



**Agilent E1438
VXI 100 MSa/s ADC
with filters and memory**

User's Guide



Agilent Technologies

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8600 Soper Hill Road, Everett, Washington 98205-1209 U.S.A.

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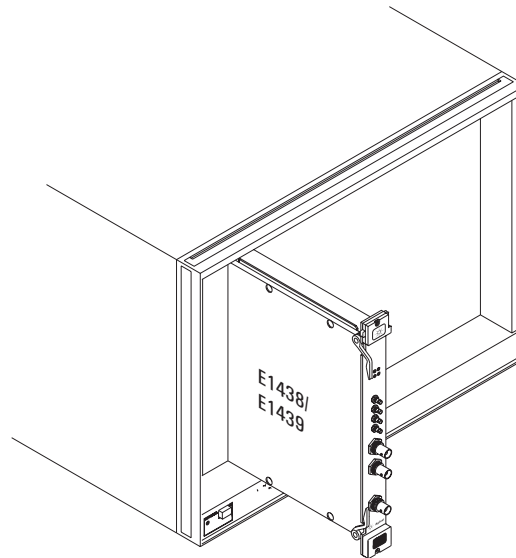
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The Agilent E1438 at a Glance

The Agilent E1438 100 MSa/s Digitizer with DSP and Memory provides high precision digitizing for time and frequency domain applications along with signal conditioning, filtering, and memory. The module plugs into a single C-size slot in a VXI mainframe.



Number of Channels	1
Type of Inputs	50 ohm
Input Bandwidth	150 MHz, 40 MHz alias protected
Sample Rate	100/102.4 Msample/second
Input Range	–21 to +30 dBm
Raw ADC resolution	12 bits
VXI Bus Support	VME and Local Bus
VXI Device Type	Register based
I/O Data Port (E1438B only)	Fiber optic serial FPDP (front panel data port)
Size	C-sized, single slot

What You Get With the Agilent E1438

The following items are included with your Agilent E1438:

Hardware

- Agilent E1438 ADC, C-size VXI module
- CD-ROM for Windows and HP-UX setup

Software

- CD-ROM for installation

A Windows setup program that installs:

- The Agilent E1438 VXi*plug&play* libraries and drivers
- The Agilent E1438 Agilent VEE header files and WinHelp
- Soft Front Panel program for the Agilent E1438 with source files
- Web-based help for the Agilent E1438
- AGDSP function library and online help
- Example programs and source files
- Microsoft Visual C++ C-library and source files
- Microsoft Visual Basic header files

A depot file for HP-UX installation:

- Libraries and drivers
- Web-based help for the Agilent E1438
- AGDSP function library and online help
- Example programs and source files

Documentation

- Agilent E1438 Installation and Service Guide
- Online documentation available after software installation:
 - Agilent E1438 User's Guide in PDF format (this document)
 - Web-based help files providing operational information and programmer's reference
 - WinHelp files for the Agilent E1438 Soft Front Panel
 - WinHelp for VEE

In This Book

This book documents the Agilent E1438 module. It provides:

- hardware installation information
- software installation information
- getting started information
- operational information
- programmer's reference
- replaceable parts

Other Documentation

Installation and Service information is provided as a printed document as well as in this PDF document.

After running the setup program the following documentation is available:

- Web-based help files are available from the Start menu.
- WinHelp for the Soft Front Panel is available from the application.

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To inspect the Agilent E1438

The Agilent E1438 single channel VXI ADC Module was carefully inspected both mechanically and electrically before shipment. It should be free of marks or scratches and it should meet its published specifications upon receipt.

If the module was damaged in transit, do the following:

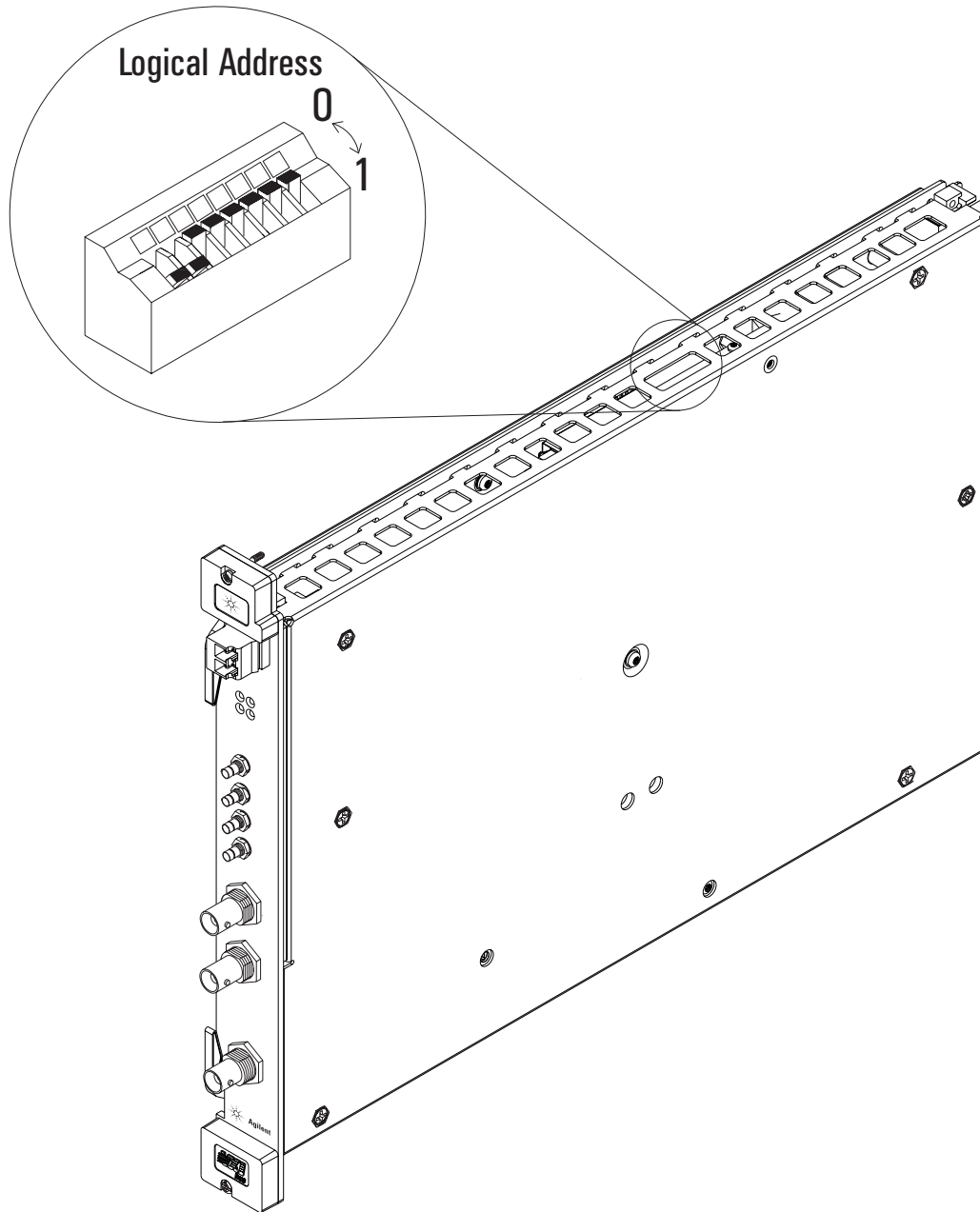
- Save all packing materials.
- File a claim with the carrier.
- Call your Agilent Technologies sales and service office.

To install the Agilent E1438

Caution

To protect circuits from static discharge, observe anti-static techniques whenever handling the Agilent E1438 VXI ADC Module.

1. Set up your VXI mainframe. See the installation guide for your mainframe.
2. Select a slot in the VXI mainframe for the E1438 module.
The Agilent E1438 module's local bus receives ECL-level data from the module immediately to its left and outputs ECL-level data to the module immediately to its right. Every module using the local bus is keyed to prevent two modules from fitting next to each other unless they are compatible. If you will be using the local bus, select adjacent slots immediately to the left of the data-receiving module. If the VXI bus is used, maximum data rates will be reduced but the module can be placed in any available slot.
3. Using a small screwdriver or similar tool, set the logical address configuration switch on the E1438. (See the illustration on the next page.) Each module in the system must have a unique logical address. The factory default setting is 1100 0000 (192).



4. Set the mainframe's power switch to off (0).

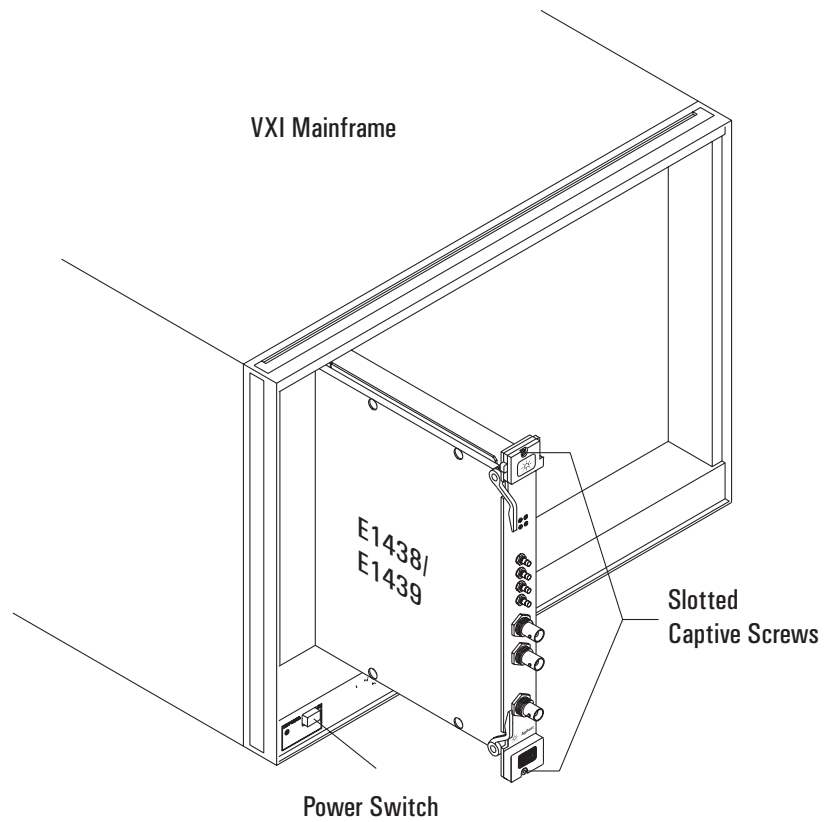
Caution

Installing or removing the module with power on may damage components in the module.

5. Place the module's card edges (top and bottom) into the module guides in the slot.
6. Slide the module into the mainframe until the module connects firmly with the backplane connectors. Make sure the module slides in straight and that the insertion/extraction levers are pressed parallel to the front panel.

To install the Agilent E1438

7. Attach the module's front panel to the mainframe chassis using the module's captive mounting screws.



To clean fiber optic connectors

The Agilent E1438B has a fiber optic serial FPD (front panel data port). Since the data transmits via light, the fiber optic connections must be clean. The following procedure describes how to clean fiber optic connectors.

Caution

Do not use any type of foam swab to clean optical fiber ends. Foam swabs can leave filmy deposits on fiber ends.

1. Apply pure isopropyl alcohol to a clean lint-free cotton swab or lens paper.

Cotton swabs can be used as long as no cotton fibers remain on the fiber end after cleaning.

2. Clean the connector while avoiding the ends of the fiber.

3. Apply isopropyl alcohol to a new clean lint-free cotton swab or lens paper.

4. Clean the fiber end with the swab or lens paper.

Do not scrub during this initial cleaning because grit can be caught in the swab and become a gouging element.

5. Immediately dry the fiber end with a clean, dry, lint-free cotton swab or lens paper.

6. Blow across the connector end face from a distance of 6 to 8 inches using filtered, dry, compressed air. Aim the compressed air at a shallow angle to the fiber end face.

Nitrogen gas or compressed dust remover can also be used.

Caution

Do not shake, tip, or invert compressed air canisters because this releases particles in the can into the air. Refer to instructions provided on the compressed air canister.

7. As soon as the connector is dry, connect or cover it for later use.

Note

To order multimode LC fiber optic cables, call Stratos Lightwave at (708) 867-9600 (<http://www.stratoslightwave.com>) or call Fiber Instrument at (800) 500-0347 (<http://www.fisfiber.com>).

To store the module

Store the module in a clean, dry, and static free environment.

For other requirements, see storage and transport restriction in “Technical Specifications”.

To transport the module

- Package the module using the original factory packaging or packaging identical to the factory packaging.
- If returning the module to Agilent Technologies for service, attach a tag describing the following:
 - Type of service required
 - Return address
 - Model number
 - Full serial number

In any correspondence, refer to the module by model number and full serial number.

- Mark the container FRAGILE to ensure careful handling.
- If necessary to package the module in a container other than original packaging, observe the following (use of other packaging is not recommended):
 - Wrap the module in heavy paper or anti-static plastic.
 - Protect the front panel with cardboard.
 - Use a double-wall carton made of at least 200-pound test (32 ECT) material.
 - Cushion the module to prevent damage. For example, several layers of plastic bubble wrap is usually sufficient.

Caution

Do not use styrene pellets in any shape as packing material for the module. The pellets do not adequately cushion the module and do not prevent the module from shifting in the carton. In addition, the pellets create static electricity that can damage electronic components.

Installing the Agilent E1438

To transport the module

Getting Started and Introduction

This section helps you get your Agilent E1438 running and making simple measurements without programming. It shows you how to install the software libraries and how to run the Soft Front Panel program. It also introduces you to the example programs. Two versions of the Host Interface Library are available. One is the Windows Library that communicates with the hardware using VISA (Virtual Instrument Software Architecture). VISA is the input-output standard upon which all the *VXIplug&play* software components are based. The second version is the HP-UX 10.2 C-language Host Interface Library that also uses VISA.

This section assumes you have already installed the module in the VXI mainframe as shown in the previous chapter . It also assumes that you have installed a VXI interface according to the manufacturer's instructions.

Note

Be sure to read the `readme` file for important up-to-date software installation information.

System Requirements

System Requirements (Microsoft Windows)

- A Pentium-class personal computer:
- Microsoft Windows 95/98, 2000, or NT.
- One of the following interfaces:
 - HP/Agilent FireWire – E8491B IEEE-1394 PC Link to VXI
 - National Instruments PCI MXI-2
 - Other VISA compliant VXI interface
- VISA (Virtual Instrument Software Architecture) library
- The computer must have a CD ROM drive for the installation media
- One of the following Web browsers:
 - Microsoft Internet Explorer 4.0 or greater
 - Netscape Navigator 4.08 or greater

System Requirements (HP-UX)

- One of the following workstation:
 - An E1498A (V743/100) VXI-embedded workstation
 - A stand-alone HP-UX workstation with a MXI interface
- The workstation must have a CD ROM drive for installation media
- VISA (Virtual Instrument Software Architecture) library
- HP-UX (version 10.2 or later)
- One of the following Web browsers:
 - Microsoft Internet Explorer 4.0 or greater
 - Netscape Navigator 4.08 or greater

To install the Windows VXiplug&play drivers

This procedure assumes that you have already installed a VISA (Virtual Instrument Software Architecture) library.

Note

If you attempt to install the Windows VXiplug&play drivers without having installed a VISA library you will receive a fatal error.

1. Insert the CD labeled: "Agilent E1438 VXI 100 MSa/s ADC with filters and memory"
2. Run the program: *drive*:\windows\setup.exe
Where *drive* represents the drive containing the setup CD.
3. The setup program asks you to confirm or change the directory path. The default directory path is recommended.
4. A dialog box asks if you want to install startup shortcuts
This creates a program group called "AGE1438" within the *Vxipnp* directory that includes:
 - A shortcut to run the Agilent E1438 Soft Front Panel
 - A shortcut for the Agilent E1438 web-based online help file
 - A shortcut for the PDF version of the *Agilent E1438 User's Guide*
 - A shortcut for the AGDSP web-based online help file
 - Several shortcuts for example programs
 - A shortcut for a readme file
5. A readme file may be displayed. If so, be sure to read it and follow the instructions.

Updating firmware

Future updates will be distributed on the Web. To check your current revision run the Info Utility or check Help/About in the Soft Front Panel program.

To check for new revisions access the Agilent Technologies Web page
<http://www.agilent.com/> and search for "E1438".

Install the updated firmware using the firmware installation program—FirmwareInstall. This program's default location is *drive*: \vxipnp\win[95|NT]\age1438\firmware. Start the program, then use the "Select File" button to locate the firmware image you want to install. Enter the VXI address of the instrument to be updated and click the "Update" button. The installation will take one or two minutes. This program requires VISA to be installed on the host computer.

To install the HP-UX C-language drivers

Be sure to read the README file, which contains important information on installation, viewing online help, and compiling example programs.

All files are installed in subdirectories under /opt/vxipnp.

Installation using the interactive menu

The e1438.depot file is in SD-UX format. To install the filesets:

1. Log in as root.
2. Insert the CD labeled: "Agilent E1438 VXI 100 MSa/s ADC with filters and memory" into the CD drive.
3. Execute the swinstall (/usr/sbin/swinstall) utility as:
 % swinstall
4. Use the interactive menus to install the file:
 drive/hpux/e1438.depot
 where *drive* represents the drive containing the setup CD.

Installation using the command line

If you prefer to install using a command line replace steps 3 and 4 above with:

```
%swinstall -s /cd/hpux/e1438.depot E1438_VISA
```

Note

If you are upgrading from an earlier revision of the driver, you may first have to remove the existing driver by typing:

```
%swremove E1438_VISA
```

Upgrading firmware

Future upgrades will be distributed on the Web. To check your current revision run the Info Utility.

To check for new revisions access the Agilent Technologies Web page <http://www.agilent.com> and search for "e1438".

Use the **Fwinstall** program to update the firmware. To use this program, place the executable file "fwinstall" in the directory of your choice. Type "fwinstall -u" to see all program options.

As an example, to install a firmware image file named "E1438_A_00_00.all" to a module at address 192, type the following command:

```
fwinstall -a 192 -f E1438_A_00_00.all
```

Installation will typically take 1-2 minutes.

To use the Resource Manager

The Resource Manager is a program from your hardware interface manufacturer. It looks at the VXI mainframe to determine what modules are installed. You need to run it every time you power up. If you get the message: "VISUCCESS_DEVICE_NPRESENT" then run the Resource Manager.

Before running the Agilent E1438 software make sure that your hardware is configured correctly and that the Resource Manager runs successfully. Before using your measurement system, you must set up all of its devices, including setting their addresses and local bus locations. No two devices can have the same address. Usually addresses 0 and 1 are taken by the Resource Manager and are not available.

For more information about the Resource Manager, see the documentation with your hardware interface.

Note

Most Resource Managers will recognize the manufacturer and model number of the Agilent E1438 but if your interface requires that you enter this information manually, use the following:

Manufacturer number: 4095 (Hex FFF)

Model number: 622 (Hex 26E)

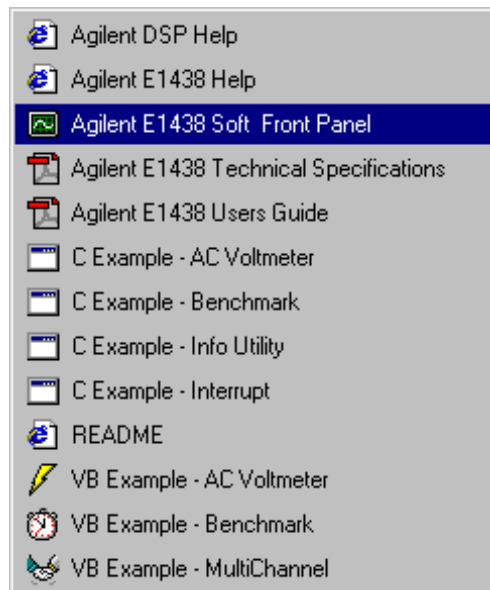
To use the program group (Windows)

If you installed the program group using the default method during the installation procedure, you have a shortcut for a program group similar the one below. Access it through the Start button:

Programs \ Vxipnp \ age1438

This program group contains shortcuts that access the Soft Front Panel program, the User's Guide, online help, and example programs. The following pages provide an overview of these items.

If you did not install the program group, executable files for each of the items represented by group shortcuts are available in the *drive:\vxipnp* directory and its subdirectories.



To use the *VXIplug&play* Soft Front Panel (SPF)

In a Windows environment, the Soft Front Panel is the best place to start to explore the capabilities of the Agilent E1438. The Soft Front Panel is useful for checking your system to make sure that it is installed correctly and that all of its parts are working. You can also use it to make actual measurements, since it accesses most of the Agilent E1438's functionality.

Select the  **E1438 Front Panel** shortcut in your program group to start the program. This assumes you have already installed all required hardware and drivers (including VISA) and have run the configurator and Resource Manager required by your hardware interface.

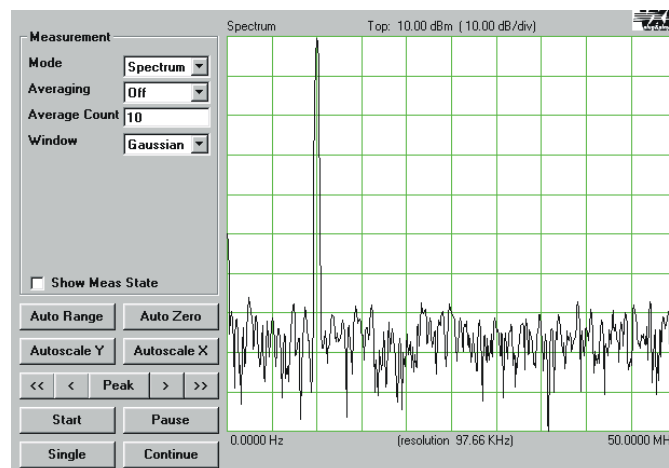
If prompted for the resource descriptor, use the default "VXI::192" unless the logical address of the Agilent E1438 has been changed from its default setting of 192. If it has been changed, type the appropriate logical address instead of 192, then press OK.

Note

You can also run the Agilent E1438 Front Panel in a simulation mode without an Agilent E1438 module, a hardware interface, or VISA libraries by typing "sim" in place of the resource descriptor.

The Agilent E1438 Front Panel Help, available from the Soft Front Panel Help menu, describes the capability of the Soft Front Panel and has links to functions that control and define many of the parameters.

The source files for this program are provided for you to use as sample code.



To use the HP-UX libraries

The README file is located at:

`/opt/vxipnp/hpux/age1438/README`

It contains the following information:

- overview of the directory structure
- how to access the online help
- how to run the example programs
- how to modify and compile the example programs.
- how to use the update program "fwinstall"

To use the example programs

Several example programs are included that perform useful tasks and can serve as a basis for your own programs. When you installed your Agilent E1438 Windows or HP-UX libraries and drivers using the setup program or utility, you also installed executable and source code files for several useful example programs. The programs demonstrate programming the module with "C", Microsoft Visual Basic, and Agilent VEE.

The executables for these examples require an Agilent E1438 and, for Windows, *VXIplug&play* support; in other words, they will not run in simulation mode like the Agilent E1438 Soft Front Panel program.

Shortcuts for the executables appear in the age1438 Windows program group if you added it during setup.

In Windows environments, executable files and source code for the Microsoft Visual Basic examples are installed in the *drive:\vxipnp\win[95|NT]\age1438\vb* directory. The VEE examples are in the *...\age1438\vee* directory, and "C" examples are in the *...\age1438\msc\examples* directory.

In the HP-UX environment, executable files and source code for the C-language examples are installed in */opt/vxipnp/hpux/age1438*.

The group of programs described here may be supplemented with additional programs later, which will be described in the online help or readme file.

ACVolts_32.exe

This is the simplest practical complete program using the Agilent E1438, and it functions like an AC voltmeter. It is written in Visual Basic.

acvolts.exe

This is a console version of acvolts_32.exe, written in Microsoft Visual C++.

Benchmark_32.exe

This performance benchmark program is really more of a utility than an example, although source code is provided. It allows users to measure data transfer rates and command processing times on their system without having to write new code. The utility is written in Visual Basic.

bench.exe

This is a console version of Benchmark_32.exe, written in Microsoft Visual C++.

multchan_32.exe

This example shows how to synchronize two modules to achieve simultaneous sampling, filter decimation, and matched local oscillator phase. It is written in Visual Basic.

info.exe

This example shows how to retrieve option and revision information from an Agilent E1438, and it doubles as a handy utility. It is written as a console program in Microsoft Visual C++.

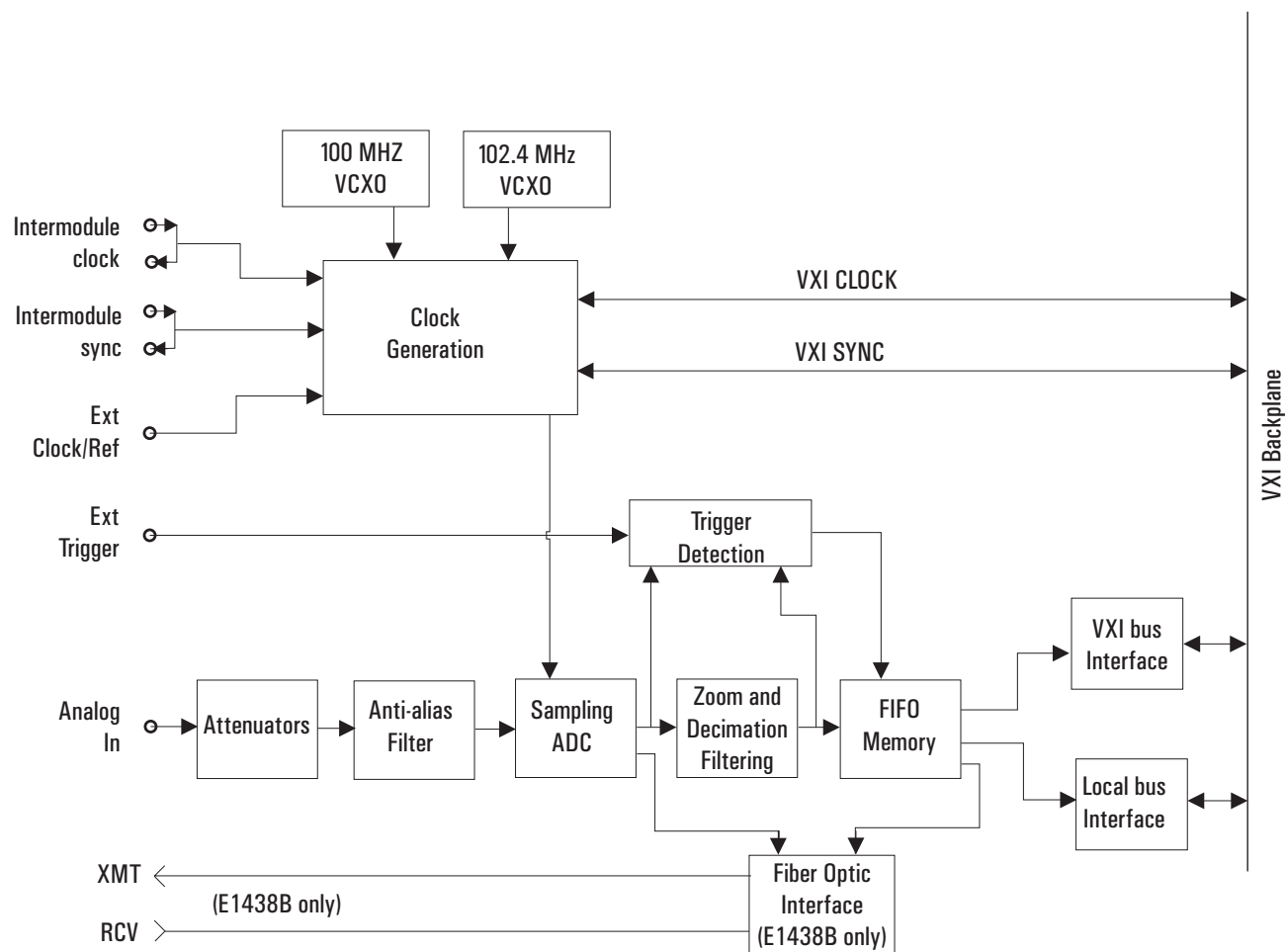
interrupt.exe

This example shows how to set up and trap a VXI interrupt to indicate an error condition in the Agilent E1438. It is written as a console program in Microsoft Visual C++.

scope.vee

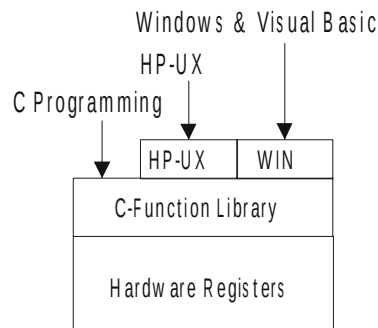
This is a simple one-channel example written in VEE. In order to view or execute it, the VEE programming environment must be installed on the system.

Agilent E1438 overview



Programming the Agilent E1438

The Agilent E1438 is shipped with software and documentation to support a broad set of choices of controllers, I/O interfaces, programming languages, and operating systems. By virtue of its compliance to the *VXIplug&play* standard, the E1438 is most easily controlled in an environment conforming to one of the supported *VXIplug&play* frameworks. However, support is also supplied for other common hardware and software environments. The relationship among the various levels of programming is shown in the diagram below.



Windows framework

The primary development environment supported by the E1438 is the *VXIplug&play* WIN95, and WINNT framework specifications. It requires the following resources prior to the installation of the E1438:

- An embedded or a stand-alone Pentium-class PC
- Microsoft Windows 95/98, 2000, or NT
- VISA interface library
- VISA compatible hardware interface
- Microsoft Visual C++ and/or Microsoft Visual Basic development system.

Additional details on the WIN framework can be found in the *VXIplug&play VPP-2 System Frameworks Specification, Revision 2.0*.

In addition to the C source code files, the E1438 includes compiled libraries, example programs, an interactive soft front panel program, online help files, and an installation program. The interactive soft front panel program allows the E1438 to be turned on, verified, and used for simple tasks without writing any user programs.

Programming the Agilent E1438

Compliance with the VXIplug&play WIN framework allows users of the Agilent VEE graphical programming system to control the E1438 from that environment. This is accomplished by using the capability of VEE to call functions in the C-library. Documentation and support for that capability is included with VEE and is not addressed further in this document.

HP-UX, Series 700 environment

The HP-UX environment is supported for developers who prefer programming tools provided on the UNIX operating system. The system requirements include:

- HP series 700 workstation
- HP-UX operating system 10.2
- MXI interface
- C-language programming system.

In addition to the source code files, the E1438 includes compiled libraries, example programs, online help files, and an installation utility.

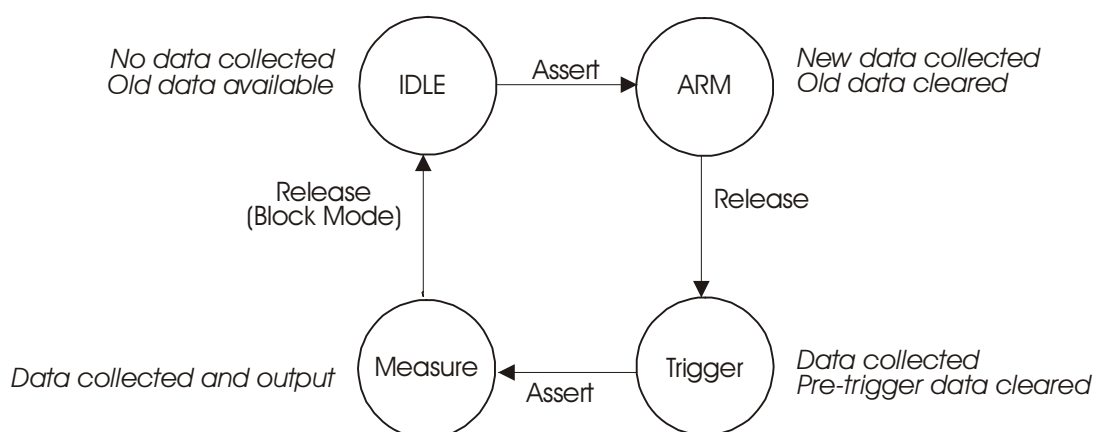
C programming

The E1438 is shipped with a source library of C-functions that can be called from user programs. This elevates the interface above the register level so the programmer does not have to be concerned with such things as register addresses and packing or splitting parameters into 16-bit register lengths. The library includes ANSI compliant source code files with all machine dependent code constrained to a single source file. By re-writing selected portions of the *machine.h* file, the programmer can create and compile an E1438 library that is compatible with virtually any development environment using the C language. The most common reason for re-writing *machine.h* is to accommodate I/O libraries other than VISA. In some cases, the library may need merely to be re-compiled to target a different processor type for the host computer.

Porting the E1438 library to a different computer environment is likely to be a fairly straight forward task. However, some of the higher level tools shipped with the E1438 may not be as easily ported. The interactive soft front panel and some example programs include human interfaces that depend on certain display and keyboard support which may be system dependent. Although source code is included for these applications, porting them to a different environment may present a greater problem than porting the library itself. The installation utilities are specifically targeted to operate on the supported development environments and may not be available in other environments.

The measurement loop

The measurement loop progresses through four states. The transition from one state to the next is tied to the transition of the Sync signal. The effect of the Sync signal is summarized in the following diagram representing the four possible states of an Agilent E1438 module.



In the *Idle* state, the E1438 places no new data into the FIFO output buffer memory although previously measured data is retained in the buffer memory and is available for output via the VME, local bus, or fiber optic transmitter port on the E1438B. The module stays in the Idle state until the Sync line is asserted.

Upon entering the *Arm* state the E1438 clears old data. It remains in the Arm state until the Sync signal is released. If an E1438 is programmed with a pre-trigger delay, it collects enough data samples to satisfy this pre-trigger delay, and then releases the Sync line. If no pre-trigger delay has been programmed, the module releases the Sync line immediately. When all E1438s in a system have released the Sync line, the module moves to the Trigger state.

Upon entering the *Trigger* state, an E1438 that is programmed with a pre-trigger delay continues collecting data into the FIFO, discarding any data prior to the pre-trigger delay. An E1438 remains in the Trigger state until the Sync line is asserted. The Sync line may be asserted by a direct command or by any E1438 that encounters a trigger condition and is programmed to assert the Sync line. When the Sync signal is asserted, all modules synchronously move to the Measure state.

In the *Measure* state, the E1438 continues collecting data and sends the data saved in the FIFO memory to the selected I/O port, starting with the sample indicated by the trigger arrival, offset by the number of samples specified by the trigger delay. This data transfer continues until all data has been transferred or until the module meets the criteria for returning to the Idle state imposed by *block mode* or *continuous mode* operation constraints.

The measurement loop

Modules programmed for *block mode* operation assert the Sync line until a complete block of data, including any pre-programmed pre- or post-trigger delay, has been collected and is available to the I/O port. The module then releases the Sync line. The module returns to the Idle state when the block of data has been collected.

In *continuous mode*, a module releases sync immediately but moves to the Idle state only if explicitly programmed to do so or if the FIFO data buffer overflows because data cannot be read from the I/O port fast enough.

The measurement loop in multi-module systems

The following rules generally apply to transitions between states when multiple modules share a Sync signal:

- If any one module *asserts* the Sync line, a synchronous state transition occurs for all modules in a system.
- All modules in a system must have *released* the Sync line in order to bring about a synchronous transition to Trigger state.
- In block mode, each module releases the Sync line after its block of data has been collected. Immediately upon entering the Measure state in continuous mode, each module releases the Sync line. It continues to collect and output data until it is programatically signaled to stop or until the FIFO overflows. With the Sync line released it is then possible to change the center frequency for one or multiple modules without interrupting the measurement. See [“Synchronizing changes in multi-module systems” on page 51](#).
- A module may be programmed explicitly to inhibit its transition to the Arm state despite Sync transitions.
- In addition to controlling the progression through the four module states, the Sync signal is used to synchronize the decimation counters and local oscillators of multiple E1438 modules.

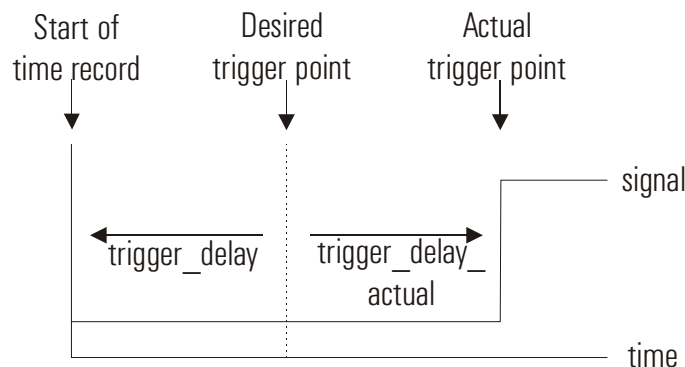
Delay and phase in triggered measurements

It is important to note that the trigger delay is specified in terms of output samples. When using the digital filters within the E1438 to reduce the sample rate, there are multiple ADC samples corresponding to each output sample. In order to determine the relationship between the first output sample of a block and the actual ADC sample where the trigger occurred, you must read the actual delay from the module using **age1438_trigger_delay_actual_get**.

This relationship varies from block to block and is a function of the particular value of counters within the digital filters at the time the trigger occurs. Thus the actual delay from the trigger event is the delay from **age1438_trigger_delay_get** multiplied by 2^{sigBw} (from **age1438_filter_bw_get** if filter decimation is used, or $2^{(\text{sigBw}-1)}$ if filter decimation is off). From this value, subtract the value returned by **age1438_trigger_delay_actual_get**. The result is in periods of the ADC sample clock. Special considerations apply in multi-module systems. See [“Trigger and phase in multi-module systems” on page 52](#).

When doing a zoomed measurement, it may also be helpful to know the phase of the digital LO at the time the trigger occurred, since the LO is also running continuously and it has an arbitrary phase relationship with the trigger event. **age1438_trigger_phase_actual_get** returns the phase of the LO at the trigger point. The LO phase could be used in time domain averaging of blocks, or other operations involving zoomed blocks of data, so that the varying phase of the LO can be removed from the calculation.

The **trigger_delay** value is the time, measured in output samples, from the desired trigger point to the start of the time record. The **trigger_delay_actual** value is the time, measured in input samples, from the desired trigger point to the actual trigger point.



The following example illustrates how **trigger_delay** and **trigger_delay_actual** can be combined. In this example:

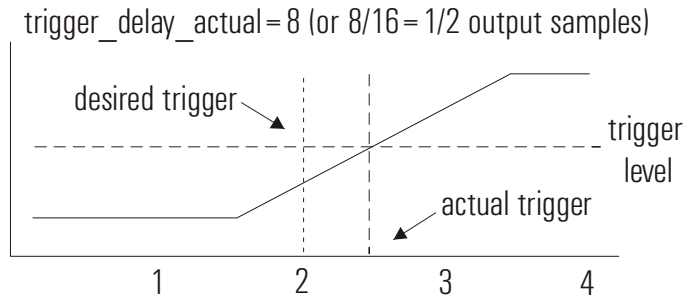
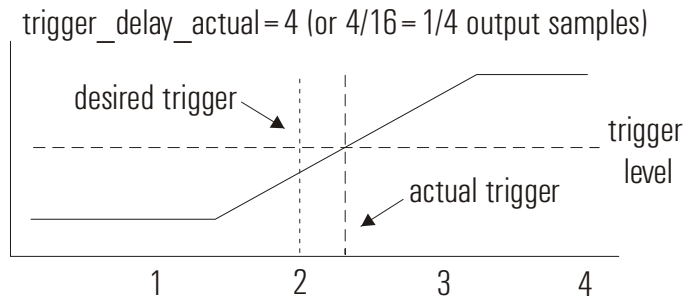
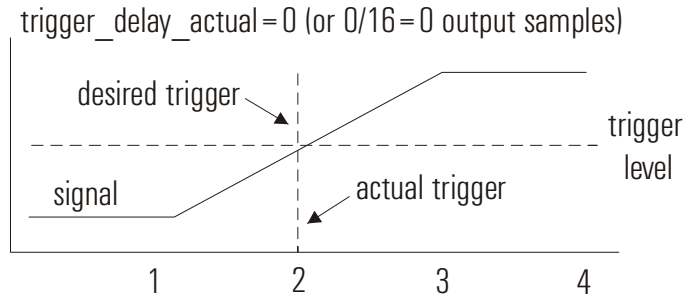
Delay and phase in triggered measurements

filter_bw=4 (2.4 MHz span)

filter_decimate = 1 (on)

trigger_delay = -2 (a pre-trigger delay of 2)

Because the *filter_bw* is 4 with decimation on, there are 16 input samples for every output sample for a decimation rate of 2^4



The phase returned is the phase of the LO at the actual trigger point, not the desired trigger point. The following example illustrates how **age1438_phase_actual_get** might be used. In this example, the input signal is a sine wave at a frequency of 4 MHz. The module is set up as follows:

frequency_center = 4.5 MHz

filter_bw = 4 (2.4 MHz span)

filter_decimate = 1 (on)

trigger_type = 1 (ADC trigger)

trigger_delay = -32 (a pre-trigger delay of 32)

trigger_adclevel = 0

data_type = 1 (complex)

Delay and phase in triggered measurements

After the measurement is completed, call **age1438_delay_actual_get** and **age1438_phase_actual_get**. In this example, the values returned happened to be:

```
delay_actual = 16  
phase_actual = 19697
```

Due to the pretrigger delay of 32, the desired trigger point would have been at the 32nd sample of the time record. However, the **delay_actual** value of 16 indicates that the sample corresponding to the actual trigger is number $32 + 16/2^4$ or the 33rd sample. The measured phase of the 33rd (complex) sample, found via the `atan2()` function, is 159 degrees. The phase of the LO at this sample is $19697 * 360 / 65536 = 108$ degrees. Adding these together to get the corrected phase of the input signal results in 267 degrees = -93 degrees, which is close to the expected phase of a sine wave triggered at its zero-crossing, which would be -90 degrees.

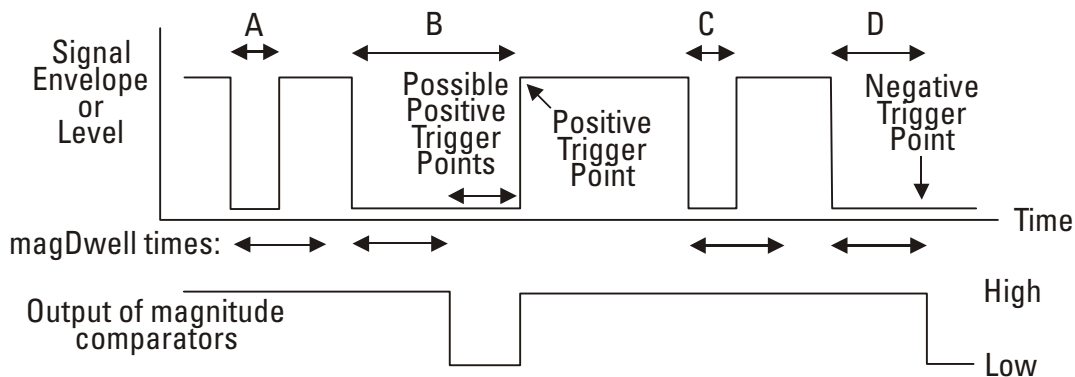
Magnitude trigger and magdwell time

The magnitude trigger operates on the magnitude of a (possibly filtered) signal. For a real signal, the magnitude is merely the absolute value of the signal. For a complex signal, the magnitude is the square root of the sum of the squares of the real and imaginary parts of the signal.

Because the magnitude trigger can operate on the filtered signal, the trigger can be more selective regarding what signals will cause a trigger than the ADC trigger. Only signals in the filter bandwidth around the center frequency will be considered when determining when a trigger occurs. Signals outside the filter's passband will be filtered out before the magnitude trigger circuit and will not cause any triggers to occur.

The magnitude trigger's behavior can be modified by the magDwell time. The magDwell time is the number of samples that a signal's magnitude must be low (i.e., below the magLevel threshold) before the magnitude trigger circuit will recognize the signal as being low. This can facilitate triggering off of a burst signal; for example, a tone burst or a TDMA burst. Due to the zero crossings within the tone burst, the ADC trigger can not reliably trigger on the leading edge of the burst. If you set the magDwell time longer than any potential drop outs within a burst and shorter than the gap between bursts, the magnitude trigger can easily catch the leading edge of a tone burst.

For a magnitude trigger with positive slope, the signal must be low for at least a magDwell number of samples. After that, the module will trigger the next time the signal goes above the magLevel threshold. For a negative slope, the module will trigger the first time that the signal is low for at least a magDwell number of samples after being high. Note that in this case, the trigger will occur a magDwell period of time after the end of the tone burst. You can use a negative trigger delay to compensate for this and to capture the end of the tone burst.



A. Time A is less than the magDwell time. The magnitude trigger does not recognize the signal as being low.

Magnitude trigger and magdwell time

- B. Time B is longer than the magDwell time. The magnitude trigger does recognize the signal as being low and a positive trigger may occur on the rising edge at the end of B.**
- C. Time C is less than the magDwell time. The magnitude trigger does not recognize the signal as being low**
- D. Time D is longer than the magDwell time. The magnitude trigger does recognize the signal as being low and a negative trigger may occur at the end of D.**

In the example shown, the signal is below the threshold at A and C, but in both of these cases, the signal is low for a time less than the magDwell time. Hence the magnitude trigger does not recognize the signal as low and these do not cause any triggers. About half way through B, the signal has remained low long enough so that the trigger recognizes the signal as low. After this, a positive trigger would occur on the next rising edge of the signal's magnitude. A negative trigger would occur at the end of D, a magDwell period of time after the falling edge.

Frequency and filtering

The Agilent E1438's center frequency is normally set at zero (baseband measurement). However, you may set the center frequency to a non-zero value in order to examine a narrower span away from baseband (zoom measurement). The frequency band of interest, represented by digitized time data samples from the ADC, is mixed with the E1438 digital LO, a complex exponential, at the desired center frequency. As a result, the frequency band of interest in the input signal is shifted to a complex signal centered around dc. See [“Synchronizing changes in multi-module systems” on page 51](#) for special considerations with respect to changing the center frequency in multi-module systems.

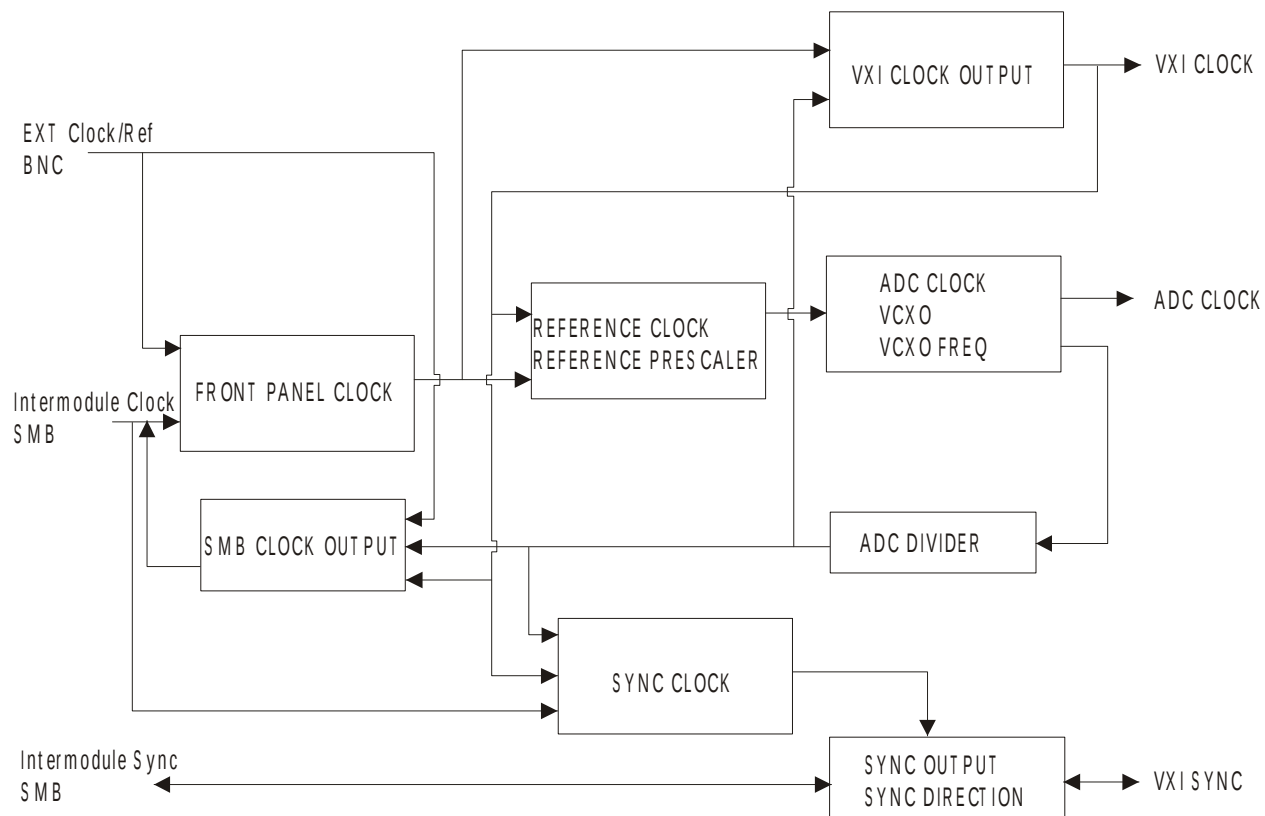
The default filter for E1438 measurements is an analog anti-alias filter. However, you may further isolate the frequency band of interest for more detailed analysis by using digital filtering. A decimating digital filter simultaneously decreases the bandwidth of the signal and decreases the sample rate. The built-in digital filters conform to the Nyquist sampling criterion, which guarantees that the output sample rate may be reduced by the same factor as the signal bandwidth reduction while still maintaining a complete representation of the underlying bandlimited signal.

For each octave step in bandwidth reduction (except for the first octave), the E1438 digital filters automatically reduce the data rate by discarding alternate output samples. This process, called decimation, results in an output sample rate that is nominally four times the signal bandwidth whenever $sigBw > 0$. This is still double the theoretical rate necessary to fully characterize the band limited signal. However, because the digital filters do not have a perfectly abrupt cutoff, the sample rate cannot be reduced to the theoretical limit without some aliasing of signals in the transition frequency band of the filters. In many applications, this limited aliasing potential is not important. For this reason you may optionally choose to apply a final factor-of-two decimation. See the Technical Specifications for detailed information on the digital filter shapes.

The decimation process used to reduce the output sample rate is driven from a "decimation counter" that keeps track of which samples to save and which ones to discard for each of the octave bandwidth reduction filter stages. In multi-module systems where synchronous sampling is required, the decimation counters in all the modules must be synchronous with each other. See [“Synchronizing changes in multi-module systems” on page 51](#).

Using clock and sync

The following diagram shows the flow of clock and sync signals:



Managing multiple modules

Sharing Reference and Sync signals in multi-module systems

The Agilent E1438 supports synchronous operation among multiple E1438s by using a shared ADC clock and Sync signal to drive all the modules in a system. The shared Sync signal is used to synchronize critical operations including arming, triggering the beginning of data collection, setting a common phase of the local oscillators for zoom operation, and forcing concurrent output sample times when decimation is used. The Sync line transitions are constrained to not occur during the critical (setup and hold) regions of the external reference. The reference operates at 1/10 of the internal ADC clock, typically 10 or 10.24 MHz for a E1438 module. The reference can be either generated within the master module or an external reference can be fed into the master module through a front panel BNC.

Note

Multi-module systems may include multiple Agilent E1438s or Agilent E1439s but not a mixture of the two types of modules.

Clock distribution

When shared, the reference clock and sync lines are distributed among modules either on the VXI backplane using the ECL Trigger lines, or on the front panel using the SMB Clock/Ref extender connectors. When VXI backplane distribution is used with more than one VXI mainframe, the front panel Intermodule Clock and Sync connectors can be used to distribute clock and Sync lines from one mainframe to another.

Since the Sync transition timing relative to the reference input is critical, the module driving the Sync line should ideally be the same one identified as the master. However, when using backplane distribution, any E1438 in the same mainframe as the master can drive the Sync line.

When using the multi-sync mode of operation, the selection of front panel or backplane distribution of reference and Sync signals involves the following considerations:

- Backplane distribution requires the use of the ECL Trigger lines on the backplane, which are then unavailable to other modules.
- The overall time skew between the arrival of ADC clock edges is smaller when using backplane distribution, particularly if the master (or buffer) module is physically located in the center of the group of E1438 modules.
- Backplane distribution is more susceptible to pickup of jitter on the ADC clock from other digital activity on the VXI backplane. The extent of this pickup depends on the mainframe and on the other modules in the mainframe. One important step in reducing this pickup is to disable, whenever possible, the 10 MHz VXI clock generated by the slot-0 controller.

Managing multiple modules

- For backplane distribution make sure that all modules conform to VXI specification 1.4 or later with regard to their attachment to the ECL Trigger lines. See the Agilent E1438 Technical Specifications for the clock jitter (phase noise) specification degradation using backplane distribution.
- Front panel distribution requires the use of two short, equal length cables with SMB connectors between modules. In addition, unused SMB connectors on modules being used for front panel distribution must be terminated in 50 ohms.

The following diagrams show typical multi-module configurations and the clock setups that apply to each module:

Managing multiple modules

Managing multi-module systems

Note

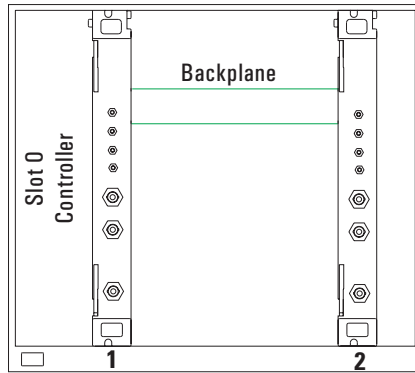
The $\otimes$ symbol indicates a 50 ohm terminator, which is required on unused SMB connectors in systems using front panel distribution

Module #1 - "Rear master, internal reference" on page 95

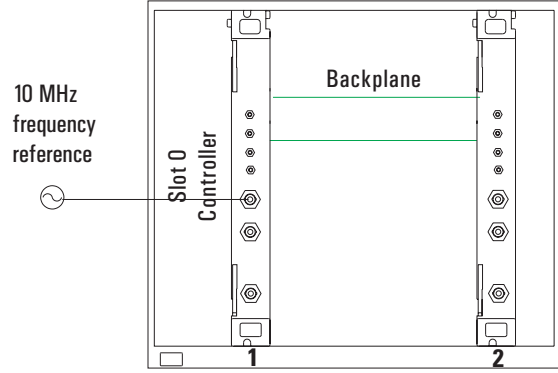
Module #2 - "Front slave, phase locked to master" on page 94

Module #1 - "Front master, phase locked to external reference" on page 94

Module #2 - "Front slave, phase locked to master" on page 94



Internal clock and SYNC distribution using VXI backplane ECL trigger lines.



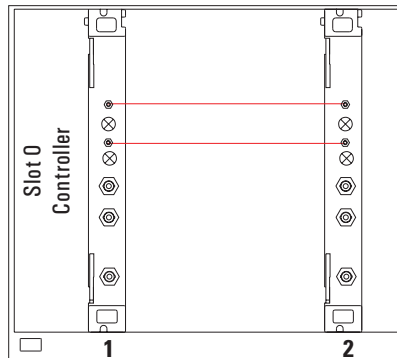
External reference and SYNC distribution using VXI backplane ECL trigger lines.

Module #1 - "Front master, internal reference" on page 93

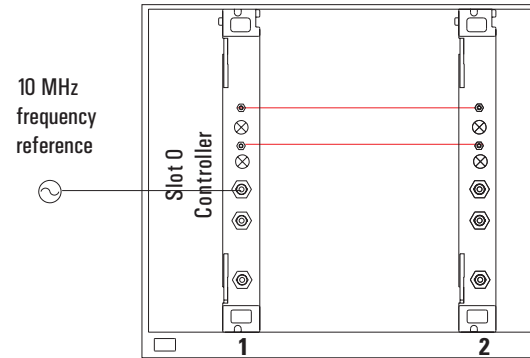
Module #2 - "Front slave, phase locked to master" on page 94

Module #1 - "Front master, phase locked to external reference" on page 94

Module #2 - "Front slave, phase locked to master" on page 94



Internal clock and SYNC distribution using front panel SMB clock and SYNC extender connections.



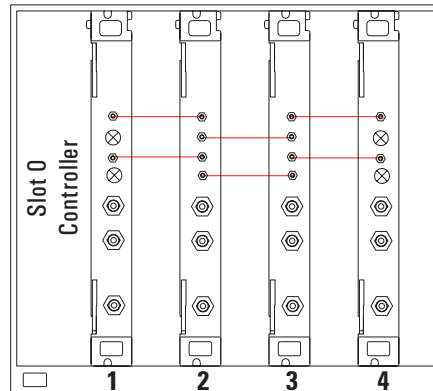
External reference and SYNC distribution using front panel SMB clock and SYNC extender connections.

Module #1 - "Front slave,
 phase locked to master" on
 page 94

Module #2 - "Front master,
 internal reference" on page
 93

Module #3 - "Front slave,
 phase locked to master" on
 page 94

Module #4 - "Front slave,
 phase locked to master" on
 page 94



Sharing clock and SYNC among several
 modules via front panel
 distribution.

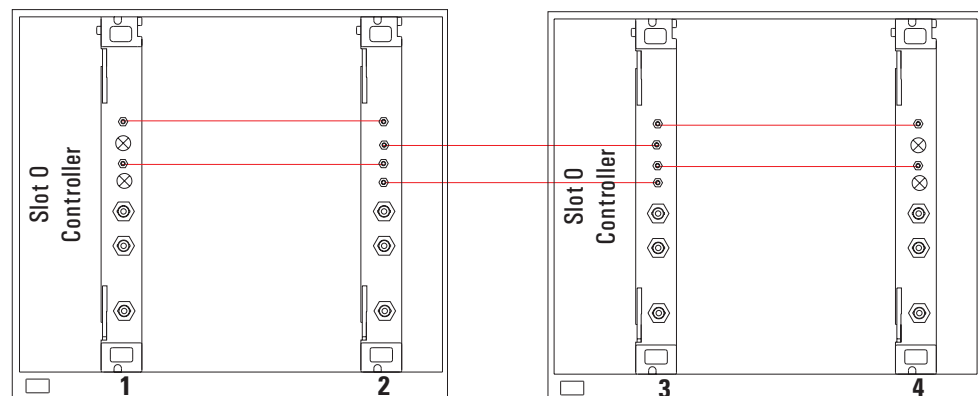
Managing multi-mainframe systems

Module #1 - "Front slave,
 phase locked to master" on
 page 94

Module #2 - "Front master,
 internal reference" on page 93

Module #3 - "Front slave,
 phase locked to master" on
 page 94

Module #4 - "Front slave,
 phase locked to master" on
 page 94



VXI Mainframe A

VXI Mainframe B

Clock and SYNC distribution using front panel
 extender connections within and between mainframes.

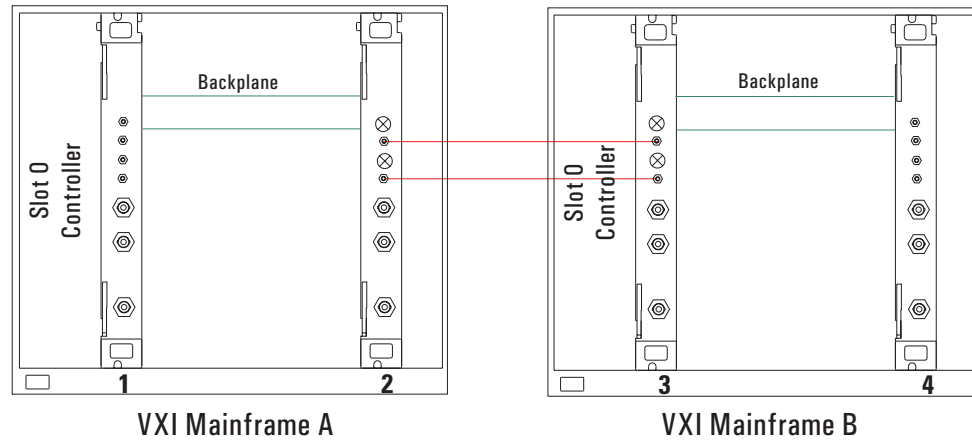
Managing multiple modules

Module #1 - "Front slave,
phase locked to master" on
page 94

Module #2 - "Send sync to
slave" on page 97

Module #3 - "Receive sync
from master" on page 98

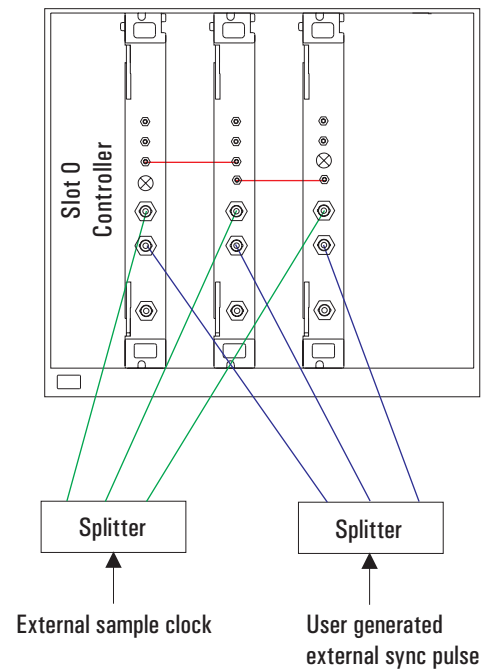
Module #4 - "Front slave,
phase locked to master" on
page 94



Clock and SYNC distribution using front panel
extender connections between mainframes and
VXI backplane connections within mainframes.

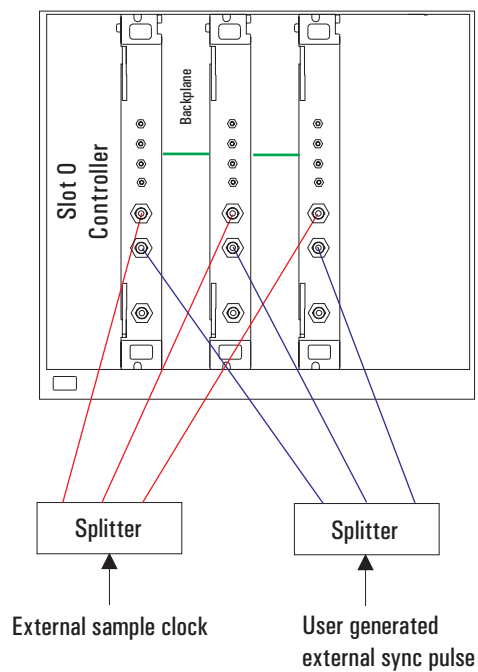
Using an external sample clock

All modules "Front sync, external sample clock, wired-OR sync" on page 96



Sharing clock and SYNC among several
modules using external sample. Front panel distribution.

All modules **"Rear sync, external sample clock, wired-OR sync"** on page 97



Sharing clock and SYNC among several
modules using external sample. Rear panel distribution.

Synchronizing changes in multi-module systems

Multi-module systems require special treatment with respect to timing of frequency and filter changes. Center frequency changes may involve synchronizing the local oscillators of all modules in a system. Digital filter changes in multi-module systems require that the decimation counters be synchronized.

Calling the following functions voids synchronized multi-module setups:

age1438_clock_setup and related low-level clock setup functions
age1438_clock_recover
age1438_input_autozero
age1438_input_range_auto
age1438_self_test
age1438_state_recall

Special considerations apply to the measurement loop. See [“The measurement loop in multi-module systems” on page 36](#).

Synchronous digital filter changes

In multi-module systems where synchronous sampling is required, the decimation counters in all the modules must be synchronous with each other. This condition can be forced by preparing each module in the system in advance. Any measurement in progress is terminated at this time and the module is placed in the Idle state. After each module is prepared, the next sync line transition causes the digital decimation counter to be reset and started at the same time. Once this is done, the decimation counters stay synchronized as long as the same ADC clock is used.

If you also intend to change the center frequency along with the digital filters, you should synchronize the digital filters first. Otherwise, the center frequency phase becomes unsynchronized when the digital filters are changed.

Synchronous center frequency changes

In multi-module systems you may prepare each module in advance of a frequency change, then perform the change synchronously by asserting the Sync line. This preserves the phase relationship of the local oscillators for all modules in the system. Certain special considerations apply to multi-module frequency changes:

- If all modules in a system are in the Idle state when the Sync line transition occurs, the LO frequency is updated and the next measurement is armed.
- If all modules are in the measurement state in continuous mode when the Sync line transition occurs, the LO frequency is synchronously updated, and the measurement continues.
- In continuous mode, care must be taken to assure that all modules are in the same state, either the Idle state or the Measure state, before the Sync line transition occurs, otherwise some modules re-arm while others continue the current measurement.
- In block mode, it is simplest to keep Forced Idle asserted during the Sync line transitions to keep all the modules in the Idle state.

Managing multiple modules

- If you also intend to change the digital filters along with the center frequency, you should synchronize the digital filters first. Otherwise, the center frequency phase becomes non-synchronized when the digital filters are changed.

Trigger and phase in multi-module systems

When you use triggering in multiple modules, you do not need to measure phase differences between two or more channels *if* the channels are set up *identically* in terms of digital filtering and LO frequency, *and* the digital filters and LOs are correctly synchronized. Since the filters and LOs are synced together, their actual trigger delays and LO phases are identical and will cancel out of relative phase measurements. Any remaining delay should be less than 10ns between two modules in the same mainframe.

Only the module that generates the trigger has knowledge of the delay between the trigger event and the start of data collection. Therefore, if you need the actual delay from the trigger, you should use the trigger delay correction from the module that generated the trigger. Likewise, you should obtain the LO phase at the time of the trigger from the module that generated the trigger. See [“Delay and phase in triggered measurements” on page 37](#).

External sample synchronization in multi-module systems

There are two general instances where you might want to use an external sample clock in a system with multiple E1438s:

- You wish to have the ADC's sample at a rate other than the 100 and 102.4 MHz clocks supplied with the E1438.
- You wish more precise simultaneous sampling than can be provided by the normal scheme that uses the internal VCXOs within the modules locked together by a 10 MHz reference that is distributed from module to module. By exercising care in matching the skew of the sample clocks fed into each module, channel-to-channel group delays at low frequencies can be well below a nanosecond.

To use external sample clocks with multiple modules and still perform synced measurements, you need to use either the AGE1438_FRNT_SYNC_EXT_SAMP or AGE1438_REAR_SYNC_EXT_SAMP clock setups (see [“age1438_clock_setup” on page 91](#)). These setups use the signal that you feed into the Ext Clock/Ref BNC input of the E1438 as a sample clock for the ADC. A counter within the E1438 generates two lower frequency clocks, one for the DSP circuitry and one to clock the measurement SYNC signal between multiple modules. Since these clocks are generated independently within each module, the counters in each module must be synced together with a common externally generated signal in order to make properly synced and triggered measurements involving multiple channels. You feed this "external sample sync" signal into the External Trigger BNC and the module uses the signal to reset the counters to a known phase.

The external sample sync signal should be generated on the falling edge of the external sample clock, and fed into each module in the system by an identical length coax cable. Likewise, the sample clock should be fed into each Ext Clock/Ref BNC by an identical length coax cable from a common driver.

Here is the sequence of operations:

1. Put all modules into either the **AGE1438_REAR_SYNC_EXT_SAMP** mode or the **AGE1438_FRNT_SYNC_EXT_SAMP** mode with the **age1438_clock_setup** command.
2. Issue the **age1438_ext_sample_sync** (**AGE1438_EXT_SAMPLE_SYNC_ENABLE**) command to reset the counters within all the E1438s.
3. Generate the external sample sync pulse simultaneously into all modules. One way to do this is to use one of the VXI TTLTRG lines and reclock the signal with the falling edge of the sample clock. Note: If you are using an E1438A module with a serial number lower than US41140000, you will need some user supplied hardware to convert TTLTRG to ECL because older E1438As do not support TTL trigger.
4. Issue the **age1438_clock_recover** command to all modules since the DSP clock was interrupted between the **age1438_ext_sample_sync** command and the external sync signal on the Trigger input.
5. Sync the digital filters:
 - Force all modules to idle (**age1438_meas_control**).
 - Send the **age1438_filter_sync** command to all modules.
 - Assert and release the sync line from the master module (**age1438_meas_control**).
 - Release all modules from idle (**age1438_meas_control**).
6. Sync the digital local oscillators:
 - Force all modules to idle (**age1438_meas_control**).
 - Set all module frequencies to zero (**age1438_frequency_center**).
 - Assert and release system Sync (**age1438_meas_control**).
 - Set the LO frequencies to the desired ones (**age1438_frequency_center**).
 - Toggle system Sync again to synchronously set the LO frequencies (**age1438_meas_control**).
 - Finally release all modules from idle (**age1438_meas_control**).
7. Now you may take a measurement:
 - Issue an **age1438_meas_start**.
 - Retrieve data from the modules when valid.

In the event that you do not supply a synchronizing signal in a reasonable length of time (or you change your mind about it), the DSP clock can be restored by issuing **age1438_ext_sample_sync** (**AGE1438_EXT_SAMP_SYNC_CANCEL**) followed by an **age1438_clock_recover**.

You should not need to perform the external sample sync operation again unless the external clocks are interrupted or the clock setup changed.

See also the diagrams earlier in this section that show the physical setup. All the functions mentioned above are described in [“Functions listed alphabetically” in chapter 4](#).

Transferring data

You can transfer data from the Agilent E1438A or E1438B via the VMEbus and the Local Bus. With the Agilent E1438B you can also transfer data via a fiber optic interface.

- The VMEbus is the universal data bus for VXI architecture. It provides flexibility and versatility in transferring data. Transfers over the VMEbus are 16 bits or 32 bits wide.
- The Local Bus supports faster transfer rates than the VMEbus. For example, if you are transferring data from the Agilent E1438 to the Agilent E1485A/B, the Local Bus provides a direct pipeline to the Agilent E1485's DSPs.

Using the Local Bus, you can transfer data in the background while processing data in a signal-processing module. All Local Bus data transfers originate in the E1438 and move towards a signal processing module to the right of the E1438. If other modules generate data to the left of the input module, the E1438 passes the data to its right and inserts or appends its own data at the beginning or end of the frame.

- The fiber optic interface, available on the Agilent E1438B, provides data rates greater than 200 Mbytes/second. It can transmit filtered or unfiltered data, copy data from its receiver to its transmitter, or append data to copied data.

Fiber Optic Interface

The E1438B provides a fiber optic interface that can transmit continuous full bandwidth data from the internal A/D converter. In addition, it can stream data from multiple synchronized modules operating at lower bandwidths onto a single fiber optic channel. An optical receiver can then simultaneously analyze data collected at different frequencies and bandwidths.

The E1438B fiber optic interface uses a serial data stream protocol providing high data throughput and low latency characteristics. This protocol is intended to be compatible with the Serial Front Panel Data Port Draft Standard (VITA 17.1, draft 0.5 dated February 26, 2001) currently under development by the VITA Standards Organization (<http://www.vita.com>). VITA 17.1 is not yet approved and manufacturers are not yet permitted to claim conformance to the draft standard. However, laboratory testing at Agilent Technologies has demonstrated interoperability of the E1438B with fiber optic products from other manufacturers that also intend to support the draft standard. These products include Systran Simplex Link Protocol products, such as the SL100 and SL240, and Mercury Computer products, such as the RINOJ-F RACEway I/O daughter card.

The following overview supplies the basic concepts required to use all the supported features. For details, see the descriptions of the API functions.

Fiber Optic Interface**Fiber Frames**

Data is transmitted over the fiber interface in a series of fiber frames. Each fiber frame is composed of a series of 32-bit values, which encode to 40 bits. Each 32-bit value can either be data or an ordered set. Data and ordered sets are strung together to make the three types of fiber frames—Data Frame, BOF, and EOE. The Data Frame transmits 0 to 512 32-bit data words. The exact amount of data that is sent depends on the amount of data that is available when the fiber interface is ready to send the Data Frame. BOF (Beginning Of Frame) is a synchronizing event that can be sent just prior to the start of data transmission. EOE (End Of Epoch) is a synchronizing event that contains the last 4 data bytes in an epoch. An epoch is composed of one or more Data Frames followed by an EOE. The following shows the ordered sets and data that make up the three fiber frames:

Data Frame (Normal Data Fiber Frame)

IDLE ¹	SOF ²	0 to 512 data words ³	CRC ⁴	FEOF ⁵	SEOF ⁶	GO/STOP ⁷
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BOF (Sync Without Data Fiber Frame)

IDLE ¹	SOF ²	No data	CRC ⁴	MEOF ⁸	SEOF ⁶	GO/STOP ⁷
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EOE (Sync with Data Fiber Frame)

SWDV ⁹	SOF ²	Last 4 data bytes in epoch ¹⁰	CRC ⁴	MEOF ⁸	SEOF ⁶	GO/STOP ⁷
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1. Pad for Data Frame or BOF
2. Start Of Frame, framing event that embeds PIO1, PIO2, and DIR
3. 32 bit or 4 Byte words, maximum 2048 Bytes
4. Cyclic Redundancy Check, optional
5. Frame End Of Frame, end of Data Frame
6. Status End Of Frame, embeds FIFO OV and NRDY
7. Flow controls
8. Mark End Of Frame, end of BOF and EOE
9. Sync With Data Valid, start of EOE
10. 4 bytes, exactly

Control Signals

PIO1, PIO2, DIR, and NRDY are FPDP (front panel data port) control signals. These signals can be defined by another product or you can define their meaning and application.

When an overflow condition in the transmit FIFO occurs, the E1438B asserts FIFO OV indicating a loss of data. This may occur in [Append](#) fiber mode if the available fiber bandwidth capability is exceeded.

If flow control is enabled, the E1438B responds to the STOP and GO signals. See [“Generate” on page 60](#) for details.

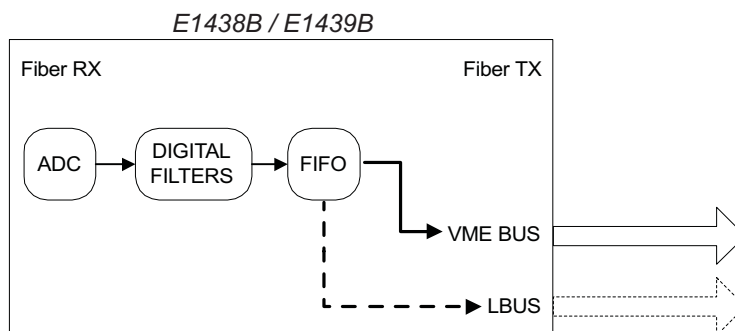
Fiber Modes

The E1438B's fiber interface can operate in five different modes:

- “Off” on page 57
- “Copy” on page 58
- “Raw” on page 59
- “Generate” on page 60
- “Append” on page 62

Off

The Off fiber mode disables the fiber transmitter but allows the fiber receiver to read control signals. Normal data collection and filtering continues, and the data port selection determines whether data is sent to the local bus or read from the FIFO via the VME bus. See the following illustration.



Fiber Interface Setup

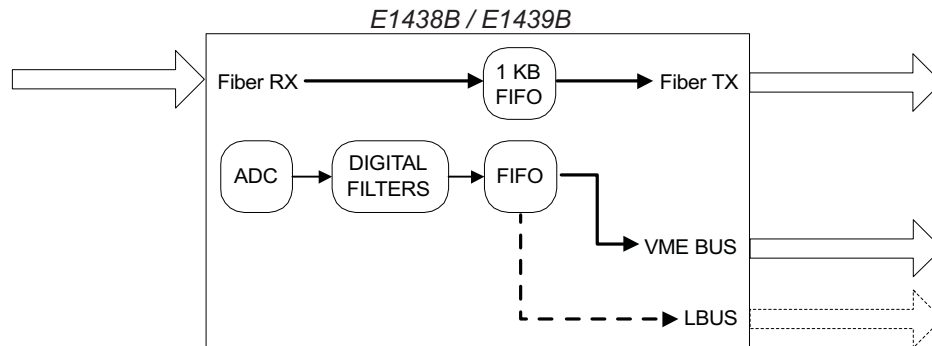
Fiber Mode	Off
Rate	setting ignored
BOF	setting ignored
CRC	setting ignored
Flow Control	setting ignored
Epoch Generate	setting ignored
Epoch Size	setting ignored

Note

Setting the data port to Fiber while in the Off fiber mode causes the data FIFO to fill up with filtered ADC data, which then causes data collection to stop.

Fiber Optic Interface**Copy**

The Copy fiber mode copies optical data from its fiber receiver to its fiber transmitter without adding any data. Normal data collection and filtering continues, and the data port selection determines whether data is sent to the local bus or read from the FIFO via the VME bus. Copy is the default fiber mode after power-on or reset. See the following illustration.

**Fiber Interface Setup**

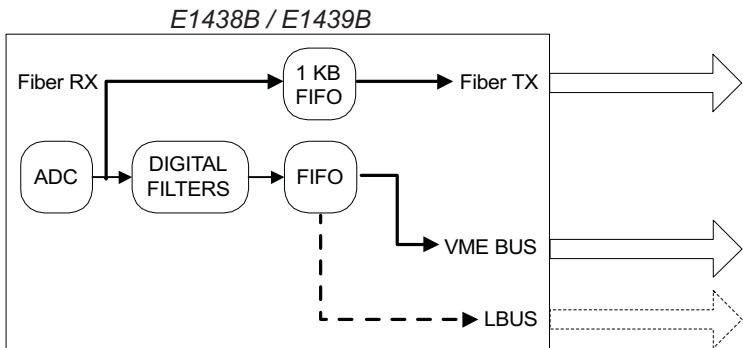
Fiber Mode	Copy
Rate	106 or 250 MBs
BOF	setting ignored
CRC	must match incoming signal
Flow Control	setting ignored
Epoch Generate	setting ignored
Epoch Size	setting ignored

Note

Setting the data port to Fiber while in the Copy fiber mode results in an invalid instrument state.

Raw

The Raw fiber mode transmits raw (i.e., unprocessed, full bandwidth) ADC data over the fiber interface. At the same time that the raw data is transmitted over the fiber interface, filtered ADC data can be sent over the local bus or read from the FIFO via the VME bus. After selecting Raw, optical data transmission starts at the trigger event and is not affected by trigger delays or data delays. The raw data transmission continues even after the measurement is complete. Changing the fiber mode stops data transmission. See the following illustration.



Fiber Interface Setup

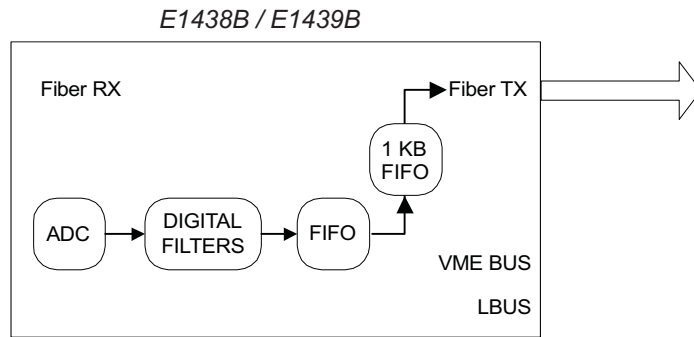
Fiber Mode	Raw
Rate	106 ¹ or 250 MBs
BOF	Optional
CRC	ON ²
Flow Control	Optional
Epoch Generate	Optional
Epoch Size	Divisible by 4

- 1. Only with external sample. Internal sample generates data too fast for this rate.
- 2. Some receivers may require CRC to be off for compatibility

Note	Setting the data port to Fiber while in the Raw fiber mode results in an invalid instrument state because raw and filtered data cannot both be sent over the fiber interface at the same time.
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Fiber Optic Interface**Generate**

If flow control is off, Generate fiber mode transmits filtered ADC data over the fiber interface as soon as data is available. ADC data is not available via any other data port and received optical data is ignored. The following illustration shows an E1438B transmitting data when flow control is turned off.

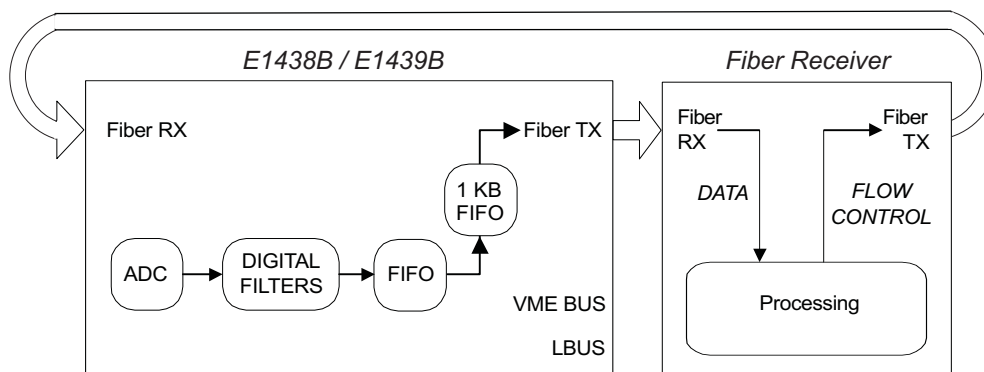
**Fiber Interface Setup**

Fiber Mode	Generate
Rate	106 or 250 MBs
BOF	Optional
CRC	ON ¹
Flow Control	OFF
Epoch Generate	Optional
Epoch Size	Divisible by 4

1. Some receivers may require CRC to be off for compatibility

Fiber Optic Interface

If flow control is on and the fiber receiver is capable of generating flow control signals, Generate fiber mode transmits filtered ADC data after the fiber receiver indicates that it is ready and a complete data block is ready to be transmitted. ADC data is not available via any other data port and received optical data, other than the flow control signals, is ignored. The following illustration shows an E1438B transmitting data to a fiber receiver when flow control is on.

**Fiber Interface Setup**

Mode	Generate
Rate	106 or 250 MBs
BOF	Optional
CRC	ON
Flow Control	No Copy
Epoch Generate	Optional
Epoch Size	Divisible by 4

Fiber Optic Interface

Append

The Append fiber mode copies optical data from its fiber receiver to its fiber transmitter and appends its own filtered ADC data. This mode is required in an optical fiber append chain. For the first module in an append chain, set the fiber mode to Generate, BOF to ON, and Epoch Generate to ON. The module generates data epochs in the standard fashion and a BOF is sent after each epoch. For all modules after the first, set fiber mode to Append, BOF to ON, and Epoch Generate to ON. Each module copies received data to its transmitter output until a BOF is received. The module then sends one epoch of filtered data from its ADC (if at least one block is available), followed by a BOF.

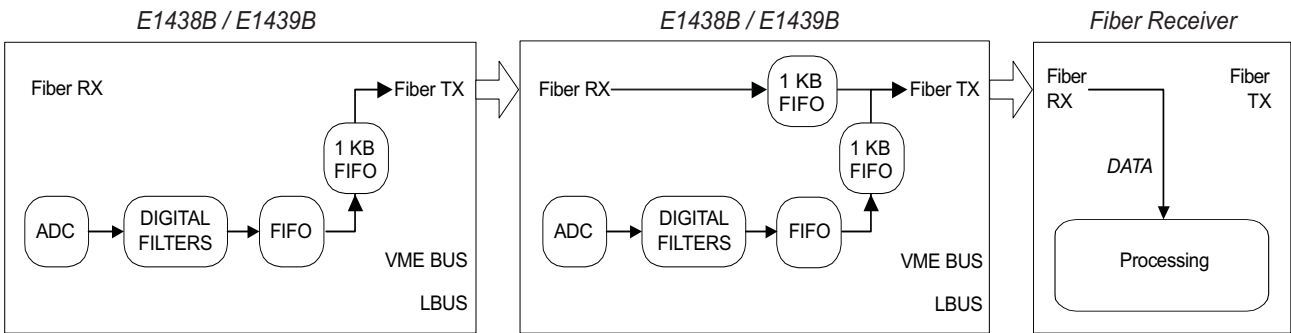
In block data mode, the data from a single trigger is transmitted. Subsequent triggers should not be generated faster than the data can be transmitted.

In continuous data mode, the generated data must not exceed the available fiber bandwidth, allowing the data to be merged without data loss from a FIFO overrun. Therefore, you must reduce the generated sample rate using either an external sample clock operating at a slower rate or data decimation. If you use an external sample clock operating at a slower rate, epoch size must be 1024 bytes (a larger epoch size causes a FIFO overrun resulting in a loss of data, and a smaller epoch size increases overhead reducing the available bandwidth). The available bandwidth is then about 101 MBytes/second or 238 MBytes/second. If you use data decimation, an epoch size of approximately 2048 bytes provides the maximum available bandwidth.

Note

Epoch size and block size must be equal (in bytes). Since block size is in samples, you can multiply block size by the number of bytes per sample to determine the equivalent epoch size. Conversely, you can divide the epoch size by the number of bytes per sample to determine the equivalent block size. Real 12-bit data contains 2 bytes per sample, complex 12-bit data and real 24-bit data contains 4 bytes per sample, and complex 24-bit data contains 8 bytes per sample.

The following shows two E1438B modules in an append chain transmitting data to a fiber receiver when flow control is off.



Fiber Interface Setup

First E1438B in chain

Mode	Generate
Rate	106 or 250 MBs
BOF	ON
CRC	ON
Flow Control	OFF
Epoch Generate	ON
Epoch Size	Divisible by 4; must match blocksize

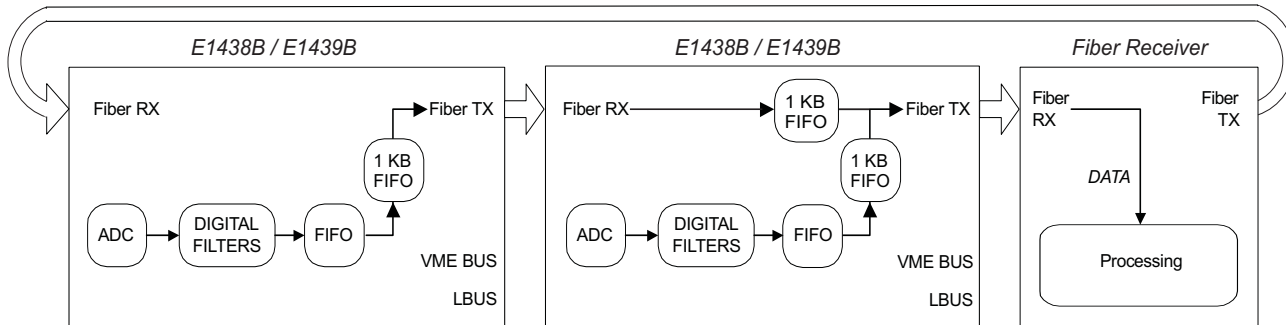
Next E1438B in chain

Mode	Append
Rate	same as module to left
BOF	ON ¹
CRC	ON
Flow Control	OFF
Epoch Generate	ON
Epoch Size	Divisible by 4; must match blocksize

1. The final module in an append chain may require BOF to be Off for compatibility with data receivers that cannot process BOFs.

Fiber Optic Interface

The following shows two E1438B modules in an append chain transmitting data to a fiber receiver when flow control is on.

**Fiber Interface Setup****First E1438B in chain**

Mode	Generate
Rate	106 or 250 MBs
BOF	ON
CRC	ON
Flow Control	Copy
Epoch Generate	ON
Epoch Size	Divisible by 4; must match blocksize

Next E1438B in chain

Mode	Append
Rate	same as module to left
BOF	ON ¹
CRC	ON
Flow Control	No Copy ²
Epoch Generate	ON
Epoch Size	Divisible by 4; must match blocksize

1. The final module in an append chain may require BOF to be Off for compatibility with data receivers that cannot process BOFs.
2. Set intermediate modules to Copy and the last module to No Copy.

Introduction

The programmer's reference is presented as a set of *VXIplug&play* functions since this is the primary targeted environment. However, when you performed the setup for the Agilent E1438, drivers were installed to support various programming environments as described in [“Programming the Agilent E1438” in chapter 3](#).

The function descriptions in the programmer's reference are valid for all environments. Be sure to follow the instructions in [“Getting Started and Introduction” in chapter 2](#) to assure proper installation and to become familiar with the capabilities of your Agilent E1438 software in various programming environments. You should find the example programs particularly helpful for programming in various environments.

Many of the function descriptions in the programming reference include several related functions. You may use the primary function to set all related parameters or you may use the other functions within the group to set or query a single parameter.

Parameter variables are presented as alphanumeric values which are descriptive and easy to remember. However, for faster programming you may use the numeric equivalents for the parameter variables listed at the end of this section.

Functions listed by class

Component	Capability	Subclass	Function Name
INITIALIZE & CLOSE			age1438_init (on page 146)
			age1438_close (on page 99)
MEASURE	READ	INITIATE	age1438_meas_control (on page 164)
			age1438_meas_init (on page 167)
			age1438_meas_start (on page 168)
			age1438_meas_status_get (on page 169)
			age1438_wait (on page 205)
MEASURE	READ	FETCH	age1438_read (on page 172)
			age1438_read64 (on page 172)
			age1438_read_raw (on page 175)
MEASURE	CONFIGURE		age1438_clock_fs (on page 89)
			age1438_clock_fs_get (on page 89)
			age1438_clock_recover (on page 90)
			age1438_clock_setup (on page 91)
			age1438_clock_setup_get (on page 91)
			age1438_combo_setup (on page 100)
			age1438_data_memsizesize_get (on page 101)
			age1438_data_scale_get (on page 102)
			age1438_data_setup (on page 103)
			age1438_ext_sample_sync (on page 117)
			age1438_ext_sample_sync_get (on page 117)
			age1438_filter_setup (on page 134)
			age1438_frequency_setup (on page 142)
			age1438_input_autozero (on page 148)
			age1438_input_range_auto (on page 151)
			age1438_input_setup (on page 154)
			age1438_input_range_convert (on page 152)
			age1438_trigger_setup (on page 196)
MEASURE	CONFIGURE	LOW LEVEL	age1438_adc_clock (on page 85)
			age1438_adc_clock_get (on page 85)
			age1438_adc_divider (on page 86)
			age1438_adc_divider_get (on page 86)

Functions listed by class

Component	Capability	Subclass	Function Name
			age1438_data_blocksize (on page 103)
			age1438_data_blocksize_get (on page 103)
			age1438_data_delay (on page 103)
			age1438_data_delay_get (on page 103)
			age1438_data_mode (on page 103)
			age1438_data_mode_get (on page 103)
			age1438_data_port (on page 103)
			age1438_data_port_get (on page 103)
			age1438_data_resolution (on page 103)
			age1438_data_resolution_get (on page 103)
			age1438_data_type (on page 103)
			age1438_data_type_get (on page 103)
			age1438_data_xfersize (on page 109)
			age1438_data_xfersize_get (on page 109)
			age1438_filter_bw (on page 134)
			age1438_filter_bw_get (on page 134)
			age1438_filter_decimate (on page 134)
			age1438_filter_decimate_get (on page 134)
			age1438_filter_sync (on page 137)
			age1438_frequency_center (on page 142)
			age1438_frequency_center_get (on page 142)
			age1438_frequency_center_raw (on page 139)
			age1438_frequency_center_raw_compute (on page 141)
			age1438_frequency_center_raw_get (on page 139)
			age1438_frequency_cmplxdc (on page 142)
			age1438_frequency_cmplxdc_get (on page 142)
			age1438_frequency_sync (on page 142)
			age1438_frequency_sync_get (on page 142)
			age1438_front_panel_clock_input (on page 145)
			age1438_front_panel_clock_input_get (on page 145)
			age1438_input_alias_filter (on page 154)
			age1438_input_alias_filter_get (on page 154)
			age1438_input_autozero (on page 148)
			age1438_input_coupling (on page 154)
			age1438_input_coupling_get (on page 154)
			age1438_input_offset (on page 149)
			age1438_input_offset_get (on page 149)
			age1438_input_offset_save (on page 150)
			age1438_input_range (on page 154)
			age1438_input_range_get (on page 154)

Component	Capability	Subclass	Function Name
ROUTE	CONFIGURE		age1438_input_signal (on page 154)
			age1438_input_signal_get (on page 154)
			age1438_reference_clock (on page 178)
			age1438_reference_clock_get (on page 178)
			age1438_reference_prescaler (on page 179)
			age1438_reference_prescaler_get (on page 179)
			age1438_smb_clock_output (on page 186)
			age1438_smb_clock_output_get (on page 186)
			age1438_sync_clock (on page 191)
			age1438_sync_clock_get (on page 191)
			age1438_sync_direction (on page 192)
			age1438_sync_direction_get (on page 192)
			age1438_sync_output (on page 193)
			age1438_sync_output_get (on page 193)
			age1438_trigger_adcleve (on page 196)
			age1438_trigger_adcleve_get (on page 196)
			age1438_trigger_delay (on page 196)
			age1438_trigger_delay_get (on page 196)
			age1438_trigger_delay_actual_get (on page 194)
			age1438_trigger_gen (on page 196)
			age1438_trigger_gen_get (on page 196)
			age1438_trigger_magdwell (on page 196)
			age1438_trigger_magdwell_get (on page 196)
			age1438_trigger_maglevel (on page 196)
			age1438_trigger_maglevel_get (on page 196)
			age1438_trigger_phase_actual_get (on page 195)
			age1438_trigger_slope (on page 196)
			age1438_trigger_slope_get (on page 196)
			age1438_trigger_type (on page 196)
			age1438_trigger_type_get (on page 196)
			age1438_vcxo (on page 201)
			age1438_vcxo_freq (on page 202)
			age1438_vcxo_freq_get (on page 202)
			age1438_vcxo_freq_preset (on page 203)
			age1438_vcxo_get (on page 201)
			age1438_vxi_clock_output (on page 204)
			age1438_vxi_clock_output_get (on page 204)
			age1438_epoch_setup (on page 111)
			age1438_fiber_setup (on page 125)
			age1438_lbus_mode (on page 160)

Functions listed by class

Component	Capability	Subclass	Function Name
ROUTE	CONFIGURE	LOW LEVEL	age1438_lbus_mode_get (on page 160)
			age1438_lbus_reset (on page 162)
			age1438_lbus_reset_get (on page 162)
			age1438_fiber_BOF (on page 125)
			age1438_fiber_BOF_get (on page 126)
			age1438_fiber_crc (on page 126)
			age1438_fiber_crc_get (on page 126)
			age1438_fiber_flow_control (on page 127)
			age1438_fiber_flow_control_get (on page 127)
			age1438_fiber_mode (on page 126)
			age1438_fiber_mode_get (on page 127)
			age1438_fiber_transfer_rate (on page 127)
			age1438_fiber_transfer_rate_get (on page 127)
			age1438_epoch_generate (on page 111)
			age1438_epoch_generate_get (on page 111)
			age1438_header (on page 112)
			age1438_epoch_header_get (on page 113)
			age1438_epoch_header_enable (on page 112)
			age1438_epoch_header_enable_get (on page 112)
			age1438_epoch_size (on page 111)
ROUTE	CONTROL		age1438_epoch_size_get (on page 112)
			age1438_fiber_clear (on page 119)
			age1438_fiber_error_clear (on page 120)
			age1438_fiber_LED_get (on page 123)
			age1438_fiber_rcv_signals_get (on page 124)
			age1438_fiber_signal_get (on page 129)
			age1438_fiber_verify (on page 130)
			age1438_fiber_xmt_BOF (on page 131)
			age1438_fiber_xmt_signals (on page 132)
			age1438_fiber_xmt_signals_get (on page 132)
UTILITY			age1438_attrib_get (on page 87)
			age1438_cal_get (on page 88)
			age1438_driver_debug_level (on page 110)
			age1438_driver_debug_level_get (on page 110)
			age1438_error_message (on page 115)
			age1438_error_query (on page 116)
			age1438_interrupt_mask_get (on page 158)
			age1438_interrupt_priority_get (on page 158)
			age1438_interrupt_restore (on page 157)
			age1438_interrupt_setup (on page 158)

Functions listed by class

Component	Capability	Subclass	Function Name
			age1438_options_get (on page 170)
			age1438_product_id_get (on page 171)
			age1438_reset (on page 180)
			age1438_reset_hard (on page 181)
			age1438_revision_query (on page 182)
			age1438_self_test (on page 183)
			age1438_serial_number (on page 185)
			age1438_serial_number_get (on page 185)
			age1438_state_save (on page 188)
			age1438_state_recall (on page 187)
			age1438_status_get (on page 189)

Functions listed by functional group

This section lists the programming functions in groups of related functions. A brief description of each group follows:

[“Initializing and closing” on page 73](#): You must initialize the I/O driver and set up each module before using any other functions.

[“Identification” on page 76](#): These functions identify the module, serial number and options.

[“Analog setup” on page 73](#): These functions determine how the analog input section is configured.

[“Data format” on page 73](#): An Agilent E1438 can collect either real or complex data in 12-bit or 24-bit format. It can collect data into various block sizes or in a continuous mode. This data can be transferred either on the VXI backplane, the Local Bus or over the fiber interface.

[“Digital processing” on page 74](#): The decimation filter provides bandpass filtering and decimation capabilities. You may also select limited frequency spans away from baseband.

[“Measurement control” on page 76](#): These functions initiate or terminate the measurement loop.

[“Timing” on page 76](#): The clock signals for the ADC sample clock can be set in a variety of ways. One Agilent E1438 can be enabled to drive the sample clock line on the VXI backplane or front panel to enable synchronization of multiple Agilent E1438 modules.

[“Trigger” on page 77](#): These functions set all parameters associated with triggering the beginning of data collection.

[“Synchronization \(controlling multiple modules\)” on page 78](#): These functions support synchronous operation among multiple Agilent E1438s by using shared ADC clock and Sync signals to drive all the modules in a system.

[“Reading data” on page 78](#): The Agilent E1438 reads data from either the VME or the Local Bus data port. This data can optionally be scaled and converted to floating point.

[“Interrupts” on page 76](#): The Agilent E1438 can be programmed to interrupt via the VXI backplane whenever certain status conditions are present.

[“Debugging” on page 74](#): Allows you to identify program and hardware problems.

[“Fiber Interface” on page 74](#): These functions are only available on E1438B.

Initializing and closing

age1438_init (on page 146) – initializes the I/O driver for a module
age1438_close (on page 99) – closes the module's software connection

Analog setup

age1438_input_setup (on page 154) – sets all the analog input parameters
age1438_input_alias_filter (on page 154) – include/bypass the built-in analog anti-alias filter
age1438_input_alias_filter_get (on page 154) – gets the anti-alias filter state
age1438_input_autozero (on page 154) – nulls out the input dc offset in baseband mode
age1438_input_coupling (on page 154) – selects ac or dc input coupling
age1438_input_coupling_get (on page 154) – get the input coupling type
age1438_input_offset (on page 149) – sets the dc offset settings for the current range
age1438_input_offset_get (on page 149) – gets the dc offset settings
age1438_input_offset_save (on page 150) – saves the dc offset settings in NVRAM
age1438_input_range (on page 154) – sets the full scale input range
age1438_input_range_auto (on page 151) – performs auto-ranging
age1438_input_range_convert (on page 152) – converts input range to volts
age1438_input_range_get (on page 154) – gets the input range
age1438_input_signal (on page 154) – connect/disconnect the input signal to the input amplifier
age1438_input_signal_get (on page 154) – gets the input buffer amplifier state
age1438_state_save (on page 188) – saves the current module state
age1438_state_recall (on page 187) – recalls a previous module state

Data format

age1438_data_setup (on page 103) – sets all format and data output flow parameters
age1438_data_blocksize (on page 103) – determines the size of the output data block
age1438_data_blocksize_get (on page 103) – gets the output data block size
age1438_data_delay (on page 103) – determines FIFO delay in continuous mode
age1438_data_delay_get (on page 103) – gets FIFO delay
age1438_data_memsize_get (on page 101) – returns module's memory size
age1438_data_mode (on page 103) – selects block mode or continuous mode
age1438_data_mode_get (on page 103) – gets the data mode
age1438_data_port (on page 103) – selects VME bus, local bus or fiber interface for output transmission
age1438_data_port_get (on page 103) – gets the output port designation
age1438_data_resolution (on page 103) – selects 12 or 24 bits data resolution
age1438_data_resolution_get (on page 103) – gets the data resolution
age1438_data_scale_get (on page 102) – gets the data scale factor used to convert raw data to volts
age1438_data_type (on page 103) – selects real or complex output data
age1438_data_type_get (on page 103) – gets output data type
age1438_data_xfersize (on page 109) – allows a specified amount of data to be read before an entire block has been acquired.
age1438_data_xfersize_get (on page 109) – gets the data transfer size
age1438_lbus_mode (on page 160) – sets the transmission mode of the local bus
age1438_lbus_mode_get (on page 160) – gets the local bus transmission mode

Functions listed by functional group

age1438_lbus_reset ([on page 162](#)) – resets the local bus

age1438_lbus_reset_get ([on page 162](#)) – gets the local bus reset state

Debugging

age1438_cal_get ([on page 88](#)) – gets last calibration date of specified board

age1438_clock_recover ([on page 90](#)) – allows recovery from an out-of-spec external sample clock

age1438_driver_debug_level ([on page 110](#)) – sets the debug level

age1438_driver_debug_level_get ([on page 110](#)) – gets the debug level

age1438_error_message ([on page 115](#)) – returns error information obtained from function calls

age1438_error_query ([on page 116](#)) – queries the module for the most recent error

age1438_status_get ([on page 189](#)) – retrieves the module's status register information

age1438_meas_status_get ([on page 169](#)) – retrieves the current measurement status register information

age1438_self_test ([on page 183](#)) – performs a self-test on the module and returns the result

Digital processing

age1438_combo_setup ([on page 100](#)) – a quick way to set blocksize, center frequency, and signal bandwidth with one function

age1438_filter_setup ([on page 134](#)) – sets the digital filter bandwidth and decimation filter parameters

age1438_filter_bw ([on page 134](#)) – selects a signal filter bandwidth

age1438_filter_bw_get ([on page 134](#)) – gets the signal filter bandwidth

age1438_filter_decimate ([on page 134](#)) – enables/disables an extra factor of 2 decimation

age1438_filter_decimate_get ([on page 134](#)) – gets current state of extra decimation

age1438_filter_sync ([on page 137](#)) – synchronizes the decimation filter counter

age1438_frequency_setup ([on page 142](#)) – sets all zoom center frequency parameters

age1438_frequency_center ([on page 142](#)) – sets the center frequency

age1438_frequency_center_get ([on page 142](#)) – gets the current center frequency

age1438_frequency_center_raw ([on page 139](#)) – quickly sets the center frequency

age1438_frequency_center_raw_compute ([on page 141](#)) – quickly calculates the values for **age1438_frequency_center_raw**

age1438_frequency_center_raw_get ([on page 139](#)) – gets the raw center frequency

age1438_frequency_cmplxdc ([on page 142](#)) – selects a complex baseband measurement

age1438_frequency_cmplxdc_get ([on page 142](#)) – gets the state of the baseband measurement mode

age1438_frequency_sync ([on page 142](#)) – prepares the module for a synchronous frequency change

age1438_frequency_sync_get ([on page 142](#)) – gets the state of the synchronous change mode

Fiber Interface

age1438_fiber_BOF ([on page 125](#)) – controls whether or not automatically gener-

ated BOF events are transmitted

age1438_fiber_BOF_get (on page 125) – returns the current value of *bofEnable*

age1438_fiber_clear (on page 119) – clears all data from the fiber interface FIFO buffers

age1438_fiber_crc (on page 125) sets up the fiber interface to transmit and receive cyclic redundancy checks.

age1438_fiber_crc_get (on page 125) – returns the current status of the cyclic redundancy check setting.

age1438_fiber_error_clear (on page 120) – clears fiber errors from the status register

age1438_fiber_error_get (on page 121) – returns the value of the fiber interface error register.

age1438_fiber_flow_control (on page 125) – configures fiber flow control, enabling or disabling transmitter flow control signals.

age1438_fiber_flow_control_get (on page 125) – returns the current status of the fiber flow control function.

age1438_fiber_LED_get (on page 123) – returns a data register indicating the state of the front panel XMT/RCV led's.

age1438_fiber_mode (on page 125) – selects the fiber interface mode.

age1438_fiber_mode_get (on page 125) – gets the current mode of the fiber interface.

age1438_fiber_rcv_signals_get (on page 124) – displays the current value of PIO1, PIO2, DIR and NRDY bits from the fiber receiver.

age1438_fiber_setup (on page 125) – sets the parameters associated with the fiber interface.

age1438_fiber_signal_get (on page 129) – returns a value indicating whether or not an optical signal is detected by the optical fiber interface receiver.

age1438_fiber_transfer_rate (on page 125) – selects the transfer rate for fiber optic data.

age1438_fiber_transfer_rate_get (on page 125) – gets the current selection of transfer rate for fiber optic data.

age1438_fiber_verify (on page 130) – performs a verification of the fiber interface using either an internal or external signal path.

age1438_fiber_xmt_BOF (on page 131) – sends a BOF event used for synchronization with other fiber interfaces before data acquisition begins.

age1438_fiber_xmt_signals (on page 132) – sets the transmitted values of any PIO1, PIO2, DIR or, NRDY FPDP control signals on the fiber transmitter

age1438_fiber_xmt_signals_get (on page 132) – displays the current value of PIO1, PIO2, DIR and NRDY bits from the fiber transmitter.

age1438_epoch_generate (on page 111) – controls whether or not data epochs are generated.

age1438_epoch_generate_get (on page 111) – gets the current value of *epoch-Generate*

age1438_epoch_header (on page 111) – sets the value of the first 32 bits of the epoch header. It can be used by the optical receiver to direct where to route and/or how to process associated epoch data.

age1438_epoch_header_get (on page 111) – returns the header value and the value of the increment count for the epoch header.

age1438_epoch_header_enable (on page 111) – controls whether or not epoch headers are generated

age1438_epoch_header_enable_get (on page 111) – returns the current value of header enable.

Functions listed by functional group

- age1438_epoch_setup** (on page 111) – sets the parameters relevant to the transmission of data epochs on the fiber interface.
- age1438_epoch_size** (on page 111) – sets the size of data epochs in bytes.
- age1438_epoch_size_get** (on page 111) – returns the current size of data epochs on the fiber interface

Identification

- age1438_product_id_get** (on page 171) – returns the module's product identification string
- age1438_options_get** (on page 170) – returns the module's options
- age1438_serial_number** (on page 170) – sets the module's serial number for product repair purposes
- age1438_serial_number_get** (on page 170) – returns the module's serial number
- age1438_revision_query** (on page 182) – returns strings that identify the date of the module's firmware revision

Interrupts

- age1438_attrb_get** (on page 87) – gets low-level attributes of current I/O library session
- age1438_interrupt_setup** (on page 158) – sets all interrupt parameters
- age1438_interrupt_mask_get** (on page 158) – gets the interrupt event mask
- age1438_interrupt_priority_get** (on page 158) – gets the VME interrupt line
- age1438_interrupt_restore** (on page 157) – restores the interrupt masks to the most recent setting

Measurement control

- age1438_meas_control** (on page 164) – initiates and controls measurements in multi-module systems
- age1438_meas_init** (on page 167) – initiates a measurement without first checking for valid hardware setup
- age1438_meas_start** (on page 168) – checks for valid hardware setup and then initiates a measurement
- age1438_reset** (on page 180) – places the module in a known state
- age1438_reset_hard** (on page 181) – resets the module hardware

Timing

- age1438_clock_setup** (on page 91) – sets all timing parameters for commonly used measurement setups
- age1438_clock_setup_get** (on page 91) – gets the current clock setup
- age1438_clock_fs** (on page 89) – provides the frequency of an external sample clock
- age1438_clock_fs_get** (on page 89) – gets the current external sample clock frequency
- age1438_adc_clock** (on page 85) – specifies the ADC clock source
- age1438_adc_clock_get** (on page 85) – gets the ADC clock source
- age1438_adc_divider** (on page 86) – determines which divider is applied to the ADC clock source
- age1438_adc_divider_get** (on page 86) – gets the module's current clock divider state

age1438_ext_sample_sync (on page 117) – enables and disables external sample sync

age1438_ext_sample_sync_get (on page 117) – gets the state of external sample sync

age1438_front_panel_clock_input (on page 145) – specifies the source for the front panel clock

age1438_front_panel_clock_input_get (on page 145) – gets the front panel clock source

age1438_reference_clock (on page 178) – selects the source of the reference clock

age1438_reference_clock_get (on page 178) – gets the source of the reference clock

age1438_reference_prescaler (on page 179) – selects prescaling of the reference clock

age1438_reference_prescaler_get (on page 179) – gets prescaling of the reference clock

age1438_smb_clock_output (on page 186) – specifies which clock to output from the SMB clock connectors

age1438_smb_clock_output_get (on page 186) – gets which clock to output from the SMB clock connectors

age1438_sync_clock (on page 191) – selects the source of the sync signal

age1438_sync_clock_get (on page 191) – gets the source of the sync signal

age1438_sync_direction (on page 192) – selects front or rear panel availability of the sync signal

age1438_sync_direction_get (on page 192) – gets the state of front or rear panel clock availability

age1438_sync_output (on page 193) – selects the output for the sync signal

age1438_sync_output_get (on page 193) – gets the output for the sync signal

age1438_vcxo (on page 201) – selects whether the module should use an internal clock source

age1438_vcxo_get (on page 201) – gets whether the internal clock source is on or off

age1438_vcxo_freq (on page 202) – selects which internal clock the module uses

age1438_vcxo_freq_get (on page 202) – gets which internal clock the module uses

age1438_vcxo_freq_preset (on page 203) – selects which internal clock source should be used as a default

age1438_vxi_clock_output (on page 204) – selects which clock drives the VXI clock

age1438_vxi_clock_output_get (on page 204) – gets which clock drives the VXI clock

Trigger

age1438_trigger_setup (on page 196) – sets all parameters associated with triggering the beginning of data collection

age1438_trigger_adclevel (on page 196) – specifies the threshold for the ADC trigger

age1438_trigger_adclevel_get (on page 196) – gets the trigger threshold

age1438_trigger_delay (on page 196) – specifies a pre- or post-trigger delay time

age1438_trigger_delay_get (on page 196) – gets the trigger delay time

age1438_trigger_delay_actual_get (on page 194) – gets the actual delay time from the most recent trigger event

age1438_trigger_gen (on page 196) – determines whether a module can generate a trigger

age1438_trigger_gen_get (on page 196) – gets the trigger generation status

age1438_trigger_magdwell (on page 196) – specifies the dwell time (in samples) before a magnitude trigger.

Functions listed by functional group

age1438_trigger_magdwell_get ([on page 196](#)) – gets the magnitude trigger dwell time.

age1438_trigger_maglevel ([on page 196](#)) – specifies the threshold for a magnitude trigger

age1438_trigger_maglevel_get ([on page 196](#)) – gets magnitude trigger threshold

age1438_trigger_phase_actual_get ([on page 195](#)) – returns a representation of the phase value of the LO at the most recent trigger point

age1438_trigger_slope ([on page 196](#)) – selects a positive or negative trigger

age1438_trigger_slope_get ([on page 196](#)) – gets trigger slope

age1438_trigger_type ([on page 196](#)) – specifies the trigger type

age1438_trigger_type_get ([on page 196](#)) – gets trigger type

Reading data

age1438_data_scale_get ([on page 102](#)) – gets data scale factor

age1438_read ([on page 172](#)) – reads scaled 32-bit float data from FIFO

age1438_read64 ([on page 172](#)) – reads scaled 64-bit float data from FIFO, specifically for VEE applications

age1438_read_raw ([on page 175](#)) – reads raw data from FIFO

Synchronization (controlling multiple modules)

age1438_clock_setup ([on page 91](#)) – supplies commonly used clock and sync configurations

See “Timing” [on page 76](#) for low level clock and sync setup commands

age1438_clock_setup_get ([on page 91](#)) – gets the current clock and sync setup

age1438_clock_fs ([on page 89](#)) – provides a clock frequency for external sample clock configurations

age1438_clock_fs_get ([on page 89](#)) – gets the external clock frequency

age1438_filter_sync ([on page 137](#)) – synchronizes the decimation filter counter

age1438_frequency_sync and **age1438_frequency_center** ([on page 142](#)) – prepare the modules for frequency change

age1438_meas_control ([on page 164](#)) – synchronizes arming and triggering in multi-module systems

age1438_trigger_gen ([on page 196](#)) – determines whether a module can generate a trigger

age1438_trigger_gen_get ([on page 196](#)) – gets the trigger generation status

age1438_wait ([on page 205](#)) – facilitates the synchronization and control of multi-module systems

Functions listed alphabetically

age1438_adc_clock (on page 85) – determines the ADC clock source
age1438_adc_clock_get (on page 85) – gets the ADC clock source
age1438_adc_divider (on page 86) – determines which divider is applied to the ADC clock source
age1438_adc_divider_get (on page 86) – gets the module's current clock divider state
age1438_attr_get (on page 87) – gets low-level attributes of current I/O library session.
age1438_cal_get (on page 88) – gets last calibration date of specified board
age1438_clock_fs (on page 89) – provides the module with the frequency of an external sample clock
age1438_clock_fs_get (on page 89) – gets the current external sample clock frequency
age1438_clock_recover (on page 90) – allows recovery from an out-of-spec external sample clock
age1438_clock_setup (on page 91) – sets all timing parameters for commonly used measurement setups
age1438_clock_setup_get (on page 91) – gets the current clock setup
age1438_close (on page 99) – closes the module's software connection
age1438_combo_setup (on page 100) – a quick way to set blocksize, center frequency, and signal bandwidth with one function
age1438_data_blocksize (on page 103) – determines the size of the output data block
age1438_data_blocksize_get (on page 103) – gets the output data block size
age1438_data_delay (on page 103) – determines FIFO delay in continuous mode
age1438_data_delay_get (on page 103) – gets FIFO delay in continuous mode
age1438_data_memsizesize_get (on page 101) – returns module's memory size in megabytes
age1438_data_mode (on page 103) – selects block mode or continuous mode
age1438_data_mode_get (on page 103) – gets the data mode
age1438_data_port (on page 103) – selects VME bus, local bus or fiber interface for output port transmission
age1438_data_port_get (on page 103) – gets the output port designation
age1438_data_resolution (on page 103) – selects 12 or 24 bits data resolution
age1438_data_resolution_get (on page 103) – gets the data resolution
age1438_data_scale_get (on page 102) – gets data scale factor used to convert raw data to volts
age1438_data_setup (on page 103) – sets all format and data output flow parameters
age1438_data_type (on page 103) – selects real or complex output data
age1438_data_type_get (on page 103) – gets output data type
age1438_data_xfersize (on page 109) – allows a specified amount of data to be

Functions listed alphabetically

read before an entire block has been acquired

- age1438_data_xfersize_get** (on page 109) – gets the data transfer size
- age1438_driver_debug_level** (on page 110) – sets the debug level
- age1438_driver_debug_level_get** (on page 110) – gets the debug level
- age1438_epoch_generate** (on page 111) – controls whether or not data epochs are generated.
- age1438_epoch_generate_get** (on page 111) – gets the current value of *epoch-Generate*
- age1438_epoch_header** (on page 111) – sets the value of the first 32 bits of the epoch header. It can be used by the optical receiver to direct where to route and/or how to process associated epoch data.
- age1438_epoch_header_get** (on page 111) – returns the header value and the value of the increment count for the epoch header.
- age1438_epoch_header_enable** (on page 111) – controls whether or not epoch headers are generated
- age1438_epoch_header_enable_get** (on page 111) – returns the current value of header enable.
- age1438_epoch_setup** (on page 111) – sets the parameters relevant to the transmission of data epochs on the fiber interface.
- age1438_epoch_size** (on page 111) – sets the size of data epochs in bytes.
- age1438_epoch_size_get** (on page 111) – returns the current size of data epochs.
- age1438_error_message** (on page 115) – returns error information obtained from function calls.
- age1438_error_query** (on page 116) – queries the module for the most recent error.
- age1438_ext_sample_sync** (on page 117) – enables and disables sync to an external sample clock
- age1438_ext_sample_sync_get** (on page 117) – gets the state of external sample sync
- age1438_fiber_BOF** (on page 125) – controls whether or not automatically generated BOF events are transmitted
- age1438_fiber_BOF_get** (on page 125) – returns the current value of *bofEnable*
- age1438_fiber_clear** (on page 119) – clears all data from the fiber interface FIFO buffers
- age1438_fiber_crc** (on page 125) sets up the fiber interface to transmit and receive cyclic redundancy checks.
- age1438_fiber_crc_get** (on page 125) – returns the current status of the cyclic redundancy check setting.
- age1438_fiber_error_clear** (on page 120) – clears fiber errors from the status register
- age1438_fiber_error_get** (on page 121) – returns the value of the fiber interface error register.
- age1438_fiber_flow_control** (on page 125) – configures fiber flow control, enabling or disabling transmitter flow control signals.
- age1438_fiber_LED_get** (on page 123) – returns a data register indicating the state of the front panel XMT/RCV led's.
- age1438_fiber_mode** (on page 125) – selects the fiber interface mode.
- age1438_fiber_mode_get** (on page 125) – gets the current mode of the fiber interface.
- age1438_fiber_rcv_signal_get** (on page 124) – displays the current value of PIO1, PIO2, DIR and NRDY bits on the fiber receiver.
- age1438_fiber_signal_get** (on page 129) – returns a value indicating whether or

not an optical signal is detected by the optical fiber interface receiver.

age1438_fiber_setup (on page 125) – sets the parameters associated with the fiber interface.

age1438_fiber_transfer_rate (on page 125) – selects the transfer rate for fiber optic data.

age1438_fiber_transfer_rate_get (on page 125) – gets the current selection of transfer rate for fiber optic data.

age1438_fiber_verify (on page 130) – preforms a verification of the fiber interface using either an internal or external signal path.

age1438_fiber_xmt_BOF (on page 131) – sends a BOF event used for synchronization with other fiber interfaces before data acquisition begins.

age1438_fiber_xmt_signals (on page 132) – sets the transmitted values of any PIO1, PIO2, DIR or, NRDY FPDP control signals on the fiber transmitter.

age1438_fiber_xmt_signals_get (on page 132) – displays the current value of PIO1, PIO2, DIR and NRDY bits on the fiber transmitter.

age1438_filter_bw (on page 134) – selects a signal filter bandwidth

age1438_filter_bw_get (on page 134) – gets the signal filter bandwidth

age1438_filter_decimate (on page 134) – enables/disables and extra factor of 2 decimation

age1438_filter_decimate_get (on page 134) – gets current state of extra decimation

age1438_filter_setup (on page 134) – sets the digital filter bandwidth and decimation filter parameters

age1438_filter_sync (on page 137) – synchronizes the decimation filter counter

age1438_frequency_center (on page 142) – sets the center frequency

age1438_frequency_center_get (on page 142) – gets the current center frequency

age1438_frequency_center_raw (on page 139) – quickly sets the center frequency

age1438_frequency_center_raw_compute (on page 141) – quickly calculates the values for **age1438_frequency_center_raw**

age1438_frequency_center_raw_get (on page 139) – gets the raw center frequency

age1438_frequency_cmplxdc (on page 142) – selects a complex baseband measurement

age1438_frequency_cmplxdc_get (on page 142) – gets the state of the baseband measurement mode

age1438_frequency_setup (on page 142) – sets all the zoom center frequency parameters

age1438_frequency_sync (on page 142) – prepares the module for a synchronous frequency change

age1438_frequency_sync_get (on page 142) – gets the state of the synchronous change mode

age1438_front_panel_clock_input (on page 145) – specifies the source of the front panel clock

age1438_front_panel_clock_input_get (on page 145) – gets the front panel clock source

age1438_init (on page 146) – initializes the I/O driver for a module

age1438_input_alias_filter (on page 154) – include/bypass the built-in analog anti-alias filter

age1438_input_alias_filter_get (on page 154) – gets the anti-alias filter state

age1438_input_autozero (on page 148) – nulls out the input dc offset in base-

Functions listed alphabetically

band mode

age1438_input_coupling (on page 154) – selects ac or dc input coupling
age1438_input_coupling_get (on page 154) – get the input coupling type
age1438_input_offset (on page 149) – sets the dc offset settings for the current

range

age1438_input_offset_get (on page 149) – gets the dc offset settings
age1438_input_offset_save (on page 150) – saves the dc offset settings in

NVRAM

age1438_input_range (on page 154) – sets the full scale range
age1438_input_range_auto (on page 151) – performs auto-ranging in baseband
mode

age1438_input_range_convert (on page 152) – converts the input range to volts
age1438_input_range_get (on page 154) – gets the input range
age1438_input_setup (on page 154) – sets all the analog input parameters
age1438_input_signal (on page 154) – connect/disconnect the input signal to the
input amplifiers

age1438_input_signal_get (on page 154) – gets the input buffer amplifier state
age1438_interrupt_mask_get (on page 158) – gets the interrupt event mask
age1438_interrupt_priority_get (on page 158) – gets the VME interrupt line
age1438_interrupt_restore (on page 157) – restores the interrupt masks to the
most recent setting

age1438_interrupt_setup (on page 158) – sets both interrupt parameters

age1438_lbus_mode (on page 160) – sets the local bus transmission mode

age1438_lbus_mode_get (on page 160) – gets the local bus mode

age1438_lbus_reset (on page 162) – resets local bus

age1438_lbus_reset_get (on page 162) – gets the local bus mode reset state

age1438_meas_control (on page 164) – initiates and controls measurements in
multi-module systems

age1438_meas_init (on page 167) – initiates a measurement without first check-
ing for valid hardware setup

age1438_meas_start (on page 168) – checks for valid hardware setup and then
initiates a measurement

age1438_meas_status_get (on page 169) – returns the current measurement sta-
tus.

age1438_options_get (on page 170) – returns the module's options

age1438_product_id_get (on page 171) – returns the module's product identifica-
tion string

age1438_read (on page 172) – reads scaled 32-bit float data from FIFO

age1438_read_raw (on page 175) – reads raw data from FIFO

age1438_read64 (on page 172) – reads scaled 64-bit float data from FIFO, specifi-
cally for VEE applications

age1438_reference_clock (on page 178) – selects the source of the reference
clock

age1438_reference_clock_get (on page 178) – gets the source of the reference
clock

age1438_reference_prescaler (on page 179) – selects prescaling of the refer-
ence clock

age1438_reference_prescaler_get (on page 179) – gets prescaling of the refer-
ence clock

age1438_reset (on page 180) – places the module in a known state

age1438_reset_hard (on page 181) – resets the module hardware

age1438_revision_query (on page 182) – returns strings that identify the date of

the firmware revision.

age1438_self_test (on page 183) – performs a self-test on the module and returns the result

age1438_serial_number (on page 170) – sets the module's serial number for product repair purposes

age1438_serial_number_get (on page 170) – returns the module's serial number

age1438_smb_clock_output (on page 186) – specifies which clock to output from the SMB clock connectors

age1438_smb_clock_output_get (on page 186) – gets which clock to output from the SMB clock connectors

age1438_state_save (on page 188) – saves the current module state

age1438_state_recall (on page 187) – recalls a saved module state

age1438_status_get (on page 189) – retrieves module's status register information

age1438_sync_clock (on page 191) – selects the source of the sync signal

age1438_sync_clock_get (on page 191) – gets the source of the sync signal

age1438_sync_direction (on page 192) – selects front or rear panel availability of the sync signal

age1438_sync_direction_get (on page 192) – gets the state of front or rear panel clock availability

age1438_sync_output (on page 193) – selects the output for the sync signal

age1438_sync_output_get (on page 193) – gets the output for the sync signal

age1438_trigger_adclevel (on page 196) – specifies the threshold for the ADC trigger

age1438_trigger_adclevel_get (on page 196) – gets the trigger threshold

age1438_trigger_delay (on page 196) – specifies a pre- or post-trigger delay time

age1438_trigger_delay_actual_get (on page 194) – gets the actual delay time from the most recent trigger event

age1438_trigger_delay_get (on page 196) – gets the trigger delay time

age1438_trigger_gen (on page 196) – determines whether a module can generate a trigger

age1438_trigger_gen_get (on page 196) – gets the trigger generation status

age1438_trigger_magdwell (on page 196) – specifies the dwell time (in samples) before a magnitude trigger

age1438_trigger_magdwell_get (on page 196) – gets the magnitude trigger dwell time in samples

age1438_trigger_maglevel (on page 196) – specifies the threshold for a magnitude trigger

age1438_trigger_maglevel_get (on page 196) – gets magnitude trigger threshold

age1438_trigger_phase_actual_get (on page 195) – returns a representation of the phase value of the LO at the most recent trigger point

age1438_trigger_setup (on page 196) – sets all parameters associated with triggering the beginning of data collection

age1438_trigger_slope (on page 196) – selects a positive or negative trigger

age1438_trigger_slope_get (on page 196) – gets trigger slope

age1438_trigger_type (on page 196) – determines the trigger type

age1438_trigger_type_get (on page 196) – gets trigger type

age1438_vcxo (on page 201) – selects whether the module should use an internal clock source

age1438_vcxo_freq (on page 202) – selects which internal clock the module uses

age1438_vcxo_freq_get (on page 202) – gets which internal clock the module uses

Functions listed alphabetically

age1438_vcxo_get ([on page 201](#)) – gets whether the internal clock source is on or off

age1438_vcxo_freq_preset ([on page 203](#)) – selects which internal clock source should be used as a default

age1438_vxi_clock_output ([on page 204](#)) – selects which clock drives the VXI clock

age1438_vxi_clock_output_get ([on page 204](#)) – gets which clock drives the VXI clock

age1438_wait ([on page 205](#)) – facilitates the synchronization and control of multi-module systems

age1438_adc_clock

Specifies the ADC clock source. This description also includes the query function:

age1438_adc_clock_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_adc_clock(ViSession id, ViInt16 adcClock);
```

```
ViStatus age1438_adc_clock_get(ViSession id, ViPInt16 adcClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Parameters**id**

is the VXI instrument session pointer returned by the **age1438_init** function.

adcClock

[AGE1438_VC XO_INTERNAL](#) selects an internal oscillator within the module. **age1438_vcxo_freq** determines which oscillator is used. **age1438_vcxo** determines whether the internal oscillator is turned on. You must use all three of the functions to provide the desired internal clock source.

[AGE1438_VC XO_EXT_REF](#) takes an external reference signal on the front panel and uses a phase-locked loop to convert it to the ADC clock of the module. The ADC clock can be either 100 MHz or 102.4 MHz. The external reference used by the phase lock loop to synthesize the ADC clock can be either a 10 MHz or 10.24 MHz signal.

[AGE1438_EXT_SAMPLE_CLOCK](#) uses an external sample clock selected by **age1438_reference_clock**.

adcClockPtr

points to the value of the current *adcClock*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

“Commands which halt active measurements” on page 213, “Default values” on page 216, “age1438_init” on page 146, “age1438_clock_setup” on page 91, “age1438_vcxo_freq” on page 202, “age1438_vcxo_freq_preset” on page 203, “age1438_vcxo” on page 201, “age1438_front_panel_clock_input” on page 145, “age1438_reference_clock” on page 178, “Using clock and sync” in chapter 3

age1438_adc_divider

Determines which divider is applied to the ADC clock source. This description also includes the query function:

age1438_adc_divider_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_adc_divider(ViSession id, ViInt16 adcDivider);
```

```
ViStatus age1438_adc_divider_get(ViSession id, ViInt16 adcDividerPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function should generally be left in the default mode. The alternate mode applies to a different model of the module.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

adcDivider [AGE1438_DIVIDE_BY_10](#) divides the ADC clock by 10.
[AGE1438_DIVIDE_BY_38](#) divides the ADC clock by 38.

adcDividerPtr points to the current value of *adcDivider*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

Comments

The Agilent E1438 normally runs its sample clock at either 100 MHz or 102.4 MHz. The PLL divider divides the VCO by 10 to get either a 10 MHz or 10.24 MHz clock to compare to a 10 or 10.24 reference clock, which the user can supply through the front panel BNC. Alternatively the reference can come from a master module in the system via the back plane or front panel SMBs.

See Also

[“Default values”](#) on page 216, [“age1438_init”](#) on page 146, [“age1438_clock_setup”](#) on page 91, [“Using clock and sync”](#) in chapter 3

age1438_attr_get

Gets low-level attributes of current I/O library session.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_attr_get(ViSession id, ViInt16 attribute, ViPint32 value);
```

Description

age1438_attr_get is used primarily to manage the use of interrupts which requires making direct VISA function calls. Since interrupts are a shared resource across all modules using the VXI interface, it is not possible for the Agilent E1438 library, which governs single modules, to provide the functions to properly manage interrupts.

This function is used to access either the I/O library handle or the mapped I/O base address of the module. You should refer to the appropriate VISA documentation for descriptions of the I/O library functions.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
attribute	designates the type of attribute to return. AGE1438_IO_HANDLE accesses the I/O library handle. AGE1438_IO_ADDRESS points to the mapped I/O base address of the module. AGE1438_RM_HANDLE accesses the I/O library handle of the default resource manager. AGE1438_DATA_REGISTER points to the mapped address of the Agilent E1438 data register. One or both of these parameters are used when calling I/O library functions directly.
value	is the value of the requested attribute. For the VISA I/O library the value of the handle attribute corresponds to the vi parameter used by the majority of the I/O functions. The address attribute points to the base of the mapped I/O address space.

Example

See the interrupt.c example program.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

["age1438_init"](#) on page 146, ["age1438_interrupt_setup"](#) on page 158

age1438_cal_get

Gets last calibration date of specified board.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_cal_get(ViSession id, ViInt16 board, ViPInt32 timestampPtr);
```

Description

age1438_cal_get is used to read the date stamp of the last calibration.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
board	AGE1438_01_BOARD returns calibration information for the 01 (digital/ADC) board. AGE1438_02_BOARD returns calibration information for the 02 (input) board.
timestampPtr	points to the return location for the timestamp of the most recent saved calibrations. Format is YYYYMMDD in base 10 notation.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_clock_fs

Provides the module with the frequency of an external sample clock. This description also includes the query:

age1438_clock_fs_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_clock_fs(ViSession id, ViReal64 fs);
```

```
ViStatus age1438_clock_fs_get(ViSession id, ViPReal64 fsPtr);
```

Description

This command is applicable only when an external sample clock is used. It is an order-dependent command and must be set after selecting the external sample clock.

When using an external sample clock or when a module is a non-master in a multi-module group, the frequency of the ADC clock is unknown by the module. It is the responsibility of the programmer to provide the correct frequency so that library functions dependent on *fs* operate properly. This value has no effect if the module is not set up to use the external sample clock.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
fs	provides the module with the frequency of an external sample clock (from 10,000,000 to 103,000,000) connected to the Ext Clk TTL connector. AGE1438_FS_MIN supplies the minimum external sample clock frequency. AGE1438_FS_MAX supplies the maximum external sample clock frequency.
fsPtr	points to the current value of the external sample clock frequency. If the Agilent E1438 is set to the internal ADC clock, this query returns the value of that clock frequency. If the Agilent E1438 is set to the external clock, this query returns the last value entered via the age1438_clock_fs function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_clock_setup” on page 91](#), [“age1438_front_panel_clock_input” on page 145](#), [“age1438_ext_sample_sync” on page 117](#), [“Using clock and sync” in chapter 3](#)

age1438_clock_recover

Allows recovery from an out-of-spec external sample clock.

***VXIplug&play* Syntax**

```
#include "age1438".h
```

```
ViStatus age1438_clock_recover(ViSession id);
```

Description

This command is used to restore proper function if the module has received an out-of-spec external sample clock. An out-of-spec situation could occur if the external sample clock is removed or changed during operation, or if it has glitches which don't meet specs. In this case the module would cease functioning and this command must be issued in order to resume proper operation after restoring a valid clock.

Parameters

id

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#), [“age1438_ext_sample_sync” on page 117](#), [“age1438_clock_setup” on page 91](#)

age1438_clock_setup

Sets all timing parameters for commonly used measurement setups. This description also includes a query:

age1438_clock_setup_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_clock_setup(ViSession id, ViInt16 clockSetup);
```

```
ViStatus age1438_clock_setup_get(ViSession id, ViPInt16 clockSetupPtr);
```

Description

age1438_clock_setup is used to select the source and distribution of clocking and synchronization signals used by the Agilent E1438 module. The primary clock signal used by the module is the ADC clock, for which the rising edges indicate the time for each sample of the analog-to-digital converter.

This function changes the settings controlled by the following lower-level functions:

```
age1438_adc_clock  
age1438_adc_divider  
age1438_front_panel_clock_input  
age1438_reference_clock  
age1438_reference_prescaler  
age1438_smb_clock_output  
age1438_sync_clock  
age1438_sync_direction  
age1438_sync_output  
age1438_vcxo
```

Note

This function does not alter settings made with [age1438_vcxo_freq](#), but it does control whether the selected VCXO is actually running.

Note

Setups using the external sample clock require that you use [age1438_clock_fs](#) to supply the clock frequency.

Parameters

id

is the VXI instrument session pointer returned by the **age1438_init** function.

clockSetup

This parameter provides a quick way to set up most of the timing parameters for several standard clock configurations. The following setups are available:

age1438_clock_setup**Simple clock setups for stand-alone modules****Internal reference****AGE1438_SIMPLE_INT_REF**

ADC_CLK	VCXO_INTERNAL
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	N/A
FRONT_PANEL_CLOCK	CLOCK_OFF
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_OFF
SYNC_DIRECTION	N/A

Phase locked to external reference**AGE1438_SIMPLE_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_OFF
SYNC_DIRECTION	N/A

External sample clock**AGE1438_SIMPLE_EXT_SAMP**

ADC_CLK	EXT_SAMPLE_CLOCK
VCXO	VCXO_OFF
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_OFF
SYNC_DIRECTION	N/A

Front panel master-slave setups, one master per mainframe**Front master, internal reference****AGE1438_FRNT_MSTR_INT_REF**

ADC_CLK	VCXO_INTERNAL
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	N/A
FRONT_PANEL_CLOCK	CLOCK_OFF
SMB_CLOCK_OUTPUT	DIVIDED_ADC_CLOCK
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_SMB
SYNC_DIRECTION	FRNT_TO_REAR

age1438_clock_setup**Front master, phase locked to external reference****AGE1438_FRNT_REAR_MSTR_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	DIVIDED_ADC_CLOCK
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_SMB
SYNC_DIRECTION	FRNT_TO_REAR

Front slave, phase locked to master**AGE1438_FRNT_REAR_SLAV_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	SMB_CLK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	SMB_CLOCK
SYNC_OUTPUT	SYNC_OUT_SMB
SYNC_DIRECTION	FRNT_TO_REAR

Rear panel master-slave setups, one master per mainframe**Rear master, internal reference****AGE1438_REAR_MSTR_INT_REF**

ADC_CLK	VCXO_INTERNAL
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	DIVIDED_ADC_CLOCK
REFERENCE_CLOCK	N/A
FRONT_PANEL_CLOCK	CLOCK_OFF
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_VXI
SYNC_DIRECTION	REAR_TO_FRNT

Rear master, phase locked to external reference**AGE1438_REAR_MSTR_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	DIVIDED_ADC_CLOCK
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_VXI
SYNC_DIRECTION	REAR_TO_FRNT

age1438_clock_setup**Rear slave, phase locked to master****AGE1438_REAR_SLAV_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	VXI_CLOCK
FRONT_PANEL_CLOCK	CLOCK_OFF
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	VXI_CLOCK
SYNC_OUTPUT	SYNC_OUT_VXI
SYNC_DIRECTION	REAR_TO_FRNT

Multi-module external sample setups, set all modules the same**Front sync, external sample clock, wired-OR sync****AGE1438_FRNT_SYNC_EXT_SAMP**

ADC_CLK	EXT_SAMPLE_CLOCK
VCXO	VCXO_OFF
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_SMB
SYNC_DIRECTION	FRNT_TO_REAR

Rear sync, external sample clock, wired-OR sync**AGE1438_REAR_SYNC_EXT_SAMP**

ADC_CLK	EXT_SAMPLE_CLOCK
VCXO	VCXO_OFF
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	CLOCK_OFF
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	BNC_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	DIVIDED_ADC_CLOCK
SYNC_OUTPUT	SYNC_OUT_VXI
SYNC_DIRECTION	REAR_TO_FRNT

Multiple mainframe setups**Send sync to slave****AGE1438_FRNT_MSTR_INT_REF**

ADC_CLK	VCXO_INTERNAL
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	DIVIDED_ADC_CLOCK
REFERENCE_CLOCK	N/A
FRONT_PANEL_CLOCK	CLOCK_OFF
SMB_CLOCK_OUTPUT	DIVIDED_ADC_CLOCK
SYNC_CLOCK	VXI_CLOCK
SYNC_OUTPUT	SYNC_OUT_BOTH
SYNC_DIRECTION	REAR_TO_FRONT

age1438_clock_setup**Receive sync from master****AGE1438_FRNT_REAR_SLAV_EXT_REF**

ADC_CLK	VCXO_EXT_REF
VCXO	VCXO_ON
ADC_DIVIDER	DIVIDE_BY_10
REFERENCE_PRESCALER	PRESCALE_BY_1
VXI_CLK_OUTPUT	FRONT_PANEL_CLOCK
REFERENCE_CLOCK	FRONT_PANEL_CLOCK
FRONT_PANEL_CLOCK	SMB_CLOCK
SMB_CLOCK_OUTPUT	CLOCK_OFF
SYNC_CLOCK	SMB_CLOCK
SYNC_OUTPUT	SYNC_OUT_BOTH
SYNC_DIRECTION	FRONT_TO_REAR

clockSetupPtr points to the current value of *clockSetup*.

is returned from [AGE1438_CUSTOM_CLOCK_SETUP](#) from **age1438_clock_setup_get** when low-level clock configuration functions are used to set up clocks to a non-standard configuration.

Example

The program `multichan.exe` example program provides an example of how to correctly set up a multi-module system with synchronous clocks.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

Effect on Active Measurement

age1438_clock_setup aborts any measurement in progress.

See Also

“Commands which halt active measurements” on page 213, “Default values” on page 216, “age1438_init” on page 146, “age1438_clock_fs” on page 89, “age1438_vcxo_freq” on page 202, “age1438_vcxo_freq_preset” on page 203, “age1438_clock_recover” on page 90, “age1438_ext_sample_sync” on page 117, “Using clock and sync” in chapter 3, “Managing multiple modules” in chapter 3

age1438_close

Closes the module's software connection.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_close(ViSession id);
```

Description

age1438_close terminates the software connection to the module, deallocates system resources, and places the module in the Idle state. After this function has been executed the specified id identifier is no longer a valid parameter for function calls.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#)

age1438_combo_setup

Combines often used setup commands from various functions.

age1438_combo_setup sets signal bandwidth, blocksize and center frequency.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_combo_setup(ViSession id, ViInt16 sigBw, ViInt32 blocksize,  
ViInt32 phase, ViInt32 interpolate);
```

Description

age1438_combo_setup provides a faster way to set up parameters from several functions which are often used together.

Note

This command is not supported in HP-VEE.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
blocksize	See “ age1438_data_setup ” on page 103 for a description of the <i>blocksize</i> parameter.
interpolate	See “ age1438_frequency_center_raw ” on page 139 for a description of the <i>interpolate</i> parameter.
phase	See “ age1438_frequency_center_raw ” on page 139 for a description of the <i>phase</i> parameter.
sigBw	See “ age1438_filter_setup ” on page 134 for a description of the <i>sigBw</i> parameter.

Comments

This command halts the current measurement which also releases the forced Idle state. If you use this command in multi-module systems to synchronously change the center frequency while the modules are forced to Idle, then you should subsequently call [age1438_meas_control](#) to re-assert the forced Idle condition.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to “[age1438_error_message](#)” on page 115.

See Also

“[Commands which halt active measurements](#)” on page 213, “[age1438_init](#)” on page 146, “[age1438_filter_setup](#)” on page 134, “[age1438_frequency_center_raw](#)” on page 139, “[age1438_data_setup](#)” on page 103, “[age1438_meas_control](#)” on page 164

age1438_data_memsize_get

Returns the module's memory size in megabytes.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_data_memsize_get(ViSession id, ViPInt16 memSizePtr);
```

Description

This command allows you to determine whether your module contains standard memory of 18 Mbytes or a larger memory option.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
memSizePtr	points to the memory size in number of Megabytes.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_data_setup” on page 103](#).

age1438_data_scale_get

Gets the data scale factor.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_data_scale_get(ViSession id, ViPReal64 scalePtr);
```

Description

age1438_data_scale_get calculates the correct scale factor for raw data using the current data resolution and input range. The factor returned by this function is used to multiply raw data to get data in volts.

When the module is providing only the real part of complex data, the data is doubled to provide consistent spectrum measurements. This occurs with either shift decimation or when the real part of a zoomed signal with a non-zero center frequency is taken.

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- scalePtr** points to the calculated scale factor with which to scale raw data to volts.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_data_setup” on page 103](#), [“age1438_read_raw” on page 175](#), [“age1438_input_range_auto” on page 151](#), [“age1438_filter_setup” on page 134](#)

age1438_data_setup

Sets all format and data output flow parameters. This description also includes information on the following functions which set or query the format and flow parameters individually:

age1438_data_blocksize determines the size of the output data block.
age1438_data_blocksize_get gets the output data block size.
age1438_data_delay determines the FIFO delay in continuous mode.
age1438_data_delay_get gets the FIFO delay in continuous mode.
age1438_data_mode selects block mode or continuous mode.
age1438_data_mode_get gets the data mode.
age1438_data_port selects VME bus or local bus output port.
age1438_data_port_get gets the output port designation.
age1438_data_resolution selects 12 or 24 bits data resolution.
age1438_data_resolution_get gets the data resolution.
age1438_data_type selects real or complex output data.
age1438_data_type_get gets output data type.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_data_setup(ViSession id, ViInt16 dataType, ViInt16 resolution,
    ViInt16 mode, ViInt32 blocksize, ViInt32 dataDelay, reserved, ViInt16 port);
ViStatus age1438_data_blocksize(ViSession id, ViInt32 blocksize);
ViStatus age1438_data_blocksize_get(ViSession id, ViPInt32 blocksizePtr);
ViStatus age1438_data_delay(ViSession id, ViInt32 dataDelay);
ViStatus age1438_data_delay_get(ViSession id, ViPInt32 dataDelayPtr);
ViStatus age1438_data_mode(ViSession id, ViInt16 mode);
ViStatus age1438_data_mode_get(ViSession id, ViPInt16 modePtr);
ViStatus age1438_data_port(ViSession id, ViInt16 port);
ViStatus age1438_data_port_get(ViSession id, ViPInt16 portPtr);
ViStatus age1438_data_resolution(ViSession id, ViInt16 resolution);
ViStatus age1438_data_resolution_get(ViSession id, ViPInt16 resolutionPtr);
ViStatus age1438_data_type(ViSession id, ViInt16 dataType);
ViStatus age1438_data_type_get(ViSession id, ViPInt16 dataTypePtr);
```

Description

Note

The functions, **age1438_data_delay**, **age1438_data_mode**, **age1438_data_resolution**, and **age1438_data_type** work the same for the fiber interface as they do for the other interfaces.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

blocksize determines the number of sample points in each output data block.
[AGE1438_BLOCKSIZE_MIN](#) selects the minimum blocksize.
[AGE1438_BLOCKSIZE_MAX](#) selects the maximum blocksize.

age1438_data_setup

[AGE1438_BLOCKSIZE_DEF](#) sets the default blocksize.

The range of available block sizes depends on the number of bytes required for each sample. The command accepts any number between 2 and memory size (in bytes) $\times 2/3$. If the requested block size falls outside the range shown in the table the previous valid value is used and a status register flag (bit 6) is set indicating a setup error. The blocksize is updated after the setup is changed to be valid.

For real data *blocksize* is the number of real data values per data block. For complex data *blocksize* is the number of complex data pairs per data block.

The following table summarizes the available block sizes for each setting of the *dataType*, and *resolution* parameters.

data type	resolution	min. block size	max block size in Msamples (2 M*72 memory) ¹
real	12	6	12
real	24	3	6
complex	12	3	6
complex	24	2	3

1. Parity memory is used in non-parity mode, so 2M $\times$ 72 bit memory yields 18 Mbytes of FIFO storage.

Note

Block size must be an even number. Considerably more samples may need to be taken in order to set the block available status bit.

blocksizePtr

points to the current value of the *blocksize* parameter. The returned value is the closest valid value to the requested block size.

dataDelay

is used to specify the minimum FIFO delay in number of samples. This parameter applies only in continuous mode.

[AGE1438_DATA_DELAY_MAX](#) sets the maximum allowable delay.

[AGE1438_DATA_DELAY_MIN](#) sets the minimum allowable delay.

dataDelayPtr

points to the current value of the *delay* parameter.

dataType

determines whether the Agilent E1438 collects and returns real or complex data.

Setting this parameter to [AGE1438_REAL](#) causes only the real part of the data to be returned for each sample

[AGE1438_COMPLEX](#) causes the real data followed by the imaginary data to be returned in each sample.

Normally, if the center frequency set with the **age1438_frequency_setup** function is zero, the type should be set to **AGE1438_REAL** since the imaginary component of each sample is zero anyway. When non-zero center frequencies are used the type should normally be set to **AGE1438_COMPLEX**, otherwise the imaginary component of the signal is lost.

when *dataType* is set to **AGE1438_REAL** and there is a non-zero center frequency the data scale value is doubled for consistent spectrum measurements

dataTypePtr

points to the current value of the *dataType* parameter.

mode

selects whether the Agilent E1438's data collection operates in block mode or continuous mode.

AGE1438_BLOCK selects block transfer mode in which the measurement is halted after each block of data. To start collection of the next data block the module must be armed and triggered again. This mode is used whenever each block of data is to be associated with an individual trigger event.

AGE1438_CONTINUOUS means that a single arm and trigger event starts a measurement which runs continuously with no gaps between output data blocks. The measurement continues as long as the data is read out fast enough to prevent overflow in the output FIFO. The continuous mode is useful for continuous signal processing applications where data gaps are unacceptable.

modePtr

points to the current value of the *mode* parameter.

port

determines which output port is used to take data from the Agilent E1438 module.

Setting *port* to **AGE1438_VME** means the data is to be output using standard VME register reads. This is the instrument default.

Setting *port* to **AGE1438_LBUS** means the data is to be output as a byte-serial data stream via the VXI local bus. When using the local bus port the module immediately to the right of the Agilent E1438 must be capable of receiving the local bus byte sequence.

Setting *port* to **AGE1438_FIBER** means the filtered ADC data is to be transmitted as a serial data stream over the fiber interface.

portPtr

points to the current value of the *port* parameter.

resolution

selects data resolution of either 12 or 24 bits by using resolution values of **AGE1438_12BIT** or **AGE1438_24BIT** respectively. Choosing 12-bit precision allows for more samples in the FIFO memory. Choosing 24 bits allows more dynamic range. Because of the broadband white noise present on the input of the analog-to-digital converter, it is normally sufficient to use 12 bit resolution whenever the **age1438_filter_setup** function specifies a signal bandwidth greater than 10 MHz. For narrower bandwidths much of the broadband white noise is filtered out, resulting in lower noise in the output data. To take advantage of this lower noise, you should use the 24-bit data resolution.

resolutionPtr

points to the current value of the *resolution* parameter.

Comments

The following table summarizes the output word or byte sequence for each combination of *dataType*, *resolution*, and *port* parameters:

age1438_data_setup

data type	data resolution	port	transfer width	xfers¹	sequence²
real	12 bit	VME	16 bit	1	R ₀ [11:0] Z4 R ₁ [11:0] Z4 ...
complex	12 bit	VME	16 bit	2	R ₀ [11:0] Z4 Q ₀ [11:0] Z4 R ₁ [11:0] Z4 Q ₁ [11:0] Z4 ...
real	24 bit	VME	16 bit	2	R ₀ [23:8] R ₀ [7:0] Z8 R ₁ [23:8] R ₁ [7:0] Z8 ...
complex	24 bit	VME	16 bit	4	R ₀ [23:8] R ₀ [7:0] Z8 Q ₀ [23:8] Q ₀ [7:0] Z8 R ₁ [23:8] R ₁ [7:0] Z8 ...
real	12 bit	LBUS	8 bit	2	R ₀ [11:4] R ₀ [3:0] Z4 R ₁ [11:4] R ₁ [3:0] Z4 ...
complex	12 bit	LBUS	8 bit	4	R ₀ [11:4] R ₀ [3:0] Z4 Q ₀ [11:4] Q ₀ [3:0] Z4 R ₁ [11:4] R ₁ [3:0] Z4 ...
real	24 bit	LBUS	8 bit	4	R ₀ [23:16] R ₀ [15:8] R ₀ [7:0] Z8 R ₁ [23:16] R ₁ [15:8] ...
complex	24 bit	LBUS	8 bit	8	R ₀ [23:16] R ₀ [15:8], R ₀ [7:0] Z8, Q ₀ [23:16] Q ₀ [15:8] Q ₀ [7:0] Z8 R ₁ [23:16] R ₁ [15:8] ...

data type	data resolution	port	transfer width	xfers ¹	sequence ²
real	12 bit	Fiber	32 bit	1/2	R ₀ [11:0] Z4 R ₁ [11:0] Z4 R ₂ [11:0] Z4 R ₃ [11:0] Z4,...
complex	12 bit	Fiber	32 bit	1	R ₀ [11:0] Z4 Q ₀ [11:0] Z4 R ₁ [11:0] Z4 Q ₁ [11:0] Z4 ...
real	24 bit	Fiber	32 bit	1	R ₀ [23:0] Z8 R ₁ [23:0] Z8 ...
complex	24 bit	Fiber	32 bit	2	R ₀ [23:0] Z8 Q ₀ [23:0] Z8 ... R ₁ [23:0] Z8 ...

1. That is, transfers required per measurement. A fraction indicates multiple samples per transfer.

2. Sequence Notation:

R = real number transfer; Q = imaginary number transfer; Z4 = 4 zero pad bits; Z8 = 8 zero pad bits (in the LSBs). Subscript denotes the sample number. Bracketed indices show which sample bits are contained in the transfer, MSB first. A vertical bar denotes bit-wise concatenation. Example: For a 12-bit sample sent to the LBUS, R₀[11:4] indicates the 8 MSBs of the sample are transferred in the first byte. Then R₀[3:0] | Z4 indicates the 4 LSBs of the sample are padded with 4 zero bits and transferred in the second byte.

The maximum rate at which data may be transferred to memory is determined by the ADC clock rate: MaxBytes/s = 1.5 × (ADC clock rate). Divide MaxBytes/s by 1.5 to get the 12-bit sample rate, and by 3 to get the 24-bit sample rate.

A limitation also applies to 32-bit, complex data transfers. Because this type of transfer cannot be made at the full sample rate, a level of decimation must be added in order to reduce the sample rate.

The following table summarizes the relationship between data parameter combinations, decimation, filter bandwidth, precision, and whether the combination permits block or continuous measurements:

Note

Continuous mode is only limited by maximum transfer rate of the selected interface.

decimate	filterBW	sample rate (Msamples/s)	BW $f_s=100$ MHz	12b real	24b real	12b complex	24b complex
n/a	0	100	40	b			
1	1	50	20	b,d		b	
0	2	50	10	b,d		b	
1	2	25	10	b,c,d	b,d	b,d	b
0	3	25	5	b,c,d	b,d	b,d	b
1	3	12.5	5	b,c,d	b,c,d	b,c,d	b,d

age1438_data_setup

decimate	filterBW	sample rate (Msamples/s)	BW $f_s=100$ MHz	12b real	24b real	12b complex	24b complex
0	4	12.5	2.5	b,c,d	b,c,d	b,c,d	b,d
1	4	6.25	2.5	b,c,d	b,c,d	b,c,d	b,c,d
0	5	6.25	1.25	b,c,d	b,c,d	b,c,d	b,c,d

b = block mode, continous mode to fiber at the fiber transfer rate of 250 Mbytes per second.

c = continuous mode to local bus

d = continuous mode to fiber at the fiber transfer rate of 106 Mbytes per second.

reserved

is a short integer which is reserved for future use and should be set to 0.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_frequency_setup” on page 142](#), [“age1438_filter_setup” on page 134](#), [“age1438_meas_control” on page 164](#), [“age1438_clock_setup” on page 91](#)

age1438_data_xfersize

Allows data to be read before an entire block had been acquired.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_data_xfersize(ViSession id, ViInt32 xfersize);
```

```
ViStatus age1438_data_xfersize_get(ViSession id, ViPInt32 xfersizePtr);
```

Description

This command allows you to specify the allowable data transfer size in a situation where you want to read a large block of data in increments before an entire block has been acquired.

Note

This function has no effect on the fiber output channel.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

xfersize specifies the data transfer size in bytes.

[AGE1438_XFERSIZE_MIN](#) selects the minimum allowable transfer size.

[AGE1438_XFERSIZE_MAX](#) selects the maximum allowable transfer size. *xfersize* must be a sub-multiple of *blocksize* or an error is generated.

[AGE1438_XFERSIZE_DEF](#) sets the default transfer size.

Note

xfersize is reset by any subsequent change in the *blocksize* parameter and therefore must be specified after *blocksize*. See “[age1438_data_setup](#)” on page 103.

xfersizePtr points to the data transfer size in number of bytes.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to “[age1438_error_message](#)” on page 115.

See Also

“[Commands which halt active measurements](#)” on page 213, “[age1438_init](#)” on page 146, “[age1438_data_setup](#)” on page 103

age1438_driver_debug_level

Sets and gets the debug level.

VXIplug&play Syntax
#include "age1438".h

```
ViStatus age1438_driver_debug_level(ViSession id, ViInt16 debugLevel);  
ViStatus age1438_driver_debug_level_get(ViSession id, ViInt16  
    debugLevelPtr);
```

Description

This command allows you to set and get debug levels. Debug messages are sent to the application debugger using the Windows kernel function Output Debug String.

Note

This function only works under Windows.

This function only works with a debug build of the library.

Debug messages are received by the Microsoft Visual C++ debugger or can be received by the dbmon example program that comes with Microsoft Visual C++.

You can compile a DEBUG build by opening age1438_32.dsw, the Visual C++ project for the driver DLL, age1438_32.dll, and selecting the "age1438_32.dl-Win32 Debug" build configuration.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

debugLevel is the debug level.

debugLevelPtr points to the value of *debugLevel*.

Debug levels are defined as follows:

Debug Level	Description
AGE1438_DEBUG_LEVEL_0	Only output errors and algorithmic results
AGE1438_DEBUG_LEVEL_1	Add output of setup function calls
AGE1438_DEBUG_LEVEL_2	Add output of measurement function calls
AGE1438_DEBUG_LEVEL_3	Add output of status query function calls
AGE1438_DEBUG_LEVEL_4	Reserved
AGE1438_DEBUG_LEVEL_5	Add output of diagnostic function calls

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_epoch_setup

Sets the parameters relevant to the transmission of data epochs over the fiber interface. This description also includes information on the following functions that set up or query the fiber epoch parameters individually:

age1438_epoch_generate controls whether data epochs are generated or not.
age1438_epoch_generate_get gets the epoch generation status.
age1438_epoch_header sets the value of the first 32 bits of the epoch header.
age1438_epoch_header_get returns the header value.
age1438_epoch_header_enable controls whether epoch headers are generated or not.
age1438_epoch_header_enable_get gets the header status.
age1438_epoch_size sets the size of the data epoch in bytes.
age1438_epoch_size_get gets the size of the data epoch

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_epoch_setup(ViSession id, ViInt16 epochGenerate, ViInt32
epochSize, ViInt16 headerEnable, ViInt32 initialValue, ViInt32 incrementCount);
ViStatus age1438_epoch_generate(ViSession id, ViInt16 epochGenerate);
ViStatus age1438_epoch_generate_get(ViSession id, ViInt16
epochGeneratePtr);
ViStatus age1438_epoch_header(ViSession id, ViInt32 headerValue,
ViInt32 incrementCount);
ViStatus age1438_epoch_header_get(ViSession id, ViInt32 headerValuePtr,
ViInt32 incrementCountPtr);
ViStatus age1438_epoch_header_enable(ViSession id, ViInt16 headerEnable);
ViStatus age1438_epoch_header_enable_get(ViSession id, ViInt16
headerEnablePtr);
ViStatus age1438_epoch_size(ViSession id, ViInt32 epochSize);
ViStatus age1438_epoch_size_get(ViSession id, ViInt32 epochSizePtr);
```

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- epochGenerate** controls whether or not data epochs are generated.
[AGE1438_EPOCH_GEN_ON](#) enables data epoch generation.
[AGE1438_EPOCH_GEN_OFF](#) disables sending end of epoch and epoch headers and disables generating data epochs.
 When *epochGenerate* is off, EOE (End of Epoch) events and epoch headers are not sent however, data still is. Generally, *epochGenerate* should be on and should only be disabled for purposes of compatibility. This setting is ignored when the fiberMode is **AGE1438_FIBER_COPY**.
- epochGeneratePtr** points to the current value of *epochGenerate*
- epochSize** sets the size of data epochs in bytes.
[AGE1438_EPOCH_SIZE_MIN](#) selects the minimum data epoch size.

age1438_epoch_setup

[AGE1438_EPOCH_SIZE_DEF](#) sets the data epoch size to the default.

[AGE1438_EPOCH_SIZE_MAX](#) selects the maximum data epoch size.

The units of *epochSize* are always in bytes and this value must be divisible by 4, with a minimum value of 8 to a maximum value of 4,294,967,292 bytes.

Note

For maximum compatibility with other fiber optic components, values divisible by 8 are recommended.

When the module is being used in a fiber append chain, *epochSize* must be set equal to *blocksize* (in bytes). Since the function **AGE1438_DATA_BLOCKSIZE** sets the blocksize in samples, the following table can be used to compute blocksize in bytes.

data type	resolution	bytes per sample
real	12	2
complex	12	4
real	24	4
complex	24	8

Note

You may set *blocksize* and *epochSize* independently for the other *fiberMode* settings.

epochSizePtr

points to the current value of *epochSize*

headerEnable

controls whether or not epoch headers are generated.

[AGE1438_HEADER_ON](#) enables epoch header generation

[AGE1438_HEADER_OFF](#) disables epoch header is generation.

The default setting is off. Epoch headers are enabled only when epoch generation is enabled. Otherwise, epoch header settings are silently accepted. The epoch header setting must match the configuration of the optical receiver.

headerEnablePtr

points to the current value of *headerEnable*

headerValue

sets the value of the first 32 bits of the epoch header.

[AGE1438_HEADER_VALUE_MIN](#) selects the minimum value for the epoch header.

[AGE1438_HEADER_VALUE_MAX](#) selects the maximum value for the epoch header.

[AGE1438_HEADER_INDEX_MASK](#) is used for setting the value of the *headerIndex* field.

[AGE1438_HEADER_INCR_MIN](#) selects the minimum value for the *incrementCount*.

[AGE1438_HEADER_INCR_MAX](#) selects the maximum value for the *incrementCount*.

Epoch headers are 64 bits long. Of these, the last 32 bits are not used and set to zero. The first 32 bits are available and can be set by the user. The 10 least significant bits of the 32 non-zero bits contain a value that can be used by the optical receiver to direct where to route and/or how to process the associated epoch data. These 10 bits are called the *headerIndex* and can be set from a value of 0 to 1023. In addition the *headerIndex* can be sequentially incremented by 1 each time it is transmitted. The number of increments that are applied before returning to the original value is programmable by the user.

The *headerValue* sets the value of all 32 non-zero bits of epoch header, including the 10 least significant bits that comprise the *headerIndex* bit field. The default *headerValue* is 0 and the maximum value is $(2^{32} - 1)$.

headerValuePtr points to the current value of *initalValue*

incrementCount specifies the number of automatic increments to the *headerIndex* bit field. The default *incrementCount* is 0 and the maximum value is $(2^{10} - 1)$.

Example

The following is a example of how the increment process works.

For *headerValue* = 0x12345678 and *incrementCount* = 0x2, the sequence of values for *headerValue* and *headerIndex* are:

Increment	headerValue	headerIndex
0	0x12345678	0x278
1	0x12345679	0x279
2	0x1234567A	0x27A
0	0x12345678	0x278
1	0x12345679	0x279
2	0x1234567A	0x27A

If an incremented header reaches a value where the *headerIndex* is 0x3FF, the next *headerIndex* will be 0x000, and no carry will be generated to the upper 22 bits of the header.

Note

If the *incrementCount* is set to 0, incrementing the *headerIndex* field is disabled.

incrementCountPtr points to the current value of *incrementCount*

The following table is a summary of valid fiber, epoch setups. Please note that the designation of N/A means that this information is not applicable to this condition. In this case the setting is accepted but ignored. The designation of OK means the setting is accepted and implemented. The designation of NO means do not use this setting with this condition.

Option/fiberMode	Off	Copy ¹	Raw	Generate	Append
BOF_OFF ¹	N/A	N/A	OK	OK	OK
BOF_ON ²	N/A	N/A	OK	OK ³	OK ⁴
CRC_OFF	N/A	OK ⁵	OK	OK	OK ⁵
CRC_ON ¹	N/A	OK ⁵	OK	OK	OK ⁵
FLOW_CONTROL_OFF ¹	N/A	N/A	OK	OK	OK
FLOW_CONTROL_COPY	N/A	N/A	OK	OK	OK
FLOW_CONTROL_NO_COPY	N/A	N/A	OK	OK	OK

age1438_epoch_setup

Option/fiberMode	Off	Copy ¹	Raw	Generate	Append
EPOCH_GEN_OFF	N/A	N/A	OK	OK	NO
EPOCH_GEN_ON ¹	N/A	N/A	OK	OK ³	OK ⁶
HEADER_OFF ¹	N/A	N/A	OK	OK	OK
HEADER_ON ²	N/A	N/A	OK	OK	OK

1. Default instrument setting on power-up and reset.
2. Not applicable unless EPOCH_GEN_ON is enabled.
3. This is required if this is the first module in an append chain.
4. This is required unless this is the last module in an append chain.
5. CRC_ON or CRC_OFF must correspond to the setting of the module supplying the data to the fiber interface.
6. This is required for all modules in an append chain.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_error_message” on page 115](#)

age1438_error_message

Returns error information obtained from function calls.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_error_message(ViSession id, ViStatus statusCode, ViChar
    errorMessage[]);
```

Description

age1438_error_message takes an error return value generated by a function and translates it to a readable string. This function includes host errors as well as firmware errors.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

errorMessage represents the error message string up to 256 characters long.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

statusCode represents the instrument numeric error code.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an unknown error condition or other important status condition and may return **VI_WARN_UNKNOWN_STATUS**.

See Also

[“age1438_init” on page 146](#), [“age1438_error_query” on page 116](#), [“Error messages” on page 214](#)

age1438_error_query

Queries the module for the first error in the queue.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_error_query(ViSession id, ViPint32 errorCode, ViChar  
    errorMessage[]);
```

Description

age1438_error_query queries the module for the oldest error and returns the corresponding error message. This function does not report host errors that originate in the C library.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
errorCode	points to the instrument numeric error code.
errorMessage	points to the error message string up to 80 characters long. This message also indicates what function call generated the error.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_error_message” on page 115](#)

age1438_ext_sample_sync

Enables synchronization of multiple modules. This description also includes the query:

age1438_ext_sample_sync_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_ext_sample_sync(ViSession id, ViInt16 syncEnable);
```

```
ViStatus age1438_ext_sample_sync_get(ViSession id, ViPInt16 syncEnablePtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This command is used to provide precision sampling in multi-module systems by synchronizing them to an external sample clock. The External Trigger BNC provides the input for a synchronizing signal. A splitter and identical cables provide external sample clock and user generated external sync pulse signals to each module.

Note

This command requires specialized external hardware. [“External sample synchronization in multi-module systems”](#) in chapter 3.

Parameters**id**

is the VXI instrument session pointer returned by the **age1438_init** function.

syncEnable

[AGE1438_EXT_SAMP_SYNC_ENABLE](#) is used after calling [age1438_clock_setup](#) to select a multi-module external sample setup. A counter within the module is put into its reset state and the two clocks within the module that are derived from the sample clock stop operating; this includes the clock used by the DSP circuitry that runs at one-half the sample clock, and a clock running at one-tenth of the sample clock used for multi-module sync. As soon as a rising edge is applied to the External Trigger input of the Agilent E1438, the counter resumes counting from a known state and the two clocks mentioned above have a known phase. Since the clocks may be interrupted for some time, it is a good idea to call [age1438_clock_recover](#) after the counter has resumed counting.

[AGE1438_EXT_SAMP_SYNC_CANCEL](#) releases the module's counter from its preset state and the clocks resume. It is still advisable to call [age1438_clock_recover](#).

syncEnablePtr

points to the value of *syncEnable*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

age1438_ext_sample_sync

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#), [“age1438_filter_sync” on page 137](#), [“age1438_clock_setup” on page 91](#), [“Managing multiple modules” in chapter 3](#), [“Using clock and sync” in chapter 3](#), [“External sample synchronization in multi-module systems” in chapter 3](#)

age1438_fiber_clear

This function clears all data from the fiber interface FIFO buffers.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_clear(ViSession id);
```

Description

age1438_fiber_clear clears all data from the fiber interface FIFO buffers, and resets other internal transient states such as, *"reset to beginning of epoch"* and *"return to copy phase of append"*.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to ["age1438_error_message"](#) on page 115.

See Also

["age1438_init"](#) on page 146, ["age1438_status_get"](#) on page 189

age1438_fiber_error_clear

This function clears the **AGE1438_STATUS_FIBER_ERROR** bit in the status register.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_error_clear(ViSession id);
```

Description

age1438_fiber_error_clear clears the **AGE1438_STATUS_FIBER_ERROR** bit in the status register. If the error is continuously present, the bit will not be cleared.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#)

age1438_fiber_error_get

This function returns the value of the fiber interface error register when the **AGE1438_STATUS_FIBER_ERROR** bit is set.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_error_get(ViSession id, ViInt16 fiberErrorPtr);
```

Description

age1438_fiber_error_get returns the fiber interface errors.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

fiberErrorPtr points to the value of the fiber interface error. The bits are defined below:

Status Bit	Definition	Numeric Value	Description
9	FI_ERR_UNLOCKED	512	Indicates that the internal receive or transmit clock is not properly locked. This could be caused by a poor quality receive signal.
8	TX_ERR_OVERRUN	256	Indicates that data transmission is not sustainable because the raw data bandwidth has exceeded the available fiber capacity.
7	RX_ERR_FIFO_OVERFLOW	128	Indicates that data arriving on the fiber receive port has been lost.
6	RX_ERR_SYNC_LOST	64	Indicates that the receiver did not detect the synchronization signal.
5	RX_ERR_DISPARITY	32	Indicates an invalid stream of bits was detected in the received data.
4	RX_ERR_CODE_VIOLATION	16	Indicates an invalid stream of bits was detected in the received data.
3	RX_ERR_ALIGNMENT	8	Indicates an invalid stream of bits was detected in the received data.
2	RX_ERR_BEGIN_DISPARITY	4	Indicates an invalid stream of bits was detected in the received data.
1	RX_ERR_CRC	2	Indicates a cyclic redundancy check error has occurred on the receiver of the fiber interface.
0	RX_ERR_SIGNAL_LOST	1	Indicates the signal is no longer being received on the fiber interface.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

age1438_fiber_error_get

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_status_get” on page 189](#) [“age1438_error_query” on page 116](#), [“Error messages” on page 214](#)

age1438_fiber_LED_get

Returns a data register indicating the state of the front panel XMT/RCV LEDs.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_LED_get(ViSession id, ViPInt16 ledRegPtr);
```

Description

This function returns a register value that indicates the current state of the front panel XMT and RCV LEDs.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

ledRegPtr points to the current value of the LED register.

[AGE1438_LED_RX_SIGNAL](#) indicates an optical signal has been detected, the RCV LED is on or blinking.

[AGE1438_LED_RX_DATA](#) indicates data was received in approximately the last 500 ms, the RCV LED is blinking.

[AGE1438_LED_TX_ENABLED](#) indicates that the transmitter is enabled, the XMT LED is on or blinking.

[AGE1438_LED_TX_DATA](#) indicates local data was transmitted in approximately the last 500 ms, the XMT LED is blinking.

Note

The [AGE1438_STATUS_FIBER_ACTIVE](#) bit is set when either of or both the XMT or RCV LEDs are blinking, indicating data is being received and/or being transmitted.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146, [“age1438_fiber_signal_get”](#) on page 129, [“age1438_status_get”](#) on page 189

age1438_fiber_rcv_signals_get

Returns the current value of the PIO1, PIO2, DIR, or NRDY bits present on the fiber receiver.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_rcv_signals_get(ViSession id, ViPInt16 pio1, ViPInt16 pio2, ViPInt16 dir, ViPInt16 nrdy);
```

Description

These are embedded Serial FPDP signals. The use of these bits is optional. Serial FPDP does not use these four signals directly, but simply transmits them from sender to receiver. This function displays the value of recovered PIO1, PIO2, DIR and NRDY bits on the fiber receiver.

Note

This function will return [AGE1438_FIBER_ERROR](#) when a signal is present, but the fiber receiver is not synced to the signal. (e.g., when the wrong interface speed has been selected). The function will also return this error if it is selected and no signal is present.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

pio1 Programmable I/O bit on the fiber receiver for user defined purposes.

pio2 Programmable I/O bit on the fiber receiver for user defined purposes.

Note

The following are FPDP signals that are accommodated in the Serial FPDP protocol. For further information on these signals refer to ANSI/VITA 17-1998, Front Panel Data Port Specifications.

dir returns the *dir* FPDP control signal.

nrdy returns the *nrdy* FPDP control signal.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

[AGE1438_FIBER_ERROR](#) is returned if there is no optical energy detected on the RCV fiber port.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146, [“age1438_fiber_setup”](#) on page 125, [“age1438_fiber_xmt_signals”](#) on page 132.

age1438_fiber_setup

Sets the fiber interface parameters. This description also includes information on the following functions which set up or query the fiber parameters individually:

age1438_fiber_BOF controls whether or not automatically generated BOF events are transmitted.
age1438_fiber_BOF_get returns the current status of *bofEnable*.
age1438_fiber_crc sets up the fiber interface to transmit and receive cycle redundancy checking to the same value.
age1438_fiber_crc_get gets the current status of *crcEnable*.
age1438_fiber_flow_control enables or disables transmitter flow control signals.
age1438_fiber_flow_control_get returns the value of *flowControlMode*.
age1438_fiber_mode is used to select the fiber mode.
age1438_fiber_mode_get returns the current value of *fiberMode*.
age1438_fiber_transfer_rate selects the transfer rate for fiber optical data.
age1438_fiber_transfer_rate_get returns the current value of *transferRate*.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_setup(Visession id, ViInt16 mode, ViInt16 bofEnable,
    ViInt16 flowControlEnable, ViInt16 crcEnable, ViInt16 transferRate);
ViStatus age1438_fiber_BOF(Visession id, ViInt16 bofEnable);
ViStatus age1438_fiber_BOF_get(Visession id, ViPInt16 bofEnablePtr);
ViStatus age1438_fiber_crc(Visession id, ViInt16 crcEnable);
ViStatus age1438_fiber_crc_get(Visession id, ViPInt16 crcEnablePtr);
ViStatus age1438_fiber_flow_control(Visession id, ViInt16 flowControlMode);
ViStatus age1438_fiber_flow_control_get(Visession id, ViInt16
    flowControlModePtr);
ViStatus age1438_fiber_mode(Visession id, ViInt16 fiberMode);
ViStatus age1438_fiber_mode_get(Visession id, ViPInt16 fiberModePtr);
ViStatus age1438_fiber_transfer_rate(Visession id, ViInt16 transferRate);
ViStatus age1438_fiber_transfer_rate_get(Visession id, ViPInt16
    transferRatePtr);
```

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

bofEnable configures the automatic generation of BOF events. Generally, this is only used by modules in an optical append chain.

[AGE1438_BOF_ON](#) is used in an optical append chain. When used in this manner, all but the last module in the append chain should have BOF events enabled. The first module in the append chain should also have *fiberMode* set to [AGE1438_FIBER_MODE_GENERATE](#). This will cause it to generate a BOF event after every EOE event, in other words, at the end of every data epoch it sends. All subsequent modules in an append chain should have *fiberMode* set to [AGE1438_FIBER_MODE_APPEND](#). In this case, the module re-transmits received data epochs without modification. The reception of a BOF event alerts the module to the opportunity to insert a data epoch of its own, if available,

age1438_fiber_setup

between the reception of EOE and BOF events. [AGE1438_BOF_ON](#) is only available when *epochGenerate* is ON and *fiberMode* is either *generate* or *append*, otherwise this setting is silently accepted and ignored.

[AGE1438_BOF_OFF](#) is the default setting. It blocks the transmission of all automatically generated BOF events. However, programmatically generated BOF events such as [age1438_fiber_xmt_BOF](#), which are used in the synchronization of fiber interfaces, are not blocked.

bofEnablePtr	points to the current value of <i>bofEnable</i> .
crcEnable	determines whether or not cyclic redundancy checking (CRC) is performed on the fiber receiver and whether or not that information will be transmitted. Generally, cyclic redundancy checking should be enabled, but turning CRC off may solve compatibility problems with some fiber optic receivers. AGE1438_CRC_ON enables CRC checking. AGE1438_CRC_OFF disables CRC checking.
crcEnablePtr	points to the current value of <i>crcEnable</i> .
fiberMode	is used to turn the fiber interface off, configure it to copy data from the receiver to the transmitter port without adding data, configure the transmission of filtered ADC data, or configure appending ADC data to received data. AGE1438_FIBER_MODE_RAW allows the transmission of unfiltered full bandwidth ADC data at the same time filtered ADC data is available to read on the VME bus or the local bus. AGE1438_FIBER_MODE_OFF turns off both the fiber transmitter and receiver (although PIO1, PIO2, NRDY and DIR bits are still received). Normal data collection and digital processing continues.

Note If **age1438_data_port** is set to *fiber* while the fiber interface is turned off, the data FIFO will fill up with filtered ADC data and collection will stop. In this case, [age1438_meas_status_get](#) will return the error, [AGE1438_NO_DATA_MEASUREMENT_PAUSED](#).

[AGE1438_FIBER_MODE_COPY](#) is the default *fiberMode* at power-on and reset. Data is copied from the fiber interface receiver to the fiber interface transmitter while the module is performing other measurements. For instance, filtered ADC data can be sent on the LBUS or read from the FIFO over the VME bus in accordance with the current setting of the **age1438_data_port** function, with this parameter set. However, selecting *fiber* as the data port while using this mode will result in setting the [AGE1438_STATUS_SETUP_ERROR](#) bit in the status register. This occurs because the fiber interface cannot perform both functions at the same time.

Note The E1438B fiber receiver's detect signal is used to activate the fiber transmitter. The E1438B fiber interface is not a data receiver. The function of the receive port is limited to copying data to the transmit port and to detecting FPDP control signals (e.g., PIO bits and flow control signals). Since signal detect works on light energy alone, there does not need to be valid data on the fiber receiver for there to be an output from the transmitter. If there is valid data present on the fiber receiver, it is copied to the fiber transmitter. This preserves data transparency but not necessarily protocol transparency. The outgoing protocol is always serial FPDP.

[AGE1438_FIBER_MODE_RAW](#) transmits unprocessed and unbuffered ADC data over the fiber interface. After selection, optical data transmission begins when the first measurement is triggered, and continues indefinitely after the measurement is complete. Transmission will continue until the fiber mode is changed to something other than [AGE1438_FIBER_MODE_RAW](#) or a fiber error occurs. While this raw data is being transmitted, filtered ADC data can still be sent over the local bus, or read from the FIFO via the VME bus. Attempting to set [AGE1438_FIBER_MODE_RAW](#) and the **age1438_data_port** to *fiber* will result in the [AGE1438_STATUS_SETUP_ERROR](#) bit being set. This is because the fiber interface cannot send both raw and filtered ADC data at the same time.

Note

Attempting to use the flow control while in [AGE1438_FIBER_MODE_RAW](#) fiber mode will likely result in a [TX_ERR_OVERRUN](#) error. The transmit FIFO size is only 1 Kbyte

[AGE1438_FIBER_MODE_GENERATE](#) causes filtered ADC data to be transmitted over the fiber interface when one block is available in the FIFO. When flow control is enabled in this mode, an external optical receiver can send stop and go commands that cause the module to pause or resume data transmission. Received optical data other than data flow control signals are ignored.

[AGE1438_FIBER_MODE_APPEND](#) copies data from the fiber optic receiver to the fiber optic transmitter and appends its own filtered ADC data, when available.

fibermodePtr

points to the current value of *fiberMode*.

flowControlMode

configures fiber flow control. When flow control is on, an external optic receiver can pause or resume the fiber data transmission by sending a stop or go command. Received optical data other than flow control signals and PIO bits are ignored.

[AGE1438_FLOW_CONTROL_NO_COPY](#) responds to received flow control signals GO and STOP, and transmits GO.

[AGE1438_FLOW_CONTROL_COPY](#) responds to received flow control signals GO and STOP, and transmits the received flow control signal values.

[AGE1438_FLOW_CONTROL_OFF](#) disables fiber flow control.

flowControlModePtr

points to the current value of *flowControlMode*.

transferRate

sets both the transmitter and receiver raw data rates.

[AGE1438_106MBS](#) transfers data at the legacy data rate of 106 Mbytes per second. This is the default setting.

[AGE1438_250MBS](#) transfers data at 250 Mbytes per second. This is fast enough to support continuous transmission of data at the highest sample rates and bit depths.

transferRatePtr

points to the current value of *transferRate*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

age1438_fiber_setup

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_error_message” on page 115](#)

age1438_fiber_signal_get

Returns a value indicating whether or not an optical signal is detected by the optical fiber interface receiver.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_signal_get(ViSession id, ViPInt16 fiberSignalPtr);
```

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

fiberSignalPtr returns a value indicating whether or not an optical signal has been detected by the fiber interface receiver.

[AGE1438_NO_FIBER_SIGNAL](#) indicates no optical signal has been detected by the fiber interface receiver.

[AGE1438_FIBER_SIGNAL_PRESENT](#) indicates an optical signal has been detected by the fiber interface receiver.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146, [“age1438_fiber_LED_get”](#) on page 123, [“age1438_status_get”](#) on page 189

age1438_fiber_verify

This function verifies the operational condition of the fiber interface.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_verify(ViSession id, ViInt16 verifyPath, ViInt16 sec);
```

Description

This function performs a verification of the fiber interface using either an internal or an external signal path. The internal signal path cannot test the actual RX/TX ports but does test the internal connections of the fiber interface to the rest of the module. The external signal path does test the RX/TX ports but requires connecting an optical short between the RX and TX fiber ports.

Note

No fiber optic cables should be connected or disconnected during verification.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

verifyPath indicates which path, internal or external, is being tested by **age1438_fiber_verify**.
[AGE1438_FIBER_VERIFY_INTERNAL](#) verifies the internal fiber interface connections to the rest of the module.

Note

age1438_self_test performs five-second internal fiber verification.

[AGE1438_FIBER_VERIFY_EXTERNAL](#) verifies the operational condition of the RX and TX fiber ports by connecting an optical short between them.

sec sets the number of seconds the verification procedure will last based on this argument.
[AGE1438_FIBER_VERIFY_MIN](#) sets minimum fiber verification time in seconds.
[AGE1438_FIBER_VERIFY_MAX](#) sets maximum fiber verification time in seconds.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115

See Also

["age1438_init"](#) on page 146, ["age1438_self_test"](#) on page 183

age1438_fiber_xmt_BOF

This function sends a BOF event used for synchronization with other fiber interfaces before data acquisition begins.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_xmt_BOF(ViSession id);
```

Parameter**id**

is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value **AGE1438_SUCCESS** indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#)

age1438_fiber_xmt_signals

Sets the transmitted values of PIO1, PIO2, DIR, and NRDY FPDP control signals on the fiber transmitter.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_xmt_signals(ViSession id, ViInt16 pio1, ViInt16 pio2,
ViInt16 dir, ViInt16 nrdy);
```

Description

These are embedded Serial FPDP signals. The use of these bits is optional. Serial FPDP does not use these four signals directly, but simply transmits them from sender to receiver. These functions set the value of PIO1, PIO2, DIR and NRDY bits on the fiber transmitter. The default value of these signals is 0.

Parameter

id	is the VXI instrument session pointer returned by the age1438_init function.
pio1	Programmable I/O bit on the fiber transmitter for user defined purposes.
pio2	Programmable I/O bit on the fiber transmitter for user defined purposes.
	AGE1438_FIBER_SIG_ON FPDP control signals enabled.
	AGE1438_FIBER_SIG_OFF FPDP control signals disabled. This is the default value for all signals.

Note

The following are FPDP signals that are accommodated in the Serial FPDP protocol. For further information on these signals refer to ANSI/VITA 17-1998, Front Panel Data Port Specifications.

dir	sets the <i>dir</i> FPDP control signal.
nrdy	sets the <i>nrdy</i> FPDP control signal.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"[age1438_init](#)" on page 146, "[age1438_fiber_setup](#)" on page 125, "[age1438_fiber_rcv_signals_get](#)" on page 124

age1438_fiber_xmt_signals_get

Returns the current value of PIO1, PIO2, DIR, and NRDY bits present on the fiber transmitter.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_fiber_xmt_signals_get(ViSession id, ViPInt16 pio1,  
ViPInt16 pio2, ViPInt16 dir, ViPInt16 NRDY);
```

Description

These are embedded Serial FPDP signals. The use of these bits is optional. Serial FPDP does not use these four signals directly, but simply transmits them from sender to receiver. These functions display the value of recovered PIO1, PIO2, DIR and NRDY bits on the fiber transmitter.

Parameter

id is the VXI instrument session pointer returned by the **age1438_init** function.

pio1 returns the current value of *pio1*.

pio2 returns the current value of *pio2*.

Note The following are FPDP signals that are accommodated in the Serial FPDP protocol. For further information on these signals refer to ANSI/VITA 17-1998, Front Panel Data Port Specifications.

dir returns the current value of *dir*.

nrdy returns the current value of *nrdy*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_fiber_setup” on page 125](#), [“age1438_fiber_rcv_signals_get” on page 124](#).

age1438_filter_setup

Sets the digital filter bandwidth and decimation filter parameters. This description also includes information on the following functions which set or query the decimation filter parameters individually:

age1438_filter_decimate selects an extra factor of 2 decimation.
age1438_filter_decimate_get gets current state of extra decimation
age1438_filter_bw selects a signal filter bandwidth.
age1438_filter_bw_get gets the signal filter bandwidth

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_filter_setup(ViSession id, ViInt16 sigBw, ViInt16 decimate);
ViStatus age1438_filter_decimate(ViSession id, ViInt16 decimate);
ViStatus age1438_filter_decimate_get(ViSession id, ViInt16 decimatePtr);
ViStatus age1438_filter_bw(ViSession id, ViInt16 sigBw);
ViStatus age1438_filter_bw_get(ViSession id, ViInt16 sigBwPtr);
```

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
decimate	selects the data output sample rate. When this parameter is set to AGE1438_DECIMATE_OFF the output sample rate is: fs when $sigBw=0$, or $fs/2^{(sigBw-1)}$ when $sigBw>0$ When <i>decimate</i> is set to AGE1438_DECIMATE_ON the output sample rate is reduced by an additional factor of two by discarding alternate samples. AGE1438_DECIMATE_SHIFT is like AGE1438_DECIMATE_ON but additional processing is performed that shifts the center frequency of zoomed data up by $fs/4$ and transforms the complex data stream into a real data stream without losing phase information. For consistent spectrum measurements the data scale value is doubled when using shift decimate.
decimatePtr	points to the current value of the <i>decimate</i> parameter.
sigBw	selects an alias protected signal filter bandwidth that is roughly $\pm fs/(2.56 \times 2^{(sigBw)})$ where fs is the ADC sample frequency. In zoom applications, where the center frequency is generally not zero, the zoom filter bandwidth is centered on the frequency programmed with the age1438_frequency_setup function. For baseband measurements the filter may equivalently be considered as a low pass filter of approximately bandwidth $fs/(2.56 \times 2^{(sigBw)})$ since the negative frequencies are generally of no interest. The valid range of <i>sigBw</i> is 0 through 18. When <i>sigBw</i> = 0, no digital filtering is applied to the signal and the module relies on the analog anti-alias filter to limit the signal bandwidth to $fs/2.56$. To more accurately calculate the bandwidth use the calculation $\pm fs \times k/2^{(sigBw)}$ where: k=.36 for .25 dB bandwidth k=.44 for 3 dB bandwidth k=.5 for 15 dB bandwidth

$k=.62$ for 110 dB bandwidth

[AGE1438_SIG_BW_MAX](#) sets *sigBw* to the maximum value and the filter bandwidth to the minimum.

[AGE1438_SIG_BW_MIN](#) sets *sigBw* to the minimum value and filter bandwidth to the maximum.

sigBwPtr

points to the current value of the *sigBw* parameter.

Caution

Selecting AGE1438_DECIMATE_ON when *sigBw*=0 results in aliasing (garbage data) due to upper limit of the sampling frequency and, therefore, causes the SETUP_ERROR bit to be set.

Selecting AGE1438_DECIMATE_SHIFT for non-zoomed data is not a useful configuration.

Comments

To ensure full alias-free operation the analog anti-alias filter (set by the **age1438_input_alias_filter** function) should be ON unless the application inherently bandlimits the input signal to less than $f_s/2$. The analog anti-alias filter has a fixed bandwidth and thus is fully effective only when $f_s \geq 100$ MHz. If a slower external ADC clock is used, an additional analog filter of the appropriate bandwidth may be required for full alias protection.

The decimation process used to reduce the output sample rate is driven from a "decimation counter" which keeps track of which samples to save and which ones to discard for each of the octave bandwidth reduction filter stages. In multi-module systems where synchronous sampling is required, the decimation counters in all the modules must be synchronous with each other. This condition can be forced by using the **age1438_filter_sync** function.

The following table lists parameter combinations (see also "[age1438_data_setup](#)" on [page 103](#)) which result in invalid measurement conditions:

Invalid parameter combinations

resolution (bits)	dataType	decimate	sigBw
12 or 24	REAL or COMPLEX	OFF or SHIFT	1
12 or 24	REAL or COMPLEX	ON or SHIFT	0
12 or 24	COMPLEX	any	0
24	REAL or COMPLEX	OFF	2
24	REAL or COMPLEX	any	0 or 1
12 or 24	COMPLEX	SHIFT	any

All other combinations are valid.

Example

Here are some bandwidth and sample rate results using the "k" calculation for bandwidth:
 $f_s = 100$ MHz default internal ADC clock (all data in MHz)

age1438_filter_setup

	Signal Bandwidth MHz		Sample Rate Msamples	
	sigBw	.25 dB	15 dB	Decimate OFF Decimate ON
1		±18	±25	N/A 50
2		±9	±12.5	50 25
3		±4.5	±6.25	25 12.5
4		±2.25	±3.125	12.5 6.5
> 4	Continue to decimate by factors of two			

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_input_setup” on page 154](#), [“age1438_clock_setup” on page 91](#), [“age1438_frequency_setup” on page 142](#), [“age1438_filter_sync” on page 137](#), [“age1438_data_setup” on page 103](#), [“Frequency and filtering” in chapter 3](#)

age1438_filter_sync

Synchronizes the decimation counter for multi-module systems.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_filter_sync(ViSession id);
```

Description

This function causes the digital decimation counter to be reset by the next Sync line rising transition. By calling **age1438_filter_sync** for every Agilent E1438 module using a shared ADC clock, and then calling **age1438_meas_control** to cause a sync transition, the decimation counters are prepared to start at the same time. Once this is done the decimation counters stay synchronized as long as the same ADC clock is used. You do not need to resynchronize the decimation counters when the digital filter bandwidths are changed.

Note

Resetting the decimation counter causes a transient in the digital filters. The transient takes about 30 decimated output sample periods to decay 100 dB. See the step response graphs in the Technical Specifications for more detail.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Comment

The correct procedure for using this command is:

1. Force all modules to idle using **age1438_meas_control**.
2. Call **age1438_filter_sync** for all modules.
3. Cause a sync transition with one module using **age1438_meas_control** without releasing force to idle.
4. Release force to idle on all modules.

If you also want to synchronize frequency or phase see **age1438_frequency_setup**. This procedure also applies to those commands for multi-module systems.

Example

The multichan.exe example program provides an example of how to correctly set up a multi-module system with synchronous filters.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

age1438_filter_sync

See Also

[“age1438_init” on page 146](#), [“age1438_filter_setup” on page 134](#), [“age1438_frequency_setup” on page 142](#), [“age1438_meas_control” on page 164](#), [“Managing multiple modules” in chapter 3](#)

age1438_frequency_center_raw

Provides a fast way to set the center frequency

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_frequency_center_raw(ViSession id, ViInt32 phase, ViInt32
interpolate);
```

```
ViStatus age1438_frequency_center_raw_get(ViSession id, ViInt32 phasePtr,
ViInt32 interpolatePtr);
```

Description

age1438_frequency_center_raw sets the center frequency without relying on the internal Agilent E1438 microprocessor to do floating point computations, since the internal microprocessor does not have a floating point co-processor. The parameters may be easily computed with [age1438_frequency_center_raw_compute](#).

Note

This command is not supported in HP-VEE.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
phase	specifies the phase part of the frequency.
interpolate	specifies the interpolation part of the frequency.
phasePtr	points to the current actual value of <i>phase</i> .
interpolatePtr	points to the value of <i>interpolate</i> .

Comments

The following examples are provided in case you want to compute your own parameter values rather than use the recommended [age1438_frequency_center_raw_compute](#) function.

The following C code segment shows how to compute these parameters, where *freq* is (center frequency/sample rate):

```
static void rawFreq(double freq, long *phase, long *interpolate)
{
    long ph, in;
    freq *= -1048576.0;
    ph = (long)fabs(freq);
    in = (long)((fabs(freq) - (double)ph)*48828125 + 0.5);
    if (freq < 0)
    {
        ph = -1 - ph;
        if (in != 0);
        in = 48828125 - in;
    }
}
```

age1438_frequency_center_raw

```

        else;
            ph = ph + 1;
        }
        *phase = ph;
        *interpolate = in;
        return;
    }

```

The equivalent Visual Basic example follows:

```

Private Sub rawFreq(dblFreq as Double)
    Dim dblFx As Double
    Dim lngIn As Long
    Dim lngPh As Long

    dblFx = -1048576# * dblFreq
    lngPh = Fix(Abs(dblFx)) 0
    lngIn = Fix(((Abs(dblFx) - CDbl(lngPh)) * 48828125#) + 0.5)
    If (dblFx < 0) Then
        lngPh = (-1) - lngPh
        If (lngIn) Then
            lngIn = 48828125 - lngIn
        Else
            lngPh = lngPh + 1
        End If
    End If
    Call age1438_frequency_center_raw(lngId, lngPh, lngIn)

End Sub

```

Example

An example of this in VB is included in the Front Panel code and can be activated by changing the following declaration in frmMain of E1438.vbp.

```

Const constFreqCentRaw = False    'When TRUE, set center frequency with
                                   'age1438_frequency_center_raw() instead of
                                   'age1438_frequency_center()

```

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_frequency_setup” on page 142](#), [“age1438_frequency_center_raw_compute” on page 141](#)

age1438_frequency_center_raw_compute

Computes the raw center frequency parameters

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_frequency_center_raw_compute(ViSession id, ViReal64
center, ViPInt32 phasePtr, ViPInt32 interpolatePtr);
```

Description

This function quickly computes the parameter values which you may use with [age1438_frequency_center_raw](#). This function also allows you to compute many values in advance to facilitate quick frequency hopping.

Note

This command is not supported in HP-VEE.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
center	provides the center frequency normalized to clock/fs.
phasePtr	points to the computed value of <i>phase</i> .
interpolatePtr	points to the computed value of <i>interpolate</i> .

Example

Here is a Visual Basic snippet showing how to use this function:

```
Call age1438_frequency_center_raw_compute(lngId, dblCenterFreq, lngPh, lngIn)
Call age1438_frequency_center_raw(lngId, lngPh, lngIn)
```

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"[age1438_init](#)" on page 146, "[age1438_frequency_setup](#)" on page 142, "[age1438_frequency_center_raw](#)" on page 139, "[age1438_combo_setup](#)" on page 100

age1438_frequency_setup

Sets all the zoom center frequency parameters. This description also includes information on the following functions which set or query frequency parameters individually:

age1438_frequency_center sets the center frequency
age1438_frequency_center_get gets the current center frequency
age1438_frequency_cmplxdc selects a complex baseband measurement
age1438_frequency_cmplxdc_get gets the state of the baseband measurement mode
age1438_frequency_sync prepares the module for a synchronous frequency change
age1438_frequency_sync_get gets the state of the synchronous change mode

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_frequency_setup(ViSession id, ViInt16 cmplxDC, ViInt16 sync,
ViReal64 centerFreq);
ViStatus age1438_frequency_center(ViSession id, ViReal64 centerFreq);
ViStatus age1438_frequency_center_get(ViSession id, ViReal64 centerFreqPtr);
ViStatus age1438_frequency_cmplxdc(ViSession id, ViInt16 cmplxDC);
ViStatus age1438_frequency_cmplxdc_get(ViSession id, ViInt16 cmplxDCPtr);
ViStatus age1438_frequency_sync(ViSession id, ViInt16 sync);
ViStatus age1438_frequency_sync_get(ViSession id, ViInt16 syncPtr);
```

Description

age1438_frequency_setup sets the center frequency of a zoomed measurement. The center of a frequency band of interest is converted to dc with this function. The frequency transition is phase continuous unless the center frequency is set to zero in which case the transition may be selected either to be phase continuous or phase reset. This function may also be used to synchronously change frequency in multiple-module systems.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
centerFreq	supplies the center frequency normalized to the sample frequency. It is a number between -1.0 and +1.0, which is interpreted as a fraction of the sample frequency. <i>centerFreq</i> is the desired center frequency divided by the ADC sample frequency. For example, selecting 0.25 with a sample clock frequency of 100 MHz yields a center frequency of 25 MHz. The ADC sample frequency is returned by the age1438_clock_fs_get function. Negative frequencies select the negative image of the signal, which is spectrally inverted from the input signal. AGE1438_CENT_FREQ_MIN selects the minimum allowable center frequency. AGE1438_CENT_FREQ_MAX selects the maximum allowable center frequency. AGE1438_CENT_FREQ_DEF sets the default center frequency.
centerFreqPtr	points to the current actual value of the center frequency (as a fraction of the sample clock frequency).

cmplxDC	selects either a phase continuous or phase reset transition when <i>freq</i>=0. AGE1438_CMPLXDC_OFF, combined with a frequency change to zero, causes phase to be reset to zero. AGE1438_CMPLXDC_ON, combined with a frequency change to zero, does not reset the phase thereby generating a complex dc measurement at baseband. The state of this parameter does not affect any transition where <i>freq</i> is nonzero. Whether the real or complex data is saved and ultimately sent to the output port is determined by the age1438_data_type function
cmplxDCPtr	points to the current actual value of <i>cmplxDC</i> .
sync	when set to AGE1438_SYNC_OFF allows an immediate frequency change in single-module systems. In multiple-module systems, setting this parameter to AGE1438_SYNC_ON prepares the modules for a frequency change, but does not actually bring about the change until the next ADC clock corresponding to the next assertion of the shared Sync signal. The Sync transition is generated by calling the age1438_meas_control function. Note that returning sync to OFF before the Sync signal transition has occurred forces an immediate asynchronous frequency change.
syncPtr	points to the value of <i>sync</i> .

Comments

Although the *freq* parameter is a double precision floating point number, its effective resolution is $1/(2^{19} \times 5^{11})$. This allows exact specification of any multiple of 1 mHz when *fs*=100 or 102.4 MHz. The actual frequency is set to the nearest available value. This value is returned by the **age1438_frequency_center_get** function. In multi-module systems this value represents the pending value rather than the current value when a frequency change is incomplete due to a pending Sync signal transition.

In multiple-module systems it is often desirable to force the frequency change to occur synchronously in order to preserve the phase relationship of the LOs. You may accomplish this by setting the sync parameter to ON for all the modules which are to be changed.

In configurations involving synchronous operation of multiple Agilent E1438 modules, the **age1438_frequency_setup** function provides a mechanism to force all LOs to the same phase. You can do this by first setting the frequency to zero and then synchronously changing the frequency to the desired value.

Example

The example program multichan.exe shows how to correctly perform synchronous frequency changes in a multi-module system.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

age1438_frequency_setup

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_clock_setup” on page 91](#), [“age1438_data_setup” on page 103](#), [“age1438_clock_fs” on page 89](#), [“age1438_meas_control” on page 164](#), [“Frequency and filtering” in chapter 3](#), [“Using clock and sync” in chapter 3](#), [“Managing multiple modules” in chapter 3](#)

age1438_front_panel_clock_input

Specifies the source for the front panel clock. This description also includes the query function:

age1438_front_panel_clock_input_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_front_panel_clock_input(ViSession id, ViInt16 fpClock);
```

```
ViStatus age1438_front_panel_clock_input_get(ViSession id, ViInt16  
fpClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function selects a front panel clock source that is used to drive the analog to digital converter (ADC) for single module operation or when a module is used as the master ADC clock source for a multi-module system.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
fpClock	AGE1438_CLOCK_OFF specifies no front panel source. AGE1438_SMB_CLOCK specifies clock input from the front panel Intermodule Clock/SMB connectors. AGE1438_BNC_CLOCK specifies clock input from the front panel Ext Clock/Ref BNC connector.
fpClockPtr	returns a pointer to the current value of <i>fpClock</i> .

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Commands which halt active measurements" on page 213, "Default values" on page 216, "age1438_init" on page 146, "age1438_clock_setup" on page 91, "Using clock and sync" in chapter 3

age1438_init

Initializes the I/O driver for a module.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_init(ViRsrc rsrcName, ViBoolean idQuery, ViBoolean
    resetInstr, ViPSession id);
```

Description

age1438_init must be the first routine called when you use the Agilent E1438 library. It establishes communication with the module and returns a module identification which is used with all subsequent functions involving this module. This function performs whatever initialization the I/O driver needs for the environment in which this library is running.

Parameters

id	is a pointer to the VXI instrument Session identifier returned by this function for the module. This identifier is then used with all other functions which address this module. This value is not a VISA id and so cannot be used with VISA functions. Use age1438_attrib_get to get the VISA id.
idQuery	set to AGE1438_MAG verifies the identity of the instrument by checking the manufacturer ID and model number in the module's VXI register set. If set to AGE1438_OFF the function does not verify the module's identity. It is helpful to disable the id query if you want to use the driver with a similar module but do not need to modify the driver source code.
resetInstr	places the module in the reset state when set to AGE1438_ON . If set to AGE1438_OFF , the function disables the reset. Disabling the reset is useful for debugging in cases where resetting would take the instrument out of the state you want to test.
rsrcName	specifies the interface and logical address. This descriptor varies depending on your I/O library.

An example of the descriptor form for the VISA I/O library is:

```
VXI[Board]::VXIlogical address [::INSTR]
```

Comments

If you receive a resource descriptor error, see your I/O library documentation to determine the correct descriptor form.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Commands which halt active measurements”](#) on page 213, [“age1438_close”](#) on page 99, [“age1438_attr_get”](#) on page 87

age1438_input_autozero

Nulls out the input dc offset voltage (applies to baseband input configuration only).

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_input_autozero(ViSession id);
```

Description

age1438_input_autozero updates a table of dc offset corrections to be used with each input setup condition. The applicable correction from this table is automatically added to the input offset parameter to achieve the correct dc offset value. Because of the length of time needed to execute this function, it is not automatically called when the module is reset. Thus, the user program is responsible for explicitly initiating the auto zero. This function should be called at least once after the temperature of the module has stabilized. The interval between calls after that depends on the importance of dc accuracy in the user application. It is not necessary to call the auto zero function for every change of input setup parameters since the correction table maintains values for all setup conditions.

Note

Calling **age1438_input_autozero** aborts any measurement already in progress and eliminates LO phase coherence and filter synchronization in a synchronous multi-module system. See the **age1438_filter_sync** and **age1438_frequency_sync** functions for details on how to re-establish LO phase coherence and filter synchronization.

Calling this function deletes any saved state and halts any measurement or fiber transfer.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#), [“age1438_input_setup” on page 154](#), [“age1438_input_offset_save” on page 150](#), [“age1438_filter_sync” on page 137](#), [“age1438_frequency_setup” on page 142](#)

age1438_input_offset

Sets the dc offset DAC setting for the current range. This description also includes the query:

age1438_input_offset_get

VXIplug&play Syntax

```
#include "age1438".h

ViStatus age1438_input_offset(ViSession id, ViInt16 coarseDac, ViInt16
    fineDac);
ViStatus age1438_input_offset_get(ViSession id, ViPInt16 coarseDacPtr,
    ViPInt16 fineDacPtr);
```

Description

These values are normally set by [age1438_input_autozero](#) so you generally would use this command only for special situations. The resultant values can be saved to non-volatile RAM with [age1438_input_offset_save](#).

Each ac coupling range has a unique DAC setting. All dc coupling ranges use the same DAC setting as the highest range setting for ac coupling. The scaling between the coarse and fine DACs is approximately 100 to 1.

[AGE1438_OFFS_DAC_MIN](#) sets the minimum dc offset DAC setting.

[AGE1438_OFFS_DAC_MAX](#) sets the maximum dc offset DAC setting.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
coarseDac	sets values of 0 to 255.
fineDac	sets values of 0 to 255.
coarseDacPtr	returns a pointer to the current value of <i>coarseDac</i>
fineDacPtr	returns a pointer to the current value of <i>fineDac</i>

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Default values" on page 216, "[age1438_init](#)" on page 146, "[age1438_input_autozero](#)" on page 148, "[age1438_input_offset_save](#)" on page 150

age1438_input_offset_save

Saves all DAC offset settings to non-volatile RAM.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_input_offset_save(ViSession id);
```

Description

Use this command if you want DAC offset settings to persist past power-down.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_input_setup” on page 154](#), [“age1438_input_offset” on page 149](#)

age1438_input_range_auto

Performs auto-ranging.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_input_range_auto(ViSession id, ViReal64 sec);
```

Description

age1438_input_range_auto sets the range of a Agilent E1438 to the lowest value that does not cause an ADC overload to occur. The algorithm starts at the lowest range and moves up until there is no ADC overload.

Note

Calling this function deletes any saved state and halts any measurement or fiber transfer.

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- sec** is the time in seconds to take data at each range to insure that an overload is detected. Setting this parameter to 0.0 results in the time being set automatically according to an algorithm that depends on block size and filter bandwidth.
- [AGE1438_RANGE_TIME_MIN](#) selects the minimum autorange time.
- [AGE1438_RANGE_TIME_MAX](#) selects the maximum autorange time.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Commands which halt active measurements”](#) on page 213, [“age1438_init”](#) on page 146, [“age1438_input_setup”](#) on page 154

age1438_input_range_convert

Converts the input range to volts.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_input_range_convert(ViSession id, ViInt16 range, ViPReal64
rangeVoltsPtr);
```

Description

age1438_input_range_convert converts the range of a Agilent E1438

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

range is the input range returned by **age1438_input_range_get**.

rangeVoltsPtr is the range in Volts.

Conversion values are as follows:

Variable	Range Index	Full Scale (dBm)	Full Scale Voltage (Vp)
AGE1438_RANGE_MAX	17		
AGE1438_RANGE_17	17	30	10.0
AGE1438_RANGE_16	16	27	7.08
AGE1438_RANGE_15	15	24	5.01
AGE1438_RANGE_14	14	21	3.55
AGE1438_RANGE_13	13	18	2.51
AGE1438_RANGE_12	12	15	1.78
AGE1438_RANGE_11	11	12	1.26
AGE1438_RANGE_10	10	9	.891
AGE1438_RANGE_9	9	6	.631
AGE1438_RANGE_8	8	3	.447
AGE1438_RANGE_7	7	0	.316
AGE1438_RANGE_6	6	-3	.224
INITIALIZE&CLOSE	5	-6	.158
AGE1438_RANGE_4	4	-9	.112
AGE1438_RANGE_3	3	-12	.0794
AGE1438_RANGE_2	2	-15	.0562
AGE1438_RANGE_1	1	-18	.0398
AGE1438_RANGE_0	0	-21	.0282
AGE1438_RANGE_MIN	0		

Note

These values are approximate. For more accuracy use [age1438_data_scale_get](#).

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to “[age1438_error_message](#)” on page 115.

See Also

“[age1438_init](#)” on page 146, “[age1438_input_setup](#)” on page 154, “[age1438_data_scale_get](#)” on page 102

age1438_input_setup

Sets all the analog input parameters. This description also includes information on the following functions which set or query the input parameters individually:

age1438_input_alias_filter selects or bypasses the built-in analog anti-alias filter
age1438_input_alias_filter_get gets the anti-alias filter state
age1438_input_coupling selects ac or dc input coupling
age1438_input_coupling_get get the input coupling type
age1438_input_range sets the full scale range
age1438_input_range_get gets the input range
age1438_input_signal connect/disconnect the input signal to the input amplifier
age1438_input_signal_get gets the input buffer amplifier state

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_input_setup(ViSession id, ViInt16 reserved, ViInt16 range,
ViInt16 coupling, ViInt16 antiAlias, ViInt16 signal);
ViStatus age1438_input_alias_filter(ViSession id, ViInt16 antiAlias);
ViStatus age1438_input_alias_filter_get(ViSession id, ViInt16 antiAliasPtr);
ViStatus age1438_input_coupling(ViSession id, ViInt16 coupling);
ViStatus age1438_input_coupling_get(ViSession id, ViInt16 couplingPtr);
ViStatus age1438_input_range(ViSession id, ViInt16 range);
ViStatus age1438_input_range_get(ViSession id, ViInt16 rangePtr);
ViStatus age1438_input_signal(ViSession id, ViInt16 signal);
ViStatus age1438_input_signal_get(ViSession id, ViInt16 signalPtr);
```

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
antiAlias	determines whether or not to use the built-in analog anti-alias filter. This filter only applies to baseband measurements. AGE1438_ANTIALIAS_ON inserts a sharp-cutoff (9-pole) 40 MHz low-pass filter ahead of the analog-to-digital converter. You should leave the filter on at all times to insure band-limited, anti-aliased data. AGE1438_ANTIALIAS_OFF replaces the low-pass filter with a soft-cutoff 3-pole low-pass filter.
antiAliasPtr	points to the current value of the <i>antiAlias</i> parameter.
coupling	specifies the ac or dc coupling mode of the input. This parameter applies to the baseband input configuration only. AGE1438_DC connects the input directly to the 50 Ohm buffer amplifier. AGE1438_ADC inserts a 0.2 μ F capacitor between the input connector and the 50 Ohm buffer amplifier.
couplingPtr	points to the current value of the <i>coupling</i> parameter for an Agilent E1438 or group of Agilent E1438s.
range	is a range index number which is transformed to a full scale voltage value.

[AGE1438_RANGE_MAX](#) sets the range to the maximum allowable.

[AGE1438_RANGE_MIN](#) sets the range to the minimum allowable.

Signal inputs with an absolute value larger than full scale generate an ADC overflow error.

Range values are as follows.

Variable	Range Index	Full Scale (dBm)	Full Scale Voltage (Vp)
AGE1438_RANGE_MAX	17		
AGE1438_RANGE_17	17	30	10.0
AGE1438_RANGE_16	16	27	7.08
AGE1438_RANGE_15	15	24	5.01
AGE1438_RANGE_14	14	21	3.55
AGE1438_RANGE_13	13	18	2.51
AGE1438_RANGE_12	12	15	1.78
AGE1438_RANGE_11	11	12	1.26
AGE1438_RANGE_10	10	9	.891
AGE1438_RANGE_9	9	6	.631
AGE1438_RANGE_8	8	3	.447
AGE1438_RANGE_7	7	0	.316
AGE1438_RANGE_6	6	-3	.224
AGE1438_RANGE_5	5	-6	.158
AGE1438_RANGE_4	4	-9	.112
AGE1438_RANGE_3	3	-12	.0794
AGE1438_RANGE_2	2	-15	.0562
AGE1438_RANGE_1	1	-18	.0398
AGE1438_RANGE_0	0	-21	.0282
AGE1438_RANGE_MIN	0		

Note

These values are approximate. For more accuracy use [age1438_data_scale_get](#).

rangePtr

points to the current value of the *range* parameter.

signal

determines whether or not the input signal is connected to the input amplifier.

[AGE1438_SIGNAL_ON](#) attaches the input signal to the 50 Ohm buffer amplifier.

[AGE1438_SIGNAL_OFF](#) redirects the input signal to a dummy 50 Ohm load, and feeds the buffer amplifier from an internally grounded 50 Ohm source resistance. The signal OFF setting is useful for making reference measurements without the signal applied. When using ac coupling the 0.2 pF capacitor remains between the input connector and its 50 Ohm termination.

signalPtr

points to the current value of the *signal* parameter.

Comments

age1438_input_setup

To ensure full alias-free operation the analog anti-alias filter should be ON unless the application inherently bandlimits the input signal to less than $fs/2$. The analog anti-alias filter has a fixed bandwidth and thus is fully effective only when $fs \geq 100$ MHz. If a slower external ADC clock is used, an additional analog filter of the appropriate bandwidth may be required for full alias protection.

When using the analog anti-alias filter, you may need to set the range parameter higher than the actual range of the input signal. The reason for this is that step changes of input voltage cause an overshoot and ringing response at the output of the anti-alias filter. The peak overshoot actually exceeds the input voltage step by about 20%. The range setting must accommodate this overshoot to avoid an ADC overflow.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_input_autozero” on page 148](#), [“age1438_input_range_auto” on page 151](#), [“age1438_input_range_convert” on page 152](#), [“age1438_data_scale_get” on page 102](#)

age1438_interrupt_restore

Restores the interrupt masks to the setting last programmed with **age1438_interrupt_setup**.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_interrupt_restore(ViSession id);
```

Description

The interrupt masks set by the **age1438_interrupt_setup** function are cleared during the interrupt acknowledge cycle. This function restores the cleared interrupt masks.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_interrupt_setup” on page 158](#)

age1438_interrupt_setup

Sets both interrupt parameters. This description also includes information on the following functions which query the interrupt parameters individually:

age1438_interrupt_mask_get gets the interrupt event mask
age1438_interrupt_priority_get gets the VME interrupt line

VXIplug&play Syntax

```
#include "age1438".h  
  
ViStatus age1438_interrupt_setup(ViSession id, ViInt16 intrNum, ViInt16  
    priority, ViInt16 mask);  
ViStatus age1438_interrupt_mask_get(ViSession id, ViInt16 intrNum, ViInt16  
    maskPtr);  
ViStatus age1438_interrupt_priority_get(ViSession id, ViInt16 intrNum,  
    ViInt16 priorityPtr);
```

Description

An Agilent E1438 has two independent interrupt generators, each capable of interrupting on one of the seven VME interrupt lines when a status condition specified by a mask occurs.

age1438_interrupt_setup sets the interrupt mask, priority and which of the two interrupt generators on the Agilent E1438 is to be used. The remaining **age1438_interrupt_** functions query the mask and priority individually.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
intrNum	is the number of the interrupt generator. The only values accepted are 0 and 1.
mask	specifies the mask of events on which to interrupt. VXIbus specifications only allow the 8 most significant bits in the status register, bits 8 to 15, to be set as interrupts. Because of this, the desired mask value must be right shifted 8 positions. In the E1438, bits 14 and 15 of the status register cannot be used to generate interrupts, effectively leaving only 6 bits, 8 through 13, to generate interrupts.
priority	specifies which of the seven VME interrupt lines to use. The only legal values are 0 through 7. Specifying 0 turns the interrupt off, while 7 is the highest priority.
maskPtr priorityPtr	contain the current value of the interrupt <i>mask</i> and <i>priority</i> parameters.

Comments

Interrupt masks are cleared during the interrupt acknowledge cycle. Therefore, the command must be sent again or restored with [“age1438_interrupt_restore” on page 157](#) in order to generate further interrupts.

Example

The program `interrupt.exe` described in the example programs provides an example of how to use interrupts correctly.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_status_get” on page 189](#), [“age1438_attr_get” on page 87](#), [“age1438_interrupt_restore” on page 157](#)

age1438_lbus_mode

Sets the local bus transmission mode. This description also includes the query:

age1438_lbus_mode_get gets the current local bus mode.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_lbus_mode(ViSession id, ViInt16 lbusMode);
```

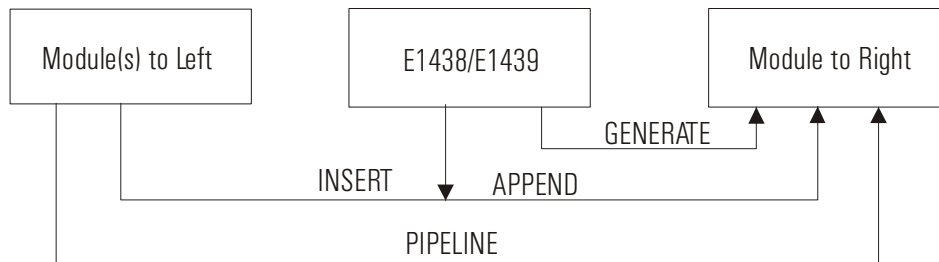
```
ViStatus age1438_lbus_mode_get(ViSession id, ViPInt16 lbusModePtr);
```

Description

age1438_lbus_mode sets the local bus to either generate, append, insert or pipeline data. The data port must be set to the local bus with the **age1438_data_port** function (See “[age1438_data_setup](#)” on page 103) before these modes take effect.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
lbusMode	selects the transmission mode of the local bus when it is enabled by the age1438_data_port function. AGE1438_GENERATE forces the module at <i>id</i> to generate data only, not passing through data from other modules on the local bus. AGE1438_APPEND causes the Agilent E1438 to pass data through from modules on its left and append its data to the end. AGE1438_INSERT causes the Agilent E1438 to place its data on the local bus and then pass data through from modules on its left. AGE1438_PIPELINE causes the Agilent E1438 to pipe data through from modules on its left without appending or inserting its own data. The state of this parameter is unaffected by switching back and forth between the local bus and the VME backplane with the age1438_data_port function.



lbusModePtr	points to the current value of the <i>lbusMode</i> parameter.
--------------------	---

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_data_setup” on page 103](#)

age1438_lbus_reset

Resets the local bus. This description also includes the query:

age1438_lbus_reset_get gets the current local bus reset state

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_lbus_reset(ViSession id, ViInt16 lbusReset);
```

```
ViStatus age1438_lbus_reset_get(ViSession id, ViPInt16 lbusResetPtr);
```

Description

In order to avoid glitches in the local bus data, the local bus interface has strict requirements as to the order in which modules in a VXI mainframe have their local bus interface reset. Upon power-up or whenever any single module in the mainframe is put into a reset state, all modules should be placed into the reset state from left to right. Then all modules can be take out of reset from left to right.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
lbusReset	puts the Agilent E1438's local bus into reset or takes it out of reset. AGE1438_LBUS_RESET_ON puts the Agilent E1438's local bus into reset while AGE1438_LBUS_RESET_OFF takes the Agilent E1438 out of reset.
lbusResetPtr	points to the current value of the <i>lbusReset</i> parameter.

Example

When Agilent E1438s are used with the E1485 measurement controller, the E1485 must be reset while all of the Agilent E1438s are being held in reset to avoid initial glitches in the local bus data. The Agilent E1438s should be taken out of reset only after the first **age1438_meas_control** release is issued. The correct way to reset the local bus is as follows:

```
lbus_control(LBUS_CTL_RESET, 0); /* reset the E1485 lbus */
for all id{
    age1438_lbus_reset(id, AGE1438_ON); /* hold Agilent E1438s in reset */
}

/*Set LBUS mode for all modules */
for all id{
    age1438_meas_control(id, AGE1438_RELEASE, AGE1438_ASSERT);
    /* first arming */
    age1438_lbus_reset(id, AGE1438_OFF);
    /* remove reset from Agilent E1438s, has no effect after first time */
}
lbus_control(LBUS_CTL_RESET, 1); /* unreset the E1485 lbus */
```

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Default values” on page 216](#), [“age1438_init” on page 146](#)

age1438_meas_control

Initiates and controls measurements in multi-module systems.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_meas_control(ViSession id, ViInt16 idle, ViInt16 sync);
```

Description

age1438_meas_control explicitly controls the measurement state.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
idle	selects the condition of the Idle state. AGE1438_ASSERT holds the module in the Idle state. AGE1438_RELEASE reverses a previous AGE1438_ASSERT or ensures that no forced Idle is active.
sync	selects the state of the sync signal. age1438_meas_control also changes the state of the Sync signal, which is used to arm or trigger an Agilent E1438 module. In systems containing multiple Agilent E1438 modules the Sync signal is used to arm or trigger all modules simultaneously, and also to synchronize decimation counters and local oscillators among the Agilent E1438 modules. AGE1438_ASSERT causes the module to assert the Sync signal. AGE1438_RELEASE causes the module to release the Sync signal. When parameters of the age1438_clock_setup function which enable sync output are selected the module shares the sync signal with other Agilent E1438 modules. If any one of these modules asserts this shared Sync signal it then becomes asserted for all of them. All modules must release it before the shared Sync signal is released. Asserting then releasing the Sync line is used to start a measurement, load local oscillator values, or take a digital filter out of reset. These situations require a Sync line transition but do not require that the Sync line be held in a asserted state.

Note	When the Sync line is asserted, it remains asserted for an adequate number of ADC clock cycles to ensure that the signal effect propagates to all the modules in the system. You can determine when the command is completed by looking at the Sync/Idle Complete bit in the Status Register.
-------------	---

Note	Any command that halts the current measurement (See “Commands which halt active measurements” on page 213) also releases the forced Idle and Sync controls. If you want to hold a module in Idle after one of these commands you must call age1438_meas_control again after the the command that halted the current measurement.
-------------	--

Comments

See [“The measurement loop” in chapter 3](#) for details on how a measurement progresses through the four states.

This function performs the following sequence:

1. **Waits for both the AGE1438_STATUS_HARDWARE_SET and AGE1438_STATUS_SYNC_COMPLETE bits to be set.**
2. **Returns AGE1438_STATUS_WAIT_TIMEOUT if more than three seconds elapses in step 1.**
3. **Returns AGE1438_SETUP_ERROR if AGE1438_STATUS_SETUP_ERROR was detected in step 1.**
4. **Writes data to the control register as prescribed by arguments to the function.**
5. **Clears the overload count maintained by the API. See [“Comments on Overload” on page 173](#)**
6. **Waits for AGE1438_STATUS_SYNC_COMPLETE.**
7. **Returns AGE1438_SYNC_NOT_COMPLETE if more than three seconds elapse in step 6, otherwise it returns AGE1438_SUCCESS.**

Special conditions prevail during the Measure state. If programmed for block mode operation in the Measure state, the module asserts the Sync signal (regardless of the **age1438_meas_control** *sync* parameter setting) until a complete block of data has been collected and is available to the I/O port. When the shared Sync signal is released, indicating that all block mode data collection is finished, all block mode modules move synchronously to the idle state. In continuous mode the module releases the Sync signal immediately after moving into the measure state. This allows the **age1438_meas_control** function to manipulate the Sync signal to cause synchronous changes to LO frequency while a continuous measurement is in progress. In continuous mode a module moves to the idle state only if explicitly programmed to do so or whenever the FIFO data buffer overflows.

In addition to controlling the progression through the four module states, the Sync signal is used to allow for synchronizing the decimation counters and local oscillators of multiple Agilent E1438 modules and synchronizing the *fs*/10 clock during external sampling. This is done by calling **age1438_filter_sync** and/or **age1438_frequency_sync** prior to asserting Sync with **age1438_meas_control**. This is normally done with the module in the Idle state; however, the center frequency can also be changed in the Measure state with **age1438_frequency_sync** if the modules are all programmed for continuous (non-block mode) data collection.

If all modules in a multi-module system are in the Idle state when the **age1438_meas_control** *sync* parameter is asserted, the LO frequency is updated and the next measurement is armed. If all modules are in the measurement state in continuous mode, the LO frequency is synchronously updated, and the measurement continues. In continuous mode you should ensure that all modules are in the same state, either the Idle state or the Measure state, before using **age1438_meas_control** to assert Sync. Otherwise some modules re-arm while others continue the current measurement. In block mode the sync assertion is ignored unless all modules are in the Idle state.

age1438_meas_control

The **age1438_meas_control** function assures that a single module is in a valid state by checking that the *hardware complete* and *sync valid* bits in the status register are both true. In synchronous multi-module systems you should use the **age1438_wait** function for each module to assure a valid state in non-master modules within a synchronous group.

In the case of systems made up of multiple mainframes you must be aware that only modules in the mainframe containing the master module, as defined by **age1438_clock_setup**, may assert sync. Any sync asserted in other mainframes is ignored by modules in all mainframes. This is true only for rear panel sync. Front panel sync is not sensitive to master mainframe designation.

Example

The program multichan.exe described in the example programs provides an example of how to correctly set up a multi-module measurement using **age1438_meas_control** to initiate state transitions.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“Default values” on page 216](#), [“age1438_init” on page 146](#), [“age1438_status_get” on page 189](#), [“age1438_data_setup” on page 103](#), [“age1438_filter_sync” on page 137](#), [“age1438_frequency_setup” on page 142](#), [“age1438_clock_setup” on page 91](#), [“age1438_wait” on page 205](#), [“age1438_read” on page 172](#), [“Managing multiple modules” in chapter 3](#), [“The measurement loop” in chapter 3](#), [“Using clock and sync” in chapter 3](#)

age1438_meas_init

Initiates a measurement without first checking for valid hardware setup.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_meas_init(ViSession id);
```

Description

age1438_meas_init provides an easy way to initiate a measurement in a single module.

Note

This command is slightly faster and slightly less robust than [age1438_meas_start](#).

Parameters

id

is the VXI instrument session pointer returned by the **age1438_init** function.

Comments

See “[The measurement loop](#)” in [chapter 3](#) for details on how a measurement progresses through the four states.

This function performs the following sequence:

1. Clears the overload count maintained by the API. See “[Comments on Overload](#)” on [page 173](#)
2. Moves the module to the Idle state.
3. Generates a Sync transition which moves the module to the Arm state.
4. Always returns AGE1438_SUCCESS (no error conditions can be detected by this function).

Return Value

This function always returns **AGE1438_SUCCESS** and does not return any error conditions.

See Also

“[Commands which halt active measurements](#)” on [page 213](#), “[age1438_init](#)” on [page 146](#), “[age1438_meas_start](#)” on [page 168](#), “[age1438_meas_control](#)” on [page 164](#), “[age1438_status_get](#)” on [page 189](#), “[age1438_read](#)” on [page 172](#)

age1438_meas_start

Checks for valid hardware setup and then initiates a measurement.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_meas_start(ViSession id);
```

Description

age1438_meas_start provides an easy way to initiate a measurement in a single module system. This command waits for a valid hardware setup, then, if the instrument is in a valid state, performs the equivalent of [age1438_meas_init](#).

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Comments

See [“The measurement loop” in chapter 3](#) for details on how a measurement progresses through the four states.

This function performs the following sequence:

1. Waits for **AGE1438_STATUS_HARDWARE_SET** bit to be set.
2. Returns **AGE1438_START_ERROR** if more than three seconds elapses in step 1.
3. Returns **AGE1438_SETUP_ERROR** if **AGE1438_STATUS_SETUP_ERROR** was detected in step 1.
4. Performs [age1438_meas_init](#) and returns **AGE1438_SUCCESS**.

Example

The program `acvolts.exe` described in the example programs provides an example of how to initiate a very simple measurement using **age1438_meas_start**.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_meas_control” on page 164](#), [“age1438_meas_init” on page 167](#), [“age1438_status_get” on page 189](#), [“age1438_read” on page 172](#), [“The measurement loop” in chapter 3](#)

age1438_meas_status_get

Returns the current measurement status.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_meas_status_get(ViSession id, ViPInt16 readValid, ViPInt16  
blockReady, ViPInt16 overload);
```

Description

This function is useful in determining the measurement status of a module when using the fiber interface. The advantage of using this function over [age1438_status_get](#), is that this function decodes the measurement-related status register bits. This function returns the current measurement status, which is represented by one of the four following values that are encoded in the bottom two bits of the status register:

Status Bit	Definition	Numeric Values
0-1	AGE1438_STATUS_MEAS_ARM_WAIT	0x0
	AGE1438_STATUS_MEAS_IDLE	0x1
	AGE1438_STATUS_MEAS_IN_PROGRESS	0x2
	AGE1438_STATUS_MEAS_TRIG_WAIT	0x3

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
readValid	returns the state of the AGE1438_STATUS_READ_VALID status register bit.
blockReady	returns the state of the AGE1438_STATUS_BLOCK_READY status register bit.
overload	returns the state of the AGE1438_STATUS_OVERLOAD status register bit.

Return Value

The return value of this function is the current measurement status, as represented by one of four numeric values that are encoded in the bottom two bits of the status register shown in the table above.

See Also

[“age1438_meas_control” on page 164](#), [“age1438_meas_init” on page 167](#), [“age1438_status_get” on page 189](#), [“age1438_read” on page 172](#), [“The measurement loop” in chapter 3](#)

age1438_options_get

Identifies module options.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_options_get(ViSession id, ViChar options[]);
```

Description

Returns a list of options separated by commas.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
options	returns a string of up to 256 characters. For example "144" indicates option 144 (memory) is installed.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_product_id_get

Gets the module's product identification string.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_product_id_get(ViSession id, ViChar productId[]);
```

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

productId returns the module ID such as E1438A or E1438B.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_read

Reads scaled 32-bit floating-point data from the VME backplane register. This description also includes the following function:

age1438_read64 reads scaled 64-bit floating-point data, implemented specifically for VEE applications.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_read(ViSession id, ViReal32 data[], ViInt32 sampleCount,  
ViPInt16 overloadPtr);
```

```
ViStatus age1438_read64(ViSession id, ViReal64 data[], ViInt32 sampleCount,  
ViPInt16 overloadPtr);
```

Description

age1438_read returns a block of floating-point data from the Agilent E1438 that has been scaled to be in volts. The function waits for a block of data to be ready before attempting to read the block.

These functions can only read data from the VME backplane register. The data port of the Agilent E1438 must be set to AGE1438_VME by the **age1438_data_port** function for these functions to be effective.

Note

When using this function, INSTR_REAL32 should be defined when compiling C/C++ programs. To do this, in the Microsoft Visual Development environment, go to Project Settings, select the C/C++ tab, and add INSTR_REAL32 to the preprocessor definitions. In a makefile or on a command line, supply the option "/D INSTR_REAL32" to cl.exe. Under HP-UX, supply the option "-DINSTR_REAL32" to cc. See the acvolts.exe example programs.

This function performs the following sequence:

1. **Checks for AGE1438_STATUS_READ_BLOCK and AGE1438_STATUS_OVERLOAD.**
2. **If a block of data is NOT ready:**
 - A. **The function immediately returns the current measurement state.**
3. **If a block of data IS ready:**
 - A. **Data is read from the module.**
 - B. **It is converted to a floating point number and scaled.**
 - C. **The function returns any errors that were encountered when reading the data.**
 - D. **The value of the overload argument is set to indicate whether any overloads have occurred since the last successful read.**

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- data** is a pointer to the array into which the floating point data is to be placed. Be sure to allocate sufficient storage space at this location to hold the full data record as determined by the *sampleCount* parameter. Note that when the module is set to complex data type, the output data record contains $2 \times \text{sampleCount}$ floating point values. For real data the record contains *sampleCount* floating point values.
- sampleCount** for **age1438_read** *sampleCount* is the number of real or complex data values to read. Real data is one 32-bit floating point value. Complex data is made up of two 32-bit floating point values comprising the real and imaginary values.
- for **age1438_read64** *sampleCount* is the number of real or complex data values to read. Real data is one 64-bit floating point value. Complex data is made up of two 64-bit floating point values comprising the real and imaginary values.
- This should never be set larger than the blocksize parameter set in the **age1438_data_blocksize** function. In continuous data collection mode, *sampleCount* should be set equal to blocksize to ensure that the entire data block is read out.
- overloadPtr** returns an overload indicator. The way to properly use the overload argument for the **age1438_read** or **age1438_read64** function is this:
1. Set up the hardware.
 2. Call **age1438_meas_start**.
 3. Call **age1438_read** or **age1438_read64**.
If data is not available, the read function returns immediately with one of the following return values, and the overload indication is **AGE1438_OFF**:
 - AGE1438_NO_DATA_MEASUREMENT_IN_PROGRESS**
 - AGE1438_NO_DATA_MEASUREMENT_PAUSED**
 - AGE1438_NO_DATA_WAITING_FOR_TRIGGER**
 - AGE1438_NO_DATA_WAITING_FOR_ARM**
 When data is available, **AGE1438_SUCCESS** is returned and the overload value reflects whether an overload was encountered for the given data block.
 4. In continuous mode, subsequent data blocks can be read by calling a **age1438_read** or **age1438_read64** function again (**age1438_meas_start** should not be called again).
 5. When used in this way, an overload indication is given for each and every data block read in block mode. In continuous mode the overload indicator only means there was an overload sometime after calling **age1438_meas_start**.

Comments on Overload

Since reading the status register clears the overload bit, overloads are tracked at the API level.

In block mode, you receive the overload indication on a block-by-block basis by calling **age1438_meas_start** and **age1438_read** in sequence.

In continuous mode, depending on the effective sample rate of the instrument and how often data is read, an overload indication returned by **age1438_read** may or may not correspond to the data returned. The overload indication only means that an overload has occurred since the most recent call to **age1438_meas_init**, **age1438_meas_init**, or

age1438_read

age1438_read, whichever was issued last. You should be aware that it is likely that the reported overload occurred in data which has been acquired in the module, is waiting in the FIFO, but has not yet been read.

Return Value

AGE1438_SUCCESS
AGE1438_NO_DATA_MEASUREMENT_IN_PROGRESS
AGE1438_NO_DATA_MEASUREMENT_PAUSED
AGE1438_NO_DATA_WAITING_FOR_TRIGGER
AGE1438_NO_DATA_WAITING_FOR_ARM

See Also

[“age1438_init” on page 146](#), [“age1438_data_setup” on page 103](#), [“age1438_meas_start” on page 168](#), [“age1438_meas_init” on page 167](#), [“age1438_meas_control” on page 164](#), [“age1438_status_get” on page 189](#), [“The measurement loop” in chapter 3](#)

age1438_read_raw

Reads raw, unscaled data from the VME backplane register.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_read_raw(ViSession id, ViInt16 data[], ViInt32 wordCount,  
    ViPInt16 overloadPtr);
```

Description

age1438_read_raw returns a block of raw, unscaled integer data from the FIFO.

This function can only read data from the VME backplane register. The data port of the Agilent E1438 must be set to AGE1438_VME by the **age1438_data_port** function for this function to be effective.

This function performs the following sequence:

1. Checks for AGE1438_STATUS_READ_BLOCK and AGE1438_STATUS_OVERLOAD.
2. If there is an overload then the overload count maintained by the API is incremented.
3. If a block of data is NOT ready:
 - A. the function immediately returns the current measurement state and
 - B. the value of the overload argument is set to AGE1438_OFF.
4. If a block of data IS ready:
 - A. data is read from the module,
 - B. the function returns any errors that were encountered when reading the data,
 - C. the value of the overload argument is set to AGE1438_ON, and
 - D. the overload count maintained by the API is set to zero.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
data	is a pointer to the array into which the raw data record is to be placed. Be sure to allocate sufficient storage space to hold the full data record as determined by the <i>wordCount</i> parameter.
wordCount	<i>wordCount</i> is the total number of data values to read into the data array from the Agilent E1438 output FIFO. The maximum <i>wordCount</i> depends on the blocksize, data type, and data resolution parameter settings.

age1438_read_raw

Data type	Resolution (bits)	Words per sample
REAL	12	2
REAL	24	4
COMPLEX	12	4
COMPLEX	24	8

In continuous data collection mode, *wordCount* should be set equal to the maximum possible *wordCount* to ensure that the entire data block is read out.

overloadPtr

returns an overload indicator. See “Comments on Overload” on page 173. The way to properly use the overload argument for the **age1438_read_raw** function is this:

1. Set up the hardware.
2. Call **age1438_meas_start**.
3. Call **age1438_read_raw**.

If data is not available, the read function returns immediately with one of the following return values, and the overload indication is **AGE1438_OFF**:

AGE1438_NO_DATA_MEASUREMENT_IN_PROGRESS
AGE1438_NO_DATA_MEASUREMENT_PAUSED
AGE1438_NO_DATA_WAITING_FOR_TRIGGER
AGE1438_NO_DATA_WAITING_FOR_ARM

When data is available, **AGE1438_SUCCESS** is returned and the overload value reflects whether an overload was encountered for the given data block.

4. In continuous mode, subsequent data blocks can be read by calling the **age1438_read_raw** function again (**age1438_meas_start** should not be called again).
5. When used in this way, an overload indication is given for each and every data block read in block mode. In continuous mode the overload indicator only means there was an overload sometime after calling **age1438_meas_start**.

Note

The primary purpose of the **age1438_read_raw** function is to provide the fastest possible way to read blocks of data from the module. Since this command does not perform data scaling after reading data it may save 10-20% of the overall **age1438_read** time, depending on the host computer in use. The resulting data ordering is dependent on the data type and resolution. The array may be cast as a long before reading the data to provide whole words.

Example

A declaration in the Front Panel example program can be changed to exercise **age1438_read_raw()** in **frmMain** of **e1438.vbp**:

```
Const constFreqCentRaw = False 'when TRUE, use age1438_read_raw()
                                'instead of age1438_read
```

Return Value

AGE1438_SUCCESS
AGE1438_NO_DATA_MEASUREMENT_IN_PROGRESS
AGE1438_NO_DATA_MEASUREMENT_PAUSED
AGE1438_NO_DATA_WAITING_FOR_TRIGGER

AGE1438_NO_DATA_WAITING_FOR_ARM**See Also**

[“age1438_init” on page 146](#), [“age1438_read” on page 172](#), [“age1438_status_get” on page 189](#), [“age1438_data_setup” on page 103](#), [“The measurement loop” in chapter 3](#)

age1438_reference_clock

Selects the source of the reference clock. This description also includes the query function:

age1438_reference_clock_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_reference_clock(ViSession id, ViInt16 refClock);
```

```
ViStatus age1438_reference_clock_get(ViSession id, ViPInt16 refClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
refClock	AGE1438_FRONT_PANEL_CLOCK specifies the front panel clock be used as the reference clock. Use this in conjunction with age1438_front_panel_clock_input . AGE1438_VXI_CLOCK specifies that the VXI (rear panel) clock be used as the reference clock. Use this in conjunction with age1438_vxi_clock_output .
refClockPtr	Returns a pointer to the current value of <i>refClock</i> .

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Default values" on page 216, "[age1438_init](#)" on page 146, "[age1438_clock_setup](#)" on page 91, "[age1438_front_panel_clock_input](#)" on page 145, "[age1438_vxi_clock_output](#)" on page 204, "[age1438_reference_prescaler](#)" on page 179, "Using clock and sync" in chapter 3

age1438_reference_prescaler

Selects prescaling of the reference clock. This description also includes the query function:

age1438_reference_prescaler_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_reference_prescaler(ViSession id, ViInt16 refPrescaler);
```

```
ViStatus age1438_reference_prescaler_get(ViSession id, ViInt16  
refPrescalerPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function should generally be left in the default mode. The alternate mode applies to a different model of the module.

Parameters

- | | |
|------------------------|---|
| id | is the VXI instrument session pointer returned by the age1438_init function. |
| refPrescaler | AGE1438_PRESCALE_BY_1 divides the reference clock by one.
AGE1438_PRESCALE_BY_4 divides the reference clock by four. |
| refPrescalerPtr | Returns a pointer to the current value of <i>refPrescalerPtr</i> . |

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Default values”](#) on page 216, [“age1438_init”](#) on page 146, [“age1438_clock_setup”](#) on page 91, [“age1438_reference_clock”](#) on page 178, [“Using clock and sync”](#) in chapter 3

age1438_reset

Places the module in a known state.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_reset(ViSession id);
```

Description

age1438_reset returns the module's internal data structures to the power-up state but does not reset the hardware. This function can be called separately by this function, or may be selected in conjunction with the **age1438_init** function.

Note

Calling this function halts any measurement or fiber transfer.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Comments

The reset values are listed in [“Default values” on page 216](#).

This command takes about 100 ms to complete.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#), [“age1438_reset_hard” on page 181](#)

age1438_reset_hard

Resets the module to the power-up state.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_reset_hard(ViSession id);
```

Description

age1438_reset_hard resets the module's firmware and hardware including the processor.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Comments

The reset values are listed in [“Default values” on page 216](#). In addition, the hardware registers, including the save register, are reset to the power-up state.

This command takes about 15 seconds to complete.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#), [“age1438_reset” on page 180](#)

age1438_revision_query

Returns strings that identify the date of the firmware revision.

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_revision_query(ViSession id, ViChar driverRev[], ViChar  
instrRev[]);
```

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
driverRev	returns the date and time of the module's driver revision in the form: a.dd.dd OPERS Ddd Mmm Date hh:mm:ss YYYY where Ddd is the abbreviated day of the week and Date is an integer from 1 to 31
instrRev	returns the date, time, and board number of the module's firmware revision in the form: mm-dd-yyyy hh:mm 01Bd: xxxx; 02Bd:xxxx where xxxx is a manufacturer's date code used for service purposes.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_self_test

Performs a self-test and returns the result of that self test.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_self_test(ViSession id, ViPInt16 testResult, ViChar
testMessage[]);
```

Description

The Agilent E1438 self test includes the following tests:

- Digital: verifies the integrity of paths from LO chip through the filters to the memory controller.
- Serial: verifies the integrity of serial setup path for each board.
- Memory: fills the entire DRAM then verifies that all the data is correct.
- Analog: verifies that auto zero adjust is working and that the input is triggering.
- Clock: verifies that 100 MHz and 102.4 MHz oscillators are working properly.
- Fiber: performs five-second internal fiber verification.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

testMessage points to the self test status message string up to 256 characters long.

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

testResult points to the instrument numeric error code.

Possible test result values are:

Error Message	Error Code (hex)	Self Test Status Message
AGE1438_ST_SUCCESS	0x000	self test successful
AGE1438_ST_HARDWARE_FAIL	0x001	hardware failure
AGE1438_ST_SERIAL1_FAIL	0x002	serial 1 test failed
AGE1438_ST_SERIAL2_FAIL	0x004	serial 2 test failed
AGE1438_ST_CLOCK1_FAIL	0x008	100 MHz clock test failed
AGE1438_ST_CLOCK2_FAIL	0x010	102.4 MHz clock test failed
AGE1438_ST_MEMORY_FAIL	0x020	memory test failed
AGE1438_ST_DIGITAL1_FAIL	0x040	real data path failed
AGE1438_ST_DIGITAL2_FAIL	0x080	complex data path failed

age1438_self_test

Error Message	Error Code (hex)	Self Test Status Message
AGE1438_ST_ANALOG_FAIL	0x100	analog test failed
AGE1438_ST_FIBER_FAIL	0x200	fiber test failed
AGE1438_ST_EXECUTION_ERR	0x4000	self-test execution error

Note

The required completion time for self-test is up to 25 seconds depending on the amount of memory in the module.

Note

Calling this function halts any measurement or fiber transfer.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“Commands which halt active measurements” on page 213](#), [“age1438_init” on page 146](#)

age1438_serial_number

Sets the serial number of the module. This description also includes the query function:

age1438_serial_number_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_serial_number(ViSession id, ViChar serialNum[]);
```

```
ViStatus age1438_serial_number_get(ViSession id, ViChar serialNum[]);
```

Caution

This command is to be used for repair purposes only.

Description

This command is used to reassign a serial number after a module has been serviced.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

serialNum sends or gets a serial number of less than 16 characters

Note

For this parameter you must allocate a character array of at least 256 characters [AGE1438_STR_LEN_MIN](#), including the null byte, prior to calling this function in any programming language.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_smb_clock_output

Specifies which clock to output from the SMB clock connectors. This description also includes the query function:

age1438_smb_clock_output_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_smb_clock_output(ViSession id, ViInt16 smbClock);
```

```
ViStatus age1438_smb_clock_output_get(ViSession id, ViPInt16 smbClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function selects the source of the output for the front panel SMB clock connectors.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
smbClock	AGE1438_BNC_CLOCK specifies that the BNC input be output from the SMB clock connectors. AGE1438_CLOCK_OFF specifies no output from the SMB clock connectors. AGE1438_DIVIDED_ADC_CLOCK specifies that the divided ADC clock be output from the SMB clock connectors. AGE1438_VXI_CLOCK specifies that the VXI clock be output from the SMB clock connectors.
smbClockPtr	Returns a pointer to the current value of <i>smbClock</i> .

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Default values”](#) on page 216, [“age1438_init”](#) on page 146, [“age1438_clock_setup”](#) on page 91, [“age1438_front_panel_clock_input”](#) on page 145, [“Using clock and sync”](#) in chapter 3

age1438_state_recall

Recalls a module's previous instrument state.

age1438_state_recall

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_state_recall(ViSession id);
```

Description

This function aborts any active measurement and recalls the instrument state previously saved by [age1438_state_save](#). This function requires >100 ms to complete.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Commands which halt active measurements”](#) on page 213, [“age1438_init”](#) on page 146, [“age1438_state_save”](#) on page 188

age1438_state_save

Saves the module's current instrument state.

age1438_state_save

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_state_save(ViSession id);
```

Description

This function may be used to save a state to which you want to return later. [age1438_reset](#) does not change a saved state. The state is not saved to non-volatile RAM.

Note

The saved state is lost by issuing the following commands: [age1438_input_range_auto](#), [age1438_input_autozero](#), [age1438_self_test](#), and [age1438_reset_hard](#).

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

["age1438_init"](#) on page 146, ["age1438_state_recall"](#) on page 187

age1438_status_get

Reads status register information for the module.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_status_get(ViSession id, ViInt16 statusPtr);
```

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

statusPtr points to the status word. The bits are defined below:

Status Bit	Definition	Description
0-1	AGE1438_STATUS_MEAS_ARM_WAIT AGE1438_STATUS_MEAS_IDLE AGE1438_STATUS_MEAS_IN_PROGRESS AGE1438_STATUS_MEAS_TRIG_WAIT	These two bits indicate the current state of the measurement loop. See “The measurement loop” in chapter 3 and “age1438_meas_status_get” on page 169 for more information about these states
2	AGE1438_STATUS_PASSED	Passed: This bit is always set to 1
3	AGE1438_STATUS_READY	This bit is set when the module is ready after power-on. See the VXIbus Specifications for more information.
4	AGE1438_STATUS_FIBER_ACTIVE	This bit is set internally whenever any data has been written to the receive FIFO, or read from the transmit FIFO of the fiber interface within the past 500 milliseconds, approximately. The bit is cleared automatically when activity ceases on the fiber interface
5	AGE1438_STATUS_FIBER_ERROR	This bit is set internally whenever an error condition occurs on the fiber interface. Reading the status register does not clear this bit. To do this, the age1438_fiber_error_clear function must be used explicitly. The function age1438_fiber_error_get can be used to read the contents of the fiber error register. If the error is continuously present, the bit will not be cleared.
6	AGE1438_STATUS_SETUP_ERROR	Setup error: An invalid parameter value was requested. If an invalid block size was requested, the closest valid block size is used until a change to an interrelated parameter makes the requested block size valid. If a data resolution, data type, filter bandwidth, trigger delay, or filter decimation parameter was requested which would result in an inability to make a measurement, the previous valid parameter is used until a change to an interrelated parameter makes the requested parameter valid
7	AGE1438_STATUS_SYNC_COMPLETE	Sync/Idle Complete: This bit is set when the most recent user-initiated Sync or Idle change has propagated through to all modules in a system. The change is a result of asserting Sync or forcing Idle via the Control Register or issuing a <code>meas_control</code> command or function

age1438_status_get

Status Bit	Definition	Description
8	AGE1438_STATUS_READ_VALID	This flag is set whenever there is at least one valid 16-bit data word available to be read via the VME data register. Not valid when using the local bus data port.
9	AGE1438_STATUS_BLOCK_READY	This bit is set in continuous mode whenever the size of the data in the FIFO is equal to or greater than the block size register. Check this bit before reading data to insure that a block of data may be transferred without fear of running out of data, thereby holding up the Local bus or VME bus. This bit is set in block mode whenever the module has successfully taken a block size number of samples since the most recent trigger and is cleared when the block is read out, when force to Idle is asserted, or when the module is armed for another measurement.
10	AGE1438_STATUS_ARMED	This bit is set whenever the module is in the Trigger state, or is in the Arm state and has satisfied its pre-trigger requirements. When this bit is set, the module releases the VXI Sync line. Once all modules release the Sync line, then all modules go to the Trigger state.
11	AGE1438_STATUS_FIFO_OVERFLOW	FIFO Overflow: This bit set when the FIFO buffer overflows in continuous mode
12	AGE1438_STATUS_OVERLOAD	This bit is set whenever the ADC converts a sample that exceeds the range of the ADC. The bit is cleared when the Status register is read.
13	AGE1438_STATUS_ERROR_QUEUE	This bit is set whenever there is an error in the error queue. It is cleared when the error queue is empty
14	AGE1438_STATUS_MODID	A (1) in this field indicates that the module is not selected via the P2 MODID line. A (0) indicates that the module is selected by a high state on the P2 MODID line
15	AGE1438_STATUS_HARDWARE_SET	This bit is set when all commands are complete and the hardware has been set

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“age1438_init”](#) on page 146

age1438_sync_clock

Selects the source of the sync clock. This description also includes the query function:

age1438_sync_clock_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_sync_clock(ViSession id, ViInt16 syncClock);
```

```
ViStatus age1438_sync_clock_get(ViSession id, ViInt16 syncClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Parameters

- | | |
|---------------------|--|
| id | is the VXI instrument session pointer returned by the age1438_init function. |
| syncClock | <p>AGE1438_SMB_CLOCK specifies using the front panel clock on the SMB connectors as the sync clock.</p> <p>AGE1438_VXI_CLOCK specifies using the VXI (rear panel) clock as the sync clock.</p> <p>AGE1438_DIVIDED_ADC_CLOCK specifies using the divided ADC clock as the sync clock.</p> |
| syncClockPtr | Returns a pointer to the current value of <i>syncClock</i> . |

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Default values" on page 216, "[age1438_init](#)" on page 146, "[age1438_clock_setup](#)" on page 91, "[age1438_sync_direction](#)" on page 192, "[age1438_sync_output](#)" on page 193, "Using clock and sync" in chapter 3

age1438_sync_direction

Selects front or rear panel availability of the sync signal. This description also includes the query function:

age1438_sync_direction_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_sync_direction(ViSession id, ViInt16 syncDirection);
```

```
ViStatus age1438_sync_direction_get(ViSession id, ViPInt16 syncDirectionPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function determines whether the front or rear panel sync signal is available to the other panel.

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- syncDirection** [AGE1438_SYNC_FRNT_TO_REAR](#) specifies that front panel sync signal be available on the VXI backplane (rear panel).
[AGE1438_SYNC_REAR_TO_FRNT](#) specifies that the VXI backplane sync signal be available on the front panel SMB sync connectors.
- syncDirectionPtr** Returns a pointer to the current value of *syncDirection*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Default values”](#) on page 216, [“age1438_init”](#) on page 146, [“age1438_sync_output”](#) on page 193, [“age1438_sync_clock”](#) on page 191, [“Using clock and sync”](#) in chapter 3

age1438_sync_output

Selects the output for the sync signal. This description also includes the query function:

age1438_sync_output_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_sync_output(ViSession id, ViInt16 syncOutput);
ViStatus age1438_sync_output_get(ViSession id, ViInt16 syncOutputPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function selects which output the module should use for its sync signal.

Parameters

id

is the VXI instrument session pointer returned by the **age1438_init** function.

syncOutput

[AGE1438_SYNC_OUT_OFF](#) specifies no sync signal output.

[AGE1438_SYNC_OUT_BOTH](#) specifies that the sync signal be output to both the front panel SMB sync connectors and the VXI backplane.

[AGE1438_SYNC_OUT_SMB](#) specifies that the sync signal be output to the front panel SMB sync connectors.

[AGE1438_SYNC_OUT_VXI](#) specifies that the sync signal be output to the VXI backplane.

syncOutputPtr

Returns a pointer to the current value of *syncOutput*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

“Default values” on page 216, [“age1438_init”](#) on page 146, [“age1438_clock_setup”](#) on page 91, [“age1438_sync_clock”](#) on page 191, [“age1438_sync_direction”](#) on page 192, “Using clock and sync” in chapter 3

age1438_trigger_delay_actual_get

Returns the actual trigger delay from the most recent trigger event.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_trigger_delay_actual_get(ViSession id, ViPInt32  
actualDelayPtr);
```

Description

This delay value provides more accuracy than the trigger delay parameter alone since it includes a measurement of the fractional part of the output sample period between the previous output sample and the actual trigger event. The trigger delay accuracy improves the delay value to one ADC sample clock period rather than one output sample period. This can result in a substantial improvement in accuracy when narrow bandwidth decimation filtering is used.

age1438_trigger_delay_actual_get must be called for each new trigger event that requires precise delay measurement. The actual delay is still expressed in ADC sample periods.

In multiple module systems, the actual delay of the triggering module should be used to correct data from other modules in the system.

Note

Due to the way the data is packed within the module, it is possible to get values from this command that represent more than one output sample.

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- actualDelayPtr** points to the returned actual delay from the most recent trigger event representing the actual time from the desired trigger point to the actual trigger point.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_trigger_setup” on page 196](#), [“age1438_trigger_phase_actual_get” on page 195](#), [“Delay and phase in triggered measurements” in chapter 3](#), [“Trigger and phase in multi-module systems” in chapter 3](#)

age1438_trigger_phase_actual_get

Returns a representation of the phase value of the LO at the most recent trigger point.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_trigger_phase_actual_get(ViSession id, ViInt16  
actualPhasePtr);
```

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

actualPhasePtr points to the returned value which is an integer from -32768 to 32767 and should be interpreted as follows:

```
AGE1438_TRIG_PHASE_0 represents 0 degrees (or 0)
AGE1438_TRIG_PHASE_90 represents 90 degrees (or 16384)
AGE1438_TRIG_PHASE_180 represents ±180 degrees (or -32768)
AGE1438_TRIG_PHASE_270 represents +270 (-90) degrees (or -16384)
```

In other words, each count represents 360/65536 degrees of phase.

To convert the returned phase value to degrees, multiply the returned value by 360/65536.

In multiple module systems, the actual phase of the triggering module should be used to correct data from other modules in the system.

The returned phase value represents the digital LO's phase at the time of the actual trigger. This time may vary from the time of the desired trigger by the value returned by [age1438_trigger_delay_actual_get](#).

The LO phase could be used in time domain averaging of blocks, or other operations involving zoomed blocks of data, so that the varying phase of the LO can be removed from the calculation.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to ["age1438_error_message"](#) on page 115.

See Also

["age1438_init"](#) on page 146, ["age1438_trigger_setup"](#) on page 196, ["age1438_trigger_delay_actual_get"](#) on page 194, ["age1438_frequency_setup"](#) on page 142, ["Delay and phase in triggered measurements"](#) in chapter 3, ["Trigger and phase in multi-module systems"](#) in chapter 3

age1438_trigger_setup

Sets all triggering parameters. This description also includes information on the following functions which set or query the trigger parameters individually:

age1438_trigger_adclevel specifies the trigger threshold for an ADC trigger
age1438_trigger_adclevel_get gets the ADC trigger threshold
age1438_trigger_delay specifies a pre- or post-trigger delay time
age1438_trigger_delay_get gets the trigger delay time
age1438_trigger_gen determines whether a module can generate a trigger
age1438_trigger_gen_get gets the trigger generation status
age1438_trigger_magdwell specifies the wait (in samples) before transition causes trigger
age1438_trigger_magdwell_get gets the number of dwell samples
age1438_trigger_maglevel specifies the trigger threshold for a magnitude trigger
age1438_trigger_maglevel_get gets magnitude trigger threshold
age1438_trigger_slope selects a positive or negative trigger
age1438_trigger_slope_get gets trigger slope
age1438_trigger_type determines the trigger type
age1438_trigger_type_get gets trigger type

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_trigger_setup(ViSession id, ViInt16 trigType, ViInt32
    trigDelay, ViInt16 adcLevel, ViInt16 magLevel, ViInt16 slope, ViInt16 genTrig,
    ViInt32 magDwell);
ViStatus age1438_trigger_adclevel(ViSession id, ViInt16 adcLevel);
ViStatus age1438_trigger_adclevel_get(ViSession id, ViPInt16 adcLevelPtr);
ViStatus age1438_trigger_delay(ViSession id, ViInt32 trigDelay);
ViStatus age1438_trigger_delay_get(ViSession id, ViPInt32 trigDelayPtr);
ViStatus age1438_trigger_gen(ViSession id, ViInt16 genTrig);
ViStatus age1438_trigger_gen_get(ViSession id, ViPInt16 genTrigPtr);
ViStatus age1438_trigger_magdwell(ViSession id, ViInt32 magDwell);
ViStatus age1438_trigger_magdwell_get(ViSession id, ViPInt32 magDwellPtr);
ViStatus age1438_trigger_maglevel(ViSession id, ViInt16 magLevel);
ViStatus age1438_trigger_maglevel_get(ViSession id, ViPInt16 magLevelPtr);
ViStatus age1438_trigger_slope(ViSession id, ViInt16 slope);
ViStatus age1438_trigger_slope_get(ViSession id, ViPInt16 slopePtr);
ViStatus age1438_trigger_type(ViSession id, ViInt16 trigType);
ViStatus age1438_trigger_type_get(ViSession id, ViPInt16 trigTypePtr);
```

Description

An Agilent E1438 can be triggered to collect data in a variety of ways. The trigger can be internally generated or can come from an external source. Multiple modules can be triggered synchronously. A variable pre- and post-trigger delay can be programmed for data collection. The slope and level of the trigger point on a signal can be selected. The source of the internal trigger can be either the output of the ADC or the magnitude of the complex output of the decimation filter.

age1438_trigger_setup is the function that sets all trigger parameters at once. An Agilent E1438 generates a trigger only when it is in the Trigger state and the Sync line on the VXI backplane is released. When a trigger is generated, the Agilent E1438 asserts the Sync line.

Parameters

- id** is the VXI instrument session pointer returned by the **age1438_init** function.
- adcLevel** is used to set the triggering signal threshold when using the ADC trigger source. This threshold is $(\text{full scale} \times \text{adclevel}/2048)$, where $-2048 \leq \text{adclevel} \leq 2047$. There is hysteresis around the threshold in order to prevent multiple triggers from a single threshold crossing. Hysteresis is 20 ADC counts, or about 1% full scale.
- Use [AGE1438_ADC_LEVEL_MAX](#) to set the maximum allowable level.
- Use [AGE1438_ADC_LEVEL_MIN](#) to set the minimum allowable level.
- Use [AGE1438_ADC_LEVEL_DEF](#) to set the default ADC trigger threshold.
- An accurate value of full scale (in volts) can be found by:
- $$\text{full scale} = (\text{age1438_data_scale_get} * 2^N) / k$$
- where $N = 15$ if `age1438_data_resolution == AGE1438_12_BIT`
 $N = 29$ if `age1438_data_resolution == AGE1438_24_BIT`
- and $k = 2$ if `age1438_filter_decimate == AGE1438_DECIMATE_SHIFT`
 $k = 2$ if `age1438_data_type == AGE1438_REAL` and `age1438_frequency_center` is non-zero
 $k = 1$ otherwise
- adcLevelPtr** points to the current value of the *adclevel* parameter.
- trigDelay** is the time delay, in units of output samples, between when a trigger is received and the first data point in the output data.
- [AGE1438_TRIG_DELAY_MIN](#) selects the minimum allowable trigger delay.
- [AGE1438_TRIG_DELAY_MAX](#) selects the maximum allowable trigger delay.
- [AGE1438_TRIG_DELAY_DEF](#) sets the default trigger delay.
- Negative values indicate a pre-trigger condition where samples prior to the trigger event are included in the output data. The amount of pre-trigger delay is limited to the number of samples which can be saved in the buffer memory. See the **age1438_data_setup** function description for the number of bytes used per sample. The delay limits depend on the data type as follows:

Trigger delay in output samples (DRAMsize in bytes)

	24 bit complex	24 bit real 12 bit complex	12 bit real
Post trigger	$2^{31}-1$	$2^{31}-1$	$2^{31}-1$
Pre-trigger	$48-(\text{DRAMsize}/6)$	$48-(\text{DRAMsize}/3)$	$48-(\text{DRAMsize}/1.5)$

If *trigDelay* is < (Pre-trigger) a bad parameter error is set.

age1438_trigger_setup

trigDelayPtr	points to the current value of the of <i>delay</i> .
genTrig	determines whether a module may generate a trigger. AGE1438_GENERATE_ON enables triggering. AGE1438_GENERATE_OFF disables triggering. This is useful in multi-module systems with the same trigger type where you want only certain module(s) to generate a trigger.
genTrigPtr	points to the current value of the <i>genTrig</i> parameter.
magDwell	represents the number of samples that the signal magnitude must dwell low before begin recognized as a low for the purpose of generating a magnitude trigger. AGE1438_MAGDWELL_DEF AGE1438_MAGDWELL_MAX AGE1438_MAGDWELL_MIN
magDwellPtr	points to the current value of the <i>magDwell</i> parameter
magLevel	is used to set the triggering to detect when the envelope of a signal crosses the threshold while using the magnitude trigger type. AGE1438_MAG_LEVEL_MAX sets the maximum allowable level and AGE1438_MAG_LEVEL_MIN sets the minimum allowable level. AGE1438_MAG_LEVEL_FS sets the full scale magnitude trigger threshold. AGE1438_MAG_LEVEL_DEF sets the default magnitude trigger threshold. The threshold is set to (AGE1438_MAG_LEVEL_SCALE $\times$ <i>magLevel</i>) dB relative to full scale signal, where $-337 \leq \text{magLevel} \leq 40$.
Comment Magnitude triggering is performed on the log magnitude of the signal. Magnitude triggering occurs when the log magnitude of the signal crosses the specified magnitude trigger threshold. Because of these facts magnitude trigger operation will not always be intuitive, and there is a case that can be misinterpreted as improper operation: Magnitude triggering may not occur when the magnitude trigger threshold level is set below the known maximum amplitude of the input signal. The problem in such a case is that the trigger threshold level is actually set too low, so that few, if any, signal samples fall below that level. A transition from below the magnitude trigger threshold to above may never be detected if a sample is not taken while the signal is below the trigger threshold. The solution is to INCREASE the magnitude trigger level to the level at which there are frequent filter samples occurring both above and below the magnitude trigger threshold	
magLevelPtr	points to the current value of the <i>magLevel</i> parameter.
slope	selects the edge of the trigger source on which a trigger occurs for ADC and external triggers. AGE1438_POSITIVE sets triggering on the positive slope and AGE1438_NEGATIVE on the negative slope.
slopePtr	points to the current value of the of the trigger <i>slope</i> parameter.
trigType	determines the trigger source.

AGE1438_ADC generates a trigger based on the raw data samples from the ADC.

AGE1438_MAG generates a trigger based on the log magnitude of the signal after it has been filtered to a selectable bandwidth around the center frequency established by the **age1438_frequency_setup** function.

AGE1438_EXTERNAL uses transitions on the signal applied to the BNC external trigger connector on the front panel.

AGE1438_EXTERNAL_ECL uses ECL level transitions on the signal applied to the BNC external trigger connector on the front panel.

Note

AGE1438_EXTERNAL_ECL has the same constant value as the **AGE1438_EXTERNAL** constant in the E1438A. **AGE1438_EXTERNAL** is retained for backward compatibility.

AGE1438_EXTERNAL_TTL uses TTL level transitions on the signal applied to the BNC external trigger connector on the front panel.

Note

AGE1438_EXTERNAL_TTL is supported on all E1438B modules, but it is not supported on early E1438A modules. A module with a serial number lower than US41140000 will result in the error **AGE1438_TTL_TRIGGER_NOT_SUPPORTED**.

AGE1438_USER disables the module from any event-driven trigger generation though it is still possible to force the module to trigger a measurement by pulling the Sync line once the module is in the trigger state. You may do this by calling the **age1438_meas_start** function, waiting for the module to reach the trigger state, then triggering the measurement by using **age1438_meas_control** to pull the Sync line.

AGE1438_IMMEDIATE triggers a measurement immediately upon entering the trigger state.

Note

In multi-module systems all modules should be use the same trigger type in order to have the same actual delay.

trigTypePtr

points to the current value of *trigType*.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "**age1438_error_message**" on page 115.

See Also

"Commands which halt active measurements" on page 213, "Default values" on page 216, "**age1438_init**" on page 146, "**age1438_frequency_setup**" on page 142, "**age1438_data_setup**" on page 103, "**age1438_data_scale_get**" on page 102, "**age1438_filter_setup**" on page 134, "**age1438_meas_start**" on page 168, "**age1438_meas_control**" on page 164, "**age1438_trigger_phase_actual_get**" on page 195, "**age1438_trigger_delay_actual_get**" on page 194, "The measurement loop" in chapter 3, "Managing multiple modules" in chapter 3, "Delay and phase in triggered measurements" in chapter 3, "Magnitude trigger and magdwell time" in chapter 3

age1438_trigger_type

This description also includes the query function:

age1438_trigger_type_get

VXI*plug&play* Syntax

```
#include "age1438".h
```

```
ViStatus age1438_trigger_type
```

Description

Parameter

Return Value **AGE1438_SUCCESS** indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

age1438_vcxo

Selects whether the internal clock source in the module is turned on or off. This description also includes the query function:

age1438_vcxo_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_vcxo(ViSession id, ViInt16 vcxoState);
```

```
ViStatus age1438_vcxo_get(ViSession id, ViPInt16 vcxoStatePtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function selects whether the internal clock source is turned on or off. If an internal source is used the [age1438_vcxo_freq](#) function selects which internal source to use.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
vcxoState	AGE1438_VCXO_OFF specifies that both internal clock sources are turned off. AGE1438_VCXO_ON that an internal source is turned on.
vcxoStatePtr	Returns a pointer to the actual state of the VCXO.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Commands which halt active measurements" on page 213, "Default values" on page 216, "[age1438_init](#)" on page 146, "[age1438_clock_setup](#)" on page 91, "[age1438_vcxo_freq](#)" on page 202, "Using clock and sync" in chapter 3

age1438_vcxo_freq

Selects which internal clock source the module should use. This description also includes the query function:

age1438_vcxo_freq_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_vcxo_freq(ViSession id, ViInt16 vcxoFreq);
```

```
ViStatus age1438_vcxo_freq_get(ViSession id, ViInt16 vcxoFreqPtr);
```

Description

This function selects which internal clock source to use. The [age1438_vcxo](#) function determines whether the internal source is activated.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
vcxoFreq	AGE1438_VC XO_100000KHZ selects the 100 MHz internal VCXO source. AGE1438_VC XO_102400KHZ selects the 102.4 MHz internal VCXO source.
vcxoFreqPtr	Returns a pointer to the current value of <i>vcxo_freq</i> .

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Commands which halt active measurements" on page 213, "Default values" on page 216, "age1438_init" on page 146, "age1438_clock_setup" on page 91, "age1438_vcxo_freq_preset" on page 203, "age1438_vcxo" on page 201

age1438_vcxo_freq_preset

Selects which internal clock source should be used as a default.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_vcxo_freq_preset(ViSession id, ViInt16 vcxoFreq);
```

Description

This function selects which internal clock frequency should be set in NVRAM for use upon power-up and reset.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

vcxoFreq [AGE1438_VC XO_100000KHZ](#) uses the 100 MHz internal source.

[AGE1438_VC XO_102400KHZ](#) uses the 102.4 MHz internal source.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message”](#) on page 115.

See Also

[“Default values”](#) on page 216, [“age1438_init”](#) on page 146, [“age1438_clock_setup”](#) on page 91, [“age1438_vcxo”](#) on page 201, [“age1438_vcxo_freq”](#) on page 202

age1438_vxi_clock_output

Selects which clock drives the VXI clock. This description also includes the query function:

age1438_vxi_clock_output_get

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_vxi_clock_output(ViSession id, ViInt16 vxiClock);
```

```
ViStatus age1438_vxi_clock_output_get(ViSession id, ViPInt16 vxiClockPtr);
```

Note

This command should be used only for specialized custom clock requirements. Most useful clock setups can be supplied by [age1438_clock_setup](#).

Description

This function selects which clock the module should use to drive its VXI clock.

Parameters

id	is the VXI instrument session pointer returned by the age1438_init function.
vxiClock	AGE1438_FRONT_PANEL_CLOCK specifies that the specified front panel clock drive the VXI clock. AGE1438_CLOCK_OFF specifies not driving vxi clock on the backplane. AGE1438_DIVIDED_ADC_CLOCK specifies using the divided ADC clock to drive the vxi clock.
vxiClockPtr	Returns a pointer to the current value of <i>vxiClock</i> .

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to "[age1438_error_message](#)" on page 115.

See Also

"Default values" on page 216, "[age1438_init](#)" on page 146, "[age1438_clock_setup](#)" on page 91, "[age1438_front_panel_clock_input](#)" on page 145, "Using clock and sync" in chapter 3

age1438_wait

Facilitates the synchronization and control of multi-module systems.

VXIplug&play Syntax

```
#include "age1438".h
```

```
ViStatus age1438_wait(ViSession id);
```

Description

This function assures that all slave modules are completely set up before issuing measurement control commands to the master module. Prior to calling **age1438_meas_control** for the master module in multi-module systems, you should call **age1438_wait** for each other module within the related synchronous group to which you have previously sent commands.

This function polls the status register of the indicated module until the **AGE1438_STATUS_HARDWARE_SET** and **AGE1438_STATUS_SYNC_COMPLETE** bits are both true, or until approximately three seconds have elapsed. The function returns **AGE1438_SUCCESS** immediately after the status bits are set, or, if the time-out limit is reached, **AGE1438_STATUS_WAIT_TIMEOUT** is returned.

Parameters

id is the VXI instrument session pointer returned by the **age1438_init** function.

Return Value

AGE1438_SUCCESS indicates that a function was successful.

Values other than **AGE1438_SUCCESS** indicate an error condition or other important status condition. To determine the error message, pass the return value to [“age1438_error_message” on page 115](#).

See Also

[“age1438_init” on page 146](#), [“age1438_meas_start” on page 168](#), [“age1438_meas_control” on page 164](#)

Equivalent numeric values for variables

Variable Name	Numeric Value
AGE1438_01_BOARD	0
AGE1438_02_BOARD	1
AGE1438_12BIT	1
AGE1438_24BIT	0
AGE1438_106MBS	0
AGE1438_250MBS	1
AGE1438_AC	1
AGE1438_ADC	1
AGE1438_ADC_LEVEL_DEF	0
AGE1438_ADC_LEVEL_MAX	2047
AGE1438_ADC_LEVEL_MIN	-2048
AGE1438_ANTIALIAS_OFF	0
AGE1438_ANTIALIAS_ON	1
AGE1438_APPEND	2
AGE1438_ASSERT	1
AGE1438_BLOCK	0
AGE1438_BLOCKSIZE_DEF	1024
AGE1438_BLOCKSIZE_MAX	805306320
AGE1438_BLOCKSIZE_MIN	2
AGE1438_BOF_OFF	0
AGE1438_BOF_ON	1
AGE1438_BNC_CLOCK	1
AGE1438_CENT_FREQ_DEF	0.0
AGE1438_CENT_FREQ_MAX	+.5
AGE1438_CENT_FREQ_MIN	-.5
AGE1438_CLOCK_OFF	0
AGE1438_CMPLXDC_OFF	0
AGE1438_CMPLXDC_ON	1
AGE1438_COMPLEX	1
AGE1438_CRC_OFF	0
AGE1438_CRC_ON	1
AGE1438_CONTINUOUS	1

Variable Name	Numeric Value
AGE1438_CUSTOM_CLOCK_SETUP	-1
AGE1438_DATA_DELAY_MAX	805306320
AGE1438_DATA_DELAY_MIN	0
AGE1438_DATA_REGISTER	3
AGE1438_DC	0
AGE1438_DEBUG_LEVEL_0	0
AGE1438_DEBUG_LEVEL_1	1
AGE1438_DEBUG_LEVEL_2	2
AGE1438_DEBUG_LEVEL_3	3
AGE1438_DEBUG_LEVEL_4	4
AGE1438_DEBUG_LEVEL_5	5
AGE1438_DECIMATE_OFF	0
AGE1438_DECIMATE_ON	1
AGE1438_DECIMATE_SHIFT	2
AGE1438_DIVIDE_BY_10	0
AGE1438_DIVIDE_BY_38	1
AGE1438_DIVIDED_ADC_CLOCK	2
AGE1438_EPOCH_GEN_OFF	0
AGE1438_EPOCH_GEN_ON	1
AGE1438_EPOCH_SIZE_MIN	8
AGE1438_EPOCH_SIZE_DEF	1024
AGE1438_EPOCH_SIZE_MAX	4294967292
AGE1438_EXTERNAL	2
AGE1438_ERR_BASE	0X80000000 + 0X3FFC0800
AGE1438_EXTERNAL_ECL	2
AGE1438_EXTERNAL_TTL	5
AGE1438_EXT_SAMPLE_CLOCK	2
AGE1438_EXT_SAMP_SYNC_ENABLE	1
AGE1438_EXT_SAMP_SYNC_CANCEL	0
AGE1438_FI_ERR_UNLOCKED	512
AGE1438_FIBER	2
AGE1438_FIBER_MODE_APPEND	4
AGE1438_FIBER_MODE_COPY	1
AGE1438_FIBER_MODE_GENERATE	3
AGE1438_FIBER_MODE_OFF	0
AGE1438_FIBER_MODE_RAW	2
AGE1438_FIBER_SIG_OFF	0
AGE1438_FIBER_SIG_ON	1
AGE1438_FIBER_SIGNAL_PRESENT	1

Variable Name	Numeric Value
AGE1438_FIBER_VERIFY_INTERNAL	0
AGE1438_FIBER_VERIFY_EXTERNAL	1
AGE1438_FIBER_VERIFY_MIN	1
AGE1438_FIBER_VERIFY_MAX	1073
AGE1438_FLOW_CONTROL_OFF	0
AGE1438_FLOW_CONTROL_NO_COPY	1
AGE1438_FLOW_CONTROL_COPY	2
AGE1438_FRNT_MSTR_EXT_REF	8
AGE1438_FRNT_MSTR_INT_REF	7
AGE1438_FRNT_REAR_MSTR_EXT_REF	10
AGE1438_FRNT_REAR_MSTR_INT_REF	27
AGE1438_FRNT_REAR_SLAV_EXT_REF	28
AGE1438_FRNT_SLAV_EXT_REF	9
AGE1438_FRNT_SYNC_EXT_SAMP	21
AGE1438_FRONT_PANEL_CLOCK	3
AGE1438_FS_MAX	103e6
AGE1438_FS_MIN	10e6
AGE1438_GENERATE	1
AGE1438_GENERATE_OFF	0
AGE1438_GENERATE_ON	1
AGE1438_HEADER_INCR_MIN	0
AGE1438_HEADER_INCR_MAX	1023
AGE1438_HEADER_INDEX_MASK	0x3FF
AGE1438_HEADER_OFF	0
AGE1438_HEADER_ON	1
AGE1438_HEADER_VALUE_MIN	0
AGE1438_HEADER_VALUE_MAX	4294967295
AGE1438_IMMEDIATE	4
AGE1438_INSERT	3
AGE1438_IO_ADDRESS	1
AGE1438_IO_HANDLE	0
AGE1438_LBUS	1
AGE1438_LBUS_RESET_OFF	0
AGE1438_LBUS_RESET_ON	1
AGE1438_LED_RX_SIGNAL	1
AGE1438_LED_RX_DATA	2
AGE1438_LED_TX_ENABLED	4
AGE1438_LED_TX_DATA	8
AGE1438_MAG	3
AGE1438_MAGDWELL_DEF	1

Variable Name	Numeric Value
AGE1438_MAGDWELL_MAX	16777215
AGE1438_MAGDWELL_MIN	0
AGE1438_MAG_LEVEL_DEF	-128
AGE1438_MAG_LEVEL_FS	0
AGE1438_MAG_LEVEL_MAX	40
AGE1438_MAG_LEVEL_MIN	-337
AGE1438_MAG_LEVEL_SCALE	0.37628749457997662
AGE1438_NEGATIVE	1
AGE1438_NO_FIBER_SIGNAL	0
AGE1438_OFF	0
AGE1438_OFFS_DAC_MAX	255
AGE1438_OFFS_DAC_MIN	0
AGE1438_ON	1
AGE1438_PIO_OFF	0
AGE1438_PIO_ON	1
AGE1438_PIPELINE	0
AGE1438_POSITIVE	0
AGE1438_PRESCALE_BY_1	0
AGE1438_PRESCALE_BY_4	1
AGE1438_RANGE_0	0
AGE1438_RANGE_1	1
AGE1438_RANGE_2	2
AGE1438_RANGE_3	3
AGE1438_RANGE_4	4
AGE1438_RANGE_5	5
AGE1438_RANGE_6	6
AGE1438_RANGE_7	7
AGE1438_RANGE_8	8
AGE1438_RANGE_9	9
AGE1438_RANGE_10	10
AGE1438_RANGE_11	11
AGE1438_RANGE_12	12
AGE1438_RANGE_13	13
AGE1438_RANGE_14	14
AGE1438_RANGE_15	15
AGE1438_RANGE_16	16
AGE1438_RANGE_17	17
AGE1438_RANGE_MAX	17
AGE1438_RANGE_MIN	0
AGE1438_RANGE_TIME_MAX	20

Variable Name	Numeric Value
AGE1438_RANGE_TIME_MIN	0
AGE1438_RATE_106MBS	0
AGE1438_RATE_250MBS	1
AGE1438_REAL	0
AGE1438_REAR_MSTR_EXT_REF	15
AGE1438_REAR_MSTR_INT_REF	14
AGE1438_REAR_SLAV_EXT_REF	16
AGE1438_REAR_SYNC_EXT_SAMP	22
AGE1438_RELEASE	0
AGE1438_RM_HANDLE	2
AGE1438_RX_ERR_	
AGE1438_RX_ERR_ALIGNMENT	8
AGE1438_RX_ERR_BEGIN_DISPARITY	4
AGE1438_RX_ERR_CODE_VIOLATION	16
AGE1438_RX_ERR_CRC	2
AGE1438_RX_ERR_DISPARITY	32
AGE1438_RX_ERR_FIFO_OVERFLOW	128
AGE1438_RX_ERR_SIGNAL_LOST	1
AGE1438_RX_ERR_SYNC_LOST	64
AGE1438_RX_ERR_UNLOCKED	512
AGE1438_SIG_BW_MAX	18
AGE1438_SIG_BW_MIN	0
AGE1438_SIGNAL_OFF	0
AGE1438_SIGNAL_ON	1
AGE1438_SIMPLE_EXT_REF	1
AGE1438_SIMPLE_EXT_SAMP	2
AGE1438_SIMPLE_INT_REF	0
AGE1438_SMB_CLOCK	4
AGE1438_ST_ANALOG_FAIL	0X100
AGE1438_ST_CLOCK1_FAIL	0X008
AGE1438_ST_CLOCK2_FAIL	0X010
AGE1438_ST_DIGITAL1_FAIL	0X040
AGE1438_ST_DIGITAL2_FAIL	0X080
AGE1438_ST_EXECUTION_ERR	0X4000
AGE1438_ST_FIBER_FAIL	0X200
AGE1438_ST_HARDWARE_FAIL	0X001
AGE1438_ST_MEMORY_FAIL	0X020
AGE1438_ST_SERIAL1_FAIL	0X002
AGE1438_ST_SERIAL2_FAIL	0X004
AGE1438_ST_SUCCESS	0X000

Variable Name	Numeric Value
AGE1438_STATUS_ARMED	0x400
AGE1438_STATUS_BLOCK_READY	0x200
AGE1438_STATUS_ERROR_QUEUE	0x2000
AGE1438_STATUS_FIBER_ACTIVE	0x10
AGE1438_STATUS_FIBER_ERROR	0x20
AGE1438_STATUS_FIFO_OVERFLOW	0x800
AGE1438_STATUS_HARDWARE_SET	0x8000
AGE1438_STATUS_MEAS_ARM_WAIT	0x1
AGE1438_STATUS_MEAS_IDLE	0x0
AGE1438_STATUS_MEAS_IN_PROGRESS	0x2
AGE1438_STATUS_MEAS_TRIG_WAIT	0x3
AGE1438_STATUS_MODID	0X4000
AGE1438_STATUS_OVERLOAD	0x1000
AGE1438_STATUS_PASSED	0x4
AGE1438_STATUS_READ_VALID	0x100
AGE1438_STATUS_READY	0x8
AGE1438_STATUS_SETUP_ERROR	0x40
AGE1438_STATUS_SYNC_COMPLETE	0x80
AGE1438_STR_LEN_MIN	256
AGE1438_SYNC_FRNT_TO_REAR	0
AGE1438_SUCCESS	0
AGE1438_SYNC_OFF	0
AGE1438_SYNC_ON	1
AGE1438_SYNC_OUT_BOTH	3
AGE1438_SYNC_OUT_OFF	0
AGE1438_SYNC_OUT_SMB	2
AGE1438_SYNC_OUT_VXI	1
AGE1438_SYNC_REAR_TO_FRNT	1
AGE1438_TRIG_DELAY_DEF	0
AGE1438_TRIG_DELAY_MAX	2147286000
AGE1438_TRIG_DELAY_MIN	-805108700
AGE1438_TRIG_PHASE_0	0
AGE1438_TRIG_PHASE_90	16384
AGE1438_TRIG_PHASE_180	-32768
AGE1438_TRIG_PHASE_270	-16384
AGE1438_TX_ERR_OVERRUN	256
AGE1438_USER	0
AGE1438_VC XO_100000KHZ	0
AGE1438_VC XO_102400KHZ	1
AGE1438_VC XO_EXT_REF	1

Equivalent numeric values for variables

Variable Name	Numeric Value
AGE1438_VC XO _INTERNAL	0
AGE1438_VC XO _OFF	0
AGE1438_VC XO _ON	1
AGE1438_VME	0
AGE1438_VXI_CLOCK	5
AGE1438_XFERSIZE_DEF	1024
AGE1438_XFERSIZE_MAX	805306320
AGE1438_XFERSIZE_MIN	2

Commands which halt active measurements

age1438_adc_clock
age1438_clock_recover
age1438_clock_setup
age1438_combo_setup
age1438_data_blocksize
age1438_data_delay
age1438_data_resolution
age1438_data_type
age1438_data_xfersize
age1438_ext_sample_sync
age1438_fiber_verify
age1438_filter_bw
age1438_filter_decimate
age1438_filter_setup
age1438_front_panel_clock_input
age1438_init
age1438_input_autozero
age1438_input_range_auto
age1438_meas_control
age1438_meas_init
age1438_meas_start
age1438_reset
age1438_reset_hard
age1438_self_test
age1438_state_recall
age1438_trigger_delay
age1438_trigger_setup
age1438_vcxo
age1438_vcxo_freq

Commands which void synchronized multi-module setups:

age1438_clock_setup and low-level clock setup functions
age1438_clock_recover
age1438_input_autozero
age1438_input_range_auto
age1438_self_test
age1438_state_recall

Error messages

Warnings and errors are based on the value VI_ERROR

Error Number	Parameter	Description
0x0000	AGE1438_SUCCESS	No error, command succeeded
0x80000000+0x3FFC0800	AGE1438_ERR_BASE	Base number for error values
AGE1438_ERR_BASE + 0x0001	AGE1438_BAD_COMMAND	Invalid command code
AGE1438_ERR_BASE + 0x0002	AGE1438_INVALID_HW_CONFIG	The hardware configuration is not supported
AGE1438_ERR_BASE + 0x0003	AGE1438_PARM_ERROR	Invalid command parameter
AGE1438_ERR_BASE + 0x0004	AGE1438_NV_SAVE_ERROR	Error while saving to non-volatile memory
AGE1438_ERR_BASE + 0x0005	AGE1438_DOWNLOAD_ERROR	Error while downloading new firmware
AGE1438_ERR_BASE + 0x0006	AGE1438_SERIAL_TIMEOUT	Serial bus time-out; hardware error
AGE1438_ERR_BASE + 0x0007	AGE1438_BYTE_SWAP_ERROR	Incorrect byte-order setting
AGE1438_ERR_BASE + 0x0008	AGE1438_START_ERROR	Start error
AGE1438_ERR_BASE + 0x0009	AGE1438_HARDWARE_FAILURE	Hardware failure
AGE1438_ERR_BASE + 0x000a	AGE1438_WATCHDOG_RESET_ERROR	Watchdog timer caused a hard reset, possibly due to a hardware problem
AGE1438_ERR_BASE + 0x0011	AGE1438_NO_DATA_MEASUREMENT_IN_PROGRESS	No data available, a measurement is in progress.
AGE1438_ERR_BASE + 0x00102	AGE1438_NO_DATA_MEASUREMENT_PAUSED	No data available, the measurement is paused
AGE1438_ERR_BASE + 0x0013	AGE1438_NO_DATA_WAITING_FOR_TRIGGER	No data available, trigger has not occurred
AGE1438_ERR_BASE + 0x0014	AGE1438_NO_DATA_WAITING_FOR_ARM	No data available, acquiring pre-trigger data
AGE1438_ERR_BASE + 0x0016	AGE1438_NO_E1438_FOUND	No AGE1438 found at specified logical address
AGE1438_ERR_BASE + 0x0017	AGE1438_PROC_READY_TIMEOUT	Time-out is waiting for AGE1438 command processor
AGE1438_ERR_BASE + 0x0018	AGE1438_MEMORY_ALLOCATION_ERROR	Memory allocation error

Error Number	Parameter	Description
AGE1438_ERR_BASE + 0x001b	AGE1438_INTERFACE_HARDWARE_INCOMPATIBLE	Interface hardware incompatible with instrument drivers
AGE1438_ERR_BASE + 0x001d	AGE1438_NULL_ID	ID parameter is zero, function aborted
AGE1438_ERR_BASE + 0x0001e	AGE1438_STATUS_WAIT_TIMEOUT	Time-out waiting for desired status
AGE1438_ERR_BASE + 0x00067	AGE1438_AUTOZERO_ERROR	Autozero error
AGE1438_ERR_BASE + 0x00068	AGE1438_AUTOZERO_CONVERGENCE_ERROR	Possible hardware problem
AGE1438_ERR_BASE + 0x00069	AGE1438_AUTOZERO_SIGN_ERROR	Possible hardware problem
AGE1438_ERR_BASE + 0x006c	AGE1438_AUTORANGE_ERROR	Autorange error
AGE1438_ERR_BASE + 0x0080	AGE1438_SETUP_ERROR	Hardware setup error
AGE1438_ERR_BASE + 0x0081	AGE1438_SYNC_NOT_COMPLETE	Command or Idle assertion did not complete
AGE1438_ERR_BASE + 0x000b	AGE1438_FIBER_ERROR	Fiber interface error
AGE1438_ERR_BASE + 0x0015	AGE1438_VERSION_B_HARDWARE_REQUIRED	Version B hardware required error
AGE1438_ERR_BASE + 0x0019	AGE1438_TTL_TRIGGER_NOT_SUPPORTED	Hardware does not support TTL trigger

Errors required for SICL/SPIL when using HP E1485

Error Number	Parameter	Description
AGE1438_ERR_BASE + 0x0082	AGE1438_UNKNOWN_STATUS	Unknown error
AGE1438_ERR_BASE + 0x0083	AGE1438_SHARED_MEMORY_MAP_ERROR	Conflict in memory mapping
AGE1438_ERR_BASE + 0x0084	AGE1438_SPIL_ERROR	Unexpected SPIL error
AGE1438_ERR_BASE + 0x0085	AGE1438_SICL_ERROR	SICL specific error

Default values

Function	Parameter	Default Value
"age1438_adc_clock" on page 85	adcClock	AGE1438_VCXO_INTERNAL
"age1438_adc_divider" on page 86	adcDivider	AGE1438_DIVIDE_BY_10
"age1438_clock_setup" on page 91	clockSetup	AGE1438_SIMPLE_INT_REF
"age1438_data_setup" on page 103	blocksize	AGE1438_BLOCKSIZE_DEF
	dataDelay	AGE1438_DATA_DELAY_MIN
	dataType	AGE1438_REAL
	mode	AGE1438_BLOCK
	port	AGE1438_VME
	resolution	AGE1438_12BIT
"age1438_data_xfersize" on page 109	xfersize	AGE1438_XFERSIZE_DEF
"age1438_epoch_setup" on page 111	epochGenerate	AGE1438_EPOCH_GEN_ON
	epochSize	AGE1438_EPOCH_SIZE_DEF
	headerEnable	AGE1438_HEADER_OFF
	incrementCount	AGE1438_HEADER_INCR_MIN
	headerValue	AGE1438_HEADER_VALUE_MIN
"age1438_ext_sample_sync" on page 117	syncEnable	AGE1438_EXT_SAMP_SYNC_CANCEL
"age1438_fiber_setup" on page 125	bofEnable	AGE1438_BOF_OFF
	crcEnable	AGE1438_CRC_ON
	fiberMode	AGE1438_FIBER_MODE_COPY
	flowControlEnable	AGE1438_FLOW_CONTROL_OFF
	transferRate	AGE1438_106MBS
"age1438_fiber_xmt_signals" on page 132	pio1	AGE1438_FIBER_SIG_OFF
	pio2	AGE1438_FIBER_SIG_OFF
	dir	AGE1438_FIBER_SIG_OFF
	nrdy	AGE1438_FIBER_SIG_OFF
"age1438_filter_setup" on page 134	decimate	AGE1438_DECIMATE_OFF
	sigBw	AGE1438_SIG_BW_MIN
"age1438_frequency_setup" on page 142	cmplxDC	AGE1438_CMPLXDC_OFF
	centerFreq	AGE1438_CENT_FREQ_DEF
	sync	AGE1438_SYNC_OFF
"age1438_front_panel_clock_input" on page 145	fpClock	AGE1438_CLOCK_OFF
"age1438_input_setup" on page 154	antialias	AGE1438_ANTIALIAS_ON

Function	Parameter	Default Value
"age1438_interrupt_setup" on page 158	coupling	AGE1438_DC
	range	AGE1438_RANGE_MAX
	signal	AGE1438_SIGNAL_ON
	mask	0
	priority	0
"age1438_lbus_mode" on page 160	lbusMode	AGE1438_PIPELINE
"age1438_lbus_reset" on page 162	lbusReset	AGE1438_LBUS_RESET_ON
"age1438_meas_control" on page 164	idle	AGE1438_RELEASE
	sync	AGE1438_RELEASE
"age1438_reference_clock" on page 178	refClock	AGE1438_VXI_CLOCK
"age1438_reference_prescaler" on page 179	refPrescaler	AGE1438_PRESCALE_BY_1
"age1438_smb_clock_output" on page 186	smbClock	AGE1438_CLOCK_OFF
"age1438_sync_clock" on page 191	syncClock	AGE1438_DIVIDED_ADC_CLOCK
"age1438_sync_direction" on page 192	syncDirection	AGE1438_SYNC_FRNT_TO_REAR
"age1438_sync_output" on page 193	syncOutput	AGE1438_SYNC_OUT_OFF
"age1438_trigger_setup" on page 196	adcLevel	AGE1438_ADC_LEVEL_DEF
	genTrig	AGE1438_GENERATE_ON
	magDwell	AGE1438_MAGDWELL_DEF
	magLevel	AGE1438_MAG_LEVEL_DEF
	slope	AGE1438_POSITIVE
	trigDelay	AGE1438_TRIG_DELAY_DEF
	trigType	AGE1438_IMMEDIATE
	vcxoState	AGE1438_VCXO_ON
	vcxoFreq	AGE1438_VCXO_100000KHZ
	vcxoFreq	AGE1438_VCXO_102400KHZ
"age1438_vxi_clock_output" on page 204	vxiClock	AGE1438_CLOCK_OFF

VXIplug&play Syntax Quick Reference

ViStatus age1438_adc_clock(**ViSession** *id*, **ViInt16** *adcClock*)
ViStatus age1438_adc_clock_get(**ViSession** *id*, **ViPInt16** *adcClockPtr*)
ViStatus age1438_adc_divider(**ViSession** *id*, **ViInt16** *adcDivider*)
ViStatus age1438_adc_divider_get(**ViSession** *id*, **ViPInt16** *adcDividerPtr*)
ViStatus age1438_attr_get(**ViSession** *id*, **ViInt16** *attribute*, **ViPInt32** *value*)
ViStatus age1438_cal_get(**ViSession** *id*, **ViInt16** *board*, **ViPInt32** *timestampPtr*)
ViStatus age1438_clock_fs(**ViSession** *id*, **ViReal64** *fs*)
ViStatus age1438_clock_fs_get(**ViSession** *id*, **ViPReal64** *fsPtr*)
ViStatus age1438_clock_recover(**ViSession** *id*)
ViStatus age1438_clock_setup(**ViSession** *id*, **ViInt16** *clockSetup*)
ViStatus age1438_clock_setup_get(**ViSession** *id*, **ViPInt16** *clockSetupPtr*)
ViStatus age1438_close(**ViSession** *id*)
ViStatus age1438_combo_setup(**ViSession** *id*, **ViInt16** *sigBw*, **ViInt32** *blocksize*,
 ViInt32 *phase*, **ViInt32** *interpolate*)
ViStatus age1438_data_memsize_get(**ViSession** *id*, **ViPInt16** *memSizePtr*)
ViStatus age1438_data_scale_get(**ViSession** *id*, **ViPReal64** *scalePtr*)
ViStatus age1438_data_setup(**ViSession** *id*, **ViInt16** *dataType*, **ViInt16** *resolution*,
 ViInt16 *mode*, **ViInt32** *blocksize*, **ViInt32** *dataDelay*, *reserved*, **ViInt16** *port*)
ViStatus age1438_data_blocksize(**ViSession** *id*, **ViInt32** *blocksize*)
ViStatus age1438_data_blocksize_get(**ViSession** *id*, **ViPInt32** *blocksizePtr*)
ViStatus age1438_data_delay(**ViSession** *id*, **ViInt32** *dataDelay*)
ViStatus age1438_data_delay_get(**ViSession** *id*, **ViPInt32** *dataDelayPtr*)
ViStatus age1438_data_mode(**ViSession** *id*, **ViInt16** *mode*)
ViStatus age1438_data_mode_get(**ViSession** *id*, **ViPInt16** *modePtr*)
ViStatus age1438_data_port(**ViSession** *id*, **ViInt16** *port*)
ViStatus age1438_data_port_get(**ViSession** *id*, **ViPInt16** *portPtr*)
ViStatus age1438_data_resolution(**ViSession** *id*, **ViInt16** *resolution*)
ViStatus age1438_data_resolution_get(**ViSession** *id*, **ViPInt16** *resolutionPtr*)
ViStatus age1438_data_type(**ViSession** *id*, **ViInt16** *dataType*)
ViStatus age1438_data_type_get(**ViSession** *id*, **ViPInt16** *dataTypePtr*)
ViStatus age1438_data_xfersize(**ViSession** *id*, **ViInt32** *xfersize*)
ViStatus age1438_data_xfersize_get(**ViSession** *id*, **ViPInt32** *xfersizePtr*)
ViStatus age1438_driver_debug_level(**ViSession** *id*, **ViInt16** *debugLevel*)
ViStatus age1438_driver_debug_level_get(**ViSession** *id*, **ViPInt16** *debugLevelPtr*)
ViStatus age1438_epoch_setup(**ViSession** *id*, **ViInt16** *epochGenerate*, **ViInt32**
 epochSize, **ViInt16** *headerEnable*, **ViInt32** *initialValue*, **ViInt32** *incrementCount*)
ViStatus age1438_epoch_generate(**ViSession** *id*, **ViInt16** *epochGenerate*)
ViStatus age1438_epoch_generate_get(**ViSession** *id*, **ViPInt16** *epochGeneratePtr*)
ViStatus age1438_epoch_header(**ViSession** *id*, **ViInt32** *headerValue*,
 ViInt32 *incrementCount*)
ViStatus age1438_epoch_header_get(**ViSession** *id*, **ViPInt32** *headerValuePtr*,
 ViPInt32 *incrementCountPtr*)
ViStatus age1438_epoch_header_enable(**ViSession** *id*, **ViInt16** *headerEnable*)

```

ViStatus age1438_epoch_header_enable_get(ViSession id, ViPInt16
    headerEnablePtr)
ViStatus age1438_epoch_size(ViSession id, ViInt32 epochSize)
ViStatus age1438_epoch_size_get(ViSession id, ViPInt32 epochSizePtr);
ViStatus age1438_error_message(ViSession id, ViStatus statusCode, ViChar
    errorMessage[])
ViStatus age1438_error_query(ViSession id, ViPInt32 errorCode, ViChar
    errorMessage[])
ViStatus age1438_ext_sample_sync(ViSession id, ViInt16 syncEnable)
ViStatus age1438_ext_sample_sync_get(ViSession id, ViPInt16 syncEnablePtr)
ViStatus age1438_fiber_clear(ViSession id)
ViStatus age1438_fiber_error_clear(ViSession id)
ViStatus age1438_fiber_error_get(ViSession id, ViInt16 fiberErrorPtr)
ViStatus age1438_fiber_LED_get(ViSession id, ViPInt16 ledRegPtr)
ViStatus age1438_fiber_rcv_signals_get(ViSession id, ViPInt16 pio1, ViPInt16
    pio2, ViPInt16 dir, ViPInt16 nrdy);
ViStatus age1438_fiber_setup(ViSession id, ViInt16 mode, ViInt16 bofEnable,
    ViInt16 flowControlEnable, ViInt16 crcEnable, ViInt16 transferRate)
ViStatus age1438_fiber_BOF(ViSession id, ViInt16 bofEnable)
ViStatus age1438_fiber_BOF_get(ViSession id, ViPInt16 bofEnablePtr)
ViStatus age1438_fiber_crc(ViSession id, ViInt16 crcEnable)
ViStatus age1438_fiber_crc_get(ViSession id, ViPInt16 crcEnablePtr)
ViStatus age1438_fiber_flow_control(ViSession id, ViInt16 flowControlMode)
ViStatus age1438_fiber_flow_control(ViSession id, ViInt16 flowControlModePtr)
ViStatus age1438_fiber_mode(ViSession id, ViInt16 fiberMode)
ViStatus age1438_fiber_mode_get(ViSession id, ViPInt16 fiberModePtr)
ViStatus age1438_fiber_signal_get(ViSession id, ViPInt16 fiberSignalPtr)
ViStatus age1438_fiber_transfer_rate(ViSession id, ViInt16 transferRate)
ViStatus age1438_fiber_transfer_rate_get(ViSession id, ViPInt16 transfer-
    RatePtr)
ViStatus age1438_fiber_verify(ViSession id, ViInt16 verifyPath, ViInt16 sec)
ViStatus age1438_fiber_xmt_BOF(ViSession id)
ViStatus age1438_fiber_xmt_signals(ViSession id, ViInt16 pio1, ViInt16 pio2,
    ViInt16 dir, ViInt16 nrdy)
ViStatus age1438_fiber_xmt_signals_get(ViSession id, ViInt16 pio1, ViInt16
    pio2, ViInt16 dir, ViInt16 nrdy)
ViStatus age1438_filter_setup(ViSession id, ViInt16 sigBw, ViInt16 decimate)
ViStatus age1438_filter_decimate(ViSession id, ViInt16 decimate)
ViStatus age1438_filter_decimate_get(ViSession id, ViPInt16 decimatePtr)
ViStatus age1438_filter_bw(ViSession id, ViInt16 sigBw)
ViStatus age1438_filter_bw_get(ViSession id, ViPInt16 sigBwPtr)
ViStatus age1438_filter_sync(ViSession id)
ViStatus age1438_frequency_center_raw(ViSession id, ViInt32 phase, ViInt32
    interpolate)
ViStatus age1438_frequency_center_raw_get(ViSession id, ViPInt32 phasePtr,
    ViPInt32 interpolatePtr)
ViStatus age1438_frequency_center_raw_compute(ViSession id, ViReal64 cen-
    ter, ViPInt32 phasePtr, ViPInt32 interpolatePtr)
ViStatus age1438_frequency_setup(ViSession id, ViInt16 cmplxDC, ViInt16 sync,
    ViReal64 centerFreq)
ViStatus age1438_frequency_center(ViSession id, ViReal64 centerFreq)
ViStatus age1438_frequency_center_get(ViSession id, ViPReal64 centerFreqPtr)

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VXIplug&play Syntax Quick Reference

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ViStatus age1438_frequency_cmplxdc(ViSession id, ViInt16 cmplxDC)
ViStatus age1438_frequency_cmplxdc_get(ViSession id, ViPInt16 cmplxDCPtr)
ViStatus age1438_frequency_sync(ViSession id, ViInt16 sync)
ViStatus age1438_frequency_sync_get(ViSession id, ViPInt16 syncPtr)
ViStatus age1438_front_panel_clock_input(ViSession id, ViInt16 fpClock)
ViStatus age1438_front_panel_clock_input_get(ViSession id, ViPInt16
    fpClockPtr)
ViStatus age1438_init(ViRsrc rsrcName, ViBoolean idQuery, ViBoolean resetIn-
    str, ViPSession id)
ViStatus age1438_input_autozero(ViSession id)
ViStatus age1438_input_offset(ViSession id, ViInt16 coarseDac, ViInt16 fineDac)
ViStatus age1438_input_offset_get(ViSession id, ViPInt16 coarseDacPtr,
    ViPInt16 fineDacPtr)
ViStatus age1438_input_offset_save(ViSession id)
ViStatus age1438_input_range_auto(ViSession id, ViReal64 sec)
ViStatus age1438_input_range_convert(ViSession id, ViInt16 range, ViPReal64
    rangeVoltsPtr)
ViStatus age1438_input_setup(ViSession id, ViInt16 reserved, ViInt16 range,
    ViInt16 coupling, ViInt16 antiAlias, ViInt16 signal)
ViStatus age1438_input_alias_filter(ViSession id, ViInt16 antiAlias)
ViStatus age1438_input_alias_filter_get(ViSession id, ViPInt16 antiAliasPtr)
ViStatus age1438_input_coupling(ViSession id, ViInt16 coupling)
ViStatus age1438_input_coupling_get(ViSession id, ViPInt16 couplingPtr)
ViStatus age1438_input_range(ViSession id, ViInt16 range)
ViStatus age1438_input_range_get(ViSession id, ViPInt16 rangePtr)
ViStatus age1438_input_signal(ViSession id, ViInt16 signal)
ViStatus age1438_input_signal_get(ViSession id, ViPInt16 signalPtr)
ViStatus age1438_interrupt_restore(ViSession id)
ViStatus age1438_interrupt_setup(ViSession id, ViInt16 intrNum, ViInt16 prior-
    ity, ViInt16 mask)
ViStatus age1438_interrupt_mask_get(ViSession id, ViInt16 intrNum, ViPInt16
    maskPtr)
ViStatus age1438_interrupt_priority_get(ViSession id, ViInt16 intrNum,
    ViPInt16 priorityPtr)
ViStatus age1438_lbus_mode(ViSession id, ViInt16 lbusMode)
ViStatus age1438_lbus_mode_get(ViSession id, ViPInt16 lbusModePtr)
ViStatus age1438_lbus_reset(ViSession id, ViInt16 lbusReset)
ViStatus age1438_lbus_reset_get(ViSession id, ViPInt16 lbusResetPtr)
ViStatus age1438_meas_control(ViSession id, ViInt16 idle, ViInt16 sync)
ViStatus age1438_meas_init(ViSession id)
ViStatus age1438_meas_start(ViSession id)
ViStatus age1438_meas_status_get(ViSession id, ViPInt16 readValid, ViPInt16
    blockReady, ViPInt16 overload)
ViStatus age1438_options_get(ViSession id, ViChar options[])
ViStatus age1438_product_id_get(ViSession id, ViChar productId[])
ViStatus age1438_read(ViSession id, ViReal32 data[], ViInt32 sampleCount,
    ViPInt16 overloadPtr)
ViStatus age1438_read64(ViSession id, ViReal64 data[], ViInt32 sampleCount,
    ViPInt16 overloadPtr)
ViStatus age1438_read_raw(ViSession id, ViInt16 data[], ViInt32 wordCount,
    ViPInt16 overloadPtr)
ViStatus age1438_reference_clock(ViSession id, ViInt16 refClock)

```

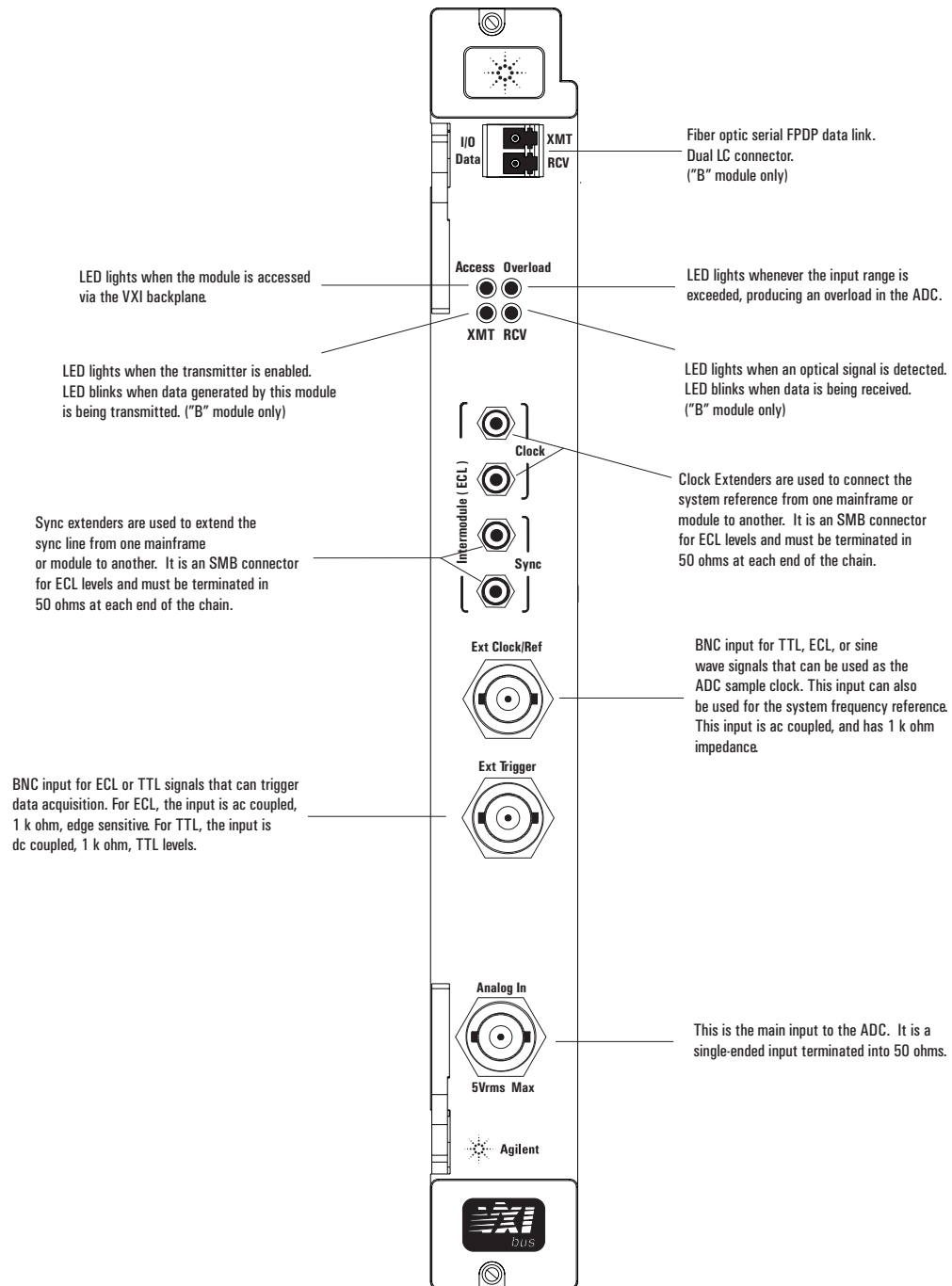
```

ViStatus age1438_reference_clock_get(ViSession id, ViPInt16 refClockPtr)
ViStatus age1438_reference_prescaler(ViSession id, ViInt16 refPrescaler)
ViStatus age1438_reference_prescaler_get(ViSession id, ViPInt16 refPrescalerPtr)
ViStatus age1438_reset(ViSession id)
ViStatus age1438_reset_hard(ViSession id)
ViStatus age1438_revision_query(ViSession id, ViChar driverRev[], ViChar instrRev[])
ViStatus age1438_self_test(ViSession id, ViPInt16 testResult, ViChar testMessage[])
ViStatus age1438_serial_number(ViSession id, ViChar serialNum[])
ViStatus age1438_serial_number_get(ViSession id, ViChar serialNum[])
ViStatus age1438_smb_clock_output(ViSession id, ViInt16 smbClock)
ViStatus age1438_smb_clock_output_get(ViSession id, ViPInt16 smbClockPtr)
ViStatus age1438_state_recall(ViSession id)
ViStatus age1438_state_save(ViSession id)
ViStatus age1438_status_get(ViSession id, ViPInt16 statusPtr)
ViStatus age1438_sync_clock(ViSession id, ViInt16 syncClock)
ViStatus age1438_sync_clock_get(ViSession id, ViPInt16 syncClockPtr)
ViStatus age1438_sync_direction(ViSession id, ViInt16 syncDirection)
ViStatus age1438_sync_direction_get(ViSession id, ViPInt16 syncDirectionPtr)
ViStatus age1438_sync_output(ViSession id, ViInt16 syncOutput)
ViStatus age1438_sync_output_get(ViSession id, ViPInt16 syncOutputPtr)
ViStatus age1438_trigger_delay_actual_get(ViSession id, ViPInt32 actualDelayPtr)
ViStatus age1438_trigger_phase_actual_get(ViSession id, ViPInt16 actualPhasePtr)
ViStatus age1438_trigger_setup(ViSession id, ViInt16 trigType, ViInt32 trigDelay, ViInt16 adcLevel, ViInt16 magLevel, ViInt16 slope, ViInt16 generate, ViInt32 magDwell)
ViStatus age1438_trigger_adclevelevel(ViSession id, ViInt16 adcLevel)
ViStatus age1438_trigger_adclevelevel_get(ViSession id, ViPInt16 adcLevelPtr)
ViStatus age1438_trigger_delay(ViSession id, ViInt32 trigDelay)
ViStatus age1438_trigger_delay_get(ViSession id, ViPInt32 trigDelayPtr)
ViStatus age1438_trigger_gen(ViSession id, ViInt16 genTrig)
ViStatus age1438_trigger_gen_get(ViSession id, ViPInt16 genTrigPtr)
ViStatus age1438_trigger_magdwell(ViSession id, ViInt32 magDwell)
ViStatus age1438_trigger_magdwell_get(ViSession id, ViPInt32 magDwellPtr)
ViStatus age1438_trigger_maglevel(ViSession id, ViInt16 magLevel)
ViStatus age1438_trigger_maglevel_get(ViSession id, ViPInt16 magLevelPtr)
ViStatus age1438_trigger_slope(ViSession id, ViInt16 slope)
ViStatus age1438_trigger_slope_get(ViSession id, ViPInt16 slopePtr)
ViStatus age1438_trigger_type(ViSession id, ViInt16 trigType)
ViStatus age1438_trigger_type_get(ViSession id, ViPInt16 trigTypePtr)
ViStatus age1438_vcxo(ViSession id, ViInt16 vcxoState)
ViStatus age1438_vcxo_get(ViSession id, ViPInt16 vcxoStatePtr)
ViStatus age1438_vcxo_freq(ViSession id, ViInt16 vcxoFreq)
ViStatus age1438_vcxo_freq_get(ViSession id, ViPInt16 vcxoFreqPtr)
ViStatus age1438_vcxo_freq_preset(ViSession id, ViInt16 vcxoFreq)
ViStatus age1438_vxi_clock_output(ViSession id, ViInt16 vxiClock)
ViStatus age1438_vxi_clock_output_get(ViSession id, ViPInt16 vxiClockPtr)
ViStatus age1438_wait(ViSession id)

```

Module Description

Front Panel Description



VXI backplane connections

Power Supplies and Ground

The E1438 conforms to the VME and VXI specifications for pin assignment. The current drawn from each supply is listed in the Technical Specifications.

Data Transfer Bus

The E1438 conforms to the VME and VXI specifications for pin assignment and protocol. Only A16/D16/D32 data transfers are supported, thus the upper addresses are ignored.

DTB Arbitration Bus

The E1438 is not capable of requesting bus control, thus it does not use the Arbitration bus. To conform to the VME and VXI specifications, it passes the bus lines through.

Priority Interrupt Bus

The E1438 generates interrupts by applying a programmable mask to its status bits. The priority of the interrupt is determined by the interrupt priority setting in the control register.

Utility Bus

The VME specification provides a set of lines collectively called the utility bus. Of these lines, the E1438 only uses the SYSRESET* line.

Pulling the SYSRESET* line low (a hardware reset) has the same effect as setting the reset bit in the Control Register (a software reset), with two exceptions. The exceptions are:

- The Control Register is also reset.
- All logic arrays are reloaded.

Reloading the logic arrays enables the hardware reset to recover from power dropouts, which may invalidate the logic setup.

Local Bus

The VXI specification includes a 12-wire local bus between adjacent module slots. Using the local bus, Agilent Technologies has defined a standard byte-wide ECL protocol that transfers data from left to right at up to 100 Mbyte/second. The E1438 can be programmed to output its data using this high speed port instead of the VME data output register. The Data Port Control register determines which output port is used.

VXI backplane connections

Trigger Lines

The VXI specification provides 8 TTL and 2 ECL trigger lines that can be used for module-specific signaling. When programmed in a multi-input configuration, the E1438 uses the ECL trigger lines, designating ECLTRG0 as the SYNC line and ECLTRG1 as the 10 MHz Reference Clock (CLOCK). These lines can be extended to other mainframes using the SMB connectors on the front panel. The SMB connectors can also be used for intermodule synchronization within a mainframe, leaving the ECL trigger lines free for other purposes.

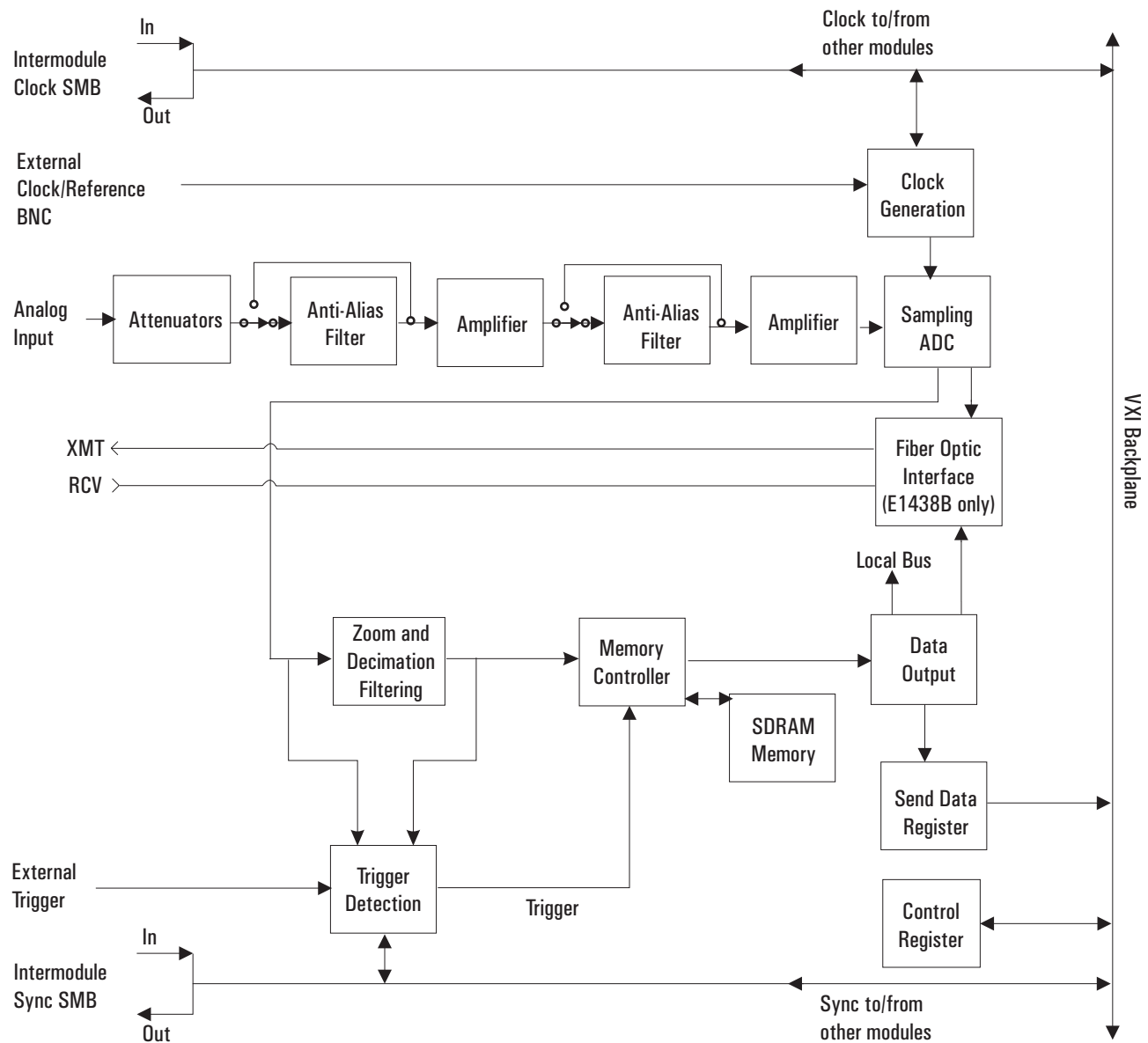
The CLOCK line is the master reference clock for a synchronous system of multiple E1438 modules. Only one E1438 module in each mainframe is allowed to drive this line.

The SYNC line is used to send timing signals among E1438 modules in a multi-input system. Any module that drives this line must do so synchronously with CLOCK so that transitions on SYNC do not occur near the rising edge of CLOCK. This ensures that all modules with a synchronous state machine clocked on CLOCK interprets SYNC in a consistent manner for each cycle of the state machine. SYNC is used for synchronizing, arming, and triggering signals between E1438 modules. The interpretation of the SYNC line is dependent on the states of the module described in [“The measurement loop” on page 35](#). The E1438 module is also capable of controlling the SYNC line synchronously via the control register.

For more information on multi-module operation see [“Managing multiple modules” on page 44](#).

Block diagram and description

More detailed descriptions of selected elements in the diagram below appear further on in this section.



Block diagram and description**Input**

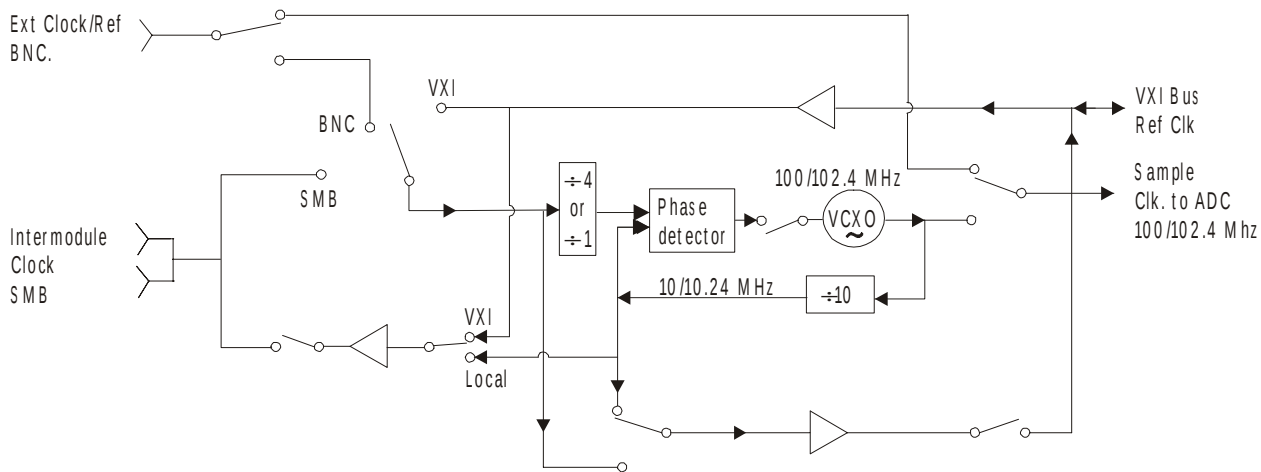
The input is terminated by the input amplifier that follows the first half of the anti-alias filter. The bandwidth of the input is 40 MHz. The attenuation of the input is programmable.

Under program control, the input signal can be ac coupled. This allows the system to measure low level ac signals in the presence of a large dc offset.

Clock Generation

The usual source for a clock signal is the 100 MHz or the 102.4 MHz crystal oscillator inside the E1438. However, the E1438 can also accept an external clock signal through a front-panel BNC "Ext Clock/Ref". This signal can be TTL, ECL, or sine wave.

In a system using more than one E1438, the ADCs can be synchronized by programming them to use a common SYNC line on the backplane as a reference. One of the modules can be the clock master that drives this line. This master clock can be extended to other mainframes by connecting an "Intermodule Clock" SMB connector to an "Intermodule Clock" SMB connector on an E1438 in the second mainframe.

**Anti-alias Filter**

Since the normal ADC sample rate is 100 MHz, a complete representation of the input signal can be achieved only for bandwidths up to 50 MHz. Frequency components above 50 MHz can cause ambiguous results (aliasing).

The anti-alias filter attenuates these high frequency components to reduce aliasing. The anti-alias filter in the E1438 is flat to 40 MHz and rejects signals above 60 MHz by at least 90 dB. Thus the 0-40 MHz frequency range of the sampled signal is -90 dB alias free. The filter's transition band from 40 MHz to 60 MHz affects flatness and allow some aliasing in the sampled signal frequency range of 40 MHz to 50 MHz.

In cases where alias filtering is not necessary, the E1438 can be programmed to bypass the anti-alias filter. To avoid incorrect results, the alias filter bypass mode should be used with caution; it is not recommended for normal operation.

Sampling ADC

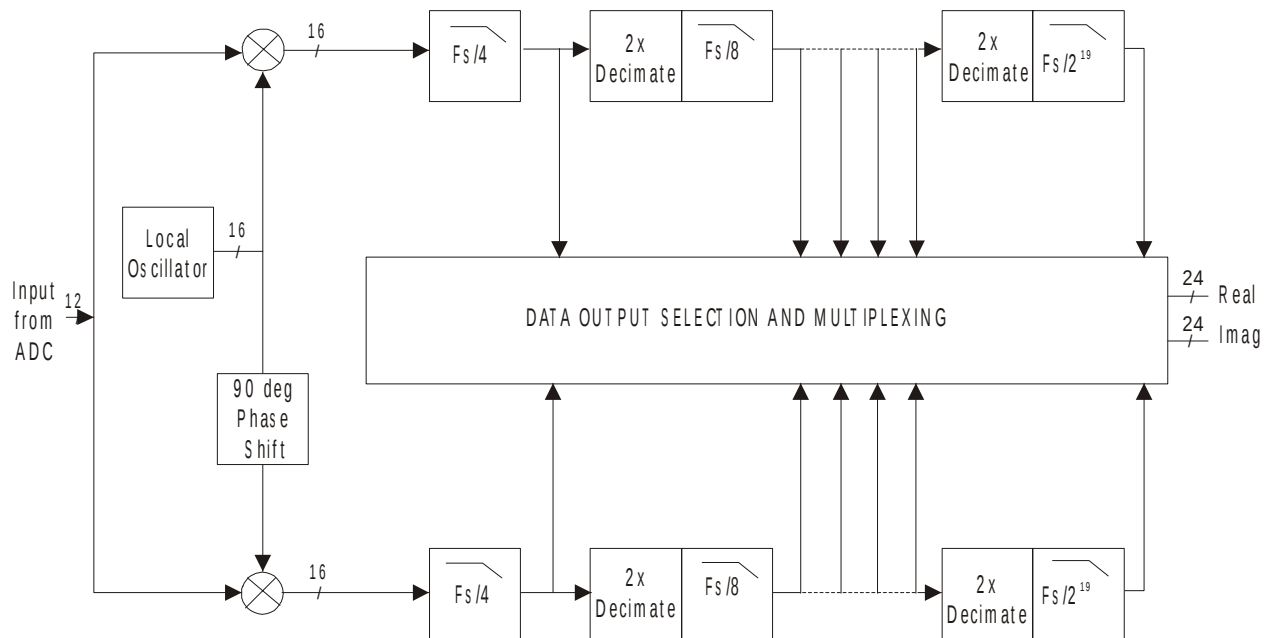
The heart of the E1438 is a precision analog-to-digital converter (ADC). The ADC generates 12 bit outputs at a sample rate up to 102.4 MHz. This raw unfiltered data can be output via the E1438B's fiber optic interface.

Zoom and Decimation Filtering

This section uses digital circuitry to allow programmable changes in the center frequency and signal bandwidth of the E1438 (zoom). This is done at high speed for real-time operation.

Bandwidth is controlled by a chain of digital low-pass filters (see the diagram below). Each of the filters reduces the bandwidth by a factor of two (decimation). With the ADC sample rate (f_s) set to the standard internal 100.0 MHz rate, the bandwidth choices are 40 MHz, 20 MHz, 10 MHz, ... 76 Hz around the programmed local-oscillator (LO) frequency.

Real and imaginary components of the signal are each computed to 24-bit precision, so the complex output of the decimation filtering block contains 48 bits. Whether or not all of these bits are stored in memory is programmable.



Memory Controller and SDRAM Memory

The E1438 can be programmed to save the real component of the signal or to save the complete complex signal. The data precision can be set to 12 bits or 24 bits. Thus, each sample occupies from 1.5 to 6 bytes of memory in the SDRAM. The memory controller block packs the selected data into 72-bit words, which are stored in the SDRAM memory. Since the standard SDRAM depth is $2M \times 72$ bits, it is possible to hold up to 12-Msamples in memory at one time.

Block diagram and description

The memory may be configured either in block mode or in continuous mode. In block mode, data collection initiated by a trigger proceeds until a specified block length is captured. The measurement is then paused so that the data can be read out. This mode is useful in capturing single transient events or whenever the output data rate is too high to be read and processed in real time.

In continuous mode, data collection is initiated by a trigger and continues as long as the SDRAM memory does not overflow. Data may be read out of the memory while the measurement is in progress. If the reading of data is sufficiently fast, the SDRAM memory never overflows and the measurement continues indefinitely. If the SDRAM memory should ever overflow then the measurement stops and waits for data to be read out, the measurement to be re-armed, and a new trigger to be initiated. This mode of operation is useful for real-time applications that employ a high speed signal processor to continuously read and operate on each sample of data. Data can be read from the SDRAM memory in bursts to accommodate pauses for such things as disk access times or block mode computations.

The effective trigger time may be offset from the actual trigger event by programming a trigger timing offset. See the Technical Specifications for the limits of the pre-trigger and post-trigger offset.

Data Output

You can transfer data from the Agilent E1438A or E1438B via the VMEbus and the Local Bus. With the Agilent E1438B, you can also transmit data via a fiber optic interface.

To use the VXI backplane, the E1438 can be programmed so that the output of the memory controller is sent to the Send Data register. The 12- or 24-bit sample data is zero-padded out to 16 or 32 bits. The register can then be read by any controller compatible with the VME standard. Maximum data flow is about 2 MB/s.

The local bus allows data transfers over a high speed 8-bit ECL bus to an adjacent module (to the right) in the VXI mainframe. Multiple adjacent E1438 modules can send data to one signal processor module. The signal processor must be one that supports the Agilent Technologies ECL local bus protocol, such as the Agilent E1485A/B. In addition to higher speed (up to 66 MB/s), the local bus has the advantage that data can be output at the same time that control signals are being sent over the VXI backplane.

The Agilent E1438B's fiber optic interface provides data rates greater than 200 MB/s. It is implemented as a serial FPDP (front panel data port). The serial FPDP is a high-speed low-latency serial communication link.

In all three of the data output modes, the samples must be read out sequentially, offset by the trigger delay.

Fiber Optic Interface

The E1438B's fiber optic interface can transmit filtered or unfiltered data, copy data from its receiver to its transmitter, or append data to copied data. The interface's receiver port is not a data receiver—it merely copies data to its transmitter port and detects FPDP control signals (e.g., PIO bits and flow control signals).

Trigger Detection

The trigger event used to start a measurement can be generated in five different ways:

- Software
- External
- ADC threshold
- Log-magnitude
- Immediate

External and ADC threshold triggering modes support slope selection. In ADC or log-magnitude mode, the trigger threshold has hysteresis (20 ADC sample counts for the ADC trigger, and 1.5 dB for the magnitude trigger) to prevent noise-generated triggers of the wrong slope. Log magnitude triggering is based on the magnitude of the complex signal after zooming and filtering and only supports positive slope trigger detection.

The external trigger mode is selectable between ECL and TTL. The trigger signal must be connected to the Ext Trigger BNC connector on the front panel. In ECL trigger mode, this input is ac coupled with an impedance of 1 k ohm so any signal with a sharp rising or falling transition greater than 100 mV (i.e., TTL or ECL) can be used as an external trigger source. Minimum pulse width is 300 ns. Since the ECL trigger input is an ac-coupled comparator with hysteresis, its initial state is unknown. Before using it, a trigger pulse should be applied to the Ext Trigger connector to initialize it to a known state. In TTL trigger mode, the external trigger input is dc coupled with an impedance of 1 k ohm and uses normal TTL level thresholds (0.8 V and 2.0 V).

Note

External TTL trigger is not supported on E1438A modules with serial numbers lower than US41140000.

Any E1438 module can trigger other E1438 modules using a shared sync line on the VXI backplane. This Sync line can be extended to other mainframes by connecting a "Sync" SMB connector in one mainframe to a "Sync" SMB connector on an E1438 in the second mainframe. All modules in a synchronous system are triggered on the same ADC sample.

The E1438 hardware samples the trigger source once every sample clock, so the trigger condition must be present for at least one sample clock in order to be recognized.

Control Registers

The E1438 module is controlled by firmware using registers mapped into the 16-bit VXI address space.

Module Description

Block diagram and description

Replacing Assemblies

Replaceable parts

The E1438 must be returned to Agilent Technologies for service or calibration. Exchange modules are shipped with no memory so you must move the memory from the original module to the replacement module. This section shows you how to add or replace memory modules.

For information on upgrading your module or replacing parts, contact your local Agilent Technologies sales and service office. See the Technical Specifications or the Agilent Technologies web site (<http://www.agilent.com>) for a list of office locations and addresses.

Ordering Information

To order parts in the U.S., call Agilent Technologies Parts Direct Ordering at (877) 447-PART or go to <https://www.parts.agilent.com/>. Outside the U.S., please contact your local Agilent Technologies parts center.

Code Numbers

The following table provides the name and location for the manufacturers' code numbers (Mfr. Code) listed in the replaceable parts table.

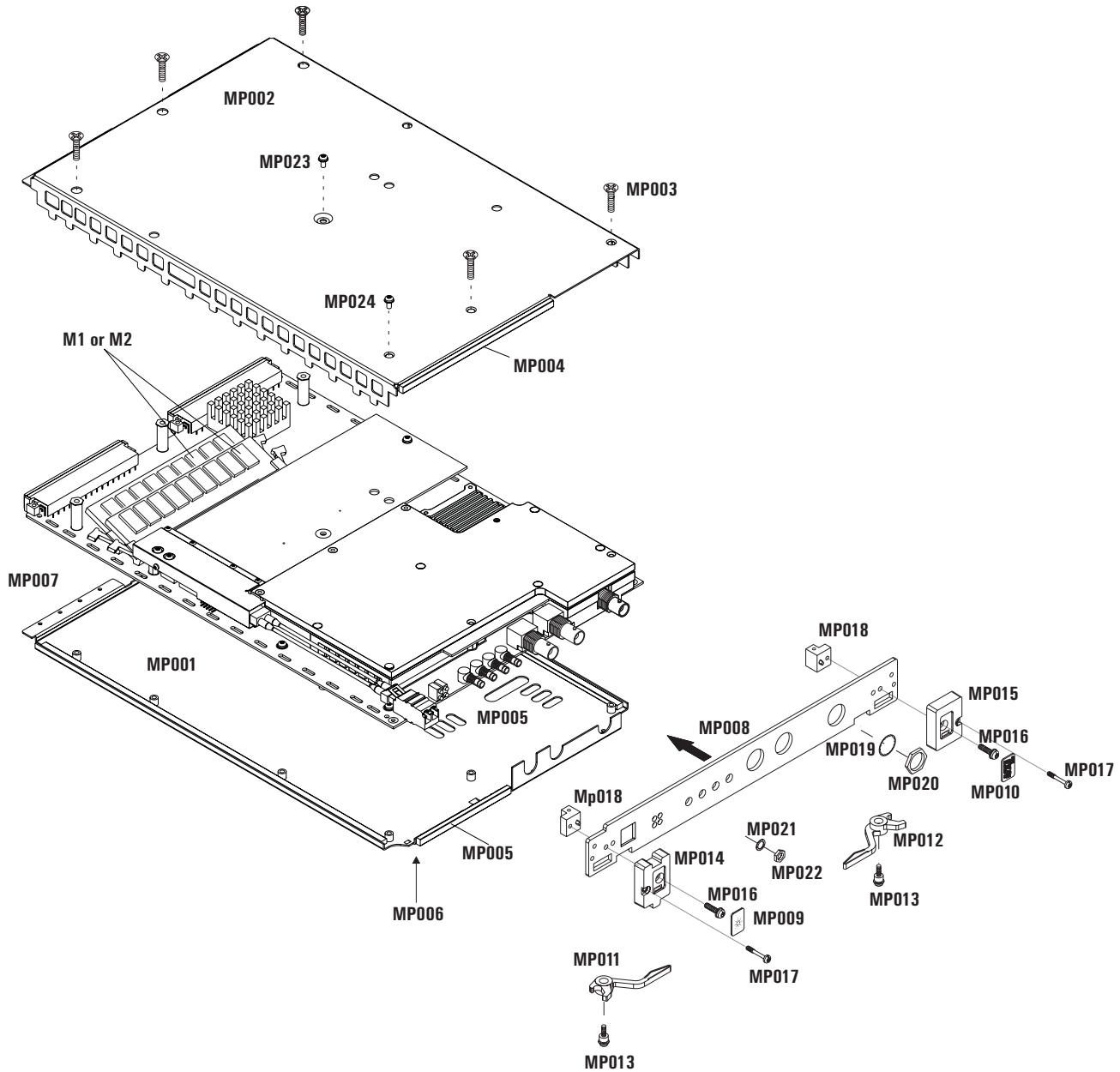
Mfr. No.	Mfr. Name	Location
28480	Agilent Technologies, Inc.	Palo Alto, CA U.S.A.
03647	Instrument Specialties Co. Inc.	Delaware Water Gap, PA U.S.A.
04637	Phelps Dodge Corp.	New York, NY U.S.A.
16044	Kingston Technology Corp.	Fountain Valley, CA U.S.A.
07606	ITW Inc. / Medalist	Glenview, IL U.S.A.
04605	Fischer Special Mfg. Co	Cincinnati, OH U.S.A.
05610	Textron, Inc.	Providence, RI U.S.A.
06363	Oudensha America Inc.	Elk Grove Village, IL U.S.A.

Replaceable parts

Assemblies

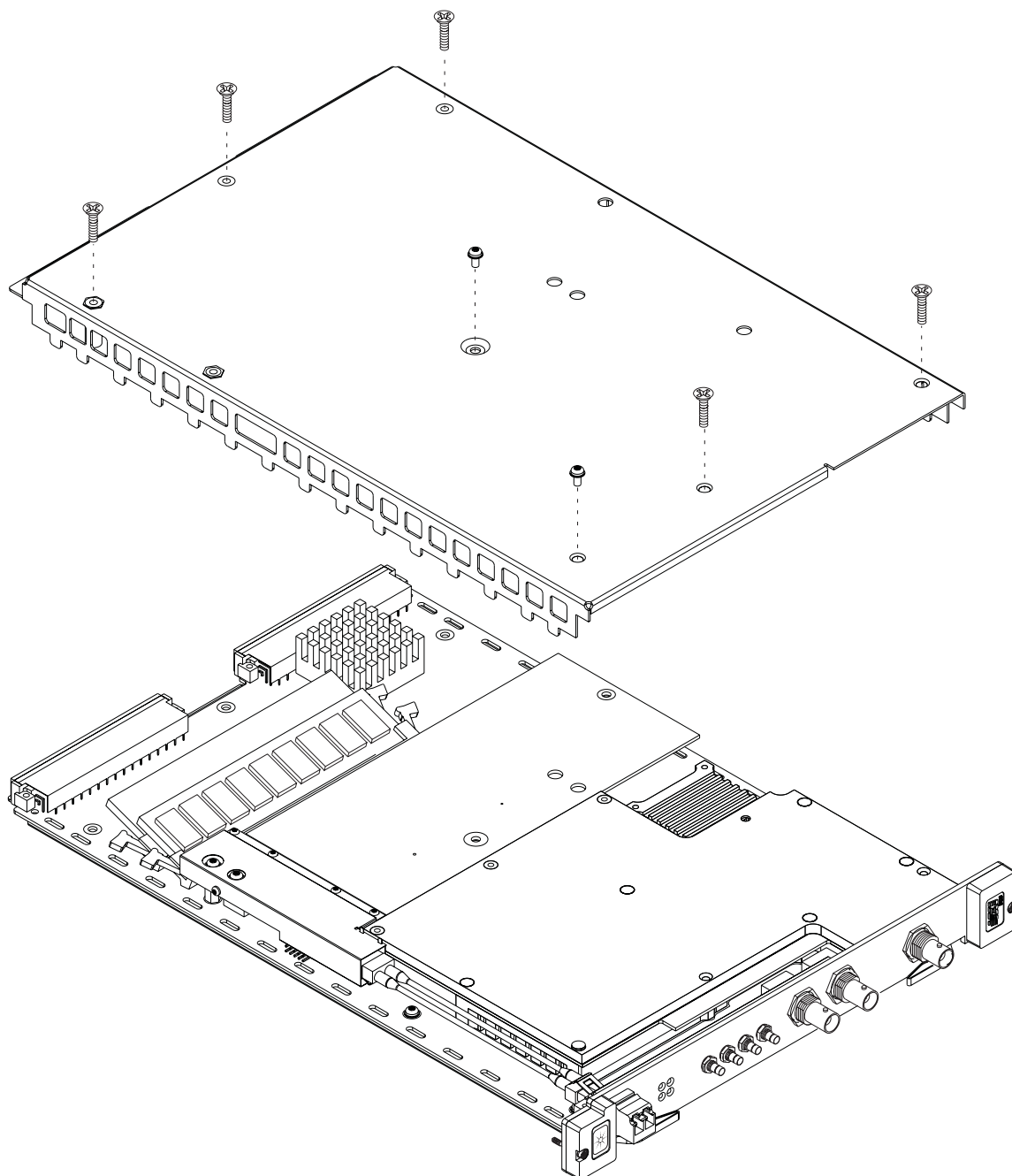
Caution

The module is static sensitive. Use the appropriate precautions when removing, handling, and installing to avoid damage.

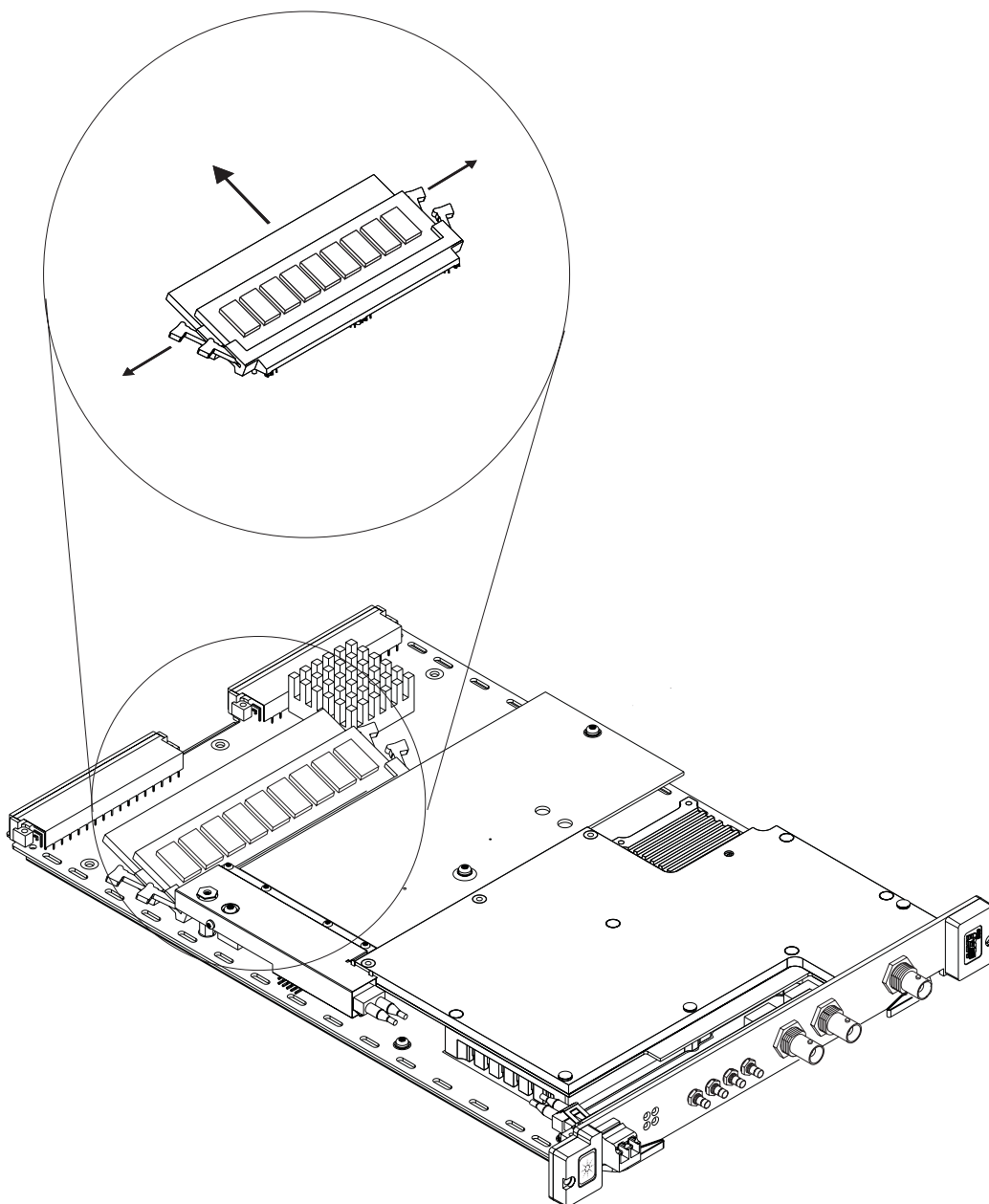


Ref Des	Agilent Part Number	Qty	Description	MfrCode	Part Number
	E1438-69201	1	E1438A EXCHANGE MODULE	28480	E1438-69201
	E1438-69211	1	E1438B EXCHANGE MODULE	28480	E1438-69211
M1	1818-7889	1	SYNC DIMM 16MB 2X72 66MHZ - 16 M mem	16044	KTM66X72/16
M2	1818-7901	2	SYNC-DIMM 16MX72 PC100 168-DIMM - 128 M mem	16044	KGM100X72C3/128
M2	1818-8606	2	SYNC-DIMM 16MX72 PC100 168-DIMM - 512 M mem	16044	KVR100X72C3/512
MP001	E1438-00203	1	SHTF-BOTTOM COVER	28480	E1438-00203
MP002	E1438-00242	1	SHTF-TOP COVER	28480	E1438-00242
MP003	0515-1135	5	SCREW-MACH M3 x 0.5 25MM-LG	05610	0515-1135
MP004	E1438-40601	1	GSKT-RFI-FRT PNL	28480	E1438-40601
MP005	E1485-40601	2	GSKT-RFI-BTTM CVR	28480	E1485-40601
MP006	8160-0686	2	RFI STRIP-FINGERS	03647	00786-185
MP007	8160-0634	0.4	RFI STRIP-FINGERS	03647	0097-0611
MP008	E1438-00234	1	FRONT PANEL 'E1438A'	28480	E1438-00234
MP008	E1438-00244	1	FRONT PANEL 'E1438B'	28480	E1438-00244
MP009	7121-7893	1	PLT-NAME 'SPARK'	06363	7121-7893
MP010	7121-7965	1	PLT-NAME VXI 'PLUG&PLAY'	06363	7121-7965
MP011	E1400-45101	1	MOLD-TOP	28480	E140045101
MP012	E1400-45102	1	MOLD-BOTTOM	28480	E140045102
MP013	E1400-00610	2	SCR-ASM SHLDR	28480	E1400-00610
MP014	E1400-45011	1	MOLD TOP-'SPARK'	28480	E1400-45011
MP015	E1400-45008	1	MOLD BTM-'VXI'	28480	E1400-45008
MP016	0515-0664	2	SCREW MACHINE ASSEMBLY M3 X 0.5 12MM-LG	07606	0515-0064
MP017	0515-2733	2	SCREW SPCL M2.5 X 0.45 17MM-LG PAN-HD	07606	0515-2733
MP018	E1400-40104	2	CAST	28480	E1400-40104
MP019	2190-0068	3	WASHER-LK INTL T 1/2 IN .505-IN-ID	07606	1924-02NP
MP020	2950-0154	3	NUTHEX-DBL-CHAM 1/2-28-THD .078-IN-THK	04605	2950-0154
MP021	2190-0124	4	WASHER-LK INTL T NO. 10 .195-IN-ID	04637	500222
MP022	2950-0078	4	NUTHEX-DBL-CHAN 10-32-THD .067-IN-THK	04637	500220
MP023	0515-0430	1	SCREW-MACHINE M3 X 0.5 6MM-LG	05610	0515-0430
MP024	0515-1103	1	SCREW-MACHINE M3 X 0.5 10MM-LG	05610	0515-1103

To remove the top cover



To remove the M1, M2 assemblies



Replaceable parts

Glossary

anti-alias filter	An analog low pass filter inserted the signal path to eliminate undesirable frequency components which appear under the alias of another (baseband) frequency. For more information, see <i>Spectrum and Network Measurements</i> available through your Agilent Technologies Sales Office.
baseband	A band in the frequency spectrum that begins at zero. In contrast a zoomed band is centered on a specific center frequency.
block mode	A mode in which the Agilent E1438 stops taking data as soon as a block of data has been collected.
block size	The number of sample points in a block of data. For complex data, block size is the number of complex data pairs per data block.
BOF	A fiber frame that acts as a synchronizing event.
continuous mode	A mode in which the Agilent E1438 collects data continuously. It does not stop taking data unless the FIFO overflows.
data frames	A fiber frame that contains 0 to 512 32-bit data words.
decimation filter	A digital filter that simultaneously decreases the bandwidth of the signal and decreases the sample rate. The digital filter provides alias protection and increases frequency resolution. For more information, see <i>Spectrum and Network Measurements</i> available through your Agilent Technologies Sales Office.
EOE	A fiber frame that contains the last 4 data bytes in an epoch.
epoch	One or more data frame followed by an EOE.
fiber frame	A series of 32-bit values that can either be data or an ordered set.
FIFO	A First In, First Out buffer and controller used to transmit data.
FPDP	Front panel data port.
LO	Local oscillator
VCXO	Voltage controlled crystal oscillator

zoom

Selects a frequency span around a specified center frequency. This is also known as band selectable operation.

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Need Assistance?

If you need assistance, contact your nearest Agilent Technologies Service Office. You can find a list of local service representatives on the Web at: <http://www.agilent.com/>. If you do not have access to the internet, one of the centers listed below can direct you to your nearest representative.

If you are contacting Agilent Technologies about a problem with your Agilent E1438 module, please provide the following information:

Model number:

Software version:

Serial number:

Options:

Date the problem was first encountered:

Circumstances in which the problem was encountered:

Can you reproduce the problem?

What effect does this problem have on you?

United States	1 800 452 4844
Canada	1 877 894 4414 (905) 206 4120 (FAX)
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Asia-Pacific	(852) 3197 7777 (852) 2506 9284 (FAX)

About this edition

April 2001: This edition documents the new fiber optic interface on the Agilent E1438B. In addition, this edition documents the new external TTL trigger on all Agilent E1438B modules and on Agilent E1438A modules with a serial number greater than US41140000.

May 2000: This edition documents a new software upgrade utility, FirmwareInstall, and a new function, age1438_frequency_center_raw_compute. In addition, the descriptions changed for the following functions:

- age1438_clock_setup
- age1438_trigger_setup
- age1438_combo_setup

November 1999: In this edition, all references to the product changed to support rebranding the product from Hewlett-Packard to Agilent Technologies.

September 1999: First Edition