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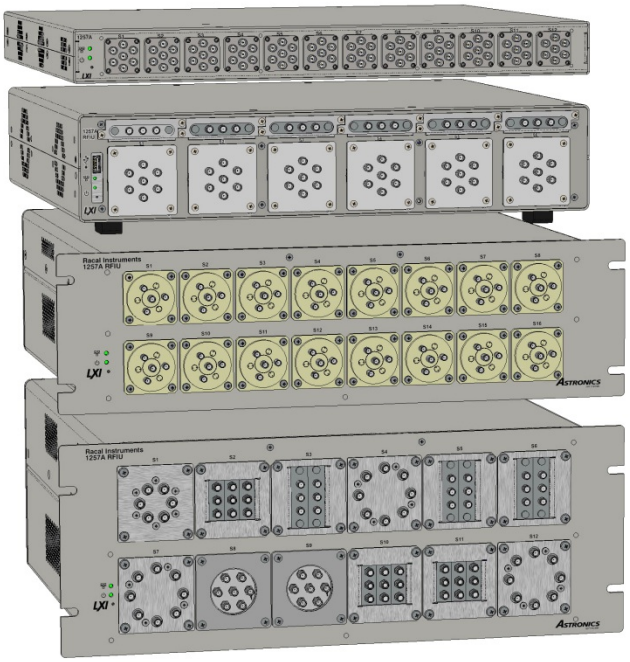
Racal Instruments™

1257A

Scalable RF Interface Unit

User Manual

Publication No. 980989 Rev. D



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FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.
2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

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We

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declare under sole responsibility that:

1257A-1 (P/N 408329)
1257A-2 (P/N 408249)
1257A-3 (P/N 408387)
1257A-4 (P/N 408386)

conform to the following Product Specifications:

Safety: **EN/IEC 61010-1, 3rd Edition: Safety Requirements, Electrical Equipment for Measurement, Control, and Laboratory Use**

EMC:

Radiated Emissions: EN 55011:2009 (Amended by A1:2010) Class B
Conducted Emissions: EN 55011:2009 (Amended by A1:2010) Class B
Harmonics: EN 61000-3-2:2006 (Amended by A1:2009 & A2:2009)
Flicker: EN 61000-3-3:2008
Radiated Immunity: EN 61000-4-3:2006 (Amended by A1:2008)
EFT: EN 61000-4-4:2004 (Amended by A1:2010)
ESD: EN 61000-4-2:2009
Surge: EN 61000-4-5:2006
Conducted Immunity: EN 61000-4-6:2009
Magnetic Field Immunity: EN 61000-4-8:2010
Voltage Interruptions: EN 61000-4-11:2004
Voltage Dips: EN 61000-4-11:2004

Irvine, CA, May 30, 2013

David Johnston, Engineering Manager

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DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
A	9/17/2012	Document Control release
B	4/25/2013	ECN02628. Adds 3U and 4U configuration information. Updates text, tables, and figures to current features and specifications. Add new configuration software tool information.
C	8/19/2014	ECN04033. Adds information on Power-On Recall, Confidence Mode, and Event System. Also adds information on establishing a connection over USB. Add CE certificate.
D	7/6/2015	ECN05930. Adds additional information to clarify Confidence Mode, Route:Verify, and Event System in the Chapter 4.

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Chapter 1
Overview and Features

The 1257A Scalable RF Interface Units are high-performance switching and control systems in 1U, 2U, 3U or 4U height configurations. They come standard with LXI/Ethernet, USB, and GPIB control interfaces as well as a rich SCPI command set and IVI drivers for ease of use and compatibility with a variety of software environments.

The 1257A series features

- Quick and easy device configuration through a web interface
- LXI™ compliant (certification pending) remote control and monitoring through your Ethernet connection
- Simplified programming allowing greater software reuse with other leading text software through our IVI™ drivers
- Fast setup with no configuration jumpers or switches to set
- Small footprint/high density size
- Rack-mount or bench top use

The 1257A-1 (**Figure 1-1**) includes the following features:

- 1U height
- Up to 12 2xSPDT, DPDT, SP4T, and SP6T miniature relays
- User-selectable standard configuration
- Relay counters with warnings and end-of-life thresholds
- Relays that are front-pluggable and connectorized for ease of expansion and field repair

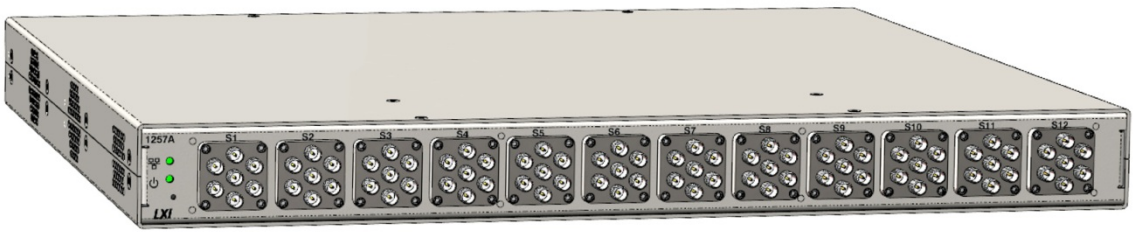


Figure 1-1, 1257A-1 (1U) Scalable RF Interface Unit

Note: *The 1257A illustrations in this manual are for example only and may not include switches or relays that are included in your configured system.*

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The 1257A-2 (**Figure 1-2**) includes the following features:

- 2U height
- Up to 6 SPDT coaxial switches
- Up to 6 SP4T or SP6T multiport coaxial switches
- Relay counters with warnings and end-of-life thresholds
- Relays that are front-pluggable and connectorized for ease of expansion and field repair

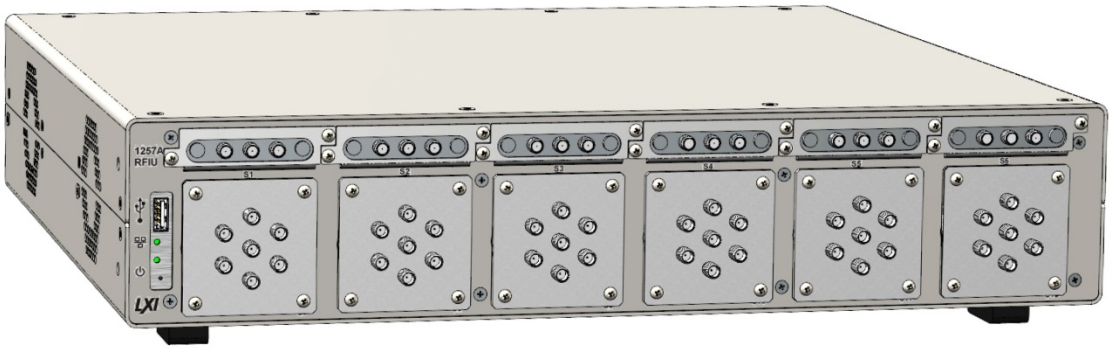


Figure 1-2, 1257A-2 (2U) Scalable RF Interface Unit

The 1257A-3 (**Figure 1-3**) includes the following features:

- 3U height
- Up to 16 SP3T, SP4T, and SP6T coaxial relays
- Relay counters with warnings and end-of-life thresholds
- Relays that are front-pluggable and connectorized for ease of expansion and field repair

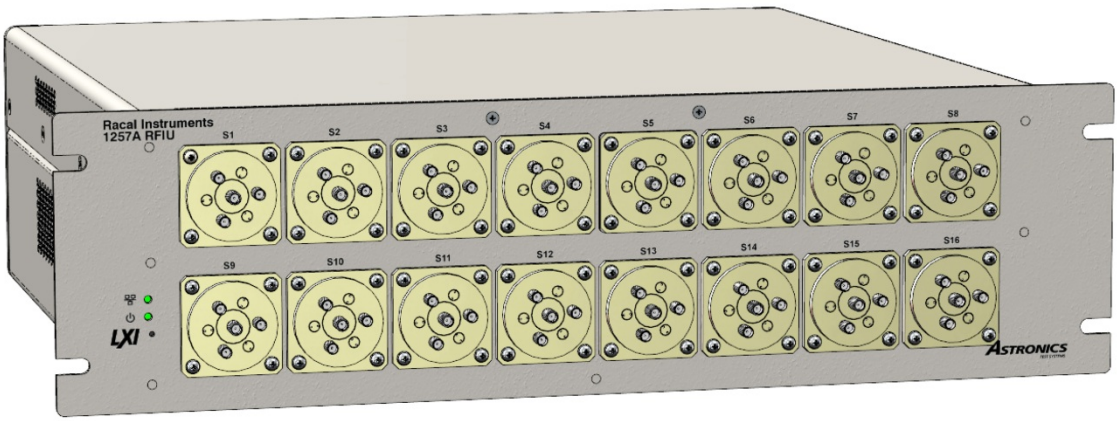


Figure 1-3, 1257A-3 (3U) Scalable RF Interface Unit

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The 1257A-4 (**Figure 1-4**) includes the following features:

- 4U height
- Up to 12 2xSPDT terminated, 3xSPDT, SP4T, and SP6T relays
- Relay counters with warnings and end-of-life thresholds
- Relays that are front-pluggable and connectorized for ease of expansion and field repair

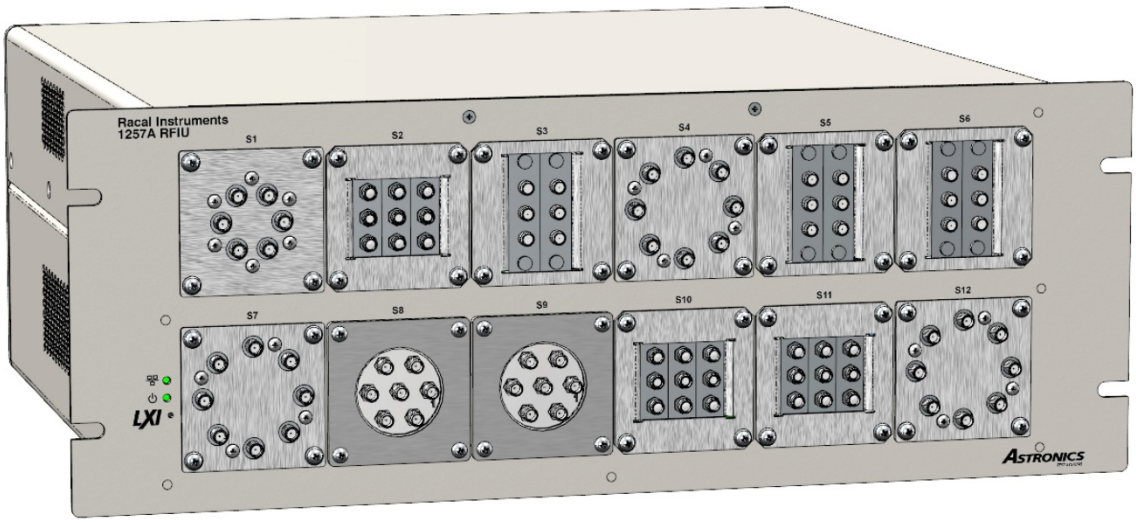


Figure 1-4, 1257A-4 (4U) Scalable RF Interface Unit

Web-Page Interface

The 1257A has a built-in web-page interface to allow full access and control of the instrument and driver cards. The system controls require you to have a recent version of the Java™ engine installed on your computer.

The web-page interface provides information regarding VISA resource strings, Refer to **Chapter 3, LXI Web-Page Controls** for further information.

Software Control

The 1257A provides extensive software capabilities, including:

- Exclude Lists. Allows you to prevent simultaneous closure of switches in a specified exclude group. The switches are then mutually exclusive.
- Include Lists. Reduces programming effort. When two or more modules are on an include list, they respond simultaneously to a command sent to any of them.
- Verification. Allows you to verify the status of all switches with proper hardware configuration. This can be either through drive feedback or indicator feedback, depending on the relay type.

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- Path-Level Switching. Allows complex paths to be defined with open and close elements, stored in non-volatile memory, and be controlled remotely.
- Non-Volatile Memory. Stores and recalls switch configurations and 1257A user preferences (such as GPIB address).
- Power-Up Recall. Automatically recalls a complete switching system configuration from non-volatile memory at power-up.
- Self-Test. Ensures that critical system components are functioning correctly. This test executes automatically at power-up.
- Relay Counters. Records each relay activation. Notification given of relay warning and end-of-life limits.
- Latching and fail-safe relay operation

Additional Features

Ease of Use

The 1257A Scalable RF Interface Unit has many design features to make it easy and convenient to use:

- Fast Setup. There are no hardware configuration jumpers or switches to set.
- Flexible Controller Interface. The controller (host computer) may communicate with the 1257A using Ethernet, USB, or GPIB interfaces. This allows an external computer to automate the operation of the 1257A.
- Command Set Commonality. The 1257A supports the Standard Commands for Programmable Instruments (SCPI) Language. This command set is used in other switching platforms such as the 1256 and 1260-Series VXI. For an introduction to the SCPI command set and its usage, see **Chapter 4, SCPI Command Basics**. For a complete description of all SCPI commands for the 1257A, see **Chapter 5, SCPI Command Reference**.

LAN Reset Button

The LAN Reset button is used to reset the LAN settings of the 1257A to a factory default setting which includes automatic IP address configuration and password reset.

To activate the LAN reset, press the button for a minimum of five seconds. When released, the LAN status light on the front panel momentarily turns off and then turns back on to indicate the LAN status.

You may need to rediscover the LAN IP address (see **Chapter 2, Getting Started**).

For initial password setting information, see **Setting the Password** in **Chapter 3, LXI Web Page Controls**.

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Power On Recall

The 1257A provides a feature to automatically recall “State 0” (known as the Reset State) at power up. To do so, enable the **Power On Recall** check box on the **System>Setup** page. (Refer to **Setup Tab** in **Chapter 4, LXI Web-Page Controls**.)

Note: *Store a “State 0” (Reset State) using the “*SAV 0” command prior to enabling and using this functionality.*

You may use Power On Recall to recall a start-up state on the 1257A. Doing so synchronizes the internal state of the 1257A system with the stored relay state on the next system power on.

Recalling a start-up state is particularly useful when you are using **latching relays with read backs**. Enabling the Power On recall ensures that at the following power-up, the 1257A internal state will synchronize with the start-up relay state set up in “State 0.”

Note: *For latching relays, if a “close” path that exists in “State 0” is already closed, the path will not be opened during the “Reset” command that is automatically executed during “Power On Recall.”*

Recall State (0) after a '*RST' (or SYSTem::PRESet) Command

This feature is available only if the **Power On Recall** feature is selected. Enabling this feature causes “State 0” to be recalled after a '*RST' or (SYSTem::PRESet) command execution. For additional information, refer to the preceding section, **Power On Recall**, and **Chapter 4, SCPI Command Basics**.

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1257A Front and Rear Panels

Note: *The illustrations of the 1257A in this manual are representative of what your customized system may look like. They illustrate the location of the front and rear controls, connectors, and indicators.*

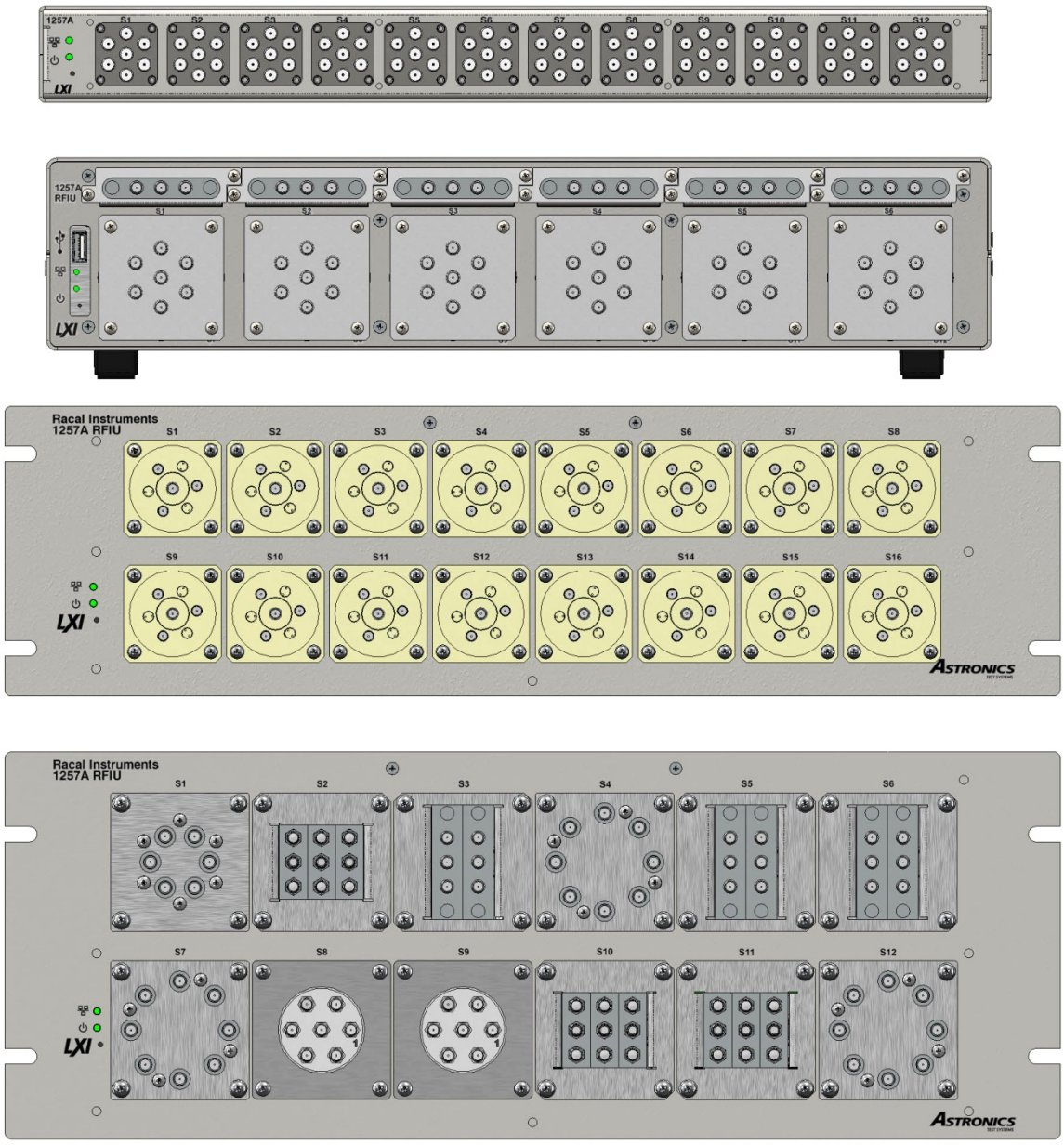


Figure 1-5, 1257A Front Views

Figures 1-5 and **1-6** show the front and rear views of the 1257A chassis. **Figures 1-7** and **1-8** detail the connectors, switches, and fuse.

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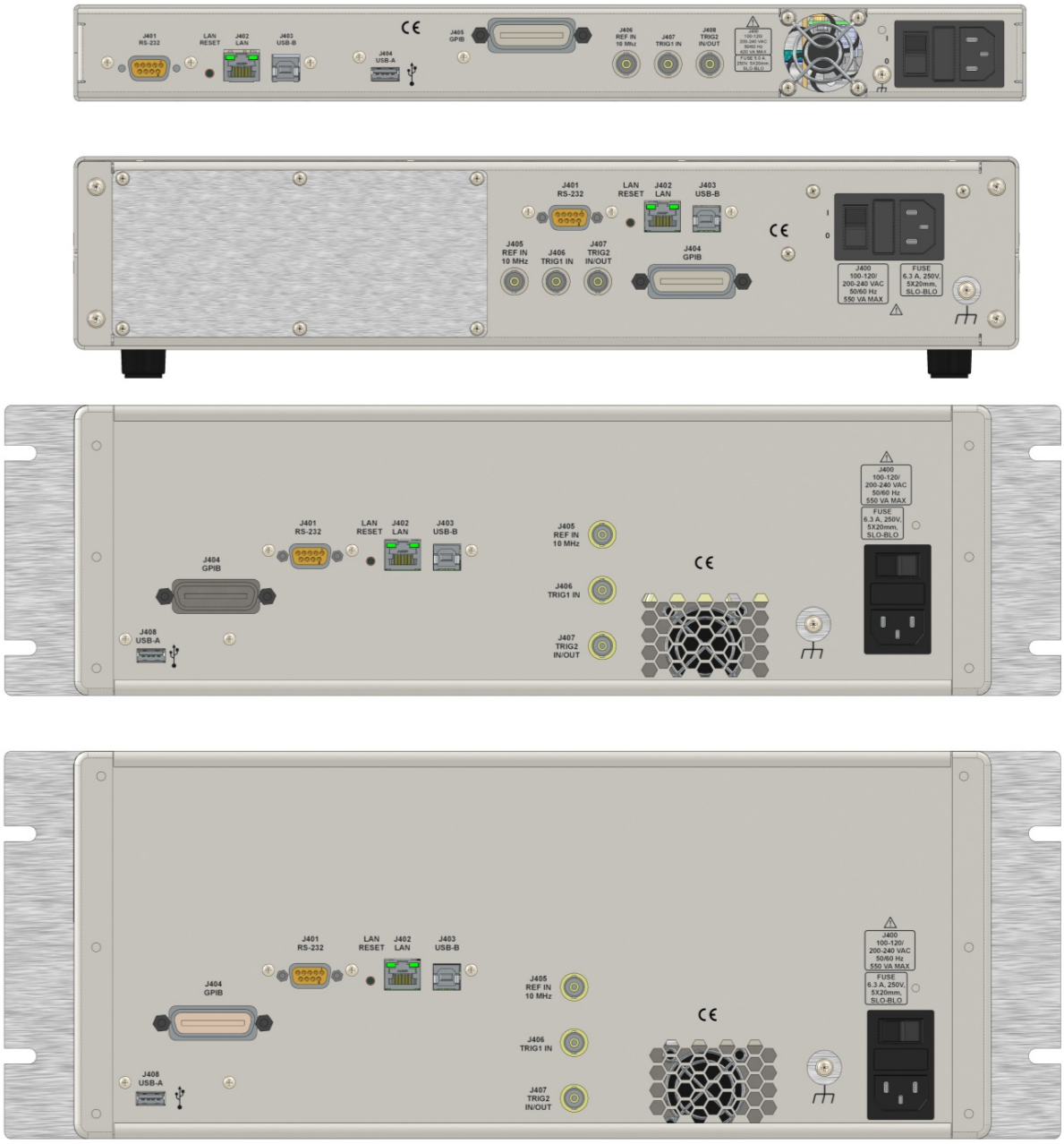


Figure 1-6, 1257A Rear Views

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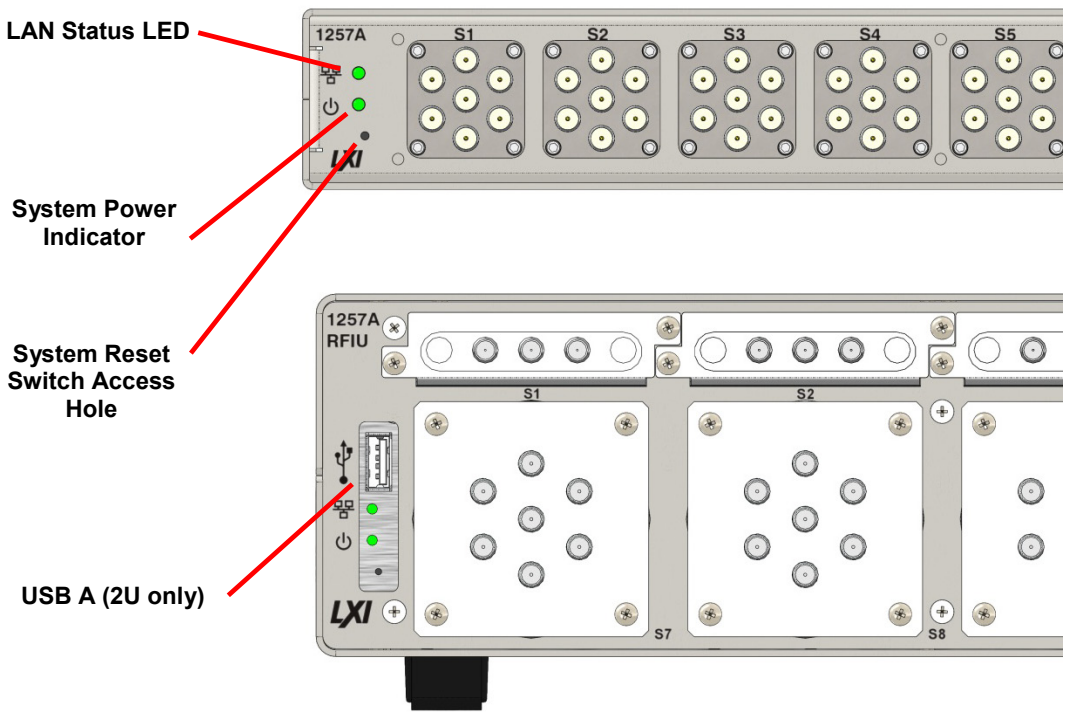


Figure 1-7, 1U and 2U Front View Detail (Appearance Typical of All Units)

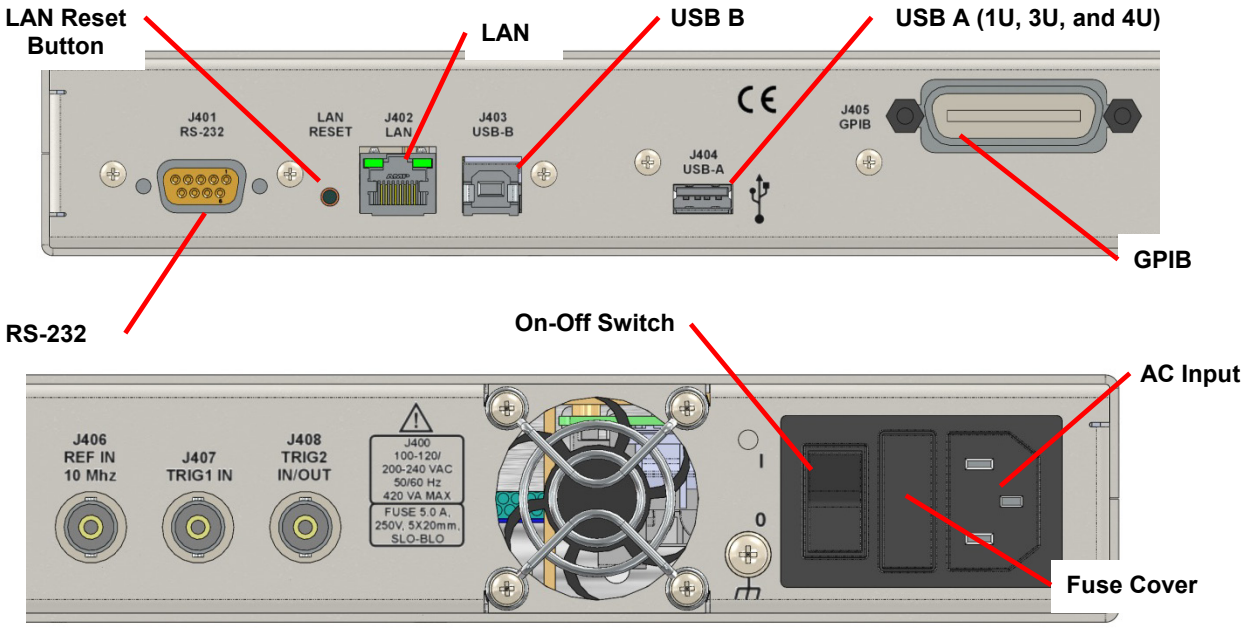


Figure 1-8, 1U Rear View Detail (Appearance Typical of All Units)

Note: *At this time, the Trigger and 10 MHz connectors on the rear of the 1257A are not supported by the operating software.*

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Chassis Identification Label

The identification label (**Figure 1-9**) on the side or rear of the 1257A chassis includes the part number and build revision level, the serial number, and the chassis Media Access Control (MAC) address.

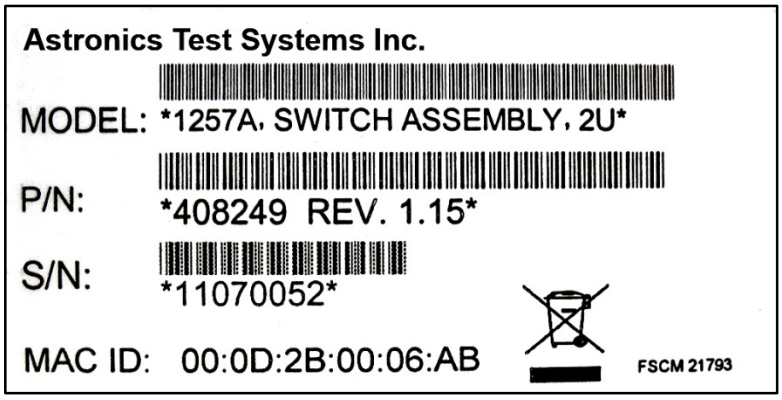


Figure 1-9, Chassis Identification Label (Appearance Typical)

Specifications

General

System Management	Firmware upgrades: via LAN port Data file I/O: via USB interface

Software

Drivers	IVI-C and IVI-COM LabVIEW™ (version 9.0)
User Interfaces	Web pages SCPI & SCPI scripting

Front Panel I/O and Controls

USB Interface	USB 2.0 full-speed Type A port (on 2U)
Indicators	LAN status System power
Reset	System reset switch

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Rear Panel I/O and Controls

Control Port Interfaces	USB 2.0 full-speed Type A port (on 1U, 3U, and 4U) USB 1.1 full-speed Type B port GPIB port (IEEE-488.2) LAN port: RJ-45 (LXI Class C) RS-232: (Factory debug port)
Indicators	LAN status
Reset	LAN reset switch
Power	Main system power
Fuses	Access cover

Note: *At this time, the Trigger and 10 MHz connectors on the rear of the 1257A are not supported by the operating software.*

Environmental

Temperature	Operating: 0°C – 50°C (Ethernet and USB) Storage: -40°C – 71°C
Relative Humidity	80% RH at 40°C

Conformance Testing

Emissions/Immunity	EN61326: 2006, Class B
Safety	EN61010-1: 2010–06
LXI Conformance	Class C
Mechanical Chassis Weight (without switches)	**1257A-1 (1U):** 10 lbs (4.5 kg) (approximate) **1257A-2 (2U):** 13.5 lbs (6.1 kg) (approximate) **1257A-3 (3U):** 14.1 lbs (6.4 kg) (approximate) **1257A-4 (4U):** 15.5 lbs (7.0 kg) (approximate)
Dimensions	**1257A-1 (1U)** 1.73” H x 17.2” W x 16.0” D (4.39 cm x 43.69 cm x 40.64 cm) **1257A-2 (2U)** 3.47” H (w/feet 3.91”) x 17.0” W x 16.0” D (8.81 cm (w/feet 9.93 cm) x 43.18 cm x 40.64 cm) **1257A-3 (3U)** 5.22” H x 19.0” W x 16.59” D ***** (13.26 cm x 48.26 cm x 42.14 cm) **1257A-4 (4U)** 6.97” H x 19.0” W x 16.59” D ***** (17.70 cm x 48.26 cm x 42.14 cm) ***** Width of 3U and 4U includes faceplate with built-in ears. Actual chassis width is 16.5” (41.91 cm). Dimensions are without handles or cable connectors.

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Reliability

Relay Operations Counter	Running total of operations stored in on-board non-volatile memory

Interface Data

Maximum Overall System Power Dissipation	**1257A-1 (1U):** Ambient 0° C – 45° C: 150 W Ambient 45° C – 50° C: 70 W Operation between 3048 m (10,000 feet) and 6,400 m (15,091 feet) requires derating the maximum overall power dissipation to 120 W (0-45 ºC) and 56 W (45-50 º C) **1257A-2 (2U):** Ambient 0° C – 45° C: 225 W Ambient 45° C – 50° C: 80 W Operation between 3048 m (10,000 feet) and 6,400 m (15,091 feet) requires derating the maximum overall power dissipation to 180 W (0-45 ºC) and 64 W (45-50 º C) **1257A-2 (3U):** Ambient 0° C – 45° C: 225 W Ambient 45° C – 50° C: 80 W Operation between 3048 m (10,000 feet) and 6,400 m (15,091 feet) requires derating the maximum overall power dissipation to 180 W (0-45 ºC) and 64 W (45-50 º C) **1257A-2 (4U):** Ambient 0° C – 45° C: 225 W Ambient 45° C – 50° C: 80 W Operation between 3048 m (10,000 feet) and 6,400 m (15,091 feet) requires derating the maximum overall power dissipation to 180 W (0-45 ºC) and 64 W (45-50 º C)
Total Available System Power	**1257A-1 (1U):** +24 V at 4.0 A **1257A-2 (2U):** +24 V at 6.0 A **1257A-3 (3U):** +24 V at 6.0 A **1257A-4 (4U):** +24 V at 6.0 A

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Power Supply

Input voltage	100–120 / 200–240 VAC
Input Frequency	50/60 Hz
Power Consumption	**1257A-1 (1U):** 420 VA (maximum) **1257A-2 (2U):** 550 VA (maximum) **1257A-3 (3U):** 550 VA (maximum) **1257A-4 (4U):** 550 VA (maximum)
Fuse	**1257A-1 (1U):** 250 V IEC SLO-BLO, 5x20mm, 5 A (qty 2) **1257A-2 (2U):** 250 V IEC SLO-BLO, 5x20mm, 6.3 A (qty 2) **1257A-3 (3U):** 250 V IEC SLO-BLO, 5x20mm, 6.3 A (qty 2) **1257A-4 (4U):** 250 V IEC SLO-BLO, 5x20mm, 6.3 A (qty 2)

Ordering and Accessory Information

Table 1-1, Model and Part Number Information

Part Number	Description
1257A-1-x-xxxxxxxxxxx-x	Racal Instruments 1257A-1 1U Scalable RF Interface Unit
1257A-2-x-xxxxxx-xxxxxx-x-x	Racal Instruments 1257A-2 2U Scalable RF Interface Unit
1257A-3-x-xxxxxxxx-xxxxxxxx-x	Racal Instruments 1257A-3 3U Scalable RF Interface Unit
1257A-4-x-xxxxxx-xxxxxx-x	Racal Instruments 1257A-4 4U Scalable RF Interface Unit

Note: *The "x" in the part number indicates the code for the selected option in a specific position in the unit. For more information, refer to the current data sheet or to our sales support team.*

Table 1-2, Included Accessories

Part Number	Description
980989	Users manual
600620	AC power cord
922676	IVI driver
922670	LXI Discovery Browser
922725	Configurator Software Tool

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Table 1-3, Optional General Accessories

Part Number	Description
602269	Europe power cord (unterminated)
602269-001	India/Africa power cord
602269-003	UK power cord
602269-008	China power cord
500310-001	GPIB cable, 1 meter
500310-002	GPIB cable, 2 meter

Table 1-4, Optional 1257A-1 Accessories

Part Number	Description
408423-001	Blanking plate kit (with mounting screws)
408414-001	Rack ear mounting kit (1U)

Table 1-5, Optional 1257A-2 Accessories

Part Number	Description
408465-001	Rectangular blanking plate kit (with mounting screws)
408465-011	Square blanking plate kit (with mounting screws)
408415-001	Rack ear mounting kit (2U)

Table 1-6, Optional 1257A-3 Accessories

Part Number	Description
408467-001	Blanking plate

Table 1-7, Optional 1257A-4 Accessories

Part Number	Description
408468-001	Blanking plate

Table 1-8, Optional Switch Kits

Kits contain switch, mounting bracket, mounting screws, and cables.

Chassis	Description	Part Number
1U	Kit, DUAL SPDT, 1257A-1U	408423-002
	Kit, DPDT TRANSFER, 1257A-1U	408423-003
	Kit, SP3T, 1257A-1U	408423-004
	Kit, SP4T, 1257A-1U	408423-005
	Kit, SP6T, 1257A-1U	408423-006

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Chassis	Description	Part Number
2U	Kit, SPDT, 20 GHz, LC	408474-001
	Kit, SPDT, 20 GHz w/Term, LC	408473-001
	Kit, SPDT, 20 GHz, EL	408480-001
	Kit, SPDT, 20 GHz w/Term, EL	408479-001
	Kit, SP4T, 20 GHz, LC	408477-001
	Kit, SP4T, 20 GHz w/Term, LC	408475-001
	Kit, SP4T, 20 GHz w/Term, EL	408471-001
	Kit, SP6T, 20 GHz, LC	408478-001
	Kit, SP6T, 20 GHz w/Term, LC	408476-001
	Kit, SP6T, 20 GHz w/Term, EL	408472-001
	Kit, SPDT, 26.5 GHz, LC	408474-002
	Kit, SPDT, 26.5 GHz w/Term, LC	408473-002
	Kit, SPDT, 26.5 GHz, EL	408480-002
	Kit, SPDT, 26.5 GHz w/Term, EL	408479-002
	Kit, SP4T, 26.5 GHz, LC	408477-002
	Kit, SP4T, 26.5 GHz w/Term, LC	408475-002
	Kit, SP4T, 26.5 GHz w/Term, EL	408471-002
	Kit, SP6T, 26.5 GHz, LC	408478-002
	Kit, SP6T, 26.5 GHz w/Term, LC	408476-002
	Kit, SP6T, 26.5 GHz w/Term, EL	408472-002
	Kit, SPDT, 40 GHz, EL	408480-003
	Kit, SPDT, 40 GHz w/Term, EL	408479-003
	Kit, SP4T, 40 GHz w/Term, EL	408471-003
	Kit, SP6T, 40 GHz w/Term, EL	408472-003
3U	Kit, SP3T, 1257A-3U	408467-002
	Kit, SP4T, 1257A-3U	408467-003
	Kit, SP6T, 1257A-3U	408467-004
4U	Kit, Single SPDT, 18 GHz	408481-001
	Kit, Single SPDT, 18 GHz w/Term	408482-001
	Kit, Dual SPDT, 18 GHz	408481-002
	Kit, Dual SPDT, 18 GHz w/Term	408482-002
	Kit, Triple SPDT, 18 GHz	408481-003
	Kit, SP4T, 18 GHz	408483-001
	Kit, SP4T, 18 GHz w/Term	408484-001
	Kit, SP6T, 18 GHz	408485-001

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Chassis	Description	Part Number
4U	Kit, SP6T, 18 GHz w/Term	408486-001
	Kit, SP8T, 18 GHz	408487-001
	Kit, SP8T, 18 GHz w/Term	408488-001
	Kit, Single SPDT, 26.5 GHz	408481-004
	Kit, Single SPDT, 26.5 GHz w/Term	408482-003
	Kit, Dual SPDT, 26.5 GHz	408481-005
	Kit, Dual SPDT, 26.5 GHz w/Term	408482-004
	Kit, Triple SPDT, 26.5 GHz	408481-006
	Kit, SP4T, 26.5 GHz	408483-002
	Kit, SP4T, 26.5 GHz w/Term	408484-002
	Kit, SP6T, 26.5 GHz	408485-002
	Kit, SP6T, 26.5 GHz w/Term	408486-002
	Kit, SP8T, 26.5 GHz	408487-002
	Kit, SP8T, 26.5 GHz w/Term	408488-002
	Kit, Single SPDT, 40 GHz	408481-007
	Kit, Single SPDT, 40 GHz w/Term	408482-005
	Kit, Dual SPDT, 40 GHz	408481-008
	Kit, Dual SPDT, 40 GHz w/Term	408482-006
	Kit, Triple SPDT, 40 GHz	408481-009
	Kit, SP4T, 40 GHz	408483-003
	Kit, SP4T, 40 GHz w/Term	408484-003
	Kit, SP6T, 40 GHz	408485-003
	Kit, SP6T, 40 GHz w/Term	408486-003
	Kit, SP8T, 40 GHz	408487-003
	Kit, SP8T, 40 GHz w/Term	408488-003

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Chapter 2
Getting Started

This chapter includes:

- Main AC power
- IVI drivers
- VISA resource strings
- Setting the GPIB address
- Communicating using GPIB and USB connections
- Connecting over a LAN connection
- Discovering and configuring on a LAN
- Installing and removing switches
- Verifying the software installation
- Verifying/modifying system configuration
- Modifying component library

Main AC Power

Caution

Use only AC power outlets that have a protective ground. DO NOT USE a two-conductor extension cord or 3-prong to 2-prong adapter that does not provide a protective ground connection.

Caution

Before connecting the unit to a power source, make sure the installed fuse has the capacity marked on the rear panel.

The 1257A is grounded in accordance with EN 61010, protecting the user from possible injury due to shorted circuits.

The 1257A requires a power input of 100-120 VAC or 200-240 VAC, 50 Hz to 60 Hz. The 1257A requires no adjustments, settings, or changes in fuse capacity to accommodate variations of voltage and frequency within these ranges.

The power outlet is wired to the standard color code as shown in **Table 2-1**.

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Table 2-1, Power Outlet Wire Code

Function	American	European
Line (Live)	Black	Brown
Neutral	White	Blue
Ground (Earth)	Green	Green/Yellow

After connecting the AC power cable to the 1257A, connect the other end of the cable to your power source.

Changing the Fuse for Main AC Power

Caution

Before replacing fuse, turn power switch off and remove the AC power cord.

To replace a fuse, remove the fuse cover on the rear of the 1257A to access the fuse. Be sure to replace the fuse with one having the same capacity as that marked on the rear panel. See the Power Supply table in the Specifications section of Chapter 1 for the type of fuse required.

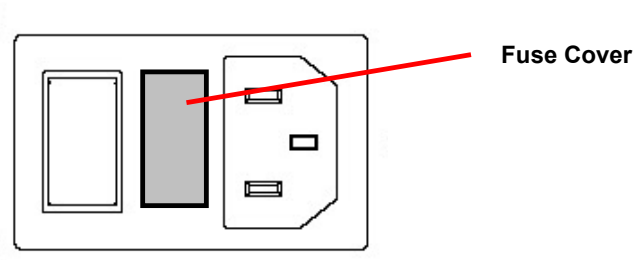


Figure 2-1, Fuse Cover (Appearance Typical)

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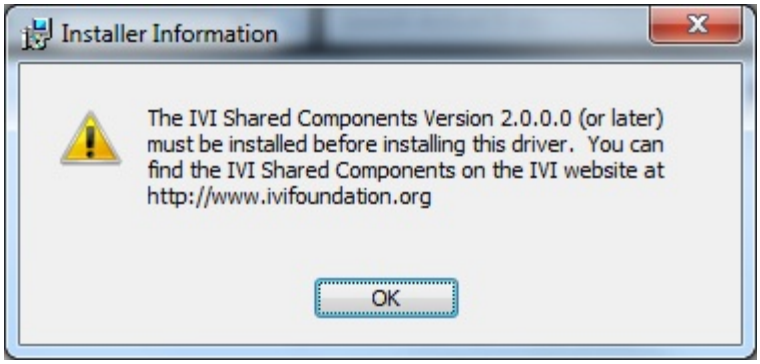
Using IVI Drivers

The IVI Shared Components Version 2.0.0.0 (or later) must be installed before installing the appropriate drivers. You can find the IVI Shared Components on the IVI website at http://www.ivifoundation.org.

If you have questions on working with IVI drivers, you can download the IVI Getting Started Guide, also available on the IVI website.

Note: *In order to use the included drivers to control the 1257A system you need to have a current version of VISA runtime loaded on your computer system. This could include the VISA product from National Instruments, among others.*

If you don't have the shared components installed prior to downloading the drivers, you might receive the following warning.



Minimum Requirements for IVI Shared Components

- Windows® 2000: Service Pack 3 (MSI installer)
- Windows 2000: no service packs (EXE installer)

  Note: The essential requirement for Windows 2000 is MSI 2.0, which is available in Windows 2000 SP3 and pre-installed by the EXE version of the IVI Shared Component Installer.
- Windows XP: no service packs
- Windows Vista: no service packs
- Windows 7: no service packs
- Microsoft® .NET Framework: 1.1

Once the IVI shared components are installed, you may install the IVI driver for the 1257A. The product CD contains an installer name "RI1257A.msi". To install the driver, run this installer on your system.

The product CD also contains a folder named "RI1257A LabVIEW driver for IVI Driver". This folder contains a library name "RI1257A.llb" that may be used to provide a programmatic interface to the IVI driver for National Instruments LabVIEW™ version 9 and later. To use this wrapper, copy the files from the folder to the LabVIEW instrument library folder on your system.

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When you use the initialization function of the IVI driver, ri1257a_init(), the driver will communicate with the 1257A and determine which components have been installed in your system. The driver automatically creates channel names for each installed switch components based on the installed position (driver board) and the number of inputs and outputs for each component.

Viewing the VISA Resource Strings

To view the VISA resource strings, go to the 1257A home page (Figure 2-2). See **Chapter 3, LXI Web-Page Controls**, for more information on accessing the web pages.

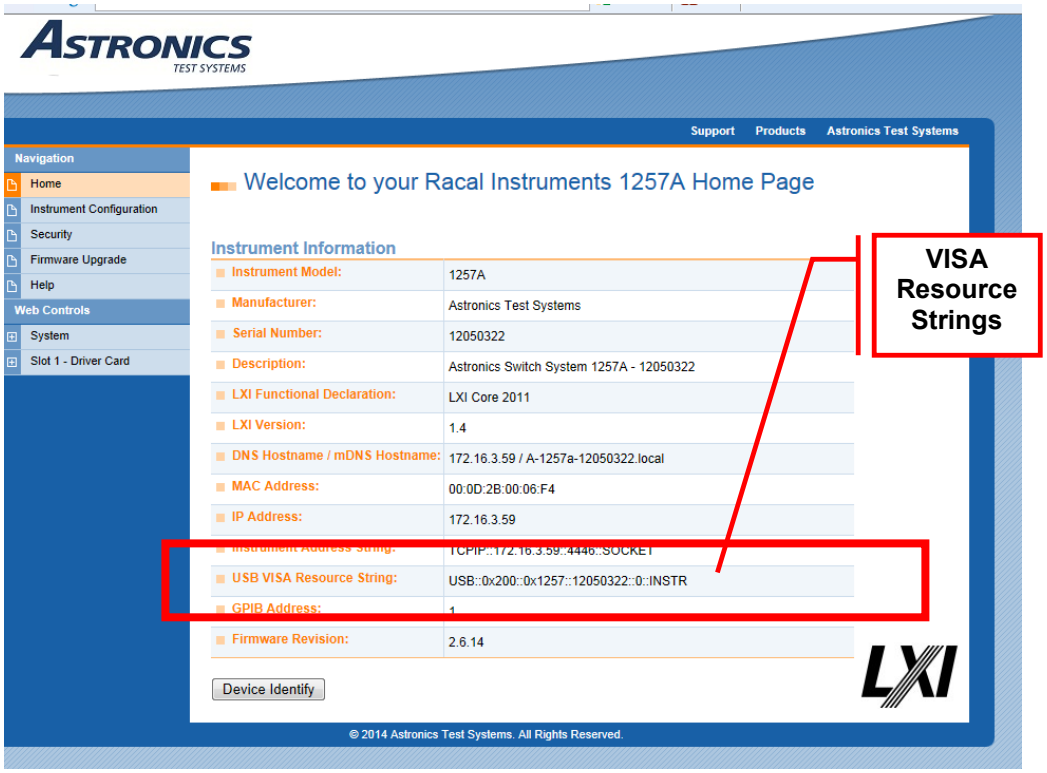


Figure 2-2, VISA Resource Strings (Screen Appearance Typical)

Setting the GPIB Address

The 1257A system does not have a physical hardware switch on the chassis to change the GPIB address. You can change the address by either using the web-page interface (using the LAN) or by sending a SCPI command (using the LAN, GPIB, or USB connection).

The factory default GPIB address setting is 1.

Using the Web-Page Interface to Set the Address

To change the GPIB address using the web-page interface, perform the following.

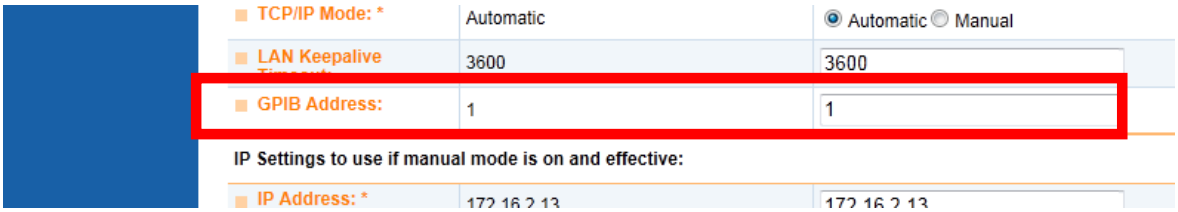
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1. From the Home Page, select **Instrument Configuration**.

   If asked for a username and password, complete the information. Remember the default username is **admin** and the password box is left blank. If you have changed this, enter the current username/password.

2. Click the **Modify** button.

3. Change the address in the box next to GPIB Address.



4. Click **Save** to save the changes.

Using SCPI to Set the Address

To change the GPIB address of the chassis using SCPI commands (with either a LAN, GPIB, or USB connection), perform the following.

1. Send a "`SYSTem:COMMunicate:GPIB:ADDRess<n>`" command where <n> is the GPIB address and a number in the range of 0 to 30.
2. Confirm the change in GPIB address by sending the query: "`SYSTem:COMMunicate:GPIB:ADDRess?`"

Communicating Using GPIB and USB

While the LAN connection is considered the easiest method to communicate with your 1257A (and we feature the next several sections showing how), you can communicated with the 1257A using the GPIB or the USB connections, as well as the VISA resources.

You first need to identify the appropriate VISA resource string. You can obtain this with the 1257A web-page interface (requiring a LAN connection) or through commonly used test programs, for instance, the National Instruments™ Measurement and Automation Explorer (NI MAX).

Communicating Using GPIB

To use VISA to communicate using GPIB, you need a GPIB VISA resource string. A GPIB VISA resource string has the format of "`GPIB<i>::<n>::INSTR`", where `<i>` is the GPIB interface number on the host computer (typically this is 0 if there's only 1 GPIB controller) and `<n>` is the GPIB address of the device.

Acquiring the GPIB VISA Resource String with the Web Page

This assumes your 1257A system is attached through a LAN connection.

1. Open the 1257A Home page using a web browser.

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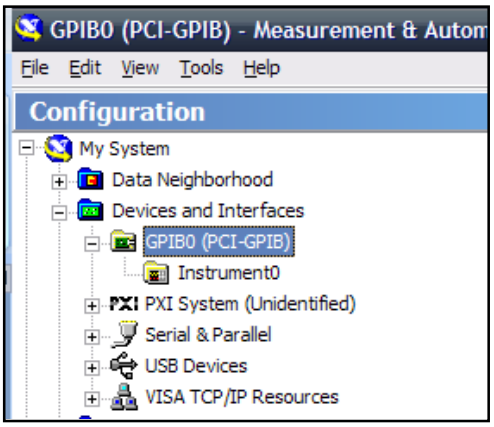
2. Under the **Instrument Information** section of the page, view and record the GPIB Address.



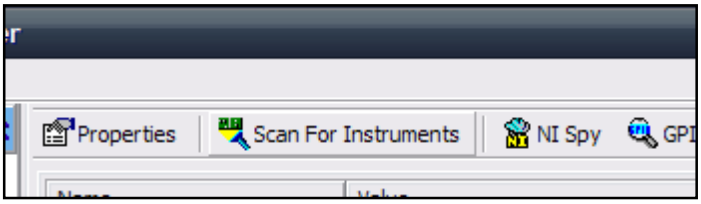
3. The VISA resource string can be formed with the discovered GPIB address. Using the example above, the resource string is "`GPIB0::1::INSTR`" (assuming there is only 1 GPIB controller).

Acquiring the GPIB VISA Resource String with NI MAX

1. Open up NI MAX.
2. Under **Devices and Interfaces**, click the GPIB interface item.

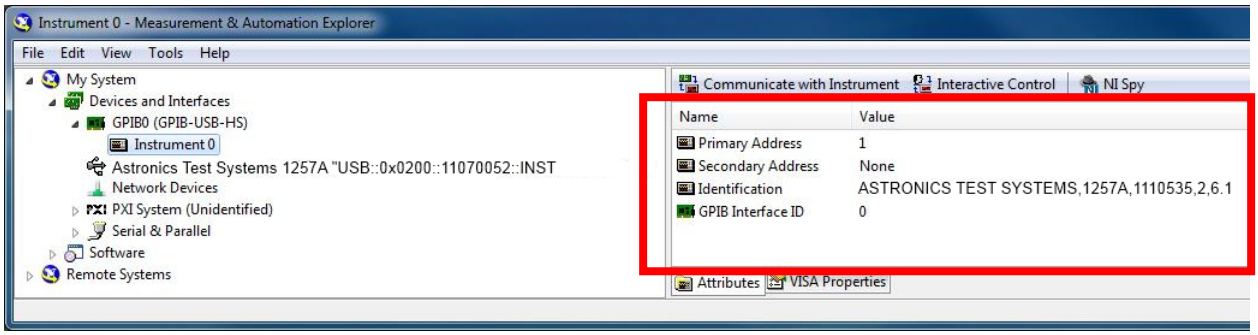


3. Click **Scan For Instruments** on NI MAX.



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4. After the scan, all of the devices connected to the GPIB controller are displayed with the address of the device shown.



The GPIB VISA resource string for the above device is "`GPIB0::1::INSTR`". Note that if there are multiple GPIB interfaces, then the VISA resource string is "`GPIB<n>::1::INSTR`", where "n" is the number of the GPIB interface.

Communicating Using USB

To use VISA to communicate with the 1257A through USB, you need a USB VISA resource string. A USB VISA resource string has the format of "`USB0::<vendor id>::<model id>::<serial number>::0:INSTR`".

For all 1257A instruments, the vendor id is "`512`" or "`0x200`" and the model id is "`4695`" or "`0x1257`". The remaining information you need to discover is the serial number of the instrument.

Acquiring the USB VISA Resource String with the Web Page

This assumes your 1257A is attached through a LAN connection.

1. Open the 1257A Home page using a web browser.
2. Under the **Instrument Information** section, view and record the USB VISA Resource String.

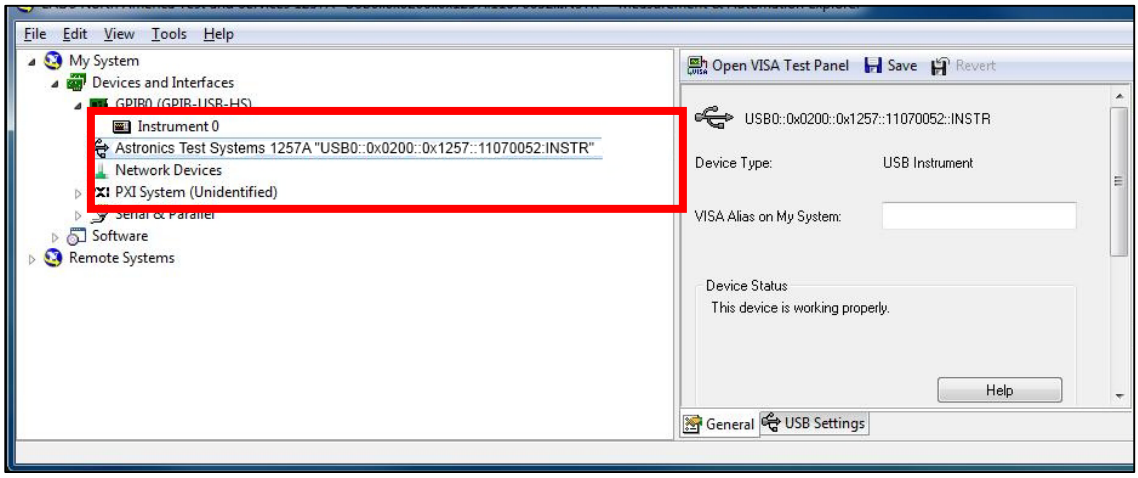


Acquiring the USB VISA Resource String with NI MAX

1. When the device is plugged in the first time, Windows asks if you want to install the appropriate drivers. Given that VISA is installed on the computer, allow Windows to automatically install the driver.
2. NI MAX recognizes Test and Measurement USB devices and they are listed

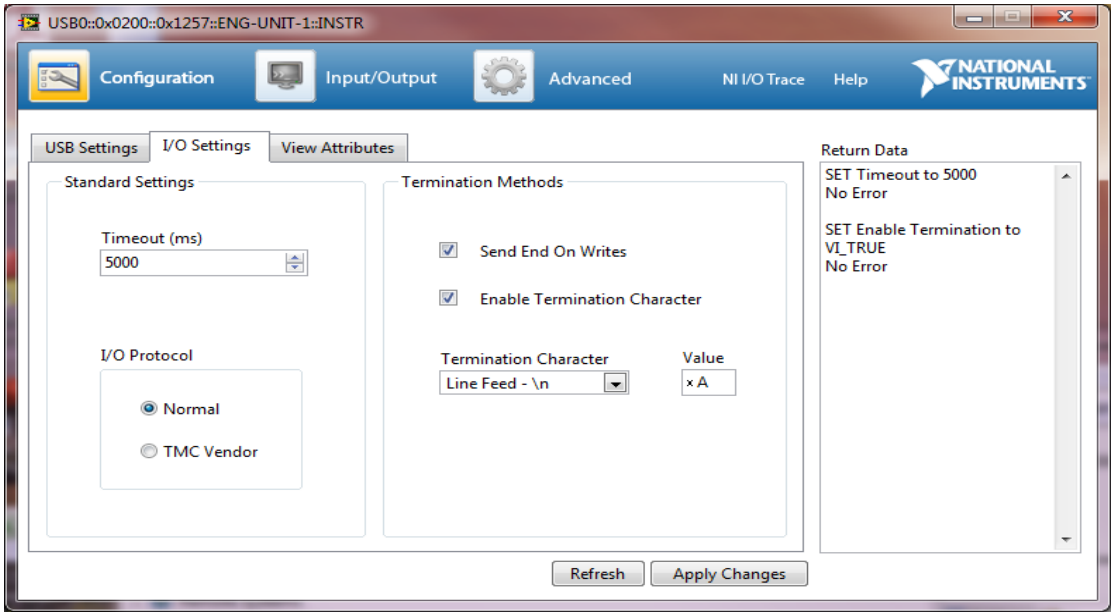
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under **USB Devices** along with the VISA resource string of the instrument.



Using NI MAX to Deliver SCPI Commands Over GPIB and USB

1. In NI MAX, open the VISA Test Panel and select **Configuration>I/O Setting.**
2. Set the **Timeout** to 2000 to 5000 ms, **I/O Protocol** to Normal, **Termination Character** to Line Feed -\n, and enable the check boxes of **Send End On Writes** and **Enable Termination Character**. Click **Apply Changes** to see the following screen.



3. Switch to the **Input/Output>Basic I/O** tab and execute the following queries in the **Select or Enter Command** box. (Click **Query** after entering text).

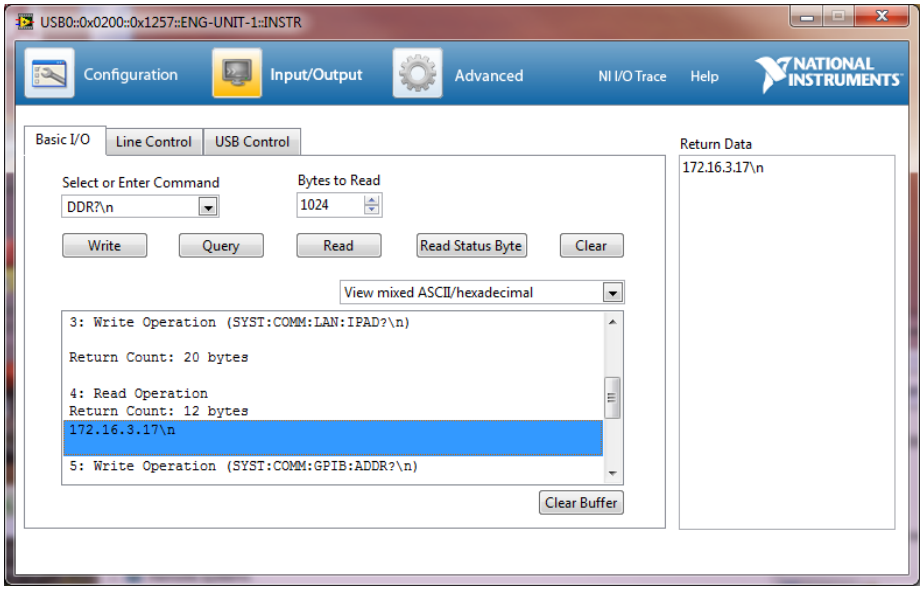
   a. `SYSTem:COMMunicate:LAN:IPADdress?\n`

   This will return the IP address of the instrument.

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b. `SYSTem:COMMunicate:GPIB:IPADdress?\n`

This will return the GPIB address of the instrument.



4. You can continue to use this tab to enter SCPI commands for the operation of the 1257A.

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Connecting Over a Local Area Network (LAN)

Selecting the LAN Network Type

You can configure your 1257A to connect to a Site or Isolated (non-site) LAN.

- A **Site LAN network** (Figure 2-3) is a local area network (LAN) in which computers and LAN-enabled instruments are connected to a site LAN (workgroup LAN, Intranet, or enterprise LAN) via optional routers, hubs, and/or switches.

  Typical Site LAN network view:

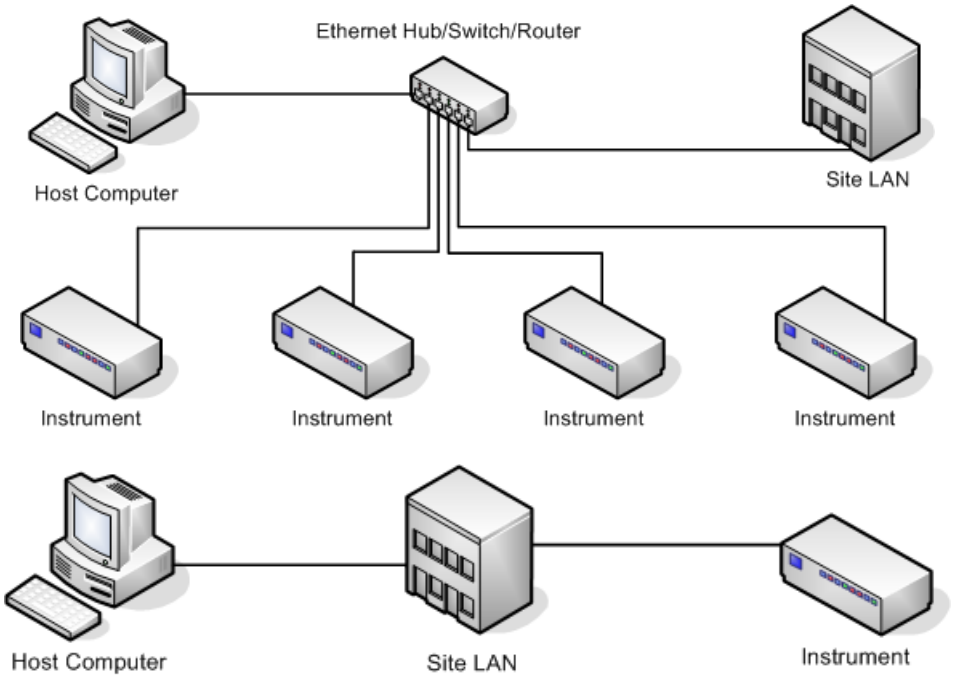


Figure 2-3, Site LAN Network

- An **Isolated LAN network** (Figure 2-4) is defined as a local area network (LAN) in which computers and LAN-enabled instruments are not connected to a site LAN.

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Typical Isolated LAN network view:

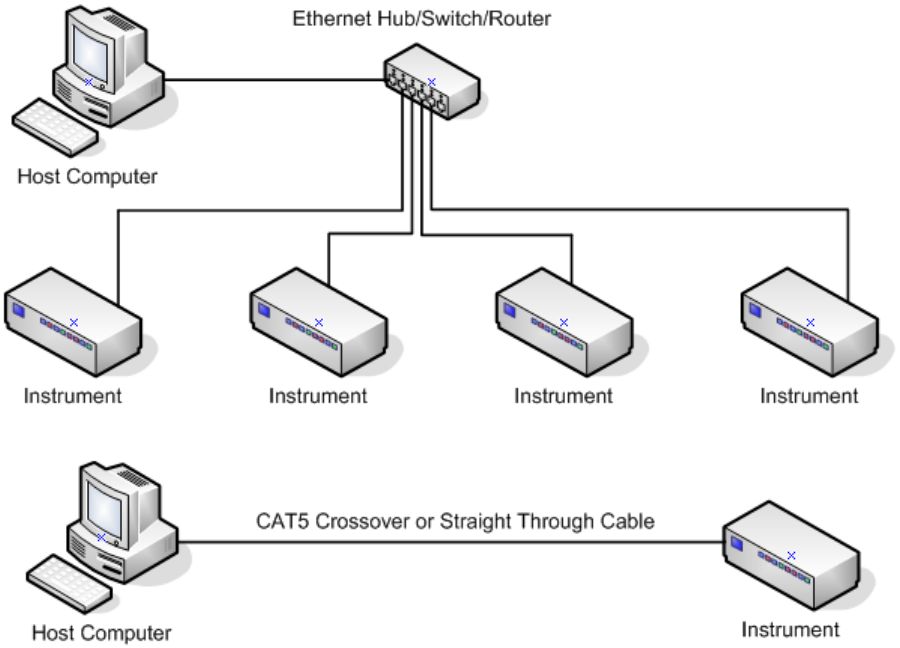


Figure 2-4, Isolated LAN Network

Select the LAN network type the 1257A will be connected to and follow the steps in the appropriate sections: **Configuring the 1257A to Work in a Site LAN** and **Configuring the 1257A to Work in an Isolated LAN**.

Static and Automatic IP Addresses

1. The 1257A can be configured to use either a *static* or an *automatic* IP address. By default, the *automatic* IP address scheme is used.
2. The automatic IP address scheme requires that a host computer on the network provide a Dynamic Host Configuration Protocol (DHCP) service to allocate a unique IP address to the 1257A when it is powered on.
3. If the 1257A is configured for automatic IP addressing, and no DHCP server is located on the network, the 1257A will default to use the IP address 169.254.54.201.
4. The static IP address scheme assigns a fixed IP address to the 1257A. This IP address is used whenever the 1257A is powered on regardless of what other computers and devices may reside on the network. With the static IP address scheme, the same IP address could be assigned to more than one device on the network, and the 1257A would not be able to communicate over the network.
5. If the 1257A is configured for a static IP address, you can reset this to use the automatic IP address scheme by pressing the LAN RESET button and holding it for 5 seconds. After you release the LAN RESET button, the 1257A will be configured for automatic addressing and will attempt to retrieve an IP address

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from the DHCP server on the network.

Configuring the 1257A to Work in a Site LAN

1. Using either a crossover or straight through CAT5 cable, connect the 1257A to the Site LAN or a switch/hub/router that is connected to the Site LAN. Or directly connect the 1257A to your computer.
2. Make sure power is applied to your computer and the 1257A.
3. The 1257A by default is configured to use "automatic" mode to obtain an IP address to use. In this mode the 1257A will get its IP address from the DHCP server that is on the Site LAN, provided the DHCP server is configured properly.
4. Use a LXI discovery browser to scan the network for LXI instruments. If the 1257A was not discovered during LXI discovery, activate the LAN Configuration Initialization (LCI) by pressing the LAN reset button on the back panel of the 1257A for at least **10 seconds**. Use the LXI discovery browser to rescan the network.
5. Once the 1257A has been discovered, enter the IP address of the 1257A in the address bar of your web browser to bring up the 1257A's welcome page.

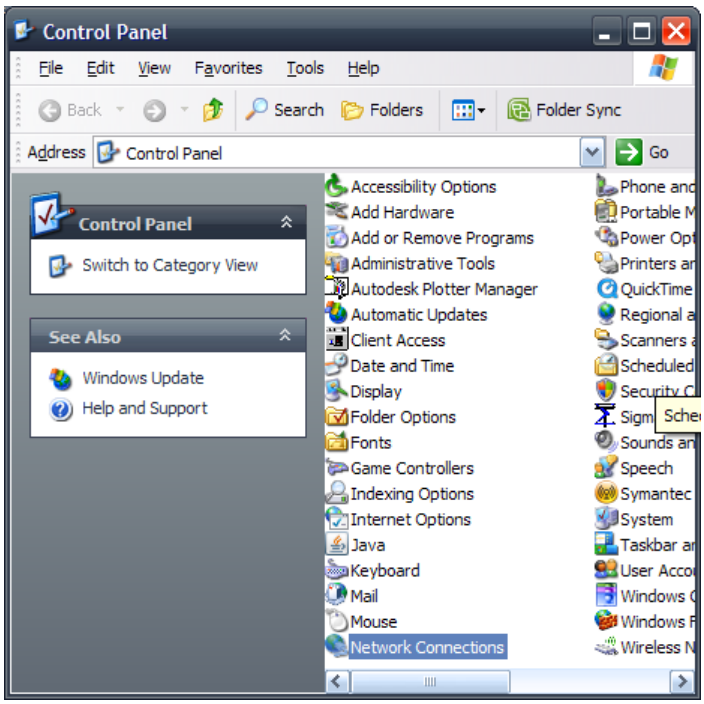
Configuring the 1257A to Work in an Isolated LAN

1. Using either a crossover or straight-through CAT5 cable, connect the 1257A to the switch/hub/router that is connected to your computer. Or directly connect the 1257A to your computer.
2. Make sure power is applied to your computer and the 1257A.
3. If a router is used to connect your computer and the 1257A and DHCP is enabled on the router, go to **Configuring the 1257A to Work in a Site LAN** to complete the rest of the procedure.

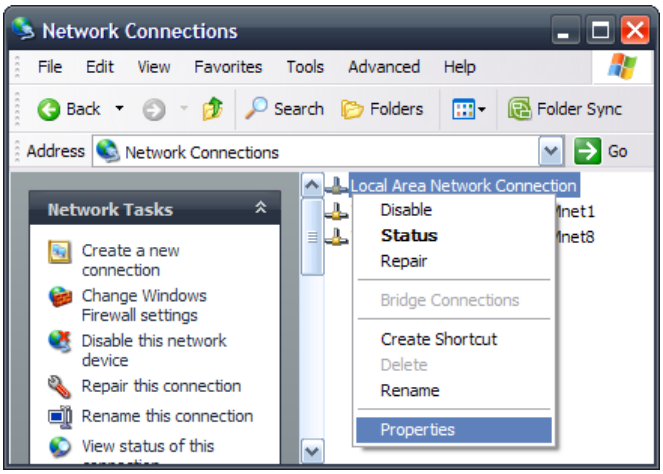
   The 1257A by default is configured to use "automatic" mode to obtain an IP address to use. Since no DHCP server is connected to your Isolated LAN network, the 1257A uses link-local addressing to obtain its IP address. If GPIB or USB communication to the 1257A is available, you may assign a static IP address to the 1257A manually, or query the 1257A for its LAN settings directly (go to **Using GPIB or USB to Set 1257A LAN Settings** or **Using GPIB or USB to Query 1257A LAN Settings**). If GPIB and USB communication are not available, proceed with the following steps.

4. Use a LXI discovery tool to scan the network for all LXI instruments. If the 1257A was discovered, enter the IP address of the 1257A in the address bar of your web browser to bring up the 1257A's welcome page. If 1257A was not discovered, proceed with the following steps.
5. Open **Control Panel** and double click on **Network Connections**.

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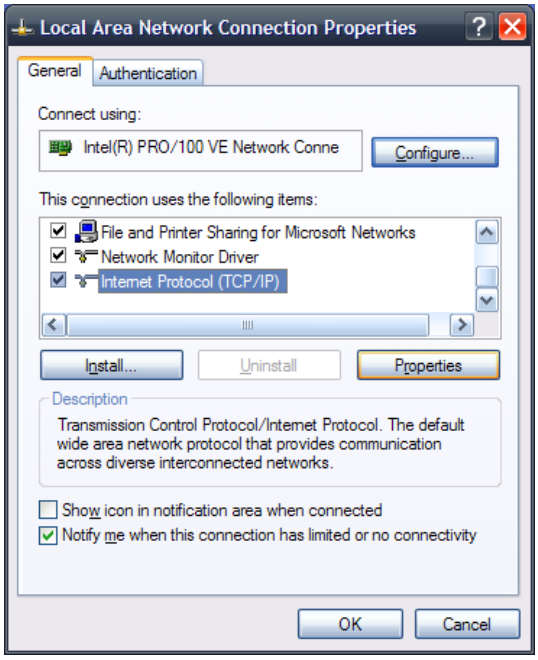


6. In the **Network Connections** window, right click on **Local Area Network Connection** and then click **Properties**.

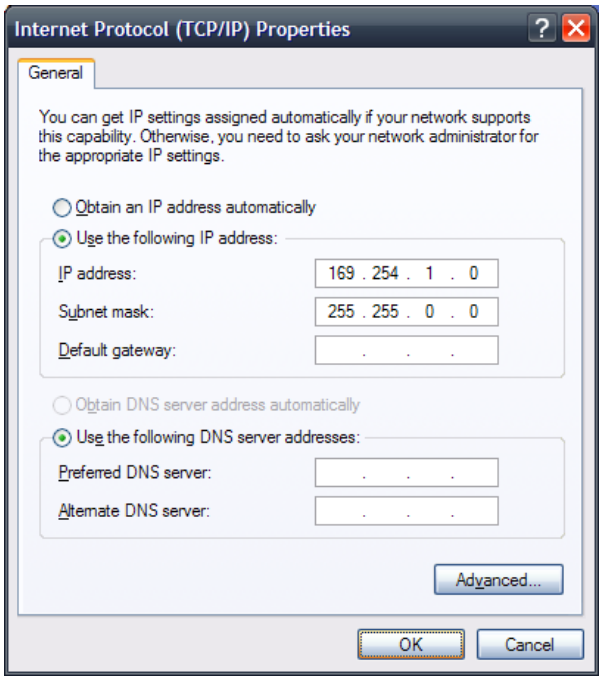


7. In the **Properties** window, click **Internet Protocol (TCP/IP)** and then click **Properties**.

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8. In the Internet Protocol (TCP/IP) Properties window, select **Use the following IP address** and input “169.254.1.0” for the IP address and “255.255.0.0” for the Subnet mask. Leave all other fields blank. Then click **OK**.



9. Click **OK** to close the **Local Area Network Connection Properties** window.
10. Use a LXI discovery tool to scan the network for LXI instruments, the 1257A should be listed as a discovered instrument. Enter the IP address of the 1257A in the address bar of your web browser to bring up the 1257A’s welcome page.

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Using GPIB or USB to Set 1257A LAN Settings

To assign an IP address to the 1257A manually, send the following SCPI commands via USB or GPIB:

1. `SYSTem:COMMunicate:LAN:MODe MANUAL`
2. `SYSTem:COMMunicate:LAN:MAN:IPADdress <Instrument's IP address>`
3. `SYSTem:COMMunicate:LAN:MAN:SMASk <Subnet mask>`
4. `SYSTem:COMMunicate:LAN:MAN:DNS NONE`
5. `SYSTem:COMMunicate:LAN:RESET`

For example, if your computer is using IP address "169.254.0.1" and the subnet mask is "255.255.0.0", then the Instrument's IP address will be in the range of 169.254.<0-255>.<0,2-255> and the subnet mask would be "255.255.0.0" as well.

Using GPIB or USB to Query 1257A LAN Settings

If you choose not to assign an IP address to the 1257A manually, you may query the 1257A for its LAN settings. Since the 1257A's factory default setting for LAN mode is "automatic", the 1257A will use link-local auto configuration if no DHCP server is connected to the LAN (which is the case in an isolated LAN). To query the 1257A for its' LAN settings, issue the following SCPI queries:

1. `SYSTem:COMMunicate:LAN:IPAD?`
2. `SYSTem:COMMunicate:LAN:SMASk?`

The 1257A's IP address is going to be in the range of 169.254.<0-255>.<0-255> with the subnet mask being "255.255.0.0.". Once you've obtained the instrument's IP address and subnet mask, may try to load the 1257A's welcome page by entering its IP address in your web browser's address bar. If you're unable to load the welcome page, perform Steps 5 to 10 of the previous section **Configuring the 1257A to Work in an Isolated LAN**.

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Discovering and Configuring on a LAN

The LXI Discovery Browser software (P/N 922670) is located on the included documentation disk or you can download it from our website. You may also locate a 1257A on your LAN with discovery software tools from other vendors. The following information shows how to install and use the LXI Discovery Browser to locate your 1257A on a LAN.

If you are trying to connect to a network without a DHCP server, refer to **Discovering and Configuring without a DHCP Server**, later in this chapter.

Installing the LXI Discovery Browser

1. Locate and double-click *setup.exe* included for the LXI Discovery Browser software on the included documentation CD to begin the installation of the browser.
2. When you see the following screen (**Figure 2-5**), select **Next** to continue.

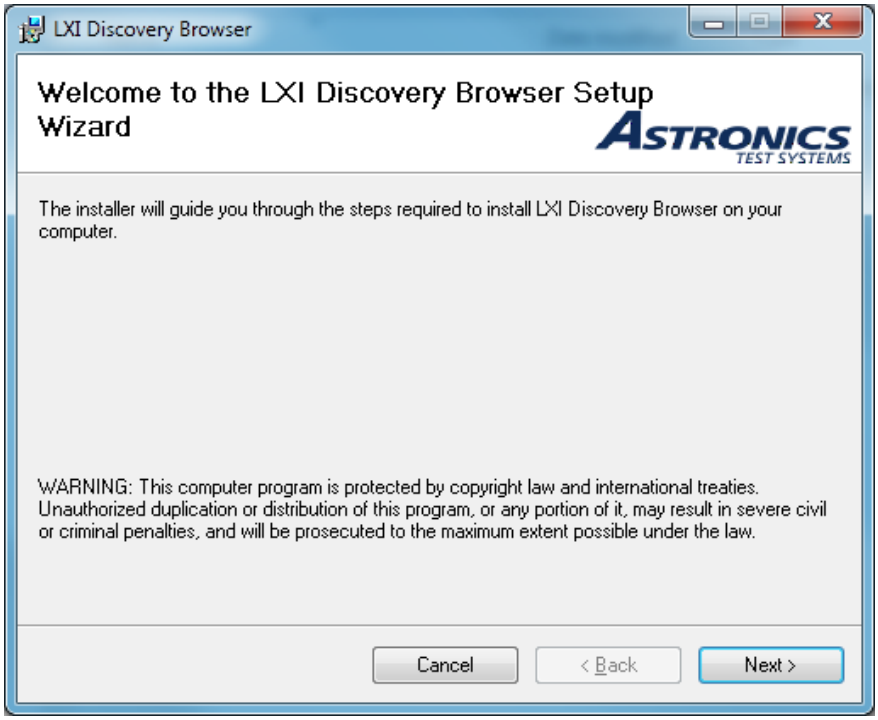


Figure 2-5, LXI Discovery Browser Tool (Appearance Typical)

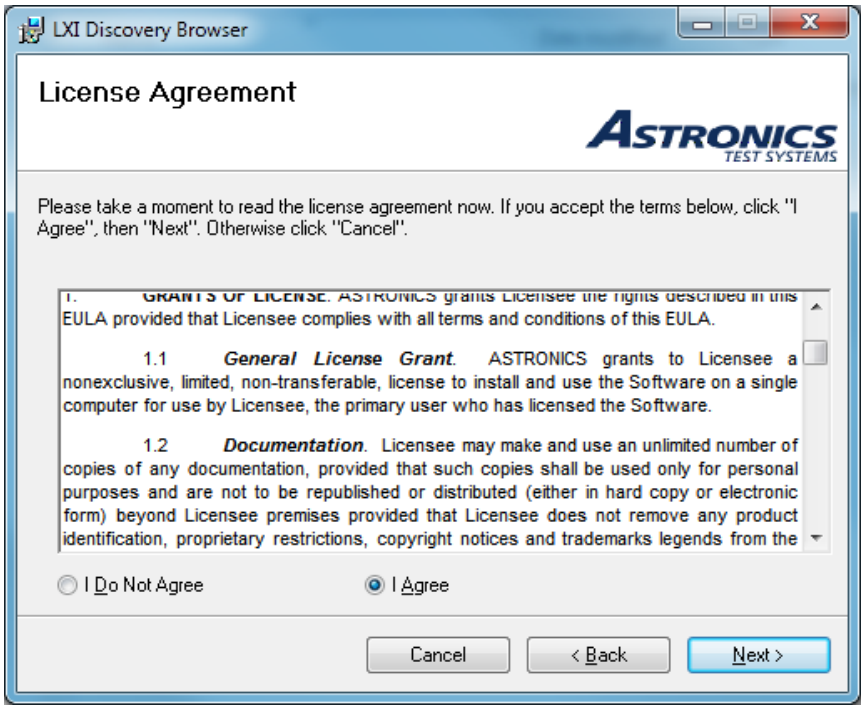
Note

The following browser setup screens are appearance typical. There may be changes to the screen and version numbers should the software be updated.

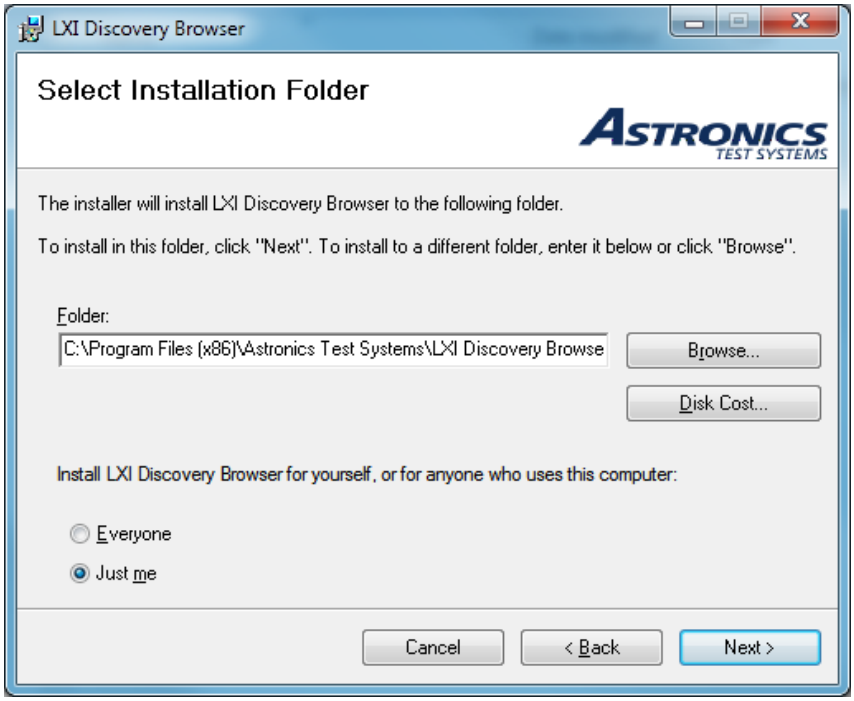
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3. On the next screen, review the terms of the License Agreement and click the **I Agree** button. Click **Next** when done.

   Should you not accept the terms, click **Cancel** to halt the installation of the software.

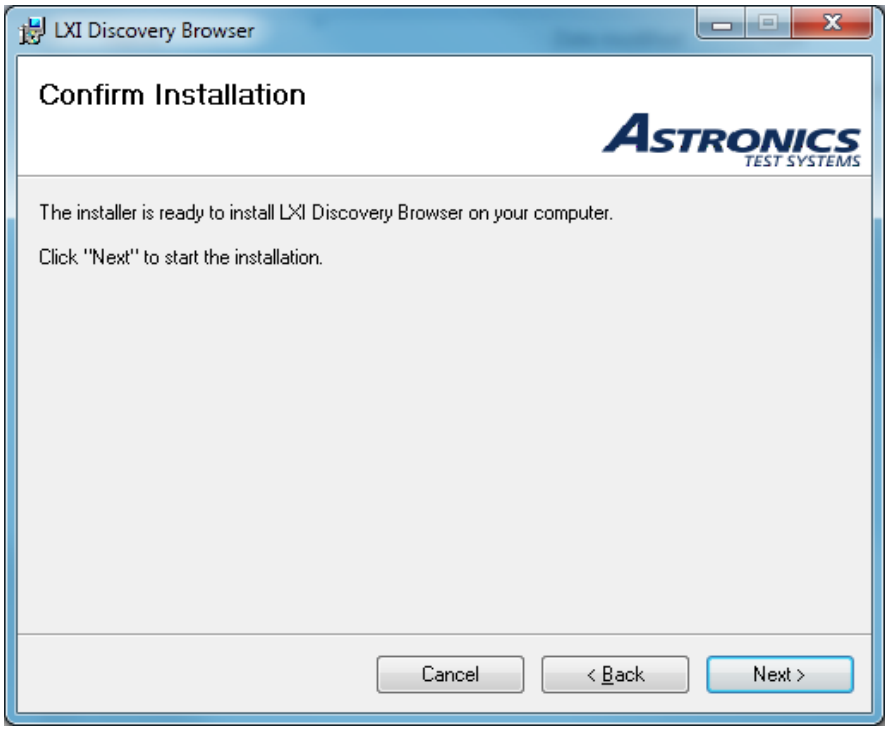


4. Confirm or change the destination folder to install the files. Click **Next**.

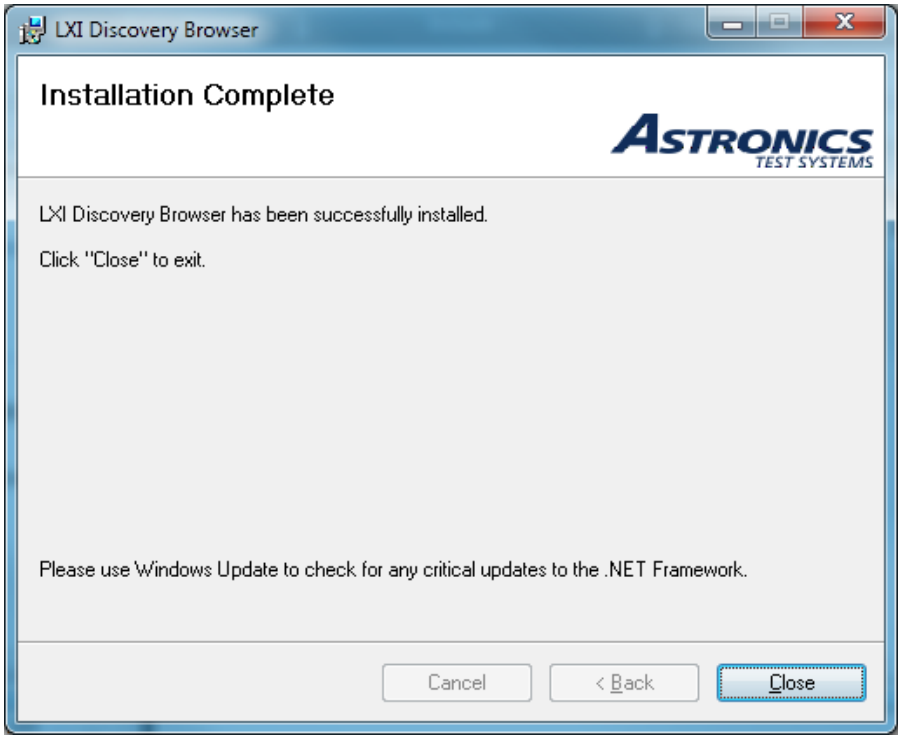


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5. Click **Next** to install the browser.



6. After a few minutes, if the setup was successful, a screen appears showing **Installation Complete.** Click **Close.** A LXI Discovery Browser icon will appear on your desktop screen.



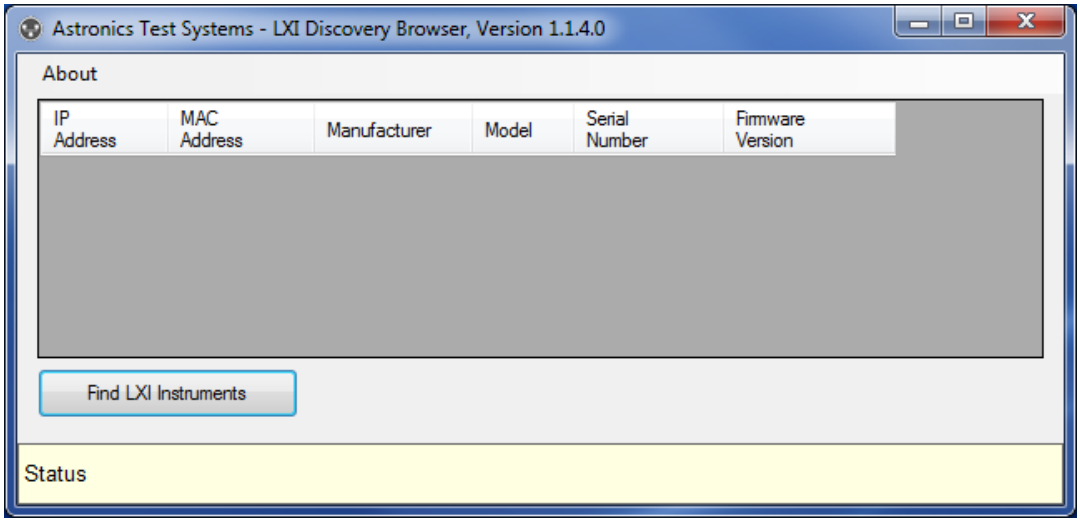
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Running the LXI Discovery Browser

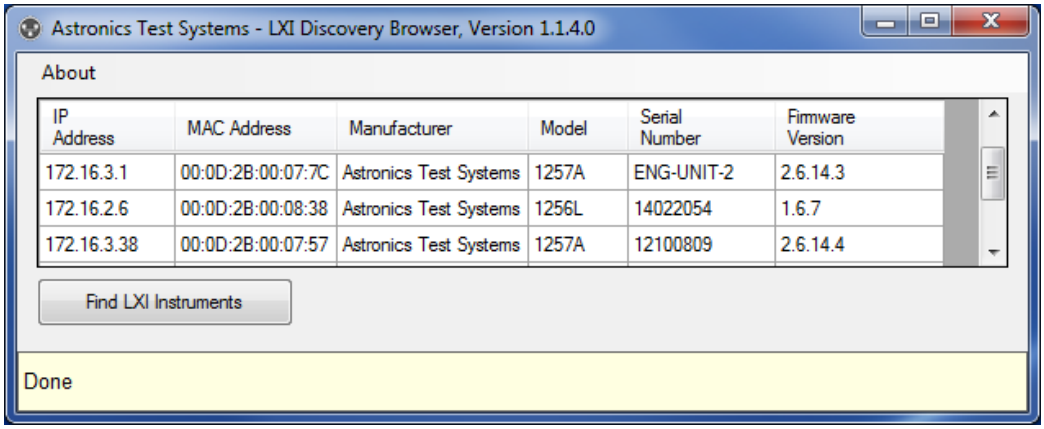
1. Double-click the LXI Discovery Browser icon on your desktop.



2. Click the **Find LXI Instruments** bar.



3. The browser will display all of the LXI devices it finds on your network. Select and double-click the desired instrument to open up its web page.



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Java Security Warning

Full-feature functionality of the web page interface relies on the Java platform. This interface may cause Java security messages (similar to what is shown in **Figure 2-6**), to appear.

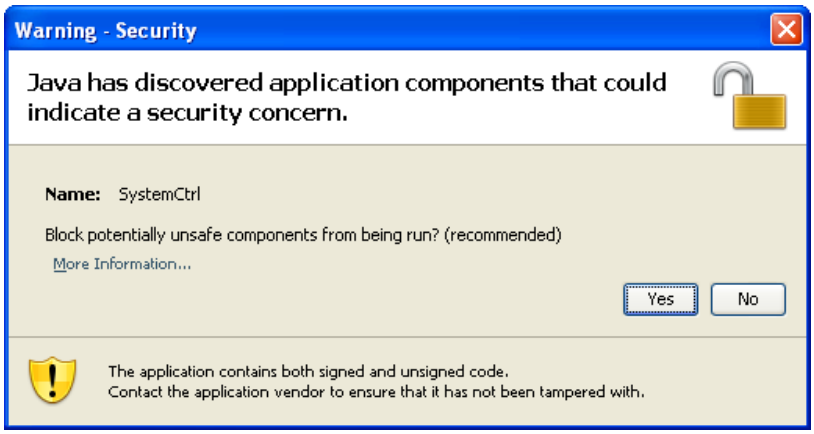
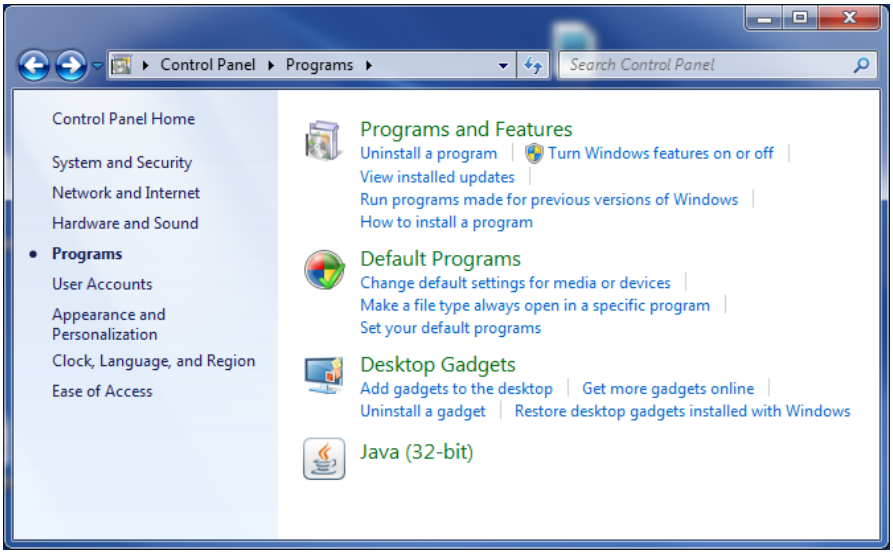


Figure 2-6 , Java Security Warning Message (Appearance Typical)

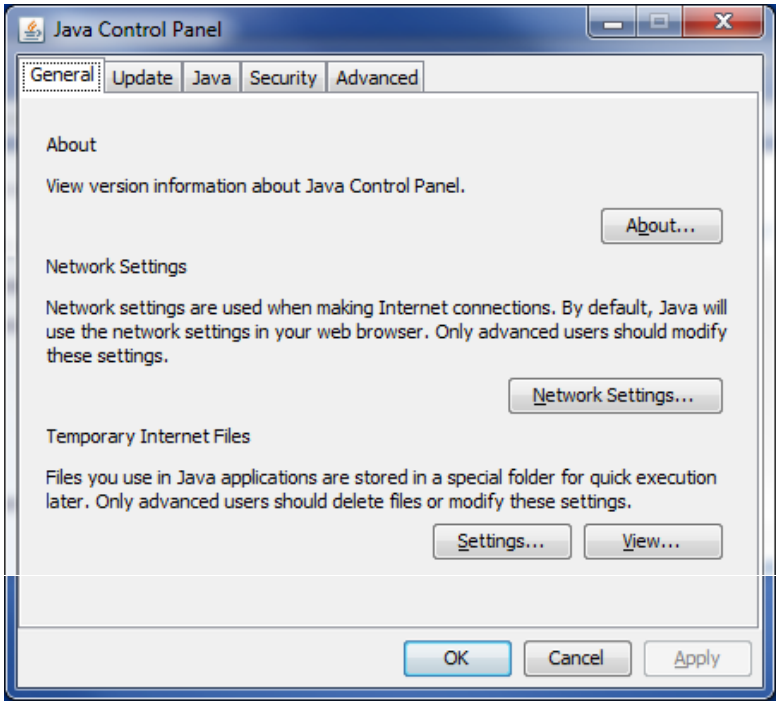
You must click **No** to allow the **SystemCtrl** component to run or you can use the following procedure to disable future Java warning messages.

1. From your Windows **Start** Menu, select **Control Panel**.
2. In Microsoft Windows 7, select **Programs**. (If you have another version of Windows, the path to the Java Control Panel may be slightly different.)
3. Double-click the **Java** icon.

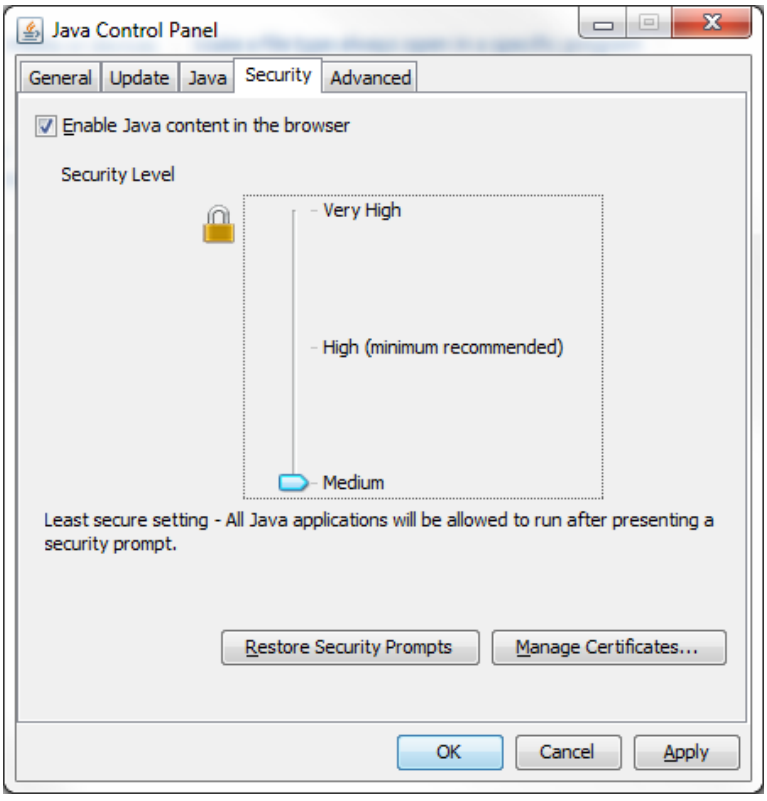


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4. Select the **Security** tab.

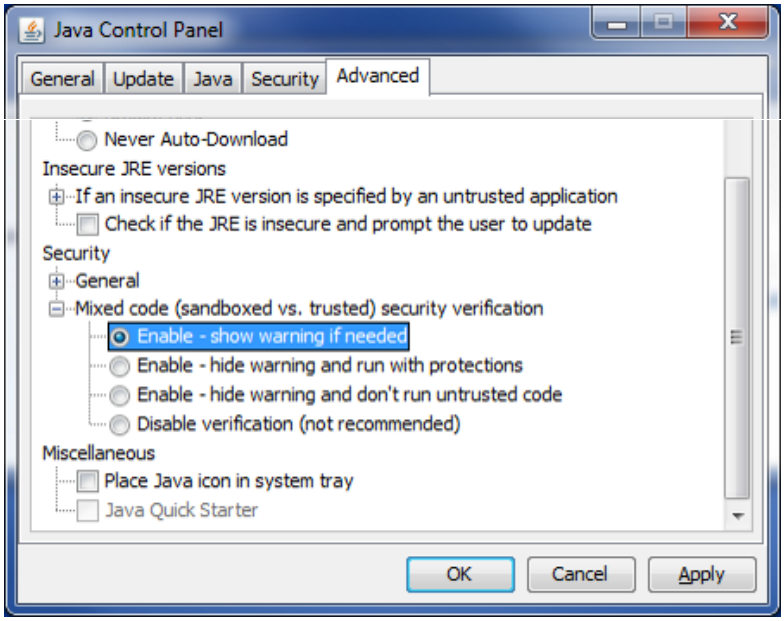


5. Set the **Security Level** to **Medium** and then select the **Advanced** tab.

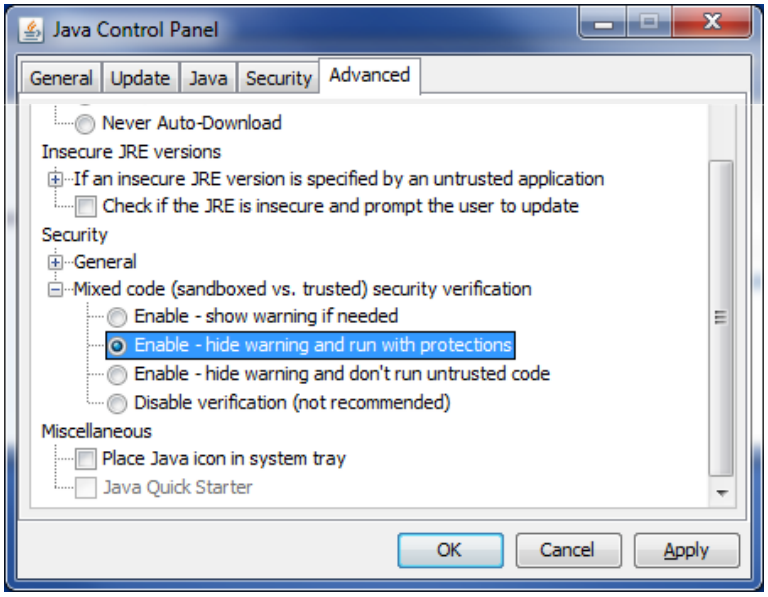


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6. Scroll down to **Security** and expand **Mixed code**.



7. Click **Enable – hide warning and run with protections**.



8. Click **Apply** and then **OK** to implement the changes.
9. Close out of **Control Panel** and return to your browser.

Verifying/Modifying System Configuration

The 1257A can have up to 10 slots configured; each which is associated with a Driver Card. Each Driver Card can have up to three Banks which are labeled A, B, and C.

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Selecting the Configuration/Adapter Board window, and selecting the Bank Selection drop-down, shows which Adapter Boards are configured on the driver card. **Table 2-2** summarizes the different Adapter board types available.

Table 2-2, Available Adapter Board Types

ID	Type	Connector	Note
0	16 Channel Configurable I/O	Terminal Blocks	
1	SP4T/SP6T	16-Pin Header	Standard for 1257A-2
2	SPST/SPDT/DPDT/DP3T	10-Pin Header	
3	SPST/SPDT/DPDT/DP3T Coil read-back	10-Pin Header	
4	SP8T	26-Pin Header	
6	Dow-Key Miniature 6L3 Dual SPDT 613 DPDT 634 SP4T 636 SP6T Open-Drain Indicator tied to Driver	10-Pin Header	Standard for 1257A-1 and 1257A-3
13	Agilent 8490x Attenuators	16-Pin Header	
15	None Installed	N/A	

Selecting a bank enables the bank configuration and board Connector options.

Once a Configuration option is selected, the web page shows the available Board Connectors. A board connector can then be selected which will display the Relay or Attenuator Configuration options and Channel Alias Assignment.

Downloading or Uploading Configuration Information

The 1257A allows you to download (or copy) your current switch configuration and then upload the information to the same or another 1257A. This can be helpful to store a copy of the configuration, upload the configuration to another system, or to modify the configuration and then upload it to a 1257A. Use the Configurator Software Tool (PN 922725) which is included on the documentation CD delivered with your system.

For additional information on installing and using the Configurator Tool, refer to **Appendix C, Using the Configurator Software Tool**.

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Modifying Component Library

The 1257A unit has a library of components which can be modified or added to as required by the user.

The component types are Relays, Attenuators, or Digital Input/Outputs (DIO). Note that entering or modifying incorrect parameters may prevent the component from operating correctly.

The following are the Relay parameters

- ID
- Manufacturer
- Model
- Poles – Number of Poles in the Switch
- Throws – Number of Throws in the Switch
- Electro-mechanical Type
- Drive Type – [TTL or Open Collector]
- Readback Indicator Available
- Readback Indicator Polarity
- Reset Available
- Reset Time
- Strobe Pulse – Pulse width for latching relays
- Settling Time – System delay after switch actuation
- Warn Threshold – Relay Counter threshold where warning occurs
- EOL Threshold – Relay Counter threshold where EOL warning occurs
- Transfer Switch – Whether switch is a standard switch or DPDT Transfer Switch
- Miniature – Whether switch is a standard switch of miniature multi-configured switch (2 x SPST, DPDT, 4PST, or 6PST)
- Supports Non-Blocking Mode

The following are the Attenuator parameters

- ID
- Manufacturer
- Model
- Attenuator Type
- Drive Type
- Switching Time
- Global Reset

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- Readback Ability
- Readback Available
- Readback Polarity
- Warn Threshold
- EOL Threshold
- Steps – Select the number of Cells
- Cell # Attenuator – Set the attenuation for the Cell

The following are the DIO parameters

- 2-8 Bit Out, 2-8 Bit In, 4-Bit Reset

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Chapter 3
LXI Web-Page Controls

The LXI Web-Page Controls allow you to access and operate the main features of the 1257A through your LAN without installing additional drivers or software on a control computer.

Initial Home Page

To access the web-page interface on your 1257A:

1. Ensure that an active LAN cable is attached to the 1257A
2. Ensure that the 1257A power switch is turned on.
3. If using the LXI Discovery Browser (see **Chapter 2**, **Getting Started**), double-click the instruments listing to launch the 1257A home page

   If using another method, type in the IP address into your computer's internet browser.

The 1257A instrument's built-in Home page appears as shown in **Figure 3-1**.

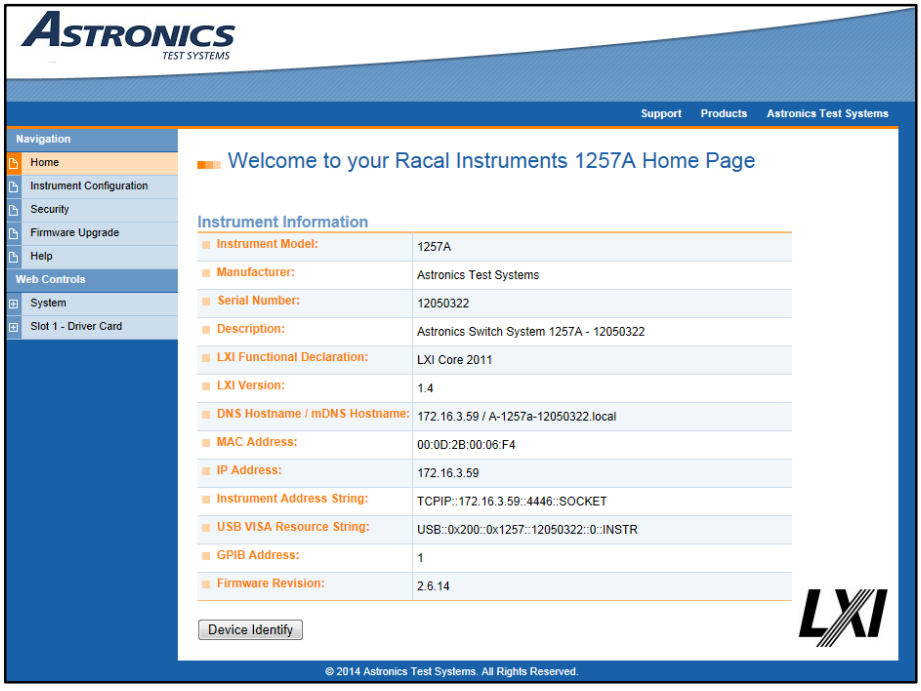


Figure 3-1, Web-Page Interface Home Page

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Setting the Password

When you first access any of the web pages that allow you to modify settings, you are asked for a username and password. The default username is **admin**. Initially, there is no password and you can access the system by leaving password line blank and click **Enter**.

To change the password at any time, click **Security** on the navigation bar on the left side of the web page. The following screen appears.

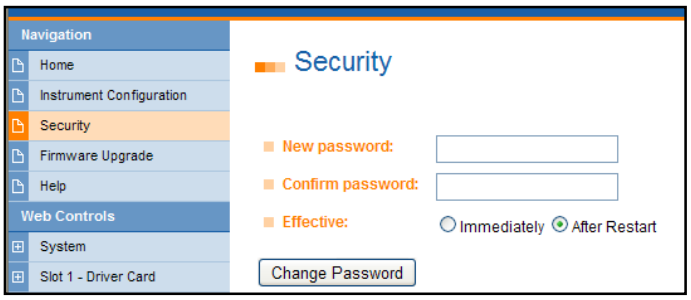


Figure 3-2, Security, Change Password

You can type in any password. The password can be virtually any length with any combination of letters and/or numbers. The password is case sensitive.

You can make the new password effective immediately or after a restart by clicking the appropriate option button. Click **Change Password** when done.

If you press the LAN Reset button on the rear panel of the 1257A for over 10 seconds, resetting your LAN setup, your password is reset to the factory default setting of no password. (See **LAN Reset Button** in **Chapter 1, Overview and Features**, for additional information on the operation of the button.)

System Web Page Descriptions

Home Page

The Home page (**Figure 3-1**) provides a navigation bar on the left side of the screen which allows you to select specific pages for

- Instrument Configuration
- Security authorization (and password configuration)
- Firmware upgrade
- Help
- Web controls for the system and the installed cards
- USB Flash drive access (if attached)

The main panel on the web page provides information on

- Instrument model

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- Manufacturer
- Serial number
- Instrument description (the instrument's description – which may be modified on the "Instrument Configuration" web page)
- LXI class (the class for which the instrument has been certified)
- LXI version (the version for which the instrument has been certified)
- Hostname (the Internet domain name for the instrument or its IP address)
- MAC address
- IP address
- TCP/IP VISA resource string (the connection string that may be used when making a VISA connection to the instrument over TCP/IP)
- USB VISA resource string (the connection string that may be used when making a VISA connection to the instrument over USB)
- GPIB address
- Firmware revision

Device Identify Button



Figure 3-3, Device Identify Button

When you click the Device Identify button on the Home page (**Figure 3-3**), the LAN status light on the 1257A front panel begins to blink. This feature allows you to identify which 1257A you are communicating with should you have a bank of them.

When you click the button a second time, the status light stops blinking and returns to normal mode.

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External Storage Devices



Figure 3-4, USB Drive Indicator

When a USB flash drive is installed to the front USB connector, an **External Storage Devices** list appears on the Home page (**Figure 3-4**).

Click **USB Drive** to see a directory of what is on the drive.

The USB connector on the rear of the chassis is only a communication interface. For memory purposes, use the USB connector on the front panel.

Instrument Configuration Page

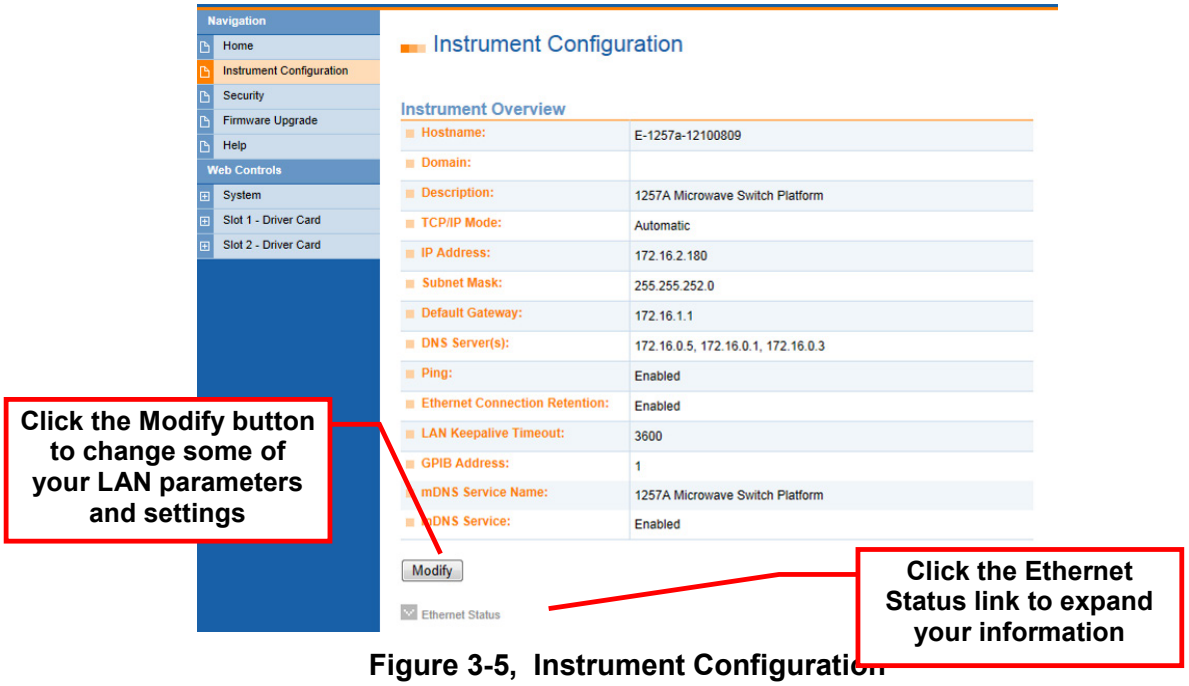


Figure 3-5, Instrument Configuration

The Instrument Configuration page (**Figure 3-5**) provides information on

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- Hostname
- Domain (if any)
- Description
- TCP/IP mode
- IP address
- Subnet mask
- Default gateway (if any)
- DNS servers(s) (if any)
- Ping
- Ethernet connection retention
- LAN Keep Alive timeout
- GPIB address
- mDNS service name
- mDNS service enabled/not

Click the link to access additional Ethernet Status information (**Figure 3-6**). This portion of the screen provides additional packet information. You can click the **Refresh** button to get updated information.

You can change some of these configurations by clicking the **Modify** button. See the next section, **Modifying the Instrument Configuration,** for more information.

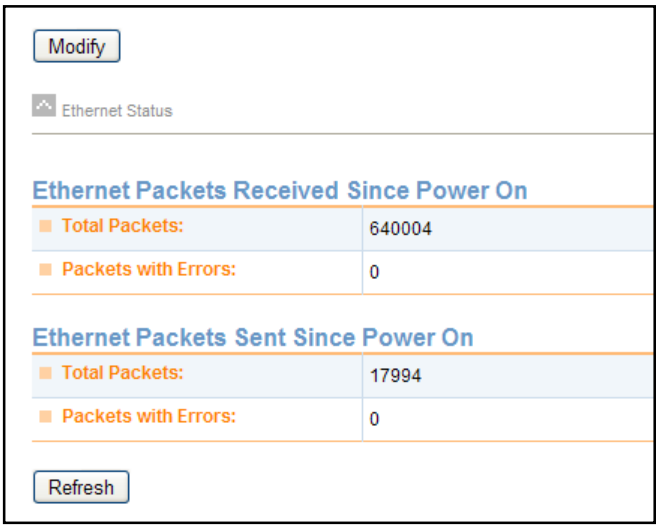


Figure 3-6, Ethernet Status

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Modifying the Instrument Configuration

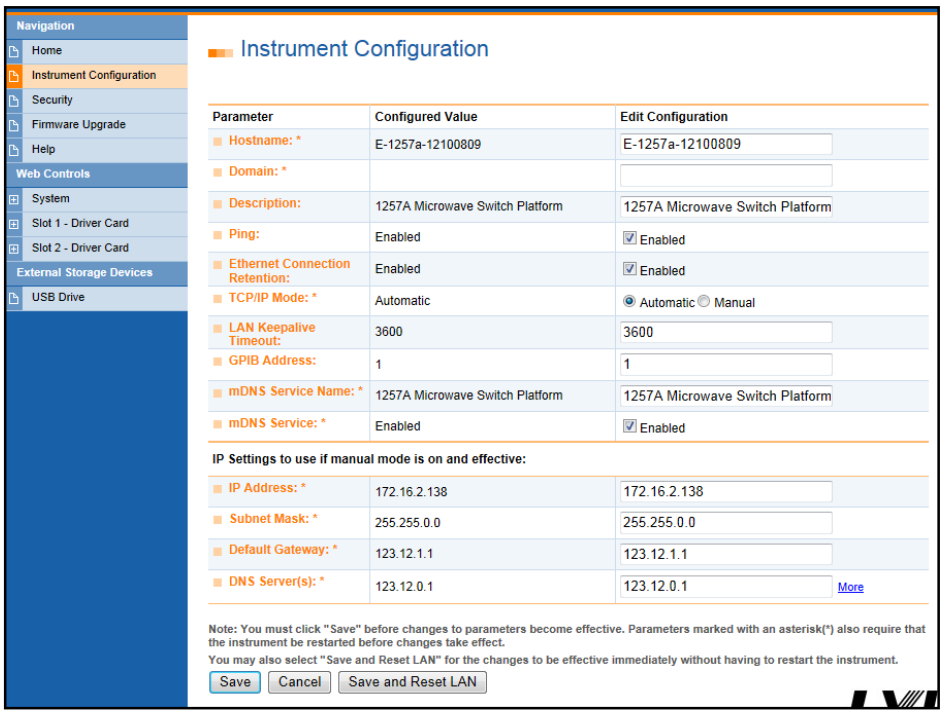


Figure 3-7, Instrument Configuration, Modify

After clicking the **Modify** button, you can modify the following parameters:

- Hostname *
- Domain *
- Description
- Ping (Enabled or not)
- Ethernet connection retention (Enabled or not)
- TCP/IP mode (Automatic or Manual) *
- LAN Keep Alive timeout
- GPIB address
- mDNS Service Name
- mDNS Service (enabled or not)
- IP address *
- Subnet mask *
- Default gateway *
- DNS server(s) *

You must click the **Save** button (**Figure 3-7**)before changes to the parameters become effective. Parameters marked with an asterisk (*) also require that the instrument be restarted before changes take effect.

You may also select the **Save and Reset LAN** button for the changes to be effective immediately without having to restart the instrument.

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Security Page

Refer to **Setting the Password** earlier in this chapter.

Firmware Upgrade Page

Refer to **Upgrading the Firmware** later in this chapter.

Help Page

The Help page offers a variety of information on the main navigation features and options of the 1257A web pages.

Web Controls

The Web Control section allows you to view and modify the status of your 1257A System as well as to view and modify the various installed cards on your system.

In order to use the various web controls, you need to have a recent version of the Java™ Runtime Engine (JRE) installed on your computer. JRE can be downloaded from

http://www.java.com/en/download/index.jsp

Some versions of JRE cause a pop up Warning Security window to appear while trying to open a 1257A web controls page (**Figure 3-8**). In order for the 1257A web controls page to display correctly, user should click **No** to allow the web controls to run. Refer to the **Java Security Warning** in **Chapter 2, Getting Started**, for information on disabling the warning notices from regularly appearing.

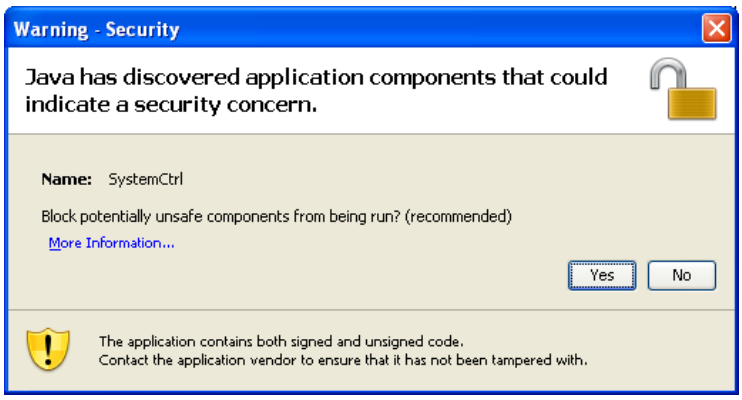


Figure 3-8, JavaScript Warning (Appearance Typical)

System Controls

Status/Configuration Tab

On this tab (**Figure 3-9**), you can view the current switch configuration as well as reorder the location of the components. Click **Reorder Components** to move the component locations.

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From this tab, components can also be controlled. Left-clicking on the switch will cause the switch to open or close. Clicking on the programmable attenuator drop-down allows for selecting the available attenuator valves.

To change the drive/output signals of the DIO component, select the bits to toggle their value. They will then be highlighted. Selecting **Write** will write the values and update their status. Selecting **Read** will perform a Read update and update the Read values.

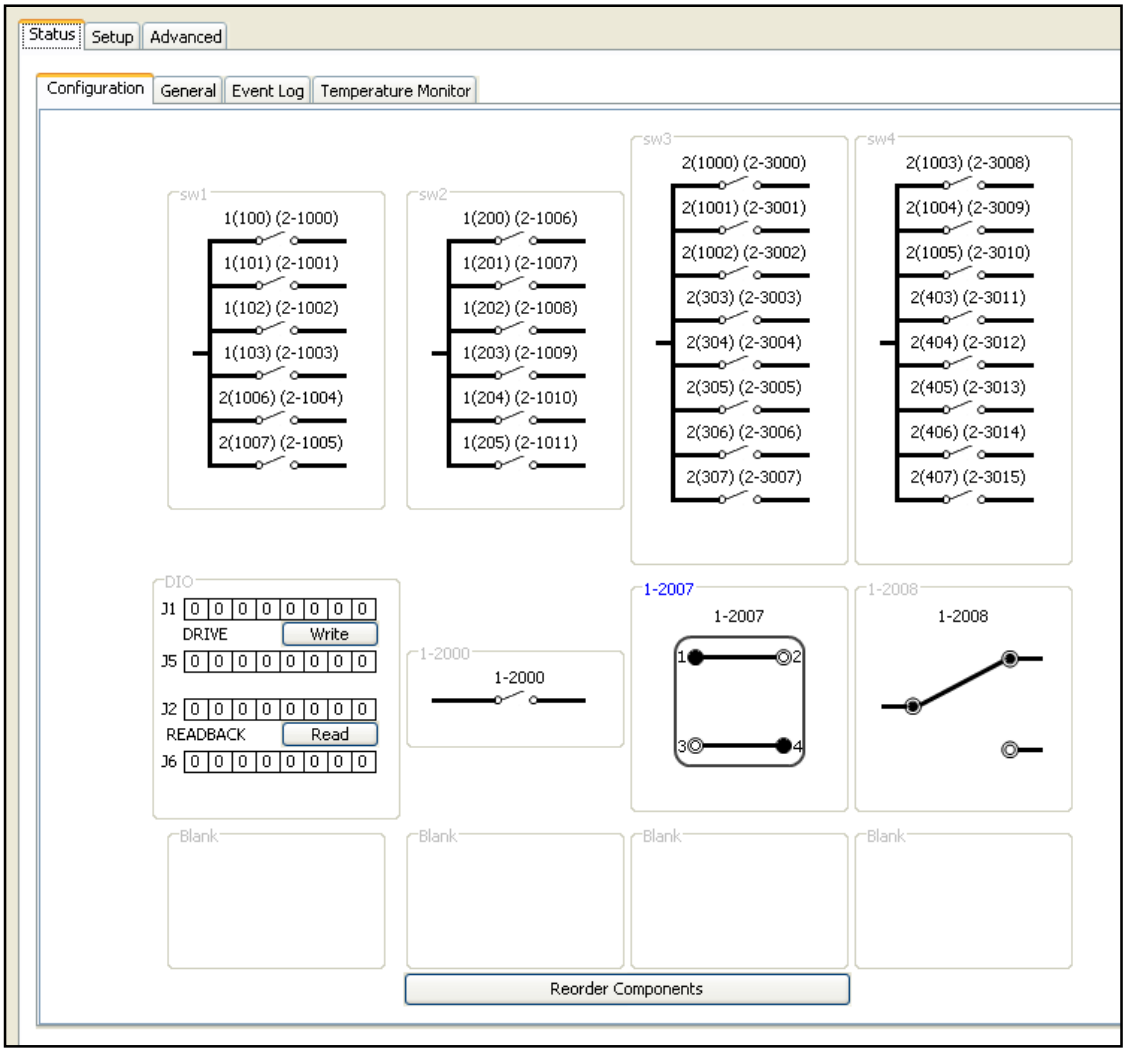


Figure 3-9, System Controls, Configuration Tab

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Reorder Components Display

In order to reposition the components on the **Configuration** tab screen, click the Reorder Component button and use the next screen to adjust their positions (**Figure 3-10**). You can update this screen to change the number of rows and columns shown on the Configuration Tab. You can change the position of the components by moving them up or down on the list. Click Submit for the changes to take effect.

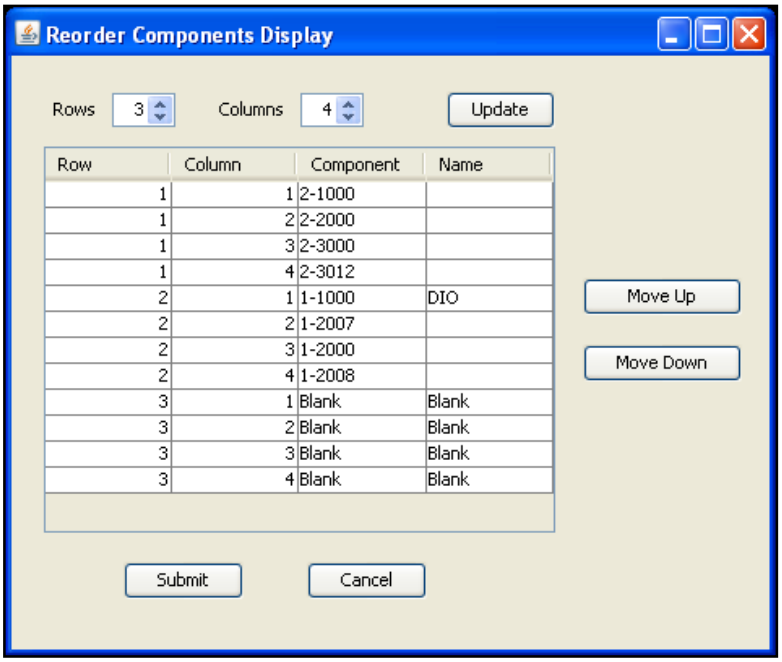


Figure 3-10, Reorder Components Display

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Status/General Tab

On this tab (**Figure 3-11**), you can view mainframe and module (card) serial number and revision information, as well as driver card slot configuration.

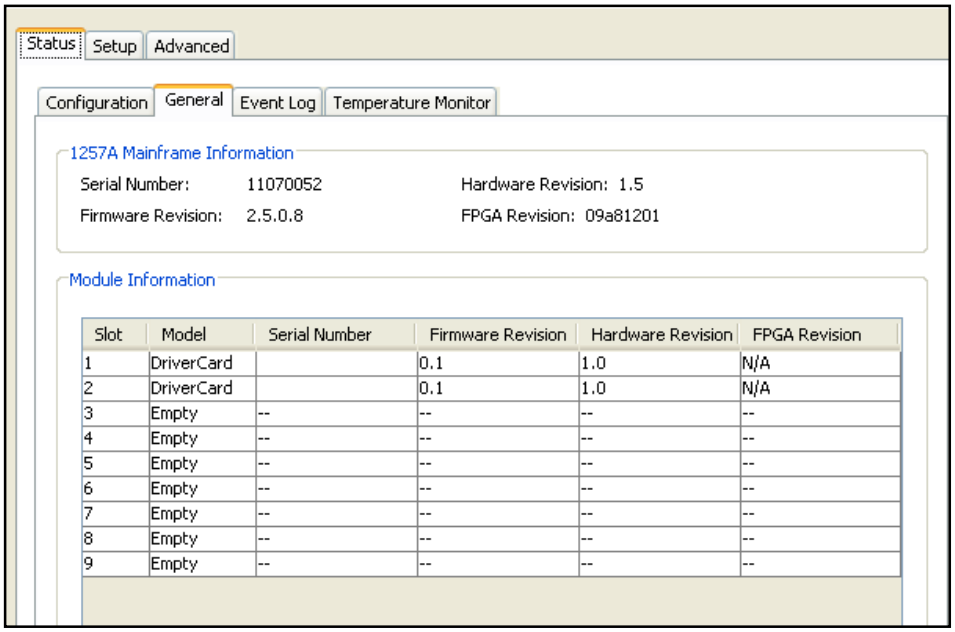


Figure 3-11, System Controls, Status/General Tab

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Status/Event Log Tab

On this tab (**Figure 3-12**), you can view the recent events including power-on, system faults, and errors. You can select and clear specific event numbers.

At the bottom of the screen, the **Read All** button shows you all the events in the log. The **Clear All** button clears all of the events from the log. The **Clear** button clears the events from this page.

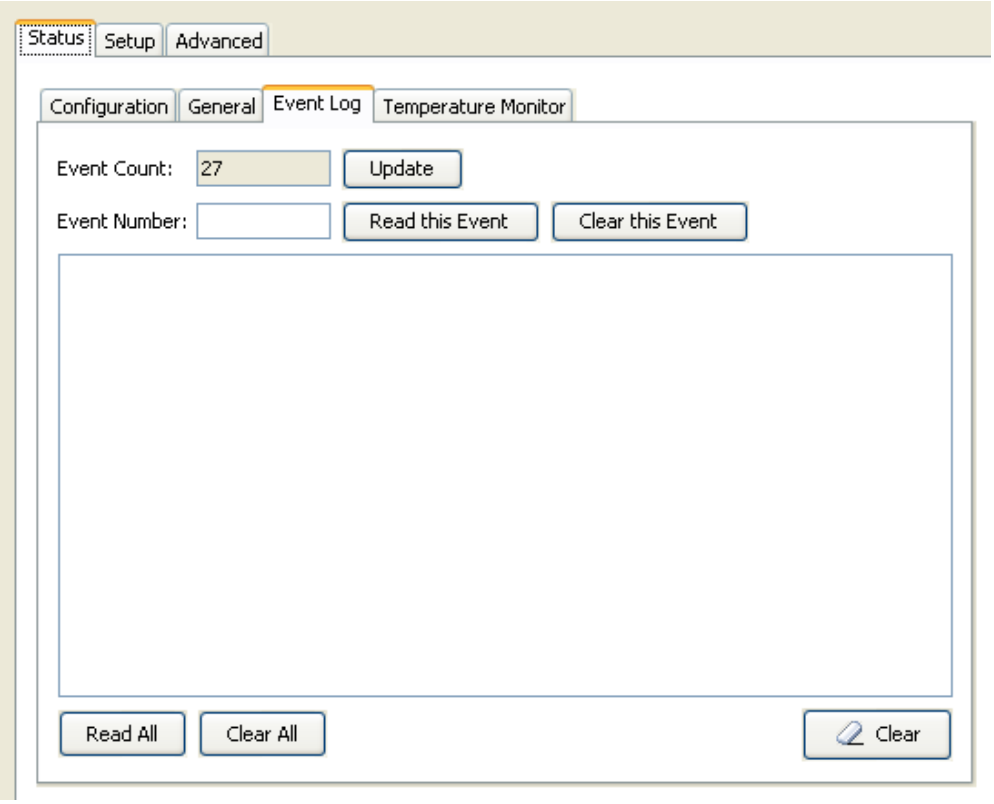


Figure 3-12, System Controls, Status/Event Log Tab

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Status/Temperature Monitor

On this tab (**Figure 3-13**), you can view the current temperature condition of various thermistors mounted at different points in the chassis. You can select the reading to report in Celsius or Fahrenheit. Click the **Refresh** button for manual refresh or check the **Auto Refresh** box for continuous updates.

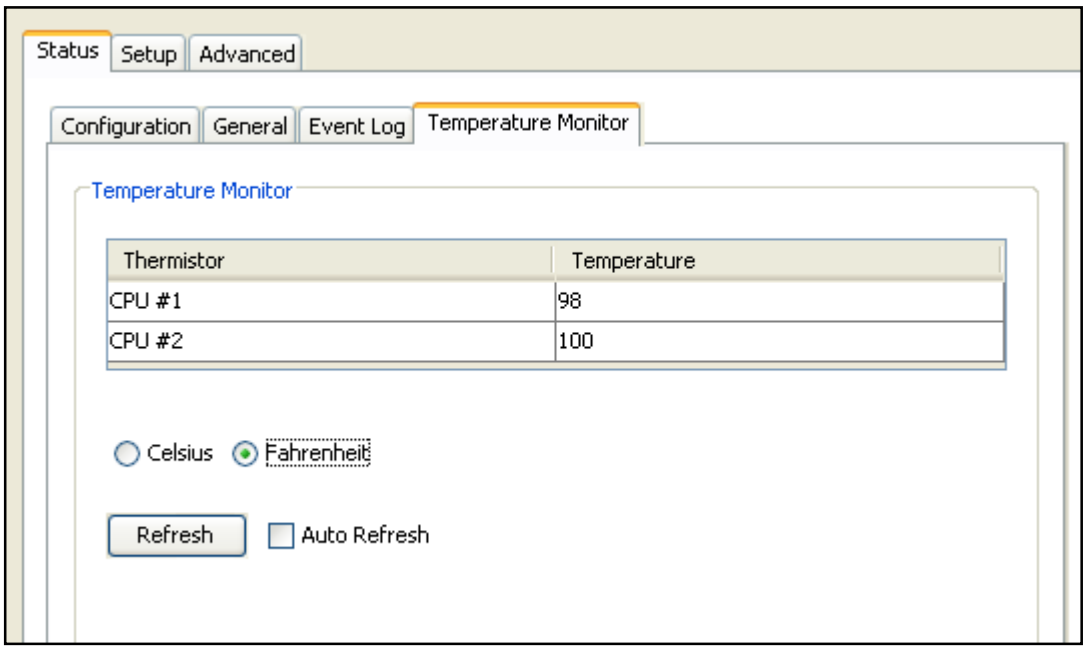


Figure 3-13, System Controls, Status/Temperature Monitor Tab

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Setup Tab

The **Setup** tab (Error! Not a valid bookmark self-reference.) allows you to save and recall 1257A system relay states as well as change or update the real time clock.

Save a relay state by setting a Location using the drop-down box and then clicking **Save**.

Recall a saved relay state by selecting the Location the state is in and clicking **Recall**.

Recall State (0) after a '*RST' command can be selected to recall State (0) anytime a '*RST' (or SYST:PRESet) command is executed.

Refer to **Power On Recal**l in **Chapter 1, Overview and Features**, for additional information about using this feature.

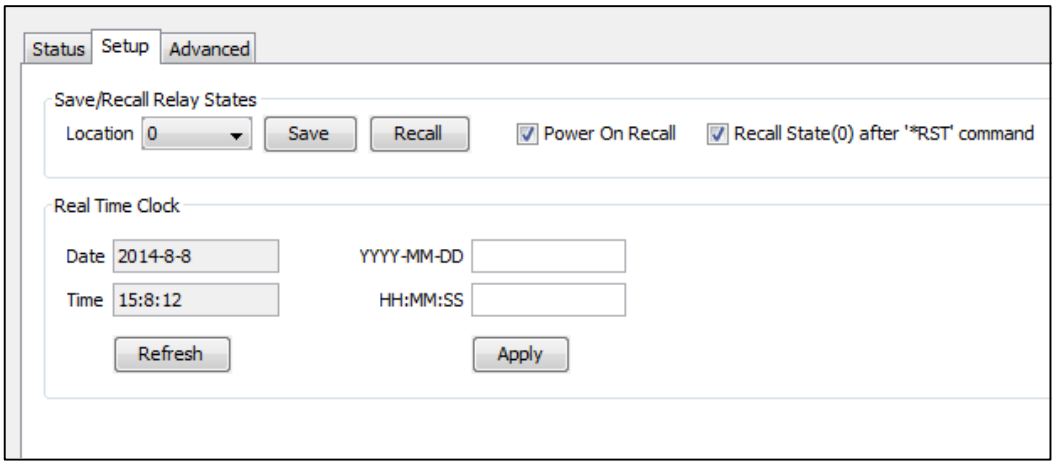


Figure 3-14, System Controls, Setup Tab

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Advanced Tab

The **Advanced** tab allows you to set or modify the following 1257A system conditions.

- Include/Exclude Lists
- Path Names
- SCPI Command Read and Write

Advanced/Include/Exclude Lists

On Include **Lists/Exclude Lists** tab (**Figure 3-15**), you can:

- Define new include lists and exclude lists
- View the set of include lists and exclude lists you have defined
- Store the include lists and exclude lists to non-volatile memory
- Recall previously stored include lists and exclude lists from non-volatile memory
- Configure the system to automatically recall include lists and excludes lists from non-volatile memory at power-up

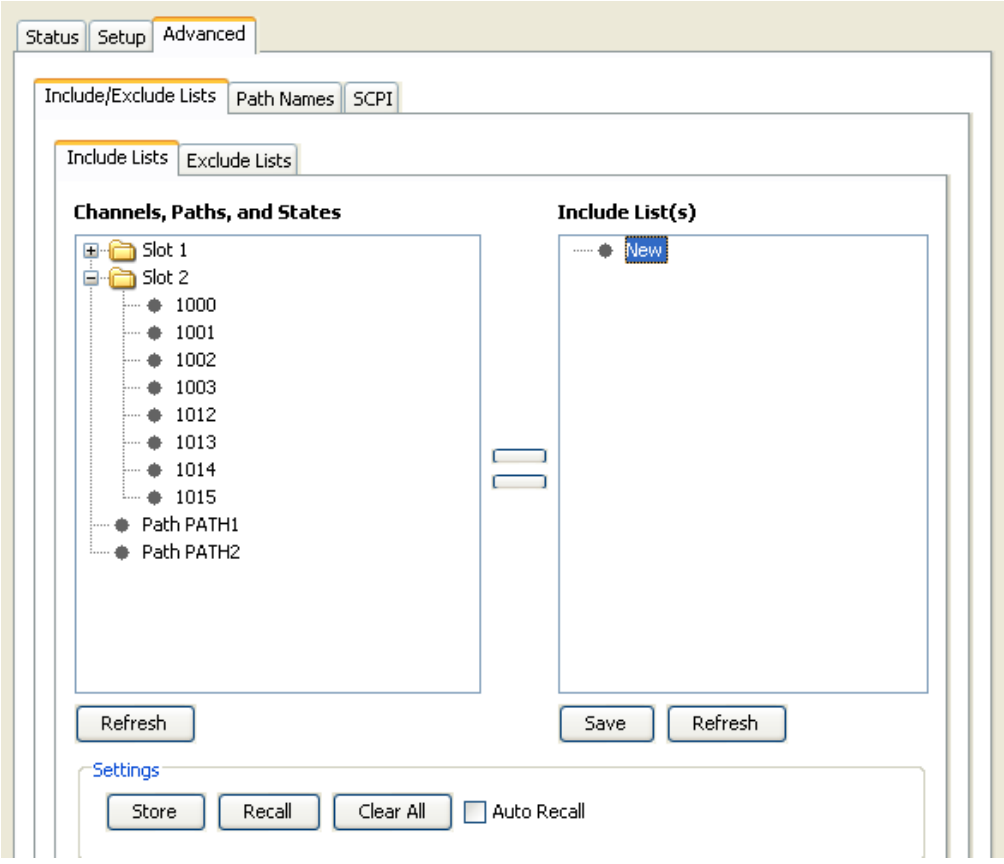


Figure 3-15, System Controls, Advanced/Include/Exclude Lists Tab

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Advanced/Path Names Tab

On the **General** tab (**Figure 3-16**), you can:

- View the paths that have been previously defined
- Delete individual path names from volatile memory
- Delete all path names from volatile memory
- Store all presently defined path names from volatile memory to non-volatile memory
- Recall previously stored path names from non-volatile memory
- Configure the system to automatically recall path names from non-volatile memory at power-up

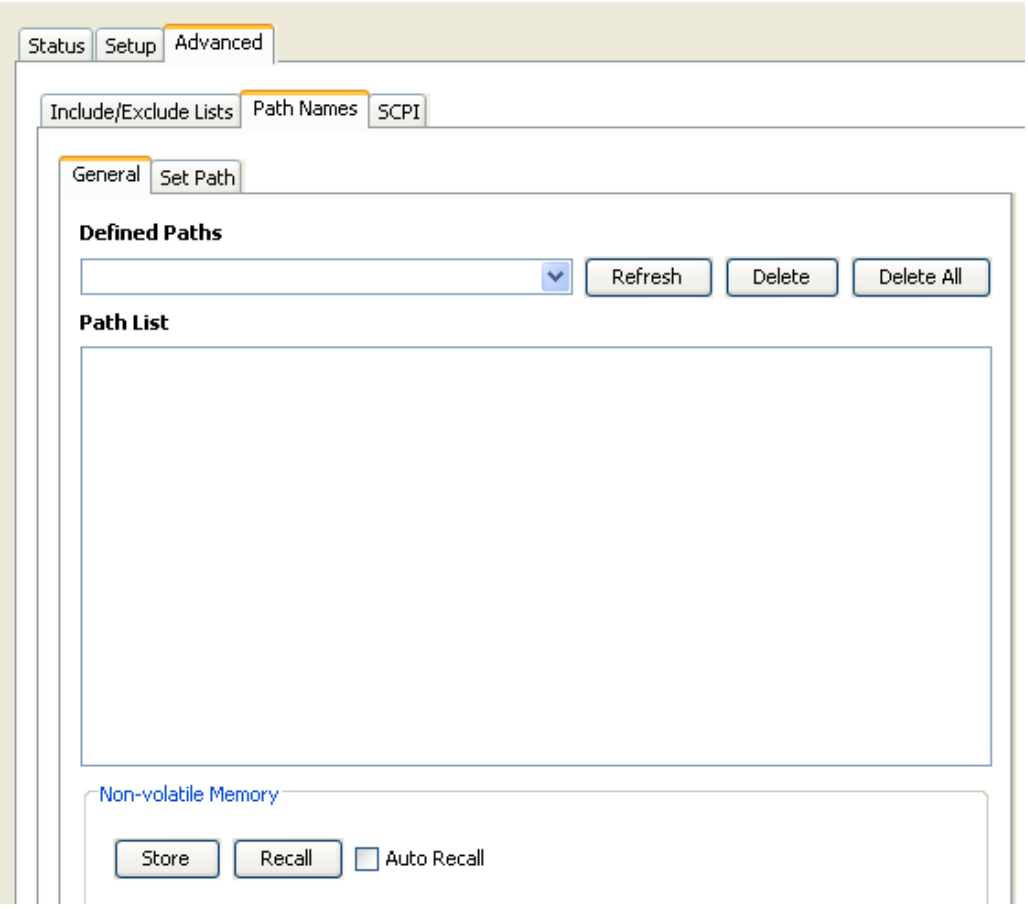


Figure 3-16, System Controls, Advanced/Path Names/General Tab

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On the **Set Path** tab (**Figure 3-17**), you can define new paths consisting of one or more relay channels from the 1257A.

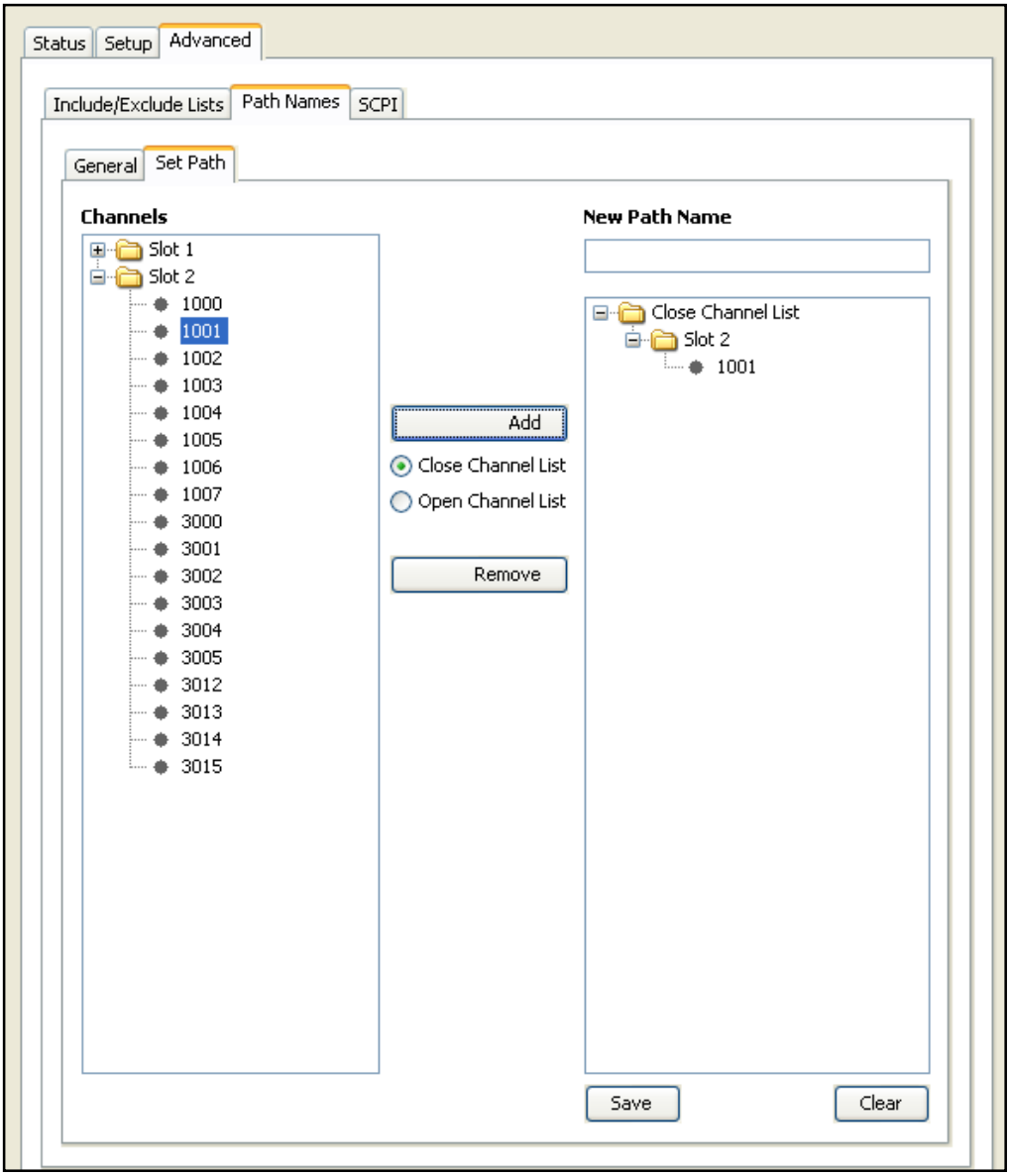


Figure 3-17, System Controls, Advanced/Path Names/Set Path Tab

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Advanced/SCPI Tab

The **SCPI** tab (**Figure 3-18**) allows you to send SCPI commands to the 1257A. A few common SCPI commands have clickable icons along the top of the tab including:

- **SYST:ERR?:** Checks on and reports if there are any errors
- **Read STB:** Reads the value of the Status Byte Register
- **Device Clear:** Clears error queue and flushes all input and output buffers
- **Clear:** Clears any text in the text message box below the icons

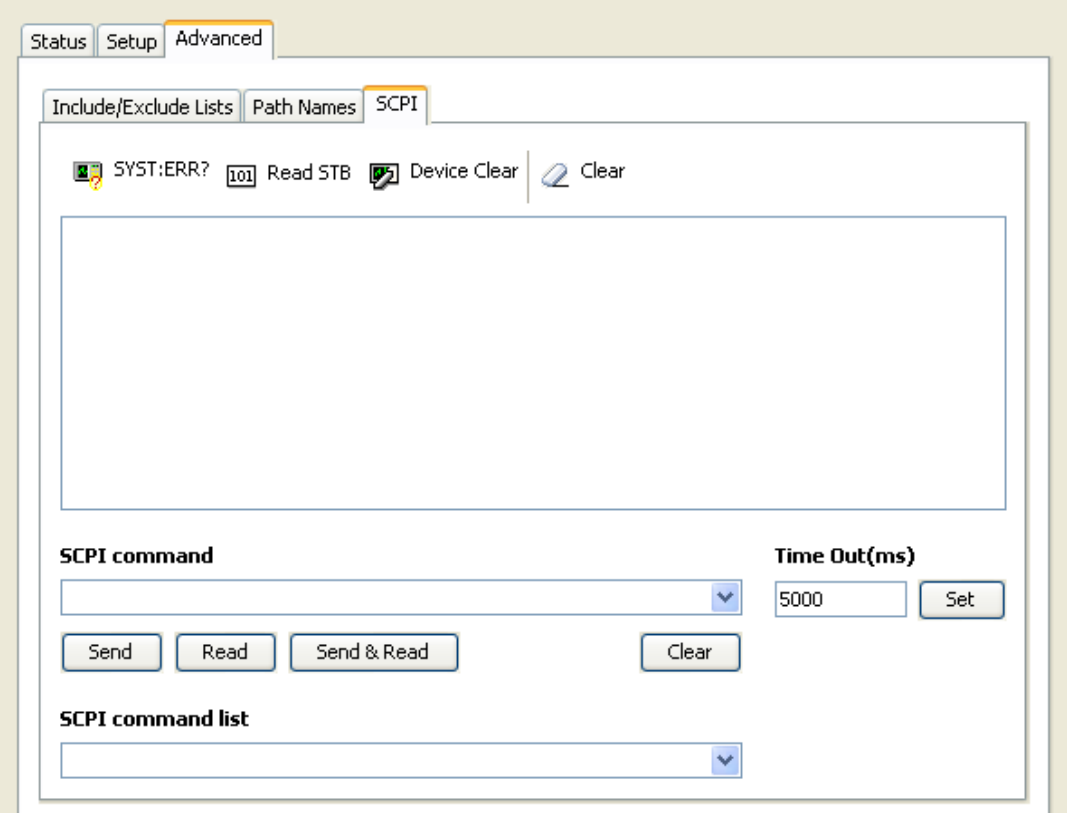


Figure 3-18, System Controls, Advanced/SCPI Tab

Use the **SCPI Command** input box to enter SCPI commands. The command and any replies will be shown in the text message box.

- Clicking **Send** sends the command.
- Clicking **Read** receives the reply.
- Clicking **Send/Read** both sends and then receives the reply.
- Clicking **Clear** clears the commands history in the **SCPI command** input box

Additional information and a listing of SCPI commands can be found in **Chapter 4, SCPI Command Basics**.

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Slot Controls Descriptions

Selecting a slot (driver card) from the main Web Page provides access for driver/component configuration and control.

Main Tab

The **Main** tab (**Figure 3-19**) allows you to control the components configured for this driver card. Selecting the component will show the component details and relay cycle counter (where applicable).

From this tab, components can also be controlled. Left-clicking on the switch will cause the switch to open or close. Clicking on the programmable attenuator drop-down allows for selecting the available attenuator valves.

To change the drive/output signals of the DIO component, select the bits to toggle their value. They will then be highlighted. Selecting **Write** will write the values and update their status. Selecting **Read** will perform a Read update and update the Read values.

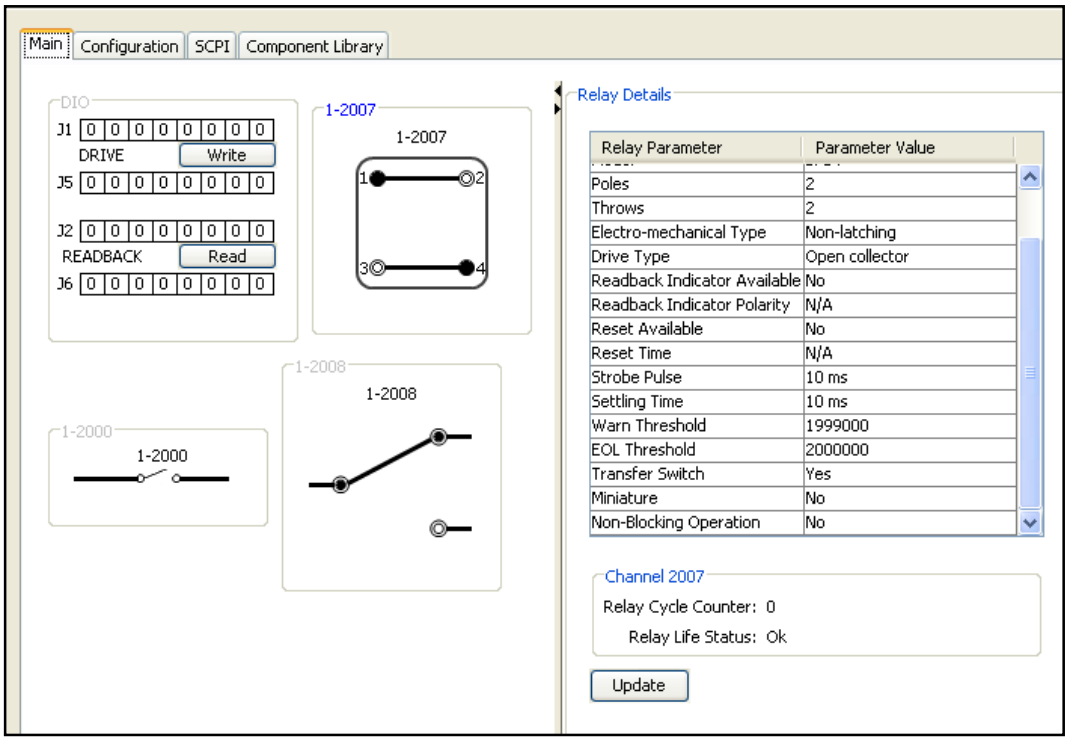


Figure 3-19, Slot Controls/Main Tab

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Configuration Tab

The **Configuration** Tab is used to configure the appropriate components compatible with each driver board. The tabs will differ depending on the Driver Board installed. **Figure 3-20** shows the Attenuator Board view. **Figure 3-21** shows the Relay Board view. **Figure 3-22** shows the DIO Board view.

Each Driver Board has three configurable banks: A, B, and C. The Bank Selection shows the installed adapters for the drive card. These are labeled A, B, and C. An adapter type ID:15 indicates NO adapter is installed into that position.

After a Bank/Adapter Card is selected, the next step is to select or review the configuration options. The configuration options present which types of components and what configuration is supported by the selected adapter board. Based upon the configuration options, the Board Connectors Section will show the available connectors and their configuration status.

To configure a connector, select the connector. For the relay configuration, enter the relay name (for example, SW2). The relay model is selected from the drop-down menu.

The Channel Alias Assignment section can be utilized to enter channel aliases.

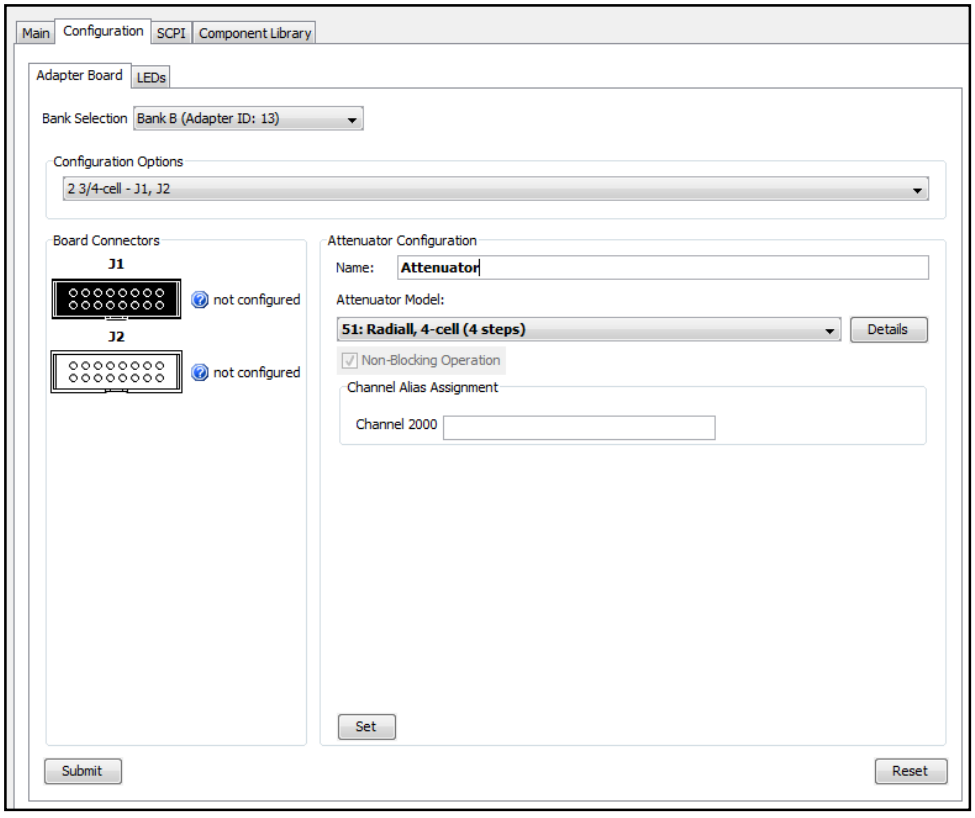


Figure 3-20, Slot Controls/Configuration/Adapter Board Tab (Attenuator Configuration)

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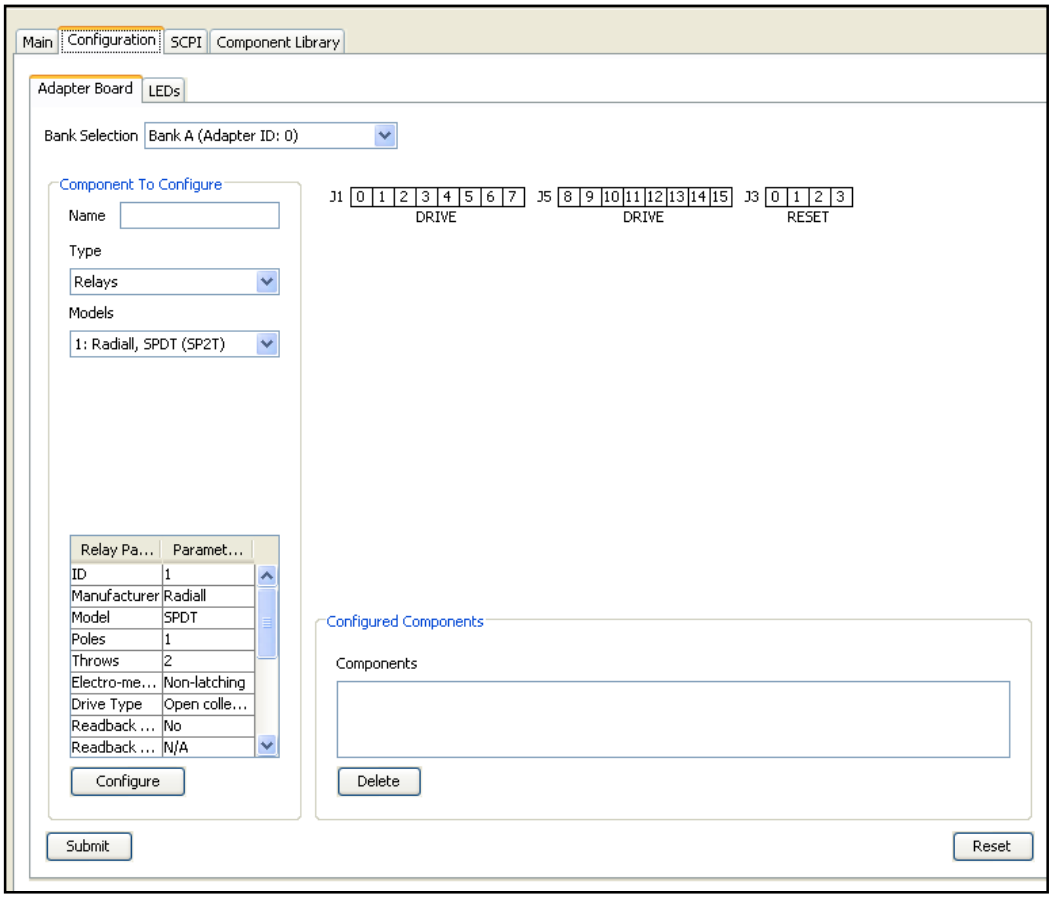


Figure 3-21, Slot Controls/Configuration/Adapter Board Tab (Relay Configuration)

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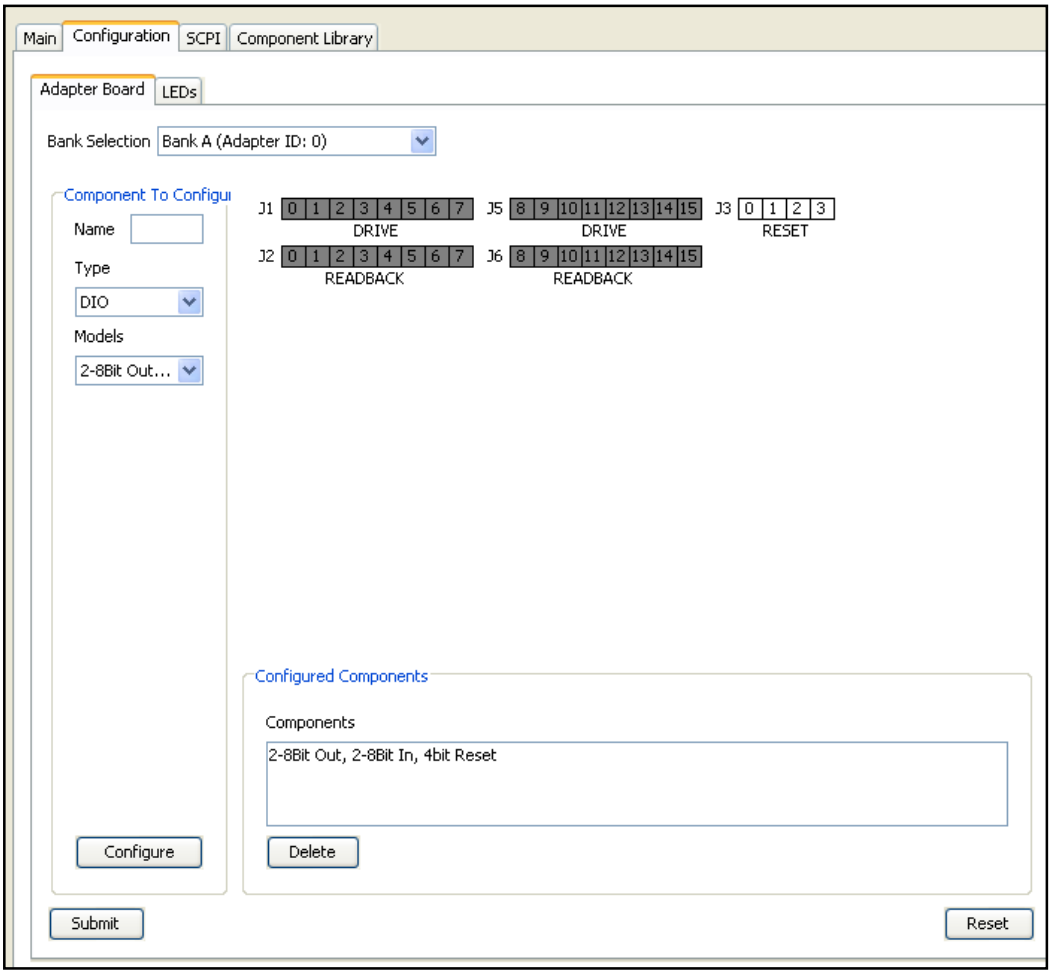


Figure 3-22, Slot Controls/Configuration/Adapter Board Tab (DIO Configuration)

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The **LEDs** tab (**Figure 3-23**) allows for configuring 16 LEDs per bank. The polarity and drive current for the LED can be selected along with its mode.

The mode choices are: Control, Indicator, and Manual.

- Control ties the LED state to the relay commanded stated.
- Indicator ties the LED state to the Indicator state.
- Manual control allows for independent LED control.

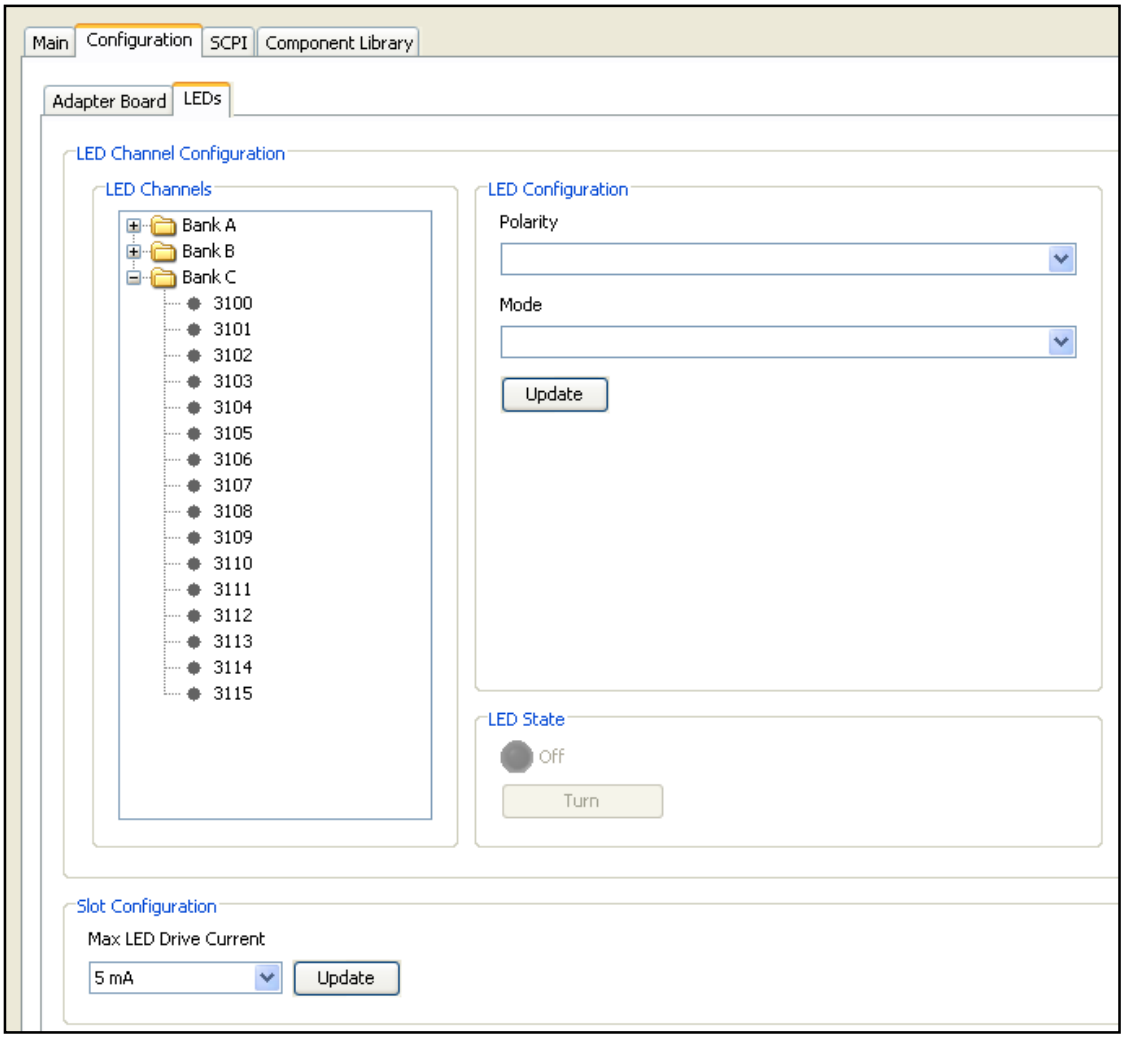


Figure 3-23, Slot Controls/Configuration/LEDs Tab

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SCPI Tab

The **SCPI** tab (**Figure 3-24**) allows you to send SCPI commands to the card. A few common SCPI commands have clickable icons along the top of the tab including:

- **SYST:ERR?:** Checks on and reports if there are any errors
- **Read STB:** Reads the value of the Status Byte Register
- **Device Clear:** Clears error queue and flushes all input and output buffers
- **Clear:** Clears any text in the text message box below the icons

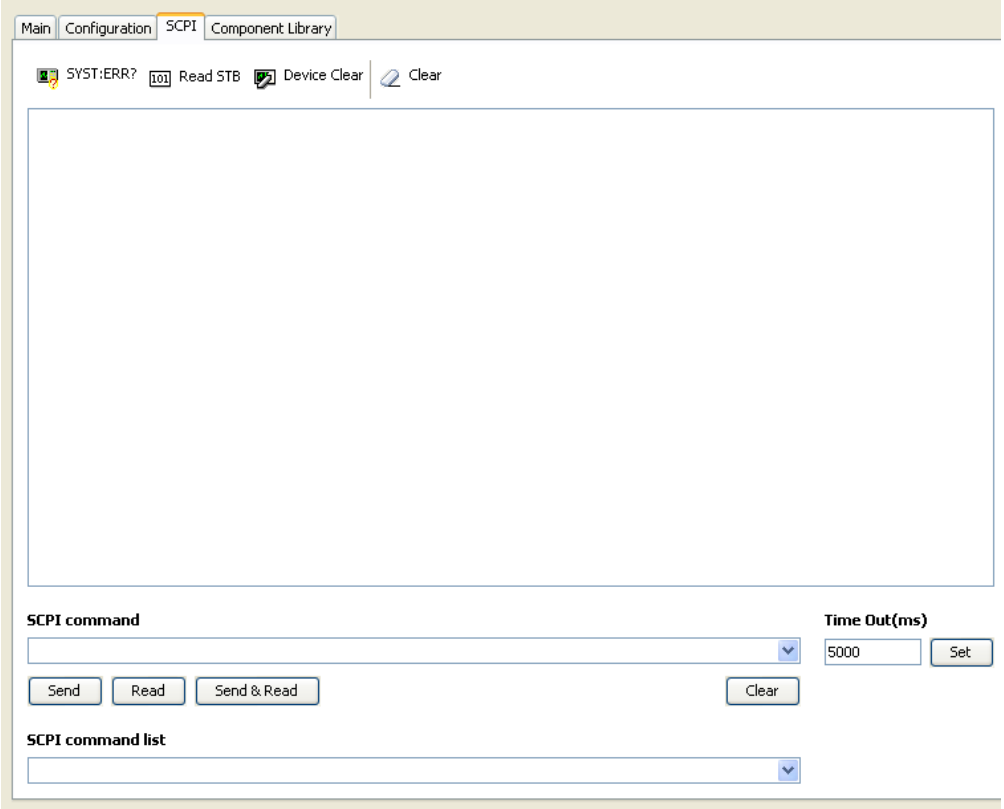


Figure 3-24, Slot Controls/SCPI Tab

Use the **SCPI Command** input box to enter SCPI commands. The command and any replies will be shown in the text message box.

- Clicking **Send** sends the command.
- Clicking **Read** receives the reply.
- Clicking **Send/Read** both sends and then receives the reply.
- Clicking **Clear** clears the commands history in the **SCPI command** input box

Additional information and a listing of SCPI commands can be found in **Chapter 4, SCPI Command Basics**.

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Component Library Tab

The **Component Library** tab (**Figure 3-25**) allows you to:

- Add new relay types to the library of relays
- Add new attenuator types to the library of attenuators
- View the attributes of the existing relay and attenuator types
- Modify existing relay and attenuator types (not recommended as this may affect the operation of your system)

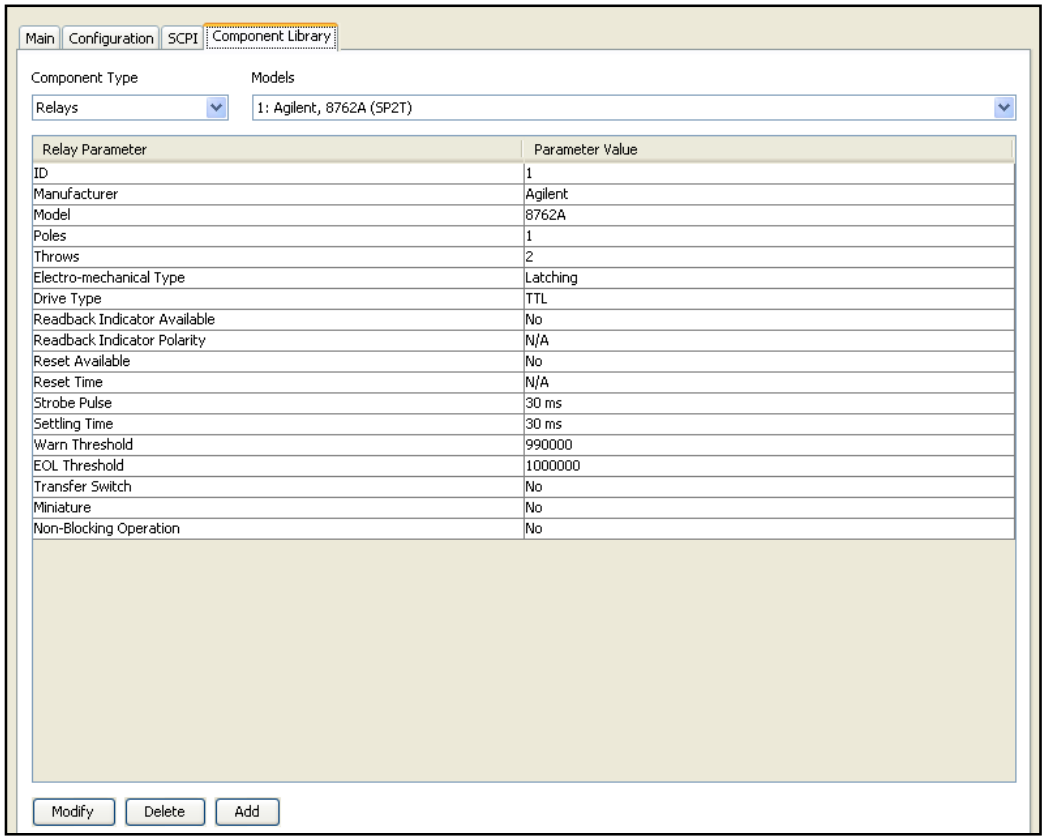


Figure 3-25, Slot Controls/Component Library Tab

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Upgrading the Firmware

The embedded software (firmware) supports downloading newer versions from our support website so that the 1257A system does not have to be returned to the factory for a software update. The firmware uses the built-in web-page interface to upload the software through the 1257A Ethernet port.

Note

Before upgrading your firmware, make a copy of your existing 1257A switch configuration information by following the procedure in *Appendix C, Using the Software Configurator Tool*. Having a copy enables you to easily restore the system configuration if needed.

When there's a new 1257A firmware upgrade available, it'll be downloadable from the Astronics Test Systems website. Once you've downloaded the new firmware upgrade file to your computer, you're ready to perform the upgrade (if a zip file was downloaded, unzip it).

1. Open the Home page of the 1257A system to upgrade.
2. Select and open the **Firmware Upgrade** link on the navigation bar (refer to Setting the Password section of this book for information regarding the user name and password).
3. Use the **Browse** button to select the file downloaded (with the ".bin" extension). It is important that you do **not** change the extension (.bin) of the upgrade firmware file (**Figure 3-26**).
4. Click the **Upgrade** button. The software begins to upgrade your current firmware. (**Figure 3-27**).

Caution



DO NOT power off the 1257A system while the upgrade is taking place. If the upgrade is interrupted and the firmware is corrupted, the 1257A system automatically loads the backup firmware. This version includes only a minimal feature set and you must upgrade the firmware again.

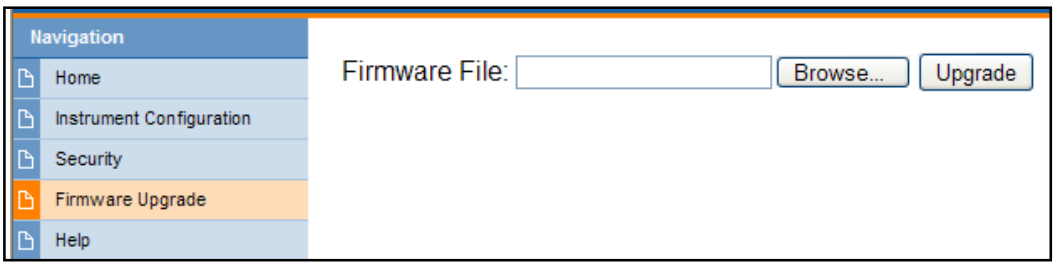


Figure 3-26, Firmware Upgrade File

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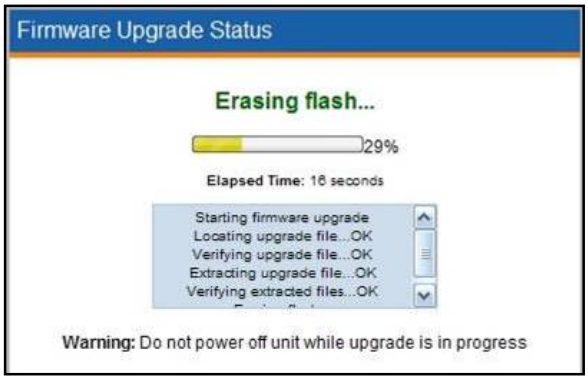


Figure 3-27, Firmware Upgrade Status

5. When the upgrade is complete (**Figure 3-28**), exit out of the message box.



Figure 3-28, Firmware Upgrade Complete

6. Turn the system power off and then back on, in order to restart the system and initialize the firmware upgrade.
7. Review the Instrument Information section of the Home page and confirm that the Firmware level is at the correct revision (**Figure 3-29**).

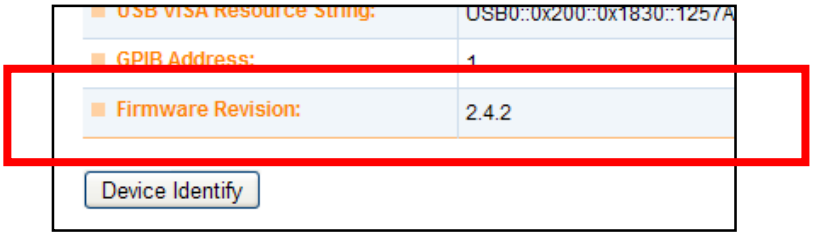


Figure 3-29, Checking Firmware Revision Level (Appearance Typical)

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Chapter 4
SCPI Command Basics

SCPI Command Overview

The 1257A accepts commands via either the GPIB or serial interface. 1257A commands follow the rules defined by the SCPI standard. SCPI is an acronym for "Standard Commands For Programmable Instruments", and defines standard command names and syntax rules for commands to the instrument and replies from the instrument.

Input Format

SCPI is an ASCII-based instrument command language designed for test and measurement instruments. SCPI commands are based on a hierarchical structure known as a tree system. In this system, associated commands are grouped together under a common root, thus forming command subsystems. Throughout this chapter, the following conventions are used for SCPI command syntax.

Square Brackets ([ ])	Enclose optional keywords or parameters
Braces ({ })	Enclose possible parameters within a command
Triangle Brackets (< >)	Substitute a value for the enclosed parameter
Vertical Bar (|)	Separate multiple parameter choices
Bold Typeface Letters	Designate factory default values
(Command Only)	Indicates the command cannot be used in query form
(Query Only)	Indicates the command can only be used as a query. The command form, without the question mark is not allowed.

To illustrate the SCPI notation, a part of the ROUTE command subsystem is shown below:

```
[:ROUTe]
      :CLOSe <channel list>
      :OPEN <channel list>
            :ALL
```

ROUTE is the root keyword of the command. This keyword is optional, since it is shown enclosed in square brackets. CLOSE and OPEN are the next level keywords. The "ALL" keyword is below the OPEN keyword in this command tree.

The colon (:) is used to separate keywords from different levels on the command

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tree. Each keyword is separated from the next by a single colon.

The SCPI commands which may be formed by this tree are shown below (a <channel list> of (@1(1000)) is used in these examples):

```
ROUTE:CLOSE (@1(1000))
CLOSE (@1(1000))
ROUTE:CLOSE? (@1(1000))
CLOSE? (@1(1000))
ROUTE:OPEN (@1(1000))
OPEN (@1(1000))
ROUTE:OPEN? (@1(1000))
OPEN? (@1(1000))
ROUTE:OPEN:ALL
OPEN:ALL
```

Note that the optional ROUTE keyword is omitted in many of the examples. This is allowed because the ROUTE keyword is optional, as indicated by the square brackets in the command tree.

Command Keyword Long Form and Short Form

Each keyword defined by SCPI has both a **long form** and a **short form**. The long form is formed by using all letters shown in the keyword. The short form is formed by using only those letters shown in upper-case in the command tree.

The short form is normally three or four letters in length ending with a consonant where possible.

For example, the ROUTE keyword may be specified by either of the following:

```
ROUT
ROUTE
```

since the final “e” is shown in lower-case in the command tree.

Only the long form or short form may be used. For example, the keyword “DEFINE” is shown as:

```
DEFine
```

Therefore, the following two command keywords are valid:

```
DEFINE
DEF
```

But the keywords

```
DE
DEFI
DEFIN
```

are NOT valid.

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Case Sensitivity

Command keywords are **NOT** case sensitive. Command parameters are not case sensitive, unless the parameter is string data enclosed in quotes.

For example, the following commands are equivalent:

```
CLOSE
Close
```

Optional Keywords

Command keywords enclosed in square brackets are optional. For example, the following commands are valid and equivalent:

```
ROUTE:CLOSE (@1(1000))
CLOSE (@1(1000))
```

Querying Parameter Setting

Most SCPI commands have corresponding query forms. The query is used to read the present state of the item that is set with the command. The query is formed by appending a question mark (?) to the end of the command keyword.

For example, the command:

```
ROUTE:CLOSE (@1(1000))
```

Has an equivalent query:

```
ROUTE:CLOSE? (@1(1000))
```

The command instructs the 1257A to close channel 0 in the drawer. The query inquires about the present open or close state of channel 0 in the drawer.

SCPI Command Terminator

For commands sent through the GPIB interface, a command string sent to the 1257A must be terminated with one of the following:

1. An ASCII linefeed character (decimal 10, hex 0A, or a character '\n').
2. The last character with the EOI signal asserted.
3. An ASCII linefeed character with the EOI signal asserted.

For commands sent through either the TCP/IP (Ethernet) or USB interfaces, the commands must be terminated with an ASCII linefeed character.

IEEE-STD-488.2 Common Commands

The IEEE-STD-488.2 standard defines a set of common commands that perform functions like reset, trigger and status operations. Common commands begin with an asterisk (*), are four to five characters in length, and may include parameters. The command keyword is separated from the first parameter by a blank space. A

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semicolon (;) may be used to separate multiple commands as shown below:

```
*RST; *STB?; *IDN?
```

The IEEE-488. 2 common commands implemented by the 1257A are described later in this chapter.

IEEE 488.2 Common Commands

The 1257A supports all required IEEE-488.2 commands. In addition, the optional *OPT?, *SAV, and *RCL commands are supported. The following paragraphs describe the IEEE-488.2 commands supported by the 1257. In addition, the status reporting model implemented by the 1257A is described. The 1257A complies with this standard for both GPIB and RS-232 operational modes.

The following commands are implemented:

*IDN? Identification query

*RST Instrument reset

*TST? Commanded self-test

*CLS Clear status

*ESE Set the Standard Event Status Enable register

*ESE? Read the Standard Event Status Enable register

*ESR? Read the Standard Event Status register

*SRE Set the Service Request Enable register

*SRE? Read the Service Request Enable register

*STB? Read the status byte

*OPC Set the OPC bit of the Standard Event Status register

*OPC? Reply with “1" when executed (used for synchronizing)

*SAV Store relay states in non-volatile memory

*RCL Recall relay states from non-volatile memory

*OPT? Read if any options are installed

These commands are described in greater detail in this section of the manual.

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IEEE-488. 2 Status Description

The IEEE-488.2 Status Reporting Model is shown in **Figure 4-1**. This figure shows how the status reporting data structures are implemented and the commands used to set and read each of the registers

The 1257A maintains a set of these status registers for each individual interface it supports. That is, there is one set of these registers for the GPIB interface, one set of these registers for the USB interface, and one set of these registers for EACH connection over the TCP/IP (Ethernet) interface.

This means that an error in the command received over the GPIB interface will not be reflected in the Standard Event Status Register value read over the USB interface or any Ethernet connection.

Standard EVENT STATUS Register

Figure 4-1 shows four related registers. The *Standard Event Status Register*, the *Standard Event Status Enable Register*, the *Status Byte Register*, and the *Service Request Enable Register*.

The *Standard Event Status Register* reflects the present status of the instrument. This register consists of eight 1-bit flags. Each flag represents a true or false indication of the corresponding condition. The bits of this register are:

PON	Power-On Bit 7 (MSB), Bit weight = 128 decimal = 80 hexadecimal This flag is set when the instrument is powered on.
URQ	User Request Bit 6, Bit weight = 64 decimal = 40 hexadecimal This bit is never set by the 1257A and will always read 0.
CME	Command Error Bit 5, Bit weight = 32 decimal = 20 hexadecimal This bit is set when a command error is detected by the 1257. Errors of this type will also result with an error added to the error queue. The error may be read using the SYST:ERR? query to determine the cause of the error
EXE	Execution Error Bit 4, Bit weight = 16 decimal = 10 hexadecimal This bit is set when a valid command is received but cannot be executed for some reason. For example, an error occurs while executing the *SAV command. When this error occurs, an error message is added to the message queue and may be read using the SYST:ERR? query.

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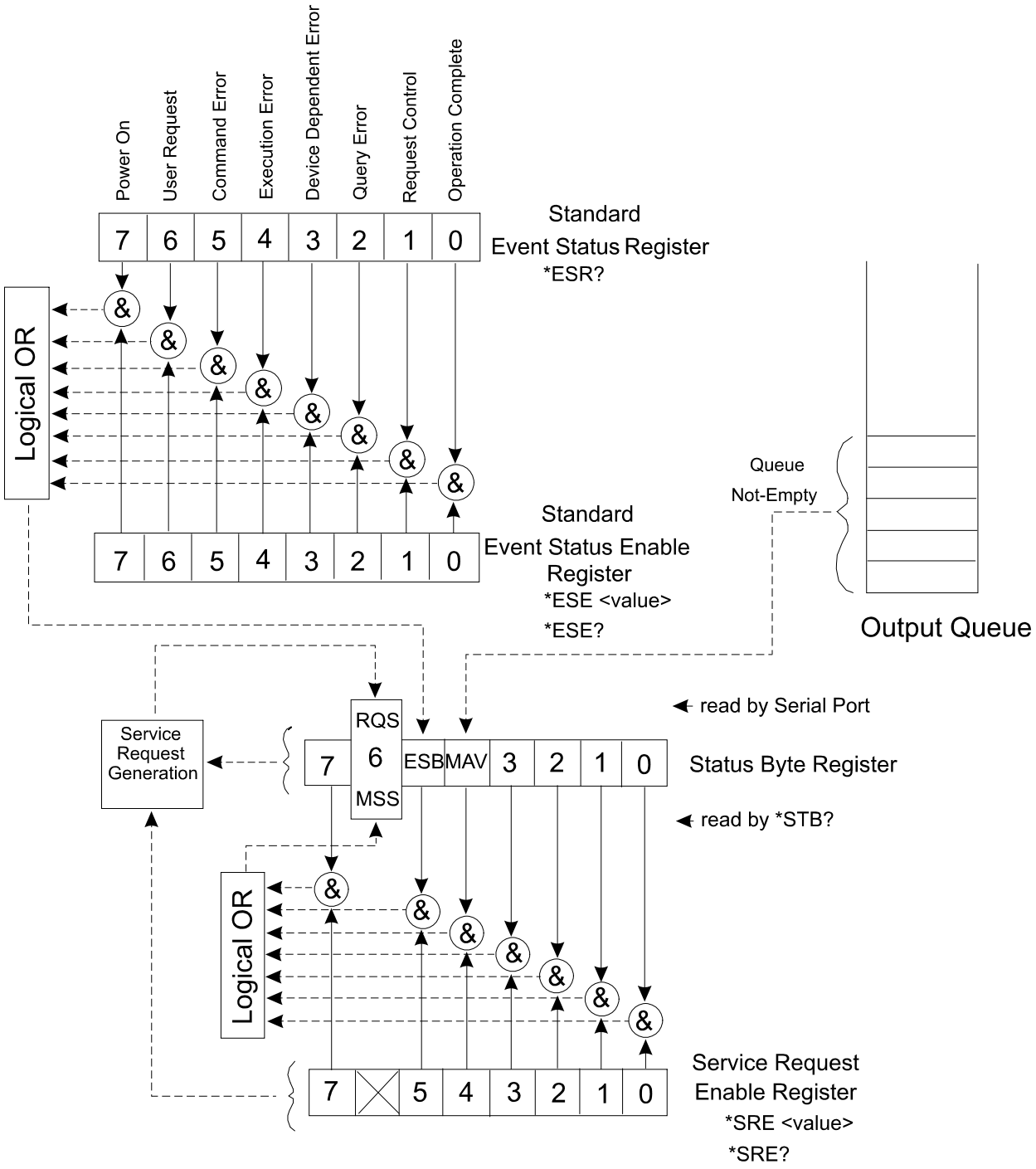


Figure 4-1, IEEE-488.2 Status Reporting Model

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DDE	Device Dependent Error Bit 3, Bit weight = 8 decimal = 8 hexadecimal This bit is set when a device-dependent error is detected. For example, a channel in the 1257A drawer is read during power-up but contains an unknown identification byte value. When this error occurs, an error is added to the error message queue.
QYE	Query Error Bit 2, Bit weight = 4 decimal = 4 hexadecimal This bit is set when a query error is detected. For example, a query is sent, but the reply is not read, and a second query or command is sent. When this error occurs, an error is added to the error message queue.
RQC	Request Control Bit 1, Bit weight = 2 decimal = 2 hexadecimal This bit is never set by the 1257A and will always read 0.
OPC	Operation Complete Bit 0, Bit weight = 1 decimal = 1 hexadecimal This bit is set when the *OPC command is executed. This may be used to synchronize the 1257A with the commands (to ensure that the 1257A command buffer is empty).

A bit is set in this register when the corresponding condition becomes true. It remains set until the *ESR? query is executed. When the query is executed, the reply contains the present value of the register, and the register is then cleared to 0.

The value returned by the *ESR? query represents a sum of the bit-weight values for all conditions that are true. For example, if the PON bit is set and the QYE bit is set, and the rest of the bits are cleared, then the value returned for the *ESR? query is:

PON + QYE = 128 + 4 = 132

The Standard Event Status Enable Register provides a mask register. The value of this register is logically ANDed with the Standard Event Status Register. If the value of this ANDing is nonzero, then bit 5 of the Status Byte Register is set. This bit is known as the “Event Summary Bit”, or ESB.

For example, if the PON and QYE bits of the *Standard Event Status Register* are set, but the *Standard Event Status Enable Register* value is 0, then the ESB of the *Status Byte Register* will not be set. If either, or both, bits 7 and bit 2 of the *Standard Event Status Enable Register* are set, then the ESB bit of the *Status Byte Register* will be set.

Another way of viewing the *Standard Event Status Enable Register* is that it selects which conditions reflected in the *Standard Event Status Register* are enabled to set the ESB bit of the status byte.

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STATUS BYTE Register

The Status Byte Register is similar to the Standard Event Status Register. Each bit of this register reflects the true or false condition of the corresponding bit. These bits reflect the PRESENT value of the condition, whereas the Standard Event Status Register bits are latched. That is, once a bit in the Standard Event Status Register is set, it remains set until a *CLS command is executed or an *ESR? Query is executed. However, the bits of the Status Byte Register change states as the corresponding condition becomes true or false. These bits are NOT latched.

Also, the Status Byte is not cleared by reading the register. Each bit of the Status Byte remains set until the condition indicated by the bit is no longer present.

The following bits are assigned in the Status Byte Register. All other bits are not used and will return “0" when read with the *STB? query:

OSE — Operation Status Event

Bit 7, bit weight = 128 decimal = 80 hexadecimal

This bit is set when any of the bits of the Operation Status Event Register are set. (This bit is NOT shown on the diagram. For a description of the Operation Status Event Register, consult the “SCPI Status Registers” section of this chapter.

MSS — Master Summary Status.

Bit 6, bit weight = 64 decimal = 40 hexadecimal

This bit is set when one or more of the “enabled” bits of the Status Byte are set. In other words:

(Status Byte bit 0 AND SRE bit 0)
OR
(Status Byte bit 1 AND SRE bit 1)
OR
(Status Byte bit 2 AND SRE bit 2)
OR
(Status Byte bit 3 AND SRE bit 3)
OR
(Status Byte bit 4 AND SRE bit 4)
OR
(Status Byte bit 5 AND SRE bit 5)
OR
(Status Byte bit 7 AND SRE bit 7)

where the SRE is the Service Request Enable Register.

ESB — Event Summary Bit

Bit 5, bit weight = 32 decimal = 20 hexadecimal

This bit is set when one of the enabled Standard Event Status Enable Register bits is set. The previous paragraphs describe the formation of the ESB bit.

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MAV	Message Available Bit 4, bit weight = 16 decimal = 10 hexadecimal This bit is set when there is a message in the output buffer of the 1257.

All other bits (3, 2, 1, and 0) of the Status Byte are not assigned and will always return 0.

When the MSS transitions from a 0 to a 1, the GPIB SRQ interrupt is generated. The MSS will remain 1 until all enabled bits of the Status Byte have returned to 0.

SERVICE Register ENABLE Register

The Service Request Enable Register is used to individually enable bits in the Status Byte to set the MSS bit of the Status Byte, thereby generating an interrupt. When the bit of the Service Request Enable bit is set, and the corresponding bit of the Status Byte Register is set, then the MSS bit will be a 1.

The following IEEE-488.2 Common Commands relate to the Status Reporting Model:

*CLS	Clear status
*ESE	Set the Standard Event Status Enable register
*ESE?	Read the Standard Event Status Enable register
*ESR?	Read the Standard Event Status register
*SRE	Set the Service Request Enable register
*SRE?	Read the Service Request Enable register
*STB?	Read the status byte

These common commands are described below.

*CLS Command

The *CLS command clears the SCPI and IEEE-488.2 defined status event registers. These include:

- The Standard Event Status Register is cleared to 0. This register is read using the *ESR? query.
- The Standard Event Status Enable Register is cleared to 0. This register is set using the *ESE command, and read using the *ESE? query.
- The Service Request Enable Register is cleared to 0. This register is set using the *SRE command, and read using the *SRE? query.
- The Operation Status Enable Register is cleared to 0. This register is set using the STATUS:OPERATION:ENABLE command. This register can also be read using the STATUS:OPERATION:ENABLE? query.
- The Operation Status Event Register is cleared to 0 This register is read using the STATUS:OPERATION:EVENT? query.

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- The Questionable Status Enable Register is cleared to 0. To set this register, the STATUS:QUESTIONABLE:ENABLE command is issued. To read this register, the query STATUS:QUESTIONABLE:ENABLE? indicates whether this feature is enabled.
- The Questionable Status Event Register is cleared to 0. It is read using the STATUS:QUESTIONABLE:EVENT? Query.

*ESE Command

The *ESE command sets the value of the Standard Event Status Enable Register. The value of this register is logically ANDed with the contents of the Standard Event Status Register (see the *ESR? query description). If any bits of this AND operation are set, then bit 5 of the Status Byte is set. Bit 5 is known as the Event Summary Bit, or ESB.

ESB of Status Byte =

(bit 0 of ESE AND bit 0 of ESR)

OR

(bit 1 of ESE AND bit 1 of ESR)

OR

(bit 2 of ESE AND bit 2 of ESR)

OR

(bit 3 of ESE AND bit 3 of ESR)

OR

(bit 4 of ESE AND bit 4 of ESR)

OR

(bit 5 of ESE AND bit 5 of ESR)

OR

(bit 7 of ESE AND bit 7 of ESR)

where:

ESE is the value as set by the *ESE command

ESR is the value which may be read with *ESR? query

The *ESE command has the format:

```
*ESE <ESE value>
```

where the “<ESE value>” is an integer numeric value in the range from 0 through 255.

*ESE? Query

This query reads the value presently programmed for the *Standard Event Status Enable Register*. This reads the value as programmed by the “*ESE” command.

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*ESR? Query

This query reads the value of *the Standard Event Status Register*. Each bit of this register indicates a true/false status condition. When the bit is set, the condition is TRUE; when the bit is cleared, the condition is FALSE. The bit assignments are defined by the IEEE-488.2 specification. The bit assignments are described in the text following **Figure 4-1**.

The bits of the *Standard Event Status Register* are cleared at power-on, except for bit 7, which is set. As conditions become true, the corresponding bit in the register are set. These bits remain set until:

- The *ESR? query is executed
- The *CLS command is executed

The reply to the *ESR? query is a numeric integer value in the range “0" to “255".

*IDN Query

This query requests the instrument to identify itself. The 1257A responds to this query with the following reply:

```
Astronics Test Systems,1257A,<serial number>,<firmware
revision>
```

This reply indicates the instrument is from Astronics Test Systems, that it is a 1257A model, and includes the serial number and the current firmware revision. The serial number is an 8-digit numeric value. The firmware revision is a three field numeric value, where each number is separated by a period. For example, a firmware revision might be “2.5.1”.:

```
Astronics Test Systems,1257A,10181382,2.5.1
```

*SRE Command

The *SRE command sets the value of Service Request Enable Register. The value of this register is logically ANDed with the contents of the Status Byte. If any bits of this AND operation are set, bit 6 of the Status Byte is set. Bit 6 is also known as the Master Status Summary bit. Consult the text immediately following **Figure 4-1** for a description of the MSS bit and the Service Request Enable register.

The command has the format:

```
*SRE <SRE value>
```

where the “<SRE value>” is an integer numeric value in the range 0 to 255. The value of bit 6 of this register is ignored, since it does not make sense to enable an interrupt when an interrupt is generated.

*SRE? Query

This query reads the value presently programmed for *the Service Request Enable Register*. This reads the value as programmed by the *SRE command. The reply to this command is a numeric value in the range 0 to 255.

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*STB? Query

This query reads the value of the *Status Byte Register*. Each bit of this register indicates a true/false status condition. When the bit is set, the corresponding condition is TRUE; when the bit is cleared, the condition is FALSE. The bit assignments are defined by the IEEE-488.2 specification. The bit assignments are described in the Status Byte Register section of this chapter.

The value returned by the *STB? Query may also be read using the GPIB serial poll command.

Note that bit 6 (MSS) of the *Status Byte Register* remains set until all enabled conditions are cleared. This is in contrast to the GPIB serial poll operation, where the SRQ bit is set until it is read once, and cleared after.

*OPC Command

The *OPC command will cause the Operation Complete bit of the Standard Event Status Register to be set when the command is executed. This is bit 0 of the register.

This command could be used to cause an interrupt (if bit 0 of the *Standard Event Status Enable Register* is set, and bit 5 of the *Service Request Enable Register* is set). This provides a means of synchronizing the application program with the 1257A and ensuring that all commands have been parsed and executed before continuing execution of the application program.

The *OPC command has no parameters. The only valid syntax for this command is:

```
*OPC
```

*OPC? Query

The *OPC? query causes the 1257A to reply with the value of “1" when the query is executed. This query may be used to ensure that all previous commands have been executed so the application program may be sure that relays have been programmed to their desired states before continuing execution of the application program.

SYSTem:PRESet Command

The System Preset command is provided as an alternative to the '*RST' command. This command works just like the '*RST' command, however, it only re-initializes the driver card hardware and does not issue a reset to relays,

The command may be useful in applications where a functionality similar to “*RST” (reset instrument) needs to be performed, without modifying (opening/closing) relays that are already in a given (or “Power on Recall”) state.

Note: During the execution of this command, “State-0” will be recalled if Power On Recall is enabled and “Recall State (0) after *RST” command is enabled.

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*RST Command

The *RST command resets the instrument to its power-on default state. These settings are shown in **Table 4-1** of this manual.

This command does **NOT** change the value of SCPI Operation or Questionable status registers or IEEE-488. 2 status registers, condition registers, or enable registers. This command does **NOT** clear the error message queue, the input command buffer, or the output reply buffer.

Note: During the execution of this command, “State-0” will be recalled if Power On Recall is enabled and “Recall State (0) after *RST” command is enabled.

Table 4-1, Power-On and Reset State

Attribute	Related Command(s)	Reset State
Relay States	*RCL 0 OPEN CLOSE	The states are recalled from non-volatile memory location 0 (power-up state). As shipped from the factory, these are all in the OPEN position.
Confidence Mode	CONFIDENCE:STATE	Off
Path List	ROUTE:PATH	Path names stored in non-volatile memory may be automatically recalled at power-up. This is configurable.
Include List	ROUTE:INCLUDE	Include Lists may be automatically recalled at power-up. This is configurable.
Exclude List	ROUTE:EXCLUDE	Excludes Lists may be automatically recalled at power-up. This is configurable.

*TST? Query

The *TST? query is supported only to be compliant with the IEEE-488.2 standard. The 1257A performs an extensive self-test at every power-up. If the system detects any failures, the condition is indicated directly on the front-panel display. Normally self-test errors are considered to be fatal conditions and result in a system halt. In this condition, communication activity ceases. For this reason, communications only function if self-test passes and therefore a *TST? will always report a value of “0” indicating a successful self-test.

*RCL Command

The *RCL command will recall the relay states from non-volatile memory. The *RCL command may specify a non-volatile memory location from which to recall the instrument state. That is, both of the following formats are accepted:

```
*RCL

*RCL <location>
```

If <location> is specified, it must be in the range 0 to 100. If <location> is not specified, it will default to 100.

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Location “0” has a special purpose. This location is used by the 1257A at power-up to set the initial relay states.

The *RCL command recalls the states of all relays in the system. The relay states are stored using the *SAV command.

Note that path names, module names, status registers, include lists, and so on are NOT affected by the *RCL command.

*SAV Command

The *SAV command will prepare to store a given state into non-volatile memory.

The *SAV command accepts one of two formats:

```
*SAV
*SAV <location>
```

If <location> is specified, it must be in the range from 0 through 100. If <location> is not specified, the instrument state will be saved into non-volatile memory location 100.

State 0 is recalled at power-up, only if the “Power On Recall” flag is set.. The 1257A is shipped without any data in state 0. This effectively tells the 1257A to open all relays at power-up. This default may be overwritten by placing all relays in the desired power-up state, and then executing the command:

```
*SAV 0
```

If new relays are configuredin the system after the *SAV 0 command has been executed, the new relays will not be programmed at power-up. In general, whenever relays are added, removed, or reconfigured in the system, the *SAV 0 command should be used to place the relays of the new modules into the desired power-up state.

*WAI Command

The *WAI command is required by the IEEE-488. 2 specification. This command is accepted but has no effect on the 1257A.

SCPI Status Registers

SCPI defines two additional registers beyond those shown in **Figure 4-1**. These are the *Operation Status Register* and the *Questionable Status Register*.

The *Operation Status Register* consists of three logical registers: a condition register, an enable register, and an event register.

Presently, there are no semantic meaning associated with any of the bits in these registers. They are implemented solely for compliance with the IEEE-488.2 specification.

The *Operation Status Enable Register* enables individual bits to pass through to the Operation Status Event Register. The bits of the *Operation Status Enable Register* are ANDed with the bits of the *Operation Status Condition Register*. If both bits are set, then the corresponding bit in the *Operation Status Event Register* is set. For example, if bits 1, 5, and 6 of *the Operation Status Condition Register*

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are set, and bits 5 and 6 of *the Operation Status Enable Register* are set, then bits 5 and 6 of the *Operation Status Event Register* will be set.

The *Operation Status Event Register* latches the status information. Once a bit is set in the *Operation Status Event Register*, it remains set until the bit is cleared by reading the register with the STATUS:OPERATION:EVENT? query, or by sending the *CLS command.

When any of the bits of the *Operation Status Event Register* are set, bit 7 of the *Status Byte Register* will be set.

The *Questionable Status Register* is not used by the 1257. When the *Questionable Status Condition Register* or *Questionable Status Event Register* are read, they will return a value of 0. The *Questionable Status Event Register* may be programmed and queried, but will have no effect on the operation of the 1257.

The STATUS:PRESET command is implemented for SCPI compliance only.

The following SCPI command tree shows the syntax of the SCPI STATUS commands:

```
:STATus
      :OPERation
            [:EVENt]?
            :CONDition?
            :ENABle
      :PRESet (Command Only)
      :QUEStionable
            [:EVENt]?
            :CONDition?
            :ENABle
```

Examples of the commands are shown below. To enable the “Wait for Trigger” and “Wait for Arm” bits the following command achieves this:

```
STAT:OPER:ENABLE 96
```

To read the value of the enable register:

```
STAT:OPER:ENABLE?
```

To read the value of the event register (and clear the event register):

```
STAT:OPER?
```

To read the value of the condition register:

```
STAT:OPER:COND?
```

These commands augment the IEEE-488. 2 Common Commands to provide additional status information.

SCPI Parameter Type

The SCPI language defines several different data formats to be used in program

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messages and response messages.

Numeric Parameters

Commands that require numeric parameters will accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation.

```
ATTENUATE 0.25,(@3(2000))
```

When a real, non-integer value is returned in a reply from the 1257A, exponential notation will be used. The exponential format is:

<Sign if negative> <Digit> . <8 Digits> E <sign> <2 digits>

For example:

1.0000000E+01

Is returned for a value of 10.0, and

-1.0000000E-01

Is returned for a value of -10.0.

Integer values may be sent in the command using decimal, octal, hexadecimal, or binary values. The default base for values is decimal.

To specify a hexadecimal value, use the prefix #H. To specify an octal value, use the prefix "#Q". To specify a binary value, use the prefix "#B". The following values are all equivalent.

`123`	123 decimal
`#B1111011`	1111011 binary = 123 decimal
`#H7B`	7B hex = 123 decimal
`#Q173`	173 octal = 123 decimal

When an integer value is returned in a reply from the 1257A, the value will be a decimal number.

Discrete Parameters

Discrete parameters are used to program settings that have a limited number of values. Parameters are NOT case sensitive. As an example of the discrete parameter, the [:ROUTe]:ORDer command is specified as:

```
[:ROUTe]
   :ORDer  { BBM | MBB } IMMediate}}
```

Meaning the parameter must be one of the following:

```
BBM
MBB
IMM
IMMEDIATE
```

Note that, just like command keywords, discrete parameters may be specified

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using either the long form or the short form.

Whenever a discrete parameter is used, the query form of the command returns the SHORT form of the parameter value, in upper-case characters. That is, the command may be specified using either “IMMEDIATE” or “IMM”, but the query:

```
ROUTE:ORDER?
```

will return the reply

```
IMM
```

NOT

```
IMMEDIATE
```

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. The 1257A accepts "OFF" or "0" for a false condition. The 1257A accepts "ON" or "1" for a true condition. The following command uses a boolean parameter:

```
[:ROUTe]
      :CONfidence
            [:STATe]  { OFF | ON | 0 | 1 }
```

The following commands turn Confidence Mode OFF:

```
ROUTE:CONFIDENCE:STATE OFF
ROUTE:CONFIDENCE:STATE 0
```

The following commands turn the Confidence Mode ON:

```
ROUTE:CONFIDENCE:STATE ON
ROUTE:CONFIDENCE:STATE 1
```

When Boolean parameters are queried, the 1257A always replies with a “1", if the state is on, or “0", if the state is off. The keywords “ON” and “OFF” are NOT returned in the reply to ROUTE: CONFIDENCE:STATE?, or any other query.

Confidence Mode

In Confidence Mode, the 1257A monitors the open and close status for each relay that has read-back capability. Each time a relay is opened or closed, those relays which have read-back capability are compared to the programmed state. If all relay states match their expected state, no action is taken. However, if there is a mismatch between the programmed and read-back state for any relay, an event is added to the event queue.

The format of the event message in the event queue will be:

```
Confidence failure on slot X, channel Y
```

Please refer to the section describing the Event System in this chapter to find how to read and clear events in the event queue.

To enable or disable Confidence Mode, use the command:

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```
ROUTE:CONFIDENCE:STATE { OFF | ON | 1 | 0 }
```

Since the “ROUTE” and “STATE” keyword are optional, all of the following examples are valid:

```
ROUTE:CONFIDENCE:STATE ON
CONFIDENCE ON
CONF OFF
ROUT:CONF 1
CONF 0
CONF:STATE 1
CONF:STAT 0
```

To query whether confidence mode is on or off, use the query:

```
ROUTE:CONFIDENCE:STATE?
```

Since the “ROUTE” and “STATE” keyword are optional, all of the following examples are valid:

```
ROUTE:CONFIDENCE:STATE?
CONFIDENCE?
CONF?
ROUT:CONF?
```

ROUTe:VERify?

The VERIFY query compares the programmed state with each relay’s read-back state. The VERIFY query can be used to read a set of relays, or all relays in the system.

There are two forms of the VERIFY query. The first includes a set of channels to compare. The second requests that all channels are compared to their programmed states.

```
ROUTE:VERIFY? <channel list>
ROUTE:VERIFY:ALL?
```

When a channel list is specified, each channel in the channel list has its programmed state compared to the read-back state. For each channel that matches, a ‘1’ is retuned in the reply. If any channel does not match its read-back state, a ‘0’ is returned.

For example, the query

```
VERIFY? (@1(3,4,7))
```

May return the reply

```
1 0 1
```

This reply indicates that the programmed and read-back states for channels 3 and 7 in slot 1 match. It further indicates that the programmed state does not match the read-back state for channel 4 in slot 1.

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The query

```
VERIFY:ALL?
```

Will return a single reply, either a '1' or a '0'. If the reply is '1', then every channel's programmed state matches its read-back state. If the reply is '0', then there is at least one channel that does not match. Each channel that has a mismatch between the programmed and read-back state will generate an event that will be added to the event queue. The event message will be in the format:

```
Verification failed for slot X, channel Y
```

Please refer to the section describing the Event System in this chapter to find how to read and clear events in the event queue.

Event System

The 1257A implements an event queue. Events include such items as power-on and power-off events, confidence mode failures, verify state failures, and so on.

The event queue maintains a queue of up to 50 events. The queue is stored in nonvolatile memory and recalled when the power is turned on. Once the queue fills up, no more events will be stored until the event queue is cleared.

The number of events in the event queue can be read by using the query:

```
SYSTEM:EVENT:COUNT?
```

This query will return an integer reply, indicating the number of events presently on the event queue. This will be a number between 0 and 50.

To read a particular event from the event queue, the following query can be used:

```
SYSTEM:EVENT?  <event number>
```

For example, to read event #3, the following query would be used:

```
SYSTEM:EVENT? 3
```

The oldest event is event #1. More recent events have a higher number.

The format for the reply to this query is:

```
YYYY/MM/DD HH:MM:SS,<event number>,<event message>
```

An example reply is shown below:

```
2014/03/14 16:05:37,3,Verification failed for slot 1,
channel 4
```

A single event may be removed from the queue by using the command:

```
SYSTEM:EVENT:CLEAR <event number>
```

For example

```
SYST:EVENT:CLEAR 7
```

Clears event number 7. After an event is cleared, all higher-numbered (more recent) events are "moved up" into the queue, so that event number 8 moves up to event number 7, event number 9 is moved up to event number 8, and so on.

To remove all events from the event queue, the following command may be used:

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```
SYSTEM:EVENT:CLEAR:ALL
```

Because the event queue fills up when 50 events are stored, the following procedure is recommended when using the CONFIDENCE mode or the VERIFY query:

1. After power-up, read the number of events on the event queue with the "SYSTEM:EVENT:COUNT?" query.
2. For each event in the queue, read the event with the "SYSTEM:EVENT?" query.
3. After you have analyzed the events for any system anomalies, clear the event queue with the "SYSTEM:EVENT:CLEAR:ALL" command.
4. When opening and closing relays with the CONFIDENCE mode on, or whenever a VERIFY query indicates a failure, use the "SYSTEM:EVENT:COUNT?" query to determine if any events have been added to the queue since you cleared it. If there are any events on the queue, read each event to determine the cause of the failed CONFIDENCE mode or VERIFY query.

Power On Recall

To enable/disable the Power On Recall State:

```
POWeron:RECall:STATE {0}
```

where {0} is **0** - false, **1** - true.

To query the Power On Recall State:

```
POWeron:RECall:STATE?
```

Returns: **0** – disabled, **1** - enabled

Command Input Buffer

The 1257A uses a command buffer to store commands sent either through the Ethernet, USB, or GPIB interfaces. The input buffer is 10240 characters in length. Each interface, and each Ethernet connection, maintains its own input queue.

Reply Output Buffer

The 1257A maintains an output buffer for sending replies to commands. This buffer is 10240 characters in length. There is a separate output queue maintained for each interface, including the GPIB, USB, and each Ethernet connection.

Although unlikely, the output buffer could become filled with replies to commands. If the output buffer is filled, the SCPI-defined "QUERY Deadlock" condition will be detected by the 1257A. In this case, the output buffer will be cleared and an error will be added to the error queue. In addition, the query error bit (QYE) of the IEEE-488.2 Standard Event Status Register will be set. The error queue may be read using the "SYST:ERR?" query, while the Standard Event Status Register may be read using the *ESR? query.

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When a reply is in the output queue, the message available, or MAV, bit of the status byte is set. The status byte of the 1257A may be read using the GPIB serial poll feature.

A Query Error may also occur if the output queue for the interface contains a reply and query is received on the same interface. If this occurs, the query error bit (QYE) will be set as above, and an error will be added to the error queue for that interface.

Specifying Channels in Commands

Many 1257A commands use a “channel list” to control the relays and attenuators in the system. A channel list consists of one of more channels. Each channel uses the form:

(@<slot number> (<channel number>))

The <slot number> refers to the plug-in card in the 1257A. The 1257A supports up to 10 plug-in modules. The <slot number> can be any number from 1 to 10. The valid <slot number>s depend on the number and location of the plug-in modules for each uniquely configured 1257A. Typically, the first plug in module would be installed into slot 1, the second into slot 2, and so on.

Each plug-in module controls up to 3 banks of channels. The <channel number> selects the channel within the plug-in module that is controlled.

The valid <channel number>s are shown in **Table 4-2**.

Table 4-2, Valid Channel Numbers

Bank	Pin out	Channel
A	Relay Drive 0 – 15	1000 – 1015
A	LED 0 – 15	1100 – 1115
A	Read Indicator 0 – 15	1200 – 1215
A	Relay Reset 0 – 3	1300 – 1303
B	Relay Drive 0 – 15	2000 – 2015
B	LED 0 – 15	2100 – 2115
B	Read Indicator 0 – 15	2200 – 2215
B	Relay Reset 0 – 3	2300 – 2303
C	Relay Drive 0 – 15	3000 – 3015
C	LED 0 – 15	3100 – 3115
C	Read Indicator 0 – 15	3200 – 3215

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Bank	Pin out	Channel
C	Relay Reset 0 – 3	3300 – 3303

This means that when using commands such as OPEN, CLOSE, PATH:DEFINE, and so on, the commands will typically access the channels 1000 to 1015, 2000 to 2015, and 3000 to 3015.

A range of channels for a drawer may be specified by using the syntax:

```
(@<address>(<channel1>:<channel2>))
```

This format indicates that all channels between <channel1> and <channel2> are to be operated. The command:

```
CLOSE (@2(1000:1003))
```

closes channels 1000 through 1003, inclusive, on the adapter board in slot 2.

A range of channels and a list of single channels may be mixed in a command. For example, the command:

```
CLOSE (@2(1000:1003,2012,2015,3000:3002))
```

closes channels 1000, 1001, 1002, 1003, 2012, 2015, 3000, 3001, and 3002 on the adapter board in slot 2.

Closing Relays

The CLOSE command may be used to close relay channels. To say a channel is closed, it means either:

1. The input of the channel is connected to the output (Single-Pole Single Throw).
2. The input of the channel is disconnected from the “normally closed” output and connected to the “normally open” output (Single-Pole Double-Throw).
3. The common input of a mux is connected to the output denoted by the channel number (1PNT)

The syntax for the CLOSE command is:

```
[:ROUTe]
      :CLOSe <channel list>
```

The format for a “<channel list>” is described in the previous paragraphs of this section of the manual.

The CLOSE? command may be used to query the present state of the relays in the system. This command returns a reply of a sequence of “0" and “1", each of which are separated by a single ASCII space character. The value of the reply is “0" if the corresponding relay is opened, or “1" if the corresponding relay is closed.

The reply is one-for-one with the <channel-list>. For example, suppose the query

```
CLOSE? (@1(1000:1015))
```

is sent to the 1257A. Assuming channels 1003 and 1014 are closed and the rest

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are open, the reply would be:

```
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 Command:
CLOSE? (@1(1000))
```

Reply:

```
0
```

Command:

```
CLOSE? (@1(1003. 1010. 1014))
```

Reply:

```
1 0 1
```

Opening Relays

The OPEN command may be used to open channels. To say a channel is open means:

1. The input of the channel is disconnected to the output (Single-Pole Single Throw)
2. The input of the channel is disconnected from the “normally open” output and connected to the “normally closed” output (Single-Pole Double-Throw).
3. The common input of the relay is disconnected from the specified output denoted by the channel (1PNT)

The syntax for the “OPEN” command is:

```
[:ROUTe]
    :OPEN <channel list>
```

The format for a “<channel list>” is described in the previous paragraphs of this section of the manual.

The OPEN? command may be used to query the present state of the channels in the system. This command returns a reply of a sequence of “0" and “1", each of which are separated by a single ASCII space character. The value of the reply is “1" if the corresponding relay is opened, or “0" if the corresponding relay is closed. **Note that this is the opposite state from the** CLOSE? **query**.

Operating Attenuators

The ATTenuate command may be used to set the attenuation value for attenuators that have been configured on the system:

The syntax for the “ATTenuate” command is:

```
:ATTenuate <level> , <channel list>
```

The < level> value identifies the attenuation level, in dB, to set for each channel in the channel list. The attenuator is selected by the first channel in the set of channels associated with the channel when the attenuator was configured in the system. For more information, consult the “CONFigure” command summary.

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The format for a “<channel list>” is described in the previous paragraphs of this section of the manual.

The “ATTenuate?” query may be used to read back the presently programmed attenuation value. The format for this query is

```
:ATTenuate? <channel list>
```

This query will return the presently programmed attenuation level for each attenuator identified with the <channel list>.

Using Paths

A group of channels may also be assigned a name. When a group of channels is named, it is called a “path”. A path may consist not only of elements that must be closed (the closed channel list) but also of elements that must be opened (the open channel list) to complete the path. This may at first seem contradictory to close a path with switching elements that must be opened, but it nevertheless occurs.

A good example which illustrates the concept of an open channel list is a typical 1P2T failsafe microwave switch. Because this type of switch is failsafe, it only requires a single control line. By default, with no power applied, the first throw is always connected to the common. Energizing the control line opens the first throw and closes the connection between the second throw and the common. Both are obviously mutually exclusive.

Defining a path through the second throw of the example switch can be done strictly with a close channel list. The problem occurs when a path must go through the failsafe throw (first throw). To make this path the switch must be in an open or off state. The open channel list readily accomplishes this task.

Defining Path Names

The PATH:DEFINE command may be used to associate a name with one or more relays. The format for this command is:

```
[:ROUTe]
   :PATH
      :DEFine <path name> ,
                <close channel list> ,
                [,<open channel list>]
```

The <path name> is an identifier from 1 to 256 characters in length. The first character of a path name must begin with a character “A” through “Z”. The remainder of the path names can be comprised of the characters “A” through “Z”, the numbers “0” through “9”, and the underscore (“_”) character.. A path name may be sent in upper, lower, or mixed case but will always be reported and used as an upper case name.

The <close channel list> and the optional <open channel list> follows the syntax rules described in the “Specifying Relays in Commands” section of this chapter.

The following examples illustrate the use of a path name.

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This associates the name path1 with the close channel list encompassing channels 1006 and 2009 on the adapter board in slot 1 and channel 2000 on the adapter board in slot 2: :

```
PATH:DEF path1,(@1(1006,2009),2(2000))
```

This associates the name signal_to_P177 with the close channel list, channels 2005 and 3005on the adapter board in slot 3:

```
PATH:DEF signal_to_P177,(@31(3005,2005))
```

The following associates the name oscope1 with a close channel list for channels 2000 and 3003 and an open channel list for channel 2015 on the adapter board in slot 1

```
PATH:DEF oscope,(@1(2000,3000)),(@1(2015))
```

Once a path name is defined, it may be used in a CLOSE or OPEN command:

```
OPEN (@path1)
CLOSE (@signal_to_P177)
CLOSE (@path1,signal_to_P177,4(1000.1005))
```

A CLOSE command, for a given path name, will effectively close all channels listed on the close channel list and open those listed on the open channel list.

An OPEN command, for a given path name, will open all channels listed on the close channel list. Channels on the open channel list are not affected when using the OPEN command.

Path names may also be used in defining an “Include List”, an “Exclude List”, or a “Scan List”. The following sections describe each of these concepts.

When using path names with the “Include List”, “Exclude List” and “Scan List”, the presently defined path is used. That is, if the following sequence of commands is received:

```
PATH:DEF PATH1,(@1(1003,1007))
INCLUDE (@PATH1,1(2015))
PATH:DEF PATH1,(@1(1000,2003))
CLOSE (@1(2015))
```

then the path definition in effect when the INCLUDE command was defined is used. For the example shown then, channels 1003 and channel 1007 for the adapter board in slot 1 are affected; channel 1000 and 2003 are NOT affected.

Removing Path Names

The PATH:DELETE command may be used to delete a single path name from the list of known path names. The PATH:DELETE:ALL command may be used to remove all presently defined path names.

The syntax for these commands is:

```
[:ROUTe]
      :PATH
            :DELete <path name>
```


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```
:ALL
```

The following examples illustrate the use of this command.

Removes the name “path1”:

```
ROUTE:PATH path1
```

Removes the name “testit”:

```
PATH:DEL testit
```

Removes all path names:

```
PATH:DEL:ALL
```

Reading the Presently Defined Path Names

The PATH:CATALOG? command may be used to read back all of the presently defined path names. The format for this command is:

```
[:ROUTe]
      :PATH
            :CATalog?
```

The reply to this command consists of the presently defined path names, each of which is separated by a comma. Path names are stored internally in upper-case characters by the 1257A. These upper-case names are returned in the reply.

For example, suppose the following commands have been executed:

```
PATH:DEFINE dmm_2_pin1,(@1(1000,1015))
PATH:DEFINE dmm_2_pin2,(@1(2000,3003))
PATH:DEFINE cntr_2_pin1,(@1(2015))
PATH:DEFINE cntr_2_pin2,(@1(3000),2(1003))
```

Then the query:

```
PATH:CAT?
```

returns the reply:

```
DMM_2_PIN1,DMM_2_PIN2,CNTR_2_PIN1,
CNTR_2_PIN2
```

Reading the Channel List for a Path Name

The module address associated with a module name may be read using the PATH:DEFINE? query. The syntax for this command is:

```
[:ROUTe]
      :PATH
          :DEFine? <path name>
```

Using the example in the previous section of this manual, the query:

```
PATH:DEFINE? dmm2_to_pin1
```

returns the reply:

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```
(@1(1000),1(1015))
```

Storing Path Names in Non-Volatile Memory

All paths presently defined may be stored in non-volatile memory using the PATH:STORE command.

Recalling Path Names from Non-Volatile Memory

All paths stored in nonvolatile memory may be recalled by using the PATH:RECALL command.

Enabling/Disabling Automatic Recall of Paths when the 1257A is Powered On

All paths may be recalled at power-on of the 1257A. by using the PATH:RECALL:AUTO command. The syntax for this command is

```
[:ROUTe]
      :PATH
            :RECall
                  :AUTO { ON | OFF | 1 | 0 }
```

If the state is ON or 1, all paths stored in nonvolatile memory will be recalled and available for use upon the 1257A power-on. If the state is OFF, no paths will be defined when the 1257A is powered-on.

The present state of the automatic recall of paths from nonvolatile memory can be read with the query:

```
PATH:RECALL:AUTO?
```

This will return “1” if the recall is enabled or “0” if the recall is disabled.

Exclude Lists

A set of channels may be grouped together so that when one of the channels in the set is closed, all other channels in the set are opened. This mutually exclusive group is called an Exclude List.

Each channel can be on at most one exclude list.

Defining Exclude Lists

The PATH:EXCLUDE command may be used to identify a set of channels on an exclude list. The format for this command is

```
[:ROUTe]
   :EXCLude <channel list>
```

The <channel list> identifies each channel in the exclude list.

The following example puts channel 1000 through 1003 of the adapter board in slot 3 into an exclude list:

```
EXCL (@3(1000:1003))
```


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The following example puts channel 1015 and 2011 from slot 1 and channels 1011 through 1015 from slot 2 into an exclude list:

```
EXCL (@1(1015,2011),2(1011:1015))
```

Removing Exclude Lists

The EXCLUDE:CLEAR command may be used remove the exclude lists for specific channels. The EXCLUDE:CLEAR:ALL command may be clear all defined exclude lists.

The syntax for these commands is:

```
[:ROUTe]
      :EXCLude
            :CLEar <channel list>
                  :ALL
```

The following examples illustrate the use of these commands.

Removes any exclude list for channel 1000 in slot 1:

```
EXCL:DEL (@1(1000))
```

Removes the exclude lists for all channels 3000 through 3015 for the adapter board in slot 6:

```
EXCL:DEL (@6(3000:3015))
```

Removes all exclude lists:

```
EXCL:DEL:ALL
```

Reading the Presently Defined Exclude List for a Channel

The EXCLUDE? command may be used to read back the channels that are in an exclude list with a one or more channels: The format for this query is:

```
[:ROUTe]
      :EXCLude? <channel list>
```

The reply to this command consists of a channel list or the keyword NONE for each channel in the <channel list>. If you specify one channel in the channel list, you will receive a single channel list (or the keyword NONE) in the reply. If you specify two channels in the channel list, you will receive two channel lists, separated by a comma, in the reply.

For example, suppose the following commands have been executed previously

```
EXCL:CLEAR:ALL
EXCL (@3(1000:1003))
EXCL (@1(1015,2011),2(1011:1013))
```

The query:

```
EXCL? (@3(1002))
```


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returns the reply:

```
(@3(1000),3(1001),3(1002),3(1003))
```

The query

```
EXCL? (@2(1012))
```

returns the reply:

```
(@1(1015),1(2011),2(1011),2(1012),2(1013))
```

The query

```
EXCL? (@3(1000,1015))
```

returns the reply:

```
(@3(1000),3(1001),3(1002),3(1003)),NONE
```

Storing Exclude Lists to Non-Volatile Memory

All presently defined exclude lists may be stored to nonvolatile memory by using the EXCLUDE:STORE command.

Recalling Exclude Lists from Non-Volatile Memory

All exclude lists stored in nonvolatile memory may be recalled by using the EXCLUDE:RECALL command.

Enabling/Disabling Automatic Recall of Exclude Lists when the 1257A is Powered On

All exclude lists may be recalled at power-on of the 1257A. by using the EXCLUDE:RECALL:AUTO command. The syntax for this command is

```
[:ROUTe]
      :EXCLude
            :RECall
                  :AUTO { ON | OFF | 1 | 0 }
```

If the state is ON or 1, all exclude lists stored in nonvolatile memory will be recalled and available for use upon the 1257A power-on. If the state is OFF, no paths will be defined when the 1257A is powered-on.

The present state of the automatic recall of exclude lists from nonvolatile memory can be read with the query:

```
EXCLUDE:RECALL:AUTO?
```

This will return “1” if the recall is enabled or “0” if the recall is disabled.

Include Lists

A set of channels may be grouped together so that when one of the channels in the set is closed, all other channels in the set are also closed, and when any of the channels in the set are opened, all other channels in the set are opened. This

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grouping is called an Include List.

Each channel can be on at most one include list.

Defining Include Lists

The PATH:INCLUDE command may be used to identify a set of channels on an include list. The format for this command is

```
[:ROUTe]
   :INCLude <channel list>
```

The <channel list> identifies each channel in the include list.

The following example puts channel 2000 through 2003 of the adapter board in slot 1 into an exclude list:

```
INCL (@2(2000:2003))
```

The following example puts channel 1015 and 2011 from slot 1 and channels 1011 through 1015 from slot 2 into an include list:

```
INCL (@1(1015,2011),2(1011:1015))
```

Removing Include Lists

The INCLUDE:CLEAR command may be used remove the include lists for specific channels. The INCLUDE:CLEAR:ALL command may be clear all defined include lists.

The syntax for these commands is:

```
[:ROUTe]
      :INCLude
            :CLEar <channel list>
                  :ALL
```

The following examples illustrate the use of these commands.

Removes any include list for channel 1000 in slot 1:

```
INCL:DEL (@1(1000))
```

Removes the include lists for all channels 3000 through 3015 for the adapter board in slot 6:

```
INCL:DEL (@6(3000:3015))
```

Removes all exclude lists:

```
INCL:DEL:ALL
```

Reading the Presently Defined Include List for a Channel

The INCLUDE? query may be used to read back the channels that are in an include list with a one or more channels: The format for this query is:

```
[:ROUTe]
```


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```
:INCLude? <channel list>
```

The reply to this command consists of a channel list or the keyword NONE for each channel in the <channel list>. If you specify one channel in the channel list, you will receive a single channel list (or the keyword NONE) in the reply. If you specify two channels in the channel list, you will receive two channel lists, separated by a comma, in the reply.

For example, suppose the following commands have been executed previously

```
INCL:CLEAR:ALL
INCL (@3(1000:1003))
INCL (@1(1015,2011),2(1011:1013))
```

The query:

```
INCL? (@3(1002))
```

returns the reply:

```
(@3(1000),3(1001),3(1002),3(1003))
```

The query

```
INCL? (@2(1012))
```

returns the reply:

```
(@1(1015),1(2011),2(1011),2(1012),2(1013))
```

The query

```
INCL? (@3(1014,1000))
```

returns the reply:

```
NONE,(@3(1000),3(1001),3(1002),3(1003))
```

Storing Include Lists to Non-Volatile memory

All presently defined include lists may be stored to nonvolatile memory by using the INCLUDE:STORE command.

Recalling Include Lists from Non-Volatile Memory

All include lists stored in nonvolatile memory may be recalled by using the INCLUDE:RECALL command.

Enabling/Disabling Automatic Recall of Include Lists When the 1257A is Powered On

All include lists may be recalled at power-on of the 1257A. by using the INCLUDE:RECALL:AUTO command. The syntax for this command is

```
[:ROUTe]
    :INCLude
        :RECall
```


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```
:AUTO { ON | OFF | 1 | 0 }
```

If the state is ON or 1, all include lists stored in nonvolatile memory will be recalled and available for use upon the 1257A power-on. If the state is OFF, no include lists will be defined when the 1257A is powered-on.

The present state of the automatic recall of include lists from nonvolatile memory can be read with the query:

```
INCLUDE:RECALL:AUTO?
```

This will return “1” if the recall is enabled or “0” if the recall is disabled.

Using Aliases

The 1257A supports an alias feature. An alias is a string that can be associated with a single 1257A channel. An alias may also be associated with a relay component, an attenuator component, or a digital I/O bank.

An alias mainly serves to associate names that are displayed on web pages. An alias for a single channel will be displayed along with the physical channel on the web page. An alias for a component will be displayed along with the overall component on the web page.

The format of the command to associate an alias with a channel is:

```
[:ROUTe]
      :ALIAS  <alias>,<channel list>
```

The <alias> is a name enclosed in quotes (single or double). The rules for a valid alias name are the same as for a valid path name.

As an example, the command

```
ALIAS ''P7'',(@2(1008))
```

Associates the alias name “P7” with the channel 1008 in slot 2. This would now appear along with the channel the next time the web page is displayed.

Note that since the alias name is within quotes, it can be specified in upper, lower, or mixed cases and the case will be maintained. Also, the empty string (“”) can be specified for the <alias name> to clear the current alias.

The presently defined alias name can be queried with the “ALIAS?” query. For example, the query:

```
ALIAS? (@2(1008))
```

Will return the reply

```
''p7''
```

Note that the double quotes are included in the reply to allow lower-case characters to be returned.

The command

```
[:ROUTe]
      ALIAS
            :DELete <channel list>
```


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can be used to delete the alias names from all channels on the <channel list>.

In addition to individual channels, a relay, attenuator, or digital I/O component can also be assigned an alias. The component alias will be displayed on the system web page the next time the web page is displayed. The command:

```
[:ROUTe]
      :ALIAS
            :DATA <slot>,<component>,<alias>
```

Is used to assign an alias name to a component. The <slot> is an integer in the range 1 through 10 that selects the slot of the component. The <component> is an integer that was assigned to the component with the "DRIVERBOARD:CONFIGURE:RELAY:ADD" or "DRIVERBOARD:CONFIGURE:ATTENUATOR:ADD" command. To see the list of components for a slot, the "DRIVERBOARD:CONFIGURE:RELAY:LIST?" query and the "DRIVERBOARD:CONFIGURE:ATTENUATOR:LIST?" query.

For example, if component 6 on slot 2 was a 1P6T relay, the command:

```
ALIAS:DATA 2,6,''SW1''
```

Could be used to associate the alias "SW1" with the 1P6T relay. The next time the system web page was displayed, the alias would appear along with the 1P6T relay. As with the assignment of an alias to an individual channel, the empty string ("") can be assigned to the component to clear the alias data.

The presently assigned alias for a component can be read back with the command:

```
[:ROUTe]
      :ALIAS
            :DATA? <slot> , <component>
```

From the previous example, the query

```
ALIAS:DATA? 2,6
```

Would return

```
''SW1''
```

Alias names are stored to nonvolatile memory and recalled at power-up automatically.

Using Aliases to Emulate a Model 1256 and 1260-115 Relay Driver Combination

The ALIAS command can also be used to emulate a Racal Instruments 1256 and 1260-115 Relay Driver in conjunction with CLOSE and OPEN commands.

An alias name that uses the form "<slot>(<channel>)" can be used to map a 1260-115 channel to a 1257A channel. So, for example, the command:

```
ALIAS ''6(103)'',(@2(1008))
```

Tells the 1257A to map the channel 1256 channel (@6(103)) to the 1257A channel (@2(1008)). The next time a CLOSE or OPEN command is executed, and channel 103 in slot 6 is specified, the 1257A will actually operate channel 1008 in slot 2. Whenever a channel is detected in a SCPI command, the 1257A will look

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to see if there is an alias that matches the slot and channel. If one is found, the alias will be used to map to a 1257A channel. This means that if you assign an alias name to any channel that matches a (different) valid 1257A channel, you will no longer be able to operate the 1257A channel directly. You would have to create a second alias that maps to the underlying 1257A channel you wish to operate in order to access it in CLOSE and OPEN commands.

Checking for Installed Adapter Boards

The DRIVerboard:ADAPter:ID? command may be used to query the 1257A for which types of adapter boards are installed in each bank of a slot with a driver board. Each driver board can support up to 3 plug in adapter boards.

```
:DRIVerboard
      :ADAPterboard
            :ID? <slot>,<bank>
```

The <bank> value ranges from 0 to 2. The query returns the type of adapter board installed in the card. The adapter board identifiers are:

1 : The adapter supports 2 SP6T and 1 SP4T or 2 SP4T and 1 SP6T

2 : The adapter supports 8 SPDT or 8 DPDT or 8 DP3T or 16 SPST

3 : The adapter supports 8 SPDT or 8 DPDT or 8 DP3T or 16 SPST

4 : 2 x SP8T

5 : 1 x SP10T

6 : SPDT, DPDT, SP4T, SP6T

13 : 2 x (3-step or 4-step attenuator) or 2 x 8-step attenuator

14 : 4 x (3-step or 4-step attenuator) or 3 x (3-step or 4-step or 5-step attenuator)

15 : There is no adapter board installed in the bank

NOTE: If there is no driver board installed in the slot, this command will not return a reply and an error indicating that no module is installed in the specified slot will be added to the SCPI error queue.

System Commands

The 1257A instrument supports several system commands. These commands generally access errors, SCPI standard information, as well as user-interface issues. Additionally, the 1257A uses a special command to update non-volatile memory.

Reading Error Messages

Whenever an error is encountered by the 1257, it will perform two actions:

1. One of the bits of the Standard Event Status Register will be set. This register may be read using the *ESR? query

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2. An error message will be added to the error message queue. The error message queue may be read using the SYSTEM:ERROR? query (or SYST:ERR?).

The error queue holds up to 15 error messages. Each time an error is detected by the 1257A, it adds a new error to the error queue. Each time the SYSTEM:ERROR? query is received, the oldest (least recent) error message is returned.

The syntax for this command is shown below:

```
:SYSTem
      :ERRor?
```

The reply to the SYSTEM:ERROR? query uses the format:

```
<error code> , ''<error message>''
```

where:

<error code>	This parameter is a numeric value. This value is "0" if there are no errors remaining in the error queue. This value is negative when an error exists on the error queue.
<error message>	This parameter is a string enclosed in double quotes. The error message provides some additional information about the error.

For example, the reply:

```
0,''No error''
```

indicates that no errors remain on the error queue, while the reply:

```
-102,''Syntax error ; missing @ sign''
```

indicates that a syntax error was detected in a previous command to the 1257. The reply:

```
-350,''Queue overflow''
```

is returned to indicate that all 15 places in the queue have been occupied and that the error queue is full.

SCPI Version Information

The SYSTEM:VERSION? query provides information about which SCPI standard the 1257A references and is required for compliance with SCPI.

The syntax for this command is shown below:

```
:SYSTem
      :VERSion?
```

For example, the query:

```
SYST:VERS?
```

always returns the following:

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```
1994.0
```

Configuration Commands

The 1257A switch system is typically configured at the Astronics Test Systems facility. However, there are several configuration commands that allow new relays and attenuators to be added to the system. This section of the manual describes how to add new relays and attenuators to a 1257A system.

Specifying New Relay Types

The “PARAMETERS:RELAY:ADD” command is used to add new types of relays in the system. This command associates an integer number with a set of attributes for the relay.

The syntax for this command is shown below:

```
:PARameters
      :RELay
            :ADD <parameters>
```

The <parameters> are defined below, in the order they appear.

Each parameter is separated from the next by a comma.

<relay id> : This is the first parameter for the command. This is an integer from 1 to 32767. This value must not be in use for other relay types already. You can see if a value is already in use by sending the “PARAMETERS:RELAY? <relay id>” query. For example to see if relay id #100 is available, send the query:

```
PARAMETERS:RELAY? 100
```

If the response is not returned, the <relay id> is not in use.

Alternatively, you can use the “PARAMETERS:RELAY:LIST?” query to return a list of <relay id> that are currently defined.

<manufacturer> : This is the second parameter and must be enclosed in quotes (single or double). Examples include “Agilent”, “Radiall”, and so on. This is effectively a comment and have no specific use other than for reporting in response to a query.

<model> : This is the third parameter and must be enclosed in quotes (single or double). Examples include “8762A”, “87106A”, and so on. This is effectively a comment and have no specific use other than for reporting in response to a query.

<mechanical type> : this is the fourth parameter and is an integer with one of the following values:

0 = latching

1 = non-latching

<relay drive type> : this is the fifth parameter and is an integer with one of the following values:

0 = TTL

1 = Open collector

<number of throws> : this is the sixth parameter and is an integer that identifies the number of throws (1 to 16 maximum)

<number of poles> : this is the seventh parameter and is an integer that identifies

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the number of poles (1 or 2)

<warn threshold> : this is the eighth parameter and is an integer value in the range 1 to 2000000000. This identifies the number of relay closures that can occur before a warning is generated.

<EOL threshold> : this is the ninth parameter and is an integer value in the range 1 to 2000000000. This identifies the number of relay closures that can occur before the relay must be replaced (end of life).

<Has Reset> : this is the tenth parameter and has a value of 0 for FALSE or 1 for TRUE. If the value is 0, the relay does not have a reset input. If the value is 1, the relay has a reset input that can be controlled with one of the channels in the 1257A.

<Reset Time> : This is the eleventh parameter and is an integer value that identifies the number of milliseconds that the reset channel must be pulsed to reset the relay.

<Strobe Time> : This is the twelfth parameter and is an integer value that identifies the minimum strobe time that a channel must be pulsed for actuating (a latched) relay channel.

<Settling Time> : This is the thirteenth parameter and is an integer value that identifies the relay settling time required for the worst case change in position from one throw to another.

<Has Read-back> : This is the fourteenth parameter and has a value of 0 to indicate that the relay does NOT support position read-back or 1 to indicate that the relay does support position read-back.

<Read-back Polarity> : This is the fifteenth parameter and has a value of 0 indicates the read-back is active low and a value of 1 indicates the read-back is active high.

<Is Transfer Switch> : this is the sixteenth parameter and has a value of 0 to indicate that the switch is not a transfer switch and a value of 1 to indicate that the switch is a transfer switch. In general, this should only be 1 when the relay has 2 poles and 2 throws.

<Is Miniature Switch> : this is the seventeenth parameter and has a value of 0 to indicate that the switch is a normal-sized switch or a value of 1 to indicate that the switch is a miniature switch.

<Supports Non-Blocking Mode> : this is the eighteenth and last parameter. This has a value of 0 to indicate that the relay is blocking, meaning at most one throw can be connected to the common input at any one time. This has a value of 1 to indicate that non-blocking is supported by the relay so that multiple throws can be connected to the COM input simultaneously.

An example of a command would be:

```
PARAMETERS:RELAY:ADD 22,”Agilent”,”86104A”,
     0, 0, 4, 1, 1999000000, 2000000000, 0,
     30, 30, 50, 0, 0, 0, 0, 1
```

The example associates relay id # 22 with an Agilent 86104A relay that has 4 throws, 1 pole, is latching, has TTL control levels, has a warning threshold of 1999000000 and an end-of-life threshold of 2000000000, with no reset connection, and a 30 millisecond strobe time and 50 millisecond relay settling time. The relay is NOT a transfer switch, is a normal-sized switch, and supports non-blocking

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mode.

The parameters associated with a relay can be read back with the "PARAMETERS:RELAY? <relay id>" query. This query will return 17 parameters. Each parameter will be separated by a comma from the next. The parameters are returned in the same order as they are specified in the "PARAMETERS:RELAY:ADD" command. The only difference is the <relay id> is NOT returned.

For example, the query

```
PARAMETERS:RELAY? 22
```

Would return

```
''Agilent'',''86104A'',
0, 0, 4, 1, 1999000000, 2000000000, 0, 30, 30, 50, 0, 0, 0, 0, 1
```

Deleting Relay Types

Caution

This command is documented for completeness. Under most circumstances, this command should NOT be sent to the 1257A as it will delete the specified relay component from the library of known components. If you delete a relay type that is used in your system, you will not be able to continue to use those relays anymore.

The "PARAMETERS:RELAY:DELETE" command is used to delete one specific relay type or all relay types from the list of known relay types.

```
:PARameters
      :RELay
            :DELete { <relay id> | ALL }
```

The following command deletes the relay information associated with relay id # 22:

```
PARAMETERS:RELAY:DELETE 22
```

The following command deletes all relay information:

```
PARAMETERS:RELAY:DELETE  ALL
```

Configuring New Relays into the System

Once the library of relay types is complete, the 1257A can be configured to control the relays installed in the system. The DRIVERBOARD:CONFIGURE:RELAY command is used to "install" a single relay into the system and to configure the control and read-back channels. The format of the command is:

```
:DRIVerboard
      :CONFigure
            :RELay
                  :ADD <parameters>
```


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The number of <parameters> is variable. The number of parameters is determined by the number of throws in relay. The number of parameters is always 6 + <number of throws>.

The <parameters> for this command are:

<slot> : This is the first parameter for the command. This is the slot of the driver card that controls the channels for this relay. This is an integer in the range 1 to 10.

<relay number> : This is the second parameter for the command. This is a unique relay number that uniquely identifies the relay in the system. This relay number cannot already be in use from a previous DRIVERBOARD:CONFIGURE:RELAY:ADD command. This parameter is an integer number with a minimum value of 1.

<relay id> : This is the third parameter in the command. This selects the relay from the by using an integer relay id that was specified in a previous PARAMETERS:RELAY:ADD command.

<non blocking mode> : This is the fourth parameter in the command. This has a value of 0 to indicate the relay should be blocking and prevent more than one throw from being connected to the common input at one time. This should normally be 0. A value of 1 indicates that the non-blocking mode is active and the common input can be connected to two or more throws simultaneously. This can have a value of 1 only if the relay selected by <relay id> supports non-blocking mode.

<reset channel> : This is the fifth parameter in the command. This is channel number associated with the reset line of the relay (if the relay has a reset line). This can be a value of 0 if there is no reset line for the relay. Typically reset channels will be 1300 – 1303, 2300 – 2303, or 3300 - 3303 (or 0 if not used).

<number of drive channels> : This is the sixth parameter in the command. This is the number of drive channels that control the individual throws of the relay. This has a minimum value of 1 and a maximum value of 16.

<drive channel 1> : This is the seventh parameter in the command. This identifies the channel number of the 1257A that controls the first throw of the relay. Channel numbers are in the range 1000 to 1015, 2000 to 2015, and 3000 to 3015.

<drive channel 2> : This is the eighth parameter in the command. This is the first optional parameter and should not be sent if the number of throws for the relay is 1. This identifies the 1257A channel that controls the second throw of the relay.

<drive channel N> : This is the (6 + <number of throws>) parameter. It identifies the channel number of the 1257A that controls the Nth throw of the relay.

The following example shows a sample use of the command:

```
DRIVERBOARD:CONF:RELAY:ADD 3,32,22,0,2302,6,
    2010,2011,2012,2013,2014,2015
```

The example shows the addition of a relay into slot 3. The unique relay number is 32. The relay id associated with this relay is 22, which from the previous examples was an “Agilent 86104A”. The relay is being configured for blocking mode so that at most one throw can be connected at one time. The reset channel is 2302.

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There are 6 throws in the relay. The channels to controls throws 1 through 6 are 2010, 2011, 2012, 2013, 2014, and 2015 respectively.

Deleting Configured Relays

Once a relay has been added, it can be removed through the "DRIVERBOARD:CONFIGURE:RELAY:DELETE" command. This is not typically required but may be useful in changing the type of relay installed in the system. The syntax for this command is

```
:DRIVerboard
      :CONFigure
            :RELay
                  :DELete  <slot> , <relay #>
```

The following command deletes relay number 32 from slot 3.

```
DRIVERBOARD:CONFIGURE:RELAY:DELETE 3,32
```

Reading the Relays that are Configured

The list of relay numbers that have been configured for a slot can be read back with the "DRIVERBOARD:CONFIGURE:RELAY:LIST?" query. The syntax for this query is

```
:DRIVerboard
      :CONFigure
            :RELay
                  :LIST?  <slot>
```

The query returns a list of the unique relay numbers associated with the specified slot.

The following example shows the request for the list of relays configured for slot 1:

```
DRIVERBOARD:CONFIGURE:RELAY:LIST? 1
```

A typical reply would be:

```
16,19,32,36,37
```

Indicating the unique relay numbers 16, 19, 32, 36, and 37 have been configured for slot 1.

Once the unique relay numbers are known, the "DRIVERBOARD:CONFIGURE:RELAY?" query can be used to retrieve the information about a single relay. The format for this query is:

```
:DRIVerboard
      :CONFigure
            :RELay? <slot> , <relay #>
```

As an example, the following query requests the information for relay number 32 that has been configured for slot 1:

```
:DRIVERBOARD:CONF:RELAY? 1,32
```


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The reply consists of the following information:

<relay id> , <non-blocking operation>,<reset channel>,

<number of throws> , <throw 1 channel> , … ,

<throw N channel>

Note that the number of items in the reply = 4 + <number of throws>.

So a typical reply might be:

```
4, 0, 2302, 6, 2010, 2011, 2012, 2013, 2014, 2015
```

Specifying New Attenuator Types

The “PARAMETERS:ATTENUATOR:ADD” command is used to add new types of attenuators in the system. This command associates an integer number with a set of attributes for the attenuator.

The syntax for this command is shown below:

```
:PARameters
      :ATTenuator
            :ADD <parameters>
```

The <parameters> are defined below, in the order they appear.

Each parameter is separated from the next by a comma.

There is a minimum of 13 parameters and a maximum of 28 parameters for this command. The number of parameters = 12 + <number of cells> in the attenuator.

<attenuator id> : This is the first parameter for the command. This is an integer from 1 to 32767. This value must not be in use for other attenuators already. You can see if a value is already in use by sending the “PARAMETERS:ATTENUATOR? <attenuator id>” query. For example to see if relay id #100 is available, send the query:

```
PARAMETERS:ATTENUATOR? 77
```

If the response is not returned, the <attenuator id> is not in use.

Alternatively, you can use the “PARAMETERS:ATTENUATOR:LIST?” query to return a list of <attenuator id> that are currently defined.

<manufacturer> : This is the second parameter and must be enclosed in quotes (single or double). Examples include “Aeroflex”, “Agilent”, and so on. This is effectively a comment and have no specific use other than for reporting in response to a query.

<model> : This is the third parameter and must be enclosed in quotes (single or double). Examples include “8494G”, “8496H”, and so on. This is effectively a comment and have no specific use other than for reporting in response to a query.

<attenuator type> : this is the fourth parameter and is an integer with one of the following values:

0 = Latching attenuator

1 = Fail-safe attenuator

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<attenuator drive type> : this is the fifth parameter and is an integer with one of the following values:

0 = TTL

1 = Open collector

<Strobe Time> : This is the sixth parameter and is an integer value that identifies the minimum strobe time, in milliseconds, that the channel must be strobed to actuate.

<Has Reset> : this is the seventh parameter and has a value of 0 for FALSE or 1 for TRUE. If the value is 0, the attenuator does not have a reset input. If the value is 1, the attenuator has a reset input that can be controlled with one of the channels in the 1257A.

<Has Read-back> : This is the eighth parameter and has a value of 0 to indicate that the attenuator does NOT support position read-back or 1 to indicate that the attenuator does support position read-back.

<Read-back Polarity> : This is the ninth parameter and has a value of 0 indicates the read-back is active low and a value of 1 indicates the read-back is active high.

<Warn threshold> : this is the tenth parameter and is an integer value in the range 1 to 2000000000. This identifies the number of attenuator (relay) closures that can occur before a warning is generated.

<EOL threshold> : this is the eleventh parameter and is an integer value in the range 1 to 2000000000. This identifies the number of attenuator (relay) closures that can occur before the attenuator must be replaced (end of life).

<attenuator pin count> : this is the twelfth parameter and is an integer that identifies the number of pins or cells that are used by the attenuator. This has a minimum value of 1 and a maximum value of 16. The number of parameters that follow must equal this value.

<attenuator pin level 1> : this is the thirteenth and last required parameter. This is an integer value and represents the attenuation value in dB for the first pin (cell) in the attenuator.

<attenuator pin level 2> : this is an optional parameter and must be present if the <attenuator pin count> is >= 2. This is an integer value and represents the attenuation value in dB for the second pin (cell) in the attenuator.

<attenuator pin level 3> : this is an optional parameter and must be present if the <attenuator pin count> is >= 3. This is an integer value and represents the attenuation value in dB for the third pin (cell) in the attenuator.

<attenuator pin level 4> : this is an optional parameter and must be present if the <attenuator pin count> is >= 4. This is an integer value and represents the attenuation value in dB for the fourth pin (cell) in the attenuator.

<attenuator pin level 16> : this is an optional parameter and must be present if the <attenuator pin count> is = 16. This is an integer value and represents the attenuation value in dB for the sixteenth pin (cell) in the attenuator.

An example of a command would be:

```
PARAMETERS:ATTENUATOR:ADD 37,
```


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```
'Agilent','8494G',
0, 0, 30, 0, 0, 0,
4999000, 5000000,
4, 1, 2, 4, 8
```

The example associates attenuator id # 37 with an Agilent 8494G attenuator is latching, has TTL control levels, has a strobe time of 30 milliseconds, has no reset or read-back, has a warning threshold of 4999000 and an end-of-life threshold of 5000000. The attenuator consists of 4 cells with attenuation values of 1 dB, 2 dB, 4 dB, and 8 dB.

The parameters associated with a relay can be read back with the "PARAMETERS:ATTENUATOR? <attenuator id>" query. This query will return 17 parameters. Each parameter will be separated by a comma from the next. The parameters are returned in the same order as they are specified in the "PARAMETERS:ATTENUATOR:ADD" command. The only difference is the <attenuator id> is NOT returned.

For example, the query

```
PARAMETERS:ATTENUATOR? 37
```

Would return

```
"Agilent","8494G",0,0,30,0,0,0,4999000,
5000000,4,1,2,4,8
```


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Deleting Attenuator Types

Caution

This command is documented for completeness. Under most circumstances, this command should NOT be sent to the 1257A as it will delete the specified attenuator component from the library of known components. If you delete an attenuator type that is used in your system, you will not be able to continue to use those attenuators anymore.

The "PARAMETERS:ATTENUATOR:DELETE" command is used to delete one specific relay type or all relay types from the list of known relay types.

:PARameters

:ATTenuator

:DELete { <attenuator id> | ALL }

The following command deletes the attenuator information associated with attenuator id # 37:

```
PARAMETERS:ATTENUATOR:DELETE 37
```

The following command deletes all attenuator information:

```
PAR:ATT:DEL  ALL
```

Configuring New Attenuators into the System

Once the library of attenuator types is complete, the 1257A can be configured to control the attenuators installed in the system. The DRIVERBOARD:CONFIGURE:ATTENUATOR command is used to "install" a single relay into the system and to configure the control and read-back channels. The format of the command is:

```
:DRIVerboard
    :CONFigure
        :ATTenuator
            :ADD <parameters>
```

The number of <parameters> is variable. The number of parameters is determined by the number of cells in the attenuator. The number of parameters is always 4 + (2 * <number of cells>).

The <parameters> for this command are:

<channel list> : This is the first parameter for the command. Each channel in the channel list is the FIRST 1257A channel that controls an attenuator of the specified type.

<attenuator id> : This is the second parameter in the command. This selects the attenuator from the by using an integer attenuator id that was specified in a previous PARAMETERS:ATTENUATOR:ADD command.

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<global reset channel> : This is the 1257A channel that controls the global reset for the attenuator. Typically reset channels will be 1300 – 1303, 2300 – 2303, or 3300 - 3303 (or 0 if not used).

<cell count> : This is the fourth parameter in the command. This specifies the number of cells in the attenuator. This must match the number of pins (cells) that was configured for the attenuator with <attenuator id> when the "PARAMETERS:ATTENUATOR:ADD" command was used.

<start channel 1> : This is the fifth parameter in the command. This identifies the starting channel number of the 1257A that controls the first attenuator specified in the <channel list>. Channel numbers are in the range 1000 to 1015, 2000 to 2015, and 3000 to 3015.

<through channel 1> : This is the sixth parameter in the command. This identifies the end of the range of channels in the 1257A channel that controls the first attenuator identified by the <channel list>.

<start channel N> : This is the (3 + (<number of cells> * 2)) parameter. It identifies the starting 1257A channel that controls the Nth attenuator specified in the <channel list>.

<through channel N> : This is the (4 + (<number of cells> * 2)) parameter in the command. This identifies the end of the range of channels in the 1257A channel that controls the Nth attenuator identified by the <channel list>.

The following example shows a sample use of the command:

```
DRIVERBOARD:CONF:RELAY:ADD (@2(1008)),
      37,1202,4,1008,1011
```

The example shows the addition of an attenuator into slot 2, channel 1008. The attenuator type (attenuator id) associated with this attenuator is 37, which from the previous examples was an "Agilent 8494G". The relay has reset channel 1202. There are 4 pins to control the attenuator, these are channels 1008 through 1011 in slot 2.

Deleting Configured Attenuators

Once an attenuator has been added, it can be removed through the "DRIVERBOARD:CONFIGURE:ATTENUATOR:DELETE" command. This is not typically required but may be useful in changing the type of attenuators installed in the system. The syntax for this command is

```
:DRIVerboard
      :CONFigure
            :ATTenuator
                  :DELete  <channel list>
```

The following command deletes attenuator from slot 2, channel 1008.

```
DRIV:CONF:ATT:DEL (@2(1008))
```


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Reading the Relays that are Configured

The list of relay numbers that have been configured for a slot can be read back with the “DRIVERBOARD:CONFIGURE:ATTENUATOR:LIST?” query. The syntax for this query is

```
:DRIVerboard
      :CONFigure
            :ATTenuator
                  :LIST?  <slot>
```

The query returns a list of the unique relay numbers associated with the specified slot.

The following example shows the request for the list of relays configured for slot 2:

```
DRIVERBOARD:CONFIGURE:RELAY:LIST? 2
```

A typical reply would be:

```
1008
```

Indicating the attenuator has been configured and the first control channel is 1008 (of slot 2). If no attenuators have been configured for the specified slot, the reply will be

```
NONE
```


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Chapter 5
SCPI Command Reference

This section contains a detailed description of each command that is either specific to the 1257A or common to multiple switch modules. The commands are presented in Table 5-1.

The commands accepted by the 1257A are shown using the SCPI syntax notation. The command syntax in Table 5-1 is displayed using the following conventions:

Square Brackets ([ ])	Enclose optional keywords or parameters
Braces ({ })	Enclose possible parameters within a command
Triangle Brackets (< >)	Substitute a value for the enclosed parameter
Vertical Bar (|)	Separate multiple parameter choices
Bold Typeface Letters	Designate factory default values
(Command Only)	Indicates the command cannot be used in query form
(Query Only)	Indicates the command can only be used as a query. The command form, without the question mark is not allowed.

To illustrate the SCPI notation, a part of the ROUTE command subsystem is shown below:

```
[:ROUTe]
        :CLOSe <channel list>
        :OPEN <channel list>
                :ALL    (Command Only)
```

This example shows the following:

The ROUTE command keyword is optional, since it is enclosed in square braces

The ROUTE command keyword may be specified as ROUTE (long form) or as ROUT (short form), since the last character is displayed in lower-case

The CLOSE keyword must be followed by a <channel list>. A <channel list> represents any of a number of possible channels in a variety of formats. The format for the <channel list> and other command parameters are described in **Chapter4: SCPI COMMAND BASICS**.

Since the ROUTE keyword is optional, and the CLOSE keyword is shown indented from the ROUTE keyword, valid commands consist of:

```
ROUTE:CLOSE
```


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```
CLOSE
```

The command ROUTE:OPEN:ALL is a command only. Therefore, the command ROUTE:OPEN:ALL? is not allowed. Since they are NOT shown as command-only, the commands ROUTE:CLOSE? and ROUTE:OPEN? are valid commands.

Table 5-1 contains a synopsis of the commands implemented by the 1257. The maximum and minimum values and resolution are shown for numeric parameters. The commands marked with an asterisk (*) are NOT defined in the SCPI language. These commands follow the SCPI syntax rules for implementing the operation of the command.

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Table 5-1, Commands Implemented by the 1257A

Command		Max	Min	Default	Notes
ROUTE Subsystem:					
[:ROUTe]					
:CLOSe <channel list>					
:CLOSe?					
:OPEN <channel list>					
:OPEN?					
:ALL	(Command Only)				
:PATH					
:CATalog?	(Query Only)				
:DEFine <path name> , <close channel list> [, <open channel list>]					
:DEFine? <path name>					no chan list for query
:DELete					
[:NAME] <path name>	(Command Only)				
:ALL	(Command Only)				
:STORe*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
:AUTO?					
:RECall*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
: AUTO?					
:EXCLude* <channel list>					no exclude list
:EXCLude?					
:CLEar <channel list>					
:STORe*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
:AUTO?					
:RECall*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
:AUTO?					
:INCLude* <channel list>					
:INCLude?					
:CLEar <channel list>					
:ALL					
:STORe*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
:AUTO?					
:RECall*	(Command Only)				
:AUTO		**ON**	**OFF**	**OFF**	
:AUTO?					

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Table 5-1, Commands Implemented by the 1257A - Continued

Command	Max	Min	Default	Notes
:VERify*				
:MASK <channel list>, 0 | 1 | X				
:MASK? <channel list>				
:VERify? <channel list or path name>				
:VERify:ALL? (Query Only)				
:CONFidence				
:STATE 0 | 1 | OFF | ON				
:STATE?				
SYSTEM Subsystem:				
:SYSTem				
:ERRor? (Query Only)				
:VERSion? (Query Only)				1994.0
:EVENT?				
:EVENT				
:COUNt?				
:CLEar <0 … N>				
:ALL				
:PRESet				
STATUS Subsystem:				
:STATus				
:PRESet (Command Only)				
:OPERation				
[:EVENt]? (Query Only)				
:CONDition? (Query Only)	255	0	0	
:ENABle <enable mask>				
:ENABle?				
:QUEStionable				When the register or status event are read, they will return a value of zero (0). These commands are not used with the 1257
[:EVENt]? (Query Only)				
:CONDition? (Query Only)				
:ENABle <enable mask>				
:ENABle?				
Power On:				
:POWeron				
:RECall				
:STATe 0 | 1				
:STATe?				
Reset/(Preset) Recall: Power On State:				
:RECall				
:POWeron				
:RESET				
:STATe 0 | 1				
:STATe?				

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Table 5-1, Commands Implemented by the 1257A - Continued

Command	Max	Min	Default	Notes
DIAGnostic Subsystem:				
:DIAGnostic				
:RELay				
:CYCLes? <channel list>				**(Query Only)**
:ENDoflife				
:STATus? <channel list>				**(Query Only)**
Configuration Commands				
::DRIVerboard				
:ADAPterboard				
:ID?				**(Query Only)**
:CONFigure				
:RELay				
:ADD <parameters>				**(Command Only)**
:DELete <slot> , <relay id>				**(Command Only)**
:LIST? <slot>				**(Query Only)**
:RELay? <slot> , <relay id>				
:ATTenuator				
:ADD <parameters>				
:DELete <slot> , <attenuator id>				
:LIST? <slot>				
:ATTenuator? <channel list>				
:RESET { ALL | <slot> }				
:LED				
:MAXCURrent <slot> , <curr. multiplier>				
:MAXCURrent? <slot>				
:DESCriptor <slot>, <descriptor>				
:DESCriptor? <slot>				
:DIGital				
:OUTPut <pattern> , <channel list>				
:OUTPut? <channel list>				
:CONFigure				
:WIDTh { 8 | 16 }, <channel list>				
:WIDTh? <channel list>				
:POLarity { NORMal | INVerted } ,<ch list>				
:POLarity? <channel list>				
IEEE-488.2 Common Commands:				
*IDN? (Query Only)				
*RST (Command Only)				
*TST? (Query Only)				
*CLS (Command Only)				
*ESE <register value>	255	0	0	
*ESE?				
*ESR? (Query Only)				
*SRE <register value>	255	0	0	
*SRE?				
*STB? (Query Only)				
*OPC				
*OPC?				
*SAV [<state>] (Command Only)	0	100	100	
*RCL [<state>] (Command Only)	0	100	100	
*OPT? (Query Only)				
*WAI				no function in the 1257A

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Appendix A
Troubleshooting

If you have difficulty using the 1257A, refer to the following troubleshooting tables. If you are still unable to resolve the problem, contact Customer Support.

Power Up

Problem	Possible Causes	What to do
Unit does not turn on (fan not running and no indicator lights).	Not connected to proper power source.	Make sure that the 1257A is connected to a live power source, using a functional power cord. For input power requirements, see **Chapter 1, Overview and Features**.
	Fuse missing, blown, or incorrectly installed.	Check fuses, verifying that they have the required capacity as marked on the 1257A rear panel. Make sure the fuse is properly installed (see **Chapter 1, Overview and Features**.

Power Indicator Light

Problem	Possible Causes	What to do
Indicator lights go blank (was working).	Power has been interrupted.	Verify that the AC input is connected to a live power outlet. Verify that the power switch is still in the ON position. Check fuses, verifying that they have not blown.

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LAN Indicator Light

Problem	Possible Causes	What to do
LAN light is red	Failure to acquire a valid IP address.	Disconnect and reconnect LAN cable. Confirm LAN cable is connected to network properly. Press the LAN reset button for 10 seconds.
	Detection of a duplicate IP address.	Change the IP address of the other device. If in manual setting, change the IP address of the 1257A. Press the LAN reset button for 10 seconds.
	LAN cable disconnected.	Reconnect LAN cable.

Password

Problem	Possible Causes	What to do
Password does not work or you have forgotten the password.	-----	Press the LAN reset button for 10 seconds and your password returns to being blank. Reset the password in your system with the web-page interface.

IEEE-488.2 (GPIB) Remote Interface

Problem	Possible Causes	What to do
1257A does not respond to GPIB commands.	Commands sent to wrong GPIB address.	Make sure that the commands are sent to the GPIB address currently assigned to the 1257A.
	The 1257A is set to the same GPIB address as another device in the system.	Make sure that the 1257A is set to a unique GPIB address.
	GPIB may have been disabled with a SCPI command.	Use the web-page interface to enable the GPIB. Send a SCPI command to enable the GPIB.

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Switches

Problem	Possible Causes	What to do
Slot containing a switch is indicated as an “empty slot” when using the web-page interface.	Switch not properly connected.	Remove top cover of 1257A and reconnect switch to electronic connection.

USB Flash (Thumb) Drive

Problem	Possible Causes	What to do
Immediately after startup, the flash drive is not recognized by the web-page interface.	Flash drive format.	The 1257A system supports both FAT32 (Windows) and VFAT (Linux). Reformat the flash drive and reinstall it.
	During the startup routine, the system may not see a previously installed flash drive.	Remove and reinstall the flash drive.

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Appendix B
Installing and Removing Switches

This appendix provides information on installing and removing switches in your 1257A, as well as adding mounting plates to new switches.

Removing Switches

To remove a switch, perform the following:

1. Turn the 1257A power switch to OFF and disconnect the power cord from the main outlet.
2. Using a Phillips-head screwdriver, remove the switch retaining screws. (Refer to **Figure B-1** for examples of both switch sizes.)



Figure B-1, Removing/Installing a Switch (Appearance Typical)

3. Carefully pull the switch out and disconnect the cable from its electronic connector (**Figure B-2**).

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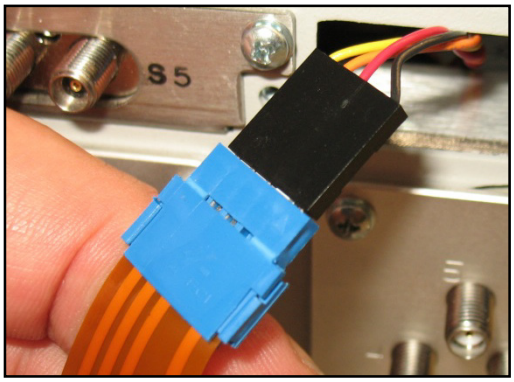


Figure B-2, Cable Connection (Appearance Typical)

If replacing the switch, continue with the following procedure. If not, cover the opening with a blanking plate and secure with the screws previously removed.

4. Connect a new switch electronic connector to the chassis cable connector.
5. Insert the switch into the chassis opening: carefully feeding the cable into the chassis. Secure with the screws removed in Step 2.
6. If necessary, repeat steps 2 through 5 for other switches.
7. Reconnect the power cord, turn the power ON, and resume 1257A operation.

Installing Switches

To install a new switch, perform the following:

1. Turn the 1257A power switch to OFF and disconnect the power cord from the main outlet.
2. Using a Phillips-head screwdriver, remove the blanking plate retaining screws.
3. If not already performed, attach the new switch to the appropriate mounting plate by following the procedure in **Adding Mounting Plates to New Switches**.
4. Connect the wiring of the new switch to the electronic connector inside the chassis (**Figure B-2**).
5. Insert the switch into the chassis opening and secure with the screws removed in Step 2 (**Figure B-1**).
6. If necessary, repeat steps 2 through 5 for other switches.
7. Reconnect the power cord, turn the power ON, and resume 1257A operation.

Adding Mounting Plates to New Switches

This procedure is a generic procedure illustrating one of several switches that can be used. Generally follow this procedure for the switch to which you are adding a mounting plate.

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To install a mounting plate, perform the following:

1. Select the appropriate plate for the switch you are using (**Figure B-3**).



Figure B-3, Matching the Switch Mounting Plate (Appearance Typical)

2. Use a Phillips-head screwdriver to secure the switch to the plate using the included screws (**Figure B-4**).

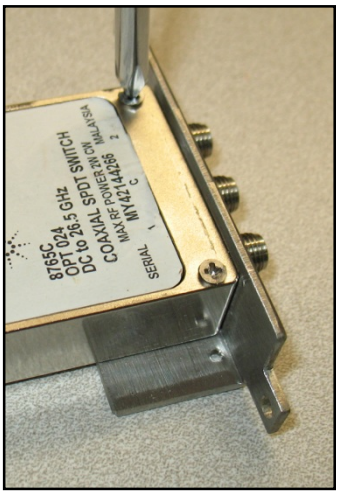


Figure B-4, Securing the Mounting Plate (Appearance Typical)

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Appendix C
Using the Configurator Software Tool

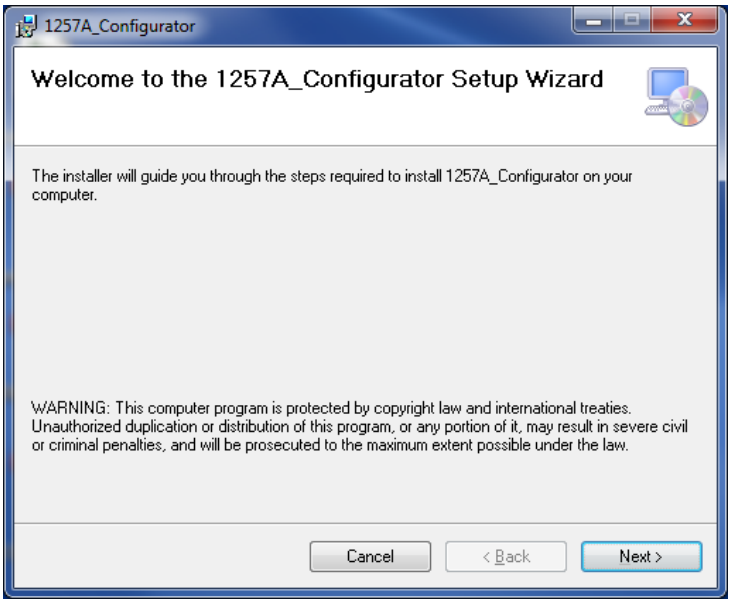
This appendix provides information on installing the Configurator Software Tool (PN 922725) and then to download (copy), modify, and upload the switch configuration of your 1257A.

Note: *A requirement to run the Configurator Software Tool is a current version of the VISA software. You can obtain VISA at www.ni.com/visa.*

Installing the Software

To install the Configurator, perform the following.

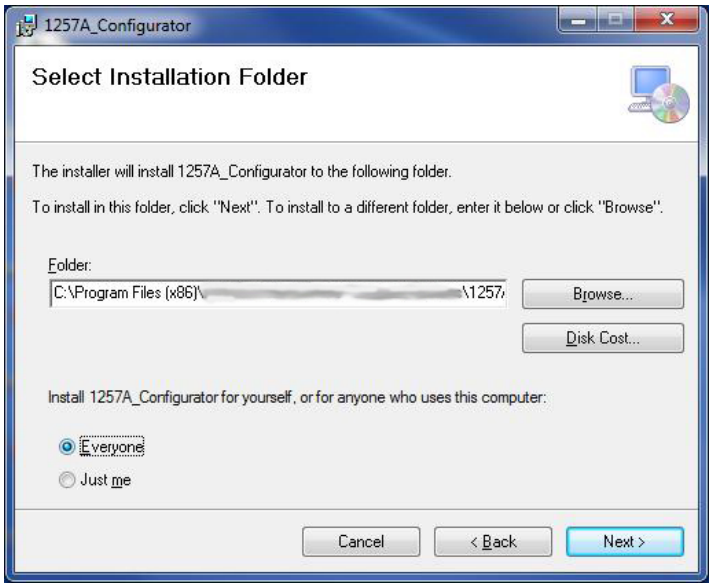
1. Locate the 922725 folder on the CD that came with your 1257A system and double-click on the setup.exe file. The Welcome screen (shown below) appears. Click **Next** to begin the installation process.



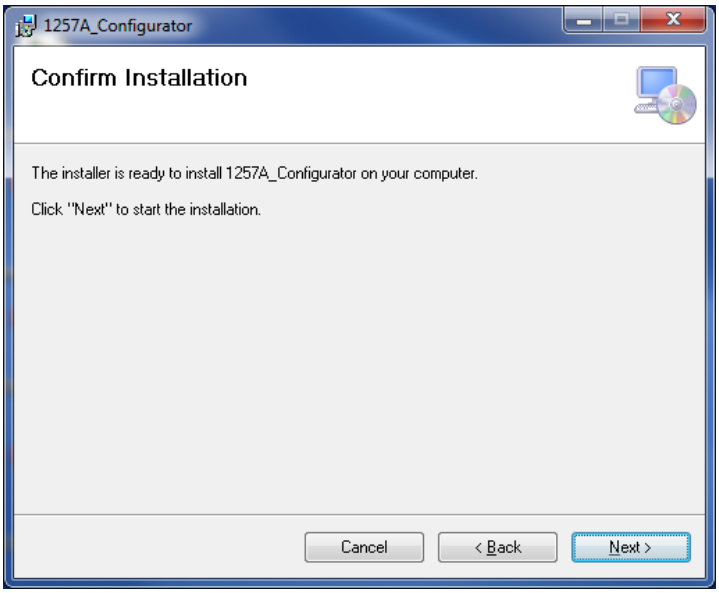
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2. If satisfied with the settings on the screen, click **Next**. Otherwise, adjust as necessary and then click **Next** to continue.

   Note: *Be sure to identify where you have installed the program so you can easily locate it later. For your convenience, afterwards install a Desktop shortcut for the program file (*1257A_Configurator.msi*).*

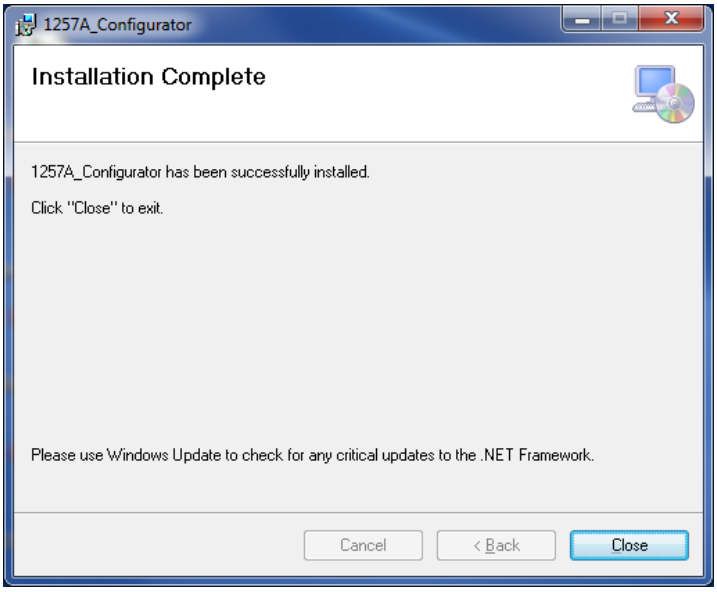


3. Click **Next** to begin the installation. If you receive a message asking if you want to install the program on your computer, click **Yes** or **Continue** to allow the installation.



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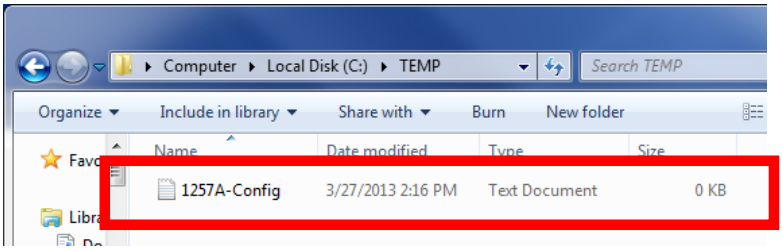
4. Click **Close** when successfully installed.



Downloading (Copying) the Configuration Information

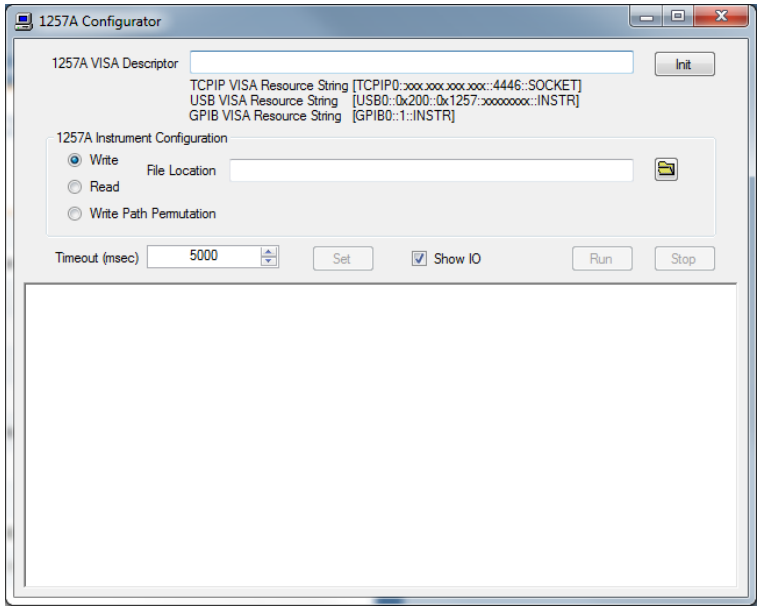
To create a file with the current system configuration, perform the following.

1. Create an empty text (.txt) file using Windows Notepad or similar program.

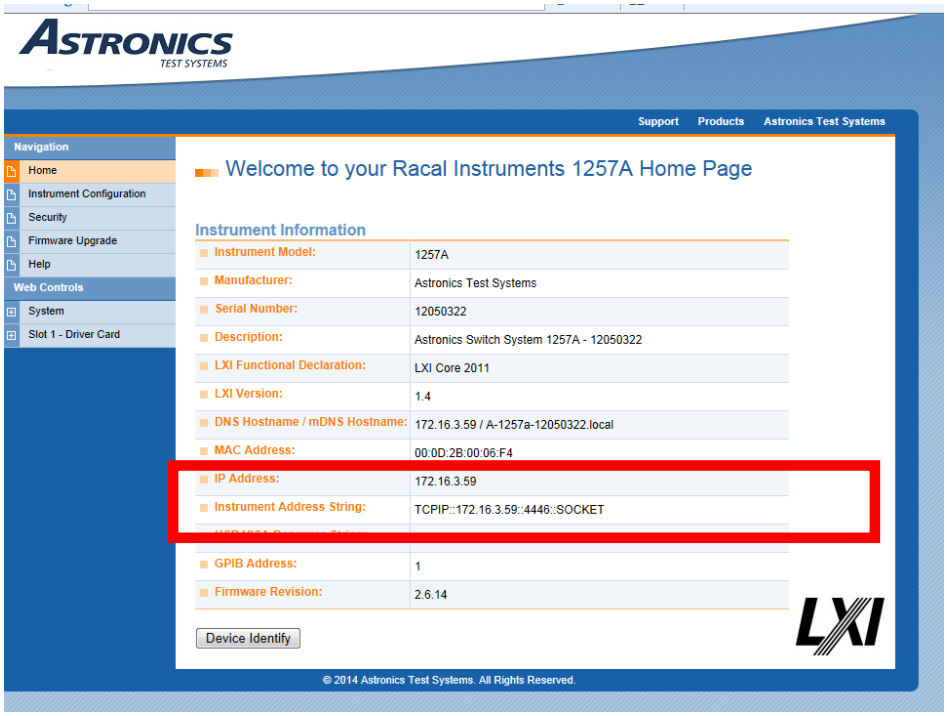


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2. Launch the Configurator Tool.



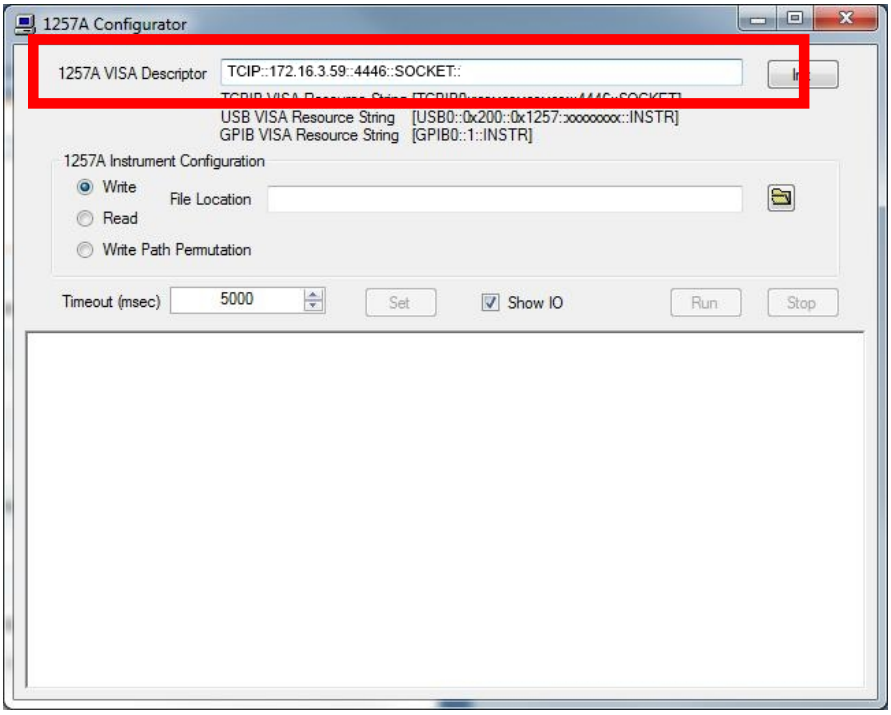
3. Go to the 1257A Home Page and identify the Instrument Address String.



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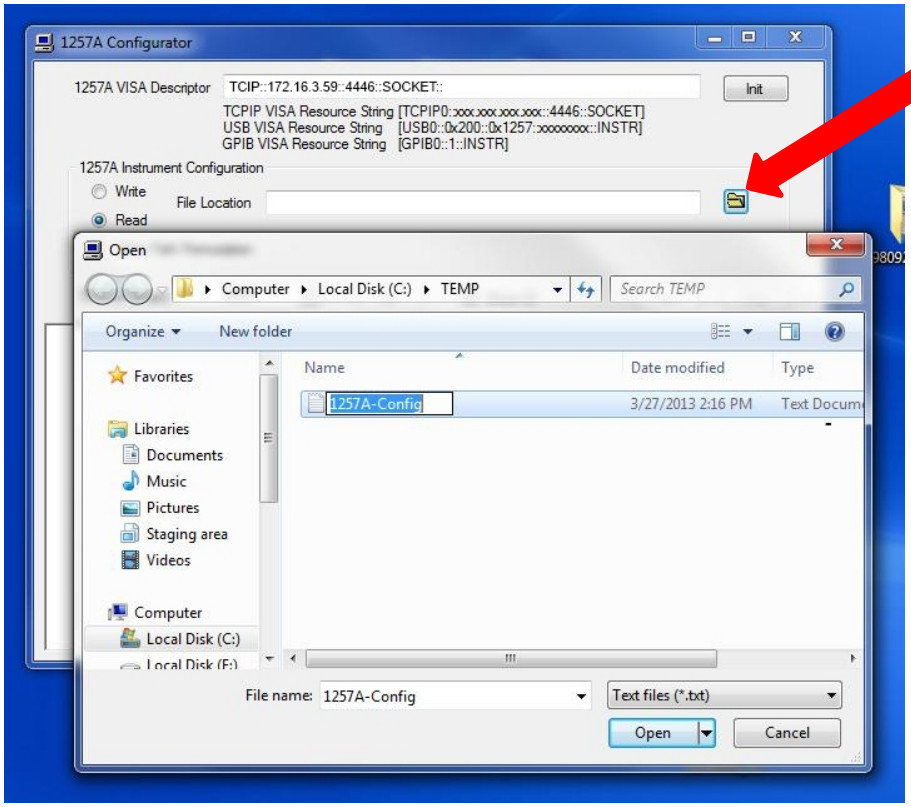
4. Copy the Instrument Address String and enter it into the 1257A VISA Descriptor box of the Configurator.

   Note: *If using USB or GPIB for a connection, you can use the USB/GPIB VISA Resource String instead).)*

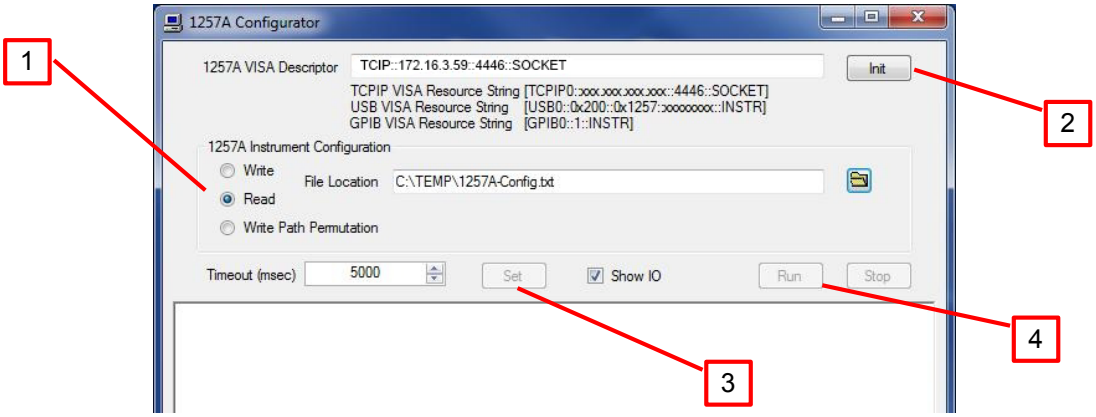


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5. Use the **File Location** icon to locate the .txt file created in Step 1. Select the file and click **Open**.

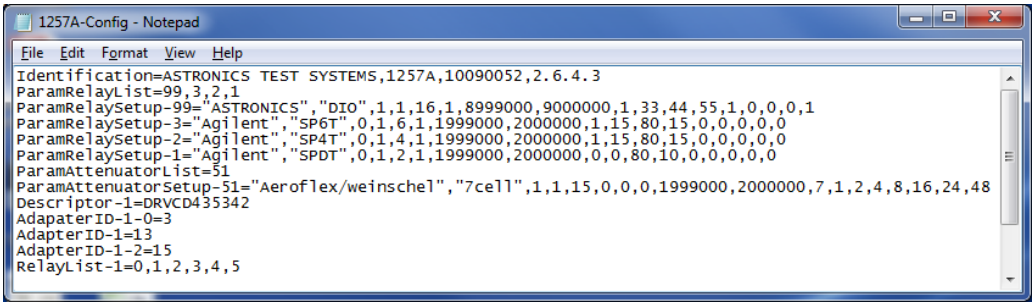


6. Select **Read** (1) under 1257A Configuration. Click **Init** (2) to initialize the connection. Click **Set** (3) to set the timeout. Finally, click **Run** (4).



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7. The text file will be populated with the current configuration like the example below.

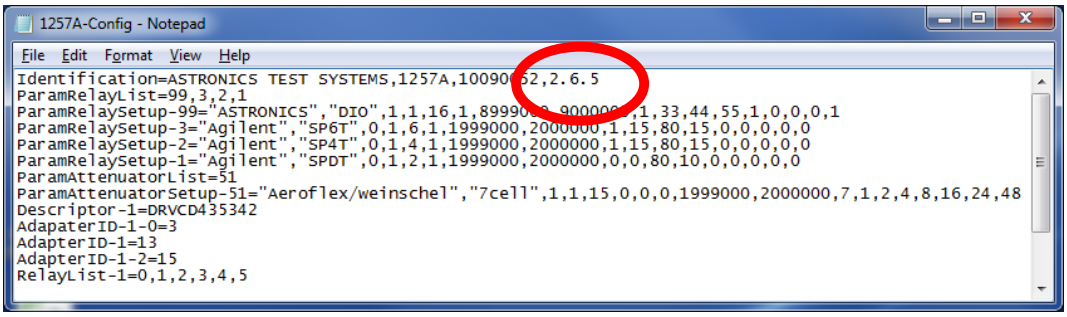


8. Close the Configurator.

Modifying the Configuration File

The configuration file is a simple text (.txt) file that can be easily modified with Windows Notepad or similar program.

For instance, if after you uploaded new firmware to the 1257A you wanted to change the firmware version from the original 2.6.4.3 to 2.6.5, simply change the version information and then save the file.

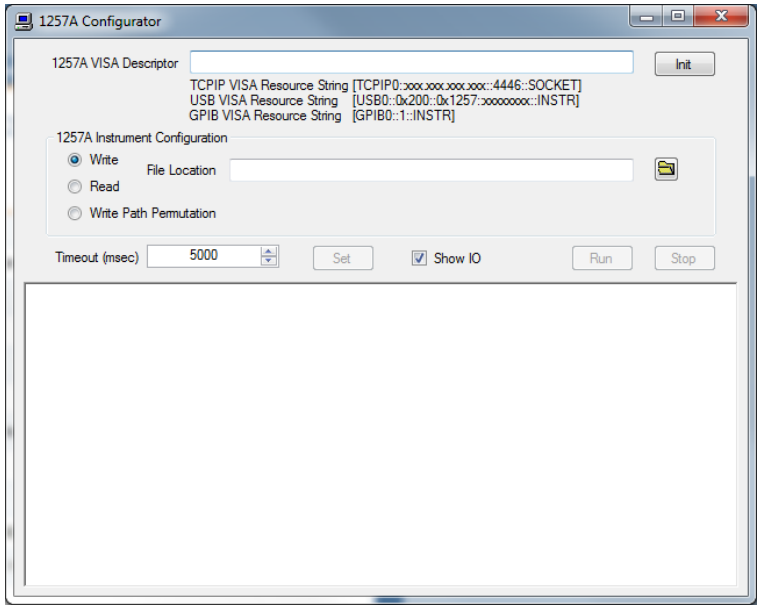


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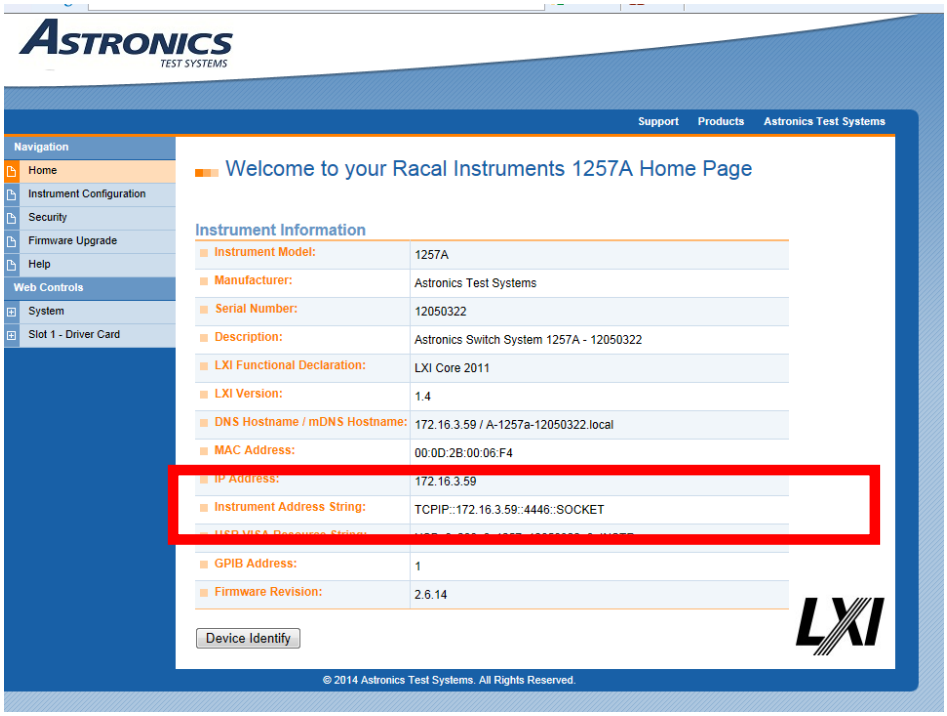
Uploading the Configuration Information

To upload a previously-created text file with a system configuration to your 1257A, perform the following.

1. Launch the Configurator Tool.



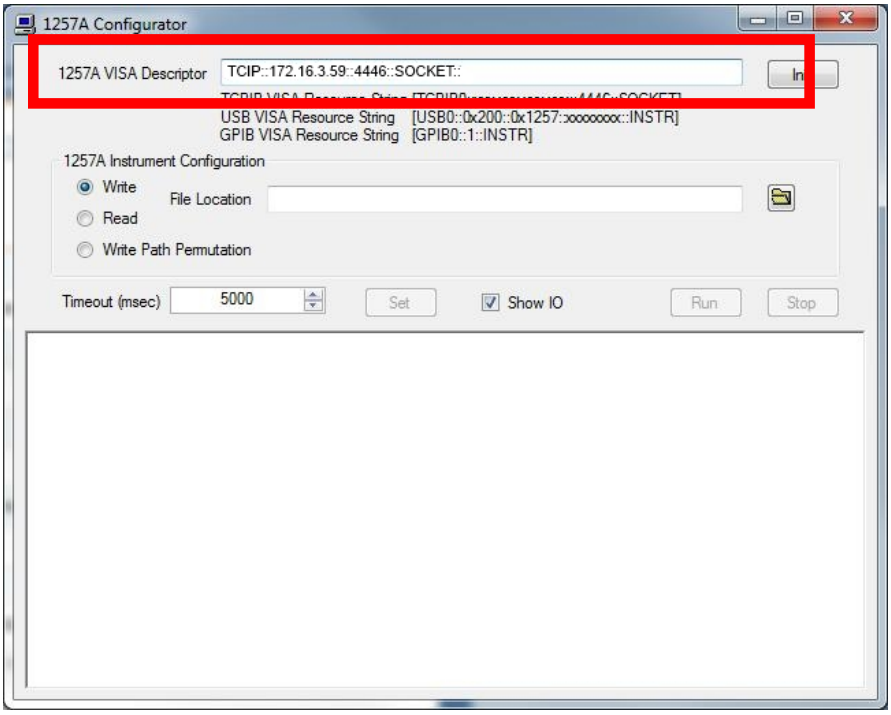
2. Go to the 1257A Home Page.



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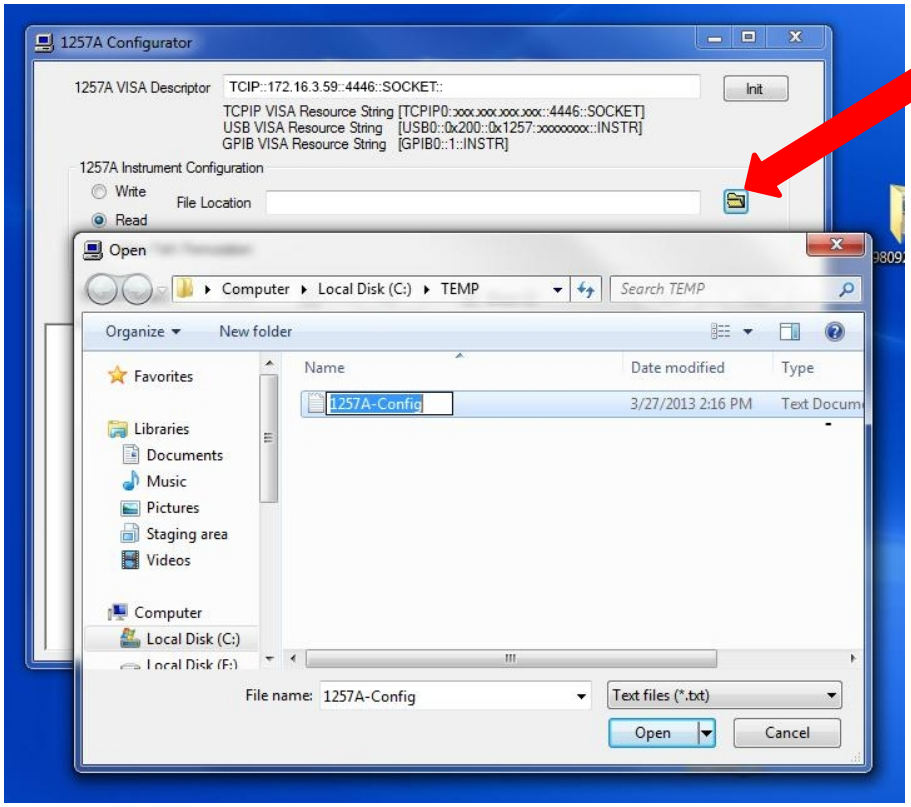
3. Copy the Instrument Address String and enter it into the 1257A VISA Descriptor box of the Configurator.

   Note: *If using USB or GPIB for a connection, you can use the USB/GPIB VISA Resource String instead).)*

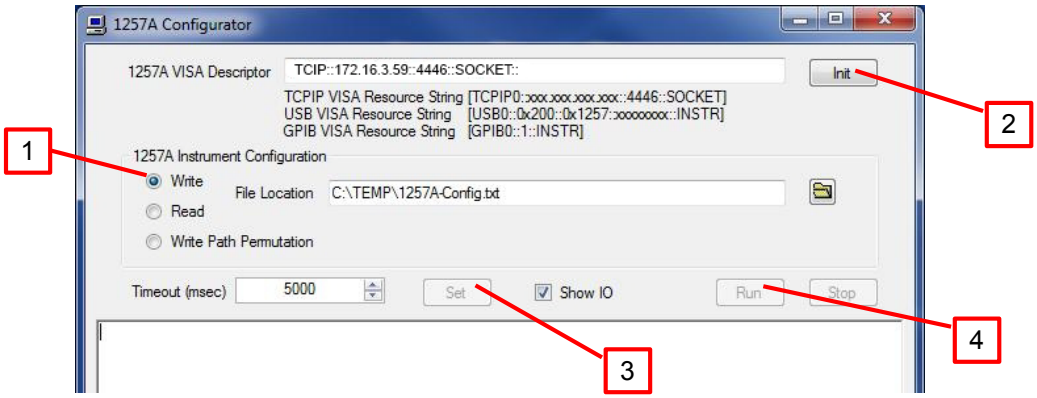


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4. Use the **File Location** icon to locate the .txt file with the configuration information. Select the file and click **Open**.



5. Select **Write** (1) under 1257A Configuration. Click **Init** (2) to initialize the connection. Click **Set** (3) to set the timeout. Finally, click **Run** (4).



6. The 1257A will be loaded with the revised configuration. Restart the 1257A prior to using it again.
7. Close the Configurator Software Tool.

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