channel

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Giga-tronics

Solutions for Next Gen EW / Radar Test & Deployment

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Warning, Caution, Note

WARNING

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.

CAUTION

A CAUTION 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 damage to the product or loss of important data or both. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

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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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).

Perform the following:

1. Review Safety Operating Requirements
2. Review AXIe System Components
3. Select and Install AXIe System Components
4. Select a System Controller (Computer)
5. Select an Interface: PCIe or USB or Parallel (BCD)
6. Install Advanced Signal Control (ASC) Software and Drivers for PCIe and USB
7. Power-On All AXIe Chassis,
   Restart the System Controller (Computer),
   and Check Device Manager for Connections (Between the ASC Software and the AXIe System Hardware)
8. Select How to Operate: GUI / Parallel Interface (Option BCD) / API

   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.

   - **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 the **GUI** or the **Parallel Interface** (Option BCD), refer to the Advanced Signal Generation and Analysis System, User Manual (Document 35984).

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).

Chapter 1. Review Safety Operating Requirements

In this chapter, learn about the conventions regarding safety and equipment operating requirements.

1.1 Warnings, Cautions, and Notes

WARNING

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CAUTION

A CAUTION 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 damage to the product or loss of important data or both. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

NOTE

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

1.2 Before Applying LINE Power

WARNING

- **Review this document to become familiar with product safety markings and instructions before operation.**
- **This product is a Safety Class I instrument (chassis provided with a protective earth terminal).**
- **Verify that the correct LINE voltage is available and the correct fuse is installed.**

CAUTION

- **The chassis is supplied with a power cord rated for 15 Amps. Always use the power cord supplied or a power cord of equivalent or greater current rating.**
- **Install or remove a Blade (Module) into or from the chassis only with the power OFF. Installing a Blade into the chassis or removing it from the chassis with the power on may damage either or both the Blade and/or the chassis.**
- **There are two power switches: A rear panel Main Power Switch on the power supply unit and a front panel ON/OFF switch.**
    - **The rear panel Main Power Switch completely removes power from the system.**
    - **The front panel ON/OFF switch changes from "ON" to "STAND-BY" to provide power to the SRM100A AXIe System Reference Module which keeps the reference oscillator heaters active.**
    - **There is no power to the ASGM18A AXIe Advanced Signal Generator or ASAM18A AXIe Advanced Signal Analyzer in "STAND-BY".**

1.3 Electrical Safety Precautions

WARNING

- **An uninterruptible safety earth ground must be provided from the Main power source to the CHSIS2A or CHSIS4A AXIe System Chassis. Any interruption of the protective ground conductor (internal or external to the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury.**
- **Grounding a single conductor of a two-conductor outlet is insufficient protection. Additionally, verify that a common ground exists between the unit under test, any additional test equipment, and this instrument prior to energizing any unit. Whenever it is likely that the protection has been impaired, the instrument must be removed from service and secured against unintended operation.**
- **If this instrument is to be energized via an autotransformer (for voltage reduction), ensure that the common terminal is connected to neutral.**
- **Do not operate in a wet or explosive environment. The instrument is intended for use in dry, indoor locations.**
- **Servicing instructions are for use by service–trained personnel only. To avoid personal injury, do not perform any service unless qualified to do so. Do not remove the instrument cover. There are no user-serviceable parts inside the instrument. There are no adjustments that can be performed with the unit energized and protective covers removed. Energy available, at many points, may cause personal injury.**
- **For continued protection against fire hazard, replace the line fuse only with a 250 V fuse of the same current rating and type. Do not use repaired fuses or short-circuited fuse holders.**

1.4 Important Operating Precautions

CAUTION

The CHSIS2A and CHSIS4A AXIe System Chassis do not include an enable/disable feature to automatically activate and deactivate modules. When connecting or disconnecting the output of the Module, it is good practice to ensure that the POWER switch on the front of the chassis is in the off position.

When connecting a Blade (Module) to a transmitting device, observe all safety procedures to ensure that the system isn't interfering with other systems in the area. High power microwaves can adversely affect power sensitive receivers in the area of transmission. Exercise precautions to avoid exposure to radiated microwave energy at all times.

CAUTION

Install or remove a Blade (Module) into or from the CHSIS2A or CHSIS4A AXIe System Chassis only with the POWER off. Installing a Blade into the chassis or removing it from the chassis with the POWER on may damage either or both the Blade and/or the chassis.

1.5 Before Applying RF and Microwave Signals

CAUTION

- **Unless otherwise specified, at no time and under no conditions, should any signal power (CW or pulsed) greater than +20 dBm (100 mW) be applied to any RF input.**
- **Applying DC power should be avoided. Absolute maximum DC voltage is 10 V.**
- **Absolute maximum IF input power level for the ASGM18A AXIe Advanced Signal Generator: +10 dBm (10 mW).**
- **Absolute maximum RF input power level for the ASAM18A AXIe Advanced Signal Analyzer: +10 dBm (10 mW).**
- **Absolute maximum EXT REF IN input power level for the SRM100A AXIe System Reference Module: +10 dBm (10 mW).**
- **When connecting the RF OUT of the ASG to a transmitting device, observe all safety procedures to ensure that the system isn't interfering with other systems in the area. High power microwaves can adversely affect power sensitive receivers in the area of transmission.**
- **Exercise precautions to avoid exposure to radiated microwave energy at all times. It is recommended that all unused outputs be terminated in 50 Ω.**

Chapter 2. Review AXIe System Components

In this chapter, learn about AXIe system components built by Giga-tronics.
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

  (Giga-tronics CHSISBK AXIe Blank Module: 2-Slot must be used whenever there are empty chassis slots; they are used to maintain proper air flow management and backplane termination.)

Model Options	Description
ASGM18A	AXIe Advanced Signal Generator: 100 MHz to 18 GHz
OPT-ATT	Electronic Step Attenuator for 90 dB Dynamic Range
OPT-UP1	1200 MHz Upconverter IF Input
OPT-BCD	Parallel BCD Input Control Interface
OPT-TCI	TEmS Control Interface
ASAM18A	AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz
OPT-BCD	Parallel BCD Input Control Interface
SRM100A	AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz
CHSIS2A	2-Channel AXIe System Chassis (4U) (For 1 or 2 channel systems)
CHSIS4A	4-Channel AXIe System Chassis (7U) (For 1 or 2 or 3 or 4 channel systems)

2.1 Giga-tronics ASGM18A AXIe Advanced Signal Generator (ASG)

The Giga-tronics ASGM18A AXIe Advanced Signal Generator (ASG) is a real-time RF signal generator over the frequency range of 100 MHz to 18 GHz. With the upconverting option (OPT-UP1), it is used for emulating agile, low-noise emitters anywhere within that same wide frequency range. As an RF Upconverter, the ASGM18A can be used to generate complex, wide bandwidth signals for testing Radar and EW systems.
The ASGM18A is built in the industry standard AXIe form factor and works in conjunction with the Giga-tronics SRM100A System Reference Module and either the Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel or Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel for multi-channel, phase coherent operation.

- Frequency range: 100 MHz to 18 GHz with 1 Hz resolution
- Frequency switching: < 1 µs
- Real-time control of frequency, phase, and amplitude: BCD parallel
- PC control of frequency, phase, and amplitude: PCIe and USB
- Up-conversion: 1 GHz instantaneous bandwidth; IF input centered at 1.2 GHz
- Multi-channel: phase coherent operation

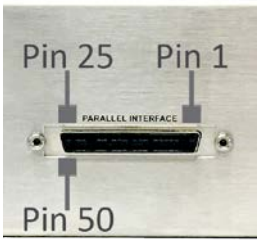
The ASGM18A AXIe Advanced Signal Generator conforms to the AXIe specification. AXIe is similar in operation to PXIe. Both interfaces use PCIe as the primary control mechanism. AXIe is based upon the ATCA telecommunications standard and extends PXIe functionality by allowing for larger Modules (Blades) with provision to create an application specific backplane. However, a user can successfully operate the system without needing any detailed knowledge of either AXIe or PXIe.

As with any programmable instrumentation, including PXIe, control of the instrument is facilitated using a system controller (computer). For the ASG, the computer connects to the instrument Blades or system using either the PCIe interface or USB interface. A DLL is supplied with a programming interface if the control program is resident on the system controller. For real-time applications, an optional BCD coded parallel interface is available on the front panel.

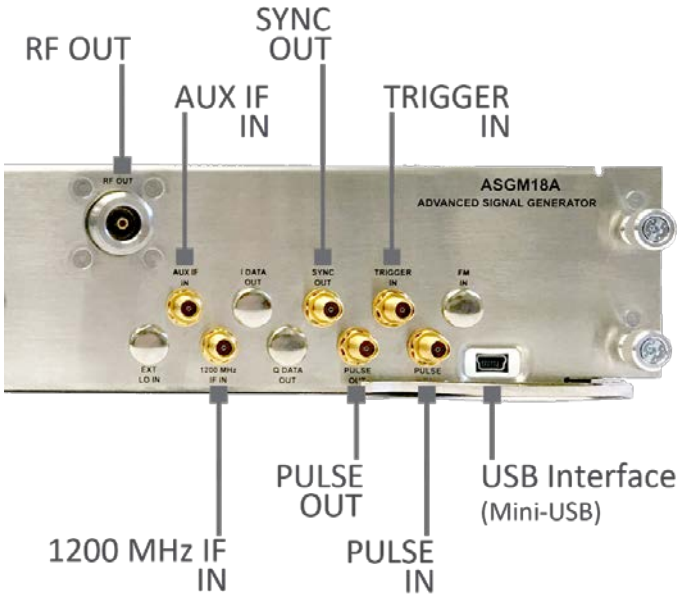
2.1.1.1 Front Panel Indicators on the ASGM18A AXIe Advanced Signal Generator

POWER	The POWER LED when illuminated (Blue), indicates AC power is applied.
STATUS	The STATUS LED has multiple states: • "Fast" flashing **Green**: the system is operating normally. The "Fast" flashing rate is multiple flashes per second. • "Slow" flashing **Green**: there is an interface problem between the module and the chassis. This could be caused by a poor connection or a PCIe link issue. The "Slow" flashing rate is approximately 1 flash per second. • Flashing **Yellow**: PCIe link failure. • Solid **Red**: When illuminated Solid Red, there is an error in a module. Error codes are available over the API. The error condition may indicate a failure or a recoverable condition.

2.1.1.2 Front Panel Connectors on the ASGM18A AXIe Advanced Signal Generator



PARALLEL INTERFACE	50 Pin Parallel Interface connector. Use with Option BCD for real-time control of frequency, phase, and amplitude. For additional details, see the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396). Front panel connector: TE Connectivity (AMP) 5787362-5 (The mating "cable" connector is TE Connectivity 5750913-5) Contact Giga-tronics for available cable assemblies.

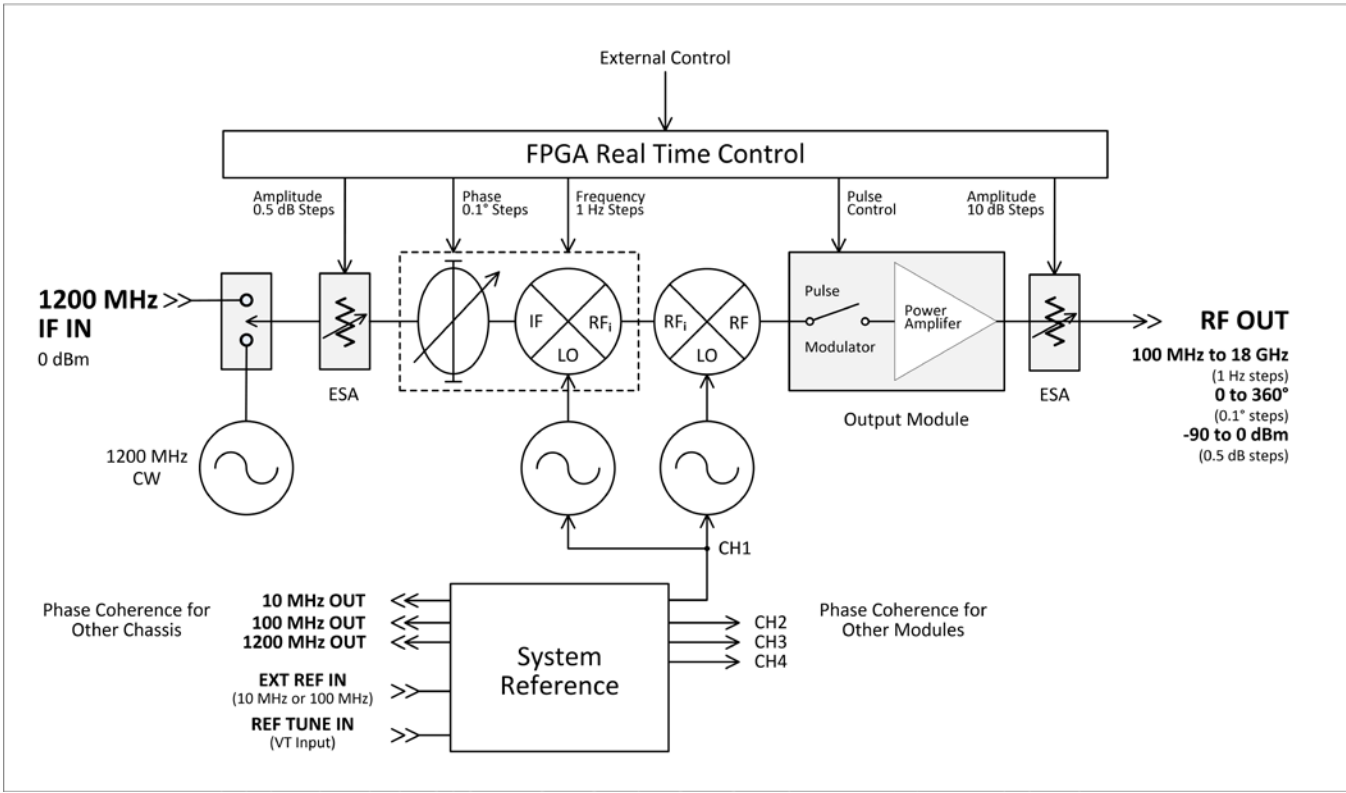


RF OUT	Type-N (F) connector. For complete specifications, see the ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz, Datasheet (Document 36195)
AUX IF IN	Reserved for future use. SMA (F) connector.
I DATA OUT	Reserved for future use. SMA (F) connector. 50 Ω, TTL levels.
SYNC OUT (TRIGGER OUT)	SMA (F) connector. +5 V (TTL compatible) output pulse, 50 ns pulse width.
TRIGGER IN	SMA (F) connector. 50 Ω, TTL levels, > 50 ns pulse width.
FM IN	Reserved for future use. SMA (F) connector. 50 Ω, nominal 0 dBm.
EXT LO IN	Reserved for future use.
1200 MHz IF IN	SMA (F) connector. 50 Ω, nominal 0 dBm. Up-converting input (Option UP1).
Q DATA OUT	Reserved for future use. SMA (F) connector. 50 Ω, TTL levels.
PULSE OUT (RF GATE OUT)	SMA (F) connector. 50 Ω, TTL levels. PULSE OUT is the PULSE IN signal plus any RF blanking, if enabled.
PULSE IN (RF GATE IN)	SMA (F) connector. 50 Ω, TTL levels, polarity selectable.
USB Interface	Mini-USB connector.

NOTE

Connect a 50 Ω termination to all unused outputs, recommended.

2.1.1.3 Block Diagram for the ASGM18A AXIe Advanced Signal Generator



2.2 Giga-tronics ASAM18A AXIe Advanced Signal Analyzer (ASA)

The Giga-tronics ASAM18A AXIe Advanced Signal Analyzer (ASA) is a real-time signal analyzer used for receiving agile, phase-coherent signals across the frequency range of 500 MHz to 18 GHz. The downconverting input allows the ASAM18A to receive complex, wide-bandwidth signals for testing radar and EW systems.
The ASAM18A is built in the industry standard AXIe form factor and works in conjunction with the Giga-tronics SRM100A System Reference Module and either the Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel or Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel for multi-channel, phase coherent operation.

- Frequency range: 500 MHz to 18 GHz with 1 Hz resolution
- Frequency switching: real time, < 1 µs
- Real-time control of frequency, phase, and amplitude: BCD parallel
- PC control of frequency, phase, and amplitude: PCIe and USB
- Downconversion: 1 GHz instantaneous bandwidth; IF output centered at 1.2 GHz
- Multi-channel phase coherent operation

The RF input of an ASA features a high sensitivity low noise microwave amplifier (LNA). The LNA gain is set when the overall ASA gain is selected.

CAUTION

Caution must be taken not to overload the LNA. Never exceed the maximum input power level for the input power range selected.

IF bandwidth is 1 GHz for RF inputs from 2 GHz to 18 GHz and 100 MHz for RF inputs below 2 GHz.

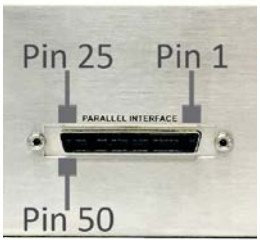
The 100 MHz IF bandwidth may be selected to apply over the entire RF frequency range.
Signals from the Giga-tronics SRM100A AXIe System Reference Module connect to the ASA modules via the chassis backplane Zone 3 analog synchronization bus to eliminate front panel cabling and to allow the signal analyzers to exhibit superior phase stability and coherence between channels.

Refer to the Advanced Signal Generation and Analysis System, Datasheet (Document 35652) for additional information.

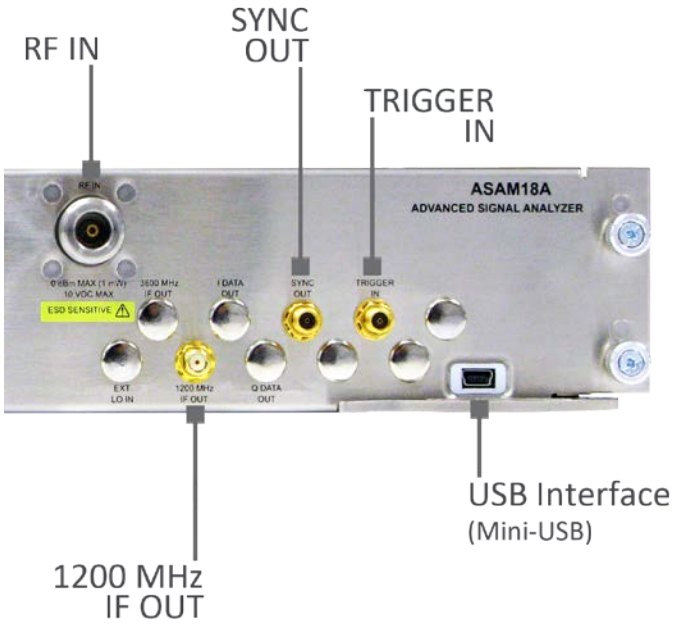
2.2.1.1 Front Panel Indicators on the ASAM18A AXIe Advanced Signal Analyzer

POWER	The POWER LED when illuminated (Blue), indicates AC power is applied.
STATUS	The STATUS LED has multiple states: • "Fast" flashing **Green**: the system is operating normally. The "Fast" flashing rate is multiple flashes per second. • "Slow" flashing **Green**: there is an interface problem between the module and the chassis. This could be caused by a poor connection or a PCIe link issue. The "Slow" flashing rate is approximately 1 flash per second. • Flashing **Yellow**: PCIe link failure. • Solid **Red**: When illuminated Solid Red, there is an error in a module. Error codes are available over the API. The error condition may indicate a failure or a recoverable condition.

2.2.1.2 Front Panel Connectors on the ASAM18A AXIe Advanced Signal Analyzer



PARALLEL INTERFACE	50 Pin Parallel Interface connector. Use with Option BCD for real-time control of frequency, phase, and amplitude. For additional details, see the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396). Front panel connector: TE Connectivity (AMP) 5787362-5 (The mating "cable" connector is TE Connectivity 5750913-5) Contact Giga-tronics for available cable assemblies.

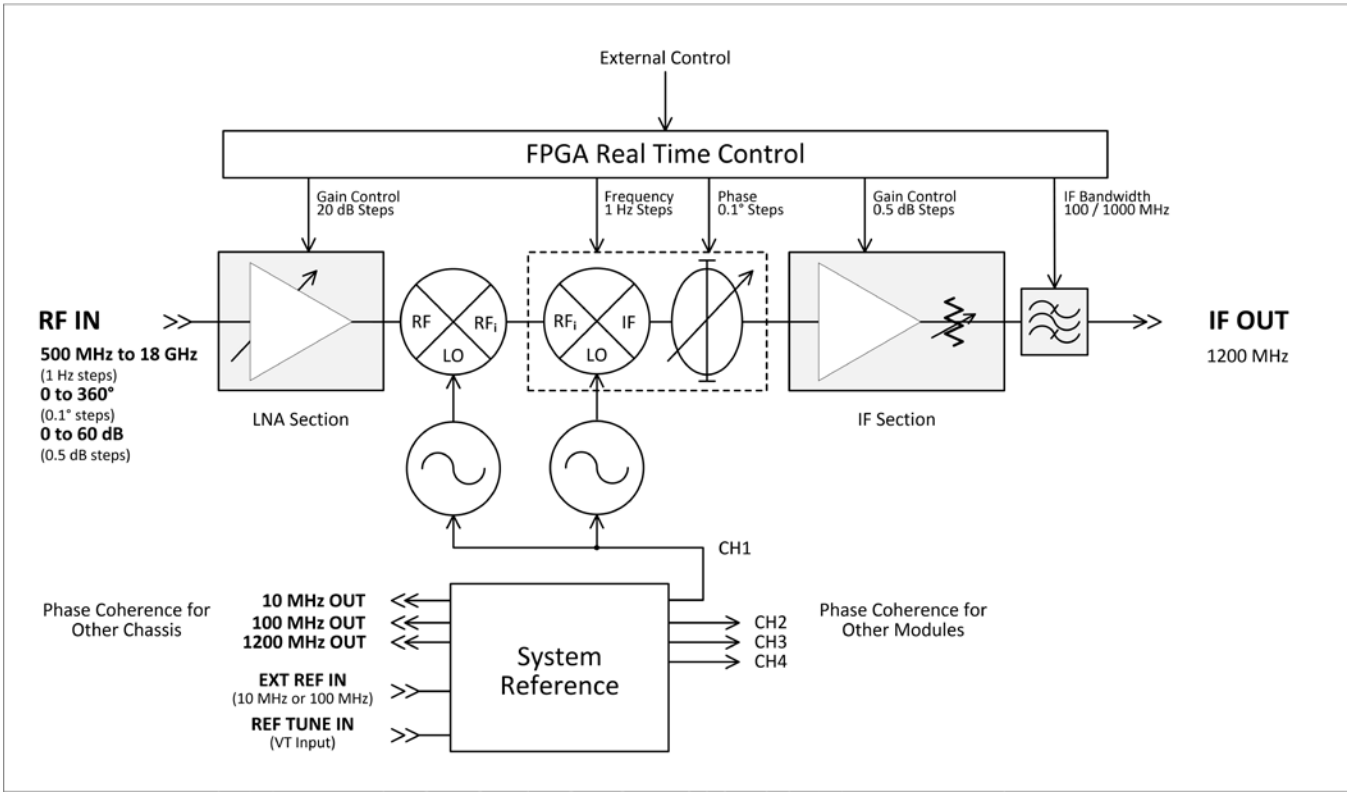


RF IN	Type-N (F) connector. For complete specifications, see the ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz, Datasheet (Document 36196).
3600 MHz IF OUT	Reserved for future use. SMA (F) connector.
I DATA OUT	Reserved for future use. SMA (F) connector. 50 Ω, TTL levels.
SYNC OUT (TRIGGER OUT)	SMA (F) connector. +5 Volt (TTL compatible) output pulse.
TRIGGER IN	SMA (F) connector. 50 Ω, TTL levels, > 50 ns pulse width.
EXT LO IN	Reserved for future use.
1200 MHz IF OUT	SMA (F) connector. Down-converting output.
Q DATA OUT	Reserved for future use. SMA (F) connector. 50 Ω, TTL levels.
USB Interface	Mini-USB connector.

NOTE

Connect a 50 Ω termination to all unused outputs, recommended.

2.2.1.3 Block Diagram for the ASAM18A AXIe Advanced Signal Analyzer



2.3 Giga-tronics SRM100A AXIe System Reference Module (SRM)

The Giga-tronics SRM100A AXIe Advanced System Reference Module is a precision frequency reference that provides the necessary signals for phase coherent operation across instruments within the AXIe chassis, as well as across multiple chassis. One SRM100A is necessary to drive a two or four channel AXIe chassis.
The SRM100A accepts an externally supplied 10 MHz or 100 MHz input, as well as providing 10 MHz and 100 MHz frequency reference outputs. Additionally, an external frequency control voltage input allows for the fine tuning of the SRM100A outputs' absolute frequencies if desired in a system test environment.

2.3.1.1 Front Panel Indicators on the SRM100A AXIe System Reference Module

PWR	When illuminated, indicates AC power is applied and unit is ready to function.
EXT REF	When illuminated, the EXT REF LED indicates that an external frequency reference signal has been detected and accepted.
UNLOCK	Early units were labeled "UNLOCK" instead of "EXT REF" and indicated the phase lock loop circuitry was not locked. This condition may indicate a failure or a recoverable condition while the internal oscillators are warming up. Allow 30 minutes for the unit to stabilize.

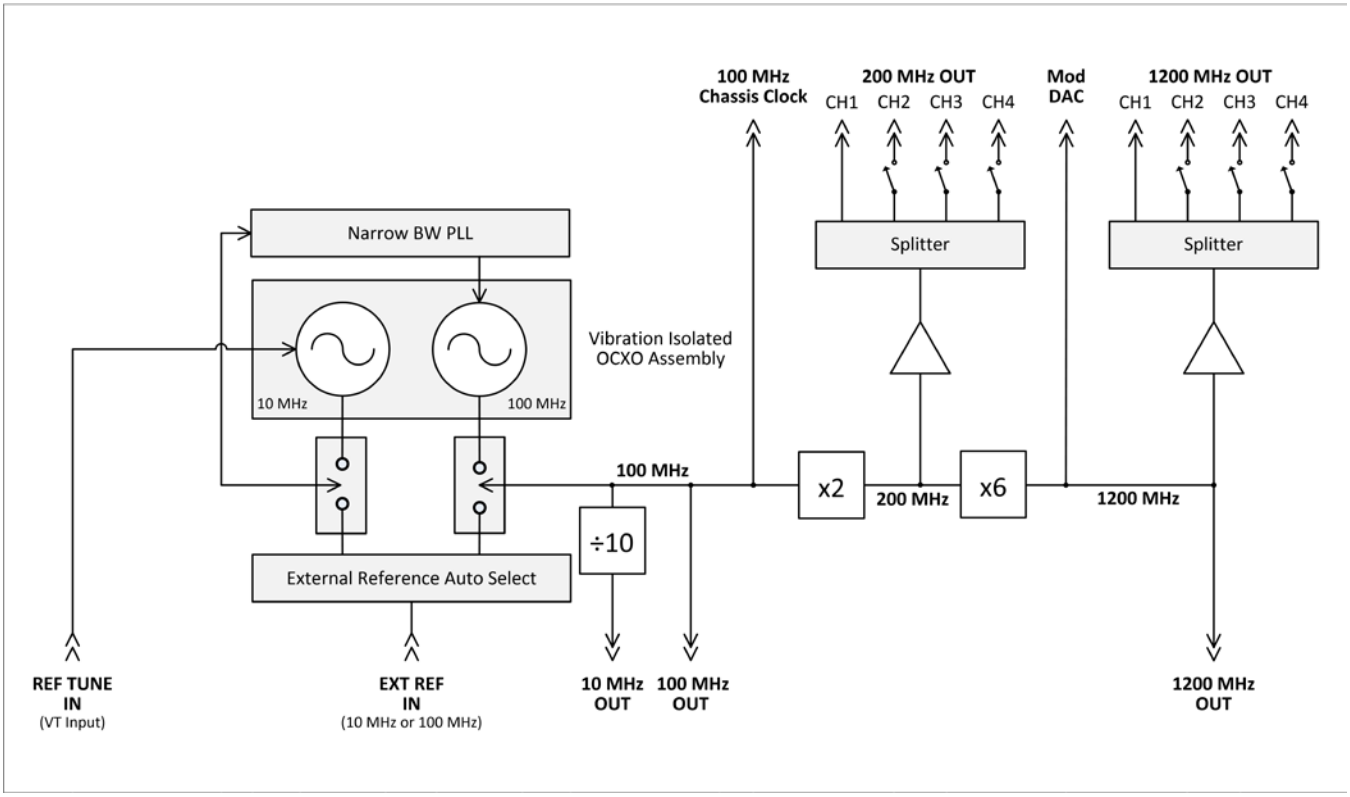
2.3.1.2 Front Panel Connectors on the SRM100A AXIe System Reference Module

10 MHz OUT	SMA (F) connector. 10 MHz frequency reference output. Power level > +8 dBm nominal into 50 Ω.
100 MHz OUT	SMA (F) connector. 100 MHz frequency reference output. Power level > +8 dBm nominal into 50 Ω.
1200 MHz OUT	SMA (F) connector. 1200 MHz frequency reference output. Power level > +12 dBm nominal into 50 Ω.
EXT REF IN	SMA (F) connector. 10 MHz sinusoid or 100 MHz frequency reference input. Input level nominal 0 dBm, range ±5 dBm maximum, into 50 Ω, automatically sensing.
REF TUNE IN	SMA (F) connector. Electronic frequency control (tune) of the 10 MHz internal reference oscillator. Tuning range ±5 Hz minimum. Input voltage range ±5 Volts maximum. Tuning sensitivity -1.2 Hz/V nominal.

NOTE

Connect a 50 Ω termination to all unused outputs, recommended.

2.3.1.3 Block Diagram for the SRM100A AXIe System Reference Module



2.3.1.4 Rear Panel Connectors on the SRM100A AXIe System Reference Module

Zone 1, Power and Diagnostics	Zone 1 contains the main power interface (-48 V); a chassis manager helps manage the power during power-up and regular instrument states.
Zone 2, PCIe, Intra Blade Communications	Zone 2 contains the PCIe bus and allows intra measurement blade communications (local bus).
Zone 3, Analog Coherent Synchronization Bus (ACSB)	Zone 3 contains a user-defined backplane with a rear I/O bus that supports the signals that allow for multi-channel signal generator coherence.
Zone 3, J304 (200 MHz)	J304 supplies 200 MHz Out for one to four channels in the chassis.
Zone 3, J302 (100 MHz)	J302 supplies 100 MHz to the chassis clock in the chassis.
Zone 3, J604 (1200 MHz)	J604 supplies 1200 MHz Mod DAC in the chassis.
Zone 3, J303 (1200 MHz)	J303 supplies 1200 MHz Out for one to four channels in the chassis.

2.4 Giga-tronics CHSISBK AXIe Blank Module (2-Slot Blank Module)

Do not operate the AXIe system with empty slots!

Install CHSISBK AXIe Blank Modules (2-Slot Blank Module) in empty slots.

The CHSISBK AXIe Blank Module maintains proper airflow through the lower modules as well as proper termination of the signals on the Zone 3 backplane; proper termination is required to minimize spurious and electro-magnetic interference (EMI) from the system.

2.5 Giga-tronics CHSIS2A and CHSIS4A AXIe System Chassis

The Giga-tronics CHSIS2A and CHSIS4A are AXIe compliant system chassis designed to house the Giga-tronics ASGM18A AXIe Advanced Signal Generator, the ASAM18A AXIe Advanced Signal Analyzer and the SRM100A AXIe Advanced System Reference module. With up to five instrument slots (2-Channel Chassis) and to nine instrument slots (4-Channel Chassis), each chassis provides the backplane hardware to enable phase-coherent RF signal creation and up and down conversion of RF microwave signals for the most demanding threat emulation applications.

CAUTION

When installing modules into the chassis, carefully align the side rails into the card guide slots and smoothly insert the module until the front panel reaches the front of the chassis. Verify that the module guide pins align with the chassis and with the module ejector levers open (out), complete the insertion into the chassis. The ejector levers should close as the module completes the insertion into the chassis. Complete the installation by hand tightening the knurled module retaining screws.

There are two power switches: A rear panel Main Power Switch on the power supply unit and a front panel ON/OFF switch.

- **The rear panel Main Power Switch completely removes power from the system.**
- **The front panel ON/OFF switch changes from "ON" to "STAND-BY" to provide power to the SRM100A AXIe System Reference Module which keeps the reference oscillator heaters active.**
- **There is no power to the ASGM18A AXIe Advanced Signal Generator or ASAM18A AXIe Advanced Signal Analyzer in "STAND-BY".**
- **DO NOT turn off the rear panel Main Power Switch unless necessary because this completely removes power from the system. When power is completely removed from the system, no power is supplied to the SRM100A AXIe System Reference Module which keeps the reference oscillator heaters active. The rear panel Main Power Switch should be left on to maintain oscillator stability and aging.**
- **If you turn off the rear panel Main Power Switch, allow time for the reference oscillators to achieve their stability specifications.**

Powering-Up / Powering-Down

- **For powering-up, turn "On" the rear panel Main Power Switch first and the front panel ON/OFF switch second.**
- **For powering-down, turn "Off" the front panel ON/OFF switch first and the rear panel Main Power Switch second.**
- **Powering-down by unplugging the AC power cord is not recommended.**

NOTE

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.

In normal operations the rear switch should remain in the "ON" position to maintain reference oscillator stability and aging.

AXIe slot number for the Giga-tronics Advanced Signal Generator and Analysis System is indicated in the figures below:

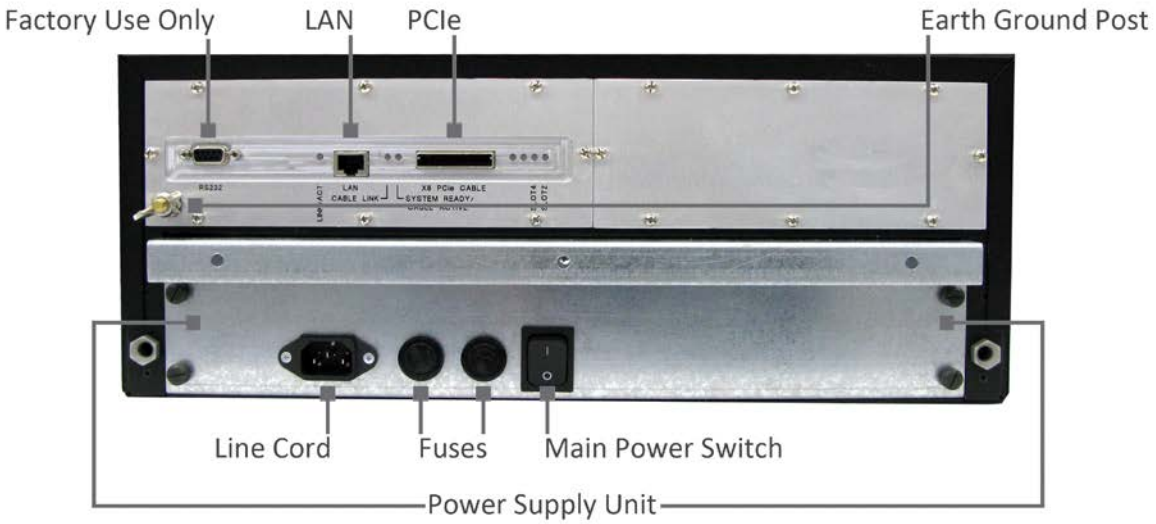
Giga-tronics
Solutions for Next Gen EW / Radar Test & Deployment
MADE IN THE USA

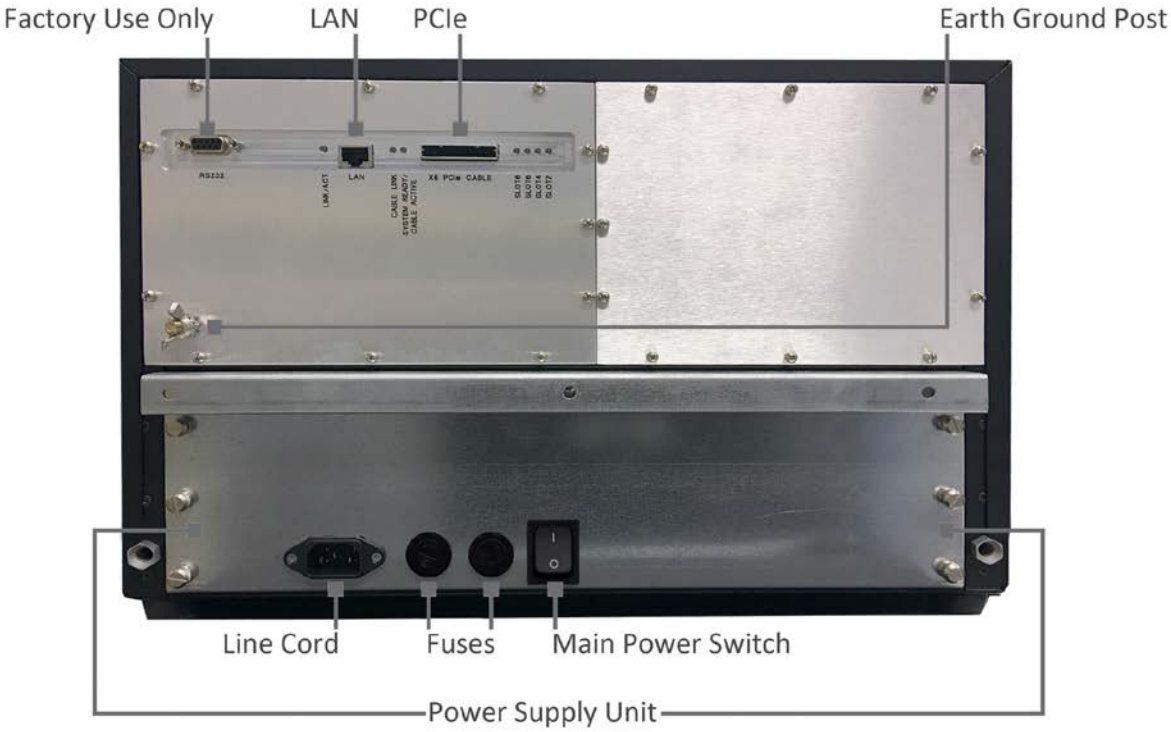
2.5.1.1 Front Panel Indicators on the CHSIS2A and CHSIS4A AXIe System Chassis

POWER	When illuminated, indicates AC power is applied and unit is ready to function.
ON/OFF SWITCH	For power down, turn off the front panel ON/OFF switch first, then the rear panel Main Power Switch. Do NOT power down by unplugging the power cord.
FAULT[1]	When illuminated, the FAULT LED indicates that one or more of the internal temperature sensors, fan sensors or voltage sensors has experienced an over-limit condition. This condition may indicate a failure or may indicate a recoverable condition. Chassis status can be monitored over the Ethernet connection.
STAND-BY	When illuminated, indicates AC power is applied and chassis is providing stand-by power to the ovenized oscillators in the SRM100A AXIe System Reference Module. The chassis should be left in STAND-BY when not in use.
PC LINK STATUS	When illuminated, indicates the PCIe bus has initialized properly and the system is communicating with the PC. The LED should be checked after the ASG/ASA system has first been powered on, and should be illuminated after turning on the PC.

[1] If any fault occurs, switch off the instrument's power at the front panel before investigating the cause of the failure.

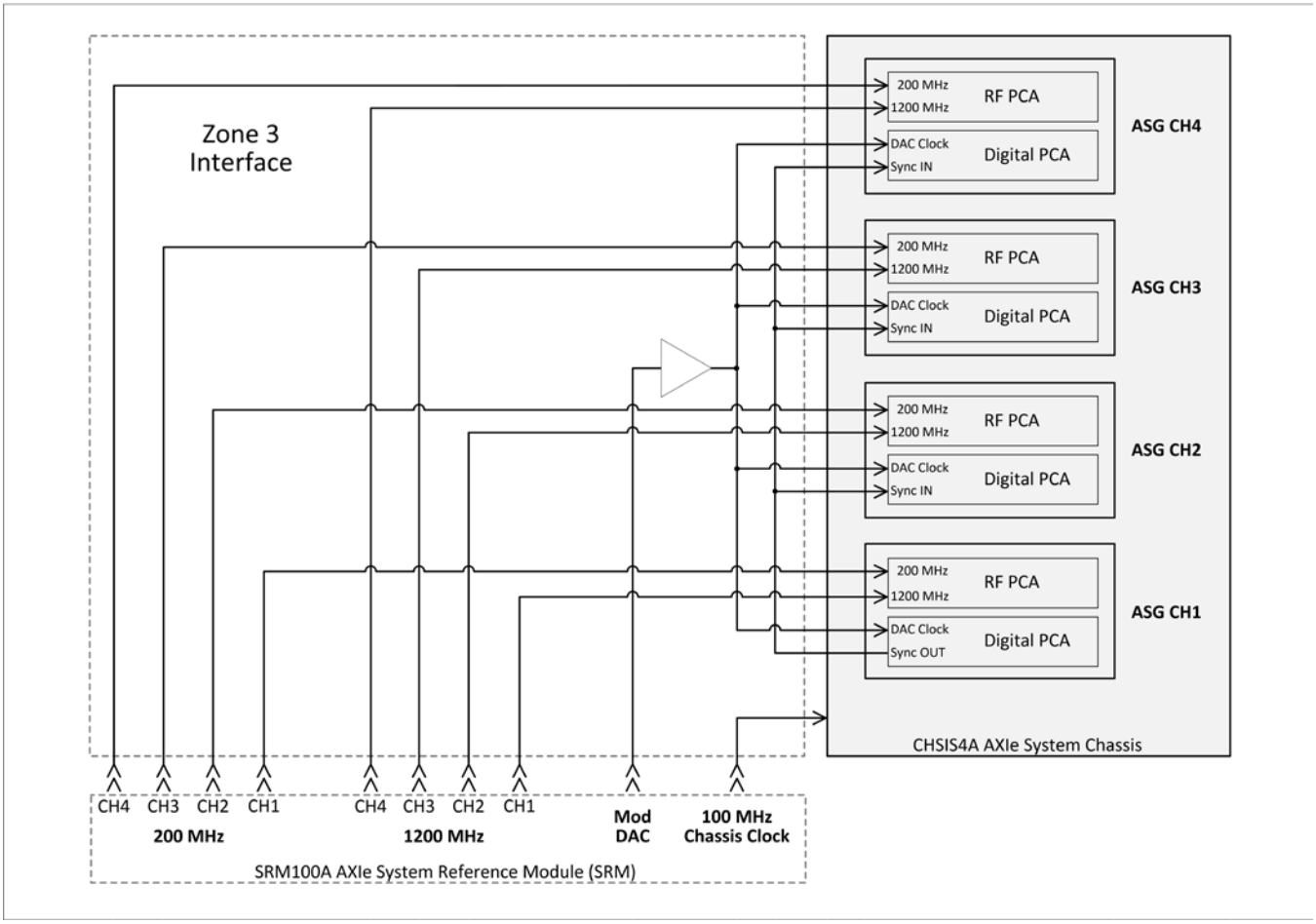
2.5.1.2 Rear Panel Indicators on the CHSIS2A and CHSIS4A AXIe System Chassis



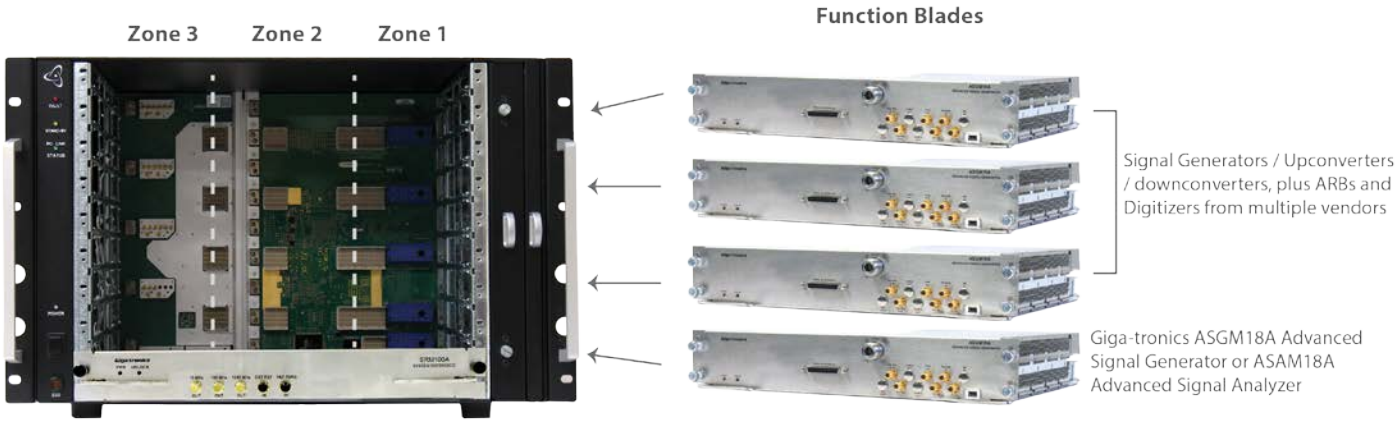


Rear Panel Indicators	
LAN	When illuminated, the LAN status LEDs indicate LAN bus activity.
PCIe	When illuminated, the PCIe status LEDs indicate PCIe bus activity.

2.5.1.3 Block Diagram for the CHSIS4A AXIe System Chassis



2.6 Interface Backplane Zones 1, 2, & 3 on CHSIS2A and CHSIS4A AXIe System Chassis



Giga-tronics CHSIS4A AXIe System Chassis backplane zone (shown with SRM100A AXIe System Reference Module)

Both the CHSIS2A and CHSIS4A AXIe System Chassis support three primary hardware interfaces – Zones: The Giga-tronics Advanced Signal Generator and Analysis System utilizes all three of these Zones.

Zone	Name	Description
Zone 1	Power and Diagnostic	Zone 1 contains the main power interface (-48 V); a chassis manager helps manage the power during power-up and regular instrument states.
Zone 2	PCIe, Intra Blade Communications	Zone 2 contains the PCIe bus and allows intra measurement blade communications (local bus).
Zone 3	Analog Coherent Synchronization Bus (ACSB)	Zone 3 contains a user-defined backplane with a rear I/O bus that supports the signals that allow for multi-channel signal generator coherence.

Primary (Non-BCD) control of the instrument is through the Zone 2 PCIe bus.

NOTE

A user can successfully operate the system without needing any detailed knowledge of either AXIe or PXIe.

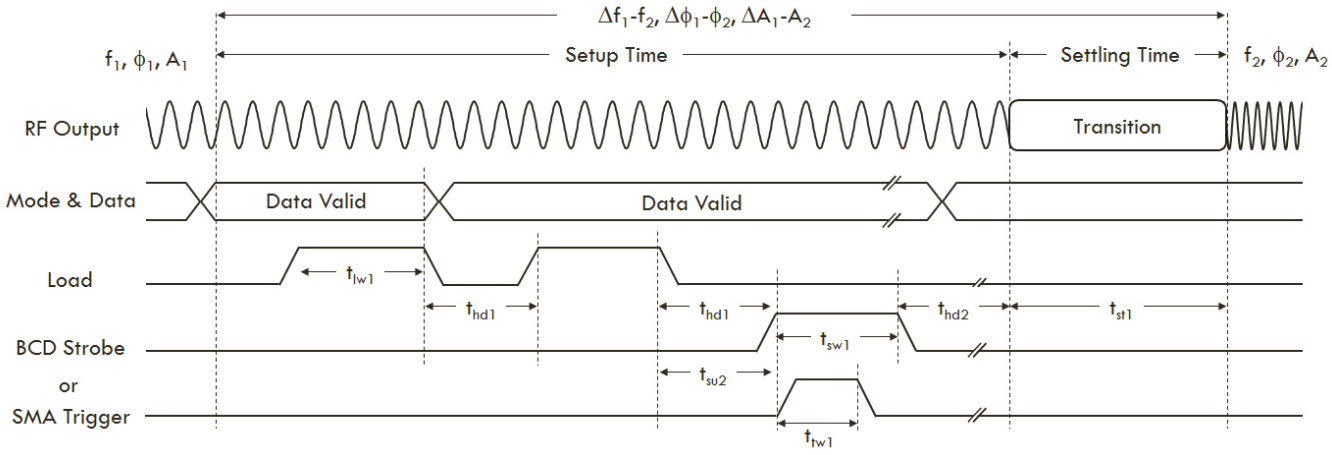
2.7 Instrument Trigger and Timing Considerations

When triggering an instrument, the following considerations need to be taken into account:

- Stability of the frequency control word on either the serial PCIe bus or the parallel BCD bus.
- The *update time* is the time it takes the digital circuits to clock a change through the instrument, combined with the time it takes the analog circuitry to change and settle.
- The *rate* at which a new frequency word can be applied is the *update time* plus *bus settling time*.

2.7.1.1 Switching Speed Definitions and Timing Diagram

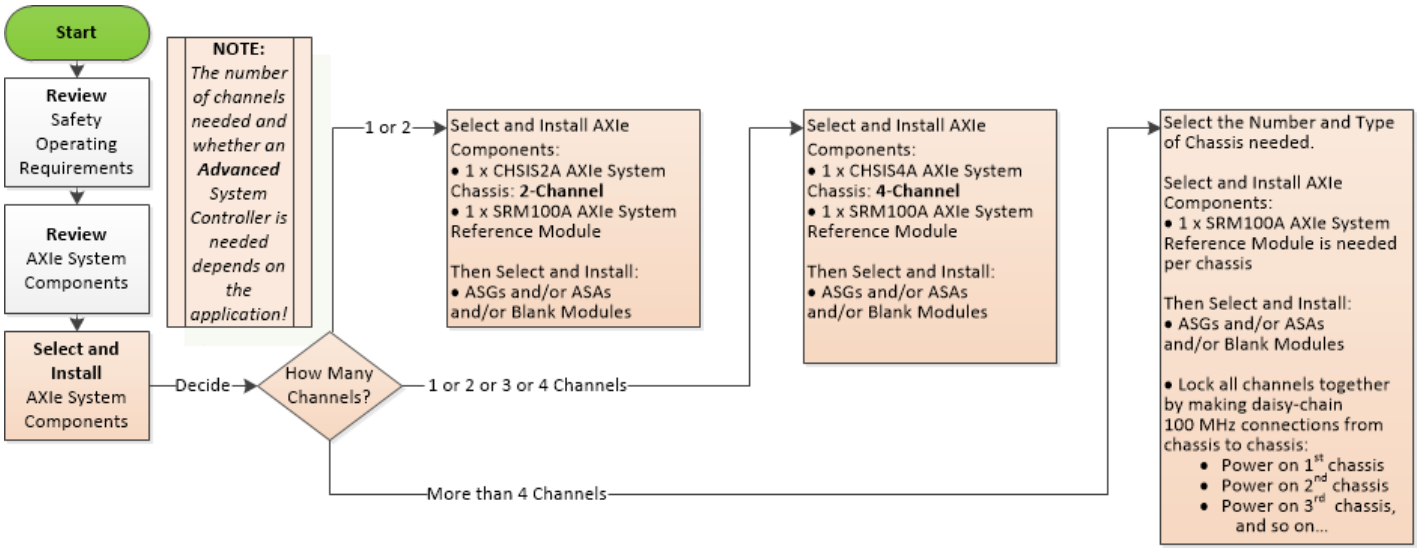
- This timing diagram shows an example with the instrument set to use the positive edge trigger.
- The timing diagram shows the latency, settling time, update time, sync output, and blanking relative to the trigger signal.



Parameter	Description	Min
t_{sw1}	BCD Strobe width	60 ns
t_{hd1}	Hold time - data stable while load is de-asserted	40 ns
t_{lw1}	Load width	60 ns
t_{hd1}	Hold time - data stable while BCD strobe is de-asserted	40 ns
t_{su1}	Setup time	60 ns
t_{tw1}	Trigger width	30 ns
t_{su2}	Setup time	40 ns
t_{hd3}	Hold time - data stable while SMA trigger is de-asserted	30 ns
t_{st1}	Settling time	300 ns ≤ 640 ns, Typical

Chapter 3. Select/Install AXIe System Components

In this chapter, learn about selecting the size of the chassis and the number of chassis needed in an AXIe system.



3.1 Decide How Many Channels are Needed in the AXIe System

NOTE

- The number of channels needed depends on the application!

- Both CHSIS2A and CHSIS4A AXIe System Chassis can be designated by either the number of signal channels or the number of slots.
  - The CHSIS2A AXIe System Chassis is a 4U height 5-slot chassis, containing Slots 1 to 5.
  - The CHSIS2A AXIe System Chassis accommodates one or two ASGM18A AXIe Advanced Signal Generator (ASG) or ASAM18A AXIe Advanced Signal Analyzer (ASA) modules in any combination, allowing for one or two signal channels.

  - The CHSIS4A AXIe System Chassis is a 7U height 9-slot chassis, containing Slots 1 to 9.
  - The CHSIS4A AXIe System Chassis accommodates one to four ASGM18A AXIe Advanced Signal Generator (ASG) or ASAM18A AXIe Advanced Signal Analyzer (ASA) modules in any combination, allowing for one to four signal channels.

- Do not operate the AXIe system with empty slots! Install CHSISBK AXIe Blank Modules in empty slots. The CHSISBK AXIe Blank Module maintains proper airflow through the lower modules as well as proper termination of the signals on the Zone 3 backplane; proper termination is required to minimize spurious and electro-magnetic interference (EMI) from the system.

3.2 Typical AXIe System Configurations with 2 or 4 Channels

Typical AXIe system configurations consist of:

- a chassis (Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel
  or Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel)
- a reference (Giga-tronics SRM100A AXIe System Reference Module)
  that can be used by up to four channels
- and one to four
  Giga-tronics ASGM18A AXIe Advanced Signal Generator (ASG) (up-converter) modules
  and/or Giga-tronics ASAM18A AXIe Advanced Signal Analyzer (ASA) (down-converter) modules
  and/or arbitrary waveform generators (AWG) and/or digitizers

NOTE

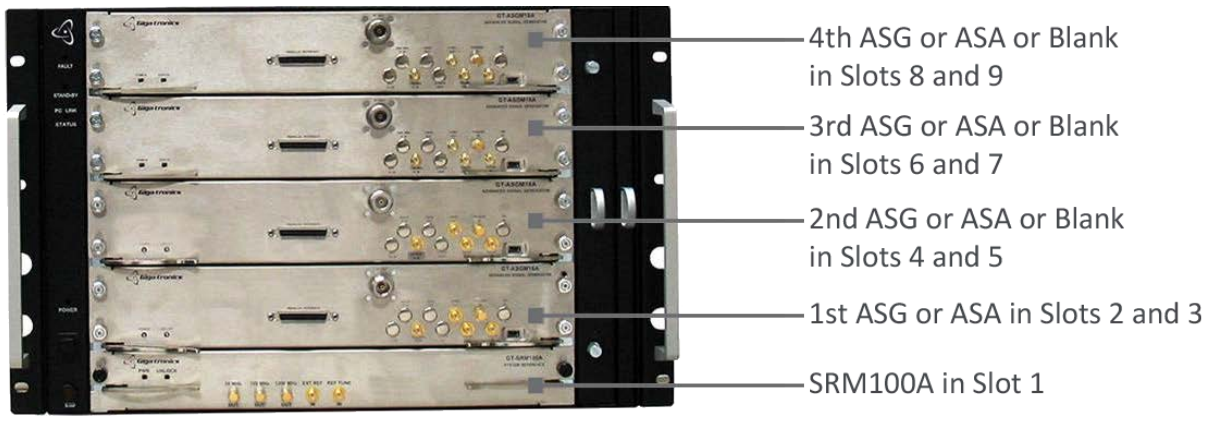
Giga-tronics CHSISBK AXIe Blank Module: 2-Slot must be used when there are empty slots; they are used to maintain proper air flow management and backplane termination.

3.2.1 Example of the Typical Module Placement in a CHSIS2A AXIe System Chassis: 2-Channel

The CHSIS2A AXIe System Chassis accommodates one or two ASGM18A AXIe Advanced Signal Generator (ASG) or ASAM18A AXIe Advanced Signal Analyzer (ASA) modules in any combination, allowing for one or two signal channels.

- The CHSIS2A AXIe System Chassis is a 4U height 5-slot chassis, containing Slots 1 to 5.
- Slot 1 must contain an SRM100A AXIe System Reference Module.
- Slot 2 must contain the 1st ASG or ASA.
  The ASG or ASA in Slot 2 is signal channel 1 and is referred to as the system master module.
- Slot 4 may contain either a 2nd ASG, a 2nd ASA, or a CHSISBK AXIe Blank Module.
  If Slot 4 contains either a 2nd ASG or a 2nd ASA, this is signal channel 2.
- Do not operate the AXIe system with empty slots! Install CHSISBK AXIe Blank Modules in empty slots.
  The CHSISBK AXIe Blank Module maintains proper airflow through the lower modules as well as proper termination of the signals on the Zone 3 backplane; proper termination is required to minimize spurious and electro-magnetic interference (EMI) from the system.

3.2.2 Example of the Typical Module Placement in a CHSIS4A AXIe System Chassis: 4-Channel



The CHSIS4A AXIe System Chassis accommodates one to four ASGM18A AXIe Advanced Signal Generator (ASG) or ASAM18A AXIe Advanced Signal Analyzer (ASA) modules in any combination, allowing for one to four signal channels.

- The CHSIS4A AXIe System Chassis is a 7U height 9-slot chassis, containing Slots 1 to 9.
- Slot 1 must contain an SRM100A AXIe System Reference Module.
- Slot 2 must contain the 1st ASG or ASA.
  The ASG or ASA in Slot 2 is signal channel 1 and is referred to as the system master module.
- Slot 4 may contain either a 2nd ASG, a 2nd ASA, or a CHSISBK AXIe Blank Module.
  If Slot 4 contains either a 2nd ASG or a 2nd ASA, this is signal channel 2.
- Slot 6 may contain either a 3rd ASG, a 3rd ASA, or a CHSISBK AXIe Blank Module.
  If Slot 6 contains either a 3rd ASG or a 3rd ASA, this is signal channel 3.
- Slot 8 may contain either a 4th ASG, a 4th ASA, or a CHSISBK AXIe Blank Module.
  If Slot 8 contains either a 4th ASG or a 4th ASA, this is signal channel 4.
- Do not operate the AXIe system with empty slots! Install CHSISBK AXIe Blank Modules in empty slots. The CHSISBK AXIe Blank Module maintains proper airflow through the lower modules as well as proper termination of the signals on the Zone 3 backplane; proper termination is required to minimize spurious and electro-magnetic interference (EMI) from the system.

3.3 Typical AXIe System Configurations with More than 4 Channels

When an AXIe system configuration requires more than 4 channels, multiple chassis must be used.

- One SRM100A AXIe System Reference Module is required for each chassis.
- All chassis should be locked together by daisy-chaining the 100 MHz OUT from the first SRM100A into the EXT REF IN of the next SRM100A.

3.3.1 Make Daisy-Chain 100 MHz OUT Connections from SRM100A to SRM100A

NOTE

The SRM100A provides phase stability between channels and across chassis. For best phase stability, do not use the 10 MHz OUT signals to daisy-chain. It is recommended that you connect the 100 MHz OUT signal from the first SRM100A to the input of the EXT REF IN on the next SRM100A in a daisy-chain.

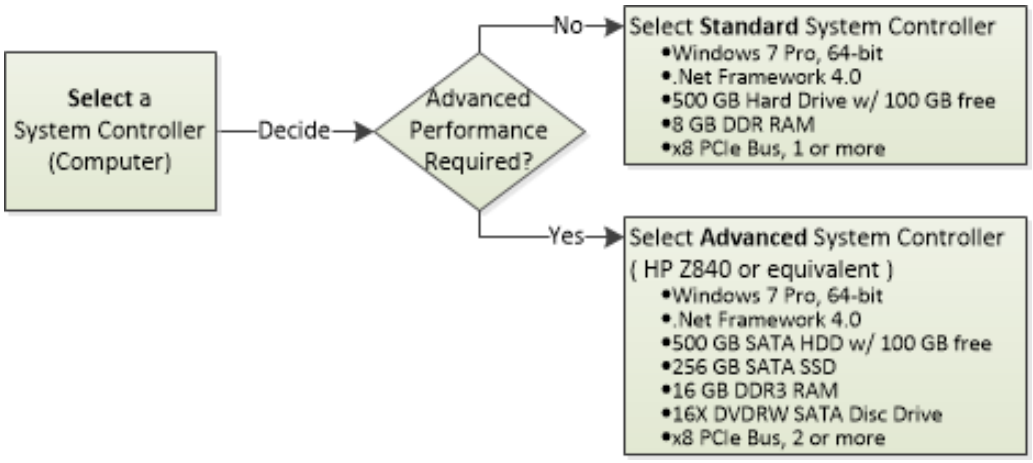
3.3.2 Example of Daisy-Chaining Multiple Chassis

- (Optional) A 10 MHz house standard can be connected to the EXT REF IN on the SRM100A in the 1st chassis.
- From the 1st chassis, connect the 100 MHz OUT of the 1st SRM100A to the EXT REF IN on the SRM100A in the 2nd chassis.
- Power on the 1st chassis.
- From the 2nd chassis, connect the 100 MHz OUT of the 2nd SRM100A to the EXT REF IN on the SRM100A in additional chassis or other equipment.
- Power on the 2nd chassis.

Follow this same sequence for additional chassis or other equipment;
first make the connections and then power on the additional chassis or other equipment.

Chapter 4. Select a System Controller (Computer)

In this chapter, learn about the different criteria used when selecting a system controller (computer).



4.1 Select a Standard or Advanced System Controller

The Advanced Signal Generation and Analysis System requires a system controller.

Depending on the number of channels needed and your application, a Standard or Advanced System Controller is needed.

- If your AXIe System components are made up of one to four channels and are being controlled through the ASC GUI (over a PCIe or USB interface), a Standard System Controller can be used.

- If your AXIe System components are made up of four or more channels and are being controlled through the Application Programming Interface (API) with C# or C++ applications, or you are controlling the ASG or ASA through their Parallel Interface (BCD) connectors, an Advanced System Controller, such as the HP Z840 or equivalent, may be needed.

4.1.1 Configuration for a Standard System Controller

- Windows® 7 Professional, 64-bit
- Microsoft .NET Framework 4.0 (should be included in Windows® 7 Professional, or downloadable from Microsoft web site).
- At least one open x8 PCIe expansion slot
- Single PCIe Adapter Card, Dolphin Interconnect Solutions or Equivalent[1]
- 1 meter or 2-meter PCIe x8 cable, Dolphin Interconnect Solutions or Equivalent
- 500 GB HDD with 100 GB free disk space at runtime (1 TB recommended)
- 8 GB DDR3 Unbuffered RAM
- 16X DVDRW SATA Disc Drive

4.1.2 Configuration for an Advanced System Controller

- HP Z840 Workstation with dual CPUs (Two Intel Xeon E5-2630 v2 2.6 GHz) or equivalent
- NVIDIA Quadro K4000 3 GB Graphics
- Windows® 7 Professional, 64-bit
- Microsoft .NET Framework 4.0 (should be included in Windows® 7 Professional, or downloadable from Microsoft web site).
- At least two open x4, x8 or x16 PCIe expansion slots
- Single or dual PCIe Adapter Card, Dolphin Interconnect Solutions or Equivalent[1]
- 1 meter or 2-meter PCIe x8 cable, Dolphin Interconnect Solutions or Equivalent
- 500 GB SATA HDD with 100 GB free disk space at runtime (1 TB recommended)
- 256 GB SATA SSD
- 16 GB DDR3 Unbuffered RAM
- 16X DVDRW SATA Disc Drive

NOTE

For high speed operation, do not exceed a 2-meter length PCIe cable.

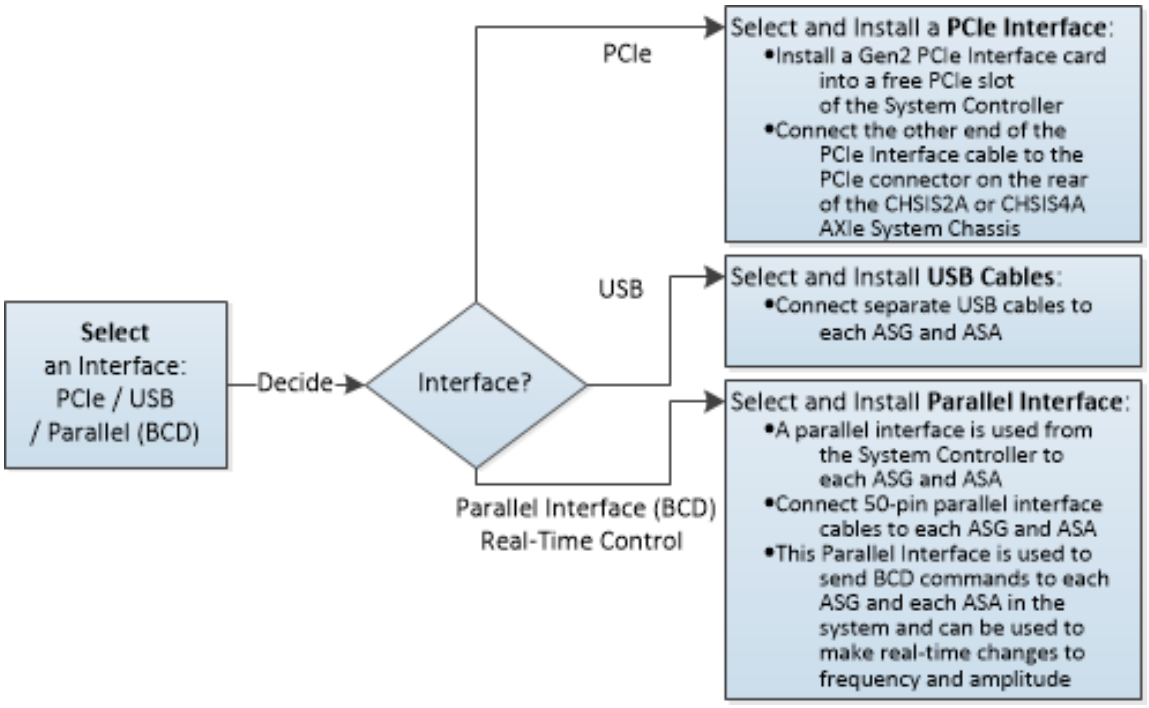
[1]Computer tested with the IXH620 Gen2 PCIe XMC Adapter Card and IXC2M cable from Dolphin Interconnect Solutions (www.dolphinics.com), and the OSS-PCIe-HIB25-x8-H PCIe x8 Gen2 Host Cable Adapter from One Stop Systems (www.onestopsystems.com). Single and dual PCIe Adapter Cards and cables are also available from Keysight Technologies (www.keysight.com).

4.1.3 Interface Port Requirements for a Standard or Advanced System Controller

Programming Interfaces	
PCIe port, one for each chassis	PCIe x8 Gen2 (full instrument control)
USB port, one for each ASG or ASA	USB 2.0 or higher (full instrument control)
Ethernet (LAN) port	10/100 Mbps (chassis status only)
Graphical User Interface (GUI)	Advanced Signal Control/Signal Analyzer Software
Application Programming Interface (API)	ASG/ASA IVI Compatible Driver
Parallel Interface (BCD)	Positive TRUE, BCD format, 11 digits with TTL strobe

Chapter 5. Select an Interface: PCIe/USB/Parallel

In this chapter, learn about selecting the interface to be used by the system controller (computer) that connects to and controls the AXIe system components.



5.1 Select the PCIe or USB or the Parallel Interface (Option BCD)

The Advanced Signal Generation and Analysis System requires a system controller connected to the AXIe system components through either a PCIe connection, USB cable connections, or the Parallel Interface (Option BCD) cables that send BCD commands.

Interface	Instrument Control	Characteristic	Functionality	Why Choose
PCIe	Utilizes a DLL. (Communicates through a rear panel chassis connector.)	Mostly deterministic timing (dependent on PCIe traffic).	All instrument features can be controlled using a PCIe interface.	**Fast**, but more complex.
USB	Utilizes a direct hardware interface. (Front panel USB connectors on each ASG and ASA.)	Mostly deterministic timing (dependent on computer).	All instrument features can be controlled using the USB interface.	**Easy**, but slow.
Parallel (Option BCD)	Utilizes a direct hardware interface. (Front panel 50-pin connector on each ASG and ASA.)	Highly deterministic timing for changing frequency, amplitude, and phase.	Most common features. Requires Option BCD.	**Real Time**, but likely custom.

NOTE

- When using Advanced Signal Control (ASC) software, the PCIe interface and the USB interface cannot be used at the same time; only one at a time can be used.
- When connecting over PCIe, ALWAYS power on the Giga-tronics Advanced Signal Generation and Analysis System prior to turning on the system controller (computer). The sequence of system “ON” first, computer “ON” second is required for proper system initialization and operation over the PCIe bus. If connecting to the system controller over USB, power on sequencing is not required.
- The PCIe interface is located on the chassis rear panel and can control all modules in a multi-channel system.
- The USB interface and the Parallel interface (Option BCD) are on each of the ASG and ASA front panels and control that (single channel) ASG or ASA module only.
- Chassis status can be monitored using either the PCIe interface or the Ethernet interface.
- In normal operations, the rear panel Main Power Switch should remain in the “ON” position to maintain reference oscillator stability and aging.
- For complete power down, turn off the front panel ON/OFF switch first, then the rear panel Main Power Switch second.
- Powering down by unplugging the power cord is not recommended.
- Refer to the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396) for the API command set.

5.1.1 Select and Install a PCIe Interface

When using the PCIe Interface, install a Gen2 PCIe Interface card into one of the free PCIe slots of the System Controller and connect the other end of the PCIe Interface cable to the PCIe connector on the rear of the CHSIS2A or CHSIS4A AXIe System Chassis.

- Connect PCIe Interface cables to each CHSIS2A or CHSIS4A AXIe System Chassis in the configuration.
- Separate PCIe Interface cables are used to connect each CHSIS2A or CHSIS4A AXIe System Chassis to the System Controller.

NOTE

- A high quality PCIe cable should be used to connect the system controller to the AXIe chassis.
- In high-speed operation, the length of a PCIe cable should be limited to a few feet, not longer than a 2-meter cable.
- In multi-chassis applications, a PCIe hub may be needed.

5.1.2 Select and Install USB Cables

When using the USB Interface, a USB 2.0 cable is used from the System Controller to each ASG and each ASA.

- Connect USB cables to each ASG and each ASA.
- Separate USB cables are used to connect each ASG and each ASA to the System Controller.

5.1.3 Select and Install Parallel Interface (Option BCD) Cables

When using the Parallel Interface (Option BCD), a parallel interface is needed from the System Controller to each ASG and each ASA.

- Connect a 50-pin parallel interface cable to each ASG and ASA.
- Separate 50-pin parallel interface cables are used to connect each ASG and each ASA to the System Controller.
- This Parallel Interface is used to send BCD commands to each ASG and each ASA in the system and can be used to make real-time changes to frequency, amplitude, and phase.

5.1.3.1 Parallel Interface (Option BCD) on ASG and ASA Front Panels

The Parallel Interface (Option BCD) is on the ASG and ASA front panels. It accepts a command word and a command action trigger/strobe. The trigger can be selected using the ASC GUI to either source the trigger on the 50-pin parallel interface connector or the higher performance external TRIGGER IN on the front panel.

Chapter 6. Install ASC Software and Drivers

In this chapter, learn how to download and install the Advanced Signal Control (ASC) Software onto the system controller (computer), along with the PCIe and USB drivers that are used to control AXIe system components.

6.1 Download Advanced Signal Control Software, a PCIe Driver, and a USB Driver

The latest version of Advanced Signal Control Software is available as a download from Giga-tronics.
https://go-asg.gigatronics.com/tech-support/

6.2 Install Advanced Signal Control Software and the PCIe Driver

1) Install Advanced Signal Control Software and the USB driver

    a) Select **AdvSignalControl_Setup.exe**
    b) Right-click the mouse and choose "**run as administrator**" to open the software.
    c) Follow the prompts.

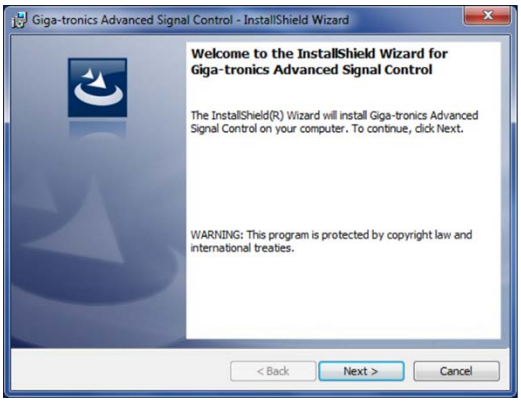
2) Install the PCIe driver

    a) Select the command prompt icon:
    (Start->All Programs-> Accessories-> Command Prompt)
    b) Right-click the mouse and choose "**run as administrator**" to open the command prompt.
    c) Run **Driver_install.bat** in the installation\PCIe Driver folder.
    d) The default installation path is:
    C:\Program Files (x86)\Giga-tronics\AdvSignalControl\PCIe Driver\Driver_install.bat
    e) Reboot the computer after PCIe driver installation.

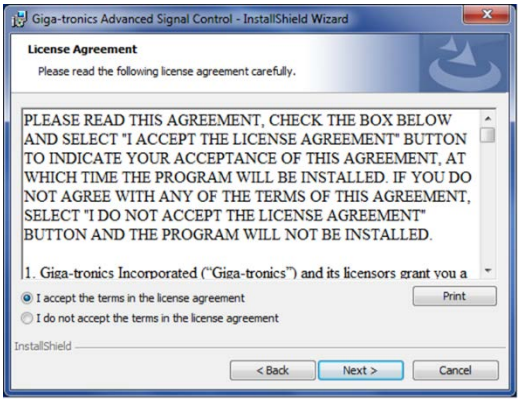
NOTE

It is recommended to always use the most current revision of software.

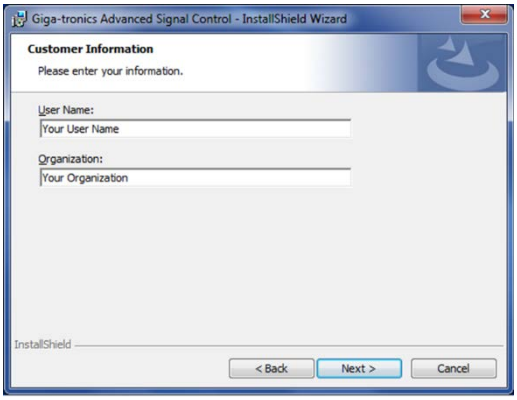
f) Select the AdvSignalControl_Setup application to launch the setup wizard:



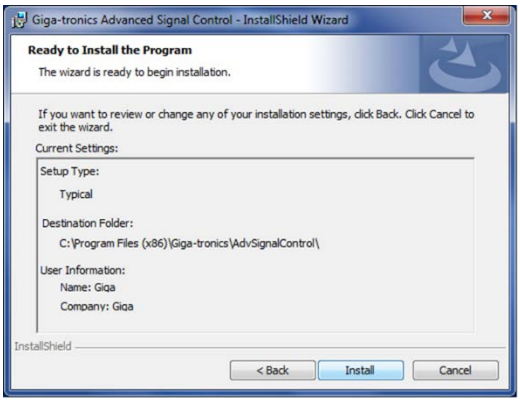
g) Read and accept the license agreement:



h) Continue with the user information:

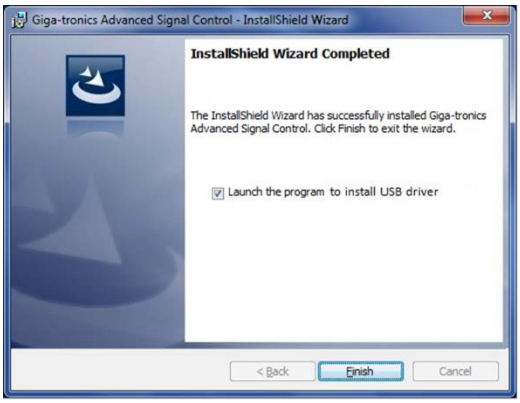


i) Continue with the destination folder:

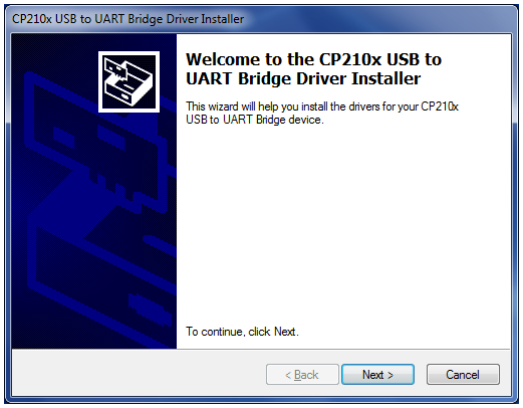


After the Advanced Signal Control software has been installed, the wizard asks if you want to install a USB driver.

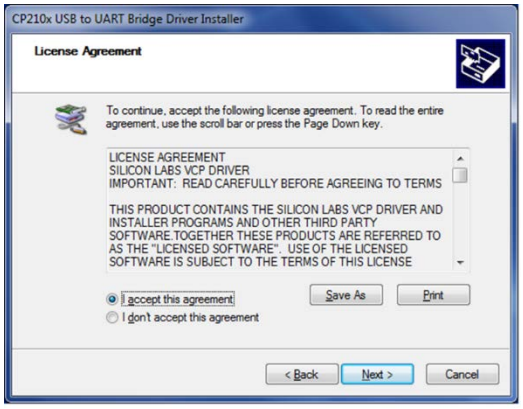
It is recommended that you install the USB driver if you plan to make a USB connection to the hardware.



6.3 Install the USB Driver



1) Read and accept the license agreement:

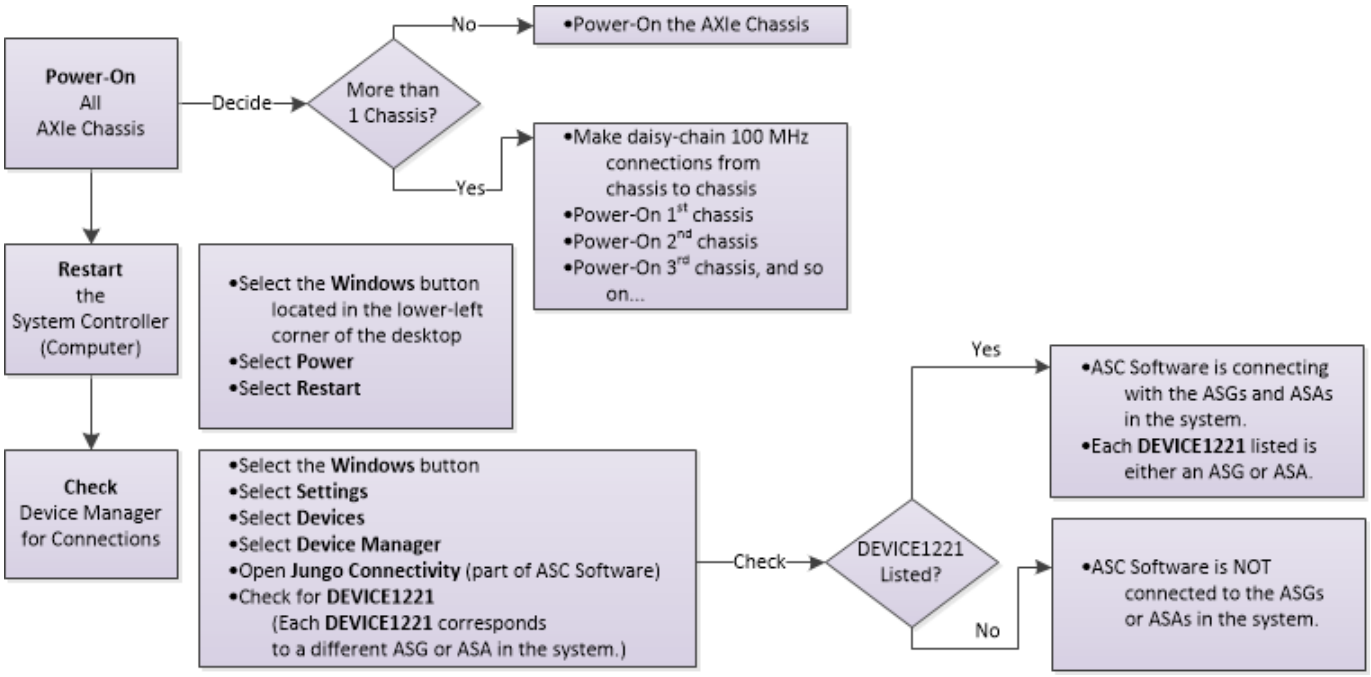


2) After completion of the USB driver installation, continue on to **Chapter 7 Power-On and Check for Connections**.

Chapter 7. Power-On and Check for Connections

In this chapter, learn about powering-on all AXIe chassis, powering-on or restarting the system controller, and then checking the Device Manager for connections from the system controller to the AXIe system components.

1. Power-On All AXIe Chassis
2. Power-On or Restart the System Controller (Computer)
3. Check for Connections



7.1 Power-On All AXIe System Chassis

When using the PCIe Interface, ALWAYS power on all AXIe System Chassis 1st prior to powering-on or restarting the system controller (computer); if the system controller is already running, all AXIe System Chassis should be powered-on and the system controller should be restarted.

A restart of the system controller is required so that the PCIe bus is refreshed which allows it to access all AXIe system components. If you do not restart the system controller after connecting the PCIe Interface to an AXIe System Chassis, the system controller may not be able to connect to and control the AXIe System Chassis because it may not be aware it is connected.

NOTE

If connecting to AXIe System Components using USB cables, power on sequencing is not required because each time a device is connected to the USB, the USB connection is added to the system controller's list of USB connections; the system controller can see each ASG and each ASA as they are connected.

When connecting to AXIe System Components or when powering on the system, allow 30 minutes minimum for the system to warm up and stabilize. Specifications only apply after the 30-minute warm-up.

7.1.1.1 To Power-On All AXIe System Chassis

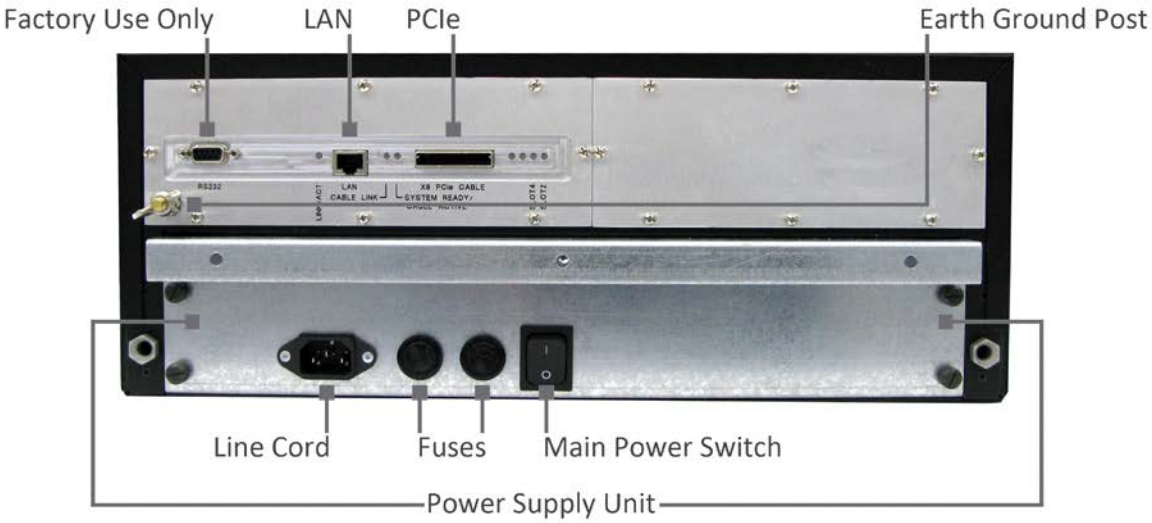
1. Verify that the modules are in their correct location and that unused slots in the chassis are filled with a CHSISBK AXIe Blank Module (2-Slot Blank Module).

2. Verify that the chassis power cord is plugged into an appropriate power outlet.

   CAUTION

   The chassis is supplied with a power cord rated for 15 Amps. Always use the power cord supplied or a power cord of equivalent or greater current rating.

3. Set the chassis rear panel Main Power Switch to the "On" position. This action turns on the Stand-By Power Supply. The Stand-By Power Supply keeps the SRM100A AXIe System Reference Module internal ovenized oscillator heaters active. In normal operations, the rear panel Main Power Switch should remain in the "ON" position to keep the ovenized oscillator heaters active and maintain reference oscillator stability and aging.



4. Turn the front panel ON/OFF switch to the On position.

NOTE

There is a 2 to 3 second delay after turning the switch on before the system initializes and the LEDs light; this is normal operation. When cold, the STATUS LED may remain lit until the system has warmed up sufficiently for the ovenized oscillators to stabilize at operating temperature.

NOTE

The power supply has internal fans. When in stand-by, the power supply fans may be audible. When the front panel power turned on, the main chassis fans (in the fan assembly) will at first turn on full speed, then settle to a speed appropriate for the ambient temperature. The chassis fan speed will vary with temperature or can be set under remote control. Refer to the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396) for the chassis and fan control command set.

NOTE

Proper airflow is required for reliable operation. Do not block or impede the airflow. Check the fan filter periodically and clean or replace as needed.

7.2 Power-On or Restart the System Controller

When using the PCIe Interface, ALWAYS power on all AXIe System Chassis 1st prior to powering-on or restarting the system controller (computer); if the system controller is already running, all AXIe System Chassis should be powered-on and the system controller should be restarted.

A restart of the system controller is required so that the PCIe bus is refreshed which allows it to access all AXIe system components. If you do not restart the system controller after connecting the PCIe Interface to an AXIe System Chassis, the system controller may not be able to connect to and control the AXIe System Chassis because it may not be aware it is connected.

7.2.1.1 To Restart the System Controller

1. Select the **Windows** button, located in the lower-left corner of the desktop.
2. Select **Power**.
3. Select **Restart**.

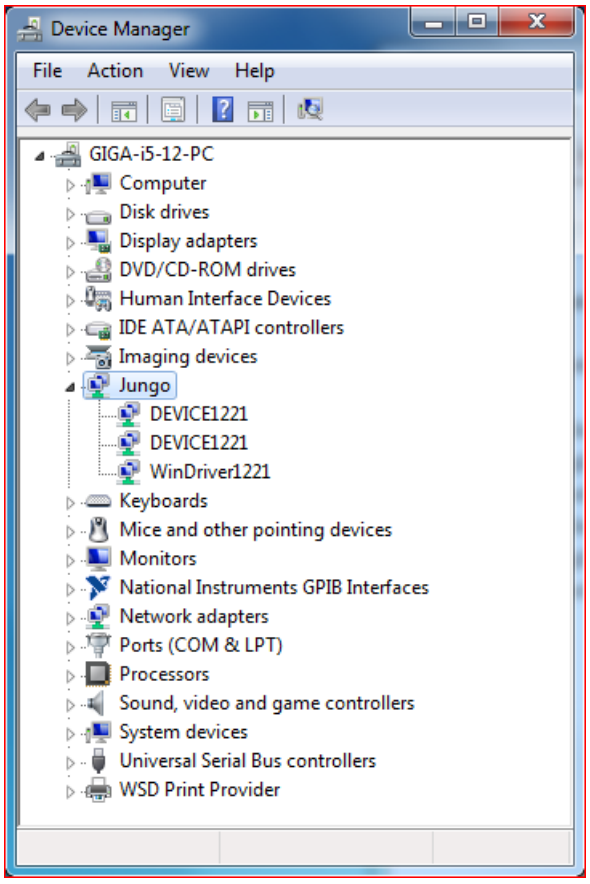
7.3 Check Device Manager for Connections

Confirm the AXIe system components are connected to the ASC Software. This can be performed using Device Manager to check for connections.

7.3.1.1 To Check the AXIe System Components are Connected to the ASC Software

1. Select the **Windows** button, located in the lower-left corner of the desktop.
2. Select **Control Panel**
3. Select **Hardware and Sound**
4. Select **Device Manager**
5. Open the **Jungo** folder (This would have been installed as part of the ASC software.)
6. Check for **DEVICE1221**. (WinDriver1221 indicates the Jungo driver, Version 12.21, is installed.)

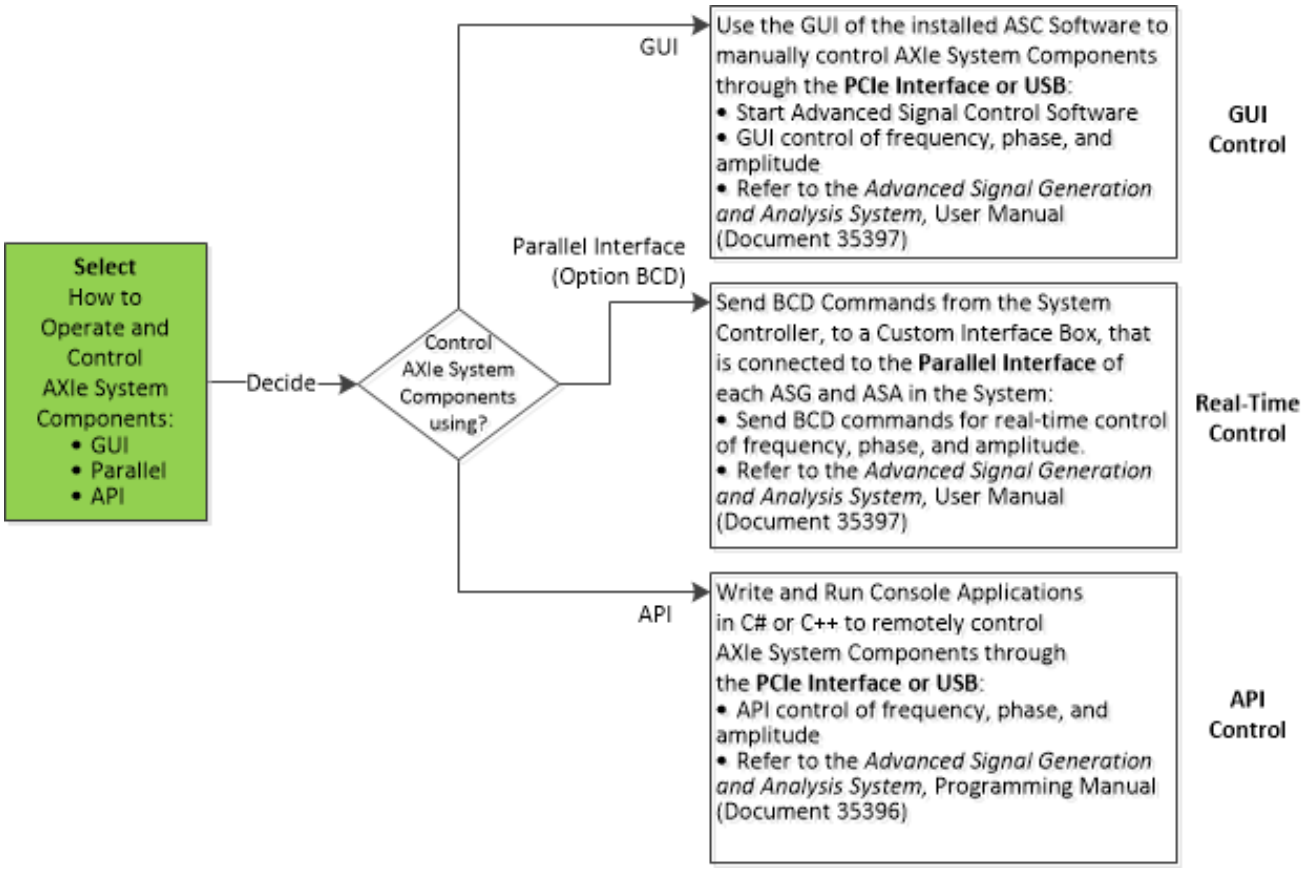
   Each **DEVICE1221** that is listed corresponds to an ASGM18A AXIe Advanced Signal Generator (ASG) or an ASAM18A AXIe Advanced Signal Analyzer (ASA) in the system.



Chapter 8. Select How to Operate: GUI/Parallel/API

In this chapter, learn about the 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.

- **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 the **GUI** or the **Parallel Interface** (Option BCD), refer to the Advanced Signal Generation and Analysis System, User Manual (Document 35984).

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).

8.1 Use the GUI of the Installed ASC Software

1. Connect the PCIe interface from the system controller to each chassis or connect the USB interface of each ASG and ASA.

2. Start Advanced Signal Control (ASC) software.

3. Select the PCIe or USB interface and use the GUI to control frequency, phase, amplitude, and other parameters of each ASG and ASA.

4. Refer to the Advanced Signal Generation and Analysis System, User Manual (Document 35397).

8.2 Use the Parallel Interface (Option BCD) to Send BCD Commands

1. Connect the Parallel Interface on each ASG and ASA and send BCD commands through the parallel interface of each ASG and ASA; real-time control of frequency, phase, amplitude, and other parameters.

2. Refer to the Advanced Signal Generation and Analysis System, User Manual (Document 35397)

8.3 Write and Run Console Applications in C# or C++ that Send API Commands

1. Write and run console applications in C# or C++ that send API commands through the PCIe or USB interface of each ASG and ASA; API control of frequency, phase, amplitude, and other parameters.

2. Refer to the Advanced Signal Generation and Analysis System, Programming Manual (Document 35396)

Chapter 9. Maintenance and Service

In this chapter, learn about the following:

- Listing of ASG / ASA Default Presets

- Accessing Service Tab Functions of the ASC Software
- Updating ASG / ASA Firmware or FPGA
- Changing the ASG / ASA Default BCD Settings
- Clearing ASG / ASA Memory

- Replaceable Assemblies
- Shipping the System
- Repairs
- Contacting Giga-tronics Customer Service
- Calibration

9.1 Listing of ASG / ASA Default Presets

Giga-tronics ASGM18A AXIe Advanced Signal Generator

Signal	Default Setting
FREQUENCY	10 GHz
PHASE	0°
POWER	0 dBm
INT/EXT LO	Internal
RF ON/OFF	RF OFF
PULSE POLARITY	Positive Polarity
PULSE ENABLE	Pulse Disabled
SPEC-INV	Non-inverting
IF PATH	CW
TRIGSRC	BCD Strobe

Giga-tronics ASAM18A AXIe Advanced Signal Analyzer

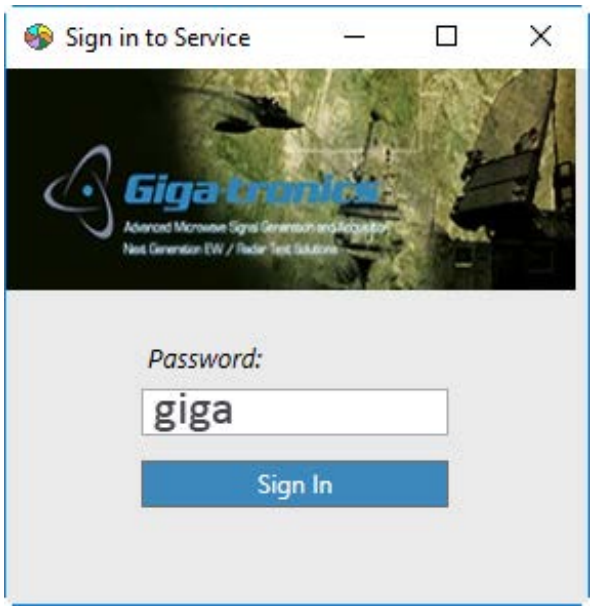
Signal	Default Setting
FREQUENCY	10 GHz
PHASE	0°
INPUT RANGE	-10 to +10 dBm
INT/EXT LO	Internal
GAIN	0 dB
IF BANDWIDTH	100 MHz
GAIN AUTO/MAN	Auto
SPEC-INV	Non-inverting
IF PATH	1200 MHz
TRIGSRC	BCD Strobe

9.2 Accessing Service Tab Functions of the ASC Software

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.



1. Select the **Service** tab from the Advanced Signal Control software.

   Before accessing service functions, a sign in password is required.

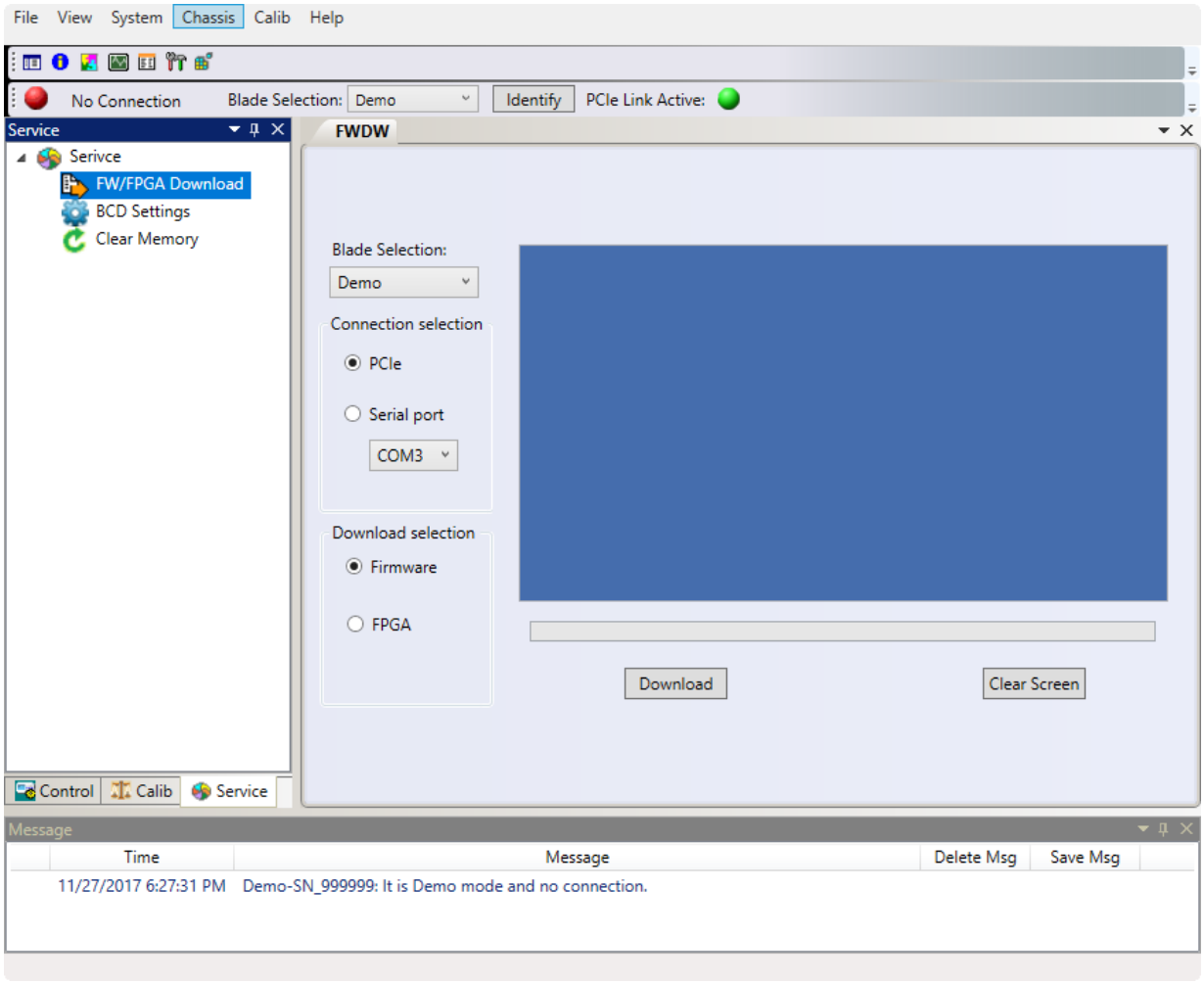
2. Enter the **Password**: *giga*.

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.

9.3 Updating ASG / ASA Firmware or FPGA

In this section, learn about the updating the Firmware or FGPA in the following products:

- Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz
- Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz



1. Select the **Service** tab from the Advanced Signal Control software.
2. Double-click **FW/FPGA Download** from the Service navigation menu.
3. Select the arrow on the **Blade Selection** drop-down menu and select a Blade.
4. Select either **PCIe** or **Serial port** connection.

   If you select to connect through a Serial port, select the arrow on the COM port drop-down menu and select the COM port to be used for the download.

5. Select either **Firmware** or **FPGA** as the type of download to be performed.

6. Click the **Download** button.

   Navigate to the file location, enter the **filename**, and click **Open**.

   The blue status box displays the download status.

NOTE

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

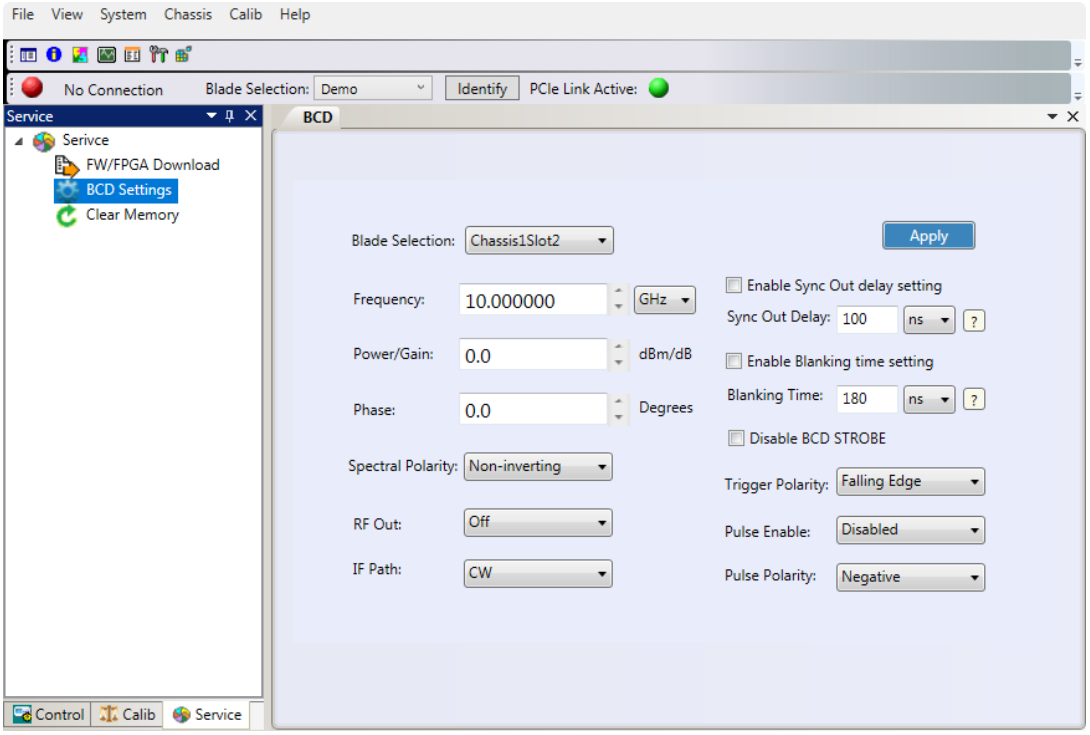
1. Shut down system controller (computer).
2. Power off all AXIe chassis being used.
    a. Power on 1st chassis.
    b. Power on 2nd chassis.
    c. Power on 3rd chassis, and so on…
3. Power on the system controller (computer).

9.4 Changing ASG / ASA Default BCD Settings

In this section, learn about the BCD Settings for the following products:

- Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz
- Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz

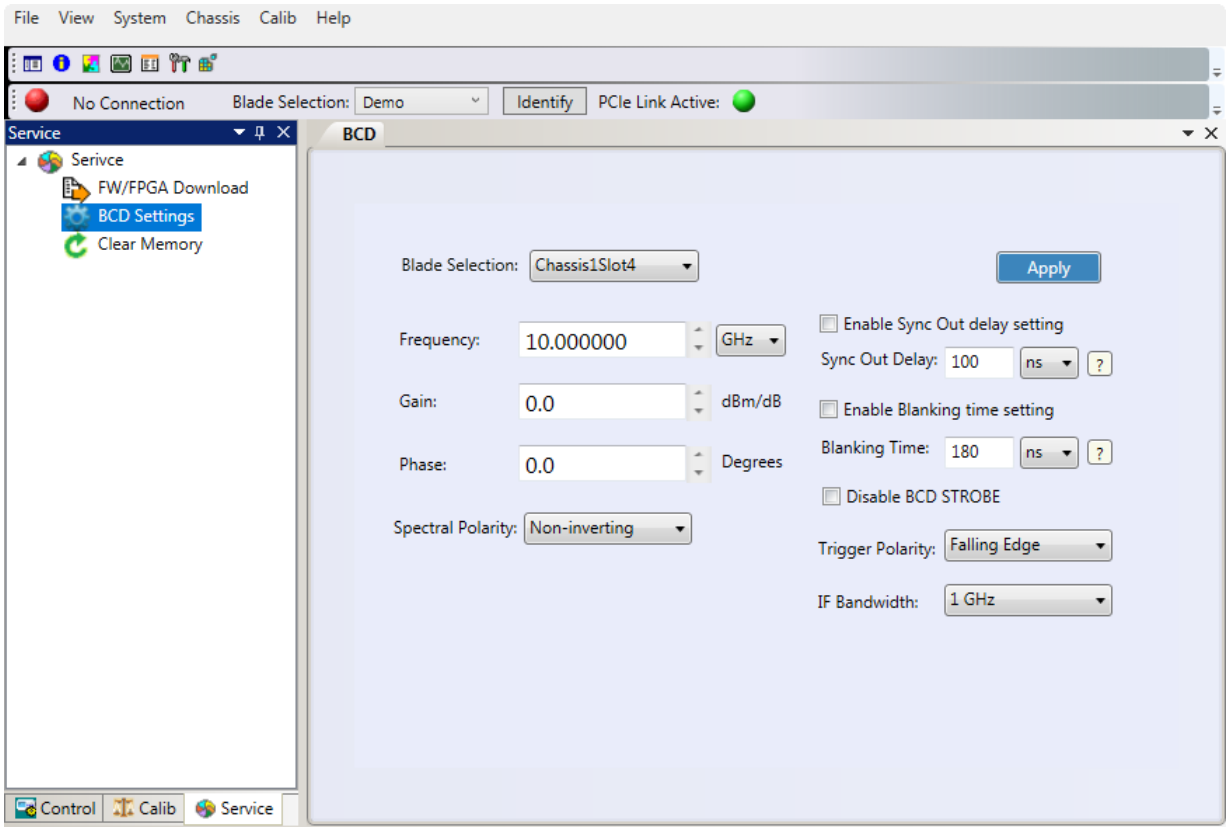
9.4.1 ASG Default BCD Settings



1. Select the **Service** tab from the Advanced Signal Control software.
2. Double-click the **BCD Settings** function from the Service navigation menu.
3. Select an arrow on a selection drop-down menu, enter a value in an entry box, or check a selection box.

BCD Function	Default BCD Setting
Frequency	10.000000 GHz
Power/Gain	0.0 dBm/dB
Phase	0.0 Degrees
Spectral Polarity	Non-inverting
RF Out	Off
IF Path	CW
Checkbox for **Enable Sync Out Delay setting**	Unchecked
Sync Out Delay	100 ns
Checkbox for **Enable Blanking Time setting**	Unchecked
Blanking Time	180 ns
Checkbox for **Disable BCD Strobe**	Unchecked
Trigger Polarity	Falling Edge
Pulse Enable	Disabled
Pulse Polarity	Negative

9.4.2 ASA Default BCD Settings



1. Select the **Service** tab from the Advanced Signal Control software.
2. Double-click the **BCD Settings** function from the Service navigation menu.
3. Select an arrow on a selection drop-down menu, enter a value in an entry box, or check a selection box.

BCD Function	Default BCD Setting
Frequency	10.000000 GHz
Power/Gain	0.0 dBm/dB
Phase	0.0 Degrees
Spectral Polarity	Non-inverting
Checkbox for **Enable Sync Out Delay setting**	Unchecked
Sync Out Delay	100 ns
Checkbox for **Enable Blanking Time setting**	Unchecked
Blanking Time	180 ns
Checkbox for **Disable BCD Strobe**	Unchecked
Trigger Polarity	Falling Edge
IF Bandwidth	1 GHz

9.5 Clearing ASG / ASA Memory

In this section, learn about the instrument security and memory clearing procedure that applies to the following products:

- Giga-tronics ASGM18A AXIe Advanced Signal Generator: 100 MHz to 18 GHz
- Giga-tronics ASAM18A AXIe Advanced Signal Analyzer: 500 MHz to 18 GHz

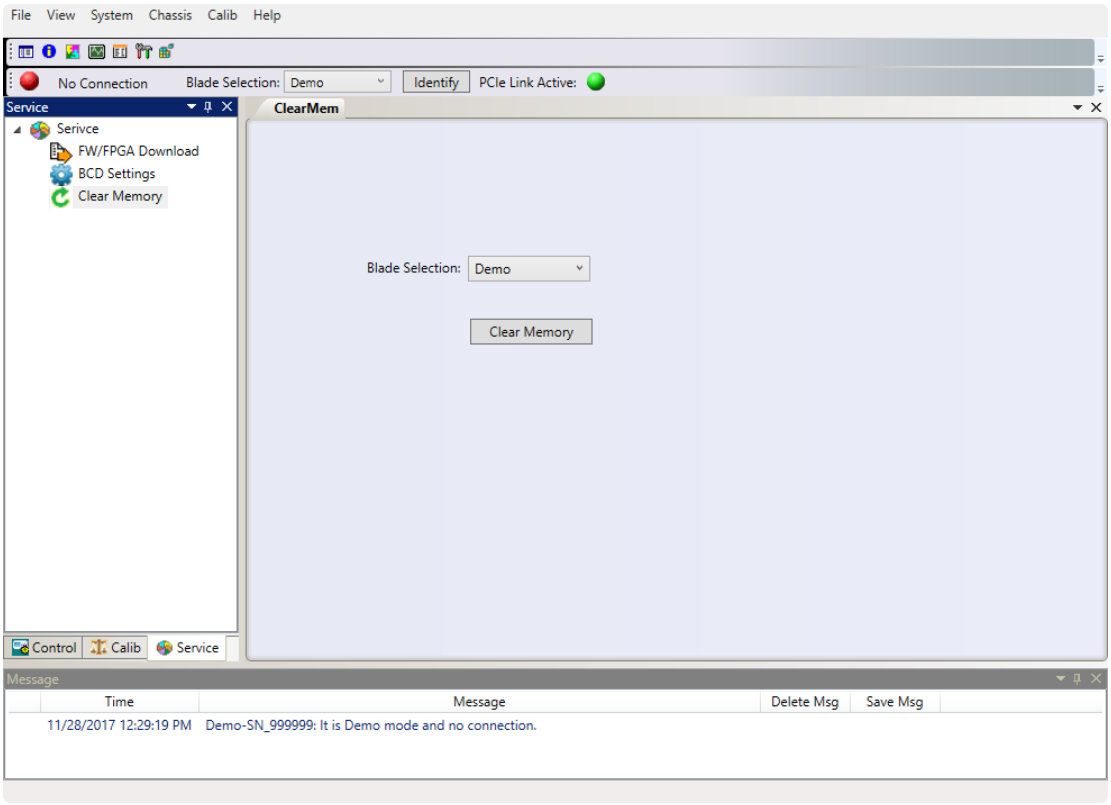
NOTE

No instrument security and memory clearing procedures are needed for the following products because they do not have the capability of storing instrument states or settings for frequency, amplitude, or phase:

- Giga-tronics SRM100A AXIe System Reference Module: 10 MHz, 100 MHz, 1200 MHz
- Giga-tronics CHSIS2A AXIe System Chassis: 2-Channel
- Giga-tronics CHSIS4A AXIe System Chassis: 4-Channel
- Giga-tronics CHSISBK AXIe Blank Module: 2-Slot

The ASGM18A AXIe Advanced Signal Generator and ASAM18A AXIe Advanced Signal Analyzer were designed with the capability of storing instrument states and the current instrument state settings are stored as the 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.

9.5.1 Performing the Clear Memory Function



1. Select the **Service** tab from the Advanced Signal Control software.
2. Double-click the **Clear Memory** function from the Service navigation menu.
3. Select the arrow on the Blade Selection drop-down menu and select a Blade.
4. Click the **Clear Memory** button.

   Clicking **Clear Memory** clears all Flash memory, including the settings, any saved states, the user tables, and deletes the saved SystemASCConfig.xml file.

9.5.2 Confirming the Clear Memory Function

1. From the Advanced Signal Control window, select the **Control** tab.
2. Confirm the settings are zero or the default value.

9.6 Replaceable Assemblies

The chassis fan and fan filter assemblies are replaceable units, as well as the power supply assembly. These assemblies are also available as spare parts. Refer to the CHSIS2A and CHSIS4A AXIe System Chassis Datasheet (Document 35536). For documents, contact your Giga-tronics representative or customer service for ordering details.

9.7 Shipping the System

If it is necessary to ship the system, observe the following:

NOTE

It is highly recommended to ship the Modules (Blades) separate from the chassis. The chassis was not designed to be shipped with the modules installed or damage may occur.

- Use the best packaging materials available.
- If possible, reuse the original shipping containers.
- If the original shipping containers are not available, use strong cartons (350 lbs. /sq. in. bursting strength) or wooden boxes.
- Wrap the chassis and modules in electro-static dissipative material before placing them into the shipping containers.
- Completely fill the areas on all sides of the chassis and modules with packaging material. Take extra precaution to protect the front and rear panels.
- Seal the packages with strong tape or metal bands.
- Mark the outside of the packages clearly, and in bold type, on all sides as follows:

FRAGILE — DELICATE INSTRUMENT

9.8 Repairs

The ASGM18A AXIe Advanced Signal Generator / ASAM18A AXIe Advanced Signal Analyzer is a robust instrument platform that has been designed and built for years of trouble-free service.

However, if you experience problems with the instrument, do the following:

- Contact your local Giga-tronics sales office or the factory.
- Be prepared to provide the model numbers, serial numbers, and any included options, with a detailed description of any problems.

9.9 Contacting Giga-tronics Customer Service

To contact the factory directly, use the following information:

Giga-tronics Incorporated
5990 Gleason Drive
Dublin, CA 94568
Tel: 800-726-4442 (USA Only)
Tel: 925-328-4650, dial “5” for support
Email: repairs@gigatronics.com

If it has been determined that you must ship the chassis or any of the modules to the factory or a service center for repair, you will be issued a ***Return Materials Authorization (RMA)*** number. Use the RMA number in all correspondence regarding the repair.
Pack the units for shipment as described in the previous section, and enclose all relevant information regarding the problem.

Ship the units to the address provided by Giga-tronics Customer Service.

9.10 Calibration

Giga-tronics recommends that the individual modules be factory calibrated every two years. For more information regarding factory calibration of your instrument, contact Giga-tronics.

Chapter 10. Performance Verification Tests

In this chapter, learn about performance verification tests and information for verifying that an ASGM18A AXIe Advanced Signal Generator (ASG) or ASAM18A AXIe Advanced Signal Analyzer (ASA), in a CHSIS2A or CHSIS4A AXIe System Chassis with a SRM100A AXIe System Reference Module, is operating within its specifications; the process of running these tests is referred to as *Performance Verification*.

Compare the results of each performance verification test to the appropriate section in each product's Datasheet and verify that each product is operating within specifications.

NOTE

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.

List of ASG Performance Verification Tests	
Name of Test	**Page**
ASG Frequency Range and Accuracy	62
ASG Maximum Output Power	63
ASG Power Level Flatness and Accuracy	64
ASG Spectral Purity	65
ASG Pulse Modulation (RF Gate) Rise/Fall Time	66

List of ASA Performance Verification Tests	
Name of Test	**Page**
ASA Frequency Range and Accuracy	67
ASA RF Input Power Range and Gain	68
ASA Spectral Purity	69

10.1 Test Equipment

The following test equipment is required for all performance verification tests in this chapter. Specific equipment required for each procedure is listed at the beginning of each procedure. An assortment of coaxial cables, connectors, and adapters for interconnecting the equipment is required.

Equivalent test equipment can be substituted for the recommended models, provided that the accuracies and specifications are equal to or better than those of the recommended models.

Equipment Required for Performance Verification	
Type of Equipment	**Model**
Signal Generator	Giga-tronics 2520B with Options 17A, 18, and 26A or Equivalent
Oscilloscope	LeCroy HDO4101 (1 GHz) or Equivalent
Power Meter	Keysight E4416A EPM-P Series Single Channel Power Meter or Equivalent
Power Sensors	Keysight E9325A E-Series Peak and Average Power Sensor, 50 MHz to 18 GHz or Equivalent
Microwave Spectrum Analyzer[1]	Keysight N9020A MXA Signal Analyzer, 10 Hz to 26.5 GHz or Equivalent
Frequency Counter[1]	Tektronix FCA3120 or Equivalent
Digital Voltage Meter (Multi-Meter)	Keysight 34461A Digital Multimeter, 6 ½ digit or Equivalent
Pulse Generator	Keysight 33210A Function / Arbitrary Waveform Generator, 10 MHz or Equivalent
Crystal (Diode) Detector	Krytar 703S or Equivalent (< 10 ns rise time, output capacitance ≤ 3 pF)
Test cables, connectors, and adapters	As required
[1] Connect to a 10 MHz "House Standard" or other source of 10 MHz Precision Frequency Reference.	

10.2 ASG Frequency Range and Accuracy

In this test, the RF output of the ASGM18A AXIe Advanced Signal Generator is connected to the input of a microwave frequency counter and the ASGM18A AXIe Advanced Signal Generator output frequency is measured at various points within its frequency range.

Set-up: Connect the RF output of the ASGM18A AXIe Advanced Signal Generator under test to the appropriate input on the microwave frequency counter. Verify that the microwave frequency counter is connected to a precision 10 MHz frequency standard. A 10 MHz “house standard” or other 10 MHz precision frequency reference is required for frequency accuracy verification.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF output level to 0 dBm, and the RF output “ON” or enabled.

Test Frequency	Measured Frequency	Maximum Error
100 MHz		± 100 Hz
500 MHz		± 500 Hz
1 GHz		± 1 kHz
2 GHz		± 2 kHz
3 GHz		± 3 kHz
5 GHz		± 5 kHz
7 GHz		± 7 kHz
10 GHz		± 10 kHz
12 GHz		± 12 kHz
15 GHz		± 15 kHz
18 GHz		± 18 kHz
ASG Serial Number:		
Tested by:	Date:	

10.3 ASG Maximum Output Power

This test measures the maximum settable output power at different frequencies.

Set-up: Zero and Cal the power meter and power sensor. Connect power meter and power sensor to the RF output of the ASGM18A AXIe Advanced Signal Generator under test.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF output level as specified and the RF output "ON" or enabled.

Test Frequency	Power Setting	Power Setting (Option ATT)	Measured Power	Maximum Error
100 MHz	+10 dBm	0 dBm		± 2 dB
500 MHz	+10 dBm	0 dBm		± 2 dB
1 GHz	+10 dBm	0 dBm		± 2 dB
2 GHz	+10 dBm	0 dBm		± 2 dB
3 GHz	+10 dBm	0 dBm		± 2 dB
5 GHz	+10 dBm	0 dBm		± 2 dB
7 GHz	+10 dBm	0 dBm		± 2 dB
10 GHz	+10 dBm	0 dBm		± 2 dB
12 GHz	+10 dBm	0 dBm		± 2 dB
15 GHz	+10 dBm	0 dBm		± 2 dB
18 GHz	+10 dBm	0 dBm		± 2 dB
ASG Serial Number:				
Tested by:			Date:	

10.4 ASG Power Level Flatness and Accuracy

This test measures the RF output power level flatness and accuracy at different frequencies.

Set-up: Zero and Cal the power meter and power sensor. Connect power meter and power sensor to the RF output of the ASGM18A AXIe Advanced Signal Generator under test.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF output level as specified and the RF output "ON" or enabled. Power levels below -10 dBm apply with Option ATT.

Test Frequency	Power Setting	Power Setting (Option ATT)	Measured Power	Maximum Error
100 MHz	+0 dBm	-10 dBm		± 2 dB
100 MHz		-20 dBm		± 2 dB
100 MHz		-40 dBm		± 2 dB
100 MHz		-60 dBm		± 2 dB
1 GHz	+0 dBm	-10 dBm		± 2 dB
1 GHz		-20 dBm		± 2 dB
1 GHz		-40 dBm		± 2 dB
1 GHz		-60 dBm		± 2 dB
10 GHz	+0 dBm	-10 dBm		± 2 dB
10 GHz		-20 dBm		± 2 dB
10 GHz		-40 dBm		± 2 dB
10 GHz		-60 dBm		± 2 dB
18 GHz	+0 dBm	-10 dBm		± 2 dB
18 GHz		-20 dBm		± 2 dB
18 GHz		-40 dBm		± 2 dB
18 GHz		-60 dBm		± 2 dB
ASG Serial Number:				
Tested by:			Date:	

10.5 ASG Spectral Purity

In this test, the output of the ASGM18A AXIe Advanced Signal Generator is connected to a spectrum analyzer. Various frequencies are selected and the analyzer tuned to determine the presence of either harmonic or non-harmonic (spurious) signals.

Set-up: Connect the RF output of the ASGM18A AXIe Advanced Signal Generator under test to the appropriate input on the microwave spectrum analyzer. Verify that the spectrum analyzer is connected to a precision 10 MHz frequency standard. Measure the highest-level harmonic and spurious responses up to 18 GHz.

NOTE

Harmonics and spurious are only specified up to 18 GHz.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF output level to 0 dBm and the RF output “ON” or enabled.

Test Frequency	Measured Harmonic (dBc)	Harmonic Specification	Measured Spurious (dBc)	Spurious Specification
100 MHz		< -60 dBc		< -60 dBc
500 MHz		< -60 dBc		< -60 dBc
1 GHz		< -60 dBc		< -60 dBc
2 GHz		< -55 dBc		< -65 dBc
3 GHz		< -55 dBc		< -65 dBc
5 GHz		< -55 dBc		< -65 dBc
7 GHz		< -55 dBc		< -65 dBc
10 GHz		< -55 dBc		< -65 dBc
12 GHz		< -55 dBc		< -65 dBc
15 GHz		< -55 dBc		< -60 dBc
ASG Serial Number:				
Tested by:			Date:	

10.6 ASG Pulse Modulation (RF Gate) Rise/Fall Time

This test measures the rise and fall times of pulse modulation (RF Gate).
In this test, the output of the ASGM18A AXIe Advanced Signal Generator is connected through a diode detector to an oscilloscope. The rise and fall times are measured.

Set-up: Connect the diode detector input to the RF output of the ASGM18A AXIe Advanced Signal Generator under test. Connect the detector output to the input on the oscilloscope. Verify that the oscilloscope input is set to the 50 Ohm impedance setting. Set the ASGM18A AXIe Advanced Signal Generator RF output power to 0 dBm. Connect a pulse generator to the ASGM18A AXIe Advanced Signal Generator pulse modulation input. Set the pulse generator to pulse repetition interval (PRI) of 500 ns and pulse width to 100 ns. Measure the 10% to 90% rise and fall time of the detected pulse waveform.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate settings. Additional test frequencies may be added to the table, as required by the application. Set the RF output “ON” or enabled.

Test Frequency	Measured Rise Time (ns)	Measured Fall Time (ns)	Specification
1 GHz			< 10 ns
10 GHz			< 10 ns
ASG Serial Number:			
Tested by:	Date:		

10.7 ASA Frequency Range and Accuracy

In this test, the RF output of the ASAM18A AXIe Advanced Signal Analyzer is connected to the input of a microwave frequency counter and the ASAM18A AXIe Advanced Signal Analyzer output frequency is measured at various points within its frequency range.

Set-up: Connect the RF Input of the ASAM18A AXIe Advanced Signal Analyzer under test to a microwave signal generator. Set the signal generator power level to 0 dBm. Connect the IF output of the ASAM18A AXIe Advanced Signal Analyzer under test to the appropriate input on the microwave frequency counter. Verify that the microwave frequency counter is connected to a precision 10 MHz frequency standard. A 10 MHz "house standard" or other 10 MHz precision frequency reference is required for frequency accuracy verification.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF input range to -10 to +10 dBm.

Test RF Frequency	Measured IF Frequency	Maximum Error
500 MHz		1200 MHz ± 500 Hz
1 GHz		1200 MHz ± 1 kHz
2 GHz		1200 MHz ± 2 kHz
3 GHz		1200 MHz ± 3 kHz
5 GHz		1200 MHz ± 5 kHz
7 GHz		1200 MHz ± 7 kHz
10 GHz		1200 MHz ± 10 kHz
12 GHz		1200 MHz ± 12 kHz
15 GHz		1200 MHz ± 15 kHz
18 GHz		1200 MHz ± 18 kHz
ASA Serial Number:		
Tested by:	Date:	

10.8 ASA RF Input Power Range and Gain

This test measures the RF Input power range and gain at different frequencies.

Set-up: Connect the RF Input of the ASAM18A AXIe Advanced Signal Analyzer under test to a microwave signal generator. Set the signal generator power level to 0 dBm. Zero and Cal the power meter and power sensor. Connect power meter and power sensor to the IF output of the ASAM18A AXIe Advanced Signal Analyzer under test.

NOTE

Allow the equipment to warm up for at least 30 minutes.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF input power level and RF input power range as specified and the RF output “ON” or enabled.

Test Frequency and Input Power Level	Gain and RF Input Power Range Setting	Measured Power	Maximum Error
1 GHz, 0 dBm	0 dB, -10 to +10 dBm		0 ± 2 dB
1 GHz, -20 dBm	20 dB, -25 to -10 dBm		0 ± 2.5 dB
1 GHz, -35 dBm	35 dB, -70 to -25 dBm		0 ± 3 dB
10 GHz, 0 dBm	0 dB, -10 to +10 dBm		0 ± 2 dB
10 GHz, -20 dBm	20 dB, -25 to -10 dBm		0 ± 2.5 dB
10 GHz, -35 dBm	35 dB, -70 to -25 dBm		0 ± 3 dB
18 GHz, 0 dBm	0 dB, -10 to +10 dBm		0 ± 2 dB
18 GHz, -20 dBm	20 dB, -25 to -10 dBm		0 ± 2.5 dB
18 GHz, -35 dBm	35 dB, -70 to -25 dBm		0 ± 3 dB
ASA Serial Number:			
Tested by:		Date:	

10.9 ASA Spectral Purity

In this test, the output of the ASAM18A AXIe Advanced Signal Analyzer is connected to a spectrum analyzer. Various frequencies are selected and the analyzer tuned to determine the presence of either harmonic or non-harmonic (spurious) signals.

Set-up: Connect the RF Input of the ASAM18A AXIe Advanced Signal Analyzer under test to a microwave signal generator. Set the signal generator power level to 0 dBm. Connect the IF output of the ASAM18A AXIe Advanced Signal Analyzer under test to the appropriate input on the microwave spectrum analyzer. Verify that the spectrum analyzer is connected to a precision 10 MHz frequency standard. Measure the highest-level spurious responses (up to 18 GHz). Note that spurious are only specified up to 18 GHz.

NOTE

Allow the equipment to warm up for at least 30 minutes. Signal generator must have better than -60 dBc spurious for this measurement.

Using either the manual GUI or under remote control, select the appropriate test frequencies per the following table. Additional test frequencies may be added to the table, as required by the application. Set the RF Input Range to -10 to +10 dBm.

Test Frequency	Measured Spurious (dBc)	Spurious Specification
1 GHz		< -60 dBc
2 GHz		< -60 dBc
3 GHz		< -60 dBc
5 GHz		< -60 dBc
7 GHz		< -60 dBc
10 GHz		< -60 dBc
12 GHz		< -60 dBc
15 GHz		< -60 dBc
ASA Serial Number:		
Tested by:		Date:

Chapter 11. 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 200 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 Endianess.

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 x 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 12. References

12.1 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)

12.2 Related Websites

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