Agilent E8402A, E8404A
C-Size VXI Mainframes

User and Service Manual

Where to Find it - Online and Printed Information

This manual is distributed as follows:

Agilent Universal Instrument Drivers CD ROM (included with the mainframe)
World Wide Web at http://www.agilent.com/find/products
For related information:

System installation (hardware/software) .....VXIbus Configuration Guide*

* *Supplied with Agilent Command Module , Embedded Controllers, and VXLink*

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AGILENT PRODUCT: Agilent E8402A, E8404A C Size VXI Mainframes **DURATION OF WARRANTY:** 3 years

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Agilent Technologies

E8402A, E8404A C-Size VXI Mainframes User/Service Manual
Edition 2

Documentation History

All Editions and Updates of this manual and their creation date are listed below. The first Edition of the manual is Edition 1. The Edition number increments by 1 whenever the manual is revised. Updates, which are issued between Editions, contain replacement pages to correct or add additional information to the current Edition of the manual. Whenever a new Edition is created, it will contain all of the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this documentation history page.

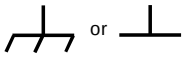
Edition 1 . . . . . .May 1998

Edition 2 . . . . . .September 2001

Safety Symbols

Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.

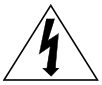
Indicates the field wiring terminal that must be connected to earth ground before operating the equipment — protects against electrical shock in case of fault.



Frame or chassis ground terminal—typically connects to the equipment's metal frame.

Alternating current (AC)

Direct current (DC).



Indicates hazardous voltages.

WARNING Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.

For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DO NOT service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

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Manufacturer's Name: Agilent Technologies, Incorporated
Manufacturer's Address: 815 – 14th St. SW
Loveland, Colorado 80537
USA

Declares, that the product

Product Name: 13 Slot, C-Size VXI Mainframe, 500 Watt
Model Number: E8401A, E8402A, E8403A, E8404A
Product Options: *This declaration covers all options of the above product(s).*

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly.

Conforms with the following product standards:

EMC	Standard	Limit
	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1990 / EN 55011:1991	*Group 1 Class A*
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	*4kV CD, 8kV AD*
	IEC 61000-4-3:1995 / EN 61000-4-3:1995	*3 V/m, 80-1000 MHz*
	IEC 61000-4-4:1995 / EN 61000-4-4:1995	*0.5kV signal lines, 1kV power lines*
	IEC 61000-4-5:1995 / EN 61000-4-5:1995	*0.5 kV line-line, 1 kV line-ground*
	IEC 61000-4-6:1996 / EN 61000-4-6:1996	*3V, 0.15-80 MHz I cycle, 100%*
	IEC 61000-4-11:1994 / EN 61000-4-11:1994	*Dips: 30% 10ms; 60% 100ms* *Interrupt > 95%@5000ms*
	Canada: ICES-001:1998 *Australia/New Zealand: AS/NZS 2064.1*	
	The product was tested in a typical configuration with Agilent Technologies test systems.	
Safety	*IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995* *Canada: CSA C22.2 No. 1010.1:1992* *UL 3111-1: 1994*	

30 March 2001
Date

Ray Corson
Product Regulations Program Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.
Authorized EU-representative: Agilent Technologies Deutschland GmbH, Herrenberger Straße 130, D 71034 Böblingen, Germany

Notes:

Chapter 1
Getting Started

This chapter contains general information on the operating features of the E8402A and E8404A C-Size VXI mainframes. The following table lists the major differences between these two mainframes:

	Power Supply		Enhanced Monitor
	500 W	1000 W	
Agilent E8402A Mainframe	✓		✓
Agilent E8404A Mainframe		✓	✓

Unless otherwise specifically noted, descriptions in this manual relate to both VXI mainframes. The designation Agilent E840xA refers to both mainframes. Chapter 2 provides a complete Enhanced Monitor description.

Product Overview

The Agilent E840xA VXI mainframes are designed in full compliance with VXIbus specification revision 1.4, VXI*plug&play* specification VPP-8, and VMEbus system specification revision C.1. Additional features of the Agilent E840xA mainframes include:

- Mainframe monitoring of:
  - backplane voltage conditions
  - individual slot and power supply temperatures
  - fan and impeller operation
- State of the art cooling technology:
  - quiet, variable speed power supply fan and backplane impeller
  - increased static pressure
- Front panel Diagnostic Connector for:
  - power supply voltage measurements
  - power supply and backplane temperature measurements
  - power supply fan and backplane impeller verification
- Color Graphical Enhanced Monitor Display:
  - Help messages localized in English, French, German, Spanish
  - Stripcharts and Histograms for easy diagnostics
  - Three Temperature sensors per mainframe slot
  - Display of each power supply voltage or current
  - User text messages
- Easy maintenance:
  - rear panel access to power supply, power supply fan, and cooling impeller for either bench or rack mount operation.

Preparing Your VXI System for Use

The Agilent E840xA mainframes are shipped from the factory ready to use. This section describes important mainframe installation procedures.

AC Power Requirements

The Agilent E840xA mainframes can be operated at line voltages of 90 VAC to 264 VAC, and line frequencies of 47 Hz to 66 Hz. The mainframe can also operate at 360 Hz to 440 Hz with line voltages of 90 VAC to 132 VAC.

The mainframes ship with a power cord and with a fast blow fuse installed. The fuse is suitable for all line voltages. The fuse is not user replaceable. Refer to “Replacement Power Cords” on page 215 for additional information on E840xA power cords and on fuse replacement. Appendix A contains complete input power specifications.

WARNING

The power cord is the only way to disconnect the mainframe from AC power and, therefore, it must be accessible to the operator at all times. When the Agilent E840xA mainframes are mounted in a system cabinet, the power cord need not be accessible since the cabinet must have its own disconnect device.

Positioning the Mainframe for Adequate Cooling

VXI instruments are cooled by air drawn through the back of the mainframe and exhausted out the sides. The power supply is cooled by air drawn from the right side (facing the mainframe) and exhausted out the left side. When placing the mainframe on a work bench or if the mainframe is rack mounted, provide at least a one inch clearance at the back and sides to allow for proper air flow.

Air filters are not necessary on these mainframes. However, an optional air filter kit (mainframe option 938 or Agilent E8401-80938) is available for use in harsh environments. The airflow is restricted less than 10% with the air filter installed. Refer to “Agilent E840xA Air Filter Kit” on page 250 for installation information.

Connecting the Mainframe to a Permanent Earth Ground

The mainframe must be connected to a permanent earth ground for line frequencies greater than 66 Hz. This connection is made on the back of the mainframe:

1. Connect a 16 AWG (1.3 mm or larger) wire to the PEM nut shown in Figure 1-1. The wire must be green with a yellow stripe, or bare (no insulation). Use a m4 x 10 screw, grounding lug, and toothed washers (or toothed lug) as shown in the Figure.

2. Attach the other end of the wire to a permanent earth ground using toothed washers or a toothed lug.

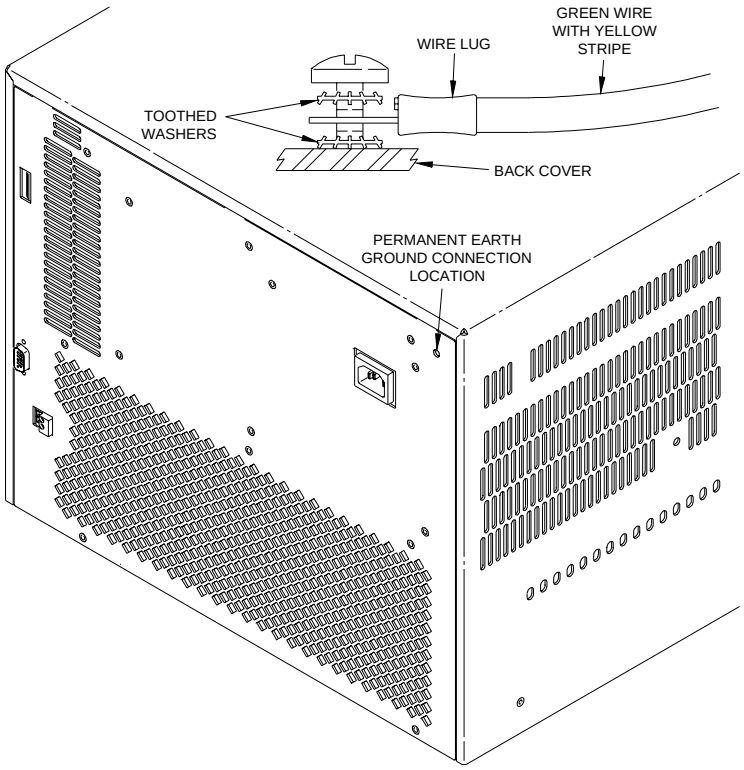


Figure 1-1. Connecting an Agilent E840xA Mainframe to a Permanent Earth Ground (Agilent E8404 shown, Agilent E8402 is similar)

WARNING

For protection from electrical shock when operating at frequencies greater than 66 Hz, connect the chassis ground terminal to permanent earth ground.

AVERTISSEMENT

Risque de Choch èlectrique. Si la frèquence du secteur est supèrieure à 66 Hz, relier la borne de masse du chassis à une prise de terre fixe.

Installing VXI Instruments

The Agilent E840xA mainframes have 13 slots labeled 0 through 12. Any VXI instrument can be installed in any slot; however, slot 0 is reserved for devices capable of providing the system's slot 0 functionality. This functionality includes:

- locating instruments installed in the mainframe
- managing (arbitrating) data flow across the backplane
- providing the system clock (SYSCLK - 16 MHz)

Examples of these devices are the Agilent E1406 Command Module and embedded controllers such as the Agilent E623x series VXI Pentium PCs, the Agilent RADEPC7B PC, and the Agilent E1497/E1498 V743 controllers.

Multiple instruments which combine to create a virtual instrument (e.g. a scanning multimeter), and instruments which access the backplane local bus should be installed in adjacent slots.

1. To prevent damage to the VXI instruments, turn off the mainframe prior to installing the instruments.
2. Insert the instrument into the mainframe by aligning the instrument with the card guides inside the mainframe. Slowly push the instrument into the slot until it seats in the backplane connectors. The front panel of the instrument should be even with the front edges of the mainframe.
3. Tighten the retaining screws on the top and bottom of the module.

WARNING **All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instrument's retaining screws to secure the instrument to the mainframe and to make the ground connection.**

Installing C-Size Instruments

Figure 1-2 shows the installation of C-Size instruments.

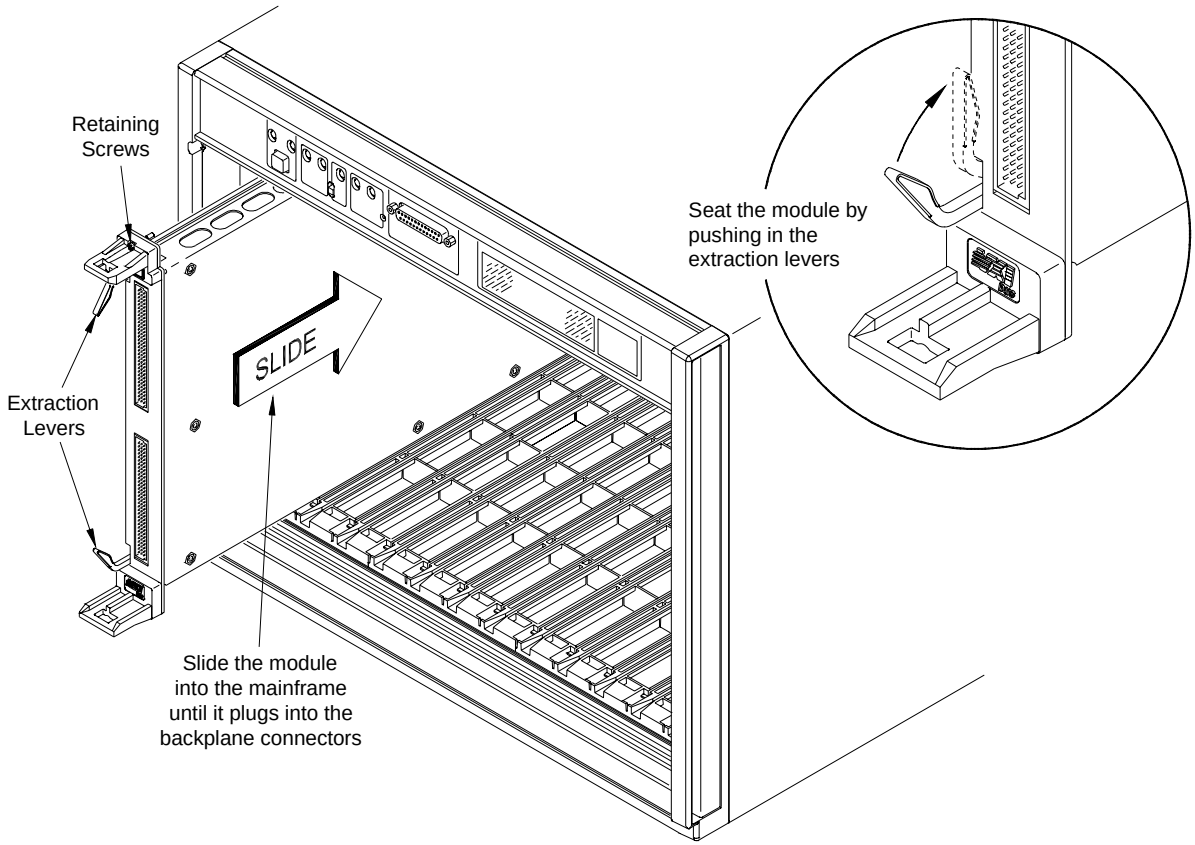


Figure 1-2. Installing C-Size Instruments in the Agilent E840xA Mainframe

WARNING **All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instrument's retaining screws to secure the instrument to the mainframe and to make the ground connection.**

Installing A- and B-Size Instruments

Figure 1-3 shows the installation of A- and B-size instruments.

- **Agilent E1403B A/B-size Module Carrier** extends the P1 connector on the VXIbus backplane and mounts the (A/B-size) modules flush with C-size modules. This carrier is recommended for Agilent B-size, slave-only devices which have the P1 connector.

- **Agilent E1407A A/B Module Carrier** extends the P1and P2 connectors on the VXIbus backplane. This carrier is recommended for B-Size, slave-only devices which have the P1/P2 connectors.

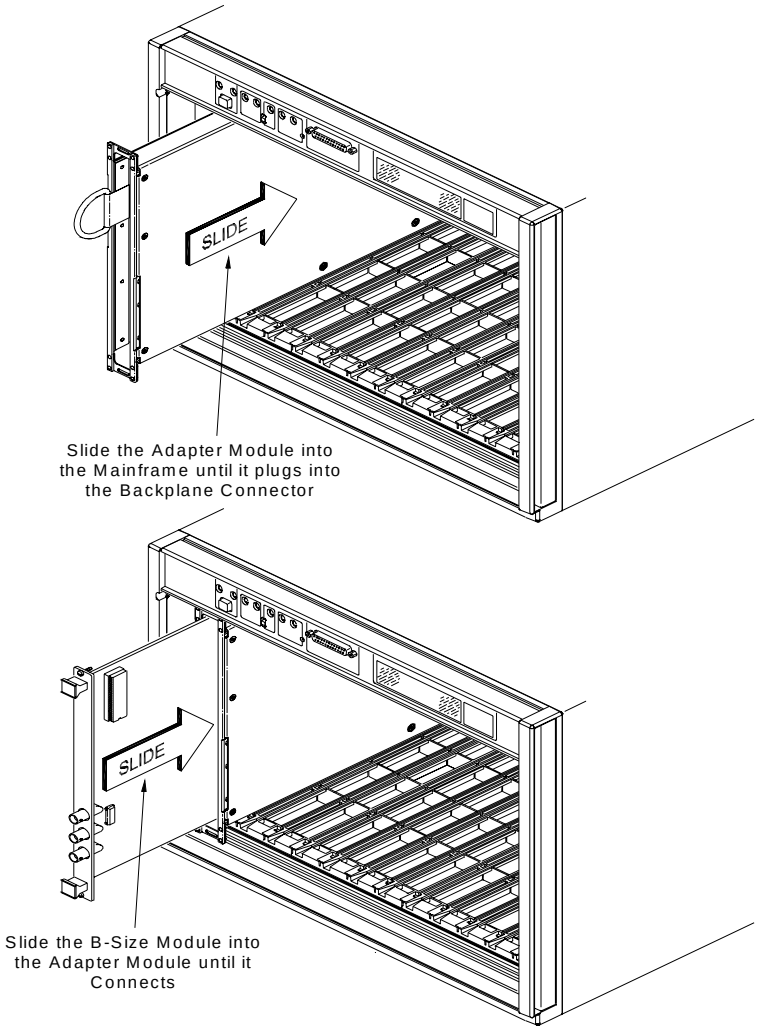


Figure 1-3. Installing A- and B-Size Instruments in the Agilent E840xA Mainframe

WARNING **All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instrument's retaining screws to secure the instrument to the mainframe and to make the ground connection.**

Configuring Your Mainframe

Setting the Enhanced Monitor VXI Logical Address

The Enhanced Monitor of the Agilent E8402 and E8404 mainframes plugs into the VXI backplane from the rear of the mainframe. It does not occupy a slot in the mainframe or tie-up the MODID line. The enhanced monitor is a message-based device, allowing easy communication over the VXIbus (for example, through a command module or embedded controller) or a standard RS-232 interface. The enhanced monitor does require a VXIbus address; 224 is the factory default. Figure 1-4 shows the rear panel of the Agilent E8402/E8404 VXI mainframe with the Enhanced Monitor logical address switches and RS-232 interface.

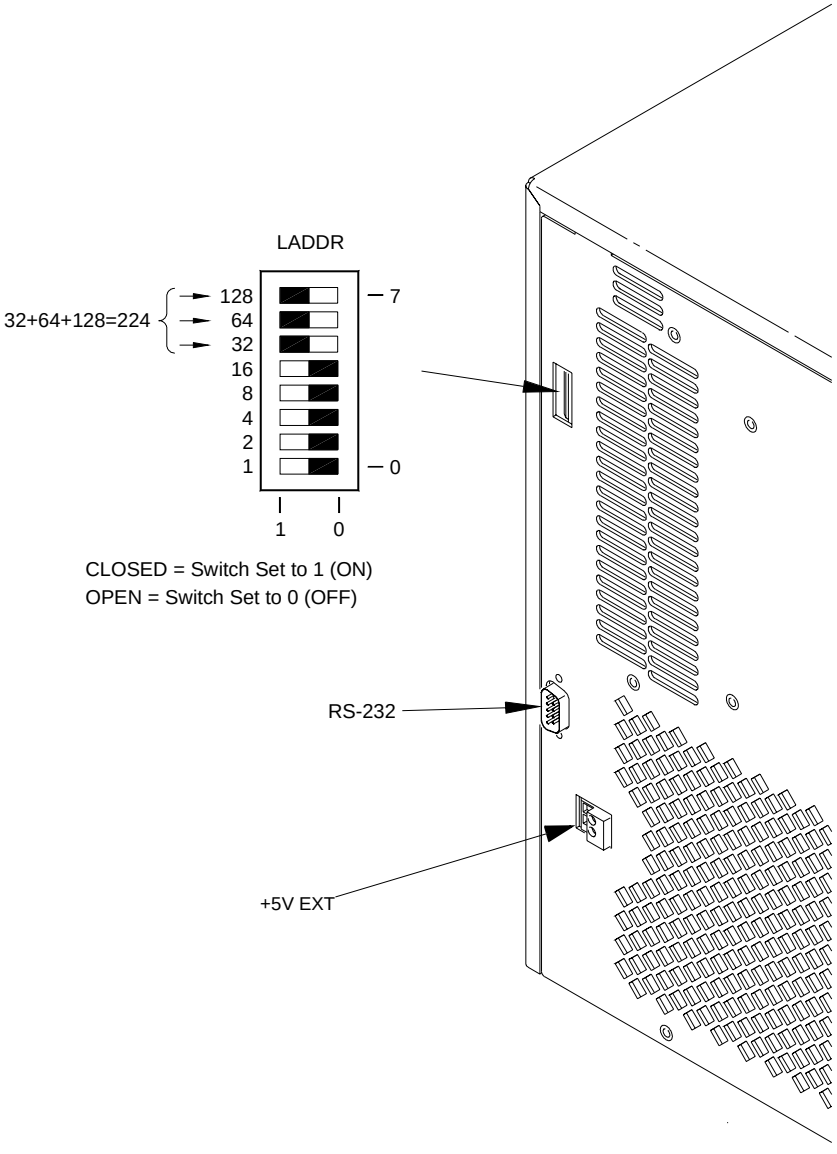


Figure 1-4. Rear panel of the Agilent E8402 and E8404 VXI Mainframes

RS-232 Interface

The RS-232 interface on the rear panel of the Enhanced Monitor mainframes (Agilent E8402 and E8404) can be used to control the Enhanced Monitor from a computer or a terminal.

Refer to Chapter 3 for RS-232 programming information. The SYSTem:COMMunicate:SERial ... commands set and/or modify the configuration of the Enhanced Monitor's serial interface. Serial communication commands take effect after the end of the program message containing the command(s).

Default RS-232 parameters are:

- Baud: 9600
- Bits: 8
- Parity: None
- Stop bits: 1
- DTR/RTS: On
- Pace: XON
- Echo: On
- ERES: On
- Line buffer: On

Note If you use the Enhanced Monitor RS-232 interface (located on the back of the mainframe) while the mainframe is in the standby mode, you must supply an external +5Vdc to the +5VEXT connector (located near the RS-232 interface). If you use the RS-232 interface while the mainframe is powered on, you do not need to provide the external +5Vdc.

External +5V Supply

The External +5V supply is for powering the Enhanced Monitor (including the RS-232 interface) while the mainframe is powered down (standby mode). This requires a stable 5 volt supply capable of 1.5A amps maximum (500mA typical, refer to specifications in Appendix A). Refer to Figure 1-4.

Using the Remote Power-On Pins

The remote power-on pins (pins 5 and 18) of the Diagnostic Connector allow you to turn the mainframe on and off without using the front panel On/Stdby switch. With the On/Stdby switch in the Stdby (off) position, connecting pin 5 to pin 18 on the diagnostic connector turns the mainframe on. Disconnecting pin 5 from pin 18 turns the mainframe off.

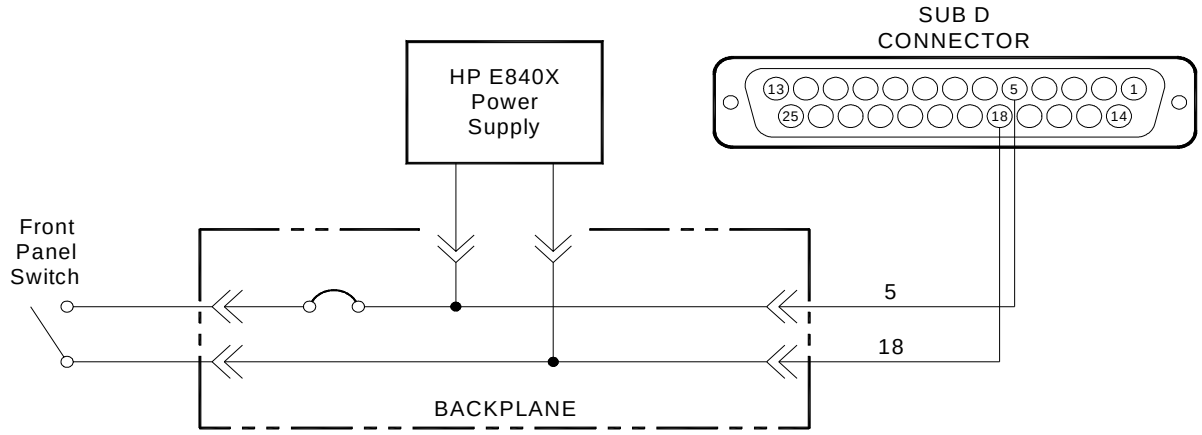


Figure 1-5. Remote Standby Switch Wiring.

Note Pin 18 is ground in the Agilent E8402 and E8404 mainframes. Therefore, you only need to ground pin 5 to turn the mainframe on.

Disabling the On/Stdby Switch

The front panel On/Stdby switch is disabled by removing surface mount 0Ω resistor located on the front monitor board (see Figure 1-6). The resistor is labeled: REM PWR JUMPER.

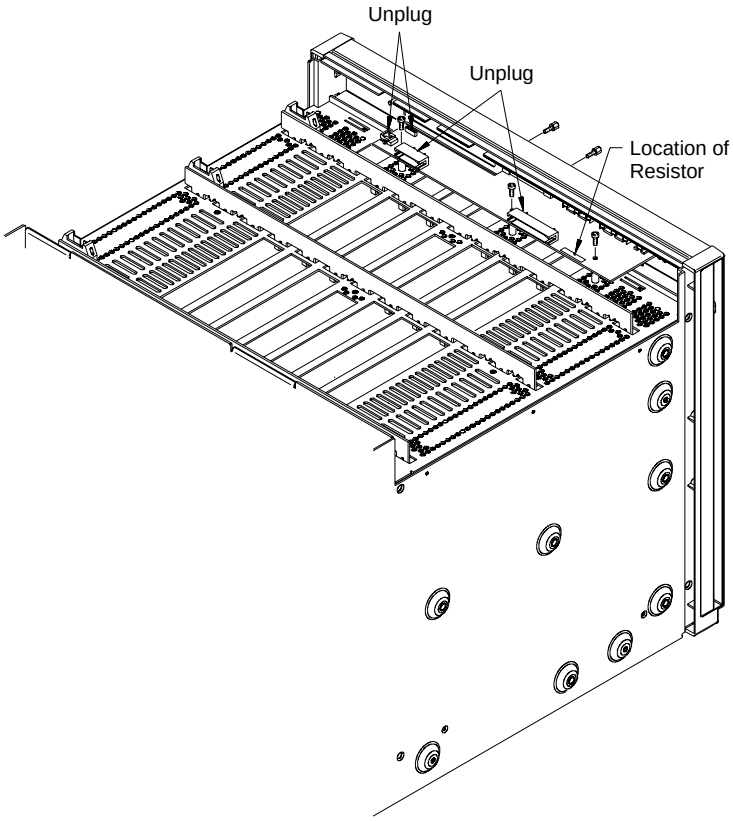


Figure 1-6. Disabling the On/Stdby Switch

Caution **After removing the 0Ω resistor, heat damage may prevent the resistor from being re-installed to re-enable the On/Stdby switch.**

To access the Monitor Display Board and resistor:

1. Turn off the mainframe and remove the power cord.
2. Remove the mainframe cover by removing the 10 m3x6 flat head torx screws.
3. Remove the 0Ω resistor by heating both sides simultaneously with soldering irons. Separate the resistor from the board by gently pressing the tips of the soldering irons together.
4. Save the resistor in order to re-enable the On/Stdby switch. Again, heat damage may prevent the resistor from being re-installed.

Mainframe Options and Accessories

Table 1-1. Agilent E840xA VXI Mainframes options and accessories

Description	Option Number	Product Number
Cable Tray Kit	Option 914	Agilent E8400-80914
Tinted Acrylic Door Kit	Option 915	Agilent E8400-80915
Backplane Connector Shields	Option 918	Agilent E8400-80918
Intermodule Chassis Shield Kit	N/A	Agilent E8400-80919
Standard Rack Mount Adapter Kit	Option 923	Agilent E8400-80923
Flush Rack Mount Kit	Option 924	Agilent E8400-80924
VXIplug&play (VPP-8) Compatible Rack Mount Kit	Option 925	Agilent E8400-80925
Air Filter Accessory Kit	Option 938	Agilent E8400-80938
Support Rail for Standard Rack Mount Adapter or Flush Rack Mount Kit	N/A	Agilent E3664A
Support Rail for VXIplug&play (VPP-8) Compatible Rack Mount Kit	N/A	Agilent E3663A
Rack Slide Kit for Standard Adapter Kit or VXIplug&play (VPP-8) Compatible Rack Mount Kit	N/A	Agilent 1494-0411

Chapter 2
Using the Enhanced Monitor

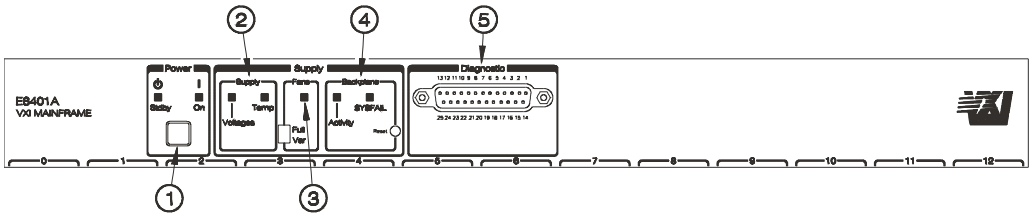
The Enhanced Monitor on the front panels of the Agilent 840xA mainframes allow you to monitor power supply voltages, mainframe temperatures, fan operation, and backplane activity. Figure 2-1 shows the mainframe front panel.

The enhanced monitor provides features such as:

- Monitoring the mainframe operating status including: blower status, slot temperatures, and power supply voltages, current, and power. The Enhanced Monitor generates a warning if any of these parameters exceed limits. Refer to Chapter 3 for programming details.
- User-definable temperature limits for individual slots; if the limit is exceeded, a beeper sounds, LEDs flash, and the display shows the warning condition.
- Storing a history of power supply voltages, currents, and power; slot temperatures; fan speeds; events such as mainframe power cycled on/off, etc.

In addition, you can:

- Perform internal Enhanced Monitor Self Tests. These verify its fans and its ability to measure the slot temperatures and power supply voltages and currents, etc.
- Set and query Enhanced Monitor system parameters. The Enhanced Monitor functions are programmable through either the system commander (command module or embedded controller) or via an RS-232 port on the back of the mainframe.
- Write user text messages to the front panel display. This is useful for communicating with an operator.



Section	Indicator / Switch	Description
① Power	On Indicator	Green - the mainframe is turned on.
	Standby Indicator	Amber - the mainframe is in standby mode; no power is applied to VXI modules.
		Both Indicators Off - there is no power applied to the mainframe.
② System	Power Supply Indicator	Green - all voltages, currents, and power supply temperatures are within expected operating ranges.
		Flashing Amber - one or more power supply measurements are out of limit.
	Temp Indicator	Green - all the individual slot temperatures and ambient temperatures are within normal operating ranges.
		Flashing Amber - one or more slot temperatures or the ambient temperature has exceeded specified limits.
③ Fans	Fan Switch	Full - the power supply and mainframe cooling fans are operating at full speed.
		Var(iable) - the power supply and mainframe cooling fans are providing user-specified cooling level. Fan speed is a function of the power supply temperature, ambient temperature, and individual slot temperatures. Fan speeds operate at the lowest possible speed to maintain user-specified cooling level.
	Fans Indicator	Green - the power supply and mainframe cooling fans are operating within expected ranges.
		Flashing Amber - the power supply fan **or** the mainframe cooling fan is not operating within expected ranges.
④ Backplane	Activity Indicator	Green - there is communication between instruments across the backplane. Off - there is no communication between instruments on the backplane.
	SYSFAIL Indicator	Amber - one or more instruments has asserted its SYSFAIL line due to a power-on initialization failure, self-test failure, or hardware failure. SYSFAIL is asserted momentarily at power on and during a system reset.
	Reset Switch	Pressing the reset button asserts the SYSRESET* line on the VXI backplane. When low, this line resets the VXI system; all VXI instruments are rest to their power-on state.
⑤ Diagnostic Connector		Refer to “Diagnostic Connector” on page 40.
⑥ Display and Keypad		Refer to “Using the Enhanced Monitor” on page 29

Figure 2-1. Agilent E8402A and E8404A Enhanced Monitoring Front Panel

Using the Enhanced Monitor

The Enhanced Monitor is a separate PC board that plugs into the VXI backplane from the rear of the mainframe. In this way it does not occupy a user slot on the front of the mainframe. The Enhanced Monitor uses a standard-defined P1 Connector but a uniquely-defined P2 Connector. It is a message-based, slave-only VXI interface card, complete with its own VXI logical address. Refer to Chapter 3 of this manual for SCPI programming information. This section provides general information about the Enhanced Monitor.

- **RS-232 Interface** supports communication with a terminal or computer for remote monitoring purposes only. Refer to Chapter 3 for SCPI programming information.
  -- All SCPI command are supported by the RS-232 interface.
  -- The RS-232 interface is set-up only through SCPI commands. Settings are stored in non-volatile memory. Factory defaults are: 9600 Baud, 8 bits, No Parity, 1 Stop Bit, DTR/RTS On, XON Pacing.
- **Ambient Temperature Monitor** (±2 °C). The sensor is located in the intake air stream path just above the mainframe impeller.
  -- A user-defined limit can be set, default is 55 °C.
  -- Limit is restored from non-volatile memory at power-on.
  -- When the limit is exceeded, the monitor generates a warning on the display, sets a status bit, the temperature LED flashes, and the beeper sounds (if enabled).
- **Power Supply Temperature Monitor** (±2 °C). The sensor is located under a power supply transformer. The reading is indicative of overall power supply loading.
  -- If the temperature exceeds an expected level, the monitor generates a warning on the display, sets a status bit, the power supply LED flashes, and the beeper sounds (if enabled).
- **Module Exhaust (Slot) Temperature Monitor** (±2 °C). Three sensors, front, middle, and rear are located above each slot.
  -- Temperatures may be queried in actual °C or as temperature rise above ambient (in °C).
  -- User-definable limits can be set for the entire cardcage or on a slot-by slot basis.
  -- Limit may be set in actual temperature (default is +65 °C) and as temperature rise above ambient (default is +15 °C).
  -- Limits are restored from non-volatile RAM at power-on.
  -- If a slot temperature exceeds the specified limit, the monitor generates a warning on the display, sets a status bit, the temperature LED flashes, and the beeper sounds (if enabled).

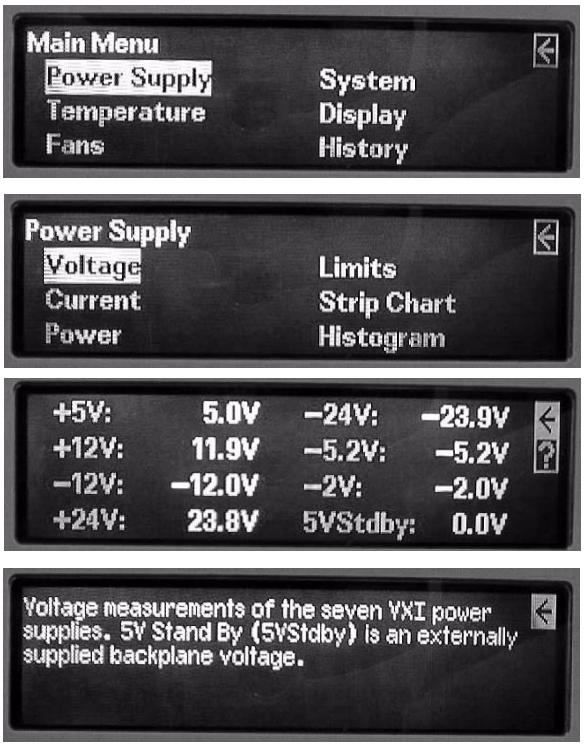
- **Voltage Monitor** measures all seven power supply voltages (+5, ±12, ±24, -5.2V, and -2V).
  -- Voltages outside of fixed limits (based on VXI specifications) causes the monitor to generate a warning on the display, set a status bit, the Power Supply LED flashes, and the beeper sounds (if enabled).
- **Current Monitor** measures the current from all seven power supplies (+5, ±12, ±24, -5.2V, and -2V).
  -- Currents exceeding user-specified limits (defaults to mainframe specifications +10%) causes the monitor to generate a warning on the display, set a status bit, the Power Supply LED flashes, and the beeper sounds (if enabled).
- **Power Monitor** calculates the total output power of the power supply [Σ(V*I)].
  -- Total output power exceeding user-specified limits (defaults to mainframe power supply maximum) causes the monitor to generate a warning on the display, set a status bit, the Power Supply LED flashes, and the beeper sounds (if enabled).
- **Backplane Activity Monitor** monitors activity on the VXI backplane.
  -- The DS0 and DS1 backplane lines are monitored. Activity is displayed through the front panel Activity LED. No warning is associated with this activity.
  -- SYSFAIL is also monitored. Assertion of SYSFAIL (by any VXI module) is shown by the amber SYSFAIL LED on. It will not sound the beeper or generate a warning on the display.
- **Fan Monitor** monitors the operation of the fans.
  -- Fan speeds outside a fixed range generate a warning on the display, sets a status bit, the FAN LED flashes, and the beeper sounds (if enabled).
  -- Fan level is returned as a percentage (%) of maximum speed.
- **Fan Controller** adjusts mainframe fan speed based on the power supply, ambient, and individual slot temperatures. The fan can be set to maximum or FULL speed by a front panel switch.
  -- In the Variable mode, if the power supply temperature exceeds an expected level, the fan speed increases to maximum.
  -- In the Variable mode, if the ambient temperature exceeds +50 °C, the fan speed increases to maximum.
  -- In the Variable mode, if any VXI module exhaust temperature approaches a user-defined limit, fan speed increases.
  -- Otherwise, fan speeds operate at the lowest possible speed to maintain user-specified cooling level.
- **Time Monitor** records:
  -- Total hours of operation
  -- Time-on since power on, last test, last calibration, last history reset.
  -- Time remaining until the next maintenance. This time can be set and queried by the user. A warning is generated when the timer reaches 0. Note: this is disabled as shipped from Agilent.

Using the Display

The Enhanced Monitor display graphically portrays status information about the mainframe. This includes strip charts and histograms of fan speed, slot and ambient temperature, and power supply voltage, and power.

The first time the mainframe is powered on, the display prompts you to select a language; either English, German (Deutsch), French (Français), or Spanish (Español). Use the arrow keys just to the right of the display to highlight a language then press the **Enter** key. All display and help screens will appear in the selected language.

Use the up/down arrow keys to highlight a display item, then press the **Enter** key to select that item. In the upper right hand corner of all displays (except the language selection display) is an arrow; selecting this arrow and pressing the **Enter** key moves you back to the previous display. Some displays also have a question mark (**?**) in the upper right corner. Selecting the question mark brings up a help screen describing the display. Figure 2-2 shows three typical displays and a help screen.



Use the UP/DOWN arrow keys to highlight a menu item (in this case "Power Supply" is highlighted). Press the Enter key to select it.

Use the UP/DOWN arrow keys to highlight a menu item (in this case "Voltage" is highlighted). Press the Enter key to select it.

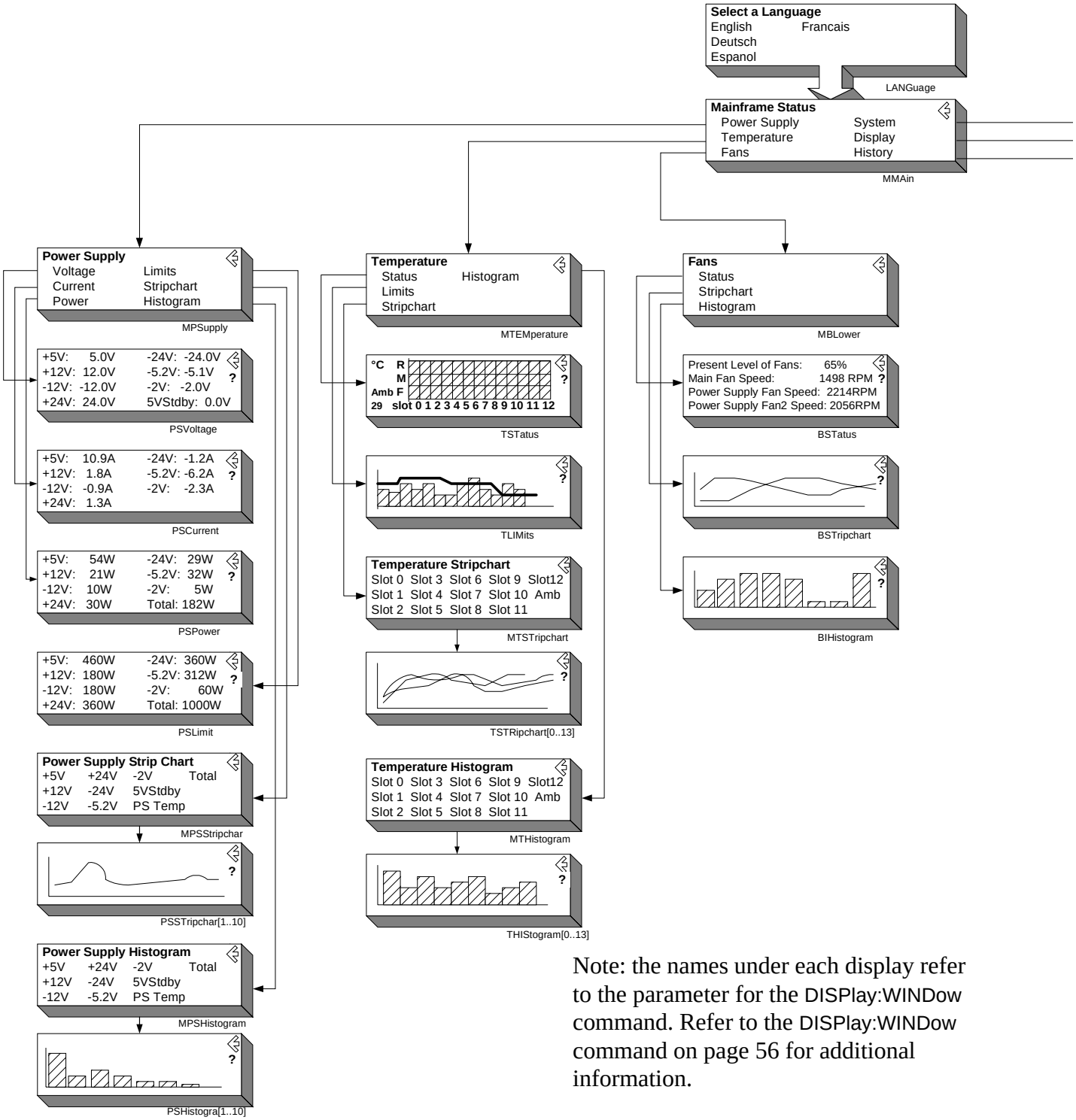
This display shows the actual measured power supply voltages. Use the UP/DOWN arrow keys to highlight either the arrow or the Question Mark. Highlight the Question Mark and press the Enter key for a display description.

Press the Enter Key to return to the previous display.

Figure 2-2. Typical Displays for the Agilent E8402A and E8404A Enhanced Monitor

Menu Map

Figure 2-3 shows a complete display menu map for the Enhanced Monitor.



Note: the names under each display refer to the parameter for the DISPlay:WINDow command. Refer to the DISPlay:WINDow command on page 56 for additional information.

Figure 2-3. Agilent E8402 & E8404 Enhanced Monitor Display Menu Map

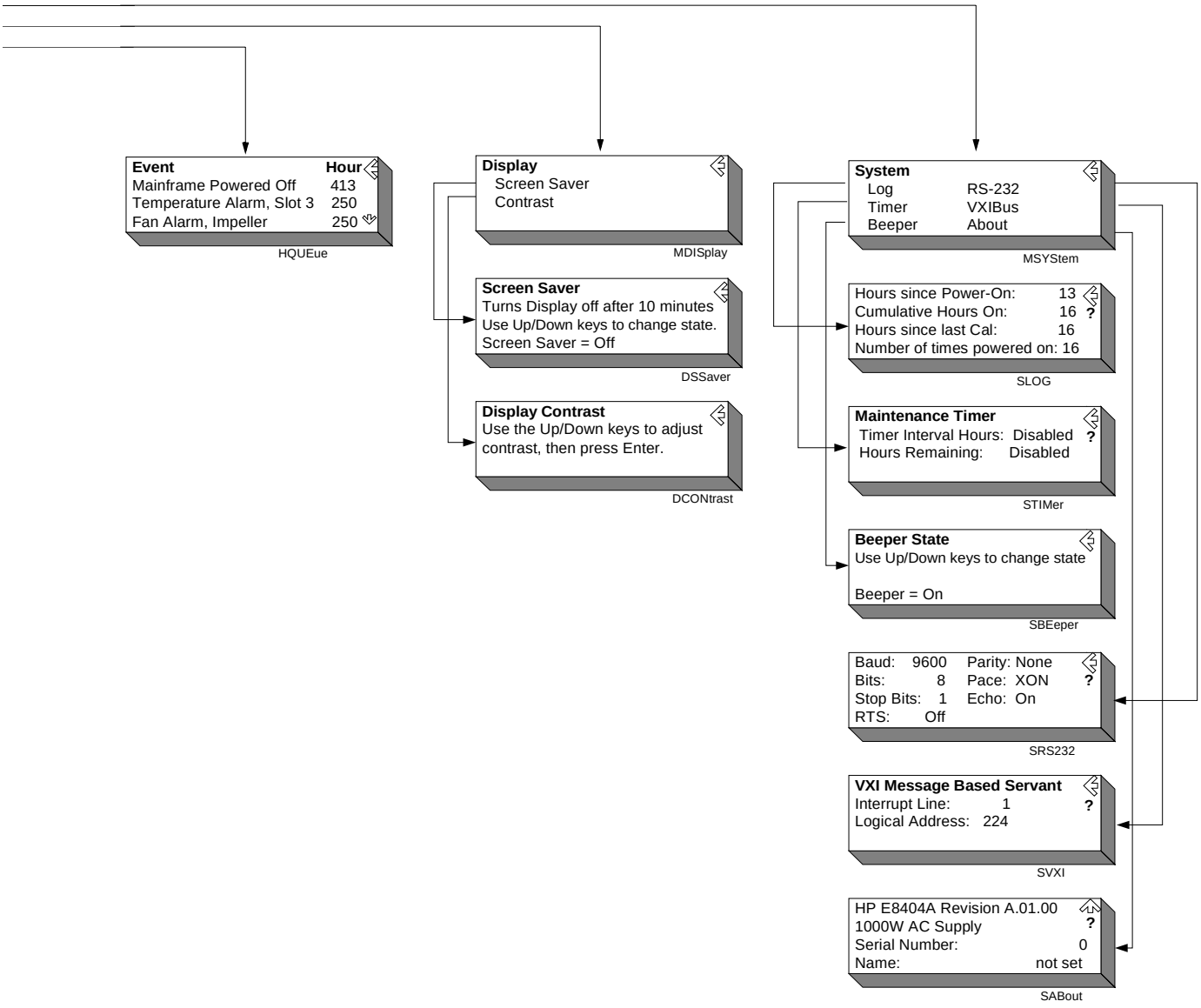


Figure 2-3. Agilent E8402 & E8404 Enhanced Monitor Display Menu Map (continued)

Enhanced Monitor Fan Control

With the front panel fan switch in the VAR position, the Enhanced monitor controls the fan speed based on slot temperature limits you specify. With the fan switch in the FULL position, the fan operates at full speed.

Essentially, the Enhanced Monitor's fan control has two contrasting functions: 1) keep the VXI modules installed in the cardcage cool and 2) operate as quietly as possible. These are somewhat conflicting goals because to operate at its quietest, the fan would have to be off and hence not keep the modules cool. Alternately, at its coolest, the fans would have to be full on and the airflow is not quiet. Therefore, the fan control algorithm is to keep the mainframe as quiet as possible while cooling the VXI modules adequately.

What is adequate cooling? You specify it through your selection of slot temperatures. For example, if you specify slot 7 temperature to be maintained within 15 °C of the ambient temperature, the fan controller adjusts fan speed until the cooling air coming off slot 7 is just under 15 °C above ambient. And it will keep it there, adjusting the fan speed as needed to maintain that temperature rise no matter what the ambient temperature might do. That way, the fan noise is at its lowest while maintaining appropriate cooling.

Each slot is monitored and compared to the specified slot temperature limits every two seconds. The slot closest to its limit is allowed to approach the limit in order to keep the fan speed as low as possible.

If you want a cooler mainframe, lower the slot temperature limits. If you want a quieter mainframe, raise the temperature limits. Just remember that the Enhanced Monitor Fan Controller is very accurate; if you specified 30 °C rise above ambient, the controller will maintain a limit just below 30 °C.

There is one exception. The power supply cooling overrides all other cooling requirements. For example, you may specify a 30 °C limit for all slots, but as you monitor the slot temperatures you notice that no slot is approaching the limit. It is likely that the Enhanced Monitor is working to keep the power supply adequately cooled. Power supply cooling requirements are primarily driven by the load placed on the power supply. It needs more cooling if it is significantly loaded. So, if the fan controller stops dropping the fan speed even though the slot temperatures are not close to the specified limits, it is probably because the power supply cooling requirements are dominating.

Software Control of Fan Speed

The SYSTem:BLOWer:STATe command (page 129) can change the state of the fans from VARiable to FULL at any time. When software control has set the fans to FULL, the front panel fan switch can be set to variable and the fans will remain at FULL. Software control can not put a mainframe with its switch set to FULL into a variable fan state. FULL means that the fans will run at full speed no matter what the conditions in the mainframe. VARiable means that the enhanced monitor sets the fan speed based on the temperature conditions in the mainframe and the temperature limits set by the user.

Setting Enhanced Monitor Limits

The Agilent E840x Enhanced Monitor has several limits that affect when it will issue warnings. Each limit should be selected based on the VXI modules installed in the mainframe.

Temperature Limits

The Enhanced Monitor monitors two types of temperature limits. First are the "Delta slot temperature limits" whose primary function is to pass your specified temperature limits to the Fan Controller (refer to “Enhanced Monitor Fan Control” on page 34). If these limits are not maintained, a warning is issued. The default value is 15 °C rise above ambient; this is a compromise between cooling and noise. Check the specifications of your installed VXI modules to determine sensitivity to temperature variation. You may need to specify a smaller delta slot temperature for some modules.

Second are the absolute temperature limits, for both individual slots and the ambient temperature. These guard the top end of the acceptable temperature spectrum and generate warnings if exceeded. The default values are generally acceptable to most VXI modules; but you should verify the temperature ratings for all VXI modules installed in the mainframe and set the slot’s absolute temperature limit accordingly. For example, many modules are specified for a temperature range of 0 to 55 °C and assume a 10 °C rise to occur in operation. Therefore, their absolute temperature is safely 65 °C (the default). But, if a VXI module is only rated to 45 °C (and assumes a 10 °C rise) then its slot should have an absolute temperature limit of 55 °C. You might set the limit lower for earlier warning.

Use the STATus:QUEStionable:TEMPerature:LIMit? command (page 112) to set temperature limits, both ambient and delta slot temperatures. Use the STATus:QUESTionable:TEMPerature:LEVEL? (page 111) to determine the actual threshold when an over-temperature warning will sound.

Current and Power Limits

By default, the Enhanced Monitor provides power supply current and power limit warnings only when the power supply is exceeding its capacity. But it is unlikely that all seven supplies will be used at maximum capacity. Consequently, this warning is generally too late for most applications. For example, the +5V supply in the Agilent E8404 is capable of providing up to 90A (peak current, refer to Appendix A). It is therefore capable of delivering the regulated voltage into nearly a dead short -- 0.06Ω. For this reason, you should specify current and power limits to reflect the actual needs of the VXI modules installed in the mainframe. Then a warning is generated in sufficient time to correct a problem.

To set current limits, calculate the worst case current needed on each supply for your application, add 10%, and set your current limit to this value. Alternately, allow your system to operate normally for a time, query the maximum values measured by the Enhanced Monitor’s history subsystem, and set the current limit to a comfortable margin above this maximum. Do this for each of the seven VXI supplies and for the total power value. In this way, the Enhanced Monitor can issue a warning when a module begins using more power than normal. Use the STATus:QUEStionable:CURRent:LIMit command (page 103) to set current limits, and STAT:QUES:POW:LIM to set the total power limit.

Handling Warnings

With the limits set, the mainframe will beep if a limit is exceeded. However, you need to include exception procedures in your computer program so that the program can handle the warnings. To do this, you need to enable the Enhanced Monitor's Status Subsystem to interrupt the computer when a warning occurs. Refer to Chapter 3, "Example 2: Setting up the Mainframe" on page 48, for a program example demonstrating this procedure.

Save The Limits

Once you have specified temperature and voltage/power limits for your mainframe, remember to save the limits in non-volatile memory. Otherwise, you will start again after a mainframe power-down or reset. Use the SYSTem:NVSave command (page 148) to save the values in non-volatile memory.

Enhanced Monitor Measurement Cycles

The Agilent E8402 and E8404 Enhanced Monitor monitors over 80 signals throughout the mainframe every two seconds. These measurements are fed to the display, the Status Subsystem (for warnings), the History Subsystem (for storage), and the Fan Controller. The display shows the measurements pertinent to the screen displayed, updated every two seconds. The Status Subsystem sets status bits in the condition registers, updated every two seconds. The History Subsystem calculates minimums, maximums, and histogram values, updated every two seconds. However, the Enhanced Monitor stores its measurements in the Trace Subsystem only once every 10 seconds.

During the measurement cycle, the Measuring bit in the Operational Status Condition Register is set and then cleared. This allows you to synchronize with the measuring cycle if you want to.

Using the History Queue

The Agilent E840x Enhanced Monitor provides many history feature records such as: minimum and maximum values, histograms, operating times, and event logs. As you begin to use the mainframe, the history features won't be of much use -- very little has happened, there is no history to record. But as time passes, the history features can provide valuable insights into the trends of your test system. Then, when you encounter a problem in your tests system, you have a record of events to evaluate:

-- What type of environment has the module experienced?
-- What events led up to the failure?
-- What changes from one test system to another?

Over time, familiarity with the problems of one particular test system may lead to predictive knowledge about the system. Then, by watching those predictive events using the history feature, you can prevent problems.

HISTory Queue

One of the history features is history queue – a list of events that occurred in the mainframe. History events are recorded with the operating time that the event took place (the operating time is the number of seconds since the mainframe was manufactured). The history queue is available through the display; operating time is displayed in hours. Operating Events are shown with the most recent displayed first, earliest events displayed last. Figure 2-4 shows an example history display.

To access the history queue, select **History** from the **Mainframe Status** display or execute the command: DISP:WIND HQU. Use the Up/Down arrow keys to page up and down the list (Up/Down arrows appear in the display only when additional data is available) four events at a time.

Figure 2-4. Example History Queue Display

RS-232 Programming

The RS-232 port on the Enhanced Monitor is primarily a debug port, designed for use with a dumb terminal or terminal emulator program on a PC. This allows you to execute SCPI commands directly without an application program and to monitor any errors in the error queue (including those generated through the VXI interface programming). It also allows you to query the Enhanced Monitor while the mainframe is in standby if an external +5VDC is applied to the 5V EXT terminals. The RS-232 port is the only possible source for temperature calibration since the mainframe must be empty for temperature calibration.

Windows 95® and Windows NT® provide a terminal emulator program called Terminal or HyperTeminal. These applets provide a convenient method of using the Enhanced Monitor. Use an appropriate nine-pin female to nine-pin female RS-232 cable (such as the Agilent 24542U) for connection between the PC and the Enhanced Monitor. Configure the Terminal settings for generic TTY, and the communication settings to match those of the Enhanced Monitor.

Default RS-232 parameters are:

- Baud: 9600
- Bits: 8
- Parity: None
- Stop bits: 1
- DTR/RTS: On
- Pace: XON
- Echo: On
- ERES: On
- Line buffer: On

Refer to Chapter 3 for RS-232 programming information. The SYSTem:COMMunicate:SERial ... commands set and/or modify the configuration of the Enhanced Monitor's serial interface. Serial communication commands take effect after the end of the program message containing the command(s).

Note If you use the Enhanced Monitor RS-232 port (located on the back of the mainframe) while the mainframe is in the standby mode, you must supply an external +5Vdc to the +5VEXT connector (located near the RS-232 port). If you use the RS-232 port while the mainframe is powered on, you do not need to provide the external +5Vdc.

The Enhanced Monitor also provides several short cuts, primarily for terminal use:

Backspace In TERMinal mode, a backspace means "back-up." It becomes a space in RAW mode.

Ctrl-R In TERMinal mode, this provides a "recall last command string" feature. It is ignored in RAW mode

Ctrl-T In either TERMinal or RAW mode, Ctrl-T performs a SYSTem:COMMunication:PRESet:TERMinal command. This puts the Enhanced Monitor into its terminal mode at whatever baud rate presently set.

Ctrl-C In either TERMinal or RAW mode, Ctrl-C performs the equivalent of a Device Clear. It can interrupt a command that is taking too long to execute and makes it possible to reset the Enhanced Monitor (*RST).

Be sure to turn off the Terminal applet's use of the control keys for Windows use if you want to use these short cuts.

The RS-232 port can be used to program the Enhanced Monitor. Be careful when programming this way though. Remember that you have to turn off terminal features like echo and immediate error. Do not try to use both the VXI programming interface and the RS-232 port at the same time. They both access the same error queue and status registers.

You should avoid changing RS-232 port parameters through the RS-232 port. It will work but you must be careful otherwise you may lose communications. Intersperse your commands with queries. This will help you stay synchronized with the port. If you reattach a terminal after using a computer and see no character echo, Ctrl-T should return the port to terminal mode.

Diagnostic Connector

The 25-pin Sub-D diagnostic connector provides access to backplane voltages, power supply and backplane temperatures, and output signals. The pins are described in Table 1-2.

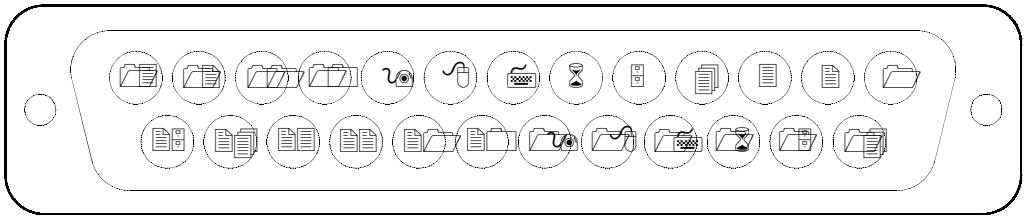


Table 2-1. Diagnostic Connector Pin Descriptions

Pin #	Function	Description
1	+5 VM	+5V backplane voltage monitor (high impedance). (+4.875 Vdc to +5.125 Vdc)
2	-12 VM	-12V backplane voltage monitor (high impedance). (-12.6 Vdc to -11.64 Vdc)
3	-24 VM	-24V backplane voltage monitor (high impedance). (-25.2 Vdc to -23.28 Vdc)
4	-2 VM	-2V backplane voltage monitor (high impedance). (-2.1 Vdc to -1.9 Vdc)
5	Rem On	Remote power on. See “Using the Remote Power-on Pins.”
6	+5 VC	+5 VDC source output (1A maximum).
7	+12 VC	+12 VDC source output (1A maximum).
8	+5 V Stdby	Input for +5V STDBY (1A maximum for pins 8 and 21 combined).
9	GND	Chassis ground.
10	SysReset *	TTL low-true input signal causes system reset, output indicates system reset. NOTE: If you use this pin you must not violate VXI specifications.
11	PS Temp	Output voltage proportional to power supply temperature (0 VDC at 0 °C, with a rise of 10 mV per degree centigrade).
12	Ref Temp	Output voltage proportional to backplane temperature (0 VDC at 0 °C, with a rise of 10 mV per degree centigrade). A function of the ambient temperature and load. At no load, $T_{ref} \simeq$ 2 °C + ambient. At full load and high fan speed, $T_{ref} \simeq$ 14 °C + ambient. At full load and low fan speed, $T_{ref} \simeq$ 20 °C + ambient.
13	Fans OK *	TTL low-true output voltage indicates power supply and backplane cooling fans are operating.
14	+12 VM	+12V backplane voltage monitor (high impedance). (+11.64 Vdc to +12.6 Vdc)
15	+24 VM	+24V backplane voltage monitor (high impedance). (+23.28 Vdc to +25.2 Vdc)
16	-5.2 VM	-5.2V backplane voltage monitor (high impedance). (-5.46 Vdc to -5.044 Vdc)
17	GND	Chassis ground.
18	REM Rtn	Remote power switch return. See “Using the Remote Power-On Pins.”.
19	V OK *	TTL low-true output voltage indicating the +5V, ± 12V, ± 24V, -5.2V, and -2V power supply voltages are within ± 8% of its allowed variation.
20	GND	Chassis ground.
21	+5 V Stdby	Input for +5V STDBY (1A maximum for pins 8 and 21 combined).
22	GND	Chassis ground.
23	ACFAIL*	TTL low-true output asserted by the mainframe power monitor at power down or whenever a loss of power is detected.
24	GND	Chassis ground.
25	RSV	Reserved. Used for Timer Verification; refer to Chapter 4.

+5VC (pin 6)

The +5 volt output allows you to power external TTL circuits if required. The maximum current allowed from this supply is 1.0A

+12VC (pin 7)

The +12 volt output allows you to power external circuits, charge a battery, or power relays if required. The maximum current allowed from this supply is 1.0A

+5V STDBY (pins 8, 21)

This provides an input to the mainframe backplane for a +5V DC standby power source. This may be from a separate battery or power supply. The maximum current allowed is 1A total (pins 8 and 21 wired in parallel). It can be used to power timers and other circuits when the mainframe is in standby mode.

SYSRESET* (pin 10)

This pin provides an extension of the VXI backplane SYSRESET* signal line. It can be used to monitor for SYSRESET* or to send a SYSRESET* tot he backplane. Shorting this line to ground asserts the SYSRESET* signal to the system. If you use an extension cable from the Diagnostic Connector, make certain that you do not violate the VXI backplane electrical specifications (i.e. keep the cable as short as possible, buffer the signal line, etc.).

ACFAIL* (pin 23)

This pin lets you monitor the ACFAIL* signal from the VXI backplane. If you use an extension cable from the Diagnostic Connector, make certain that you do not violate the VXI backplane electrical specifications (i.e. keep the cable as short as possible, buffer the signal line, etc.).

Chapter 3
Programming the Enhanced Monitor

This chapter explains how to program the enhanced monitor of the Agilent E8402A and E8404A VXI mainframes including:

- Complete C language program examples
- Complete SCPI Command Reference
- Complete IEEE 488.2 Common Command Reference

Understanding SCPI Commands

Commands are separated into two types: IEEE 488.2 Common Commands and SCPI Commands.

Common Command Format

The IEEE 488.2 standard defines the Common commands that perform functions like reset, self-test, status byte query, etc. Common commands are four or five characters in length, always begin with the asterisk character (*), and may include one or more parameters. The command keyword is separated from the first parameter by a space character. Some examples of Common commands are shown below:

```
*RST    *ESR 32    *STB?    *TST?
```

SCPI Command Format

The SCPI commands perform functions like setting parameters, making measurements, and querying instrument states or retrieving data. A subsystem command structure is a hierarchical structure that usually consists of a top level (or root) command, one or more lower-level commands, and their parameters. The following example shows part of a typical subsystem:

```
:DISPlay
  [:WINDow] <display window>
  [:WINDow]?
  :TEXT
      [:DATA] <string>
      [:DATA]?
```

:DISPlay is the root command, [:WINDow] is a second-level command with parameter.

Command Separator

A colon (:) always separates one command from the next lower-level command as shown in the example subsystem above.

Abbreviated Commands

The command syntax shows most commands as a mixture of upper- and lowercase letters. The uppercase letters indicate the abbreviated spelling for the command. For shorter program lines, send the abbreviated form. For better program readability, you may send the entire command. The instrument will accept either the abbreviated form or the entire command.

For example, if the command syntax shows DISPlay, then DISP and DISPLAY are both acceptable forms. Other forms of DISPlay, such as DISPL or DISPLY will generate an error. You may use upper- or lowercase letters. Therefore, DISPLAY, display, and DiSpLaY are all acceptable.

Implied Commands

Implied commands are those which appear in square brackets ([ ]) in the command syntax. (Note that the brackets are not part of the command and are not sent to the instrument.) Suppose you send a second-level command but do not send the preceding implied command. In this case, the instrument assumes you intend to use the implied command and it responds as if you had sent it.

Examine the example subsystem above. The second level command [:WINDow] is an implied command (indicated by square brackets []). You can use either form:

:DISPlay:WINDow <*display window*> **or** :DISPlay <*display window*>

Parameters

Parameter Types. The following table contains explanations and examples of parameter types you might see later in this chapter.

Parameter Type	Explanations and Examples
Enumerated (abbreviated enum in the Parameter tables)	Accepts a specified set of words as the parameter. For example, the <*display window*> parameter of the :DISPlay:WINDow command accepts: MMAin, MPSupply, MTEMperature, MBLower, MDISplay, MSYStem . . .
Numeric	Accepts all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. 123, 123E2, -123, -1.23E2, .123, 1.23E-2, 1.23000E-01. Special cases include MIN, MAX, and DEF.
int16 or uint32	int16 means a signed 16-bit integer value; uint32 means an unsigned 32-bit integer value.
float	floating point number
Boolean	Represents a single binary condition that is either true or false. ON, OFF, 1, 0.

Optional Parameter: Parameters shown within square brackets ([ ]) are optional parameters. (Note that the brackets are not part of the command and are not sent to the instrument.) If you do not specify a value for an optional parameter, the instrument chooses a default value.

Parameters separated by a vertical bar (|) indicate the only possible choices. For example:

SYSTem:COMMunicate:SERial:CONTrol:RTS ON|OFF

the ON|OFF means that you can set RTS to either ON or OFF.

Linking Commands

Linking IEEE 488.2 Common Commands with SCPI Commands. Use a semicolon (;) between the commands. For example:

```
*RST;SYSTem:VERSion?   or   SYSTem:VERSion?;*RST
```

Linking Multiple SCPI Commands. Use both a semicolon (;)and a colon (:) between the commands. For example:

```
SYST:COMM:SER:BAUD 19200;:SYST:COMM:SER:BITS 8
```

Programming Examples

This section contains SCPI program examples that demonstrate how to read history data from the enhanced monitor, perform the self test, set and verify limit warnings. The program examples are written in ANSI C language with Agilent VISA extensions. To run one of these programs you must have the Agilent SICL Library, the Agilent VISA library, an Agilent-IB interface module installed in an external PC, an Agilent E1406 Command Module, and the enhanced monitor in either the Agilent E8402A or E8404A VXI mainframe.

The following program examples are developed with the ANSI C language using the Agilent VISA extensions. The program was written and tested in Microsoft Visual C++® but can be compiled under any standard ANSI C compiler.

A more complete Enhanced Monitor setup example is provided on the Agilent Universal Instrument Drivers CD ROM in the directories:

```
\examples\Agilente8402
\examples\Agilente8404
```

Example 1: Self Test & Verification

The following example program resets the Enhanced Monitor, performs a complete self test (this can take up to seven minutes to complete), read the mainframe model number string, read the mainframe serial number, and writes data to the Enhanced Monitor display.

```
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

    /* Interface address is 9, Enhanced Monitor secondary address is 224*/
    /* #define INSTR_ADDR "GPIB0::9::224::INSTR" */
#define INSTR_ADDR "GPIB-VXI0::224::INSTR"

    /* a simple VISA error-handling macro. This version prints the line number  from which
       it was called and exits if it gets an error */
#define CHECKERR(errStatus, line) if (errStatus < VI_SUCCESS) { \
                    printf("Line %d: error %x returned from visa. Aborting\n", \
                        line, errStatus); \
                    exit (errStatus); \
                  }

int main()
{
   ViStatus errStatus;                  /*Status from each VISA call */
   ViSession viRM;                      /*Resource mgr. session */
   ViSession en_mon;                    /* Enhanced Monitor session */

   int into;                            /* variable for *OPC? */
   char id_string[256];                 /* Model Number string */
   char ser_num[256]                    /* mainframe serial number */
   chr txt_string[256]                  /* String sent to display */
   char selftst_string[256];            /* Self-test string */

    /* Open the default resource manager  */
   errStatus = viOpenDefaultRM (&viRM);
     CHECKERR(errStatus, __LINE__);

    /* Open the Enhanced Monitor instrument session */
   errStatus = viOpen(viRM,INSTR_ADDR,VI_NULL,VI_NULL,&en_mon);
     CHECKERR(errStatus, __LINE__);

    /* Reset the Enhanced Monitor */
   errStatus = viQueryf(en_mon, "*RST;*OPC?\n","%i",&into);
     CHECKERR(errStatus, __LINE__);

    /* Set Timeout Value to 8 minutes for Self Test */
  viSetAttribute (en_monA,VI_ATTR_TMO_VALUE,480000);

    /* Perform Enhanced Monitor Self-Test - approx. 7 minutes */
   errStatus = viQueryf(en_mon, "TEST:ALL?\n", "%t", selftst_string);
         CHECKERR(errStatus, __LINE__);
   printf("Self Test Result is %s\n", selftst_string);
```

PROGRAM CONTINUED NEXT PAGE

```
    /* Query the mainframe model */
    errStatus = viQueryf(en_mon, "SYSTEM:MODEL?\n", "%t", id_string);
      CHECKERR(errStatus, __LINE__);
    printf("ID is %s\n", id_string);

    /* Query the mainframe serial number*/
    errStatus = viQueryf(en_mon, "SYSTEM:SNUMBER?\n", "%t", ser_num);
      CHECKERR(errStatus, __LINE__);
    printf("Serial Number is: %s\n", ser_num);

    /* Write a Message to the Enhanced Monitor Display */
    errStatus = viPrintf(en_mon,"DISP:TEXT %s \n","\\n        Hello World!");
      CHECKERR(errStatus, __LINE__);

    /* Close the Enhanced Monitor Instrument Session */
    errStatus = viClose (en_mon);
      CHECKERR(errStatus, __LINE__);

    /* Close the Resource Manager Session */
    errStatus = viClose (viRM);
      CHECKERR(errStatus, __LINE__);

    return VI_SUCCESS;
}
```

Example 2: Setting up the Mainframe

The following example program demonstrates how to customize the mainframe's Enhanced Monitor features. Specifically, it enables the status subsystem, sets temperature limits for a specific slot in the mainframe and verifies the limit. To simulate a limit warning, you can set the limit to a value lower than ambient temperature.

```
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

    /* Interface address is 9, Enhanced Monitor default secondary address is 224 */
    /* #define INSTR_ADDR "GPIB0::9::224::INSTR" */
#define INSTR_ADDR "GPIB-VXI0::224::INSTR"

    /* Enable STAT:OPER bits for Calibrating, Measuring, History Queue Full */
#define OPER_ENAB           (ViUInt16)0x0411

    /* Enable STAT:QUES bits for Voltage Summary, Current Summary, Power,
    Temperature summary, Calibration, Blower summary, UMCounter, Unexpected
    parameter */
#define QUES_ENAB           (ViUInt16)0x471B

    /* Set absolute temperature limit TEMP_LIM  (45 °C) for slot LIM_SLOT  (slot 6)*/
#define LIM_SLOT            "OUT6"
#define TEMP_LIM            (ViInt16)45

    /* a simple VISA error-handling macro. This version prints the line number  from which
       it was called and exits if it gets an error */
#define CHECKERR(errStatus, line) if (errStatus < VI_SUCCESS) { \
                    printf("Line %d: error %x returned from visa. Aborting\n", \
                        line, errStatus); \
                    exit (errStatus); \
                  }

int main()
{
    ViStatus errStatus;                 /* Status from each VISA call */
    ViSession viRM;                     /* Resource mgr. session */
    ViSession en_mon;                   /* Enhanced Monitor session */
    ViUInt16 echoed_limit;              /* For verification of programmed temp
                                        limit */

        /* Open the default resource manager */
    errStatus = viOpenDefaultRM(&viRM);
    CHECKERR(errStatus, __LINE__);

        /* Open the Enhanced Monitor instrument session */
    errStatus = viOpen(viRM, INSTR_ADDR, VI_NULL, VI_NULL, &en_mon);
    CHECKERR(errStatus, __LINE__);
```

```
    /* Reset the Enhanced Monitor */
    errStatus = viPrintf(en_mon, "*RST\n");
    CHECKERR(errStatus, __LINE__);

    /* Clear status of the Enhanced Monitor */
    errStatus = viPrintf(en_mon, "*CLS\n");
    CHECKERR(errStatus, __LINE__);

    /* Enable STAT subsystem */
    errStatus = viPrintf(en_mon, "STAT:OPER:ENAB %hd\n", OPER_ENAB);
    CHECKERR(errStatus, __LINE__);

    errStatus = viPrintf(en_mon, "STAT:QUES:ENAB %hd\n", QUES_ENAB);
    CHECKERR(errStatus, __LINE__);

    /* Program a temperature limit for a selected slot */
    errStatus = viPrintf(en_mon, "STAT:QUES:TEMP:LIM %s,%hd\n", LIM_SLOT,
                                 TEMP_LIM);
    CHECKERR(errStatus, __LINE__);

    /* Verify the temperature limit setting */
    errStatus = viQueryf(en_mon, "STAT:QUES:TEMP:LIM? %s\n", "%hd",
                                 LIM_SLOT,&echoed_limit);
    CHECKERR(errStatus, __LINE__);

    printf("Temperature limit for slot %s is now %hd\n", LIM_SLOT,echoed_limit);
    if (TEMP_LIM != echoed_limit)
        printf("ERROR: requested %d deg limit for slot %s, actual: %hd deg\n",
                TEMP_LIM, LIM_SLOT, echoed_limit);

    /* If you wish to save your new settings in non-volatile RAM (NVRAM),
   uncomment the following 2 lines of code */
    /*
    errStatus = viPrintf(en_mon, "SYST:NVS\n");
    CHECKERR(errStatus, __LINE__);
    */

    /* Close the Enhanced Monitor instrument session */
    errStatus = viClose(en_mon);
    CHECKERR(errStatus, __LINE__);

    /* Close the resource manager session */
    errStatus = viClose(viRM);
    CHECKERR(errStatus, __LINE__);

    return VI_SUCCESS;
}
```

Example 3: Set-up the RS-232

The following example program demonstrates how to set-up the RS-232 Port on the Enhanced Monitor. In this setup, the Enhanced Monitor is set to its default values which are suitable for use with a dumb terminal. The baud rate is changed to 19200 baud.

Note If you use the Enhanced Monitor RS-232 port (located on the back of the mainframe) while the mainframe is in the standby mode, you must supply an external +5Vdc to the +5VEXT connector (located near the RS-232 port). If you use the RS-232 port while the mainframe is powered on, you do not need to provide the external +5Vdc.

```
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

    /* Interface address is 9, Enhanced Monitor secondary address is 224*/
    /* #define INSTR_ADDR "GPIB0::9::224::INSTR" */
#define INSTR_ADDR "GPIB-VXI0::224::INSTR"

    /* a simple VISA error-handling macro. This version prints the line number  from which
       it was called and exits if it gets an error */
#define CHECKERR(errStatus, line) if (errStatus < VI_SUCCESS) { \
                    printf("Line %d: error %x returned from visa. Aborting\n", \
                        line, errStatus); \
                    exit (errStatus); \
                  }

int main()
{
   ViStatus errStatus;                  /*Status from each VISA call*/
   ViSession viRM;                      /*Resource mgr. session */
   ViSession en_mon;                    /* Enhanced Monitor session  */

    /* Open the default resource manager  */
   errStatus = viOpenDefaultRM (&viRM);
    CHECKERR(errStatus, __LINE__);

    /* Open the Enhanced Monitor instrument session */
   errStatus = viOpen(viRM,INSTR_ADDR,VI_NULL,VI_NULL,&en_mon);
    CHECKERR(errStatus, __LINE__);

    /* Reset the Enhanced Monitor */
   errStatus = viPrintf(en_mon, "*RST\n");
    CHECKERR(errStatus, __LINE__);


    /* Set Serial Port Parametersfor use with dumb terminal */
   errStatus = viPrintf(en_mon, "SYST:COMM:SER:PRES:TERM");
    CHECKERR(errStatus, __LINE__);
```

```
    /* For use with a computer (PC), execute the following lines of code */
    /*errStatus = viPrintf(en_mon, “SYST:COMM:SER:PRES:RAW”);
      CHECKERR(errStatus, __LINE__);
      */

      /* Set Baud Rate to 19200 */
    errStatus = viPrintf(en_mon, “SYST:COMM:SER:BAUD 19200“);
      CHECKERR(errStatus, __LINE__);

      /* Close the Enhanced Monitor Instrument Session */
    errStatus = viClose (en_mon);
      CHECKERR(errStatus, __LINE__);

      /* Close the Resource Manager Session */
    errStatus = viClose (viRM);
      CHECKERR(errStatus, __LINE__);

    return VI_SUCCESS;
}
```

Example 4: Reading Current Status Information

The following example program reads the current status of the VXI mainframe and reads trace data or histogram data from slot 5 of the VXI mainframe.

```
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

    /* Interface address is 9, Enhanced Monitor secondary address is 224 */
/* #define INSTR_ADDR "GPIB0::9::224::INSTR"  */
#define INSTR_ADDR "GPIB-VXI0::224::INSTR"

    /* a simple VISA error-handling macro. This version prints the line number from which
    it was called and exits if it gets an error */
#define CHECKERR(errStatus, line) if (errStatus < VI_SUCCESS) { \
     printf("Line %d: error %x returned from visa. Abort!\n", line, errStatus); \
          exit (errStatus); \
     }

int main()
{
     ViStatus errStatus;                    /* Status from each VISA call */
     ViSession viRM;                        /* Resource mgr. session */
     ViSession en_mon;                      /* Enhanced Monitor session */

     short tracArray[400];                  /* Stores up to 360 points from a TRAC */
     char preamble[1024];                   /* Receives PREamble textual info */
     int siz, i, scaledTimes[360];
     float scaledTemps[360];
     ViInt16 format, type, points, count;   /* utility variables for PREamble */
     float yincrement;                      /* utility variables for PREamble */
     ViInt16 xincrement, xreference, yorigin, yreference;  /* utility variables for
                                            PREamble */
     ViInt32 xorigin;                       /* utility variable for PREamble */

     int histArray[10];              /* HIST:TEMP:HIST data storage for OUT5 */
     int minArray[10], maxArray[10]; /* HISTogram "bucket" boundaries */

        /* Open the default resource manager */
     errStatus = viOpenDefaultRM(&viRM);
     CHECKERR(errStatus, __LINE__);

        /* Open the Enhanced Monitor instrument session */
     errStatus = viOpen(viRM, INSTR_ADDR, VI_NULL, VI_NULL, &en_mon);
     CHECKERR(errStatus, __LINE__);

     errStatus = viSetAttribute(en_mon, VI_ATTR_TMO_VALUE, 10000);

        /* Reset the Enhanced Monitor */
     errStatus = viPrintf(en_mon, "*RST\n");
     CHECKERR(errStatus, __LINE__);
```

```
/* Read and Print temperature TRACe data for slot OUTF5 */

    /* Compute the number of elements in teh tracArray[] */
     siz = sizeof(tracArray) / sizeof(tracArray[0]);/* siz is initially max data count */

    /* Read TRACe raw data for slot 5 Front (OUTF5) into tracArray[] and get the actual
    data count */
     errStatus = viQueryf(en_mon, "TRAC:DATA? OUTF5\n", "%#hb%*t",
                                  &siz, tracArray);   /* siz receives actual data count */
     CHECKERR(errStatus, __LINE__);

        /* Now read the PREamble that describes this trace data. Note that you
           MUST read the TRAC data immediately prior to reading the PREamble. */
     errStatus = viQueryf(en_mon, "TRAC:DATA:PRE? OUTF5\n", "%t", preamble);
     CHECKERR(errStatus, __LINE__);

     printf("PREamble: %s\n", preamble); /* For visual reference */

        /* Extract the various fields of the PREamble. */
     sscanf(preamble, "%hd,%hd,%hd,%hd,%hd,%ld,%hd,%f,%hd,%hd",
                &format, &type, &points, &count, &xincrement, &xorigin,
                &xreference, &yincrement, &yorigin, &yreference);

    /* Print scaled Temperature trace data */
     if (siz > 0) {                              /* we have some trace data */
          printf("Scaled times:temperatures for trace OUTF5\n");
        /* Note that TRAC data for +2 (2 seconds after turn-on) is not valid.
           Invalid (unacquired) data in TRAC is set to -1 (-0.1 degree) */
          for (i=0; i<siz; i++) {                /* scale it, store it, and display it. */
               scaledTimes[i] = ((i-xreference) * xincrement) + xorigin;
               scaledTemps[i] = ((tracArray[i]-yreference) * yincrement) + yorigin;
               printf("%5d: %3.1f,    ", scaledTimes[i], scaledTemps[i]);
          }
     }

/* Read and print temperature HISTogram data for slot OUT5 into histArray[] */

    /* Set units of returned data to seconds */
     errStatus = viPrintf(en_mon, "HIST:UNIT:TIME SEC\n"); /* max precision */
     CHECKERR(errStatus, __LINE__);

    /* Get the array of histogram values */
     errStatus = viQueryf(en_mon, "HIST:TEMP:HIST? OUT5\n", "%,10d", histArray);
     CHECKERR(errStatus, __LINE__);

    /* Get the array of histogram "buckets" minima */
     errStatus = viQueryf(en_mon, "HIST:TEMP:HIST? OUT5,MIN\n", "%,10d",minArray);
     CHECKERR(errStatus, __LINE__);

    /* Get the array of histogram "buckets" maxima */
     errStatus = viQueryf(en_mon, "HIST:TEMP:HIST? OUT5,MAX\n", "%,10d",maxArray);
     CHECKERR(errStatus, __LINE__);
```

```
        printf("\nHISTogram data for 10 temperature ranges of slot OUT5\n");
        for (i=0; i<10; i++)
            printf("%5.1f to %5.1f deg: %d seconds\n",
                    0.1*minArray[i], 0.1*maxArray[i] , histArray[i]);

        /* Close the Enhanced Monitor instrument session */
        errStatus = viClose(en_mon);
        CHECKERR(errStatus, __LINE__);

        /* Close the resource manager session */
        errStatus = viClose(viRM);
        CHECKERR(errStatus, __LINE__);
        return VI_SUCCESS;

}
```

SCPI Command Reference

The following section describes the SCPI commands for the Agilent E8402A Enhanced Monitor. Commands are listed alphabetically by subsystem and also within each subsystem.

CALibration Subsystem

The CALibration Subsystem is described in detail in Chapter 4 of this manual. Refer to that chapter for complete calibration and performance verification procedures.

Subsystem Syntax

:CALibration	
[:ALL]?	Performs complete monitor calibration.
:TEMPerature?	Calibrates temperature monitoring
:VALue	
:TEMPerature <value>	Sets the calibration temperature.
:TEMPerature?	Returns the calibration temperature.
:VOLTage <*supply*>,<*value*>	Sets calibration voltage value
:VOLTage? <*supply*>	Returns calibration voltage value
:VOLTage? <*supply*>	Calibrates voltage monitoring

The DISPlay subsystem controls the mainframe's display.

Subsystem Syntax

```
:DISPlay
  [:WINDow] <display window>     Sets display data screen to <display window>
  [:WINDow]?                     Returns display data screen presently showing
     :STATe <state>              Sets mainframe display state (ON/OFF/AUTO)
     :STATe?                     Returns monitor mod state (ON/OFF/AUTO)
     :TEXT[:DATA] <string>       Displays a user-defined message on the display
```

DISPlay[:WINDow] *<display window>*
DISPlay[:WINDow]?

DISPlay[:WINDow] <*display window*> sets the data screen presently showing on the mainframe's display to the window described by the <*display window*> parameter.

DISPlay[:WINDow]? returns a string representing the current display window.

Parameters

Name	Type	Range	Default	Description
<*display window*>	enum	MMAin	MMAin	top level menu
		MPSupply		power supply menu
		MTEMperature		temperature menu
		MBLower		fan menu
		MDISplay		display menu
		MSYStem		system menu
		MPSStripchar		power supply stripchart menu
		MPSHistogra		power supply histogram menu
		MTSTripchart		temperature stripchart menu
		MTHistogram		temperature histogram menu
		PSVoltage		power supply voltage status
		PSCurrent		power supply current status
		PSPower		power supply power status
		PSLimit		power supply limits
		PSSTripcha1 - PSSTripcha10		power supply stripcharts (refer to comments)
		PSHistogra1 - PSHistogra10)		power supply histograms (refer to comments)
		TSTatus		temperature status
		TLIMits		temperature limits
		TSTRipchar0 - TSTRipchar13)		temperature stripcharts (refer to comments)
		THIStogram0 - THIStogram13)		temperature histograms (refer to comments)
		BSTatus		blower status
		BSTRipchart		mainframe cooling blowers stripchart
		BHIStogram		mainframe cooling blowers histogram
		DCONtrast		display contrast alteration
		DSSaver		display screen saver state selection
		SBEeper		system beeper setting
		SABout		system mainframe description
		STIMer		system user maintenance counter status
		SLOG		system log data
		SRS232		system RS-232 settings
		SVXI		System VXI Settings
		HQUeue		History Queue Listing
		LANGuage		mainframe display language selection

Comments

- The "Agilent E8402 & E8404 Enhanced Monitor Display Menu Map" on page 32 shows a simplified menu map for the Enhanced Monitor. The keywords below each display box are the <*display window*> range parameter from the previous table.

- For PSSTripchart and PSHistogram, the number suffix (1 - 10) indicates which power supply is displayed, refer to the following table. PSSTripchart displays Watts vs. Time; PSHistogram displays hours/minutes/seconds vs. Watts.

PSSTripchart, PSHistogram	Power Supply
1	P5 (positive 5 volt supply)
2	P12 (positive 12 volt supply)
3	N12 (negative 12 volt supply)
4	P24 (positive 24 volt supply)
5	N24 (negative 24 volt supply)
6	N5PT2 (negative 5.2 volt supply)
7	N2 (negative 2 volt supply)
8	P5STby (positive 5 volt standby)
9	Power Supply Temperature
10	Total wattage from power supply

- For TSTRipchar and THIStogram, the number suffix (0 - 12) represents the slot number (the suffix 0 (zero) indicates slot 0, the suffix 1 (one) indicates slot one, etc); the number 13 represents the ambient temperature.

Returned Data

Type	Range	Description
string		The string is the same as that listed in uppercase in the Range column under Parameters.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*display window*> parameter was omitted.
-221	"Settings Conflict"	The mainframe's power is off.
-224	"Illegal Parameter"	The <*display window*> parameter was not correct.

Reset Condition

At *RST, DISPlay[:WINDow] is set to MMAin.

DISPlay[:WINDow]:STATe *<state>*
DISPlay[:WINDow]:STATe?

DISPlay[:WINDow]:STATe sets the state of the mainframe's display (ON, OFF, AUTO). ON is the default, and means the display is always on when the mainframe is powered up. OFF disables the display window and it is dark. AUTO places the Display in screen saver mode where the display will turn off when no keys are pressed for 10 minutes.

DISPlay[:WINDow]:STATe? returns the state of mainframe's display. The returned data is a string (enumerated); either ON, OFF, or AUTO.

Parameters

Name	Type	Range	Default	Description
<*state*>	enum.	ON,OFF,AUTO	ON	State of Display

Returned Data

Type	Range	Description
enum	ON,OFF,AUTO	State of Display

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*state*> parameter was omitted.
-221	"Settings Conflict"	The mainframe's power is off.
-224	"Illegal Parameter"	The <*state*> parameter was not correct.

Reset Condition

At *RST, DISPlay[:WINDow]:STATe is set to ON.

DISPlay[:WINDow]:TEXT[:DATA] <*string*>

DISPlay[:WINDow]:TEXT[:DATA] displays a user defined message string on the mainframe's display. The message remains on the display until a key is pressed, the display window is changed programmatically, or the screen saver turns off the display.

Parameters

Name	Type	Range	Default	Description
<*string*>	string	186 characters	none	Message to display on screen. Can be any ASCII character (decimal value 20 to 225).

Comments

- Four lines of text can be displayed. The display uses a proportional font; line length can vary from 25 to 45 characters. The string will be clipped at 45 characters if there is not an embedded '\n', or it will be clipped at 4 lines, or at 186 characters. There is no error generated if the string is clipped. Text is white letters on a black background.)
- Embed a '\n' to cause a second, third, or fourth line. For example, the command **`DISP:TEXT "this is a test\nof the immediate \nmessage capability."`** executed from an RS-232 terminal will create the following display:

  this is a test
  of the immediate
  message capability.

- Pressing any front panel key (up/down arrow keys or **ENTER** key) or executing a DISP:WIND command will remove the text.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-128	"Numeric data not allowed"	The <*string*> started with a number.
-148	"Character data not allowed"	Quotation marks were left off.
-151	"Invalid string data"	An embedded new line in the string instead of a '\n'.
-221	"Settings Conflict"	The mainframe's power is off.

Reset Condition

*RST removes text, and set the display screen to MMAin.

Example

The following is a Visual C example:

```
viPrintf(vi, "disp:text \"this is a test\nof the immediate\nmessage capability.\"\n")
```

The FORMat subsystem controls the TRACe data format.

Subsystem Syntax

```
:FORMat
   :BORDer NORM|SWAP   Sets the byte order of TRACe data.
   :BORDer?            Returns the byte order of the TRACe data.
```

FORMat:BORDer <*order*>
FORMat:BORDer?

FORMat:BORDer sets the byte order of the data returned by the TRACe subsystem. NORMal is with most significant byte first. SWAPped is with least significant byte first.

FORMat:BORDer? returns the byte order of the data returned by the TRACe subsystem.

Parameters

Name	Type	Range	Description
<*order*>	enum.	NORM, SWAP	Sets byte order for TRACe subsystem.

Returned Data

Type	Range	Description
enum.	NORM, SWAP	String description of byte order.

Comments

- Byte order is not stored in non-volatile memory. Programs requiring SWAP order should include this command before reading TRACe data.
- Agilent VISA swaps the bytes in the definite block format of viQueryf in a PC. Therefore, you should not use this command if you are using Agilent VISA.

Reset Condition

At *RST, the byte order is reset to NORMal.

The history subsystem gives access to the enhanced monitor's history-gathering function.

Subsystem Syntax

:HISTory	
:BLOWer	
[:HISTogram]? <*blower*>	Returns <blower> histogram data
:CURRent	
:CMAXimum? <*supply*>	Returns max. <*supply*> current since pwr-on.
[:HISTogram]? <*supply*>	Returns <*supply*> current histogram data
:MAXimum? <*supply*>	Returns maximum <*supply*> current.
:POWer	
:CMAXimum? <*supply*>	Returns max. <*supply*> power since pwr-on.
[:HISTogram]? <*supply*>	Returns <*supply*> power histogram data.
:MAXimum? <*supply*>	Returns maximum <*supply*> power.
:QUEue	
:COUNt?	Returns number of events in history queue.
[:FETCh]? <*event index*>	Returns <*number*> history event from queue.
:RESet	
[:ALL]	Resets data in history subsystem to zero.
:BLOWer <*blower*>	Resets data in <*blower*> history to zero.
:CURRent <*supply*>	Resets data in <*supply*> current history to zero.
:POWer <*supply*>	Resets data in <*supply*> power history to zero.
:QUEue	Erases all data in history queue.
:TEMPerature <*slot*>	Resets the data in <*slot*> history to be zero.
:VOLTage <*supply*>	Resets data in <*supply*> voltage history to zero.
:TEMPerature	
:CMAXimum? <*slot*>	Returns max. <*slot*> temperature since pwr-on.
:CMINimum? <*slot*>	Returns min. <*slot*> temperature since pwr-on.
[:HISTogram]? <*slot*>	Returns for <*slot*> histogram data.
:MAXimum? <*slot*>	Returns maximum <*slot*> temperature.
:MINimum? <*slot*>	Returns minimum <*slot*> temperature.
:TIME	
:LCALibration?	Returns hr, min, sec since last calibration.
:LHReset?	Returns hr, min, sec since last history reset.
:LTST?	Returns hr, min, sec since last *TST.
:ON?	Returns hr, min, sec since power-on.
:OPERating?	Returns time mainframe has been operating.
:UNITs	
[:TIME]<*unit*>	Sets time units for history subsystem.
[:TIME]?	Returns time units for history subsystem.
:VOLTage	
:CMAXimum? <*supply*>	Returns max. <*supply*> voltage since pwr-on.
:CMINimum? <*supply*>	Returns min. <*supply*> voltage since pwr-on.
[:HISTogram]? <*supply*>	Returns <*supply*> voltage histogram data.
:MAXimum? <*supply*>	Returns maximum <*supply*> voltage.
:MINimum? <*supply*>	Returns minimum <*supply*> voltage.

HISTory:BLOWer[:HISTogram]? *<blower>[,MIN|MAX]*

HISTory:BLOWer[:HISTogram]? <*blower*> returns the histogram data for the specified <*blower*>. Ten values are returned for the amount of time the <*blower*>'s RPM level spent in ten different RPM ranges. Those RPM ranges can be queried with the MIN and MAX optional parameter. The units of the time values returned are HOURs by default, but can be changed with the HISTory:UNIT[:TIME] command.

Parameters

Name	Type	Range	Default	Description
<*blower*>	enum.	BLOWer1, BLOWer2, BLOWer3	none	Selects the fan whose RPM histogram is desired. BLOWer1 is the main cooling fan, BLOWer2 is the Power Supply cooling fan, BLOWer3 is a second Power Supply cooling fan on the Agilent E8404A mainframes.
optional parameter	enum.	MIN, MAX	none	Returns the maximums or minimums of the RPM ranges.

Returned Data

	Type	Range	Default	Description
<range1>	int32	0-2147483647	none	lowest RPM range.
<range2>	int32	0-2147483647	none	second RPM range.
<range3>	int32	0-2147483647	none	third RPM range.
<range4>	int32	0-2147483647	none	fourth RPM range.
<range5>	int32	0-2147483647	none	fifth RPM range.
<range6>	int32	0-2147483647	none	sixth RPM range.
<range7>	int32	0-2147483647	none	seventh RPM range.
<range8>	int32	0-2147483647	none	eighth RPM range.
<range9>	int32	0-2147483647	none	ninth RPM range.
<range10>	int32	0-2147483647	none	highest RPM range.

Comments

- HIST:BLOW? BLOW1 returns 10 time values, units set/queried by HIST:UNIT.
- HIST:BLOW? BLOW1,MAX returns 10 values representing the maximums for each RPM range.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*blower*> parameter was omitted.
-224	"Illegal Parameter"	The <*blower*> or *optional parameter* not correct.
-311	"Memory error"	The historical data's memory is not available.

Reset Condition

*RST has no effect on the HISTory subsystem.

Related Commands

HISTory:RESet:BLOWer, HISTory:UNITs[:TIME]

HISTory:CURRent:CMAXimum? <*supply*>

HISTory:CURRent:CMAXimum? <*supply*> returns a single floating point number for the maximum amperage (in milliamps) measured by the Enhanced Monitor for the <*supply*> since power-on of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5, P12, N12, P24, N24, N5PT2, N2	none	Selects the power supply for the current maximum request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float		Maximum current (in amperes) for specified power supply.

Comments

- These maximums can be reset by powering the mainframe off and then powering it back on.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The power supply doesn’t support current measurements.
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.

Reset Condition

*RST has no effect on the HISTory subsystem.

Related Commands

HISTory:CURRent:MAXimum?, HISTory:CURRent:[HISTogram]?

HISTory:CURRent[:HISTogram]? *<supply>[,MIN|MAX]*

HISTory:CURRent[:HISTogram]? <*supply*> returns the histogram data held for the specified <*supply*>. Ten values are returned for the amount of time the <*supply*>'s current spent in ten different current ranges. Those current ranges can be queried with the MIN and MAX optional parameter. The units of the time values returned are HOURs by default, but can be changed with the HISTory:UNIT[:TIME] command. The units returned for current ranges queried with the MIN or MAX parameters are integer values in milliamps.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum	P5, P12, N12, P24, N24, N5PT2, N2	none	Selects the power supply whose current histogram is desired. P5 is +5 Vdc supply, N12 is -12 Vdc supply, etc.
optional parameter	enum	MIN, MAX	none	Returns the minimums or maximums of the current ranges in milliamps.

Returned Data

	Type	Range	Default	Description
<range1>	int32	0-2147483647	none	lowest current range.
<range2>	int32	0-2147483647	none	second current range.
<range3>	int32	0-2147483647	none	third current range.
<range4>	int32	0-2147483647	none	fourth current range.
<range5>	int32	0-2147483647	none	fifth current range.
<range6>	int32	0-2147483647	none	sixth current range.
<range7>	int32	0-2147483647	none	seventh current range.
<range8>	int32	0-2147483647	none	eighth current range.
<range9>	int32	0-2147483647	none	ninth current range.
<range10>	int32	0-2147483647	none	highest current range.

Comments

- HIST:CURR? P5 returns 10 time values for the +5V supply.
- HIST:CURR? P5,MAX returns 10 values representing the maximum currents in each current range in milliamps.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*supply*> parameter was omitted.
-224	"Illegal Parameter"	*The <supply>* or *optional parameter* not correct.
-221	"Settings Conflict"	Power supply doesn't support current measurements.
-311	"Memory error"	The historical data's memory is not available.

Reset Condition

*RST has no effect on the HISTory subsystem.

Related Commands

HISTory:CURRent:MAXimum?, HISTory:RESet:CURRent, HISTory:UNITs[:TIME]

HISTory:CURRent:MAXimum? <*supply*>

HISTory:CURRent:MAXimum? <*supply*> returns a single floating point number for the maximum amperage that has occurred to the <*supply*> since manufacture of the mainframe, or the most recent HIST:RES:CURR or HIST:RES:ALL.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum	P5, P12, N12, P24, N24, N5PT2, N2	none	Selects the power supply for the maximum amperage request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float		Maximum current (in amperes) for specified power supply.

Comments

- The maximum amperage tracking can be zeroed by the HISTory:RESet commands.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The power supply doesn’t support current measurements.
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.
-311	“Memory error”	The historical data’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:CURRent:CMAXimum?, HISTory:CURRent:[HISTogram]?, HISTory:RESet:CURRent, HISTory:RESet[:ALL]

HISTory:POWer:CMAXimum? <*supply*>

HISTory:POWer:CMAXimum? <*supply*> returns a single floating point number for the maximum wattage measured by the Enhanced Monitor for the <*supply*> since power-on of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum	P5, P12, N12, P24, N24, N5PT2, N2, TOTal	none	Selects the power supply for the current maximum request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float		Maximum power (in watts) for specified power supply.

Comments

- These maximums can be reset by powering the mainframe off and then powering it back on.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The power supply doesn’t support current measurements.
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:POWer:MAXimum?, HISTory:POWer:[HISTogram]?

HISTory:POWer[:HISTogram]? <*supply*>[,*MIN*|*MAX*]

HISTory:POWer[:HISTogram]? <*supply*> returns the histogram data held for the <*supply*>. Ten values are returned for the amount of time the <*supply*>'s power spent in ten different power ranges. Those power ranges can be queried with the MIN and MAX optional parameter. The units of the time values returned are HOURs by default, but can be changed with the HISTory:UNIT[:TIME] command.The units returned for power ranges queried with the MIN or MAX parameters are integer values in milliwatts.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5, P12, N12, P24, N24, N5PT2, N2, TOTal	none	Selects the power supply whose power histogram is desired. P5 is +5 Vdc supply, N12 is -12 Vdc supply, etc.
optional parameter	enum.	MIN, MAX	none	Returns the maximum or minimum of the power range in milliwatts.

Returned Data

	Type	Range	Default	Description
<range1>	int32	0-2147483647	none	lowest power range.
<range2>	int32	0-2147483647	none	second power range.
<range3>	int32	0-2147483647	none	third power range.
<range4>	int32	0-2147483647	none	fourth power range.
<range5>	int32	0-2147483647	none	fifth power range.
<range6>	int32	0-2147483647	none	sixth power range.
<range7>	int32	0-2147483647	none	seventh power range.
<range8>	int32	0-2147483647	none	eighth power range.
<range9>	int32	0-2147483647	none	ninth power range.
<range10>	int32	0-2147483647	none	highest power range.

Comments

- HIST:POW? P5 returns 10 time values for +5V supply.
- HIST:POW? P5,MAX returns 10 values representing the maximum power for each power range in milliwatts.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	"Illegal Parameter"	The <*supply*> or *optional parameter* not correct.
-109	"Missing Parameter"	The <*supply*> parameter was omitted.
-311	"Memory error"	The historical data's memory is not available.
-221	"Settings Conflict"	The power supply doesn't support power measurements.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:POWer:MAXimum?, HISTory:RESet:POWer, HISTory:UNITs[:TIME]

HISTory:POWer:MAXimum? <*supply*>

HISTory:POWer:MAXimum? <*supply*> returns a single floating point number for the maximum wattage measured by the Enhanced Monitor for the <*supply*> since either manufacture of the mainframe or the most recent HIST:RES:POW or HIST:RES:ALL.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum	P5, P12, N12, P24, N24, N5PT2, N2, TOTal	none	Selects the power supply for the maximum wattage request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float		Maximum current (in amperes) for specified power supply.

Comments

- The maximum wattage tracking can be zeroed by the HISTory:RESet commands.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	“Missing parameter”	You must include the <*supply*> parameter.
-221	“Settings Conflict”	The power supply doesn’t support power measurements.
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.
-311	“Memory error”	The historical data’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:POWer:CMAXimum?, HISTory: POWer:[HISTogram]?, HISTory:RESet: POWer, HISTory:RESet[:ALL]

HISTory:QUEue:COUNt?

HISTory:QUEue:COUNt? returns the number of history events in the history queue.The maximum number of events capable of being stored in the history queue varies from 500 to 1000 depending on the type of events stored.

Returned Data

Type	Range	Default	Description
uint16	0 through 1000	none	The count of history events presently in the history queue.

Comments

- HIST:QUE:COUN? determines the maximum number accepted by the HIST:QUE:FETC? command.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-311	“Memory error”	The history queue’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:QUEue[:FETCh]?, HISTory:RESet:QUEue, HISTory:UNITs[:TIME], HISTory:UNITs[:TIME]?

HISTory:QUEue[:FETCh]? <*event index*>

HISTory:QUEue[:FETCh]? <*event index*> returns a history event from the history queue corresponding to <*event index*>. The queue is in chronological order, with the oldest event in the index as <*event index*> number 1.

Parameters

Name	Type	Range	Default	Description
<*event index*>	uint16	1 through the value returned from HIST:QUEue:COUNt	none	The index of the history event requested.

Returned Data

	Type	Range	Default	Description
<*event type*>	int16	0 to 127	none	An number associated with the logged event.
<*time stamp*>	uint32	0 to 4294967295	none	Amount of time since manufacture that the event occurred. Units are set with HIST:UNIT
<*event string*>	string			Event string associated with the logged event.

Comments

- Many types of events are logged: amount of time on; wake-up test failures; temperature, current, power, voltage, fan warning events and conditions; calibration occurrences and results; test occurrences and results; and all history reset events. The event strings return in the language selected on the display.

Event Number	Description
0	Mainframe powered off.
1	History queue was reset/cleared
3	Unexpected power-down occurred. Data was lost.
4	Power-on test failure. Result given in the event string. Refer to next comment.
5 - 17	Front slot temperature over limit. Event Number 5 is slot 0; 17 is slot 12. Limit is given in the event string.
18 - 30	Middle slot temperature was over the limit. Event Number 18 is slot 0; 30 is slot 12. Limit is given in the event string.
31 - 43	Rear slot temperature was over the limit. Event Number 31 is slot 0; 43 is slot 12. Limit is given in the event string.
44	Ambient temperature was over limit. Limit given in the event string.
45	Power supply temperature was over limit.
47 - 53	Voltage was over upper limit. Event 47 is +5V supply, ... +12V, -12V, +24V, -24V, -5.2V, and event 53 is -2V supply.
54 - 60	Voltage was under lower limit. Event 54 is +5V supply, ... +12V, -12V, +24V, -24V, -5.2V, and event 60 is -2V supply.
61 - 67	Current was over limit. Limit given in the event string. Event 61 is +5V supply, ... +12V, -12V, +24V, -24V, -5.2V, and event 67 is -2V supply.
68	Total power was over limit. Limit given in the event string.
69 - 71	Fan was over upper limit. Event 69 is BLOW1, 70 is BLOW2, 71 is BLOW3

Event Number	Description
72 - 74	Fan was under lower limit. Event 72 is BLOW1, 73 is BLOW2, 74 is BLOW3
75	Calibration or test occurred. Kind and result are given in event string.
76	Reset of history data occurred. Event string specifies which one.
77	VXI SYSRESET occurred.
78	Queue is full and event(s) are lost.
79	Maintenance timer warning occurred.

- Power-on test failures (Event number 4) include a hex value (0000 to FFFF) which is a sum of the failures that occurred. The following list indicates the possible power-on test failures:

  -- Bit 0 set: non-volatile timing data lost or corrupted.
  -- Bit 1 set: non-volatile power supply data lost or corrupted.
  -- Bit 2 set: non-volatile maximum measurements lost or corrupted.
  -- Bit 3 set: non-volatile minimum measurements lost or corrupted.
  -- Bit 4 set: non-volatile user settings lost or corrupted.
  -- Bit 5 set: non-volatile RS-232 settings lost or corrupted.
  -- Bit 6 set: non-volatile calibration settings lost or corrupted.
  -- Bit 7 set: non-volatile histogram data lost or corrupted.
  -- Bit 10 set: non-volatile history queue data lost or corrupted.
  -- Bit 12 set: wake-up ROM test failed.
  -- Bit 13 set: wake-up RAM test failed.
  -- Bit 14 set: wake-up VXI Communication test failed.
  -- Bit 15 set: unexpected power failure occurred, some data loss likely.

- Once an event is logged, it stays there. For example, an event at event index 7 will always be at event index 7 until the queue is reset.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	“Missing parameter”	You must include the <*event index*> parameter.
-222	“Data out of range”	The <*event number*> was beyond HIST:QUE:COUN.
-311	“Memory error”	The history queue’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:QUEue:COUNt?, HISTory:RESet:QUEue, HISTory:UNITs[:TIME], HISTory:UNITs[:TIME]?

HISTory:RESet[:ALL]
HISTory:RESet:BLOWer [<*blower*>]
HISTory:RESet:CURRent [<*supply*>]
HISTory:RESet:POWer [<*supply*>]
HISTory:RESet:QUEue
HISTory:RESet:TEMPerature [<*slot*>]
HISTory:RESet:VOLTage [<*supply*>]

The HISTory:RESet commands erase all data being held by the HISTory subsystem: histograms, minimum/maximum values, and the history queue. For example, HIST:RES:ALL erases all historical data; HIST:RES:BLOW erases the historical data stored for the specified <*blower*>, HIST:RES:CURR erases the amperage historical data for the specified <*supply*>, etc. The HISTory:RESet command does not erase stripchart data. The following table describes the commands and their parameters. These commands are not allowed while the mainframe's power is off.

Parameters

Command	Parameter(s) Range	Default	Description
[:ALL]			Erases all historical data. The history queue retains two entries (ALL HISTORY RESET, and QUEUE RESET) marking the time between manufacture and the HISTory:RESet. These commands are not allowed while the mainframe's power is off.
:BLOW <*blower*>	BLOWer1, BLOWer2, BLOWer3	none	Selects the fan whose historical data is to be erased. BLOWer1 is the main cooling fan, BLOWer2 is the Power Supply cooling fan, BLOWer3 is a second Power Supply cooling fan on the Agilent E8404A mainframes.
:CURR <*supply*>	P5, P12, N12, P24, N24, N5PT2, N2, P5STby	none	Erases the amperage historical data for the selected <*supply*>. Selects the power supply whose historical data is to be zeroed. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.
:POW <*supply*>	P5, P12, N12, P24, N24, N5PT2, N2, TOTal	none	Erases the wattage historical data for the <*supply*>. Selects the power supply whose historical data is to be zeroed. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.
:QUE			Erases all the events stored in the history queue. One event is put in the history queue on this command: an event logging the time since manufacture of the mainframe until the HIST:RES:QUE command. This is a completely destructive command. There is no retrieving the history queue. It is primarily needed if the history queue has filled up.
:TEMP <*slot*>	OUT0…OUT12, DELTa0…DELTa12, AMBient PSUPply	none	Absolute Slot Temperature Histogram Delta Slot Temperature Histogram Ambient Temperature Histogram Power Supply Temperature Histogram
:VOLT <*supply*>	P5, P12, N12, P24, N24, N5PT2, N2	none	Erases the voltage historical data for the selected <*supply*>. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Comments

- If a parameter is left off, then all the historical data for all parameters of that command is erased. For example, if the <*blower*> parameter is left off of the HIST:RES:BLOW command, then **ALL** of the BLOWer historical data is erased.

- These commands are not allowed while the mainframe's power is off.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	"Settings Conflict"	The mainframe's power is off.
-224	"Illegal Parameter"	The parameter was not correct.
-311	"Memory error"	The historical data's memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

HISTory:TEMPerature:CMAXimum? <*slot*>
HISTory:TEMPerature:CMINimum? <*slot*>

HISTory:TEMPerature:CMAXimum? <*slot*> returns a single floating point number for the maximum temperature measured by the Enhanced Monitor for the <*slot*> parameter since power-on of the mainframe.

HISTory:TEMPerature:CMINimum? <*slot*> returns a single floating point number for the minimum temperature measured by the Enhanced Monitor for the <*slot*> parameter since power-on of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*slot*>	enum.	OUT0…OUT12, DELTa0…DELTa12, AMBient	none	Exhaust temperature for slots 0 - slot 12 Temperature change above the ambient temperature for slots0 - slot 12 Entrance air temperature

Returned Data

Type	Range	Description
float		Minimum or maximum temperature.

Comments

- These maximums/minimums can be reset by powering the mainframe off and then powering it back on.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	“Missing parameter”	You must include the <*slot*> parameter.
-224	“Illegal Parameter”	The <*slot*> parameter was not correct.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:TEMPerature:MAXimum?, HISTory:TEMPerature:MINimum?, HISTory:TEMPerature:[HISTogram]?

HISTory:TEMPerature[:HISTogram]? <*slot*>[,*MIN*|*MAX*]

HISTory:TEMPerature[:HISTogram]? <*slot*> returns the histogram data held for the specified <*slot*>. Ten values are returned for the amount of time the <*slot*>'s temperature spent in ten different temperature ranges. Those temperature ranges can be queried with the MIN and MAX optional parameter. The units of the time values returned are HOURs by default, but can be changed with the HISTory:UNIT[:TIME] command. The units returned for temperature ranges queried with the MIN or MAX parameters are an integer values in tenths of a degree Celsius (0.x °C).

Parameters

Name	Type	Range	Default	Description
<*slot*>	enum.	OUT0…OUT12, DELTa0…DELTa12, AMBient PSUPply	none	Absolute Slot Temperature Delta Slot Temperature Histogram Ambient Temperature Histogram Power Supply Temperature
optional parameter	enum.	MIN, MAX	none	Returns the maximums or minimums of the temperature ranges.

Returned Data

	Type	Range	Default	Description
<range1>	int32	0-2147483647	none	lowest temperature range.
<range2>	int32	0-2147483647	none	second temperature range.
<range3>	int32	0-2147483647	none	third temperature range.
<range4>	int32	0-2147483647	none	fourth temperature range.
<range5>	int32	0-2147483647	none	fifth temperature range.
<range6>	int32	0-2147483647	none	sixth temperature range.
<range7>	int32	0-2147483647	none	seventh temperature range.
<range8>	int32	0-2147483647	none	eighth temperature range.
<range9>	int32	0-2147483647	none	ninth temperature range.
<range10>	int32	0-2147483647	none	highest temperature range.

Comments

- HIST:TEMP? OUT2 returns 10 time values for the exhaust temperature of slot 2, units set/queried by HIST:UNIT.
- HIST:TEMP? OUT2,MAX returns 10 temperatures that returns the maximums for each temperature range in tenths of a degree Celsius (0.x °C) for slot 2.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*slot*> parameter was omitted.
-224	"Illegal Parameter"	The <*slot*> or optional parameter were not correct.
-311	"Memory error"	The historical data's memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:RESet:CURRent, HISTory:UNITs[:TIME]

HISTory:TEMPerature:MAXimum? <*slot*>
HISTory:TEMPerature:MINimum? <*slot*>

HISTory:TEMPerature:MAXimum? <*slot*> returns a single floating point number for the maximum temperature measured by the Enhanced Monitor for the <*slot*> since either manufacture of the mainframe or the most recent HIST:RES:TEMP or HIST:RES:ALL.

HISTory:TEMPerature:MINimum? <*slot*> returns a single floating point number for the minimum temperature measured by the Enhanced Monitor for the <*slot*> since either manufacture of the mainframe or the most recent HIST:RES:TEMP.

Parameters

Name	Type	Range	Default	Description
<*slot*>	enum.	OUT0…OUT12, DELTa0…DELTa12, AMBient	none	Exhaust temperature for slots 0 - slot 12 Temperature change above the ambient temperature for slots0 - slot 12 Entrance air temperature

Returned Data

Type	Range	Description
float		minimum or maximum temperature

Comments

- The maximum/minimum temperature tracking can be zeroed by the HISTory:RESet commands.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	“Missing parameter”	You must include the <*event index*> parameter.
-224	“Illegal Parameter”	the <*slot*> parameter was not correct.
-311	“Memory error”	the historical data’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:TEMPerature:[HISTogram]?, HISTory:RESet:TEMPerature, HISTory:RESet[:ALL]

HISTory:TIME:LCALibration?

HISTory:TIME:LCALibration? returns the amount of operating time that has passed since the last calibration was performed.

Returned Data

	Type	Range	Default	Description
<*hours*>	uint32	0 to 4294967295	none	Hours since cal
<*min*>	uint16	0 to 60	none	+ minutes since cal
<*sec*>	uint16	0 to 60	none	+ seconds since cal

Comments

- This query returns 4294967295,+0,+0 if a CAL, CAL:TEMP, or CAL:VOLT has not been done. The history queue contains information on which calibration was done.

Reset Condition

*RST has no effect on this query.

Related Commands

CAL:VOLT?, CAL:TEMP?, CAL[:ALL]?

HISTory:TIME:LHReset?

HISTory:TIME:LHReset? returns the amount of operating time since the last HISTory:RESet (or any specific HIST:RES:xxxx) command.

Returned Data

	Type	Range	Default	Description
<*hours*>	uint32	0 to 4294967295	none	hours since history reset
<*min*>	uint16	0 to 60	none	+ minutes since history reset
<*sec*>	uint16	0 to 60	none	+ seconds since history reset

Comments

- If no HISTory:RESet has been performed, this query returns the amount of time since mainframe manufacture. The history queue contains information on which reset was done.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-311	“Memory Error”	Non-volatile memory is inaccessible.

Reset Condition

*RST has no effect on this query.

Related Commands

HISTory:RESet[:ALL], HISTory:RESet:TEMPerature, HISTory:RESet:QUEue

HISTory:TIME:LTST?

HISTory:TIME:LTST? returns the amount of operating time that has passed since the last *TST? or TEST command was performed.

Returned Data

	Type	Range	Default	Description
<*hours*>	uint32	0 to 4294967295	none	Hours since *TST
<*min*>	uint16	0 to 60	none	+ minutes since *TST
<*sec*>	uint16	0 to 60	none	+ seconds since *TST

Comments

- This query returns 4294967295,+0,+0 if a *TST? or TEST has not been done. The history queue contains information on which test was done.

Reset Condition

*RST has no effect on this query.

Related Commands

*TST?, TEST[:ALL]?, TEST:BLOWer?, TEST:SENSe?, TEST:DISPlay?, TEST:TEMPerature?, TEST:MEMory?, TEST:TIME?

HISTory:TIME:ON?

HISTory:TIME:ON? returns the amount of time operating since the last power up.

Returned Data

	Type	Range	Default	Description
<*hours*>	uint32	0 to 4294967295	none	Hours since last power-on
<*min*>	uint16	0 to 60	none	+ minutes since last power-on
<*sec*>	uint16	0 to 60	none	+ seconds since last power-on

Comments

- When the power is turned off and the enhanced monitor is operating on external power, the timer does not advance.

Reset Condition

*RST has no effect on this query.

HISTory:TIME:OPERating?

HISTory:TIME:OPERating? returns the amount of time the mainframe has been operating since the last factory maintenance.

Returned Data

	Type	Range	Default	Description
<*hours*>	uint32	0 to 4294967295	none	Hours since last factory maintenance
<*min*>	uint16	0 to 60	none	+ minutes since last factory maintenance
<*sec*>	uint16	0 to 60	none	+ seconds since last factory maintenance

Comments

- Time stands still while the mainframe's power supply is off. This time returned does not indicate any time that the enhanced monitor may have been running on external 5V.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-311	"Memory Error"	Non-volatile memory is inaccessible.

Reset Condition

*RST has no effect on this query.

HISTory:UNIT[:TIME] <*unit*>
HISTory:UNIT[:TIME]?

HISTory:UNIT[:TIME] <*unit*> sets the time units that will be used to report historical data with histograms and history events.

HISTory:UNIT[:TIME]? returns a string (enumerated) of the time units that are used to report historical data with histograms and history events. The strings returned are: HOUR, MIN, SEC.

Parameters

Name	Type	Range	Default	Description
<*unit*>	enum.	HOUR, MINute, SECond	HOUR	Selects the time unit used within the HISTory subsystem.

Returned Data

Type	Range	Description
enum.	HOUR, MIN, SEC	Time units for reporting historical data.

Comments

- Use of this command does not change the amount and resolution of the data kept by the enhanced monitor's HISTory subsystem. It simply changes the reporting of that data. When set to hours it reports the data to the nearest hour, and so on.
- The setting is stored in non-volatile memory with the SYSTem:NVSave command.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing parameter"	The <*unit*> parameter was omitted.
-224	"Illegal Parameter"	The <*unit*> parameter was not correct.

Reset Condition

*RST sets units back to the last value saved with the SYSTem:NVSave command.

Related Commands

SYSTem:NVSave, SYSTem:NVRecall, HISTory:QUEue[:FETCh]?, HISTory:TEMPerature[:HISTogram]?, HISTory:CURRent[:HISTogram]?

HISTory:VOLTage:CMAXimum? <*supply*>
HISTory:VOLTage:CMINimum? <*supply*>

HISTory:VOLTage:CMAXimum? <*supply*> returns the maximum voltage measured by the Enhanced Monitor for the <*supply*> since power-on of the mainframe.

HISTory:VOLTage:CMINimum? <*supply*> returns the minimum voltage measured by the Enhanced Monitor for the <*supply*> since power-on of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5,P12,N12,P24, N24,N5PT2,N2, P5STby	none	Selects the power supply for the current maximum request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float.		Minimum or maximum voltage.

Comments

- These maximums and minimums can be reset by powering the mainframe off and then powering it back on.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:VOLTage:MAXimum?, HISTory:VOLTage:MINimum?, HISTory:VOLTage:[HISTogram]?

HISTory:VOLTage[:HISTogram]? *<supply>[,MIN|MAX]*

HISTory:VOLTage[:HISTogram]? <*supply*> returns the voltage histogram data held for the <*supply*>. Ten values are returned for the amount of time the <*supply*>'s voltage spent in ten different current ranges. Those voltage ranges can be queried with the MIN and MAX optional parameter. The units of the time values returned are HOURs by default, but can be changed with the HISTory:UNIT[:TIME] command. The units returned with the MIN or MAX parameters are millivolts.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5, P12, N12, P24, N24, N5PT2, N2, P5STby	none	Selects the power supply whose voltage histogram is desired.
optional parameter	enum.	MIN, MAX	none	Returns the maximums or minimums volts (in millivolts).

Returned Data

	Type	Range	Default	Description
<range1>	int32	0-2147483647	none	lowest voltage range.
<range2>	int32	0-2147483647	none	second voltage range.
<range3>	int32	0-2147483647	none	third voltage range.
<range4>	int32	0-2147483647	none	fourth voltage range.
<range5>	int32	0-2147483647	none	fifth voltage range.
<range6>	int32	0-2147483647	none	sixth voltage range.
<range7>	int32	0-2147483647	none	seventh voltage range.
<range8>	int32	0-2147483647	none	eighth voltage range.
<range9>	int32	0-2147483647	none	ninth voltage range.
<range10>	int32	0-2147483647	none	highest voltage range.

Comments

- HIST: VOLTage? P5 returns 10 time values, units set/queried by HIST:UNIT.
- HIST: VOLTage? P5,MAX returns 10 voltages (in millivolts) representing the maximums for each voltage range for the 5 volt supply.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	"Illegal Parameter"	The <*supply*> or *optional parameter* not correct.
-109	"Missing Parameter"	The <*supply*> parameter was omitted.
-311	"Memory error"	the historical data's memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:VOLTage:MAXimum?, HISTory:VOLTage:CMINimum?, HISTory:VOLTage:MINimum?, HISTory:RESet:VOLTage, HISTory:UNITs[:TIME]

HISTory:VOLTage:MAXimum? <*supply*>
HISTory:VOLTage:MINimum? <*supply*>

HISTory:VOLTage:MAXimum? <*supply*> returns a single floating point number for the maximum voltage measured by the Enhanced Monitor for the <*supply*> since either manufacture of the mainframe or the most recent HIST:RES:VOLT or HIST:RES:ALL.

HISTory:VOLTage:MINimum? <*supply*> returns a single floating point number for the minimum voltage measured by the Enhanced Monitor for the <*supply*> since either manufacture of the mainframe or the most recent HIST:RES:VOLT or HIST:RES:ALL.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5, P12, N12, P24, N24, N5PT2, N2, P5STby	none	selects the power supply for the maximum voltage request. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.

Returned Data

Type	Range	Description
float.		Minimum or maximum voltage.

Comments

- The maximum and minimum voltage tracking can be zeroed by the HISTory:RESet commands.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	“Illegal Parameter”	the <*slot*> parameter was not correct.
-311	“Memory error”	the historical data’s memory is not available.

Reset Condition

A *RST has no effect on the HISTory subsystem.

Related Commands

HISTory:VOLTage:CMAXimum?, HISTory:VOLTage:CMINimum?, HISTory:VOLTage:[HISTogram]?, HISTory:RESet:VOLTage, HISTory:RESet[:ALL]

SCPI uses four status groups - the Status Byte, the Standard Event status group, the Operation status group, and the Questionable Data status group. The STATus subsystem controls those command (and queries) that affect the OPERation status group and the QUEStionable status group.

The OPERation status group provides information about the state of the monitoring systems in an instrument. The QUEStionable data status group provides information about the quality of instrument output and monitoring data.

Each status group consists of a condition register, transition filters, event register, and enable register. The enable register values are stored in non-volatile memory with the SYSTem:NVSave command and restored at power-on.

The CONDition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only.

The EVENt register latches transition events from the condition register as specified by the transition filter. Only the positive transition filter is active in the module, this means that a transition event will occur when a condition makes a transition from a low to a high state[1]. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:OPERation:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only. Events are queried in order to determine if transitions have occurred since the last query. They do not indicate the current state (condition) of a particular event. Nor do they indicate how many times a transition has occurred.

The ENABle register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The OPERation and QUEStionable status summary bits are recorded in the Status Byte. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Figure 3-1 shows a simplified register diagram for the status subsystem.

1.The only exception is the STATus:QUEStionable:VOLTage register which is set with the STATus:QUESTionable:VOLTage:PTR command.

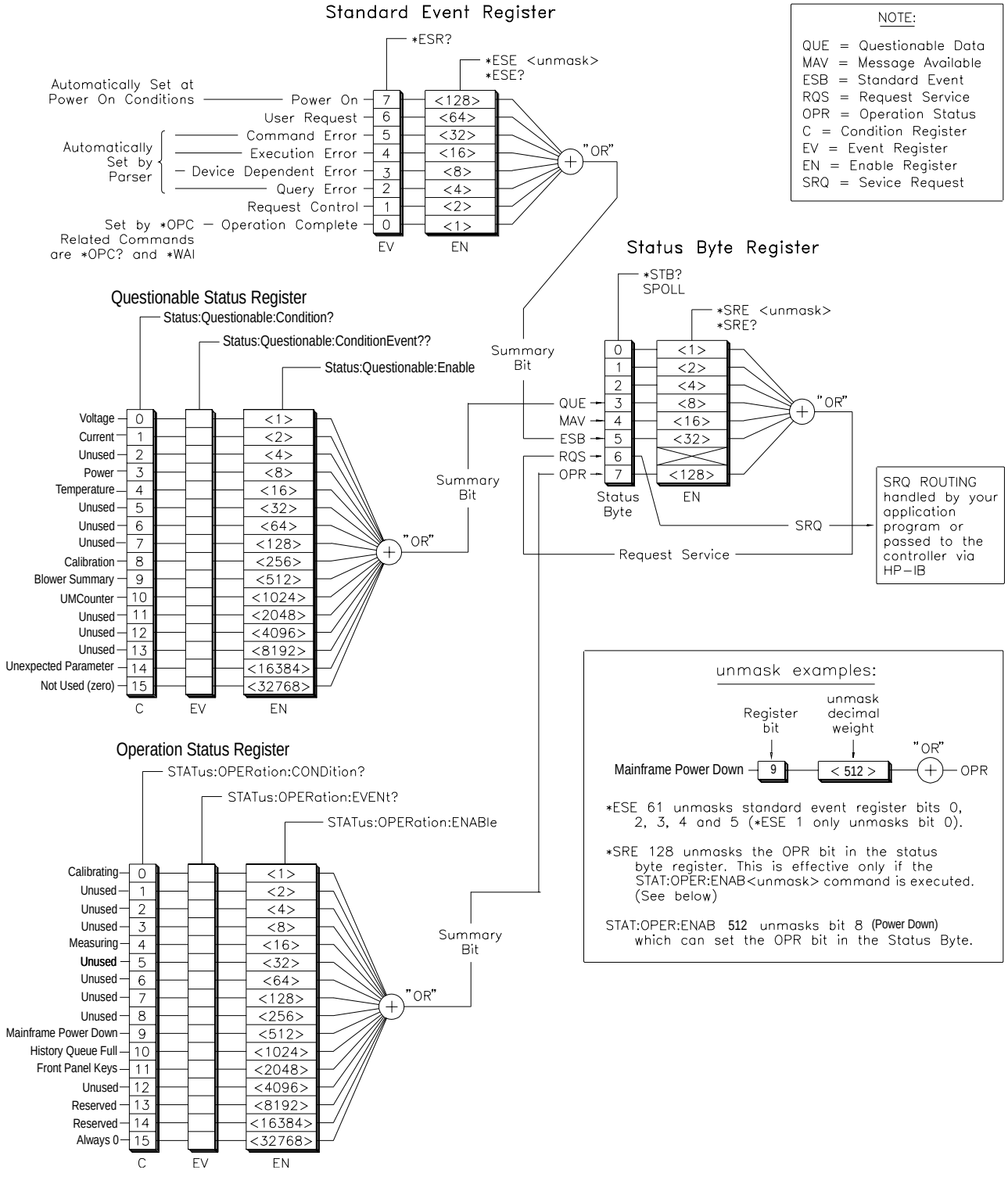


Figure 3-1. Agilent E8402A/E8404A Status System Register Diagram

Subsystem Syntax

:STATus	
:OPERation	
:CONDition?	Returns OPERation condition register
:ENABle <*mask*>	Sets OPERation enable register
:ENABle?	Returns OPERation enable register
:[EVENt]?	Returns OPERation event register
:PRESet	Clears OPER & QUES enable registers
:QUEStionable	
:BLOWer	
:CONDition?	Returns Blower condition register
:ENABle <*mask*>	Sets Blower enable register
:ENABle?	Returns Blower enable register
:[EVENt]?	Returns Blower event register
:LEVel?	Returns mainframe fans' % level.
:SPEed? <*blower*>	Returns last fan rpm measurement
:CONDition?	Returns Questionable condition register
:CURRent	
:CMAXimum? <*supply*>	Alias for HIST:CURR:CMAX
:CONDition?	Returns Current condition register
:ENABle <*mask*>	Sets Current enable register
:ENABle?	Returns Current enable register
:[EVENt]?	Returns Current event register
:LEVel? <*supply*>	Returns <*supply*> current meas.
:LIMit <*limit*>	Sets mainframe max. current limits
:LIMit? <*limit*>	Returns mainframe max. current limits
:MAXimum?<*supply*>	Alias for HIST:CURR:MAX
:ENABle <*mask*>	Sets the Questionable enable register
:ENABle?	Returns Questionable enable register
[:EVENt?]	Returns Questionable event register
:FILTer	
:TINTerval <*interval*>	Alias for STAT:QUES:UMC:TINT
:TINTerval?	Alias for STAT:QUES:UMC:TINT?
:TREMaing?	Alias for STAT:QUES:UMC:TREM?
:TRESet	Alias for STAT:QUES:UMC:TRES
:POWer	
:CMAXimum? <*supply*>	Alias for HIST:POW:CMAX
:LEVel? <*supply*>	Returns power levels of power supply.
:LIMit <*limit*>	Sets mainframe max. power limit
:LIMit? <*limit*>	Returns mainframe max. power limit
:MAXimum? <*supply*>	Alias for HIST:POW:MAX
:TEMPerature	
:CMAXimum? <*slot*>	Alias for HIST:TEMP:CMAX?
:CONDition?	Returns Temp. Condition Register
:ENABle <*mask*>	Sets the Temperature enable register
:ENABle?	Returns Temperature enable register
:[EVENt]?	Returns Temperature event register
:LEVel? <*slot*>	Returns last <*slot*> temp. meas.
:LIMit <*slot*>,<*val1*>*[,*<*val2*>*[,*<*val3*>*]]*	Sets max. mainframe temp. limits
:LIMit? <*slot*>	Returns max. mainframe temp. limits
:MAXimum?<*slot*>	Alias for HIST:TEMP:MAX?
:UMCounter	
:TINTerval <*time*>	Sets countdown timer interval
:TINTerval?	Returns countdown timer interval
:TREMaining?	Returns countdown timer
:TRESet	Resets countdown timer
:VOLTage	
:CONDition?	Returns Voltage condition register
:ENABle <*mask*>	Sets Voltage enable register
:ENABle?	Returns Voltage enable register
:[EVENt]?	Returns Voltage event register
:LEVel? <*supply*>	Returns last <*supply*> voltage meas.
:PTR <*mask*>	Sets voltage positive transition filter.
:PTR?	Returns voltage positive transition filter.
:SCONdition?	Returns monitor pass/fail condition.

STATus:OPERation:CONDition?

The STATus:OPERation:CONDition? query returns an integer representing the contents of the condition register associated with the operation status group. The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only. The following table describes each bit in the OPERation status group:

Bit	Description	Decimal Value
0	CALibrating. While a “1”, the instrument is calibrating.	1
1	Unused	2
2	Unused	4
3	Unused	8
4	Measuring. While a “1”, the instrument is measuring.	16
5	Unused	32
6	Unused	64
7	Unused	128
8	Unused	256
9	Mainframe power-down. While a “1”, the instrument is in the power-down state (command execution is only available through the Enhanced Monitor’s RS-232 port with external +5V supply).	512
10	History Queue full. While a “1”, history queue is full and is accepting no more events.	1024
11	Front Panel Keys. Momentarily set to “1” when monitor detects any front panel key pressed. Use Event Register to monitor events.	2048
12	Unused	4096
13	Reserved	8192
14	Reserved	16384
15	Always Zero	32768

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) in the OPERation status group. Each condition has a decimal weighted value.

Comments

- The condition register reflects the real-time state. This differs from events which are latching.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:OPERation:EVENt?, STATus:OPERation:ENABle

STATus:OPERation:ENABle <*mask*>
STATus:OPERation:ENABle?

The STATus:OPERation:ENABle command sets the value of the enable register for the operation status group.

The STATus:OPERation:ENABle? query returns an integer representing the value of the enable register for the operation status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. The operation status summary bit is recorded in the Status Byte. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	none (see last comment)	Bit mask for the enable register of the OPERation status group. Each operation enable bit has a decimal weighted value.

Returned Data

Type	Range	Description
int16	0 - 32767	mask value.

Comments

- Refer to STATus:OPERation:CONDition? for a description of each bit in the OPERation status group.
- To enable a bit in the event register, specify that bit's decimal value as the <*mask*> parameter. To enable two or more bits, specify the sum of the decimal values.
- The <*mask*> parameter may be sent as a decimal, hexadecimal (#H), octal (#Q), or binary (#B) number.
- The Enable register values are saved in non-volatile RAM with the SYSTem:NVSave command. The register values are restored to the registers at power-on if *PSC was set to 0 before power-on. SYSTem:NVRecall will also restore the enable registers.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	"Data out of range"	The <*mask*> was an invalid number (for example, it may be negative).

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:OPERation:CONDition?, STATus:OPERation:EVENt?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:OPERation:EVENt?

The STATus:OPERation:EVENt? query returns an integer representing the value of the event register for the operation status group.

The event register latches positive transition events from the condition register. A positive transition event will occur when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:OPERation:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Events are queried in order to determine if transitions have occurred since the last query. They do not indicate the current state (condition) of a particular event. Nor do they indicate how many times a transition has occurred.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the OPERation status group. Each event has a decimal weighted value.

Comments

- Refer to STATus:OPERation:CONDition? for a description of each bit in the OPERation status group.
- **Cleared by:** *CLS, power-on, and by reading the register.

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:OPERation:CONDition?, STATus:OPERation:ENABle,*CLS

STATus:PRESet

The STATus:PRESet command sets the enable registers. The Operation and Questionable Enable Registers are preset to 0, disabling all events. All other enable registers are preset to 1s (except P5STBY and P5EXT in the STAT:QUES:VOLT:ENABle register), enabling all events. The SCPI positive transition filters are preset to 1s.

Comments

- After executing this command, none of the events in the OPERation event register or the QUEStionable event register will be reported as a summary bit in the Status Byte.
- This command does not clear or change any of the Events in the OPERation status group or the QUEStionable status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned. The factory defaults are listed in the following table:

Register	Default Value
STATus:OPERation:ENABle	0
STATus:QUEStionable:ENABle	0
STAT:QUES:BLOWer:ENABle	7
STAT:QUES:CURRent:ENABle	487
STAT:QUES:TEMPerature:ENABle	32767
STAT:QUES:VOLT:ENABle	487
STAT:QUES:VOLT:PTR	511

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:OPERation:ENABle, STATus:QUEStionable:ENABle, STATus:QUEStionable:BLOWer:ENABle, STATus:QUEStionable:CURRent:ENABle, STATus:QUEStionable:TEMPerature:ENABle, STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:BLOWer:CONDition?

The STATus:QUEStionable:BLOWer:CONDition? query returns an integer representing the contents of the condition register associated with the BLOWer status group. The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only. The following table describes each bit in the BLOWer status group:

Bit	Description	Decimal Value
0	BLOWer1 (Mainframe fan)	1
1	BLOWer2 (Power supply fan)	2
2	BLOWer3 (Power supply fan)	4
3	Unused	8
4	Unused	16
5	Unused	32
6	Unused	64
7	Unused	128
8	Unused	256
9	Unused	512
10	Unused	1024
11	Unused	2048
12	Unused	4096
13	Unused	8192
14	Unused	16384
15	Unused	32768

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) for the BLOWer status group.

Comments

- The status bit is set when a blower is outside of its expected speed for its present level.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:BLOWer:EVENt?,
STATus:QUEStionable:BLOWer:ENABle

STATus:QUEStionable:BLOWer:ENABle <*mask*>
STATus:QUEStionable:BLOWer:ENABle?

The STATus:QUEStionable:BLOWer:ENABle command sets the value of the enable register for the BLOWer status group.

The STATus:QUEStionable:BLOWer:ENABle query returns an integer representing the value of the enable register for the BLOWer status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The blower summary bit is recorded in the Questionable Condition Register. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	7 (see 2nd comment)	Bit mask indicating which enable bits are set (1) or cleared (0) for the BLOWer status group.

Returned Data

Type	Range	Description
int16	0 - 32767	mask value.

Comments

- Refer to STATus:QUEStionable:BLOWer:CONDition? for a description of each bit in the BLOWer status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	The <*mask*> value was invalid.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:QUEStionable:BLOWer:CONDition?, STATus:QUEStionable:BLOWer:EVENt?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:QUEStionable:BLOWer:EVENt?

The STATus:QUEStionable:BLOWer:EVENt? query returns an integer representing the value of the event register for the BLOWer status group.

The event register latches positive transition events from the blower condition register. A positive transition occurs when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:QUEStionable:BLOWer:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the BLOWer status group.

Comments

- Refer to STATus:QUEStionable:BLOWer:CONDition? for a description of each bit in the BLOWer status group.
- **Cleared by:** *CLS, power-on, and by reading the event register.

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:QUEStionable:BLOWer:CONDition?,
STATus:QUEStionable:BLOWer:ENABle, *CLS

STATus:QUEStionable:BLOWer:LEVel?

The STATus:QUEStionable:BLOWer:LEVel? query returns an integer representing the present fan level as a percentage of full scale speed. A percent symbol (%) is attached to the value.

Returned Data

Type	Range	Default	Description
string	0 - 100%	none	The last measured fan level percentage. It can be read an integer.

Comments

- This query provides a percentage level of all the fans in the mainframe. It is not a measurement. Individual fan speed measurements are provided by the STATus:QUEStionable:BLOWer:SPEed? query.
- Example: on an RS-232 terminal, the command STAT:QUES:BLOW:LEV? might return the string:

  75%

Reset Condition

*RST does not affect the fan level directly. If the fans were on full speed because the SYSTem:BLOWer:STATE FULL command had been executed, then *RST clears that state to VARiable.

Related Commands

STATus:QUEStionable:BLOWer:SPEed?

STATus:QUEStionable:BLOWer:SPEed? *<blower>[,MIN|MAX]*

The STATus:QUEStionable:BLOWer:SPEed? query returns an integer representing the present fan speed in revolutions per minute (RPM).

Parameters

Name	Type	Range	Default	Description
<*blower*>	enum.	BLOWer1, BLOWer2, BLOWer3	none	Indicates which fan speed is being queried. BLOWer1 is the main cooling fan, BLOWer2 is the Power Supply cooling fan, BLOWer3 is a second Power Supply cooling fan on the Agilent E8404A mainframes.
optional parameter	enum	MIN MAX		When used, returns maximum or minimum RPM for the present fan level.

Returned Data

Type	Range	Description
int16	0 - 3500	The last measured fan speed, given in RPM.

Comments

- All fans operate at the same levels as a percentage of their full scale (STAT:QUES:BLOW:LEV? returns that level). However, the power supply fans operate at higher speeds than the mainframe cooling fan. The measurement returned is the last measurement made on the fans. This should be within the last 2 seconds. If the power of the mainframe is off, this query will return the last measurement made before power turned off.

Reset Condition

*RST does not affect the fan speed directly. If the fans were on full speed because the SYSTem:BLOWer:STATE FULL command had been executed, then *RST clears that state to VARiable

Related Commands

STATus:QUEStionable:BLOWer:LEVel?

STATus:QUEStionable:CONDition?

The STATus:QUEStionable:CONDition? query returns an integer representing the contents of the condition register associated with the questionable data status group.

The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only.

The following table describes each bit in the QUEStionable status group:

Bit	Description	Decimal Value
0	VOLTage summary. While a “1”, an event is occurring in the VOLT:COND register.	1
1	CURRent summary. While a “1”, an event is occurring in the CURR:COND register.	2
2	Unused	4
3	POWer. While a “1”, total power is over limit.	8
4	TEMPerature summary. While a “1”, an event is occurring in the TEMP:COND register.	16
5	Unused	32
6	Unused	64
7	Unused	128
8	CALibration. While a “1”, the last temperature or voltage calibration failed.	256
9	BLOWer summary. While a “1”, an event is occurring in the BLOW:COND register.	512
10	UMCounter. While a “1”, the UMC counter expired.	1024
11	Unused	2048
12	Unused	4096
13	Unused	8192
14	Unexpected Parameter	16384
15	Always Zero	32768

Comments

- For any of the summary bits to be set, an enabled bit in the corresponding Event Register was set. Refer to Figure 3-1 for the relationship between event registers and summary bits.
- Events are latched. The condition that set a bit may have stopped occurring.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) for the QUEStionable status group.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:EVENt?, STATus:QUEStionable:ENABle

STATus:QUEStionable:CURRent:CONDition?

The STATus:QUEStionable:CURRent:CONDition? query returns an integer representing the contents of the condition register associated with the CURRent status group.

The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only.

The following table describes each bit in the CURRent status group:

Bit	Description	Decimal Value
0	+24 (P24) volt power supply	1
1	+12 (P12) volt power supply	2
2	+5 (P5) volt power supply	4
3	Unused	8
4	Unused	16
5	-2 (N2) volt power supply	32
6	-5.2 (N5P2) volt power supply	64
7	-12 (N12) volt power supply	128
8	-24 (N24) volt power supply	256
9	Unused	512
10	Unused	1024
11	Unused	2048
12	Unused	4096
13	Unused	8192
14	Unused	16384
15	Unused	32768

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) for the CURRent status group.

Comments

- A bit is set when a current measurement is outside of the user-set limit.

Error conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-241	“Hardware missing”	Power supply doesn’t support current measurements

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:CURRent:EVENt?,
STATus:QUEStionable:CURRent:ENABle

STATus:QUEStionable:CURRent:ENABle <*mask*>
STATus:QUEStionable:CURRent:ENABle?

The STATus:QUEStionable:CURRent:ENABle command sets the value of the enable register for the CURRent status group.

The STATus:QUEStionable:CURRent:ENABle? query returns an integer representing the value of the enable register for the CURRent status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The Questionable Current Summary bit is recorded in the Questionable Condition Register. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	487 (see comments below)	Bit mask for the enable register of the CURRent status group.

Returned Data

Type	Range	Description
int16	0 - 32767	mask value.

Comments

- Refer to STATus:QUEStionable:CURRent:CONDition? for a description of each bit in the CURRent status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	The <*mask*> value is invalid.
-241	“Hardware missing”	Power supply doesn’t support current measurements

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:QUEStionable:CURRent:CONDition?, STATus:QUEStionable:CURRent:EVENt?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:QUEStionable:CURRent[:EVENt]?

The STATus:QUEStionable:CURRent:EVENt? query returns an integer representing the value of the event register for the CURRent status group.

The event register latches positive transition events from the current condition register. A positive transition occurs when a condition makes a transition from unasserted to asserted (a low to a high state). Bits in the event register are latched, and once set, they remain set until cleared by a STATus:QUEStionable:CURRent:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the CURRent status group.

Comments

- Refer to STATus:QUEStionable:CURRent:CONDition? for a description of each bit in the CURRent status group.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-241	“Hardware missing”	power supply doesn’t support current measurements

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:QUEStionable:CURRent:CONDition?, STATus:QUEStionable:CURRent:ENABle, *CLS

STATus:QUEStionable:CURRent:LEVel? <*supply*>[,*MIN*|*MAX*]

The STATus:QUEStionable:CURRent:LEVel? query returns a floating number representing the last measurement of the power supply current in Amps.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P24, P12, P5, N2, N5P2, N12, N24	none	Indicates which power supply current is being queried. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.
optional parameter	optional enum.	MIN, MAX	none	When added after <*param*>, returns the maximum and minimum current limits.

Returned Data

Type	Range	Default	Description
float32		none	Power-supply current in Amps.

Comments

- This command is not supported for all power supplies. When current measurement is supported, the measurement returned is the last measurement made on the supply identified with <*param*>. Under normal operation, this should be within the last 2 seconds. Current is not measured during a *TST? or CAL? operation, so a query to STAT:QUES:CURR:LEV? will return the last measurement made before the long operation was entered. If the power of the mainframe is off, this query will return the last measurement made before power turned off.

- The optional MIN and MAX parameter allows the power supply's current limits to be queried. For Example, STAT:QUES:CURR:LEV? P5,MAX returns the limit warning point for the 5V supply.

Error conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-241	"Hardware missing"	Power supply doesn't support current measurements

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:CURRent:EVENt?,
STATus:QUEStionable:CURRent:CONDition?,
STATus:QUEStionable:CURRent:ENABle?,
STATus:QUEStionable:CURRent:ENABle

STATus:QUEStionable:CURRent:LIMit *<supply>,<value>*
STATus:QUEStionable:CURRent:LIMit? *<supply> [,MIN|MAX]*

The STATus:QUEStionable:CURRent:LIMit sets the limit for amperage on one of the seven supplies in the mainframe. If it is exceeded, a warning is generated. These values are stored in non-volatile memory.

The STATus:QUEStionable:CURRent:LIMit? returns a floating number representing the limits for amperage in the mainframe.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P24, P12, P5, N2, N5PT2, N12, N24	none	Indicates which power supply current limit is being set. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.
<*value*>	float32	-1000 to 1000, MIN, MAX	Min is either +1.0 or -1.0; see table below for MAX	Current limit. Each supply has its own maximum. Use negative value for negative supplies.
optional parameter	enum.	MIN MAX		Returns maximum or minimum current limit.

Returned Data

Type	Range	Description
float		Current limit for <*supply*>.

Comments

- Power Supply Maximums:

Power Supply	Agilent E8402	Agilent E8404
P5	50A	90A
P12	6A	15A
N12	– 4A	– 15A
P24	4A	15A
N24	– 4A	– 15A
N5PT2	– 20A	– 60A
N2	– 10A	– 30A

- This command corrects the polarity of <*value*> to match the specified <*supply*>. It then determines if <*value*> is within the valid range for the specified <*supply*>; if it is not, the limit is set to MAX. No error is generated.
- Remember to execute a SYSTem:NVSave after setting all the limits you desire. This will move them into non-volatile memory.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command.

Related Commands

SYSTem:NVSave

STATus:QUEStionable:ENABle <*mask*>
STATus:QUEStionable:ENABle?

The STATus:QUEStionable:ENABle command sets the value of the enable register for the questionable status group.

The STATus:QUEStionable:ENABle? query returns an integer representing the value of the enable register for the questionable status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The questionable status summary bit is recorded in the Status Byte. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	0 (see 2nd comment below)	Bit mask for the enable register of the QUEStionable status group.

Returned Data

Type	Range	Description
int16	0 - 32767	mask value.

Comments

- Refer to STATus:QUEStionable:CONDition? for a description of each bit in the QUEStionable status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	The <*mask*> value is invalid.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:QUEStionable:CONDition?, STATus:QUEStionable:EVENt?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:QUEStionable[:EVENt]?

The STATus:QUEStionable:EVENt? query returns an integer representing the value of the event register for the operation status group.

The event register latches positive transition events from the condition register. A positive transition occurs when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:QUEStionable:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the QUEStionable status group.

Comments

- Refer to STATus:QUEStionable:CONDition? for a description of each bit in the QUEStionable status group.
- **Cleared by:** *CLS, power-on, and by reading the event register.

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:QUEStionable:CONDition?, STATus:QUEStionable:ENABle, *CLS

STATus:QUEStionable:POWer:LEVel? <*supply*>[,*MIN*|*MAX*]

The STATus:QUEStionable:POWer:LEVel? query returns a floating number representing the power levels of each power supply in watts.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P24, P12, P5 N2, N5P2, N12 N24, TOTal	none	Indicates which power supply wattage is being queried. P5 is positive 5 Vdc supply, N12 is negative 12 Vdc supply, etc.
optional parameter	optional enum.	MIN, MAX	none	When added after <*param*>, returns the maximum and minimum wattage limits.

Returned Data

Type	Range	Default	Description
float32		none	Power level of <*supply*>, in Watts.

Comments

- This command is not supported for all power supplies. If the power of the mainframe is off, this query will return the last measurement made before power turned off.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-241	“Hardware missing”	Power supply doesn’t support power measurements.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:CONDition?, STATus:QUEStionable:EVENt?, STATus:QUEStionable:ENABle?, STATus:QUEStionable:ENABle

STATus:QUEStionable:POWer:LIMit *<limit>*
STATus:QUEStionable:POWer:LIMit? *[MIN|MAX]*

The STATus:QUEStionable:POWert:LIMit sets the limit for wattage for the total of the seven supplies in the mainframe. If it is exceeded, a warning will be issued. This value is stored in non-volatile memory.

The STATus:QUEStionable:POWert:LIMit? returns a floating point number representing the limit for total power in the mainframe.

Parameters

Name	Type	Range	Default	Description
<*limit*>	int16	0 to 2000, MIN, MAX	none	Total power limit. Different power supplies have different maximums.
optional parameter	enum	MIN, MAX		Returns the minimum or maximum power limit.

Returned Data

Type	Range	Description
float	0 to 2000	Total power limit.

Comments

- Remember to execute a SYSTem:NVSave after setting all the limits you desire. This will move them into non-volatile memory.
- This command determines if <*value*> is within the valid range for the specified <*supply*>; if it is not, the limit is set to MAX. No error is generated. Use MIN and MAX parameters with the query to determine the maximum and minimum power limits.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command.

Related Commands

STAT:QUES:CURR:LIMit?, SYSTem:NVSave

STATus:QUEStionable:TEMPerature:CONDition?

The STATus:QUEStionable:TEMPerature:CONDition? query returns an integer representing the contents of the condition register associated with the TEMPerature status group.

The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only.

The following table describes each bit in the TEMPerature status group:

Bit	Description	Decimal Value
0	Slot 0	1
1	Slot 1	2
2	Slot 2	4
3	Slot 3	8
4	Slot 4	16
5	Slot 5	32
6	Slot 6	64
7	Slot 7	128
8	Slot 8	256
9	Slot 9	512
10	Slot 10	1024
11	Slot 11	2048
12	Slot 12	4096
13	AMBient	8192
14	Power supply	16384
15	Unused	32768

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) for the TEMPerature status group.

Comments

A bit is set when a slot temperature is over the user-specified limit.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:TEMPerature:EVENt?,
STATus:QUEStionable:TEMPerature:ENABle,
STATus:QUEStionable:TEMPerature:LIMit

STATus:QUEStionable:TEMPerature:ENABle <*mask*>
STATus:QUEStionable:TEMPerature:ENABle?

The STATus:QUEStionable:TEMPerature:ENABle command sets the value of the enable register for the TEMPerature status group.

The STATus:QUEStionable:TEMPerature:ENABle? query returns an integer representing the value of the enable register for the TEMPerature status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The questionable temperature status summary bit is recorded in the Questionable Condition Register. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	32767 (see 2nd comment below)	Bit mask for the enable register of the TEMPerature status group.

Returned Data

Type	Range	Description
int16	0 - 32767	Mask value.

Comments

- Refer to STATus:QUEStionable:TEMPerature:CONDition? for a description of each bit in the TEMPerature status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	The <*mask*> value is invalid.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:QUEStionable:TEMPerature:CONDition?, STATus:QUEStionable:TEMPerature:EVENt?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:QUEStionable:TEMPerature:EVENt?

The STATus:QUEStionable:TEMPerature:EVENt? query returns an integer representing the value of the event register for the TEMPerature status group.

The event register latches positive transition events from the condition register. A positive transition occurs when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:QUEStionable:TEMPerature:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the TEMPerature status group.

Comments

- Refer to STATus:QUEStionable:TEMPerature:CONDition? for a description of each bit in the TEMPerature status group.

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:QUEStionable:TEMPerature:CONDition?, STATus:QUEStionable:TEMPerature:ENABle, *CLS

STATus:QUEStionable:TEMPerature:LEVel? *<slot>[,MIN|MAX]*

The STATus:QUEStionable:TEMPerature:LEVel? query returns three integers representing the present temperatures, in degrees Celsius, in the mainframe.

Parameters

Name	Type	Range	Default	Description
<*slot*>	enum.	OUT0…OUT12, DELTa0…DELTa12 AMBient	none	Last measured exhaust temperature for slots 0 - slot 12 Last measured temperature change above the ambient temperature for slot0 - slot 12 Last measured entrance air temperature
optional parameter	enum.	MIN, MAX	none	Adding MIN or MAX to the query returns the present threshold being used to determine temperature warnings.

Returned Data

Type	Range	Default	Description
int16, int16, int16	-100 to +100	none	Temperature, in °C, from each of the three sensors: front, middle, rear

Comments

- When querying AMBient, MIN, or MAX temperature, the same temperature is returned in all three values. The measurements returned for any <*slot*> are the last measurements taken. In normal operation, this is a measurement taken during the last 2 seconds. If a *TST? or CAL? are being performed, the measurements returned by this query are the last measurements taken before the long operation started. If the mainframe power is off, the measurements returned by this query are the last measurements taken before power went down.

- Refer to “Setting Enhanced Monitor Limits” on page 35 for information on selecting and using temperature limits.

Reset Condition

*RST does not affect the temperatures. It can affect the maximums and minimums if a limit was set and not saved with the SYSTem:NVSave command.

STATus:QUEStionable:TEMPerature:LIMit *<slot>,<value1>[,<value2>[,<value3>]]*
STATus:QUEStionable:TEMPerature:LIMit? *<slot>[,MIN|MAX]*

The STATus:QUEStionable:TEMPerature:LIMit sets the limit, in °C, for temperatures in the mainframe. If the limit is exceeded, a warning is issued. These values are stored in non-volatile memory.

The STATus:QUEStionable:TEMPerature:LIMit? query returns an integer representing the limit for temperatures in the specified mainframe slot.

Parameters

Name	Type	Range	Default	Description
<*slot*>	enum.	OUT0…OUT12,	65	Absolute limit for slots 0 - slot 12
		DELTa0…DELTa12	15	Delta limit above ambient for slots0 - slot 12
		ALL		sets every temperature limit.
		AMBient	55	Absolute limit for air entering mainframe.
<*value1*>	int16	0 to 75, MAX, MIN, DEF		Temperature limit. With ALL it is the absolute slot temperature limit.
<*value2*>	int16	0 to 55, MAX, MIN, DEF		Delta slot temperature limit. Use only with ALL.
<*value3*>	int16	0 to 65, MAX, MIN, DEF		Ambient temperature limit. Use only with ALL.

Returned Data

Type	Range	Description
int16		Temperature limit for <*slot*>.

Comments

- There are two limits for each slot in the mainframe: the absolute limit (default at 65) and the delta limit (default at 15 above the ambient air reading). Normally, the delta limit predominates the actual limit point—where a warning will sound. But as the ambient (mainframe intake air) increases, the delta limit may pass over the absolute limit. The absolute limit will then dominate the warning trip point. The actual limit point can be queried with the MAX optional parameter on the STAT:QUES:TEMP:LEV? query.
- This command determines if <*value*> is within the valid range for the specified <*slot*>; if it is not, the limit is set to MAX. No error is generated. Use MIN and MAX parameters with the query to determine the maximum and minimum temperature limits.
- If having the temperature warning trip point tied to the ambient air is undesirable, set the delta limits to 55. This effectively moves them out of range.
- Remember to execute a SYSTem:NVSave after setting all the limits you desire. This will move them into non-volatile memory.
- Refer to “Setting Enhanced Monitor Limits” on page 35 for information on selecting and using temperature limits.

Reset Condition *RST resets register the last value saved by the SYST:NVS command.

Related Commands SYSTem:NVSave

Examples

```
STAT:QUES:TEMP:LIM OUT7,57          Absolute limit for Slot 7, limit of 57 °C
STAT:QUES:TEMP:LIM DELT7,25         Delta limit for slot 7, limit of 25 °C
STAT:QUES:TEMP:LIM AMB, 67          Absolute limit for ambient temp. 67 °C
STAT:QUES:TEMP:LIM ALL, 57,25, 67   Absolute limit of all output temps of 57
                                    °C, all delta temps of 25 °C, and ambient
                                    temp of 67 °C.
```

STATus:QUEStionable:UMCounter:TINTerval <*time*>
STATus:QUEStionable:UMCounter:TINTerval?

The STATus:QUEStionable:UMCounter:TINTerval command sets the time interval value of the user maintenance counter. The user maintenance counter is a countdown timer that counts hours down to zero. The time interval is the value from which the UMCounter will start. This value is stored in non-volatile memory immediately.

The STATus:QUEStionable:UMCounter:TINTerval? command returns an integer representing the time interval value of the user maintenance counter.

Parameters

Name	Type	Range	Default	Description
<*time*>	int16	1 to 65535,MIN, MAX, DEF	65535	number of hours the UMCounter will count down from.

Returned Data

Type	Range	Description
int16		User Maintenance Counter

Comment

- The value 65535 means that the counter is disabled. It is shipped from the factory disabled. Set the time interval (STAT:QUES:UMC:TINT) and then reset the counter (STAT:QUES:UMC:TRES) to enable the user maintenance counter. To disable the counter, send the command STATus:QUEStionable:UMCounter:TINTerval DEF.
- The MINimum value is 1, MAXimum value is 65534, DEFault value is 65535.

Reset Condition

*RST does not affect the UM Counter.

Related Commands

STATus:QUEStionable:UMCounter:TRESet,
STATus:QUEStionable:UMCounter:TREMaining?

STATus:QUEStionable:UMCounter:TREMaining?

The STATus:QUEStionable:UMCounter:TREMaining query returns an integer representing the time remaining on the user maintenance counter. The user maintenance counter is a countdown timer that counts hours down to zero. The time remaining is the number of hours until a UMCounter warning is issued.

Returned Data

Type	Range	Default	Description
int16	0 - 65535	65535	number of hours remaining in the UMCounter.

Comment

- The value 65535 means that the counter is disabled. It is shipped from the factory disabled. Set the time interval (STAT:QUES:UMC:TINT) and then reset the counter (STAT:QUES:UMC:TRES) to enable the user maintenance counter.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:UMCounter:TINTerval,
STATus:QUEStionable:UMCounter:TREMaining?

STATus:QUEStionable:UMCounter:TRESet

The STATus:QUEStionable:UMCounter:TRESet command resets the user maintenance counter to the time interval value set by STAT:QUES:UMC:TINT. The user maintenance counter is a countdown timer that counts hours down to zero. STAT:QUES:UMC:TRES clears any present UMCounter warnings and begins the countdown again.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:UMCounter:TINT,
STATus:QUEStionable:UMCounter:TREMaining?

STATus:QUEStionable:VOLTage:CONDition?

The STATus:QUEStionable:VOLTage:CONDition? query returns an integer representing the contents of the condition register associated with the VOLTage status group.

The condition register continuously monitors the hardware and firmware status of the instrument. There is no latching or buffering for this register; it is updated in real time. Condition registers are read-only.

The following table describes each bit in the VOLTage status group:

Bit	Description	Decimal Value
0	+24 (P24) volt power supply	1
1	+12 (P12) volt power supply	2
2	+5 (P5) volt power supply	4
3	5Volt Standby	8
4	External 5 volt supply for Enhanced Monitor RS-232 port.	16
5	-2 (N2) volt power supply	32
6	-5.2 (N5Pt2) volt power supply	64
7	-12 (N12) volt power supply	128
8	-24 (N24) volt power supply	256
9	Unused	512
10	Unused	1024
11	Unused	2048
12	Unused	4096
13	Unused	8192
14	Unused	16384
15	Unused	32768

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which conditions are set (1) or cleared (0) for the VOLTage status group.

Comments

- A bit is set when the supply is out of limits.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:VOLTage:EVENt?,
STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:VOLTage:ENABle <*mask*>
STATus:QUEStionable:VOLTage:ENABle?

The STATus:QUEStionable:VOLTage:ENABle command sets the value of the enable register for the VOLTage status group.

The STATus:QUEStionable:VOLTage:ENABle query returns an integer representing the value of the enable register for the VOLTage status group.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The questionable voltage status summary bit is recorded in the Questionable Condition Register. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 32767	487 (see 2nd comment below)	Bit mask for the enable register of the VOLTage status group.

Returned Data

Type	Range	Description
int16	0 - 32767	Mask value.

Comments

- Refer to STATus:QUEStionable:VOLTage:CONDition? for a description of each bit in the VOLTage status group.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned. The value 487 includes all power supples except P5STby and P5EXt.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	The <*mask*> value is invalid.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command. Use STATus:PRESet to clear the enable registers of the OPERation status group and the QUEStionable status group.

Related Commands

STATus:QUEStionable:VOLTage:CONDition?, STATus:QUEStionable:VOLTage:EVENt? STATus:QUEStionable:VOLTage:ENABle?, STATus:PRESet, SYSTem:NVSave, *PSC

STATus:QUEStionable:VOLTage:EVENt?

The STATus:QUEStionable:VOLTage:EVENt? query returns an integer representing the value of the event register for the VOLTage status group.

The event register latches transition events from the condition register as specified by the transition filter. In general, a transition event occurs when a condition makes a transition from a low to a high state AND the event has been enabled with the STATus:QUEStionable:VOLTage:PTR command. The 5Vstdby and the external +5Vdc can be set to transition on a high to low. Bits in the event register are latched, and once set, they remain set until cleared by a STATus:QUEStionable:EVENt? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

Returned Data

Type	Range	Default	Description
int16	0 - 32767	none	Bit mask indicating which events are set (1) or cleared (0) for the VOLTage status group.

Comments

- Refer to STATus:QUEStionable:VOLTage:CONDition? for a description of each bit in the VOLTage status group.

Reset Condition

*RST does not affect the status system, use *CLS to clear all event registers.

Related Commands

STATus:QUEStionable:VOLTage:PTR,
STATus:QUEStionable:VOLTage:ENABle, *CLS

STATus:QUEStionable:VOLTage:LEVel? <*supply*>[,MIN|MAX]

The STATus:QUEStionable:VOLTage:LEVel? query returns a floating number representing the last measurement of the power supply voltage.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enumerated	P24, P12, P5, N2, N5PT2, N12 N24, P5STby, P5EXt	none	Indicates which power supply current is being queried
optional parameter	optional enumerated	MIN, MAX	none	When added after <*supply*>, queries the maximum and minimum voltage limits.

Returned Data

Type	Range	Default	Description
float32		None	power-supply voltage

Comments

- The measurement returned is the last measurement made on the supply identified with <*supply*>. Under normal operation, this should be within the last 2 seconds. Voltage is not measured during a *TST? or CAL? operation, so a query to STAT:QUES:VOLT:LEV? will return the last measurement made before the long operation was entered. If the power of the mainframe is off, this query will return the last measurement made before power turned off.

- The optional MIN and MAX parameter allows the power supply's voltage limits to be queried. STAT:QUES:VOLT:LEV? P5, MAX will return the limit warning point for the 5V supply.

Reset Condition

*RST does not affect the status system.

Related Commands

STATus:QUEStionable:VOLTage:EVENt?,
STATus:QUEStionable:VOLTage:CONDition?,
STATus:QUEStionable:VOLTage:ENABle?,
STATus:QUEStionable:VOLTage:ENABle

STATus:QUEStionable:VOLTage:PTR *<mask>*
STATus:QUEStionable:VOLTage:PTR?

The STATus:QUEStionable:VOLTage:PTR sets the voltage positive transition filter.

The STATus:QUEStionable:VOLTage:PTR? returns an integer representing the voltage positive transition filter.

Only bit 3 and bit 4 of the transition filter can be set or cleared by the user.

Parameters

Name	Type	Range	Default	Description
<mask>	int16	0 to 32767	511 (see comment below)	Indicates the transition direction when an event will occur.

Returned Data

Type	Range	Default	Description
int16	0 to 32767	none	Indicates the transition direction when an event will occur.

Comments

- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned.

- The following table describes the bits in the VOLTage status group:

Bit	Description	Decimal Value
0	+24 (P24) volt power supply	1
1	+12 (P12) volt power supply	2
2	+5 (P5) volt power supply	4
3	5Volt Standby	8
4	External 5 volt supply for Enhanced Monitor RS-232 port.	16
5	-2 (N2) volt power supply	32
6	-5.2 (N5P2) volt power supply	64
7	-12 (N12) volt power supply	128
8	-24 (N24) volt power supply	256
9	Unused	512
10	Unused	1024
11	Unused	2048
12	Unused	4096
13	Unused	8192
14	Unused	16384
15	Unused	32768

STATus:SCONdition?

The STATus:SCONdition? query returns two integers indicating the pass/fail condition in the Enhanced Monitor. The integers are the sum of the decimal values of the bits that are set. A returned value of 0 in both integers indicates that there are no failures. A value of 1 (one) in a bit indicates that the corresponding present condition has failed. Unused bits return 0. Reading the condition does not clear the failure.

Returned Data

Type	Range	Default	Decimal Weight	Description
uint32	0 to 2147483647	none	1	Bit 0: Maintenance Counter Expired
			2	Bit 1: +5V Power Supply Voltage out of limit
			4	Bit 2: +12V Power Supply Voltage out of limit
			8	Bit 3: -12V Power Supply Voltage out of limit
			16	Bit 4: +24V Power Supply Voltage out of limit
			32	Bit 5: -24V Power Supply Voltage out of limit
			64	Bit 6: -5.2V Power Supply Voltage out of limit
			128	Bit 7: -2V Power Supply Voltage out of limit
			256	Bit 8: +5V STby Power Supply Voltage out of limit
			512	Bit 9: +5V Power Supply Current out of limit
			1024	Bit 10: +12V Power Supply Current out of limit
			2048	Bit 11: -12V Power Supply Current out of limit
			4096	Bit 12: +24V Power Supply Current out of limit
			8192	Bit 13: -24V Power Supply Current out of limit
			16384	Bit 14: -5.2V Power Supply Current out of limit
			32768	Bit 15: -2V Power Supply Current out of limit
			65536	Bit 16: Slot 0 Temperature over limit
			131072	Bit 17: Slot 1 Temperature over limit
			262144	Bit 18: Slot 2 Temperature over limit
			524288	Bit 19: Slot 3 Temperature over limit
			1048576	Bit 20: Slot 4 Temperature over limit
			2097152	Bit 21: Slot 5 Temperature over limit
			4194304	Bit 22: Slot 6 Temperature over limit
			8388608	Bit 23: Slot 7 Temperature over limit
			16777216	Bit 24: Slot 8 Temperature over limit
			33554432	Bit 25: Slot 9 Temperature over limit
			67108864	Bit 26: Slot 10 Temperature over limit
			134217728	Bit 27: Slot 11 Temperature over limit
			268435456	Bit 28: Slot 12 Temperature over limit
			536870912	Bit 29: Ambient Temperature over limit
			1073741824	Bit 30 Power Supply Temperature over limit
			2147483648	Bit 31: Not Used; set to 0.
uint32	0 to 31	none	1	Bit 0: Total power
			2	Bit 1: Blower 1 (main cooling fan)[a]
			4	Bit 2: Blower 2 (1st Power Supply cooling fan)[a]
			8	Bit 3: Blower 3 (2nd Power Supply cooling fan)[a]
			16	Bit 4: 5V External Voltage
			32	Bit 5 through Bit 31: Not used; set to 0.

a. Fan is operating out of expected range for the present level.

The SYSTem subsystem commands set parameters and return values that are not directly related to instrument performance.

Subsystem Syntax

:SYSTem	
:BEEPer	
:FREQuency <*frequency*>	Sets the beeper's frequency.
:FREQuency?	Returns the beeper's frequency.
[:IMMediate][<*freq*>[,<*dur*>]]	Causes the mainframe to beep
:STATe <*state*>	Enables all beeps inc. key beeps
:STATe?	Disables all beeps inc. key beeps
:TIME <*duration*>	Sets the beeper's duration.
:TIME?	Returns the beeper's duration.
:BLOWer	
:STATe <*state*>	Sets mainframe fan state
:STATe?	Returns mainframe fan state
:COMMunicate:SERial	
:CONTrol	
:RTS <rts>	Sets the RS-232 control value.
:RTS?	Returns the control value for RS-232.
:ECHO <echo>	Sets the state of echoing characters.
:ECHO?	Returns the state of echoing characters.
:ERESponse<eresponse>	Sets state of immediate error reporting.
:ERESponse?	Returns state of error reporting.
:LBUFfer<lbuffer>	Sets the state of line buffering.
:LBUFfer?	Returns the state of line buffering.
:PRESet	
[:ALL]	Presets RS-232 to default (TERM)
:RAW	Presets RS-232 to computer settings.
:TERM	Presets RS-232 to terminal settings.
:RECeive	
:BAUD <*baud*>	Sets RS-232 baud rate
:BAUD?	Returns RS-232 baud rate
:BITS <*bits*>	Sets RS-232 number of bits
:BITS?	Returns RS-232 number of bits
:PACE <*pace*>	Sets RS-232 pacing style
:PACE?	Returns RS-232 pacing style
:PARity:	
[:TYPE] <*parity*>	Sets RS-232 parity
[:TYPE]?	Returns RS-232 parity
:SBITs <*bits*>	Sets RS-232 number of stop bits
:SBITs?	Returns RS-232 number of stop bits
:VXI:ADDRess? <*address*>	Returns enhanced monitor VXI address
:DATE:LMA?	Returns last factory maintenance date.
:ERRor?	Returns error number and message
:FACTory	Alias for SYSTem:NVDefault
:HELP:HEADers?	Returns all SCPI commands & queries
:MODel?	Returns model number of mainframe
:NAME <*name*>	Sets a name for the mainframe
:NAME?	Returns system name for mainframe
:NVDefault	Resets mainframe settings
:NVRecall	Recalls mainframe settings
:NVSave	Stores mainframe settings

SYSTem Subsystem commands continued on next page.

:SYSTem	
:POWer<*state*>	Turns the mainframe on or off.
:POWer?	Returns mainframe state (ON,OFF)
:CYCLe?	Returns mainframe power cycles
:SOURce?	Returns monitor power source
:STATus?	Returns status of power on/off systems.
:SNUMber<*string*>	Sets the serial number of the mainframe.
:SNUMber?	Returns mainframe serial number
:SER	Alias for SYSTem:SNUM
:TIME	
:LMA?	Alias for HIST:TIME:OPER?
:ON?	Alias for HIST:TIME:ON?
:VERSion?	Returns SCPI Version compliance year

RS-232 Port Information

The SYSTem:COMMunicate:SERial ... commands set and/or modify the configuration of the Enhanced Monitor's serial interface. Serial communication commands take effect after the end of the program message containing the command(s).

Default parameters are:

- Baud: 9600
- Bits: 8
- Parity: None
- Sbits: 1
- DTR/RTS: On
- Pace: XON
- Echo: On
- ERES: On
- Lbuf: On

Note If you are using the Enhanced Monitor RS-232 port while the mainframe is in standby mode, you must supply +5 Vdc from an external source at the +5VEXT connector. Refer to "External +5V Supply" on page 22. If you are using the RS-232 port while the mainframe is powered ON, the external 5Vdc is not necessary.

SYSTem:BEEPer:FREQuency <*frequency*>
SYSTem:BEEPer:FREQuency? [MIN | MAX]

SYSTem:BEEPer:FREQuency <*frequency*> sets the frequency of the beeper for the SYSTem:BEEPer:IMMediate command and mainframe warnings. Use the SYSTem:NVSave command to save the frequency in non-volatile memory.

SYSTem:BEEPer:FREQuency? returns an integer representing the frequency of the beeper.

Parameters

Name	Type	Range	Default	Description
<*frequency*>	int16	125 - 6000 MIN, MAX, DEF	1000	Frequency of beep, in Hertz
	enum	MIN, MAX		Returns minimum and maximum frequency for beeper.

Returned Data

Type	Range	Description
int16	125 - 6000	Beeper Frequency.

Comment

- The frequency is used by SYSTem:BEEP:IMM and by warning conditions in the mainframe.
- If you specify a <*frequency*> out side of the valid boundaries (125 to 6000), the actual frequency is clamped to the closest valid value; no error is generated. For example, if you specify <*frequency*> as 10000, it is clamped at 6000. Similarly, if you specify 100, it is clamped at 125.

Reset Condition

*RST returns the beeper frequency to the last values saved by the SYST:NVS command.

Related Commands

SYSTem:BEEPer:TIME, SYSTem:NVSave

SYSTem:BEEPer[:IMMediate] [<*frequency*>[,<*duration*>]]

SYSTem:BEEPer[:IMMediate] causes the mainframe to beep. The optional parameters <*frequency*> and <*duration*> override the frequency and time settings set by SYSTem:BEEP:FREQ and SYSTem:BEEP:TIME.

Parameters

Name	Type	Range	Default	Description
<*frequency*>	int16	125 - 6000 MIN, MAX	1000	Frequency of beep, in Hertz
<*duration*>	float32	0.01 - 2.0 MIN, MAX	0.2	Duration of beep, in seconds

Comments

- The mainframe will beep whether SYSTem:BEEP:STATe is ON or OFF.
- Out of range values for <*frequency*> and <*duration*> do not cause the mainframe to generate an error. Instead, the closest minimum or maximum value is used, and the beeper sounds. For example, if you specify <*frequency*> as 10000, it is clamped at 6000. Similarly, if you specify 100, it is clamped at 125.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST has no effect on the SYSTem:BEEP command.

Related Commands

SYSTem:BEEPer:FREQuency, SYSTem:BEEPer:TIME

SYSTem:BEEPer:STATe <*state*>
SYSTem:BEEPer:STATe?

SYSTem:BEEPer:STATe <*state*> sets the state of the beeper.

SYSTem:BEEPer:STATe? returns an integer with the state of the beeper.

If ON, the beeper will beep for key presses, during internal self test execution, and when a warning condition occurs in the mainframe. If OFF, a beep will not occur unless the SYSTem:BEEP command is issued.

Parameters

Name	Type	Range	Default	Description
<*state*>	Boolean	ON, OFF, 0, 1	ON	State of beep warning. 0 is off, 1 is on.

Returned Data

Type	Range	Description
Boolean	0, 1	Beeper state. 0 is off, 1 is on.

Comments

- The SYSTem:BEEP:STATe OFF command does not prevent a beep from occurring if a SYSTem:BEEP is sent.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST sets the state to ON.

Related Commands

SYSTem:BEEPer:STATe?

SYSTem:BEEPer:TIME <*duration*>
SYSTem:BEEPer:TIME?

SYSTem:BEEPer:TIME <*duration*> sets the duration of the beeper. The duration is stored in non-volatile memory with the SYSTem:NVSave command.

SYSTem:BEEPer:TIME? returns a floating point number representing the duration of the beeper.

Parameters

Name	Type	Range	Default	Description
<*duration*>	float32	0.01 - 2.0, MIN, MAX, DEF	0.2	Duration of beep in seconds

Returned Data

Type	Range	Description
float32	0.01 - 2.0	Beeper duration.

Comment

- The duration is used in SYTS:BEEP:IMM (when using defaults) and in warning conditions in the mainframe.
- Out of range values for <*duration*> do not cause the mainframe to generate an error. Instead, the duration is set to the closest value within the valid range.

Reset Condition

*RST resets beeper duration to the last value saved by the SYST:NVS command.

Related Commands

SYSTem:BEEPer:FREQuency, SYSTem:NVSave

SYSTem:BLOWer:STATe <*state*>
SYSTem:BLOWer:STATe?

SYSTem:BLOWer:STATe <*state*> sets the state of the fans in the mainframe.

SYSTem:BLOWer:STATe? returns a string with the state of the fans in the mainframe. The string is either "FULL" or "VAR."

FULL means either software control or front panel switch has put the fans at full speed. VARiable means both software control and front panel switch are at VARiable.

Parameters

Name	Type	Range	Default	Description
<*state*>	enum.	FULL, VAR	Match fan switch setting	The status of the fans.

Returned Data

Type	Range	Description
enum.	FULL, VAR	Fan speed status.

Comments

- This command can change the state of the fans from VARiable to FULL at any time. When software control has set the fans to FULL, the front panel fan switch can be set to variable and the fans will remain at FULL. Software control can not put a mainframe with its switch set to FULL into a variable fan state. FULL means that the fans will run at full speed no matter what the conditions in the mainframe. VARiable means that the enhanced monitor sets the fan speed based on the temperature conditions in the mainframe and the temperature limits set by the user.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-109	"Missing Parameter"	The <*state*> parameter was omitted.
-221	"Settings Conflict"	The mainframe's power is off, or the mainframe's fan switch is set to FULL and the parameter sent was VARiable. In this case, the fan speed was not set to variable. Software assertion of FULL (using the command SYSTem:BLOW:STATe FULL) is disabled on this error.
-224	"Illegal Parameter"	The <*state*> parameter was not correct.

Reset Condition

*RST sets SYSTem:BLOWer:STATe to match the front panel fan switch setting. If you had executed SYSTem:BLOWer:STATe FULL, it is reset to VAR.

Related Commands

STATus:QUEStionable:TEMPerature:LIMits

SYSTem:COMMunicate:SERial:CONTrol:RTS *<rts>*
SYSTem:COMMunicate:SERial:CONTrol:RTS?

SYSTem:COMMunicate:SERial:CONTrol:RTS controls the behavior of the Request To Send (RTS) output line. RTS can be a static state (ON/OFF), or it can be used as a hardware handshake line (IBFull).

SYSTem:COMMunicate:SERial:CONTrol:RTS? returns a string (enumerated) with the control value for RS-232 communication. The string is either "ON", "OFF", or "IBF."

Parameters

Name	Type	Range	Default	Description
<rts>	enum	ON, OFF, IBFull	ON	RTS can be a static state (ON/OFF), or it can be used as a hardware handshake line (IBFull).

Returned Data

Type	Range	Description
enum.	ON, OFF IBF	RTS setting

Comments

- RTS ON means the RTS line is asserted; OFF means the RTS line is unasserted.
- RTS IBFull means that while the input buffer is not yet full, RTS is asserted. When the buffer becomes full, RTS becomes unasserted.

Reset Condition

*RST resets RTS to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:SERial:ECHO <*echo*>
SYSTem:COMMunicate:SERial:ECHO?

SYSTem:COMMunicate:SERial:ECHO sets the state of character echo. Parameter choices are: ON and OFF. If set to ON, an echoed character is transmitted for each received character. If OFF, no echoing character is sent. ECHO ON is useful when using a "dumb" terminal connected to the mainframe so that you can see what you are typing. Set it to OFF if you are using direct computer control.

SYSTem:COMMunicate:SERial:ECHO? returns an integer representing (0 or 1) the state of echoing characters.

Parameters

Name	Type	Range	Default	Description
<*echo*>	Boolean	ON, OFF 0, 1	On	Echoing characters from keyboard. 0 is OFF, and 1 is ON

Returned Data

Type	Range	Description
Boolean	0, 1	Echoing characters from keyboard. 0 is OFF, 1 is ON

Reset Condition

*RST resets ECHO to the last value saved by the SYST:NVS command.

Related Commands

SYSTem:COMMunicate:PRESet:TERMinal

SYSTem:COMMunicate:SERial:ERESponse <*eresponse*>
SYSTem:COMMunicate:SERial:ERESponse?

SYSTem:COMMunicate:SERial:ERESponse sets the state of immediate error reporting. Parameter choices are: ON and OFF. If ON, the Enhanced Monitor's response queue is emptied and transmitted over the RS-232 interface at any carriage return or line feed received (after the command is parsed and acted on). This is useful when using a "dumb" terminal connected to the mainframe so that errors are immediately apparent. If set to OFF, the error queue remains intact unless a SYSTem:ERRor? is executed.

Note: any word serial errors are also emptied.

SYSTem:COMMunicate:SERial:ERESponse? returns an integer (0 or 1) representing the state of immediate error reporting.

Parameters

Name	Type	Range	Default	Description
<*eresponse*>	Boolean	ON, OFF, 0, 1	On	Immediate error reporting. 0 is OFF, and 1 is ON.

Returned Data

Type	Range	Description
Boolean	0, 1	Immediate error reporting. 0 is OFF, 1 is ON

Reset Condition

*RST resets ERESponse to the last value saved by the SYST:NVS command.

Related Commands

SYSTem:COMMunicate:PRESet:TERMinal

SYSTem:COMMunicate:SERial:LBUFfer <*lbuffer*>
SYSTem:COMMunicate:SERial:LBUFfer?

SYSTem:COMMunicate:SERial:LBUFfer sets the state of line buffering. Parameter choices are: ON and OFF. If ON, the Enhanced Monitor buffers each character received over the RS-232 port until a carriage return or linefeed is received. At that time, the entire command line is parsed and acted on. This is useful when using a "dumb" terminal to connect to the mainframe so that backspacing is possible; backspacing is not possible if LBUF is turned off.

SYSTem:COMMunicate:SERial:LBUFfer? returns an integer(0 or 1) representing the state of line buffering.

Parameters

Name	Type	Range	Default	Description
<*lbuffer*>	Boolean	ON, OFF 0, 1	On	Line buffering state. 0 is OFF, and 1 is ON.

Returned Data

Type	Range	Description
Boolean	0, 1	Line buffer state 0 is OFF, 1 is ON

Reset Condition

*RST resets LBUFfer to the last value saved by the SYST:NVS command.

Related Commands

SYSTem:COMMunicate:PRESet:TERMinal

SYSTem:COMMunicate:SERial:PRESet[:ALL]
SYSTem:COMMunicate:SERial:PRESet:RAW
SYSTem:COMMunicate:SERial:PRESet:TERMinal

SYSTem:COMMunicate:SERial:PRESet presets **ALL** RS-232 settings to default, power-on settings.

SYSTem:COMMunicate:SERial:PRESet:RAW presets some RS-232 settings for use with a computer.

SYSTem:COMMunicate:SERial:PRESet:TERMinal presets some RS-232 settings for use with a dumb terminal.

Settings

SERial Port Parameter	[:ALL]	:RAW	:TERMinal
Baud	9600	Not Changed	Not Changed
Bits	8	Not Changed	Not Changed
Control:RTS	On	Not Changed	Not Changed
Echo	On	Off	On
ERESponse	On	Off	On
LBUFfer	On	Off	On
Pace	XON	None	XON
Parity	None	Not Changed	Not Changed
Sbits	1	Not Changed	Not Changed

Reset Condition

*RST has no effect on this command.

SYSTem:COMMunicate:SERial[:RECeive]:BAUD <*baud*>|MIN|MAX|DEF
SYSTem:COMMunicate:SERial[:RECeive]:BAUD?

SYSTem:COMMunicate:SERial[:RECeive]:BAUD sets the baud rate for RS-232 communication.

SYSTem:COMMunicate:SERial[:RECeive]:BAUD? returns an integer representing the baud rate for RS-232 communication.

Parameters

Name	Type	Range of Values	Default	Description
<*baud*>	int16 enum.	300, 1200, 2400, 4800, 9600, 19200, MIN|MAX|DEF	9600	Baud Rate

Returned Data

Type	Range	Description
int16	300, 1200, 2400, 4800, 9600, 19200	Baud rate.

Comments

- When used with :BAUD, the MIN parameter sets the baud rate to the minimum value, 300 baud. When used with :BAUD? it returns the minimum value of 300 but does not change the actual baud rate. Likewise, MAX sets or returns the maximum baud rate (19200), and DEF sets/returns the default baud rate.

Reset Condition

*RST resets baud to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:SERial[:RECeive]:BITS *<bits>*
SYSTem:COMMunicate:SERial[:RECeive]:BITS?

SYSTem:COMMunicate:SERial[:RECeive]:BITS sets the number of bits used to transmit and receive data. Valid parameters are 7, 8, MIN, MAX, and DEF. Default is 8.

SYSTem:COMMunicate:SERial[:RECeive]:BITS? returns an integer representing the number of bits for RS-232 communication.

Parameters

Name	Type	Range of Values	Default	Description
<bits>	numeric enum.	7, 8 MIN|MAX|DEF	8	Bits for RS-232 communications.

Returned Data

Type	Range	Description
int16	7, 8	Bits for RS-232 communications.

Comments

- When used with :BITS, the MIN parameter sets the number of data bits to the minimum value, 7. When used with :BITS? it returns the minimum value of 7 but does not change the actual number of data bits used. Likewise, MAX sets or returns the maximum number of bits (8), and DEF sets/returns the default number of data bits, 8.

- While this command operates independently of either the ...PARity <*type*> and ...SBITs commands, there are combinations which are not allowed because of their data frame bit width. The following table shows the possible combinations:

...BITS	...PARity <*type*>	...SBITs	Frame Bits
7	NONE	1	disallowed
7	NONE	2	10
7	ODD/EVEN	1	10
7	ODD/EVEN	2	11
8	NONE	1	10
8	NONE	2	11
8	ODD/EVEN	1	11
8	ODD/EVEN	2	disallowed

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	You tried to set a disallowed combination of Bits, Parity, and Stop Bits.

Reset Condition

*RST resets Bits to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:SERial[:RECeive]:PACE <*pace*>
SYSTem:COMMunicate:SERial[:RECeive]:PACE?

SYSTem:COMMunicate:SERial[:RECeive]:PACE enables or disables the receive pacing (XON/XOFF) protocol. Valid parameters are XON or NONE. Default is XON.

SYSTem:COMMunicate:SERial[:RECeive]:PACE? returns a string representing the pacing style for RS-232 communication. The string returned is either “XON” or “NONE.”

Parameters

Name	Type	Range	Default	Description
<*pace*>	enum	XON, NONE	XON	Enables or Disable receiver pacing.

Returned Data

Type	Range	Description
enum	XON, NONE	Receiver pacing enabled or disable.

Comments

- While ...:PACE is XON, the serial interface will send XOFF when the buffer becomes full, and XON when the buffer is empty.
- The XON character is Control Q (ASCII 17_{10}, 11_{16}). The XOFF character is Control S (ASCII 19_{10}, 13_{16}).

Reset Condition

*RST resets pace to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE] *<parity>*
SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE]?

SYSTem:COMMunicate:SERial[:RECeive]:PARITY sets the parity for the RS-232 communications. Parameters are EVEN (received parity maintains even parity), ODD (received parity maintains odd parity), or NONE (no parity bit will be received). Default is NONE (no parity).

SYSTem:COMMunicate:SERial[:RECeive]:PARITY? returns a string representing the parity for RS-232 communication. The string is either “EVEN”, “ODD”, or “NONE.”

Parameters

Name	Type	Range	Default	Description
<parity>	enum	EVEN, ODD, NONE	NONE	RS-232 Parity.

Returned Data

Type	Range	Description
enum	EVEN, ODD, NONE	RS-232 Parity

Comments

- While this command operates independently of either the ...BITs and ...SBITs commands, there are combinations which are not allowed because of their data frame bit width. The following table shows the possible combinations:.

..BITS	...PARity <*type*>	...SBITs	Frame Bits
7	NONE	1	disallowed
7	NONE	2	10
7	ODD/EVEN	1	10
7	ODD/EVEN	2	11
8	NONE	1	10
8	NONE	2	11
8	ODD/EVEN	1	11
8	ODD/EVEN	2	disallowed

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	You tried to set a disallowed combination of Bits, Parity, and Stop Bits.

Reset Condition

*RST resets parity to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:SERial[:RECeive]:SBITs <*bits*>
SYSTem:COMMunicate:SERial[:RECeive]:SBITs? [MIN|MAX|DEF]

SYSTem:COMMunicate:SERial[:RECeive]:SBITs sets the number of stop bits for RS-232 communication. Valid parameters are 1 or 2. Default is 1 stop bit.

SYSTem:COMMunicate:SERial[:RECeive]:SBITs? returns an integer (1 or 2) representing the number of stop bits for RS-232 communication.

Parameters

Name	Type	Range of Values	Default	Description
<*bits*>	numeric enum.	1, 2 MIN|MAX|DEF	1	Number of Stop Bits.

Returned Data

Type	Range	Description
int16	1, 2	Number of Stop Bits.

Comments

- When used with :SBITs, the MIN parameter sets the number of data bits to the minimum value, 1. When used with :SBITs? it returns the minimum value of 2 but does not change the actual number of data bits used. Likewise, MAX sets or returns the maximum number of stop bits (2), and DEF sets/returns the default number of data bits, 1.

- While this command operates independently of either the ...BITs and ...PARity <*type*> commands, there are combinations which are not allowed because of their data frame bit width. The following table shows the possible combinations:

...BITS	...PARity <*type*>	...SBITs	Frame Bits
7	NONE	1	disallowed
7	NONE	2	10
7	ODD/EVEN	1	10
7	ODD/EVEN	2	11
8	NONE	1	10
8	NONE	2	11
8	ODD/EVEN	1	11
8	ODD/EVEN	2	disallowed

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Data out of range”	You tried to set a disallowed combination of Bits, Parity, and Stop Bits.

Reset Condition

*RST resets sbits to the last value saved by the SYST:NVS command.

SYSTem:COMMunicate:VXI:ADDRess? <*address*>

SYSTem:COMMunication:VXI:ADDRess returns the current VXI logical address of the enhanced monitor device. This address is set by a switch on the back of the mainframe.

Parameters

Name	Type	Range of Values	Default
<*address*>	enum.	MIN|MAX|DEF	none

Returned Data

Type	Range	Default	Description
int16	1 through 254, or 32767	224	VXI logical address

Comments

- The MIN parameter returns the lowest possible address, 1 but does not change the actual VXI logical address used with the Enhanced Monitor. Similarly, the MAX parameter returns the largest possible VXI address, 254 but does change the address used. DEF returns the factory default address of 224.
- This query will return the VXI logical address unless the mainframe's power is off and the enhanced monitor device cannot read it. It then returns the value 32567.

Reset Condition

*RST has no effect on the VXI logical address.

SYSTem:DATE:LMAintenance?

SYSTem:DATE:LMAintenance? returns three dates (integers) of the last factory maintenance of the mainframe.

Returned Data

	Type	Range	Default	Description
<*year*>	int16	1998 through 32767	1998	Year of last factory maintenance
<*month*>	int8	1 through 12	1	Month of last factory maintenance
<*date*>	int8	1 through 31	1	Date of last factory maintenance

Comments

- This date is set in the manufacturing factory. The default date would not exist unless the enhanced monitor's non-volatile memory is lost.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-311	"Memory error"	Non-volatile memory is inaccessible.

Reset Condition

*RST has no effect on the manufacturing date.

SYSTem:ERRor?

SYStem:ERRor? returns the error number and corresponding error message string from the error queue.

Returned Data

Type	Range	Default	Description
int16	-32768 through 32767	none	Error number
string		none	Error message

Comments

- The response format is:

  ```
  error_number, "error description string".
  ```

- **Error Numbers/Message in the Error Queue:** Each error generated by this instrument driver stores an error number and corresponding error message in the error queue. The error message can be up to 255 characters long.

- **Clearing the Error Queue:** An error number/message is removed from the queue each time the SYSTem:ERRor? command is sent. The errors are cleared on a first-in, first-out basis. When the queue is empty, SYSTem:ERRor? returns 0, "No error". To clear all error number/messages in the queue, execute the *CLS command.

- **Maximum Error Numbers/Message in the Error Queue:** The queue holds a maximum of 30 error numbers/messages. If the queue overflows, the last error number/message in the queue is replaced by -350, "Too many errors". The least recent error number/message remains in the queue and the most recent are discarded.

Reset Condition

*RST does not affect the status system, use *CLS to clear the error queue.

Related Commands

*CLS

SYSTem:HELP:HEADers?

SYSTem:HELP:HEADers? returns a string containing a list of all the valid SCPI commands accepted by the enhanced monitor. The commands are separated by linefeeds.

Returned Data

Type	Range	Default	Description
string		none	Each command is separated by a new-line within the return string.

Comments

The returned data string is very large, nearly 5000 bytes. Be sure to allocate a large enough buffer variable in which to receive it.

Reset Condition

*RST has no effect on this command.

Related Commands

SYSTem:MODel?

SYSTem:MODel? returns the model number (string) of the mainframe

Returned Data

Type	Range	Default	Description
string	E8402A, E8404A	none	Mainframe Model Number

Reset Conditions

*RST has no effect on this query.

Related Commands

SYSTem:SNUMber?, *IDN?

SYSTem:NAME <*name*>
SYSTem:NAME?

SYSTem:NAME sets a user-specified name (quoted string) for the mainframe. The name is stored in non-volatile memory.

SYSTem:NAME? returns a string with the mainframe's system name.

Parameters

Name	Type	Range	Default	Description
<*name*>	string (quoted)	31 characters	none	Any Identifier set by user. Must be set in double quotation marks.

Returned Data

Type	Range	Default	Description
string	31 characters	"not set"	Mainframe system name (any identifier set by user).

Comments

- SYSTem:NVSave must be executed after setting this command to store the new name string in non-volatile memory.
- You may supply 31 characters in addition to enclosing quotation marks (“). You may need up to 33 characters of buffer space to receive the response because it include the quotation marks.
- The command determines if <*name*> is within the valid 31 character limit. If it is not, the string is truncated to 31 characters. No error is generated.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-128	“Numeric data not allowed”	The <*string*> started with a number.
-221	“Settings Conflict”	The mainframe's power is off.
-148	“Character data not allowed”	Must use quotation marks around string.

Reset Condition

*RST will load the non-volatile settings. Any change to the SYSTem:NAME that was not saved with the SYSTem:NVSave command is lost.

Related Commands

SYSTem:SNUMber

SYSTem:NVDefault

SYSTem:NVDefault resets many non-volatile mainframe settings to factory defaults. This includes temperature limits, current limits, total power limits, status enable settings, PSC flag, beep frequency, beep duration, system name, and mainframe serial number. RS-232 settings are not reset; use SYST:COMM:SER:PRES to reset RS-232 settings to the factory defaults.

Comments

- This command is similar to SYSTem:NVRecall except that SYST:NVD recalls the factory defaults -- not those set by the last SYSTem:NVSave command. SYST:NVD places the defaults into registers but does not alter non-volatile memory.
- Note that the mainframe serial number is set to “0”, not the actual serial number of the mainframe. Refer to the SYSTem:SNUMber command.
- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on, the factory defaults are returned. The factory defaults are listed in the following table:

Register	Default Value		Register	Default Value
STATus:OPERation:ENABle	0		STAT:QUES:POW:LIM	none
STATus:QUEStionable:ENABle	0		SYST:BEEP:FREQ	1000
STAT:QUES:BLOWer:ENABle	7		SYST:BEEP:TIM	0.2
STAT:QUES:CURRent:ENABle	487		SYST:NAME	none
STAT:QUES:TEMPerature:ENABle	32767		SYST:SNUM	none
STAT:QUES:VOLT:ENABle	487		HIST:UNIT:TIME	Hour
STAT:QUES:VOLT:PTR	511		*PSC	
STAT:QUES:CURR:LIM	none		*ESE	
STAT:QUES:TEMP:LIM	65, 20, 55		*SRE	

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.
-311	“Memory Error”	Non-volatile memory failure.

Reset Condition

*RST has no effect on this command.

Related Commands

SYSTem:NVRecall, SYSTem:NVSave

SYSTem:NVRecall

SYSTem:NVRecall causes the enhanced monitor to reload many of its parameters from non-volatile memory. This includes temperature limits, current limits, total power limits, status enable settings, PSC flag, beep frequency, beep duration, system name, and mainframe serial number. RS-232 settings are not recalled; they are recalled only at power-on.

Comments

- This command is very similar to SYSTem:NVDefault except that the settings recalled are the last ones saved by the SYSTem:NVSave command and not the factory defaults.The commands affected are:

Register		Register
STATus:OPERation:ENABle		STAT:QUES:POW:LIM
STATus:QUEStionable:ENABle		SYST:BEEP:FREQ
STAT:QUES:BLOWer:ENABle		SYST:BEEP:TIM
STAT:QUES:CURRent:ENABle		SYST:NAME
STAT:QUES:TEMPerature:ENABle		SYST:SNUM
STAT:QUES:VOLT:ENABle		HIST:UNIT:TIME
STAT:QUES:VOLT:PTR		*PSC
STAT:QUES:CURR:LIM		*ESE
STAT:QUES:TEMP:LIM		*SRE

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.
-311	“Memory Error”	Non-volatile memory is inaccessible.

Reset Condition

*RST has no effect

Related Commands

SYSTem:NVSave

SYSTem:NVSave

SYSTem:NVSave causes the enhanced monitor to store many of its parameters to non-volatile memory. This includes temperature limits, current limits, total power limits, status enable settings, PSC flag, beep frequency, beep duration, system name, mainframe serial number, and all RS-232 settings.

Comments

- Non-volatile memory has a finite access lifetime. For this reason, these values are saved only when explicitly requested with this command and all at one time. The commands/registers affected are:

Register		Register
STATus:OPERation:ENABle		SYST:BEEP:FREQ
STATus:QUEStionable:ENABle		SYST:BEEP:TIM
STAT:QUES:BLOWer:ENABle		SYST:NAME
STAT:QUES:CURRent:ENABle		SYST:SNUM
STAT:QUES:TEMPerature:ENABle		HIST:UNIT:TIME
STAT:QUES:VOLT:ENABle		*PSC
STAT:QUES:VOLT:PTR		*ESE
STAT:QUES:CURR:LIM		*SRE
STAT:QUES:TEMP:LIM		SYST:COMM:SER:REC:BAUD
STAT:QUES:POW:LIM		SYST:COMM:SER:REC:BITS
SYST:COMM:SER:CONT:RTS		SYST:COMM:SER:REC:PACE
SYST:COMM:SER:ECHO		SYST:COMM:SER:PARity
SYST:COMM:SER:ERES		SYST:COMM:SER:SBIT
SYST:COMM:SER:LBUF		

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.
-311	“Memory Error”	Non-volatile memory is inaccessible.

Reset Condition

*RST has no effect

Related Commands

SYSTem:NVRecall

SYSTem:POWer <*state*>
SYSTem:POWer?

SYSTem:POWer <*state*> sets the software controlled power-on/off state of mainframe.

SYSTem:POWer? returns a string representing the power state of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*state*>	Boolean	ON, OFF, 0, 1	1	Sets the software control state of the mainframe. 0 is OFF, 1 is ON.

Returned Data

Type	Range	Description
Boolean	0, 1	Software control state for mainframe power. 0 is OFF, 1 is ON.

Comments

- The mainframe can be turned on with this command at any time, even when mainframe power is already on. Once set ON with this command, a SYSTem:POW OFF must be sent before the mainframe can actually turn off. The mainframe will not turn off unless the main power switch is on STDBY and the Diagnostic Connector power pin (pin 5) is unasserted (not grounded, refer to "Using the Remote Power-On Pins" on page 23).

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	"Illegal Parameter"	The <*state*> parameter was not correct.
-109	"Missing Parameter"	The <*state*> parameter was omitted.
-221	"Settings Conflict"	The mainframe cannot turn off by software control because the main power switch is on, or the Diagnostic Connector's power pin is being driven.

Reset Condition

*RST has no effect on powering of the mainframe.

Related Commands

SYSTem:POWer:STATus?

SYSTem:POWer:CYCLe?

SYSTem:POWer:CYCLe? returns an integer representing the number of times the mainframe has been turned on since it was manufactured.

Returned Data

Type	Range	Default	Description
uint16	0 through 65535	none	Number of times the mainframe has turned on.

Comments

- This count contains only power cycles. VXI SYSRESET occurrences do not increment this counter.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-311	“Memory Error”	the non-volatile memory is inaccessible.

Reset Condition

*RST has no effect on this query.

Related Commands

SYSTem:POWer

SYSTem:POWer:SOURce?

SYSTem:POWer:SOURce? returns a string representing the source of power operating the enhanced monitor device. The string returned is either “MAIN” or “EXT”.

Returned Data

Type	Range	Default	Description
enum.	MAIN, EXTernal	none	MAIN is the 5V VXI supply, EXTernal is the 5VEXt supply.

Comments

- The enhanced monitor is always operating on the 5V VXI supply if it is operating.

Reset Condition

*RST has no effect on this query.

Related Commands

SYSTem:POWer

SYSTem:POWer:STATus?

SYSTem:POWer:STATus? returns three integers representing the status of the three sources of power-up/power-down assertion. The three sources are the front panel ON/STDBY switch, the diagnostic connector's remote power lines, and the SYSTem:POWer command.

Returned Data

	Type	Range	Default	Description
<*switch*>	unit16n	0, 1	none	This indicates the front panel switch state. 1 indicates it is pushed in (power-on).
<*auxRemote*>	unit16	0, 1	none	The state of the Diagnostic connector's remote power signal. 1 indicates it is connected to the remote power signal return. Refer to "Using the Remote Power-On Pins" on page 23 and "Diagnostic Connector" on page 40
<*software*>	unit16	0, 1	none	The state of the software power-on command (SYSTem:POW ON/OFF). 1 indicates that a software power-on command is active.

Comments

The mainframe cannot power-off unless ALL three of these states are 0 (zero).

Reset Condition

*RST has no effect on this query.

Related Commands

SYSTem:POWer

SYSTem:SNUMber <*string*>
SYSTem:SNUMber?

SYSTem:SNUMber sets the serial number of the mainframe.

SYSTem:SNUMber? returns the serial number of the mainframe.

Parameters

Name	Type	Range	Default	Description
<*string*>	string	15 characters	none	Serial Number of mainframe.

Returned Data

Type	Range	Default	Description
string	15 characters	"0"	Serial number of instrument

Comments

- This number is set during manufacturing. However, the owner of the mainframe can choose to store their own identifying number for the mainframe. SYSTem:NAME may be a better choice for an identifying name. The serial number is reported through the *IDN? command. Once changed, the original serial number is only available from the serial number label on the rear panel of the mainframe. It will not be returned to memory with the SYSTem:NVDefault command. Instead, the SYSTem:NVDefault command restores the value 0 to SYSTem:SNUMber.
- You may supply 15 characters in addition to enclosing quotation marks (“). You may need up to 17 characters of buffer space to receive the response because it include the quotation marks.
- This command determines if <*string*> is within the valid 15 character range. If it is not, the string is truncated to 15 characters. No error is generated.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-128	“Numeric data not allowed”	Requires quotes around string.
-148	“Character data not allowed”	Requires quotes around string.
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST resets serial number the last value saved by the SYST:NVS command.

Related Commands

SYSTem:NAMe

SYSTem:VERSion?

SYStem:VERSion? returns the SCPI compliance version for this instrument.

Returned Data

Type	Range	Default	Description
decimal	1996.0	none	SCPI version supported

The TEST subsystem performs tests on the enhanced monitor functionality.

Subsystem Syntax

```
:TEST
   [:ALL]?                  Performs all the tests.
   :BLOWer?<blower>         Performs a fan test.
   :DISPlay?                Performs a display and beeper test.
   :MEMory?                 Performs a memory test.
   :NUMBer? 1000            Alias for TEST:BLOW?
   :NUMBer? 1010            Alias for TEST:SENSe? and TEST:TEMPerature?
   :NUMBer? 1100|1110|1120  Alias for TEST:DISP?
   :RESults
        [:CODE]?            Returns the result code of last test performed.
        :VERBose?[<code>]Returns string describing results of last test.
   :SENSe?                  Performs a test of A/D and D/A.
   :TEMPerature?            Performs a test of slot exhaust temperature sensor
                             boards.
   :TIME?                   Performs a test of enhanced monitor's timing.
```

TEST[:ALL]?

TEST:ALL? performs all the tests in the TEST subsystem except TEST:TIME?. They are performed in the following order: MEMory, SENSe, TEMPerature, DISPlay, BLOWer. Any failure causes an immediate error return. The command returns an integer; refer to the table below for valid responses and meaning.

Returned Data

Type	Range	Test Result Codes and Description	
int16	-32767 to 32767	result of test. +0 is a successful test.	
		+996	ROM checksum failure
		+997	RAM test failure
		+998	VXI communication hardware failure
		+999	Non-volatile memory corruption
		+1000 - 1006	Bad internal ground measurements
		+1007 - 1019	Bad front slot temperature measurement
		+1020-1032	Bad middle slot temperature measurement.
		+1033-1045	Bad rear slot temperature measurement.
		+1046	Bad ambient temperature measurement.
		+1050-1056	Bad voltage measurement.
		+1103-1306	Bad A/D or D/A.
		+1307	Bad multiplexer.
		+1308	Bad display contrast
		+1309	Bad front temperature board
		+1310	Bad middle temperature board
		+1311	Bad rear temperature board
		+1312-1381	Bad measurement or ground
		+1382-1389	Bad fan voltage
		+1390-1397	Bad impeller measurement
		+1398-1405	Bad power supply fan 1 measurement.
		+1406-1413	Bad power supply fan 2 measurement.

Comments

- This is a complete test. It can take up to 7 minutes before it returns. TEST:[:ALL]? interrupts the monitoring function of the enhanced monitor. Measurement levels returned from other commands during a test routine were all measured before the test routine started.
- Executing TEST:RES:VERB? following a test command, returns a string describing the result.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:MEM?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:RESults:VERBose?

TEST:BLOWer? [<*blower*>]

TEST:BLOWer? performs a test of the fans in the mainframe. The fans are set to every possible speed at and above present fan setting, allowed to settle for 30 seconds, and checked against limits. The test immediately returns on the first failure. The optional <*blower*> parameter allows a choice of which blower should be checked against limits. If <*blower*> is left off, all fans are tested in this order: BLOWer1, BLOWer2, BLOWer3. The command returns an integer; refer to TEST:ALL? for a complete list of test failure messages.

Parameters

Name	Type	Range	Default	Description
<*blower*>	optional enum.	BLOWer1, BLOWer2, BLOWer3	all	Selects the fan to check against limits. BLOWer1 is the main cooling fan, BLOWer2 is the Power Supply cooling fan, BLOWer3 is a second Power Supply cooling fan on the Agilent E8404A mainframe.

Returned Data

Type	Range	Description
int16	-32767 to 32767	Result of test. +0 is a successful test. Refer to TEST:ALL? for a complete list of test failure messages.

Comments

- This test can take 4 minutes. TEST:BLOWer? interrupts the monitoring function of the enhanced monitor. Measurement levels returned from other commands during a test routine were all measured before the test routine started.
- Fan settings below the fan level when the command is invoked, are not tested.
- If the fan switch is set to FULL during the test, the test will immediately complete.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.
-241	“Hardware missing”	Blower 3 does not exist on the Agilent E8402A

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:ALL?, TEST:MEM?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:TIME?, TEST:RESults:VERBose?

TEST:DISPlay?

TEST:DISPlay? performs the test of the mainframe's front panel function: display window, monitoring LEDs, and beeper. There is no failure result for this test. The display cycles through all pixels and all colors. The "Temp" / "Fan" / "Power Supply" LEDs change states, and the beeper performs a Bach song (if SYST:BEEP:STAT is enabled). The command returns an integer (always returns 0).

Returned Data

Type	Range	Description
int16	0	Result of test. Always +0.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	"Settings Conflict"	The mainframe's power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:MEM?, TEST:SENS?, TEST:TEMP?, TEST:ALL?, TEST:BLOW?, TEST:TIME?

TEST:MEMory?

TEST:MEMory? performs a test of the ROM, RAM, VXI communication, and non-volatile memory in the enhanced monitor. The command returns an integer; refer to TEST:ALL? for a complete list of test failure messages.

Returned Data

Type	Range	Description
int16	-32767 to 32767	Result of test. +0 is a successful test. Refer to TEST:ALL? for a complete list of test failure messages.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:ALL?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:TIME?

TEST:RESults[:CODE]?

TEST:RESults[:CODE]? returns the results code for the last executed TEST, *TST, or calibration command. The command returns an integer; refer to TEST:ALL? for a complete list of test failure messages and CAL:ALL? for a complete list of calibration failure commands.

Returned Data

Type	Range	Description
int16	-32768 to 32767	Result of test. +0 is a successful test. Refer to TEST:ALL? for a complete list of test failure messages.

Comments

- The history queue also contains an entry for each test run and its results and time stamp. Refer to HIST:QUE:FETC?
- Two other codes can be returned:
  - -- 478 indicating the last calibration or test was aborted.
  - -- 995 indicating that no calibration or test has been done since mainframe power-on.

Reset Condition

*RST does not change the last test results.

Related Commands

TEST:RES:VERB?

*TST?, TEST:ALL?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:TIME?, HIST:QUEue:FETCh?

TEST:RESults:VERBose? [<*code*>]

TEST:RESults:VERBose? returns a string describing the results of the last executed TEST, *TST, or calibration command. The optional parameter can be a result code (Refer to TEST[:ALL]? and CAL:ALL? for a list of test result codes); it will return the string for that result rather than the last test or calibration result.

Parameters

Name	Type	Range	Description
<*code*>	int16		Results of the last test. Refer to TEST:ALL? and CAL:ALL? for a list of results.

Returned Data

Type	Range	Description
string		String description of result of test or calibration.

Comments

- The history queue also contains an entry for each test run and its results and time stamp. Refer to HIST:QUE:FETC?
- Two other codes can be returned:

  -- 478 indicating the last calibration or test was aborted.
  -- 995 indicating that no calibration or test has been done since mainframe power-on.

Reset Condition

*RST does not change the last test results.

Related Commands

TEST:RES:CODE?, *TST?, TEST:ALL?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:TIME?, HIST:QUEue:FETCh?

TEST:SENSe?

TEST:SENSe? performs a test of the A/D, D/A, and multiplexers in the enhanced monitor. The command returns an integer; refer to TEST:ALL? for a complete list of test failure messages.

Returned Data

Type	Range	Description
int16	-32767 to 32767	Result of test. +0 is a successful test. Refer to TEST:ALL? for a complete list of test failure messages.

Comments

- TEST:SENSe? interrupts the monitoring function of the enhanced monitor. Measurement levels returned from other commands during a test routine were all measured before the test routine started.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:ALL?, TEST:MEM?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:TIMe?

TEST:TEMPerature?

TEST:TEMPerature? performs a test of the 3 temperature boards containing the 39 slot exhaust air temperature sensors. The command returns an integer; refer to TEST:ALL? for a complete list of test failure messages.

Returned Data

Type	Range	Description
int16	-32767 to 32767	Result of test. +0 is a successful test. Refer to TEST:ALL? for a complete list of test failure messages.

Comments

- TEST:TEMPerature? interrupts the monitoring function of the enhanced monitor. Measurement levels returned from other commands during a test routine were all measured before the test routine started.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:ALL?, TEST:SENS?, TEST:MEM?, TEST:DISP?, TEST:BLOW?

TEST:TIME?

TEST:TIME? performs a test of the timing functionality of the enhanced monitor. This test outputs a waveform on Pin 25 of the Diagnostic Connector with a 16 msec period for 10 seconds. The waveform will start within 2 seconds of the command. This waveform can be measured with a counter to determine its accuracy and jitter. There is no failure return for this test.

Returned Data

This command always returns a +0. Refer to Chapter 4 for instructions on performing this test.

Comments

- TEST:TIME? interrupts the monitoring function of the enhanced monitor. Measurement levels returned from other commands during a test routine were all measured before the test routine started.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

*RST aborts any TEST being performed.

Related Commands

*TST?, TEST:ALL?, TEST:SENS?, TEST:TEMP?, TEST:DISP?, TEST:BLOW?, TEST:MEM?

The TRACe subsystem provides the measurement data streams.

Subsystem Syntax

:TRACe	
[:DATA]? <*name*>	Returns measurement data for trace <*name*>.
[:DATA]:PREamble? <*name*>	Returns preamble data for trace <*name*>.
:POINts? <*name*>	Returns number of measurements in Trace <*name*>

TRACe[:DATA]? <*name*>

TRACe[:DATA]? returns the measurement data over the past hour for the <*name*> trace. All data is provided as a finite IEEE488.2 block containing 2 byte integers. Byte order is set by FORMat:BORDer.

Parameters

Name	Type	Range	Default	Description
<*name*>	enum.	OUTF0..OUTF12	none	slot 0 through 12 front temperatures
		OUTM0..OUTM12		slot 0 through 12 middle temperatures
		OUTR0..OUTR12		slot 0 through 12 rear temperatures
		AMBient		mainframe intake air temperature
		PSUPply		Power Supply Temperature
		VP5		5V supply voltage
		VP12		12V supply voltage
		VN12		-12V supply voltage
		VP24		24V supply voltage
		VN24		-24V supply voltage
		VN5PT2		-5.2V supply voltage
		VN2		-2V supply voltage
		P5STdby		5V Standby voltage
		P5EXt		External 5v voltage
		IP5		5V supply amperage
		IP12		12V supply amperage
		IN12		-12V supply amperage
		IP24		24V supply amperage
		IN24		-24V supply amperage
		IN5PT2		-5.2V supply amperage
		IN2		-2V supply amperage
		TPWR		total power on all seven supplies
		BLOW1		Main Cooling Fan
		BLOW2		Power Supply Cooling Fan
		BLOW3		Power Supply Cooling Fan (Agilent E8404 only)

Returned Data

Type	Range	Description
IEEE 488.2 Block		Trace data for previous hour. (except for P5EXt)

Comments

- Data is stored every 10 seconds over a 1 hour period for all waveforms except P5EXt. The first integer in the data block is the most recent reading. TRAC:PRE? values are used to convert the integer value to a floating point measurement. Refer to TRAC:PRE? for details.

- If less than 1 hour of data has been taken, a value of -1 is used as a pad to complete the hour's worth of data.

- In general, you should execute commands in the following order:

TRACe:POINts	*to determine number of points*
TRACe:DATA?	*to get the actual data*
TRACe:PREamble	*to get time stamp of first trace point*

The *xorigin* field of the TRACe:PREamble data is the first reading time stamp

in the block of data was taken. The units for *xorigin* is seconds since power-on.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	“Illegal Parameter”	The <*name*> parameter was not correct.
-109	“Missing Parameter”	The <*name*> parameter was omitted.

Reset Condition

*RST has no effect on the TRACe data.

Related Commands

TRACe:PREamble?, TRACe:POINts?

TRACe[:DATA]:PREamble? <*name*>

TRACe:PREamble? returns the measurement envelope for the last requested <*name*> trace.

Parameters

Name	Type	Range	Default	Description
<*name*>	enum.	OUTF0..OUTF12 OUTM0..OUTM12 OUTR0..OUTR12 AMBient PSUPply VP5 VP12 VN12 VP24 VN24 VN5PT2 VN2 P5STdby P5EXt IP5 IP12 IN12 IP24 IN24 IN5PT2 IN2 TPWR BLOW1 BLOW2 BLOW3	none	slot 0 through 12 front temperatures slot 0 through 12 middle temperatures slot 0 through 12 rear temperatures mainframe intake air temperature Power Supply Temperature 5V supply voltage 12V supply voltage -12V supply voltage 24V supply voltage -24V supply voltage -5.2V supply voltage -2V supply voltage 5V Standby voltage External % Voltage 5V supply amperage 12V supply amperage -12V supply amperage 24V supply amperage -24V supply amperage -5.2V supply amperage -2V supply amperage total power on all seven supplies Main Cooling Fan Power Supply Cooling Fan Power Supply Cooling Fan (Agilent E8404 only)

Returned Data

	Type	Range	Default	Description
<*format*>	int8	0,1	0	see FORMat:BORDer? A 0 is normal, a 1 indicates swapped byte order.
<*type*>	int8	1	1	always raw data
<*points*>	int16	0 to 360	360	identical to TRACe:POINts?
<*count*>	int8	1	1	always 1.
<*xincrement*>	int8	-10	-10	each reading is 10 seconds apart.
<*xorigin*>	int32	0 - 2,147,483,648	none	seconds since power-on when last reading was taken.
<*xreference*>	int8	0	0	always 0.
<*yincrement*>	float32	-100 to 100	none	conversion factor for integer value to float.
<*yorigin*>	int8	0	0	always 0.
<*yreference*>	int8	0	0	always 0.

Comments

- Data is stored every 10 seconds over a 1 hour period. The first integer in the data block is the most recent reading. Integer data values retrieved by the TRACe? query are scaled to obtain useful information. The conversion formula are:
  -- Measurement conversion:
  $$\text{measurement} = ((\text{data value} - y_{reference}) \times y_{increment}] + y_{origin}$$
  -- Time conversion:
  $$\text{time} = [(\text{data point number} - x_{reference}) \times x_{increment}] + x_{origin}$$
- TRACe:PREamble should always follow its trace data. Otherwise, the *xorigin* is undefined.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	"Illegal Parameter"	The <*name*> parameter was not correct.
-109	"Missing Parameter"	The <*name*> parameter was omitted.

Reset Condition

*RST has no effect on the TRACe data.

Related Commands

TRACe?, TRACe:POINts?

TRACe:POINts? <*name*>

TRACe:POINts? returns the number of points in the <*name*> trace. This same data is available through TRAC:PRE? At this time, 360 points are kept for each trace except the external 5Vdc supply (P5EXt). Refer to TRACe[:DATA]:PREamble for detailed information.

These commands are defined in the IEEE 488.2 standard and are found on most SCPI instruments.

Syntax:	Description
*CLS	Clear all status groups and empties the error queue.
*ESE <*mask*>	Sets enable register of the standard event status group
*ESE?	Returns enable register of the standard event status group
*ESR?	Return events of the standard event status group
*IDN?	Return the SCPI Identification String
*OPC	Sets the operation complete bit when pending events finish
*OPC?	Returns 1 when pending events are finished
*PSC	Sets the power-on state clear flag
*PSC?	Returns the power-on state clear flag
*SRE <*mask*>	Sets the service request enable mask for the Status Byte
*SRE?	Returns the service request enable mask for the Status Byte
*STB?	Returns the contents of the status byte
*RST	Sets the module to a known state
*TST?	Returns the self-test result
*WAI	Waits for all pending operations to complete

*CLS

*CLS clears all status groups and empties the error queue.

Comments

- All event registers are cleared. This includes the Standard Event Status register, the OPERation event status register, and the QUEStionable data status register.
- *CLS does not affect the enable bits in any of the status register groups. (The SCPI command STATus:PRESet does clear the Operation Status Enable register and the Questionable Data Enable registers).
- *CLS disables the Operation Complete (*OPC) and the Operation Complete query (*OPC?).
- Use *CLS to clear the error queue. It typically follows *RST to reset the module to a known state.

Reset Condition

*RST does not affect the status system

Related Commands

STATus:OPERation:EVENt?, STATus:QUEStionable:EVENt?, *ESR?

*ESE <*mask*>
*ESE?

*ESE <*mask*> command sets the value of the enable register in the Standard Event status group.

*ESE? query returns the value of the enable register in the Standard Event status group.

The standard event status group provides the status of common instrument events including synchronization (Operation Complete) and Errors (Parser, Execution, Command Errors, and Instrument Dependent).

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The standard event status summary bit is recorded in the Status Byte. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

The following table describes each bit in the Standard Event status group:

Bit	Description	Decimal Value
0	Operation Complete (OPC)	1
1	Request Control (RQC)	2
2	Query Error (QYE)	4
3	Instrument Dependent (DDE)	8
4	Execution Error (EXE)	16
5	Command Error (CME)	32
6	User Request (URQ)	64
7	Power On (PON)	128

Parameter

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 255	none	Bit mask indicating which enable bits are set (1) or cleared (0) for the Standard Event status group.

Returned Data

Type	Range	Default	Description
int16	0 - 255	none	Bit mask indicating which enable bits are set (1) or cleared (0) for the Standard Event status group.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command.

Related Commands

STATus:OPERation:ENABle, STATus:QUEStionable:ENABle, *ESE?

*ESR? query returns the value of the event register for the Standard Event status group.

The standard event status group provides the status of common instrument events including synchronization (Operation Complete) and Errors (Parser, Execution, Command Errors, and Instrument Dependent).

The event register latches transition events from the condition register as specified by the transition filter. Only the positive transition filter is active in the module, this means that a transition event will occur when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a *ESR? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

The following table describes each bit in the Standard Event status group:

Bit	Description	Decimal Value
0	Operation Complete (OPC)	1
1	Request Control (RQC)	2
2	Query Error (QYE)	4
3	Instrument Dependent (DDE)	8
4	Execution Error (EXE)	16
5	Command Error (CME)	32
6	User Request (URQ)	64
7	Power On (PON)	128

Returned Data

Type	Range	Default	Description
int16	0 - 255	none	Bit mask indicating which enable bits are set (1) or cleared (0) for the Standard Event status group.

Reset Condition

*RST does not affect the status system. Use *CLS to clear all event registers in the status system.

Related Commands

STATus:OPERation:EVENt?, STATus:QUEStionable:EVENt?

*IDN?

*IDN? query returns the module's identification string.

Returned Data

Type	Range	Default	Description
string	none	none	Module identification string containing the revision of the SCPI driver.

Comments

- The identification string returns four fields (separated by commas)

1. Manufacturer
2. Model Number (identical to model returned with SYSTem:MODel?)
3. Serial Number (identical to number returned with SYSTem:SNUMber?)
4. Firmware Revision (returns 0 if not available)

- The identification string is less than 255 characters.

- Example return: Agilent,E8402A,0,A.01.00

Related Commands

SYSTem:SNUMber, SYSTem:SNUMber?

*OPC
*OPC?

*OPC command will cause the OPC event to occur in the Standard Event status group when all pending operations are complete.

*OPC? Query returns a 1 when all pending operations are complete.

Returned Data

Type	Range	Default	Description
int16	0, 1	none	Status of Operation Complete.

Comments

- By enabling this bit to be reflected in the Status Byte Register (sending *ESE 1), you can ensure synchronization between the instrument and an external computer or between multiple instruments.
- By requiring your computer to read the *OPC? response before continuing program execution, you can ensure synchronization between one or more instruments and the computer.
- The OPC? query does not affect the OPC bit in the Standard Status Event status group. In order to set this event use *OPC.

Related Commands

*ESE, *OPC?, *WAI

*PSC
*PSC?

*PSC command sets/clears the power-on status clear flag.

*PSC? returns the power-on status clear flag.

Parameters

Type	Range	Default	Description
boolean	0-1	1	Sets/clears the PSC flag

Returned Data

Type	Range	Default	Description
int16	0 - 255	none	Status of Power-on clear flag.

Comments

- If *PSC was set to 0 prior to power-down, then at power-on, the enable registers are loaded from non-volatile memory. Therefore, any values that you have stored (SYSTem:NVSave command) are returned to the registers. However, if *PSC was set to 1, then at power-on the factory defaults are returned. The factory defaults are listed in the following table:

Register	Default Value
STATus:OPERation:ENABle	0
STATus:QUEStionable:ENABle	0
STAT:QUES:BLOWer:ENABle	7
STAT:QUES:CURRent:ENABle	487
STAT:QUES:TEMPerature:ENABle	32767
STAT:QUES:VOLT:ENABle	487
STAT:QUES:VOLT:PTR	511

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-222	“Settings Conflict”	Mainframe power is off.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command.

Related Commands

SYSTem:NVSave

*RST

*RST will reset the enhanced monitor device to a known state. The display is returned to the top menu level. Any pending operation is aborted (i.e. a *RST through RS-232 would abort a *TST? in process through a VXI command).

Comments

- *RST resets the following:

  -- Byte Order (reset back to normal). Refer to the FORMat:BORDer command.
  -- Fan State (cancels whatever was set by the software SYSTem:BLOWer:STATe command, the fan sped will match whatever is set on the front panel switch).
  -- Beeper state reset to On. Refer to the SYSTem:BEEPer:STATe command.
  -- Display state reset to On. Refer to the DISPlay:STATe command.
  -- Display screen reset to MMAin if you have selected a language. If you have not selected a language, it resets to the language option screen. Refer to the DISPlay:WINDow command.

- Everything stored in non-volatile memory is reset to whatever was stored with the last execution of SYSTem:NVSave. In this way, *RST is equivalent to SYSTem:NVRecall. Note that RS-232 values are not reset.

- The status system is unaffected by the *RST command. Use *CLS to clear the status system. RS-232 settings are unaffected by the *RST command. Use SYSTem:COMM:SER:PRES to clear RS-232 settings. Non-volatile memory is unaffected by the *RST command. Use SYSTem:NVD and HIST:RES to clear non-volatile memory.

- In contrast, pressing the SYSRESET button on the front panel resets the entire mainframe (including RS-232 values). This is equivalent to its power-on state except that trace data is not restarted and the power-on time is not restarted and CMAX and CMIN values are not restarted.

Related Commands

*CLS, SYSTem:COMM:SERial:PRESet, SYSTem:NVDefault, HISTory:RESet:xxxx

*SRE <*mask*>
*SRE?

*SRE <*mask*> command sets the value of the enable register in the Status Byte status group.

*SRE? query returns the value of the enable register in the Status Byte status group.

The Status Byte is used to summarize information from all other status groups.

The enable register specifies which bits in the event register can generate a summary bit. The instrument logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are, in turn, recorded in another register. The standard event status summary bit is recorded in the Status Byte. Enable registers are read-write. Enable registers are not affected by *CLS (Clear status). Querying enable registers does not affect them.

The following table describes each bit in the Status Byte status group:

Bit	Description	Decimal Value
0	Not Used	1
1	Not Used	2
2	Error query summary bit. When set, indicates the error queue is not empty.	4
3	Summary bit from the Questionable Data status group (QUE)	8
4	Messages available in the Output Queue (MAV)	16
5	Summary bit from the Standard Event status group (ESB)	32
6	Service Request (RQS)	64
7	Summary bit from the Standard Operation status group (OPR)	128

Parameters

Name	Type	Range	Default	Description
<*mask*>	int16	0 - 255	none	Bit mask indicating which enable bits are set (1) or cleared (0) for the Status Byte status group.

Returned Data

Type	Range	Default	Description
int16	0 - 255	none	Bit mask indicating which enable bits are set (1) or cleared (0) for the Status Byte status group.

Reset Condition

*RST resets register the last value saved by the SYST:NVS command.

Related Commands

STATus:OPERation:ENABle, STATus:QUEStionable:ENABle, *ESE?

*STB?

*STB? query returns the value of the event register for the Status Byte status group.

The Status Byte is used to summarize information from all other status groups.

The event register latches transition events from the condition register as specified by the transition filter. Only the positive transition filter is active in the module. This means that a transition event will occur when a condition makes a transition from a low to a high state. Bits in the event register are latched, and once set, they remain set until cleared by a *STB? query or *CLS (clear status). There is no buffering; so while an event bit is set, subsequent events corresponding to that bit are ignored. Event registers are read only.

The following table describes each bit in the Status Byte status group:

Bit	Description	Decimal Value
0	Not Used	1
1	Not Used	2
2	Error query summary bit. When set, indicates the error queue is not empty.	4
3	Summary bit from the Questionable Data status group (QUE)	8
4	Messages available in the Output Queue (MAV)	16
5	Summary bit from the Standard Event status group (ESB)	32
6	Service Request (RQS)	64
7	Summary bit from the Standard Operation status group (OPR)	128

Returned Data

Type	Range	Default	Description
int16	0 - 255	none	Bit mask indicating which events are set (1) or cleared (0) in the Status Byte status group.

Comments

- The Status Byte can be read using either *STB? or by a serial poll. There are some subtle differences between *STB? and serial polling. You can use either method to read the state of bits 0-5 and bit 7. Bit 6 is treated differently depending on whether you use *STB? or serial poll. In general, use serial polling inside interrupt service routines, not a *STB?.

Reset Condition

*RST does not affect the status system

Related Commands

*SRE

*TST?

*TST? performs several tests of the enhanced monitor functionality. This is a subset of the full test set TEST:ALL? The tests performed are TEST:MEMory, TEST:SENSe, TEST:TEMPerature, and TEST:DISPLAY.

Returned Data

Type	Range	Default	Description
int16	-32767 to 32767	none	Result of running the self test. +0 indicates a successful test. Refer to TEST:ALL for a complete list of test failure results.

Comments

- *TST? interrupts the monitoring function of the enhanced monitor for four seconds during the end of the test.
- Refer to TEST:ALL for a complete list of test failure results.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	the mainframe’s power is off.

Related Commands

CALibration?

*WAI command will not return until all pending operations have completed.

Comments

- This command is identical to *OPC? except that it does not return a value.

Related Commands

*OPC?

Keyword	Parameters	Notes	Description
:CALibration			
[:ALL]?		[query only]	Performs complete calibration of the enhanced monitor.
:TEMPerature?		[query only]	Performs a calibration of the temperature monitoring function.
:VALue			
:TEMPerature	<*value*>		Sets/returns the calibration temperature.
:VOLTage	<*supply*>,<*value*>		Sets/returns the calibration voltage value for each VXI supply.
:VOLTage?	<*supply*>	[query only]	Performs a calibration of the voltage monitoring function.
:DISPlay			
[:WINDow]	<*display window*>		Set/returns display data screen to <*display window*>
:STATe	<*state*>		Set/returns state of mainframe's display (ON|OFF|AUTO)
:TEXT[:DATA]	<*string*>		Displays a user-defined message on the display.
:FORMat:BORDer	<*order*>		Sets/returns the byte order (NORM|SWAP)
:HISTory			
:BLOWer			
[:HISTogram]?	<*blower*>	[query only]	Returns histogram data for the <*blower*>
:CURRent			
:CMAXimum?	<*supply*>	[query only]	Returns <*supply*> maximum amperage since power-on.
[:HISTogram]?	<*supply*>	[query only]	Returns <*supply*> amperage histogram data
:MAXimum?	<*supply*>	[query only]	Returns the maximum amperage for the <*supply*>.
:POWer			
:CMAXimum?	<*supply*>	[query only]	Returns the maximum wattage since power-on for <*supply*>
[:HISTogram]?	<*supply*>	[query only]	Returns <*supply*> wattage histogram data
:MAXimum?	<*supply*>	[query only]	Returns the maximum wattage for the <*supply*>.
:QUEue			
:COUNt?		[query only]	Returns the number of events in the history queue.
[:FETCh]?	<*event index*>	[query only]	Returns the queue for the <*number*> history event.
:RESet			
[:ALL]		[no query]	Resets the data in the entire history subsystem to zero.
:BLOWer	<*blower*>	[no query]	Resets the data in <*blower*> history to be zero.
:CURRent	<*supply*>	[no query]	Resets the data in <*supply*> amperage history to be zero.
:POWer	<*supply*>	[no query]	Resets the data in <*supply*> wattage history to be zero.
:QUEue		[no query]	Erases all the data in the history queue.
:TEMPerature	<*slot*>	[no query]	Resets the data in <*slot*> history to be zero.
:VOLTage	<*supply*>	[no query]	Resets the data in <*supply*> voltage history to be zero.
:TEMPerature			
:CMAXimum?	<*slot*>	[query only]	Returns the maximum temperature since power-on in <*slot*>.
:CMINimum?	<*slot*>	[query only]	Returns the minimum temperature since power-on in <*slot*>.
[:HISTogram]?	<*slot*>	[query only]	Returns for histogram data on the <*slot*>
:MAXimum?	<*slot*>	[query only]	Returns the maximum temperature in <*slot*>.
:MINimum?	<*slot*>	[query only]	Returns the minimum temperature in <*slot*>.
:TIME			
:LCALibration?		[query only]	Returns hr, min, sec since last calibration.
:LHReset?		[query only]	Returns hr, min, sec since last history reset.
:LTST?		[query only]	Returns hr, min, sec since last *TST.
:ON?		[query only]	Returns hr, min, sec since power-on.

:OPERating?		[query only]	Returns hr, min, sec mainframe has been operating.
:UNIT[:TIME]	<*unit*>		Sets/returns time units returned within the history subsystem.
:VOLTage			
:CMAXimum?	<*supply*>	[query only]	Returns the maximum voltage since power-on for <*supply*>
:CMINimum?	<*supply*>	[query only]	Returns the minimum voltage since power-on for <*supply*>
[:HISTogram]?	<*supply*>	[query only]	Returns <*supply*> voltage histogram data
:MAXimum?	<*supply*>	[query only]	Returns the maximum voltage for the <*supply*>.
:MINimum?	<*supply*>	[query only]	Returns the minimum voltage for the <*supply*>.
:STATus			
:OPERation			
:CONDition?		[query only]	Returns OPERation Condition Register.
:ENABle	<*mask*>		Sets/returns Operation Enable Register
[:EVENt?]		[query only]	Returns Operation Event Register
:PRESet		[no query]	Clears OPER & QUES enable registers
:QUEStionable			
:BLOWer			
:CONDition?		[query only]	Returns the contents of the Blower condition register
:ENABle	<*mask*>		Set/returns the Blower enable register
:[EVENt]?		[query only]	Returns the contents of the Blower event register
:LEVel?		[query only]	Returns the mainframe fans' percentage level.
:SPEed?	<*blower*>	[query only]	Returns the last fan RPM measurement
:CONDition?		[query only]	Returns Questionable Condition Register
:CURRent			
:CMAXimum?	<*supply*>	[query only]	Alias for HIST:CURR:CMAX
:CONDition?		[query only]	Returns the contents of the Current Condition Register
:ENABle	<*mask*>		Sets/returns the Current Enable Register
:[EVENt]?		[query only]	Returns the contents of the Current Event Register
:LEVel?	<*supply*>	[query only]	Returns the last power supply current measurement.
:LIMit	<*supply*>,<*value*>		Sets/returns maximum current limits.
:MAXimum?	<*supply*>	[query only]	Alias for HIST:CURR:MAX
:ENABle	<*mask*>		Enable mask for QUEStionable status
[:EVENt?]		[query only]	QUEStionable status group events
:FILTer			
:TINTerval	<*interval*>		Alias for STAT:QUES:UMC:TINT
:TREMaining?		[query only]	Alias for STAT:QUES:UMC:TREM?
:TRESet			Alias for STAT:QUES:UMC:TRES
:POWer			
:CMAXimum?	<*supply*>	[query only]	Alias for HIST:POW:CMAX
:LEVel?	<*supply*>	[query only]	Returns the last power supply power measurement.
:LIMit	<*limit*>		Sets/returns maximum total power limit.
:MAXimum?	<*supply*>	[query only]	Alias for HIST:POW:MAX
:TEMPerature			
:CMAXimum?	<*slot*>	[query only]	Alias for HIST:TEMP:CMAX
:CONDition?		[query only]	Returns the contents of the Temperature condition register
:ENABle	<*mask*>		Sets/returnse Temperature enable register
:[EVENt]?		[query only]	Returns the contents of the Temperature event register
:LEVel?	<*slot*>	[query only]	Returns the last <slot> temperature measurement.
:LIMit	<*slot*>,<*val1*> [,<*val2*>[,<*val3*>]]		Sets/returns maximum slot temperature limits.
:MAXimum?	<*slot*>	[query only]	Alias for HIST:TEMP:MAX
:UMCounter			

:TINTerval	<*time*>		Sets/returns the time interval.
:TREMaining?		[query only]	Returns the time remaining.
:TRESet		[no query]	Resets the user countdown timer.
:VOLTage			
:CONDition?		[query only]	Returns the contents of the Voltage condition register
:ENABle	<*mask*>		Sets/returnse Voltage enable register
:[EVENt]?		[query only]	Returns the contents of the Voltage event register
:LEVel?	<*supply*>	[query only]	Returns the last power supply voltage measurement.
:PTR	<*mask*>		Sets/returns the voltage positive transition filter.
:SCONdition?		[query only]	Returns monitor pass/fail condition
:SYSTem			
:BEEPer			
:FREQuency	<*frequency*>		Sets/returns the beeper's pitch.
[:IMMediate]	*[<freq>[,<dur>]]*	[no query]	Causes the mainframe to beep.
:STATe	<*state*>		Enables/Disables the beeper, returns beeper state
:TIME	<*duration*>		Sets/returns the beeper's duration.
:BLOWer:STATe	<*state*>		Sets/returns status of mainframe fans. (ON, VARiable)
:COMMunicate			
:SERial			
:CONTrol			
:RTS	<*rts*>		Sets/returns the control value for RS-232 communication.
:ECHO	<*echo*>		Sets/returns the state of echoing characters.
:ERESponse	<*eresponse*>		Sets/returns the state of immediate error reporting.
:LBUFfer	<*lbuffer*>		Sets/returns the state of line buffering.
:PRESet			
[:ALL]		[no query]	Presets RS-232 settings to default (TERM).
:RAW		[no query]	Presets RS-232 settings for use with a computer.
:TERM		[no query]	Presets RS-232 settings for use with a dumb terminal.
[:RECeive]			
:BAUD	<*baud*>		Sets/returns the baud rate for RS-232 communication.
:BITS	<*bits*>		Sets/returns the number of bits for RS-232 communication.
:PACE	<*style*>		Sets/returns the pacing style for RS-232 communication.
:PARity			
[:TYPE]	<*parity*>		Sets/returns the parity for RS-232 communication.
:SBITs	<*bits*>		Sets/returns the number of stop bits for RS-232 communication.
:VXI:ADDRess?	<*address*>	[query only]	Returns the VXI address of the enhanced monitor.
:DATE:LMA?		[query only]	Returns date of last factory maintenance
:ERRor?		[query only]	Returns error numbers and messages
:FACTory		[no query]	Alias for SYSTem:NVD
:HELP:HEADers?		[query only]	Returns all the legal SCPI commands and queries.
:MODel?		[query only]	Returns model number of the mainframe.
:NAME	<*name*>		Sets/returns system name for mainframe.
:NVDefault		[no query]	Resets many of the mainframe settings to factory defaults.
:NVRecall		[no query]	Recalls mainframe settings stored in non-volatile memory.
:NVSave		[no query]	Stores many mainframe settings to non-volatile memory.
:POWer	<*state*>		Set/returns mainframe power (ON,OFF).
:CYCLe?		[query only]	Returns number of mainframe power cycles since manufacture.
:SOURce?		[query only]	Returns the source of power for the enhanced monitor.
:STATus?		[query only]	Returns status of three power on/off controlss.

:SNUMber	*<string>*		Sets/returns the serial number of the mainframe.
:SER			Alias for SYSTem:SNUM
:TIME			
:LMA?		[query only]	Alias for HIST:TIME:OPER?
:ON?		[query only]	Alias for HIST:TIME:ON?
:VERSion?		[query only]	Returns SCPI Version number
:TEST			
[:ALL]?		[query only]	Performs all the tests.
:BLOWer?	*[<blower>]*	[query only]	Performs a fan test.
:DISPlay?		[query only]	Performs a display and beeper test.
:MEMory?		[query only]	Performs a memory test.
:NUMBer? 1000		[query only]	Alias for TEST:BLOW?
:NUMBer? 1010		[query only]	Alias for TEST:SENSe and TEST:TEMPerature??
:NUMBer? 1100		[query only]	Alias for TEST:DISPlay?
:NUMBer? 1110		[query only]	Alias for TEST:DISPlay?
:NUMBer? 1120		[query only]	Alias for TEST:DISPlay?
:RESults			
[:CODE]?		[query only]	Returns the result code of last test performed.
:VERBose?	*[<code>]*	[query only]	Returns string describing results of last test performed.
:SENSe?		[query only]	Performs a test of A/D and D/A.
:TEMPerature?		[query only]	Performs a test of slot exhaust temperature sensor boards.
:TIME?	*.*	[query only]	Performs a test of enhanced monitors timing
:TRACe			
[:DATA]?	*<name>*	[query only]	Returns measurement data for trace.
:PREamble?	*<name>*	[query only]	Returns preamble data trace.
:POINTs?	*<name>*	[query only]	Returns number of measurements in trace.

Keyword	Parameters	Notes	Description
*CLS			Clears the status system
*ESR?		[query only]	Standard Event status group events
*ESE			Enable mask for Standard Event status
*IDN?		[query only]	Returns identification string
*OPC			Operation complete
*PSC			Sets/returns the power-on state clear flag
*SRE			Enable mask for Status Byte
*STB?		[query only]	Returns Status Byte
*RST		[no query]	Reset the module
*TST?		[query only]	Returns result of running self test
*WAI			Wait to complete

Chapter 4
Calibrating and Verifying Performance

The procedures in this chapter describe how to calibrate and verify the Enhanced Monitor functions of the Agilent E8402A and E8404A VXI Mainframes. The SCPI calibration commands are described in this chapter; for details on SCPI programming, refer to Chapter 3.

Recommended Test Equipment

Table 4-1 lists the test equipment recommended for calibrating and verifying the Agilent E840x Enhanced Monitor. Essential requirements for each piece of equipment are described in the Requirements column. Other equipment may be substituted as long as it meets the requirements listed.

Table 4-1. Recommended Test Equipment

Instrument	Requirements	Recommended Model
DC Voltmeter	DC Volts to ±24 V	Agilent 34401 DMM Agilent E1412 VXI DMM
Frequency Counter	Period measurement 10 mS ±0.1µs resolution	Agilent 53131 Universal Counter Agilent E1420 VXI Universal Counter
Temperature Sensor (optional)	±0.1 °C resolution	RTD preferred
+5Vdc Power Supply (for Enhanced Monitor RS-232 port)	+5 V DC 1.5 amp (max)	

Functional Verification

The functional Verification test for the Enhanced Monitor consists of sending the *TST? command and checking the response. This test verifies that the device is connected properly and is responding to commands. Periodically, TEST:TIMe and TEST:BLOW should be executed; these are not included in the *TST? tests.

Procedure

1. Verify that the computer is connected to the Enhanced Monitor through an RS-232 cable. Ensure baud rate and other parameters are correct. Alternately, you can send the command through the system commander.

2. Send the *TST? command to the monitor.

3. The monitor will return an error code and message. A zero (0) indicates no errors and the self-test passed. Any non-zero code indicates a self-test failure. Refer to TEST:ALL for an explanation of the error codes. Executing TEST:RES:VERB? following a test command, returns a string describing the result.

Calibration and Performance Verification

The procedures in this section calibrate and verify the Temperature Monitor Function and Voltage Monitor Function of the Enhanced Monitor. Specifications are listed in Appendix A of this manual. In general, the calibration and verification procedures are similar. Use the reference voltmeter or temperature probe as the standard. Calibration should be done annually.

Test Conditions & Procedures

For temperature calibration/verification, the mainframe must be empty. This means that the calibration/verification commands must be sent through the Enhanced Monitor's RS-232 port.

The voltage calibration/verification should be done under normal use conditions meaning that typical VXI modules (VXI modules used in your test system) should be installed. Refer to each procedure for specific conditions.

These procedures assume that the person performing the calibration and verification understands how to operate the mainframe and specified equipment. The test procedures do not specify equipment settings for test equipment, except in general terms. It is assumed that a qualified, service-trained technician will select and connect equipment required for the test.

The following procedures demonstrate how to measure and store the reference measurements and then calibrate the Temperature Monitor function and the Voltage Monitor function. After storing the reference temperature and all of the reference voltages, you can perform a complete calibration in one step by executing the CAL:ALL? command.

Issuing Commands

Temperature calibration and verification commands must be sent through the Enhanced Monitor's RS-232 port. Refer to Chapter 2, "RS-232 Programming" on page 38 for details on using the port.

Temperature Monitor Calibration & Verification

To perform a complete Temperature Calibration or Verification, the mainframe *must* be in the following state:

- No VXI modules installed in mainframe. This means that the calibration commands must always be issued through the Enhanced Monitor's RS-232 interface; no command module or embedded controller is allowed.
- Mainframe is at a steady state temperature in a constant temperature environment. The mainframe should be on for at least one-half hour prior to calibration or verification. The fan switch should be set to the FULL position during warm-up and the calibration or verification.
- Calibration includes: Calculating A/D offset and gain for each temperature sensor. Externally measured temperature previously reported to the enhanced monitor through CAL:VAL:TEMP are used for these calculations. Flag any sensor varying more than ±2 degrees off expected.

The CALibration:VALue:TEMPerature command provides the Enhanced Monitor with an externally measured temperature, measured with a user-supplied sensor inside the mainframe cardcage in a constant temperature environment with no modules installed in the mainframe. The measured temperature is used to calibrate each temperature sensor of the enhanced monitor.

Alternately, if a value of -1 is provided, the calibration command will calculate a calibration temperature value from the average of all slot cavity sensors (39 total). Since the Enhanced Monitor temperature sensors are absolute devices, this procedure is adequate for most calibration purposes.

Note

Because the mainframe must be empty (no VXI modules installed), these calibration commands must be sent through the Enhanced Monitor's RS-232 Port.

Calibration Procedure

1. Set the front panel fan switch to FULL.
2. Make certain that the ambient temperature measurement is stable for at least ten minutes. Execute the command DISPlay:WINDow TSTR136. This places the Enhanced Monitor display in strip chart mode displaying ambient temperature.
3. If you are using an external temperature sensor, place the sensor in the approximate center of the mainframe cardcage. Wait for the temperature measurement to stabilize. Record this as the calibration temperature.
4. For Calibration, start by storing the calibration temperature with the CAL:VAL:TEMP <*value*> command. For example, if the calibration temperature is 26.4 °C, send the command:

   ```
   CAL:VAL:TEMP 26.4
   ```

5. Alternately, to use the average of the 39 internal sensors, send the command:

   ```
   CAL:VAL:TEMP -1
   ```

6. Then, to actually perform the calibration, send the command:

   CAL:TEMP?

   If the command returns a 0 (zero), then the calibration was successful. If any other value is returned, a defective temperature sensor exists. execute the command TEST:RES:VERB? to get a detailed string description of the problem

7. Read the temperatures from all three sensors in all thirteen slots. Use the command:

   STAT:QUES:TEMP:LEV? OUT<n> *where x is the slot number 0 - 12*

   Record these temperatures in the Performance Test Record Table.

8. If you used the average of the 39 internal sensors (you did *not* use an external temperature sensor), read the calibration temperature with the command:

   CAL:VAL:TEMP?

   Record the value.

This concludes the Temperature Monitor calibration procedure. Note any temperature that is more than ±2 degrees off the expected value.

Verification Procedure

1. For Performance Verification, read the temperatures from all three sensors in all thirteen slots. Use the command:

   STAT:QUES:TEMP:LEV? OUT<n> *where x is the slot number 0 - 12*

   Record these temperatures in the Performance Test Record Table. Note any temperature more than ±2 degrees off the expected value.

This concludes the Temperature Monitor verification procedure. Note any temperature that is more than ±2 degrees off the expected value.

Voltage Monitor Calibration & Verification

To perform a complete Temperature Calibration or Verification, the mainframe ***must*** be in the following state:

- The mainframe should be under normal use conditions. This means that typical VXI modules (VXI modules used in your test system) should be installed in the mainframe.
- Commands can be sent via the Enhanced Monitor's RS-232 port or through a command module or embedded controller.
- Calibration includes: Calculating A/D offset and gain for each of the seven VXI power supplies and externally applied voltages. Externally measured voltages previously reported to the enhanced monitor through CAL:VAL:VOLT are used for these calculations.

The CALibration:VALue:VOLTage command provides the enhanced monitor with the externally measured voltages of the VXI power supplies measured at the auxiliary connector of the mainframe. The value will be used to calibrate each power supply-related measurement of the enhanced monitor.

To measure the power supply voltages, connect your DMM to the Diagnostic Connector on the front panel of the VXI mainframe. Refer to Chapter 2, "Diagnostic Connector" on page 40, for pinout information.

Note Make certain you use the power supplies labeled "VM" on the Diagnostic Connector. These are high impedance lines to the power supplies.

Table 4-2 lists the Diagnostic Connector pins to use for the power supply measurements.

Table 4-2. Diagnostic Connector Pin Numbers

Power Supply	Diagnostic Connector Pin Number
+5	1
-12	2
-24	3
-2	4
+12	14
+24	15
-5.2	16

Calibration Procedure

1. Measure the +5Vdc supply at the Diagnostic Connector (Pin 1).
2. For Calibration, start by storing the reference voltage by sending the CAL:VAL:VOLT <*supply*>,<*value*> command. For example, if the +5 Vdc supply measured 4.987, send the command:

   ```
   CAL:VAL:VOLT P5,4.987
   ```

   The P5 specifies the Positive 5 Vdc supply. Repeat the procedure for the +12 Vdc Supply (use P12 to specify), –12 Vdc Supply (N12), +24 Vdc Supply (P24), –24 Vdc Supply (N24), –5.2 Vdc Supply (N5PT2), and –2.0 Vdc Supply (N2).

   After you have measured and stored the actual power supply voltages; perform the actual calibration by sending the command:

   ```
   CAL:VOLT?
   ```

3. Optionally, you can also calibrate the measurements for the +5 volt external supply (used for the RS-232 port) and the +5 volt standby supply. Measure the supply voltages where they enter the mainframe (rear panel for the +5 volt external, Diagnostic Connector for +5 volt standby). Calibrate by sending the commands:

   ```
   CAL:VAL:VOLT P5EX,x.xxx      for 5 volt external supply
   CAL:VAL:VOLT P5ST,x.xxx      for 5 volt standby supply
   ```

4. Remeasure the voltages at the Diagnostic Connector. Record these voltage readings on the Performance Test Record Table.

This concludes the Power Supply Voltage Monitor calibration procedure.

Verification Procedure

1. Measure the +5Vdc supply at the Diagnostic Connector (Pin 1).
2. For Performance Verification, record this reading on the Performance Test Record Table.

   Repeat steps 1 and 2 for the + 12 Vdc Supply, –12 Vdc Supply, +24 Vdc Supply, –24 Vdc Supply, –5.2 Vdc Supply, and –2.0 Vdc Supply. Record these voltage readings on the Performance Test Record Table.

This concludes the Power Supply Voltage Monitor verification procedure.

Timer Test Verification

This section describes how to verify the timing functionality of the Enhanced Monitor. This test outputs a waveform on pin 25 of the Diagnostic Connector with a 16msec period for 10 seconds. Use a counter to determine accuracy.

Procedure

1. Connect a counter to pin 25 of the Diagnostic Connector on the front panel of the mainframe (pin 18 is ground). Set the counter to measure period.

2. Execute the command:

   ```
   TEST:TIME?
   ```

3. The average period should be 16mS ±1µS.

This concludes the Timer Test. If this test fails, return the mainframe for service to your Agilent Sales and Service Office.

Performance Test Record

Table 4-3 is a form you can copy and use to record calibration and performance verification results for the Enhanced Monitor.

Table 4-3. Agilent E8402A/E8404A VXI Mainframe Enhanced Monitor Test Record

General Information:

Test Facility:

Name: _____ Report No._____

Address: _____ Date: _____

_____ Customer: _____

City/State: _____ Tested By: _____

Phone: _____ Mainframe Serial No. _____

Comments:

_____

_____

_____

_____

_____

_____

Test Equipment Used:

Test Equipment Used: Description	Model No.	Trace No.	Cal Due Date

Table 4-3. Agilent E8402A/E8404A VXI Mainframe Enhanced Monitor Test Record (continued)

Record the calibration temperature here: _____

Record the individual slot temperatures here:

Slot:	Front	Middle	Back
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Record the individual power supply voltages here:

Power Supply	Minimum Value	Measured Value	Maximum Value
+5 Vdc	4.975 Vdc		5.025 Vdc
+12 Vdc	11.94 Vdc		12.06 Vdc
–12 Vdc	–12.06 Vdc		–11.94 Vdc
+24 Vdc	23.88 Vdc		24.12 Vdc
–24 Vdc	–24.12 Vdc		–23.88 Vdc
–5.2 Vdc	–5.226 Vdc		–5.174 Vdc
–2 Vdc	–2.01 Vdc		–1.99 Vdc
+ 5 volt external (optional)	+4.875 Vdc		+5.250 Vdc
+5 volt Standby (optional)	+4.875 Vdc		+5.250 Vdc

Record the timer value here:

Nominal Value	Measured Value
16mS ±2µS	

The calibration subsystem controls the calibration of the mainframe's monitoring function.

Subsystem Syntax

```
:CALibration
  [:ALL]?                          Complete calibration of enhanced monitor.
  :TEMPerature?                    Calibrates temperature monitoring function
  :VALue
      :TEMPerature <value>         Sets the calibration temperature.
      :TEMPerature?                Returns calibration value
      :VOLTage <supply>,<value>    Sets the VXI supply calibration voltage
      :VOLTage? <supply>           Returns calibration value
  :VOLTage?                        Calibrates voltage monitoring function
```

CALibration[:ALL]?

CALibration[:ALL]? performs all calibration procedures. Calibration is performed assuming the mainframe is in these conditions: no VXI modules installed in mainframe, mainframe at a steady state temperature in a constant temperature environment (fan switch set to FULL for at least ten minutes). This means that this command should always be issued through the Enhanced Monitor's RS-232 interface. Calibrations performed are:

- Calculate A/D offset and gain for each VXI power supply. Externally measured voltages previously reported to the enhanced monitor through CAL:VAL:VOLT are used for these calculations.
- Calculated A/D offset and gain for each temperature sensor. Externally measured temperatures previously reported to the enhanced monitor through CAL:VAL:TEMP are used for these calculations. Flag any sensor varying more than ±2 degree off expected.

Returned Data

Type	Range	Description
int16	0-32767	+0 indicates a satisfactory calibration. +1057 to 1069: bad front sensor in slot [*result-1057*] +1070 to 1082: bad middle sensor in slot [*result-1070*] +1083 to 1095: bad rear sensor in slot [*result-1083*] +1096: bad voltage gain calculation on +5V Supply +1097: bad voltage gain calculation on +12V Supply +1098: bad voltage gain calculation on -12V Supply +1099: bad voltage gain calculation on +24V Supply +1100: bad voltage gain calculation on -24V Supply +1101: bad voltage gain calculation on -5.2V Supply +1102: bad voltage gain calculation on -2V Supply

Comments

- Make the calibration values measurements and provide them to the enhanced monitor via the CAL:VAL:VOLT and CAL:VAL:TEMP immediately prior to using this command. Old values will be used otherwise. If you want the calibration routine to calculate a temperature calibration value you MUST send a CAL:VAL:TEMP -1 before every calibration command.

- The calibration values (reported to the enhanced monitor with CAL:VAL:VOLT and CAL:VAL:TEMP) have default values that will be used by the calibration routines if no values are ever measured and reported to the enhanced monitor. See CAL:VAL:VOLT and CAL:VAL:TEMP for details.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	"Settings Conflict"	The mainframe's power is off or command sent through VXI commander.
-410	Query interrupted	Calibration was aborted by a device clear event or *RST

Reset Condition

Calibration is not affected by reset. However, if a *RST is issued while a calibration is occurring the calibration will be aborted.

Related Commands

CALibration:VOLtage?, CALibration:TEMPerature?, CALibration:VALue:VOLTage, CALibration:VALue:TEMPerature, TEST:RESULTS:VERBOSE?

CALibration:TEMPerature?

CALibration:TEMPerature? performs the temperature-related calibration procedures. Calibration is performed assuming the mainframe is in these conditions: no modules loaded, mainframe at a steady state temperature in a constant temperature environment (fan switch set to FULL for at least ten minutes). This means that this command should always be issued through the RS-232 interface. Calibrations performed are:

- Calculated A/D offset and gain for each temperature sensor. Externally measured temperature previously reported to the enhanced monitor through CAL:VAL:TEMP are used for these calculations. Flag any sensor varying more than ±2 degree off expected.

Returned Data

Type	Range	Description
int16	0-32767	+0 indicates a satisfactory calibration. +1057 to 1069: bad front sensor in slot [*result-1057*] +1070 to 1082: bad middle sensor in slot [*result-1070*] +1083 to 1095: bad rear sensor in slot [*result-1083*]

Comments

- It is advisable to make the calibration value measurement and provide it to the enhanced monitor via CAL:VAL:TEMP immediately prior to using this command. Old values will be used otherwise. If you want the calibration routine to calculate a temperature calibration value you MUST send a CAL:VAL:TEMP -1 before every calibration command.

- The calibration value (reported to the enhanced monitor with CAL:VAL:TEMP) has a default value that will be used by the calibration routine if no value is ever measured and reported to the enhanced monitor. See CAL:VAL:TEMP for details.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off or command sent through VXI commander.
-410	Query interrupted	Calibration was aborted by a device clear event or *RST

Reset Condition

Calibration is not affected by reset. However, if a *RST is issued while a calibration is occurring the calibration will be aborted.

Related Commands

CALibration:ALL?, CALibration:VALue:TEMPERature

CALibration:VALue:TEMPerature <*value*>
CALibration:VALue:TEMPerature?

CALibration:VALue:TEMPerature <*value*> provides the enhanced monitor with an externally measured temperature measured at a sensor inside the mainframe in a constant temperature environment with no modules installed in the mainframe. The value will be used to calibrate each temperature sensor of the enhanced monitor.

If a value of -1 is provided, the calibration command will calculate a calibration temperature value from the average of all slot cavity sensors. Since the temperature sensors are absolute temperature devices, this is adequate for most calibration purposes.

CALibration:VALue:TEMPerature? returns the externally measured temperature stored by the CALibration:VALue:TEMPerature command. If the value of -1 was stored by the CAL:VAL:TEMP command and a CAL:TEMP? or CAL? was performed, then CAL:VAL:TEMP? will return the averaged value calculated by the calibration routine.

Parameters

Name	Type	Range	Default	Description
<*value*>	float32	-1, 0-55	-1	Provides the external measurement of ambient temperature in °C. issuing a -1 forces the Enhanced Monitor to use the average value of all 39 slot exhaust temperature sensors as the calibration value.

Returned Data

Type	Range	Default	Description
float32	-1, 0-55	-1	Returns the stored external measurement of ambient temperature in °C.

Comments

- The sensor used for this measurement should be located in the center of the mainframe's slot cavity. It should have an accuracy of 0.5 °C. If you want the calibration routine to calculate a temperature calibration value you MUST send a CAL:VAL:TEMP -1 before every calibration command.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	"Settings Conflict"	The mainframe's power is off.

Reset Condition

Calibration is not affected by *RST.

Related Commands

CALibration:ALL?

CALibration:VALue:VOLTage <*supply*>,<*value*>
CALibration:VALue:VOLTage? <*supply*>

CALibration:VALue:VOLTage <*supply*>,<*value*> provides the enhanced monitor with the externally measured voltages of the VXI power supplies measured at the diagnostic connector of the mainframe. The value will be used to calibrate each power supply-related measurement of the enhanced monitor. This value is stored in non-volatile memory by the CAL:STOR command.

CALibration:VALue:VOLTage? returns the externally measured voltage stored for the <*supply*> by the CALibration:VALue:VOLTage command.

Parameters

Name	Type	Range	Default	Description
<*supply*>	enum.	P5, P12, N12, P24, N24, N5PT2, N2, P5ST, P5EXT	none	Selects the VXI power supply.
<*value*>	float64	allowed VXI limits for each supply	+5 for P5, +12 for P12, -12 for N12, +24 for P24, -24 for N24, -5.2 for N5PT2, -2 for N2	Provides the external measurement of each supply.

Returned Data

Type	Range	Default	Description
float64	allowed VXI limits for each supply		Returns the stored external measurement of each supply.

Note

Make certain you measure the power supplies at the pins labeled "VM" on the Diagnostic Connector. These are high impedance lines to the power supplies.

Comments

- The measurements made of each VXI power supply made at the Diagnostic Connector should have an accuracy of 0.5%. Refer to "Diagnostic Connector" on page 40 for additional information on the Diagnostic Connector.
- Optionally, you can also calibrate the measurements for the +5 volt external supply (used for the RS-232 port) and the +5 volt standby supply. Measure the supply voltages where they enter the mainframe (rear panel for the +5 volt external, Diagnostic Connector for +5 volt standby). If these are not supplied, the measurements will not be calibrated.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-224	“Illegal Parameter”	The <*supply*> parameter was not correct.
-109	“Missing Parameter”	The <*supply*> parameter was omitted.
-221	“Settings Conflict”	The mainframe’s power is off.

Reset Condition

Calibration is not affected by *RST.

Related Commands

CALibration:ALL?

CALibration:VOLTage?

CALibration:VOLTage? performs the voltage-related calibration procedures. Calibrations performed are: Calculate A/D offset and gain for each VXI supply. Externally measured voltages previously reported to the enhanced monitor through CAL:VAL:VOLT are used for these calculations.

Returned Data

Type	Range	Description
int16	0-32767	+0 indicates a satisfactory calibration. +1096: bad voltage gain calculation on +5V Supply +1097: bad voltage gain calculation on +12V Supply +1098: bad voltage gain calculation on -12V Supply +1099: bad voltage gain calculation on +24V Supply +1100: bad voltage gain calculation on -24V Supply +1101: bad voltage gain calculation on -5.2V Supply +1102: bad voltage gain calculation on -2V Supply

Comments

- Make the calibration values measurements and provide them to the enhanced monitor via the CAL:VAL:VOLT command immediately prior to using this command. Old values will be used otherwise.
- The calibration values (reported to the enhanced monitor with CAL:VAL:VOLT) have default values that will be used by the calibration routines if no values are ever measured and reported to the enhanced monitor. See CAL:VAL:VOLT for details.

Error Conditions

The following table lists the most common error conditions and causes. Error numbers and corresponding messages can be found using SYSTem:ERRor? query.

Number	Message	Probable Cause
-221	“Settings Conflict”	The mainframe’s power is off.
-410	Query interrupted	Calibration was aborted by a device clear event, or a *RST

Reset Condition

Calibration is not affected by reset. However, if a *RST is issued while a calibration is occurring the calibration will be aborted.

Related Commands

CALibration:TEMPerature?

Chapter 5
Servicing Your Mainframe

Chapter Overview

This chapter contains information for troubleshooting and replacing selected components of the Agilent E840xA VXI mainframe. This chapter includes the following information:

- Problem Isolation 205
- Replacing Assemblies 206
- Replacement Power Cords and Line Fuse 215

Problem Isolation

Table 5-1 lists symptoms which could appear in the mainframe over time. The assembly most likely responsible for the symptom is also listed. Notice that customer repair of the Agilent E840xA is limited to replacement of the monitor printed circuit (PC) assemblies (Enhanced Monitor PC board, temperature monitor PC boards, Enhanced Monitor display PC board), power supply, and impeller assemblies.

WARNING

There are no serviceable parts inside the mainframe. Repair is limited to replacement of the monitor printed circuit assemblies, power supply, power supply fan, and impeller (backplane fan). Replacement of these components must be performed at a static-controlled workstation by trained service personnel only.

WARNING

The front panel power switch does not disconnect all power from internal circuits. Unplug the power cord before opening the mainframe fro service.

No Power Line Fuse

There are no user-replaceable power line fuses in the Agilent E8402 and E8404 VXI mainframes. If the mainframe power supply fails to operate, the power supply should be replaced. Exchange assemblies are available; refer to Figure 5-2.

Table 5-1. Isolating Problems Within the Agilent E840xA Mainframe.

Symptom	Action
Flashing Voltages Indicator	One or more backplane voltages may be out of specification. Check diagnostic connector pins 1, 2, 3, 4, 14,15,16. Check for a loose cable between the basic monitor assembly and the backplane. Replace power supply if any voltage remains out of specification.
Flashing Temperature Indicator	Power supply or slot temperature is high. Mainframe is nearing automatic shutdown. Check for proper airflow and clearance around the mainframe.
Flashing Fans Indicator	Power supply fan or mainframe impeller has failed. Visually inspect to determine which fan is not rotating. Turn off mainframe to avoid possible overheating. Replace the affected fan.
Monitor indicators are off and fans do not operate when On button is pressed.	Check for a loose cable between the basic monitor assembly and the backplane. Replace the basic monitor board.
No monitor indicators when mainframe is turned on.	Check diagnostic connector pins 1, 2, 3, 4, 13, 14, 15, 16 to determine if backplane voltages are within specification and power supply and backplane impeller are functioning. Replace the basic monitor
The SYSFAIL indicator will come on and remain on when a VXI module installed in the mainframe fails.	

Replacing Assemblies

This section contains instructions for replacing the basic monitor, power supply, power supply fan, and impeller.These assemblies are available from Agilent under the part numbers shown in Table 5-2. Contact the Agilent TMO Business Center at 1-800-829-4444 to obtain replacement assemblies.

Table 5-2. Agilent E8400A Replacement Assemblies

Assembly	Agilent E8402A Part Number	Agilent E8404A Part Number
Enhanced Monitor Display PC Board	E8402-66502	E8402-66502
Temperature Sensor PC Boards (replace all three)	E8401-66504 (includes all three PC boards)	E8401-66504 (includes all three PC boards
Enhanced Monitor Controller PC Board	E8401-66503	E8401-66503
Enhanced Monitor Display Lamp		
Power Supply	E8401-69204 500 W Power Supply Exchange Assembly	E8403-69204 1000W Power Supply Exchange Assembly
Impeller (backplane fan)	E8400-68501	E8400-68501

Removing the Rear Panel from the Mainframe

For most service work, you will need to remove the rear panel from the mainframe. Figure 5-1 shows the procedure.

1. Remove the 14 screws from the rear panel.
2. The rear panel hinges at it top; rotate the panel upward. Pull the panel out from the mainframe.
3. To replace the panel, insert the three tabs into the slots at the top of the mainframe. Rotate the panel down until it is flush against the mainframe. Replace all 14 screws.

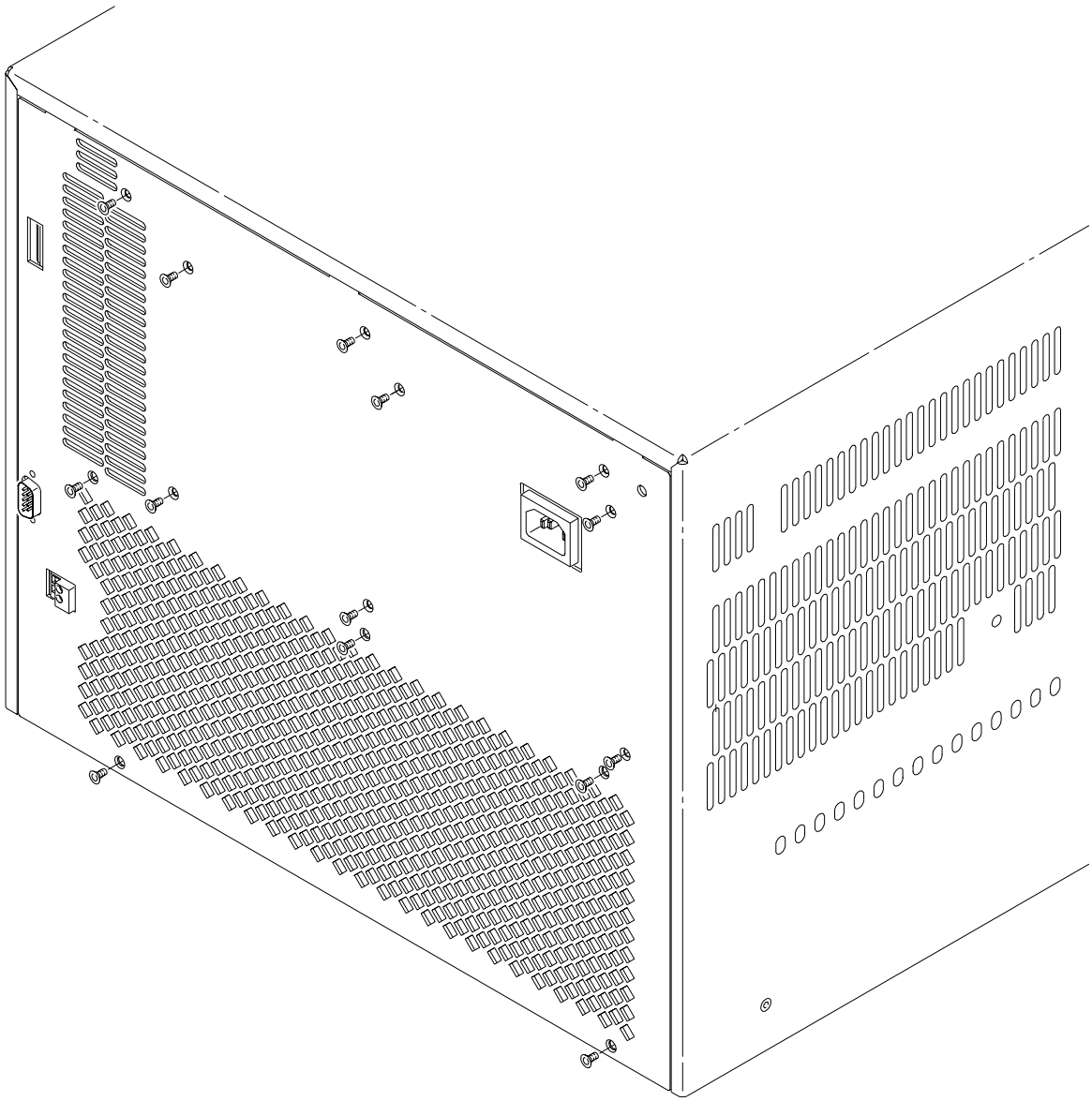


Figure 5-1. Removing / Replacing the Mainframe Rear Panel (Agilent E8404 shown, Agilent E8402 is similar)

Removing the Mainframe Cover

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Remove the mainframe cover by removing the ten m3x6 flat head torx screws (five on each side of the mainframe). Refer to Figure 5-2.

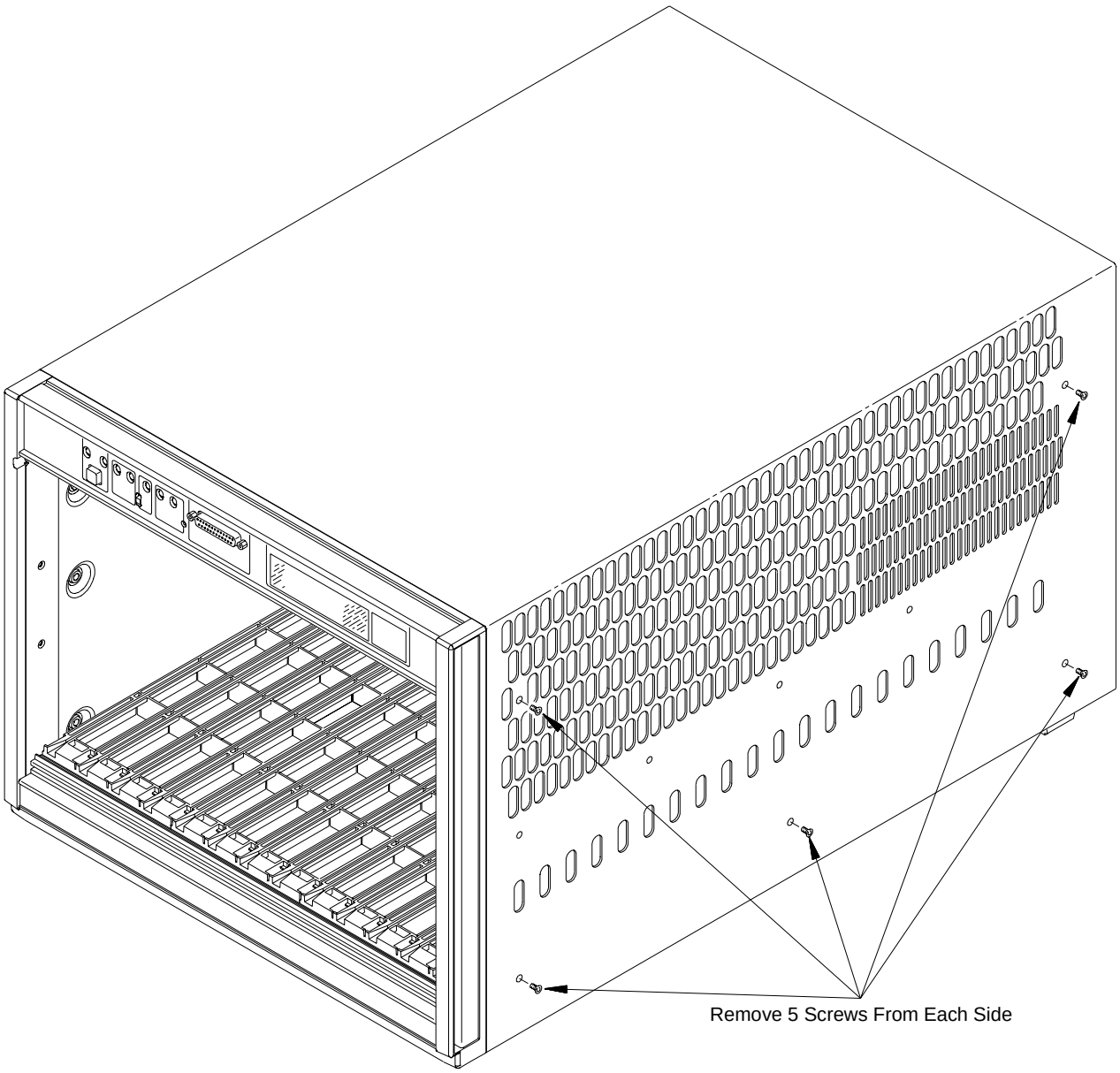


Figure 5-2. Removing the Mainframe Cover

Replacing the Internal Temperature Sensor Boards

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Remove the mainframe cover by removing the ten m3x6 flat head torx screws (five on each side of the mainframe). Refer to “Removing the Mainframe Cover” on page 208.
4. Refer to Figure 5-3. To replace the temperature sensor boards (all three should be replaced together), remove the old boards.Carefully break-apart the new sensor PC boards. Look carefully at the three new PC boards; each one is labeled as either FRONT, MIDDLE, or REAR. Make certain you place the sensor boards in the correct positions.
5. Refer to Figure 5-3. To replace the Enhanced Monitor display board, remove the screws holding the PC board and the nuts holding the Diagnostic Connector to the front panel. Remove all ribbon cable.
6. Replace the mainframe cover and rear panel.

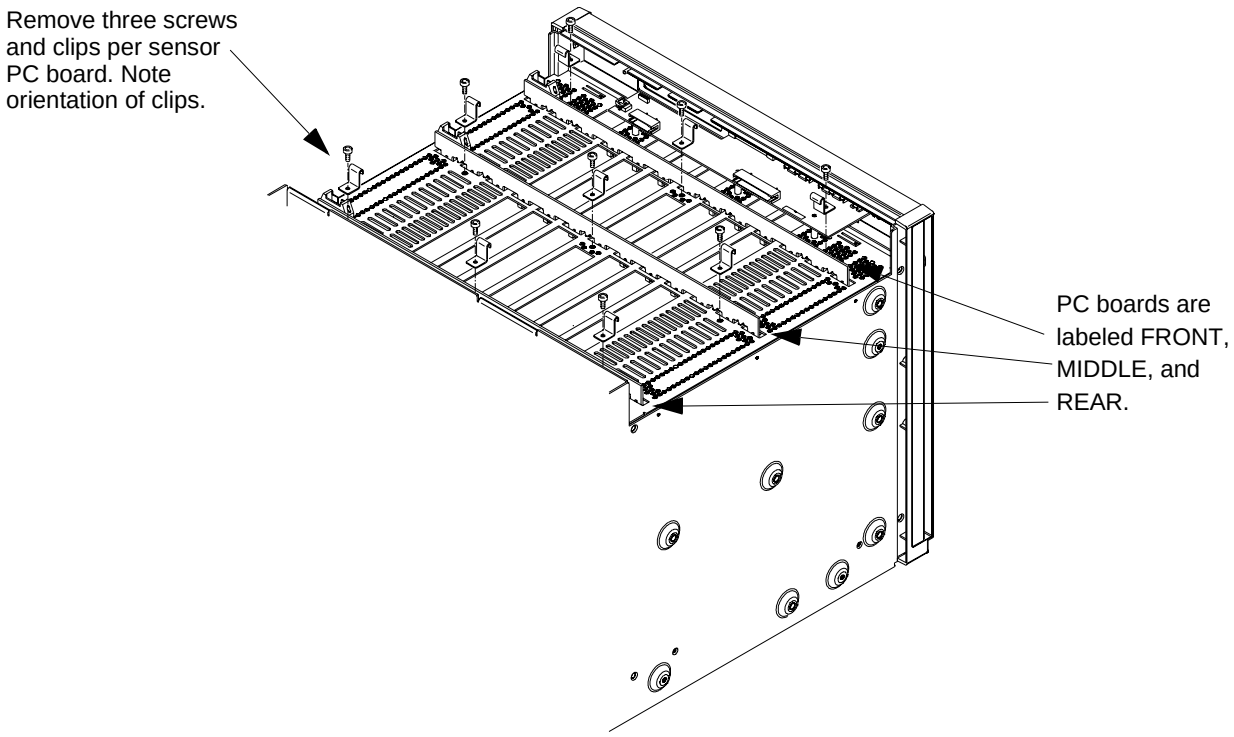


Figure 5-3. Removing / Replacing the Enhanced Monitor PC Boards

Note You *must* recalibrate the Enhanced Monitor after replacing the temperature sensor boards. Refer to Chapter 4, “Temperature Monitor Calibration & Verification” on page 191 for details.

Replacing the Enhanced Monitor Controller Board

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Grasp the pull ring on the Enhanced Monitor PC Board and gently pull it from the mainframe.
4. To replace the board, align the board in the card guides. slide the board forward and press it into the backplane connectors.

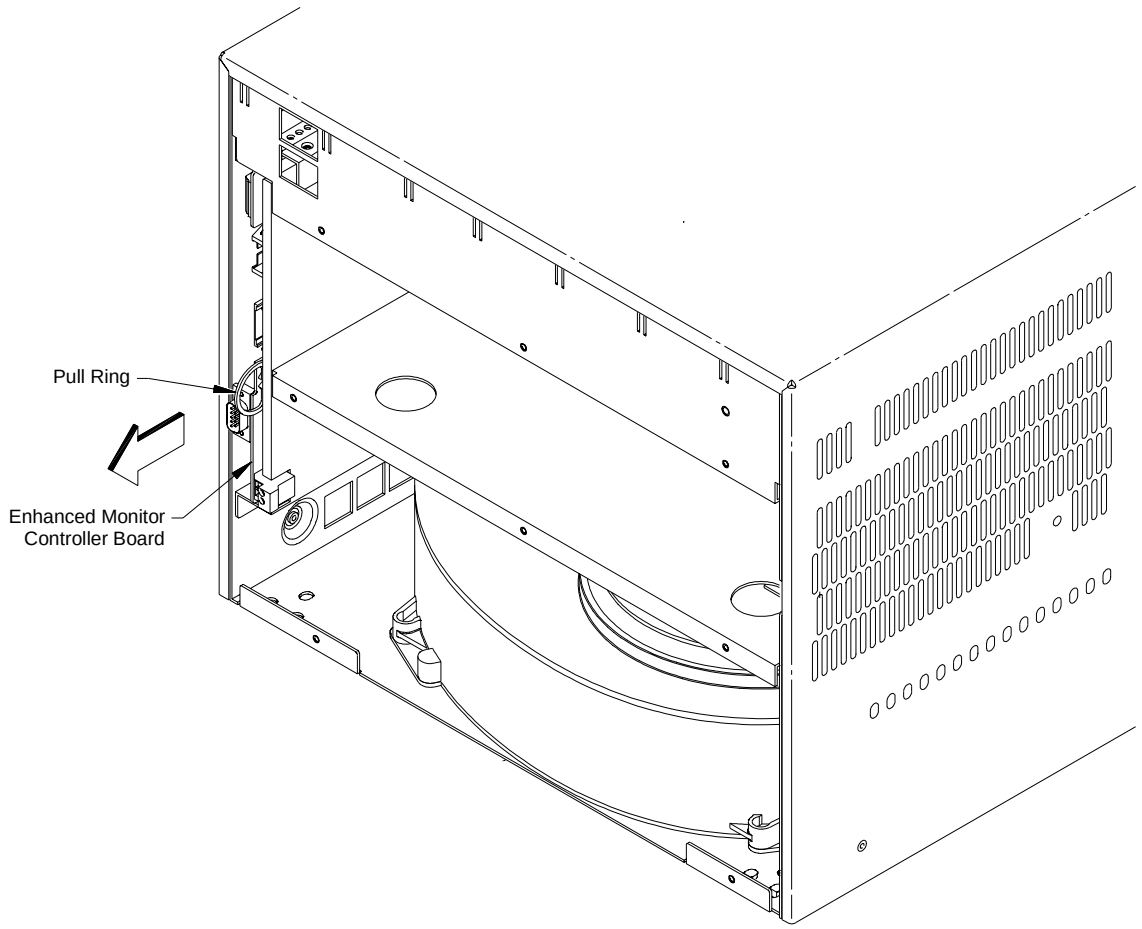


Figure 5-4. Removing/Replacing the Enhanced Monitor Controller Board

Replacing the Agilent E8402A Power Supply

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Gently pull the supply out from the connectors on the backplane adapter board.

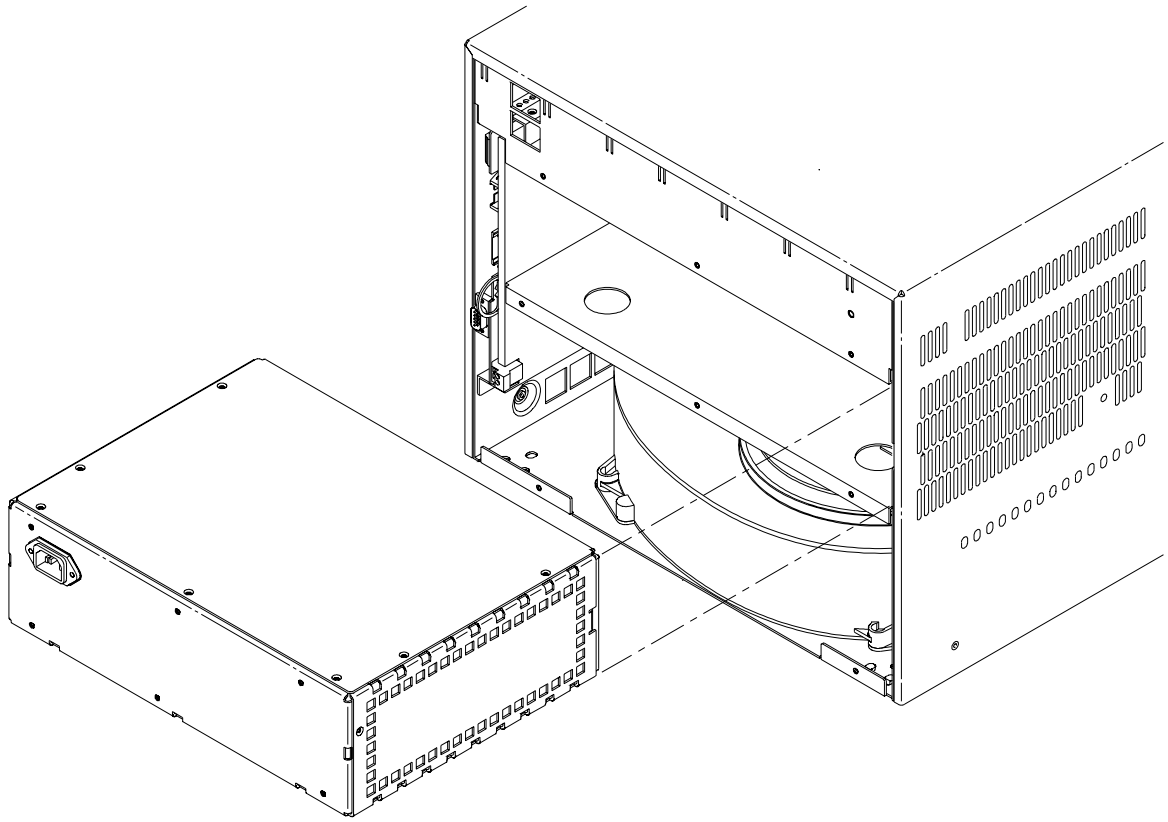


Figure 5-5. Removing the Agilent E8402A Power Supply

4. Install the exchange power supply. Keep the replacement power supply to the far right in the mainframe. Make sure the supply is firmly inserted into the backplane connectors.
5. Replace the rear panel. Make certain that all 14 screws are secured.

Note You *must* recalibrate the Enhanced Monitor after replacing the power supply. Refer to Chapter 4 for calibration details.

Replacing the Agilent E8404A Power Supply

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Using the rings on the power supply, gently pull the supply out from the plastic connectors on the backplane adapter board. Do not carry the supply using the rings.

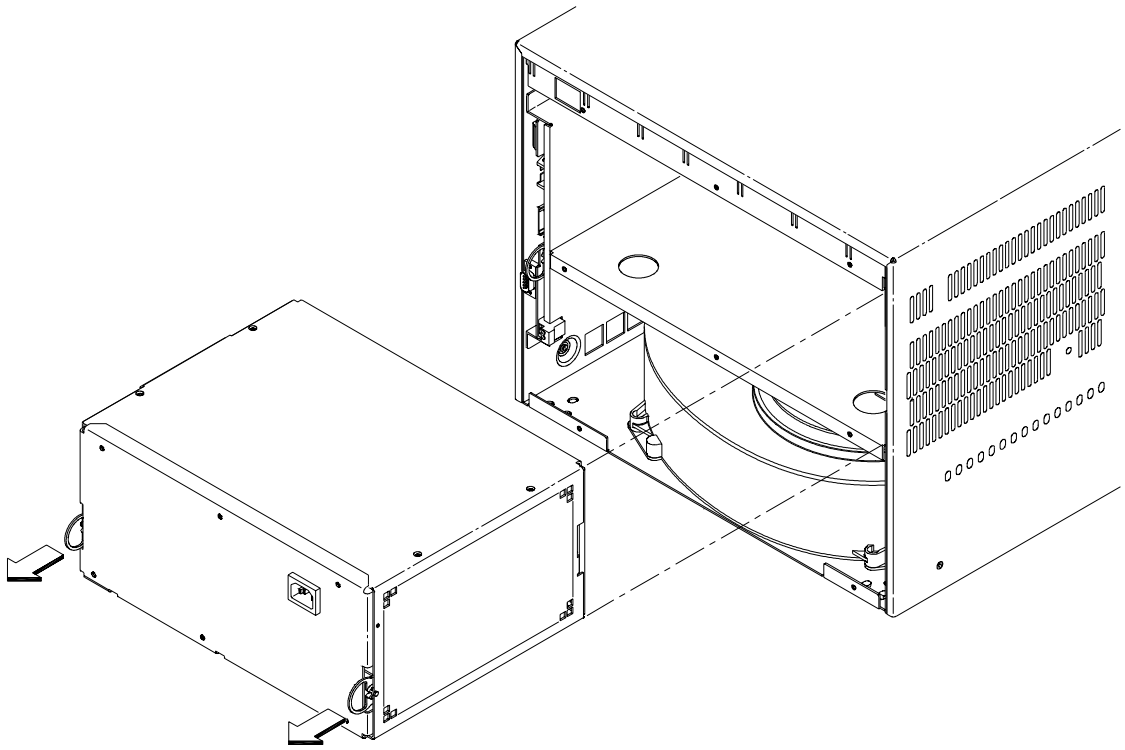


Figure 5-6. Removing the Agilent E8404A Power Supply

4. Install the exchange power supply. Keep the replacement power supply to the far right in the mainframe. Make sure the supply is firmly inserted into the backplane connectors.
5. Replace the rear panel. Make certain that all 14 screws are secured.

Note You *must* recalibrate the Enhanced Monitor after replacing the power supply. Refer to Chapter 4 for calibration details.

Replacing the Impeller

1. Turn off the mainframe and remove the power cord.
2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.
3. Disconnect the impeller wires from the backplane by gently pulling down on the wire housing (Figure 5-7). Note the position of the connector for re-installation.

Caution **Static sensitive components on the mainframe backplane are exposed when the impeller cover is removed. Use care when removing / inserting the impeller wires.**

4. Loosen the two m4x8 pan head torx screws which secure the impeller assembly to the mainframe.
5. Lift the impeller assembly off the screw locators and gently pull the impeller assembly out from the mainframe (Figure 5-7).

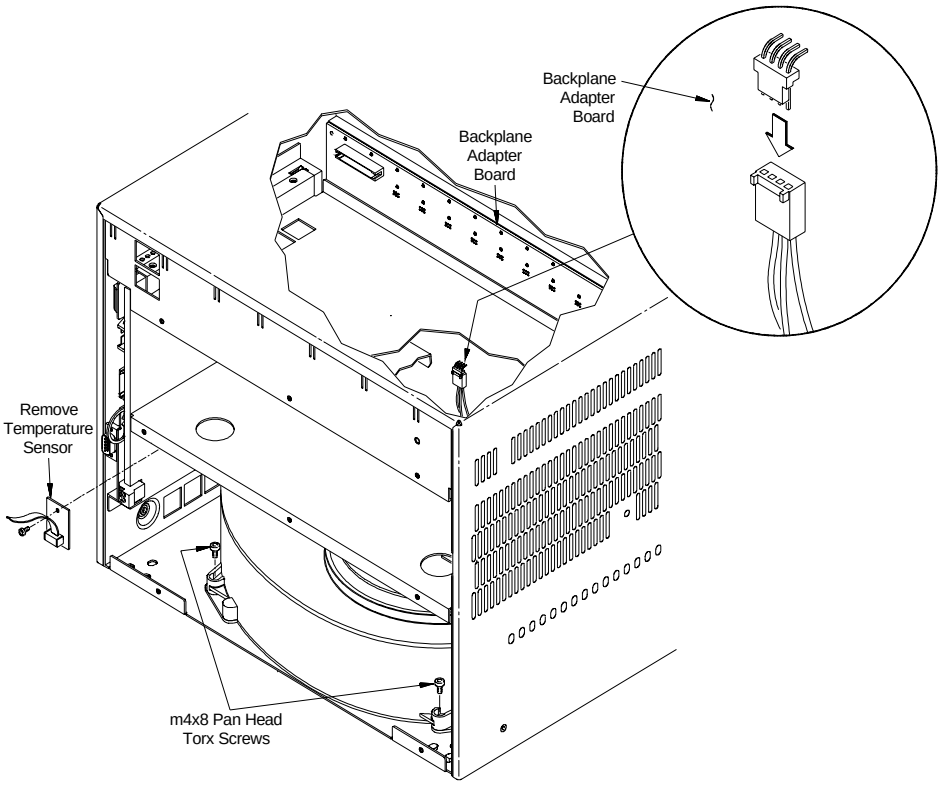


Figure 5-7. Removing / Installing the Impeller

6. Install the replacement impeller assembly by lining up the horizontal slots on the bottom of the impeller assembly with the raised edges on the mainframe. Slide the impeller assembly into the mainframe until the impeller housing is over the screw locators.

7. Reconnect the impeller wires to the adapter board. Tighten the impeller screws into the screw locators.

8. Replace the rear panel. Make certain that all 14 screws are secured.

Replacing the Enhanced Monitor Display Lamp

To replace the Enhanced Monitor back-light bulb:

1. Turn off the mainframe and remove the power cord.

2. Remove the rear panel. Refer to “Removing the Rear Panel from the Mainframe” on page 207 for instructions.

3. Remove the mainframe cover by removing the ten m3x6 flat head torx screws (five on each side of the mainframe). Refer to “Removing the Mainframe Cover” on page 208.

4. Carefully remove the Enhanced Monitor PC board (three screws and three ribbon cables). Unplug the bulb cord from the display driver PC board. Refer to Figure 5-8.

5. Carefully remove the display assembly from the mainframe front panel.

6. Slide the old bulb from the display and replace it with the new bulb.

7. Replace the display assembly.

8. Replace the Enhanced Monitor PC board. Reattach all cables.

9. Replace the mainframe cover and the rear panel. Make certain that all screws are secured.

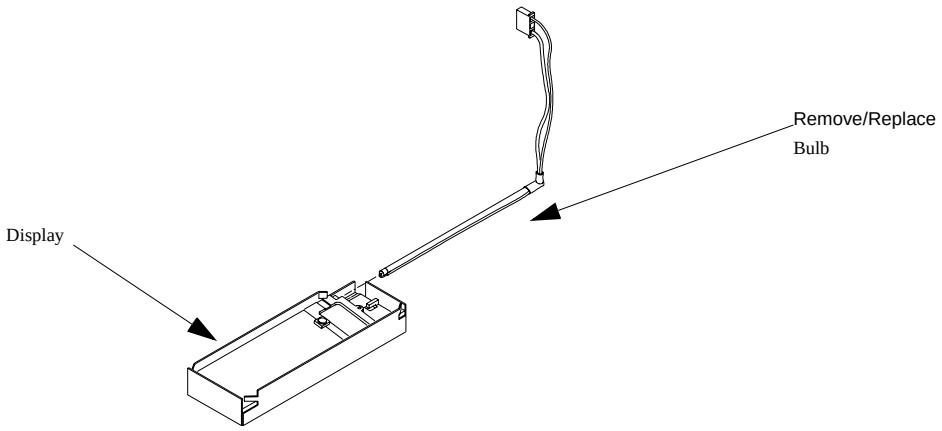


Figure 5-8. Replacing the Display Back-light Bulb

Replacement Power Cords

Table 5-3 lists the power cords rated for use with the Agilent E840x mainframes. If it becomes necessary to replace the power cord, obtain the appropriate cord listed in the table or use a cord with the same voltage and current ratings.

WARNING **Use the power cord rated for maximum current for the operating voltage of the mainframe.**

Table 5-3. Replacement Power Cords for the Agilent E8402 and E8404 VXI Mainframes

Country	Voltage	Part Number for Agilent E8402	Part Number for Agilent E8404	Rated Amps
U.K.	250 VAC	8120-1351	8120-1351	10A
Australia	250 VAC	8120-1369	8120-1369	10A
Europe	250 VAC	8120-1689	8120-1689	10A
U.S./Canada	125 VAC	8120-1378	8120-2371	10A Agilent E8402 13A Agilent E8404
U.S./Canada	250 VAC	8120-5338	8120-5338	10A
Switzerland	250 VAC	8120-2104	8120-21046	10A
Denmark	250 VAC	8120-2956	8120-2956	10A
Japan	100 VAC	8120-4753	8120-5400	12A Agilent E8402 15A Agilent E8404
India / South Africa	250 VAC	8120-4211	8120-4211	10A

Power cords supplied by Agilent have polarities matched to the power input socket on the instrument:

L = line or active conductor (also called “live” or “hot”)
N = neutral or identified conductor
E = earth or safety ground

WARNING **For protection from electrical shock, the power cord ground must not be defeated.**

Appendix A
Agilent E8402, E8404A Product Specifications

Product Descriptions

Model	Description	Power Supply	Monitoring
Agilent E8402A	13-Slot C-size VXI Mainframe	500W Available Power	Enhanced Monitoring
Agilent E8404A	13-Slot C-size VXI Mainframe	1000W Available Power	Enhanced Monitor

General Specifications

VXI Device Type: Mainframe
Data Transfer Bus: per VXIbus Spec, Rev 1.4
Size: C
Slots: 13 available
Connectors: P1 / P2
Shared Memory: n/a
VXI Busses: per VXIbus Spec, Rev 1.4

Mechanical Specifications

Module Size:

Thirteen (13) C-Size slots. The mainframe also accepts A- or B-size modules using the Agilent E1403 or E1407 Adapters.

Mainframe Dimensions:

Height: 352 mm (13.9 inches) (8 EIA rack units)
Width: 424.5 mm (16.7 inches)
Depth: 631 mm (24.9 inches)
Weight with no modules installed:
E8402A: approximately 20 Kg (44 lbs)
E8404A: approximately 25 Kg (55 lbs)

Maximum Module Weight:

3.5 Kg (7.7 lbs) per slot to comply with shock and vibration specifications. Heavier modules may be installed if shock and vibration environment is less severe.

Output Power Specifications

Total Available and Usable Power

Product	Temperature	Available Power[a] 90-264VAC	Usable Power[b] 110-264VAC	Usable Power[b] 90-110VAC
E8402A	0-55°C	686 W	500 W	500 W
E8404A	0-55°C	1,902 W	1,000 W	950W

a. Sum of voltages times currents. Not always usable due to thermal protection shutdown.

b. Total output before thermal protection shutdown or safety limitation.

Peak and Dynamic Current

	E8402A		E8404A	
Voltage	Peak Current, I_{MP} [a, b]	Dynamic Current, I_{MD} [a, c]	Peak Current, I_{MP} [a,b]	Dynamic Current, I_{MD} [a,c]
+5V	50A	5A	90A	9A
+12V	6A	1A	15A	2.5A
-12V	4A	1A	15A	2.5A
+24V	4A	2A	15A	5A
-24V	4A	2A	15A	5A
-5.2V	20A	2A	60A	8A
-2V	10A	1A	30A	5A

a. Specifications apply at the backplane, 0-55°C.

b. IMP = Rated mainframe peak DC output current as defined by the VXIbus Specification.

c. IMD = Rated mainframe peak-to-peak dynamic current as defined in the VXIbus Specification by a current vs. frequency curve.

Output Voltage Specifications

Voltage	Allowed Variation[a]	Ripple/Noise DC Load[a]	Induced Ripple/Noise[a]
+5V	+0.25V / –0.125V	50mV	50mV
+12V	+0.60V / –0.36V	50mV	50mV
-12V	–0.60V / +0.36V	50mV	50mV
+24V	+1.20V / –0.72V	150mV	150mV
-24V	–1.20V / +0.72V	150mV	150mV
-5.2V	–0.26V / +0.156V	50mV	50mV
-2V	–0.10V / +0.10V	50mV	50mV

a. Specifications apply at the backplane, 0-55°C.

+5VSTDBY: Up to 1A may be available if provided by the user through pins 8 and 21 of the diagnostic connector.

Input Power Requirements

Input Voltage: 90VAC Min to 264VAC Max, Single continuous range
Input Frequency: 47Hz Min to 66Hz Max (across full input voltage range)
360Hz to 440Hz: (Not Recommended. Leakage currents may exceed safety limits, 132VAC Max)
DCV Input: (Not Recommended. Input connector is not certified for DCV input.)
Inrush Current:
E8402A: Input Voltage 110VAC:25A Typical
Input Voltage 264VAC:55A Typical
E8404A: Input Voltage 110VAC:40A Typical
Input Voltage 264VAC:60A Typical

Note: If inrush current causes mains supply voltage to temporarily drop below the required minimum voltage (90VAC), the mainframe may not turn on properly.

Total Input Power may be estimated by the following expressions:
1.4 * (Output Power + 70W)
Notes: Total Power Input in Watts or VA, Power Factor Corrected.
Output Power in Watts = Sum of Voltage times Current for the seven VXI output voltages.
Expressions are valid for full output load and 90VAC.
Efficiency increases slightly with higher input voltage.
Efficiency decreases slightly with lower output load.

Power Switch: On/Standby switch on front.
Indicators: Green when On, amber in Standby and line connected.
May be switched On/Standby remotely via Diagnostic Connector.
May be switched On/Standby remotely via SCPI command (E8402A, E8404A only).

Mains Power Installation Category II

+5VSTDBY: Power may be provided by the user to the +5VSTDBY bus on the VXI backplane.
Current:1A Max
Voltage Range:5.25V Max, 4.875V Min
Connector:Pins 8 and 21 of the Diagnostic Connector.

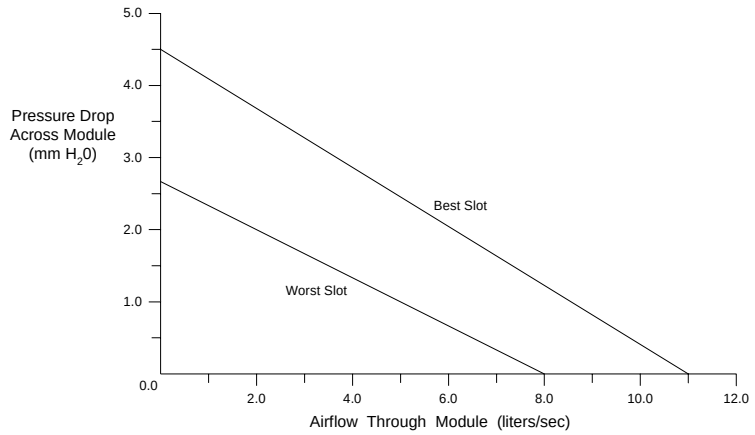
External +5V: Power may be provided by the user to operate the Enhanced Monitor controller board in the absence of line power.
Current:500mA Typical, 1.5A Max
Inrush Current:2A Max
Voltage Range:5.25V Max, 4.875V Min
Connector:Rear Panel

Chassis Ground Connection: M4 x 0.7 threaded nut insert on rear panel.

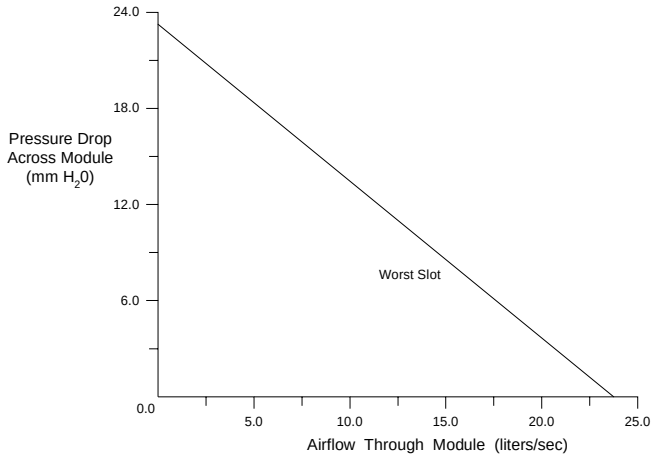
Cooling Specifications

High performance impeller provides cooling air to modules. Unique air distribution system (patent applied) and positively-pressurized plenum provide quiet operation and uniform airflow from slot to slot and from front to rear of modules. Outstanding back pressure performance insures airflow through dense modules. Separate power supply cooling fan(s) provides an independent air path for reliable cooling of power supply.

Cooling Specification Charts



- VXI-8 Specification Draft 2.0. Fixture revision 1.7.
- VXI-8 Standard Modules installed in all other slots.
- Performance shown for Worst Slot (slot 1) and Best Slot (slot 10).
- Front-to-Rear Variance 13% worst case. Typically 10%-12% in most slots.
- Fans on Full Speed. Minimum airflow is approximately 50% with fans on Variable Speed.
- Air Filter Kit not installed. Airflow is reduced approximately 10% with clean air filters installed.
- Measurements taken at 1,500m altitude.



- All other slots blocked. Airflow decreases as additional slots are opened.
- Performance shown for Worst Slot (slot 2). Airflow is greater in all other slots.
- Fans on Full Speed. Minimum airflow is approximately 50% with fans on Variable Speed.
- Air Filter Kit not installed. Airflow is reduced approximately 10% with clean air filters installed.
- Measurements taken at 1,500m altitude.

Cooling Mode (High or Variable)

Switchable on the front panel. Controls both impeller and fan.

High Fan Speed Mode: Full Airflow all the time.

Variable Fan Speed Mode:

Fan Speed increments through 8 discrete speeds as a function of:
Module exhaust temperature limits (user settable)
Module exhaust temperature rise (ΔT) limits
Ambient temperature limit (user settable)
Power supply temperature limit (fixed).

Assuming default limits:

At full load: Low Speed up to approximately 30°C
High Speed above approximately 40°C

At no load: Low Speed up to approximately 40°C
High Speed above approximately 50°C

Airflow Path

Inlet through rear and exhaust through upper sides for both power supply and modules. Allow 50mm clearance for proper airflow.

Air Filter Kit available for demanding environmental applications.

Acoustical Noise Specifications

Low Fan Speed:41.4 dBA sound pressure at bystander position, 1m in front of mainframe.

High Fan Speed:54.9 dBA sound pressure at bystander position, 1m in front of mainframe.

Backplane Specifications

- Solid state automatic daisy-chain jumpering for BUS GRANT and IACK signals.
- Full differential distribution of CLK10.
- ACFAIL* and SYSRESET* in full compliance with the VMEbus and VXIbus Specifications.
- Surface mount construction and no sockets for maximum reliability.

General Monitor Specifications

Indicators

- **Power/Stdby:** Glows amber in Standby and line connected.
- **Power/On:** Glows green when On.
- **Status/System/Power Supply:** Glows green when power supply output voltages within VXI specification, power supply temperature is below a set limit, and power supply output currents and power are below user-specified limits. Otherwise flashes amber.
- **Status/System/Temp:** Glows green when ambient temperature and module exhaust temperatures are below user-specified limits. Otherwise flashes amber.
- **Monitor(Status)/Fans**: Glows green when module and power supply fans are operating within set limits. Otherwise flashes amber.
- **Monitor(Status)/Backplane/Activity:** Flashes green when backplane activity occurs. Triggered by backplane signals DS0 and DS1.
- **Monitor(Status)/Backplane/SYSFAIL:** Glows amber when backplane signal SYSFAIL* is asserted. Any module in the VXI mainframe can assert this signal.

Switches

- **On/Standby**
- **Fan Mode:** Switch all fans between full speed and variable speed modes.
- **Reset:** Asserts backplane signals SYSRESET* and ACFAIL*.

Diagnostic Connector

- Output all 7 backplane voltages for monitoring
- Output +5V and +12V for remote applications. 1A max each.
- Input +5VSTDBY to backplane. 1A max total for pins 5 and 18.
- Remotely operate On/Standby
- Power supply temperature output. 0mV = 0°C, 10mV per °C.
- Reference temperature output. 0mV = 0°C, 10mV per °C.
- Fans OK output, same as Fans indicator. TTL low true logic levels.
- Backplane voltages OK output. TTL low true logic levels.
- SYSRESET*, input or output. TTL low true logic levels.
- ACFAIL*, output. TTL low true logic levels.
- Ground

Enhanced Monitor Specifications

Temperature Monitor

Module exhaust temperatures: 13 slots, front, middle and rear. Ambient temperature. Power Supply temperature.

Accuracy: ± 2 °C

Default slot exhaust alarm limits: 65°C absolute, user-settable via SCPI command
15°C delta, user-settable via SCPI command

Voltage Monitor

Seven VXI power supply outputs and +5VSTDBY. In Volts.

Default alarm limits: Per VXI regulation spec for each voltage, fixed.

Current Monitor

Seven VXI power supply outputs. In Amps.

Default alarm limits: Specified peak current for each output voltage, user-settable via SCPI command.

Note that measurement accuracy may cause an alarm even if peak current has not exceeded specified maximum. Limit may need to be adjusted higher.

Power Monitor

Seven VXI power supply outputs. In Watts.

Accuracy: Value calculated from voltage and current measurements.

Default alarm limits: Specified peak power level for total power, user-settable via SCPI command. Note that measurement accuracy may cause an alarm even if power has not exceeded specified maximum. Limit may need to be adjusted higher.

Fan Speed Monitor

Module cooling fan (impeller). Power supply cooling fan(s). In % of speed and rpm.

Timer

Accuracy, Δs/s:± 120 ppm
Aging, Δs/s: ± 5 ppm / yr

Resolution: 2 seconds
Non-Volatile Memory Life:>10 years

Front Panel Display

Type: 16 color liquid crystal display
Size: 92mm W x 25mm H, 256 x 64 pixels
Average bulb life:25,000 hrs
Languages supported: English, French, German, Spanish
Command Set: Per IEEE-488.1, 488.2, SCPI-1996.0

VXIbus Interface

VXI Device Type: Message-based Servant
Programmable Interrupter
Statically addressed A16 Device
Device Code: 618

RS232 Interface

Baud Rate: 300, 1200, 2400, 4800, 9600, 19200
Parity: Even, Odd, One, Zero, None
Character Size:7, 8
Pace: Xon/Xoff, None
Hardware handshake:DTR, RTS

External 5V Operation: Refer to Input Power Requirements Section

Environmental Specifications

Temperature

Operating Temperature Range: 0°C to +55°C

Storage Temperature Range: -40°C to +75°C

Humidity

Operating Humidity Range: Up to 95% RH from 0°C to +40°C.
Up to 65% RH from +40°C to +55°C.

Storage Humidity Range: Up to 95% RH from 0°C to +55°C.
Up to 65% RH from +55°C to +75°.

Shock

End Use Handling: Half sine waveform, <3 msec Duration,
Δv = 160 cm/sec minimum

Transportation: Trapezoidal waveform, Δv = 605 cm/sec,
30 g minimum

Vibration

Operating and Functional: 5 to 500 Hz, 0.0001 g^2/Hz Spectral Density

Survival, Swept Sine: 5 to 500 Hz Resonance Search, 5 minute Dwell on Resonances at 0.5 g

Survival, Random: 0.015 g^2/Hz Spectral Density

Altitude: Up to 3000m

Pollution Degree 2

Safety Specifications

Conforms to EN61010-1 including Amendment 2 (IEC 1010-1 including Amendment 2)

Certified to CSA 1010.1

NRTL Listing to UL 3111-1

Certified to EN60950 (IEC 950)

Certified to CSA 950.

NRTL Listing to UL 1950 Compliance.

Electromagnetic Compliance Specifications

Conducted Emissions

Conforms to EN55011, CISPR11, Group 1 Class A

Conforms to EN61000-3-2, IEC 1000-3-2, Class A, Harmonic Current

Conforms to EN61000-3-3, IEC 1000-3-3, Class A, Voltage Fluctuations and Flicker

Conducted Immunity

Conforms to EN50082-1, IEC 1000-4-4, Fast Transients Immunity

Conforms to EN61000-4-5, IEC 1000-4-5, Surge Immunity

Conforms to ENV50141, IEC 1000-4-6, Conducted Immunity

Conforms to EN61000-4-11, IEC 1000-4-11 Voltage Dips & Interruptions

Radiated Emissions
Conforms to EN55011, CISPR11, Group 1 Class A

Radiated Field Immunity
Conforms to EN50082-1, IEC 1000-4-3, Radiated Field Immunity

ESD Immunity
Conforms to EN50082-1, IEC 1000-4-2, 4kV CD, 8kV AD

Magnetic Field Immunity
Conforms to EN61000-4-8, IEC 1000-4-8, Level 2, Magnetic Field Immunity

EMC Accessories: The standard mainframe is suitable for the majority of applications. For more demanding EMC applications, the following accessories are available:

-- Chassis Shield Kit (E8400-80919) per VXI Specification Rev. 1.4, B.7.3.4. The chassis shield is used to provide additional isolation or shielding between noisy or sensitive modules. This may be useful, for example, with custom modules that do not meet the VXI near-field radiation spec. The Agilent chassis shields are easy to install and are grounded in all four corners (patent applied).
-- Backplane Connector Shields (E8400-80918) per VXI Specification Rev. 1.4, B.7.3.1. Backplane connector shields are useful for improving the ground connection between a module and the backplane. For a few modules, they are necessary for emc compliance to EN55011 and CISPR11. For the vast majority of modules, they are not necessary. Note that these shields are *only* useful *if* the module includes contacts conforming to VXI spec B.7.2.3.
-- EMC Filler Panels (E8400-60602) per VXI Specification Rev. 1.4, B.7.2.3. EMC Filler Panels are used to provide a continuous connection across the front opening of the mainframe. All Agilent modules include emc contacts to the adjacent slot. Using EMC Filler Panels in the empty slots completes the connection and reduces radiated emissions and increases radiated and esd immunity.

Power Supply Protection All outputs protected from over-temperature, over-voltage, over-current, short-to-ground and short-to-other-output. Protection mode is full shutdown. Recovery occurs when the fault condition is removed and power of on/standby is cycled.

Repair Diagnosis and Troubleshooting through the front panel monitor and connector.

- MTTR, Power Supply:<10 minutes (with mainframe and modules fully installed in rack).
- MTTR, Impeller and/or Fan:<10 minutes (with mainframe and modules fully installed in rack).
- MTTR, Enhanced Monitor Control Board:<10 minutes (with mainframe and modules fully installed in rack).
- MTTR, Enhanced Monitor Display Bulb:<15 minutes (requires removal of main cover).
- Calibration time: 5 to 10 minutes after steady temperature reached.
- Air Filter Replacement (if kit installed):<2 minutes.

Appendix B
Rack Mounting and Option Installation

Chapter Overview

This chapter contains procedures for rack mounting the mainframe and for installing the hardware options available with the mainframe.The sections in this chapter include:

- Rack Mounting the Agilent E840xA Mainframe 229
- Installing the Cable Tray. 242
- Installing the Tinted Acrylic Door 244
- Installing the Intermodule Chassis Shields 246
- Installing the Backplane Connector Shields. 248
- Agilent E840xA Air Filter Kit 250

Rack Mounting the Agilent E840xA Mainframe

The Agilent E840xA is mounted into standard EIA cabinets using the rack mount adapter options and support rail or rack slide kit shown in Table B-1.

Table B-1. Agilent E840xA Rack Mount Options and Kits.

Rack Mount Adapter Options	Rail and Rack Slide Kits
Agilent E840xA Standard Adapter Kit Option 923 (kit p/n E8400-80923)	Support Rail Kit Agilent E3664A or Rack Slide Kit Agilent p/n 1494-0411
Agilent E840xA Flush Mount Adapter Kit Option 924 (kit p/n E8400-80924)	Support Rail Kit Agilent E3664A
Agilent E840xA VXIplug&play Compliant Adapter Kit Option 925 (kit p/n E8400-80925)	Support Rail Kit Agilent E3663A* or Rack Slide Kit Agilent p/n 1494-0411
* This adapter kit can also be used with the Agilent E3665A rail kit.	

When rack mounting the mainframe, you must order an adapter option **and** the rail **or** rack slide kit supported by the adapter.

Parts List

The parts included with each rack mount adapter option and the support rail and slide rail kits are shown in Table B-2.

Table B-2. Rack Mount Adapter, Support Rail, and Rack Slide Parts Lists.

Quantity	Description	Part Number
Agilent E840xA Standard Adapter Option 923 (kit p/n E8400-80923)		
1	Rack Mount Adapter (left)	E8400-61203
1	Rack Mount Adapter (right)	E8400-61204
2	Handles	*
4	Handle Screws - m5x10 flat head	0515-1020
8	Adapter-to-Mainframe Screws - m5x8 pan head	0515-0979
4	Adapter Dress Screws	0570-1577
4	Channel Nuts (for adapter dress screws)	0590-0804
Agilent E840xA Flush Mount Adapter Option 924 (kit p/n E8400-80924)		
1	Rack Mount Adapter (left)	E8400-61205
1	Rack Mount Adapter (right)	E8400-61206
4	Adapter-to-Mainframe Screws - m5x8 pan head	0515-0979
4	Adapter Dress Screws	0570-1577
4	Channel Nuts (for adapter dress screws)	0590-0804
Agilent E840xA VXIplug&play Compliant Adapter Option 925 (kit p/n E8400-80925)		
1	Rack Mount Adapter (left)	E8400-61207
1	Rack Mount Adapter (right)	E8400-61208
4	Fixture Screws - m5x12 flat head	0515-0956
8	Adapter-to-Mainframe Screws - m5x8 pan head	0515-0979
6	Adapter Dress Screws	0570-1577
6	Channel Nuts (for adapter dress screws)	0590-0804
Support Rails (Agilent E3664A)		
2	Support Rails	E3664-00001
4	Channel Nuts (for support rail-to-rack)	0590-0804
4	Support Rail-to-Rack Screws - 0.5x10.32	2680-0278
Rack Slides (Agilent p/n 1494-0411)		
2	Rack Slides	**
8	Rack Slide-to-Adapter Screws - m5x8 flat head	0515-1019
8	Channel Nuts (for slide rails)	0590-0804
4	Rack Slide-to-Rack Front Screws - m5x12 flat head	0515-0956
4	Rack Slide-to-Rack Rear Screws - m5x12 pan head	0515-0904
* AMATOM p/n 10939-A-032-2		
** General Devices p/n CC1502-99-0016		

Rack Mounting the Agilent E840xA using Support Rails

This section contains instructions for mounting the Agilent E840xA mainframe in an EIA cabinet using the Agilent E3664A support rail kit. The E3664A kit can be used with any of the rack mount adapter options; however, the E3664A is only compatible with Agilent cabinets. The following procedures apply to all adapters, with adapter-specific information noted where necessary.

Note If you ordered Cable Tray Option 914, refer to page 242 and install the tray before rack mounting the mainframe.

Procedure

1. Attach the handles to the adapters using the m5x10 flat head screws (Figure B-1). Handles are included only with the Agilent E840xA Standard adapters (Option 923).

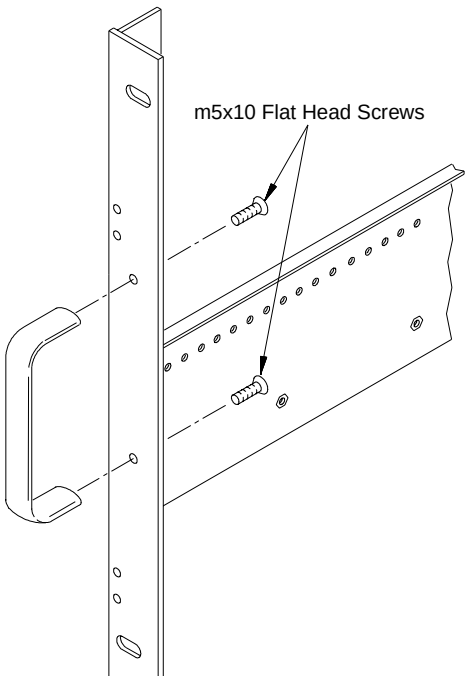


Figure B-1. Attaching Handles to the Adapters (Option 923 - kit p/n E8400-80923)

2. Using the rack mount adapters as templates, position the adapters on the rack's vertical rails where the mainframe is to be mounted. Align the adapter holes over the "center" holes of the EIA rack units (Figure B-2).

Note If you are using the Agilent E840xA VXIplug&play Compliant adapters (Option 925), position the adapters such that all three mounting holes are directly over holes on the rack's vertical rails, and that the adapter flanges cover nine full EIA rack units with no overlap.

3. Slide channel nuts over the rack holes to be used by the rack mount adapters.

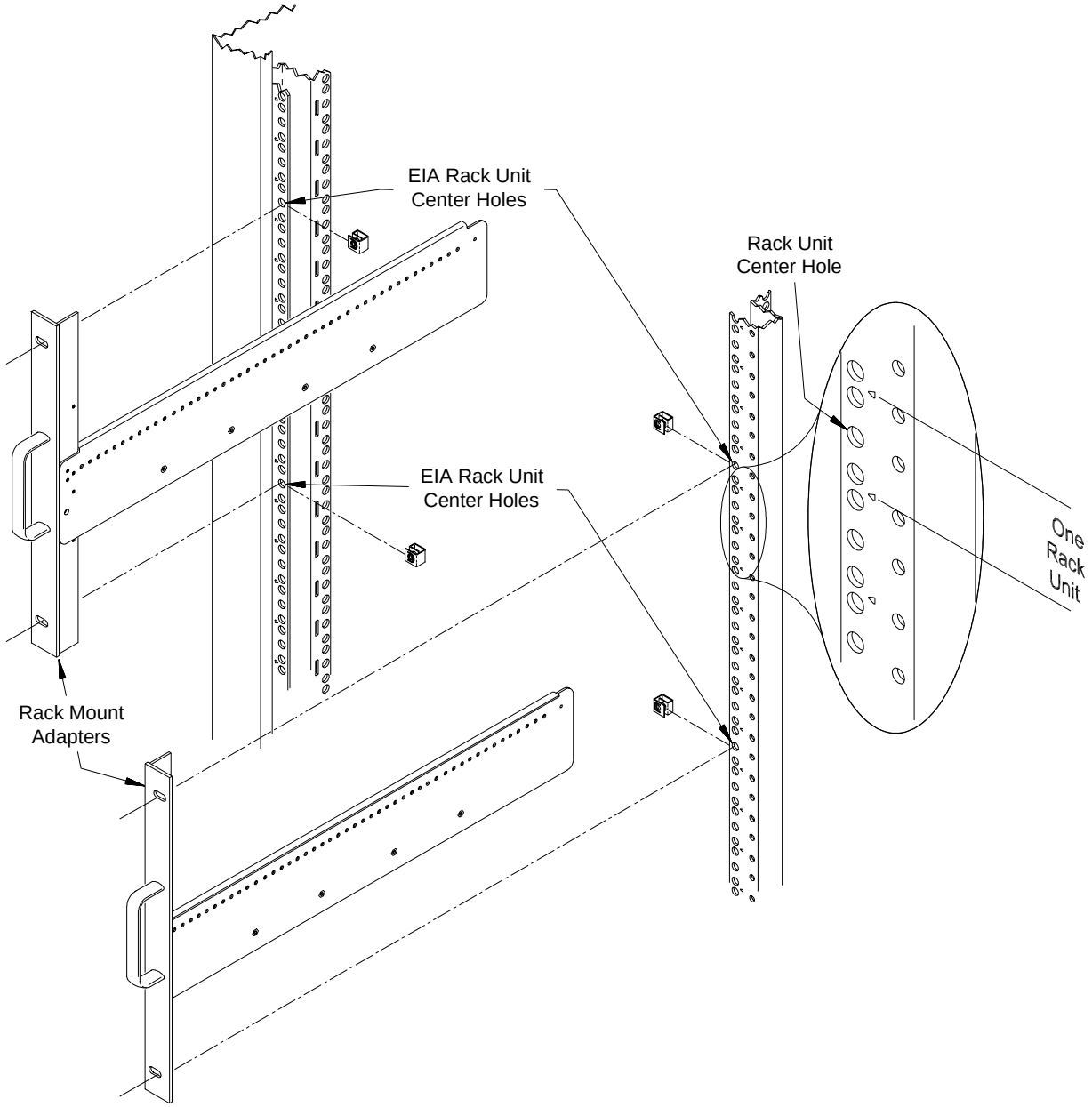


Figure B-2. Positioning the Mainframe in the Rack

4. Attach the support rails to the rack's inside vertical rails. The support rails must be positioned behind the **bottom** channel nuts installed in Step 3. Refer to Figure B-3. Use four channel nuts and the four 0.5x10-32 support rail-to-rack pan head screws to secure the rail.

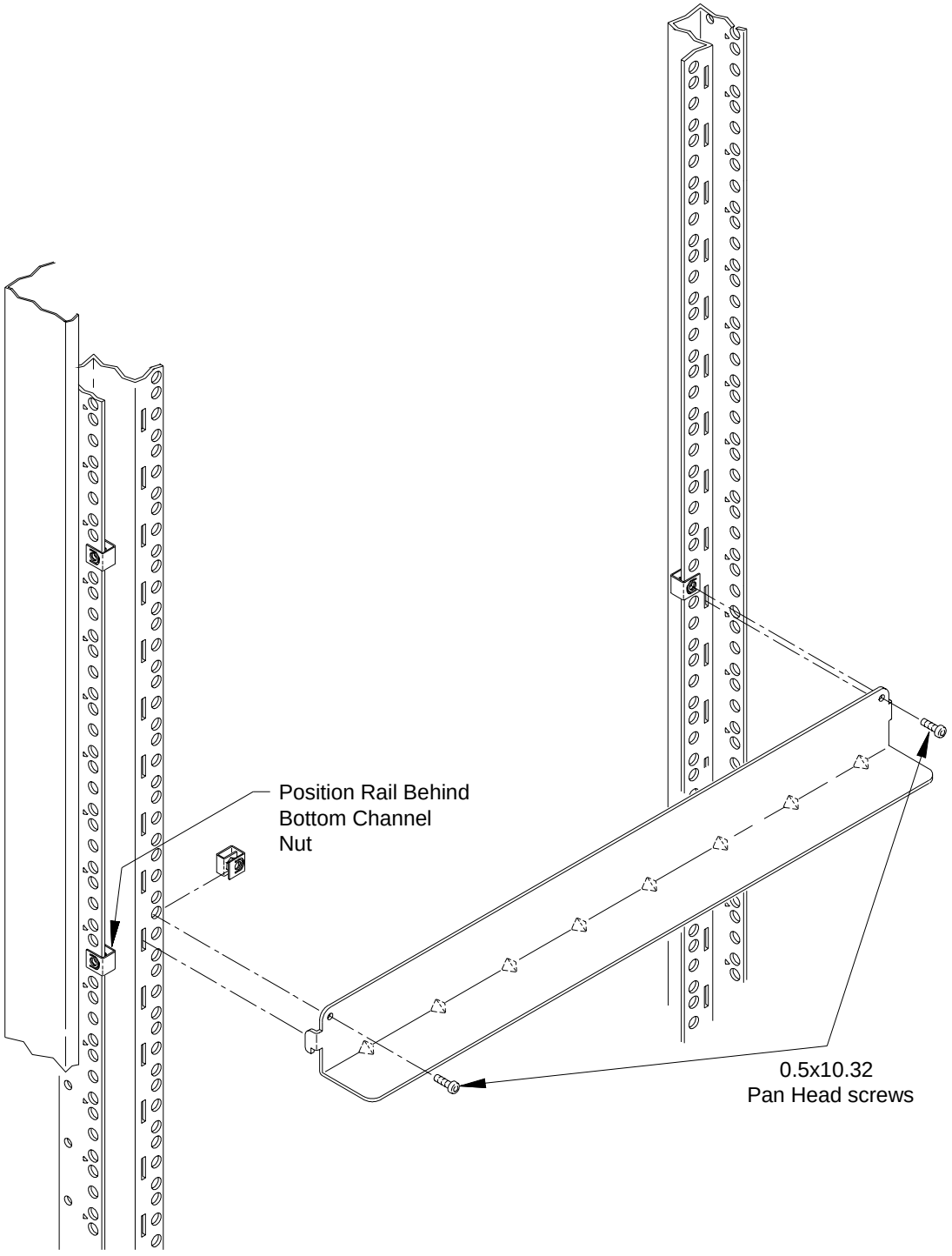


Figure B-3. Attaching the Support Rails to the Rack

5. Attach the rack mount adapters to the mainframe using the m5x8 pan head screws provided. To mount the mainframe flush with the rack front, begin with the 3rd hole from the front of the adapter (Figure B-4).

   With the standard adapters (Option 923), the mainframe can be recess mounted up to 270.7 mm (10.6 inches), or extended out from the rack up to 147.6 mm (5.8 inches) in 12.3 mm (approximately 1/2 inch) increments.

   The rack mount adapters for the VXI compliant and flush mount options are also shown in Figure B-4.

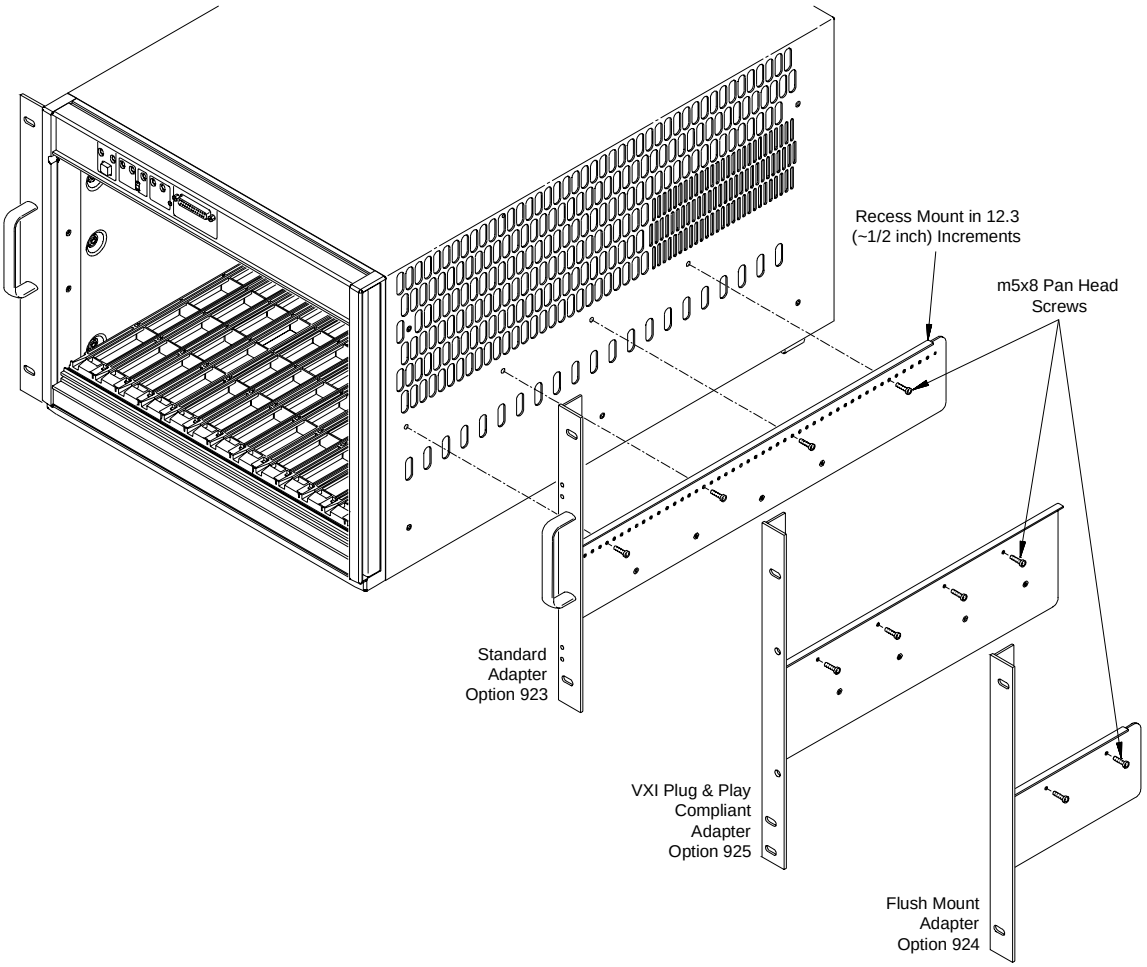


Figure B-4. Attaching the Rack Mount Adapter to the Mainframe

6. Remove the mainframe feet by lifting the tabs and sliding the feet towards the center of the mainframe.

7. With one person on each side of the mainframe, lift the mainframe onto the support rails. Slide the mainframe into the rack until the rack mount adapter flanges are against the rack's vertical rails. Secure the mainframe to the rack using the adapter dress screws.

WARNING **To prevent injury during rack mounting, the mainframe should be empty and two people should lift the mainframe into the rack.**

Rack Mounting the Agilent E840xA Using Rack Slide Rails

This section contains instructions for mounting the Agilent E840xA mainframe in an EIA cabinet using the rack slide kit (p/n 1494-0411). The rack slide kit, which is used with either the Standard adapters (Option 923) or the VXIplug&play Compliant adapters (Option 925), allows you to extend the mainframe from the cabinet for easier access to installed instruments.

The following procedures apply to the adapter kits listed above, with adapter-specific information noted where necessary. The rack slide kit is not used with the flush mount adapters (Option 924).

Procedure

1. Attach the handles to the standard adapters using the m5x10 flat head screws (Figure B-5). Handles are included only with the Agilent E840xA Standard adapters (Option 923).

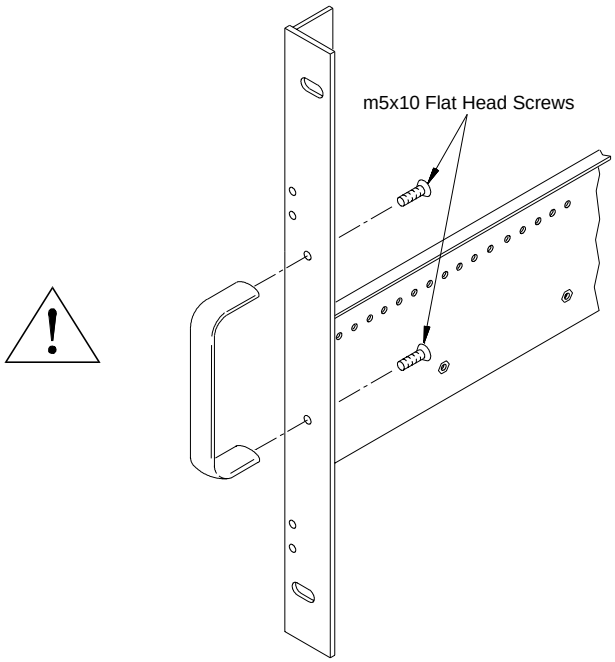


Figure B-5. Attaching Handles to the Adapters (Option 923 - kit p/n E8400-80923)

2. Using the rack mount adapters as templates, position the adapters on the rack's vertical rails where the mainframe is to be positioned. Be sure to align the adapter holes over center holes on the vertical rail (Figure B-6).

   If you are using the Agilent E840xA VXIplug&play Compliant adapters (Option 925), position the adapters such that all three mounting holes are directly over holes on the rack's vertical rails, and that the adapter flanges cover nine full EIA rack units with no overlap.

3. Slide channel nuts over the rack center holes to be used by the rack mount adapters.

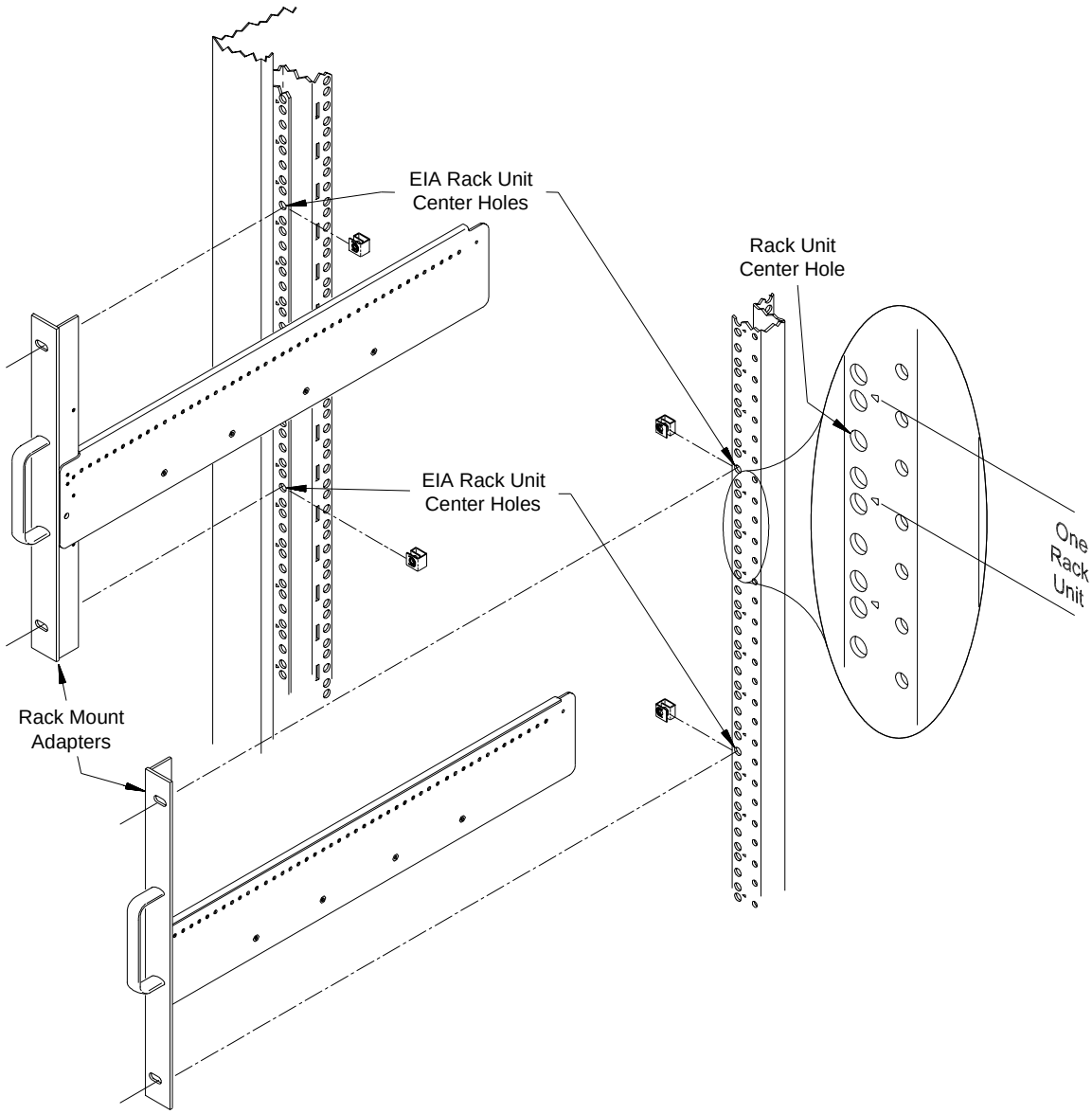


Figure B-6. Positioning the Mainframe in the Rack

4. From the bottom channel nut inserted in Step 3, count up four holes. Slide a channel nut over the corresponding hole on the inside vertical rail (Figure B-7). Install a second channel nut on the inside rail four holes above the first nut. Repeat for the other rail. Install channel nuts on the corresponding holes on the rear inside rails.

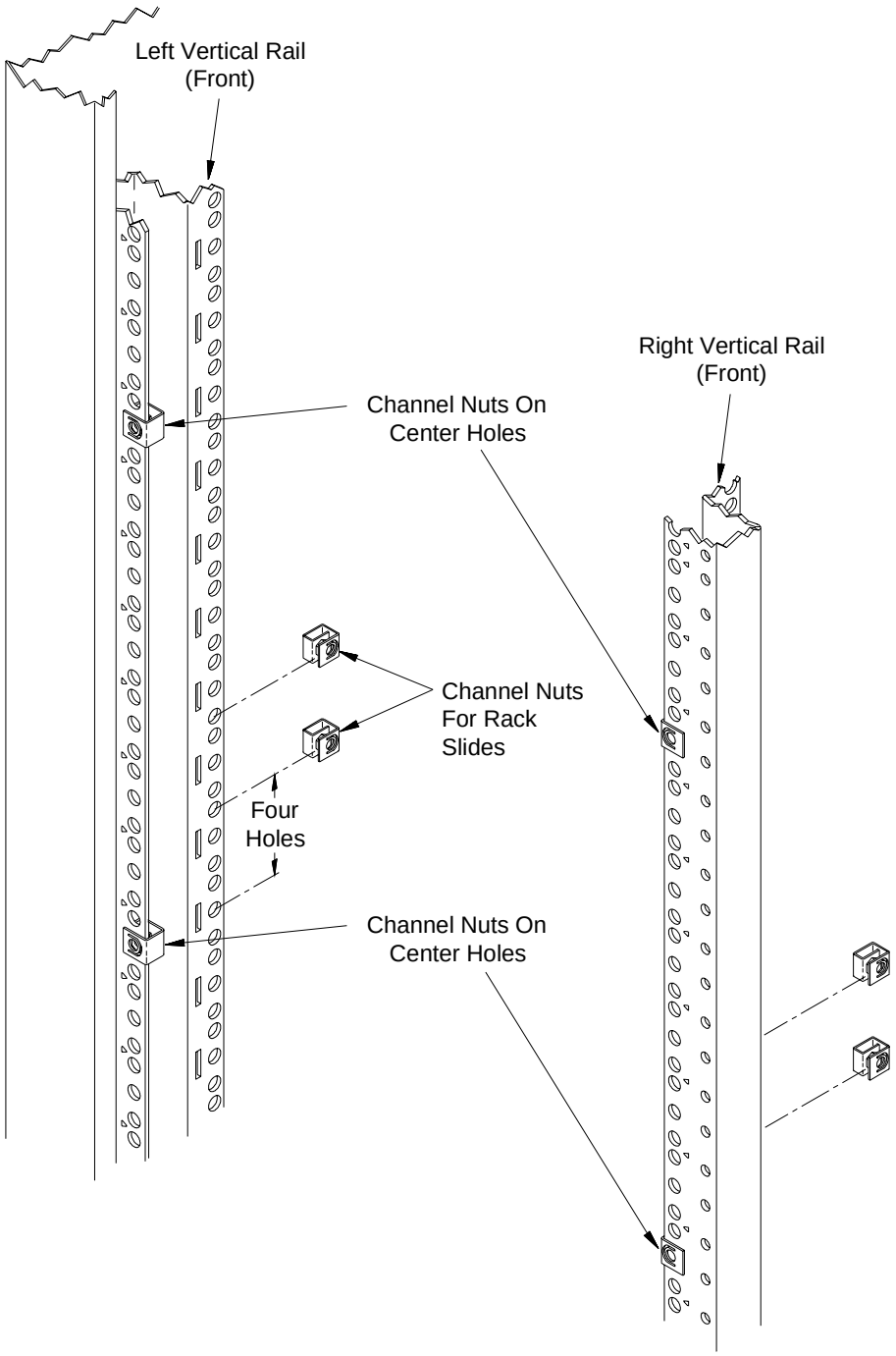


Figure B-7. Positioning the Rack Slides (using Option 923 - standard adapters)

5. Remove the chassis section from the intermediate section (Figure B-88). (The chassis section will be connected to the mainframe in Step 7.) Slide the intermediate section back into the stationary section.

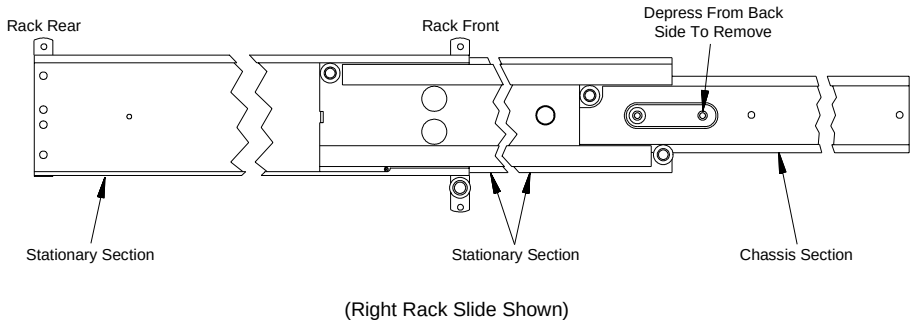


Figure B-8. Removing the Rack Slide Chassis Section from the Intermediate Section

6. Attach the stationary section to the rack's front inside rail through the channel nuts. Use two m5x12 flat head screws. Attach the stationary section to the rear inside rail using two m5x12 pan-head screws (Figure B-9).

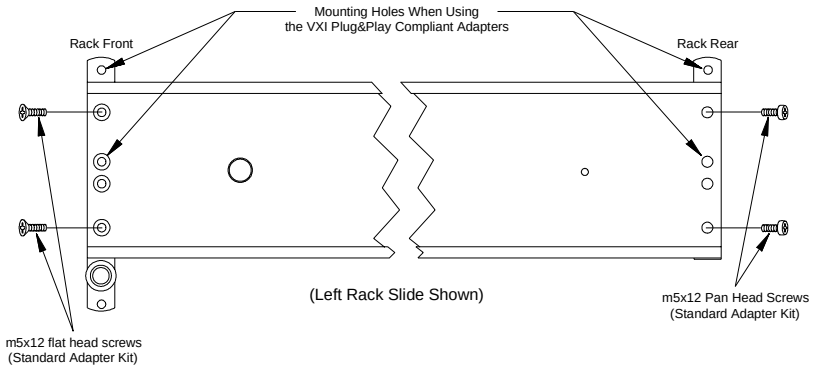


Figure B-9. Installing the Rack Slide Stationary Sections

7. Attach the rack mount adapters to the mainframe using the eight m5x8 pan head screws provided. To mount the mainframe flush with the rack front, begin with the 3rd hole from the front of the adapter (Figure B-10).

The mainframe can be recess mounted up to 270.7 mm (10.6 inches) in approximately 12.3 mm (1/2 inch) increments. Note that in some recess positions, the front screw attaching the rack slide adapter may have to be removed.

8. Attach the chassis sections to the rack mount adapters using four m5x8 flat head screws per side (Figure B-10).

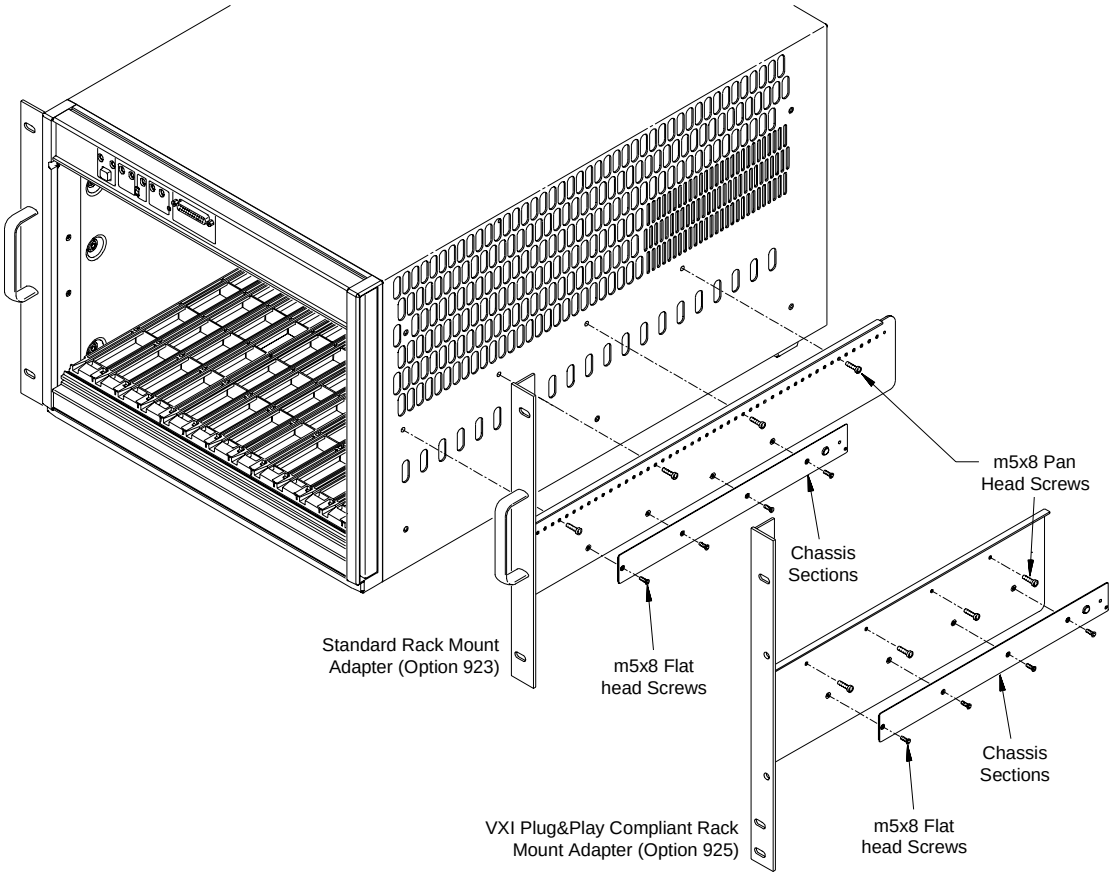


Figure B-10. Attaching the Rack Mount Adapters and Chassis Sections to the Mainframe

9. If additional rack space is required for other instruments, remove the mainframe feet by lifting the tabs and sliding the feet towards the center of the mainframe.

10. Slide the rack slide intermediate sections out from the rack slide stationary sections until they lock into place. With one person on each side, lift the mainframe and slide the chassis sections into the intermediate sections until the chassis sections lock into place. Slide the mainframe into the rack until the rack mount adapter flanges are against the rack's vertical rails. Secure the mainframe to the rack using the adapter dress screws.

WARNING **To prevent injury during rack mounting, the mainframe should be empty and two people should lift the mainframe into the rack.**

Installing the Cable Tray

The Agilent E840xA Cable Tray (Option 914) allows you to route VXI instrument cables and wires under the mainframe. The cable tray can be used when the mainframe is on a bench top or when mounted in a standard EIA cabinet. The tray is compatible with the support rail (Agilent E3664A) and rack slide (Agilent p/n 1494-0411) kits.

Note If you ordered the support rail (Agilent E3664A) or rack slide (p/n 1494-0411) kit, install the cable tray before rack mounting the mainframe.

Parts List

The parts included in Option 914 are shown in Table B-3.

Table B-3. Agilent E840xA Cable Tray Option 914 Parts List.

Quantity	Description	Part Number
1	Cable Tray	E8400-04102
4	Cable Tray-to-Mainframe Screws - m5x8 pan head	0515-0979

Procedure

1. Remove the four mainframe feet by lifting the tabs and moving each foot towards the center of the mainframe.

2. Attach the cable tray to the mainframe as shown in Figure B-11 using four m5x8 pan head screws. Select the tray holes based on the amount of cable clearance required.

   The bottom mounting holes position the tray over one additional EIA rack unit (44.5 mm), the top holes position the tray over two EIA rack units, and the center holes position the tray between one and two EIA rack units.

Note If the mainframe is mounted extending out from the rack, install the cable tray with the notched end at the front of the mainframe.

3. If the mainframe will be placed on a bench top, attach the mainframe feet to the cable tray. If the mainframe is to be rack mounted, you can save rack space by leaving the feet off.

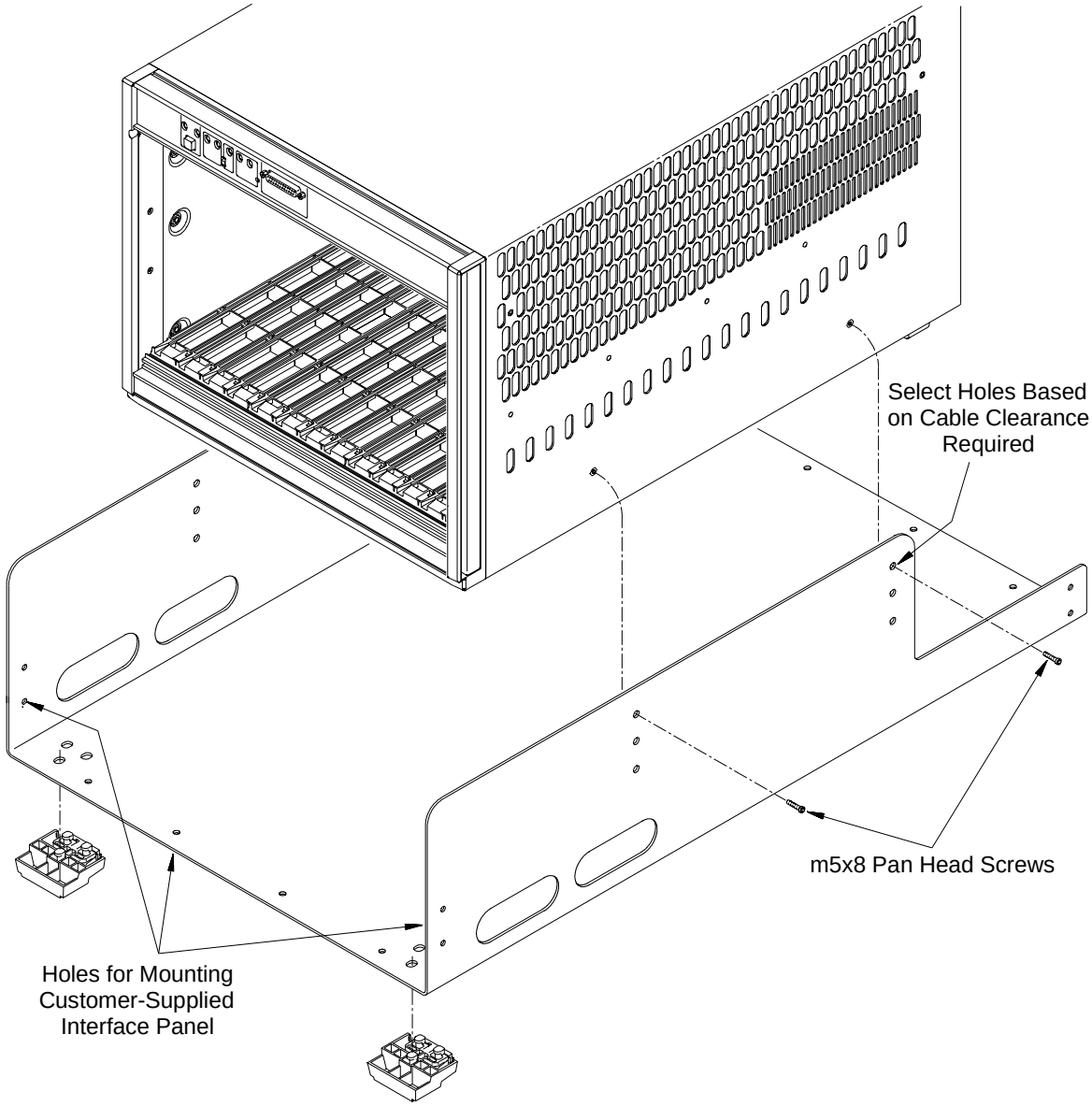


Figure B-11. Installing the Cable Tray

Note Holes are provided at each end of the cable tray for mounting a customer-supplied interface panel. The maximum height of the panel must be 41.275 mm for a one EIA rack unit cable tray position, or 85.725 mm for a two EIA rack unit cable tray position.The panel width cannot exceed 424 mm. The four holes across the bottom are 101.6 mm center-to-center, and centered on the tray. The side holes are 34.9 mm center-to-center, with the bottom hole 25.4 mm above the tray's inside surface. All holes are 12.7 mm from the edge and have a diameter of 3.175 mm.

Installing the Tinted Acrylic Door (Option 915)

This procedure describes how to install the Tinted Acrylic Door on the Agilent E840xA mainframe. The door requires the Standard Adapter Kit (p/n E8400-80923), and is compatible with either the support rail kit (Agilent E3664A) or the rack slide kit (p/n 1494-0411).

Parts List

The parts included in Option 915 are shown in Table B-4.

Table B-4. Agilent E840xA Option 915 Parts List.

Quantity	Description	Part Number
1	Acrylic Door Assembly	E8400-09301
2	Hinges	3110-0409
1	Door Latch, Lock, and Keys	1390-0891
2	Rubber Door Stops	0403-0002
4	Screws - m5x10 flat head	0515-1020
4	Screws - m3x8 pan head	0515-0897

Note The door requires the mainframe to be recess mounted a minimum of 111 mm (4.36") or up to a maximum of 270.7 mm (10.6 inches) to accommodate wiring terminals on the VXI instruments. When using the minimum recess distance, field wiring cables must enter/exit the instruments through the top and/or bottom openings only.

Procedure

1. Recess mount the mainframe a minimum of 111 mm (4.36 inches) using the Standard Adapter kit and either the support rail kit (page 231) or rack slide kit (page 235).

Note For the minimum recess distance, attach the rack mount adapters to the mainframe beginning with the 12th hole from the front of the adapter.

2. If necessary, remove the dress screws (0570-1577) securing the adapters to the rack.

3. Attach the hinge pins to the right rack mount adapter using four m5x10 flat head screws (Figure B-12). Attach the rubber door stops and door latch to the left adapter using four m3x8 pan head screws as also shown in Figure B-12.

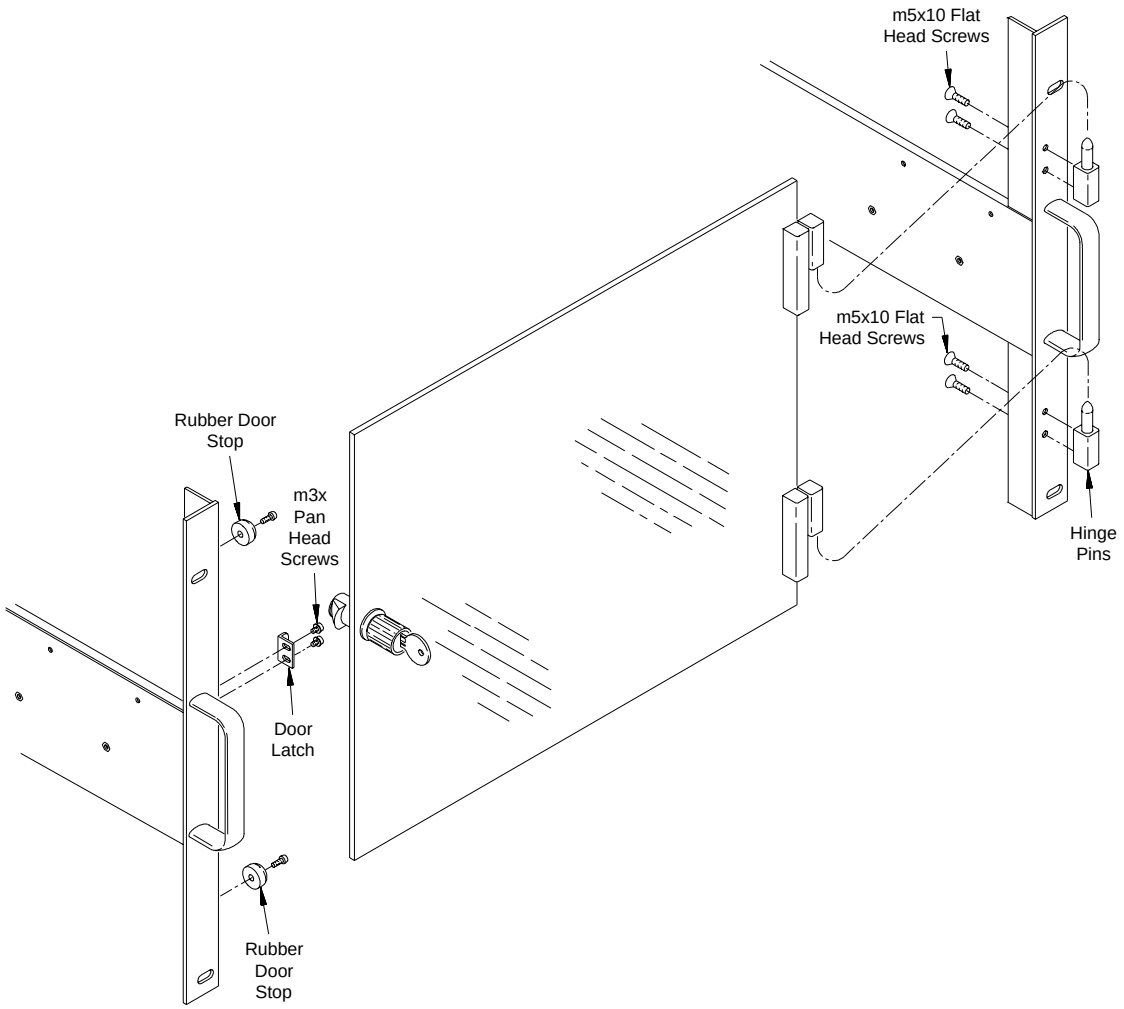


Figure B-12. Installing the Acrylic Door Hinges, Door Stops, and Latch Keeper

4. Slide the mainframe into the rack until the rack mount adapters contact the rack's vertical rails.Start the dress screws but do not tighten.

5. Install the door assembly by placing the hinges over the hinge pins on the right adapter. Adjust the door for squareness and clearance by holding the door in place while tightening the dress screws.

6. Adjust the latch keeper so that the door latches as it makes contact with the rubber door stops.

Note Once installed and adjusted, the door can be removed when necessary by lifting the door off the hinge pins.

Installing the Intermodule Chassis Shields

This procedure describes how to install kit p/n E8400-80919 - Intermodule Chassis Shields in the Agilent E840xA mainframe. The chassis shield is Agilent's implementation of VXI revision 1.4, specification B.7.3.4 that allows grounded shielding between mainframe slots. The shield is used to isolate VXI modules that generate electromagnetic interference (EMI) at excessive levels, or to protect VXI measurement modules from noise sources.

WARNING **Do not install intermodule chassis shields while the mainframe is turned on or plugged into an AC power source.**

Parts List

The parts included in the E8400-80919 kit are shown in Table B-5.

Table B-5. E8400-80919 Parts List.

Quantity	Description	Part Number
1	Chassis Shield	E8400-00600
8*	Grounding Spring	E8400-09101
* Includes 4 extra springs.		

Procedure

Note Each mainframe slot has top and bottom chassis shield guides (Figure B-13). Chassis shields should be installed on both sides of an instrument generating interference/noise, or installed on both sides of a sensitive instrument.

1. Insert grounding springs into the four sockets (two top, two bottom) along the shield guides (Figure B-13). Use a small flat blade screwdriver to secure each spring under the socket tab.

   Use the chassis shield to cover the vent holes inside the mainframe when installing grounding springs in the top guide sockets. This prevents the springs from falling into the mainframe if they are accidently dropped.

2. Align the chassis shield with the shield guides and gently slide the shield into the mainframe. Be careful not to crimp the front grounding springs with the edge of the shield. Slide the shield in until it reaches the end of the shield guide.

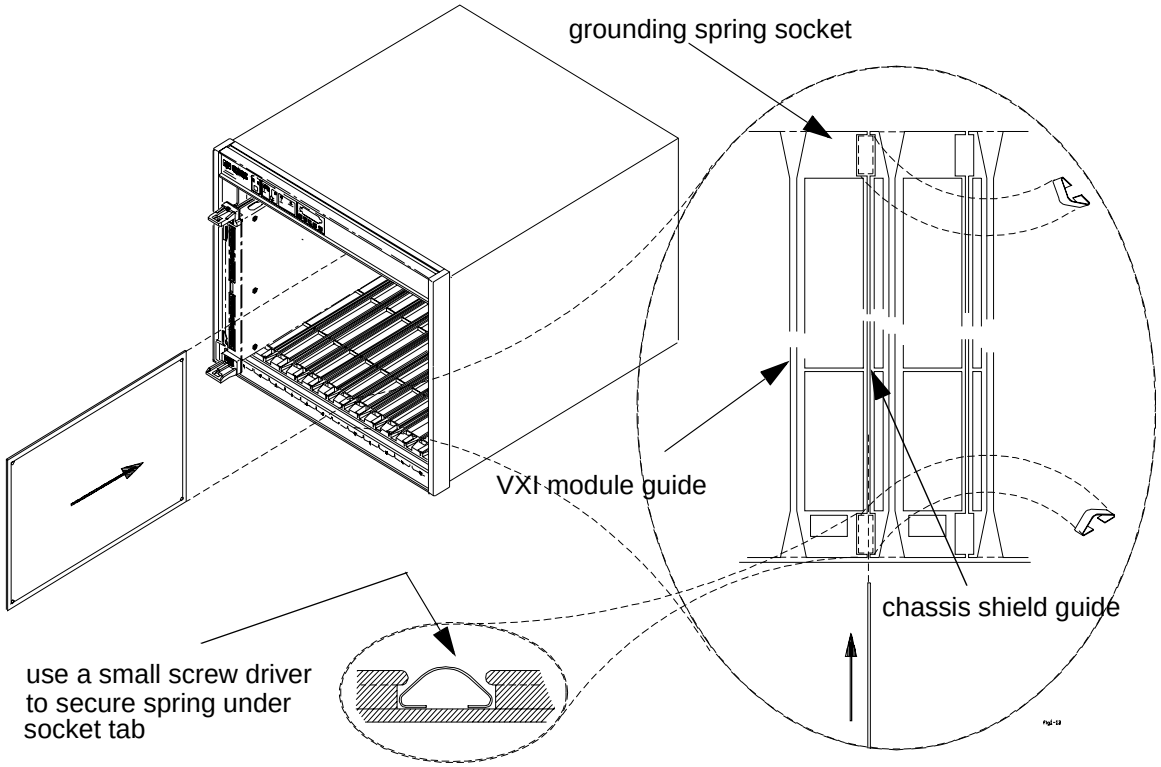


Figure B-13. Installing the Grounding Springs and Chassis Shield

Installing the Backplane Connector Shields

This procedure describes how to install backplane connector shields (kit p/n E8400-80918 in the Agilent E840xA mainframe. The shields are Agilent's implementation of VXI revision 1.4, specification B.7.2.3 which ensures compliance with RFI levels specified in standards EN55011 and CISPR11.

Note A number of VXI instruments require shields for compliance with EN55011 and CISPR11. Refer to the instrument documentation to determine if shields are required.

WARNING **Do not install backplane connector shields while the mainframe is turned on or plugged into an AC power source.**

Parts List

The parts included in the E8400-80918 kit are shown in Table B-6.

Table B-6. Agilent E8400-80918 Parts List.

Quantity	Description	Part Number
54*	Torx Head Screw - 4-20x.25	0624-0702
26	Backplane Connector Shield	E1400-80601
* Includes two extra screws		

Procedure

1. Position the shields over the backplane connectors as shown in Figure B-14. Two connector shields and four screws are required for each slot.

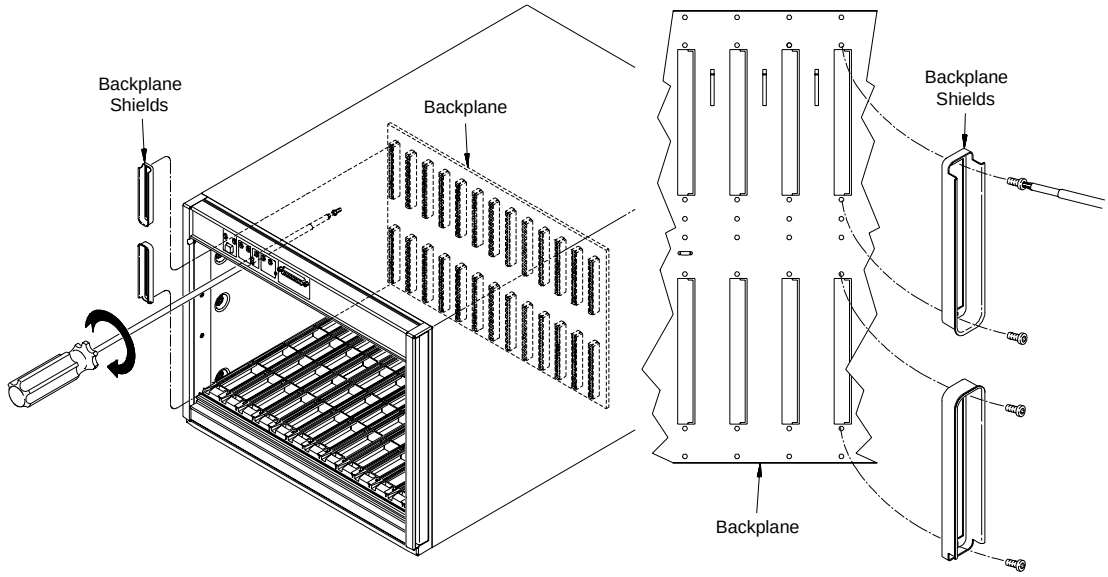


Figure B-14. Positioning the Backplane Shields on the Connectors

2. To install the screws, firmly press the screw onto a Torx driver. This prevents the screw from falling off as you reach into the mainframe. Placing a sheet of paper under the backplane connectors will catch screws if they fall.

3. Tighten the screws by turning them clockwise. The screws are thread-forming and will go in slowly when you install them the first time.

Agilent E840xA Air Filter Kit

An optional air filter kit can be purchased for the Agilent E840xA mainframe. Figure B-15 shows how to install the kit.

1. Remove the four screws from the rear panel as shown in Figure B-15.

2. Install the bottom Air Filter Bracket as shown. Use the two pan-head screws included with the Air Filter Kit.

3. Install the Air filter. Carefully place the filter into the bottom bracket.

4. Attach the top bracket to the mainframe. Hand-tighten the

thumbscrews; do not over-tighten.

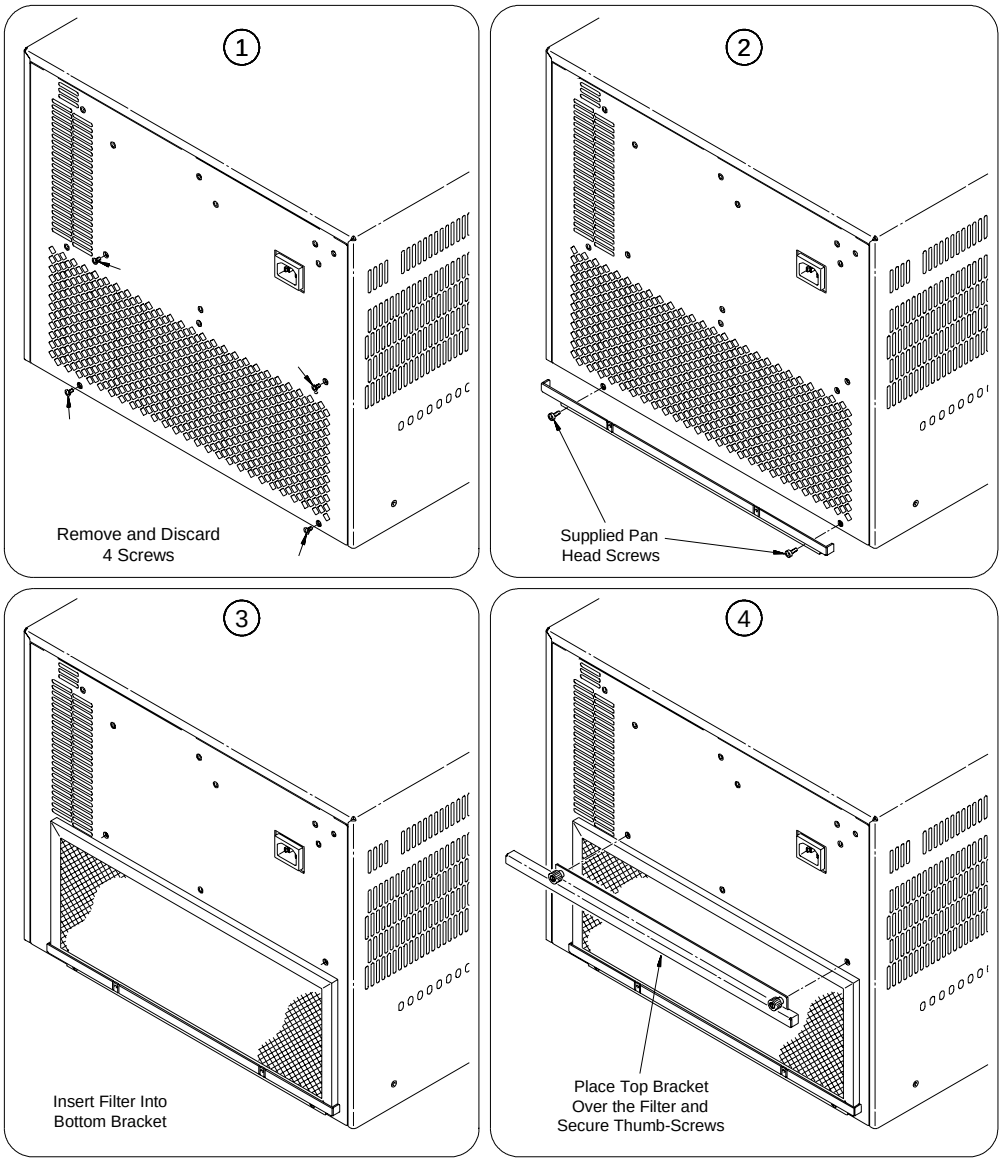


Figure B-15. Installing the Optional Air Filter Kit

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