Keysight 14360A Solar Array Simulator System Control Tools

User's Guide

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In this Book

Specific chapters in this manual contain the following information:

- Installation – Chapter 1 describes the installation of the system control tools.
- Using the System Control Tools – Chapter 2 describes how to use the Configuration Wizard, Initialize the Driver, and use the Server Control.
- System Driver Functions – Chapter 3 gives a detailed description of the driver functions including syntax, parameters, and return values.
- System Driver Enumerations – Chapter 4 describes the driver function enumerations.

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Or contact your Keysight Technologies Representative.

The web contains the most up to date version of the manual. Go to www.keysight.com/find/14360A to get the latest version of the manual.

Contents

1
Installation

This chapter describes the installation of the Keysight 14360A System Control Tools. It also describes the system requirements.

For complete details on installation, load connections, interface connections, and programming the instrument from the front panel, refer to the E4360 SAS Users Guide.

For complete details on programming the instrument using SCPI commands, refer to the E4360 Programmer's Reference Guide.

Both documents available at http://www.keysight.com/find/E4360 under Technical Support.

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Installing the Keysight 14360A System Control Tools

System Control Tools

System Driver. The driver for controlling the SAS system. It is in the form of a DLL with a COM interface.

Configuration Wizard. An application for creating and editing configuration files that describe the layout of the instruments in your SAS system. The configuration file is used to initialize the System driver.

Server Control. An application used when the System Driver is controlling the system from a remote application. The Server Control will listen for remote client requests to communicate with the SAS system. This application also includes a Web monitor that lets you view the measurements and settings in the system.

Examples. Programming examples that demonstrate the functionality of the System Driver.

Requirements

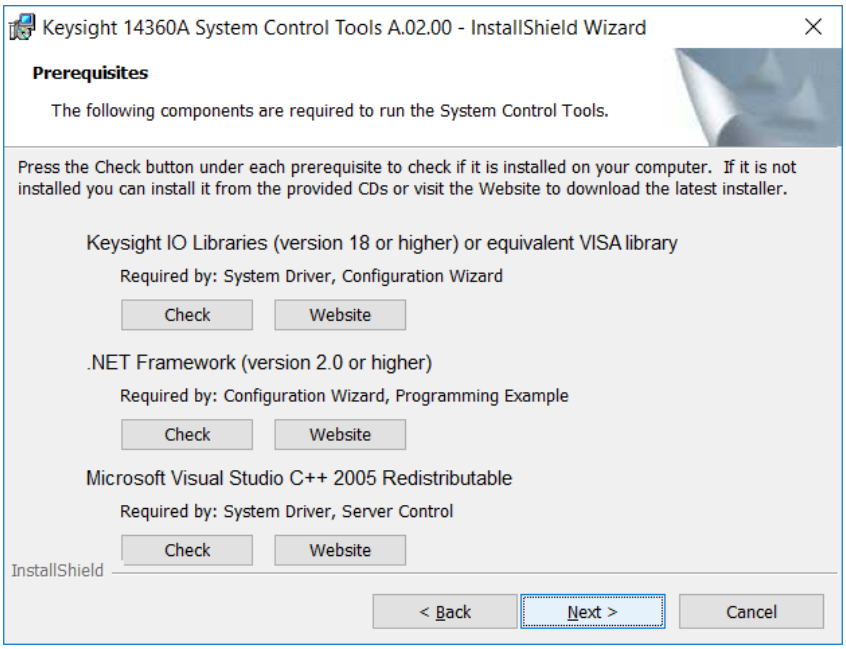
- Windows 7.0 or 10, 32 or 64 bit
- Keysight IO Libraries Suite 18 (www.keysight.com/find/iolibraries). This must be installed *before* you install the Keysight 14360 System Control Tools.
- Any COM compatible programming language such as: C++, VB, LabView, and .NET languages such as C#, VB.NET.
- E4360 Series SAS (E4350B not supported)
- Not supported on Unix or Linux

Installation

Download and install the Keysight 14360 System Control Tools software from the web at www.keysight.com/find/14360A.

When the installer runs, it puts up the following dialog box that lets you check if your system has the following prerequisite software components installed. If you have installed the Keysight IO Libraries Suite, these components should have been installed on your system.

Click Check to check that the software is installed. If it is not installed, you can install the software from the web address indicated above under Keysight IO Libraries Suite 18.



After you have checked for the software prerequisites, continue with the installation procedure and install the Complete package.

If you wish to install just the minimum necessary components follow these guidelines:

If you are installing the software on a single-controller PC, you need at minimum to install the following components:

- System Driver
- Configuration Wizard

If you are installing on an Application PC connected to a Controller PC, you need at minimum to install the following components:

- System Driver - on both Controller PC and Application PC
- Server Control - on the Controller PC
- Configuration Wizard - on the Controller PC

2
Using the System Control Tools

This chapter describes how to use the 14360 System Control Tools when programming a number of individual SAS instruments configured as a large solar array simulator system.

NOTE The system control tools described in this chapter are not available from the front panel or when using SCPI programming commands.

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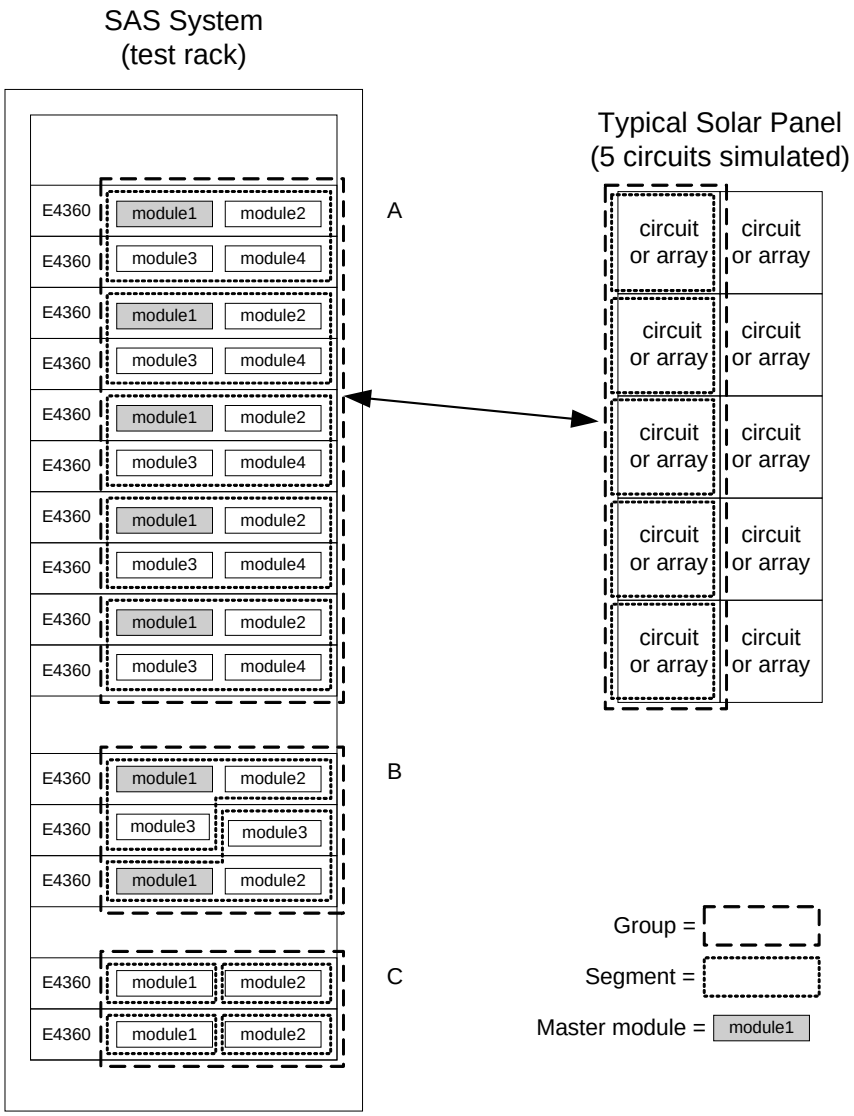
System Description

A typical SAS system contains between 25 and 50 instruments, with each instrument typically containing two output power modules. The output modules can be paralleled to produce higher output power. The individual instruments and modules in an SAS system can be organized into programmable groups that are tailored to specific power requirements. The Keysight 14360 System Control Tools simplify the task of a system integrator because they provide system-level control of all instruments through a single driver interface. The initial setup of the System Driver is simplified through the use of the Configuration Wizard.

The following figure illustrates the terminology used by the System Driver software to describe the various system components. The figure also shows the correspondence of these components to an actual solar array panel.



Glossary and Terms

System

A System refers to a system bay or test rack, which includes at least one logical group containing a number of SAS segments. A system is not necessarily limited to one test track, but can span multiple racks, depending how the system is configured.

Group

A Group is defined as a collection of segments. A system bay or test rack must have at least one group, but is not limited to just one. Groups provide an increased level of flexibility when emulating solar panels. Any number or arrangement of segments (circuits) can be configured into a group, which then allows all member segments to be programmed using system-level driver functions.

The example test rack in the previous figure illustrates three groups (A through C). Example A illustrates a logical group that corresponds to a grouping of circuits in a solar panel.

NOTE

A “group” in this context should not be confused with the channel groups described in Appendix D of the Keysight E4360A User’s Guide. A channel group can only be configured on a single mainframe.

Segment

A Segment corresponds to a single circuit on a solar panel (example A). A segment can contain from 1 to 4 paralleled modules installed in up to 2 mainframes. If the Parallel Type in the configuration file (located under the Properties tab) is set to Auto, all modules in the segment must be wired according to the Auto-parallel connections diagram described in Chapter 2 of the E4360 User’s Guide. The analog connectors must be wired, with one of the modules in the channel 1 location wired as the “master” channel, and the remaining channels (2 through 4) wired as “follower” channels. If the Parallel Type in the configuration file is set to Direct, all modules in the segment must be wired according to the Direct-parallel connections diagram.

The bottom half of the test rack shows a number of alternate segment configurations. In a configuration where 3 modules are auto-paralleled, note that the master module must always be in the channel 1 location of the mainframe (example B).

Module

A Module corresponds to a single output channel on a Keysight E4360A SAS mainframe. A module **must** be assigned to a segment even if it is not paralleled with another module (example C). This means that a system of 50 unparalleled modules, for example, still requires 50 segments to be created in the Configuration Wizard.

IP Addresses and Hostnames

Connecting to a site LAN

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network through routers, hubs, and/or switches. They are typically large, centrally-managed networks with services such as DHCP and DNS servers.

Normally, when connecting the instrument to the site LAN, the factory-shipped instrument LAN settings are configured to automatically obtain an IP address from the network using a DHCP server. This is **not** recommended when you will be using a configuration file to initialize the instruments under system control.

Because the configuration file stores the instrument's IP address and hostname, the instrument's IP address and hostname must not change each time the instrument is turned on. If this occurs, the configuration file cannot initialize the SAS system.

Therefore, it is recommended that you manually assign an IP address and hostname to the instrument using the instrument's front panel. The following table gives examples of IP addresses and hostnames that could be used in an SAS system consisting of 50 instruments:

Sample IP Addresses (DHCP servers)	Sample Hostnames (DNS servers)
192.168.1.101	A-E4360-01
192.168.1.102	A-E4360-02
192.168.1.103	A-E4360-03
.	.
.	.
.	.
192.168.1.150 (Note: The first 3 values are the network portion of the address)	A-E4360-50

Sample Subnet Mask

255.255.255.0

Sample Default Gateway

192.168.1.1

Configuring the LAN Parameters

To manually configure the LAN settings, press the Menu key, then use the navigation keys to select: **System** → **IO** → **LAN** → **Config**.

In the **Config** menu select **IP** to configure IP addresses; select **Name** to configure hostnames.

IP

Select **IP** to configure the addressing of the instrument.

Select **Manual** — This parameter allows you to manually configure the addressing of the instrument by entering values in the following three fields. These fields only appear when Manual is selected.

IP Address — This value is the Internet Protocol (IP) address of the instrument. The IP Address consists of 4 decimal numbers separated by periods. Each decimal number ranges from 0 through 255.

Subnet Mask — This value is used to enable the instrument to determine if a client IP address is on the same local subnet. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway.

Default Gateway — This value is the IP Address of the default gateway that allows the instrument to communicate with systems that are not on the local subnet, as determined by the subnet mask setting.

Name

Select **Name** to configure the hostname of the instrument.

Host name — Each SAS is shipped with a default hostname with the format: A-modelnumber-serialnumber, where *modelnumber* is the mainframe's 6-character model number (e.g. E4360A), and *serialnumber* is the last five characters of the 10-character mainframe serial number located on the label on the top of the unit (e.g. 45678 if the serial number is MY12345678).

Connecting to a private LAN

A private LAN is a network in which LAN-enabled instruments and computers are connected to a router that has DHCP for assigning addresses. These may or may not be reconfigured each time the instruments are turned on.

Basically, a private LAN has the advantage of having a smaller numbed of instruments (clients) and PCs, and there is usually greater control of network settings compared to a site LAN. Therefore, it is a good environment for using manual LAN settings as previously described, because usually there will be only one person responsible for setting these and less likelihood that others will be arbitrarily changing addresses – resulting in address collisions.

Manual addressing also allows you to use the same configuration file in multiple SAS systems that are each connected to a private LAN. Of course, each instrument in each SAS system must be set to the same IP address and Hostname as used in the configuration file.

NOTE — When replacing an instrument in a previously configured SAS system, you must manually set the IP address and Hostname of the new instrument to the same address as the replaced instrument

Running the Configuration Wizard

The purpose of the Configuration Wizard is to create a configuration file that describes the layout of the output modules in your SAS system. The configuration file contains information about the groups, segments, and modules. It also contains other information like the digital I/O pin assignments of the instruments.

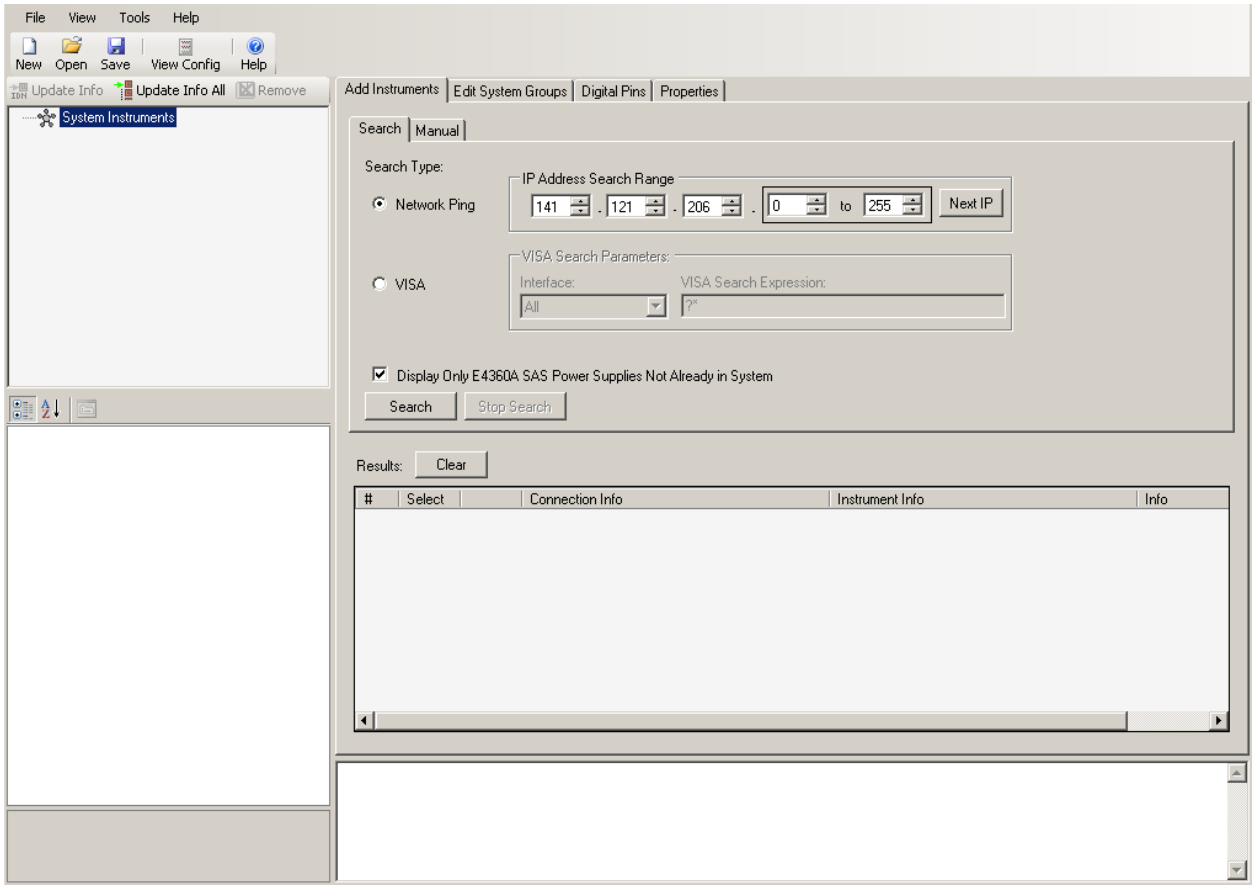
The System Configuration Wizard should be installed on the PC that has communication to the instruments via the chosen interface. This is because the Configuration Wizard will have the ability to search, find, and retrieve information about the instruments in your system.

Once the Configuration file has been created, it can be moved or copied to other controller PCs, where it will be used to initialize the System Driver on that PC.

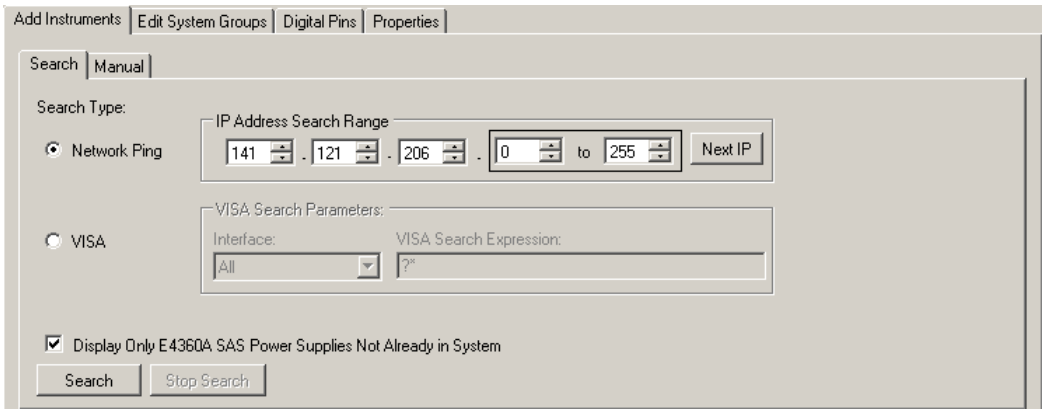
To run the 14360 Configuration Wizard, click on **Start → Programs → Keysight 14360A System Control Tools → Configuration Wizard**.

Adding Instrument to the Configuration

Step 1. Select the **Add Instruments** tab.



Step 2. Select the connection type: Network Ping or VISA.

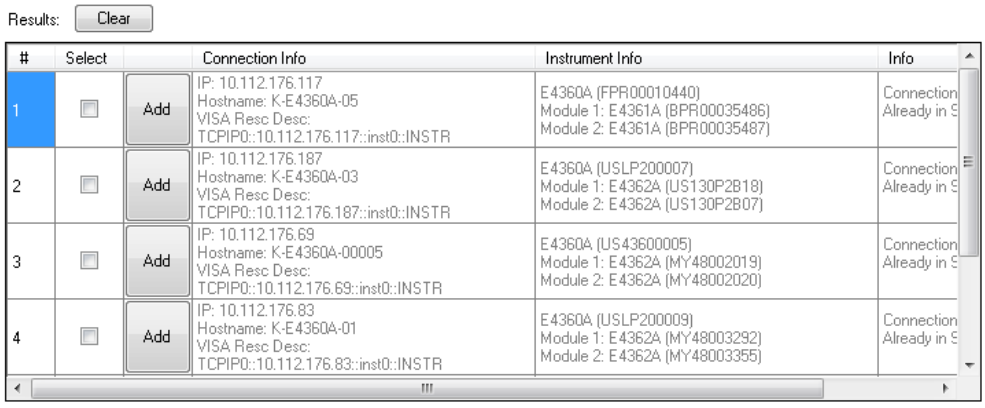


With **Network Ping**, you are searching (pinging) all the IP addresses in the specified IP search range. If a pinged IP address responds, a connection is attempted to verify if the instrument is an SAS. The System Driver will then connect to the instrument using the operating system's sockets library (i.e. WinSock). The advantage of using network ping is a speed-up over VISA when sending small amounts of data between the PC and the instruments as in most cases. The disadvantage is a minor slowdown over VISA when retrieving larger amounts of data. Under IP Address Search Range, specify an address range. For class C addresses, the first three fields are the network portion. The last field is the host portion of the address. You can enter a range to search on for the host portion.

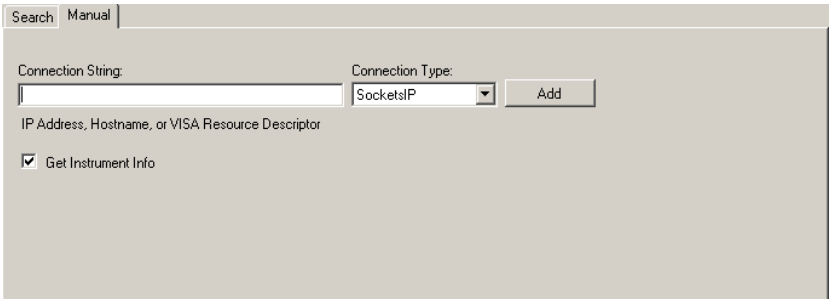
NOTE You can view the active IP address of an instrument by pressing the **Menu** key on the instrument's front panel, and using the navigation keys to select: **System** > **IO** > **LAN** > **ActiveSettings**.

With **VISA**, you can specify the interface type and the search criteria for VISA connection types.

Step 3. Click on the **Search** button. The search will find all instruments and output modules that are connected to the specified interface. Once the search is complete, the instruments are added to the **Results**. The Results area displays all addresses found in the search range.



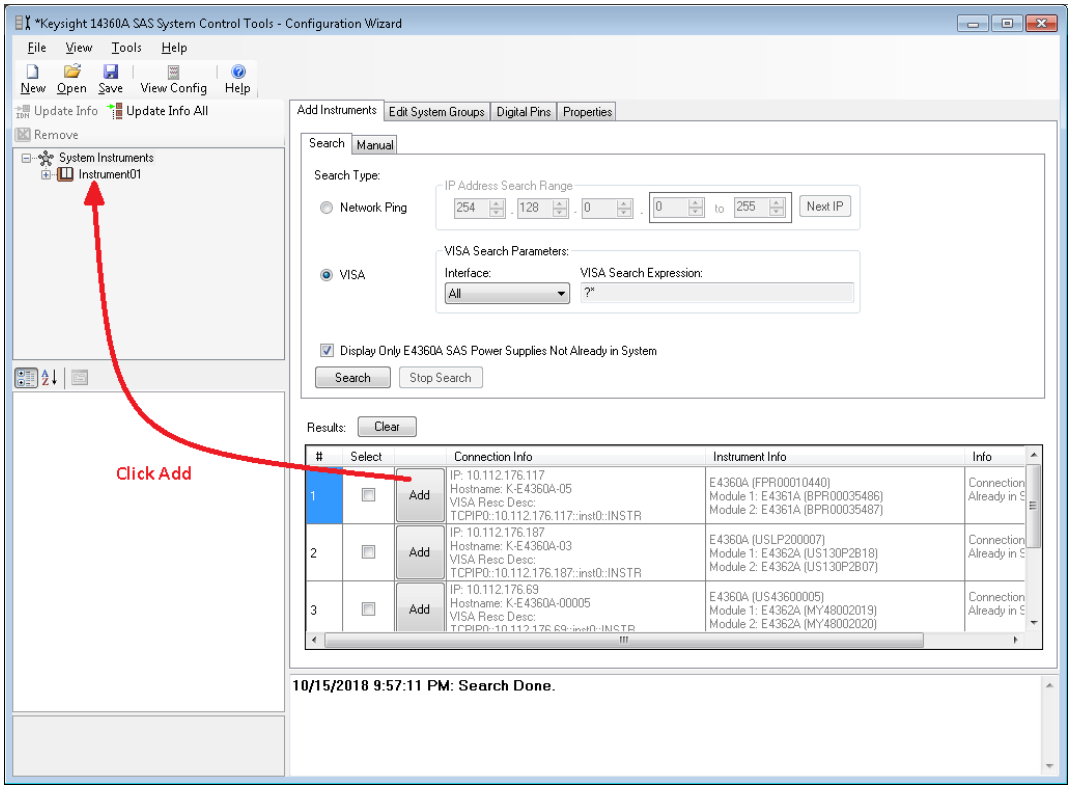
Alternatively, use the **Manual** tab to add a single instrument at a known address or an instrument that is not found by the Search function. You will need to supply the connection string and connection type. When you click **Add**, a connection with the specified connection string will be attempted.



Checking **Get Instrument Info** will retrieve information about the instrument and its modules. Uncheck this when working on a PC that does not have connection to the instruments.

Step 4. Click the **Add** buttons to add the instruments to the System Instruments list. Checking the Select boxes allows any Add button to add all of the selected instruments at once.

All of the instruments you added will now appear in the System Instruments view on the left side of the window. At this point, all of the instruments that you will be using in your system have been identified, but information as to how the outputs are connected together and how they will be controlled must now be provided.

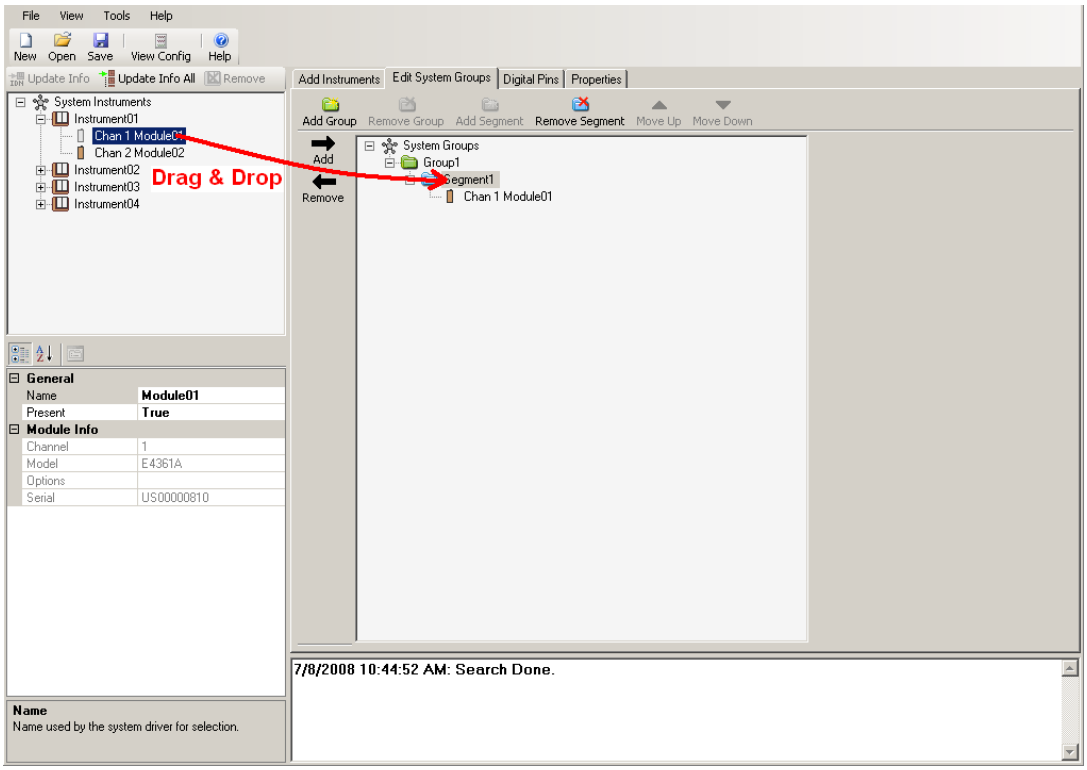


Creating the System Groups

Step 1. Now you must specify the Groups, Segments, and the Modules present in the Segments. Click on the **Edit System Groups** tab. From the toolbar buttons located in the Edit tab, click on the **Add Group** button. This adds a group named “Group1” to the System Groups. Note that each system must consist of at least one Group.

Step 2. To add segments to the Group that has just been created, click to highlight “Group1” in the tree view, then click the **Add Group** button, which is now active. A Segment heading named “Segment1” in this example will now been added under the group named Group1.

Step 3. To add modules to a Segment, simply select the module from the System Instruments list on the left side of the window and drag and drop it to the newly created Segment heading. You can also use the **Add** button to add the selected module.



You can have a maximum of four (4) modules in a Segment. If a module has already been assigned to a segment, it cannot be used in another segment. By definition, if there is more than one module in a segment, the modules must be connected in parallel. The first module in the list is the master module. It **must** be located in channel one (1) of the mainframe, otherwise it cannot appear first in the list. The remaining modules in the list are the follower modules.

You can change the order of the modules in the list by selecting a module and using the Up/Down buttons to move it up or down. You can move a module from one segment to another by using the drag and drop method. You can also move segments among groups.

Important If the Parallel Type located under the Properties tab is set to Auto, all modules that have been assigned to the segment must have their output connectors and analog connectors wired according to the Auto-parallel connections diagram described in Chapter 2 of the E4360 User's Guide. This is because the analog wire connections from the master module to the follower modules provide accurate output synchronization between modules. If the Parallel Type is set to Direct, module connections must be wired according to the Direct-parallel connections diagram. The analog connections are not used.

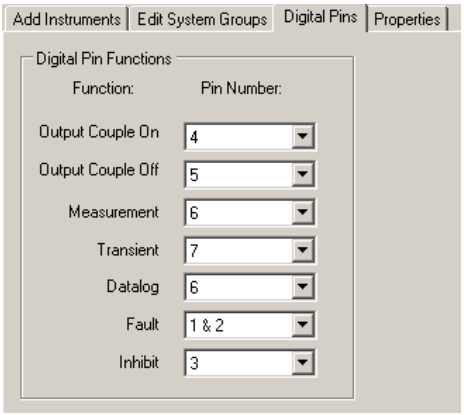
Step 4. To display and edit relevant information about any item in either the System Instruments list or the System Group list, simply click on an item. Information about the selected item will be displayed in the Properties area on the left side of the window.

Configure the Digital Pins

The Digital I/O pins configure the synchronized system functions, which send a single SCPI command to an output module that will then trigger the other output modules using the digital port.

Select the **Digital Pins** tab to enter information about the digital pins into the configuration file. The digital pins must be configured across the entire system. This means that if digital pin 4 is configured to perform an Output Couple On function, digital pin 4 on **each** instrument must be dedicated to perform this function. Pin 4 cannot be used for any other function. An example of how to wire output pins 6 and 7 to perform a synchronized Output Couple On/Output Couple Off function is given in Appendix B of the E4360 Users Guide.

Each pin has the option of being disabled in the configuration file, so that it will not be programmed using the system software.



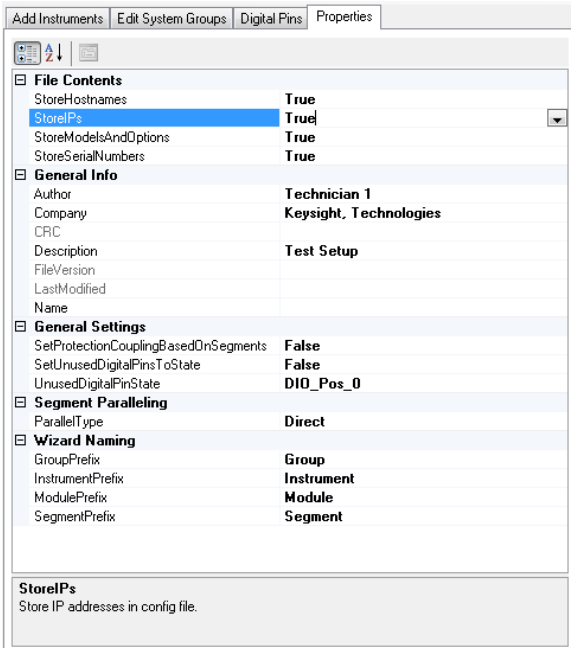
Note When the Digital I/O functions are disabled, you may still use the synchronized functions in your test program. However, the execution of the functions will not be synchronized. Instead, the commands will be sent to the output modules one at a time.

The following pin functions can be programmed for the entire system.

Synchronized pin function	Description	Available pins
Output Couple On Output Couple Off	This function enables or disables the outputs on of all connected mainframes. It requires both ONC and OFFC pin connections. All designated pins and the common pins must be connected together. This function can be programmed for the entire system or a specific group. If group-wide connections have been configured, the system-wide functionality is not available.	4 - 7
Measurement	This function synchronously triggers a measurement on all outputs of all connected mainframes. All designated pins and the common pins must be connected together.	4 - 7
Transient	This function synchronously triggers an SAS list on all connected mainframes. All designated pins and the common pins must be connected together. If multiple lists have been programmed, they must all be programmed with the exact same dwell times.	3 - 7
DataLog	This function synchronously triggers a datalog on all connected mainframes. All designated pins and the common pins must be connected together. Only one datalog can be running at a time in instruments connected by the same datalog pin wire.	3-7
Fault	This function enables a fault condition on any channel to generate a fault signal on the Digital Control port. The following conditions will generate a fault event: over-voltage, over-current, over-temperature, inhibit signal, power-fail condition, or on some models, a power-limit condition. Pin 2 is the common for pin 1. Pin 2 must also be connected to the common pin.	1, 2
Inhibit	This function lets an external input signal control the output state of all of the output channels if they have previously been enabled. All designated pins and the common pins must be connected together.	3

Specify the Configuration Properties

Select the **Properties** tab to specify the following properties of the configuration file.



File Contents

You can specify the type of information stored in the configuration file by setting the following parameters True: **StoreHostnames** stores the hostnames of the instruments. **StoreIPs** stores the sockets IP of the instrument. **StoreModelsAndOptions s**tores the model numbers and installed option numbers to identify a specific module. **StoreSerialNumbers s**tores the serial numbers of the instrument.

Setting all these parameters False lets you create a configuration file that contains no uniquely identifying instrument information. This allows the same configuration file to be used in replicated systems.

General Info

Heading information can be added to the Configuration file. You can specify the file's **Author**, **Company**, a brief **Description**, and a file **Name**. The CRC, FileVersion, and LastModified information is automatically generated and cannot be edited.

General Settings

General settings specify the operation of the coupled protection functions as well as the state of any unused digital pins.
When True, **SetProtectionCouplingBasedOnSegments** enables protection coupling if both power modules in a mainframe belong to the same segment. If both modules do not belong to the same segment, protection coupling is disabled within the mainframe.

When True, SetUnusedDigitalPinsToState allows you to specify the state digital pins that are unused by any function will be set to. UnusedDigitalPinState specifies one of the following two states for any unused digital pins when SetUnusedDigitalPinsToState is True:
DIO_Pos_0 specifies positive polarity with a value of zero;
DIO_Pos_1 specifies positive polarity with a value of one.

Segment Paralleling

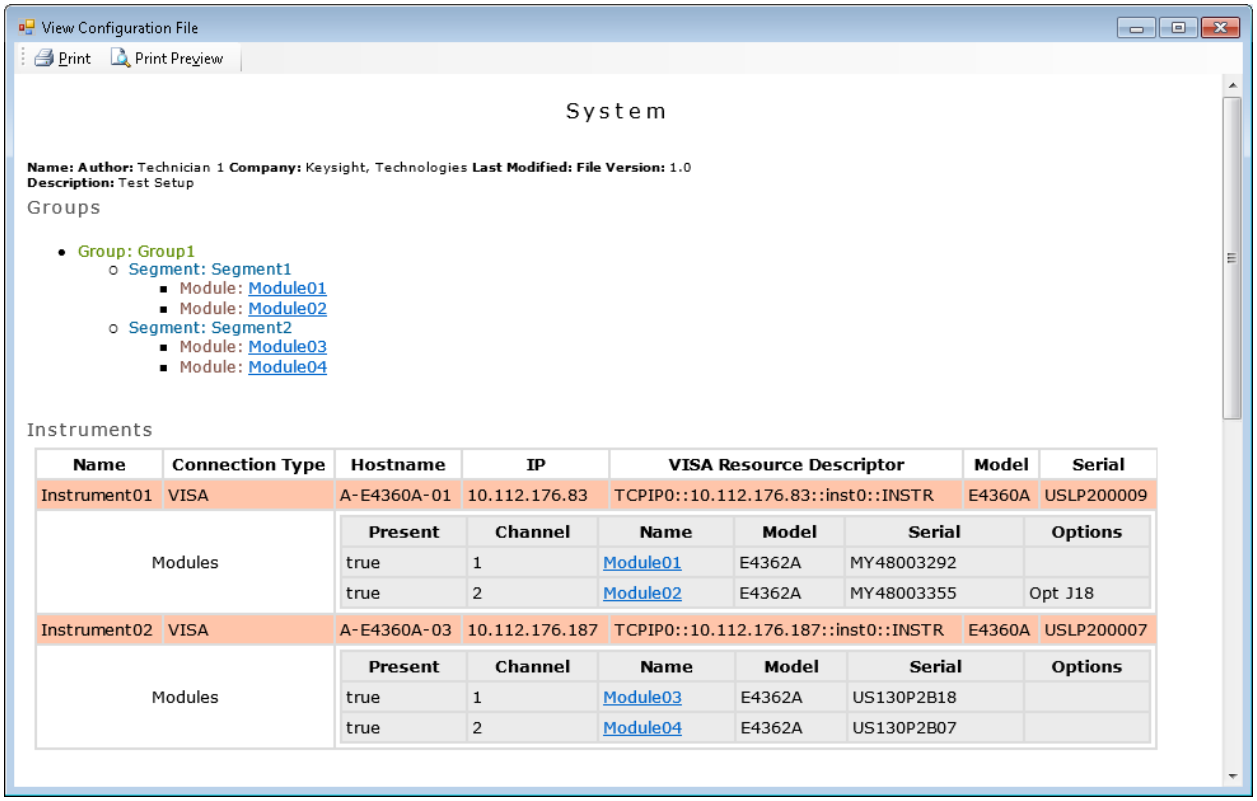
This section describes how modules are paralleled. Direct indicates that modules in the segment are directly paralleled. Auto indicates that modules in the segment are channel-grouped. Channel grouping is explained in Appendix D of the E4360 User's Guide.

Wizard Naming

You can change the prefixes used when automatically generating Groups, Instruments, Modules, or Segment. Enter a name to describe a GroupPrefix, InstrumentPrefix ModulePrefix, or SegmentPrefix.

View the Configuration File

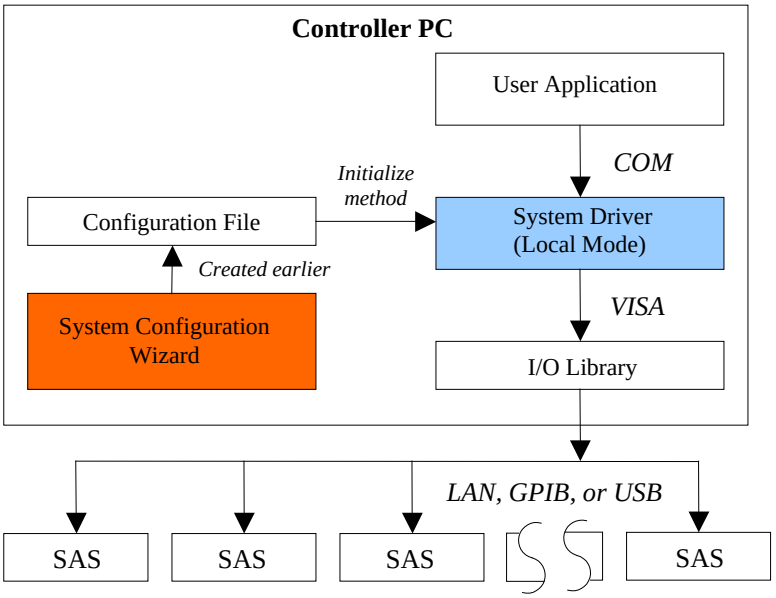
Select the **View Config** button tab to view the information in the configuration file. You can print the system information by selecting either the **Print** or the **Print Preview** button.



Using the System Driver Locally and Remotely

Single-controller PC (Local mode)

Once installed on the single-controller PC and initialized by the Initialize method, the System Driver is set to Local mode by default. In Local mode the System Driver will communicate directly with the instruments in the system as shown in the following figure.



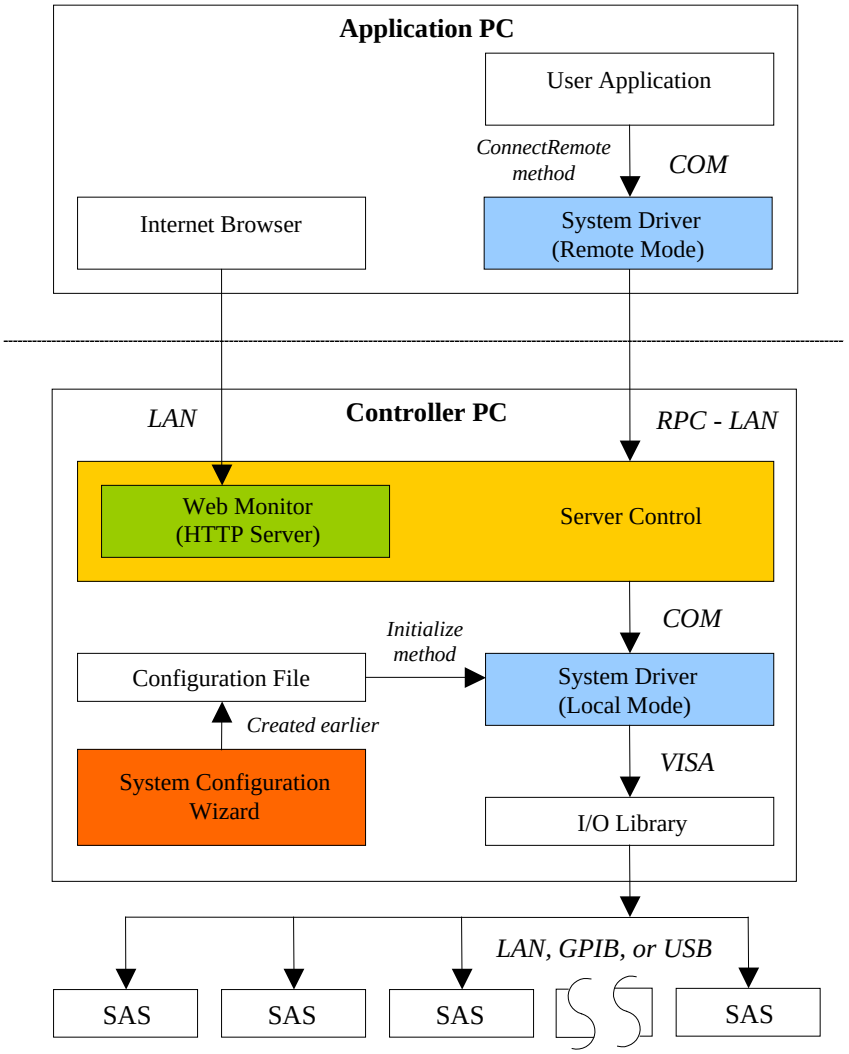
Application and Controller PC (Remote mode)

In Remote mode, the driver first goes through the Server Control and then communicates with the system using the Server Control's instance of the System Driver running in Local mode as shown in the following figure. This setup allows the SAS instruments to be isolated in a private network. The Controller PC would have two network cards with access to the SAS private network and the other to the network of the Application PC. The Application PC would only be able to access the instruments through the use of the Server Control and would not have direct access to the instruments.

Important As explained in the next section, the Server Control must first be running with the RPC Server Control **Start**ed for the System Driver running in Remote mode to communicate with the System Driver running in Local mode.

The System Driver function calls are same in both Local and Remote modes. The only difference is that in Remote mode the ConnectRemote function is called prior to calling the Initialize function. This design allows for greater portability of your application, since it can be moved from running locally and directly communicating with the system, to running remotely and being relayed through the Server Control.

After it as been created using the Configuration Wizard, the Configuration file must reside on the PC that is controlling the System Driver in Local mode. The Configuration file cannot reside on a PC that will be used in Remote mode. There is no capability of uploading a configuration file from a Remote mode PC.



The Web Monitor illustrated in the figure above is discussed under "Using the System Web Monitor" in the next section. Use the Web Monitor to view the status of the Local mode System Driver on the Controller PC and read back measurements from the system.

Important

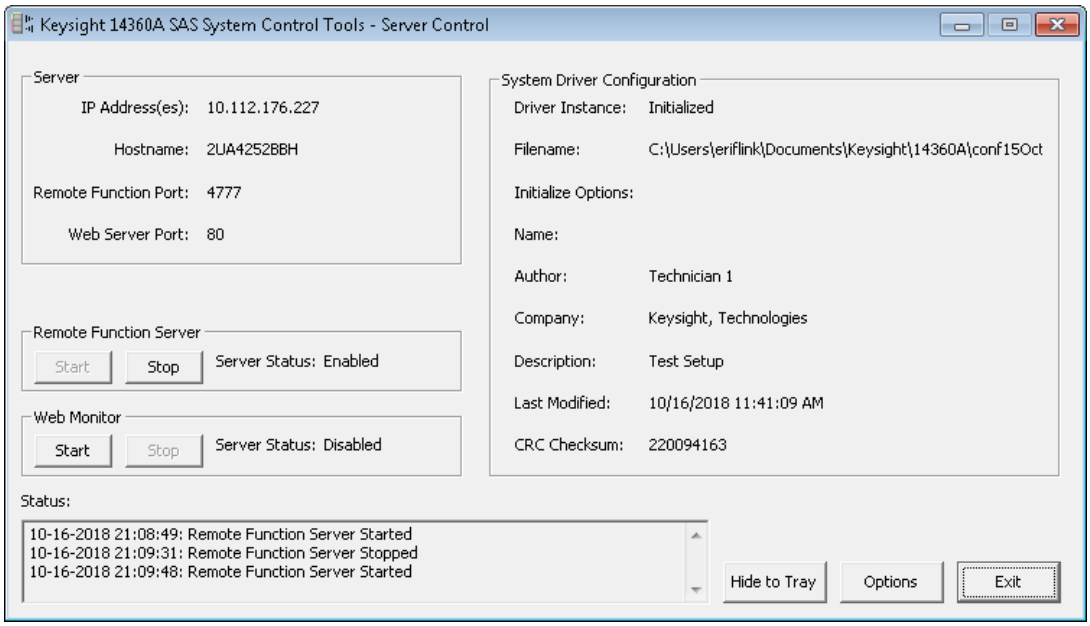
As explained in the next section, the Server Control must first be running with the RPC Server Control **Start**ed for the System Driver running in Remote mode to be able to communicate with the System Driver running in Local mode. The Web Monitor control must also be **Start**ed for the internet browser on the Application PC to access the monitor.

All of the System Driver functions that you will use to control your SAS system are described in chapter 3.

Coordinating Access by Remote Clients

The Server Control is an application running in the background of the Controller PC. The main purpose of the Server Control is to be able to control the SAS system from a remote PC. The Server Control is also used to coordinate access to the system by remote clients.

To access the Server Control application, click on **Start** → **Programs** → **Keysight 14360A System Control Tools** → **Server Control**.



The window of the Server Process includes the following information fields and controls:

Server — Displays the IP Address and the Hostname of the Controller PC. Also indicates the address of the Remote Function Server Port and the address of the Web Server Port.

Remote Function Server — Indicates the status of the Remote Function Server (either Enabled or Disabled). Click **Start** to start the Remote Function Server. Click **Stop** to stop the server.

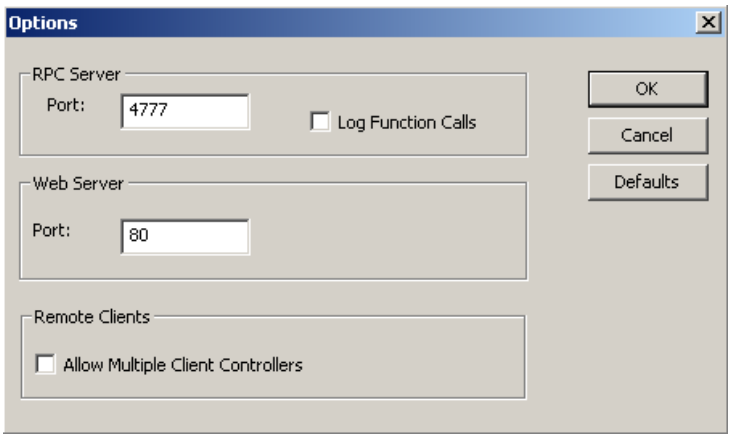
Web Monitor — Indicate the status of the Web Monitor (either Enabled or Disabled). Click **Start** to start the Web Monitor. Click **Stop** to stop the Web Monitor.

System Driver Configuration — Indicates the status of the Local mode System Driver instance on the Controller PC (either Initialized or Not Initialized). Also displays the following information from the active Configuration file: Filename, Initialize options, Name, Author, Company, Description, Last Modified date, and CRC checksum.

Status area Displays the application's status messages.

Hide to Tray button Minimizes the Server Control to the computer's system tray.

Options button Lets you configure the following options:
RPC Server – modify the RPC Server port number. Check Log Function Calls to enable or disable logging function calls to an external Log.txt file located in the installation folder of the Server Control.
Web Server – modify the Web Server port number.
Remote Clients – Check Allow Multiple Client Controllers to enable multiple clients to control the SAS system. If this box is not checked, only the first client will have the ability to control the SAS system. Subsequent clients will only have the ability to retrieve (or Get) information from the SAS system.



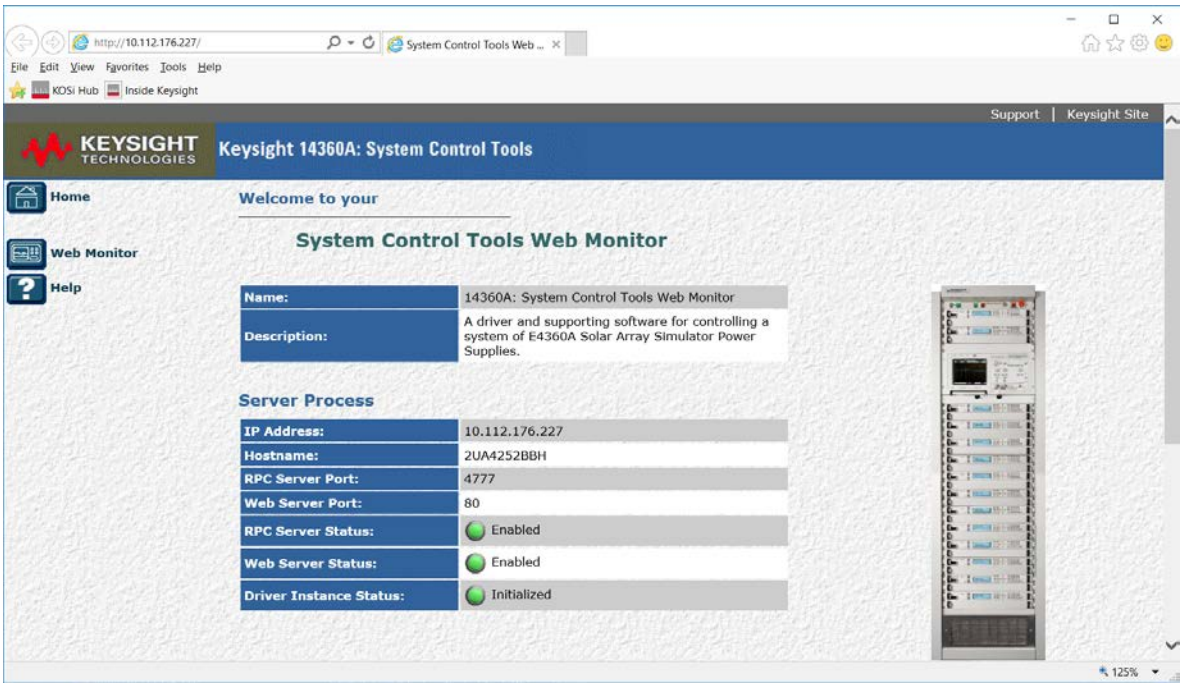
Exit button Closes the Server Control.

Using the System Web Monitor

The System Web Monitor is a series of web pages hosted by the server process' Web server on the Controller PC. The Web monitor lets you view the status of the SAS system from an internet browser on a remote computer on the same network as the Server Control. It does not allow control of any of the instruments in the system.

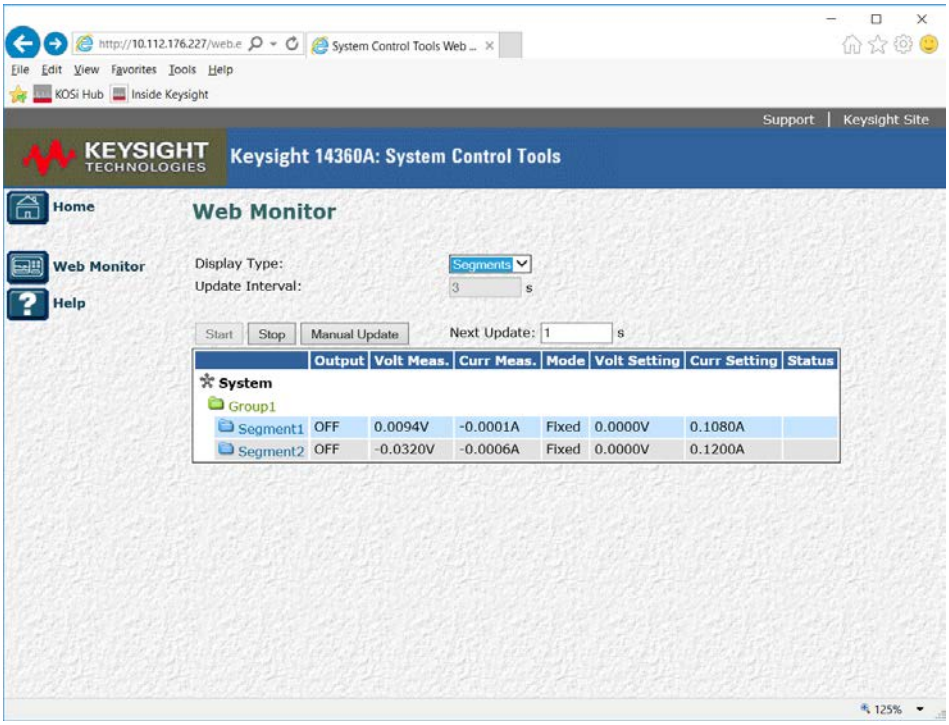
To launch the System Web Monitor:

1. Open the internet browser on your computer.
2. Enter the controller PC's full hostname or IP address into the browser's Address field to launch the Web monitor. Type in "localhost" if you are using the internet browser on the Controller PC to access the Web Monitor. The following home page will appear:
3. Click on the Web Monitor button in the navigation bar on the left to begin monitoring your system.

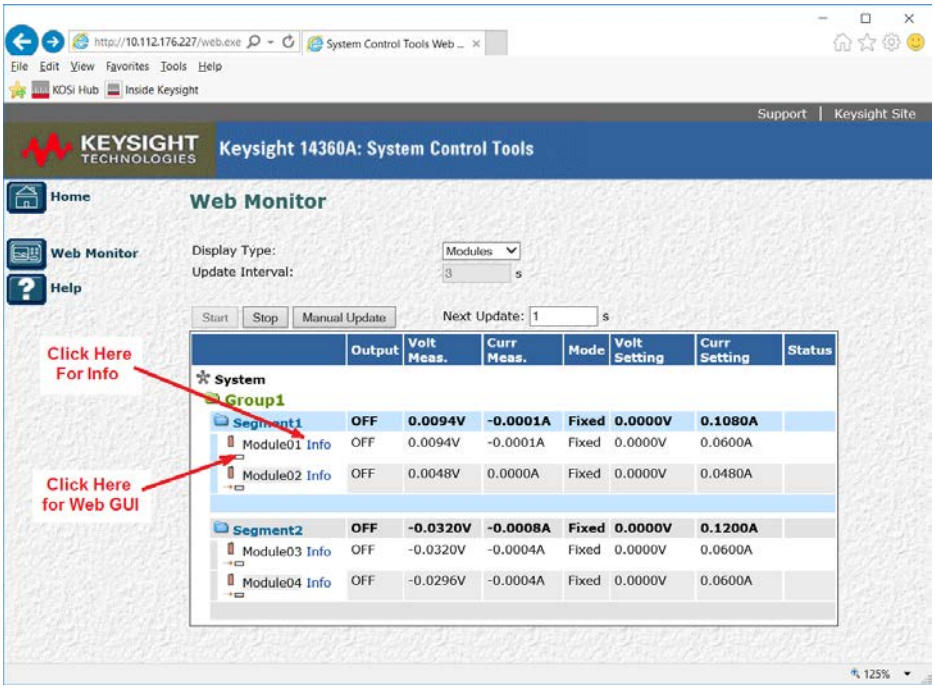


4. For information about any of the pages, click on the Help button.

As shown in the following figure, after clicking the Web Monitor button, the system will be displayed in a table type display. Under Display Type, you can display just the Segments, or the Segments with their included Modules. You can specify the Update Interval at which the measurements are updated on the display. Click Start to start the automatic updates. Click Stop to stop the automatic updates. Click Manual Refresh to manually update the display.



When Modules are selected as the Display Type, you can click the Info link that appears below each Module icon to display additional information about the module. To access the internal Web GUI of the instrument containing the module, click the small rectangle that appears to the right of the Info link. These controls are shown in the following figure.

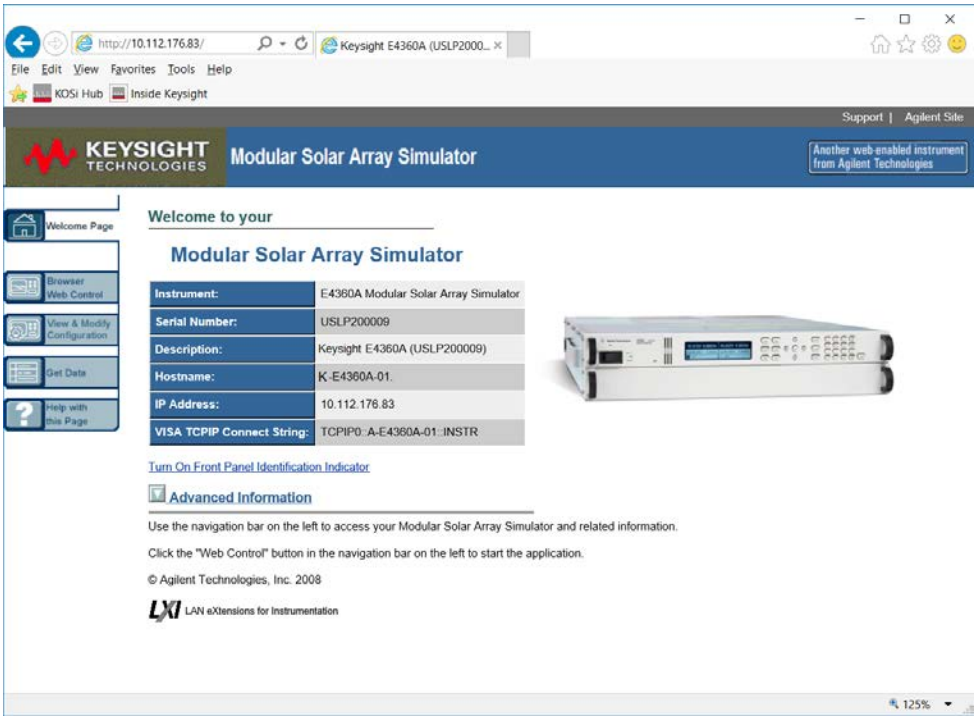


The following information is displayed at the bottom of the Web Monitor page when the Info link is pressed.

Module Info
Name: Module01
Model: E4361A
Serial: US12345678
Options:
Segment Member Type: Master
Channel Group Member Type: None

Instrument Info
Name: Instrument01
Model: E4360A
Serial: US12345678
Connection String: 141.121.202.1
Sockets IP: 141.121.202.1
Sockets Hostname:
VISA Resc Desc:

The following is an example of the Web GUI page of an individual instrument that appears after the small rectangle is pressed.

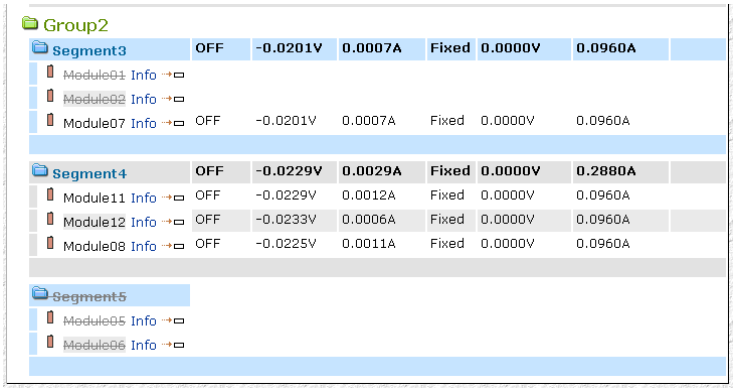


If the Web GUI does not appear, it may be because the remote computer is located on different network the Server Control. In this case, the Web GUI of the individual instrument cannot be accessed.

CAUTION

In contrast to the System Web monitor, the Web GUI page of an individual instrument **does** allow you to control it from the Web GUI page. This can cause unpredictable results if the SAS system is also being controlled by an application program running on the Controller PC.

The Web monitor will also indicate if a group, segment, or module is disabled by crossing out the entity in the view and not displaying any measurements or settings.



Information about enabling and disabling groups, segments, modules and instruments at driver initialize time or while the driver is initialized is found in Chapter 3 under “SelectCriteria - Enabling and Disabling Groups, Segments, Modules, and Instrument”.

Example Program

The Keysight 14360A Server Control Tools come with one comprehensive example program that covers System Driver initialization, monitoring, setting up Fixed mode, setting up SAS mode, protection, and data logging.

To access the Example, click on **Start → Programs → Keysight 14360A System Control Tools → Examples → UserApplication**.
The following application window should appear.

To access the User application source code, open the **Examples** folder. In the SystemDriverExamples1 folder, open the solution named SystemDriverExamples.sln. Visual Studio C# 2005 or newer is required to open the solution. If you do not have Visual Studio you may still view the source code of the project by opening the .cs files located in the UserApplication folder using a text editor.

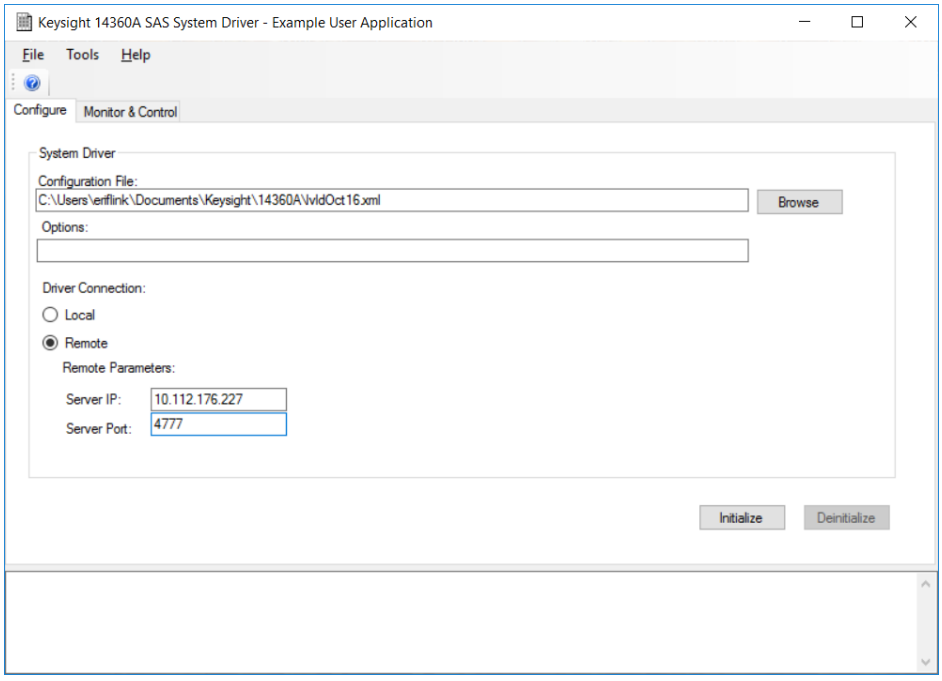
Configure Tab

The Configure tab lets you browse for a configuration file for initializing the System Driver. Browse and select a configuration file.

Other fields let you specify initialization options and select either Local or Remote mode. Under Options, you can select from the following: CheckInstError, CheckInstErrorOptional, CheckInstModelOnInit, CheckInstSerialOnInit, CheckModuleModelOnInit, CheckModuleSerialOnInit, CRCCheckOnInit, RebootTimeoutOnInit, ResetOnInit, ShutdownOnError, Simulation, and Timeout.

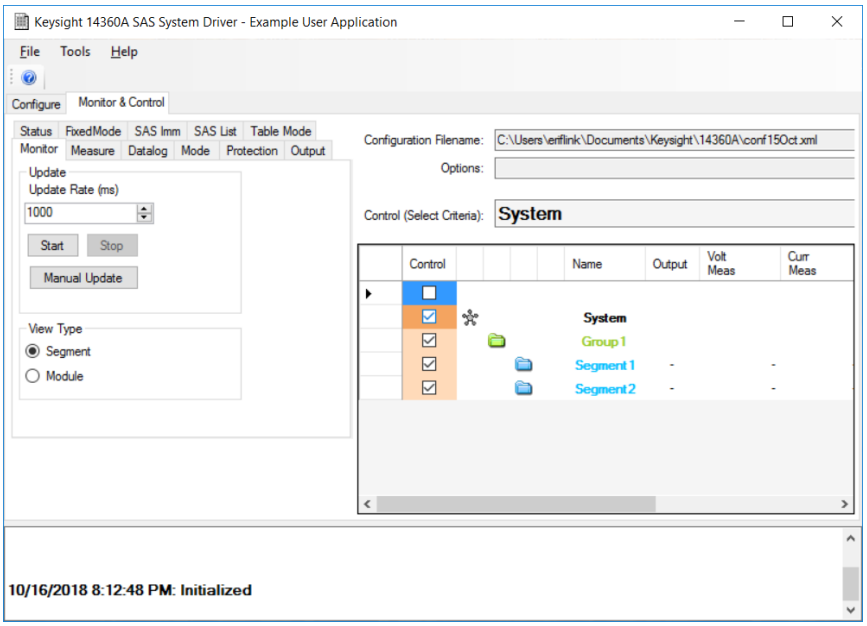
These are described in chapter 3 under Initialize Method.

After making your selections, click **Initialize** to initialize the System Driver.



Monitor and Control Tab

After successfully initializing, the system can be monitored and controlled from this Tab window.



The tabs on the left side of the window correspond to the various functions of the system and the monitor window.

Status - lets you monitor the status indicators.

Fixed Mode - lets you set the Fixed mode voltage and current.

SAS Imm – lets you enter equation parameters for Immediate mode.

SAS List – lets you configure the SAS parameters for List mode.

Table mode – lets you enter voltage/current pairs for Table mode.

Monitor – specifies the update rate and view of the monitor window.

Measure - measures output voltage and current of the Results type.

Datalog – configures the data logger and specifies an output file.

Mode – selects the operating mode of the SAS.

Protection – configures the over-voltage, over-current and soft limits.

Output - enables/disable the output.

The right side of the window displays the active configuration file and options. The Control (Select Criteria) field displays the part of the system tree that is being controlled.

The spreadsheet area of the window displays the system monitor. The checkboxes let you select the Groups/Segments that will be controlled. The settings and results are filled in as they become available. Click Clear to clear the checkboxes.

System Driver Usage Guide

This section describes some common tasks that are required for you to create an application program in the programming environment of your choice. All code samples are in C#. Most of the code samples are taken directly from the example program described previously.

You can view the source code of the example project by opening the .cs files located in "C:\Program Files\Keysight\14360A\Examples\SystemDriverewxamples1\UserApplication" with a text editor.

Adding a Reference

In your project, you must add a reference to the System Driver. In many development environments there is a section under Project Settings for adding references to outside dlls. The System Driver is a COM component named *Keysight 14360A 1.0 Type Library* that by default points to the file "C:\Program Files\Keysight\14360A\System Driver\Keysight14360A.dll". In Visual Studio 2005 a project's References can be found in the Solution Explorer under the Project Name.

The System Driver class, functions, interfaces, and enumerations are part of the Keysight14360 namespace. It is common to specify which namespaces a project uses. For example in C# programs this is done on top of source code files with the *using* keyword.

```
using Keysight14360A;
```

Declaration and Instantiation

Next, you must declare and instantiate the System Driver in your project. Since the driver will probably be used across many functions, the driver variable should be declared as a class member variable or a global variable. When adding a COM component reference to a project, the development environment may automatically generate another layer on top of the COM interface called a "wrapper". In .NET languages this is necessary to translate between the managed code of .NET and unmanaged code of the COM component. Thus, depending on your environment, the declaration of the System Driver variable may look a bit different. For example, in C# the System Driver is declared as the root interface of the driver:

```
private IKeysight14360 m_SystemDriver;
```

The variable is then instantiated as a new instance of CKeysight14360Class, a class generated by the .NET wrapper. In code this looks like:

```
m_SystemDriver = new CKeysight14360Class();
```

In other programming environments you may be declaring a variable of type CKeysight14360 and instantiating it as a new instance of CKeysight14360.

Initialization

Once the System Driver is declared and instantiated, the System Driver functions are ready for use. The next step is to initialize the System Driver with a configuration file. The functions for initializing the driver can be found in the root interface IKeysight14360. The following are the three possible initilization scenarios. Assume that ConfigFileTB, OptionsTB, ServerIPTB, and ServerPortTB are textboxes in the application for the user to fill in with values.

In Local Mode

```
m_SystemDriver.Initialize(ConfigFileTB.Text, OptionsTB.Text);
```

The driver will communicate with the instruments in the system directly.

In Remote Mode

```
m_SystemDriver.ConnectRemote(ServerIPTB.Text,
int.Parse(ServerPortTB.Text));

m_SystemDriver.Initialize(ConfigFileTB.Text, OptionsTB.Text);
```

The driver first connects to the PC running the Server Control's RPC Server and then it initializes the Server Control's System Driver and itself. If an exception is thrown stating that "The Server Control's System Driver is already initialized with the configuration file: ..." you can forcefully close down the Server Control's System Driver by using the option "ForceRemoteClose=true" in the Initialize function.

In Remote Mode (Non-initializing)

```
m_SystemDriver.ConnectRemote(ServerIPTB.Text,
int.Parse(ServerPortTB.Text));

m_SystemDriver.Initialize("", "");
```

The driver first connects to the PC running the Server Control's RPC Server and then it initializes itself to communicate with the already initialized Server Control's System Driver. The Sever Control's System Driver would have been initialized previously by another client using the preceding Remote Mode initialization scenario. You can check if the Server Control's System Driver is initialized with the use of the GetInitilized() Function. The permission to call Set functions by non-initializing clients is set by the Server Control's Option checkbox labeled "Allow Multiple Client Controllers".

Application Design

After a successful initialization, the System Driver is ready to send and receive data between the application and the SAS system. You can now control the SAS System with function calls such as:

```
m_SystemDriver.FixedMode.SetVoltLevel("GroupName=MyGroup1", 65);

m_SystemDriver.Output.SetOutputEnabled("System", true);

m_SystemDriver.Measurement.Measure("SegmentName=MySegment1",
Keysight14360ResultsTypeEnum.Keysight14360ResultsTypeSegment, 1, out namesArr, out voltMeasArr, out
currMeasArr);
```

All of these examples would work if the Configuration file the driver was initialized with contains a group named MyGroup1 and a segment named MySegment1. If the configuration file used for initialization did not contain those names, the driver would throw exceptions at run-time stating that none of the output modules in the system were selected for control.

To remedy this problem, the application could, at runtime, query the driver for names of all the groups, segments, and modules in the configuration. Refer to the IKeysight14360DriverOperation interface of the System Driver. The following code is an example of how to create in the application a data structure representing the hierarchy of Groups, Segments, and Modules.

```
public class Group {
   public String Name;

   /// <summary>
   /// List of segments belonging to this group
   /// </summary>
   public List<Segment> Segments;
   public Group() {
      Segments = new List<Segment>();
   }
};

public class Segment {
   public String Name;

   /// <summary>
   /// List of modules belonging to this segment.
   /// </summary>
   public List<Module> Modules;
   public Segment() {
      Modules = new List<Module>();
   }
}

public class Module {
   public string Name;
}
```

Three classes are declared, representing a group, a segment, and a module. A group has a list of member segments and a segment has a list of member modules.

```
/// <summary>
/// List of elements of type Group class. This will hold the tree
/// representation of the configuration's Groups, Segments, and Modules.
/// </summary>
private List<Group> m_Groups;
```

To represent the entire system of groups, segments, and modules, declare a list of type class Group.

```
/// <summary>
/// Populate in the application a data structure to represent
/// the tree of Groups, Segments, and Modules based on configuration file
/// passed to the system driver's initialize function.
/// </summary>
private void BuildGroupLists() {
   int groupCount, segmentCount, moduleCount;
   Group group;
   Segment segment;
   Module module;
   IKeysight14360DriverOperation Ido = m_SystemDriver.DriverOperation;

   m_Groups.Clear();

   /* get the number of groups in the configuration */
   groupCount = Ido.GetGroupCount();
   for (int g = 0; g < groupCount; g++) {
      group = new Group();
      m_Groups.Add(group);

      /* get the Name of the group at index g */
      group.Name = Ido.GetGroupNameAtIndex(g);

      segmentCount = Ido.GetGroupSegmentCount(group.Name);
      for (int s = 0; s < segmentCount; s++) {
         segment = new Segment();
         group.Segments.Add(segment);
         segment.Name = Ido.GetGroupSegmentNameAtIndex(group.Name, s);

         moduleCount = Ido.GetSegmentModuleCount(segment.Name);
         for (int m = 0; m < moduleCount; m++) {
            module = new Module();
            segment.Modules.Add(module);
            module.Name = Ido.GetSegmentModuleNameAtIndex(segment.Name, m);
         }
      }
   }
}
```

Finally, you must call the functions of IKeysight14360DriverOperation to retrieve all the group, segment, and module names.

With the application now having a representation of the hierarchy of groups, segments, and modules in the Configuration file, the System Driver function calls can have their SelectCriteria parameter created at runtime. Assume bSelected is a member variable of each of the three entities and is true if in the application the user specified that entity for control.

```
m_SystemDriver.Output.SetOutputEnabled("System", true);

foreach (Group group in m_Groups) {
   if (group.bSelected)
      m_SystemDriver.FixedMode.SetVoltLevel("GroupName=" + group.Name, 65);
   foreach (Segment segment in group.Segments) {
      if (segment.bSelected)
         m_SystemDriver.Measurement.Measure("SegmentName=" + segment.Name,
Keysight14360ResultsTypeEnum.Keysight14360ResultsTypeSegment, 1, out namesArr, out voltMeasArr, out
currMeasArr);
   }
}
```

Using SetEnabled with the Initialize Function

The following example illustrates how to use the SetEnabled Method to enable only parts of the configuration file (individual groups, segments, modules, or instrument) at driver initialize time or while the driver is initialized.

For more information, refer to Chapter 3 under “SelectCriteria” – “Enabling and Disabling Groups, Segments, Modules, and Instruments”, under “IKeysight14360 Interface” – “Initialize Method”, and under “IKeysight14360DriverOperation Interface” – “GetEnabled Method” and “SetEnabled Method”.

```
CKeysight14360Class driver = new CKeysight14360Class();
IKeysight14360 iRoot = driver;
string strConfigFile = @"C:\Configs\myconfig.xml";
string strOptions = "Simulation=false";

// read configuration file information into the driver but do not connect
iRoot.Initialize(strConfigFile, strOptions + ";InitializeAction=ReadConfig");
// disable 2 instruments and their modules
iRoot.DriverOperation.SetEnabled("InstrumentName=Instrument01", false);
iRoot.DriverOperation.SetEnabled("InstrumentName=Instrument02", false);
// connect to any instruments that are enabled
iRoot.Initialize(strConfigFile, strOptions + ";InitializeAction=Connect");

// use the driver like the disabled instruments are not part of the configuration
iRoot.FixedMode.SetVoltLevel("System", 5.0);
```

```
// ...
// To read the enabled states of all the entites of the configuration try the following code
foreach (Group group in m_System.Groups) {
   group.Enabled = iRoot.DriverOperation.GetEnabled("GroupName=" + group.Name);
   foreach (Segment segment in group.Segments) {
      segment.Enabled = iRoot.DriverOperation.GetEnabled("SegmentName=" + segment.Name);
      foreach (Module module in segment.Modules) {
         module.Enabled = iRoot.DriverOperation.GetEnabled("ModuleName=" + module.Name);
      }
   }
}

foreach (Instrument inst in m_System.Instruments) {
   inst.Enabled = iRoot.DriverOperation.GetEnabled("InstrumentName=" + inst.Name);
}
```

3
System Driver Functions

This chapter describes the System Driver functions. These driver functions are not available from the front panel or when using individual SCPI commands.

KEYSIGHT TECHNOLOGIES

Driver Function Hierarchy

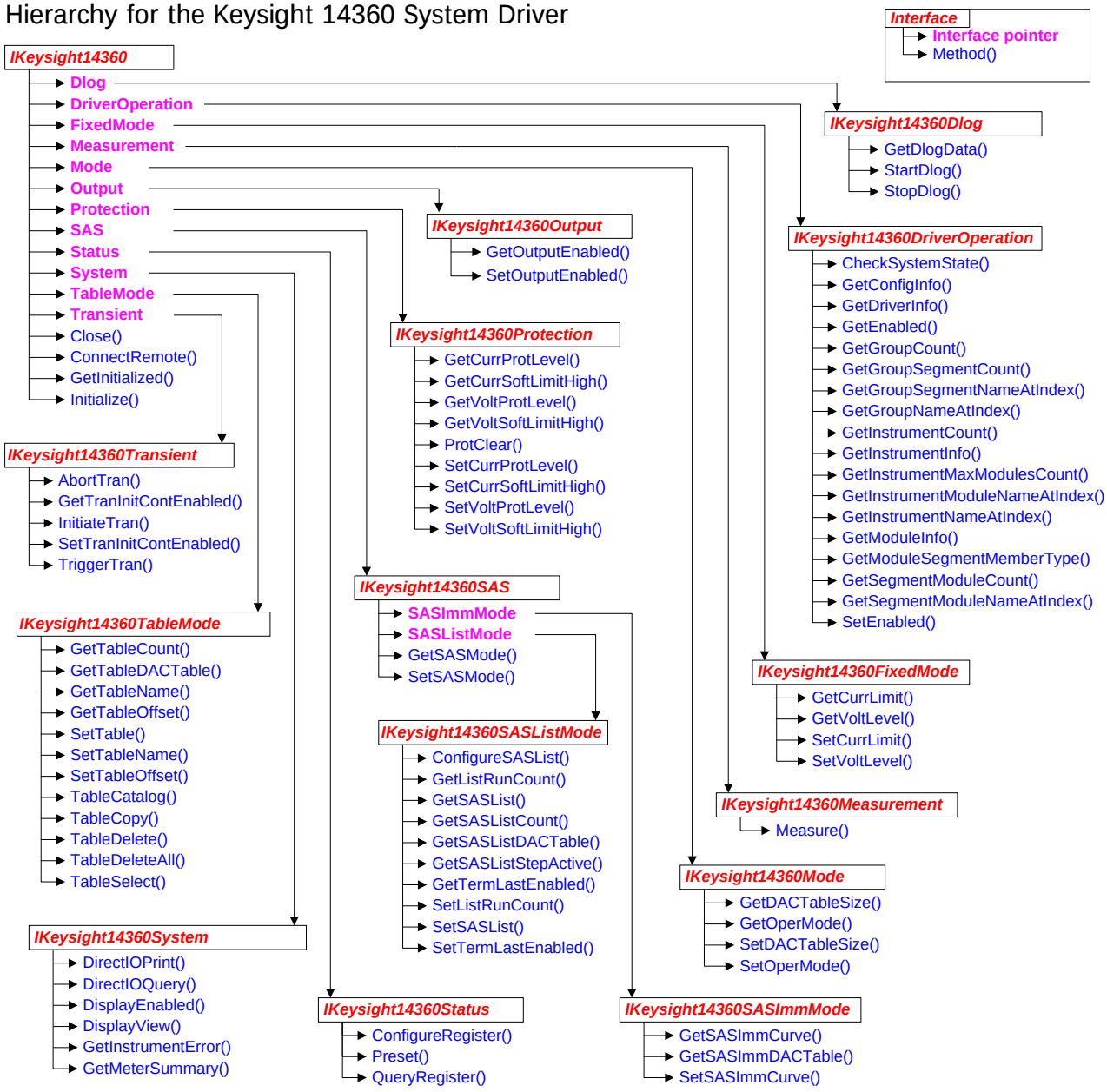
The driver functions are organized as follows:

Interface - An interface is a collection of related methods and properties.

Properties - Properties are used to access interface reference pointers that allow you to navigate the driver interface hierarchy.

Methods - Methods perform actions either within the System Driver or with a specific instrument. All work in the driver is done using methods.

Hierarchy for the Keysight 14360 System Driver



SelectCriteria

Controlling a System Subset

When using the System Driver functions, you need to specify with which configured modules you are communicating. This is done using the SelectCriteria string that is passed into the functions that require the destination of the command.

The format of the SelectCriteria string is semicolon separated key and value pairs -- "Key=Value".

The following table summarizes the naming keys:

Key (Name)	SelectCriteria Example	Description
System	System (no value required)	Selects the entire system.
GroupName	GroupName=MyGroup1	Selects a group's segments. Groups are referenced by name.
SegmentName	SegmentName=MySegment1	All the modules of a segment. Segments are referenced by name.
ModuleName	ModuleName=MyModule1	A single module (output channel).
InstrumentName	InstrumentName=Inst1[@<chanlist>] Optional <chanlist> selects individual channels (@1; @2; @1,2; @1:2).	A single mainframe. To program individual modules on a mainframe, use the optional <chanlist>. Otherwise, no modules are programmed.

The following example sets the output voltage of all the modules in the group "MyGroup1" to 5V:

SetVoltLevel("GroupName=MyGroup1", 5.0);

The following example sets the output voltage of all the modules in the segment named "MySegment1" to 5V:

SetVoltLevel("SegmentName=MySegment1", 5.0);

The following example returns the error that occurred on the mainframe "Inst1":

GetInstrumentError("InstrumentName=Inst1");

Interpreting Function Parameters

All parameter values passed into the driver functions are interpreted based on the SelectCriteria. Most functions like SetVoltLevel or SetSASMode will not alter the passed-in parameters. However, with the functions dealing with current, like SetCurrLimit, the parameters will be altered if sent to a segment or a group but not when sent to a module directly.

The current parameter value is actually divided among the segment modules. This affects the values sent to each individual module as well as the values returned by the individual module when queried. The following is a summary of the interpretations and actions taken by the driver when SetCurrLimit and GetCurrLimit are programmed.

Action	Example	Description
Setting the current limit of a Group	SetCurrLimit (“GroupName=MyGroup1”, 2.0)	The parameter value is passed to the group’s segments, where it will be divided evenly between all the modules in the segment. With 4 modules, each module would be set to 0.5A.
Getting the current limit of a Group	GetCurrLimit (“GroupName=MyGroup1”)	Returns the current passed to the group’s segments before it was divided.
Setting the Current limit of a Segment	SetCurrLimit (“SegmentName=MySegment1”, 2.0)	The parameter value is divided evenly between all the modules in the segment. If there were 4 modules, each module would be set to 0.5A.
Getting the current limit of a Segment	GetCurrLimit (“SegmentName=MySegment1”)	Returns the current passed to the segment before it was divided.
Setting the current limit of a Module	SetCurrLimit (“ModuleName=Module1”, 2.0)	The value is passed directly to the module (not divided).
Getting the current limit of a Module	GetCurrLimit (“ModuleName=Module1”)	Returns the actual value that is passed to the module.

Using Get functions with Groups and Segments

When Get functions are used along with either GroupName or SegmentName Select Criteria, they will return the requested value of all instruments and modules in that group or segment.

All of the values returned from the Group or Segment must be the same value. If one of the requested values is different from the others, an exception is generated. You must create an exception handler to deal with any exceptions that may occur.

Enabling and Disabling Groups, Segments, Modules, and Instruments

The SetEnabled function in IKeysight14360DriverOperation can enable or disable parts of the configuration at driver initialize time or while the driver is initialized. Disabling an entity name has the effect of excluding that entity from the configuration.

For example if you disable a module, the parent segment, group, and system no longer have that module as a member. Through the use of functions SetEnabled and Initialize with the InitailizeAction option it becomes possible to have a single configuration file and still disable parts of a system not needed during a session. The following table specifies the actions performed by the SetEnabled function based on the entity specified in the SelectCriteria and the Initialize state of the driver.

Key (Name)	SetEnabled Method= False	SetEnabled Method= True
GroupName SegmentName ModuleName	The entity name is disabled from the configuration.	The entity name is enabled in the configuration. If the parent instrument of a module is disabled, the enable will not proceed. The instrument must be initialized prior to the call.
InstrumentName	During driver initialization The instrument and its modules are disabled from the configuration. The driver will not attempt to connect to the instrument. While the driver initialized The instrument and its modules are disabled from the configuration. The driver will disconnect from the instrument. If applicable, output synchronization will be disabled for the modules of the instrument.	During driver initialization The instrument and its modules are enabled in the configuration. The instrument will be connected to during the connect action of the initialize function. While the driver initialized Connection to the instrument will be attempted. If successful, the driver will enable the instrument and the modules in the configuration.

For an example program illustrating how to enable or disable parts of the configuration, refer to chapter 2 under “System Driver Usage Guide” – “Application Design” – “Using SetEnabled with the Initialize Function”.

Note

Segment Auto Paralleling Mode: You cannot disable a master module if the follower modules of a segment are still enabled. You cannot enable a follower module if the master module of the segment is disabled.

IKeysight14360 Interface

This is the root interface of the driver.

Dlog Property

Syntax:

HRESULT Dlog([out, retval] IKeysight14360Dlog** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Dlog reference.

DriverOperation Property

Syntax:

HRESULT DriverOperation([out, retval] IKeysight14360DriverOperation** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360DriverOperation reference.

FixedMode Property

Syntax:

HRESULT FixedMode([out, retval] IKeysight14360FixedMode** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360FixedMode reference.

Measurement Property

Syntax:

HRESULT Measurement([out, retval] IKeysight14360Measurement** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Mesurement reference.

Mode Property

Syntax:

HRESULT Mode([out, retval] IKeysight14360Mode** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Mode reference.

Output Property

Syntax:

HRESULT Output([out, retval] IKeysight14360Output** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Output reference.

Protection Property

Syntax:

HRESULT Protection([out, retval] IKeysight14360Protection** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Protection reference.

SAS Property

Syntax:

HRESULT SAS([out, retval] IKeysight14360SAS** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360SAS reference.

Status Property

Syntax:

HRESULT Status([out,retval] IKeysight14360Status** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Status reference.

System Property

Syntax:

HRESULT System([out, retval] IKeysight14360System** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360System reference.

TableMode Property

Syntax:

HRESULT TableMode([out,retval] IKeysight14360TableMode** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360TableMode reference.

Transient Property

Syntax:

HRESULT Transient([out, retval] IKeysight14360Transient** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360Transient reference.

Close Method

Syntax:

HRESULT Close();

Description:

Closes the driver session. In Local mode the driver disconnects from the instruments and de-initializes the driver. In Remote mode the Server Control local mode instance of the driver is de-initialized and connection to the Server Control RPC Server is closed.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

ConnectRemote Method

Syntax:

HRESULT ConnectRemote([in] BSTR ServerIP, [in] int ServerPort);

Description:

Connects to the Server Control RPC Server. If ConnectRemote was called prior to calling Initialize, the driver will run in Remote mode and communicate with the instruments indirectly through the Server Control RPC Server.

Parameters:

ServerIP IP address of the Server Control RPC Server.

ServerPort Port number of the Server Control RPC Server.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning

GetInitialized Method

Syntax:

HRESULT GetInitialized([out, retval] VARIANT_BOOL* pVal);

Description:

Returns if the driver is initialized. In Local mode it returns if the driver initialized successfully with a configuration file. In Remote mode it returns if the Server Control local mode driver instance is initialized. You may call DriverOperation.GetConfigInfo to determine the active configuration file of the Server Control.

Return Value:

true: Initialized. false. Not Initialized.

Initialize Method

Syntax:

HRESULT Initialize([in]BSTR ConfigurationFilename, [in]BSTR Options);

Description:

Initializes the driver. If ConnectRemote is not called prior to Initialize, the driver will run in Local mode and communicate with the instruments directly. If ConnectRemote was called prior to calling Initialize, the driver will run in Remote mode and communicate with the instruments indirectly through the Server Control RPC Server.

In case of multiple user-applications running in Remote mode and communicating through the Server Control, if the Server Control is already initialized with a Configuration file, pass in empty strings (or NULL) as the ConfigurationFilename and Options parameters for applications that will only be monitoring the system. Note that only the first Remote mode driver instance can control the instruments; additional driver instances can only monitor the instruments.

Parameters:

ConfigurationFilename Filename of the configuration file used to initialize the driver.

Options List of options. The format of the Options string is semicolon separated key and value pairs -- “Key=Value”.
Example: “Simulation=True;Timeout=10000”

Key (Option name)	Description	Default value
CheckInstError	Check the error status register after function calls that could produce an instrument error - like a Set function.	True
CheckInstErrorOptional	Check the error status register after function calls that are unlikely to produce an instrument error - like a Get function.	False
CheckInstModelOnInit	Check the instrument’s model number and compare it with the model number stored in the configuration file.	True
CheckInstSerialOnInit	Check the instrument’s serial number and compare it with the serial number stored in the configuration file.	False
CheckModuleModelOnInit	Check the output module’s model number and compare it with the model number stored in the configuration file.	True
CheckModuleSerialOnInit	Check the output module’s serial number and compare it with the serial number stored in the configuration file.	False

Key (Option name)	Description	Default value
CRCCheckOnInit	Calculate the CRC checksum of the configuration file at initialize time and compare it to the CRC checksum	True

	stored in the configuration file. This verifies the file's data integrity.	
DisableOnConnectionLoss	If an instrument loses connection after the driver was initialized, set the instrument to disabled state. When an instrument becomes disabled, its modules are also disabled and are no longer part the system. When DisableOnConnectionLoss=True and the connection is lost to an instrument during a function call, the function will return prematurely without completing the entire operation and will need to be rerun in order to get the desired result.	False
ForceRemoteClose	Force a close of the System Driver instance of the Server Control prior to initialization.	False
InitializeAction	Specify one of the following actions to perform by the Initialize function. This facilitates the disabling of groups, segments, modules or instruments prior to the driver going into initialized state. *Standard*: Read the configuration file and connect to all instruments *ReadConfig*: Read the configuration file *Connect*: Connect only to the enabled instruments	Standard
RebootTimeoutOnInit	The timeout in milliseconds after calling reboot in order to allow the instrument to restart its LAN connection. A reboot may be performed by the driver at initialize time.	25000
SetupOnInit	Reset and set up the instruments at initialize time. Instrument settings will be based on the configuration file. Set this option to false if you want to connect to a system without modifying its state. The configuration file should be the same as in the previous session.	True
ShutdownOnError	Turn all outputs off when an error occurs.	False
Simulation	Enable instrument simulation. Only applies to Fixed mode.	False
Timeout	The timeout in milliseconds for instrument IO to respond	5000

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Dlog Interface

This controls the Datalog functions.

GetDlogData Method

Syntax:

HRESULT GetDlogData([in] BSTR SelectCriteria, [in] Keysight14360ResultsTypeEnum ResultsType, [out, satype("float")] SAFEARRAY** VoltArr, [out, satype("float")] SAFEARRAY** CurrArr);

Description:

Retrieves the datalog data from a single module or segment. Calling this function transfers the datalog data from the selected modules to the driver.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command. Only a single module or segment can be selected.

ResultsType Results type: module or segment.

VoltArr Array that will be filled in with datalog voltage data.

CurrArr Array that will be filled in with datalog current data.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

StartDlog Method

Syntax:

HRESULT StartDlog([in] BSTR SelectCriteria, [in] float TimeInterval);

Description:

Starts a new datalog. Any previously captured data is cleared.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TimeInterval The time interval for capturing measurements into the datalog buffer. The range is from 0.02 seconds to 65 seconds.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

StopDlog Method

Syntax:

HRESULT StopDlog([in] BSTR SelectCriteria);

Description:

Stops a datalog that is in progress.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360DriverOperation Interface

These are the functions for retrieving information about the system based on the configuration.

CheckSystemState Method

Syntax:

HRESULT CheckSystemState([in] VARIANT_BOOL bOnErrorThrowException, [in] VARIANT_BOOL bOnErrorShutdownSystem, [out, retval] VARIANT_BOOL* bPassed);

Description:

Performs a self-test in all the instruments in the system and checks the status registers for error conditions. The live Questionable registers of each module are checked for indicators of OV, OC, PF, OT, OS, INH, UNR, and PROT.

Parameters:

bOnErrorThrowException Flag indicating whether or not to throw an exception if an error condition is found.

bOnErrorShutdownSystem Flag indicating whether or not to shutdown the system if an error condition is found.

Return Value:

true: Passed. false: Failed.

GetConfigInfo Method

Syntax:

HRESULT GetConfigInfo([in] Keysight14360ConfigInfoEnum InfoType, [out, retval] BSTR* Info);

Description:

Gets configuration information based on InfoType.

Parameters:

InfoType Information type.

Info The string that will be filled in with the requested information.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetDriverInfo Method

Syntax:

HRESULT GetDriverInfo([in] Keysight14360DriverInfoEnum InfoType, [out, retval] BSTR* Info);

Description:

Gets driver information based on InfoType.

Parameters:

InfoType Information type.

Info The string that will be filled in with the requested information.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetEnabled Method

Syntax:

HRESULT GetEnabled([in] BSTR SelectCriteria, [out, retval] VARIANT_BOOL* bEnabled);

Description:

Gets the enabled state of the group, segment, module or instrument.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command. Only a single group, segment, module or instrument can be selected.

Return Value:

The enabled state.

GetGroupCount Method

Syntax:

HRESULT GetGroupCount([out, retval] int* count);

Description:

Gets the number of groups in the system.

Return Value:

Group count.

GetGroupNameAtIndex Method

Syntax:

HRESULT GetGroupNameAtIndex([in] int Index, [out, retval] BSTR* Name);

Description:

Gets the group name at index.

Parameters:

Index The group index of system. The maximum index is GetGroupCount() - 1.

Name The group name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetGroupSegmentCount Method

Syntax:

HRESULT GetGroupSegmentCount([in] BSTR GroupName, [out, retval] int* count);

Description:

Gets the number of segments of a group.

Parameters:

GroupName The group's name.

Return Value:

Segment count.

GetGroupSegmentNameAtIndex Method

Syntax:

HRESULT GetGroupSegmentNameAtIndex([in] BSTR GroupName, [in] int Index, [out, retval] BSTR* Name);

Description:

Gets the name of a segment of a group at index.

Parameters:

GroupName The group's name.

Index The segment index of the group. The maximum index is GetGroupSegmentCount() - 1.

Return Value:

Segment name.

GetInstrumentCount Method

Syntax:

HRESULT GetInstrumentCount([out, retval] int* count);

Description:

Gets the number of instruments in the system. Only instruments that are part of groups are included.

Return Value:

Instrument count.

GetInstrumentInfo Method

Syntax:

HRESULT GetInstrumentInfo([in] BSTR Name, [in] Keysight14360InstrumentInfoEnum InfoType, [out, retval] BSTR* Info);

Description:

Gets instrument information based on the InfoType.

Parameters:

Name The instrument's name

InfoType Information type.

Info The string that will be filled in with the requested information.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetInstrumentMaxModulesCount Method

Syntax:

HRESULT GetInstrumentMaxModulesCount([in] BSTR InstrumentName, [out, retval] int* count);

Description:

Gets the maximum number of modules of an instrument.

Parameters:

InstrumentName The instrument's name.

Return Value:

Max modules count.

GetInstrumentModuleNameAtIndex Method

Syntax:

HRESULT GetInstrumentModuleNameAtIndex([in] BSTR InstrumentName, [in] int Index, [out, retval] BSTR* Name);

Description:

Gets the name of the module of the instrument at index.

Parameters:

InstrumentName The instrument's name.

Index Module index of the instrument. The maximum index is GetInstrumentMaxModulesCount() - 1.

Return Value:

Module name.

GetInstrumentNameAtIndex Method

Syntax:

HRESULT GetInstrumentNameAtIndex([in] int Index, [out, retval] BSTR* Name);

Description:

Get the name of the instrument at index.

Parameters:

Index Instrument index of system. The maximum index is GetInstrumentCount() - 1.

Return Value:

Instrument name.

GetModuleInfo Method

Syntax:

HRESULT GetModuleInfo([in] BSTR Name, [in] Keysight14360ModuleInfoEnum InfoType, [out, retval] BSTR* Info);

Description:

Gets module information based on InfoType.

Parameters:

Name The module's name.

InfoType Information type.

Info The string that will be filled in with the requested information.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetModuleSegmentMemberType Method

Syntax:

HRESULT GetModuleSegmentMemberType([in] BSTR ModuleName, [out, retval] Keysight14360ModuleSegmentMemberEnum* Type);

Description:

Gets the segment member type of module.

Parameters:

ModuleName The module's name.

Return Value:

Segment member type of type Keysight14360ModuleSegmentMemberEnum.

GetSegmentModuleCount Method

Syntax:

HRESULT GetSegmentModuleCount([in] BSTR SegmentName, [out, retval] int* count);

Description:

Gets the number of modules of a segment.

Parameters:

SegmentName The segment's name.

Return Value:

Module count.

GetSegmentModuleNameAtIndex Method

Syntax:

HRESULT GetSegmentModuleNameAtIndex([in] BSTR SegmentName, [in] int Index, [out, retval] BSTR* Name);

Description:

Gets the module name of a segment at index.

Parameters:

SegmentName The segment's name.

Index The module index of a segment. The maximum index is GetSegmentModuleCount() - 1.

Return Value:

Module name.

SetEnabled Method

Syntax:

HRESULT SetEnabled([in] BSTR SelectCriteria, [in] VARIANT_BOOL bEnabled);

Description:

Sets the enabled state of the group, segment, module or instrument.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

bEnabled The enabled state.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360FixedMode Interface

This controls the Fixed operating mode.

GetCurrLimit Method

Syntax:

HRESULT GetCurrLimit([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the current limit in Fixed mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

Current limit.

GetVoltLevel Method

Syntax:

HRESULT GetVoltLevel([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the voltage level in Fixed mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

Voltage level.

SetCurrLimit Method

Syntax:

HRESULT SetCurrLimit([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the current limit in Fixed mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The current limit.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetVoltLevel Method

Syntax:

HRESULT SetVoltLevel([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the voltage level in Fixed mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The voltage level.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Measurement Interface

This controls the measurement functions.

Measure Method

Syntax:

HRESULT Measure([in] BSTR SelectCriteria, [in] Keysight14360ResultsTypeEnum ResultsType, [out, satype("BSTR")] SAFEARRAY** NameArray, [out, satype("float")] SAFEARRAY** VoltMeasArray, [out, satype("float")] SAFEARRAY** CurrMeasArray);

Description:

Do a voltage and current measurement in the specified modules. Each measurement result based on ResultsType is a triplet (Name, VoltMeas, and CurrMeas).

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

ResultsType Results type of type Keysight14360ResultsTypeEnum.

NameArray Pointer to an array of size ResultsCount with the name of each corresponding voltage and current measurement.

VoltMeasArray Pointer to an array of size ResultsCount with the voltage measurements.

CurrMeasArray Pointer to an array of size ResultsCount with the current measurements.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Mode Interface

This controls the operating mode.

GetDACTableSize Method

Syntax:

HRESULT GetDACTableSize([in] BSTR SelectCriteria, [out, retval] Keysight14360DACTableSizeEnum* pVal);

Description:

Gets the digital-to-analog converter table size for SAS and Table modes.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

Table size of type Keysight14360DACTableSizeEnum.

GetOperMode Method

Syntax:

HRESULT GetOperMode([in] BSTR SelectCriteria, [out, retval] Keysight14360OperModeEnum* pVal);

Description:

Gets the operating mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

Operating mode of type Keysight14360OperModeEnum.

SetDACTableSize Method

Syntax:

HRESULT SetDACTableSize([in] BSTR SelectCriteria, [in] Keysight14360DACTableSizeEnum newVal);

Description:

Sets the digital-to-analog converter table size for SAS and Table modes.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal Table size of type Keysight14360DACTableSizeEnum.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetOperMode Method

Syntax:

HRESULT SetOperMode([in] BSTR SelectCriteria, [in] Keysight14360OperModeEnum newVal);

Description:

Sets the operating mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal Operating mode of type Keysight14360OperModeEnum.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Output Interface

This controls the output state and related functions.

GetOutputEnabled Method

Syntax:

HRESULT GetOutputEnabled([in] BSTR SelectCriteria, [out, retval] VARIANT_BOOL* pVal);

Description:

Gets the output enable state.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

True: enabled. False: disabled.

SetOutputEnabled Method

Syntax:

HRESULT SetOutputEnabled([in] BSTR SelectCriteria, [in] VARIANT_BOOL Enabled);

Description:

Sets the output enabled state.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Enabled True: enabled. False: disabled.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Protection Interface

This controls the protection functions of the instruments and modules.

GetCurrProtLevel Method

Syntax:

HRESULT GetCurrProtLevel([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the current protection level.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

The current protection level.

GetCurrSoftLimitHigh Method

Syntax:

HRESULT GetCurrSoftLimitHigh([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the current high soft limit.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

The current high soft limit.

GetVoltProtLevel Method

Syntax:

HRESULT GetVoltProtLevel([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the voltage protection level.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

The voltage protection level.

GetVoltSoftLimitHigh Method

Syntax:

HRESULT GetVoltSoftLimitHigh([in] BSTR SelectCriteria, [out, retval] float* pVal);

Description:

Gets the voltage high soft limit.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

The voltage high soft limit.

ProtClear Method

Syntax:

HRESULT ProtClear([in] BSTR SelectCriteria);

Description:

Clears output protection.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetCurrProtLevel Method

Syntax:

HRESULT SetCurrProtLevel([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the current protection level.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The current protection level.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetCurrSoftLimitHigh Method

Syntax:

HRESULT SetCurrSoftLimitHigh([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the current high soft limit.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The current high soft limit.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetVoltProtLevel Method

Syntax:

HRESULT SetVoltProtLevel([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the voltage protection level.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The voltage protection level.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetVoltSoftLimitHigh Method

Syntax:

HRESULT SetVoltSoftLimitHigh([in] BSTR SelectCriteria, [in] float newVal);

Description:

Sets the voltage high soft limit.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The voltage high soft limit.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360SAS Interface

Controls the SAS Immediate and SAS List modes.

SASImmMode Property

Syntax:

HRESULT SASImmMode([out,retval] IKeysight14360SASImmMode** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360SASImmMode reference.

SASListMode Property

Syntax:

HRESULT SASListMode([out,retval] IKeysight14360SASListMode** ppInterface);

Description:

Returns an interface reference of the driver instance.

Return Value:

IKeysight14360SASListMode reference.

GetSASMode Method

Syntax:

HRESULT GetSASMode([in] BSTR SelectCriteria, [out, retval] Keysight14360SASModeEnum* pVal);

Description:

Gets the SAS mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

The current SAS mode of type Keysight14360SASModeEnum.

SetSASMode Method

Syntax:

HRESULT SetSASMode([in] BSTR SelectCriteria, [in] Keysight14360SASModeEnum newVal);

Description:

Sets the SAS mode.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal The current SAS mode of type Keysight14360SASModeEnum.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360SASImmMode Interface

This controls the SAS Immediate mode.

GetSASImmCurve Method

Syntax:

HRESULT GetSASImmCurve([in] BSTR SelectCriteria, [out] float* CurrentSAS_ISC, [out] float* CurrentSAS_IMP, [out] float* VoltageSAS_VOC, [out] float* VoltageSAS_VMP);

Description:

Gets the SAS Immediate mode curve parameters.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

CurrentSAS_ISC ISC (short-circuit current).

CurrentSAS_IMP IMP (current at maximum power).

VoltageSAS_VOC VOC (open-circuit voltage).

VoltageSAS_VMP VMP (voltage at maximum power).

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetSASImmDACTable Method

Syntax:

HRESULT GetSASImmDACTable([in] BSTR SelectCriteria, [in] Keysight14360TableEnum TableType, [out, retval, satype("float")] SAFEARRAY** Table);

Description:

Gets the current or voltage DAC table of the SAS Immediate mode curve.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TableType The current or voltage table.

Table The DAC table points.

Return Value:

The DAC table points.

SetSASImmCurve Method

Syntax:

HRESULT SetSASImmCurve([in] BSTR SelectCriteria, [in] float CurrentSAS_ISC, [in] float CurrentSAS_IMP, [in] float VoltageSAS_VOC, [in] float VoltageSAS_VMP);

Description:

Sets the SAS Immediate mode curve parameters.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

CurrentSAS_ISC ISC (short-circuit current).

CurrentSAS_IMP IMP (current at maximum power).

VoltageSAS_VOC VOC (open-circuit voltage).

VoltageSAS_VMP VMP (voltage at maximum power).

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360SASListMode Interface

This controls the SAS List mode.

ConfigureSASList

Syntax:

HRESULT ConfigureSASList([in] BSTR SelectCriteria, [in] Keysight14360ListStepEnum StepType);

Description:

Sets the SAS list trigger step type. The trigger parameters are then configured based on the step type. Call this function prior to Transient.InitiateTran.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

StepType Step type of type Keysight14360ListStepEnum.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetListRunCount Method

Syntax:

HRESULT GetListCount([in] BSTR SelectCriteria, [out, retval] int* pVal);

Description:

Gets the SAS List mode list run count. A value greater than 256 is considered to be infinity.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

Run count.

GetSASList Method

Syntax:

HRESULT GetSASList([in] BSTR SelectCriteria, [in] Keysight14360SASListEnum ListType, [out, retval, satype("float")] SAFEARRAY** List);

Description:

Gets the SAS List points.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

ListType List type of type Keysight14360SASListEnum.

List Pointer to an array of size ElementsCount to be filled with list points.

Return Value:

The number of list points returned.

GetSASListCount Method

Syntax:

HRESULT GetSASListCount([in] BSTR SelectCriteria, [in] Keysight14360SASListEnum ListType, [out, retval] int* Count);

Description:

Gets the SAS List points count.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

ListType List type of type Keysight14360SASListEnum.

Return Value:

The list points count.

GetSASListStepActive Method

Syntax:

HRESULT GetSASListStepActive([in] BSTR SelectCriteria, [out, retval] int* Step);

Description:

Gets the present list step. A -1 is returned if a list is not running.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Step The zero-based list step.

Return Value:

The list step.

GetSASListDACTable Method

Syntax:

HRESULT GetSASListDACTable([in] BSTR SelectCriteria, [in] int Step, [in] Keysight14360TableEnum TableType, [out, retval, satype("float")] SAFEARRAY** Table);

Description:

Gets the current or voltage DAC table of the specified SAS List step curve.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Step The zero-based list step.

TableType The current or voltage table.

Table The DAC table points.

Return Value:

The DAC table points.

GetTermLastEnabled Method

Syntax:

HRESULT GetTermLastEnabled([in] BSTR SelectCriteria, [out, retval] VARIANT_BOOL* pVal);

Description:

Gets the SAS List Mode terminate on last list point enabled.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

True: enabled. False: disabled.

SetListRunCount Method

Syntax:

HRESULT SetListRunCount([in] BSTR SelectCriteria, [in] int newVal);

Description:

Sets the SAS List mode list run count. A value greater than 256 is considered to be infinity.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal Run count.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetSASList Method

Syntax:

HRESULT SetSASList([in] BSTR SelectCriteria, [in] Keysight14360SASListEnum ListType, [in, satype("float")] SAFEARRAY* List);

Description:

Sets the SAS List points.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

ListType List type of type Keysight14360SASListEnum.

List Pointer to an array of size ElementsCount with the list points.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetTermLastEnabled Method

Syntax:

HRESULT SetTermLastEnabled([in] BSTR SelectCriteria, [in] VARIANT_BOOL newVal);

Description:

Sets the SAS List Mode terminate on last list point enabled.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

newVal True: enabled. False: disabled.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Status Interface

This controls the status functions.

ConfigureRegister Method

Syntax:

HRESULT ConfigureRegister([in] BSTR SelectCriteria, [in] Keysight14360StatusRegisterEnum Register, [in] Keysight14360StatusSubRegisterEnum SubRegister, [in] int newVal);

Description:

Sets the value of the specified register's subregister. See the SCPI Programmers Reference for an explanation of the status system.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Register The register type.

SubRegister The subregister type.

newVal Register value.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

Preset Method

Syntax:

HRESULT Preset([in] BSTR SelectCriteria);

Description:

Sets the status registers to their default values.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

QueryRegister Method

Syntax:

HRESULT QueryRegister([in] BSTR SelectCriteria, [in] Keysight14360StatusRegisterEnum Register, [in] Keysight14360StatusSubRegisterEnum SubRegister, [out, retval] int* pVal);

Description:

Gets the value of the specified register's subregister. See the SCPI Programmers Reference for an explanation of the status system.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Register The register type.

SubRegister The subregister type.

Return Value:

Register value.

IKeysight14360System Interface

This controls the system functions.

DirectIOPrint Method

Syntax:

HRESULT DirectIOPrint([in] BSTR SelectCriteria, [in] BSTR Command);

Description:

Sends a SCPI command.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Command The SCPI command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

DirectIOQuery Method

Syntax:

HRESULT DirectIOQuery([in] BSTR SelectCriteria, [in] BSTR Query, [in] int TimeoutMS, [in] int BufferSize, [out, retval] BSTR* Response);

Description:

Sends a SCPI query and gets the response.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Query The SCPI query.

TimeoutMS IO timeout in milliseconds. Default is 5000 ms.

BufferSize The maximum string length to expect as a response from the instrument.

Response The string buffer that will be filled in with the response from the instrument.

Return Value:

The SCPI response.

DisplayEnabled Method

Syntax:

HRESULT DisplayEnabled([in] BSTR SelectCriteria, [in] VARIANT_BOOL Enabled);

Description:

Enables or disables the display on the instrument.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Enabled True: enabled. False: disabled.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

DisplayView Method

Syntax:

HRESULT DisplayView([in] BSTR SelectCriteria, [in] Keysight14360DisplayViewEnum View);

Description:

Sets the display view of an instrument.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

View View type of type Keysight14360DisplayViewEnum.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetInstrumentError Method

Syntax:

HRESULT GetInstrumentError([in] BSTR SelectCriteria, [out, retval] BSTR* ErrorMessage);

Description:

Gets the instrument's first error from the error queue.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

ErrorMessage The error message.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetMeterSummary Method

Syntax:

HRESULT GetMeterSummary([in] BSTR SelectCriteria, [out] VARIANT_BOOL* bOutputEnabled, [out] float* fVoltMeas, [out] float* fCurrMeas, [out] Keysight14360OperModeEnum* Mode, [out] float* fVoltSetting, [out] float* fCurrSetting, [out, retval] BSTR* Status);

Description:

Gets the summary values of a module's front panel meter. This function utilizes instrument IO bandwidth more efficiently than individual queries of each value and should be used in applications like a system meter view that are frequently refreshed.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

bOutputEnabled Output enabled state.

fVoltMeas Front panel voltage measurement.

fCurrMeas Front panel current measurement.

Mode Current mode of type Keysight14360OperModeEnum.

fVoltSetting The voltage setting of the current mode. In Fixed mode this is the volt level. In SAS mode this is VMP.

fCurrSetting The current setting of the current mode. In Fixed mode this is the current limit. In SAS mode this is IMP.

Status

The status of the module. Values include "" when output is off, "CV", "CC", "OV", "OC", "PF", "OT", "OS", "INH", "UNR", "PROT", and "Unknown".

Return Value:

The SCPI response.

IKeysight14360TableMode Interface

This controls the Table functions.

Tables are saved per instrument, not per module. If you are programming a table for the segments in an SAS system, all segments must have the same number of modules assigned. This is because when setting the current points of the table for the segment, the values of the table are divided by the number of modules in each segment.

GetTableCount Method

Syntax:

HRESULT GetTableCount([in] BSTR SelectCriteria, [in] Keysight14360TableEnum TableType, [out, retval] float* pVal);

Description:

Get the selected table's points count.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TableType Table type of type Keysight14360TableEnum.

Return Value:

The table points count.

GetTableDACTable Method

Syntax:

HRESULT GetTableDACTable([in] BSTR SelectCriteria, [in] BSTR Name, [in] Keysight14360TableEnum TableType, [out, retval, satype("float")] SAFEARRAY** Table);

Description:

Gets the current or voltage DAC table of the specified table name.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name stored in instrument memory.

TableType The current or voltage table.

Table The DAC table points.

Return Value:

The DAC table points.

GetTableName Method

Syntax:

HRESULT GetTableName([in] BSTR SelectCriteria, [out, retval] BSTR* Name);

Description:

Gets the active table name.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetTableOffset Method

Syntax:

HRESULT GetTableOffset([in] BSTR SelectCriteria, [in] Keysight14360TableEnum TableType, [out, retval] float* pVal);

Description:

Gets the selected table's offset.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TableType Table type of type Keysight14360TableEnum.

Return Value:

The table offset.

SetTable Method

Syntax:

HRESULT SetTable([in] BSTR SelectCriteria, [in] Keysight14360TableEnum TableType, [in, satype("float")] SAFEARRAY* Points);

Description:

Set the selected table's points.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TableType Table type of type Keysight14360TableEnum.

Values Array with the new point values.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetTableName Method

Syntax:

HRESULT SetTableName([in] BSTR SelectCriteria, [in] BSTR Name);

Description:

Set the active table name.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetTableOffset Method

Syntax:

HRESULT SetTableOffset([in] BSTR SelectCriteria, [in] Keysight14360TableEnum TableType, [in] float newVal);

Description:

Set the selected table's offset.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

TableType Table type of type Keysight14360TableEnum.

newValue The table offset.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TableCatalog Method

Syntax:

HRESULT TableCatalog([in] BSTR SelectCriteria, [out, retval] BSTR* Catalog);

Description:

Returns the names of all user-defined tables in both volatile and non-volatile memory.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Catalog A string with comma-separated table names.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TableCopy Method

Syntax:

HRESULT TableCopy([in] BSTR SelectCriteria, [in] BSTR Name);

Description:

Copies the active table to non-volatile memory with the specified name.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TableDelete Method

Syntax:

HRESULT TableDelete([in] BSTR SelectCriteria, [in] BSTR Name);

Description:

Delete the table with the specified name from memory.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TableDeleteAll Method

Syntax:

HRESULT TableDeleteAll([in] BSTR SelectCriteria);

Description:

Delete all tables from memory.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TableSelect Method

Syntax:

HRESULT TableSelect([in] BSTR SelectCriteria, [in] BSTR Name);

Description:

Select a table from memory for table operations.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Name The Table name.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

IKeysight14360Transient Interface

This controls the transient functions.

AbortTran Method

Syntax:

HRESULT AbortTran([in] BSTR SelectCriteria);

Description:

Aborts a transient trigger that is either initiated or has been triggered.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

GetTranInitContEnabled Method

Syntax:

HRESULT GetTranInitContEnabled([in] BSTR SelectCriteria, [out, retval] VARIANT_BOOL* pVal);

Description:

Gets the transient initiate continuous enabled setting.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

True: enabled. False: disabled.

InitiateTran Method

Syntax:

HRESULT InitiateTran([in] BSTR SelectCriteria, [in] VARIANT_BOOL WaitToInitiate);

Description:

Initiates the transient trigger system.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

WaitToInitiate Whether or not to wait for the initiate process to complete before the function returns.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

SetTranInitContEnabled Method

Syntax:

HRESULT SetTranInitContEnabled([in] BSTR SelectCriteria, [in] VARIANT_BOOL Enabled, [in] VARIANT_BOOL WaitToInitiate);

Description:

Sets transient initiate continuous enabled.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Enabled True: enabled. False: disabled.

WaitToInitiate Whether or not to wait for the initiate process to complete before the function returns.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

TriggerTran Method

Syntax:

HRESULT TriggerTran([in] BSTR SelectCriteria);

Description:

Trigger transient immediate.

Parameters:

SelectCriteria Selection Criteria to specify the destination of the command.

Return Value:

0: Success. Greater than 0: Error. Less than 0: Warning.

4
System Driver Enumerations

This chapter describes the System Driver enumerations.

KEYSIGHT TECHNOLOGIES

System Driver Enumerations

This section lists all of the enumerations of the driver functions.

Keysight14360ConfigInfoEnum

Configuration information.

Value	Description
Keysight14360ConfigInfoName	Name.
Keysight14360ConfigInfoAuthor	Author.
Keysight14360ConfigInfoCompany	Company.
Keysight14360ConfigInfoDescription	Description.
Keysight14360ConfigInfoLastModified	Last modified date.
Keysight14360ConfigInfoCRCChecksum	CRC checksum.
Keysight14360ConfigInfoFilename	Filename.
Keysight14360ConfigInfoInitializeOptions	Initialize options string.

Keysight14360DACTableSizeEnum

Digital-to-analog converter table size.

Value	Description
Keysight14360DACTableSize256	256: Faster to calculate and activate, at the expense of resolution.
Keysight14360DACTableSize4096	4096: Greater resolution of the I-V characteristic, but takes longer to calculate and activate.

Keysight14360DisplayViewEnum

Display type.

Value	Description
Keysight14360DisplayViewChan1	Channel 1.
Keysight14360DisplayViewChan2	Channel 2.
Keysight14360DisplayViewAll	All channels.

Keysight14360DriverInfoEnum

Driver information.

Value	Description
Keysight14360DriverInfoName	Name.
Keysight14360DriverInfoVersion	Version.
Keysight14360DriverInfoDescription	Description.

Keysight14360InstrumentInfoEnum

Instrument information.

Value	Description
Keysight14360InstrumentInfoModel	Model.
Keysight14360InstrumentInfoConnStr	Connection string. The actual string used to successfully connect to the instrument.
Keysight14360InstrumentInfoSerial	Serial number.
Keysight14360InstrumentInfoIP	IP address.
Keysight14360InstrumentInfoHostname	Hostname.
Keysight14360InstrumentInfoVISAResDesc	VISA resource descriptor.

Keysight14360ListStepEnum

List step.

Value	Description
Keysight14360ListStepOnce	Once.
Keysight14360ListStepAuto	Auto.

Keysight14360ModuleInfoEnum

Module information.

Value	Description
Keysight14360ModuleInfoModel	Model.
Keysight14360ModuleInfoSerial	Serial number.
Keysight14360ModuleInfoOptions	Options.
Keysight14360ModuleInfoParentInstrumentName	Parent instrument name.
Keysight14360ModuleInfoChannel	Channel number.
Keysight14360ModuleInfoChannelGroupCount	Channel group count.

Keysight14360ModuleSegmentMemberEnum

Module segment member.

Value	Description
Keysight14360ModuleSegmentMemberMaster	Master. The first module in a segment.
Keysight14360ModuleSegmentMemberFollower	Follower. Modules in a segment other than the first master module.

Keysight14360OperModeEnum

The operating current mode.

Value	Description
Keysight14360OperModeFixed	Fixed mode.
Keysight14360OperModeSAS	SAS mode. Set the SAS mode to Immediate or List using SAS.SetSASMode.
Keysight14360OperModeTable	Table mode.

Keysight14360ResultsTypeEnum

Measurement results type.

Value	Description
Keysight14360ResultsTypeModule	Return results per module.
Keysight14360ResultsTypeSegment	Return results per segment. Segment results are calculated from member modules.

Keysight14360SASListEnum

SAS list type.

Value	Description
Keysight14360SASListISC	ISC (short circuit current).
Keysight14360SASListIMP	IMP (current at max power).
Keysight14360SASListVOC	VOC (open circuit voltage).
Keysight14360SASListVMP	VMP (Voltage at max power).
Keysight14360SASListDwell	Dwell.

Keysight14360SASModeEnum

SAS mode.

Value	Description
Keysight14360SASModeImm	SAS Immediate mode.
Keysight14360SASModeList	SAS List mode.

Keysight14360StatusRegisterEnum

Status register.

Value	Description
Keysight14360StatusRegisterStatusByte	Status byte.
Keysight14360StatusRegisterStandardEvent	Standard event.
Keysight14360StatusRegisterOperation	Operation.
Keysight14360StatusRegisterQuestionable	Questionable.

Keysight14360StatusSubRegisterEnum

Sub Register.

Value	Description
Keysight14360StatusSubRegisterCondition	Condition.
Keysight14360StatusSubRegisterNegativeTransition	Negative Transition.
Keysight14360StatusSubRegisterPositiveTransition	Positive Transition.
Keysight14360StatusSubRegisterEvent	Event.
Keysight14360StatusSubRegisterEnable	Enable.

Keysight14360TableEnum

Table type.

Value	Description
Keysight14360TableCurr	Current table.
Keysight14360TableVolt	Voltage table.

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