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User's Guide

Agilent Technologies
E6432A Microwave Synthesizer



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In This Book...

In this user guide you will learn about:

- Installation
- Hardware Front Panel Connectors and LEDs
- Soft Front Panel Controls and its Various Pull Down Menus and Dialog Boxes
- Remote Programming with VXIplug&play Functions in C, VEE, or LabVIEW
- Applications and Example Programs
- Specifications and Characteristics
- Getting Additional Help from Agilent Technologies

This user guide prepares you for your first steps in using the Agilent Technologies E6432A microwave synthesizer in a VXI system. The standard Agilent Technologies E6432A microwave synthesizer is a C-size, VXI, modular microwave source optimized for system use that occupies three slots in a VXI mainframe. The arbitrary waveform generators (ARBs) for generating AM, FM, and Pulse drive signals are external to the synthesizer and take additional VXI slots.

Fast Response to VXI Host Interface

The synthesizer is based on a drift canceling circuit employing a fast tuning microwave VCO. In addition, the synthesizer's assist processor is optimized for fast data throughput and the phase-locked loops are optimized for fast settling. The resulting frequency switching times are in the hundreds of microseconds. Settling time for an amplitude change is similar.

Register Based

To keep the synthesizer's response fast, it is register based with a minimum of "smarts." This gives the user the maximum amount of flexibility in how the synthesizer is used.

How to proceed...

First, refer to installation to learn about the hardware and software requirements for using this product. After installing the Agilent Technologies E6432A VXIplug&play driver software, become familiar with the features available on the hardware front panel connectors and LEDs. When ready, become familiar with the soft front panel and its various pull down sub-windows and dialog boxes. Finally, learn how to program with VXIplug&play functions using C, Agilent Technologies VEE, or National Instruments LabVIEW.

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1 Installation

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Overview

In this chapter, you will learn about:

- Hardware and software requirements prior to installation
- Installation of the E6432A microwave synthesizer
- Folders and files supplied with the E6432A VXIplug&play driver
- Typical equipment configurations

Prior to Installation of the E6432A

Prior to installation of the E6432A microwave synthesizer, items listed as **A** through **G** must be completed as detailed in the section titled "Hardware and Software Requirements Prior to Installation" on page 1-3. If you have problems or questions regarding the processes for items **A** through **G**, refer to the manufacturer's documentation for the product in question.

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Hardware and Software Requirements Prior to Installation

Year 2000 (Y2K) Compliancy

Microsoft Corporation states that the Y2K compliant version of Windows NT uses Service Pack 4. Although the E6432A VXIplug&play driver has been tested and found to be Y2K compliant using Service Pack 4, there may be some additional requirements for revision of the Windows NT operating system to make it Y2K compliant. Additional information related to Y2K Compliancy can be obtained using the Internet at: `http://www.microsoft.com`

The E6432A VXIplug&play driver requires the following hardware and software:

- ❏ WIN NT 4.0 Framework
  - Windows NT 4.0 computer with Service Pack 3 or higher
  - Minimum of 32 MB of RAM or higher
  - CD-ROM drive
- ❏ Agilent E8403A C-size VXI mainframe or equivalent
- ❏ One of the following Slot 0 Modules:
  - Agilent E8491B IEEE-1394 PC Link to VXI - Using a PCI to IEEE-1394 Interface
    - — Agilent Technologies E2094G I/O library version G.02.02 (which contains VISA 1.1) or higher
  - Agilent E623x VXI Embedded PC Controller or equivalent
    - — Agilent E2094G I/O library version G.02.02 (which contains Agilent Technologies VISA 1.1) or higher
  - NI VXI-MXI-2 - Using a PCI-MXI-2 Interface
    - — National Instruments VISA I/O library version 2.0 or higher
- ❏ E6432A driver revision A.01.00 or higher

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Prior to Installation of the E6432A

Prior to installation of the E6432A microwave synthesizer, the following items listed as **A** through **G** must be completed. If you have problems or questions regarding the processes for items **A** through **G**, refer to the manufacturer's documentation for the product in question.

A. Set up a C-size VXI mainframe.

If you have problems or questions regarding the set up process, refer to the manufacturer's documentation that came with the VXI mainframe being used.

The VXI mainframe must have at least four or five empty slots. The actual number of empty slots that are required depends on the Slot 0 module being used and the number of E6432A microwave synthesizers being used. The Slot 0 module requires either one or two empty slots and each E6432A microwave synthesizer requires three empty slots. (For equipment configuration examples, refer to "Typical Equipment Configurations" on page 1-19.)

Slots Required	**One Slot 0 Module Being Used**
One Slot	Agilent E8491B IEEE-1394 PC Link to VXI - Using a PCI to IEEE-1394 Interface
Two Slots	Agilent E623x VXI Embedded PC Controller or equivalent
One Slot	NI VXI-MXI-2 - Using a PCI-MXI-2 Interface
Slots Required	**One Module Being Used**
Three Slots	E6432A microwave synthesizer

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B. Turn power OFF to the C-size VXI mainframe and install the Slot 0 module being used.

If you have problems or questions regarding the Slot 0 module installation process, refer to the manufacturer's documentation that came with the Slot 0 module being used.

CAUTION **Do not turn power ON to the C-size VXI mainframe until you make all peripheral connections to the Slot 0 module being used. (Refer to the manufacturer's documentation that came with the Slot 0 module being used for details and explanations.)**

C. Set up a Windows NT computer.

If you have problems or questions regarding the set up process, refer to the manufacturer's documentation that came with the Windows NT computer being used.

D. Turn power OFF to the Windows NT computer and install the PC interface card being used.

If you have problems or questions regarding the PCI interface card installation or connection process, refer to the manufacturer's documentation that came with the PCI interface card being used.

PCI Interface Card Being Used	One Slot 0 Module Being Used
PCI to IEEE-1394 Interface	Agilent E8491B IEEE-1394 PC Link to VXI
None Required	Agilent E623x VXI Embedded PC Controller or equivalent
PCI-MXI-2 Interface	National Instruments VXI-MXI-2

E. Connect the interface cable between the PCI interface card and the Slot 0 module being used.

F. Turn power ON to the Windows NT computer and the C-size VXI mainframe.

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G. Select one of the following three options:

Depending on the Slot 0 module being used, either Agilent Technologies I/O library (which contains Agilent Technologies VISA) or National Instruments VISA library is used. Because the VISA libraries that Agilent Technologies and National Instruments support are slightly different in their current form, only one can be used at a given time. The file, `Visa32.dll` is replaced by either the Agilent Technologies or National Instruments version. The one that is required, depends on the Slot 0 module being used.

❏ (Option 1) Install the Agilent Technologies I/O library (which contains Agilent Technologies VISA) when using:

- Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

❏ (Option 2) Run the pre-installed Agilent Technologies I/O library (which contains Agilent Technologies VISA) when using:

- Slot 0 Module (Agilent E623x VXI Embedded PC Controller or equivalent)

❏ (Option 3) Install the National Instruments VISA library when using:

- Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

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(Option 1) Install the Agilent Technologies I/O Library (which contains Agilent Technologies VISA 1.1)

Install the Agilent Technologies I/O library from the CD that came with the Slot 0 module being used. If you have problems or questions regarding the installation process, refer to the manufacturer's documentation that came with the Slot 0 module being used. Additional information related to this product can be obtained using the Internet at: `http://www.agilent.com`

- If using Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface, the following must be performed during the installation process of the I/O library:

  a. Check the box labeled, "Install Agilent E8491 VXI Components." (This installs code for the PCI to IEEE-1394 interface card.)

  b. Check the box labeled, "Configure interfaces automatically". (If this box is not checked, you can manually configure the PCI to IEEE-1394 interface card using the I/O Config utility located in the I/O Libraries program folder.

     The I/O Config utility is used by the I/O Libraries to configure instrument I/O interfaces. An interface must be configured with the I/O Config utility before it can be used with the I/O Libraries.)

  c. Reboot the Windows NT computer and VXI mainframe so that changes take effect.

  d. Perform the steps describing "Installation of the E6432A Microwave Synthesizer" on page 1-11.

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(Option 2) Run the Pre-Installed Agilent Technologies I/O Library (which contains Agilent Technologies VISA 1.1)

The Windows NT operating system software comes pre-installed on the embedded controller's hard disk along with controller drivers and utilities software. Installation of the Agilent Technologies I/O library from the CD that comes with the Slot 0 module being used only has to be performed if there is ever a need to re-install the software. If you have problems or questions regarding the installation process, refer to the manufacturer's documentation that came with the Slot 0 module being used. Additional information related to this product can be obtained using the Internet at: `http://www.agilent.com`

- If using Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller or equivelant) the following must be performed after the embedded controller has been installed into the C-size VXI mainframe.

CAUTION

Do not turn power ON to the C-size VXI mainframe and the Agilent E623x VXI Embedded Controller until you make all connections to the peripherals. (Refer to the manufacturer's documentation that came with the Slot 0 module being used for details and explanations.)

Use extreme caution when connecting peripheral cables to the embedded controller. The I/O base board of the embedded controller provides power for peripheral devices through different pins. Making incorrect connections can damage the board and may damage the peripheral device being connected.

a. Connect any desired peripherals (keyboard, mouse, serial ports, monitor, and SCSI devices) and turn power ON to the C-size VXI mainframe. When the system is powered on, the embedded controller automatically runs the Startup Resource Manager (SURM).

b. Before the Windows NT software (including VISA) can be used, the I/O Config utility must be run.

   While running the I/O Config utility, check the box labeled, "Configure interfaces automatically."

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The I/O Config utility is used by the I/O Libraries to configure instrument I/O interfaces. An interface must be configured before it can be used with the I/O Libraries.

c. Reboot the C-size VXI mainframe so that changes take effect.

d. Perform the steps describing “Installation of the E6432A Microwave Synthesizer” on page 1-11.

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(Option 3) Install the National Instruments VISA Library

Install the National Instruments VISA library from the CD that came with the Slot 0 module being used. If you have problems or questions regarding the installation process, refer to the manufacturer's documentation that came with the Slot 0 module being used. Additional information related to this product can be obtained using the Internet at: `http://www.natinst.com`

- If using Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface, the following must be performed after the National Instruments VISA library installation process:

a. Run the program T&M Explorer [Test and Measurement Explorer].

   T&M Explorer is available from the Windows NT Start taskbar by selecting: **Start/Programs/Ni-vxi/T&M Explorer**.

b. Select the PCI-MXI-2 Interface.

c. Right-mouse click and select Hardware Configuration.

d. Select the PCI tab.

e. Select the checkbox, `Enable low-level register access API support`.

f. Select the down arrow on the `User window size` entry box and select 256 KB.

g. Select OK.

h. Exit T&M Explorer.

i. Reboot the Windows NT computer and VXI mainframe so that changes take effect.

j. Run Resman (VXI Resource Manager) and verify that the Slot 0 module being used is found.

k. Perform the steps describing "Installation of the E6432A Microwave Synthesizer" on page 1-11.

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Installation of the E6432A Microwave Synthesizer

Prior to Installation of the E6432A

Prior to installation of the E6432A microwave synthesizer, items listed as **A** through **G** must be completed as called out in “Hardware and Software Requirements Prior to Installation” on page 1-3.

1. Set the E6432A microwave synthesizer's logical address.

   The unit is factory set to be Auto Configured at address 255 (FF).

   Agilent VEE requires a fixed address. Factory suggestion is address 210 (D2).

2. Turn power OFF to the C-size VXI mainframe and install the E6432A microwave synthesizer.

3. Turn power ON to the C-size VXI mainframe and run one of the following:

Run...	One Slot 0 Module Being Used
I/O Config	Agilent E8491B IEEE-1394 PC Link to VXI - Using a PCI to IEEE-1394 Interface
Resman	NI VXI-MXI-2 - Using a PCI-MXI-2 Interface
SURM	Agilent E623x VXI Embedded PC Controller or equivalent

4. Install the E6432A VXIplug&play driver software from the supplied CD.

   If the CD does not auto install, run Setup.exe from the Windows NT Start taskbar.

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5. Start the E6432A microwave synthesizer Soft Front Panel by double-clicking the icon displayed or access it through the Windows NT Start taskbar.

   The `Setup.exe` program installs the E6432A VXIplug&play driver in the `VXIpnp\WinNT` folder by default and does not allow the destination folder to be changed during installation.

   The `VXIpnp\WinNT` folder is located under the directory path that you selected when installing the VISA library. To change the location of these folders, refer to the installation procedure that was used to install Agilent Technologies I/O library or National Instruments VISA library; if you desire to change the directory path, the library will need to be reinstalled before installing the E6432A VXIplug&play driver.

   If the E6432A microwave synthesizer Soft Front Panel is able to establish communication with the hardware, the VXI address is displayed in the title bar.

6. At this point, installation is complete and an Acceptance Test Procedure (ATP) may be performed. The ATP is a set of manual tests and is documented at the end of this chapter

   The ATP is intended as a functionality check and is not intended for testing against customer specifications.

   For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

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Folders and Files Supplied with the E6432A VXIplug&play Driver

This section describes the folders and files that are supplied with the VXIplug&play driver.

- ❏ If a VISA library is not installed, the VXIplug&play driver can only be used in demo mode.

  Demo mode is used for demonstration purposes of the graphical user interface only, and does not require any physical connection to hardware or the VXI bus. The `Setup.exe` program installs the VXIplug&play driver in the `VXIpnp\WinNT` folder by default, but allows the destination folder to be changed during installation.

  If you answer yes to the "Startup Error Dialog Box," the VXIplug&play driver will be used in demo mode.

- ❏ If a VISA library is installed, the VXIplug&play driver can be used in demo mode or run-time mode.

  Run-time mode is used during normal operation of the graphical user interface, and does require physical connections to hardware and the VXI bus. The `Setup.exe` program installs the VXIplug&play driver in the `VXIpnp\WinNT` folder by default, and does not allow the destination folder to be changed during installation.

  The `VXIpnp\WinNT` folder is located under the directory path that you selected when installing the VISA library. To change the location of these folders, refer to the installation procedure that was used to install Agilent Technologies I/O library or National Instruments VISA library; if you desire to change the directory path, the library will need to be reinstalled before installing the E6432A VXIplug&play driver.

After installing the VXIplug&play driver, the `WinNT` folder contains the following folders and files:

`Bin`:

- `HPE6432.dll`

  This dynamic link library file is the VXIplug&play driver for the E6432A microwave synthesizer. This file is generated by compiling the `HPE6432.c` file and linking it with the `libHPE6432.lib` file.

- `HPE6432_32.dll`

  This dynamic link library file is a copy of the `HPE6432.dll` file, but is used by the Agilent VEE and LabVIEW environments.

  If you plan to customize the `HPE6432.dll` file, refer to the procedure: To generate a new HPE6432.dll file

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Hpe6432:

- HPE6432Types.h

  This header file defines the minimum and maximum parameter values that are used by the E6432A microwave synthesizer's VXIplug&play driver.

- HPE6432Errors.h

  This header file defines all of the error codes that can be reported by an E6432A microwave synthesizer.

- HPE6432.h

  This header file is duplicated in this folder for convenience, but is also located in the **Include:** folder.

  This header file contains the function prototypes for each of the VXIplug&play functions used by the E6432A microwave synthesizer.

- libHPE6432.h

  This header file is written using C syntax and contains the function prototypes for all low-level driver functions that are called by E6432A VXIplug&play functions; low-level driver function names begin with an underscore. (For example, _Close is the low-level driver function name used by the VXIplug&play HPE6432_close function, and its corresponding function prototype is: ViStatus _Close(ViSession instrumentHandle);.)

- libHPE6432.lib

  This library file contains all of the compiled code required to run the low-level driver functions that are called by E6432A VXIplug&play functions.

- HPE6432.lib

  This library file is duplicated in this folder for convenience, but is also located in the Lib/Msc: folder.

  This library file contains the code required to use the HPE6432.dll dynamic link library.

  The HPE6432.dll dynamic link library is generated by compiling the HPE6432.c source file and linking it with the libHPE6432.lib library file. When the HPE6432.c source file is modified by the user, it must be recompiled and linked with the libHPE6432.lib library file to produce a new HPE6432.lib library file and new HPE6432.dll dynamic link library.

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- `HPE6432.c`

  This is the C source code for the E6432A VXIplug&play driver. This file is compiled and linked with the `libHPE6432.lib` file to generate the `HPE6432.lib` library file and the `HPE6432.dll` dynamic link library.

- `HPE6432_panel.uir`

  This file defines the soft front panel user interface that is used by the E6432A microwave synthesizer.

- `HPE6432.exe`

  This file generates the soft front panel that controls the E6432A microwave synthesizer's functionality.

- `HPE6432.bas`

  This header file is duplicated in this folder for convenience, but is also located in the `Include:` folder.

  This header file is written using Visual Basic 6.0 syntax and contains the function prototypes for all E6432A VXIplug&play functions.

- `HPE6432.frm`

  This file contains an example soft front panel that can be used within the Visual Basic 6.0 environment to control the E6432A microwave source. This file uses the `HPE6432.bas` header file.

- `Uninstall.exe`

  This file is used to uninstall the VXIplug&play driver and all of its related files from the WinNT folder. `Install.log` keeps track of all installation settings.

- `HPE6432.fp`

  This file documents the VXIplug&play commands and their parameters. It is used to supply on-line help information to the Agilent VEE and LabVIEW environments.

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Help:

- Agte6432.htm

  This file is used to generate a cross-platform Help system for the VXIplug&play driver that runs on both Unix and Windows platforms using an internet browser. The Help system requires internet browsers that are Java enabled with Java 1.02 and above, can use Microsoft Internet Explorer 4.0 and above, or Netscape Navigator 4.0 and above.

  In this Help folder, there may also be files that end with a .pdf that require Adobe Acrobat Reader and files that end with a .mov that require QuickTime software. To get either of these pieces of software, refer to "Adobe Acrobat Reader or QuickTime Software Downloads" on page 6-18.

Include:

- HPE6432.h

  This header file contains the function prototypes for each of the VXIplug&play functions used by the E6432A microwave synthesizer.

- HPE6432.bas

  This header file is written using Visual Basic 6.0 syntax and contains the function prototypes for all E6432A VXIplug&play functions.

Lib/Msc (Microsoft C Libraries):

- HPE6432.lib

  This library file contains the code required to use the HPE6432.dll dynamic link library.

  The HPE6432.dll dynamic link library is generated by compiling the HPE6432.c source file and linking it with the libHPE6432.lib library file. When the HPE6432.c source file is modified by the user, it must be recompiled and linked with the libHPE6432.lib library file to produce a new HPE6432.lib library file and new HPE6432.dll dynamic link library.

Agilent Technologies Visa or NIvisa library files.

- In order to use the VXIplug&play driver, either Agilent Technologies VISA library or National Instruments VISA library must first be installed; the VISA library that you install depends on the Slot 0 module being used. For further information, refer to "Hardware and Software Requirements Prior to Installation" on page 1-3.

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Related Topics

- Slot 0 Module (Agilent E8491B IEE-1394 PC Link to VXI) -Using a PCI IEE-1394 Interface.
- Slot 0 Module (NI VXI-MXI-2)- Using PCI-MXI-2 Interface Module.
- Slot 0 Module (Agilent E6432, 4A, 5a VXI Embedded PC Controller or equivalent).
- Startup Error Dialog Box.

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To Generate a New HPE6432.dll File

The HPE6432.dll dynamic link library file is the E6432A microwave synthesizer's VXIplug&play driver.

The HPE6432.dll dynamic link library is generated by compiling the HPE6432.c source file and linking it with the libHPE6432.lib library file. When the HPE6432.c source file is modified by the user, it must be recompiled and linked with the libHPE6432.lib library file to produce a new HPE6432.lib library file and new HPE6432.dll dynamic link library file.

The following list of files are required to generate a new HPE6432.dll file:

- HPE6432Types.h
- HPE6432Errors.h
- HPE6432.h
- libHPE6432.h
- libHPE6432.lib
- HPE6432.lib
- HPE6432.def

This file defines the names of all entry points into the HPE6432.dll file that is generated during the linking process.

- HPE6432.c
- cvidef.h – This file is not part of the VXIplug&play driver.
- cvirte.h – This file is not part of the VXIplug&play driver.
- visatype.h – This file is not part of the VXIplug&play driver.

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Typical Equipment Configurations

Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

- Used with Three Agilent E1445A Arbitrary Waveform Synthesizers
- Used with Three Racal 3152 Arbitrary Waveform Generators
- Used with One Racal 3153 Triple Arbitrary Waveform Generator
- Used with Three-Pair of E6432A and Racal 3153 to Produce Radar Simulations

Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

- Used with Three E1445A Arbitrary Waveform Synthesizers
- Used with Three Racal 3152 Arbitrary Waveform Generators
- Used with One Racal 3153 Triple Arbitrary Waveform Generator
- Used with Three-Pair of E6432A and Racal 3153 to Produce Radar Simulations

Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller)

- Used with Three Agilent E1445A Arbitrary Waveform Synthesizers
- Used with Three Racal 3152 Arbitrary Waveform Generators
- Used with One Racal 3153 Triple Arbitrary Waveform Generator

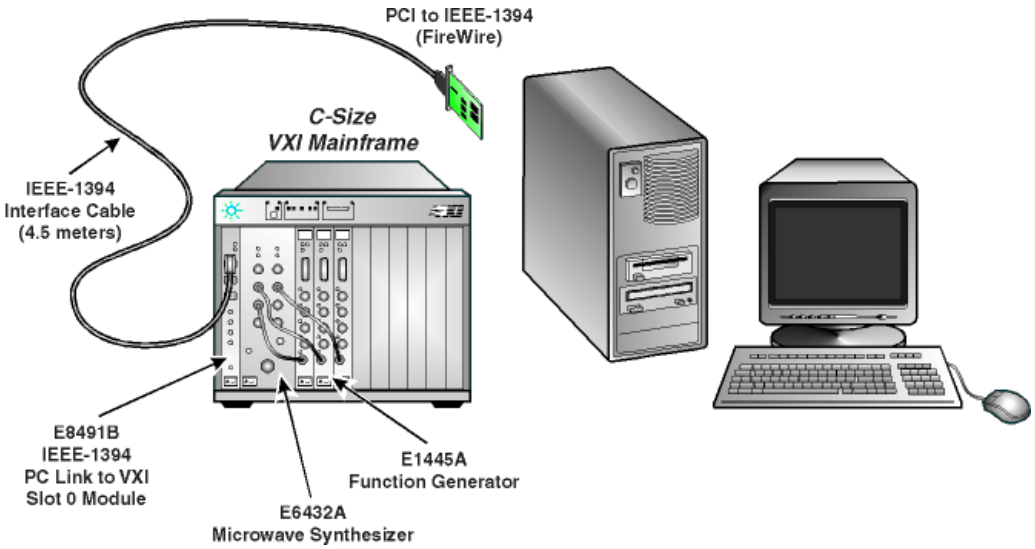
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Agilent E8491B IEEE-1394 - Used with Three E1445A Arbitrary Waveform Synthesizers

Related Topics

Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

Typical Equipment Configurations



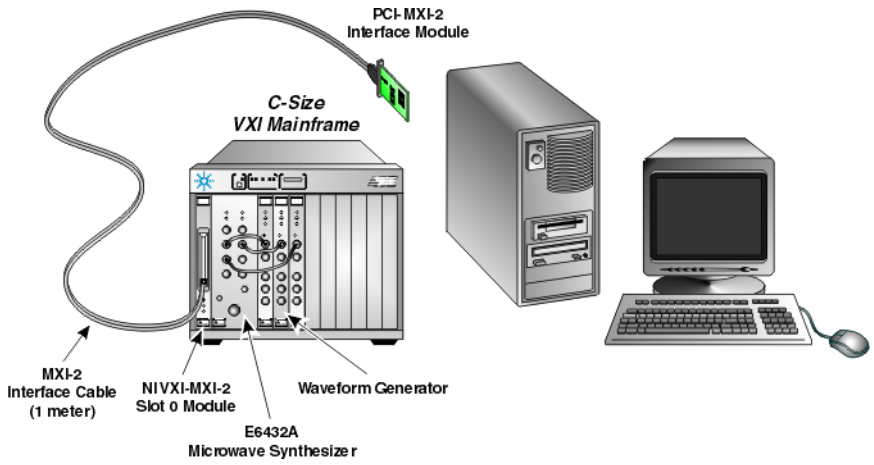
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Agilent E8491B IEEE-1394 - Used with Three Racal 3152 Arbitrary Waveform Generators

Related Topics

Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

Typical Equipment Configurations



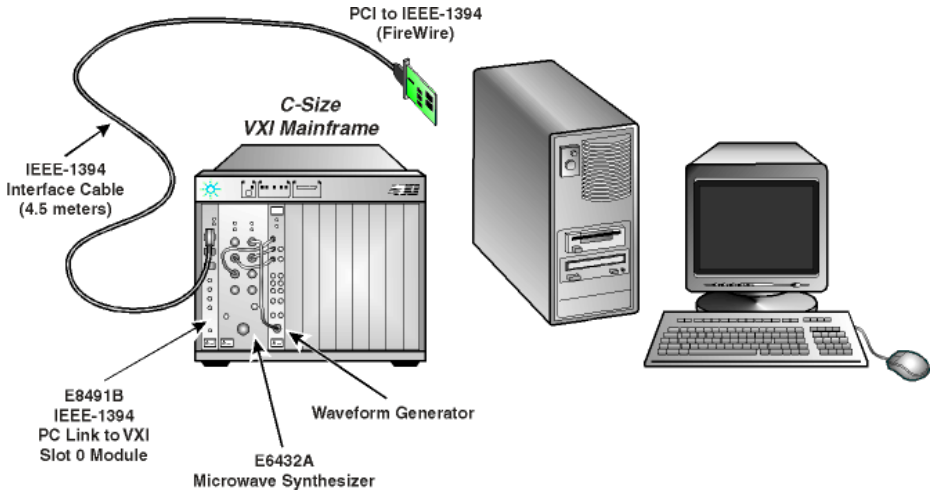
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Agilent E8491B IEEE-1394 - Used with One Racal 3153 Triple Arbitrary Waveform Generator

Related Topics

Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

Typical Equipment Configurations



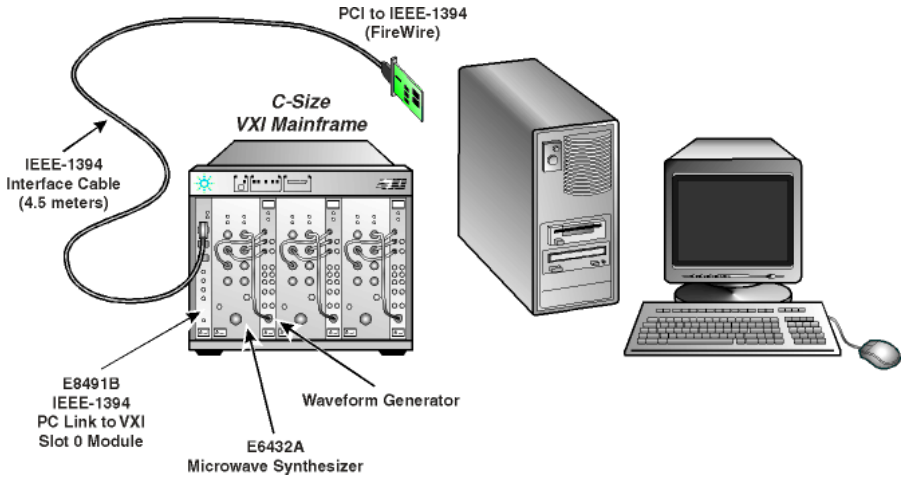
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Agilent E8491B IEEE-1394 - Used with Three-Pair of E6432A and Racal 3153 to Produce Radar Simulations

Related Topics

Slot 0 Module (Agilent E8491B IEEE-1394 PC Link to VXI) - Using a PCI to IEEE-1394 Interface

Typical Equipment Configurations



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Slot 0 Module (NI VXI-MXI-2)- Using a PCI-MXI-2 Interface

- Used with Three Agilent E1445A Arbitrary Waveform Synthesizers
- Used with Three Racal 3152 Arbitrary Waveform Generators
- Used with One Racal 3153 Triple Arbitrary Waveform Generator
- Used with Three-Pair of E6432 and Racal 3153 to Produce Radar Simulations

Related Topics

Typical Equipment Configurations

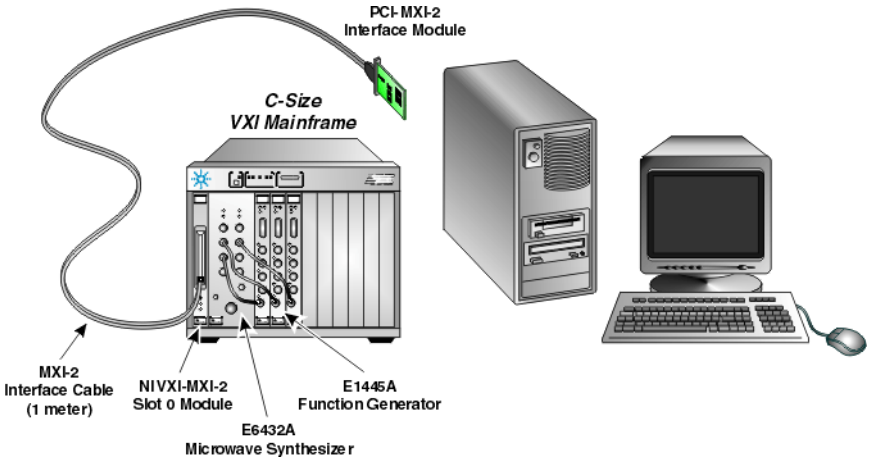
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NI VXI-MXI-2 - Used with Three Agilent E1445A Arbitrary Waveform Synthesizers

Related Topics

Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

Typical Equipment Configurations



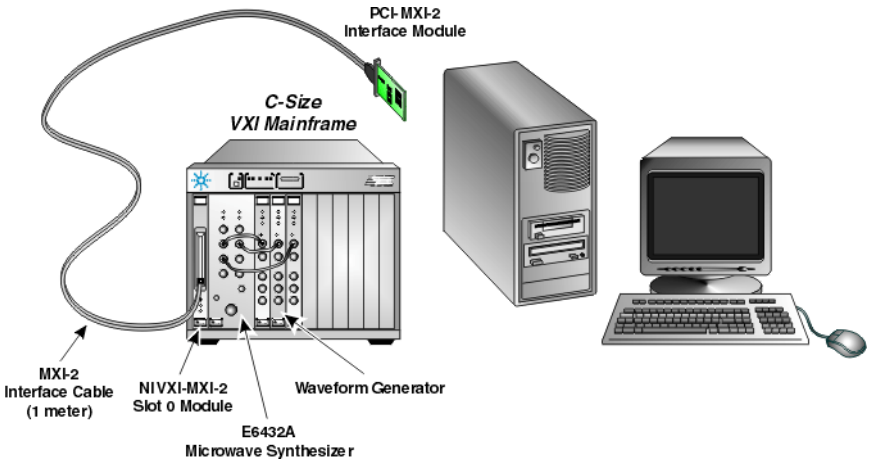
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NI VXI-MXI-2 - Used with Three Racal 3152 Arbitrary Waveform Generators

Related Topics

Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

Typical Equipment Configurations



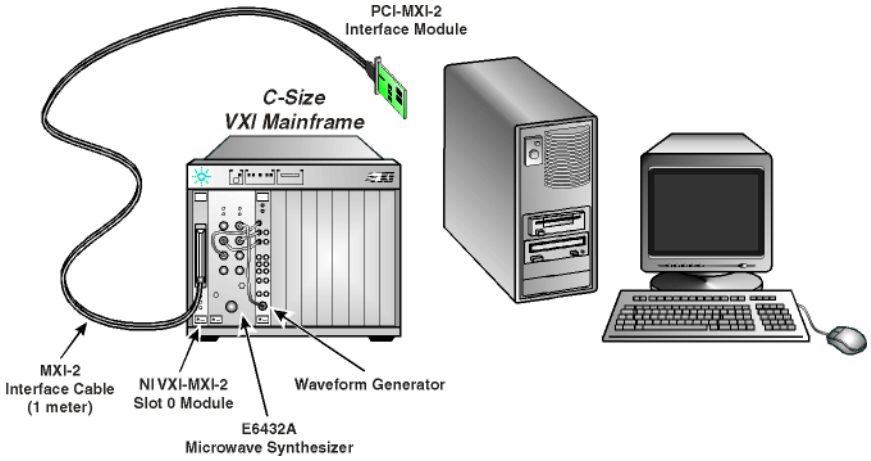
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NI VXI-MXI-2 - Used with One Racal 3153 Triple Arbitrary Waveform Generator

Related Topics

Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

Typical Equipment Configurations



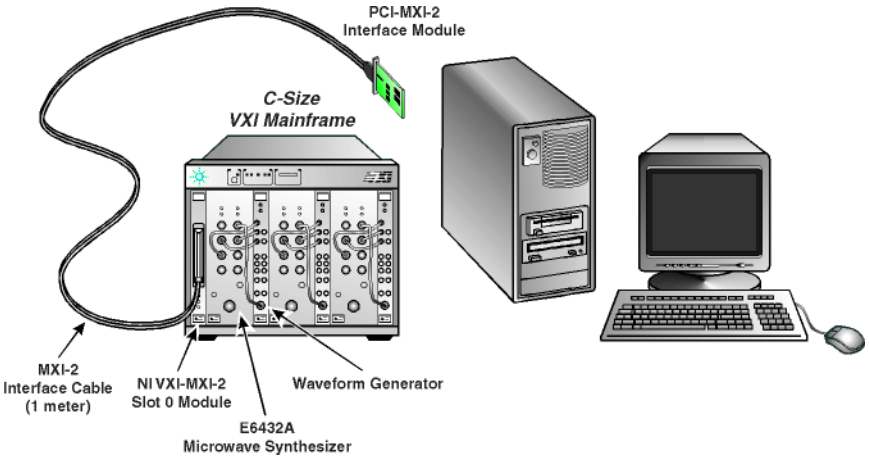
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NI VXI-MXI-2 - Used with Three-Pair of E6432A and Racal 3153 to Produce Radar Simulations

Related Topics

Slot 0 Module (NI VXI-MXI-2) - Using a PCI-MXI-2 Interface

Typical Equipment Configurations



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Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller)

- Used with Three Agilent E1445A Arbitrary Waveform Synthesizers
- Used with Three Racal 3152 Arbitrary Waveform Generators
- Used with One Racal 3153 Triple Arbitrary Waveform Generator

Related Topics

Typical Equipment Configurations

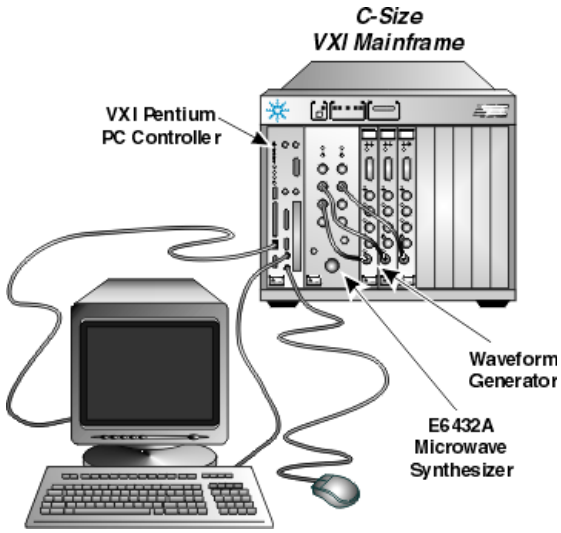
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Agilent E6233A, 4A, 5A VXI Embedded PC Controller - Used with Three Agilent E1445A Arbitrary Waveform Synthesizers

Related Topics

Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller)

Typical Equipment Configurations



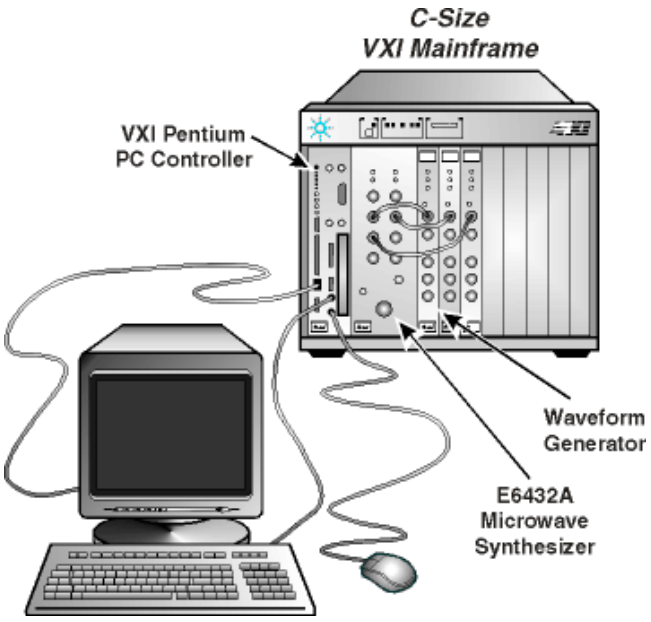
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Agilent E6233A, 4A, 5A VXI Embedded PC Controller - Used with Three Racal 3152 Arbitrary Waveform Generators

Related Topics

Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller)

Typical Equipment Configurations



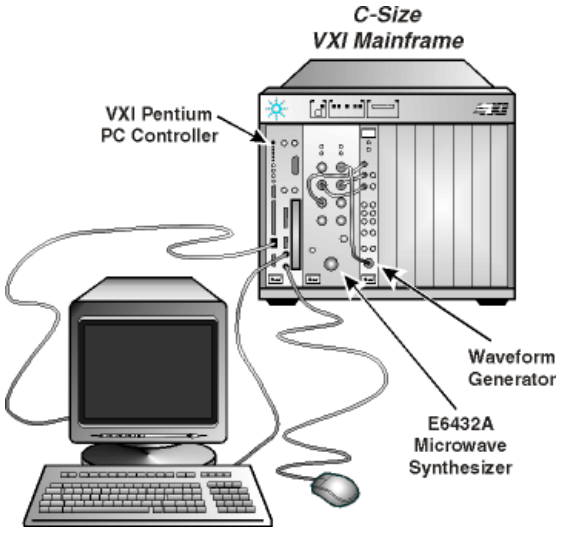
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Agilent E6233A, 4A, 5A VXI Embedded PC Controller - Used with One Racal 3153 Triple Arbitrary Waveform Generator

Related Topics

Slot 0 Module (Agilent E6233A, 4A, 5A VXI Embedded PC Controller)

Typical Equipment Configurations



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Agilent E6432A Acceptance Test Procedure

After satisfying the requirements and steps detailed in the sections titled “Hardware and Software Requirements Prior to Installation” on page 1-3 and “Installation of the E6432A Microwave Synthesizer” on page 1-11, the following Acceptance Test Procedure (ATP) may be performed.

This manual ATP is intended as a functionality check, and is not intended for testing against customer specifications. The ATP consists of seven tests that can be performed in under three hours with a minimum of test equipment.

Acceptance Tests

- Test 1. Maximum Power and Power Flatness
- Test 2. Linear AM Accuracy
- Test 3. FM Accuracy
- Test 4. Pulse Modulation Level Accuracy
- Test 5. Harmonics
- Test 6. External Leveling
- Test 7. I/Q Functionality

Required Test Equipment or Equivalent

- 8563E spectrum analyzer
- 33120A function generator
- E4418A power meter
- E4413A power sensor
- 33330C detector
- Krytar directional coupler with 16 dB coupling factor

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Test 1. Maximum Power and Power Flatness

Description

This test sets the E6432A microwave synthesizer to its maximum power at two frequencies, one in low band and one in high band. A power meter and sensor are used to measure maximum power at both frequencies. Power flatness is checked in low band, high band, and then over the entire frequency range. A delta power measurement is made to check flatness.

Required Test Equipment

- EPM-441A (E4418A) single channel power meter
- ECP-E26A (E4413A) 50 MHz to 26.5 GHz power sensor
- 11730A power sensor cable

Equipment Setup

NOTE All test equipment requires a 30 minute warm-up period to ensure warranted performance. The E6432A microwave synthesizer must be connected to an external 10 MHz reference. Ensure that external 10 MHz reference is selected in the Configuration Dialog Box

E4418A Setup Summary	E4418A Setup Details
	1. Using the 11730A power sensor cable, connect the E4413A power sensor to the E4418A power meter.
Mode dBm	2. On the E4418A, press **dBm/W**, then press *dBm*.
Zero power sensor	3. Press **Zero/Cal**, then press *Zero*.
	4. Connect the E4413A power sensor to the E4418A POWER REF output.
Cal power sensor	5. Press **Zero/Cal**, then **Cal**. The E4418A automatically reads the E4413A calibration table.
	6. Connect the E4413A power sensor to the E6432A RF output.

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E6432A Setup Summary	E6432A Setup Details
Obtain option information	1. Obtain option information by selecting “About E6432A” from the pull down Help menu on the E6432A Soft Front Panel.

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Maximum Power Measurement

E6432A Measurement Summary	E6432A Measurement Details
Frequency 50 MHz	1. From the 6432A Soft Front Panel, select the Frequency entry box and enter 50 MHz.
RF On	2. Select the RF OFF button. The green indicator and the message RF ON should come on.
Maximum Output Power	3. Select the Output Power entry box. Enter the maximum power for your model from the Maximum Power Table shown below.
Measure power	4. Enter the power meter reading in the Maximum Power Table under Measured Power. Note: Ensure that the Unleveled indicator does not illuminate for any of the measurements. If it is illuminated, it indicates a failure.
Frequency 20 GHz	5. Select the Frequency entry box and enter 20 GHz and complete the table.

Table 1-1 Maximum Power Table

Model	Test Frequency	Measured Power	Test Limits
Standard	50 MHz		+17 dBm
	20 GHz		+17 dBm
1E1	50 MHz		+16 dBm
	20 GHz		+16 dBm
UNH	50 MHz		+14 dBm
	20 GHz		+17 dBm
1E1 and UNH	50 MHz		+13 dBm
	20 GHz		+16 dBm
UNF	50 MHz		+17 dBm
	20 GHz		+20 dBm
UNF and 1E1	50 MHz		+16 dBm
	20 GHz		+19 dBm
UNF, 1E1, and UNH	50 MHz		+13 dBm
	20 GHz		+19 dBm

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Power Flatness Measurement

Measurement Summary	Measurement Details
E6432A +7 dBm (STD) or –35 dBm (1E1)	1. If the 6432A is a Standard model, enter +7 dBm in the Output Power entry box. If the E6432A is an Option 1E1, enter –35 dBm in the Output Power entry box.
E4418A Mode **Rel/Offset, Rel, Ref**	2. Press **Rel/Offset**, **Rel**, then **Ref** on the E4418A. The power level at 20 GHz is then used as a reference.
E6432A Frequency 2 GHz Record E4418A reading	3. On the E6432A, select the Frequency entry box and enter 2 GHz. The reading on the E4418A is the leveled power flatness from 2 GHz to 20 GHz. Record the value in the Power Flatness Table shown below under the D Power Measured column.
Frequency 50 MHz Record E4418A reading	4. On the E6432A, select the Frequency entry box and enter 50 MHz. The reading on the E4418A is the leveled power flatness from 50 MHz to 20 GHz. Record this value in the Power Flatness Table shown below.
E4418A Mode **Rel/Offset, Rel, Ref**	5. Press **Rel/Offset**, **Rel**, and then **Ref** on the E4418A. The power level at 50 MHz is then used as a reference.
E6432A Frequency 1.99 GHz Record E4418A reading	6. On the E6432A, select the Frequency entry box and enter 1.99 GHz. The reading on the E4418A is the leveled power flatness from 50 MHz to less than 2 GHz. Record this value in the Power Flatness Table shown below.

Table 1-2 Power Flatness Table

Model	Test Frequencies	Δ Power Measured	Test Limits
Standard	2 GHz to 20 GHz		± 3.3 dB
	50 MHz to 20 GHz		± 3.3 dB
	50 MHz < 2 GHz		± 3.3 dB
1E1	2 GHz to 20 GHz		± 5.5 dB
	50 MHz to 20 GHz		± 5.5 dB
	50 MHz < 2 GHz		± 5.5 dB

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Test 2. AM Accuracy

Description

The E6432A microwave synthesizer is configured for linear AM and a spectrum analyzer is used to measure sidebands. An external function generator drives the E6432A AM input. The test is performed at carrier frequencies of 10 MHz and 20 GHz with AM depths of 10% and 90%. Two AM rates are tested at 1 kHz and 100 kHz.

Required Test Equipment

- 33120A function generator
- 8563E spectrum analyzer
- BNC tee
- BNC 50-ohm load

Equipment Setup

NOTE All test equipment requires a 30 minute warm-up period to ensure warranted performance. The E6432A microwave synthesizer must be connected to an external 10 MHz reference. Ensure that external 10 MHz reference is selected in the Configuration Dialog Box.

7. Connect a BNC tee to the E6432A microwave synthesizer AM input.
8. Connect a 50-ohm load to one port of the BNC tee.
9. Using a BNC cable, connect the 33120A function generator output to the other port of the BNC tee.

NOTE The E6432A microwave synthesizer AM input impedance is 2 kilohm and the 33120A requires a 50-ohm load; therefore, a BNC tee and 50-ohm load are used.

10. Use a high frequency 3.5 mm cable to connect the E6432A microwave synthesizer output to the input of the 8563E spectrum analyzer.

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33120A Setup Summary	33120A Setup Details
Output impedance 50 ohm	1. Press **Shift** and **Menu** keys.
	2. Press the > key three times until `D:Sys Menu` is displayed.
	3. Press the key ∨ until `1:Out Term` is displayed.
	4. Press the key ∨ until `50 Ohm` is displayed.
	5. Press the **Enter** key.
1 kHz sine wave at 200 mVpp	6. Press the ~ sine wave key.
	7. Press **Freq**, **Enter Number**, **1**, and **kHz**.
	8. Press the **Ampl**, **Enter Number**, **200**, **Shift**, and **m Vpp**.
Offset 0 Vdc	9. Press **Offset**, **Enter Number**, **0**, **Shift**, and **m Vpp**.

E6432A Setup Summary	E6432A Setup Details
	1. Start the E6432A Soft Front Panel.
Frequency 10 MHz	2. Select the Frequency entry box and enter 10 MHz.
AM On	3. Select the AM check box.
Output Power 0 dBm	4. Select Configuration from the pull down View menu.
	5. Return to the Soft Front Panel, select the Output Power entry box, and enter 0 dBm.
Deep AM Off Linear AM On	6. In the Configuration Dialog Box, ensure that the Deep AM is set to Off and AM Mode is set to Linear.
RF On	7. From the Soft Front Panel, select the RF OFF button so that RF ON is displayed.

8563E Setup Summary	8563E Setup Details
Preset	1. Press the green Preset key.
Center Frequency 10 MHz	2. Press the Frequency key and enter 10 MHz.
Span 10 kHz	3. Press the Span key and enter 10 kHz.
Reference Level +10 dBm	4. Press the Amplitude key and enter +10 dBm for the reference level.

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AM Accuracy Measurement

Measurement Summary	Measurement Details
8563E Mkr peak search Marker Delta Next Peak Center Frequency 20 GHz	1. On the 8563E, press the **Mkr** and **Peak Search** keys. 2. Press the *Marker Delta* and *Next Peak* keys. 3. Enter the value in the AM Accuracy Table on the next page.
E6432A Frequency 20 GHz	4. Change the E6432A Frequency entry box and the 8563E to a carrier frequency of 20 GHz.
8563E Mkr peak search Marker Delta Next Peak	5. Repeat the above marker measurements.
33120A Amplitude 1.8 Vpp	6. Change the 33120A amplitude to 1.8 Vpp.
E6432A Deep AM On	7. On the E6432A, select Configuration from the pull down View menu. Select Deep AM and set it to on.
8563E Mkr peak search Marker Delta Next Peak Center Frequency 10 MHz	8. Repeat the 8563E marker measurements and complete the 20 GHz portion of the AM Accuracy Table for 90% depth.
E6432A Frequency 10 MHz	9. Change the E6432A Frequency entry box and the 8563E to a carrier frequency of 10 MHz.
8563E Mkr peak search Marker Delta Next Peak	10. Repeat the above marker measurements.
33120A Frequency 100 kHz	11. Change the 33120A frequency to 100 kHz to test an AM rate of 100 kHz.
8563E Span 1 MHz Mkr peak search Marker Delta Next Peak Center Frequency 20 GHz	12. Change the 8563E to a Span of 1 MHz. 13. Repeat the 8563E marker measurement for an AM rate of 100 kHz at 90% depth.

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Measurement Summary	Measurement Details
E6432A Frequency 20 GHz	14. Change the E6432A Frequency entry box and the 8563E carrier frequency to 20 GHz.
8563E Mkr peak search Marker Delta Next Peak	15. Perform the 8563E marker measurements. Record the 90% depth in the AM Accuracy Table.
33120A Amplitude 200 mVpp	16. Change the 33120A amplitude to 200 mVpp.
E6432A Deep AM Off	17. On the Configuration Dialog Box available from the E6432A Soft Front Panel, select Deep AM and set it to off.
8563E Mkr peak search Marker Delta Next Peak Center Frequency 10 MHz	18. Repeat the marker measurements and complete the AM Accuracy Table for an AM Rate of 100 kHz and depth of 10%.
E6432A Frequency 10 MHz	19. Change the E6432A Frequency entry box and the 8563E to a carrier frequency of 10 MHz.
8563E Mkr peak search Marker Delta Next Peak	20. Perform the 8563E marker measurements. Record this value in the AM Accuracy Table.

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Table 1-3 AM Accuracy Table

Carrier Frequency	AM Rate	AM Depth	Measured	Test Limits
10 MHz	1 kHz	10%		–21.4 dB to –36.5 dB
20 GHz	1 kHz	10%		–21.4 dB to –36.5 dB
20 GHz	1 kHz	90%		–6.3 dB to –7.6 dB
10 MHz	1 kHz	90%		–6.3 dB to –7.6 dB
10 MHz	100 kHz	90%		–6.3 dB to –7.6 dB
20 GHz	100 kHz	90%		–6.3 dB to –7.6 dB
20 GHz	100 kHz	10%		–21.4 dB to –36.5 dB
10 MHz	100 kHz	10%		–21.4 dB to –36.5 dB

AM Accuracy Test Limit = ±12% and is calculated as follows:

$$Esb\ (dB) - Ec\ (dB) = 20 \log m/2$$

where: Esb = the amplitude of the AM sideband
Ec = the amplitude of the carrier
m = modulation percent expressed as a fraction

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Test 3. FM Accuracy

Description

The E6432A and the function generator are configured for modulation indices corresponding to Bessel nulls of Jo. The amplitude of the function generator is varied until the carrier being monitored on the spectrum analyzer is a minimum. The function generator amplitude is then recorded and compared to the theoretical value to calculate the FM accuracy error. This test is also used for testing Option 002, low rate FM.

Equipment Required:

33120A function generator

8563E spectrum analyzer

BNC Tee

BNC 50 ohm load

Equipment Setup:

NOTE All test equipment requires a 30 minute warm up period to ensure warranted performance. The E6432A needs to have an external 10 MHz reference connected. Ensure the external 10 MHz reference is selected in the configuration pull down menu.

WARNING Function generator amplitudes greater than or equal to +15 V or less than or equal to –15 V applied to the FM input will cause damage to internal circuitry. Amplitudes greater than +8 V or less than –8 V may cause distortion.

1. Connect a BNC Tee to the E6432A FM input.
2. Connect a 50 ohm load to one port of the BNC Tee.
3. Using a BNC cable connect the 33120A output to the other port of the BNC Tee.
   Due to the E6432A FM input impedance being 2 K ohm and the 33120A wanting to see a 50 ohm load; a BNC Tee and 50 ohm load are used.

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4. Use a high frequency 3.5 mm cable to connect the E6432A output to the input of the 8563E.

33120A Setup Summary	33120A Setup Details
Output impedance = 50 ohms	1. Press the “Shift” key.
Std; 200 kHz sine wave at 2.208 Vpp	2. Press the “Enter” key.
Opt 002; 1 kHz sine wave at 110.4 mVpp	3. Press the “>” key three times until “D: Sys Menu” is displayed.
Offset = 0 Vdc	4. Press the “^” key and “1: Out Term” is displayed.
	5. Press the “^” key until “50 Ohm” is displayed.
	6. Press the Enter key.
	7. Press the “~“ sine wave front panel key.
	8. Press the Freq front panel key. Press the Enter Number front panel key and enter the correct FM rate for your option using the numeric keys. To enter the number press kHz.
	9. Press the Ampl front panel key. Press the Enter Number front panel key and enter the correct amplitude for your option using the numeric keys. To enter the number press Shift and Vpp.

E6432A Setup Summary	E6432A Setup Details
Frequency = 10 MHz	1. Load the E6432A Soft Front Panel (SFP).
Output Power 0 dBm	2. Click on the frequency field and enter a frequency of 10 MHz.
RF On	3. Click on the Output Power field and enter 0 dBm.
Opt 002 FM Sensitivity = 100 kHz/V	4. Click on the RF OFF/ON so ON is displayed.
FM On	5. If you have Option 002, click on the View pull down menu. a. Click on Configuration. b. Click on the FM Sensitivity pull down menu. c. Select the 100 kHz/V sensitivity.
	6. Click on the FM checkbox.

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8563A Setup Summary	8563A Setup Details
Center Frequency = 10 MHz	1. Press Frequency front panel key and enter 10 MHz.
Std: Span 1 MHz	2. Press the Span front panel key and enter the span needed.
Opt 002; Span = 10 kHz	

Measurement Summary	Measurement Setup Details
8563E Marker to carrier at 10 MHz	1. On the 8563E press the Mkr front panel key.
33120A vary amplitude for minimum marker	2. Use the RPG knob on the 8563E and place the marker on the carrier at 10 MHz.
E6432A Frequency = 20 GHz	3. Using the RPG knob on the 33120A vary the amplitude of the 33120A until the spectrum analyzer marker is at a minimum. Record the 33120A amplitude in the FM Accuracy Table.
8563E Center Frequency = 20 GHz	4. Change the E6432A to a carrier frequency of 20 GHz.
Marker to carrier at 20 GHz	5. Change the center frequency on the 8563E to 20 GHz.
33120A vary amplitude for minimum marker	6. Repeat the above steps and enter the 33120A amplitude in the table for 20 GHz and the FM rate being used.
Frequency = 900 kHz	7. Change the 33120A frequency to 900 kHz to test an FM rate of 900 kHz.
Amplitude = 4.33 Vpp	8. Change the 33120A amplitude to 4.33 Vpp.
E6432A Opt 002 FM Sensitivity = 1 MHz/V	9. If you are testing an Option 002, change the FM sensitivity back to 1 MHz/V using the Configuration menu.
8563E Span = 10 MHz	10. Change the 8563E Span to 10 MHz.
Marker to carrier at 20 GHz	11. Vary the 33120A amplitude until the carrier on the 8563E is a null. Record this value in the FM Accuracy Table for a test frequency of 20 GHz and FM rate of 900 kHz.
33120A vary amplitude for minimum marker	12. Change the E6432A SFP to a carrier frequency of 10 MHz.
E6432A Frequency = 10 MHz	13. Change the 8563E center frequency to 10 MHz and repeat the marker null measurements for a test frequency of 10 MHz and FM rate of 900 kHz.
8563E Center Frequency = 10 MHz	

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Measurement Summary	Measurement Setup Details
Marker to carrier at 10 MHz 33120A vary amplitude for minimum marker	

FM Accuracy Error % = (Calc Fgen Amp Vpp – Act Fgen Amp Vpp)/Calc Fgen Amp Vpp) * 100 Test Limit = +40%

Table 1-4

Test Frequency	FM Rate	Calc Fgen Amp Vpp	Act Fgen Amp Vpp	FM Accuracy Error %
10 MHz	200 kHz	2.208 Vpp		
10 MHz Opt 002	1 kHz	110.4 mVpp		
20 GHz	200 kHz	2.208 Vpp		
20 GHz Opt 002	1 kHz	110.4 mVpp		
20 GHz	900 kHz	4.33 Vpp		
10 MHz	900 kHz	4.33 Vpp		

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Test 4. Pulse Modulation Level Accuracy

Description

The E6432A microwave synthesizer and the function generator are configured for pulse modulation. A spectrum analyzer is used in zero span to measure the amplitude of the pulse envelope. This measured value is compared to the CW amplitude with pulse modulation turned off. Depending on the model of spectrum analyzer used, the Pulse Repetition Frequency (PRF) may need to be decreased to measure the pulse.

Required Test Equipment

- 33120A function generator
- 8563E spectrum analyzer

Equipment Setup

NOTE All test equipment requires a 30 minute warm-up period to ensure warranted performance. The E6432A microwave synthesizer must be connected to an external 10 MHz reference. Ensure the external 10 MHz reference is selected in the Configuration Dialog Box.

WARNING **Voltages greater than or equal to +5.5 V or less than or equal to –0.5 V will damage the E6432A microwave synthesizer pulse modulation input. Before connecting the function generator to the E6432A microwave synthesizer ensure its amplitude does not exceed the damage levels.**

1. Using a BNC cable, connect the 33120A function generator output to the E6432A microwave synthesizer Pulse input.
2. Use a high frequency 3.5 mm cable to connect the E6432A microwave synthesizer output to the input of the 8563E spectrum analyzer.

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33120A Setup Summary	33120A Setup Details
30 kHz square wave at 4 Vpp	1. Press the square wave key.
	2. Press **Freq**, **Enter Number**, **30**, and **kHz**.
	3. Press **Ampl**, **Enter Number**, **4**, and **Vpp**.
Offset 2 Vdc	4. Press **Offset**, **Enter Number**, **2**, and **Vpp**.

E6432A Setup Summary	E6432 Setup Details
	1. Start the E6432A Soft Front Panel.
Frequency 1 GHz	2. Set the E6432A carrier frequency to 1 GHz.
Pulse Modulation On	3. Turn on the E6432A Pulse Modulation by selecting the Pulse check box.
Output Power 0 dBm	4. Select the Output Power entry box and enter 0 dBm.
RF On	5. Select the RF OFF button so that RF ON is displayed.

8563E Setup Summary	8563E Setup Details
Center Frequency 1 GHz	1. Press **Frequency** and enter 1 GHz.
Span 0 Hz	2. Press **Span** and enter 0 Hz.
Reference Level 4 dBm	3. Press **Amplitude** and enter 4 dBm.
dB/div 1 dB	4. Press *Log dB/div* and enter 1 dB.
Sweeptime 50 uS	5. Press **Sweep** and enter 50 ms.
Adjust Video Trigger	6. Press **Trig** and select *Video*. Using the RPG, adjust the Video Trigger level for a stable trace.
RBW 1 MHz	7. Press **BW** and enter 1 MHz.

Measurement Summary	Measurement Details
8563E Mkr to pulse plateau	1. Press the 8563E **Mkr** key. Use the RPG knob to place the marker on the plateau of the pulse. Record this amplitude in the Pulse Leveled Accuracy Table shown below.
E6432A Frequency 20 GHz	2. Set the E6432A Frequency to 20 GHz.
8563E Center Frequency 20 GHz	3 Change the 8563E center frequency to 20 GHz.

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Measurement Summary	Measurement Details
Mkr to pulse plateau	4. Repeat the above 8563E marker measurement and record in the Pulse Leveled Accuracy Table.
E6432A Pulse Modulation Off	5. On the 6432A turn off the Pulse Modulation by un-checking the Pulse check box.
8563E Preset	6. Press the 8563E **Preset** key.
Center Frequency 20 GHz Span 20 MHz	7. Configure the 8563E for a center frequency of 20 GHz and span of 20 MHz.
RBW 1 MHz	8. Press the 8563E **BW** key and enter an RBW of 1 MHz.
Reference Level 4 dBm	9. Press the 8563E **Amplitude** and enter 4 dBm.
Mkr peak search	10. Use the 8563E marker to measure the amplitude of the carrier and record in the Pulse Leveled Accuracy Table.
E6432A Frequency 1 GHz	11. Change the E6432A Frequency to 1 GHz.
8563E Center Frequency 1 GHz Mkr peak search	12. Change the 8563E center frequency to 1 GHz and measure the amplitude of the carrier. Record the amplitude in the Pulse Leveled Accuracy Table.

Accuracy = –(Carrier Amplitude – Pulse Amplitude)

Table 1-5 Pulse Leveled Accuracy Table

Test Frequency	PRF	Pulse Amplitude	Carrier Amplitude	Accuracy	Test Limit
1 GHz	30 kHz				±2 dB
20 GHz	30 kHz				±2 dB

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Test 5. Harmonics

Description

The E6432 microwave synthesizer is set for a CW frequency in low and high band. A spectrum analyzer is used to measure the harmonics.

Required Test Equipment

- 8563E spectrum analyzer

Equipment Setup

NOTE All test equipment requires a 30 minute warm-up period to ensure warranted performance. The E6432A microwave synthesizer must be connected to an external 10 MHz reference. Ensure the external 10 MHz reference is selected in the Configuration Dialog Box.

1. Use a high frequency 3.5 mm cable to connect the E6432A microwave synthesizer output to the input of the 8563E spectrum analyzer.

E6432A Setup Summary	E6432A Setup Details
	1. Start the E6432A Soft Front Panel.
	2. Obtain option information by selecting “About E6432A” from the pull down Help menu.
Frequency 400 MHz	3. Set the E6432A Frequency to 400 MHz.
Output Power +10 dBm	4. Select the Output Power entry box and enter +10 dBm.
RF On	5. Select the RF OFF button so that RF ON is displayed.

8563E Setup Summary	8563E Setup Details
Center Frequency 400 MHz	1. Press **Frequency** and enter 400 MHz.
Span 200 kHz	2. Press **Span** and enter 200 kHz.
Reference Level +15 dBm	3. Press **Amplitude** and enter +15 dBm.
RBW 1 kHz	4. Press **BW** and enter 1 kHz.

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Harmonics Measurement

Measurement Summary	Measurement Details
8563E Mkr peak search	1. Press the 8563E **Mkr** and **Peak Search** keys. Record the amplitude in the Carrier (dBm) column of the Harmonics Table shown below.
Center Frequency 800 MHz	2. Change the 8563E center frequency to 800 MHz.
Reference Level -25 dBm	3. Press the **Amplitude** key and enter –25 dBm.
Mkr peak search	4. Repeat step 1 and record the amplitude in the Harmonic (dBm) column of the Harmonics Table.
E6432A Frequency 5 GHz	5. Change the E6432A frequency to 5 GHz.
8563E Center Frequency 5 GHz Reference Level +15 dBm Mkr peak search	6. Change the 8563E center frequency to 5 GHz and a reference level of +15 dBm. 7. Repeat step 1 and record the amplitude in the Carrier (dBm) column of the Harmonics Table.
Center Frequency 10 GHz Reference Level -25 dBm Mkr peak search	8. Change the 8563E center frequency to 10 GHz and a reference level of –25 dBm. 9. Repeat step 1 and record the amplitude in the Harmonic (dBm) column of the Harmonics Table.

$$\text{Harmonic (dBc) Error} = -(\text{Carrier (dBm)} - \text{Harmonics (dBm)})$$

Table 1-6 Harmonics Table

Model	Carrier Frequency	Carrier (dBm)	Harmonic (dBm)	Harmonic (dBc) Error	Test Limits
STD/1E1	400 MHz				–20 dBc
	5 GHz				–50 dBc
UNH	400 MHz				–50 dBc
	5 GHz				–50 dBc
UNF	400 MHz				–20 dBc
	5 GHz				–45 dBc

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Test 6. External Leveling

Description

The E6432A microwave synthesizer is configured for external leveling using a negative detector and a directional coupler. An E6432A microwave synthesizer user calibration is then performed and the synthesizer is checked for leveling.

Required Test Equipment

- 33330C detector

NOTE A different negative detector may be used depending upon the frequency range of the external leveling loop configuration.

- Krytar directional coupler with 16 dB coupling factor
- EPM-441A (E4418A) single channel power meter
- ECP-E26A (E4413A) 50 MHz to 26.5 GHz power sensor

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Equipment Setup

NOTE All test equipment requires a 30 minute warm-up period to ensure warranted performance. The E6432A microwave synthesizer must have an external 10 MHz reference connected. Ensure the external 10 MHz reference is selected in the Configuration Dialog Box.

1. Use a high frequency 3.5 mm cable to connect the E6432A microwave synthesizer output to the input of the directional coupler.
2. Connect the 33330C detector to the coupled port of the directional coupler.
3. Using an SMC to BNC cable, connect the 33330C detector output to the E6432A Ext ALC input.
4. Connect E4413A power sensor to the output port of the directional coupler.

E6432A Setup Summary	E6432A Setup Details
	1. Start the E6432A Soft Front Panel.
Output Power 0 dBm	2. Select the Output Power entry box and enter 0 dBm.

4418A Setup Summary	4418A Setup Details
Preset	1. Press the **Preset** key.

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External Leveling Measurement

Measurement Summary	Measurement Details
E6432A Perform External Detector Linearization Calibration	1. From the E6432A Soft Front Panel, select the pull down View menu. Scroll to Calibration and select External Detector Linearization Calibration (Run 1st).
Perform External Modulator Gain Calibration	2. Enter the calibration start and stop frequency range and select Start. 3. Enter the power meter reading and complete the calibration. 4. When the calibration is complete, select Close. 5. Select the pull down View menu. Scroll down to Calibration and select External Modulator Gain Calibration (Run 2nd). 6. Enter the calibration start and stop frequency range followed by the step size and select Start. When the calibration is complete, select Close.
Set frequency within range of external leveling loop configuration	7. Set the Frequency of the E6432A within the range of the external leveling loop configuration.
Output Power 0 dBm.	8. Select Output Power and enter 0 dBm.
E4418A Verify power	9. Verify the power on the E4418A power meter and ensure that the E6432A is not unleveled.

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Test 7. I/Q Functionality

Description:

An internal I/Q calibration is performed using the E6432A Soft Front Panel (SFP). The E6432A Option UNG is IQ modulated by an E4430B Option UN8. A QPSK modulation format is used with a symbol rate of 2 MS/s and a root Nyquist filter with an alpha of 0.5. The occupied bandwidth is then, 1.52 MHz or 3 MHz. The bandwidth is measured with a spectrum analyzer.

Equipment Required:

8563E spectrum analyzer

E4430B Option UN8

Equipment Setup:

NOTE All test equipment requires a 30 minute warm up period to ensure warranted performance. The E6432A needs to have an external 10 MHz reference connected. Ensure the external 10 MHz reference is selected in the configuration pull down menu.

Connections

1. Use a high frequency 3.5 mm cable to connect the E6432A output to the input of the 8563E.
2. Connect BNC cables from the E4430B rear panel I and Q outputs to the E6432A front panel I and Q inputs.

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E6432A Setup Summary	E6432A Setup Details
Reset	1. Load the E6432A Soft Front Panel (SFP).
Frequency = 1 GHz	2. Click on the Reset field.
ALC Off	3. Highlight the frequency field and enter 1000 MHz using the numeric keypad.
Power = +10 dBm	4. Click on the ALC pull down menu and select the ALC Off mode.
I/Q On	5. Highlight the Output Power field and enter +10 dBm using the numeric keypad.
RF On	6. Click on the I/Q checkbox.
View pull down	7. Click on the RF Off button to change to RF On.
Calibration	8. Click on the View pull down menu.
I/Q External Source Adjustments	9. Scroll down to the Calibration menu.
I Attenuation = 12 dB	10. Click on I/Q Calibration.
Q Attenuation = 12 dB	11. Click on the Calibrate I/Q Modulator.
Close I/Q External Source Adjustments	12. Click on Close.
Calibration	13. Click on the View pull down menu.
I/Q Calibration	14. Scroll down to the Calibration menu.
Calibrate I/Q Modulator	15. Click on I/Q External Source Adjustments.
Close I/Q Panel	16. Click on the I/Q Input pull down menu.
View pull down	17. Click on Test Tone.
Calibration	18. Click on Power Search in the main Soft Front Panel.
I/Q External Source Adjustments	19. Click on the I/Q Input pull down menu.
I/Q Input = Test Tone	20. Click on Normal.
Power Search	21. Increment the up arrow key for the I attenuator until you have 12 dB displayed.
I/Q Input = Normal	22. Increment the up arrow key for the Q attenuator until you have 12 dB displayed.
Close I/Q External Source Adjustments	23. Click on Close I/Q External Source Adjustments.

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E4430B Setup Summary	E4430B Setup Details
Preset	1. Press the green Preset front panel key.
I/Q	2. Select the I/Q front panel key.
More (1 of 2)	3. Select the More (1 of 2) softkey.
I/Q Calibration	4. Select I/Q Calibration softkey.
Calibration Type Full	5. Select the Calibration Type Full softkey.
Execute Cal	6. Select the Execute Cal softkey.
	7. Turn on I/Q Baseband Modulation.

E4430B Setup Summary	E4430B Setup Details
Quick Set up	1. Press the Mode front panel key.
Mode = Real Time I/Q Baseband	2. Select the Real Time I/Q Baseband softkey.
Custom Modulation = QPSK	3. Select the Custom softkey.
Symbol Rate = 2 MS/s	4. Select the Modulation Type softkey.
Filter = Root Nyquist	5. Select the Select (XXX) softkey where XXX is the current modulation format selected.
Alpha = .5	6. Select the PSK (XXX) softkey where XXX is the current modulation format selected.
Turn on Custom Modulation	7. Select the QPSK and OQPSK softkey.
	8. Select the QPSK softkey.
	9. Press the Return front panel key.
	10. Select the Symbol Rate softkey.
	11. Enter 2 MS/s using the numeric keypad and softkey.
	12. Press the Return front panel key.
	13. Select the Filter softkey.
	14. Select the Select (XXX) softkey, where XXX is the current filter type selected.
	15. Select the Root Nyquist softkey.
	16. Select the Filter Alpha softkey.
	17. Enter 0.5 via the numeric keypad.
	18. Press the Return front panel key.
	19. Select the Custom On softkey.

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Measurement Summary	Measurement Details
8563E	1. Press the green Preset front panel key.
Preset	2. Press the Amplitude front panel key.
Reference Level = -10 dBm	3. Select the Ref Lvl softkey and enter -10 dBm.
Log dB/Div = 5 dB	4. Select the Log dB/Div softkey and enter 5 dB.
Center Frequency = 1 GHz	5. Press the Frequency front panel key.
Span = 5 MHz	6. Select the Center Frequency softkey and enter 1 GHz.
Video Averaging On	7. Press Span front panel key and enter 5 MHz.
Measure Occupied Bandwidth	8. Press the BW front panel key.
Record the Occupied Bandwidth in Table 1-7.	9. Select the Vid Avg On key.
	10. Press the Meas/User front panel key.
	11. Select the Power Menu softkey.
	12. Select the Occupied Pwr Menu softkey.
	13. Ensure the Occupied (XXX) is set for 99.00%.
	14. Select the Occupied Bandwidth softkey.
	15. Record the Occupied BW in Table 1-7.

E6432A Setup Summary	E6432A Setup Details
Frequency = 10 GHz	1. Highlight the Frequency field and enter 10000 MHz using the numeric keypad.
View pull down	2. Click on the View pull down menu.
Calibration	3. Scroll down to the Calibration menu.
I/Q Calibration	4. Click on I/Q Calibration.
Calibrate I/Q Upconverter	5. Click on Calibrate I/Q Upconverter.
Close I/Q Panel	6. Click on Close.

8563E Setup Summary	8563E Setup Details
Center Frequency = 10 GHz	1. Press the Frequency front panel key.
Reference Level = –5 dBm	2. Select the Center Frequency softkey and enter 10 GHz.
Measure Occupied Bandwidth	3. Press the Amplitude front panel key.
I/Q Calibration	4. Select the Ref Lvl softkey and enter –5 dBm.
Calibrate I/Q Upconverter	5. Press the Meas/User front panel key.

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8563E Setup Summary	8563E Setup Details
Close I/Q Panel	6. Select the Power Menu softkey. 7. Select the Occupied Pwr Menu softkey. 8. Ensure the Occupied (XXX) is set for 99.00%. 9. Select the Occupied Bandwidth softkey. 10. Record the Occupied BW in Table 1-7.

Table 1-7

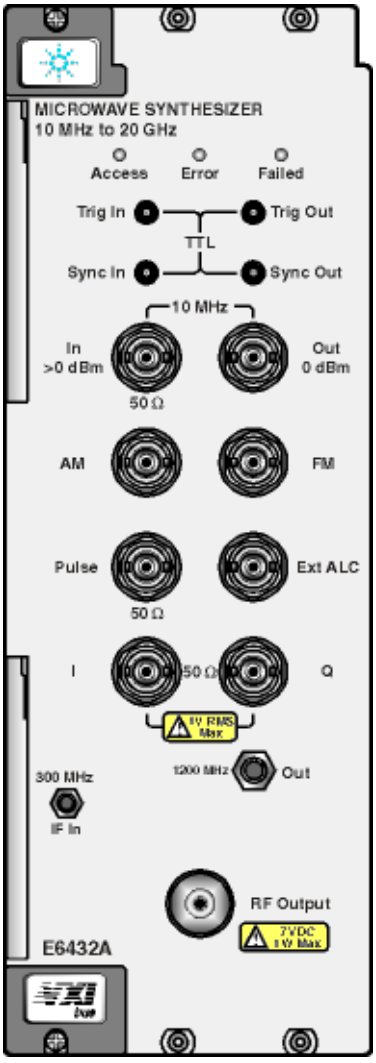
Carrier Frequency	Bandwidth	Test Limits
1 GHz		> 2 MHz
10 GHz		> 2 MHz

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2 Hardware Front Panel Connectors

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Hardware Front Panel Connectors



In this chapter, get detailed information on the following topics.

LEDs

- Access LED
- Error LED
- Failed LED

TTL Trigger and Sync Connectors

- Trig In
- Trig Out

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- Sync In
- Sync Out

Modulation and Ext ALC Connectors

- AM Input
- FM Input
- PULSE Input
- Ext ALC Input
- I/Q Inputs
- 300 MHz IF In

Reference Connectors

- 10 MHz In
- 10 MHz Out
- 1200 MHz Out

RF Output Connector

- RF Output

Related Topics

- Typical Equipment

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Access LED

Access LED, available from the Hardware Front Panel, indicates that the synthesizer has been accessed with a read or write over the VXIbus.

Related Topics

Hardware Front Panel Connectors

Error LED

Error LED, available from the Hardware Front Panel, indicates a programmable or configuration error has occurred; this Error LED remains active until the error queue has been cleared.

Indications include the following:

- Invalid function call to a VXIplug&play function.

  This includes an invalid parameter set or an invalid function call order; for example, a function being called prior to calling the `HPE6432_init` function.

- 100 MHz reference unlock (when external reference is selected)
- ALC high and low unlevel (when external leveling is selected)

TIP

To help identify and clear any of the above errors:

❏ Using the Soft Front Panel, refer to the procedure on how “To Display a List of the Synthesizer’s Error Queue Messages” on page 3-113.

❏ Using the VXIplug&play commands, use the HPE6432_error_query command.

Related Topics

Selecting External Reference from the Configuration Dialog Box Controls

Errors and Failures Dialog Box

HPE6432_SetRefSource

HPE6432_init

VXIplug&play Commands (Functional List)

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Failed LED

Failed LED, available from the Hardware Front Panel, indicates a failed power-on self test or that a hardware failure has occurred.

Indications include the following:

- Power-on self test failure
- Assist processor unable to execute or its watchdog timer firing
- Fractional-N synthesizer (Parent loop) unlock
- Microwave PLL unlock
- 100 MHz reference unlock (when internal reference is selected)
- ALC high and low unlevel (when internal leveling is selected)
- Failure of internal calibration
- Failure of diagnostic test

This Failed LED remains illuminated until the user performs an initialization, and the synthesizer passes the power-on self-test with none of the above failure conditions being indicated.

TIP

To help identify any of the above failures:

- ❏ Using the Soft Front Panel, refer to the procedure on how “To Display a List of the Synthesizer’s Error Queue Messages” on page 3-113.
- ❏ Using the VXIplug&play commands, use the HPE6432_error_query command.

Related Topics

View Pull Down Menu

Errors and Failures Dialog Box

Pull Down Diagnostics Menu

Full Self Test With RF On

HPE6432_init

HPE6432_error_query

HPE6432_SetRefSource

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TTL Trig In

TTL Trig In, available from the Hardware Front Panel, is used to externally initiate an analog sweep or to advance to the next point of a step list or frequency list.

Related Topics

Trigger Input

HPE6432_SetTriggerInput

List Dialog Box

TTL Trig Out

TTL Trig Out, available from the Hardware Front Panel, produces a 1 us wide TTL-level pulse at each point in a step list or frequency list.

Related Topics

Trigger Out Front Panel

List Dialog Box

HPE6432_SetExtTriggerOut

TTL Sync In

TTL Sync In, available from the Hardware Front Panel, is used to reset to the beginning of a step list or frequency list.

Related Topics

Sync Input

TTL Sync Out

TTL Sync Out, available from the Hardware Front Panel, is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled.

The output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode or list mode.

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10 MHz In

10 MHz In, available from the Hardware Front Panel, accepts a 10 MHz reference signal +/– 100 Hz, 0 to +10 dBm with a nominal input impedance of 50 ohms.

To accept a 10 MHz reference signal through this input, external must be selected. If instead, internal is selected, a 10 MHz reference signal is provided internally by the synthesizer.

The 10 MHz reference signal that is used, either internal or external, directly affects the 1200 MHz Reference Out signal because the two signals are phase-coherent.

Related Topics

Selecting Internal or External 10 MHz Reference Signal

1200 MHz Reference Out

E6432_SetRefSource

10 MHz Out

10 MHz Out, available from the Hardware Front Panel, supplies a 10 MHz reference signal that is phase-coherent with the 10 MHz reference signal.

This 10 MHz reference signal is produced by a free-running 10 MHz crystal. There is no specification attached to the crystal. The crystal's basic accuracy is about 70 ppm, and inside the synthesizer, its accuracy is improved to less than 10 ppm. The crystal has a settability of 2 ppm.

At the factory, the crystal is adjusted to be close at room temperature. By close, it should be within 50 kHz at a 20 GHz center frequency. This adjustment drifts with crystal aging and changes in ambient temperature. A service routine will be available to adjust the DAC that controls the crystal and can be run as needed during periodic calibrations.

Related Topics

10 MHz In Reference Signal

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AM Input

AM Input, available from the Hardware Front Panel, is used to supply amplitude modulation input signals from external signal sources such as arbitrary waveform generators and function generators.

An amplitude modulation signal can be applied by itself or at the same time as a frequency modulation or pulse signal.

There are two AM operation modes:

- ❏ Exponential AM Mode
- ❏ Linear AM Mode

Exponential AM Mode

When the synthesizer is in exponential AM mode, the input accepts a wider range of input signal. The RF output level (the reference power level) is affected by the exponential input level as follows:

Exponential Input Level	RF Output Level
0 V	Unaffected
–1 Vp	Decreases by 10 dB / –1 V
+1 Vp	Increases by 10 dB / +1 V

The dynamic range of the positive to negative power levels is dependent on the synthesizer power level setting. The input impedance for this input connector is factory set at 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

TIP When using a signal generator to drive the AM input, the output impedance of the signal generator must be taken into account. If the signal generator has an output impedance of 50 ohms and it is set to output a –0.5 Vp to +0.5 Vp signal into a 50-ohm load, the actual signal level at the AM input will be a –1 Vp to +1 Vp. This occurs because the AM input on the synthesizer has a 2 kilohm input impedance; a –1 Vp to +1 Vp signal at the AM input will generate 20 dB of peak-to-peak AM modulation.

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One solution to remedy this impedance mismatch is to place a BNC tee connector on the AM input with a 50-ohm load connected to one port of the BNC tee connector. The input signal from the signal generator would be connected to the other port so that the output impedance of the signal generator sees approximately a 50-ohm input impedance as a load. If the signal generator is set to output a –1 Vp to +1 Vp signal, the actual signal level at the AM input should be a –1 Vp to +1 Vp, +/– the accuracy of the signal generator itself.

Another way to assure that the output level of the signal generator is set to the expected level, is to measure the signal generator output with an oscilloscope or multimeter. When measuring the output level of the signal generator with these devices, it should be noted that many models have switchable inputs that may allow 50 ohm, 1 megohm, or some other value to be selected as the input impedance. If the incorrect input impedance is selected, you could also generate an incorrect signal level.

Related Topics

Deep AM

AM Mode (Linear/Exponential)

HPE6432_SetAmMode

Spectrum Analysis AM and FM (Application Note 150-1) requires Adobe Acrobat Reader and QuickTime Software

Linear AM Mode

When the synthesizer is in linear AM mode, the input accepts a –1 Vp to +1 Vp signal. The RF output level (the reference power level) is effected by the AM input level as follows:

Linear Input Level	RF Output Level
0 V	Unaffected
–1 Vp	Minimum Power
+1 Vp	100% (3 dB) Higher than the Reference Power Level

Therefore, there must be greater than or equal to 3 dB of margin between the reference power level and the maximum available at a given frequency. The unmodulated (0 V input) to modulated (–1 Vp input) ratio is a function of power level and frequency, but is always greater than 20 dB. The amplitude of the RF output changes linearly as the AM input changes.

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Hardware Front Panel Connectors

The input impedance for this input connector is factory set at 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

TIP

When using a signal generator to drive the AM input, the output impedance of the signal generator must be taken into account. If the signal generator has an output impedance of 50 ohms and it is set to output a –0.5 Vp to +0.5 Vp signal into a 50-ohm load, the actual signal level at the AM input will be a –1 Vp to +1 Vp. This occurs because the AM input on the synthesizer has a 2 kilohm input impedance; a –1 Vp to +1 Vp signal at the AM input will generate 100% AM modulation.

One solution to remedy this impedance mismatch is to place a BNC tee connector on the AM input with a 50-ohm load connected to one port of the BNC tee connector. The input signal from the signal generator would be connected to the other port so that the output impedance of the signal generator sees approximately a 50-ohm input impedance as a load. If the signal generator is set to output a –1 Vp to +1 Vp signal, the actual signal level at the AM input should be a –1 Vp to +1 Vp, +/– the accuracy of the signal generator itself.

Another way to assure that the output level of the signal generator is set to the expected level, is to measure the signal generator output with an oscilloscope or multimeter. When measuring the output level of the signal generator with these devices, it should be noted that many models have switchable inputs that may allow 50 ohm, 1 megohm, or some other value to be selected as the input impedance. If the incorrect input impedance is selected, you could also generate an incorrect signal level.

Related Topics

Deep AM

AM Mode (Linear/Exponential)

E6432_SetAmMode

Spectrum Analysis AM and FM (Application Note 150-1) requires Adobe Acrobat Reader and QuickTime

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FM Input

FM Input, available from the Hardware Front Panel on standard instruments and instruments with Option 002, is used to supply frequency modulation input signals from external signal sources such as arbitrary waveform generators and function generators.

A frequency modulation signal can be applied by itself or at the same time as an amplitude modulation or pulse modulation signal.

Standard instruments

This input accepts a –10 Vp to +10 Vp signal with 1 MHz/V sensitivity. Any signal greater than these limits causes distortion. The deviation changes linearly as the FM input changes from 0 to its upper and lower voltage limit. The input impedance for this input connector is 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

Instruments with Option 002

Adding Option 002 adds low rate FM capability. This option is not available on instruments with I/Q modulation (Option UNG).

Instruments with Option 002 accept a –10 Vp to +10 Vp signal with 100 kHz/V, 1 MHz/V, 10 MHz/V sensitivities. Any signal greater than these limits causes distortion. The deviation changes linearly as the FM input changes from 0 to its upper and lower voltage limit.

The input impedance for this input connector is 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

TIP

When using a signal generator to drive the FM input, the output impedance of the signal generator must be taken into account. If the signal generator has an output impedance of 50 ohms and it is set to output a –1 Vp to +1 Vp signal into a 50-ohm load, the actual signal level at the FM input will be a –2 Vp to +2 Vp. This occurs because the FM input on the synthesizer has a 2 kilohm input impedance; a –2 Vp to +2 Vp signal at the FM input will generate a 4 MHz FM peak-to-peak modulation.

One solution to remedy this impedance mismatch is to place a BNC tee connector on the FM input with a 50-ohm load connected to one port of the BNC tee connector. The input signal from the signal generator would be connected to the other port so that the output impedance of the signal generator sees approximately a 50-ohm input impedance as a

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load. If the signal generator is set to output a –1 Vp to +1 Vp signal, the actual signal level at the FM input should be a –1 Vp to +1 Vp, +/– the accuracy of the signal generator itself.

Another way to assure that the output level of the signal generator is set to the expected level, is to measure the signal generator output with an oscilloscope or multimeter. When measuring the output level of the signal generator with these devices, it should be noted that many models have switchable inputs that may allow 50 ohm, 1 megohm, or some other value to be selected as the input impedance. If the incorrect input impedance is selected, you could also generate an incorrect signal level.

Related Topics

E6432_SetFreqModState

Spectrum Analysis AM and FM (Application Note 150-1) requires Adobe Acrobat Reader and QuickTime Software

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PULSE Input

PULSE Input, available from the Hardware Front Panel, is used to supply pulse modulation input signals from external signal sources such as arbitrary waveform generators and function generators.

A pulse modulation signal can be applied by itself or at the same time as an amplitude modulation or frequency modulation signal.

The input impedance for the PULSE input connector is 50 ohms. Damage levels for this input are greater than or equal to +5.5 V, or less than or equal to –0.5 V.

A TTL high input (greater than +2 V) causes a maximum selected RF power output, while a TTL low input causes minimum RF output (greater than 80 dB RF on/off ratio).

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

HPE6432_SetPulseModState

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Ext ALC Input

Ext ALC Input, available from the Hardware Front Panel, is used to supply an external feedback connection from a negative-output diode detector that allows the synthesizer to level power in the ALC loop. External Leveling Point must be specified when using this input.

The input impedance for this input connector is 1 M ohms.

Related Topics

External Leveling Point

Leveling (ALC) Controls

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I/Q Inputs

I/Q Inputs, available from the Hardware Front Panel on instruments with Option UNG, are used to supply the in-phase and quadrature component (90 degrees) of an I/Q modulation signal.

The input impedance for these I/Q input connectors is 50 ohms.

The I/Q inputs accept input signals that are produced by arbitrary waveform generators and function generators. This allows the creation of microwave signals that have complex I/Q modulation impressed on the RF/microwave signal. The I/Q modulation may be any type of communication format (such as CDMA, TDMA, GSM, BPSK, QPSK, and others), phase encoding of a radar pulse, low rate FM signal simulation, multi-tone signal simulation, or even random noise simulation. Complex signals can be generated at baseband as I/Q signals, or with the addition of Option 300, a 300 MHz IF input is provided that allows complex signals to be modulated onto a 300 MHz IF input signal.

Instruments with Option UNG have analog I/Q modulation capability with 40 MHz of bandwidth. Option 300 adds a 300 MHz IF input that is upconverted to 3.3 GHz. The VXIplug&play driver is used to control the I/Q and IF driver boards, provide manual control of I/Q gain, offset, and quadrature, and user calibration of I/Q gain, offset, and quadrature.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

300 MHz IF In

300 MHz IF In, available from the Hardware Front Panel on instruments with Option 300, accepts an IF input signal with a 300 MHz center frequency. The IF input signal may have AM, FM, Pulse, I/Q, or combinations of these modulations impressed on it.

In order to maintain frequency accuracy, the signal being applied to this input must be phase-locked with the 10 MHz reference signal.

Related Topics

Selecting Internal or External 10 MHz Reference Signal

E6432_SetRefSource

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1200 MHz Reference Out

1200 MHz Reference Out, available from the Hardware Front Panel, supplies a 1200 MHz reference signal that is phase-locked with the 10 MHz reference signal; it can be used to phase-lock other equipment to the synthesizer's RF output signal.

Related Topics

Selecting Internal or External 10 MHz Reference Signal

E6432_SetRefSource

RF Output

RF Output, available from the Hardware Front Panel, supplies the RF output signals. Signals can be CW or modulated with AM, FM, Pulse, or I/Q.

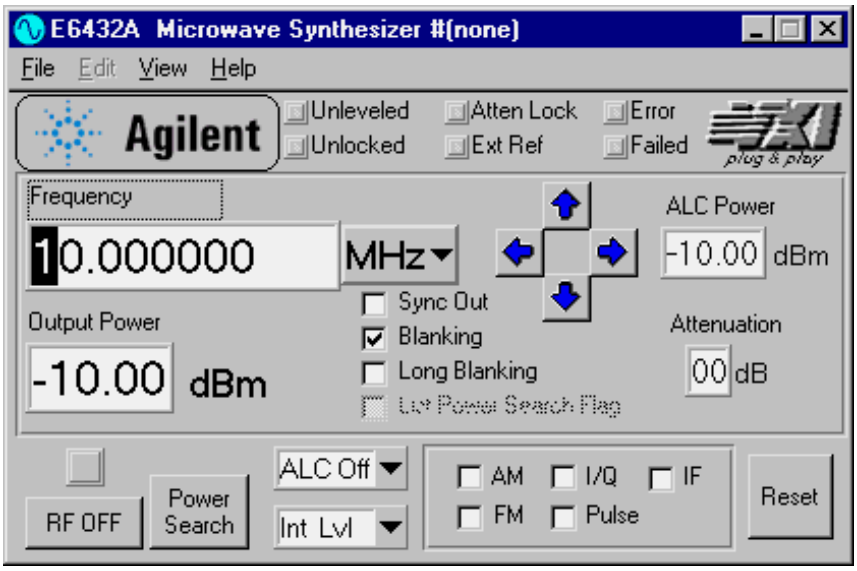
Related Topics

Specifications and Characteristics

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3 Soft Front Panel Help

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When hardware can not be found for this Soft Front Panel, refer to the “Startup Error Dialog Box” on page 3-4.

Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

Error Indicators

- Unlocked
- Unleveled
- Atten Lock
- Ext Ref
- Error
- Failed

Main Panel Controls

- Yellow Background Entry Boxes
- Red Entry Values

RF Output Controls

- Flags - of a List Point
- Leveling (ALC) Controls
- Modulation Controls

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Pull Down Menus

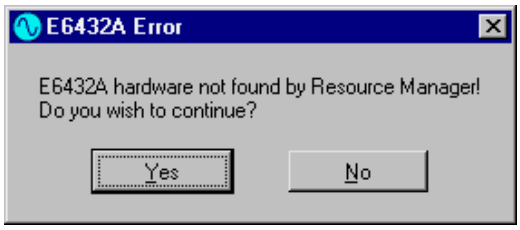
- File Pull Down Menu
- Edit Pull Down Menu
- View Pull Down Menu

Dialog Boxes

- Configuration Dialog Box
- List Dialog Box
- List Point Calculator Dialog Box
- Errors and Failures Dialog Box
- Pull Down Diagnostics Menu
- Pull Down Calibration Menu

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Startup Error Dialog Box



The above dialog box is displayed when hardware for the Soft Front Panel can not be found.

- If you answer yes to the Startup Error Dialog Box, the VXIplug&play driver can only be used in demo mode.

  Demo mode is used for demonstration purposes of the graphical user interface only, and does not require any physical connection to hardware or the VXI bus.

- If you answer no to the Startup Error Dialog Box, the program will close.

  In order to use the Soft Front Panel to control hardware, you must have a VISA I/O library installed and configured properly to work with the Slot 0 interface being used. (For further information, refer to “Hardware and Software Requirements Prior to Installation” on page 1-3.)

Related Topics

Typical Equipment Configurations

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Unlocked Error Indicator

The Unlocked error indicator, available from the Soft Front Panel, indicates that one of the synthesizer's phase-locked loops is unlocked; this Unlocked error indicator remains active until the problem is resolved.

Indications include the following:

- Fractional-N synthesizer (Paren loop) is unlocked
- Microwave PLL is unlocked
- 10 MHz reference is unlocked

TIP

To help identify any of the above unlocks:

❏ Using the Soft Front Panel, refer to the procedure on how "To Display a List of the Synthesizer's Error Queue Messages" on page 3-113.

❏ Using the VXIplug&play commands, use the HPE6432_error_query command.

Related Topics

Soft Front Panel Help

Selecting Internal or External 10 MHz Reference Signal

Errors and Failures Dialog Box

Hardware Front Panel Connectors

1200 MHz Reference Out

HPE6432_SetRefSource

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Unleveled Error Indicator

The Unleveled error indicator, visible on the Soft Front Panel, is turned on (changes color to red) when the synthesizer exceeds the output power range that it is capable of producing while leveled.

This leveled output power range is dependent on the range of the ALC; if a step attenuator (Option 1E1) is present, the ALC range can be offset by the value of the applied attenuation.

For complete specifications, refer to: “Specifications and Characteristics” on page 6-1.

TIP

To help identify an unleveled error:

- Using the Soft Front Panel, refer to the procedure on how “To Display a List of the Synthesizer’s Error Queue Messages” on page 3-113.
- Using the VXIplug&play commands, use the HPE6432_error_query command.

Related Topics

Soft Front Panel Help

Understanding the ALC System

Errors and Failures Dialog Box

HPE6432_SetLevelingPoint

HPE6432_SetLevelingState

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Atten Lock Indicator

The Atten Lock Indicator, visible on the Soft Front Panel, is turned on (changes color to green) when the Lock RF Attenuator check box is selected. The Lock RF Attenuator check box is available from the Configuration Dialog Box.

Related Topics

Soft Front Panel Help

Configuration Dialog Box

Lock RF Attenuator

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Ext Ref Indicator

The Ext Ref indicator, visible on the Soft Front Panel, is turned on (changes color to red) when the synthesizer is set to accept an external reference signal.

To set the synthesizer to external reference:

1. Access the Configuration Dialog Box from the pull down View menu.
2. Set 10 MHz Ref to External.

Related Topics

Soft Front Panel Help

Configuration Dialog Box

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Error LED Indicator

The Error LED indicator, visible on the Soft Front Panel, is turned on (changes color to red) when the synthesizer has errors to report. For convenience, an Error LED indicator is also visible on the Errors and Failures Dialog Box.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

Error LED, from the Hardware Front Panel

Failed LED, from the Hardware Front Panel

Error LED, from the Errors and Failures Dialog Box

Failed LED, from the Errors and Failures Dialog Box

Failed LED, from the Soft Front Panel

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Failed LED Indicator

The Failed LED indicator, visible on the Soft Front Panel, is turned on (changes color to red) when the synthesizer has failures to report. For convenience, a Failed LED indicator is also visible on the Errors and Failures Dialog Box.

Related Topics

Soft Front Panel Help

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

Error LED, from the Hardware Front Panel

Failed LED, from the Hardware Front Panel

Error LED, from the Errors and Failures Dialog Box

Failed LED, from the Errors and Failures Dialog Box

Error LED, from the Soft Front Panel

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RF Output Controls

Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

In this section, get detailed information on the following topics.

- Yellow Background Entry Boxes
- Red Entry Values

- Frequency
- Frequency Units
- Arrow Keys
- Output Power
- Attenuation
- ALC Power
- Blanking of a List Point Flag
- RF ON/OFF
- Reset

Yellow Background Entry Boxes and Red Entry Values

The entry boxes that accept numeric values on the Soft Front Panel Help and the Configuration Dialog Box exhibit the following characteristics.

Yellow Background Entry Boxes

When the background color of the entry box being edited turns yellow, the value being entered has not yet been accepted; the synthesizer hardware is set once a value is accepted.

The value can be accepted by one of the following methods:

❏ press Enter or Return on the computer keyboard

❏ select another entry box by pointing and clicking with the mouse

❏ press Tab on the computer keyboard; this moves the focus to another entry box

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Red Entry Values

When the value being displayed turns red in an entry box, the value is out of range for the particular setting, and the synthesizer is being asked to generate a signal that is outside of its specified range. If a signal is still generated with these red entry values, none of the specifications or characteristics for this product apply to such a signal.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

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Frequency Control

Frequency Control, available from the Soft Front Panel, sets the current frequency of the output while all other instrument states remain unchanged.

The current frequency can be adjusted by highlighting one or more digits with a mouse and entering a frequency directly in the dialog box or by using the adjustment arrow keys.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Yellow Background Entry Boxes

Red Entry Values

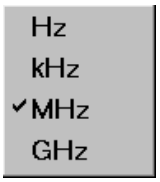
Frequency Units

Arrow Keys

HPE6432_SetFreqAlcAtten

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Frequency Units



Frequency Units, available from the Soft Front Panel, selects the number of digits displayed to the left and right of the decimal point in the current frequency of the output. A check mark designates the current selection; for example, MHz is selected in the above drawing.

Allowable values: GHz, MHz, kHz, and Hz.

Related Topics

Soft Front Panel Help

Frequency Control

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Arrow Keys



The left and right arrow keys, available from the Soft Front Panel, are used to select a digit in any of the numeric entry boxes available from the Soft Front Panel or its dialog boxes. Once a digit has been selected, the value can be adjusted using the up and down arrow keys or by direct keyboard entry using the computer keyboard.

The left and right arrow keys on the computer keyboard can also be used to perform the same function as the left and right arrow keys on the Soft Front Panel.



The up and down arrow keys, available from the Soft Front Panel, adjust the value of the currently selected digit in any of the numeric entry boxes available from the Soft Front Panel or its dialog boxes.

The up and down arrow keys on the computer keyboard can also be used to perform the same function as the up and down arrow keys on the Soft Front Panel.

Related Topics

Soft Front Panel Help

Frequency Control

Frequency Units

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Output Power Control

Output Power Control, available from the Soft Front Panel, automatically sets the ALC power level and output attenuation (Option 1E1) when given a desired output power.

The current power level can be adjusted by highlighting one or more digits with a mouse and entering a power level directly in the entry box or by using the adjustment arrow keys.

When the value being displayed turns red, the value is out of range; the synthesizer may still put out a signal with these settings, but the signal has no specifications or characteristics associated with it.

The following formulas are used to compute output power, ALC power level, and attenuator level:

Output Power = ALCPower Level – Attenuator Level

or

Attenuator Level = ALCPower Level – Output Power

or

ALCPower Level = Output Power + Attenuator Level

When using these formulas, the following applies:

```
if an attenuator exists (Option 1E1) then
        if Output Power <= -70 then Attenuator Level = 70
    else if Output Power <= -60 then Attenuator Level = 60
    else if Output Power <= -50 then Attenuator Level = 50
    else if Output Power <= -40 then Attenuator Level = 40
    else if Output Power <= -30 then Attenuator Level = 30
    else if Output Power <= -20 then Attenuator Level = 20
    else if Output Power <= -10 then Attenuator Level = 10
    else if Output Power  > -10 then Attenuator Level = 0
  if Option 1E1 is not present then
        Attenuator Level = 0
```


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For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Yellow Background Entry Boxes

Red Entry Values

Attenuation

ALC Power

Leveling Control

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Attenuation Control

Attenuation Control, available from the Soft Front Panel, sets the current attenuation of the output while all other instrument states remain unchanged. This attenuation control requires that the synthesizer in use contains the Option 1E1 step attenuator.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Yellow Background Entry Boxes

Red Entry Values

ALC Power

Output Power

Coupled Operation

Uncoupled Operation

Leveling Control

Understanding the ALC System

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ALC Power Control

ALC Power Control, available from the Soft Front Panel, sets the current ALC power level of the output while all other instrument states remain unchanged.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Yellow Background Entry Boxes

Red Entry Values

Attenuation

Output Power

Coupled Operation

Coupled Operation

Uncoupled Operation

Leveling Control

Understanding the ALC System

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RF ON/OFF Control

Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

RF ON/OFF Control, available from the Soft Front Panel, enables or disables the RF output while all other instrument state settings are unaffected.

Factory Preset Value: OFF

Related Topics

Soft Front Panel Help

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Reset Control

Reset, available from the Soft Front Panel, sets the entire instrument and VXIplug&play driver to some predetermined factory preset state. It modifies both the driver instrument state and the actual hardware so that they match.

For security reasons, users may have the requirement that all frequency information be erased from memory.

- There is no battery backed up memory in the synthesizer, and memory is completely purged when power is removed. A function that clears list memory is not required; the synthesizer does not have any frequency information stored in its internal memory.
- Since lists can be saved to a file, the user will have to take responsibility to manage the file system to ensure security.

Related Topics

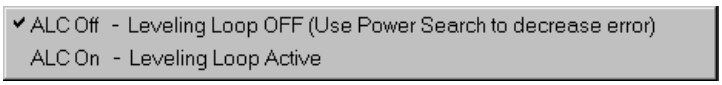
Soft Front Panel Help

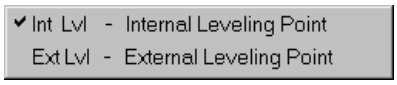
Configuration Dialog Box

HPE6432_reset

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Leveling (ALC) Controls





- ALC On/Off
- Power Search
- Internal Leveling Point (Int Lvl)
- External Leveling Point (Ext Lvl)

Related Topics

Understanding the ALC System

ALC Bandwidth

HPE6432_SetAlcBandwidth

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Understanding the ALC System

The purpose of the ALC system is to control the amplitude or power level of the RF energy generated by the synthesizer. It is a feedback control system, in which the output power is measured and compared to the desired power level. If the output power level does not equal the desired power level, the ALC system changes the output until they are equal.

A desired power level can be set by using either soft front panel controls or remote VXIplug&play commands. As shown in the ALC System, the inputs and calibration data are processed by the synthesizer's assist processor. The assist processor uses this information to set the Level DAC. In turn, the Level DAC sends a controlling voltage to the Level Control Circuits. In the presence of modulation, voltages appearing at the AM input contribute to the control of the Level Control Circuits.

In synthesizers with an optional step attenuator (Option 1E1), the power level at the RF output connector can be reduced by the attenuation of the step attenuator. This is in addition to the control capabilities provided by the Level Control Circuits.

A feed-back signal to the Level Control Circuits can be provided by either internal or external detectors. This signal provides the feed-back voltage that is compared to the voltage representing a desired power level. This leveling loop allows the synthesizer to provide accurate and stable power level setting with improved, corrected, source-match at the internal or external leveling point. Alternately, the power level can be set without using feed back. In this mode however, power level is uncalibrated and is subject to drift with temperature.

The following sections describe the operation of the different leveling modes and leveling points. Two terms are used in the following discussions: output power and ALC level. Output power is defined as the actual output power including the affects of the step attenuator (Option 1E1). In synthesizers without step attenuators, the terms output power and ALC level are equivalent.

Related Topics

Soft Front Panel Help

Leveling (ALC) Controls

ALC System Diagram

Internal Leveling Point

External Leveling Point

ALC Bandwidth

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ALC On/Off

Power Search

Coupled Operation

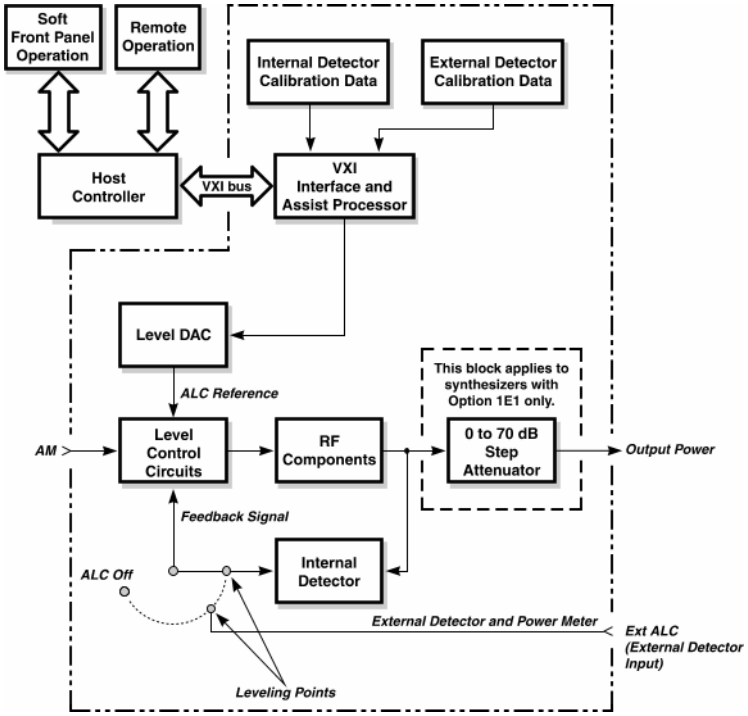
Uncoupled Operation

HPE6432_SetLevelingState

HPE6432_SetOutputPower

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ALC System Diagram



Related Topics

Understanding the ALC System

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Internal Leveling Point

Internal Leveling Point (Int Lvl), available from the Soft Front Panel, controls which detector is used in the ALC loop. Selecting Internal Leveling Point specifies that the INTERNAL_DETECTOR be used which allows the synthesizer to level power at the output of the directional coupler located inside of the synthesizer.

Factory Preset Value: INTERNAL_DETECTOR

In this configuration, power is sensed by a detector internal to the synthesizer and a dc output from this detector is fed back to the Level Control Circuits.

The ALC level is limited at the low end by the Level Control Circuits and at the high end by the maximum available power. Noise and drift limit the range at the low end to –20 dBm or greater. The combination of RF frequency and RF components (different options of synthesizers have different RF components) limit the ALC range available at the high end. If the power level requested is higher than the synthesizer is capable of producing, the maximum available power is produced, and the Unleveled error indicator is displayed.

ALC leveling accuracy depends on the power level. Although the ALC level range is usable from –20 dBm to maximum power (maximum power varies depending on whether your synthesizer is a standard model or a high power option) it is most accurate from –10 to +10 dBm.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Leveling (ALC) Controls

Understanding the ALC System

HPE6432_SetLevelingPoint

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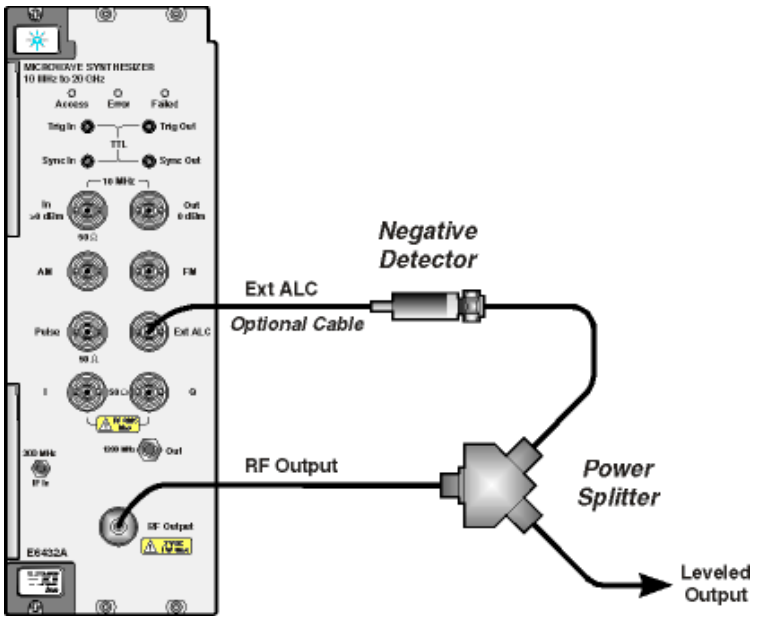
External Leveling Point

External Leveling Point (Ext Lvl), available from the Soft Front Panel, controls which detector is used in the ALC loop. Selecting External Leveling Point specifies that the EXTERNAL_DETECTOR_1 be used which allows the synthesizer to level power by accepting an external feedback connection from a negative-output diode detector. The Ext ALC BNC connector on the front panel is used for the required signal.

Factory Preset Value: INTERNAL_DETECTOR

In externally leveled operations, the output power from the synthesizer is detected by an external sensor. The output of this detector is returned to the leveling circuits, and the output power is automatically adjusted to keep the power constant at the point of detection. The following figure shows a basic external leveling arrangement. The output of the detected arm of the splitter or coupler is held constant. If the splitter response is flat, the output of the other arm is also constant. This arrangement offers superior flatness over internal leveling, especially if long cables are involved.

In some instances, the use of an external detector and long cabling creates excessive phase shift, which in turn could result in oscillations. Problems such as this can be eliminated in External Leveling Mode by selecting low ALC bandwidth.



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Related Topics

Panel Help

Ext ALC BNC Connector

Leveling (ALC) Controls

Understanding the ALC System

HPE6432_SetAlcBandwidth

HPE6432_SetLevelingPoint

ALC On/Off

ALC On/Off, available from the Soft Front Panel, is used to enable or disable the ALC.

In this configuration, when the ALC is off (disabled), power is not sensed at any point, and the absolute power level is uncalibrated. Direct and separate control of the RF modulator and the attenuator is possible.

The ALC Off configuration is useful for applications that involve pulse modulation with extremely narrow pulses. For pulse widths less than the minimum specified for leveled pulse, the ALC will not maintain accurate leveling and therefore the ALC off mode must be selected.

For complete specifications, refer to: “Specifications and Characteristics” on page 6-1.

NOTE Turning on I/Q or IF turns off ALC Leveling. ALC Leveling can be turned back on manually using the ALC On/Off control.

Related Topics

Soft Front Panel Help

Leveling (ALC) Controls

Understanding the ALC System

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Power Search

Power Search, available from the Soft Front Panel, returns an ALC integrator offset value for the current frequency and ALC power that is selected on the main Soft Front Panel (attenuation is not counted). If the List Dialog Box is open, a Power Search is performed on each item in the list that has a **P** flag selected.

Power Search ALC integrator values ARE NOT USED (have no effect) when leveling is on:

The ALC integrator offset value that is returned from a Power Search is not used (has no effect) when leveling is turned on (ALC loop is closed).

Power Search ALC integrator values ARE USED (improve power accuracy) when leveling is off:

This ALC integrator offset value minimizes the power level change that occurs when leveling is turned off (ALC loop is open). Leveling is typically turned off for pulsed signals with pulse width less than 2.5 us and for complex modulated signals such as I/Q modulation.

As an example, Power Search could be used to correct (offset) the power level of a signal with leveling turned off as follows: If the frequency is set to 10 GHz, output power is set to –10 dBm, and leveling is turned off (ALC loop is open), the power error may be greater than desired. The greater power error is caused because leveling is turned off. If a Power Search is performed, leveling is momentarily turned on (ALC loop is momentarily closed) so that the power is as accurate as possible and the integrator offset is adjusted to zero using an offset zero DAC. Leveling is then turned off (ALC loop is opened) and because the integrator error voltage is zero, the power level does not change.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Power Search - of a List Point

Ext ALC BNC Connector

Leveling (ALC) Controls

Understanding the ALC System

HPE6432_SetLevelingState

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Coupled Operation

During coupled operation, the ALC and attenuation values are changed together.

Since many applications require output power less than –20 dBm, an optional step attenuator (Option 1E1) can be used. Lower output power can be achieved when the step attenuator and level control circuits work in conjunction. With the step attenuator, the ALC level is normally used over the smaller, more accurate portion of its range. Since ALC level accuracy suffers below –10 dBm, the ALC level is set between –10 and 0 dBm with the following exceptions:

- When the step attenuator is set to 70 dB, the ALC is allowed to go down to –20 dBm.
- When the step attenuator is set to 0 dB, the ALC is allowed to go to maximum power; maximum power varies depending on whether your synthesizer is a standard model or a high power option.

When you set output power, coupled operation is assumed by the VXIplug&play driver unless leveling is set to off. The proper combination of ALC level and step attenuator setting is decided by the VXIplug&play driver. In coupled operation, when desired output power is set, by adjusting the Output Power value from the main Soft Front Panel, the ALC level and step attenuator are set automatically to provide the best accuracy for the output power requested.

Related Topics

Soft Front Panel Help

Leveling (ALC) Controls

Understanding the ALC System

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Uncoupled Operation

During uncoupled operation, the ALC and attenuation values are changed independently.

In some applications, it is advantageous to control the ALC level and step attenuator separately, using combinations of settings that are not available in coupled operation. Uncoupled operation is accomplished as follows:

- by adjusting the ALC value from the main Soft Front Panel, only the ALC level is changed
- by adjusting the attenuation value from the main Soft Front Panel, only the attenuation is changed

NOTE Uncoupled operation is always recommended when in external leveling mode and must be used when specifying points in a list.

Related Topics

Soft Front Panel Help

Leveling (ALC) Controls

Understanding the ALC System

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Modulation Controls



- AM
- FM
- Pulse
- I/Q (Option UNG Only)
- IF (Option 300 Only)

AM (On/Off)

AM (On/Off), available from the Soft Front Panel, enables or disables amplitude modulation while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list. When enabled, the analog input will always come from an external BNC AM input.

Factory Preset Value: Off

Related Topics

AM Input

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetAmModState

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FM (On/Off)

FM (On/Off), available from the Soft Front Panel, enables or disables frequency modulation while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list. When On, the analog input will always come from an external BNC FM input.

Factory Preset Value: Off

Related Topics

FM Input

Soft Front Panel Help

HPE6432_SetFreqModState

Pulse Modulation (On/Off)

Pulse Modulation (On/Off), available from the Soft Front Panel, enables or disables pulse modulation while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list. When On, the analog input will always come from an external BNC input.

Factory Preset Value: Off

Related Topics

PULSE Input

Soft Front Panel Help

HPE6432_SetPulseModState

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I/Q (On/Off)

I/Q (On/Off), available from the Soft Front Panel, enables or disables the I and Q inputs on the hardware front panel.

This feature is only available on units with the an Option UNG.

NOTE Turning on I/Q or IF turns off ALC Leveling. ALC Leveling can be turned back on manually using the ALC On/Off control.

Related Topics

Soft Front Panel Help

I/Q Calibration (Option UNG Only)

IF (On/Off)

IF (On/Off), available from the Soft Front Panel, enables or disables the IF input on the hardware front panel.

This feature is only available on units with the an Option 300.

Turning on I/Q or IF turns off ALC Leveling. ALC Leveling can be turned back on manually using the ALC On/Off control.

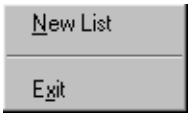
Related Topics

Soft Front Panel Help

IF Upconverter Level Calibration (Option 300 Only)

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Pull Down File Menu



- New List
- Exit

New List

New List, available from the pull down File menu, creates a new list that consists of a single point and destroys any existing list that is currently visible in the *List Dialog Box*.

The new list containing a single list point mirrors the entries (frequency, output power, attenuation, ALC power, and flags) in the main soft front panel; changes to any of the parameters in the main soft front panel will also change the values in the list point being displayed.

NOTE If the List Dialog Box is not visible, the New List selection is grayed out and not available. The List Dialog Box can be displayed by selecting it from the pull down View menu.

Related Topics

Soft Front Panel Help

List Dialog Box

Working with Lists (A Programmer's Model)

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Exit

Exit, available from the pull down File menu, performs the following:

- closes the instrument I/O session and all windows associated with the synthesizer soft front panel
- destroys the instrument driver session and all of its attributes
- deallocates system resources including any memory resources the instrument driver uses
- breaks all links that it has established with the VXIbus

Because you may start more than one Soft Front Panel, each session must be exited separately.

Related Topics

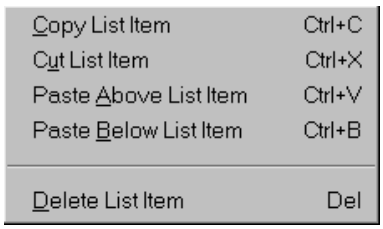
Soft Front Panel Help

HPE6432_close

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Pull Down Edit Menu

The pull down Edit menu is only available when the List dialog box is selected from the “Pull Down View Menu” on page 3-40.



- Copy List Item
- Cut List Item
- Paste Above List Item
- Paste Below List Item
- Delete List Item

Related Topics

Soft Front Panel Help

Pull Down Edit Menu

Pull Down View Menu

List Dialog Box

Copy List Item

Copy List Item, available from the pull down Edit menu, is used to copy a single point from a list to the Microsoft Windows Clipboard.

Once a list point has been copied to the Clipboard, it can be copied back into the current list with Paste Above List Item or Paste Below List Item.

It may also be pasted into other applications using the application’s Paste command from their pull down Edit menu.

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Related Topics

Soft Front Panel Help

Pull Down Edit Menu

Cut List Item

Cut List Item, available from the pull down Edit menu, is used to cut a point from a list and copy it to the Microsoft Windows Clipboard.

Once a list point has been copied to the Clipboard, it can be copied back into the current list with **Past Above List Item** or **Paste Below List Item.**

It may also be pasted into other applications using the application's Paste command from their pull down Edit menu.

Related Topics

Soft Front Panel Help

Pull Down Edit Menu

Paste Above List Item

Paste Above List Item, available from the pull down Edit menu, copies a list point from the Microsoft Windows Clipboard and places it above the currently selected list point in the List Dialog Box.

Related Topics

Soft Front Panel Help

Pull Down Edit Menu

List Dialog Box

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Paste Below List Item

Paste Below, available from the pull down Edit menu, copies a list point from the Microsoft Windows Clipboard and places it below the currently selected list point in the List Dialog Box.

Related Topics

Soft Front Panel Help

Pull Down Edit Menu

List Dialog Box

Delete List Item

Delete List Item, available from the pull down Edit menu, deletes the currently selected point from the current list in the List Dialog Box.

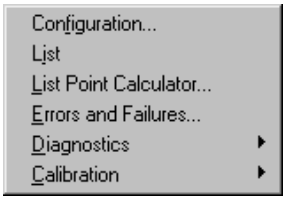
Related Topics

Soft Front Panel Help

Pull Down Edit Menu

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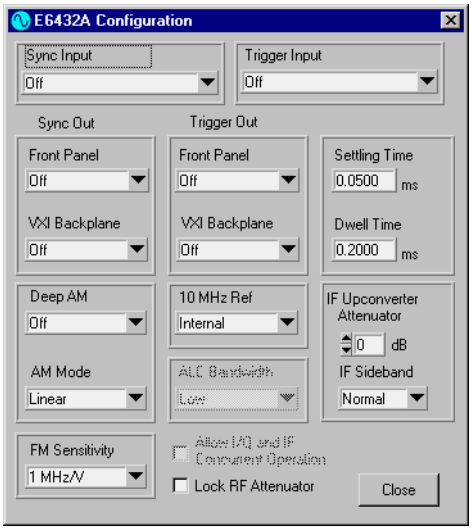
Pull Down View Menu



- Configuration Dialog Box
- List Dialog Box
- List Point Calculator Dialog Box
- Errors and Failures Dialog Box
- Pull Down Diagnostics Menu
- Pull Down Calibration Menu

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Configuration Dialog Box



RF Output Controls

- Lock RF Attenuator
- 10 MHz Ref
- Settling Time
- Yellow Background Entry Boxes
- Red Entry Values

ALC Controls

- ALC Bandwidth

Modulation Controls

- Deep AM
- AM Mode (Linear/Exponential)

List Controls

- Dwell Time
- Yellow Background Entry Boxes
- Red Entry Values

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Trigger and Marker Controls

- Trigger Input
- Trigger Out (Front Panel)
- Trigger Out (VXI Backplane)
- Sync Input
- Sync Out (Front Panel)
- Sync Out (VXI Backplane)

Low Rate FM (Option 002 Only) Controls

- FM Sensitivity

  This option is not available on instruments with Option UNG.

I/Q Modulation (Options UNG and 300 Only) Controls

- Allow IF and I/Q Concurrent Operation

300 MHz IF Input (Option 300 Only) Controls

- IF Upconverter Attenuator
- IF Sideband

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Lock RF Attenuator

Lock RF Attenuator, available from the Configuration Dialog Box, allows the RF attenuator (Option 1E1 Only) to be locked at its current setting.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

Atten Lock Indicator

10 MHz Ref

10 MHz Ref, available from the Configuration Dialog Box, allows selection of the internal 10 MHz reference or an external 10 MHz reference.

If internal is selected, a 10 MHz reference signal is provided internally by the synthesizer. If external is selected instead, a 10 MHz reference signal greater than 0 dBm must be supplied through the 10 MHz In connector that is available from the Hardware Front Panel.

Factory Preset Value: Internal

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

10 MHz In

HPE6432_SetRefSource

Settling Time

Settling time is the period of time the synthesizer waits, following the switch/blanking time, before producing a Trig Out trigger or a Sync Out trigger. Settling time is used every time a new frequency or power is set up in the synthesizer.

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Settling time can be set by an external host computer to different values. These values of settling time control how close to the final frequency and power the synthesizer reaches before the Trig Out trigger and a Sync Out trigger are asserted. As an example, a 50 us settling time yields a typical settling within 50 kHz of the final frequency.

Settable Range: 0.5 us to 32.7675 ms

Settling time begins after switch/blanking time is completed. Settling time is user-definable and can be adjusted between a minimum and maximum value; longer periods of settling time can be specified in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer.

Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

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For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Some example cases in which the settling time would be extended by the external host computer would be:

- when a slow external detector is used; in this case, a longer settling time would be required before the power is settled to within specification
- when using Trig Out trigger to trigger a measurement and additional time is required for the measurement system to settle

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

Yellow Background Entry Boxes

Red Entry Values

HPE6432_SetSettlingTime

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ALC Bandwidth

ALC Bandwidth, available from the Configuration Dialog Box, selects high or low ALC bandwidth while all other instrument state settings are unaffected.

- When high ALC bandwidth is selected, the ALC loop has a bandwidth of 100 kHz.
- When low ALC bandwidth is selected, the ALC loop has a bandwidth of 10 kHz.

Internal Leveling Mode

When using Internal Leveling Mode and frequencies less than 560 MHz, the ALC bandwidth is always low. When the frequency is greater than or equal to 560 MHz, the ALC bandwidth is always high.

External Leveling Mode

When using External Leveling Mode, the ALC bandwidth is low for all frequencies by default, but can be changed to high if desired.

In External Leveling Mode, high ALC bandwidth can be used in a effort to minimize the effects of settling time. Because some situations that use External Leveling Mode utilize an external detector, miscellaneous equipment (such as amplifiers), and long cabling, an excessive phase shift can be created which in turn could result in oscillations. Problems such as this can be eliminated in External Leveling Mode by selecting low ALC bandwidth.

The following table shows the default and selectable ALC bandwidth in relation to leveling mode and frequency:

Leveling Mode	< 560 MHz	>/= 560 MHz
Internal	Always Low ALC Bandwidth (10 kHz)	Always High ALC Bandwidth (100 kHz)
External	Default Low ALC Bandwidth (10 kHz), but Selectable to High (100 kHz)	Default Low ALC Bandwidth (10 kHz), but Selectable to High (100 kHz)

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Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetAlcBandwidth

Deep AM

Deep AM, available from the Configuration Dialog Box, selects either Normal or Deep amplitude modulation while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list.

Factory Preset Value: Normal

Related Topics

Specifications and Characteristics

Soft Front Panel Help

Configuration Dialog Box Controls

AM Input

AM Mode (Linear/Exponential)

HPE6432_SetDeepAmState

AM Mode (Linear/Exponential)

AM Mode (Linear/ Exponential), available from the Configuration Dialog Box, selects either exponential or linear AM while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list.

Factory Preset Value: Linear

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Related Topics

Soft Front Panel Help

AM Input

Deep AM

HPE6432_SetAmMode

Dwell Time

Dwell Time, available from the Configuration Dialog Box, sets the minimum period of time after the settling time that the synthesizer will remain at its current state. The synthesizer can accept a Trig In trigger during or after the dwell time, but it will not act until after the dwell time is complete.

Dwell time can be set by an external host computer to different values. These values of dwell time control how long the trigger outputs are asserted. The synthesizer will wait the dwell time before going to the next frequency or power or both, or when in list mode. The synthesizer will wait the dwell time even if a new trigger is received before the end of the dwell time is completed.

Settable Range: 0.5 us to 32.7675 ms

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

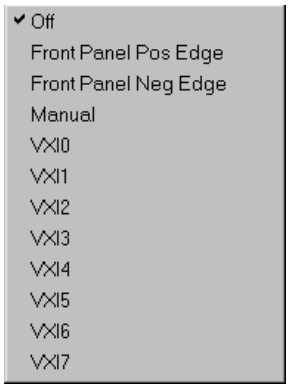
Yellow Background Entry Boxes

Red Entry Values

HPE6432_SetDwellTime

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Trigger Input



Trigger Input, available from the Configuration Dialog Box, provides a way to control which signal will be used as the Trig In trigger.

This is an input trigger and it can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time. This input trigger can be received at any time after the settling time is completed. However, an advance will not take place until after the dwell time is complete.

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`triggerInputSource`	Source Description	Source of Input Trigger
	Trig In	From the Trig In connector on the hardware front panel of the synthesizer.
FRONT_IN_POS = 24	Front Panel Pos Edge	The trigger is asserted with a positive edge polarity.
FRONT_IN_NEG = 8	Front Panel Neg Edge	The trigger is asserted with a negative edge polarity.
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	From any one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted low for at least 250 ns.
IN_MANUAL = 9	Manual	From a software Trig In trigger using `HPE6432_GenerateManualTriggerInput()` or from the List Dialog Box using the manual Trigger button.
IN_OFF = 15	Off	Trig In triggers are disabled.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetTriggerInput

Settling Time

Dwell Time

Trigger Out (Front Panel)



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Trigger Out (Front Panel), available from the Configuration Dialog Box, provides a way to control the signal on the front panel Trig Out connector.

This is an output trigger and is produced after each new hardware frequency or power level setting has settled; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Trig Out trigger can be directed to the Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode.

When the Trig Out trigger is directed to the front panel connector, the following apply:

FRONT_OUT_OFF = 0	Off	No Trig Out is output.
FRONT_OUT_POS = 16	Front Panel +	The Trig Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	Front Panel –	The Trig Out trigger is generated with a negative polarity.

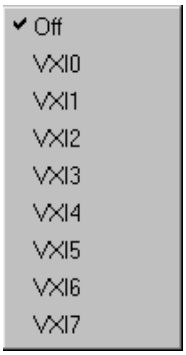
Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetExtTriggerOutput

Trigger Out (VXI Backplane)



Trigger Out (VXI Backplane), available from the Configuration Dialog Box, provides a way to control which VXI backplane line will have the trigger output signal.

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This is an output trigger and is produced after each new hardware frequency or power level setting has settled; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Trig Out trigger can be directed to the Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode.

When the Trig Out trigger is directed to the VXI backplane, the following apply:

VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	The Trig Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Trig Out trigger is output.

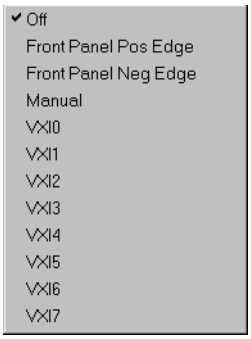
Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetExtTriggerOutput

Sync Input



Sync Input, available from the Configuration Dialog Box, provides a way to control which signal will be used as the Sync In trigger.

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This is an input trigger and it can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time.

	Sync In	From the Sync In connector on the hardware front panel of the synthesizer.
FRONT_IN_POS = 8	Front Panel Pos Edge	The Sync In trigger is asserted with a positive edge polarity.
FRONT_IN_NEG = 24	Front Panel Neg Edge	The Sync In trigger is asserted with a negative edge polarity.
VXI0 = 0, VXI1 = 1 VXI2 = 2, VXI3 = 3 VXI4 = 4, VXI5 = 5 VXI6 = 6, VXI7 = 7	VXI Backplane TTL Trigger	From any one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted low for at least 250 ns.
IN_MANUAL = 9	Manual	From a software trigger (Sync In) using HPE6432_GenerateManualSyncInput()or from the List Dialog Box using the manual Sync button.
IN_OFF = 15	Off	Sync In triggers are disabled.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetSyncInput

Sync Out (Front Panel)



Sync Out (Front Panel), available from the Configuration Dialog Box, provides a way to control the signal on the front panel Sync Out connector.

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This is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time.

When the Sync Out trigger is directed to the front panel connector, the following apply:

FRONT_OUT_POS = 16	Front Panel +	The Sync Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	Front Panel –	The Sync Out trigger is generated with a negative polarity.
FRONT_OUT_OFF = 0	Off	No Sync Out trigger is output.

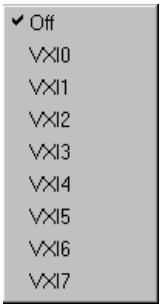
Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetExtSyncOutput

Sync Out (VXI Backplane)



Sync Out (VXI Backplane), available from the Configuration Dialog Box, provides a way to control which VXI backplane line will have the Sync Out trigger.

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This is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time.

When the Sync Out trigger is directed to the VXI backplane, the following apply:

VXI0 = 0, VXI1 = 1 VXI2 = 2, VXI3 = 3 VXI4 = 4, VXI5 = 5 VXI6 = 6, VXI7 = 7	VXI Backplane TTL Trigger	The Sync Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Sync Out trigger is output to the VXI backplane. The Sync Out trigger may still be output to the hardware front panel using HPE6432_SetExtSyncOutput.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

HPE6432_SetVxiSyncOutput

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FM Sensitivity (Option 002 Only)

This option is not available on instruments with Option UNG.

FM Sensitivity, available from the pull down View menu by selecting Configuration, is used to select the FM sensitivity. It can be set to 10 MHz/V, 1 MHz/V, or 100 KHz/V.

Level accuracy with ALC off below 2 GHz is unspecified.

A Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator, available from the pull down View menu by selecting Configuration, can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary.

If the modulation index, defined as the peak frequency deviation divided by the frequency of the modulating signal, is greater than ~120, a frequency shift may occur.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

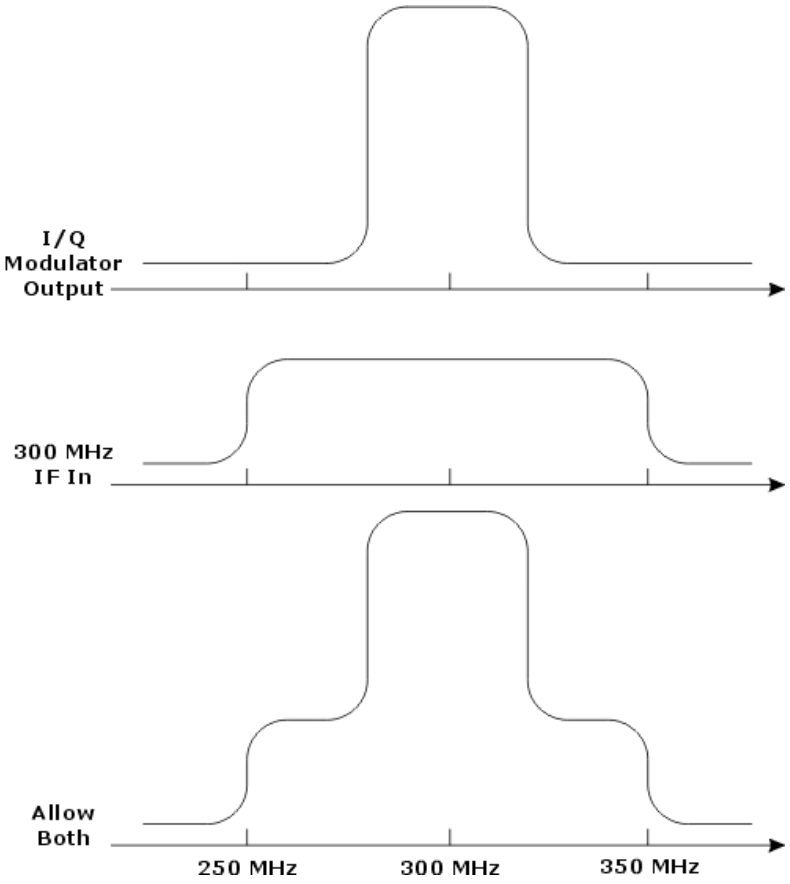
Configuration Dialog Box Controls

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Allow IF and I/Q Concurrent Operation (Options UNG and 300 Only)

Allow IF and I/Q Concurrent Operation, available from the Configuration Dialog Box, is used to allow both the 300 MHz IF In port (Option 300 Only) and the I/Q Input ports (Option UNG Only) to be used concurrently. This allows the output of the I/Q modulator circuitry to be summed with the 300 MHz IF In signal. This summed signal is delivered to the IF input of the first mixer.

The IF Upconverter Calibration Attenuator, available from the Configuration Dialog Box, can be used to set the signal level delivered to the IF input of the first mixer.



Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

IF Upconverter Calibration Attenuator

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IF Upconverter Calibration Attenuator (Option 300 and Option UNG Only)

IF Upconverter Calibration Attenuator, available from the Configuration Dialog Box, is used to set the signal level delivered to the IF input of the first mixer. The first mixer's IF input comes from the 300 MHz IF In connector on the hardware front panel (Option 300 Only), from the output of the I/Q modulator circuitry (Option UNG Only), or both concurrently when the Allow IF and I/Q Concurrent Operation check box is selected; this check box is available from the Configuration Dialog Box.

The IF Upconverter Calibration Attenuator is used to select the amount of attenuation to be applied to any incoming signal. This attenuation is used to adjust the incoming calibration signal to a 0 dBm level. The IF Upconverter Calibration Attenuator has a range of 0 to 30 dB in 2 dB steps. This attenuator control can be used to increase the dynamic range of the first mixer.

Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

IF Calibration (Option 300 Only)

Allow IF and I/Q Concurrent Operation

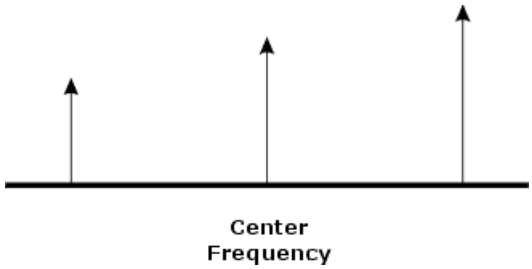
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IF Sideband (Option 002, 300 or UNG)

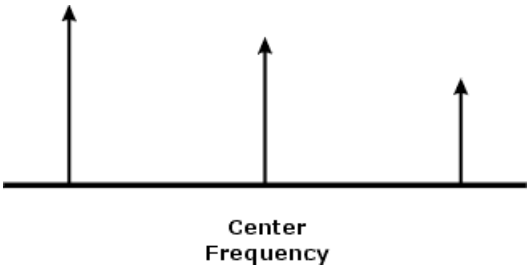
IF Sideband, available from the Configuration Dialog Box, provides a way to invert the spectrum of signals that are delivered to the IF input of the first mixer when using an instrument equipped with Option 300 or Option 002.

The first mixer's IF input comes from the 300 MHz IF In connector on the hardware front panel (Option 300 Only), the output Low-Rate FM circuitry (Option 002 Only), or from the output of the I/Q modulator circuitry (Option UNG Only).

Normal Spectrum



Inverted Spectrum



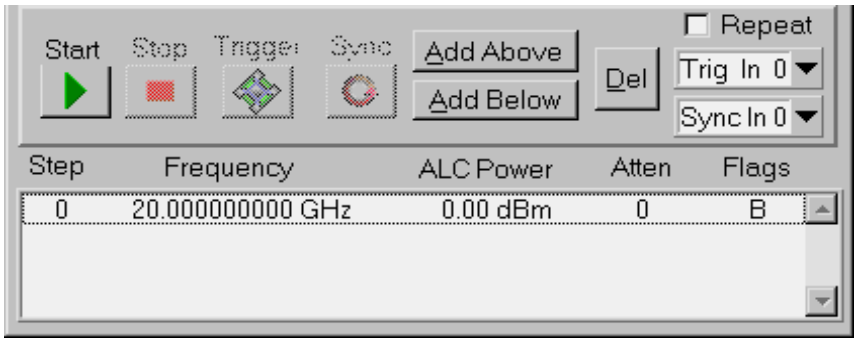
Related Topics

Soft Front Panel Help

Configuration Dialog Box Controls

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List Dialog Box



NOTE

A *List* is defined as one or more points that can be stored in the synthesizer's *List Point Memory*. Although the synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070), the largest list that can be created using the List Dialog Box or the List Point Calculator is limited to 32,768 points (with a range of 0 to 32,767). To create lists that are larger than 32,768 points, use the HPE6432_WriteListPoint and HPE6432_WriteListPoints VXIplay&play commands.

List Playing Controls

- Start
- Stop
- Trigger
- Sync
- Repeat
- Trig In (0, 1, 2)
- Sync In (0, 1, 2, 3)

List Editing Controls

- Add Above
- Add Below
- Del

List Point Settings

- Step
- Frequency
- ALC Power
- Atten

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List Point Flags

- S - Sync Out Flag
- B - Blanking Flag
- L - Long Blanking
- P - Power Search

Related Topics

Soft Front Panel Help

New List

Working with Lists (A Programmer's Model)

Start - List Playing Control

Start, available from the List Dialog Box, begins stepping through the currently defined list.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Stop - List Playing Control

Stop, available from the List Dialog Box, stops stepping through the currently defined list.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Trigger - List Playing Control

Trigger, available from the List Dialog Box, manually steps through the currently defined list each time it is pressed.

This control acts as a manual Trig In trigger. When this button is selected, the synthesizer steps to the next point in the list. It behaves just as if it had received a trigger from either the Trig In on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

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To activate this Trigger button:

1. On the List Dialog Box, set the Trig In selection to either Trig In 1 or Trig In 2.
2. On the Configuration Dialog Box, set Trigger Input to Manual.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Configuration Dialog Box

Sync - List Playing Control

Sync, available from the List Dialog Box, acts as a Sync In trigger and causes the currently defined list to start running from the beginning. A Sync In trigger can be used to restart a list at the end of the list or any arbitrary point in the list while it is running.

If the Repeat box is checked, a new Sync In trigger is required at the end of a list in order for the list to repeat.

To activate this Sync button:

1. On the List Dialog Box, set the Sync In selection to either Sync In 1, Sync In 2, or Sync In 3.
2. On the Configuration Dialog Box, set Sync Input to Manual.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Sync In (Source)

Repeat – List Playing Control

Repeat - List Playing Control

Repeat, available from the List Dialog Box, repeats stepping through the currently defined list.

If a Trig In (1 or 2) or a Sync In (2, 3, or 4) is specified to start the list, it will again be required to start each run through the list before the list is repeated.

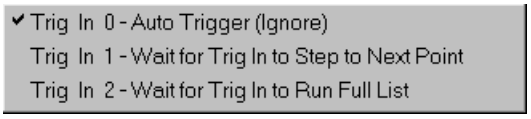
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Related Topics

Soft Front Panel Help

List Dialog Box Controls

Trig In (0, 1, 2) - List Playing Control



Trig In #, available from the List Dialog Box, specifies the action that a Trig In trigger has on the current list.

Trig In triggers can come from the Trig In connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7). Refer to Trigger Input, available from the Configuration Dialog Box, to control which signal will be used as the Trig In trigger.

Trig In 0 – Auto Trigger (Ignore)

If the Repeat check box, available from the List Dialog Box, is selected, this setting runs the list repeatedly until stopped and does not require a Trig In trigger. The list can be stopped using the Stop button available from the List Dialog Box.

If the Repeat check box, available from the List Dialog Box, is not selected, this setting runs the list once automatically and does not require a Trig In trigger.

Trig In 1 – Wait for Trig In to Step to Next Point

This setting specifies that the synthesizer is to step to the next point in the list each time a Trig In trigger is received.

Trig In 2 – Wait for Trig In to Run Full List

This setting specifies that the synthesizer runs through the entire list automatically after receiving a single Trig In trigger.

TIP These same modes can be specified programmatically by setting the `featureBits` parameter using the `HPE6432_RunList()` function.

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Related Topics

Soft Front Panel Help

List Dialog Box Controls

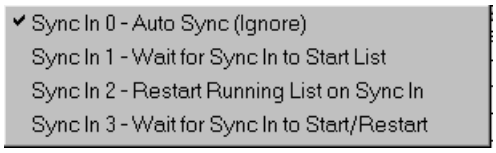
Trigger Input

Configuration Dialog Box

HPE6432_RunList

Working with Lists (A Programmer's Model)

Sync In (0, 1, 2, 3) - List Playing Control



Sync In #, available from the List Dialog Box, specifies the action that a Sync In trigger has on the current list.

Sync In triggers can come from the Sync In connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7). Refer to Sync Input, available from the Configuration Dialog Box, to control which signal will be used as the Sync In trigger.

Sync In 0 – Auto Sync (Ignore)

This setting causes Sync In to be ignored so that Sync In does not affect the operation of list mode.

Sync In 1 – Wait for Sync In to Start List

This setting starts at the beginning of the list after receiving a Sync In trigger; if in Repeat Mode, a new Sync In trigger is required at the end of the list to restart the list. Advancement through the list is dependent on the Trigger Input Mode.

Sync In 2 – Restart Running List on Sync In

This setting restarts the list at any point in the list while it is running. The list will restart automatically after reaching the end of the list and does not require a new Sync In trigger.

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Sync In 3 – Wait for Sync In to Start/Restart

This setting is a combination of the Start and Restart values (Sync In 1 and Sync In 2). A Sync In trigger is always required to start the list. However, a Sync In trigger can restart the list while it is running, and this can occur at any arbitrary point in the list. The list will stop after reaching the end of the list and wait for a Sync In trigger before restarting.

TIP

These same modes can be specified programmatically by setting the `featureBits` parameter using the `HPE6432_RunList()` function.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Configuration Dialog Box

Sync Input

HPE6432_RunList

Working with Lists (A Programmer's Model)

Add Above - List Editing Control

Add Above, available from the List Dialog Box, adds a new list point above the currently active list point.

The point added is exactly the same as the currently active list point, but can be immediately edited. The values for a list point can be changed as desired.

NOTE

The time to download a list in the List Dialog Box is exponential and is related to the size of the list; the larger the list, the longer it takes to load each point into the List Dialog Box.

Adding a single point to a very long list is much slower than adding a single point to a short list.

The values for a list point can be changed with the following:

- Select an entry in the list using the mouse.

  The background color of the selected entry is shaded red, and the words "Editing Step (followed by the entry position in the list)" is displayed above the frequency entry box on the main Soft Front Panel.

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- Using the main Soft Front Panel boxes, change the values for a particular setting by selecting a desired box and clicking on the up and down arrows, or selecting a desired box and entering the values directly from the keyboard.

  The Sync Out, Blanking, Long Blanking, and Power Search flags are also controlled by selecting their corresponding box for each entry in the list.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Add Below - List Editing Control

Add Below, available from the List Dialog Box, adds a new list point below the currently active list point.

The point added is exactly the same as the currently active list point, but can be immediately edited. The values for a list point can be changed as desired.

NOTE

The time to download a list in the List Dialog Box is exponential and is related to the size of the list; the larger the list, the longer it takes to load each point into the List Dialog Box.

Adding a single point to a very long list is much slower than adding a single point to a short list.

The values for a list point can be changed with the following:

- Select an entry in the list using the mouse.

  The background color of the selected entry is shaded red, and the words “Editing Step (followed by the entry position in the list)” is displayed above the frequency entry box on the main Soft Front Panel.

- Using the main Soft Front Panel boxes, change the values for a particular setting by selecting a desired box and clicking on the up and down arrows, or selecting a desired box and entering the values directly from the keyboard.

  The Sync Out, Blanking, Long Blanking, and Power Search flags are also controlled by selecting their corresponding box for each entry in the list.

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Related Topics

Soft Front Panel Help

List Dialog Box Controls

Del - List Editing Control

Del, available from the List Dialog Box, deletes the currently active list point.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Step - of a List Point

Step, available from the List Dialog Box, is the step number associated with a specific list point.

When an entry is selected from a list, the background color of the selected entry is shaded red. The words “Editing Step (followed by the entry position in the list)” is displayed above the frequency entry box on the main Soft Front Panel.

If the List Dialog Box is not active, the currently selected step number is not displayed.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Frequency - of a List Point

Frequency, available from the List Dialog Box, is the frequency value associated with a specific list point.

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The values for a list point can be changed with the following:

- Select an entry in the list using the mouse.

  The background color of the selected entry is shaded red, and the words “Editing Step (followed by the entry position in the list)” is displayed above the frequency entry box on the main Soft Front Panel.

- Using the main Soft Front Panel boxes, change the values for a particular setting by selecting a desired box and clicking on the up and down arrows, or selecting a desired box and entering the values directly from the keyboard.

The Sync Out, Blanking, Long Blanking, and Power Search flags are also controlled by selecting their corresponding box for each entry in the list.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Yellow Background Entry Boxes

Red Entry Values

ALC Power of a List Point

ALC Power, available from the List Dialog Box, is the ALC power level associated with a specific list point.

The values for a list point can be changed with the following:

- Select an entry in the list using the mouse.

  The background color of the selected entry is shaded red, and the words “Editing Step (followed by the entry position in the list)” is displayed above the frequency entry box on the main Soft Front Panel.

- Using the main Soft Front Panel boxes, change the values for a particular setting by selecting a desired box and clicking on the up and down arrows, or selecting a desired box and entering the values directly from the keyboard.

  The Sync Out, Blanking, Long Blanking, and Power Search flags are also controlled by selecting their corresponding box for each entry in the list.

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Related Topics

Soft Front Panel Help

List Dialog Box Controls

Yellow Background Entry Boxes

Red Entry Values

Soft Front Panel Help

Attenuation of a List Point

Attenuation, available from the List Dialog Box, is the attenuation level associated with a specific list point.

The values for a list point can be changed with the following:

- Select an entry in the list using the mouse.

  The background color of the selected entry is shaded red, and the words “Editing Step (followed by the entry position in the list)” is displayed above the frequency entry box on the main Soft Front Panel.

- Using the main Soft Front Panel boxes, change the values for a particular setting by selecting a desired box and clicking on the up and down arrows, or selecting a desired box and entering the values directly from the keyboard.

  The Sync Out, Blanking, Long Blanking, and Power Search flags are also controlled by selecting their corresponding box for each entry in the list.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Yellow Background Entry Boxes

Red Entry Values

Flags - of a List Point

S – Sync Out

B – Blanking

L – Long Blanking

P – Power Search

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Sync Out - of a List Point

The Sync Out check box, available from the Soft Front Panel, is used to indicate whether or not there is a Sync Out trigger associated with the currently selected list point. When this check box is selected, an **S** is also displayed under the Flags column of the List Dialog Box.

The Sync Out trigger (that can also be used as a marker) is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Flags - of a List Point

Sync Out Trigger – Front Panel

Sync Out Trigger – VXI Backplane

HPE6432_SetExtSyncOutput

HPE6432_SetVxiSyncOutput

Blanking - of a List Point

The Blanking check box, available from the Soft Front Panel, is used to indicate whether or not the RF output is being blanked, during the switch/blanking time, for the currently selected list point. When this check box is selected, a **B** is displayed under the Flags column of the List Dialog Box.

- If the RF output is being blanked, the RF output is turned off during the switch/blanking time. Although the RF output can be optionally blanked when changing frequency or power or both, it is always blanked when the 10 dB step attenuator (Option 1E1) is changed.

- If the RF output is not being blanked, the RF output is turned on during the switch/blanking time and may be affected by spurious signals, harmonics, or other glitches.

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Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

Once switch/blanking time is completed, the settling time begins. Settling time is user-definable and can be adjusted between a minimum and maximum value; longer periods of settling time can be specified in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer. (For more information, refer to “Settling Time” on page 3-43.)

In summary, there is a delay time that is required by the synthesizer to change between frequencies or power or both. This delay time is a combination of the switch/blanking time and settling time. The switch/blanking time is dependent on the criteria listed above while the settling time is user-definable and dependent on the accuracy required of the final signal. If RF blanking is on during switch/blanking time, you do not see the effects on the RF output, but if RF blanking is off during switch/blanking time, you see all of the effects on the signal that might include spurious signals, harmonics, and other glitches. Whether RF blanking is on or off has no effect on settling time, it only affects the RF output during switch/blanking time.

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Related Topics

Soft Front Panel Help

List Dialog Box Controls

Flags - of a List Point

Long Blanking - of a List Point

Settling Time

HPE6432_WriteListPoints

HPE6432_SetBlankingState

Long Blanking - of a List Point

The Long Blanking (also referred to as long switch/blanking time) check box, available from the Soft Front Panel, is used to specify that the switch/blanking time for the currently selected list point be set to 350 us. When this check box is selected, an L is displayed under the Flags column of the List Dialog Box.

Selecting the Long Blanking check box is different from selecting the Blanking check box. Selecting the Long Blanking check box does not specify that the RF output be blanked; it only specifies that the switch/blanking time be set to 350 us. If RF output blanking is also desired, the Blanking check box must be selected.

- If the RF output is being blanked, the RF output is turned off during the switch/blanking time. Although the RF output can be optionally blanked when changing frequency or power or both, it is always blanked when the 10 dB step attenuator (Option 1E1) is changed.
- If the RF output is not being blanked, the RF output is turned on during the switch/blanking time and may be affected by spurious signals, harmonics, or other glitches.

Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

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Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

Once switch/blanking time is completed, the settling time begins. Settling time is user-definable and can be adjusted between a minimum and maximum value; longer periods of settling time can be specified in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer. (For more information, refer to “Settling Time” on page 3-43.)

In summary, there is a delay time that is required by the synthesizer to change between frequencies or power or both. This delay time is a combination of the switch/blanking time and settling time. The switch/blanking time is dependent on the criteria listed above while the settling time is user-definable and dependent on the accuracy required of the final signal. If RF blanking is on during switch/blanking time, you do not see the effects on the RF output, but if RF blanking is off during switch/blanking time, you see all of the effects on the signal that might include spurious signals, harmonics, and other glitches. Whether RF blanking is on or off has no effect on settling time, it only affects the RF output during switch/blanking time.

Related Topics

Soft Front Panel Help

List Dialog Box Controls

Flags - of a List Point

Blanking - of a List Point

Settling Time

HPE6432_WriteListPoints

HPE6432_SetLongBlankingState

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Power Search - of a List Point

If the List Dialog Box is not active

If the List Dialog Box is not active, the List Power Search Flag check box is not available. The List Dialog Box can be activated from the Soft Front Panel's "Pull Down View Menu" on page 3-40.)

If the List Dialog Box is already active

The List Power Search Flag check box, available from the Soft Front Panel, is used to immediately run a Power Search on the currently selected list point. When this check box is selected, a **P** is displayed under the Flags column of the List Dialog Box.

- A Power Search is immediately run so that when a list is run (started), from the List Dialog Box, all list points that require a Power Search have been completed prior to the list being run.
- A Power Search is run using the current frequency and ALC power settings (attenuation is not counted). If the frequency and ALC power are changed after a Power Search has been performed, the Power Search is repeated.
- During list operations, if leveling is turned on (ALC loop is closed), the ALC integrator offset values returned by each Power Search are not used. If the same list of points is run with leveling off (ALC loop is open), the values obtained for each Power Search are then used.
- A Power Search is run on list points that are placed into the list using any of the following methods:
  - — pasting a single list point from the Microsoft Windows Clipboard using Paste Above List Item or Paste Below List Item (these are available from the Pull Down Edit Menu)
  - — adding list points using the Add Above or Add Below buttons (available from the List Dialog Box)
  - — adding list points using the List Point Calculator
- If the Power Search button is pressed, a Power Search is run on each item in the list that has a P flag selected. A Power Search is run even if it was performed previously.

NOTE If the List Power Search Flag check box is selected on the Soft Front Panel and a range of points is generated using the List Point Calculator, a Power Search is performed on each list point as it is added to the list. This could add a significant amount of time when building the list.

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Related Topics

Soft Front Panel Help

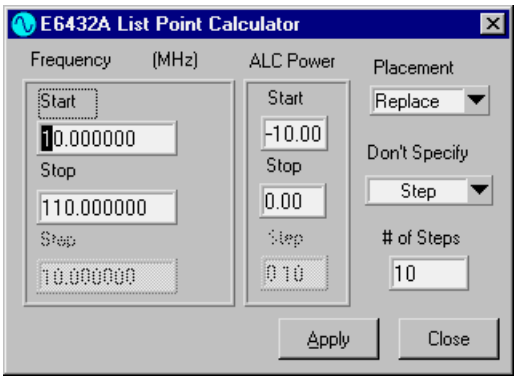
List Dialog Box Controls

Flags - of a List Point

Power Search

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List Point Calculator Dialog Box



NOTE

- A *List* is defined as one or more points that can be stored in the synthesizer's *List Point Memory*. Although the synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070), the largest list that can be created using the List Dialog Box or the List Point Calculator is limited to 32,768 points (with a range of 0 to 32,767). To create lists that are larger than 32,768 points, use the HPE6432_WriteListPoint and HPE6432_WriteListPoints VXIplay&play commands.
- The time to download a list in the List Dialog Box is exponential and is related to the size of the list; the larger the list, the longer it takes to load each point into the List Dialog Box.
- If the List Power Search Flag check box is selected on the Soft Front Panel and a range of points is generated using the List Point Calculator, a Power Search is performed on each list point as it is added to the list. This could add a significant amount of time when building the list.

- Frequency Start
- Frequency Stop
- Frequency Step
- ALC Power Start
- ALC Power Stop
- ALC Power Step
- Placement
- Don't Specify (Start, Stop, Step, or # of Steps) View Menu
- # of Steps
- Apply

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Related Topics

Soft Front Panel Help

Power Search – of a List Point

New List

Working with Lists (A Programmer's Model)

HPE6432_WriteListPoint

HPE6432_WriteListPoints

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Frequency Start

Frequency Start, available from the List Point Calculator Dialog Box, specifies the starting frequency for a given set of points in a list.

Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

Frequency Stop

Frequency Stop, available from the List Point Calculator Dialog Box, specifies the stopping frequency for a given set of points in a list.

Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

Frequency Step

Step Frequency, available from the List Point Calculator Dialog Box, specifies the Frequency Step size between points in a list.

Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

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ALC Power Start

ALC Power Start, available from the List Point Calculator Dialog Box, specifies the ALC power at the starting frequency for a given set of points in a list.

Valid range: –20 dBm to Maximum Leveled Output Power

Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

ALC Power Stop

ALC Power Stop, available from the List Point Calculator Dialog Box, specifies the ALC power at the stopping frequency for a given set of points in a list.

Valid range: –20 dBm to Maximum Leveled Output Power

Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

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ALC Power Step

ALC Power Step, available from the List Point Calculator Dialog Box, specifies the ALC Power step size between points in a list.

Related Topics

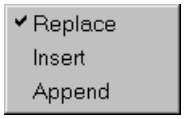
Soft Front Panel Help

List Point Calculator Dialog Box

HPE6432_WriteListPoint

HPE6432_WriteListPoints

Placement Control



Placement Control, available from the List Point Calculator Dialog Box, can be set to one of three values:

Replace

This setting specifies that a set of list steps (determined by the values specified by Start, Stop, Step, or # of Steps parameter) replace the current list in the List Dialog Box.

Insert

This setting specifies that a set of list steps (determined by the values specified by Start, Stop, Step, or # of Steps parameter) be inserted into the current list in the List Dialog Box.

Append

This setting specifies that a set of list steps (determined by the values specified by Start, Stop, Step, or # of Steps parameter) be appended onto the existing list in the List Dialog Box.

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Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

Don't Specify the Start, Stop, Step, or the # of Steps Parameter



Don't Specify, available from the List Point Calculator Dialog Box, designates that the Start, Stop, Step, or the # of Steps parameter is not specified. In this way, the number of list points that are created for a given frequency range or power range can be calculated using only three of the four parameters; one of the four parameters is always disabled.

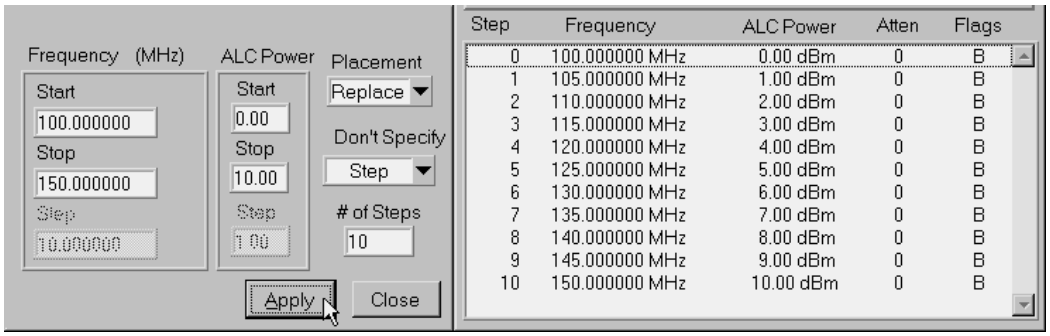
- Don't Specify Step
- Don't Specify Start
- Don't Specify Stop
- Don't Specify # of Steps

Don't Specify Step

Selecting Don't Specify **Step**, on the List Point Calculator Dialog Box, designates that the Step parameter is not specified when calculating a frequency and ALC power list.

For example, produce a list with ten steps over a frequency range of 100 MHz to 150 MHz with corresponding ALC Power levels from 0 dBm to 10 dBm. The list that is produced has a frequency step size of 5 MHz and a 1 dB ALC power change per step.

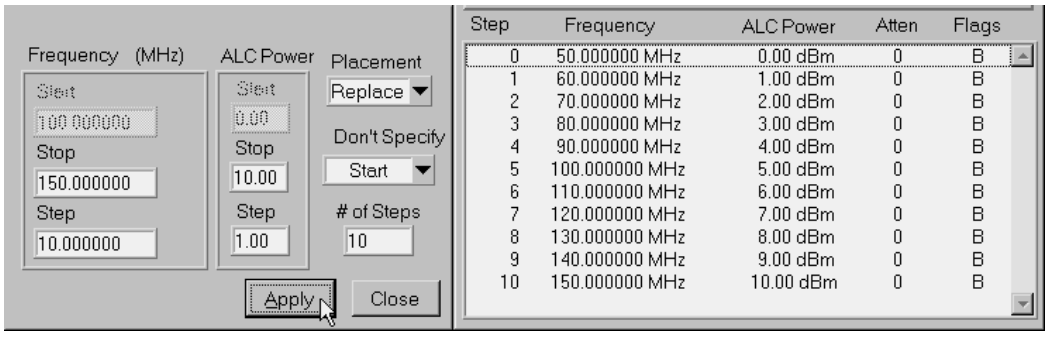
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Don't Specify Start

Selecting Don't Specify **Start**, on the List Point Calculator Dialog Box, designates that the Start parameter is not specified when calculating a frequency and ALC power list.

For example, produce a list with ten steps over a frequency range of 50 MHz to 150 MHz with corresponding ALC Power levels from 0 dBm to 10 dBm. The list that is produced has a frequency step size of 10 MHz and a 1 dB ALC power change per step.

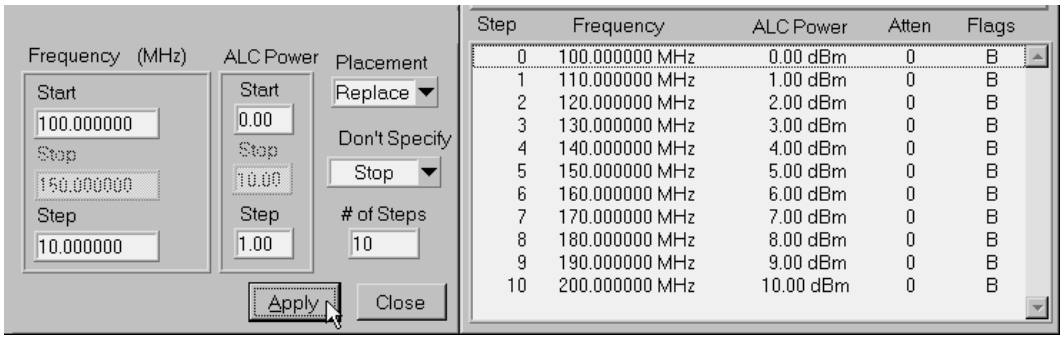


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Don’t Specify Stop

Selecting Don’t Specify **Stop**, on the List Point Calculator Dialog Box, designates that the Stop parameter is not specified when calculating a frequency and ALC power list.

For example, produce a list with five steps over a frequency range of 100 MHz to 200 MHz with corresponding ALC Power levels from 0 dBm to 10 dBm. The list that is produced has a frequency step size of 10 MHz and a 1 dB ALC power change per step.



Don’t Specify # of Steps

Selecting Don’t Specify **# of Steps**, on the List Point Calculator Dialog Box, designates that the # of Steps parameter is not specified when calculating a frequency and ALC power list.

With this selection, a frequency and ALC power list is derived as follows:

$$\text{Requested Frequency Steps} = (\text{Frequency Stop} - \text{Frequency Start}) / \text{Frequency Step Size}$$

$$\text{Requested ALC Power Steps} = (\text{ALC Power Stop} - \text{ALC Power Start}) / \text{ALC Power Step Size}$$

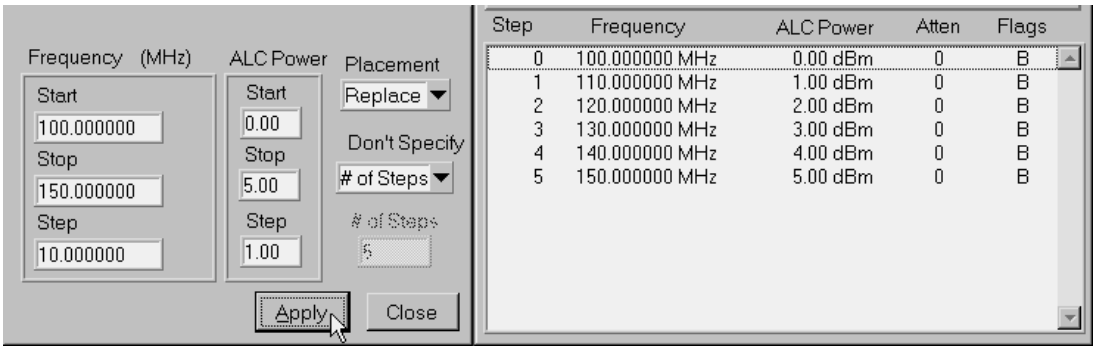
There are three possible situations that can occur with this control:

- If the *Requested Frequency Steps* are equal to the *Requested ALC Power Steps*, and both requested lists have step sizes that divide evenly into the frequency and ALC power ranges requested

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- If the *Requested Frequency Steps* are not equal to the *Requested ALC Power Steps*, and both requested lists have step sizes that divide evenly into the frequency and ALC power ranges requested
- If the *Requested Frequency Steps* are not equal to the *Requested ALC Power Steps*, and one or both requested lists do not have step sizes that divide evenly into the frequency and ALC power ranges requested
- If the *Requested Frequency Steps* are equal to the *Requested ALC Power Steps*, and both requested lists have step sizes that divide evenly into the frequency and ALC power ranges requested, all requested steps are generated. No duplicating of values is required to satisfy the requested lists.

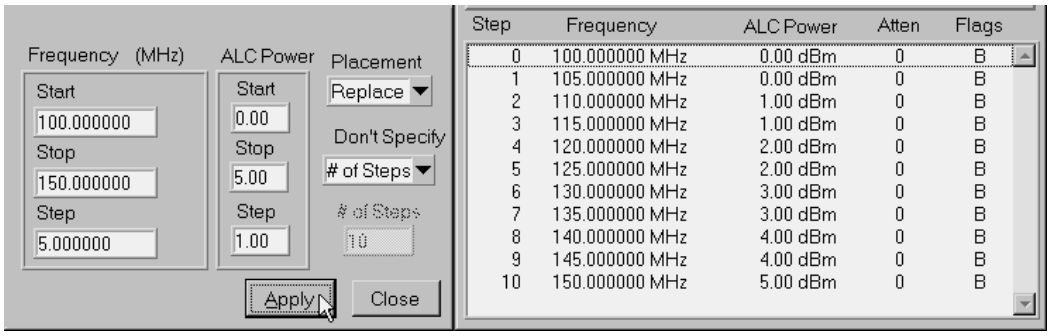
  For example, there are five *Requested Frequency Steps* when given a frequency range of 100 MHz to 150 MHz with a 10 MHz step frequency. There are also five *Requested ALC Power Steps* when given an ALC power range from 0 dBm to 5 dBm with a 1 dB step size. Since the *Requested Frequency Steps* are equal to the *Requested ALC Power Steps*, no duplicating of values is required for any of the frequencies or the ALC powers, so all requested steps are generated.



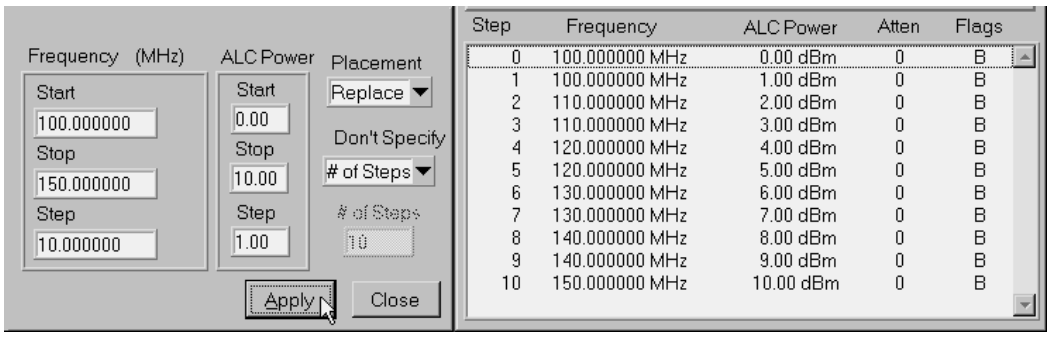
- If the *Requested Frequency Steps* are not equal to the *Requested ALC Power Steps*, and both requested lists have step sizes that divide evenly into the frequency and ALC power ranges requested, the calculation with the greatest number of requested steps is generated.
- The calculation with the lower number of requested steps is generated with duplicated values so that the calculation with the greatest number of requested steps can be satisfied.

  For example, there are ten *Requested Frequency Steps* when given a frequency range of 100 MHz to 150 MHz with a 5 MHz step frequency. Because only five *Requested ALC Power Steps* are required to satisfy the ALC power range from 0 dBm to 5 dBm with a 1 dB step size, some of the values in the ALC Power list are duplicated.

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- For another example, there are five *Requested Frequency Steps* when given a frequency range of 100 MHz to 150 MHz with a 10 MHz step frequency. Because ten *Requested ALC Power Steps* are required to satisfy the ALC power range from 0 dBm to 10 dBm with a 1 dB step size, some of the values in the Frequency list are duplicated.



- If the *Requested Frequency Steps* are not equal to the *Requested ALC Power Steps*, and one or both requested lists do not have step sizes that divide evenly into the frequency range and ALC power range requested, the calculation with the greatest number of requested steps is generated.

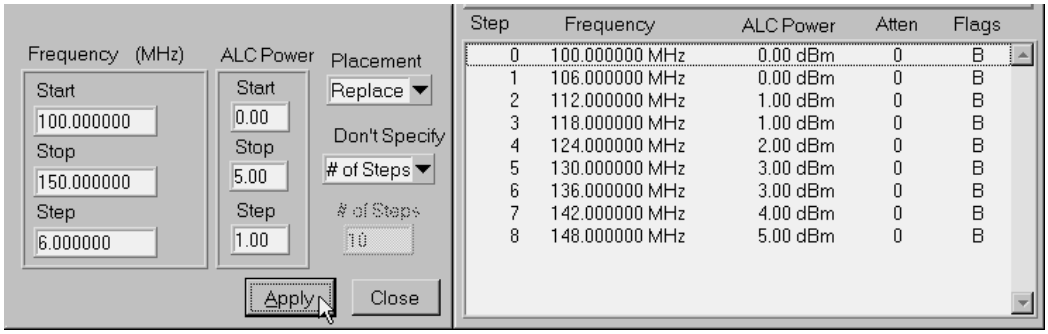
  In addition, the full frequency or ALC power range requested (by the Start and Stop values) is not covered because one or both of the requested step sizes does not divide evenly into their corresponding ranges. Because of this, the last list step is not generated if it is outside of the frequency range or ALC power range specified.

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The calculation with the lower number of requested steps is generated with duplicated values so that the calculation with the greatest number of requested steps can be satisfied.

For example, there are eight *Requested Frequency Steps* when given a frequency range of 100 MHz to 150 MHz with a 6 MHz step frequency. Because only five *Requested ALC Power Steps* are required to satisfy the ALC power range from 0 dBm to 5 dBm with a 1 dB step size, some of the values in the ALC Power list are duplicated.

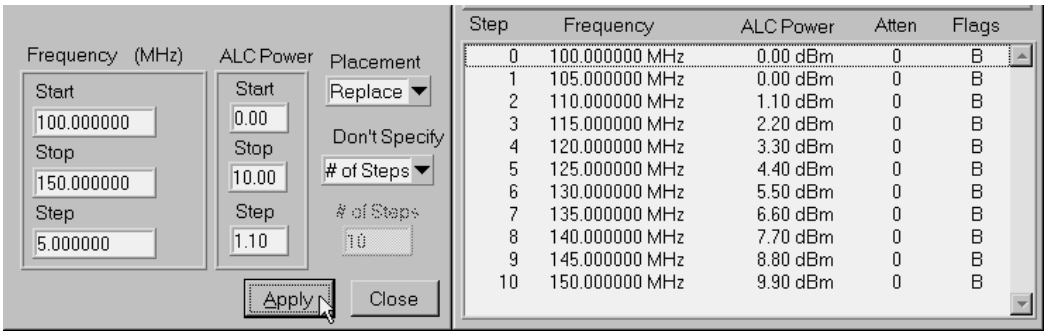
In addition, the full frequency range requested (by the Start and Stop values) is not covered because the requested frequency Step size does not divide evenly into the requested frequency range.



- For another example, there are five *Requested Frequency Steps* when given a frequency range of 100 MHz to 150 MHz with a 10 MHz step frequency. Because nine *Requested ALC Power Steps* are required to satisfy the ALC power range from 0 dBm to 10 dBm with a 1.1 dB step size, some of the values in the Frequency list are duplicated.

  In addition, the full ALC power range requested (by the Start and Stop values) is not covered because the requested ALC power Step size does not divide evenly into the requested ALC power range.

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Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

of Steps

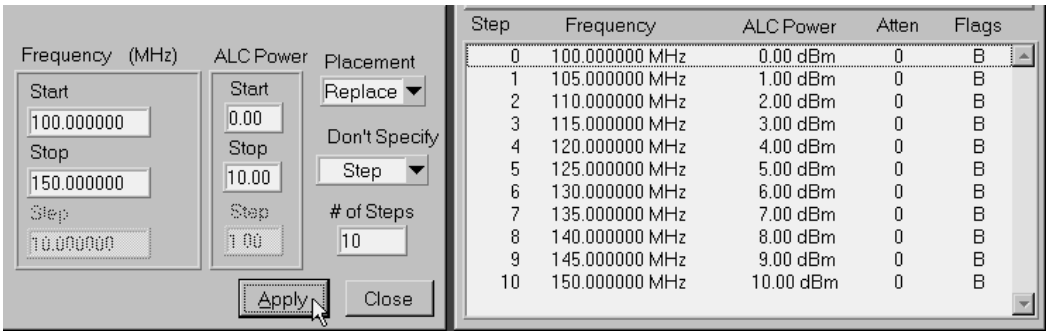
of Steps, available from the List Point Calculator Dialog Box, specifies the number of steps that are created for a given frequency and ALC power range.

- For example, produce a list with five steps over a frequency range of 100 MHz to 150 MHz with corresponding ALC Power levels from 0 dBm to 10 dBm. The list that is produced has a frequency step size of 10 MHz and a 2 dB ALC power change per step.



- For another example, produce a list with ten steps over a frequency range of 100 MHz to 150 MHz with corresponding ALC Power levels from 0 dBm to 10 dBm. The list that is produced has a frequency step size of 5 MHz and a 1 dB ALC power change per step.

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Related Topics

Soft Front Panel Help

List Point Calculator Dialog Box

Apply - List Point Calculator Values

Apply, available from the List Point Calculator Dialog Box, applies the calculated list points to the List Dialog Box.

The Placement Control specifies the way in which the list points are placed in the List Dialog Box. It can be set to Replace the current list, Insert into the current list, or Append onto the existing list.

Related Topics

Soft Front Panel Help

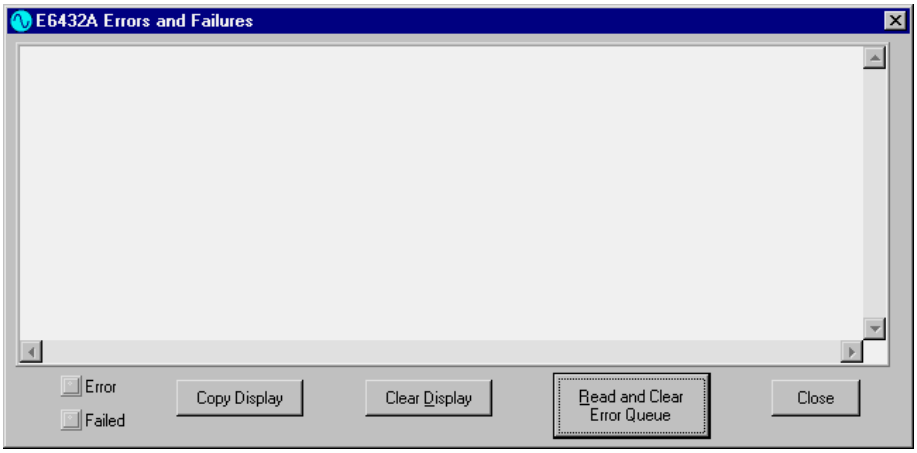
List Point Calculator Dialog Box

Placement Control

List Dialog Box

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Errors and Failures Dialog Box



- Error LED Indicator
- Failed LED Indicator
- Copy Display
- Clear Display
- Read and Clear Error Queue
- Error-Code and Fail-Code Messages
- Error-Code Messages
- Fail-Code Messages

Related Topics

Soft Front Panel Help

Pull Down View Menu

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

Error LED Indicator

The Error LED Indicator, available from the Errors and Failures Dialog Box, is an indicator light that is used as an alert that there are reported errors in the synthesizer's error queue. For convenience, an Error LED indicator is also visible on the Soft Front Panel.

- If the indicator light is gray, there are no reported errors in the synthesizer's error queue.

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- If the indicator light is red, there are reported errors in the synthesizer's error queue that can be displayed using the Read and Clear Error Queue button.

  Either the Error LED or Failed LED or both, which are located on the Hardware Front Panel, are also on when this Error LED indicator light is red.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

Error LED, from the Hardware Front Panel

Failed LED, from the Hardware Front Panel

Error LED, from the Soft Front Panel

Failed LED, from the Soft Front Panel

Failed LED Indicator

The Failed LED Indicator, available from the Errors and Failures Dialog Box, is an indicator light that is used as an alert that there are reported failures in the synthesizer's error queue. For convenience, a Failed LED indicator is also visible on the Soft Front Panel.

- If the indicator light is gray, there are no reported failures in the synthesizer's error queue.
- If the indicator light is red, there are reported failures in the synthesizer's error queue that can be displayed using the Read and Clear Error Queue button.

  Either the Error LED or Failed LED or both, which are located on the Hardware Front Panel, are also on when this Failed LED indicator light is red.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

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To Print a List of the Synthesizer's Error Queue Messages

Error LED, from the Hardware Front Panel

Failed LED, from the Hardware Front Panel

Error LED, from the Soft Front Panel

Failed LED, from the Soft Front Panel

Copy Display

Copy Display, available from the Errors and Failures Dialog Box, can be used to copy the currently displayed list of error messages to the Microsoft Windows Clipboard. Once they are copied to the Clipboard, they may be pasted to other applications that can read from the Clipboard; error messages may also be printed using such applications.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

Clear Display

Clear Display, available from the Errors and Failures Dialog Box, can be used to clear the currently displayed list of error messages from the Errors and Failures Dialog Box; these error messages were read from the synthesizer's error queue.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

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Read and Clear Error Queue

Read and Clear Error Queue, available from the Errors and Failures Dialog Box, queries the synthesizer and reads all of the current error messages from the synthesizer's error queue, displays the errors in the display buffer, and clears the synthesizer's error queue. If error messages are currently displayed in the Errors and Failures Dialog Box, new messages are appended to the end of the list being displayed.

Reading error messages that begin with ERR from the error queue remove them permanently. Reading error messages that begin with FAIL remain on the error queue and are only removed when the system's power is cycled.

Messages that begin with FAIL are considered hardware failures and the synthesizer must be repaired. All other error messages can be resolved by the user. For hints on resolving an error message, refer to "Error-Code and Fail-Code Messages" on page 3-93.

When the power to the synthesizer is cycled off and on, all errors in the synthesizer's error queue are lost.

TIP Because error messages are appended to the display each time the Read and Clear Error Queue button is selected, the Clear Display button should be selected to remove old error messages; a list of error messages that are no longer valid may be displayed if this is not done.

Related Topics

Pull Down View Menu

Soft Front Panel Help

Errors and Failures Dialog Box

Error-Code and Fail-Code Messages

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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Error-Code and Fail-Code Messages

The synthesizer can generate a list of error-code and fail-code messages that have been grouped and sub-grouped according to whether they are error or failure conditions.

- Error-Code Messages - If the synthesizer produces an error-code message, insight is provided to the user about what could be going wrong along with a list of steps that should help correct the error condition.
- Fail-Code Messages - If the synthesizer produces a fail-code message, a hardware failure is being reported and the synthesizer must be repaired. These messages begin with the word FAIL.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Query_Errors

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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Error-Code Messages

If the synthesizer produces an error-code message that is listed in the following table, insight is provided to the user about what could be going wrong along with information that should help correct the error condition.

In the following table, both the Error Codes and Error-Code Labels are `#define` statements in the `HPE6432Errors.h` header file, and can be used to write error-checking routines while using VXIplug&play commands. The Error-Code Labels are the symbolic names given to each Error Code. When writing programming code, either the Error Code or the Error-Code Label can be used. Each Error-Code Message is a description of a corresponding Error Code, and is displayed in the synthesizer's error queue if one of the errors occur.

Error Code	Error-Code Label and Corrective Action	Error-Code Message
VISA Open Errors		
0xBFFC0B00	ERR_OPEN_DEFAULT_RM_FAILED The VISA resource manager could not be opened. VISA is not installed and configured correctly.	"VISA Open Default RM failed (see next error)"
0xBFFC0B01	ERR_OPEN_A16_FAILED VISA open of E6432 failed. The address of the E6432 specified in the HPE6432_init call is probably incorrect. If the address specified is correct, this could also be a Windows resources error. Monitor Windows resources to verify that there is enough space to allocate memory for this process.	"VISA Open A16 Failed (see next error)"
0xBFFC0B02	ERR_SET_TIMEOUT_A16_FAILED The VISA interface could not set this attribute for the opened session.	"VISA Set A16 Timeout Failed (see next error)"
0xBFFC0B03	ERR_MAP_ADDRESS_A16_FAILED This could be a Windows resource error. Monitor Windows resources to verify that there is enough space to allocate memory for this process.	"VISA Map A16 Address Failed (see next error)"

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0xBFFC0B04	ERR_OPEN_A24_FAILED The address of the E6432 specified in the HPE6432_init call is probably incorrect. If the address specified is correct, this could also be a Windows resource error. Monitor Windows resources to verify that there is enough space to allocate memory for this process.	"VISA Open A24 Failed (see next error)"
0xBFFC0B05	ERR_SET_TIMEOUT_A24_FAILED This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"VISA Set A24 Timeout Failed (see next error)"
0xBFFC0B06	ERR_MAP_ADDRESS_A24_FAILED This could be a Windows resources error. Monitor the Windows resources to verify that there is enough space to allocate memory for this process.	"VISA Map A24 Address Failed (see next error)"
0xBFFC0907	ERR_INSTALL_HANDLER_FAILED The interface for this system is not one of the supportable interfaces, such as GPIB which doesn't support interrupt handling. Verify that a supportable interface is being used.	"VISA Install Handler Failed (see next error)"
0xBFFC0908	ERR_ENABLE_EVENT_FAILED The interface for this system is not one of the supportable interfaces, such as GPIB which doesn't support interrupt handling. Verify that a supportable interface is being used.	"VISA Enable Event Failed (see next error)"

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Initialization Errors

0xBFFC0830	ERR_INCORRECT_ID If the VXI Identifier for the selected board doesn't indicate it is an Agilent Technologies manufactured product, this error is returned. Verify that the address of the E6432 specified in the HPE6432_init call is correct.	"Incorrect ID Error"
0xBFFC0831	ERR_INCORRECT_DEVICE_TYPE If the VXI Device Type Identifier for the selected board wasn't programmed properly to the E6432 device value, this error is returned. Verify that the address of the E6432 specified in the HPE6432_init call is correct.	"Incorrect Device Type Error"
0xBFFC0837	ERR_OLD_BOARD_REVISION This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Old Board Revision ID"
0xBFFC083B	ERR_OPTION_DOES_NOT_EXIST This indicates there was an attempt to perform a function on the system that requires options that are not present. For example, if the user attempted to call the SetExtIfState without having the IF Option, this error would be returned.	"Function requires option that does not exist."

Flash Data Errors

0xBFFC0845	ERR_FLASH_DATA_NOT_FOUND This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Flash Data Not Found - used for data that may not always be required."
0xBFFC0846	ERR_FLASH_DATA_OPTION_NOT_AVAILABLE This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Warning, this flash data is dependent on available options which are not selected."

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Flash CRC Errors

0xBFFC0854	ERR_EXT1_CORRECTION_DATA_CRC_ERROR This error will be generated if the external detector 1 correction data does not pass the CRC check. This indicates that the data in flash is probably corrupt. This could have been caused by a power supply glitch or power cycling at the time of attempting to store the correction data. The external correction routine should be run again and the data saved again.	"Indicates the external 1 flatness correction CRC check failed."
0xBFFC0855	ERR_EXT2_CORRECTION_DATA_CRC_ERROR This error will be generated if the external detector 1 correction data does not pass the CRC check. This indicates that the data in flash is probably corrupt. This could have been caused by a power supply glitch or power cycling at the time of attempting to store the correction data. The external correction routine should be run again and the data saved again.	"Indicates the external 2 flatness correction CRC check failed."

System Resource Errors

0xBFFC0860	ERR_MEMORY_ALLOCATION_FAILED This could be a Windows resource error. Monitor Windows resources to verify that there is enough space to allocate memory for this process.	"Memory Allocation Failure"
0xBFFC0861	ERR_CREATE_MAPPING_FAILED This could be a Windows resource error. Monitor Windows resources to verify that there is enough space to allocate memory for this process.	"Mapping Creation Failure"
0xBFFC0862	ERR_MAP_VIEW_FAILED This could be a Windows resource error. Monitor the Windows resources to verify that there is enough space to allocate memory for this process.	"Map View Failure"

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0xBFFC0A63	ERR_SHARED_MEMORY_CREATE This error results when the system is unable to create the shared memory for the ability to allow multiple processes to be attached to the Agilent E6432. This could be the result of lack of memory or another problem with file access. Check memory and system privileges.	"Failed to create shared memory"
0xBFFC0A64	ERR_SHARED_MEMORY_DELETE This error results when the system is unable to delete the shared memory that was created for the ability to allow multiple processes to be attached to the Agilent E6432. This could because system privileges access or problems with memory access.	"Failed to delete shared memory"
0xBFFC0A65	ERR_TO_ATTACH_SHARED_MEMORY This error results when the system attempts to attach to the shared memory section that was previously created. This could occur if initialize was called again prior to the required close.	"Failed to attach shared memory for the process. Can only attach once per process."
0xBFFC086F	ERR_WINDOWS_ERROR This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Windows error"

Frequency and Power Setting Errors

0xBFFC0880	ERR_PAREN_UNLOCKED This error could occur, for some frequency value settings, when the system is driven in FM with extreme modulated power. Ensure that any modulated input is within the specified operational range for the system.	"Paren Unlock Error"

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0xBFFC0881	ERR_UWPLL_UNLOCKED For some conditions, when an external reference is used and the reference source is reapplied (for example, powered down then back up, or disconnected then reconnected) a transient may occur. Reading the error queue should clear this error. If the reference is constantly applied and this error is not cleared when the error is read, this may indicate a hardware failure. If this error occurs when an internal reference is selected, this may also indicate a hardware failure.	"Microwave Phase Locked Loop Unlock Error"
0xBFFC0883	ERR_ALC_HIGH_UNLEVELED This error could occur if power is set above the maximum specified power level when using internal leveling. Check to ensure the proper power level is being requested. If using external leveling, this could occur if the power is set above any of the internal maximum power limits, which could be caused by the external hardware configuration and power levels being selected in association with them. Check the external configuration and ensure that the returned power level within the loop and that being selected are within the proper operational range of the E6432.	"ALC High-Band Unleveled Error"
0xBFFC0884	ERR_ALC_LOW_UNLEVELED This error occurs if power is set below the minimum specified power level when using internal leveling. Check to ensure the proper power level is being requested. If using external leveling this could occur if the power is set below any of the internal minimum power limits which could be caused by the external hardware configuration and power levels being selected in association with them. Check the external configuration and ensure that the returned power level within the loop and that being selected are within the proper operational range of the E6432.	"ALC Low-Band Unleveled Error"

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0xBFFC0885	ERR_EXTERNAL_REF100_UNLOCKED This error indicates that the E6432 is unable to lock with the external reference source. Check the external reference connection and also verify that the external reference source is putting out the proper signal.	"External 100 MHz Reference Unlock Error"
0xBFFC0886	ERR_UNLOCK_IN_LIST This error could occur while running a list, for some frequency value settings, when the system is driven in FM with extreme modulated power. Ensure that any modulated input is within the specified operational range for the system.	"Unleveled in List Error"
0xBFFC0887	ERR_UNLEVEL_IN_LIST This error could occur if using internal leveling and the power is set beyond the minimum or maximum specified power limits within a list point. Check to ensure the proper power level is being requested for all the list points. This error could occur if using external leveling and the power is set beyond any of the internal minimum or maximum power limits; this could be caused by the external hardware configuration or the power levels being selected in association with them. Check the external configuration and ensure that the returned power level within the loop and that being selected are within the proper operational range of the E6432.	"Unlevel in List Error"
0xBFFC0888	ERR_TIMEOUT_WAITING_FOR_SETTLED This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Timeout Error While Waiting For Settled Interrupt"

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0xBFFC0889	ERR_LIST_STILL_RUNNING This error will occur when the user attempts to set frequency and power while a list is being executed. The user should either wait for the list to complete, or abort the list prior to attempting to set frequency and power.	"List is still running"
0xBFFC088A	ERR_EXTERNAL_REF100_UNLOCKED_TRANSIENT This error indicates that the E6432 is not always able to lock with the external reference source. The error is transient indicating it isn't always set. Check the external reference connection for a possible loose connection and verify that the external reference source is constantly putting out the proper signal.	"Transient External 10 MHz Reference Unlock Error"
0xBFFC088C	ERR_UWPLL_UNLOCKED_TRANSIENT For some conditions, when an external reference is used and the reference source is reapplied (for example, powered down then back up, or disconnected then reconnected) a transient may occur. Reading the error queue should clear this error. If the reference is constantly applied and this error is not cleared when the error is read, this may indicate a hardware failure. If this error occurs when an internal reference is selected, this may also indicate a hardware failure.	"Transient Microwave Phase Locked Loop Unlock Error"
0xBFFC088D	ERR_PAREN_UNLOCKED_TRANSIENT This error could occur, for some frequency value settings, when the system is driven in FM with extreme modulated power. Ensure that any modulated input is within the specified operational range for the system.	"Transient Paren Unlock Error"

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0xBFFC088E	ERR_ALC_HIGH_UNLEVELED_TRANSIENT This error occurs if power is set above the maximum specified power level when using internal leveling. Check to ensure the proper power level is being requested. If using external leveling, this could occur if the power is set above any of the internal maximum power limits, which could be caused by the external hardware configuration and power levels being selected in association with them. Check the external configuration and ensure that the returned power level within the loop and that being selected are within the proper operational range of the E6432.	"Transient ALC High Power Unleveled Error"
0xBFFC088F	ERR_ALC_LOW_UNLEVELED_TRANSIENT This error indicates that the unleveled interrupt is transient and that it isn't always set. This could occur under the following conditions when either the provided return signal is oscillating or the selected level is on the edge of the system performance, causing the leveled interrupt to oscillate between being set and not-set. If power is set beyond the minimum specified power level when using internal leveling. Check to ensure the proper power level is being requested. If using external leveling this could occur if the power is set beyond any of the internal minimum power limits, which could be caused by the external hardware configuration and power levels being selected in association with them. Check the external configuration and ensure that the returned power level within the loop and that being selected are within the proper operational range of the E6432. This error could also be caused by external modulation inputs that are not within the allowable range. Verify that all external modulation is within the specified limits for proper operation.	"Transient ALC Low Power Unleveled Error"

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Code Errors

0xBFFC0890	ERR_INVALID_TEST_POINT This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Invalid Test Point Error"
0xBFFC0891	ERR_ARG_OUT_OF_RANGE This error indicates that a parameter sent to a routine is outside the valid range for that parameter. Verify the calling routines used which generate this error and verify that the parameters are within the valid range. If this is generated during operation of the Soft Front Panel contact an Agilent Technologies Service Center.	"Argument out of Range Error"
0xBFFC0892	ERR_OPENING_FILE There may be a problem with file access on the system. Make sure permissions to open a file exist for the user running the E6432 functions.	"Error Opening a File"
0xBFFC0893	ERR_CLOSING_FILE There may be a problem with file access on the system. Make sure the file is not locked by another user or process.	"Error Closing a File"
0xBFFC0894	ERR_INVALID_FILE This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"An Invalid File was Found"
0xBFFC0895	ERR_MUTUALLY_EXCLUSIVE_MODULATIONS This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"IF and IQ Modulations not allowed together"

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0xBFFC0896	ERR_ERROR_READING_FILE	"Error reading data from a file"
	This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	
0xBFFC0897	ERR_ERROR_WRITING_FILE	"Error writing data to a file"
	This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	

Error Queue Errors

0xBFFC08A0	ERR_ERROR_QUEUE_OVERFLOW	"Error queue error"
	This occurs when the error queue reaches its maximum size limit which is currently defined as 30 errors. Reading the error queue cleared this error and empties the error queue to allow errors to be properly queued.	
0xBFFC08A1	ERR_PAGE_LOCK_DEADLOCK	"Page register lock is deadlocked"
	This may occur if two applications are exercising a single E6432 and accessing common data. Make sure only one application is running that interfaces with the E6432.	

Frequency and Power Setting Errors (continued)

0xBFFC08B0	ERR_TIMEOUT_WAITING_FOR_ABORT	"Timeout Error While Waiting For List to Abort"
	This error should not be generated under normal operation. However, if the user is using more than one application to control the E6432 at the same time, this type of error could be generated. Verify that there is only one application interfacing with the unit at any given time. Contact an Agilent Technologies Service Center for more information.	
0xBFFC08B1	ERR_WAITING_FOR_SETTLED	"Error While Waiting For Settled Interrupt"
	This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	

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0xBFFC08F0	ERR_ALC_CAL_FAIL_LIMITS This error could be generated during a diagnostic test run. If the mod-gain calibration loop is unable to be modified to close the loop within a specified voltage limit, this error is generated. It indicates that there is something not operating properly within the ALC loop and the unit should be serviced. Contact an Agilent Technologies Service Center for more information.	"ALC Mod-Gain Calibration Limits Failure"

Calibration Errors – Contact an Agilent Technologies Service Center

0xBFFC08F3	ERR_AM_DELAY_EXCEED_MAX_LIMITS This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"The calibrated AM Delay DAC exceeded the maximum DAC limit"
0xBFFC08F4	ERR_AM_DELAY_EXCEED_MIN_LIMITS This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"The calibrated AM Delay DAC exceeded the minimum DAC limit"
0xBFFC08F5	ERR_INVALID_EXT_DET_CAL_ORDER This error occurs when the user calls the `HPE6432_SetupCalExtDetPoint` or `HPE6432_EnterCalExtDetPowerMeterReading` functions with the “point” parameter not set to the expected value. Make sure the routine is being called in the proper order. The number of points returned from the `HPE6432_GetNumExtDetCalPoints` is used as the total number of points. The setup and enter routines are called with the “point” parameter set to 1, then incremented by one, until the total number of points is reached.	"The external detector calibration routines were called in an improper order"
0xBFFC08F6	ERR_SERIAL_N_FLASH_DETECTOR_DIFFER This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"The detector data stored in Flash and Serial EEROM are different"

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0xBFFC08F7	ERR_EXT_DET_POWER_LIMITS This error will be generated if the user enters power meter readings into the `HPE6432_EnterCalExtDetPowerMeterReading` routine that exceeds the +/- 35 dB limits. If a power meter reading value is seen outside this range during calibration, the configuration is not within the limits of calibration. You should refer to the specification on the valid external detector configurations and verify that the configuration being used for the calibration process is proper. This could also occur if the external loop is not properly physically connected or a connection is broken. Verify that the connections are proper and working, and attempt the calibration again.	"Power reading exceeds the expected limit"
0xBFFC08F8	ERR_EXT_DET_LIMIT_EXCEEDED This error is generated if the user enters power meter readings into the `HPE6432_EnterCalExtDetPowerMeterReading` function that indicates the current external detector configuration can not be calibrated. This could occur if there are problems with the external configuration connections, or if the equipment used is not within the range specified for this system.	"Calibration range of system exceeded"
0xBFFC08F9	ERR_POWER_SEARCH_FAIL_LIMITS This error will occur during a power search function. It indicates that the system was not able to get a stable DAC setting that drove the integrator voltage to a small number. The power search attempts to drive the integrator voltage level down. This has an effect of keeping the power level stable between open and closed loop operation. Contact an Agilent Technologies Service Center for more information.	"Power Search limits failure"

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0xBFFC08FA	ERR_IF_CAL_SIG_LEVEL_TOO_HIGH When performing an IF calibration, this error may occur if the IF input signal of 300 MHz (which should be applied to the external IF input at 0 dBm + losses in the hardware) is not providing the proper signal level to the upconverter mixer. This error would indicate the power level is too high for the calibration. Verify that the proper signal is applied and connected properly and test again.	"IF Calibration signal level too high or not enough attenuation"
0xBFFC08FB	ERR_IF_CAL_SIG_LEVEL_TOO_LOW When performing an IF calibration, this error may occur if the IF input signal of 300 MHz (which should be applied to the external IF input at 0 dBm + losses in the hardware) is not providing the proper signal level to the upconverter mixer. This error would indicate the power level is too low for the calibration. Verify that the proper signal is applied and connected properly and test again.	"IF Calibration signal level too low - Check connections"
0xBFFC08FC	ERR_SETTINGS_CONFLICT This error should not be generated under normal operation. Contact an Agilent Technologies Service Center for more information.	"Settings conflict"

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Read and Clear Error Queue

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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Fail-Code Messages

If the synthesizer produces a fail-code message that is listed in the following table, the synthesizer must be repaired.

In the following table, both the Fail Codes and Fail-Code Labels are `#define` statements in the `HPE6432Errors.h` header file, and can be used to write error-checking routines while using VXIplug&play commands. The Fail-Code Labels are the symbolic names given to each Fail Code. When writing programming code, either the Fail Code or the Fail-Code Label can be used. Each Fail-Code Message is a description of a corresponding Fail Code, and is displayed in the synthesizer's error queue if one of the failures occur.

Fail Code	Fail-Code Label	Fail-Code Message
Flash Failures		
0xBFFC0C10	FAIL_FLASH_WRITE_TIMEOUT	"Flash Write Timeout"
0xBFFC0C11	FAIL_FLASH_PROGRAMMING_VOLTAGE_LOW	"Flash Programming Voltage Low"
0xBFFC0C12	FAIL_FLASH_HIGH_DATA_WRITE_ERROR	"Flash High Data Write Error"
0xBFFC0C13	FAIL_FLASH_LOW_DATA_WRITE_ERROR	"Flash Low Data Write Error"
0xBFFC0C14	FAIL_FLASH_WRITE_FAILED	"Flash Write Failed"
0xBFFC0C15	FAIL_FLASH_NOT_ERASED	"Flash Not Erased"
0xBFFC0C16	FAIL_FLASH_ERASE_FAILED	"Flash Erase Failed"
0xBFFC0C17	FAIL_FLASH_ERASE_TIMEOUT	"Flash Erase Timeout"
0xBFFC0C18	FAIL_FLASH_HIGH_DATA_ERASE_ERROR	"Flash High Data Erase Error"
0xBFFC0C19	FAIL_FLASH_LOW_DATA_ERASE_ERROR	"Flash Low Data Erase Error"
0xBFFC0C1A	FAIL_FLASH_ERASE_SUSPENDED	"Flash Erase Suspend"

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Hardware Failures

0xBFFC0C20	FAIL_INCORRECT_FLASH_ID	"Incorrect Flash ID"
0xBFFC0C21	FAIL_INCORRECT_FLASH_DEVICE_TYPE	"Incorrect Flash Device Type"
0xBFFC0C22	FAIL_BUS_ERROR_DEST	"Bus Error Destination"
0xBFFC0C23	FAIL_BUS_ERROR_SOURCE	"Bus Error Source"

Assist Processor Failures

0xBFFC0C25	FAIL_CHIP_WRITE_FAILURE	"Chip Write Failure"
0xBFFC0C26	FAIL_ASSIST_PROCESSOR_STARTUP_FAILED	"Assist Processor Startup Failed"
0xBFFC0C27	FAIL_CODE_COMPARE_FAILURE	"Code Compare Failure"
0xBFFC0C28	FAIL_A24_TIMEOUT	"A24 Timeout Error"
0xBFFC0C29	FAIL_WATCHDOG_TIMEOUT	"Watch Dog Timeout Error"
0xBFFC0C2A	FAIL_ASSIST_MANGLED_CHIP_WRITE	

Initialization Failures

0xBFFC0C32	FAIL_A24_NOT_ACTIVE	"A24 Not Active Error"
0xBFFC0C33	FAIL_STILL_RESET	"Still Reset Error"
0xBFFC0C34	FAIL_UNLOCK_UNLEVEL_ERROR	"Unlock or Unlevel Error"
0xBFFC0C35	FAIL_68360_INTERRUPT_PROBLEM	"68360 Interrupt Problem"
0xBFFC0C36	FAIL_INVALID_BOARD_ID	"Invalid Board ID"
0xBFFC0C38	FAIL_SERIAL_EEROM_DATA_CRC_ERROR	"Serial EEROM Data CRC Error"
0xBFFC0C39	FAIL_INCOMPATABLE_HARDWARE_OPTIONS	"This indicates conflicting options, such as I/Q and Low Rate FM"

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0xBFFC0C3A	FAIL_UNKNOWN_INITIALIZATION_EXCEPTION	“This error occurs when an unhandled exception is thrown...”

Flash Data Region Failures

0xBFFC0C40	FAIL_FLASH_DATA_NOT_FOUND	"Flash Data Not Found"
0xBFFC0C41	FAIL_FLASH_DATA_CHECKSUM	"Flash Data Checksum Error"
0xBFFC0C42	FAIL_FLASH_DATA_BLOCK_FULL	"Flash Data Block is Full"
0xBFFC0C43	FAIL_FLASH_DATA_TOO_SHORT	"Flash Data is Too Short"
0xBFFC0C44	FAIL_FLASH_DATA_CORRUPT	"Flash Data page corrupt"

Flash CRC Failures

0xBFFC0C50	FAIL_FLASH_CODE_CRC_ERROR	"Flash Assist Processor Code Section CRC Failure"
0xBFFC0C51	FAIL_FLASH_DATA_CRC_ERROR	"Flash Data Section CRC Failure"
0xBFFC0C52	FAIL_FREQ_TABLE_CRC_ERROR	"Flash Frequency Table Section CRC Failure"
0xBFFC0C53	FAIL_CORRECTION_DATA_CRC_ERROR	"Indicates the internal flatness correction CRC check failed."

Assist Processor Code Failures

0xBFFC0C70	FAIL_CODE_FILE_MISSING	"Assist Processor Code File Missing"
0xBFFC0C71	FAIL_CODE_CHECK_SUM	"Assist Processor Code Check Sum Error"
0xBFFC0C72	FAIL_CODE_ADDRESS_ERROR	"Assist Processor Code Address Error"

Hardware Failures

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0xBFFC0C82	FAIL_INTERNAL_REF100_UNLOCKED	"Internal 100 MHz Reference Unlock Error"
0xBFFC0C8B	FAIL_INTERNAL_REF100_UNLOCKED_TRANSIENT	"Transient Internal 10 MHz Reference Unlock Error"

Self-Test Failures with RF On

0xBFFC0CD0	FAIL_SELF_TEST_RF_FAIL	"Failure during self test with RF On"
0xBFFC0CD1	FAIL_MOD_GAIN_SUB_CAL_TEST	"Failure during mod-gain closed loop cal test"
0xBFFC0CD2	FAIL_POWER_SEARCH_TEST	"Failure during power-search test"

Self-Test Failures with No RF

0xBFFC0CE0	FAIL_SELF_TEST_NORF_FAIL	"Failure during self test no RF"
0xBFFC0CE1	FAIL_CPU_RAM_TEST	"Failure while Performing CPU RAM Test"
0xBFFC0CE2	FAIL_DIGITAL_TEST	"Failure while performing a digital test"
0xBFFC0CE3	FAIL_ALC_DATA_BUS_TEST	"Failure while Performing ALC Data Bus Test"
0xBFFC0CE4	FAIL_PAREN_DIGITAL_TEST	"Failure while Performing Paren Digital Test"
0xBFFC0CE5	FAIL_BACKPLANE_DATA_BUS_TEST	"Failure while Performing Backplane Data Bus Test"
0xBFFC0CE6	FAIL_UWRF_DATA_BUS_TEST	"Failure while Performing Microwave Data Bus Test"
0xBFFC0CE7	FAIL_POWER_SUPPLY_TEST	"Failure while Performing Power Supply Test"

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0xBFFC0CE8	FAIL_CODE_RAM_TEST	"Failure while Performing code RAM Test"
0xBFFC0CE9	FAIL_LIST_RAM_TEST	"Failure while Performing list RAM Test"
0xBFFC0CEA	FAIL_PULSE_DATA_BUS_TEST	"Failure while Performing Pulse Module Digital Test"
0xBFFC0CEB	FAIL_IQ_DATA_BUS_TEST	"Failure while Performing I/Q Board Digital Test"
0xBFFC0CEC	FAIL_FM_DATA_BUS_TEST	"Failure while Performing Low-Rate FM Board Digital Test"

Calibration Failures

0xBFFC0CF0	FAIL_ALC_CAL_FAIL_LIMITS	"ALC Mod-Gain Calibration Limits Failure"
0xBFFC0CF1	FAIL_PAREN_CAL_FAIL_LIMITS	"Paren KV Calibration Limits Failure"
0xBFFC0CF2	FAIL_AM_DELAY_CAL_FAIL_LIMITS	"AM Delay DAC calibration error"

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Read and Clear Error Queue

To Display a List of the Synthesizer's Error Queue Messages

To Print a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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To Display a List of the Synthesizer's Error Queue Messages

If the Errors and Failures Dialog Box is not open:

1. From the Soft Front Panel's Pull Down View Menu, open the Errors and Failures Dialog Box.

   When the Errors and Failures Dialog Box is opened, the synthesizer's error queue is automatically read and all errors are displayed. This also clears the synthesizer's error queue of all errors except failures.

If the Errors and Failures Dialog Box is already open:

1. Click the Clear Display button.

   This removes all previous error messages from the Errors and Failures Dialog Box; error messages may have been reported earlier, but may no longer be valid.

2. Click the Read and Clear Error Queue button and a current list of error messages is displayed; these error messages are read from the synthesizer's error queue.

   Selecting the Read and Clear Error Queue button, clears the synthesizer's error queue of all errors except failures.

TIP The Errors and Failures Dialog Box may be left open while operating the system. This allows the error queue to be monitored.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

Read and Clear Error Queue

To Print a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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To Print a List of the Synthesizer's Error Queue Messages

If the Errors and Failures Dialog Box is not open:

1. From the Soft Front Panel's Pull Down View Menu, open the Errors and Failures Dialog Box.

   When the Errors and Failures Dialog Box is opened, the synthesizer's error queue is automatically read and all errors are displayed. This also clears the synthesizer's error queue of all errors except failures.

If the Errors and Failures Dialog Box is already open:

1. Click the Copy Display button.

   The currently displayed list of error messages are copied to the Microsoft Windows Clipboard.

2. Start or switch to a Microsoft Windows application such as WordPad or Notepad.

3. Using a Microsoft Windows application:

   a. Click its Pull Down Edit menu.

   b. Click Paste.

      A copy of the error messages that was copied to the Clipboard should appear on the Microsoft Windows application.

   c. Click the Pull Down File Menu.

   d. Click Print.

Related Topics

Soft Front Panel Help

Errors and Failures Dialog Box

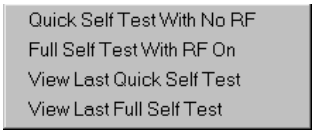
Read and Clear Error Queue

To Display a List of the Synthesizer's Error Queue Messages

HPE6432_error_query

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Pull Down Diagnostics Menu



- Quick Self Test With No RF
- Full Self Test With RF On
- View Last Quick Self Test
- View Last Full Self Test

Related Topics

Soft Front Panel Help

Pull Down View Menu

HPE6432_self_test

HPE6432_SelfTest

HPE6432_GetLastSelfTestResults

Quick Self Test With No RF

Selecting Quick Self Test With No RF from the Pull Down Diagnostics Menu, available from the Pull Down View Menu, runs a shortened version of the full self test.

This quick self test excludes testing of the signal path circuitry which is performed in the full self test. During this quick self test, the RF output is never turned on.

The result of this quick self test is either Pass or Fail; if Fail is returns, a fail code is also returned (in hexadecimal representation) that indicates the sub-tests that failed. This fail code should be used when contacting Agilent Technologies Service Centers for support.

The Copy Detailed Information button, available at the bottom of the Diagnostics Dialog Box, can be used to copy the currently displayed Detailed Information to the Microsoft Windows Clipboard. Once the Detailed Information has been copied to the Clipboard, it may be pasted to other applications that can read from the Clipboard.

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Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Diagnostics Menu

Full Self Test With RF On

Selecting Full Self Test With RF On from the Pull Down Diagnostics Menu, available from the Pull Down View Menu, runs a full self test.

This full self test includes all testing performed in the quick self test and includes testing of the signal path circuitry. During this full self test, the RF output is turned on.

The result of this full self test is either Pass or Fail; if Fail is returns, a fail code is also returned (in hexadecimal representation) that indicates the sub-tests that failed. This fail code should be used when contacting Agilent Technologies Service Centers for support.

The Copy Detailed Information button, available at the bottom of the Diagnostics Dialog Box, can be used to copy the currently displayed Detailed Information to the Microsoft Windows Clipboard. Once the Detailed Information has been copied to the Clipboard, it may be pasted to other applications that can read from the Clipboard.

Related Topics

Pull Down View Menu

Pull Down Diagnostics Menu

View Last Quick Self Test

Selecting View Last Quick Self Test from the Pull Down Diagnostics Menu, available from the Pull Down View Menu, displays the test status of the last quick self test as either pass or fail.

It also displays the test type (Quick No RF or Full), and the test date of the last quick self test that had been performed on the synthesizer. Detailed information related to errors that occurred during the test is also displayed.

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The Copy Detailed Information button, available at the bottom of the Diagnostics Dialog Box, can be used to copy the currently displayed Detailed Information to the Microsoft Windows Clipboard. Once the Detailed Information has been copied to the Clipboard, it may be pasted to other applications that can read from the Clipboard.

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Diagnostics Menu

View Last Full Self Test

Selecting View Last Full Self Test from the Pull Down Diagnostics Menu, available from the Pull Down View Menu, displays the test status of the last full self test as either pass or fail.

It also displays the test type (Quick No RF or Full), and the test date of the last full self test that had been performed on the synthesizer. Detailed information related to errors that occurred during the test is also displayed.

The Copy Detailed Information button, available at the bottom of the Diagnostics Dialog Box, can be used to copy the currently displayed Detailed Information to the Microsoft Windows Clipboard. Once the Detailed Information has been copied to the Clipboard, it may be pasted to other applications that can read from the Clipboard.

Related Topics

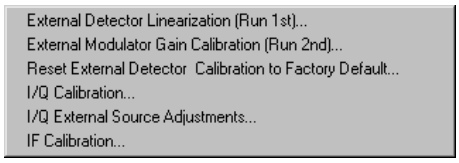
Soft Front Panel Help

Pull Down View Menu

Pull Down Diagnostics Menu

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Pull Down Calibration Menu



Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

NOTE

- For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run. Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.
- For best results when performing an I/Q Calibration, both the internal I/Q Calibration and I/Q External Source Adjustments should be run. When running these calibrations, order matters; the I/Q External Source Adjustments must be run only after an internal I/Q Calibration is run. Running these calibrations any additional times provides no further accuracy improvement.
- The most recently run level calibration supersedes any previous level calibrations. This is because a calibration DAC is adjusted during a level calibration and depending on which level calibration is performed (IF Calibration or I/Q Upconverter Calibration), its DAC settings are used.

- External Detector Linearization
- External Modulator Gain Calibration
- Reset External Detector Calibration to Factory Default
- I/Q Calibration (Option UNG Only)
- I/Q External Source Adjustments (Option UNG Only)
- IF Calibration (Option 300 Only)

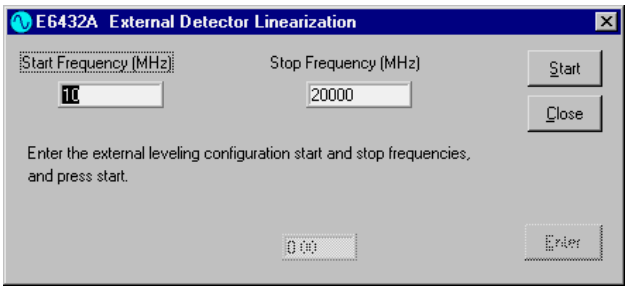
Related Topics

Soft Front Panel Help

Pull Down View Menu

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External Detector Linearization



NOTE

For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

- Typical Equipment Setup for External Detector Linearization
- Start Frequency
- Stop Frequency
- Start
- Power Meter Reading Dialog Box

Related Topics

Pull Down View Menu

Pull Down Calibration Menu

HPE6432_GetNumExtDetCalPoints

HPE6432_SetupCalExtDetPoint

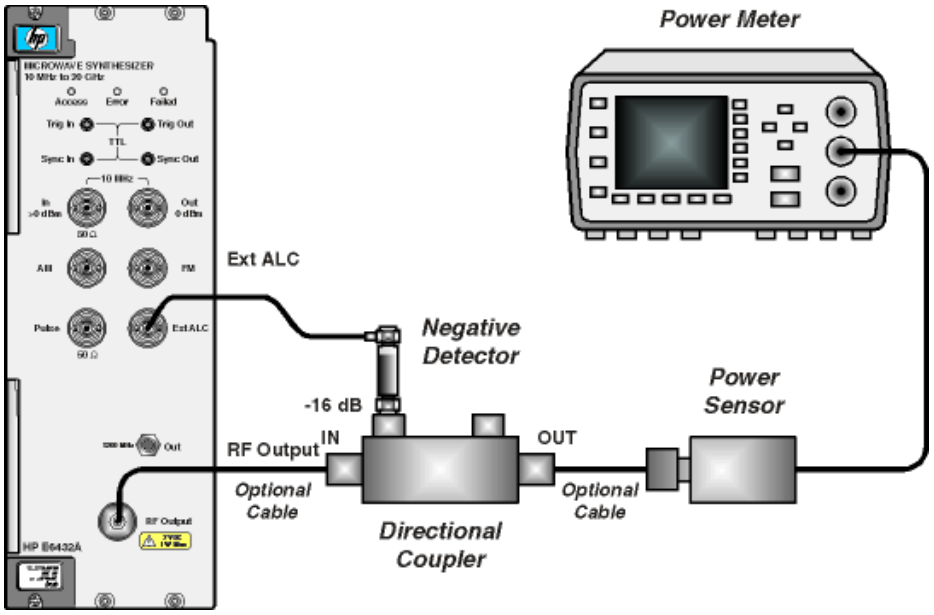
HPE6432_EnterCalExtDetPowerMeterReading

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Typical Equipment Setup for External Detector Linearization

In a typical equipment setup that is used to perform an external detector linearization calibration, an external directional coupler's input is connected to the synthesizer's RF Output connector. A detector is connected to the coupler and its output is fed back into the synthesizer at the EXT ALC connector. (There may also be optional cabling, switches, amplifiers, or other combinations of hardware between the RF Output connector and the input to the directional coupler.)

The directional coupler's output is connected to a calibrated power meter. This power meter is used to make the power measurements that are entered into the external detector linearization calibration routine.



Related Topics

- Hardware Front Panel Connectors
- Soft Front Panel Help
- Pull Down View Menu
- Pull Down Calibration Menu

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Start Frequency of an External Detector Linearization

Start Frequency, available from the External Detector Linearization Dialog Box, specifies the starting frequency point at which a linearization calibration is to be performed on the external leveling loop configuration being used.

This start frequency corresponds to the lower-operational range of the external leveling loop configuration, and can not be less than the minimum frequency of the synthesizer.

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

For complete specifications, refer to: “Specifications and Characteristics” on page 6-1.

Related Topics

- Soft Front Panel Help
- Pull Down View Menu
- Pull Down Calibration Menu

Stop Frequency of an External Detector Linearization

Stop Frequency, available from the External Detector Linearization Dialog Box, specifies the stopping frequency point at which a linearization calibration is to be performed on the external leveling loop configuration being used.

This stop frequency corresponds to the upper-operational range of the external leveling loop configuration, and can not be greater than the maximum frequency of the synthesizer.

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

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For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

- Soft Front Panel Help
- Pull Down View Menu
- Pull Down Calibration Menu

Start an External Detector Linearization

Start, available from the External Detector Linearization Dialog Box, starts an external detector linearization calibration that is used to adjust or compensate the output power for an external leveling loop configuration.

The system is configured for a calibration point and a dialog box is displayed allowing the user to enter power meter measurement. This is repeated a number of times. Each time a configuration is made, the power meter reading must be entered into the displayed Power Meter Reading Dialog Box. Once the power meter reading for the last point in the loop is entered, the routine completes the calibration and stores the calibrated values within the synthesizer's FLASH memory, thus completing the calibration process.

NOTE

If a different external detector or other combination of hardware being used in the external leveling loop configuration is replaced, the external detector linearization calibration should be repeated using the new hardware configuration.

If a calibration is cancelled prior to completion, using the **Cancel** button, none of the new calibration values are retained and the values from the last calibration are restored.

Once the external detector linearization calibration is performed, the user must perform the external modulator gain calibration to complete the external detector calibration.

Related Topics

Soft Front Panel Help

Pull Down View Menu

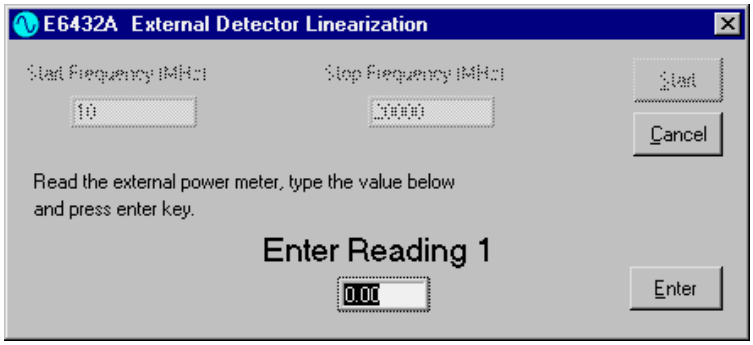
Pull Down Calibration Menu

Power Meter Reading Dialog Box

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Power Meter Reading Dialog Box

A Power Meter Reading Dialog Box is displayed after selecting Start, from the External Detector Linearization Dialog Box. This allows the user to enter power meter measurements and is repeated a number of times. Each time a configuration is made, the power meter reading must be entered into the displayed dialog box. Once the power meter reading for the last point in the loop is entered, the routine completes the calibration and stores the calibrated values within the synthesizer's FLASH memory, thus completing the external detector linearization calibration process.



NOTE

If a different external detector or other combination of hardware being used in the external leveling loop configuration is replaced, the external detector linearization calibration should be repeated using the new hardware configuration.

If a calibration is cancelled prior to completion, using the **Cancel** button, none of the new calibration values are retained and the values from the last calibration are restored.

Once the external detector linearization calibration is performed, the user must perform the external modulator gain calibration to complete the external detector calibration.

Related Topics

Soft Front Panel Help

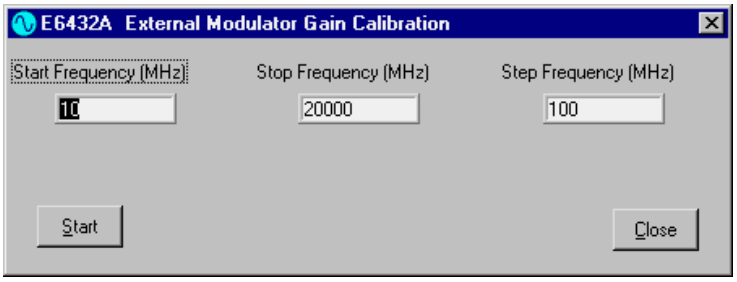
Pull Down View Menu

Pull Down Calibration Menu

Reset External Detector Calibration to Factory Default

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External Modulator Gain Calibration



Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

NOTE

For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

- Start Frequency
- Stop Frequency
- Step Frequency
- Start

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Calibration Menu

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Start Frequency for External Modulator Gain Calibration

Start Frequency, available from the External Modulator Gain Calibration Dialog Box, specifies the starting frequency for the modulator gain calibration in the external leveling loop configuration. Its value is used in conjunction with the stop and step frequency values that are also specified.

This start frequency corresponds to the lower-operational range of the external leveling loop configuration, and can not be less than the minimum frequency of the synthesizer.

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Calibration Menu

Stop Frequency for External Modulator Gain Calibration

Stop Frequency, available from the External Modulator Gain Calibration Dialog Box, specifies the stopping frequency for the modulator gain calibration in the external leveling loop configuration. Its value is used in conjunction with the start and step frequency values that are also specified.

This stop frequency corresponds to the lower-operational range of the external leveling loop configuration, and can not be less than the minimum frequency of the synthesizer.

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NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Calibration Menu

Step Frequency for External Modulator Gain Calibration

Step Frequency, available from the External Modulator Gain Calibration Dialog Box, specifies the calibration step size for the modulator gain calibration in the external leveling loop configuration. Its value is used in conjunction with the start and stop frequency values that are also specified.

The calibration step size is used to determine the actual points used in the External Modulator Gain Calibration. The smaller the step size, the more accurate the calibration is for all frequencies, but this enhanced accuracy is at the cost of increased time for the calibration process. A calibration step size value of 100 MHz is recommended.

The number of calibration steps is defined by the following equation and can not exceed 201:

$$\text{Number of Steps} = (\text{Stop Frequency} - \text{Start Frequency}) / \text{Step Frequency}$$

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NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

For complete specifications, refer to “Specifications and Characteristics” on page 6-1.

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Calibration Menu

Start an External Modulator Gain Calibration

Start, available from the External Modulator Gain Calibration Dialog Box, starts an external modulation-gain calibration on an external leveling loop configuration over a frequency range specified by the start and stop frequency values at points specified by the step value. When completed, the calibration results are loaded into the synthesizer's FLASH memory.

NOTE This calibration could take up to 15 minutes to complete and can not be aborted once it has started; it must run to completion.

An external modulation-gain calibration is used to adjust the external leveling loop configuration and provide adjustment values that enhance the performance when switching between open and closed loop. Assuming the factory preset values remain present, this calibration has no effect when the external leveling loop configuration is closed, it only affects the output power when the loop is opened.

This calibration is required (or desirable) if the operator plans to use an external leveling loop configuration and operate the synthesizer in open loop mode. This calibration is good for the frequency range defined by the start and stop values entered by the user. The smaller the step size, the more accurate the adjustment values are, but this enhanced accuracy is at the cost of increased time for the calibration process. There is only one adjustment made for the full power range at any given frequency, so adjustment values are not optimal for

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frequency-power pairs. To obtain even better performance for frequency-power pairs, the power-search function can be used. The power-search function returns a correction factor that can be sent to the synthesizer when tuning to a frequency and power to provide the optimum open-loop performance.

Related Topics

Soft Front Panel Help

Pull Down View Menu

Pull Down Calibration Menu

Power Search

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Reset External Detector Calibration to Factory Default

Reset External Detector Calibration to Factory Default, available from the Pull Down Calibration Menu, is used to restore factory preset values for the external leveling loop configuration. These factory preset values are changed when a detector linearization calibration or modulator-gain frequency table calibration is performed.

This selection should be used if a calibrated external leveling loop configuration has been changed, or if difficulties occur while performing calibrations on the external leveling loop configuration.

NOTE To obtain calibration values for an external leveling loop configuration after performing this selection, the External Detector Linearization and External Modulator Gain Calibration must be performed again.

Related Topics

External Modulator Gain Calibration

External Detector Linearization

HPE6432_GetNumExtDetCalPoints

HPE6432_SetupCalExtDetPoint

HPE6432_EnterCalExtDetPowerMeterReading

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I/Q Calibration (Option UNG Only)

Performing an I/Q Calibration is necessary for optimum performance of the I/Q modulator.

- Internal I/Q Modulator Calibration

Due to the inherently sensitive nature of I/Q (vector) modulators, it is recommended that a calibration be performed before each use, when I/Q signal levels being used have changed, if the environmental temperature has changed significantly, or if a long period of time has elapsed since the last calibration. (For complete specifications, refer to "Specifications and Characteristics" on page 6-1)

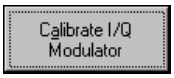
- External I/Q Source Calibration

  If you would like to account for imperfections or impairments in the external I/Q source signals being used, perform an external I/Q source calibration. If the external I/Q sources being used have no or little I/Q impairments (where the gain balance is unity and the dc offsets are close to zero), performing an external I/Q source generator calibration is not necessary.

  For further information about I/Q calibration, refer to Understanding I/Q Calibration.

To Perform an I/Q Calibration

1. Turn on the RF Output power of the synthesizer.
2. From the pull down View menu, point to Calibration, and select I/Q Calibration.
3. When the I/Q Calibration Dialog Box appears, select the Calibrate I/Q Modulator button.



An iterative calibration algorithm will run and make corrections for the impairments within the synthesizer by adjusting the Gain, Offset, and Quadrature adjustment DACs. This portion of the I/Q calibration does not account for impairments due to external I and Q sources.

You may verify the success of your I/Q modulator calibration by referring to the procedure, To Check the Level of the Carrier Feed-Through.

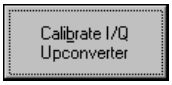
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4. Enter an I/Q Upconverter Calibration Frequency from 2 GHz </= 20 GHz.

   The I/Q Upconverter calibration is only valid for synthesizer frequencies between 2 GHz </= 20 GHz. The I/Q Upconverter calibration cannot be used for synthesizer frequencies from 10 MHz < 2 GHz.

   For synthesizer frequencies from 10 MHz < 2 GHz, a Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator, available from the pull down View menu by selecting Configuration, can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary because the I/Q Upconverter calibration controls the level accuracy.

5. Select the Calibrate I/Q Upconverter button.



   Performing this calibration supersedes the calibration DAC settings obtained from running IF Upconverter Level Calibration (Option 300 Only).

6. From the pull down View menu, point to Calibration, and select I/Q External Source Adjustments.

7. When the External I/Q Source Adjustments Dialog Box appears, select Normal as the I/Q Input.

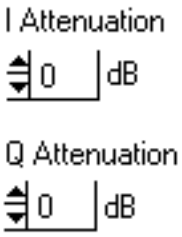
8. Configure the External I and Q Source generators to produce signals with equal levels, with a quadrature phase relationship (I input is a cosine wave and Q input is a sine wave), and both at the same frequency (for example, 10 kHz).

   The recommended input level is Sqrt(I^2 + Q^2) = 0.5 Vrms. With equal signal levels applied to the I and Q inputs, this is equivalent to 0.35 Vrms on each input.

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NOTE

If the external I and Q source signals cannot be adjusted to a low enough output level, attenuator values within the I/Q modulator circuitry can be adjusted. For example, from the I/Q External Source Adjustments dialog box, adjust the I Attenuation and Q Attenuation controls. These I and Q Attenuation controls adjust the input level to the mixers in the I/Q modulator circuitry to prevent overdriving. (Refer to the drawing shown in Understanding I/Q Calibration.)



9. Adjust the ratio of I-gain to Q-gain (leave Q Gain fixed and adjust I Gain) as well as the Quadrature to minimize the Undesired-Sideband Signal. For optimum results, it is best to iterate a few times between the gain adjustment and the quadrature adjustment.

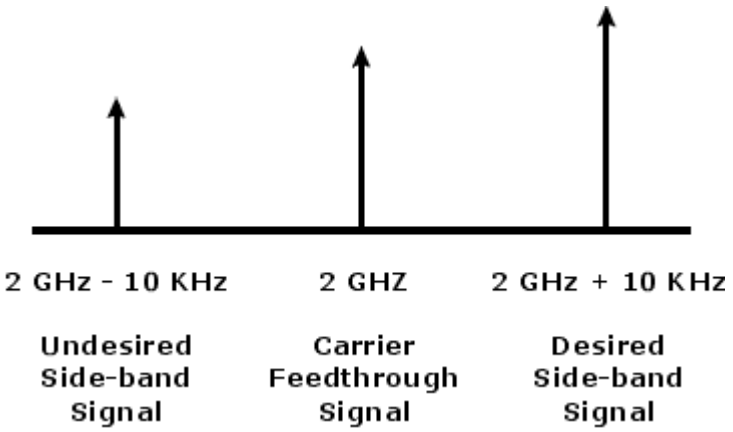
   Adjust the I and Q Offset values to minimize the carrier feed through signal. It is best to iterate a few times between the I and Q Offset adjustments.

I/Q Calibration Example

As an example, set the synthesizer center frequency to 2 GHz, with external I and Q source signals of approximately 0.35 Vrms, the I input as a cosine wave at 10 kHz, and the Q input as a sine wave at 10 kHz. (The synthesizer may be set to any center frequency from 10 MHz to 20 GHz; I/Q calibration is independent of the synthesizer center frequency.)

The result, when viewing the RF output of the synthesizer on a spectrum analyzer, should produce an undesired-sideband signal, a carrier-feedthrough signal, and a desired-sideband signal.

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The intent of performing the I/Q calibration is to reduce or eliminate the undesired-sideband signal and the carrier feedthrough signal.

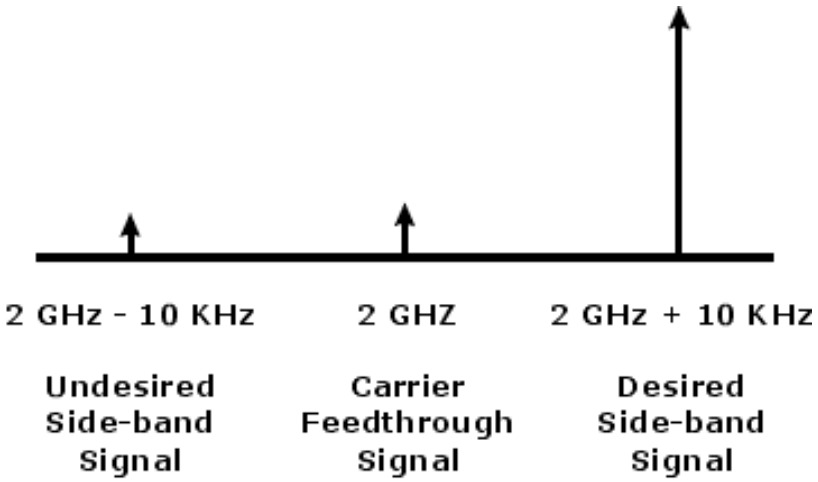
Adjustments to the ratio of I Gain to Q Gain as well as adjustments to Quadrature can minimize the undesired-sideband signal. For example:

1. leave Q Gain fixed and adjust I Gain until the undesired-sideband signal is minimized
2. adjust Quadrature until the undesired-sideband signal is minimized
3. repeat this process a few times between the I Gain, Q Gain, and Quadrature adjustments to obtain the best overall reduction in the level of the undesired-sideband signal

Adjustments to the I Offset and Q Offset can minimize the carrier feedthrough signal. For example:

1. adjust I Offset until the carrier feedthrough signal is minimized
2. adjust Q Offset until the carrier feedthrough signal is minimized
3. repeat this process a few times between the I Offset and Q Offset adjustments to obtain the best overall reduction in carrier feedthrough

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Adjustments to Vblo Setting (I/Q mixer bias) on the I/Q Calibration dialog box can minimize the conversion loss and improve the IM performance. The factory default value of DAC value 2048 is mid-range for the DAC adjustment and is normally a good compromise. The I/Q Calibration must be performed each time that the Vblo setting is changed.

Optimizing Error Vector Magnitude (EVM) Measurements

After completing an I/Q Calibration and IF Upconverter Calibration, set the IF Upconverter Attenuator to 12 dB. This can be accomplished by increasing the ALC power up 12 dB. For example, the ALC power could be adjusted from 0 dBm to 12 dBm. This would result in the same output power, but with improved EVM.

Related Topics

I/Q Calibration Dialog Box

External I/Q Source Adjustments Dialog Box

Understanding I/Q Calibration

Power Search

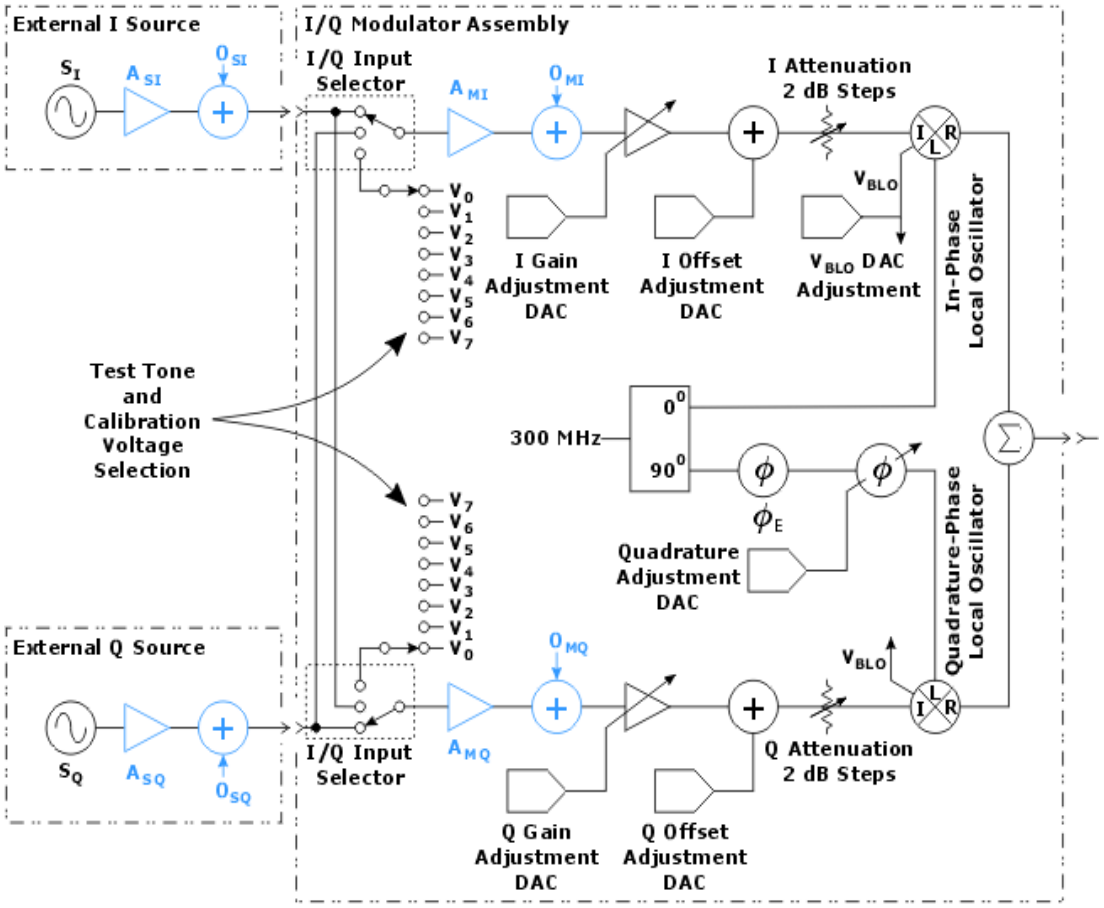
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Understanding I/Q Calibration

When a synthesizer I/Q calibration is run, an iterative algorithm makes corrections for the impairments within the synthesizer by adjusting the Gain, Offset, and Quadrature adjustment DACs. This calibration does not account for impairments in external I/Q sources. After the calibration is run, a separate, manual adjustment must be performed so as to minimize the impairments in the external I/Q sources. The most useful modulation type for minimizing the impairments in the external I/Q sources is a single-sideband signal. A single-sideband signal may be generated by adjusting the external source that is driving the I input with a cosine wave, and the Q input with a sine wave at the same frequency. The result is an undesired sideband signal, a carrier feedthrough signal, and a desired sideband signal. Adjustments made to the ratio of I-gain to Q-gain as well as adjustments to quadrature can minimize the undesired sideband signal. Adjustment to the I and Q offsets can minimize the carrier feedthrough signal.

NOTE Items shown as blue represent the impairments that are being "calibrated-out" with the Calibration Settings (from the I/Q Calibration dialog box) and Adjustments to Calibration Setting (on the I/Q External Source Adjustments dialog box). These impairments are not physical components in the I/Q modulator assembly or the external I/Q sources.

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The I/Q modulator consists of circuits to select the I/Q input signal (Normal, Swapped, Test Tone), circuits to select calibration voltages or a Test Tone, and adjustments for optimizing performance by minimizing I/Q impairments.

I/Q impairments may be due to the following:

- errors in the gain match between I and Q signal paths
- dc offsets on I and Q signal paths
- deviations from a quadrature phase relationship (90 degrees) between the I and Q mixer local oscillator signals

  These impairments may be due to the external I and Q source signals being applied and they may be due to the hardware within the synthesizer itself.
- The external I and Q source signals are modeled as perfect sources (Si and Sq), followed by impairments in gain (Asi and Asq) and dc offset (Osi and Osq).

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- The impairments due to the I/Q modulator hardware within the synthesizer are modeled as I/Q gain imbalance (Ami and Amq), dc offset (Omi and Omq), and local oscillator deviation from quadrature (FE).

  The modulation signal paths have DAC-controlled gain (I and Q Gain), offset (I and Q Offset), and quadrature (Quadrature Skew) adjustments that are used to compensate for impairments. There is also a DAC-controlled mixer bias voltage (VBLO) which can be adjusted to maximize mixer dynamic range. Precision voltage references (V0-V7) are used to generate I and Q pairs (vectors) during calibration and to produce the Test Tone.

  The input to the I/Q modulator can be from the external source through the front panel connections (I/Q Input Normal) or from the internal reference sources (I/Q Input Test Tone). Additionally, the external inputs may be swapped under software control (I/Q Input Swapped). Having the external inputs swapped inverts the direction of phase rotation of the I/Q modulator.

Related Topics

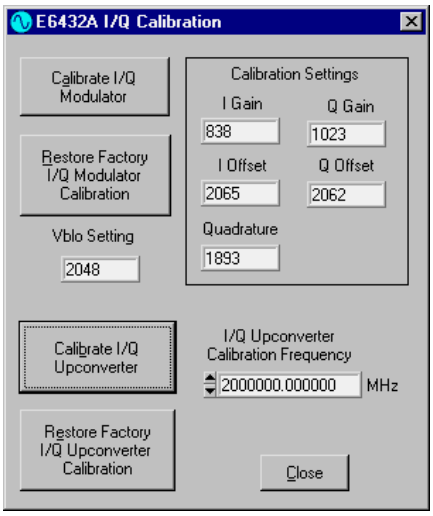
I/Q Calibration (Option UNG Only)

Configuration Dialog Box

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I/Q Calibration Dialog Box

If you would like to account for impairments in the internal I/Q modulator circuitry, it is recommended that a calibration be performed before each use, when I/Q signal levels being used have changed, or if a long period of time has elapsed since the last calibration. (For complete specifications, refer to “Specifications and Characteristics” on page 6-1.)



I/Q Calibration, available from the Pull Down Calibration Menu, is used to calibrate the I/Q Modulator and the I/Q Upconverter circuits.

Calibrate I/Q Modulator

The Calibrate I/Q Modulator button is used to run an iterative algorithm that makes corrections for the impairments within the synthesizer by adjusting the Gain, Offset, and Quadrature adjustment DACs. This calibration does not account for impairments due to external I/Q sources.

Restore Factory I/Q Modulator Calibration

The Restore Factory I/Q Modulator Calibration button can be used to return to the original factory calibration values. All values from any previous user calibrations are lost.

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Vblo Setting

The Vblo Setting is initially set to 2048 and has a range from 0 to 4095. The Vblo Setting is used to adjust the voltage bias that is applied to the mixers within the I/Q modulator assembly. Vblo has some affect on the I/Q modulator conversion loss. Some improvement may be possible, but the default setting should usually be used. Avoid values below 1000 as this can cause the mixers to become under biased and distort.

Calibration Settings

The Calibration Settings are the values in the DAC driving the I Gain, Q Gain, I Offset, Q Offset, and Quadrature (Offset) correction points.

I Gain

I Gain is used to enter compensation values for internal gain impairments in the I signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Q Gain

Q Gain is used to enter compensation values for internal gain impairments for the Q signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

I Offset

I Offset is used to enter an origin offset voltage for the in-phase portion of an I/Q signal. The value of I Offset is used to adjust out imperfections in the in-phase signal.

The level of dc offset determines the level of carrier feed-through.

Q Offset

Q Offset is used to enter an origin offset voltage for the quadrature-phase portion of an I/Q signal. The value of Q Offset is used to adjust out imperfections in the quadrature-phase signal.

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Quadrature (Offset)

Quadrature (Offset) is used to adjust the phase angle between the I and Q input vectors

When the Quadrature Skew is...	The phase angle is...
Zero	90 degrees
Positive	increases the angle from 90 degrees
Negative	decreases the angle from 90 degrees

I/Q Upconverter Calibration Frequency

The I/Q Upconverter Calibration Frequency is used to select the frequency where a calibration is performed.

Enter an **I/Q Upconverter Calibration Frequency** from 2 GHz </= 20 GHz.

The I/Q Upconverter calibration is only valid for synthesizer frequencies between 2 GHz </= 20 GHz. The I/Q Upconverter calibration cannot be used for synthesizer frequencies from 10 MHz < 2 GHz.

For synthesizer frequencies from 10 MHz < 2 GHz, a Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator, available from the pull down View menu by selecting Configuration, can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary because the I/Q Upconverter calibration controls the level accuracy.

Calibrate I/Q Upconverter

The Calibrate I/Q Upconverter button is used to run an iterative algorithm that drives the ALC modulator with a DAC while the ALC is off so that the output signal power level matches the setting selected.

The most recently run level calibration supersedes any previous level calibrations. This is because a calibration DAC is adjusted during a level calibration and depending on which level calibration is performed (IF Calibration or I/Q Upconverter Calibration), its DAC settings are used.

Restore Factory I/Q Upconverter Calibration

The Restore Factory I/Q Upconverter Calibration button can be used to return to the original factory calibration values. All values from any previous user calibrations are lost.

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Related Topics

I/Q Calibration (Option UNG Only)

Allow IF and I/Q Concurrent Operation

Power Search

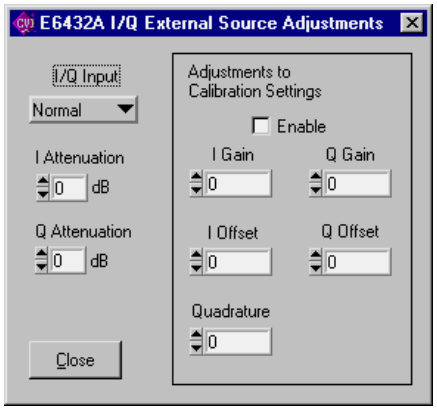
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I/Q External Source Adjustments Dialog Box

The I/Q External Source Adjustments Dialog Box is used for the following:

- Selecting the I/Q input signals for the I/Q modulator circuitry
- Adjusting the gain, offset, and quadrature of the I/Q input signals paths
- Compensating for impairments due to external I/Q source generators

From this dialog box, you can select an I/Q signal that is normal, swapped, or a test tone. You can adjust the gain of both I and Q input signals through individual attenuators, and you can apply adjustments to the calibration settings.



I/Q Input

The I/Q Input is used to select the way in which the I and Q input signals are supplied to the synthesizer's I/Q modulator circuitry.



- When set to Normal, the signal that is physically connected to the I Input on the synthesizer's hardware front panel is used as the I input signal, and the signal that is physically connected to the Q Input on the synthesizer's hardware front panel is used as the Q input signal.

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- When set to Swapped, the signal that is physically connected to the I Input on the synthesizer's hardware front panel is used as the Q input signal, and the signal that is physically connected to the Q Input on the synthesizer's hardware front panel is used as the I input signal.
- When set to Test Tone, both the I and Q inputs are connected to dc levels which produce only a carrier feed-through signal with no offset signals. This is used to verify that the I/Q modulator is functioning and to provide a known signal level at the output of the I/Q modulator (0 dBm).

I Attenuation

I Attenuation is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry. This attenuator can reduce the signal level in 2 dB steps and can be adjusted for up to 12 dB of attenuation

Changes made to I Attenuation should also be made to Q Attenuation. Usually the I and Q signal paths will have the same gain although they are individually adjustable.

Q Attenuation

Q Attenuation is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry. This attenuator can reduce the signal level in 2 dB steps and can be adjusted for up to 12 dB of attenuation.

Changes made to Q Attenuation should also be made to I Attenuation. Usually the I and Q signal paths will have the same gain although they are individually adjustable.

Adjustments to Calibration Settings

The Adjustments to Calibration Settings are only applied to an I/Q input signal when the Enable check box is selected. When enabled, the values specified for I Gain, Q Gain, I Offset, Q Offset, and Quadrature (Offset) are applied as adjustments to the calibration settings that were selected on the I/Q Calibration dialog box. These are offsets added to the calibration values.

These gain, offset, and quadrature adjustments are used to compensate for external I and Q source impairments, while the gain, offset, and quadrature settings specified by selecting the Calibrate I/Q Modulator button are used to compensate for I and Q impairments within the I/Q modulator circuitry

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I Gain

I Gain is used to enter compensation values for external source impairments from the I signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Q Gain

Q Gain is used to enter compensation values for external source impairments from the Q signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

I Offset

I Offset is used to enter an origin offset voltage for the in-phase portion of an I/Q signal. The value of I Offset is used to adjust out imperfections in the in-phase signal.

The level of dc offset determines the level of carrier feed-through.

Q Offset

Q Offset is used to enter an origin offset voltage for the quadrature-phase portion of an I/Q signal. The value of Q Offset is used to adjust out imperfections in the quadrature-phase signal.

The level of dc offset determines the level of carrier feed-through.

Quadrature (Offset)

Quadrature (Offset) is used to adjust the phase angle between the I and Q local oscillator signals.

When the Quadrature is...	The phase angle is...
Zero	90 degrees
Positive	increases the angle from 90 degrees
Negative	decreases the angle from 90 degrees

To Check the Level of the Carrier Feed-Through

1. Set the I/Q Input to Test Tone.
2. Observe the level of the signal on a spectrum analyzer.
3. Remove the input signal if present.
4. Set the I/Q Input to Normal.

The amplitude difference should be at least as good as the level specified by Origin Offset. (For complete specifications, refer to “Specifications and Characteristics” on page 6-1.)

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Related Topics

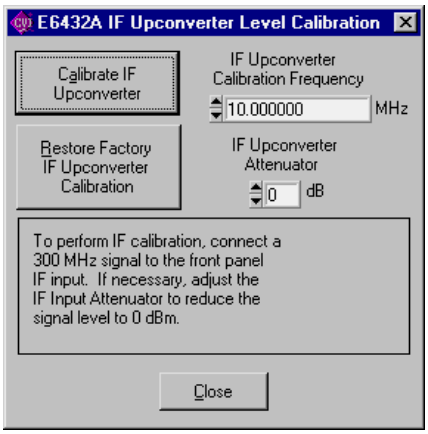
Soft Front Panel Help

I/Q Calibration (Option UNG Only)

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IF Calibration (Option 300 Only)

IF Upconverter Level Calibration, available from the Pull Down Calibration Menu, is used to calibrate the IF Upconverter. The IF Upconverter is available on instruments with Option 300 only.



Calibrate IF Upconverter

The Calibrate IF Upconverter button is used to perform the calibration at the selected frequency and attenuator settings that are specified.

Restore Factory IF Upconverter Calibration

The Restore Factory IF Upconverter Calibration button can be used to return to the original factory calibration values. All values from any previous user calibrations will be lost

IF Upconverter Calibration Frequency

The IF Upconverter Calibration Frequency is used to select the frequency where a calibration is performed.

The IF Upconverter calibration is only valid for synthesizer frequencies between 2 GHz </= 20 GHz. The IF Upconverter calibration cannot be used for synthesizer frequencies from 10 MHz < 2 GHz.

For synthesizer frequencies from 10 MHz < 2 GHz, a Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator, available from the pull down View menu by selecting Configuration, can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary.

IF Upconverter Calibration Attenuator

The IF Upconverter Calibration Attenuator is used to select the amount of attenuation to be applied to any incoming signal. This attenuation is used to adjust the incoming calibration signal to a 0 dBm level. The IF Upconverter Calibration Attenuator has a range of 0 to 30 dB in 2 dB steps.

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To perform an IF calibration

1. Connect a 300 MHz signal to the front panel IF input connector.
2. Turn on the RF Output power of the synthesizer.
3. Set the frequency that a calibration is to performed at by adjusting the IF Upconverter Calibration Frequency.
4. Set the amount of attenuation that is to be applied to the incoming signal by adjusting the IF Input Calibration Attenuator to reduce the incoming signal level to 0 dBm.

Any power level near 0 dBm (–8 dBm to + 16 dBm) can be calibrated so that the synthesizer's RF output is 0 dBm.

- If a 300 MHz signal is too low or the level of the IF Upconverter Calibration Attenuator is too high, an error is generated. (IF calibration signal is too low. Check the input and output connections and the level of the IF Upconverter Calibration Attenuator.)
- If a 300 MHz signal is too high or > 20 dBm, an error is also generated. (IF calibration signal is too high. Reduce the input power level or increase the the level of the IF Upconverter Calibration Attenuator.)

To optimize IF input intermodulation products

After performing an IF Upconverter Calibration, adjust the IF Input Calibration Attenuator to add an additional 14 dB of attenuation. Adjust the ALC power up 14 dB to compensate. The result should be the original desired output power with improved intermodulation performance. For frequencies below 2 GHz, this attenuator adjustment can be performed after a Power Search.

Related Topics

I/Q Calibration (Option UNG Only)

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4 Programming Information

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Introduction to Programming

- Selecting Functions
- Compiling and Linking Programs Using Integrated Environments
- Getting Started with Agilent VEE
- Getting Started with LabVIEW
- Getting Started with LabWindows

Selecting Functions

To identify the functions you will need in order to write your VXIplug&play programs, refer to “VXIplug&play Commands (Functional List)” on page 4-22.

Compiling and Linking Programs Using Integrated Environments

This section introduces information on how to create projects using the Microsoft Visual C++ compiler.

The example VXIplug&play programs in this Help file were developed, compiled, linked, and tested using the Microsoft Visual C++ 6.0 integrated environment.

Using Microsoft Visual C++ (32-bit compiler versions)

To compile, link, and run programs from the Microsoft Visual C++ 6.0 integrated environment, you must create a project which specifies the files necessary for Visual C++ to build the program.

1. Create a project workspace.
   a. Select File | New... | Project Workspace
   b. Set the project Type to Console Application.
   c. Specify a project Name, set the Platform to Win32, and specify a location where a project subdirectory can be created.
2. Insert the files needed to build the project.
   a. Select Insert | Files into Project...
   b. Add the application program (program.c) file and the driver library file (for example, `c:\vxipnp\winnt\lib\msc\hpe6432.lib`)

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3. Specify the VXIplug&play driver's header (.h) file location.

   a. From the menu bar, select Build | Settings | C/C++

   b. Set Category to Preprocessor

   c. In the field, `Additional include directories`, specify the path to the hpe6432.h file (for example, `c:\vxipnp\winnt\include`).

Getting Started with Agilent VEE

The 32-bit (winnt framework) Agilent Technologies E6432A driver can be used with Agilent VEE 4.0 and above. Agilent VEE 4.0 is a 32-bit version that runs on Windows NT.

To access the functions of the Agilent Technologies E6432A driver from within Agilent VEE, consult the manual Using VXIplug&play Drivers with Agilent VEE, which comes with Agilent VEE 4.0.

Using Agilent VEE 4.0 with VXIplug&play drivers provides several features that make the driver easy to use:

- Agilent VEE makes the connection to the instrument for you
- Agilent VEE handles any driver errors for you
- Agilent VEE ensures that the driver is consistent with the VXIplug&play infrastructure
- Agilent VEE makes it possible to connect driver variables to Agilent VEE variables

Getting Started with LabVIEW

The 32-bit Agilent Technologies E6432A VXIplug&play driver can be used with LabVIEW 4.0 and above. LabVIEW 4.0 is a 32-bit version of LabVIEW that runs on Windows NT 4.0.

To access the functions of the Agilent Technologies E6432A VXIplug&play driver from within LabVIEW, select File from the main menu, and select the **Convert CVI FP File** submenu item. In the file selection dialog box that appears, select `HPE6432.fp` and click on the OPEN button. LabVIEW will create a series of VI's, one per driver function. It creates a file called `HPE6432.llb` that contains these VI's. This library of VI's can then be accessed like any other VI library in LabVIEW.

To locate the `HPE6432.fp` and the `HPE6432.llb` files in your system, refer to "Folders and Files Supplied with the E6432A VXIplug&play Driver" on page 1-13.

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Getting Started with LabWindows

The 32-bit Agilent Technologies E6432A VXIplug&play driver can be used with LabWindows 5.01 and above. LabWindows 5.01 is a 32-bit version of LabWindows that runs on Windows NT 4.0.

To access the functions of the Agilent Technologies E6432A VXIplug&play driver from within LabWindows, select Instrument from the main menu, and select the **LOAD...** submenu item. In the file selection dialog box that appears, select `HPE6432.fp` and click on the OPEN button. LabWindows loads the function panel and instrument driver. The driver appears as a selection on the Instrument menu and can be treated like any LabWindows driver.

To locate the `HPE6432.fp` file in your system, refer to "Folders and Files Supplied with the E6432A VXIplug&play Driver" on page 1-13.

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Using the VXIplug&play Driver

- Instrument Addressing
- Determining the Logical Address of the Synthesizer when Set to be Auto-Configured (FF)
- Opening an Instrument Session
- Closing an Instrument Session
- Agilent Technologies VISA Data Types
- Querying the Instrument
- Events and Errors

Related Topics

Hardware and Software Requirements

Instrument Addressing

The synthesizer has a factory preset logical address of FF; this value allows the synthesizer to be “auto-configured” where the Slot 0 device assigns an address based on address availability.

- When using the Soft Front Panel, view the assigned logical address on the top bar of the dialog box.
- When using a programmable interface, refer to “Determining the Logical Address of the Synthesizer When Set to Be Auto-Configured (FF)” on page 4-8.
- When opening an instrument session using the `HPE6432_init` function, an instrument address must be specified for the function’s ViRsrc InstrDesc parameter. The instrument address is based on the logical address and on the communication interface between the computer/controller and the instrument.

  The address strings for various interface are given below. In each address, take note of the following:

- ‘INSTR’ is an Agilent Technologies VISA resource type
- `VXI0 => could be VXI0..VXI7`
- `210 => could be any available address from 1..254`

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Visual C++ Programing

```
/* VXI addressing - used when programming instruments from
the VXI backplane with either an Agilent E8491B IEEE-1394
PC Link to VXI, an Agilent E6233A, 4A, 5A VXI Embedded PC
Controller or equivalent, or a National Instrument's
VXI-MXI-2 interface. */


VXI[board]::logical address[::INSTR]
```

examples:

```
ViSession instrumentHandle;
HPE6432_init("VXI0::210::INSTR", 0, 0, &instrumentHandle);
```

or

```
#define RESOURCENAME "VXI0::210::INSTR"

ViSession instrumentHandle;
HPE6432_init(RESOURCENAME, 0, 0, &instrumentHandle);
```

Visual BASIC 6.0 Programming

```
' VXI addressing --used when programming instruments over
the VXI backplane
' with either an Agilent E8491B IEEE-1394 PC Link to VXI,
' an Agilent E6233A, 4A, 5A VXI Embedded PC Controller or
equivalent,
' or a National Instrument's VXI-MXI-2 interface. */


VXI[board]::logical address[::INSTR]
```

examples:

```
Dim instrumentHandle As Long
Dim errStatus As Long
errStatus = HPE6432_init("VXI0::210::INSTR", 0, 0,
instrumentHandle)
```


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or

```
Dim instrumentHandle As Long
Dim errStatus As Long
Dim Addr As String

Addr = "VXI0::210::INSTR"
errStatus = HPE6432_init(Addr, 0, 0, instrumentHandle)
```


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Determining the Logical Address of the Synthesizer When Set to Be Auto-Configured (FF)

- Using the Soft Front Panel, view the assigned logical address on the top bar of the dialog box.
- Using a programmable interface, the following code can be used to determine the logical address of the synthesizer:

```
// Open resource manager
if ((status = viOpenDefaultRM(&dSession)) == VI_SUCCESS) {
   // Open find for all vxi instruments
   if ((status = viFindRsrc(dSession, "?*VXI[0-9]*::?*INSTR",
      &findList, &findCount, (ViChar) &DeviceName))
      == VI_SUCCESS) {
      // for each instrument
      do {
         // Open it
         if ((status = viOpen(dSession, DeviceName,
            VI_NULL, VI_NULL, &session))
            == VI_SUCCESS) {
            // Check to see if it is an Agilent E6432
            if (viIn16(session, VI_A16_SPACE, 0,
            &manufacturer) == VI_SUCCESS
            // 0xCFFF is Agilent Technologies's ID Code
            && manufacturer == 0xCFFF
            && viIn16(session, VI_A16_SPACE, 2,
            &type) == VI_SUCCESS
            // 0x5290 is the Agilent E6432's ID Code
            && (type & 0xFFF0) == 0x5290) {
            // This is an Agilent E6432 // at address
      DeviceName.
            }
          viClose(session);
```


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```
        }
    } while (--findCount > 0
        && (status = viFindNext(findList,
        (ViChar)&DeviceName))
       == VI_SUCCESS);
    }
    viClose(dSession);
}
```

Opening an Instrument Session

To program the instrument using its VXIplug&play driver, a communication path between the computer/controller and the instrument must be opened. This path is known as an instrument session and is opened with the function:

`ViStatus HPE6432_init (ViRsrc resourceName, ViBoolean idQuery, ViBoolean reset, ViSession *instrumentHandle);`

Instruments within a VXIplug&play program are assigned a handle when the instrument session is opened. The handle, which is a pointer to the instrument, is the first parameter passed in all driver functions.

The parameters of the function `HPE6432_init` include:

`ViRsrc resourceName` – This parameter defines the address of the instrument.

`ViBoolean idQuery` – This parameter is a Boolean flag which indicates if in-system verification should be performed. Passing `VI_TRUE (1)` will perform an in-system verification, and passing `VI_FALSE (0)` will also.

`ViBoolean reset` – This parameter is a Boolean flag which indicates if the instrument should be reset when it is opened. Passing `VI_TRUE (1)` will perform a reset when the session is opened, and passing `VI_FALSE (0)` will not perform a reset.

`ViSession *instrumentHandle` – This parameter is a pointer to an instrument session, and is the handle which addresses the instrument. It is the first parameter passed in all other driver functions.

Successful completion of this function returns `VI_SUCCESS`.

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Opening a Session Using C

An example of opening a VXI session is:

```
/* open a VXI session to the instrument at logical address 210
*/
#include “visatype.h”
#include “hpe6432types.h”
#include “hpe6432errors.h”
#include “hpe6432.h”

ViSession instrumentHandle;
ViStatus errStatus;
errStatus = HPE6432_init("VXI0::210::INSTR", VI_FALSE,
VI_FALSE, &instrumentHandle);
if( VI_SUCCESS <> errStatus) {
  printf("Unable to open instrument\n");
}
```

Opening a Session Using Visual BASIC 6.0

An example of opening a session to the Agilent Technologies E6432A using Visual BASIC 6.0 is:

```
' open a VXI device session to the instrument at logical
address 210

errStatus = HPE6432_init("VXI0::210::INSTR", 0, 1, vi)

If VI_SUCCESS > errStatus Then
  errStatus = HPE6432_error_message(vi, errStatus, ErrMsg)
  msg$ = "Unable to open " + Addr + Chr$(13)
  msg$ = msg$ + "HPE6432_init() returned message: " + ErrMsg
  MsgBox msg$
  End
End If
```


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Or, the address string can be replaced by a symbolic name such as:

```
Dim resourceName as String
resourceName = "VXI0::210::INSTR"
```

Closing an Instrument Session

Sessions (`instrumentHandle`) opened with the `HPE6432_init` function are closed with the function:

```
HPE6432_close (ViSession instrumentHandle);
```

When no further communication with an instrument is required, the session must be explicitly closed (`HPE6432_close`). Agilent Technologies VISA does not remove sessions unless they are explicitly closed. Closing the instrument session frees all data structures and system resources allocated to that session.

Related Topics

HPE6432_init

HPE6432_close

Agilent Technologies VISA Data Types

The driver functions use Agilent Technologies VISA data types. Agilent Technologies VISA data types are identified by the 'Vi' prefix in the data type name (for example, ViInt16, ViUInt16, ViChar). The `visatype.h` file contains definitions of the Agilent Technologies VISA data types.

Related Topics

Hardware and Software Requirements

Querying the Instrument

The Agilent Technologies E6432A VXIplug&play driver has several functions that can be used to query the instrument. Variables to contain the data returned by the query must be of sufficient size and be declared before the function is called.

Related Topics

VXIplug&play Commands (Functional List)

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Events and Errors

Events and errors within a VXIplug&play program can be detected by polling the instrument's error queue.

Related Topics

Error Query

Errors and Failures Dialog Box

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VXIplug&play Commands (Function Prototypes)

```
ViStatus HPE6432_close (ViSession instrumentHandle);

ViStatus HPE6432_error_message (ViSession
instrumentHandle, ViStatus errorCode, ViChar
errorMessage[]);

ViStatus HPE6432_error_query (ViSession instrumentHandle,
ViStatus *errorCode, ViChar errorMessage[]);

ViStatus HPE6432_init (ViRsrc resourceName, ViBoolean
idQuery, ViBoolean reset, ViSession *instrumentHandle);

ViStatus HPE6432_readStatusByte_Q (ViSession
instrumentHandle, ViUInt16 *statusByte);

ViStatus HPE6432_reset (ViSession instrumentHandle);

ViStatus HPE6432_revision_query (ViSession
instrumentHandle, ViChar instrumentDriverRevision[],
ViChar firmwareRevision[]);

ViStatus HPE6432_self_test (ViSession instrumentHandle,
ViInt16 *selfTestResult16, ViChar selfTestMessage[]);

ViStatus HPE6432_ClearErrors (ViSession instrumentHandle);

ViStatus HPE6432_EnterCalExtDetPowerMeterReading ViSession
instrumentHandle, ViInt32 numDetCalPointsCounter, ViReal64
powerMeterReading);

ViStatus HPE6432_EnterFlatnessCalPowerMeterReadi ViSession
instrumentHandle, ViInt32 numDetCalPointsCounter, ViReal64
powerMeterReading);

ViStatus HPE6432_GenerateAndLoadExtFreqTable (ViSession
instrumentHandle,ViReal64 startDetFreqRangeHz, ViReal64
stopDetFreqRangeHz, ViReal64 stepFreqHz);

ViStatus HPE6432_GenerateManualSyncInput (ViSession
instrumentHandle);

ViStatus HPE6432_GenerateManualTriggerInput (ViSession
instrumentHandle);

ViStatus HPE6432_GetAlcBandwidth (ViSession
instrumentHandle, ViBoolean *alcBandwidth);

ViStatus HPE6432_GetAmMode (ViSession instrumentHandle,
ViBoolean *amMode);

ViStatus HPE6432_GetAmpModState (ViSession
instrumentHandle, ViBoolean *amEnable);
```


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```
ViStatus HPE6432_GetAmplitudeBlankingTime (ViSession
instrumentHandle, ViInt16 *amplitudeBlankingTime);

ViStatus HPE6432_GetAtten (ViSession instrumentHandle,
ViUInt16 *attenuation);

ViStatus HPE6432_GetAttenAuto (ViSession instrumentHandle,
ViBoolean *attenAutoEnable);

ViStatus HPE6432_GetAttenuationLimits (ViSession
instrumentHandle, ViInt16 *minAttenuation, ViInt16
*maxAttenuation);

ViStatus HPE6432_GetBlankingState (ViSession
instrumentHandle, ViBoolean *blankingEnable);

ViStatus HPE6432_GetDeepAmState (ViSession
instrumentHandle, ViBoolean *deepAMEnable);

ViStatus HPE6432_GetDwellTime (ViSession instrumentHandle,
ViReal64 *dwellTime);

ViStatus HPE6432_GetErrorQueueCount (ViSession
instrumentHandle, ViInt32 *errorQueueCount);

ViStatus HPE6432_GetExtIfInvert (ViSession
instrumentHandle, ViBoolean *ifSidebandInvert);

ViStatus HPE6432_GetExtIfState (ViSession
instrumentHandle, ViBoolean *ifEnable);

ViStatus HPE6432_GetExtSyncOutput (ViSession
instrumentHandle, ViUInt16 *syncOutFrontPanel);

ViStatus HPE6432_GetExtTriggerOutput (ViSession
instrumentHandle, ViUInt16 *trigOutFrontPanel);

ViStatus HPE6432_GetFailCount (ViSession instrumentHandle,
ViInt32 *failCount);

ViStatus HPE6432_GetFlatnessCalData (ViSession
instrumentHandle, ViInt32 signalPath, ViInt16
correctionData[]);

ViStatus HPE6432_GetFreqAlcAtten (ViSession
instrumentHandle, ViReal64 *frequency, ViReal64 *alcPower,
ViUInt16 *attenuation);

ViStatus HPE6432_GetFreqModExtSensitivity (ViSession
instrumentHandle, ViReal64 *HZperVolt);

ViStatus HPE6432_GetFreqModState (ViSession
instrumentHandle, ViBoolean *fmEnable);

ViStatus HPE6432_GetFrequencyLimits (ViSession
instrumentHandle, ViReal64 *minFrequency, ViReal64
*maxFrequency);
```


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```
ViStatus HPE6432_GetIAttenuation (ViSession
instrumentHandle, ViUInt16 *iAttenuation);

ViStatus HPE6432_GetICal (ViSession instrumentHandle,
ViUInt16 *iCalLevel);

ViStatus HPE6432_GetIGainAdjust (ViSession
instrumentHandle, ViInt16 *iGainAdjustDac);

ViStatus HPE6432_GetIGainDac (ViSession instrumentHandle,
ViUInt16 *iGainDac);

ViStatus HPE6432_GetIOffsetAdjust (ViSession
instrumentHandle, ViInt16 *iOffsetAdjustDac);

ViStatus HPE6432_GetIOffsetDac (ViSession
instrumentHandle, ViUInt16 *iOffsetDac);

ViStatus HPE6432_GetIfAtten (ViSession instrumentHandle,
ViUInt16 *ifAttenuation);

ViStatus HPE6432_GetIfLowerSidebandDac (ViSession
instrumentHandle, ViUInt16 *ifLowerSidebandDac);

ViStatus HPE6432_GetIfUpperSidebandDac (ViSession
instrumentHandle, ViUInt16 *ifUpperSidebandDac);

ViStatus HPE6432_GetInterruptFlags (ViSession
instrumentHandle, ViUInt16 *interruptFlags);

ViStatus HPE6432_GetIqAdjustState (ViSession
instrumentHandle, ViBoolean *iqAdjustmentsEnable);

ViStatus HPE6432_GetIqInput (ViSession instrumentHandle,
ViUInt16 *iqInput);

ViStatus HPE6432_GetIqModState (ViSession
instrumentHandle, ViBoolean *iqEnable);

ViStatus HPE6432_GetLastSelfTestResults (ViSession
instrumentHandle, ViInt16 selfTestType, ViUInt32
*diagResult, ViChar date[], ViChar sLogFile[]);

ViStatus HPE6432_GetLevelingPoint (ViSession
instrumentHandle, ViInt16 *levelingPoint);

ViStatus HPE6432_GetLevelingState (ViSession
instrumentHandle, ViBoolean *levelingEnable);

ViStatus HPE6432_GetListIndex (ViSession instrumentHandle,
ViInt32 *index);

ViStatus HPE6432_GetLongBlankingState (ViSession
instrumentHandle, ViBoolean *longBlankingEnable);

ViStatus HPE6432_GetLongBlankingTime (ViSession
instrumentHandle, ViInt16 *longBlankingTime);
```


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```
ViStatus HPE6432_GetNormalBlankingTime (ViSession
instrumentHandle, ViInt16 *normalBlankingTime);

ViStatus HPE6432_GetNumExtDetCalPoints (ViSession
instrumentHandle, ViReal64 startDetFreqRangeHz, ViReal64
stopDetFreqRangeHz, ViInt32 *numDetCalPoints);

ViStatus HPE6432_GetNumFlatnessCalPoints (ViSession
instrumentHandle, int signalPath, ViReal64
startDetFreqRangeHz, ViReal64 stopDetFreqRangeHz, ViReal64
lowbandStepSize, ViReal64 highbandStepSize, ViInt32
*numberOfPoints);

ViStatus HPE6432_GetOptionString (ViSession
instrumentHandle, ViChar optionString[]);

ViStatus HPE6432_GetOutputPower (ViSession
instrumentHandle, ViReal64 *outputPower);

ViStatus HPE6432_GetPowerLimits (ViSession
instrumentHandle, ViReal64 *minPower, ViReal64 *maxPower);

ViStatus HPE6432_GetPowerLimitsAtFrequency (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 *minPower,
ViReal64 *maxPower);

ViStatus HPE6432_GetPulseModState (ViSession
instrumentHandle, ViBoolean *pulseModulationEnable);

ViStatus HPE6432_GetQAttenuation (ViSession
instrumentHandle, ViUInt16 *qAttenuation);

ViStatus HPE6432_GetQCal (ViSession instrumentHandle,
ViUInt16 *qCalLevel);

ViStatus HPE6432_GetQGainAdjust (ViSession
instrumentHandle, ViUInt16 *qGainAdjustDac);

ViStatus HPE6432_GetQGainDac (ViSession instrumentHandle,
ViInt16 *qGainDac);

ViStatus HPE6432_GetQOffsetAdjust (ViSession
instrumentHandle, ViUInt16 *qOffsetAdjustDac);

ViStatus HPE6432_GetQOffsetDac (ViSession
instrumentHandle, ViInt16 *qOffsetDac);

ViStatus HPE6432_GetQuadratureAdjust (ViSession
instrumentHandle, ViUInt16 *quadratureAdjustDac);

ViStatus HPE6432_GetQuadratureDac (ViSession
instrumentHandle, ViInt16 *quadratureDac);

ViStatus HPE6432_GetRefSource (ViSession instrumentHandle,
ViBoolean *reference10MHz);

ViStatus HPE6432_GetRfOutputState (ViSession
instrumentHandle, ViBoolean *rfOutputEnable);
```


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```
ViStatus HPE6432_GetSerialNumber (ViSession
instrumentHandle, ViChar serialNumber[]);

ViStatus HPE6432_GetSettlingTime (ViSession
instrumentHandle, ViReal64 *settlingTime);

ViStatus HPE6432_GetSyncInput (ViSession instrumentHandle,
ViUInt16 *syncInSource);

ViStatus HPE6432_GetSyncOutState (ViSession
instrumentHandle, ViBoolean *syncOutEnable);

ViStatus HPE6432_GetTriggerInput (ViSession
instrumentHandle, ViUInt16 *trigInSource);

ViStatus HPE6432_GetUserBlankingState (ViSession
instrumentHandle, ViBoolean *userBlankingEnable);

ViStatus HPE6432_GetVbloDac (ViSession instrumentHandle,
ViUInt16 *vbloDac);

ViStatus HPE6432_GetVxiSyncOutput (ViSession
instrumentHandle, ViUInt16 *syncOutVXIBackplane);

ViStatus HPE6432_GetVxiTriggerOutput (ViSession
instrumentHandle, ViUInt16 *trigOutVXIBackplane);

ViStatus HPE6432_IfUpconverterLevelCalibrate (ViSession
instrumentHandle);

ViStatus HPE6432_IfUpconverterRestoreFactoryCal ViSession
instrumentHandle);

ViStatus HPE6432_IqCalibrate (ViSession instrumentHandle);

ViStatus HPE6432_IqRestoreFactoryCal (ViSession
instrumentHandle);

ViStatus HPE6432_IqUpconverterLevelCalibrate (ViSession
instrumentHandle, ViReal64 calFrequency);

ViStatus HPE6432_IqUpconverterRestoreFactoryCal ViSession
instrumentHandle);

ViStatus HPE6432_IsListRunning (ViSession
instrumentHandle, ViBoolean *runningStatus);

ViStatus HPE6432_PowerSearch (ViSession instrumentHandle,
ViReal64 frequency, ViReal64 alcPower, ViUInt16
*alcOffset);

ViStatus HPE6432_PutFlatnessCalData (ViSession
instrumentHandle, ViInt32 signalPath, ViInt16
correctionData[]);

ViStatus HPE6432_ReadHwState (ViSession instrumentHandle,
ViUInt16 *hardwareState);
```


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```
ViStatus HPE6432_ReadInterruptHwState (ViSession
instrumentHandle, ViUInt16 *interruptHardwareState);

ViStatus HPE6432_ReadListData (ViSession instrumentHandle,
ViUInt32 startingPoint, ViUInt32 numberOfPoints, ViInt32
listPointData[]);

ViStatus HPE6432_ResetExtDetCalData (ViSession
instrumentHandle);

ViStatus HPE6432_RunList (ViSession instrumentHandle,
ViUInt32 startingPoint, ViUInt32 numberOfPoints, ViUInt32
featureBits);

ViStatus HPE6432_RunListAbort (ViSession
instrumentHandle);

ViStatus HPE6432_SelfTest (ViSession instrumentHandle,
ViInt16 selfTestType, ViUInt32 *selfTestResult32, ViChar
sLogFile[]);

ViStatus HPE6432_SetActiveVxiInt (ViSession
instrumentHandle, ViUInt16 selectedVXIInterrupt);

ViStatus HPE6432_SetAlcAtten (ViSession instrumentHandle,
ViReal64 alcPower, ViUInt16 attenuation);

ViStatus HPE6432_SetAlcBandwidth (ViSession
instrumentHandle, ViBoolean alcBandwidth);

ViStatus HPE6432_SetAmMode (ViSession instrumentHandle,
ViBoolean amMode);

ViStatus HPE6432_SetAmpModState (ViSession
instrumentHandle, ViBoolean amEnable);

ViStatus HPE6432_SetAmplitudeBlankingTime (ViSession
instrumentHandle, ViInt16 amplitudeBlankingTime);

ViStatus HPE6432_SetAtten (ViSession instrumentHandle,
ViUInt16 attenuation);

ViStatus HPE6432_SetAttenAuto (ViSession instrumentHandle,
ViBoolean attenAutoEnable);

ViStatus HPE6432_SetBlankingState (ViSession
instrumentHandle, ViBoolean blankingEnable);

ViStatus HPE6432_SetDeepAmState (ViSession
instrumentHandle, ViBoolean deepAMEnable);

ViStatus HPE6432_SetDwellTime (ViSession instrumentHandle,
ViReal64 dwellTime);

ViStatus HPE6432_SetExtIfInvert (ViSession
instrumentHandle, ViBoolean ifSidebandInvert);
```


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```
ViStatus HPE6432_SetExtIfState (ViSession
instrumentHandle, ViBoolean ifEnable);

ViStatus HPE6432_SetExtSyncOutput (ViSession
instrumentHandle, ViUInt16 syncOutFrontPanel);

ViStatus HPE6432_SetExtTriggerOutput (ViSession
instrumentHandle, ViUInt16 trigOutFrontPanel);

ViStatus HPE6432_SetFreqAlcAtten (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 alcPower,
ViUInt16 attenuation);

ViStatus HPE6432_SetFreqAlcAttenBit (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 alcPower,
ViUInt16 attenuation, ViUInt16 featureBits, ViUInt16
alcOffset);

ViStatus HPE6432_SetFreqModExtSensitivity (ViSession
instrumentHandle, ViReal64 HZperVolt);

ViStatus HPE6432_SetFreqModState (ViSession
instrumentHandle, ViBoolean fmEnable);

ViStatus HPE6432_SetFrequency (ViSession instrumentHandle,
ViReal64 frequency);

ViStatus HPE6432_SetIAttenuation (ViSession
instrumentHandle, ViUInt16 iAttenuation);

ViStatus HPE6432_SetICal (ViSession instrumentHandle,
ViUInt16 iCalLevel);

ViStatus HPE6432_SetIGainAdjust (ViSession
instrumentHandle, ViUInt16 iGainAdjustDac);

ViStatus HPE6432_SetIGainDac (ViSession instrumentHandle,
ViUInt16 iGainDac);

ViStatus HPE6432_SetIOffsetAdjust (ViSession
instrumentHandle, ViInt16 iOffsetAdjustDac);

ViStatus HPE6432_SetIOffsetDac (ViSession
instrumentHandle, ViUInt16 iOffsetDac);

ViStatus HPE6432_SetIfAtten (ViSession instrumentHandle,
ViUInt16 ifAttenuation);

ViStatus HPE6432_SetIqAdjustState (ViSession
instrumentHandle, ViBoolean iqAdjustmentsEnable);

ViStatus HPE6432_SetIqInput (ViSession instrumentHandle,
ViUInt16 iqInput);

ViStatus HPE6432_SetIqModState (ViSession
instrumentHandle, ViBoolean iqEnable);
```


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```
ViStatus HPE6432_SetLevelingPoint (ViSession
instrumentHandle, ViInt16 levelingPoint);

ViStatus HPE6432_SetLevelingState (ViSession
instrumentHandle, ViBoolean levelingEnable);

ViStatus HPE6432_SetLongBlankingState (ViSession
instrumentHandle, ViBoolean longBlankingEnable);

ViStatus HPE6432_SetLongBlankingTime (ViSession
instrumentHandle, ViInt16 longBlankingTime);

ViStatus HPE6432_SetNormalBlankingTime (ViSession
instrumentHandle, ViInt16 normalBlankingTime);

ViStatus HPE6432_SetOutputPower (ViSession
instrumentHandle, ViReal64 outputPower);

ViStatus HPE6432_SetPulseModState (ViSession
instrumentHandle, ViBoolean pulseModulationEnable);

ViStatus HPE6432_SetQAttenuation (ViSession
instrumentHandle, ViUInt16 qAttenuation);

ViStatus HPE6432_SetQCal (ViSession instrumentHandle,
ViUInt16 qCalLevel);

ViStatus HPE6432_SetQGainAdjust (ViSession
instrumentHandle, ViInt16 qGainAdjustDac);

ViStatus HPE6432_SetQGainDac (ViSession instrumentHandle,
ViUInt16 qGainDac);

ViStatus HPE6432_SetQOffsetAdjust (ViSession
instrumentHandle, ViInt16 qOffsetAdjustDac);

ViStatus HPE6432_SetQOffsetDac (ViSession
instrumentHandle, ViUInt16 qOffsetDac);

ViStatus HPE6432_SetQuadratureAdjust (ViSession
instrumentHandle, ViInt16 quadratureAdjustDac);

ViStatus HPE6432_SetQuadratureDac (ViSession
instrumentHandle, ViUInt16 quadratureDac);

ViStatus HPE6432_SetRefSource (ViSession instrumentHandle,
ViBoolean reference10MHz);

ViStatus HPE6432_SetRfOutputState (ViSession
instrumentHandle, ViBoolean rfOutputEnable);

ViStatus HPE6432_SetSettlingTime (ViSession
instrumentHandle, ViReal64 settlingTime);

ViStatus HPE6432_SetSyncInput (ViSession instrumentHandle,
ViUInt16 syncInSource);

ViStatus HPE6432_SetSyncOutState (ViSession
instrumentHandle, ViBoolean syncOutEnable);
```


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```
ViStatus HPE6432_SetTriggerInput (ViSession
instrumentHandle, ViUInt16 trigInSource);

ViStatus HPE6432_SetUserBlankingState (ViSession
instrumentHandle, ViBoolean userBlankingEnable);

ViStatus HPE6432_SetVbloDac (ViSession instrumentHandle,
ViUInt16 vbloDac);

ViStatus HPE6432_SetVxiSyncOutput (ViSession
instrumentHandle, ViUInt16 syncOutVXIBackplane);

ViStatus HPE6432_SetVxiTriggerOutput (ViSession
instrumentHandle, ViUInt16 trigOutVXIBackplane);

ViStatus HPE6432_SetupCalExtDetPoint (ViSession
instrumentHandle, ViInt32 numDetCalPointsCounter);

ViStatus HPE6432_SetupFlatnessCalPoint (ViSession
instrumentHandle, ViReal64 *frequency, ViReal64 *power,
ViUInt16 *attenuation);

ViStatus HPE6432_WaitForSettled (ViSession
instrumentHandle, ViInt16 disableErrorHandling);

ViStatus HPE6432_WriteFlatnessCalData (ViSession
instrumentHandle, ViInt32 signalPath);

ViStatus HPE6432_WriteListData (ViSession
instrumentHandle, ViUInt32 startingPoint, ViUInt32
numberOfPoints, ViInt32 listPointData[]);

ViStatus HPE6432_WriteListPoint (ViSession
instrumentHandle, ViUInt32 startingPoint, ViReal64
frequency, ViReal64 alcPower, ViUInt16 attenuation,
ViUInt16 featureBits, ViUInt16 alcOffset);

ViStatus HPE6432_WriteListPoints (ViSession
instrumentHandle, ViUInt32 startingPoint, ViReal64
frequency[], ViReal64 alcPower[], ViInt16 attenuation[],
ViInt16 featureBits[], ViInt16 alcOffset[], ViUInt32
numberOfPoints);
```


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VXIplug&play Commands (Functional List)

Overview

In this section you will learn about:

- detailed information on each VXIplug&play driver function

Use this section as a programming reference guide. All available VXIplug&play functions are described. The functions are grouped according to their functionality, with a description of the function and its C syntax, a description of each parameter, and a list of possible error codes. The left-hand column is a list of descriptive names and the right-hand column is the name of the actual function call. For a list of these functions in alphabetical order, refer to the table of contents at the front of this book.

Functions are listed in the following groups:

- Session Control Functions
- RF Output Functions
- RF Output Non-List Functions
- ALC Functions
- Modulation Functions
  - — AM Functions
  - — FM Functions
  - — Pulse Functions
  - — IF Functions
  - — I/Q Functions
- List Functions
- Input Trigger Functions
- Output Trigger Functions
- Utility/Service Functions
- External Detector Functions
- Flatness Calibration Functions

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Session Control Functions

Initialize	HPE6432_init
Close	HPE6432_close
Reset	HPE6432_reset
	*RST

RF Output Functions

Set RF Output (On/Off)	HPE6432_SetRfOutputState
	OUTPut[:STATe](0|OFF|1|ON)
Get RF Output (On/Off)	HPE6432_GetRfOutputState
	OUTPut[:STATe]?
Set Freq, ALC, Atten, Bit	HPE6432_SetFreqAlcAttenBit
Set Freq, ALC, Atten	HPE6432_SetFreqAlcAtten
	OUTPut:VECTor(Freq,AlcPower,Atten)
Get Freq, ALC, Atten	HPE6432_GetFreqAlcAtten
	OUTPut:VECTor?
Set Frequency	HPE6432_SetFrequency
	[SOURce:]FREQuency(value)
Set ALC, Atten	HPE6432_SetAlcAtten
	[SOURce:]POWer:VECTor(AlcPower,Atten)
Set Output Power	HPE6432_SetOutputPower
	[SOURce:]POWer[:LEVel](value)
Get Output Power	HPE6432_GetOutputPower
	SOURce:POWer?
Set Attenuator Auto (On/Off)	HPE6432_SetAttenAuto
	[SOURce:]POWer:ATTenuation:AUTO (0|OFF|1|ON)
Get Attenuator Auto (On/Off)	HPE6432_GetAttenAuto
	[SOURce:]POWer:ATTenuation:AUTO?
Set Attenuator	HPE6432_SetAtten
	[SOURce:]POWer:ATTenuation (0 to 70 in 10db steps)
Get Attenuator	HPE6432_GetAtten
	[SOURce:]POWer:ATTenuation?

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Power Search	HPE6432_PowerSearch [SOURce:]POWer:SEARch? (frequency, power)
Set Reference Source (Int/Ext)	HPE6432_SetRefSource [SOURce:]ROSCillator:SOURce(INT|EXT)
Get Reference Source (Int/Ext)	HPE6432_GetRefSource [SOURce:]ROSCillator:SOURce?
Set Dwell Time	HPE6432_SetDwellTime LIST:DWELl(value)
Get Dwell Time	HPE6432_GetDwellTime LIST:DWELl?
Set Settling Time	HPE6432_SetSettlingTime LIST:SETTling(value)
Get Settling Time	HPE6432_GetSettlingTime LIST:SETTling?

RF Output Non-List Functions

Set Sync Out (On/Off)	HPE6432_SetSyncOutState OUTPut:SYNC[:STATe](0|OFF|1|ON)
Get Sync Out (On/Off)	HPE6432_GetSyncOutState OUTPut:SYNC[:STATe]?
Set Blanking (On/Off)	HPE6432_SetBlankingState OUTPut:BLANking[:STATe](0|OFF|1|ON)
Get Blanking (On/Off)	HPE6432_GetBlankingState OUTPut:BLANking[:STATe]?
Set Long Blanking (On/Off)	HPE6432_SetLongBlankingState OUTPut:BLANking:LONG[:STATe](0|OFF|1|ON)
Get Long Blanking (On/Off)	HPE6432_GetLongBlankingState OUTPut:BLANking:LONG[:STATe]?

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User Blanking Functions

Set User Blanking (On/Off)	HPE6432_SetUserBlankingState OUTPut:BLANking:USER[:STATe](0|OFF|1|ON)
Get User Blanking (On/Off)	HPE6432_GetUserBlankingState OUTPut:BLANking:USER[:STATe]?
Set Normal Blanking Time	HPE6432_SetNormalBlankingTime OUTPut:BLANking:TIME (value 20-1023)
Get Normal Blanking Time	HPE6432_GetNormalBlankingTime OUTPut:BLANking:TIME?
Set Long Blanking Time	HPE6432_SetLongBlankingTime OUTPut:BLANking:LONG:TIME (value 20-1023)
Get Long Blanking Time	HPE6432_GetLongBlankingTime OUTPut:BLANking:LONG:TIME?
Set Amplitude Blanking Time	HPE6432_SetAmplitudeBlankingTime OUTPut:BLANking:AMPLitude:TIME (value 20-1023)
Get Amplitude Blanking Time	HPE6432_GetAmplitudeBlankingTime OUTPut:BLANking:AMPLitude:TIME?

ALC Functions

Set Leveling (On/Off)	HPE6432_SetLevelingState [SOURce:]POWer:ALC:STATe(0|OFF|1|ON)
Get Leveling (On/Off)	HPE6432_GetLevelingState [SOURce:]POWer:ALC:STATe?
Set Leveling Point (Int/Ext)	HPE6432_SetLevelingPoint [SOURce:]POWer:ALC:SOURce (INTernal|EXTernal)
Get Leveling Point (Int/Ext)	HPE6432_GetLevelingPoint [SOURce:]POWer:ALC:SOURce?
Set Bandwidth (High/Low)	HPE6432_SetAlcBandwidth [SOURce:]POWer:ALC:BWIDth(WIDE|NARRow)
Get Bandwidth (High/Low)	HPE6432_GetAlcBandwidth [SOURce:]POWer:ALC:BWIDth?

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Modulation Functions

AM Functions

Set AM (On/Off)	HPE6432_SetAmModState [SOURce:]AM[:STATe](0|OFF|1|ON)
Get AM (On/Off)	HPE6432_GetAmpModState [SOURce:]AM[:STATe]?
Set Deep AM (On/Off)	HPE6432_SetDeepAmState [SOURce:]AM:DEEP[:STATe](0|OFF|1|ON)
Get Deep AM (On/Off)	HPE6432_GetDeepAmState [SOURce:]AM:DEEP[:STATe]?
Set AM Mode (LIN/EXP)	HPE6432_SetAmMode [SOURce:]AM:TYPE(LINear|EXPonential)
Get AM Mode (LIN/EXP)	HPE6432_GetAmMode [SOURce:]AM:TYPE?

FM Functions

Set FM (On/Off)	HPE6432_SetFreqModState [SOURce:]FM[:STATe](0|OFF|1|ON)
Get FM (On/Off)	HPE6432_GetFreqModState [SOURce:]FM[:STATe]?
Set FM External Sensitivity	HPE6432_SetFreqModExtSensitivity
Get FM External Sensitivity	HPE6432_GetFreqModExtSensitivity

Pulse Functions

Set Pulse Modulation (On/Off)	HPE6432_SetPulseModState [SOURce:]PULM[:STATe](0|OFF|1|ON)
Get Pulse Modulation (On/Off)	HPE6432_GetPulseModState [SOURce:]PULM[:STATe]?

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IF Functions

Set IF (On/Off)	HPE6432_SetExtIfState [SOURce:]IF:STATe (0|OFF|1|ON)
Get IF (On/Off)	HPE6432_GetExtIfState [SOURce:]IF:STATe?
Calibrate IF Upconverter	HPE6432_IfUpconverterLevelCalibrate CALibrate:IF:UPConverter (IF_Attenuation, Frequency)
Restore Factory IF Upconvt Cal	HPE6432_IfUpconverterRestoreFactoryCal CALibrate:IF:UPConverter:FACTory
Set IF Sideband (Normal/Invert)	HPE6432_SetExtIfInvert [SOURce:]IF:INVert (0|OFF|1|ON)
Get IF Sideband (Normal/Invert)	HPE6432_GetExtIfInvert [SOURce:]IF:INVert?
Set IF Attenuation	HPE6432_SetIfAtten [SOURce:]IF:ATTenuation (0 to 30 in 2 db steps)
Get IF Attenuation	HPE6432_GetIfAtten [SOURce:]IF:ATTenuation?
Get IF Upper Sideband DAC	HPE6432_GetIfUpperSidebandDac
Get IF Lower Sideband DAC	HPE6432_GetIfLowerSidebandDac

I/Q Functions (Option UNG Only)

Set I/Q (On/Off)	HPE6432_SetIqModState [SOURce:]IQ[:STATe] (0 | OFF | 1 | ON)
Get I/Q (On/Off)	HPE6432_GetIqModState [SOURce:]IQ[:STATe]?

I/Q Modulator Calibration Functions (Option UNG Only)

Calibrate I/Q Modulator	HPE6432_IqCalibrate CALibrate:IQ
Restore Factory I/Q Mod Cal	HPE6432_IqRestoreFactoryCal CALibrate:IQ:FACTory

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Set Vblo Setting DAC	HPE6432_SetVbloDac
Get Vblo Setting DAC	HPE6432_GetVbloDac
Set I Gain DAC	HPE6432_SetIGainDac
Get I Gain DAC	HPE6432_GetIGainDac
Set Q Gain DAC	HPE6432_SetQGainDac
Get Q Gain DAC	HPE6432_GetQGainDac
Set I Offset DAC	HPE6432_SetIOffsetDac
Get I Offset DAC	HPE6432_GetIOffsetDac
Set Q Offset DAC	HPE6432_SetQOffsetDac
Get Q Offset DAC	HPE6432_GetQOffsetDac
Set Quadrature DAC	HPE6432_SetQuadratureDac
Get Quadrature DAC	HPE6432_GetQuadratureDac

I/Q Upconverter Calibration (Option UNG Only)

Calibrate I/Q Upconverter	HPE6432_IqUpconverterLevelCalibrate CALibrate:IQ:UPConverter (Frequency)
Restore Factory I/Q Upconvt Cal	HPE6432_IqUpconverterRestoreFactoryCal CALibrate:IQ:UPConverter:FACTory

I/Q External Source Adjustments (Option UNG Only)

Set Input (Normal/Swapped/Tone)	HPE6432_SetIqInput [SOURce:]IQ:INPut (NORMal | SWAPped | CALibration)
Get Input (Normal/Swapped/Tone)	HPE6432_GetIqInput [SOURce:]IQ:INPut?
Set I Cal (Test Tone Level)	HPE6432_SetICal
Get I Cal (Test Tone Level)	HPE6432_GetICal
Set Q Cal (Test Tone Level)	HPE6432_SetQCal
Get Q Cal (Test Tone Level)	HPE6432_GetQCal
Set I Attenuation	HPE6432_SetIAttenuation
Get I Attenuation	HPE6432_GetIAttenuation
Set Q Attenuation	HPE6432_SetQAttenuation
Get Q Attenuation	HPE6432_GetQAttenuation

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Set Adjustments to Cal (On/Off)	HPE6432_SetIqAdjustState
Get Adjustments to Cal (On/Off)	HPE6432_GetIqAdjustState
Set I Gain Adjustment DAC	HPE6432_SetIGainAdjust [SOURce:]IQ:ADJust:IGAin (value)
Get I Gain Adjustment DAC	HPE6432_GetIGainAdjust [SOURce:]IQ:ADJust:IGAin?
Set Q Gain Adjustment DAC	HPE6432_SetQGainAdjust [SOURce:]IQ:ADJust:QGAin (value)
Get Q Gain Adjustment DAC	HPE6432_GetQGainAdjust [SOURce:]IQ:ADJust:QGAin?
Set I Offset Adjustment DAC	HPE6432_SetIOffsetAdjust [SOURce:]IQ:ADJust:IOFFset (value)
Get I Offset Adjustment DAC	HPE6432_GetIOffsetAdjust [SOURce:]IQ:ADJust:IOFFset?
Set Q Offset Adjustment DAC	HPE6432_SetQOffsetAdjust [SOURce:]IQ:ADJust:QOFFset (value)
Get Q Offset Adjustment DAC	HPE6432_GetQOffsetAdjust [SOURce:]IQ:ADJust:IOFFset?
Set Quadrature Adjustment DAC	HPE6432_SetQuadratureAdjust [SOURce:]IQ:ADJust:QUADrature (value)
Get Quadrature Adjustment DAC	HPE6432_GetQuadratureAdjust [SOURce:]IQ:ADJust:QUADrature?

List Functions

Write List Point	HPE6432_WriteListPoint LIST:VECTor (Point,Frequency,AlcPower,Attenuation, FeatureBits,AlcOffset)
Write List Points	HPE6432_WriteListPoints
Write List Data	HPE6432_WriteListData
Read List Data	HPE6432_ReadListData

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Run List	HPE6432_RunList INITiate[:IMMediate] Uses the current setting of: INITiate:CONTinuous(0|OFF|1|ON) INITiate:CONTinuous? LIST:POINts(value) LIST:POINTs? LIST:SETTling:BIT[:ENABle](0|OFF|1|ON) LIST:SETTling:BIT[:ENABle]? LIST:STARt[:POINt](value) LIST:STARt[:POINt]? LIST:SYNC:BIT[:ENABle](0|OFF|1|ON) LIST:SYNC:BIT[:ENABle]? LIST:SYNC:INPut:MODE(STARt|RESTart|BOTH) LIST:SYNC:INPut:MODE? LIST:TRIGger:INPut:MODE(POINt|LIST) LIST:TRIGger:INPut:MODE?
Run List Abort	HPE6432_RunListAbort ABORt
Is List Running	HPE6432_IsListRunning LIST:RUNNing?
Get List Index	HPE6432_GetListIndex LIST:INDex?
Clear List	HPE6432_ClearList LIST:CLEAr

Input Trigger Functions

Set Trigger In (Source)	HPE6432_SetTriggerInput LIST:TRIGger:INPut:SOURce(AUTO|POSitive|NEGative|SOFTware|VXI0-7)
Get Trigger In (Source)	HPE6432_GetTriggerInput LIST:TRIGger:INPut:SOURce?
Generate Manual Trigger In	HPE6432_GenerateManualTriggerInput LIST:TRIGger:INPut[:IMMediate]

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Set Sync In (Source)	HPE6432_SetSyncInput
	LIST:SYNC:INPut:SOURce(AUTO|POSitive|NEGative|SOFTware|VXI0-7)
Get Sync In (Source)	HPE6432_GetSyncInput
	LIST:SYNC:INPut:SOURce?
Generate Manual Sync In	HPE6432_GenerateManualSyncInput
	LIST:SYNC:INPut[:IMMediate]

Output Trigger Functions

Set Trigger Out - Front Panel	HPE6432_SetExtTriggerOutput
	LIST:TRIGger:OUTPut:EXTernal(OFF|POSitive|NEGative)
Get Trigger Out - Front Panel	HPE6432_GetExtTriggerOutput
	LIST:TRIGger:OUTPut:EXTernal?
Set Trigger Out - VXI Backplane	HPE6432_SetVxiTriggerOutput
	LIST:TRIGger:OUTPut:VXI(OFF|VXI0-7)
Get Trigger Out - VXI Backplane	HPE6432_GetVxiTriggerOutput
	LIST:TRIGger:OUTPut:VXI?
Set Sync Out - Front Panel	HPE6432_SetExtSyncOutput
	LIST:SYNC:OUTPut:EXTernal (OFF|POSitive|NEGative)
Get Sync Out - Front Panel	HPE6432_GetExtSyncOutput
	LIST:SYNC:OUTPut:EXTernal?
Set Sync Out - VXI Backplane	HPE6432_SetVxiSyncOutput
	LIST:SYNC:OUTPut:VXI(OFF|VXI0-7)
Get Sync Out - VXI Backplane	HPE6432_GetVxiSyncOutput
	LIST:SYNC:OUTPut:VXI?
Wait for Settled	HPE6432_WaitForSettled
	SOURce:Settled?

Utility/Service Functions

Self-Test (VXIplug&play)	HPE6432_self_test
	*TST?
Self-Test (Full/Quick)	HPE6432_SelfTest
Get Last Self-Test Results	HPE6432_GetLastSelfTestResults

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Error Query	HPE6432_error_query SYSTem:ERRor?
Error Message	HPE6432_error_message
Clear Error Queue	HPE6432_ClearErrors *CLS
Get Error Queue Count	HPE6432_GetErrorQueueCount
Get Serial Number	HPE6432_GetSerialNumber *IDN?
Get Option String	HPE6432_GetOptionString SYSTem:OPTion?
Revision Query	HPE6432_revision_query *IDN?
Set Active VXI Interrupt (1-7)	HPE6432_SetActiveVxiInt
Get Interrupt Flags	HPE6432_GetInterruptFlags SYSTem:HARDware:FLAGs?
Read Status Byte Query	HPE6432_readStatusByte_Q SCPI STATus: commands include bits for Unlocked,Unleveled, List Running, and Self Test Failed.
Read Hardware State	HPE6432_ReadHwState
HPE6432_ReadHwState	HPE6432_ReadHwState SYSTem:HARDware:STATe?
Get Frequency Limits	HPE6432_GetFrequencyLimits [SOURce:]FREQuency:LIMits?
Get Power Limits	HPE6432_GetPowerLimits [SOURce:]POWer:LIMits?
Get Power Limits At Frequency	HPE6432_GetPowerLimitsAtFrequency
Get Attenuation Limits	HPE6432_GetAttenuationLimits [SOURce:]POWer:ATTenuation:LIMits?

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External Detector Functions

Generate/Load Ext Freq Table	HPE6432_GenerateAndLoadExtFreqTable
	CALibrate:EXTernal:MODulator[:INITiate](StartFreq,StopFreq,Step)
Get Number Ext Det Cal Points	HPE6432_GetNumExtDetCalPoints
	CALibrate:EXTernal:DETector:POINts?(StartFreq,StopFreq)
Setup Cal Ext Det Point	HPE6432_SetupCalExtDetPoint
	CALibrate:EXTernal:DETector:SETup(Point)
Enter Cal Ext Det Power Reading	HPE6432_EnterCalExtDetPowerMeterReading
	CALibrate:EXTernal:DETector:POWer(Point,PowerMeterReading)
Reset Ext Det Cal Data	HPE6432_ResetExtDetCalData
	CALibrate:EXTernal:DETector:RESet

Flatness Calibration Functions

Get Number Flatness Cal Points	HPE6432_GetNumFlatnessCalPoints
	CALibrate:FLATness:INITialize:POINts? (THRU | ATT10 | ATT20 | ATT30 | ATT40 | ATT50 | ATT60 | ATT70 | EXT1 | EXT2, StartFreq, StopFreq, LowStep, HighStep)
	CALibrate:FLATness:ZERO (THRU | ATT10 | ATT20 | ATT30 | ATT40 | ATT50 | ATT60 | ATT70 |EXT1 | EXT2)
Setup Flatness Cal Point	HPE6432_SetupFlatnessCalPoint
Enter Flatness Cal Reading	HPE6432_EnterFlatnessCalReading
	CALibrate:FLATness:NEXT? (PMReading)
Write Flatness Cal Data	HPE6432_WriteFlatnessCalData
	CALibrate:FLATness:WRITe (EXT1 | EXT2)
Get Flatness Cal Data	HPE6432_GetFlatnessCalData
	CALibrate:FLATness:DATA? (THRU | ATT10 | ATT20 | ATT30 | ATT40 | ATT50 | ATT60 | ATT70 |EXT1 | EXT2)
Put Flatness Cal Data	HPE6432_PutFlatnessCalData

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Alphabetical List of VXIplug&play Commands

HPE6432_ClearErrors

```
ViStatus HPE6432_ClearErrors (ViSession instrumentHandle);
```

Purpose

This function can be used to clear the errors from the synthesizer's error queue.

The synthesizer can generate a list of error-code and fail-code messages.

- Error-Code Messages- If the synthesizer produces an error-code message, insight is provided to the user about what could be going wrong.
- Fail-Code Messages- If the synthesizer produces a fail-code message, a hardware failure is being reported and the synthesizer must be repaired. These messages begin with the word FAIL and cannot be cleared using the `HPE6432_ClearErrors` or `HPE6432_error_query` functions.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Read and Clear Error Queue

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_ClearList

```
ViStatus HPE6432_ClearList (ViSession instrumentHandle);
```

Purpose

This function sets every point in list point memory to minimum frequency and power with maximum attenuation. If your synthesizer does not have a step attenuator, the attenuation setting has no effect.

For minimum and maximum frequency, power, and attenuation levels in your synthesizer, refer to "Specifications and Characteristics" on page 6-1.

TIP This function can be used to clear a user list from list point memory so that another user can not gain access to it.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value reports the status of the `Clear List` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Reset

Write List Point

Write List Points

Write List Data

Read List Data

Run List

Run List Abort

Is List Running

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HPE6432_close

```
ViStatus HPE6432_close (ViSession instrumentHandle);
```

Purpose

This function performs the following operations:

- closes the instrument I/O session
- destroys the instrument driver session and all of its attributes
- deallocates system resources including any memory resources the instrument driver uses

NOTE After calling the `Close` function, the `Initialize` function must be called before the instrument driver can be used again.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value reports the status of the `Close` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

Initialize

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_EnterCalExtDetPowerMeterReading

```
ViStatus HPE6432_EnterCalExtDetPowerMeterReading (ViSession
instrumentHandle, ViInt32 numberDetCalPointsCounter,
ViReal64 powerMeterReading);
```

Purpose

This function is passed two input parameters that allows the synthesizer to compute the linearization calibration for the specific frequency point using the actual power meter reading at that point.

There are three VXIplug&play functions used to accomplish the external detector linearization calibration for an external leveling loop configuration:

- `HPE6432_GetNumExtDetCalPoints`
- `HPE6432_SetupCalExtDetPoint`
- `HPE6432_EnterCalExtDetPowerMeterReading`

NOTE For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

The user first queries for the number of Calibration Points that must be taken using the `HPE6432_GetNumExtDetCalPoints` function. This function requires the user to pass the operating range of their current external leveling loop configuration's start and stop frequency in Hertz. This routine calculates the number of external leveling loop configuration calibration points required for this operation range. The user repeats the following process using this return value as the number of repetitions. Within the loop, they call the setup routine (HPE6432_SetupCalExtDetPoint) to configure the synthesizer for the current calibration point. Once configured, the user must supply their own power meter reading utility that reads the value at the power meter for the current configuration. Next, they call the `HPE6432_EnterCalExtDetPowerMeterReading` function to enter the power meter reading value. Once the last point is entered, the function completes the calibration and stores the calibrated values within the synthesizer flash memory, thus completing the calibration process.

If an invalid start or stop frequency for the external leveling loop configuration is passed to the function, the

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ERR_ARG_OUT_OF_RANGE error flag is returned. This flag is also returned if the functions are called with a detector point identifier out of the valid range.

If the calibration functions are not called in the proper order, the ERR_INVALID_EXT_DET_CAL_ORDER error is returned. The proper order is defined by the loop indicator parameter that is sent to the routine and used to configure the system for calibration, and the other parameter is used to enter the power meter reading.

The following example code demonstrates the external detector linearization calibration functions:

```
ViReal64 startDetFreqRangeHz, stopDetFreqRangeHz;

ViInt32 numDetCalPoints;

ViReal64 powerMeterReading;

HPE6432_GetNumExtDetCalPoints

  startDetFreqRangeHz
  stopDetFreqRangeHz,
  &numDetCalPoints

);


for ( int loop=1; loop <= numDetCalPoints; loop++ ) {
  HPE6432_SetupCalExtDetPoint(loop);
  /* The customer supplies the ReadPowerMeter() function. */
  ReadPowerMeter(&powerMeterReading);
  HPE6432_EnterCalExtDetPowerMeterReading(
  loop, powerMeterReading);

  }
```

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`numberDetCalPointsCounter`

`Variable Type ViInt32`

This parameter specifies the current external detector calibration point.

`powerMeterReading`

`Variable Type ViReal64`

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This parameter specifies the power meter value read for the current calibration point.

Return Value

This return value reports the status of the Enter `Cal Ext Det Power Reading` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

Reset Ext Det Cal Data

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_EnterFlatnessCalReading

```
ViStatus HPE6432_EnterFlatnessCalReading(ViSession
instrumentHandle, ViReal64 reading);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and accepts a power meter reading, computes a corresponding correction value, and stores this correction value in a correction table. It then interpolates between the next lower correction and the current correction if necessary to fill the table. If the data is for an attenuator path and of a lower resolution than the through path, the interpolation uses the through path data with a computed offset for the attenuation setting.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat".

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`signalPath`

`Variable Type ViReal64`

This parameter accepts the power meter reading for the calibration point being measured.

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Return Value

This return value always returns VI_SUCCESS.

Related Topics

HPE6432_GetNumFlatnessCalPoints

HPE6432_SetupFlatnessCalPoint

HPE6432_WriteFlatnessCalData

HPE6432_GetFlatnessCalData

HPE6432_PutFlatnessCalData

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HPE6432_error_message

```
ViStatus HPE6432_error_message (ViSession instrumentHandle,
ViStatus errorCode, ViChar errorMessage[]);
```

Purpose

This function converts a status code returned by an instrument driver function into a user-readable string.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

You can pass `VI_NULL` for this parameter. This is useful when the `Initialize` function fails.

Default Value: `VI_NULL`

`errorCode`

`Variable Type ViStatus`

This parameter is the return Status from any of the instrument driver functions.

`errorMessage`

`Variable Type ViChar[]`

This parameter returns the user-readable message string that corresponds to the status code you specify.

You must pass a ViChar array with at least 256 bytes.

Return Value

This return value reports the status of the `Error Message` function.

To obtain further information about the status that is returned, refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

Error-Code and Fail-Code Messages

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HPE6432_error_query

```
ViStatus HPE6432_error_query (ViSession instrumentHandle,
ViStatus *errorCode, ViChar errorMessage[]);
```

Purpose

This function queries the synthesizer and returns an error code and a corresponding error message from the instrument's error queue.

This function can be used to clear the errors from the synthesizer's error queue.

The synthesizer can generate a list of error-code and fail-code messages.

- Error-Code Messages- If the synthesizer produces an error-code message, insight is provided to the user about what could be going wrong.
- Fail-Code Messages- If the synthesizer produces a fail-code message, a hardware failure is being reported and the synthesizer must be repaired. These messages begin with the word FAIL and cannot be cleared using the `HPE6432_ClearErrors` or `HPE6432_error_query` functions.

Each time the `HPE6432_error_query` function is called, one error code and its corresponding message is returned from the instrument's error queue. Unless the error code and its corresponding error message is due to a failure (indicated as FAIL), both the error code and its corresponding error message are removed from the instrument's error queue.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`errorCode`

`Variable Type ViStatus (passed by reference)`

This parameter returns the error code read from the instrument's error code queue.

`errorMessage`

`Variable Type ViStatus (passed by reference)`

This parameter returns the error message string read from the instrument's error message queue.

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You must pass a ViChar array with at least 256 bytes.

Return Value

This return value reports the status of the `Error Query` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_GenerateAndLoadExtFreqTable

```
ViStatus HPE6432_GenerateAndLoadExtFreqTable (ViSession
instrumentHandle, ViReal64 startDetFreqRangeHz, ViReal64
stopDetFreqRangeHz, ViReal64 stepFreqHz);
```

Purpose

This function is used to perform an external modulation-gain calibration on an external leveling loop configuration over a frequency range specified by the start and stop frequency values at points specified by the step value. When completed, the calibration results are loaded into the synthesizer's FLASH memory.

NOTE This calibration could take up to 15 minutes to complete and can not be aborted once it has started; it must run to completion

NOTE For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

NOTE Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

An external modulation-gain calibration is used to adjust the external leveling loop configuration and provide adjustment values that enhance the performance when switching between open and closed loop. Assuming the factory preset values remain present, this calibration has no effect when the external leveling loop configuration is closed, it only affects the output power when the loop is opened.

This calibration is required (or desirable) if the operator plans to use an external leveling loop configuration and operate the synthesizer in open loop mode. This calibration is good for frequencies, as defined by the user based on the start, stop, and step size. The smaller the step size, the more accurate the adjustment values are, but enhanced accuracy is at the cost of increased time for the calibration process. There is only one adjustment made for the full power range at any given frequency, so they are not optimal for frequency-power pairs. To obtain even better performance for frequency-power pairs, the power-search function can be used. The power-search function returns a correction factor that is sent to the synthesizer when tuning to a frequency and power which has optimum open-loop performance.

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Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startDetFreqRangeHz`

`Variable Type ViReal64`

This parameter specifies the starting frequency for the external leveling loop configuration being calibrated. Its value is used in conjunction with the stop and step frequency values that are also specified.

This start frequency corresponds to the lower-operational range of the external leveling loop configuration, and can not be less than the minimum frequency of the synthesizer.

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

`stopDetFreqRangeHz`

`Variable Type ViReal64`

This parameter specifies the stopping frequency for the external leveling loop configuration being calibrated. Its value is used in conjunction with the start and step frequency values that are also specified.

This stop frequency corresponds to the upper-operational range of the external leveling loop configuration, and can not be greater than the maximum frequency of the synthesizer.

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

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`stepFreqHz`

`Variable Type ViReal64`

This parameter specifies the calibration step size for the external leveling loop configuration being calibrated. Its value is used in conjunction with the start and stop frequency values that are also specified.

The calibration step size is used to determine the actual points used in the External Modulator Gain Calibration. The smaller the step size, the more accurate the calibration is for all frequencies, but this enhanced accuracy is at the cost of increased time for the calibration process. A calibration step size value of 100 MHz is recommended.

The number of calibration steps is defined by the following equation and can not exceed 201:

$$\text{Number of Steps} = (\text{Stop Frequency} - \text{Start Frequency}) / \text{Step Frequency}$$

NOTE If other combinations of hardware are being used in the external leveling loop configuration that do not have an operational range equal to the external detector being used, their operational range must be used instead.

Return Value

This return value reports the status of the `Generate/Load Ext Freq Table` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Reset Ext Det Cal Data

Power Search

Specifications and Characteristics

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HPE6432_GenerateManualSyncInput

```
ViStatus HPE6432_GenerateManualSyncInput (ViSession
instrumentHandle);
```

Purpose

This function provides a way to generate a Sync In trigger through software.

This function is used in conjunction with the `Set Sync In (Source)` function; the `Set Sync In (Source)` function must be set to IN_MANUAL. The proper `featureBits` in the `HPE6432_RunList` function must also be set to allow the list to be affected by the Sync In trigger.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Sync In (Source)

Run List

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_GenerateManualTriggerInput

```
ViStatus HPE6432_GenerateManualTriggerInput (ViSession
instrumentHandle);
```

Purpose

This function provides a way to generate a Trig In trigger through software.

This function is used in conjunction with the `Set Trigger In (Source)` function; the `Set Trigger In (Source)` function must be set to IN_MANUAL. The proper `featureBits` in the `HPE6432_RunList` function must also be set to allow the list to be affected by the Trig In trigger.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Sync In (Source)

Set Trigger In (Source)

Run List

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_GetAlcBandwidth

```
ViStatus HPE6432_GetAlcBandwidth (ViSession
instrumentHandle, ViBoolean *alcBandwidth);
```

Purpose

This function gets the value of the ALC bandwidth which can be either high or low; this setting affects the current state as well as the list.

Factory Preset Value: High

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`alcBandwidth`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current ALC bandwidth specified by the `Set Bandwidth (High/Low)` function.

Allowable values: low=`VI_TRUE`, high=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetAlcBandwidth

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HPE6432_GetAmMode

```
ViStatus HPE6432_GetAmMode (ViSession instrumentHandle,
ViBoolean *amMode);
```

Purpose

This function gets the state of the AM mode which can be either exponential or linear; this setting affects the current instrument state as well as the list.

Factory Preset Value: Linear

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amMode`

`Variable Type ViBoolean (passed by reference)`

This parameter gets the current amplitude modulation mode specified by the `Set AM Mode (LIN/EXP)` function.

Allowable values: Exponential=`VI_TRUE`, Linear=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetAmMode

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HPE6432_GetAmpModState

```
ViStatus HPE6432_GetAmpModState (ViSession
instrumentHandle, ViBoolean *amEnable)
```

Purpose

This function gets the state of the amplitude modulation port on the synthesizer front panel.

Factory Preset Value: Disable

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amEnable`

`Variable Type ViBoolean (passed by reference)`

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetAmModState

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HPE6432_GetAmplitudeBlankingTime

```
ViStatus HPE6432_GetAmplitudeBlankingTime (ViSession
instrumentHandle,ViInt16 *amplitudeBlankingTime);
```

NOTE Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE This function requires Set User Blanking to be enabled.

Purpose

This function returns the blanking time specified by the `Set Amplitude Blanking Time` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amplitudeBlankingTime`

`Variable Type ViInt16 (passed by reference)`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Amplitude Blanking Time

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HPE6432_GetAtten

```
ViStatus HPE6432_GetAtten (ViSession instrumentHandle,
ViUInt16 *attenuation);
```

Purpose

This function gets the current value of the attenuator.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`attenuation`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current setting of the attenuator if one exists. Attenuators are available on instruments with Option 1E1 only.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Attenuator

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HPE6432_GetAttenAuto

```
ViStatus HPE6432_GetAttenAuto (ViSession instrumentHandle,
ViBoolean *attenAutoEnable);
```

Purpose

This function gets the state of the attenuator lock mechanism.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`attenAutoEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the state of whether the attenuator lock mechanism is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetAttenAuto

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HPE6432_GetAttenuationLimits

```
ViStatus HPE6432_GetAttenuationLimits (ViSession
instrumentHandle, ViInt16 *minAttenuation, ViInt16
*maxAttenuation);
```

Purpose

This function gets the minimum and maximum output attenuation that the synthesizer is specified to deliver.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`minAttenuation`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the minimum output attenuation that the synthesizer is specified to deliver.

`maxAttenuation`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the maximum output attenuation that the synthesizer is specified to deliver.

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetBlankingState

```
ViStatus HPE6432_GetBlankingState (ViSession
instrumentHandle, ViBoolean *blankingEnable);
```

Purpose

This function returns the current blanking state.

Factory Preset Value: Enabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`blankingEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the blanking state specified by the `Set Blanking (On/Off)` function. The current state and every point in the list specifies this point independently.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetBlankingState

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HPE6432_GetDeepAmState

```
ViStatus HPE6432_GetDeepAmState (ViSession
instrumentHandle, ViBoolean *deepAMEnable);
```

Purpose

This function gets the state of amplitude modulation depth which can be either normal or deep. The value of this setting affects the current instrument state as well as the list.

Factory Preset Value: Normal

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`deepAMEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter gets the current amplitude modulation depth specified by the `Set Deep AM (On/Off)` function.

Allowable values: Deep=`VI_TRUE`, Normal=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetDeepAmState

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HPE6432_GetDwellTime

```
ViStatus HPE6432_GetDwellTime (ViSession instrumentHandle,
ViReal64 *dwellTime);
```

Purpose

This function gets the current dwell time value.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`dwellTime`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the minimum period of time, following the settling time, that the synthesizer remains at each point in the list.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetDwellTime

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HPE6432_GetErrorQueueCount

```
ViStatus HPE6432_GetErrorQueueCount (ViSession
instrumentHandle, ViInt32 *errorQueueCount);
```

Purpose

This function returns the number of errors in the error queue.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`errorQueueCount`

`Variable Type ViInt32 (passed by reference)`

This parameter returns the number of errors in the error queue.

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetExtIfInvert

```
ViStatus HPE6432_GetExtIfInvert (ViSession
instrumentHandle, ViBoolean *ifSidebandInvert);
```

Purpose

This function gets the state of whether Normal or Invert is selected as the IF Sideband to be used.

Factory Preset Value: Normal

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

ifSidebandInvert

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current state specified by the `Set IF Sideband (Normal/Invert)` function.

Allowable values: Normal or Invert

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetExtIfInvert

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HPE6432_GetExtIfState

```
ViStatus HPE6432_GetExtIfState (ViSession instrumentHandle,
ViBoolean *ifEnable);
```

Purpose

This function gets the state of whether the external 300 MHz IF In port on the synthesizer front panel is enabled or disabled.

Factory Preset Value: Disabled

Parameter List

instrumentHandle

Variable Type ViSession

This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

ifEnable

Variable Type ViBoolean (passed by reference)

This parameter returns the current state specified by the Set IF (On/Off) function.

Allowable values: enable=VI_TRUE, disable=VI_FALSE

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the Error Message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetExtIfState

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HPE6432_GetExtSyncOutput

```
ViStatus HPE6432_GetExtSyncOutput (ViSession
instrumentHandle, ViUInt16 *syncOutFrontPanel);
```

Purpose

This function returns the value specified by the `Set Sync Out - Front Panel` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`syncOutFrontPanel`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the value specified by the `Set Sync Out-Front Panel` function.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetExtSyncOutput

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HPE6432_GetExtTriggerOutput

```
ViStatus HPE6432_GetExtTriggerOutput (ViSession
instrumentHandle, ViUInt16 *trigOutFrontPanel);
```

Purpose

This function returns the value specified by the `Set Trigger Out-Front Panel` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`trigOutFrontPanel`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the value specified by the `Set Trigger Out-Front Panel` function.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetExtTriggerOutput

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HPE6432_GetFlatnessCalData

```
ViStatus HPE6432_GetFlatnessCalData(ViSession
instrumentHandle,ViInt32 signalPath, ViInt16
*flatnessData);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and is used specify a particular signal path and return the calibration data for the requested signal path from the VXIplug&play driver's internal memory table. The calibration data being retrieved using this function had to have been previously placed in the VXIplug&play driver's internal memory table using the `HPE6432_PutFlatnessCalData()` function.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat".

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`signalPath`

`Variable Type ViInt32`

This parameter specifies the signal path to be calibrated.

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The following signal paths may be specified with this function:

Parameter Value	Signal Path
0	FLATNESS_INTERNAL_THROUGH
1	FLATNESS_EXTERNAL_1
2	FLATNESS_EXTERNAL_2
3	FLATNESS_ATTENUATION_10
4	FLATNESS_ATTENUATION_20
5	FLATNESS_ATTENUATION_30
6	FLATNESS_ATTENUATION_40
7	FLATNESS_ATTENUATION_50
8	FLATNESS_ATTENUATION_60
9	FLATNESS_ATTENUATION_70

`flatnessData`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the number of calibration points needed to cover the frequency range with the number of calibration steps requested.

Return Value

This return value always returns VI_SUCCESS.

Related Topics

HPE6432_GetNumFlatnessCalPoints

HPE6432_SetupFlatnessCalPoint

HPE6432_EnterFlatnessCalReading

HPE6432_WriteFlatnessCalData

HPE6432_PutFlatnessCalData

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HPE6432_GetFreqAlcAtten

```
ViStatus HPE6432_GetFreqAlcAtten (ViSession
instrumentHandle, ViReal64 *frequency, ViReal64 *alcPower,
ViUInt16 *attenuation);
```

Purpose

This function gets the output frequency, ALC power level, and attenuation values.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`frequency`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the current frequency setting.

`alcPower`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the current ALC power setting.

`attenuation`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current attenuation setting.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetFreqAlcAtten

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HPE6432_GetFreqModExtSensitivity

```
ViStatus HPE6432_GetFreqModExtSensitivity (ViSession
instrumentHandle, ViReal64 *HZperVolt);
```

Purpose

This function gets the current FM sensitivity setting.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`HZperVolt`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the FM sensitivity specified by the `Set FM External Sensitivity` function.

Allowable values: 10E6, 1E6, 100E3

These values correspond to 10 MHz/V, 1 MHz/V, or 100 KHz/V.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetFreqModExtSensitivity

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HPE6432_GetFreqModState

```
ViStatus HPE6432_GetFreqModState (ViSession
instrumentHandle, ViBoolean *fmEnable);
```

Purpose

This function gets the state of whether the frequency modulation port on the synthesizer front panel is enabled or disabled.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`fmEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current frequency modulation state specified by the `Set FM (On/Off)` function.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetFreqModState

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HPE6432_GetFrequencyLimits

```
ViStatus HPE6432_GetFrequencyLimits (ViSession
instrumentHandle, ViReal64 *minFrequency, ViReal64
*maxFrequency);
```

Purpose

This function gets the minimum and maximum output frequencies that the synthesizer is specified to deliver.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`minFrequency`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the minimum output frequency that the synthesizer is specified to deliver.

`maxFrequency`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the maximum output frequency that the synthesizer is specified to deliver.

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetIAttenuation

```
ViStatus HPE6432_GetIAttenuation (ViSession
instrumentHandle, ViUInt16 *iAttenuation);
```

Purpose

This function gets the level of I Attenuation that is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iAttenuation`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns a value for I Attenuation.

Allowable values: 0, 2, 4, 6, 8, 10, 12

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIAttenuation

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HPE6432_GetICal

```
ViStatus HPE6432_GetICal (ViSession instrumentHandle,
ViUInt16 *iCalLevel);
```

Purpose

This function gets the level of the calibration voltage used for the I input when Test Tone is selected as the I/Q Input.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iCalLevel`

`Variable Type  ViUInt16 (passed by reference)`

This parameter returns the Test Tone calibration voltage for the I input.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetICal

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HPE6432_GetIfAtten

```
ViStatus HPE6432_GetIfAtten (ViSession instrumentHandle,
ViUInt16 *ifAttenuation);
```

Purpose

This function gets the IF upconverter attenuator value.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifAttenuation`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns a value for IF Attenuation being applied.

Allowable values: 0 to 30 dB in 2 dB steps

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIfAtten

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HPE6432_GetIfLowerSidebandDac

```
ViStatus HPE6432_GetIfLowerSidebandDac (ViSession
instrumentHandle, ViUInt16 *ifLowerSidebandDac);
```

Purpose

This function gets the current setting of an internal preleveling DAC that is used for IF Upconverter level calibration or I/Q Upconverter level calibration. This calibration setting applies to output frequencies that use lower sideband mixing.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifLowerSidebandDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current setting of an internal preleveling DAC.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIfUpperSidebandDac

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HPE6432_GetIfUpperSidebandDac

```
ViStatus HPE6432_GetIfUpperSidebandDac (ViSession
instrumentHandle, ViUInt16 *ifUpperSidebandDac);
```

Purpose

This function gets the current setting of an internal preleveling DAC that is used for IF Upconverter level calibration or I/Q Upconverter level calibration. This calibration setting applies to output frequencies that use upper sideband mixing.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifUpperSidebandDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current setting of an internal preleveling DAC.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIfLowerSidebandDac

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HPE6432_GetIGainAdjust

```
ViStatus HPE6432_GetIGainAdjust (ViSession
instrumentHandle, ViInt16 *iGainAdjustDac);
```

Purpose

This function gets the value of where the I Gain adjustment DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iGainAdjustDac`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the current I Gain Adjustment DAC setting specified by the `SetIGainAdjustmentDAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIGainAdjust

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HPE6432_GetIGainDac

```
ViStatus HPE6432_GetIGainDac (ViSession instrumentHandle,
ViUInt16 *iGainDac);
```

Purpose

This function gets the value of where the I Gain DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iGainDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current I Gain DAC setting specified by the `Set I Gain DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIGainDac

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HPE6432_GetInterruptFlags

```
ViStatus HPE6432_GetInterruptFlags (ViSession
instrumentHandle, ViUInt16 *interruptFlags);
```

Purpose

This function gets the interrupt bit flags. These bit flags indicate which interrupts have been received since the last call to this function. Once the bit flags have been read, all bit flags are cleared.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`interruptFlags`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the interrupt bit flags

Bit Number	Mask	Description
0	1	A24 Access Timeout
1	4	68360 Watchdog Timeout
2	3	Settled Interrupt
3	8	Sync Output Settled Interrupt
4	16	List Stopped
5	32	Unlocked
6	64	Unleveled
7-15	_	Not Defined

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetIOffsetAdjust

```
ViStatus HPE6432_GetIOffsetAdjust (ViSession
instrumentHandle, ViInt16 *iOffsetAdjustDac);
```

Purpose

This function gets the value of where the I Offset adjustment DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iOffsetAdjustDac`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the current I Offset Adjustment DAC setting specified by the `Set I Offset Adjustment DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIOffsetAdjust

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HPE6432_GetIOffsetDac

```
ViStatus HPE6432_GetIOffsetDac (ViSession instrumentHandle,
ViUInt16 *iOffsetDac);
```

Purpose

This function gets the value of where the I Offset DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iOffsetDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current I Offset DAC setting specified by the `Set I Offset DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIOffsetDac

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HPE6432_GetIqAdjustState

```
ViStatus HPE6432_GetIqAdjustState (ViSession
instrumentHandle, ViBoolean *iqAdjustmentsEnable);
```

Purpose

This function gets the state of whether or not the Adjustments to Calibration Settings are enabled or disabled.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqAdjustmentsEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns whether I/Q External Source adjustments are enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIqAdjustState

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HPE6432_GetIqInput

```
ViStatus HPE6432_GetIqInput (ViSession instrumentHandle,
ViUInt16 *iqInput);
```

Purpose

This function returns the selection for the I/Q Input of either Normal, Swapped, or Test Tone.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqInput`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns an integer indicating whether the I/Q input is set to Normal, Swapped, or Test Tone.

Allowable values: 0 (Normal), 1 (Swapped), or 2 (Test Tone)

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIqInput

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HPE6432_GetIqModState

```
ViStatus HPE6432_GetIqModState (ViSession instrumentHandle,
ViBoolean *iqEnable);
```

Purpose

This function gets the state of whether the I/Q modulation ports on the synthesizer front panel are enabled or disabled.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current IQ modulation state specified by the `Set IQ (On/Off)` function.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetIqModState

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HPE6432_GetLastSelfTestResults

```
ViStatus HPE6432_GetLastSelfTestResults (ViSession
instrumentHandle, ViInt16 selfTestType, ViUInt32
*diagResult, ViChar date[], ViChar sLogFile[]);
```

Purpose

This function is used to get the last self test results that were produced using either a full or a quick self test.

The test status is returned as either pass or fail. The test type (full or quick), the result (zero indicating pass and non-zero indicating fail), the test date, and a logfile name containing detailed information related to errors that occurred during the self test are also returned.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session

`selfTestType`

`Variable Type ViInt16`

This parameter specifies the type of test results to be viewed.

Self-Test CodeDescription

---

0 View results from Full Self Test with RF On

1 View results from Quick Self Test with No RF

`diagResult`

`Variable Type ViUInt32 (passed by reference)`

This parameter returns which tests failed. A zero return indicates that all tests passed.

`date`

`Variable Type ViChar[]`

This parameter returns the date that the self test was run.

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`sLogFile`

`Variable Type ViChar[]`

This parameter returns the name of the self test log file. The self test log file contains the test's error results from a self test that is run and fails. If the self test passes, a log file is not generated and this parameter is null.

Return Value

This return value reports the status of the `Self-Test` function.

If the self test fails, a text description of the failure can be obtained by reading the self test log file. The self test log file's name is returned in the sLogFile parameter.

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HPE6432_GetLevelingPoint

```
ViStatus HPE6432_GetLevelingPoint (ViSession
instrumentHandle, ViInt16 levelingPoint);
```

Purpose

This function gets the ALC leveling point. The ALC leveling point affects the current state as well as the list.

Factory Preset Value: INTERNAL_DETECTOR

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`*levelingPoint`

`Variable Type ViInt16`

This parameter returns the current ALC leveling point specified. The external leveling point affects the current state as well as the list.

Allowable values:

- INTERNAL_DETECTOR (Factory Preset Value)
- EXTERNAL_DETECTOR_1 (Ext ALC - front panel connector)

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetLevelingPoint

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HPE6432_GetLevelingState

```
ViStatus HPE6432_GetLevelingState (ViSession
instrumentHandle, ViBoolean *levelingEnable);
```

Purpose

This function gets the ALC leveling state: Enabled or Disabled

Factory Preset Value: Enabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`levelingEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current ALC leveling state specified by the `Set Leveling (On/Off)` function. The leveling state affects the current state as well as the list.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetLevelingState

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HPE6432_GetListIndex

```
ViStatus HPE6432_GetListIndex (ViSession instrumentHandle,
ViInt32 *index);
```

Purpose

This function returns the list point that is currently set.

When to use HPE6432_GetListIndex

This function is only valid:

- in manual trigger mode using either
- `HPE6432_GenerateManualSyncIn` or `HPE6432_GenerateManualTriggerIn` functions
- when using external triggering at a low rate

How to use HPE6432_GetListIndex

This following sequence must be followed when using this function:

- set dwell time to minimum value (0.5 us) using the `HPE6432_SetDwellTime` function
- wait for a settled interrupt flag (Bit 2=1) using the `HPE6432_GetInterruptFlags` function
- use the `HPE6432_GetListIndex` function to get the value of the list point

NOTE Using this function in any other way than described above may return undetermined results.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`index`

`Variable Type ViInt32 (passed by reference)`

This parameter returns the index point in the list that is currently being run.

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Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Run List Abort

Generate Manual Sync In

Generate Manual Trigger In

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HPE6432_GetLongBlankingState

```
ViStatus HPE6432_GetLongBlankingState (ViSession
instrumentHandle, ViBoolean *longBlankingEnable);
```

Purpose

This function returns the current long blanking state.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`longBlankingEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the long blanking state specified by the `Set Long Blanking (On/Off)` function. The current state and every point in the list specifies this parameter independently.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetLongBlankingState

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HPE6432_GetLongBlankingTime

```
ViStatus HPE6432_GetLongBlankingTime (ViSession
instrumentHandle, ViInt16 *longBlankingTime);
```

NOTE Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE This function requires Set User Blanking to be enabled.

Purpose

This function returns the blanking time specified by the `Set Long Blanking Time` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`longBlankingTime`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the amount of long blanking time.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetLongBlankingTime

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HPE6432_GetNormalBlankingTime

```
ViStatus HPE6432_GetNormalBlankingTime (ViSession
instrumentHandle, ViInt16 *normalBlankingTime);
```

NOTE Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE This function requires Set User Blanking to be enabled.

Purpose

This function returns the blanking time specified by the `Set Normal Blanking Time` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`normalBlankingTime`

`Variable Type ViInt16 (passed by reference)`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetNormalBlankingTime

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HPE6432_GetNumExtDetCalPoints

```
ViStatus HPE6432_GetNumExtDetCalPoints (ViSession
instrumentHandle, ViReal64 startDetFreqRangeHz, ViReal64
stopDetFreqRangeHz, ViInt32 numDetCalPoints);
```

Purpose

This function is passed the start and stop frequency range of an external leveling loop configuration, and returns the number of power meter reading points required to accomplish a linearization calibration for the external leveling loop configuration over the defined frequency range.

There are three VXIplug&play functions used to accomplish the external detector linearization calibration for an external leveling loop configuration:

`HPE6432_GetNumExtDetCalPoints`

`HPE6432_SetupCalExtDetPoint`

`HPE6432_EnterCalExtDetPowerMeterReading`

NOTE For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

The user first queries for the number of Calibration Points that must be taken using the `HPE6432_GetNumExtDetCalPoints` function. This function requires the user to pass the operating range of their current external leveling loop configuration's start and stop frequency in Hertz. This routine calculates the number of external leveling loop configuration calibration points required for this operation range. The user repeats the following process using this return value as the number of repetitions. Within the loop, they call the setup routine (HPE6432_SetupCalExtDetPoint) to configure the synthesizer for the current calibration point. Once configured, the user must supply their own power meter reading utility that reads the value at the power meter for the current configuration. Next, they call the `HPE6432_EnterCalExtDetPowerMeterReading` function to enter the power meter reading value. Once the last point is entered, the function completes the calibration and stores the calibrated values within the synthesizer flash memory, thus completing the calibration process.

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If an invalid start or stop frequency for the external leveling loop configuration is passed to the function, the ERR_ARG_OUT_OF_RANGE error flag is returned. This flag is also returned if the functions are called with a detector point identifier out of the valid range.

If the calibration functions are not called in the proper order, the ERR_INVALID_EXT_DET_CAL_ORDER error is returned. The proper order is defined by the loop indicator parameter that is sent to the routine and used to configure the system for calibration, and the other parameter is used to enter the power meter reading.

The following example code demonstrates the external detector linearization calibration functions:

```
ViReal64 startDetFreqRangeHz, stopDetFreqRangeHz;
ViInt32 numDetCalPoints;
ViReal64 powerMeterReading;
HPE6432_GetNumExtDetCalPoints(
  startDetFreqRangeHz,
  stopDetFreqRangeHz,
  &numDetCalPoints
);

for ( int loop=1; loop <= numDetCalPoints; loop++ ) {
  HPE6432_SetupCalExtDetPoint(loop);
  /* The customer supplies the ReadPowerMeter() function. */
  ReadPowerMeter(&powerMeterReading);
  HPE6432_EnterCalExtDetPowerMeterReading(
loop, powerMeterReading)
```

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

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`startDetFreqRangeHz`

`Variable Type ViReal64`

This parameter specifies the starting frequency for the external leveling loop configuration being calibrated.

The start frequency can not be less than 10 MHz.

`stopDetFreqRangeHz`

`Variable Type ViReal64`

This parameter specifies the stopping frequency for the external leveling loop configuration being calibrated.

The stop frequency can not be greater than 20 GHz.

`*stepFreqHz`

`Variable Type ViInt32`

This parameter returns the number of power meter reading points required to accomplish a linearization calibration for the external leveling loop configuration over the defined frequency range.

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetNumFlatnessCalPoints

```
ViStatus HPE6432_GetNumFlatnessCalPoints(ViSession
instrumentHandle, ViInt16 signalPath, ViReal64 startFreq,
ViReal64 stopFreq, ViReal64 lowBandStep, ViReal64
highBandStep, ViInt32 *points);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and accepts parameters that specify the signal path to be calibrated, a calibration start frequency, a calibration stop frequency, a lowband calibration step size, and a highband calibration step size. With these specified parameters, the function returns the number of calibration points needed to cover the frequency range with the number of calibration steps requested. In addition, the input parameters are stored internally.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat".

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`signalPath`

`Variable Type ViInt16`

This parameter specifies the signal path to be calibrated.

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The following signal paths may be specified with this function:

Parameter Value	Signal Path
0	FLATNESS_INTERNAL_THROUGH
1	FLATNESS_EXTERNAL_1
2	FLATNESS_EXTERNAL_2
3	FLATNESS_ATTENUATION_10
4	FLATNESS_ATTENUATION_20
5	FLATNESS_ATTENUATION_30
6	FLATNESS_ATTENUATION_40
7	FLATNESS_ATTENUATION_50
8	FLATNESS_ATTENUATION_60
9	FLATNESS_ATTENUATION_70

`startFreq`

`Variable Type ViReal64`

This parameter specifies the starting frequency of the output power level correction routine.

`stopFreq`

`Variable Type ViReal64`

This parameter specifies the stopping frequency of the output power level correction routine.

`lowBandStep`

`Variable Type ViReal64`

This parameter specifies the low-band frequency step size. The frequency step size is the difference in frequency steps between each calibration point.

`highBandStep`

`Variable Type ViReal64`

This parameter specifies the high-band frequency step size. The frequency step size is the difference in frequency steps between each calibration point.

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`points`

`Variable Type ViInt32 (passed by reference)`

This parameter returns the number of calibration points needed to cover the frequency range with the number of calibration steps requested.

Return Value

This return value returns the number of calibration points.

Related Topics

HPE6432_SetupFlatnessCalPoint

HPE6432_EnterFlatnessCalReading

HPE6432_WriteFlatnessCalData

HPE6432_GetFlatnessCalData

HPE6432_PutFlatnessCalData

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HPE6432_GetOptionString

```
ViStatus HPE6432_GetOptionString (ViSession
instrumentHandle, ViChar optionString[]);
```

Purpose

This function queries the synthesizer and returns a string that indicates which options are installed.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`optionString`

`Variable Type ViChar[]`

This parameter returns an option string.

Return Value

This return value reports the status of the `Get Option String` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_GetOutputPower

```
ViStatus HPE6432_GetOutputPower (ViSession
instrumentHandle, ViReal64 *outputPower);
```

Purpose

This function gets the current output power setting.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`outputPower`

`Variable Type  ViReal64 (passed by reference)`

This parameter returns the current output power setting.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetOutputPower

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HPE6432_GetPowerLimits

```
ViStatus HPE6432_GetPowerLimits (ViSession
instrumentHandle, ViReal64 *minPower, ViReal64 *maxPower);
```

Purpose

This function gets the minimum and maximum output power that the synthesizer is specified to deliver. It does not include any attenuator settings.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`minPower`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the minimum output power that the synthesizer is specified to deliver.

`maxPower`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the maximum output power that the synthesizer is specified to deliver.

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_GetPowerLimitsAtFrequency

```
ViStatus HPE6432_GetPowerLimitsAtFrequency (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 *minPower,
ViReal64 *maxPower);
```

Purpose

This function gets the minimum and maximum output power that the synthesizer is specified to deliver at a specified frequency.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`frequency`

`Variable Type ViReal64`

This parameter is used to specify the frequency that the synthesizer is queried at for minimum and maximum output power.

`minPower`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the minimum output power that the synthesizer is specified to deliver.

`maxPower`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the maximum output power that the synthesizer is specified to deliver.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetPowerLimits

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HPE6432_GetPulseModState

```
ViStatus HPE6432_GetPulseModState (ViSession
instrumentHandle, ViBoolean *pulseModulationEnable);
```

Purpose

This function gets the state of whether the pulse modulation port on the synthesizer front panel is enabled or disabled. This setting affects the current state as well as the list.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`pulseModulationEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the current pulse modulation state specified by the `Set Pulse Modulation (On/Off)` function.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetPulseModState

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HPE6432_GetQAttenuation

```
ViStatus HPE6432_GetQAttenuation (ViSession
instrumentHandle, ViUInt16 *qAttenuation);
```

Purpose

This function gets the level of Q Attenuation that is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qAttenuation`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns a value for Q Attenuation.

Allowable values: 0, 2, 4, 6, 8, 10, 12

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQAttenuation

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HPE6432_GetQCal

```
ViStatus HPE6432_GetQCal (ViSession instrumentHandle,
ViUInt16 *qCalLevel);
```

Purpose

This function gets the level of the calibration voltage used for the Q input when Test Tone is selected as the I/Q Input.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qCalLevel`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the Test Tone calibration voltage for the Q input.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQCal

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HPE6432_GetQGainAdjust

```
ViStatus HPE6432_GetQGainAdjust (ViSession
instrumentHandle, ViInt16 *qGainAdjustDac);
```

Purpose

This function gets the value of where the Q Gain adjustment DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qGainAdjustDac`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the current Q Gain Adjustment DAC setting specified by the `Set Q Gain Adjustment DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQGainAdjust

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HPE6432_GetQGainDac

```
ViStatus HPE6432_GetQGainDac (ViSession instrumentHandle,
ViUInt16 *qGainDac);
```

Purpose

This function gets the value of where the Q Gain DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qGainDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current Q Gain DAC setting specified by the `Set Q Gain DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQGainDac

HPE6432_GetQOffsetAdjust

```
ViStatus HPE6432_GetQOffsetAdjust (ViSession
instrumentHandle, ViInt16 *qOffsetAdjustDac);
```

Purpose

This function gets the value of where the Q Offset adjustment DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

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This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

qOffsetAdjustDac

Variable Type ViInt16 (passed by reference)

This parameter returns the current Q Offset Adjustment DAC setting specified by the Set Q Offset Adjustment DAC function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the Error Message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQOffsetAdjust

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HPE6432_GetQOffsetDac

```
ViStatus HPE6432_GetQOffsetDac (ViSession instrumentHandle,
ViUInt16 *qOffsetDac);
```

Purpose

This function gets the value of where the Q Offset DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qOffsetDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current Q Offset DAC setting specified by the `Set Q Offset DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQOffsetDac

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HPE6432_GetQuadratureAdjust

```
ViStatus HPE6432_GetQuadratureAdjust (ViSession
instrumentHandle, ViInt16 *quadratureAdjustDac);
```

Purpose

This function gets the value of where the Quadrature Offset adjustment DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`quadratureAdjustDac`

`Variable Type ViInt16 (passed by reference)`

This parameter returns the current Quadrature (Offset) Adjustment DAC setting specified by the `Set Quadrature Adjustment DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQuadratureAdjust

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HPE6432_GetQuadratureDac

```
ViStatus HPE6432_GetQuadratureDac (ViSession
instrumentHandle, ViUInt16 *quadratureDac);
```

Purpose

This function gets the value of where the Quadrature DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`quadratureDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current Quadrature DAC setting specified by the `Set Quadrature DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetQuadratureDac

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HPE6432_GetRefSource

```
ViStatus HPE6432_GetRefSource (ViSession instrumentHandle,
ViBoolean *reference10MHz);
```

Purpose

This function gets the reference source setting: Internal or External

Factory Preset Value: Internal

Parameter List

`instrumentHandle`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`reference10MHz`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the value specified by the `Set Reference Source (Int/Ext)` function.

Allowable values: external=`VI_TRUE`, internal=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetRefSource

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HPE6432_GetRfOutputState

```
ViStatus HPE6432_GetRfOutputState (ViSession
instrumentHandle, ViBoolean *rfOutputEnable);
```

Purpose

This function gets the state of the RF Output: Enabled or Disabled

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`rfOutputEnable`

`Variable Type ViBoolean (passed by reference)`

This function gets the state of the RF Output specified by the `Set RF Output (On/Off)` function.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetRfOutputState

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HPE6432_GetSerialNumber

```
ViStatus HPE6432_GetSerialNumber (ViSession
instrumentHandle, ViChar serialNumber[]);
```

Purpose

This function queries the synthesizer and returns the serial number.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`serialNumber`

`Variable Type ViChar[]`

This parameter returns the serial number string.

Return Value

This return value reports the status of the `Get Serial Number` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_GetSettlingTime

```
ViStatus HPE6432_GetSettlingTime (ViSession
instrumentHandle, ViReal64 *settlingTime);
```

Purpose

This function gets the amount of time that is currently specified as the settling time.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`settlingTime`

`Variable Type ViReal64 (passed by reference)`

This parameter returns the settling time specified by the `Set Settling Time` function.

Valid Range: 0.5 x 10-6 seconds to 32.7675 x 10-3 seconds

Return Value

This return value always returns `VI_SUCCESS.`

Related Topics

HPE6432_SetSettlingTime

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HPE6432_GetSyncInput

```
ViStatus HPE6432_GetSyncInput (ViSession instrumentHandle,
ViUInt16 *syncInSource);
```

Purpose

This function gets the source of the Sync In trigger.

The source of the Sync In trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time. Its functionality is determined by the mode used during a `Run List` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`syncInSource`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current value specified by the `Set Sync In (Source)` function.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetSyncInput

HPE6432_RunList

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HPE6432_GetSyncOutState

```
ViStatus HPE6432_GetSyncOutState (ViSession
instrumentHandle, ViBoolean *syncOutEnable);
```

Purpose

This function returns the current state of the Sync Out trigger.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`syncOutEnable`

`Variable Type ViBoolean (passed by reference)`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetSyncOutState

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HPE6432_GetTriggerInput

```
ViStatus HPE6432_GetTriggerInput (ViSession
instrumentHandle, ViUInt16 *trigInSource);
```

Purpose

This function gets the source of the Trig In trigger.

The source of the Trig In trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time. Its functionality is determined by the mode used during a `Run List` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`trigInSource`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the value specified by the `Set Trigger In (Source)` function.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetTriggerInput

HPE6432_RunList

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HPE6432_GetUserBlankingState

```
ViStatus HPE6432_GetUserBlankingState (ViSession
instrumentHandle, ViBoolean *userBlankingEnable);
```

NOTE Use of this function can result in unspecified performance Performance of the synthesizer resulting from this usage is unwarranted.

Purpose

This function returns the current user blanking state.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`userBlankingEnable`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the state specified by the `Set User Blanking (On/Off)` function.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetUserBlankingState

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HPE6432_GetVbloDac

```
ViStatus HPE6432_GetVbloDac (ViSession instrumentHandle,
ViUInt16 *vbloDac);
```

Purpose

This function gets the value of where the Vblo DAC is set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`vbloDac`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the current Vblo DAC setting specified by the `Set Vblo DAC` function.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_SetVbloDac

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HPE6432_GetVxiSyncOutput

```
ViStatus HPE6432_GetVxiSyncOutput (ViSession
instrumentHandle, ViUInt16 *syncOutVXIBackplane);
```

Purpose

This function returns the value specified by the Set Sync Out – VXI Backplane function.

Parameter List

instrumentHandle

Variable Type ViSession

This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

syncOutVXIBackplane

Variable Type ViUInt16 (passed by reference)

This parameter returns the value specified by the Set Sync Out - VXI Backplane function.

Return Value

This return value always returns VI_SUCCESS.

Related Topics

HPE6432_SetVxiSyncOutput

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HPE6432_GetVxiTriggerOutput

```
ViStatus HPE6432_GetVxiTriggerOutput (ViSession
instrumentHandle, ViUInt16 *trigOutVXIBackplane);
```

Purpose

This function returns the value specified by the `Set Trigger Out - VXI Backplane` function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`trigOutVXIBackplane`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the value specified by the `Set Trigger Out - VXI Backplane` function.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_SetVxiTriggerOutput

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HPE6432_IfUpconverterLevelCalibrate

```
ViStatus HPE6432_IfUpconverterLevelCalibrate (ViSession
instrumentHandle);
```

Purpose

This function is used to perform an IF level calibration.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_IfUpconverterRestoreFactoryCal

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HPE6432_IfUpconverterRestoreFactoryCal

```
ViStatus HPE6432_IfUpconverterRestoreFactoryCal (ViSession
instrumentHandle);
```

Purpose

This function can be used to return to the original factory calibration values. All values from any previous user calibrations will be lost.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_IfUpconverterLevelCalibrate

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HPE6432_init

```
ViStatus HPE6432_init (ViRsrc resourceName, ViBoolean
idQuery, ViBoolean reset, ViSession *instrumentHandle);
```

Purpose

This function is the first function called when you access an instrument driver. It performs the following initialization actions:

- creates a new Agilent Technologies VISA instrument driver session
- opens a session to the specified device using the interface and address you specify for the resourceName parameter
- sends initialization commands to set the instrument to the state necessary for the operation of the instrument driver
- if the idQuery parameter is set to `VI_TRUE`, the `Initialize` function queries the instrument ID and checks that it is valid for this instrument driver
- if the driver is already open by an application and the reset parameter is set to `VI_TRUE`, the `Initialize` function resets the instrument to a known state

  if the driver is not open, a reset is always performed regardless of the reset parameter value
- returns a `ViSession instrumentHandle` that you use to identify the instrument in all subsequent instrument driver function calls

NOTE This function creates a new session each time you invoke it. Although you can open more than one Agilent Technologies VISA session for the same resource, it is best not to do so. You can use the same session in multiple program threads, but you should not control the instrument from more than one thread at a time.

Parameter List

`resourceName`

`Variable Type ViRsrc`

Pass the `resourceName` of the device to initialize.

Factory Preset Value: `"VXI0::255::INSTR"`

Factory Recommended Value: `"VXI0::210::INSTR"`

The recommended value shown is valid for a PCI to VXI connection with the synthesizer set to a logical address of 210 when using Agilent VEE.

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The exact grammar to use for this parameter is as follows:

`VXI[board]::logical address[::INSTR]`

Optional fields are shown in square brackets ([ ]). If you do not specify a value for an optional field,

board=0 and secondary address=none

`idQuery`

`Variable Type ViBoolean`

This parameter is ignored and the instrument ID is always checked.

`reset`

`Variable Type ViBoolean`

This parameter specifies whether or not the instrument driver performs a reset.

Valid Range:

- `VI_TRUE` (1) - reset (Factory Preset Value)
- `VI_FALSE` (0) - Don't Reset (unless necessary because state is undefined)
- if the driver is already open by an application and the reset parameter is set to `VI_TRUE`, the `Initialize` function resets the instrument to a known state
- if the driver is not open, a reset is always performed regardless of the reset parameter value

`instrumentHandle`

`Variable Type ViSession (passed by reference)`

Returns a `ViSession` handle that is used to identify the instrument in all subsequent instrument driver function calls.

NOTE This function creates a new session each time it is invoked. This is useful if you have multiple physical instances of the same type of instrument.

NOTE Avoid creating multiple concurrent sessions to the same physical instrument. Although you can create more than one Agilent Technologies VISA session for the same resource, it is best not to do so. A better approach is to use the same Agilent Technologies VISA session in multiple execution threads.

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Return Value

This return value reports the status of the `Initialize` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Even if the `Initialize` function returns `VI_SUCCESS`, the `HPE6432_error_query` function should be called to verify that all errors in the synthesizer's error queue have been reported.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Opening an Instrument Session

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HPE6432_IqCalibrate

```
ViStatus HPE6432_IqCalibrate (ViSession instrumentHandle);
```

Purpose

This function is used to run an iterative algorithm that makes corrections for the impairments within the synthesizer by adjusting the Gain, Offset, and Quadrature adjustment DACs. This calibration does not account for impairments due to external I/Q sources.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_IqRestoreFactoryCal

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HPE6432_IqRestoreFactoryCal

```
ViStatus HPE6432_IqRestoreFactoryCal (ViSession
instrumentHandle);
```

Purpose

This function can be used to return to the original factory calibration values. All values from any previous user calibrations are lost.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_IqCalibrate

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HPE6432_IqUpconverterLevelCalibrate

```
ViStatus HPE6432_IqUpconverterLevelCalibrate (ViSession
instrumentHandle, ViReal64 calFrequency);
```

Purpose

This function is used to run an iterative algorithm that drives the ALC modulator with a DAC while the ALC is off so that the output signal power level matches the setting selected.

The most recently run level calibration supersedes any previous level calibrations. This is because a calibration DAC is adjusted during a level calibration and depending on which level calibration is performed (IF Calibration or I/Q Upconverter Calibration), its DAC settings are used.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`calFrequency`

`Variable Type  ViReal64`

This parameter is used to select the frequency where a calibration is performed during an I/Q Upconverter Calibration.

Enter an I/Q Upconverter Calibration Frequency from
2 GHz </= 20 GHz.

The I/Q Upconverter calibration is only valid for synthesizer frequencies between 2 GHz </= 20 GHz. The I/Q Upconverter calibration cannot be used for synthesizer frequencies from 10 MHz < 2 GHz.

For synthesizer frequencies from 10 MHz < 2 GHz, a Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary because the I/Q Upconverter calibration controls the level accuracy.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

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Related Topics

HPE6432_IqUpconverterRestoreFactoryCal

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HPE6432_IqUpconverterRestoreFactoryCal

```
ViStatus HPE6432_IqUpconverterRestoreFactoryCal (ViSession
instrumentHandle);
```

Purpose

This function can be used to return to the original factory calibration values. All values from any previous user calibrations are lost.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_IqUpconverterLevelCalibrate

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HPE6432_IsListRunning

```
ViStatus HPE6432_IsListRunning (ViSession instrumentHandle,
ViBoolean *runningStatus);
```

Purpose

This function returns the status of whether a list is running or not.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`runningStatus`

`Variable Type ViBoolean (passed by reference)`

This parameter returns the status of whether a list is running or not.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Run List

Run List Abort

Clear List

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HPE6432_PowerSearch

```
ViStatus HPE6432_PowerSearch (ViSession instrumentHandle,
ViReal64 frequency, ViReal64 alcPower, ViUInt16
*alcOffset);
```

Purpose

This function runs an ALC power level calibration for a specific power level and frequency (specified in MHz) and returns the calibration value (ALC Offset). The ALC Offset can be used to obtain the best open-loop performance for the frequency-power setting. The ALC Offset can be passed to the `Set Freq`, `Alc`, `Atten`, `Bit` or `Write List Point` functions. When the ALC Offset is passed to these functions with the same frequency-power settings used in Power Search, the system will provide optimum open-loop performance at the frequency specified frequency-power setting.

When this function is run, the synthesizer searches out the appropriate modulator level so that the RF output power after the ALC is opened closely matches the power that it would have had with the ALC loop closed.

To use with the `Set Freq`, `Alc`, `Atten`, `Bit` function:

```
HPE6432_PowerSearch(instrumentHandle, frequency/1e6,
alcPower, &alcOffset);
```

```
HPE6432_SetFreqAlcAttenBit(instrumentHandle, frequency,
alcPower, attenuation, Use_the_alcOffset_from_PowerSearch,
alcOffset);
```

To use with the `Write List Point` function:

```
HPE6432_PowerSearch(instrumentHandle, frequency/1e6,
alcPower, &alcOffset);
```

```
HPE6432_WriteListPoint(instrumentHandle, startingPoint,
frequency, alcPower, attenuation,
Use_the_alcOffset_from_PowerSearch, alcOffset);
```

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

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`frequency`

`Variable Type ViReal64`

This parameter specifies a frequency setting in MHz.

Valid range: 10 MHz to 20000 MHz (20 GHz)

`alcPower`

`Variable Type ViReal64`

This parameter specifies an ALC power setting.

Valid range: –20 dBm to Maximum Leveled Output Power

`alcOffset`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns the ALC Offset calibration value.

Return Value

This return value reports the status of the `Power Search` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Frequency, Alc, Atten, Bit

Write List Point

Set PowerSearch (On/Off)

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HPE6432_PutFlatnessCalData

```
ViStatus HPE6432_PutFlatnessCalData (ViSession
instrumentHandle, ViInt32 signalPath, ViInt16
correctionData[]);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and is used to specify a particular signal path and place the calibration data for the requested signal path into the VXIplug&play driver's internal memory table. The calibration data can be retrieved using the `HPE6432_GetFlatnessCalData()` function.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat."

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`signalPath`

`Variable Type ViInt32`

This parameter specifies the signal path to be calibrated.

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The following signal paths may be specified with this function:

Parameter Value	Signal Path
0	FLATNESS_INTERNAL_THROUGH
1	FLATNESS_EXTERNAL_1
2	FLATNESS_EXTERNAL_2
3	FLATNESS_ATTENUATION_10
4	FLATNESS_ATTENUATION_20
5	FLATNESS_ATTENUATION_30
6	FLATNESS_ATTENUATION_40
7	FLATNESS_ATTENUATION_50
8	FLATNESS_ATTENUATION_60
9	FLATNESS_ATTENUATION_70

`ViInt16 correctionData[]`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetNumFlatnessCalPoints

HPE6432_SetupFlatnessCalPoint

HPE6432_EnterFlatnessCalReading

HPE6432_WriteFlatnessCalData

HPE6432_GetFlatnessCalData

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HPE6432_ReadHwState

```
ViStatus HPE6432_ReadHwState (ViSession instrumentHandle,
ViUInt16 *hardwareState);
```

Purpose

This function reads the current state of the unleveled and unlocked bits.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`hardwareState`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns an integer bit field.

Bit 0 = Fractional-N synthesizer (Paren loop) unlocked error

Bit 1 = uW PLL unlocked error

Bit 2 = Ref unlocked error

Bit 3 = ALC High unleveled error

Bit 4 = ALC Low unleveled error

Bits 5-15 = Not Used

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_ReadInterruptHwState

```
ViStatus HPE6432_ReadInterruptHwState (ViSession
instrumentHandle, ViUInt16 *interruptHardwareState);
```

Purpose

This function reads the interrupt status of the unleveled and unlocked bits.

This function can be used to return the last caught interrupt bit status. The difference between this function and the `Read Hardware State` function is that this function only returns bits that were seen as a valid interrupt (bits that were not masked out by the VXIplug&play driver).

Parameter List

`instrumentHandle`

`Variable Type  ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`interruptHardwareState`

`Variable Type  ViUInt16 (passed by reference)`

This parameter returns an integer bit field.

Bit 0 = Fractional-N synthesizer (Paren loop) unlocked error

Bit 1 = uW PLL unlocked error

Bit 2 = Ref unlocked error

Bit 3 = ALC High unleveled error

Bit 4 = ALC Low unleveled error

Bit 5-15 = Not Used

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Interrupt Mode Defined

Read Hardware State

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HPE6432_ReadListData

```
ViStatus HPE6432_ReadListData (ViSession instrumentHandle,
ViUInt32 startingPoint, ViUInt32 numberOfPoints, ViInt32
listPointData[]);
```

Purpose

This function reads an array of list points from list point memory and provides it to an external application using the listPointData[] array.

A List is defined as one or more points that can be stored in the synthesizer's List Point Memory. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its Starting Point and its Number of Points (length).

The Starting Point parameter specifies a starting point in the list point memory at which to begin reading the list data.

The Number of Points (length) parameter specifies the number of points to take from the list point memory.

The List Point Data parameter specifies the memory address to store the list point data.

For example, using C, you could read 10 points from list point memory as follows:

```
ViInt32 buf[40];

HPE6432_ReadListData(0, 10, buf);

fwrite(buf, 16, 10, stream);
```

NOTE Downloading large lists could take long periods of time that depend on the speed of the computer and interface being used as well as the size of the list. Examples are shown below of loading different size lists into list point memory with the `HPE6432_WriteListPoints` function using different interfaces and different speed computers. The times listed below are given in seconds.

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Number of Points	PII-400/MXI-2	PII-400	P-150/MXI-2	P-90
1,000	0.01	0.01	0.01	0.14
2,000	0.02	0.02	0.02	0.30
5,000	0.05	0.05	0.06	0.70
10,000	0.10	0.10	0.11	1.38
20,000	0.19	0.19	0.22	2.78
50,000	0.46	0.46	0.55	6.92
100,000	0.92	0.92	1.11	13.51
131,071	1.16	1.20	1.38	17.62

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startingPoint`

`Variable Type ViUInt32`

This parameter is the starting point in the list point memory at which to begin reading the list data.

Valid range: 0 to (131,070 - Number_of_Points)

`numberOfPoints`

`Variable Type ViUInt32`

This parameter is the number of list points to read from list point memory.

Valid range: 1 to 131,070

`listPointData`

`Variable Type ViInt32[]`

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This parameter returns the buffer, containing list point data, from the synthesizer's list point memory.

Return Value

This return value reports the status of the `Read List Data` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_readStatusByte_Q

```
ViStatus HPE6432_readStatusByte_Q (ViSession
instrumentHandle, ViUInt16 *statusByte);
```

Purpose

This function reads the status byte.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`statusByte`

`Variable Type ViUInt16 (passed by reference)`

This parameter returns an integer bit field.

Bit 0 = List Running

Bit 1 = Unleveled

Bit 2 = Unlocked

Bit 3 = Not Used

Bit 4 = Message available (read with error query)

Bit 5 to Bit 15 = Not Used

Return Value

This return value always returns `VI_SUCCESS`.

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HPE6432_reset

```
ViStatus HPE6432_reset (ViSession instrumentHandle);
```

Purpose

This function sets the entire instrument and VXIplug&play driver to some predetermined default state. It modifies both the driver instrument state and the actual hardware so that they match.

For security reasons, users may have the requirement that all frequency information be erased from memory; the Reset function when used in conjunction with ClearList can be used for this purpose.

Only non-volatile memory is used for calibration data; all other memory is completely purged when power is turned off. If external calibration data is considered confidential, use the HPE6432_ResetExtDetCalData function to load the factory-preset values.

Since lists can be saved to a file, the user will have to take responsibility to manage the file system to ensure security.

Parameter List

instrumentHandle

Variable Type ViSession

This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

Return Value

This return value reports the status of the Reset function.

To obtain further information about the status that is returned, call the HPE6432_error_message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_ResetExtDetCalData

```
ViStatus HPE6432_ResetExtDetCalData (ViSession
instrumentHandle);
```

Purpose

This function is used to restore factory preset values for the external leveling loop configuration. These factory preset values are changed when an External Detector Linearization or External Modulator Gain Calibration is performed.

This function should be used if a calibrated external leveling loop configuration has been changed, or if difficulties are occurring while performing calibrations on the external leveling loop configuration.

NOTE To obtain calibration values for an external leveling loop configuration after performing this selection, the External Detector Linearization and External Modulator Gain Calibration must be performed again.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value reports the status of the `Reset Ext Det Cal Data` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

External Modulator Gain Calibration

External Detector Linearization

Reset External Detector Calibration to Factory Default

HPE6432_GetNumExtDetCalPoints

HPE6432_SetupCalExtDetPoint

HPE6432_EnterCalExtDetPowerMeterReading

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HPE6432_revision_query

```
ViStatus HPE6432_revision_query (ViSession
instrumentHandle, ViChar instrumentDriverRevision[], ViChar
firmwareRevision[]);
```

Purpose

This function returns the revision numbers of the instrument driver and instrument firmware.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`instrumentDriverRevision`

`Variable Type ViChar[]`

This parameter returns the instrument driver software revision numbers in the form of a string.

You must pass a ViChar array with at least 256 bytes.

`firmwareRevision`

`Variable Type ViChar[]`

This parameter returns the instrument firmware revision numbers in the form of a string.

You must pass a ViChar array with at least 256 bytes.

Return Value

This return value reports the status of the `Revision Query` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_RunList

```
ViStatus HPE6432_RunList (ViSession instrumentHandle,
ViUInt32 startingPoint, ViUInt32 numberOfPoints, ViUInt32
featureBits);V
```

Purpose

This function specifies and starts running a list that is currently stored in the synthesizer list point memory.

A List is defined as one or more points that can be stored in the synthesizer's List Point Memory. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its Starting Point and its Number of Points (length).

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startingPoint`

`Variable Type ViUInt32`

This parameter specifies the first point in list point memory to be used as the current list being run.

Valid range: 0 to (131,070 - Number_of_Points)

`numberOfPoints`

`Variable Type ViUInt32`

This parameter specified the number of points in list point memory to run.

Valid range: 1 to 131,071

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`featureBits`

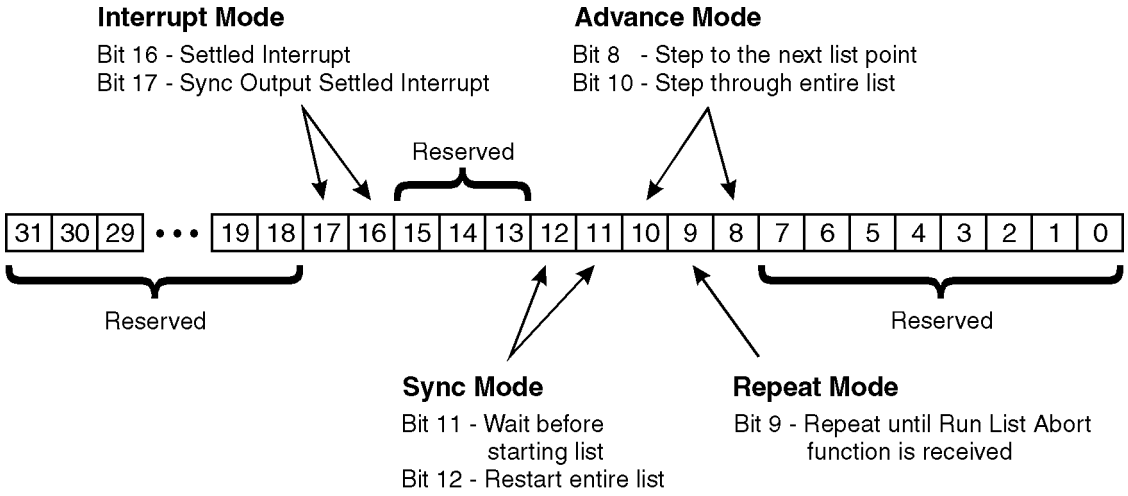
`Variable Type ViUInt32`

When using the `HPE6432_RunList()` function in any of the list modes, the `featureBits` parameter controls the features that establish how a list runs. Changing the feature bits to either on or off has the following effect on a list:

Decimal Value	**Bit #**	**Effect on a List**
0		With all bits set to 0, the list will run once automatically.
---	Bits 0-7	Reserved
256	Bit 8	Step to the next list point for each Trig In trigger
512	Bit 9	Repeat the list continuously until a `Run List Abort` function is received
1024	Bit 10	Step through entire list after receiving a Trig In trigger (Setting this bit clears Bit 8)
2048	Bit 11	Wait for a Sync In trigger before starting the list (Bits 8, 9, 10, and 12 still apply)
4096	Bit 12	Restart a running list when a Sync In trigger is received
	Bits 13-15	Reserved
65536	Bit 16	Send *Settled Interrupt* when list point is settled
131072	Bit 17	Send *Sync Output Settled Interrupt* when Sync Out bit is set; the Sync Out bit is set with the `HPE6432_WriteListPoints()` function.
	Bits 18-31	Reserved.

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NOTE To read the interrupt flag status, refer to the "HPE6432_GetInterruptFlags" on page 4-78, function.



Return Value

This return value reports the status of the `Run List` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Run List Abort

Is List Running

Clear List

Set Trigger In (Source)

Generate Manual Trigger In

Set Sync In (Source)

Generate Manual Sync In

Set Trigger Out - Front Panel

Set Trigger Out - VXI Backplane

Set Sync Out - Front Panel

Set Sync Out - VXI Backplane

Write List Points

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HPE6432_RunListAbort

```
ViStatus HPE6432_RunListAbort (ViSession instrumentHandle);
```

Purpose

This function aborts any list that might be running.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

Return Value

This return value reports the status of the `Run List Abort` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Run List

Is List Running

Clear List

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HPE6432_SelfTest

```
ViStatus HPE6432_SelfTest (ViSession instrumentHandle,
ViInt16 selfTestType, ViUInt32 *selfTestResult32, ViChar
sLogFile[]);
```

Purpose

This function runs either a full or a quick self test.

- Full Self Test with RF On - includes all testing performed in the quick self test and includes testing of the signal path circuitry.
- Quick Self Test with No RF - is a shortened version of the Full Self Test with RF On. This quick self test excludes testing of the signal path circuitry which is performed in the full self test.

The result of either a full or quick self test is a zero integer value which indicates that the test passed. If the full or quick self test does not pass, the result is a non-zero integer value (in hexadecimal representation) that indicates the sub-tests that failed.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`selfTestType`

`Variable Type ViInt16`

This parameter specifies the type of self test to be performed.

Self-Test Code Description

---

0 Run Full Self Test with RF On

1 Run Quick Self Test with No RF

`selfTestResult32`

`Variable Type ViUInt32 (passed by reference)`

This parameter returns a value from the instrument self test.

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Self-Test Code Description

---

0 Passed self test

Non-zero Integer Failed self test

`sLogFile`

`Variable Type ViChar[]`

This parameter returns the name of the self test log file. The self test log file contains the test's error results from a self test that is run and fails. If the self test passes, a log file is not generated and this parameter is null.

If the self test fails, a text description of the failure can be obtained by reading the self test log file. The self test log file's name is returned in the sLogFile parameter.

Return Value

This return value reports the status of the `Self-Test (VXIplug&play)` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

Pull Down Diagnostics Menu

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_self_test

```
ViStatus HPE6432_self_test (ViSession instrumentHandle,
ViInt16 *selfTestResult16, ViChar selfTestMessage[]);
```

Purpose

This function calls the `HPE6432_SelfTest` function and runs the quick self test. This function is made available to meet the requirements of the VXIplug&play standard.

For further information, refer to the documentation for "HPE6432_SelfTest" on page 4-151, function.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`selfTestResult16`

`Variable Type ViInt16 (passed by reference)`

This parameter returns a value from the instrument's quick self test.

Self-Test Code Description

---

0 Passed quick self test

1 Failed quick self test

`selfTestMessage`

`Variable Type ViChar[]`

Returns the self-test response string from the instrument.

You must pass a ViChar array with at least 256 bytes.

The self-test response string is a message that directs you to view the self test log file. This is the same self test log file that is returned in the `Self Test (Quick/Full)` function's sLogFile parameter.

If the self test fails, a text description of the failure can be obtained by reading the self test log file. The self test log file's name is returned in the sLogFile parameter.

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Return Value

This return value reports the status of the `Self-Test (Full/Quick)` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

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HPE6432_SetActiveVxiInt

```
ViStatus HPE6432_SetActiveVxiInt (ViSession
instrumentHandle, ViUInt16 selectedVXIInterrupt);
```

Purpose

This function selects a VXI interrupt level for the synthesizer.

The VXI interrupt level designates the priority level that the synthesizer can send to the host controller. Multiple synthesizers, in the same mainframe, can use the same interrupt level.

In order to use the requested interrupt level, the selected interrupt should be allocated by the resource manager and must be set to the same value in both the Slot 0 controller and the synthesizer.

CAUTION

If you are using the VXIplug&play driver that is supplied with your synthesizer from Agilent Technologies, the factory preset interrupt level should be used. The ability to change the interrupt level for this synthesizer is made available for system integrators that have working knowledge of the VXI bus interrupt system and understand the effects of changing interrupt levels. For details on setting interrupt levels and their effects, refer to “The VMEbus Specification”.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`selectedVXIInterrupt`

`Variable Type ViUInt16`

This parameter selects a VXI interrupt level.

Allowable values: 1 – 7 (7 is the highest priority interrupt)

Factory Preset Value: 5

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Get Interrupt Flags

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HPE6432_SetAlcAtten

```
ViStatus HPE6432_SetAlcAtten (ViSession instrumentHandle,
ViReal64 alcPower, ViUInt16 attenuation);
```

Purpose

This function sets the current ALC power level and attenuation of the output while all other instrument states remain unchanged.

This function uses the compound frequency+power function (`Set Freq`, `ALC`, `Atten`) to set the synthesizer by remembering and sending the current value for frequency along with user-specified values for ALC power level and attenution.

The ALC power and attenuation values are applied to the synthesizer without incurring the additional setup time associated with setting frequency or with setting power and attenuation separately.

Factory Preset Values:

ALC Power = –10 dBm

Attenuation = 70 dB

NOTE

When in high band, ALC switching speed can be maximized with minimum settling and dwell times while using the fastest interface and computer available. Examples are shown below of the average ALC switching times required to set the ALC using different interfaces and different speed computers.

PII-400/MXI-2	P-200/MXI-2	P-150/MXI-2
0.35 ms	0.5 ms	0.6 ms

PII-400/FireWire	P-90/FireWire
2.0 ms	5.1 ms

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`alcPower`

`Variable Type ViReal64`

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This parameter specifies an ALC power setting.

Valid range: –20 dBm to Maximum Leveled Output Power

`attenuation`

`Variable Type ViUInt16`

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

Return Value

This return value reports the status of the `Set ALC, Atten` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Freq, ALC, Atten

Set Blanking (On/Off)

Set Long Blanking (On/Off)

Set Sync Out (On/Off)

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HPE6432_SetAlcBandwidth

```
ViStatus HPE6432_SetAlcBandwidth (ViSession
instrumentHandle, ViBoolean alcBandwidth);
```

Purpose

This function sets the ALC bandwidth to either high or low while all other instrument state settings are unaffected; this setting affects the current state as well as the list.

- When high ALC bandwidth is selected, the ALC loop has a bandwidth of 100 kHz.
- When low ALC bandwidth is selected, the ALC loop has a bandwidth of 10 kHz.

Internal Leveling Mode

When using Internal Leveling Mode and frequencies less than 560 MHz, the ALC bandwidth is always low. When the frequency is greater than or equal to 560 MHz, the ALC bandwidth is always high.

External Leveling Mode

When using External Leveling Mode, the ALC bandwidth is low for all frequencies by default, but can be changed to high if desired.

In External Leveling Mode, high ALC bandwidth can be used in a effort to minimize the effects of settling time. Because some situations that use External Leveling Mode utilize an external detector, miscellaneous equipment (such as amplifiers), and long cabling, an excessive phase shift can be created which in turn could result in oscillations. Problems such as this can be eliminated in External Leveling Mode by selecting low ALC bandwidth.

The following table shows the default and selectable ALC bandwidth in relation to leveling mode and frequency.

Leveling Mode	< 560 MHz	>/= 560 MHz
Internal	Always Low ALC Bandwidth (10 kHz)	Always High ALC Bandwidth (100 kHz)
External	Default Low ALC Bandwidth(10 kHz), but Selectable to High (100 kHz)	Default Low ALC Bandwidth(10 kHz) , but Selectable to High (100 kHz)

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Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`alcBandwidth`

`Variable Type ViBoolean`

This parameter specifies whether high or low ALC bandwidth is used.

Allowable values: low=`VI_TRUE`, high=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Long Blanking (On/Off)

HPE6432_GetAlcBandwidth

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HPE6432_SetAmMode

```
ViStatus HPE6432_SetAmMode (ViSession instrumentHandle,
ViBoolean amMode);
```

Purpose

This function selects either exponential or linear AM mode; this setting affects the current instrument state as well as the list.

When the synthesizer is in linear AM mode, the input accepts a –1 Vp to +1 Vp signal. The RF output level (the reference power level) is affected by the AM input level as follows:

Linear Input Level	RF Output Level
0 V	Unaffected
–1 Vp	Minimum Power
+1 Vp	100% (3 dB) Higher than the Reference Power Level

Therefore, there must be greater than or equal to 3 dB of margin between the reference power level and the maximum available at a given frequency. The unmodulated (0 V input) to modulated (–1 Vp input) ratio is a function of power level and frequency, but is always greater than 20 dB. The amplitude of the RF output changes linearly as the AM input changes. The input impedance for this input connector is factory set at 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

When the synthesizer is in exponential AM mode, the input accepts a wider range of input signal. The RF output level (the reference power level) is affected by the exponential input level as follows:

Exponential Input Level	RF Output Level
0 V	Unaffected
–1 Vp	Decreases by 10 dB / –1 V
+1 Vp	Increases by 10 dB / +1 V

The dynamic range of the positive to negative power levels is dependent on the synthesizer power level setting. The input impedance for this input connector is factory set at 2 kilohms. Damage levels for this input are greater than or equal to +15 Vp, or less than or equal to –15 Vp.

Factory Preset Value: Linear

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Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amMode`

`Variable Type ViBoolean`

This parameter specifies whether exponential or linear amplitude modulation mode is used.

Allowable values: Exponential=`VI_TRUE`, Linear=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetAmMode

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HPE6432_SetAmModState

```
ViStatus HPE6432_SetAmModState (ViSession instrumentHandle,
ViBoolean amEnable);
```

Purpose

This function enables or disables the amplitude modulation port on the synthesizer front panel. This affects the current state as well as the list.

Factory Preset Value: Disable

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amEnable`

`Variable Type ViBoolean`

This parameter specifies whether amplitude modulation is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Deep AM (On/Off)

Set AM Mode (LIN/EXP)

HPE6432_GetAmpModState

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HPE6432_SetAmplitudeBlankingTime

```
ViStatus HPE6432_SetAmplitudeBlankingTime (ViSession
instrumentHandle, ViInt16 amplitudeBlankingTime);
```

NOTE Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE This function requires Set User Blanking to be enabled.

Purpose

This function allows the user to adjust the amplitude blanking time from 20 us to 1023 us when the frequency is above 560 MHz and Set Long Blanking (On/Off) is disabled.

20 ms is added to the blanking time each time the step attenuator (Option 1E1) is changed.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`amplitudeBlankingTime`

`Variable Type  ViInt16`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetAmplitudeBlankingTime

HPE6432_SetUserBlankingState

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HPE6432_SetAtten

```
ViStatus HPE6432_SetAtten (ViSession instrumentHandle,
ViUInt16 attenuation);
```

Purpose

This function sets the current attenuation of the output while all other instrument states remain unchanged. This function accepts a value of 0 to 70 (0, 10, 20, 30, 40, 50, 60, or 70) and locks the attenuator value at this setting.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`attenuation`

`Variable Type  ViUInt16`

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetAtten

Set Attenuation Auto (On/Off)

Set Freq, ALC, Atten

Set Blanking (On/Off)

Set Long Blanking (On/Off)

Set Sync Out (On/Off)

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HPE6432_SetAttenAuto

```
ViStatus HPE6432_SetAttenAuto (ViSession instrumentHandle,
ViBoolean attenAutoEnable);
```

Purpose

This function allows you to select whether the attenuator operates automatically or in a locked setting.

When SetAttenAuto = enabled (true), the attenuator changes automatically, as used with the Set RF Output Power command, so that the RF output power = ALC + Attenuation.

When SetAttenAuto = disable (false), the attenuator is locked in its current setting.

Factory Preset Value: True

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`attenAutoEnable`

`Variable Type ViBoolean`

This parameter specifies whether the attenuator lock mechanism is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetAttenAuto

Set Attenuator

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HPE6432_SetBlankingState

Set AM Mode (LIN/EXP)

```
ViStatus HPE6432_SetBlankingState (ViSession
instrumentHandle, ViBoolean blankingEnable);
```

Purpose

This function is used to control whether or not the RF output is being blanked during the switch/blanking time.

This function applies only to the following functions:

- This function applies only to the following functions:
- `Set Freq`, `ALC`, `Atten`
- `Set Frequency`
- `Set Alc`, `Atten`
- `Set Output Power`

The following functions override this setting with the featureBits parameter:

- `Set Freq`, `Alc`, `Atten`, `Bit`
- `Write List Point`
- `Write List Points`

If the RF output is being blanked, the RF output is turned off during the switch/blanking time. Although the RF output can be optionally blanked when changing frequency or power or both, it is always blanked when the 10 dB step attenuator (Option 1E1) is changed.

If the RF output is not being blanked, the RF output is turned on during the switch/blanking time and may be affected by spurious signals, harmonics, or other glitches.

Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)

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- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

Once switch/blanking time is completed, the settling time begins. Settling time is user-definable, and can be adjusted, from a minimum value, to longer periods of time, up to a maximum value, in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer. (For more information, refer to “Settling Time” on page 3-43.)

In summary, there is a delay time that is required by the synthesizer to change between frequencies or power or both. This delay time is a combination of the switch/blanking time and settling time. The switch/blanking time is dependent on the criteria listed above while the settling time is user-definable and dependent on the accuracy required of the final signal. If RF blanking is on during switch/blanking time, you do not see the effects on the RF output, but if RF blanking is off during switch/blanking time, you see all of the effects on the signal that might include spurious signals, harmonics, and other glitches. Whether RF blanking is on or off has no effect on settling time, it only affects the RF output during switch/blanking time.

When in list mode, the function `Write List Points` is used to control, on a point by point basis, whether the RF output is on or off during switch/blanking time and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.

When in set-spot mode, the function `Set Blanking (On/Off)` is used to control whether the RF output is on or off during switch/blanking time, and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.

Factory Preset Value: Enabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`blankingEnable`

`Variable Type ViBoolean`

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This parameter specifies whether blanking is enabled or disabled.

Allowable values: enable=VI_TRUE, disable=VI_FALSE

Return Value

This return value always returns VI_SUCCESS.

Related Topics

Set Freq, Alc, Atten, Bit

Set Freq, ALC, Atten

Set Frequency

Set Alc, Atten

Set Output Power

Set Settling Time

Set Long Blanking (On/Off)

Write List Point

Write List Points

HPE6432_GetBlankingState

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HPE6432_SetDeepAmState

```
ViStatus HPE6432_SetDeepAmState (ViSession
instrumentHandle, ViBoolean deepAMEnable);
```

Purpose

This function selects either Normal or Deep amplitude modulation while all other instrument state settings are unaffected.

This setting affects the current instrument state as well as the list.

Factory Preset Value: Normal

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`deepAMEnable`

`Variable Type ViBoolean`

This parameter specifies whether deep amplitude modulation is on or off.

Allowable values: Deep=`VI_TRUE`, Normal=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetDeepAmState

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HPE6432_SetDwellTime

```
ViStatus HPE6432_SetDwellTime (ViSession instrumentHandle,
ViReal64 dwellTime);
```

Purpose

This function sets the dwell time.

Dwell time is the minimum period of time after the settling time that the synthesizer will remain at its current state. The synthesizer can accept a Trig In trigger during or after the dwell time, but it will not act until after the dwell time is complete.

Factory Preset Value: 200 us

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`dwellTime`

`Variable Type ViReal64`

This parameter specifies the minimum period of time, following the settling time, that the synthesizer remains at a point in the list.

Range: 0.5 us to 32.7675 ms

Return Value

This return value reports the status of the `Set Dwell Time` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

HPE6432_SetSettlingTime

HPE6432_GetDwellTime

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HPE6432_SetExtIfInvert

```
ViStatus HPE6432_SetExtIfInvert (ViSession
instrumentHandle, ViBoolean ifSidebandInvert);
```

Purpose

This function sets the IF Sideband to either Normal or Invert.

Factory Preset Value: Normal

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifSidebandInvert`

`Variable Type ViBoolean`

This parameter specifies whether normal or invert is selected as the IF sideband to be used.

Allowable values: Normal or Invert

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetExtIfInvert

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HPE6432_SetExtIfState

```
ViStatus HPE6432_SetExtIfState (ViSession instrumentHandle,
ViBoolean ifEnable);
```

Purpose

This function enables or disables the external 300 MHz IF In port on the synthesizer front panel; all other instrument state settings are unaffected.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifEnable`

`Variable Type ViBoolean`

This parameter specifies whether the external 300 MHz IF In is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetExtIfState

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HPE6432_SetExtSyncOutput

ViStatus HPE6432_SetExtSyncOutput (ViSession instrumentHandle, ViUInt16 syncOutFrontPanel);

Purpose

This function controls the Sync Out trigger on the hardware front panel of the synthesizer.

To direct the Sync Out trigger to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7), refer to the “Sync Out (VXI Backplane)” on page 3-54.

To control the Sync Out trigger in set-spot mode, refer to the `Set Sync Out (On/Off)` function.

The Sync Out trigger is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted.

The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode or list mode.

Allowable values:

FRONT_OUT_OFF = 0	No Sync Out trigger is output.
FRONT_OUT_POS = 16	The Sync Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	The Sync Out trigger is generated with a negative polarity.

Factory Preset Value: FRONT_OUT_OFF

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

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`syncOutFrontPanel`

`Variable Type ViUInt16`

This parameter specifies whether the Sync Out trigger is off or has a positive or negative polarity.

Return Value

This return value reports the status of the `Set Sync Out - Front Panel` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Settling Time

Set Sync Out (On/Off)

Set Sync Out - VXI Backplane

Write List Point

Write List Points

HPE6432_GetExtSyncOutput

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HPE6432_SetExtTriggerOutput

```
ViStatus HPE6432_SetExtTriggerOutput (ViSession
instrumentHandle, ViUInt16 trigOutFrontPanel);
```

Purpose

This function controls the Trig Out trigger on the hardware front panel of the synthesizer.

The Trig Out trigger is an output trigger and is produced after each new hardware frequency or power level setting has settled; the value of the dwell time controls how long the trigger outputs (Sync Out and Trig Out) are asserted.

The Trig Out trigger can be directed to the Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode or list mode.

Allowable values:

FRONT_OUT_OFF = 0	No Trig Out trigger is output to the hardware front panel of the synthesizer.
FRONT_OUT_POS = 16	The Trig Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	The Trig Out trigger is generated with a negative polarity.

Factory Preset Value: FRONT_OUT_OFF

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`trigOutFrontPanel`

`Variable Type ViUInt16`

This parameter specifies whether the Trig Out trigger is off or has a positive or negative polarity.

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Return Value

This return value reports the status of the `Set Trigger Out - Front Panel` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

HPE6432_GetExtTriggerOutput

To direct the Trig Out trigger to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7), refer to “Trigger Out (VXI Backplane)” on page 3-51.

`attenuation`

Valid range: –20 dBm to Maximum Leveled Output Power

`Variable Type ViUInt16`

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

Return Value

This return value reports the status of the `Set Freq, ALC, Atten` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Frequency

Set Output Power

Set Blanking (On/Off)

Set Long Blanking (On/Off)

Set Sync Out (On/Off)

HPE6432_GetFreqAlcAtten

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HPE6432_SetFreqAlcAtten

```
ViStatus HPE6432_SetFreqAlcAtten (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 alcPower,
ViUInt16 attenuation);
```

Purpose

This function sets the output frequency, ALC power level, and attenuation to specified values. An attenuation value must still be specified even if the synthesizer does not contain a step attenuator (Option 1E1).

This function allows a single operation to set both frequency and power so that the synthesizer can be rapidly moved from point to point in a system environment without using the list mode.

NOTE

When in high band, ALC switching speed can be maximized with minimum settling and dwell times while using the fastest interface and computer available. Examples are shown below of the average ALC switching times required to set the ALC using different interfaces and different speed computers.

PII-400/MXI-2	P-200/MXI-2	P-150/MXI-2
0.35 ms	0.5 ms	0.6 ms

PII-400/FireWire	P-90/FireWire
2.0 ms	5.1 ms

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`frequency`

`Variable Type ViReal64`

This parameter specifies a frequency setting.

Valid range: 10 MHz to 20 GHz with 1 Hz resolution

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`alcPower`

`Variable Type ViReal64`

This parameter specifies an ALC power setting.

Valid range: –20 dBm to Maximum Leveled Output Power

`attenuation`

`Variable Type ViUInt16`

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

Return Value

This return value reports the status of the `Set Freq`, `ALC`, `Atten` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Frequency

Set Output Power

Set Blanking (On/Off)

Set Long Blanking (On/Off)

Set Sync Out (On/Off)

HPE6432_GetFreqAlcAtten

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HPE6432_SetFreqAlcAttenBit

```
ViStatus HPE6432_SetFreqAlcAttenBit (ViSession
instrumentHandle, ViReal64 frequency, ViReal64 alcPower,
ViUInt16 attenuation, ViUInt16 featureBits, ViUInt16
alcOffset);
```

Purpose

This function sets the output frequency, ALC power level, and attenuation to specified values. Additional features can be specified by passing a fourth parameter value that turns on different bits in the featureBits parameter. An ALC integrator zero offset value can also be supplied if the featureBits parameter sets Bit 3=1,

This function allows a single operation to set both frequency and power so that the synthesizer can be rapidly moved from point to point in a system environment without using the list mode.

NOTE When in high band, ALC switching speed can be maximized with minimum settling and dwell times while using the fastest interface and computer available. Examples are shown below of the average ALC switching times required to set the ALC using different interfaces and different speed computers

PII-400/MXI-2	P-200/MXI-2	P-150/MXI-2
0.35 ms	0.5 ms	0.6 ms

PII-400/FireWire	P-90/FireWire
2.0 ms	5.1 ms

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`frequency`

`Variable Type ViReal64`

This parameter specifies a frequency setting.

Valid range: 10 MHz to 20 GHz with 1 Hz resolution

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alcPower

Variable Type ViReal64

This parameter specifies an ALC power setting.

Valid range: –20 dBm to Maximum Leveled Output Power

attenuation

Variable Type ViUInt16

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

featureBits

Variable Type ViUInt16

This parameter specifies the features used while setting a frequency and power level. One or more features can be selected. To select a single feature, specify its feature bit value. To select multiple features, add the desired feature bit values together.

featureBits	**Description**
---	With all featureBits set to 0, set a frequency and power level, but do not generate a Sync Out trigger, do not adjust ALC Offset, and do not use long banking.
Bit 0=1	Reserved
Bit 1=1	Do not blank RF output unless the step attenuator is changed.
Bit 2=1	Set switch/blanking time to long switch/blanking; normal switch/blanking time is 150 us and long switch/blanking time is 350 us.
Bit 3=1	Use the ALC integrator zero offset value that is passed in from the alcOffset parameter in place of the ALC integrator zero offset value from the frequency table.
Bits 4-7	Reserved
Bit 8=1	The synthesizer will produce a Sync Out trigger at the end of the Settling Time
Bits 9-15	Reserved

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`alcOffset`

`Variable Type ViUInt16`

This parameter specifies an ALC integrator zero offset value (a 16 bit value) that is applied to the ALC Integrator Zero DAC at the specified frequency and power. This allows minimal shift in the power from the value sent as power when the ALC loop is opened.

Valid range: 0 - 4095

The ALC integrator zero offset value is ignored unless the featureBits parameter sets Bit 3=1.

Return Value

This return value reports the status of the `Set Freq`, `ALC`, `Atten`, `Bit` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Sync Out - Front Panel

Set Sync Out - VXI Backplane

Set Blanking (On/Off)

Set Long Blanking (On/Off)

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HPE6432_SetFreqModExtSensitivity

```
ViStatus HPE6432_SetFreqModExtSensitivity (ViSession
instrumentHandle, ViReal64 HZperVolt);
```

Purpose

This function, only available on instruments with Option 002, is used to select the FM sensitivity. It can be set to 10 MHz/V, 1 MHz/V, or 100 KHz/V.

This option is not available on instruments with Option UNG.

Level accuracy with ALC off below 2 GHz is unspecified.

A Power Search may be used to improve level accuracy with ALC off. Alternately, the IF Attenuator, can be adjusted in 2 dB steps to obtain the correct level within +/- 1 dB; above 2 GHz or with ALC on, this is unnecessary.

If the modulation index, defined as the peak frequency deviation divided by the frequency of the modulating signal, is greater than ~120, a frequency shift may occur.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`HZperVolt`

`Variable Type  ViReal64`

This parameter specifies the FM sensitivity.

Allowable values: 10E6, 1E6, 100E3

These values correspond to 10 MHz/V, 1 MHz/V, or 100 KHz/V.

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetFreqModExtSensitivity

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HPE6432_SetFreqModState

```
ViStatus HPE6432_SetFreqModState (ViSession
instrumentHandle, ViBoolean fmEnable);
```

Purpose

This function enables or disables the frequency modulation port on the synthesizer front panel; all other instrument state settings are unaffected.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`fmEnable`

`Variable Type ViBoolean`

This parameter specifies whether frequency modulation is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetFreqModState

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HPE6432_SetFrequency

```
ViStatus HPE6432_SetFrequency (ViSession instrumentHandle,
ViReal64 frequency);
```

Purpose

This function sets the current frequency of the output while all other instrument states remain unchanged.

This function uses the compound frequency+power function (Set Freq, ALC, Atten) to set the synthesizer by remembering and sending the current value for power along with a user-specified value for frequency.

Factory Preset Value: Frequency = 10 MHz

Parameter List

instrumentHandle

Variable Type ViSession

This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

frequency

Variable Type ViReal64

This parameter specifies a frequency setting.

Valid range: 10 MHz to 20 GHz with 1 Hz resolution

Return Value

This return value reports the status of the Set Frequency function.

To obtain further information about the status that is returned, call the HPE6432_error_message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Freq, ALC, Atten

Set Blanking (On/Off)

Set Long Blanking (On/Off)

Set Sync Out (On/Off)

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HPE6432_SetIAttenuation

```
ViStatus HPE6432_SetIAttenuation (ViSession
instrumentHandle, ViUInt16 iAttenuation);
```

Purpose

This function sets the level of I Attenuation that is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry. This attenuator can reduce the signal level in 2 dB steps and can be adjusted for up to 12 dB of attenuation.

Changes made to I Attenuation should also be made to Q Attenuation. Usually the I and Q signal paths will have the same gain although they are individually adjustable.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iAttenuation`

`Variable Type  ViUInt16`

This parameter specifies a value for I Attenuation.

Allowable values: 0, 2, 4, 6, 8, 10, 12

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIAttenuation

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HPE6432_SetICal

```
ViStatus HPE6432_SetICal (ViSession instrumentHandle,
ViUInt16 iCalLevel);
```

Purpose

This function sets the level of the calibration voltage used for the I input when Test Tone is selected as the I/Q Input.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iCalLevel`

`Variable Type  ViUInt16`

This parameter selects the Test Tone calibration voltage for the I input.

iCalLevel Voltage

7= 1.000

6= 0.000

5= -0.167

4= 0.167

3= -0.354

2= 0.354 (Recommended Value)

1= -0.500

0= 0.500

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetICal

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HPE6432_SetIfAtten

```
ViStatus HPE6432_SetIfAtten (ViSession instrumentHandle,
ViUInt16 ifAttenuation);
```

Purpose

This function sets the IF upconverter attenuator and has a range of 0 to 30 dB in 2 dB steps.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`ifAttenuation`

`Variable Type  ViUInt16`

This parameter specifies the amount of IF Attenuation to be applied.

Allowable values: 0 to 30 dB in 2 dB steps

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIfAtten

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HPE6432_SetIGainAdjust

```
ViStatus HPE6432_SetIGainAdjust (ViSession
instrumentHandle, ViUInt16 iGainAdjustDac);
```

Purpose

This function sets the I Gain adjustment DAC that is used to enter compensation values for external source impairments from the I signal path.

Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iGainAdjustDac`

`Variable Type  ViUInt16`

This parameter specifies the setting for the I Gain adjustment DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIGainAdjust

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HPE6432_SetIGainDac

```
ViStatus HPE6432_SetIGainDac (ViSession instrumentHandle,
ViUInt16 iGainDac);
```

Purpose

This function sets a value for the I Gain DAC.

I Gain is used to enter compensation values for internal gain impairments in the I signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Factory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iGainDac`

`Variable Type ViUInt16`

This parameter specifies a value for the I Gain DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIGainDac

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HPE6432_SetIOffsetAdjust

```
ViStatus HPE6432_SetIOffsetAdjust (ViSession
instrumentHandle, ViInt16 iOffsetAdjustDac);
```

Purpose

This function sets the I Offset adjustment DAC that is used to enter an origin offset voltage for the in-phase portion of an I/Q signal. The value of I Offset is used to adjust out imperfections in the in-phase signal.

The level of dc offset determines the level of carrier feed-through.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iOffsetAdjustDac`

`Variable Type  ViInt16`

This parameter specifies the setting for the I Offset adjustment DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the Error Message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIOffsetAdjust

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HPE6432_SetIOffsetDac

```
ViStatus HPE6432_SetIOffsetDac (ViSession instrumentHandle,
ViUInt16 iOffsetDac);
```

Purpose

This function sets a value for the I Offset DAC.

I Offset is used to enter an origin offset voltage for the in-phase portion of an I/Q signal. The value of I Offset is used to adjust out imperfections in the in-phase signal.

The level of dc offset determines the level of carrier feed-through.

Factory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iOffsetDac`

`Variable Type ViUInt16`

This parameter specifies a value for the I Offset DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIOffsetDac

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HPE6432_SetIqAdjustState

```
ViStatus HPE6432_SetIqAdjustState (ViSession
instrumentHandle, ViBoolean iqAdjustmentsEnable);
```

Purpose

This function is used to enable or disable the Adjustments to Calibration Settings so that they may be applied to an I/Q input signal.

When enabled, the values specified for I Gain, Q Gain, I Offset, Q Offset, and Quadrature (Offset) are applied as adjustments to the calibration settings that were selected using the following commands:

- ❏ Set I Gain Adjustment DAC
- ❏ Set Q Gain Adjustment DAC
- ❏ Set I Offset Adjustment DAC
- ❏ Set Q Offset Adjustment DAC
- ❏ Set Quadrature Adjustment DAC

  These gain, offset, and quadrature adjustments when applied are used to compensate for external I and Q source impairments.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqAdjustmentsEnable`

`Variable Type  ViBoolean`

This parameter specifies whether I/Q External Source adjustments are enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIqAdjustState

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HPE6432_SetIqInput

```
ViStatus HPE6432_SetIqInput (ViSession instrumentHandle,
ViUInt16 iqInput);
```

Purpose

This function is used to select the I/Q Input, which is used to select the way in which the I and Q input signals are supplied to the synthesizer's I/Q modulator circuitry.

When set to Normal, the signal that is physically connected to the I Input on the synthesizer's hardware front panel is used as the I input signal, and the signal that is physically connected to the Q Input on the synthesizer's hardware front panel is used as the Q input signal.

When set to Swapped, the signal that is physically connected to the I Input on the synthesizer's hardware front panel is used as the Q input signal, and the signal that is physically connected to the Q Input on the synthesizer's hardware front panel is used as the I input signal.

When set to Test Tone, both the I and Q inputs are connected to dc levels which produce only a carrier feed-through signal with no offset signals. This is used to verify that the I/Q modulator is functioning and to provide a known signal level at the output of the I/Q modulator (0 dBm).

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqInput`

`Variable Type  ViUInt16`

This parameter specifies whether the I/Q input is set to Normal, Swapped, or Test Tone.

Allowable values: 0 (Normal), 1 (Swapped), or 2 (Test Tone)

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

HPE6432_GetIqInput

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HPE6432_SetIqModState

```
ViStatus HPE6432_SetIqModState (ViSession instrumentHandle,
ViBoolean iqEnable);
```

Purpose

This function enables or disables the IQ modulation ports on the synthesizer front panel; all other instrument state settings are unaffected.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`iqEnable`

`Variable Type ViBoolean`

This parameter specifies whether IQ modulation is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetIqModState

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HPE6432_SetLevelingPoint

CAUTION If selecting external leveling (EXTERNAL_DETECTOR_1) and a calibration has not been performed on the external leveling loop configuration, any sensitive DUT [Device Under Test] is subject to unknown changes in unknown RF output.

```
ViStatus HPE6432_SetLevelingPoint (ViSession
instrumentHandle, ViInt16 levelingPoint);
```

Purpose

This function sets the ALC leveling point while all other instrument state settings are unaffected.

The ALC leveling point affects the current state as well as the list.

When INTERNAL_DETECTOR is selected, this function allows the synthesizer to level power at the output of the directional coupler located inside of the synthesizer.

When EXTERNAL_DETECTOR_1 is selected, this function allows the synthesizer to level power by accepting an external feedback connection from a negative-output diode detector. The Ext ALC BNC connector on the front panel is used for the required signal.

Factory Preset Value: INTERNAL_DETECTOR

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`levelingPoint`

`Variable Type ViInt16`

This parameter specifies the ALC leveling point that is to be used.

Allowable values:

INTERNAL_DETECTOR (Factory Preset Value)

EXTERNAL_DETECTOR_1 (Ext ALC - front panel connector)

Return Value

This return value always returns `VI_SUCCESS`.

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Related Topics

HPE6432_GetLevelingPoint

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HPE6432_SetLevelingState

```
ViStatus HPE6432_SetLevelingState (ViSession
instrumentHandle, ViBoolean levelingEnable);
```

Purpose

This function enables or disables the ALC leveling while all other instrument state settings are unaffected; this setting affects the current state as well as the list.

When enabled, the power can be set in fundamental units of dBm.

When disabled, the ALC is not calibrated, power is affected in a logarithmic fashion, but is still in dBm.

This function is used in pulse mode with a pulse width less than 2.5 us or when I/Q modulation is applied to the RF signal. It is used in conjunction with Power Search Mode to set the RF output power.

Power Search Mode is used to keep the output power of an opened ALC loop relatively close to the value of a closed ALC loop.

For example: set the RF output power, perform a Power Search, open the ALC loop, add a pulse with a pulse width less than 2.5 us or add an I/Q modulation, and the ALC power level should stay relatively close to the power level that was set with the ALC loop closed; refer to instrument specifications for an exact value.

Factory Preset Value: Enabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`levelingEnable`

`Variable Type ViBoolean`

This parameter specifies whether automatic level control is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

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Related Topics

HPE6432_GetLevelingState

Power Search

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HPE6432_SetLongBlankingState

```
ViStatus HPE6432_SetLongBlankingState (ViSession
instrumentHandle, ViBoolean longBlankingEnable);
```

Purpose

This function is used to control whether or not long blanking time is used during frequency or power changes. Set Long Blanking State is different from Set Blanking State. Set Long Blanking State does not specify that the RF output be blanked, it only specifies that the switch/blanking time be set to 350 us. If RF output blanking is also desired, Set Blanking State must be used.

Purpose

This function applies only to the following functions:

- `Set Freq, ALC, Atten`
- `Set Frequency`
- `Set Alc, Atten`
- `Set Output Power`

The following functions override this setting with the `featureBits` parameter:

- `Set Freq, Alc, Atten, Bit`
- `Write List Point`
- `Write List Points`

If the RF output is being blanked, the RF output is turned off during the switch/blanking time. Although the RF output can be optionally blanked when changing frequency or power or both, it is always blanked when the 10 dB step attenuator (Option 1E1) is changed.

If the RF output is not being blanked, the RF output is turned on during the switch/blanking time and may be affected by spurious signals, harmonics, or other glitches.

Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set

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- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

Once switch/blanking time is completed, the settling time begins. Settling time is user-definable, and can be adjusted, from a minimum value, to longer periods of time, up to a maximum value, in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer. (For more information, refer to “Settling Time” on page 5-23.)

In summary, there is a delay time that is required by the synthesizer to change between frequencies or power or both. This delay time is a combination of the switch/blanking time and settling time. The switch/blanking time is dependent on the criteria listed above while the settling time is user-definable and dependent on the accuracy required of the final signal. If RF blanking is on during switch/blanking time, you do not see the effects on the RF output, but if RF blanking is off during switch/blanking time, you see all of the effects on the signal that might include spurious signals, harmonics, and other glitches. Whether RF blanking is on or off has no effect on settling time, it only effects the RF output during switch/blanking time.

When in list mode, the function `Write List Points` is used to control, on a point by point basis, whether the RF output is on or off during switch/blanking time and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.

When in set-spot mode, the function `Set Blanking (On/Off)` is used to control whether the RF output is on or off during switch/blanking time, and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`longBlankingEnable`

`Variable Type ViBoolean`

This parameter specifies whether long blanking is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

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Return Value

This return value always returns VI_SUCCESS.

Related Topics

Set Freq, Alc, Atten, Bit

Set Freq, ALC, Atten

Set Frequency

Set Alc, Atten

Set Output Power

Set Settling Time

Set Long Blanking (On/Off)

Write List Point

Write List Points

HPE6432_GetLongBlanking State

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HPE6432_SetLongBlankingTime

```
ViStatus HPE6432_SetLongBlankingTime (ViSession
instrumentHandle, ViInt16 longBlankingTime);
```

NOTE ❑Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE ❑This function requires Set User Blanking to be enabled.

Purpose

This function allows the user to adjust the long blanking time from 20 us to 1023 us.

Long switch blanking time is typically 350 us for all frequencies that are:

- ❑ ❑560 MHz or less
- ❑ ❑above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth).

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`longBlankingTime`

`Variable Type  ViInt16`

This parameter specifies the length of long blanking time.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetLongBlankingTime

HPE6432_SetUserBlankingState

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HPE6432_SetNormalBlankingTime

```
ViStatus HPE6432_SetNormalBlankingTime (ViSession
instrumentHandle, ViInt16 normalBlankingTime);
```

NOTE ❑Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

NOTE ❑This function requires Set User Blanking to be enabled.

Purpose

This function allows the user to adjust the normal blanking time from 20 us to 1023 us.

Normal switch blanking time is 150 us for all frequencies above 560 MHz with normal switch/blanking mode set.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`normalBlankingTime`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetNormalBlankingTime

HPE6432_SetUserBlankingState

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HPE6432_SetOutputPower

```
ViStatus HPE6432_SetOutputPower (ViSession
instrumentHandle, ViReal64 outputPower);
```

Purpose

This function automatically sets the ALC power level and output attenuation when given a desired output power.

The following formula is used to compute output power:

$$\text{Output Power} = \text{ALC Power Level} - \text{Attenuator Level}$$

where: Attenuator Level is 0 to 70 dB in 10 dB steps, and ALC Power Level is between –10 dB and 0 dB.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`outputPower`

`Variable Type ViReal64`

This parameter specifies an output power setting.

Valid range: -90.0000 dBm to 25.00 dBm

Return Value

This return value reports the status of the `Set Output Power` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Freq, ALC, Atten

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HPE6432_SetPulseModState

```
ViStatus HPE6432_SetPulseModState (ViSession
instrumentHandle, ViBoolean pulseModulationEnable);
```

Purpose

This function enables or disables the pulse modulation port on the synthesizer front panel. This affects the current state as well as the list.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`pulseModulationEnable`

`Variable Type ViBoolean`

This parameter specifies whether pulse modulation is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetPulseModState

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HPE6432_SetQAttenuation

```
ViStatus HPE6432_SetQAttenuation (ViSession
instrumentHandle, ViUInt16 qAttenuation);
```

Purpose

This function sets the level of Q Attenuation that is used to reduce the level of the signal being applied to the mixer located within the I/Q modulator circuitry. This attenuator can reduce the signal level in 2 dB steps and can be adjusted for up to 12 dB of attenuation.

Changes made to Q Attenuation should also be made to I Attenuation. Usually the I and Q signal paths will have the same gain although they are individually adjustable.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qAttenuation`

`Variable Type  ViUInt16`

This parameter specifies a value for Q Attenuation.

Allowable values: 0, 2, 4, 6, 8, 10, 12

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQAttenuation

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HPE6432_SetQCal

```
ViStatus HPE6432_SetQCal (ViSession instrumentHandle,
ViUInt16 qCalLevel);
```

Purpose

This function sets the level of the calibration voltage used for the Q input when Test Tone is selected as the I/Q Input.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qCalLevel`

`Variable Type  ViUInt16`

This parameter selects the Test Tone calibration voltage for the Q input.

qCalLevel Voltage

7= 1.000

6= 0.000

5= -0.167

4= 0.167

3= -0.354

2= 0.354 (Recommended Value)

1= -0.500

0= 0.500

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQCal

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HPE6432_SetQGainAdjust

```
ViStatus HPE6432_SetQGainAdjust (ViSession
instrumentHandle, ViInt16 qGainAdjustDac);
```

Purpose

This function sets the Q Gain adjustment DAC that is used to enter compensation values for external source impairments from the Q signal path.

Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qGainAdjustDac`

`Variable Type  ViInt16`

This parameter specifies the setting for the Q Gain adjustment DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQGainAdjust

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HPE6432_SetQGainDac

```
ViStatus HPE6432_SetQGainDac (ViSession instrumentHandle,
ViUInt16 qGainDac);
```

Purpose

This function sets a value for the Q Gain DAC.

Q Gain is used to enter compensation values for internal gain impairments for the Q signal path. Since it is the ratio of I Gain to Q Gain that is important, it is usually only necessary to make adjustments to I Gain or Q Gain, but not both.

Factory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qGainDac`

`Variable Type ViUInt16`

This parameter specifies a value for the Q Gain DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQGainDac

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HPE6432_SetQOffsetAdjust

```
ViStatus HPE6432_SetQOffsetAdjust (ViSession
instrumentHandle, ViInt16 qOffsetAdjustDac);
```

Purpose

This function sets the Q Offset adjustment DAC that is used to enter an origin offset voltage for the quadrature-phase portion of an I/Q signal. The value of Q Offset is used to adjust out imperfections in the quadrature-phase signal.

The level of dc offset determines the level of carrier feed-through.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qOffsetAdjustDac`

`Variable Type  ViInt16`

This parameter specifies the setting for the Q Offset adjustment DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQOffsetAdjust

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HPE6432_SetQOffsetDac

```
ViStatus HPE6432_SetQOffsetDac (ViSession instrumentHandle,
ViUInt16 qOffsetDac);
```

Purpose

This function sets a value for the Q Offset DAC.

Q Offset is used to enter an origin offset voltage for the quadrature-phase portion of an I/Q signal. The value of Q Offset is used to adjust out imperfections in the quadrature-phase signal.

The level of dc offset determines the level of carrier feed-through.

Factory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`qOffsetDac`

`Variable Type ViUInt16`

This parameter specifies a value for the Q Offset DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQOffsetDac

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HPE6432_SetQuadratureAdjust

```
ViStatus HPE6432_SetQuadratureAdjust (ViSession
instrumentHandle, ViInt16 quadratureAdjustDac);
```

Purpose

This function sets the Quadrature (Offset) adjustment DAC that is used to adjust the phase angle between the I and Q local oscillator signals.

When the Quadrature is:	The phase angle is:
Zero	90 degrees
Positive	increases the angle from 90 degrees
Negative	decreases the angle from 90 degrees

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`quadratureAdjustDac`

`Variable Type  ViInt16`

This parameter specifies the setting for the Quadrature adjustment DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQuadratureAdjust

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HPE6432_SetQuadratureDac

```
ViStatus HPE6432_SetQuadratureDac (ViSession
instrumentHandle, ViUInt16 quadratureDac);
```

Purpose

This function sets a value for the Quadrature DAC.

Quadrature (Offset) is used to adjust the phase angle between the I and Q input vectors.

When the Quadrature is:	The phase angle is:
Zero	90 degrees
Positive	increases the angle from 90 degrees
Negative	decreases the angle from 90 degrees

PurposeFactory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`quadratureDac`

`Variable Type ViUInt16`

This parameter specifies a value for the Quadrature DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetQuadratureDac

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HPE6432_SetRefSource

```
ViStatus HPE6432_SetRefSource (ViSession instrumentHandle,
ViBoolean reference10MHz);
```

Purpose

This function allows selection of the internal 10 MHz reference or an external 10 MHz reference.

Factory Preset Value: Internal

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`reference10MHz`

`Variable Type ViBoolean`

This parameter specifies whether the internal or external 10 MHz reference is used.

Allowable values: external=`VI_TRUE`, internal=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetRefSource

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HPE6432_SetRfOutputState

```
ViStatus HPE6432_SetRfOutputState (ViSession
instrumentHandle, ViBoolean rfOutputEnable);
```

Purpose

This function enables or disables the RF output while all other instrument state settings are unaffected.

Factory Preset Value: Disabled

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`rfOutputEnable`

`Variable Type ViBoolean`

This parameter specifies whether the RF output is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

HPE6432_GetRfOutputState

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HPE6432_SetSettlingTime

```
ViStatus HPE6432_SetSettlingTime (ViSession
instrumentHandle, ViReal64 settlingTime);
```

Purpose

This function sets the settling time.

Settling time is the period of time the synthesizer waits, following the switch/blanking time, before producing a Trig Out trigger or a Sync Out trigger.

This time is in addition to the switch/blanking time. A “settled signal” implies that the frequency and amplitude that was requested of the hardware is close but not exact. Typically a “frequency only” change settled to within a few kHz of the desired frequency takes about 200 us. This is a combination of the 150 us switch/blanking time and 50 us of settling time; long switch/blanking time is 350 us.

Changing the 10 dB step attenuator (Option 1E1) adds 20 ms to the switch/blanking time. The switch/blanking time takes place even when RF blanking is disabled. RF blanking is enabled when the 10 dB step attenuator is changed.

After a signal is settled, the synthesizer will accept another Trig In. However, the synthesizer will not step to the next point in the frequency list until after waiting the specified dwell time.

Settling time specifies the time between the hardware being set up and the point in time that the synthesizer generates a Sync Out trigger. Settling time is used every time a new frequency or power is set up in the synthesizer.

Factory Preset Value: 50 us

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`settlingTime`

`Variable Type ViReal64`

This parameter specifies the time to allow for output settling.

Range: 0.5 x 10-6 seconds to 32.7675 x 10-3 seconds

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Return Value

This return value reports the status of the `Set Settling Time` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Dwell Time

Set Long Blanking

HPE6432_GetSettlingTime

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HPE6432_SetSyncInput

```
ViStatus HPE6432_SetSyncInput (ViSession instrumentHandle,
ViUInt16 syncInSource);
```

Purpose

This function specifies the source of the Sync In trigger.

The source of the Sync In trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time. Its functionality is determined by the mode used during a `Run List` function.

Allowable values:

FRONT_IN_POS=24	The Sync In trigger is asserted with a positive edge polarity.
FRONT_IN_NEG=8	The Sync In trigger is asserted with a negative edge polarity.
VXI0=0	The Sync In trigger can come from any one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7). The VXI backplane triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted for at least 250 ns.
VXI1=1	
VXI2=2	
VXI3=3	
VXI4=4	
VXI5=5	
VXI6=6	
VXI7=7	
IN_MANUAL=9	The Sync In trigger can come from a software trigger using the `Generate Manual Sync In` function.
IN_OFF=15	The Sync In triggers are disabled.

Factory Preset Value: IN_OFF

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Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`syncInSource`

`Variable Type ViUInt16`

This parameter specifies the source of the Sync In trigger.

Return Value

This return value reports the status of the `Set Sync In (Source)` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

HPE6432_GetSyncInput

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HPE6432_SetSyncOutState

```
ViStatus HPE6432_SetSyncOutState (ViSession
instrumentHandle, ViBoolean syncOutEnable);
```

Purpose

This function is a non-list function and is used to enable/disable the Sync Out trigger.

This function does not apply to list-mode functions; it is referred to as a non-list function. A non-list function is used during set-spot mode and is specifically for use with the following functions:

- `Set Freq, ALC, Atten`
- `Set Frequency`
- `Set ALC, Atten`
- `Set Output Power`

The following functions override the Set Sync Out (On/Off) function's setting with the featureBits parameter:

- `Set Freq, Alc, Atten, Bit`
- `Write List Point`
- `Write List Points`

When Sync Out trigger is enabled and the synthesizer has settled (from changing frequency or power or both), a Sync Out trigger is generated. The Sync Out trigger can be viewed at the Sync Out connector on the hardware front panel or over the VXI backplane or both.

Factory Preset Value: Disabled

There are two other functions that control the Sync Out trigger. These other functions direct the Sync Out trigger in both set-spot mode or list-mode:

- `Set Sync Out - Front Panel`
- `Set Sync Out - VXI Backplane`

These functions control whether the Sync Out trigger is sent to the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

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`syncOutEnable`

`Variable Type ViBoolean`

This parameter specifies whether the Sync Out trigger is enabled or disabled.

Allowable values: Enable=`VI_TRUE`, Disabled=`VI_FALSE`

Return Value

This return value always returns `VI_SUCCESS`.

Related Topics

Set Settling Time

Set Sync Out - Front Panel

Set Sync Out - VXI Backplane

HPE6432_GetSyncOutState

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HPE6432_SetTriggerInput

```
ViStatus HPE6432_SetTriggerInput (ViSession
instrumentHandle, ViUInt16 trigInSource);
```

Purpose

This function specifies the source of the Trig In trigger.

The source of the Trig In trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled; it can only come from one source at a time. Its functionality is determined by the mode used during a `Run List` function.

Allowable values:

FRONT_IN_POS=24	The Trig In trigger is asserted with a positive edge polarity.
FRONT_IN_NEG=8	The Trig In trigger is asserted with a negative edge polarity.
VXI0=0	The Trig In trigger can come from any one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7). The VXI backplane triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted for at least 250 ns.
VXI1=1	
VXI2=2	
VXI3=3	
VXI4=4	
VXI5=5	
VXI6=6	
VXI7=7	
IN_MANUAL=9	The Trig In trigger can come from a software trigger using the `Generate Manual Trig In` function.
IN_OFF=15	The Trig In triggers are disabled.

Factory Preset Value: IN_OFF

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Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`trigInSource`

`Variable Type ViUInt16`

This parameter specifies the source of the Trig In trigger.

Return Value

This return value reports the status of the `Set Trigger In (Source)` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Dwell Time

Set Settling Time

Write List Points

Run List

Set Trigger Out

HPE6432_GetTriggerInput

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HPE6432_SetupCalExtDetPoint

```
ViStatus HPE6432_SetupCalExtDetPoint (ViSession
instrumentHandle, ViInt32 numberDetCalPointsCounter);
```

Purpose

This function is used to configure the external detector calibration for the current calibration point.

This function is passed the current external detector calibration point. This configuration parameter allows the synthesizer to be configured for the appropriate power meter reading.

There are three VXIplug&play functions used to accomplish the external detector linearization calibration for an external leveling loop configuration:

- HPE6432_GetNumExtDetCalPoints
- HPE6432_SetupCalExtDetPoint
- HPE6432_EnterCalExtDetPowerMeterReading

NOTE For best results when calibrating an external leveling loop configuration, both the External Detector Linearization and External Modulator Gain Calibration must be run. When running these calibrations, order matters; the External Modulator Gain Calibration must be run only after an External Detector Linearization is run.

NOTE Running these calibrations a second time may yield a minor improvement in accuracy; the accuracy improvement is less than 0.25 dB. Running these calibrations any additional times provides no further accuracy improvement.

The user first queries for the number of Calibration Points that must be taken using the `HPE6432_GetNumExtDetCalPoints` function. This function requires the user to pass the operating range of their current external leveling loop configuration's start and stop frequency in Hertz. This routine calculates the number of external leveling loop configuration calibration points required for this operation range. The user repeats the following process using this return value as the number of repetitions. Within the loop, they call the setup routine (HPE6432_SetupCalExtDetPoint) to configure the synthesizer for the current calibration point. Once configured, the user must supply their own power meter reading utility that reads the value at the power meter for the current configuration. Next, they call the `HPE6432_EnterCalExtDetPowerMeterReading` function to enter the power meter reading value. Once the last point is entered, the function completes the calibration and stores the calibrated values within the synthesizer flash memory, thus completing the calibration process.

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If an invalid start or stop frequency for the external leveling loop configuration is passed to the function, the ERR_ARG_OUT_OF_RANGE error flag is returned. This flag is also returned if the functions are called with a detector point identifier out of the valid range.

If the calibration functions are not called in the proper order, the ERR_INVALID_EXT_DET_CAL_ORDER error is returned. The proper order is defined by the loop indicator parameter that is sent to the routine and used to configure the system for calibration, and the other parameter is used to enter the power meter reading.

The following example code demonstrates the external detector linearization calibration functions:

```
ViReal64 startDetFreqRangeHz, stopDetFreqRangeHz;

ViInt32 numDetCalPoints;

ViReal64 powerMeterReading;

HPE6432_GetNumExtDetCalPoints(

startDetFreqRangeHz,

stopDetFreqRangeHz,

&numDetCalPoints

);


for ( int loop=1; loop <= numDetCalPoints; loop++ ) {

HPE6432_SetupCalExtDetPoint(loop);

/* The customer supplies the ReadPowerMeter() function. */

ReadPowerMeter(&powerMeterReading);

HPE6432_EnterCalExtDetPowerMeterReading(

loop, powerMeterReading);

}
```

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

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`numberDetCalPointsCounter`

`Variable Type ViInt32`

This parameter specifies the external detector calibration point.

Return Value

This return value reports the status of the `Setup Cal Ext Det Point` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

HPE6432_SetupCalExtDetPoint

HPE6432_EnterCalExtDetPowerMeterReading

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HPE6432_SetupFlatnessCalPoint

```
ViStatus HPE6432_SetupFlatnessCalPoint(ViSession
instrumentHandle, ViReal64 *frequency, ViReal64 *power,
ViUInt16 *attenuation);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and is used to set the frequency, power, and attenuation for the next calibration point and return the settings to the user.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat".

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`frequency`

`Variable Type ViReal64 (passed by reference)`

This parameter specifies the frequency for the next correction point.

`power`

`Variable Type ViReal64 (passed by reference)`

This parameter specifies the power level for the next correction point.

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attenuation

Variable Type ViUInt16 (passed by reference)

This parameter specifies the attenuation level for the next correction point.

Return Value

This return value always returns VI_SUCCESS.

Related Topics

HPE6432_GetNumFlatnessCalPoints

HPE6432_EnterFlatnessCalReading

HPE6432_WriteFlatnessCalData

HPE6432_GetFlatnessCalData

HPE6432_PutFlatnessCalData

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HPE6432_SetUserBlankingState

```
ViStatus HPE6432_SetUserBlankingState (ViSession
instrumentHandle, ViBoolean userBlankingEnable);
```

NOTE Use of this function can result in unspecified performance. Performance of the synthesizer resulting from this usage is unwarranted.

Purpose

This function is used to enable or disable user blanking, long blanking, and amplitude blanking adjustments.

This function applies only to the following functions:

`Set Normal Blanking Time`

`Set Long Blanking Time`

`Set Amplitude Blanking Time`

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`userBlankingEnable`

`Variable Type  ViBoolean`

This parameter specifies whether user blanking is enabled or disabled.

Allowable values: enable=`VI_TRUE`, disable=`VI_FALSE`

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetUserBlankingState

Set Normal Blanking Time

Set Long Blanking Time

Set Amplitude Blanking Time

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HPE6432_SetVbloDac

```
ViStatus HPE6432_SetVbloDac (ViSession instrumentHandle,
ViUInt16 vbloDac);
```

Purpose

This function sets a value for the Vblo DAC.

The Vblo DAC is initially set to 2048 and has a range from 0 to 4095. The Vblo DAC is used to adjust the voltage bias that is applied to the mixers within the I/Q modulator assembly. Vblo has some affect on the I/Q modulator conversion loss. Some improvement may be possible, but the default setting should usually be used. Avoid values below 1000 as this can cause the mixers to become under biased and distort.

Factory Preset Value: 2048 (Recommended)

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`vbloDac`

`Variable Type ViUInt16`

This parameter specifies a value for the Vblo DAC.

Allowable values: 0 to 4095

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_GetVbloDac

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HPE6432_SetVxiSyncOutput

```
ViStatus HPE6432_SetVxiSyncOutput (ViSession
instrumentHandle, ViUInt16 syncOutVXIBackplane);
```

Purpose

This function controls whether the Sync Out trigger is off or is sent to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

- To direct the Sync Out trigger to the hardware front panel of the synthesizer, refer to the "Sync Out (Front Panel)" on page 3-53 function.
- To control the Sync Out trigger in set-spot mode, refer to the `Set Sync Out (On/Off)` function.

The Sync Out trigger is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out and Trig Out trigger) are asserted.

The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode or list mode.

Allowable values:

syncOutVXIBackplane	Trigger Description	Destination of Output Trigger
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	The Sync Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Sync Out trigger is output to the VXI backplane. The Sync Out trigger may still be output to the hardware front panel using HPE6432_SetExtSyncOutput.

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Factory Preset Value: VXI_OUT_OFF

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`syncOutVXIBackplane`

`Variable Type ViUInt16`

This parameter specifies whether the Sync Out trigger is off or is sent to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

Return Value

This return value reports the status of the `Set Sync Out - VXI Backplane` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Set Settling Time

Set Sync Out (On/Off)

Set Sync Out - Front Panel

Write List Point

Write List Points

HPE6432_GetVxiSyncOutput

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HPE6432_SetVxiTriggerOutput

```
ViStatus HPE6432_SetVxiTriggerOutput (ViSession
instrumentHandle, ViUInt16 trigOutVXIBackplane);
```

Purpose

This function controls whether the Trig Out trigger is off or is sent to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

The Trig Out trigger is an output trigger and is produced after each new hardware frequency or power level setting has settled; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted.

The Trig Out trigger can be directed to the Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode.

Allowable values:

trigOutVXIBackplane	Trigger Description	Destination of Output Trigger
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	The Trig Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Trig Out trigger is output to the VXI backplane. The Trig Out trigger may still be output to the hardware front panel using HPE6432_SetExtTriggerOutput.

Factory Preset Value: VXI_OUT_OFF

Parameter List

`instrumentHandle`

`Variable Type ViSession`

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This is the ViSession handle that is obtained from the Initialize function. The instrumentHandle identifies a particular instrument session.

trigOutVXIBackplane

Variable Type ViUInt16

This parameter specifies whether the Trig Out trigger is off or is sent to one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

Return Value

This return value reports the status of the Set Trigger Out - VXI Backplane function.

To obtain further information about the status that is returned, call the HPE6432_error_message function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

To direct the Trig Out trigger to the hardware front panel of the synthesizer, refer to the “Trigger Out (Front Panel)” on page 3-50 function.

HPE6432_GetVxiTriggerOutput

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HPE6432_WaitForSettled

```
ViStatus HPE6432_WaitForSettled (ViSession
instrumentHandle, ViInt16 disableErrorHandling);
```

Purpose

This function waits until a settled interrupt is returned from the assist processor. If the interrupt is not returned within a predetermined time, the function exits and a timeout error is reported. If disableErrorHandling is enabled, this function will return without indicating an error; this will occur even if the function times out.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`disableErrorHandling`

`Variable Type ViInt16`

This parameter specifies whether to enable or disable error handling.

Return Value

This parameter reports the return status of this function.

To obtain further information about the status that is returned, call the `Error Message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

Interrupt Mode Defined

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HPE6432_WriteFlatnessCalData

```
ViStatus HPE6432_WriteFlatnessCalData(ViSession
instrumentHandle, ViInt32 signalPath);
```

Purpose

There are six associated functions used to produce output power level correction values. This function is one of the six associated functions and is used to specify a particular signal path, validate that a complete calibration has been completed for the signal path, and writes flatness correction data from the VXIplug&play driver's internal memory table to the synthesizer's FLASH memory.

Because output power level can vary over the synthesizer's frequency range and attenuator settings, correction values can be produced and applied to the output power level so that it is essentially "flat".

Once output power level correction values have been produced and applied, the synthesizer can be programmed to any frequency from 10 MHz to 20 GHz and attain power level accuracy:

- ❑better than +/– 1.5 dB (over the full attenuator range)
- ❑better than +/– 1.0 dB (at a fixed attenuator setting)

These levels of output power level accuracy allow for all measurement uncertainties and variations over temperature. The actual performance achieved with the same power measurement device at a single temperature and at any frequency (from 10 MHz to 20 GHz) typically will be less than +/– 0.1 dB.

For complete specifications, refer to "Specifications and Characteristics" on page 6-1.

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`signalPath`

`Variable Type ViInt32`

This parameter specifies the signal path to be calibrated.

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The following signal paths may be specified with this function:

Parameter Value	Signal Path
0	FLATNESS_INTERNAL_THROUGH
1	FLATNESS_EXTERNAL_1
2	FLATNESS_EXTERNAL_2
3	FLATNESS_ATTENUATION_10
4	FLATNESS_ATTENUATION_20
5	FLATNESS_ATTENUATION_30
6	FLATNESS_ATTENUATION_40
7	FLATNESS_ATTENUATION_50
8	FLATNESS_ATTENUATION_60
9	FLATNESS_ATTENUATION_70

Return Value

This return value always returns VI_SUCCESS.

Related Topics

HPE6432_GetNumFlatnessCalPoints

HPE6432_SetupFlatnessCalPoint

HPE6432_EnterFlatnessCalReading

HPE6432_WriteFlatnessCalData

HPE6432_PutFlatnessCalData

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HPE6432_WriteListData

```
ViStatus HPE6432_WriteListData (ViSession instrumentHandle,
ViUInt32 startingPoint, ViUInt32 numberOfPoints, ViInt32
listPointData[]);
```

Purpose

This function writes an array of list point data to the synthesizer's internal list point memory.

A List is defined as one or more points that can be stored in the synthesizer's List Point Memory. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its Starting Point and its Number of Points (length).

For example, using C, you could read and write 10 points to list point memory as follows:

```
int rtn=0;

ViInt32 buf[40];

/* Load buf with list data */

rtn= HPE6432_ReadListData(instrumentHandle, 0, 10, buf);

/* Create duplicate list at list point memory 100 */

rtn= HPE6432_WriteListData(instrumentHandle, 100, 10, buf);

fwrite(buf, 16, 10, stream);
```

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startingPoint`

`Variable Type ViUInt32`

This parameter specifies a starting point in the list point memory at which to begin writing the list data.

Valid range: 0 to (131,070 - Number_of_Points)

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`numberOfPoints`

`Variable Type ViUInt32`

This parameter specifies the number of list points to write to list point memory.

Valid range: 1 to 131,071

`listPointData`

`Variable Type ViInt32[]`

This parameter specifies the buffer, containing list point data, that is to be written into the synthesizer's list point memory.

Return Value

This return value reports the status of the `Write List Data` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to "Error-Code and Fail-Code Messages" on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Clear List

Read List Data

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HPE6432_WriteListPoint

```
ViStatus HPE6432_WriteListPoint (ViSession
instrumentHandle, ViUInt32 startingPoint, ViReal64
frequency, ViReal64 alcPower, ViUInt16 attenuation,
ViUInt16 featureBits, ViUInt16 alcOffset);
```

Purpose

This function allows random writes to any list point in list point memory.

A List is defined as one or more points that can be stored in the synthesizer's List Point Memory. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its Starting Point and its Number of Points (length).

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startingPoint`

`Variable Type ViUInt32`

This parameter specifies the starting point in the list point memory at which to write list data.

Valid range: 0 to 131,070

`frequency`

`Variable Type ViReal64`

This parameter specifies a frequency setting.

Valid Values: 10 MHz to 20 GHz with 1 Hz resolution.

`alcPower`

`Variable Type ViReal64`

This parameter specifies an ALC power level setting.

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Valid range: –20 dBm to Maximum Leveled Output Power

`attenuation`

`Variable Type ViUInt16`

This parameter specifies an attenuation setting.

Valid values: 0 to 70 dB in 10 dB steps

`featureBits`

`Variable Type ViUInt16`

This parameter specifies the features used while setting a frequency and power level. One or more features can be selected. To select a single feature, specify its feature bit value. To select multiple features, add the desired feature bit values together.

featureBits	**Description**
---	With all featureBits set to 0, set a frequency and power level, but do not generate a Sync Out trigger, do not adjust ALC Offset, and do not use long banking.
Bit 0=1	Reserved
Bit 1=1	Do not blank RF output unless the step attenuator is changed.
Bit 2=1	Set switch/blanking time to long switch/blanking; normal switch/blanking time is 150 us and long switch/blanking time is 350 us.
Bit 3=1	Use the ALC integrator zero offset value that is passed in from the alcOffset parameter in place of the ALC integrator zero offset value from the frequency table.
Bits 4-7	Reserved
Bit 8=1	The synthesizer will produce a Sync Out trigger at the end of the Settling Time
Bits 9-15	Reserved

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`alcOffset`

`Variable Type ViUInt16`

This parameter specifies an ALC integrator zero offset value (a 16 bit value) that is applied to the ALC Integrator Zero DAC at each corresponding list point. This allows minimal shift in the power from the value sent as power when the ALC loop is opened.

Valid range: 0 - 4095

The ALC integrator zero offset value is ignored unless the featureBits parameter sets Bit 3=1.

Return Value

This return value reports the status of the `Write List Point` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Clear List

Set Sync Out - Front Panel

Set Sync Out - VXI Backplane

Set Blanking (On/Off)

Set Long Blanking (On/Off)

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HPE6432_WriteListPoints

```
ViStatus HPE6432_WriteListPoints (ViSession
instrumentHandle, ViUInt32 startingPoint, ViReal64
frequency[], ViReal64 alcPower[], ViInt16 attenuation[],
ViInt16 featureBits[], ViInt16 alcOffset[], ViUInt32
numberOfPoints);
```

Purpose

This function writes arrays of list points to list point memory.

A List is defined as one or more points that can be stored in the synthesizer's List Point Memory. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its Starting Point and its Number of Points (length).

The Starting Point parameter specifies the starting point in the list point memory at which to begin writing the list data, and Number of Points specifies the number of points to take from the following arrays and write into list point memory:

- Frequency[]
- ALC_Power_Level[]
- Attenuation[]
- Feature_Bits[]
- ALC_Offset[]

NOTE

Downloading large lists could take long periods of time that depend on the speed of the computer and interface being used as well as the size of the list. Examples are shown below of loading different size lists into list point memory with the `HPE6432_WriteListPoints` function using different interfaces and different speed computers. The times listed below are given in seconds.

Number of Points	PII-400/MXI-2	PII-400	P-150/MXI-2	P-90
1,000	0.01	0.01	0.01	0.14
2,000	0.02	0.02	0.02	0.30
5,000	0.05	0.05	0.06	0.70
10,000	0.10	0.10	0.11	1.38
20,000	0.19	0.19	0.22	2.78

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Number of Points	PII-400/MXI-2	PII-400	P-150/MXI-2	P-90
50,000	0.46	0.46	0.55	6.92
100,000	0.92	0.92	1.11	13.51
131,071	1.16	1.20	1.38	17.62

Parameter List

`instrumentHandle`

`Variable Type ViSession`

This is the `ViSession` handle that is obtained from the `Initialize` function. The `instrumentHandle` identifies a particular instrument session.

`startingPoint`

`Variable Type ViUInt32`

This parameter specifies the first point to write to list point memory.

Valid range: 0 to (131,070 - Number_of_Points)

Factory Preset Value: 0

`frequency`

`Variable Type ViReal64[]`

This parameter specifies an array of frequency settings.

Valid Values: 10 MHz to 20 GHz with 1 Hz resolution.

`alcPower`

`Variable Type ViReal64[]`

This parameter specifies an array of ALC power level settings.

Valid range: –20 dBm to Maximum Leveled Output Power

`attenuation`

`Variable Type ViInt16[]`

This parameter specifies an array of attenuation settings.

Valid values: 0 to 70 dB in 10 dB steps

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`featureBits`

`Variable Type ViUInt16`

This parameter specifies the features used while setting a frequency and power level. One or more features can be selected. To select a single feature, specify its feature bit value. To select multiple features, add the desired feature bit values together.

featureBits	**Description**
---	With all featureBits set to 0, set a frequency and power level, but do not generate a Sync Out trigger, do not adjust ALC Offset, and do not use long banking.
Bit 0=1	Reserved
Bit 1=1	Do not blank RF output unless the step attenuator is changed.
Bit 2=1	Set switch/blanking time to long switch/blanking; normal switch/blanking time is 150 us and long switch/blanking time is 350 us.
Bit 3=1	Use the ALC integrator zero offset value that is passed in from the alcOffset parameter in place of the ALC integrator zero offset value from the frequency table.
Bits 4-7	Reserved
Bit 8=1	The synthesizer will produce a Sync Out trigger at the end of the Settling Time
Bits 9-15	Reserved

`alcOffset`

`Variable Type ViInt16[]`

This parameter specifies an ALC integrator zero offset value (a 16 bit value) that is applied to the ALC Integrator Zero DAC at each corresponding list point. This allows minimal shift in the power from the value sent as power when the ALC loop is opened.

Valid range: 0 - 4095

The ALC integrator zero offset value is ignored unless the featureBits parameter sets Bit 3=1.

`numberOfPoints`

`Variable Type ViUInt32`

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This parameter specifies the number of list points to write to list point memory.

Return Value

This return value reports the status of the `Write List Points` function.

To obtain further information about the status that is returned, call the `HPE6432_error_message` function or refer to “Error-Code and Fail-Code Messages” on page 3-93.

Related Topics

HPE6432_error_message

Error-Code and Fail-Code Messages

Clear List

Set Sync Out - Front Panel

Set Sync Out - VXI Backplane

Set Blanking (On/Off)

Set Long Blanking (On/Off)

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SCPI Interfaces and Commands

The following section contains a complete list of SCPI commands for the Agilent Technologies E6432A microwave synthesizer. For additional information related to what each SCPI command does, refer to “VXIplug&play Commands (Functional List)” on page 4-22.

Remote SCPI Interface command line syntax:

ScpiClient.exe /driver (telnet | sockets | serial | "hpib7") /resource "VXI0::210::INSTR"

/resource parameter is optional and defaults to the first E6432 found or demo mode if no E6432 hardware is found.

SCPI Status Register Queries:

Event Status Register (*ESR?) Mask is *ESE (value)

bit 0	=	1	Operation Complete
bit 1	=	2	Request Control
bit 2	=	4	Query Error
bit 3	=	8	Device Dependent Error (Summary of QSR bits 3,5,9)
bit 4	=	16	Execution Error. All API call error returns.
bit 5	=	32	Command Error
bit 6	=	64	User Request
bit 7	=	128	Power On

Status Byte (*STB?) Mask is *SRE (value)

bit 0	=	1	Not Used
bit 1	=	2	Not Used
bit 2	=	4	Error/Event Queue
bit 3	=	8	Summary of Questionable Status Register
bit 4	=	16	MAV (Message Available)
bit 5	=	32	Summary of Standard Event Status Register
bit 6	=	64	RQS (SRQ State)
bit 7	=	128	Summary of Operation Status Register

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Status Operation Register (STATus:OPERation:CONDition?)

bit 0	=	1	Not Used
bit 1	=	2	Not Used
bit 2	=	4	Not Used
bit 3	=	8	List Running
bit 4	=	16	Not Used
bit 5	=	32	Not Used
bit 6	=	64	Not Used
bit 7	=	128	Not Used

Status Questionable Register (STATus:QUEStionable:CONDition?)

bit 0	=	1	Not Used
bit 1	=	2	Not Used
bit 2	=	4	Not Used
bit 3	=	8	Unleveled
bit 4	=	16	Not Used
bit 5	=	32	Unlocked
bit 6	=	64	Not Used
bit 7	=	128	Not Used
bit 8	=	256	Not Used
bit 9	=	512	Self Test Failed
bit 10	=	1024	Not Used
bit 11	=	2048	Unleveled
bit 12	=	4096	Not Used
bit 13	=	8192	Unlocked
bit 14	=	16384	Not Used
bit 15	=	32768	Not Used

Overlapped commands which start Pending Operations:

These are the only commands to which *OPC, *OPC? and *WAI apply:

INITiate[:IMMediate]

Full Command Set

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1. Characters in lower case may be omitted.
2. Commands within square brackets [.] are optional.
3. Parentheses mark places where data parameters are required. Choose one from the list provided or enter a numeric value.
4. Allowed Terminators: DB, mA, Hz, KHz, MHz, or GHz.
5. Default Terminators: If none of the above are provided, the entry is assumed to be in fundamental units of measure, which includes: DB, Hz, etc.
6. Numeric values: Exponential notation is accepted along with simple integers. (For example, 234, -139.34E+6.)

SCPI COMMANDS

```
*CLS

*ESE (value)

*ESE?

*ESR?

*IDN?

*OPC

*OPC?

*RST

*SRE (value)

*SRE?

*STB?

*TST?

*WAI


ABORt


CALibrate:EXTernal:DETector:POINts?  (StartFreq, StopFreq)

CALibrate:EXTernal:DETector:POWer  (Point,
PowerMeterReading)

CALibrate:EXTernal:DETector:RESet

CALibrate:EXTernal:DETector:SETup  (Point)

CALibrate:EXTernal:MODulator[:INITiate]  (StartFreq,
StopFreq, Step)
```


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```
CALibrate:FLATness:DATA? (THRU | ATT10 | ATT20 | ATT30 |
ATT40 | ATT50 | ATT60 | ATT70 |EXT1 | EXT2)

CALibrate:FLATness:INITialize:POINts? (THRU | ATT10 | ATT20
| ATT30 | ATT40 | ATT50 | ATT60 | ATT70 | EXT1 | EXT2,
StartFreq, StopFreq, LowStep, HighStep)

CALibrate:FLATness:NEXT? (PMReading)

CALibrate:FLATness:WRITe (EXT1 | EXT2)

CALibrate:FLATness:ZERO (THRU | ATT10 | ATT20 | ATT30 |
ATT40 | ATT50 | ATT60 | ATT70 |EXT1 | EXT2)

CALibrate:IF:UPConverter (IF_Attenuation, Frequency)

CALibrate:IF:FACTory

CALibrate:IQ

CALibrate:IQ:FACTory

CALibrate:IQ:UPConverter  (Frequency)

CALibrate:IQ:UPConverter:FACTory

INITiate:CONTinuous (0 | OFF | 1 | ON)

INITiate:CONTinuous?

INITiate[:IMMediate]


LIST:CLEAr

LIST:DWELl (value)

LIST:DWELl?

LIST:INDex?

LIST:POINts (value)

LIST:POINTs?

LIST:RUNNing?

LIST:SETTling  (value)

LIST:SETTling?

LIST:SETTling:BIT[ENABle] (0 | OFF | 1 | ON)

LIST:SETTling:BIT[ENABle]?

LIST:STARt[:POINt]  (value)

LIST:STARt[:POINt]?

LIST:SYNC:BIT[ENABle] (0 | OFF | 1 | ON)
```


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```
LIST:SYNC:BIT[ENABle]?

LIST:SYNC:INPut[:IMMediate]

LIST:SYNC:INPut:MODE (STARt | RESTart | BOTH)

LIST:SYNC:INPut:MODE?

LIST:SYNC:INPut:SOURce (AUTO | POSitive | NEGative |
SOFTware | VXI0-7)

LIST:SYNC:INPut:SOURce?

LIST:SYNC:OUTPut:EXTernal (OFF | POSitive | NEGative)

LIST:SYNC:OUTPut:EXTernal?

LIST:SYNC:OUTPut:VXI (OFF | VXI0-7)

LIST:SYNC:OUTPut:VXI?

LIST:TRIGger:INPut[:IMMediate]

LIST:TRIGger:INPut:MODE  (POINt | LIST)

LIST:TRIGger:INPut:MODE?

LIST:TRIGger:INPut:SOURce (AUTO | POSitive | NEGative |
SOFTware | VXI0-7)

LIST:TRIGger:INPut:SOURce?

LIST:TRIGger:OUTPut:EXTernal (OFF | POSitive | NEGative)

LIST:TRIGger:OUTPut:EXTernal?

LIST:TRIGger:OUTPut:VXI (OFF | VXI0-7)

LIST:TRIGger:OUTPut:VXI?

LIST:VECTor  (Point, Frequency, AlcPower, Attenuation,
FeatureBits, AlcOffset)


OUTPut[:STATe] (0 | OFF | 1 | ON)

OUTPut[:STATe]?

OUTPut:BLANking[:STATe]  (0 | OFF | 1 | ON)

OUTPut:BLANking[:STATe]?

OUTPut:BLANking:LONG[:STATe]  (0 | OFF | 1 | ON)

OUTPut:BLANking:LONG[:STATe]?

OUTPut:BLANking:USER[:STATe]  (0 | OFF | 1 | ON)

OUTPut:BLANking:USER[:STATe]?

OUTPut:BLANking:TIME  (value 20-1023)
```


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```
OUTPut:BLANking:TIME?
OUTPut:BLANking:LONG:TIME  (value 20-1023)
OUTPut:BLANking:LONG:TIME?
OUTPut:BLANking:AMPLitude:TIME  (value 20-1023)
OUTPut:BLANking:AMPLitude:TIME?
OUTPut:SYNC[:STATe]  (0 | OFF | 1 | ON)
OUTPut:SYNC[:STATe]?
OUTPut:VECTor (Frequency, AlcPower, Attenuation)
OUTPut:VECTor?

[SOURce:]AM[:STATe] (0 | OFF | 1 | ON)
[SOURce:]AM[:STATe]?
[SOURce:]AM:DEEP[:STATe]  (0 | OFF | 1 | ON)
[SOURce:]AM:DEEP[:STATe]?
[SOURce:]AM:TYPE (LINear | EXPonential)
[SOURce:]AM:TYPE?
[SOURce:]FM[:STATe] (0 | OFF | 1 | ON)
[SOURce:]FM[:STATe]?
[SOURce:]FREQuency (value)
[SOURce:]FREQuency?
[SOURce:]FREQuency:LIMits?
[SOURce:]IF:ATTenuation (0 to 30 in 2db steps)
[SOURce:]IF:ATTenuation?
[SOURce:]IF[:STATe] (0 | OFF | 1 | ON)
[SOURce:]IF[:STATe]?

[SOURce:]IQ[:STATe] (0 | OFF | 1 | ON)
[SOURce:]IQ[:STATe]?
[SOURce:]IQ:ADJust:IGAin (value)
[SOURce:]IQ:ADJust:IGAin?
[SOURce:]IQ:ADJust:QGAin (value)
[SOURce:]IQ:ADJust:QGAin?
```


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```
[SOURce:]IQ:ADJust:IOFFset (value)
[SOURce:]IQ:ADJust:IOFFset?
[SOURce:]IQ:ADJust:QOFFset (value)
[SOURce:]IQ:ADJust:QOFFset?
[SOURce:]IQ:ADJust:QUADrature (value)
[SOURce:]IQ:ADJust:QUADrature?
[SOURce:]IQ:ADJust[:STATe] (0 | OFF | 1 | ON)
[SOURce:]IQ:ADJust[:STATe]?
[SOURce:]IQ:INPut (NORMal | SWAPped)
[SOURce:]IQ:INPut?
[SOURce:]POWer[:LEVel] (value)
[SOURce:]POWer[:LEVel]?
[SOURce:]POWer:LIMits?
[SOURce:]POWer:ALC:BWIDth (WIDE | NARRow)
[SOURce:]POWer:ALC:BWIDth?
[SOURce:]POWer:ALC[:LEVel] (value)
[SOURce:]POWer:ALC[:LEVel]?
[SOURce:]POWer:ALC:SOURce (INTernal | EXTernal)
[SOURce:]POWer:ALC:SOURce?
[SOURce:]POWer:ALC:STATe (0 | OFF | 1 | ON)
[SOURce:]POWer:ALC:STATe?
[SOURce:]POWer:ATTenuation (value)
[SOURce:]POWer:ATTenuation?
[SOURce:]POWer:ATTenuation:AUTO (0 | OFF | 1 | ON)
[SOURce:]POWer:ATTenuation:AUTO?
[SOURce:]POWer:ATTenuation:LIMits?
[SOURce:]POWer:VECTor (AlcPower, Attenuation)
[SOURce:]POWer:VECTor?
[SOURce:]POWer:SEARch? (frequency, power)
[SOURce:]PULM[:STATe] (0 | OFF | 1 | ON)
[SOURce:]PULM[:STATe]?
[SOURce:]ROSCillator:SOURce (INTernal | EXTernal)
```


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```
[SOURce:]ROSCillator:SOURce?

STATus:OPERation:CONDition?
STATus:OPERation:ENABle (value)
STATus:OPERation:ENABle?
STATus:OPERation:EVENt?
STATus:OPERation:NTRansition (value)
STATus:OPERation:NTRansition?
STATus:OPERation:PTRansition (value)
STATus:OPERation:PTRansition?
STATus:PRESet
STATus:QUEStionable:CONDition?
STATus:QUEStionable:ENABle (value)
STATus:QUEStionable:ENABle?
STATus:QUEStionable:EVENt?
STATus:QUEStionable:NTRansition (value)
STATus:QUEStionable:NTRansition?
STATus:QUEStionable:PTRansition (value)
STATus:QUEStionable:PTRansition?

SYSTem:ERRor?
SYSTem:HARDware:FLAGs?
SYSTem:HARDware:STATus?
SYSTem:HELP:HEADers?
SYSTEM:MODel?
SYSTem:OPTion?
SYSTem:VERSion?
```

Related Topics

VXIplug&play Commands (Functional List)

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5 Applications and Example Programs

In this chapter you can view a list of example programs that use VXIplug&play driver functions:

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Overview

- Determining the Logical Address of the Synthesizer when Set to be Auto-Configured (FF)
- Opening a Session Using C
- RunList.cpp
- Step.cpp
- Working with Lists (A Programmer's Model)

Related Topics

Spectrum Analysis AM and FM (Application Note 150-1) requires Adobe Acrobat Reader and QuickTime Software.

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Example Program RunList.cpp

```
// RunList.cpp : Run a list
//
// Note: Error checking eliminated for clarity

#include "stdafx.h"
#include "windows.h"
#include "visatype.h"
#include "HPE6432.h"

#define          LIST_POINTS         10000
int main(int argc, char* argv[]) {
         ViSessionsession;
         ViStatusstatus;
         ViUInt16flags;
         ViReal64f=10e6, a=10.0;
         ViInt32loops=LIST_POINTS;
         ViReal64freq[LIST_POINTS],
          power[LIST_POINTS];
         ViInt16atten[LIST_POINTS];
         ViInt16features[LIST_POINTS];
// Initialize E6432
      status = HPE6432_init("VXI0::210::INSTR", false,
false, &session);
      // Set minimum dwell time
status = HPE6432_SetDwellTime(session, 0.0000005);
      // Turn RF Onstatus =
HPE6432_SetRfOutputState(session, VI_TRUE);
      // Build a list and write it to the E6432
  for (int j=0 ; j<LIST_POINTS ; j++){
          freq[j] = f;
```


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```
            power[j] = a;
            atten[j] = 0;
            features[j] = 0;
            a += .001;
            f += 10000;
}
   status = HPE6432_WriteListPoints(session, 0, freq,
power, atten, features,
features, LIST_POINTS);
        // Start list running
status = HPE6432_RunList(session, 0, LIST_POINTS, 0x00);
        // Wait for end_of_list interrupt
while (HPE6432_GetInterruptFlags(session, &flags) ==
VI_SUCCESS && (flags & 0x10) == 0)
         Sleep(0);
        // Close E6432 session
HPE6432_close(session);
      return 0;
}
```


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Example Program Step.cpp

```
// Step.cpp : Step through some frequencies and powers
//
// Note: Error checking eliminated for clarity


#include "stdafx.h"
#include "windows.h"
#include "visatype.h"
#include "HPE6432.h"


#define         LIST_POINTS             10000
int main(int argc, char* argv[
])
        ViSessionsession;
        ViStatusstatus;
        ViReal64f=10e6, a=10.0;
                // Initialize E6432
status = HPE6432_init("VXI0::208::INSTR", false, false,
&session);
                // Turn RF on
status = HPE6432_SetRfOutputState(session, VI_TRUE);
                                    //Step
through some frequencies and powers
for (int j=0 ; j<LIST_POINTS ; j++)
{status = HPE6432_SetFreqAlcAtten(session, f, a, 0);
         a += .001;
         f += 10000;
        // Close HPE6432 session
HPE6432_close(session);
return 0;
}
```


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Working with Lists (A Programmer's Model)

When using the synthesizer, there are two modes of operation:

- *Set-Spot Mode* means that an external host computer has sent a single frequency or power or both to the synthesizer.
- *List Mode* allows an external host computer to run a pre-loaded list of frequencies or powers or both.
- List Modes - Controlled by the featureBits Parameter
  - ❏ featureBits Parameter
  - ❏ Trigger Input Mode
  - ❏ Sync Input Mode
  - ❏ Repeat Mode
  - ❏ Interrupt Mode
- Input and Output Triggers
  - ❏ Input Triggers
  - ❏ Trig In
  - ❏ Sync In
  - ❏ Output Triggers
  - ❏ Sync Out
  - ❏ Trig Out
- Synthesizer Switching Speeds (List Timing)
  - ❏ Assist Processor Time
  - ❏ Switch/Blanking Time
  - ❏ Settling Time
  - ❏ Dwell Time
- Timing Example - Putting It All Together

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List Modes - Controlled by the featureBits Parameter

A *List* is defined as one or more points that can be stored in the synthesizer's *List Point Memory*. The synthesizer's list point memory can hold 131,071 points (with a range of 0 to 131,070) and can be broken up into different size lists; although there can be multiple lists stored in list point memory, only one list can be run at a given time. Each list is delimited by two parameters that specify its *Starting Point* and its *Number of Points (length).*

We can create a list of points that can be run in various modes. While running a list, we can control the way in which the list is traversed by using input triggers, and we can set up the list so that output triggers are generated after specific events.

To illustrate some examples, we can define a list with ten points. We can start this list with an input trigger and have an output trigger produced each time a point in the list has settled. We could further add an output trigger that is output at the end of the list or at any arbitrary point in the list, or we could make the list restart to the beginning after reaching the end of the list or at any arbitrary point in the list.

One or more of the following list modes, which are controlled by the `HPE6432_RunList()` function, can be used simultaneously to run list scenarios with input and output triggers:

- Trigger Input Mode
- Sync Input Mode
- Repeat Mode
- Interrupt Mode

Related Topics

featureBits Parameter

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featureBits Parameter

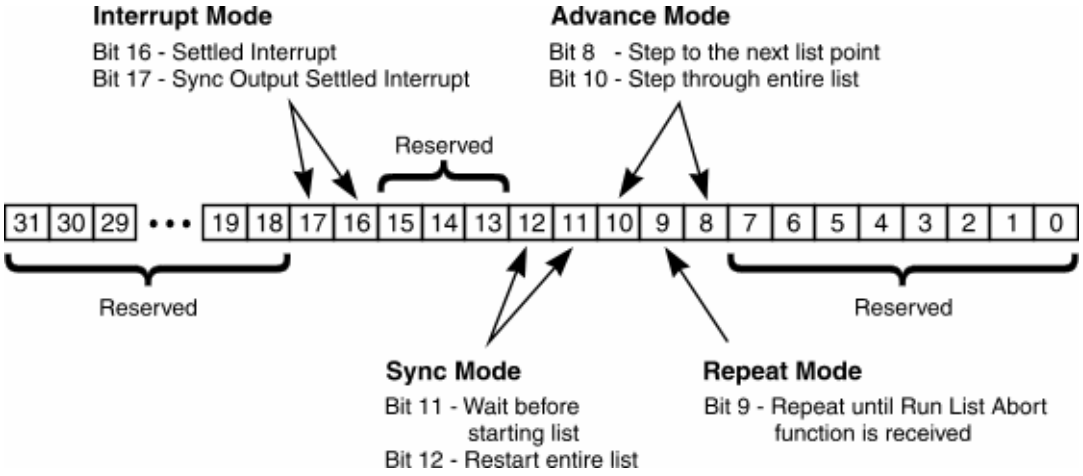
HPE6432_RunList(instrumentHandle, startingPoint, numberofPoints, featureBits);

When using the `HPE6432_RunList()` function in any of the list modes, the `featureBits` parameter controls the features that establish how a list runs. Changing the feature bits to either on or off has the following effect on a list:

Decimal Value	Bit #	Effect on a List
0		With all bits set to 0, the list will run once automatically.
	Bits 7 0	Reserved
256	Bit 8	Step to the next list point for each Trig In trigger
512	Bit 9	Repeat the list continuously until a `Run List Abort` function is received
1024	Bit 10	Step through entire list after receiving a Trig In trigger (Setting this bit clears Bit 8)
2048	Bit 11	Wait for a Sync In trigger before starting the list (Bits 8, 9, 10, and 12 still apply)
4096	Bit 12	Restart a running list when a Sync In trigger is received
	Bits 15-13	Reserved
65536	Bit 16	Send *Settled Interrupt* when list point is settled
131072	Bit 17	Send *Sync Output Settled Interrupt* when Sync Out bit is set; the Sync Out bit is set with the `HPE6432_WriteListPoints` function.
	Bits 31-18	Reserved.

To read the interrupt flag status, refer to the `HPE6432_GetInterruptFlags` function.

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Trigger Input Mode

The trigger input can come from the Trig In on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

featureBits	Mode Description	Effect on a List
Bit 8 = 0 Bit 10 = 0	Automatic	Run the list once automatically and do not require a Trig In. If Automatic is not selected as the Trigger Input Mode value, either Single or Step must be selected; both can not be selected at the same time.
Bit 8 = 1 Bit 10 = 0	Step	The synthesizer steps to the next point in the list each time a trigger is received from the trigger input.
Bit 8 = 0 Bit 10 = 1	Single	The synthesizer runs through the entire list automatically after receiving a single trigger from the trigger input.

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Sync Input Mode

The trigger input can come from the Sync In on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7).

featureBits	Mode Description	Effect on a List
Bit 11 = 0 Bit 12 = 0	Automatic	Run the list once automatically and do not require a Sync In trigger.
Bit 11 = 1 Bit 12 = 0	Start	Start at the beginning of the list after receiving a Sync In trigger; if in Repeat Mode, a new Sync In trigger is required at the end of the list to restart the list. Advancement through the list is dependent on the Trigger Input Mode.
Bit 11 = 0 Bit 12 = 1	Restart	Restart the list at any point in the list while it is running. The list will restart automatically after reaching the end of the list and does not require a new Sync In trigger. This value can be used by itself; it does not have to be combined with Start.
Bit 11 = 1 Bit 12 = 1	StartRestart	This is a combination of the Start and Restart values. A Sync In trigger is always required to start the list. However, a Sync In trigger can restart the list while it is running, and this can occur at any arbitrary point in the list. The list will stop after reaching the end of the list and wait for a Sync In trigger before restarting.

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Repeat Mode

featureBits	Mode Description	Effect on a List
Bit 9 = 1	On	The synthesizer runs through the list repeatedly until the `HPE6432_RunListAbort()` function is sent to the synthesizer. The values of the Sync Input Mode, Trigger Input Mode, and Interrupt Mode remain valid. The synthesizer generates an *End of List Interrupt* after receiving an `HPE6432_RunListAbort()` function call.
Bit 9 = 0	Off	Repeat Mode is disabled. The synthesizer does not repeat the list when this value is selected. The `HPE6432_RunList()` function must be sent to the synthesizer each time the list is run. The synthesizer generates an *End of List Interrupt* when the list is completed.

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Interrupt Mode

NOTE To read the interrupt flag status, refer to the `HPE6432_GetInterruptFlags()` function.

When running the synthesizer in list mode, there are seven *interrupt causes* that can be output on any of the seven VXI backplane interrupt request lines (IRQ1- IRQ7), but only two can be controlled by the user. When running the synthesizer in set-spot mode, a *Settled Interrupt* is always generated after a list point has settled, but none of the interrupt causes can be directly controlled by the user in this mode.

Interrupt modes have no affect on how a list is traversed. They enable or disable interrupts generated by the synthesizer. These interrupts are processed by the VXIplug&play driver, and it may be possible for a user to redefine or supercede the Interrupt Service Routine that is provided.

CAUTION **Using these interrupts with triggers having a high repetition-rate may exceed the ability of the host computer to service the interrupts in a timely fashion; this could cause the host to appear non-responsive to user inputs. This depends on the system configuration, the user's application software, and the performance resources of the host computer.**

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featureBits	Interrupt Description	Effect on a List
Bit 16 = 1	Settled Interrupt	This interrupt occurs simultaneously with the Sync Output Settled Interrupt. As the synthesizer steps through a list, a Settled Interrupt is generated each time a list point is settled (after settling time is complete).
Bit 17 = 1	Sync Output Settled Interrupt	This interrupt occurs simultaneously with the *Settled Interrupt*, but is set for a given list point in a list. As the synthesizer steps through a list, a Sync Output Settled Interrupt is generated each time a list point is settled (after settling time is complete) as long as the Sync Out bit is set for a given list point in a list. The Sync Out bit is set using the `HPE6432_WriteListPoint` or `HPE6432_WriteListPoints` function.
Bit 16 = 0		No Settled Interrupt
Bit 17 = 0		No Sync Output Settled Interrupt

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Input and Output Triggers

Before running a list, input and output triggers must be set up. The synthesizer has two input triggers and two output triggers. The input triggers are only useful when running a list in the synthesizer (list mode), but the output triggers are valid when running a list in the synthesizer or when changing frequency or power or both in set-spot mode.

Input Triggers	Source of Input Triggers
Trig In	Trig In connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7)
Sync In	Sync In connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7)

Output Triggers	Destination of Output Triggers
Trig Out	Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time
Sync Out	Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time

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Trig In

This is an input trigger and its functionality is determined by the mode used during an HPE6432_RunList function. This input trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled. This input trigger can be received at any time after the settling time has occurred. However, an advance will not take place until after the dwell time is completed.

```
HPE6432_SetTriggerInput(instrumentHandle,
triggerInputSource);
```

triggerInputSource	Source Description	Source of Input Trigger
	Trig In	From the Trig In connector on the hardware front panel of the synthesizer.
FRONT_IN_POS = 24	Positive	The trigger is asserted with a positive edge polarity.
FRONT_IN_NEG = 8	Negative	The trigger is asserted with a negative edge polarity.
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	From any one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted low for at least 250 ns.
IN_MANUAL = 9	Manual	From a software Trig In trigger using HPE6432_GenerateManualTriggerInput().
IN_OFF = 15	Off	Trig In triggers are disabled.

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Sync In

This is an input trigger and its functionality is determined by the mode used during an `HPE6432_RunList` function. This input trigger can come from the hardware front panel, the VXI backplane, a software function, or it can be disabled. This input trigger can only come from one source at a time.

```
HPE6432_SetSyncInput(instrumentHandle, syncInputSource);
```

syncInputSource	Source Description	Source of Input Trigger
	Sync In	From the Sync In connector on the hardware front panel of the synthesizer.
FRONT_IN_POS = 24	Positive	The Sync In trigger is asserted with a positive edge polarity.
FRONT_IN_NEG = 8	Negative	The Sync In trigger is asserted with a negative edge polarity.
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	From any one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line must be asserted low for at least 250 ns.
IN_MANUAL = 9	Manual	From a software trigger (Sync In) using `HPE6432_GenerateManualSyncInput`.
IN_OFF = 15	Off	Sync In triggers are disabled.

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Trig Out

This is an output trigger and is produced after each new hardware frequency or power level setting has settled; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Trig Out trigger can be directed to the Trig Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode.

HPE6432_SetExtTriggerOutput(instrumentHandle, triggerOutFrontPanel)

triggerOutFrontPanel	Trig Out Values	Destination of Output Trigger
	Trig Out	The trigger is present at Trig Out on the hardware front panel of the synthesizer.
FRONT_OUT_POS = 16	Positive	The Trig Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	Negative	The Trig Out trigger is generated with a negative polarity.
FRONT_OUT_OFF = 0	Off	No Trig Out trigger is output.

HPE6432_SetVxiTriggerOutput(instrumentHandle, triggerOutVXIBackplane);

triggerOutVXIBackplane	Trig Out Values	Destination of Output Trigger
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	The Trig Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Trig Out trigger is output.

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Sync Out

This is an output trigger (that can also be used as a marker) and is asserted during dwell time; the value of the dwell time controls how long the trigger outputs (Sync Out trigger and Trig Out trigger) are asserted. The Sync Out trigger is produced after each point in the list has settled if the point has a Sync Out bit enabled. This output trigger can be directed to the Sync Out connector on the hardware front panel or one of the eight-shared VXI backplane TTL triggers (TTLTRG0-TTLTRG7) or both at the same time. This output trigger can also be enabled when changing frequency or power or both in set-spot mode or list mode.

HPE6432_SetExtSyncOutput(instrumentHandle, syncOutFrontPanel);

syncOutFrontPanel	Trigger Description	Destination of Output Trigger
	Sync Out	The Sync Out trigger is present at the Sync Out connector on the hardware front panel of the synthesizer.
FRONT_OUT_POS = 16	Positive	The Sync Out trigger is generated with a positive polarity.
FRONT_OUT_NEG = 48	Negative	The Sync Out trigger is generated with a negative polarity.
FRONT_OUT_OFF = 0	Off	No Sync Out trigger is output.

HPE6432_SetVxiSyncOutput(instrumentHandle, syncOutVXIBackplane);

syncOutVXIBackplane	Trigger Description	Destination of Output Trigger
VXI0 = 0 VXI1 = 1 VXI2 = 2 VXI3 = 3 VXI4 = 4 VXI5 = 5 VXI6 = 6 VXI7 = 7	VXI Backplane TTL Trigger	The Sync Out trigger is output to one of the eight-shared VXI backplane TTL triggers (TTLTRG0 - TTLTRG7). The VXI backplane TTL triggers follow the Synchronous Trigger Protocol as outlined in the VXIbus Specification. This means that the VXI backplane trigger line is asserted low.
VXI_OUT_OFF = 15	Off	No Sync Out trigger is output to the VXI backplane. The Sync Out trigger may still be output to the hardware front panel using HPE6432_SetExtSyncOutput.

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Synthesizer Switching Speeds

Synthesizer switching speed is a combination of the assist processor time, switch/blanking time, settling time, and dwell time parameters.

NOTE These times are defined as the times that occur once the synthesizer receives a new function from an external host computer. The time that it takes an external host computer to generate such a function and send it to the synthesizer are separate issues and can not be controlled by the synthesizer.

There are four times that affect synthesizer switching speeds:

- Assist Processor Time
- Switch/Blanking Time
- Settling Time
- Dwell Time

Assist Processor Time

When using the synthesizer in either set-spot mode or list mode, an assist processor time of between 15 us to 20 us is added each time a change is made to frequency or power or both.

Switch/Blanking Time

Switch/blanking time is the period of time required to change between frequencies or power or both.

- If the RF output is being blanked, the RF output is turned off during the switch/blanking time. Although the RF output can be optionally blanked when changing frequency or power or both, it is always blanked when the 10 dB step attenuator (Option 1E1) is changed.

- If the RF output is not being blanked, the RF output is turned on during the switch/blanking time and may be affected by spurious signals, harmonics, or other glitches.

  Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

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Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

Once switch/blanking time is completed, the settling time begins. Settling time is user-definable and can be adjusted between a minimum and maximum value; longer periods of settling time can be specified in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer. (For more information, refer to “Settling Time” on page 5-23.)

`HPE6432_SetLongBlankingState(instrumentHandle, blankingEnable);` is used to indicate whether or not long blanking time is used during frequency or power changes. This command does not specify that the RF output be blanked, it only specifies that the switch/blanking time be set to 350 us.

`HPE6432_SetBlankingState(instrumentHandle, longblankingEnable);` is used to turn the blanking on or off for the RF output during the switch/blanking time.

In summary, there is a delay time that is required by the synthesizer to change between frequencies or power or both. This delay time is a combination of the switch/blanking time and settling time. The switch/blanking time is dependent on the criteria listed above while the settling time is user-definable and dependent on the accuracy required of the final signal. If RF blanking is on during switch/blanking time, you do not see the effects on the RF output, but if RF blanking is off during switch/blanking time, you see all of the effects on the signal that might include spurious signals, harmonics, and other glitches. Whether RF blanking is on or off has no effect on settling time, it only affects the RF output during switch/blanking time.

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Related Topics

- When in list mode, the function `Write List Points` is used to control, on a point by point basis, whether the RF output is on or off during switch/blanking time, and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.
- When in set-spot mode, the function `Set Blanking (On/Off)` is used to control whether the RF output is on or off during switch/blanking time, and the function `Set Long Blanking (On/Off)` is used to enable long switch/blanking time.

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Settling Time

Settling time is the period of time the synthesizer waits, following the switch/blanking time, before producing a Trig Out trigger or a Sync Out trigger. Settling time is used every time a new frequency or power is set up in the synthesizer.

Settling time can be set by an external host computer to different values. These values of settling time control how close to the final frequency and power the synthesizer reaches before the Trig Out trigger and a Sync Out trigger are asserted. As an example, a 50 us settling time yields a typical settling within 50 kHz of the final frequency.

Settable Range: 0.5 us to 32.7675 ms

Settling time begins after switch/blanking time is completed. Settling time is user-definable and can be adjusted between a minimum and maximum value; longer periods of settling time can be specified in order to gain additional accuracy. Both switch/blanking time and settling time are used every time a new frequency or power is set up in the synthesizer.

Whether or not the RF output is turned off (blanked), there is always a switch/blanking time. Switch/blanking time is the period of time, prior to the user-definable settling time, that is required by the synthesizer to change between frequencies or power or both. Switch/blanking time can not be turned off.

Switch/blanking time is established by the following criteria:

- 350 us for all frequencies 560 MHz or less
- 350 us for all frequencies above 560 MHz with long switch/blanking mode set (long blanking is typically used when external leveling is enabled or when using low ALC bandwidth)
- 150 us for all frequencies above 560 MHz with normal switch/blanking mode set
- 50 us for all frequencies above 560 MHz with power-only mode set
- 20 ms is added, to each of the times listed above, any time the step attenuator (Option 1E1) is changed

For complete specifications, refer to: “Specifications and Characteristics” on page 6-1.

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Some example cases in which the settling time would be extended by the external host computer would be:

- when a slow external detector is used; in this case, a longer settling time would be required before the power is settled to within specification
- when using Trig Out trigger to trigger a measurement and additional time is required for the measurement system to settle

Related Topics

HPE6432_SetSettlingTime

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Dwell Time

Dwell time is the minimum period of time after the settling time that the synthesizer will remain at its current state. The synthesizer can accept a Trig In trigger during or after the dwell time, but it will not act until after the dwell time is complete.

Dwell time can be set by an external host computer to different values. These values of dwell time control how long the trigger outputs are asserted. The synthesizer will wait the dwell time before going to the next frequency or power or both, or when in list mode. The synthesizer will wait the dwell time even if a new trigger is received before the end of the dwell time is completed.

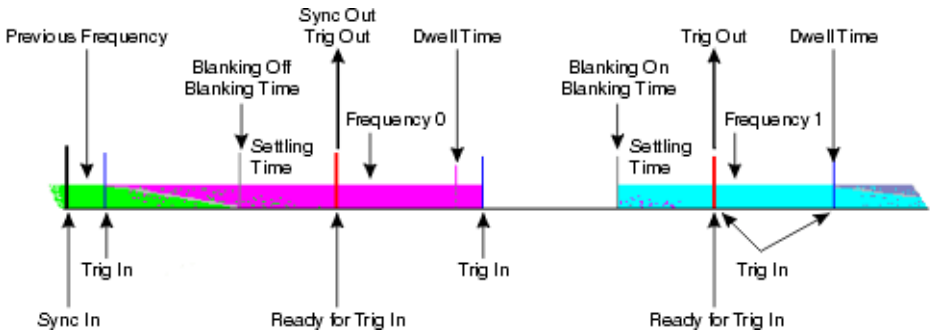
For complete specifications, refer to: “Specifications and Characteristics” on page 6-1.

Related Topics

HPE6432_SetDwellTime

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Timing Example - Putting It All Together



The above figure shows many of the events that occur while the synthesizer is running a list. In this example, trigger inputs and outputs are connected using the hardware front panel connectors. The list is set to run with the following values: Sync Input Mode = Automatic, Trigger Input Mode = Stepped, Repeat Mode = On, and Interrupt Mode = Off.

The synthesizer is at some frequency and power initially; the green band in the above figure illustrates this. A Sync In trigger is received from the hardware front panel input and the list is ready to run. A Trig In trigger into the hardware front panel connector causes the synthesizer to step to the first point in the list. Because Switch/Blanking is off, the actual change is visible at the RF output; the change may or may not be “well behaved”. At the end of the Switch/Blanking time (150 us or 350 us), the Settling Time starts. The point in the list (purple band) has been reached and becomes more stable during the Settling Time. At the end of the Settling Time, the synthesizer outputs a Trig Out trigger to the Trig Out connector and a Sync Out trigger to the Sync Out connector.

The purple frequency and power are held for the Dwell Time. During the Dwell Time, the synthesizer is ready to receive another Trig In trigger. In this case, a trigger is not received until after the Dwell Time. Upon receiving the Trig In trigger, the synthesizer immediately steps to the next point in the list. Here, the Switch/Blanking is on, the RF output is blanked and the actual change is not visible at the RF output. After the Switch/Blanking time, the Settling Time starts. The new point in the list (light blue band) is visible at the RF output during the Settling Time. At the end of the Settling Time, the synthesizer generates a Trig Out trigger. A Sync Out trigger is not generated because the trigger bit was not set for this point in the list. The synthesizer starts the Dwell Time and is ready for another Trig In trigger. Here, the trigger is received during the Dwell Time; this is perfectly legal. However, the synthesizer will not act on this trigger until the Dwell Time is complete. At the end of the Dwell Time, the synthesizer steps to the next point in the list.

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6 Specifications and Characteristics

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Specifications and Characteristics

Specifications describe warranted product performance and apply over the 0 to +55 degrees Celsius temperature range, except as noted otherwise.

Items noted as ***Typical*** describe non-warranted typical performance and items noted as ***Characteristic*** describe non-warranted functional and performance information of a product. This non-warranted information is derived during the design phase of a product and is not verified on a continuing basis.

Warm-Up Time Required

Warm-up time is required before the synthesizer can meet specifications. Operation to specifications requires 30 minutes to warm up from a cold start at 0 to +55 degrees Celsius.

Specifications and Characteristics are listed in the following groups:

- Options
- Output
- Unwanted Signals
- Absolute SSB Phase Noise
- Power Supply Requirements
- AM Modulation
- FM Modulation
- Pulse Modulation
- I/Q Modulation (Option UNG Only)
- List Mode Characteristics
- VXI Characteristics
- General Specifications
- Declaration of Conformity

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Options

The following options affect some specifications and characteristics.

- Adding Option 002 adds low rate FM capability. This option is not available on instruments with Option UNG.
- Adding Option 1E1 adds a 70 dB step attenuator, but this degrades output power 1 dB above 2 GHz.

  The 70 dB step attenuator has valid values of 0 to 70 dB in 10 dB steps.
- Adding Option UK6 may be considered a subset of an ANSI/NCSL Z540 calibration. It includes a Certificate of Calibration, a Standards Used Trace page, and a Manufacturing Test Data page.
- Adding Option UNF increases output power to +20 dBm in high band (2 GHz to 20 GHz), but this degrades to +19 dBm with Option 1E1.
- Adding Option UNG adds I/Q modulation capability. This option is not available on instruments with Option 002.
- Adding Option UNH adds improved spectral purity, but this degrades output power 4 dB in low band (10 MHz < 2 GHz).

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Output

Frequency Range	10 MHz to 20 GHz
Frequency Accuracy	same as time base
Frequency Resolution	1 Hz
Frequency Switching Time	< 400 us *Typical*

Maximum Leveled Output Power

(The following maximum leveled output power specifications only apply for ambient temperatures 0 to +35 degrees Celsius, and typically degrades 2 dB for ambient temperatures greater than +35 and up to +55 degrees Celsius.)

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Frequency Range	With Option 1E1	Standard Model	With Option UNH	With Option UNF	With Options UNH and UNF
10 MHz < 2 GHz	No	–20 to +17 dBm	–20 to +13 dBm	–20 to +17 dBm	–20 to +13 dBm
2 GHz to 20 GHz	No	–20 to +17 dBm	–20 to +17 dBm	–20 to +20 dBm	–20 to +20 dBm
10 MHz < 2 GHz	Yes	–90 to +17 dBm	–90 to +13 dBm	–90 to +17 dBm	–90 to +13 dBm
2 GHz to 20 GHz	Yes	–90 to +16 dBm	–90 to +16 dBm	–90 to +19 dBm	–90 to +19 dBm

Vernier Accuracy

Vernier accuracy is measured at a single fixed frequency and refers to changes up and down in ALC power relative to a 0 dBm output power setting.

+/– 1.3 dB from –20 to –10 dBm

+/– 0.5 dB from > –10 to +10 dBm

+/– 1.0 dB
from > +10
to Maximum Leveled Output Power

Accuracy

Accuracy is measured at a single fixed frequency and refers to changes up and down in total (absolute) output power.

(The following accuracy specifications only apply to frequencies < 2.0 GHz after a power level correction has been performed. For frequencies >/= 2.0 GHz, flatness degrades by 0.1 dB.)

Accuracy (with or without Option 1E1)	+/– 1.2 dB from > +10 to Maximum Leveled Output Power
Accuracy (with or without Option 1E1)	+/– 0.8 dB from > –10 to +10 dBm
Accuracy (with or without Option 1E1)	+/– 1.1 dB from > –20 to –10 dBm
Accuracy (with Option 1E1)	+/– 1.1 dB from > –60 to –20 dBm
Accuracy (with Option 1E1)	+/– 1.4 dB from –90 to –60 dBm Typical

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Flatness

Flatness is measured across the frequency ranges and refers to changes up and down in relative output power.

(The following flatness specifications only apply to frequencies < 2.0 GHz after a power level correction has been performed. For frequencies >/= 2.0 GHz, flatness degrades by 0.1 dB.)

Flatness (with or without Option 1E1)	+/– 0.9 dB from > +10 to Maximum Leveled Output Power
Flatness (with or without Option 1E1)	+/– 0.5 dB from > –10 to +10 dBm
Flatness (with or without Option 1E1)	+/– 0.7 dB from > –20 to –10 dBm
Flatness (with Option 1E1)	+/– 0.7 dB from > –60 to –20 dBm
Flatness (with Option 1E1)	+/– 1.1 dB from –90 to –60 dBm Typical
Resolution	0.02 dB
Switching Time	< 400 us Characteristic, across ALC range
	< 20 ms Characteristic, with attenuator step change
External ALC Range	40 dB Characteristic
VSWR @ 50 ohm	1.6:1 Characteristic

Unwanted Signals

Low and High Band

Line-Related Spurs	< –45 dBc *Typical*
Fan Microphonics	< –45 dBc *Typical*

Low Band (10 MHz < 2 GHz)

Standard Model

Harmonics (Power Out </= +10 dBm)	< –25 dBc

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Synthesizer-Related Residuals and Non-Harmonic Spurious	< –55 dBc (power output >/= 0 dBm)
(Synthesizer-Related Residuals and Non-Harmonic Spurious degrades 1 dB/dB for power output < 0 dBm, and typically degrades 0.25 dB/degrees Celsius for temperature < +25 degrees Celsius.)	

Standard Model with Option UNH

Harmonics (Power Out </= +13 dBm)	< –55 dBc
Synthesizer-Related Residuals and Spurious	< –55 dBc (power output >/= 0 dBm)
(Synthesizer-Related Residuals and Non-Harmonic Spurious degrades 1 dB/dB for power output < 0 dBm, and typically degrades 0.25 dB/degrees Celsius for temperature < +25 degrees Celsius.)	

Standard Model with Options UNH and UNF

Harmonics (Power Out </= +13 dBm)	
(CF < 300 MHz)	< –35 dBc
(CF >/= 300 MHz)	< –55 dBc

High Band (2 to 20 GHz)

Standard Model

Harmonics (Power Out </= +17 dBm)	< –55 dBc
(This specification applies for ambient temperatures 0 to +35 degrees Celsius, and typically degrades < 2 dB for ambient temperatures > +35 and up to +55 degrees Celsius.)	

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Non-Harmonic Spurious	< –60 dBc < –70 dBc *Typical*

Standard Model with Option UNF

Harmonics (Power Out </= +20 dBm)	< –50 dBc

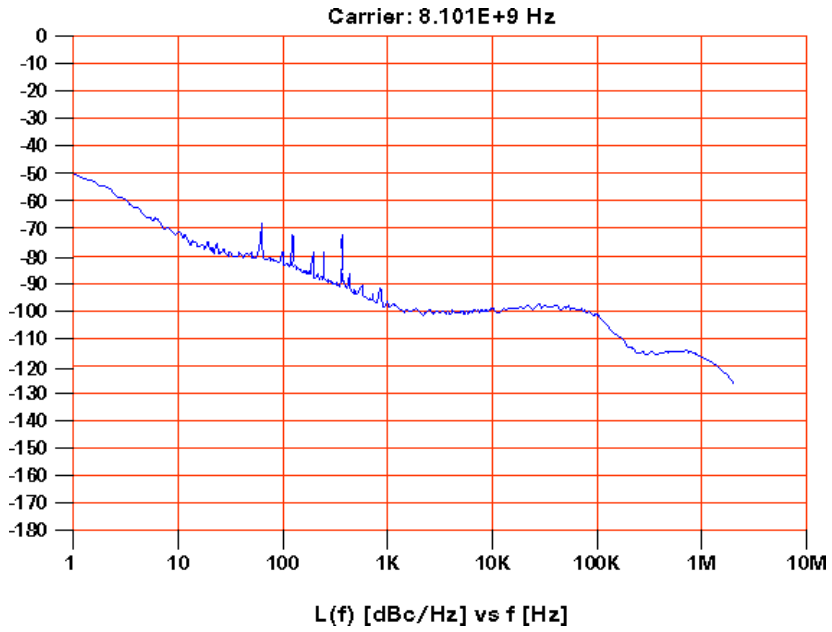
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Absolute SSB Phase Noise (All Values are in dBc/Hz)

Carrier (GHz)	Offset 10 Hz	Offset 100 Hz	Offset 1 kHz	Offset 10 kHz	Offset 100 kHz	Offset 1 MHz	Offset >/= 10 MHz
.01 < 2	–67	–75	–90	–90	–90	–102	–120
2 < 5	–58	–66	–87	–90	–90	–104	–128
5 < 10	–55	–61	–83	–90	–90	–104	–125
10 < 15	–48	–58	–80	–90	–90	–104	–125
15 </= 20	–46	–54	–77	–90	–90	–104	–125

Specified for external 10 MHz reference mode using an HP/Agilent 10811E 10 MHz reference source or equivalent. (> +7 dBm, < 130 dBc @ 10 Hz, and < 150 dBc @ 100 Hz)

The following graph is an example of typical phase noise performance with a 8.101 GHz carrier frequency.



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Power Supply Requirements

Volts	+5	–5.2	–2	+12	–12	+24	–24	+5 standby
dc Current (A)	10	2.35	0	2.4	1.0	0.4	0.15	0
Dynamic Current (A)	2	0.1	0	0.8	0.05	0.5 with Option 1E1	0.03	0

AM Modulation

AM Rate (3 dB BW)	dc to 250 kHz *Typical*
Maximum AM Depth in Normal ALC Mode	–20 dBm
Maximum AM Depth in Deep ALC Mode (Low Band)	45 dB < Maximum Power, *Typical*
Maximum AM Depth in Deep ALC Mode (High Band)	50 dB < Maximum Power, *Typical*
AM Sensitivity	100%/V in Linear Mode, *Characteristic* 10 dB/V in Exponential Mode, *Characteristic*
AM Accuracy	7% of modulation depth@ 1 kHz rate 30% depth, 5% *Typical*
Exponential AM Accuracy	0.25 dB +/– 8% of setting in dB

FM Modulation

Standard Model

FM Maximum Deviation	> 8 MHz
FM Rate (3 dB limits)	50 kHz to 10 MHz *Typical*
FM Sensitivity	1 MHz/V *Characteristic*
FM Accuracy	30% @ 1 Vpp and 1 MHz FM Rate 10% *Typical*
FM Flatness	+/– 1 dB, from 100 kHz to 1 MHz

Standard Model with Option 002

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FM Maximum Deviation	+/– 85 MHz *Typical*
FM Rate (3 dB limits)	800 Hz to 10 MHz *Typical*
FM Sensitivity	100 kHz/V, 1 MHz/V, 10 MHz/V *Characteristic*
FM Accuracy (100 kHz/V)	30% @ 1 Vpp and 100 kHz FM Rate 10% *Typical*
FM Accuracy (1 MHz/V)	30% @ 1 Vpp and 1 MHz FM Rate 10% *Typical*
FM Accuracy (10 MHz/V)	30% @ 1 Vpp and 1 MHz FM Rate 10% *Typical*
FM Flatness	+/– 1 dB, from 1 kHz to 1 MHz
Maximum FM Modulation	180 *Typical*

Pulse Modulation (Low Band 560 MHz < 2 GHz)

ON/OFF Ratio	68 dB @ +10 dBm degrades –1 dB/dB below +10 dBm
Minimum Repetition Rate (ALC On) Minimum Repetition Rate (ALC Off)	10 Hz dc
Rise/Fall Time (>560 MHz)	25 ns
Minimum Pulse Width	50 ns
Leveled Accuracy (Pulse Width >/= 3.0 us relative to a CW carrier)	+/– 0.5 dB *Typical* +/– 0.3 dB *Typical*
Unleveled Accuracy (Pulse Width < 3.0 us)	+/– 0.5 dB *Typical*, after performing a Power Search
Video Feed-Through (Pulse Width > 100 ns)	< 5 % of voltage envelope *Typical*
Compression	+/– 16 ns *Typical*
Overshoot and Ringing	+/– 15% *Typical*

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Pulse Modulation (High Band 2 GHz - 20 GHz)

ON/OFF Ratio	> 80 dB
Minimum Repetition Rate (ALC On) Minimum Repetition Rate (ALC Off)	10 Hz dc
Rise/Fall Time	10 ns (< +35 degrees Celsius) 10 ns *Typical*
Minimum Pulse Width	15 ns
Leveled Accuracy (Pulse Width >/= 2.5 us)	+/– 0.5 dB +/– 0.3 dB *Typical*
Unleveled Accuracy (Pulse Width < 2.5 us)	+/– 0.5 dB Typical, after performing a Power Search
Video Feed-Through (using 500 MHz LPF)	< 5 mV *Typical*
Compression	+/– 15 ns *Typical*
Overshoot and Ringing	+/– 10% *Typical*

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I/Q Modulation (Option UNG Only)

Input Sensitivity	0.5 V 100% *Typical*
I and Q 1 dB Bandwidth	dc to 15 MHz *Typical*
I and Q 2 dB Bandwidth	dc to 20 MHz *Typical*
Manual I and Q Gain Adjustment Range	+/– 4 dB *Characteristic*
Manual I and Q Offset Adjustment Range	+/– 100% *Characteristic*
Manual Quadrature Adjustment	+/– 10 degrees *Characteristic*
I/Q Attenuation Range	0 to 12 dB in 2 dB Steps *Characteristic*

The following I/Q specifications apply only after an internal calibration, and are valid for 10 days at a calibration temperature of +/– 5 degrees. These specifications include I/Q impairments of an Agilent Technologies ESG-D Series signal generator as the baseband I/Q source.

Dynamic Error Vector Magnitude (EVM) @ 2 MSymbols/s QPSK, Raised Cosine Filter with Alpha 0.35, 14 dB IF attenuation, maximum output level </= 0 dBm, and ALC off	1.50% rms @ 500 MHz to 20 GHz 1.20% rms *Typical*
Origin Offset	– 45 dBc *Typical*

List Mode Characteristics

Accuracy	same as the time base
Minimum Step Size	same as the frequency resolution
Number of Points	131,071 points, with a range of 0 to 131,070 points
Switching Time	same as the CW

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VXI Characteristics

Size	C
Slots	3
VXI Device Type	A16/A24 D16/D32 Register-Based Servant
Instrument Driver	VXIplug&play using Windows NT 4.0 with Service Pack 3 or higher and a minimum of 32 MB of RAM

General Specifications

Operating Temperature Range	0 to +55 degrees Celsius, unless otherwise specified
Size	W of 91.4 mm (3.6 in), H of 261.6 mm (10.3 in), D of 370.8 mm (14.6 in)
Weight	7.16 kg (15.8 lbs)
RF Output Connector	3.5 mm

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Declaration of Conformity (According to ISO/IEC Guide 22 and EN 45014)

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Agilent Technologies
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that this product:

Product Name:	VXI Microwave Synthesizer
Model Number:	E6432A
Product Options:	This declaration covers all options of the above product.

Conforms to the following product specifications:

Safety: IEC 61010-1:1990 / EN 61010-1:1993
Can / CSA-22.2 No. 1010.1-92

EMC: CISPR 11:1990/EN 55011:1991 Group 1, Class A
IEC 801-2:1984/EN 50082-1:1992 4 kV CD, 8 kV AD
IEC 801-3:1984/EN 50082-1:1992 3 V/m, 27-500 MHz
IEC 801-4:1988/EN 50082-1:1992 0.5 kV sig. lines, 1 kV power lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Santa Rosa, CA USA
April 16, 1999

Greg Pfeiffer
Quality Engineering Manager

European Contact: Your local Agilent Technologies Sales and Service Office or Agilent Technologies GmbH Department HQ-TRE, Herreneberger Strasse 130, D71034 Boblingen, Germany
(FAX +49-7031-14-3143)

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Contacting Agilent Technologies

This synthesizer user guide provides information related to soft front panel operation as well as remote programming using VXIplug&play commands.

You can obtain up to date product information about the synthesizer from the Internet at: http://www.agilent.com, or you can obtain additional assistance from Agilent Technologies Service Centers.

Files that end with a `.pdf` require Adobe Acrobat Reader and files that end with a .mov require QuickTime software. To get either of these pieces of software, refer to Adobe Acrobat Reader or QuickTime Software Downloads.

Agilent Technologies Service Centers

A current list of Agilent Technologies Service Centers can be accessed on the Internet at: http://www.agilent.com

If you do not have access to the Internet, one of the following Agilent Technologies locations can direct you to your nearest Agilent Technologies representative:

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Table 6-1 Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States *(tel)* 1 800 452 4844	**Latin America** *(tel)* (305) 269 7500 *(fax)* (305) 269 7599	**Canada** *(tel)* 1 877 894 4414 *(fax)* (905) 282-6495	**Europe** *(tel)* (+31) 20 547 2323 *(fax)* (+31) 20 547 2390
New Zealand *(tel)* 0 800 738 378 *(fax)* (+64) 4 495 8950	**Japan** *(tel)* (+81) 426 56 7832 *(fax)* (+81) 426 56 7840	**Australia** *(tel)* 1 800 629 485 *(fax)* (+61) 3 9210 5947	**Singapore** *(tel)* 1 800 375 8100 *(fax)* (65) 836 0252
Malaysia *(tel)* 1 800 828 848 *(fax)* 1 800 801 664	**Philippines** *(tel)* (632) 8426802 *(tel) (PLDT subscriber only):* 1 800 16510170 *(fax)* (632) 8426809 *(fax) (PLDT subscriber only):* 1 800 16510288	**Thailand** *(tel) outside Bangkok:* (088) 226 008 *(tel) within Bangkok:* (662) 661 3999 *(fax)* (66) 1 661 3714	**Hong Kong** *(tel)* 800 930 871 *(fax)* (852) 2506 9233
Taiwan *(tel)* 0800-047-866 *(fax)* (886) 2 25456723	**People's Republic of China** *(tel) (preferred):* 800-810-0189 *(tel) (alternate):* 10800-650-0021 *(fax)* 10800-650-0121	**India** *(tel)* 1-600-11-2929 *(fax)* 000-800-650-1101	

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Adobe Acrobat Reader or QuickTime Software Downloads

In addition to this Help file, you may find other documents of interest and use that are available from Agilent Technologies. These documents could include user guides and application notes that are made available in PDF format (.pdf extension); some of these electronic documents also contain embedded media files (.mov extension). In order to view these documents, your system requires Adobe Acrobat Reader or QuickTime software.

The following application note may be of special interest and use for your product:

- Spectrum Analysis AM and FM (Application Note 150-1)

You can download this application note at: http://www.agilent.com

This application note discusses the measurement of amplitude and frequency modulated signals using a spectrum analyzer. The basic theory behind AM and FM modulation including time and frequency domain representations is presented. For AM signals, various techniques for measuring the degree of modulation, such as fast Fourier transforms, are described. For FM signals, techniques for calculating and measuring the frequency bandwidth are outlined. In an appendix, a detailed mathematical treatment of modulation is presented along with a phasor description of AM and FM modulated signals. This application note contains more than 60 online pages, more than 60 analyzer screen-captures, zoomable illustrations, photographs, and four QuickTime signal animations.

If your system does not have Adobe Acrobat Reader or QuickTime software, you can download them from the Internet:

- Adobe Acrobat Reader at
  http://www.adobe.com/prodindex/acrobat/readstep.html
- Apple QuickTime Software at
  http://www.apple.com/quicktime/download/index.html

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