Keysight Technologies
Test and Measurement Instrument Security

Application Note

KEYSIGHT
TECHNOLOGIES

Introduction

This document describes security features and the steps to perform a security erase for select Keysight test and measurement instruments. For additional information please go to **www.keysight.com/find/ad** and click on the instrument security link.

Memory Clearing Operations for Keysight Test and Measurement Instruments

The following table provides detailed instructions to clear storage on various Keysight instruments.

Product number	Storage	How to clear storage
32220A, N6700A, 548XX, 16900, 167X, 168X	USB port	The Keysight function generator (33220A) and new modular power supply (N6700A) both have a USB 2.0 port as standard, but only support device side USB. The only way to extract data from the USB port would be to use an external PC and use a PC application. In addition, the USB connector on these products does not use the standard computer side USB connector and current available memory sticks will not plug in to either of these products. Infiniium scopes (548XX) and all logic analyzers (16900, 167X, 168X) have USB ports and additionally are PC-based instruments and run MS Windows. They have fully functioning PCs inside with hard-drives and memory. The products use one of two PC boards, either a VP22 (Infiniium and the six-slot 16900 models) and the three-slot 16900, 167X and 168X use an SC815. (Infiniium is moving to the SC815 in September 2004). The USB ports can be disabled as follows: VP22: 1. Power on the instrument. 2. During the black and white Keysight splash screen, press the [DEL] key. 3. Using the cursor keys, select "Integrated Peripherals" and press [ENTER]. 4. Highlight "USB Controller". Press [ENTER], then select "Disabled", press [ENTER] again. 5. Press [ESC] to return to the Main Menu. 6. Select "Set Supervisor Password" to set the BIOS password. Press [ENTER]. Enter new password. Press [ENTER]. Confirm new password. Press [ENTER]. 7. Press [F10] to save settings and exit "CMOS Setup Utility". SC815: 1. Power on the instrument. 2. During the black and white Keysight splash screen, press [F2]. 3. Using the left/right cursor keys, select the "Advanced" tab. 4. Using the up/down cursor keys, select the "Advanced Chipset Control" listing. Press [ENTER]. 5. Select "Embedded USB Device". Press [ENTER], then select "Disabled", press [ENTER] again. 6. Select "Embedded USB Device 2". Press [ENTER], then select "Disabled", press [ENTER] again. 7. Using the left/right cursor keys, select the "Security" tab. Select "Set Supervisor Password". Enter new password. Press [ENTER]. Confirm new password. Press [ENTER]. 8. Press [F10] to save settings and exit "BIOS Setup Utility".
11713A	No memory	To clear registers, recycle power.
11713B/C	EEPROM	4 save recall state will not clear by factory default. You need to manually clear it. Immediately after factory default, (do not switch any channel or set any voltage) press: Save/Recall > STATE 0 > Save State. STATE 1 > Save State. STATE 2 > Save State. STATE 3 - Save State.
33220A	256 k waveform memory, 5 state memories	SYSTEM: SECURITY: IMMEDIATE command destroys all user-defined state information, user-defined arbitrary waveforms, and user-defined I/O settings. Power off clears volatile memory. There is a USB port but there isn't a memory stick or internal hard disks.

Memory Clearing Operations for Keysight Test and Measurement Instruments

The following table provides detailed instructions to clear storage on various Keysight instruments.

Product number	Storage	How to clear storage
3458A	20 K "V" and 128 K with an OPT. 14 K "NV"	[DELSUB] deletes subprograms. [SCRATCH] deletes all stored subprograms and states. [PURGE] deletes only one stored state.
E4401B/02B/04B/ 05B/07B E4403B/E4408B/ E4411B E7401A/02A/03A/ 04A/05A		See page 12 for detailed information on how to erase/clear user data in an ESA/EMC spectrum analyzer.
J7211A/B/C	EEPROM	Utility > Factory default > Yes > OK

E4440A		The PSA Series spectrum analyzer offers a free security management utilities software (Option HS7) and user guide. This can be ordered at the time of purchase, ordered as an upgrade or downloaded from the Web site at: www.keysight.com/find/ad
		
		Click on Instrument Security and under spectrum analyzers click on What procedure do I use to perform a security erase on a PSA Series Spectrum Analyzer? The software offers three levels of security. Each of the three security levels can be downloaded onto its own disk.
		– Blank the display
		– Erase user files
		– Erase all memory including the operating system
		
		There is a user guide and three security functions for PSA to download from this site:
		
		1. "HS7 Docs.pdf" contains the user instructions for the PSA Security functions.
		
		  This document contains the recommended procedure for performing a security erase on a PSA Series spectrum analyzer. Also included in this document is the following:
		  – The size, type and usage information of the various volatile and nonvolatile memories in the PSA Series spectrum analyzer.
		  – Recommended procedure for performing a security erase of the various memory types.
		  – Important information on the security erase process.
		
		NOTE: It is strongly recommended that these instructions are read before using any of the PSA Security functions. Failure to read and follow these instructions exactly may render your PSA inoperable, and it will be necessary to send the PSA to an Keysight Service Center to have it restored to operational condition.
		
		2. "ScreenBlank.EXE" contains disk one, Screen Blanking Functionality. This functionality is standard and does not need to be downloaded if your PSA has firmware revision A.04.05 and newer. Download this file to a freshly formatted 3.5" floppy disk and execute it – it will extract the Screen Blanking files to be installed in your PSA. Refer to the user instructions for detailed installation instructions.

Product number	Storage	How to clear storage
		3. "EraseUserFiles.EXE" contains disk two, the "Erase User Files" Routine. The user file erase routine will eliminate several user files in the PSA memory. The instrument's display will indicate the removal of the respective files as they are being removed. The memory consists of TRACE, STATE, LIMITS, SCREEN CORRECTION AND LAST STATE information. The user erase selectively erases all of the user information that is stored on internal FLASH memory. Erase is defined as writing the single character "1" over these memory locations. Download this file to a freshly formatted 3.5" floppy disk and execute it - it will extract the Erase User Files required to remove all user files from your PSA. Refer to the user instructions for detailed installation instructions. "WIPESA.EXE" contains disk three, the "WIPESA" Routine. The WIPESA routine erases the PSA's operating system, which will render the instrument inoperable. Disk three also performs the disk two routine as well. It is strongly recommended to perform a backup of your intrument as described in the user instructions. Download this file to a freshly formatted 3.5" floppy disk and execute it - it will extract the WIPESA files required to render your PSA inoperable. Refer to the user instructions for detailed installation instructions. CAUTION: This routine will render your PSA inoperable - if you fail to follow the directions in the user instructions, your PSA will need to be sent to an Keysight Service Center to be restored to operating condition. The functionality and usage of disks one, two, and three are fully described in the user instructions.
E4416A E4417A E4418B E4419B	SRAM, FLASH EEPROM	Power meters (EPM & EPM-P) 1. There are no floppy drives, USB interfaces on the power meters. 2. The instrument security documentation can be found on the http://www.keysight.com/find/ad Web site. 3. The EPM Series power meters have a total memory capacity of 1.5 Mb. This comprises of 1 Mb SRAM and 0.5 Mb FLASH EEPROM. The 1 Mb SRAM is further divided into two 0.5 Mb chunks, one of which may be considered nonvolatile due to the on-board lithium backup battery. When the memory is cleared for security purposes, both the volatile and nonvolatile chunks of the SRAM are erased. The FLASH EEPROM is not erased during this procedure, as it is only used to store the instrument firmware - it does not contain any user data, and is therefore not a security concern. 4. The EPM-P Series power meters have a total memory capacity of 3 Mb. This comprises of 2 Mb SRAM and 1 Mb FLASH EEPROM. The 2 Mb SRAM is further divided into two 1 Mb chunks, one of which may be considered nonvolatile due to the on-board lithium backup battery. When the memory is cleared for security purposes, both the volatile and nonvolatile chunks of the SRAM are erased. The FLASH EEPROM is not erased during this procedure, as it is only used to store the instrument firmware - it does not contain any user data, and is therefore not a security concern.

Product number	Storage	How to clear storage
E4438C/E8247C/ E8257C/E8267C		See page 16 for security issues and solutions of the Keysight signal generators.
54621A	1.44 MB floppy disk drive 2 M "V" RAM (display) 2 M per analog channel "V" RAM (acquisition) 4 M total for all digital channels "V" RAM (acquisition) 12 K "NV" RAM (scope setups) 96 K "NV" RAM (waveform traces)	This procedure is applicable to Keysight/HP Infiniium oscilloscope models 54621A, 54621D, 54622A, 54622D, 54624A. The Keysight/HP Infiniium oscilloscope can be declassified by performing the following eight steps: 1. Remove signals from front panel. 2. Press the [Save Recall] front panel key. 3. Press [Default setup] soft key. 4. Press the [Save] soft key. 5. Press the [To] soft key and select "INTERN_0". 6. Press the [Press to Save] soft key. This stores the default set and trace base line to trace memory and setup memory INTERN_0. 7. Repeat steps 5 and 6 for INTERN_1 and INTERN_2. 8. With no signal attached to the scope, press the [Autoscale] key twice to ensure that the undo autoscale memory is cleared.
54641A	1.44 MB floppy disk drive 2 M "V" RAM (display) 4 M per analog channel "V" RAM (acquisition) 4 M total for all digital channels "V" RAM (acquisition) 16 K "NV" RAM (scope setups) 128 K "NV" RAM (waveform traces)	This procedure is applicable to Keysight Infiniium oscilloscope models 54641A, 54641D, 54642A, 54642D. Infiniium oscilloscope can be declassified by performing the following eight steps: 1. Remove signals from front panel. 2. Press the [Save Recall] front panel key. 3. Press [Default setup] soft key. 4. Press the [Save] soft key. 5. Press the [To] soft key and select "INTERN_0". 6. Press the [Press to Save] soft key. This stores the default set and trace base line to trace memory and setup memory INTERN_0. 7. Repeat steps 5 and 6 for INTERN_1 and INTERN_2, and INTERN_3. 8. With no signal attached to the scope, press the [Autoscale] key twice to ensure that the undo autoscale memory is cleared.
54810A/15A/20A/25A/ 35A/45A/45B/46A/46B	6 GB hard drive 120 MB floppy disk drive 64 MB RAM (mother board) 32 K "NV" RAM (Intfc. Assy) 1 M "V" RAM (Intfc. Assy) 1 M "V" RAM (Disp. Assy)	This procedure is applicable to Keysight/HP Infiniium oscilloscope models 54810A, 54815A, 54820A, 54825A, 54835A, 54845A/B and 54846A/B. The Keysight/HP Infiniium oscilloscope can be declassified by performing three steps: 1. Cycle power on the scope. This clears all of the volatile RAM memory. 2. Switch to Default Setups two consecutive times (Push [Default Setup] key, then immediately push [Default Setup] key again). This process insures a generic setup in battery-backed nonvolatile RAM on the scope interface assembly and generic setup in nonvolatile hard disc drive. 3. Remove the hard disc drive from the instrument completely. Replace with a separate hard disc drive (an Infiniium hard drive containing no security issues). Refer to the service manual for the part numbers for the hard disc drive for your scope. The hard disc drive contains the Windows operating system, Scope operating system, setups, waveform memories, waveform files, screen images, and calibration data for the scope and probes. All RAM information is duplicated on hard disc drive. This enables proper startup and operation after a shut down.

Product number	Storage	How to clear storage
		This procedure declassifies all of the RAM as listed below:
		There are 64 MB of RAM on the mother board.
		There is also 32 K of nonvolatile RAM on the scope interface assembly, which stores the last scope setting prior to power down. Switching to default setups insures that a known and consistent set of information is stored in this RAM.
		Finally, there is volatile RAM on the display assembly. There is 1 MB volatile video RAM for save waveform display data and 1 MB volatile display RAM for screen colors. This RAM is used to aid in multiplexing the graticule and alphanumeric information with the dynamic waveform information of the acquisition section of the oscilloscope.
		This procedure will insure that all setup and measurement information is removed from all models of the Infiniium oscilloscopes.
54830B/D 54831B/D 54832B/D 54833A/D	20 GB hard drive 120 MB floppy disk drive 512 MB RAM (mother board) 512 MB RAM (mother board) 32 K " NV" RAM (Intfc. Assy) 1 MK "V" RAM (Intfc. Assy) 1 MK "V" RAM (Disp. Assy)	This procedure is applicable to Keysight Infiniium oscilloscope models 54830B/D, 54831B/D, 54832B/D and 54833A/D scopes. The Keysight Infiniium oscilloscope can be declassified by performing three steps: 1. Cycle power on the scope. This clears all of the volatile RAM memory. 2. Switch to Default Setups two consecutive times (Push [Default Setup] key, then immediately push [Default Setup] key again). This process insures a generic setup in battery-backed nonvolatile RAM on the scope interface assembly and generic setup in nonvolatile hard disc drive. 3. Remove the hard disc drive from the instrument completely. Replace with a separate hard disc drive (an Infiniium hard drive containing no security issues). Refer to the service manual for part number of the hard disc drive part for your scope. The hard disc drive contains the Windows operating system, Scope operating system, setups, waveform memories, waveform files, screen images, and calibration data for the scope and probes. All RAM information is duplicated on hard disc drive. This enables proper startup and operation after a shut down. This procedure declassifies all of the RAM as listed below: There are 512 MB of RAM on the mother board. There is also 32 K of nonvolatile RAM on the scope interface assembly, which stores the last scope setting prior to power down. Switching to default setups insures that a known and consistent set of information is stored in this RAM.

Product number	Storage	How to clear storage
		Finally, there is volatile RAM on the display assembly. There is 1 MB volatile video RAM for save waveform display data and 1 MB volatile display RAM for screen colors. This RAM is used to aid in multiplexing the graticule and alphanumeric information with the dynamic waveform information of the acquisition section of the oscilloscope.
		This procedure will insure that all setup and measurement information is removed from all models of the Infiniium oscilloscopes.
		If the user loads a waveform to one of the four waveform memories (Setup $\rightarrow$ Waveform Memory $\rightarrow$ Pick a waveform memory and a source $\rightarrow$ "Load from waveform" or "load from file"), this waveform memory will persist after power is cycled, even if Default Setup is pressed twice before shutting off.
		To clear waveform memories (and all other user data in all memory locations) in 5483XB/D and 5485XA scopes:

		Control $\rightarrow$ Factory default
		    OR
		To clear the waveform memories:
		    Close the scope application (File $\rightarrow$ Exit)
		    Open a command prompt window (Start $\rightarrow$ Command Prompt)
		    Type "cd\scope\memories", press [Enter]
		    Type "del *.wfm", press [Enter]

54852A/53A/54A/55A	20 GB hard drive 1.44 MB floppy disk drive 512 MB RAM (mother board) 32 K " NV" RAM (Intfc. Assy) 1 MK "V" RAM (Intfc. Assy) 1 MK "V" RAM (Disp. Assy)	This procedure is applicable to Keysight Infiniium oscilloscope models 54852A, 54853A, 54854A, and 54855A.
		The Keysight Infiniium oscilloscope can be declassified by performing three steps:
		1. Cycle power on the scope. This clears all of the volatile RAM memory. 2. Switch to Default Setups two consecutive times (Push [Default Setup] key, then immediately push [Default Setup] key again).
		This process insures a generic setup in battery-backed nonvolatile RAM on the scope interface assembly and generic setup in nonvolatile hard disc drive.
		3. Remove the hard disc drive from the instrument completely. Replace with a separate hard disc drive (an Infiniium hard drive containing no security issues). Refer to the service manual for the hard disc drive for your scope.
		The hard disc drive contains the Windows operating system, Scope operating system, setups, waveform memories, waveform files, screen images, and calibration data for the scope and probes.
		All RAM information is duplicated on hard disc drive. This enables proper startup and operation after a shut down.
		This procedure declassifies all of the RAM as listed below: There are 512 MB of RAM on the mother board. There is also 32 K of nonvolatile RAM on the scope interface assembly, which stores the last scope setting prior to power down. Switching to default setups insures that a known and consistent set of information is stored in this RAM.

Product number	Storage	How to clear storage

		Finally there is volatile RAM on the display assembly. There is 1 MB volatile video RAM for save waveform display data and 1 MB volatile display RAM for screen colors. This RAM is used to aid in multiplexing the graticule and alphanumeric information with the dynamic waveform information of the acquisition section of the oscilloscope.
		
		This procedure will insure that all setup and measurement information is removed from all models of the Infiniium oscilloscopes.
		
		If the user loads a waveform to one of the four waveform memories (Setup → Waveform Memory → Pick a waveform memory and a source → "Load from waveform" or "load from file"), this waveform memory will persist after power is cycled, even if default setup is pressed twice before shutting off.
		
		To clear waveform memories (and all other user data in all memory locations) in 5483XB/D and 5485XA scopes:
		
		Control → Factory default
		    OR
		To clear the waveform memories:
		    Close the scope application (File → Exit)
		    Open a command prompt window (Start → Command Prompt)
		    Type "cd\scope\memories", press [Enter]
		    Type "del *.wfm", press [Enter]

E5505A	Nonvolatile EEPROM Volatile RAM	Nothing is stored in any of the N550xA instruments (with power off) that could be construed as being related to measurement parameters (frequency, power, etc.). All non-unique supported instruments in the E5505A systems have their own memory and are not covered by the E5505A. N5500A phase noise test set contains two types of memory: 1. Nonvolatile EEPROM - Contains no measurement-related information (carrier frequency, offset frequency, power level, etc.). It does contain its own instrument type/option info, instrument serial number, signal path (and other) calibration data. This memory contains only calibration constants and operational firmware. It does not store any measurement data whatsoever and erasing it would require complete re-calibration of the instrument. 2. Volatile RAM - Instrument state info. This memory is erased when power is removed from the instrument. N550xA downconverters - contain two types of memory: 1. Nonvolatile EEPROM - this memory contains only calibration constants, calibration instrument interface address info, YTF cal data, and operational firmware. It does not store any measurement data whatsoever and erasing it would require complete re-calibration of the instrument. 2. Volatile RAM - Instrument state info. This memory is erased when power is removed from the instrument. N5508A microwave source (stand-alone) is also used in A/D applications. It contains two types of memory: 1. Nonvolatile EEPROM - this memory contains only calibration constants, reference source interface address info (but no frequency information), YTF cal data and operational firmware. It does not store any measurement data whatsoever and erasing it would require complete re-calibration of the instrument. 2. Volatile RAM - Instrument state info. This memory is erased when power is removed from the instrument.

Product number	Storage	How to clear storage
6624A	128 K "NV" EPROM	Recycle power.
6654A	2 K EEPROM/64K RAM 512 K ROM/0 NVRAM	The 664x, 665x, 667x, 668x & 6610x family of supplies have the same interface. There are five (5) nonvolatile store/ recall states you may save output voltage and current settings along with protection features. To remove the stored stated you must do a *RST to each state saved or purposefully store "0" in each location from the front panel. These supplies will always come up at turn on to the state stored in state zero. The calibration of voltage and current occupy 256 K of ROM and are password secured during calibration. The remainder of ROM is power supply firmware and is not customer accessible.
N6700A	Mainframe: 1 KB EEPROM 8 MB Flash 32 MB RAM Each module: 2 KB EEPROM	The N6700A is a mainframe that can have up to four power supply modules installed. Flash memory contains only instrument firmware. RAM is volatile. Mainframe and module EEPROM contain internal system parameters plus some customer data such as I/O configuration, user preferences and saved instrument states. All customer data can be reset from the front panel by using the menu. Select the\System\Preferences\Security\ResetNvRam dialog box and then press the [Reset] button.
8114A	6 128 K by 8 bit EPROM 2 128 K by 8 bit RAM	The EPROM's contain no customer data. The RAM has nine locations for customer data. To purge customer data, overwrite all nine locations with the standard settings as follows: Load the standard settings, press [SHIFT] [RECALL] [0]. Then store the settings in the other nine registers. Press [STORE] [1]. Press [STORE] [2]. . . . . . . Press [STORE] [9].
6624A	128 K "NV" EPROM	Recycle power.
6654A	2 K EEPROM/64K RAM 512 K ROM/0 NVRAM	The 664x, 665x, 667x, 668x & 6610x family of supplies have the same interface. There are five (5) nonvolatile store/ recall states you may save output voltage and current settings along with protection features. To remove the stored stated you must do a *RST to each state saved or purposefully store "0" in each location from the front panel. These supplies will always come up at turn on to the state stored in state zero. The calibration of voltage and current occupy 256 K of ROM and are password secured during calibration. The remainder of ROM is power supply firmware and is not customer accessible.
N6700A	Mainframe: 1 KB EEPROM 8 MB Flash 32 MB RAM Each module: 2 KB EEPROM	The N6700A is a mainframe that can have up to four power supply modules installed. Flash memory contains only instrument firmware. RAM is volatile. Mainframe and module EEPROM contain internal system parameters plus some customer data such as I/O configuration, user preferences and saved instrument states. All customer data can be reset from the front panel by using the menu. Select the \System\Preferences\Security\ResetNvRam dialog box and then press the [Reset] button.
8114A	6 128 K by 8 bit EPROM 2 128 K by 8 bit RAM	The EPROM's contain no customer data. The RAM has nine locations for customer data. To purge customer data, overwrite all nine locations with the standard settings as follows: Load the standard settings, press [SHIFT] [RECALL] [0]. Then store the settings in the other nine registers. Press [STORE] [1]. Press [STORE] [2]. . . . . . . Press [STORE] [9].
83020A	No memory	
E836x	Removable hard drive	Please see page 20 for detailed information on how to maintain the PNA in a secured environment.
83630B S/N < 3104A	500 K UVEPROM/32 K This EEPROM/260 K "NV" RAM	Blanking display press [MENU] [MORE] [SECURITY MENU] [BLANK DISPLAY] turns off the four lines of display and deactivation is only by presetting synthesizer.

Product number	Storage	How to clear storage
83630B S/N [3] 3104A	1M UVEPROM/64 K EEPROM/780 K "NV" RAM	Blanking frequency display press [MENU] [MORE] [SECURITY MORE] [ZERO FREQ]. Zeros are displayed in freq. And deactivation is only by presetting synth. Clearing memory press [MENU] [MORE] [SECURITY MENU] [CLEAR MEMORY]. When [CLEAR MEMORY] is selected, synth. Displays "# OF TIMES TO CLEAR MEMORY: X". Enter the number of times the state info. Should be overwritten with all 1's and 0's. This writes 1's and 0's over all instrument states, save/recall registers, and frequency lists a selectable # of times and return the synth. To factory preset state.
84813A	No memory	–
84904K	No memory	–
84907K	No memory	–
8560 Series: 8560A/61A/62A/ 63A/61B/62B/60E/ 61E/62E/63E/64E/ 65E/60EC/61EC/ 62EC/63EC/64EC/ 65EC		See page 23 for detailed information on security procedures for the Keysight 8560 Series of portable spectrum analyzers.
8563E (same procedure as 8563EC)	s/n <= 3305A 128 K Display RAM 1.2 M RAM/16 K EEPROM 12 M UVEPROM s/n >=3310A 128 K Display RAM 4 M RAM/16 K EEPROM 8 M UVEPROM Firmware Rev >931216 128 K Display RAM 4 M RAM/64 K EEPROM 12 M UVEPROM	If there isn't a mass memory module present, or if the module does not contain DLP's, preset the analyzer and save the preset states and traces into each trace and state register to declassify the instrument. Another method would be to remove the battery and leave power off for at least one hour. Ensure that Error 718 "BATTERY ?" message appears on CRT at power up.
8722ES	512 K NVROM 2 M V RAM +	See Chapter 12 in User's Guide. The 2M RAM can be increased depending on options. To clear press [Save/Recall] [Clear Register] [Clear All] then [Preset] and cycle the power.
81101A	128 K "NV" RAM PCMCIA Memory Card Slot	All memory locations that hold any setup information needs to be overwritten. The 81101A has 10 memory locations, 0-9. Memory location zero holds the default setup. Memory locations 1-9 can be used to store any other setups. By recalling locations 1-9 and overwriting them with information in memory location zero, the generator is not holding any user setup but the default one. All customer has to do is: 1. Press the [Shift] blue key. 2. Press the [Recall] key (same key that says store but when you are in shift mode, this is now the recall key). 3. Press [0] to recall settings in memory location zero (default settings). 4. Press the [Store] key (you are not in shift mode anymore, so this is now the store key). 5. Press [1] to store default settings in memory location one. 6. Repeat process for all other memory locations (2 through 9).

Product number	Storage	How to clear storage
N897xA	Floppy drive Flash EEPROM, DRAM	Noise figure analyzers (NFA) 1. There is a floppy drive on the NFA - this cannot be removed easily or disabled. 2. There is not a USB on the NFA. 3. The instrument security documentation can be found on the **http://www.keysight.com/find/ad** Web site. 4. The N897xA NFA Series contains 8 MB of Flash EEPROM, which is used to store the instrument firmware and any files the user has saved to internal memory. The N897xA NFA Series also contains 16 M of DRAM which is used during normal operation. The instrument firmware is loaded from Flash into DRAM on power up. The DRAM also stores current user files (e.g. ENR files, limit lines, etc.).

How To Erase/Clear User Data in an ESA/EMC Spectrum Analyzer for Security Reasons

Warnings

Be sure that all information stored by the user in the instrument that needs to be saved is properly backed-up before attempting to clear any of the instrument memory. Keysight cannot be held responsible for any lost files or data resulting from the clearing of memory.

In most cases there will be no user prompts to confirm the clearing or deleting of files or instrument memory. Be sure to read this document entirely before proceeding with any file deletion or memory clearing.

Types of internal memory that can store user information

DRAM

This memory is volatile so any information stored by the instrument in this area is lost when the instrument is turned off. This is the memory that the instrument uses to run its processes out of.

SRAM

This memory stores such system information as:

– Self alignment data
– Current time & date
– Remote interface configuration
– Printer setup information
– Last state settings
– Segmented sweep settings (ESA-E analyzers only)
– Misc. instrument system information

This memory is battery backed-up, so it is not lost when the power is removed from the instrument.

FLASH

This is where the instrument stores:

– Instrument firmware/operating system
– Installed measurement personalities (ESA analyzers only)
– Option license keys (ESA analyzers only)
– Loaded user limit lines
– Loaded user amplitude correction factors
– User preset data

The user C: drive is also stored in this memory, which could contain the following file types that the user can save internally:

– Instrument states and setups
– Trace data
– Limit line files
– Screen images
– Amplitude correction files
– Reports (EMC analyzers only)
– Signal lists (EMC analyzers only)

This memory is nonvolatile, so nothing is lost when the instrument power is removed.

Clearing the different types of memory

DRAM

This memory is volatile. All you have to do is remove the power to the instrument and all data stored in it will be lost.

SRAM

This is volatile memory that is kept alive with an internal battery, and the battery cannot be removed to clear the memory without taking the instrument apart. However, there is a procedure that can be used to have the instrument clear most of this memory itself.

To clear the SRAM memory, follow this procedure:

– Turn the instrument Off.
– Turn the instrument back On while holding down both the [ESC] & [Return] front panel keys[1].
– Continue hold these two keys for 10 second after pressing the [On] button.
– The instrument will now clear it's SRAM memory and then power up.

Information such as the current time and date will not be erased by this procedure.

FLASH

This type of memory will hold its information indefinitely without any backup supply. It will have to be erased electronically. There is a procedure that can be used to make the instrument completely clear this memory itself.

Since the FLASH memory does contain all of the files required to operate the instrument, you will want to be sure that you have what is needed to restore it to an operating condition after is has been cleared. This would include such things as:

  – Instrument firmware disk set[2]
  – Measurement personality disk sets (ESA analyzers only)
  – Installed option license keys[3]

If there are any user saved files on the C: drive that need to be saved, they can be copied to a floppy disk inserted into the A: drive, then re-stored at a later time.

To clear the FLASH memory, follow this procedure:

  – Turn the instrument Off.
  – Turn the instrument back On while holding down both the [ESC] & [View/Trace] front
  – panel keys[1].
  – Continue to hold these two keys for 10 seconds after pressing the [On] button.
  – The instrument will now clear it's flash memory.
  – Allow 10 minutes for this process to complete, as there will be no visual indication of when it is done.
  – Unplug the instrument to turn it off, as the Standby button will not work at this point.

Since this memory contains the instrument firmware/operating system, the instrument will be non-functional at this point. You will need to refer to the section below to determine what is needed to return it to an operating condition.

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1. Both SRAM and FLASH can be cleared at the same time if all three of the [ESC], [Return], & [View/Trace] front panel keys are held down during this process.
2. If a disk set of the latest version of instrument firmware is needed, go to:
   http://www.keysight.com/find/esa_firmware for ESA analyzers
   http://www.keysight.com/find/emc_firmware for EMC analyzers
3. To retrieve license key information from an instrument the following remote query needs to be used:
   :SYST:LKEY? 'option number'
   For example, to retrieve the license key for the ESA phase noise measurement utility (Option 226) use: :SYST:LKEY? '226'
   This will need to be done for each licensed option that is installed. To obtain a list of the installed licensed options in an instrument Press: [System] [More 1 of 2] [More 2 of 3] [Personalities]. License keys will need to be saved for all licensed options listed.

Recovering from clearing the instrument memory

DRAM

No recovery required. The information in this memory is built by the instrument every time it is turned on.

SRAM

Once the SRAM is cleared and the instrument has finished powering up, cycle the power once again to load all installed measurements.

The "System, Alignments, Align Now, All Required" message will be displayed on the screen. You will need to manually perform a front panel alignment of the instrument before using it. Follow the key press sequence in the on-screen message to do this, being sure to connect the AMPTD REF OUT to the RF INPUT if the instrument is equipped with one. Refer to your instrument's Getting Started Guide if further instructions are required on how this is done. If the instrument has a remote interface, and it was configured to anything other than the default settings, it will need to be re-configured. This would include the settings for both the remote control interface as well as the parallel printer port.

FLASH

At this point the instrument will not function, as there is no operating system installed.

To install the instrument firmware/operating system and return the instrument to an operating condition do the following:

– Insert the firmware loader disk into the floppy drive and turn the instrument power on.
– Follow the on-screen prompts to install the firmware and measurement suite.
– When the installation is complete Press: [System] [More 1 of 3] [Restore Sys Defaults] [Restore Sys Defaults].

The "System, Alignments, Align Now, All Required" message will be displayed on the screen. You will need to manually perform a front panel alignment of the instrument before using it. Follow the key press sequence in the on-screen message to do this, being sure to connect the AMPTD REF OUT to the RF INPUT if the instrument is equipped with one. Refer to your instrument's Getting Started Guide if further instructions are required on how this is done. If optional measurement personalities were installed (ESA analyzers only) you will now need to re-install them and their license keys. Refer to the User's Guide for these measurement personalities for detailed instructions on how this is done. Before re-installing any measurement personalities it would be best to verify that the latest versions are being used. To find a listing of all the latest versions go to: http://www.keysight.com/find/esa_revisions

Deleting user information without clearing memory

This is a list of all of the different places that user information could be saved, as well as information on how to delete it without totally erasing the instrument memory. Of course, this may not be as secure of an erase as clearing the memory would be, but it will help to find all of the information that could contain classified information. The following are locations where user information can be stored:

– Saved user files on the C: drive
– Loaded Amplitude correction data
– Loaded Limit Line data
– User Preset
– Last state settings
– Trace registers
– Segmented Sweep settings (ESA-E analyzer only)
– Signal List (EMC analyzer only)

Clearing the individual types of user information:

Saved user files on the C: drive
Press: [File] [Delete] then select and delete all files of the following types:

– SET   instrument setup
– STA   instrument state
– TRC   trace & state
– CSV   trace & state
– LIM   limit line
– GIF   screen image
– BMP   screen image
– ANT   antenna corrections
– CBL   cable corrections
– OTH   other corrections
– AMP   user corrections
– LIS   signal list (EMC analyzer only)
– HTM   report (EMC analyzer only)

Loaded Amplitude correction data

Press: [Amplitude] [More 1 of 3] [Corrections] [More 1 of 2] [Delete All Corrections}]
[Delete All Corrections]

Loaded Limit Line data
Press: [Display] [Limits] [Delete All Limits] [Delete All Limits]

User Preset
Press: [Preset] [Factory Preset (if displayed)] [System] [Power On/Preset]
[Save User Preset]

Last State Settings
Press: [Preset] [Preset]

Trace registers
A power cycle will clear all three trace registers

Segmented Sweep settings (ESA-E analyzer only)
Press: [Sweep] [Segmented] [Modify] [Delete] [Delete]

Signal List (EMC snalyzer only)
Press: [Measure] {More 1 of 2} [Signal List] [Delete Signals] [Delete All] [Yes]

Security of Keysight Signal Generators Issues and Solutions

Instrument security

To protect sensitive data, it is important for signal generator users to understand the generator's features. There are three main areas which must be considered when determining appropriate security measures in relation to the generator 's use.

Storage media

Storage media, or memory for user information, can be categorized into two groups: explicit and implicit. Explicitly stored information consists of data enter by the user. Implicitly stored information includes items such as IQ calibration data, user flatness, table editor files, and last state information. This information is stored in various memory devices within the signal generator. Understanding the memory devices used within the signal generator enables users to define best-practice security measures for their application needs.

Memory description	Contents	Location	Persistence
DRAM	Running firmware code temporary operational storage	Processor board, baseband	Memory contents are completely erased when powered off for longer than a few seconds.
SRAM	Certain user-editable data (table editors), last state and last state back-up, state storage	Generator board	Memory contents do not get erased by turning off the power because the memory is connected to a back-up battery. (The battery is located on the processor board in the E82x7C, or on the motherboard in the E4438C).
CPU flash	User files including: flatness calibration, IQ calibration, instrument states, waveforms, modulation definitions, sweep lists, firmware code and factory calibrations	Processor board	Memory contents cannot be removed by turning off power. A low-level erase procedure will completely clean the contents in a single cycle. Note: since this memory contains both factory data and user data, a full chip erase is not desirable. However, user data areas can be selectively and completely sanitized.
Other flash	Factory calibration and information files, code images, and self test limits	RF boards, baseband generator board, motherboard	Memory remains intact through power cycles, however, there is no security concern because there is no user information in this memory.
Hard disk	User files including: flatness calibrations, IQ calibration, instrument states, waveforms, modulation definitions, and sweep lists. Note: the hard disk is an option and is therefore not present in some instruments. If it is present, the listed files are stored on the hard disk instead of in flash memory.	Instrument chassis (controlled by processor board)	Memory contents cannot be emoved by turning off power. The magnetic residue will require several rewrite cycles or drive removal and destruction.

Display

The second element to consider in generator security is the display, as it can reveal sensitive information. To prevent unauthorized people from reading the instrument display, it can be blanked. In this mode, no information appears on the display. Once the display is blanked, one must cycle the power on the instrument to re-enable the display. In the reboot sequence, the Erase All action (described later in this document), is performed to remove all user information so that the stored states cannot be retrieved.

I/O ports

The I/O ports must also be considered, since they allow remote access to the instrument. These ports, which provide access to all user settings, user states, and display images, include the GPIB, LAN, and RS-232. To prevent remote access to these ports, the physical area around these connections must be tightly controlled.

There is also a "ping" service, which presently cannot be selectively disabled. The concern here might be that it is possible to discover IP addresses of connected instruments in order to query their setups over the Internet, or break into the code.

Application environments

To illustrate how to safeguard the content on signal generators, four use scenarios are provided.

1. **The instrument is moved between users or shared by many users**
   In this instance, security measures may necessitate that all user files and information be cleared to prohibit other users from accessing this information through the instrument interface. In this scenario, we assume that other people will not take the instrument apart and analyze the internal chips or storage media. For this scenario, use the Erase All feature described in Using Security Commands.

2. **The instrument is used in a secure area**
   In this circumstance, people walking past should not be able to access the instrument or read any information from the display. Remote access through the I/O ports is limited or controlled. For this scenario, the front panel must be used to blank the display and access to the I/O ports must be controlled. (Refer to Using Security Commands.)

3. **The instrument is moved from a secure area to an insecure area**
   When the signal generator is relocated from a secure area to an insecure area, all user information must be removed. The information should not be recoverable even if someone takes the instrument apart and analyzes the storage media. For this scenario, use the Erase and Sanitize All feature described in Using Security Commands.

4. **The instrument fails in a secure area and must leave the secure area to be repaired**
   This case means that the instrument is not functioning and cannot clear its own storage media. None of the storage media can leave the secure area. The instrument without storage media can leave the secure area to be repaired. For this scenario, use the procedures noted in Hardware Removal.

Using security commands

The built-in security features of Keysight signal generators are accessed by various methods, depending upon the element of the generator to be secured.

Memory

Memory security features are accessible by soft key menus on the front panel and by SCPI commands through the remote interface.

Key entry

Options for erasing memory are obtained through a series of keystrokes.

Utility   [Memory Catalog] [More] [Erase All] [Confirm Delete]
Utility   [Memory Catalog] [More] [Erase and Overwrite All] [Confirm Delete]
Utility   [Memory Catalog] [More] [Erase and Sanitize All] [Confirm Delete]

SCPI commands

To erase memory from a remote location, SCPI commands can be sent to the signal generator.

> SYStem:SECUrity:ERASeall
> SYStem:SECUrity:OVERwrite
> SYStem:SECUrity:SANitize

These three commands perform as described below.

Erase All

This procedure removes all user files and user information so they are not accessible through the instrument interface. This action will remove only the file references and clear all table editors without sanitizing the memory. The instrument will appear in a similar state as it was shipped from the factory. The action will include all user files, table editor contents, user flatness calibration, and user IQ calibration. This action will be relatively quick, taking less than one minute. (Note: this is different than the current Delete All Files key under the Utility >Memory Catalog >More menu which deletes all user explicit files but not current table editor files.)

Erase and Overwrite All

The command includes the Erase All procedure from above. It then clears the memory according to the security standards defined by the United States' Department of Defense (DOD).

All addressable locations are overwritten with random characters in the SRAM, DRAM and hard disk. All addressable locations in the CPU flash also are overwritten with random characters, and then the flash blocks are erased. This is equivalent to erasing entire chip but is only done on the areas of the chip, which are no longer in use.

Erase and Sanitize All

The procedure undertakes the measures included in Erase and Overwrite All from above.

In clearing the SRAM, the user is required to wait at least the same amount of time the instrument was used in the secure area to comply with SRAM sanitation. Each overwrite must reside in memory for a longer period than the classified resided in memory. (Alternatively, the SRAM battery could be removed and reinserted manually. See issues below.)

On the hard disk, all addressable locations are overwritten with a single character, its complement, then a random character, and then verified. (Note: this is insufficient for top secret data according to the DOD standard. For top secret data, the hard drive must be removed and destroyed.)

DRAM memory is overwritten with a single character; then the instrument must be powered off.

Display

Blocking the display of sensitive data can be done using the generator's entry keys or using SCPI commands.

Key entry
[Utility] [Display] [More] [Display Off] [Confirm Display Off]

SCPI command
:DISPlay [:WINDow] [:STATe] ON|OFF|1|0

I/O Ports

While controlling access to the generator's ports is the leading security measure, the LAN port provides four services, which can be selectively disabled:

- http
- ftp
- sockets
- telnet

There is also a "ping " service, which presently cannot be selectively disabled. It should be noted that this service makes it is possible to discover IP addresses of connected instruments in order to query their setups over the Internet, or break into the code.

Hardware removal

In the following circumstances, security measures may make it necessary to disassemble the instrument.

- – If the instrument is non-functioning, the internal security features cannot be accessed. The storage media must be removed so the instrument can be sent to a repair facility.
- – If top-secret data has been stored, the storage media must be destroyed.

In these circumstances, the hard disk and the processor board must be removed. The assemblies can be reinstalled after the instrument has been repaired, or they can be destroyed.

Other security factors

Given that firmware commands are an inherent part of the virtually all electronic equipment, there are some security measures which may be impractical to implement. These relate to the following areas:

SRAM

According to DOD sanitize standards, a back-up battery should be removed. This requires opening the instrument (and thus voiding the warranty). The alternative is to perform a DOD clear and then wait for a period longer then the instrument was in use. Solutions include adding a software controlled "battery switch ", adding an externally removable battery tray, or describing how to disassemble and remove the battery.

FLASH

Since the factory calibration files are stored along with the user files, a "chip erase" cannot be performed. However, selective block erase achieves the same purpose.

DRAM

This area of memory is ignored in security features since its content is lost (erased) after powering down the instrument.

Conclusion

Aglient 's signal generators combine outstanding RF and microwave performance and baseband generation to deliver calibrated test signals at baseband, IF, and RF microwave frequencies. While the nature of the equipment requires the storage and use of data, generator features and operating practices can be combined to effectively safeguard data during the generator's use. To ensure data protection in security-sensitive applications, the information is easily erased to DOD-standards using built-in utilities.

Maintaining The PNA In A Secured Environment

In many cases it is imperative that the PNA be used in a secured environment. Generally these secured environments will not allow any test equipment to leave the area unless it can be proven that all devices capable of maintaining memory have been thoroughly erased. This, in conjunction with the Windows operating system, presents some difficulties when the PNA must be transported to a non-secure environment such as a repair/calibration facility.

Please note that some of this information is dependent upon the CPU board used in your PNA. For purposes of this document, these are divided into "older CPU" and "newer CPU." You can easily determine which of these you have by looking at the rear panel USB port on the CPU board. If it is horizontal, it is an older CPU board, otherwise it is a newer board. All PNAs shipped since about March 2002 have the newer CPU board.

Battery information

There are no batteries in the PNA other than the one used to power the clock chip on the CPU board.

Types of memory

The PNA has several types of memory.
– The PNA has 64-512 MB of SDRAM in one or two SODIMMs, but this is volatile memory and it loses its memory as soon as power is removed. This is not a security concern.
– The main nonvolatile device is, of course, the hard drive. As of this writing it is a 10 GB "laptop" hard drive. This is a security concern.
– Newer CPU boards have a compact flash header, which could contain nonvolatile compact flash memory, however, none is installed at the time of shipment. This was for possible future uses, but has not been implemented. The presence of any compact flash card is not dealt with in this document.
– Each board assembly may have one, two, or three serial EEPROM devices. These devices hold only 512 bytes each and are not generally user accessible. These contain information related to the installed hardware, such as board serial number, options, correction constants, offsets, DAC values, etc. This data is required to make the PNA functional. This data can be changed only by factory personnel or by calibration labs when performing adjustments. No user data is stored in these locations.

Maintaining security

Because it is virtually impossible to completely and selectively erase all user data on a hard drive without also destroying the operating system, the best method for maintaining security when the PNA must be removed from a secure area is to replace the hard drive with a "non-secure" hard drive (i.e. a drive that has never had any sensitive data placed on it). This allows the PNA to still function properly in non-secured areas or for use when servicing. All microwave PNAs (stop freq ≥ 10 GHz) have an easily accessible hard drive on the rear panel. RF PNA's have a kit available that can also add easy rear-panel accessibility (view picture). See below. This document does not detail the step-by-step instructions of how to remove the hard drive (see service manual for this). Instead, it documents the general steps needed to maintain security. This document assumes that this spare hard drive is on hand.

Keysight has available a relatively inexpensive, pre-configured hard drive for the PNA which must be purchased in order for this security method to work. Because there are two different CPU boards and different mounting methods, the proper part number must be ordered. See below.

– For any microwave PNA (Stop Freq >10 GHz.) All have the new CPU. Order model # Z5623AHD2. This can be ordered at any time, and can be specified with the purchase of the PNA. It comes with a mounting tray and complete operating system. It does not include mxcal files for your specific instrument (see below).
– For RF PNAs (Stop Freq <10 GHz) with new CPU board. Order E8801-60063. This is just a hard drive with the operating system on it. Does not include mxcal files for your specific instrument (see below).
– For RF PNAs with older CPU board. Order E8356-60076. This is just a hard drive with the operating system on it. Does not include mxcal files for your specific instrument (see below).
– For any RF PNA. To add the rear panel, easy-access kit, contact Keysight. The part number for this kit is E8356-60120, but it is not orderable directly. This is just a mounting kit and does not include the extra hard drive.

As shipped from the factory, all PNAs have very little unique information stored on the hard drive. This allows one hard drive to function on most any PNA assuming it has the appropriate type of CPU. However, there are a few small instrument-specific files that contain some factory correction data. For best performance, these should be copied to whichever hard drive is being used. These files are not critical and, in fact, are not even needed if a full user calibration is performed before measurement data is taken. These files all begin with mxcalfiles and are located in the directory: C:\Program Files\ Keysight\Network Analyzer. There may be several of these files, all of them about 10 kB in size. Whenever a new PNA is received, these files should be backed up to a floppy disk. Don't forget to label the disk with the model/serial number. This will save you the trouble of performing service adjustment routines, should the hard drive ever fail in the future.

Step-by-step security

These steps should be followed to maintain security:

1. Whenever a new PNA is received, or if this step has not yet been done, copy any files that begin with mxcalfiles to a floppy disk. This disk should be maintained in a non-secure area.

2. Purchase the appropriate spare hard drive and keep it with the above floppy disk. Clearly mark this hard drive as "unsecured". In the event the secure PNA needs to be used elsewhere, or, if it needs servicing:

   – Remove the secure hard drive (label it as secured if desired) and keep it in the secured area.
   – Remove the PNA from the secured area and install the "unsecured" hard drive.
   – If not previously done, copy the mxcalfiles from the floppy disk to the directory listed above.

The PNA can now be used elsewhere or sent for servicing without fear of leaking any sensitive information. When the PNA needs to be returned to the secured area, follow the below steps. Any servicing of the PNA may include the regeneration of correction constants. Most of these are contained in the on-board EEPROMs so no action is necessary. The only exception is with the mxcalfiles (see below).

1. If the PNA was sent out for servicing, you should first check to see if any of the mxcalfiles have been updated (check the last-modified date.) If so, these updated files should be copied to a floppy disk so that they can be updated on the secured hard drive.

2. Remove the unsecured hard drive, transport the PNA to the secured area, and replace the hard drive with the secured version

3. If the mxcalfiles have changed, copy all new files saved to the floppy disk to the directory listed above.

4. Also, if the PNA was sent out for servicing, it might have had its firmware updated (see below for more information about this).

Additional notes

Firmware that has been updated on the unsecured hard drive during servicing can usually be copied to a memory media and used to update the secured hard drive. The recommended method is to use 64 MB (or more) USB key drives (a.k.a. pen drives) to copy the firmware upgrade file (a USB CD-RW could also be used but is much more difficult.) This firmware installation file usually resides on the D:\Upgrades\Firmware directory. If not, the latest version can always be obtained via the Internet.

Any account names and passwords that have been created on either hard drive will not be available on the other drive unless they are manually installed; generally, this is a security advantage.

The use of another hard drive will generate a new Network ID (computer name) for the PNA upon initial boot up. If this is not desired, the Network ID should be changed immediately after boot-up. See your system's administrator for complete information.

Other issues

It has been suggested that the USB may pose a security risk, mainly due to the proliferation of USB pen drives that are very small and can store up to 2 GB of data. There are ways to prevent the operation of these devices without affecting the USB mouse or keyboard. Contact Keysight for more information, or download this USB security word document for details.

As shipped, the PNA has a back-up administrator account that is designed to be used by Keysight service personnel. This also comes in handy when a user forgets their password. The password for this account is unique to each instrument and is encrypted based upon the serial number. This security is sufficient for non-critical usage, but any high security location will probably want to delete this account. However, if the administrator password is then forgotten, the entire hard drive will have to be replaced in order to make the unit functional again.

For more information, go to: **http://na.tm.keysight.com/pna/security.html**

You can access the Web site via the Help menu on the PNA. There is also information on how to remove frequency information from the screen and printouts under Help.

Includes program that makes USB mass storage devices unable to store data from the USB port on the PNA. The program is on the Maintaining the PNA in a Secured Environment Web page.

Security Procedure for Keysight 8560-Series Portable Spectrum Analyzers

Be sure that all information stored by the user in the instrument that needs to be saved is properly backed-up before attempting to clear any of the instrument memory. Keysight cannot be held responsible for any lost files or data resulting from the clearing of memory.

In most cases there will be no user prompts to confirm the clearing or deleting of files or instrument memory. Be sure to read this document entirely before proceeding with any A-Series B-Series E-Series EC-Series 8560A file deletion or memory clearing.

Memory types and usage

The 8560-Series portable spectrum analyzers contain processor assemblies which employ different types of memory. These are RAM, UVEPROM and EEPROM.

RAM:

Battery-backed RAM is used to store instrument states, user preselector peaks and for trace storage. RAM which is not backed up by battery is used for the instrument's scratch pad. This portion of RAM is erased when the instrument power is turned off. Additional RAM is used for the display.

UVEPROM:

Processor firmware, which determines instrument functionality, resides in the UVEPROM. Firmware is programmed onto chips which are in sockets and can be readily changed to incorporate later enhancements and bug fixes.

EEPROM:

The EEPROM contains the instrument's serial ID string, model number, flatness calibration data, preselector tuning data, microcircuit bias values, external mixer conversion loss factors, focus and intensity values, and elapsed time data. See the table at the end of this document for more details on instrument memory capacity.

Downloadable Programs (DLPs) can be used with these instruments only with an 85620A mass memory module, which has built-in RAM for these programs. DLPs do not reside in the spectrum analyzer itself.

Disabling display parameters

Various portions of the display can be turned off by a simple key sequence. The sequence depends on the instrument model number as described below.

Function	61A, 62A/B Sequence	60A, 61B, 63A, 6XE/EC Sequence
Annotation	[DISPLAY] {MORE} {ANNOT ON OFF}	[DISPLAY] {MORE 1 OF 2} {ANNOT ON OFF}
Graticule	[DISPLAY] {MORE} {GRAT ON OFF}	[DISPLAY] {MORE 1 OF 2} {GRAT ON OFF}
Disp Line	[DISPLAY] {DISPL LIN ON OFF}	[DISPLAY] {DISPL LIN ON OFF}
Threshold	[DISPLAY] {THRESHLD ON OFF}	[DISPLAY] {THRESHLD ON OFF}
Frequency	[DISPLAY] {MORE} {FREQ DSP OFF}	[DISPLAY] {MORE 1 OF 2} {FREQ DSP OFF}
Trace	[TRACE] {BLANK A} or {BLANK B}	[TRACE] {BLANK A} or {BLANK B}
Soft keys	[HOLD]	[HOLD]

Executing all of the above sequences can totally blank the display.

The blanking can be reversed by similar key sequences or by pressing [PRESET].

Frequency offset

A frequency offset for absolute frequency readouts such as center frequency can be entered.

For the 8561A and 8562A/B models press [FREQUENCY] {MORE} {FREQ OFFSET} and use the data entry keys.

For the 8560A, 8561B, 8563A and 856XE/EC models press [FREQUENCY] {FREQ OFFSET} and use the data entry keys.

The frequency offset is cleared by pressing [PRESET] or by entering an offset of 0 Hz.

User memory: trace storage

Up to seven traces can be saved in trace storage registers. If the traces are named, the name will be stored as a soft key label for the register in which the trace was stored. The trace register and its corresponding soft key can be cleared by pressing [PRESET] and storing the preset state of the instrument in that register. Repeat this process for all seven trace registers. Clear trace storage memory by pressing [SAVE] {SAVE TRACE A} or [SAVE TRACE B}, then the appropriate trace register.

User memory: instrument states

Up to ten instrument states can be stored in instrument state registers. Instrument states include frequency, amplitude, bandwidth and other settings. As with trace storage, the states can be named to label their soft key. These registers can also be cleared by storing the instrument preset state in them. State storage is accessed by pressing [SAVE] {SAVE STATE}, then the appropriate State register.

To clear the "Last State" all that needs to be done is to press [PRESET] twice.

The instrument's Power On state is also saved by pressing [SAVE] {PWR ON STATE}. This can also be cleared by saving the preset state to it.

Removing the memory backup battery

User memory is retained in an internal lithium battery (silver oxide in 8562A option H50 and H51). User memory can be cleared by removing the battery and leaving the line switch off for over one hour. Remove the battery by removing the two screws on the battery cover on the instrument's rear panel. The battery can then be removed from the battery holder. The battery voltage to the RAM is controlled by a battery manager circuit and stored in a capacitor on the A2 controller board. Shorting the terminals on the battery holder will not accelerate memory erasure. When the RAM is cleared, an error 718 "BATTERY ?" message will appear on the display.

Remote commands

Commands that control the display and trace/state storage are listed in the table below. Consult the Operating and Programming manual on the proper use of these commands. Some of the commands can have a large effect on program operation.

In addition, the BASIC command LLO (Local Lockout) can be exercised by the controller on the GPIB to prevent front panel keyboard access.

Command	Description
Annotation	Turns annotation on or off
DL	Turns display line on or off
FDSP	Turns all frequency display annotation off
GRAT	Turns graticule on or off
PSTATE	Protect saved states
HD	Disables data entry and blanks active function on display readout
SAVET	Save specified trace data
BLANK	Stores and blanks specified trace data
SAVES	Saves specified state

Downloadable programs (DLPs) in the 85620A mass memory module

The 8560 Series spectrum analyzers have no internal DLP storage capability. DLPs are stored in the mass memory module which mates to the rear panel of the analyzer. DLPs are either stored on a removable memory card or in the user RAM of the module.

DLPs stored in a memory card can be removed by simply removing the card. DLPs stored in RAM can be erased by using the DISPOSE ALL remote command. The mass memory module can also be removed from the instrument rear panel once power has been removed.

Security recommendations

Cleared operator in a controlled area:

Use annotation, frequency or display blanking to conceal classified information.

Cleared operator in proximity to an uncontrolled area:

Use annotation, frequency or display blanking to conceal classified information. Preset the spectrum analyzer and save the preset states in the instrument state and trace registers to clear the analyzer of any classified information.

Uncleared operator in an uncontrolled area:

A local lockout (LLO) can be programmed over the GPIB to disable the analyzer front panel. This will prevent an operator from altering front panel settings. See that the analyzer user RAM has been cleared by removing the battery for at least one hour with the line power off. To verify that the user RAM has been cleared, look for the Error 718 "BATTERY ?" message on the display.

If an 85620A mass memory module is present, clear any DLPs in RAM by using the DISPOSE ALL remote command. Remove DLPs in the memory card by removing the card. With the analyzer power off, the entire mass memory module can be removed from the instrument rear panel.

Moving an analyzer from a controlled area to an uncontrolled area:

If there isn't a mass memory module present, or if the module does not contain DLPs, preset the spectrum analyzer and save the preset state and trace to each trace and state register to declassify the instrument. Another method of declassification would be to remove the battery and leave the instrument power off for at least one hour. Make sure that the Error 718 "BATTERY ?" message appears on the display when the instrument is powered up. If a mass memory module is present and contains a DLP, remove the memory card and clear the user RAM by executing the DISPOSE ALL remote command.

Memory allocation

The following table applies to instruments as they were originally shipped from the factory.

Model	Serial prefix	Display RAM	RAM	EEPROM	UBEPROM
8561A	≤ 3040A	128 K	512 K	16 K	3 M
8562A	≥ 3051A	128 K	512 K	16 K	4 M
8562B					
8560A	≤ 2925A	128 K	640 K	16 K	4 M
8561B	2928A-3204A	128 K	1.2 M	16 K	4 M
	≥ 3206A	128 K	1.2 M	16 K	8 M[1]
8563A	≤ 2925A	128 K	640 K	16 K	4 M
	3207A	128 K	1.2 M	16 K	4 M
	≥ 3216A	128 K	1.2 M	16 K	8 M[1]
8560E	≤ 3305A	128 K	1.2 M	16 K	12 M[1]
8561E	≥ 3310A	128 K	4 M	16 K	12 M[1]
8562E	Firmware	128 K	4 M	64 K	12 M[1]
8563E	≥ 931216				
8564E					
8565E					
8560EC	All	128 K	4 M	64 K	12 M[1]
8561EC					
8562EC					
8563EC					
8564EC					
8565EC					

1. Includes 4 M for 85629B test and adjustment module.

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