

Security Features

Agilent Technologies Signal Generators

This guide applies to the following Agilent Technologies signal generator models:

Agilent MXG:

N5181A (firmware revision - all)

N5182A (firmware revision - all)

Agilent ESG:

E4428C (firmware revision - all)

E4438C (firmware revision \geq C.03.40)

Agilent PSG:

E8247C (firmware revision \geq C.03.40)

E8257C (firmware revision \geq C.03.40)

E8267C (firmware revision \geq C.03.40)

E8257D (firmware revision - all)

E8267D (firmware revision - all)

Agilent E8663B (firmware revision - all)



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Using Security Functions

This document describes how to use the signal generator's security functions to protect and remove classified proprietary information stored or displayed in the instrument.

The information in this document is presented with the assumption that you are familiar with the basic operation of the signal generator. If you are not comfortable with using the instrument's menu structure, and functions such as setting power level and frequency, refer to the *User's Guide* and familiarize yourself with basic instrument operation.

All security functions described in this section also have an equivalent SCPI command for remote operation. (Refer to the *SCPI Command Reference* for more information.)

Understanding Memory Types

The signal generator has several memory types, each used for storing a specific type of data. Before removing sensitive data, it is important to understand how each memory type is used.

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Agilent MXG Memory

The following tables describe each memory type used in the base instrument and optional baseband generator.

Table 1 Base Instrument Memory

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Location in Instrument and Remarks
Main Memory (RAM) 32 MB	Yes	No	firmware operating memory no user data	operating system	CPU board
Main Memory (Flash) 8 MB	Yes	Yes	factory calibration/configuration data ^a user file system, which includes flatness calibration, instrument states, and sweep lists	firmware upgrades and user-saved data ^a	CPU board (same chip as firmware memory, but managed separately) Because this memory chip contains 8 MB of user data (described here) and 8 MB of firmware memory, a full-chip erase is not desirable. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Firmware Memory (Flash) 8 MB	No	Yes	main firmware image	factory installed or firmware upgrade	CPU board (same chip as main flash memory, but managed separately) During normal operation, this memory cannot be overwritten. It is only overwritten during the firmware installation or upgrade process. Because this memory chip contains 8 MB of user data and 8 MB of firmware memory (described here), a full-chip erase is not desirable. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Bootrom Memory (EEPROM) 8 kB	No	Yes	CPU bootup parameters no user data	factory programmed	CPU board During normal operation, this memory cannot be overwritten or erased except for LAN configuration. This read-only data is programmed at the factory.
	Yes	Yes	LAN configuration	Front panel entry or remotely	
Calibration Data (Flash) 256 kB	No	Yes	factory calibration/configuration data backup no user data	factory or service only	RF Board
LCD Display Memory (RAM) 160 kB	No	No	display buffer	operating system	RF board
Front Panel Memory (Flash) 32 kB	No	No	front panel keyboard controller firmware no user data	operating system	Front Panel board

^aAnalog instruments only

Table 2 Baseband Generator Memory (Options 651,652, 654)

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Remarks
Waveform Memory (RAM) ≤ 320 MB	Yes	No	waveforms (including header and marker data)	normal user operation	
Persistent Memory (Flash) 512 MB	Yes	Yes	all user data		User data is completely sanitized when you perform the Erase and Sanitize function.
Calibration Data Memory (Flash) 128 kB	No	Yes	no user data		

Agilent ESG/PSG Memory

The following tables describe each memory type used in the base instrument, optional baseband generator, and optional hard disk.

Table 3 Base Instrument Memory

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Location in Instrument and Remarks
Main Memory (SDRAM) 64 MB	Yes	No	firmware operating memory	operating system (not user)	CPU board
Main Memory (Flash) 20 MB	Yes	Yes	factory calibration/configuration data user file system, which includes instrument status backup, flatness calibration, IQ calibration, instrument states, waveforms (including header and marker data), modulation definitions, and sweep lists	firmware upgrades and user-saved data	CPU board (same chip as firmware memory, but managed separately) User data is not stored in this memory if hard disk (Option 005) is installed. Because this 32-MB memory chip contains 20 MB of user data (described here) and 12 MB of firmware memory, a selective chip erase is performed. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Firmware Memory (Flash) 12 MB	No	Yes	main firmware image	factory installed or firmware upgrade	CPU board (same chip as main flash memory, but managed separately) During normal operation, this memory cannot be overwritten except for LAN configuration. It is only overwritten during the firmware installation or upgrade process.
	Yes	Yes	LAN configuration	front panel entry or remotely	Because this 32-MB memory chip contains 20 MB of user data and 12 MB of firmware memory (described here), a selective chip erase is performed. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Battery Backed Memory (SRAM) 512 kB	Yes	Yes	user-editable data (table editors) last instrument state, last instrument state backup, and persistent instrument state and instrument status	firmware operations	CPU board The battery can be removed to clear the memory, but must be reinstalled for the instrument to operate. The battery is located on the motherboard for the ESG and on the CPU board for the PSG.
Bootrom Memory (Flash) 128 kB	No	Yes	CPU bootup program and firmware loader/updater	factory programmed	CPU board During normal operation, this memory cannot be overwritten or erased. This read-only data is programmed at the factory.
Calibration Backup Memory (Flash) 512 KB	No	Yes	factory calibration/configuration data backup no user data	factory or service only	motherboard
Boards Memory (Flash) 512 Bytes	No	Yes	factory calibration and information files, code images, and self-test limits no user data	factory or service only	all RF boards, baseband generator, and motherboard
Micro-processor Cache (SRAM) 3 kB	Yes	No	CPU data and instruction cache	memory is managed by CPU, not user	CPU board

Table 4 Baseband Generator Memory (Options 601 and 602)

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Remarks
Waveform Memory (SDRAM) 40–320 MB	Yes	No	waveforms (including header and marker data) and PRAM	normal user operation	User data is completely sanitized when you perform the Erase and Sanitize function.
BBG Firmware Memory (Flash) 32 MB	No	Yes	firmware image for baseband generator	firmware upgrade	
Coprocessor Memory (SRAM) 32 MB	Yes	No	operating memory of baseband coprocessor CPU	During normal operation, some user information, such as payload data, can remain in the memory.	This memory is used during normal baseband generator operation. It is not directly accessible by the user.
Buffer Memory (SRAM) 5 x 512 kB	No	No	support buffer memory for ARB and real-time applications	normal user operation	This memory is used during normal baseband generator operation. It is not directly accessible by the user.

Table 5 Hard Disk Memory

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Remarks
Media Storage (Built-in Hard Disk) 6 GB or 10 GB (4 GB usable in both cases)	Yes	Yes	user files, including flatness calibrations, IQ calibration, instrument states, waveforms (including header and marker data), modulation definitions, and sweep lists	user-saved data	The magnetic residue requires several rewrite cycles or drive removal and destruction. The hard disk is an option and is therefore not installed in some instruments. If it is installed, these files are stored on the hard disk instead of in flash memory. User data is completely sanitized when you perform the Erase and Sanitize function.
Buffer Memory (DRAM) 512 kB	No	No	buffer (cache) memory	normal operation through hard disk	

Agilent E8663B Memory

The following tables describe each memory type used in the base instrument, optional baseband generator, and optional hard disk.

Table 6 Base Instrument Memory

Memory Type and Size	Writable During Normal Operation?	Data Retained When Powered Off?	Purpose/Contents	Data Input Method	Location in Instrument and Remarks
Main Memory (SDRAM) 64 MB	Yes	No	firmware operating memory	operating system (not user)	CPU board
Main Memory (Flash) 20 MB	Yes	Yes	factory calibration/configuration data user file system, which includes instrument status backup, flatness calibration, IQ calibration, instrument states, waveforms (including header and marker data), modulation definitions, and sweep lists	firmware upgrades and user-saved data	CPU board (same chip as firmware memory, but managed separately) Because this 32-MB memory chip contains 20 MB of user data (described here) and 12 MB of firmware memory, a selective chip erase is performed. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Firmware Memory (Flash) 12 MB	No	Yes	main firmware image	factory installed or firmware upgrade	CPU board (same chip as main flash memory, but managed separately) During normal operation, this memory cannot be overwritten except for LAN configuration. It is only overwritten during the firmware installation or upgrade process.
	Yes	Yes	LAN configuration	front panel entry	Because this 32-MB memory chip contains 20 MB of user data and 12 MB of firmware memory (described here), a selective chip erase is performed. User data areas are selectively and completely sanitized when you perform the Erase and Sanitize function.
Battery Backed Memory (SRAM) 512 kB	Yes	Yes	user-editable data (table editors) last instrument state, last instrument state backup, and persistent instrument state and instrument status	firmware operations	CPU board The battery can be removed to clear the memory, but must be reinstalled for the instrument to operate. The battery is located on the motherboard for the ESG and on the CPU board for the PSG.
Bootrom Memory (Flash) 128 kB	No	Yes	CPU bootup program and firmware loader/updater	factory programmed	CPU board During normal operation, this memory cannot be overwritten or erased. This read-only data is programmed at the factory.
Calibration Backup Memory (Flash) 512 KB	No	Yes	factory calibration/configuration data backup no user data	factory or service only	motherboard
Boards Memory (Flash) 512 Bytes	No	Yes	factory calibration and information files, code images, and self-test limits no user data	factory or service only	all RF boards, baseband generator, and motherboard
Micro-processor Cache (SRAM) 3 kB	Yes	No	CPU data and instruction cache	memory is managed by CPU, not user	CPU board

Removing Sensitive Data from Memory

This section describes several security functions you can use to remove sensitive data stored in the signal generator when moving it from a secure development environment.

CAUTION The following functions do *not* erase or sanitize external media connected to the Agilent MXG's USB port. You must use some other method to dispose of information on this media.

Erase All

This function removes all user files, user flatness calibrations, user I/Q calibrations, and resets all table editors with original factory values, ensuring that user data and configurations are not accessible or viewable. The instrument appears as if it is in its original factory state, however, the memory is not sanitized. This action is relatively quick, typically taking less than one minute (the exact time depends on the number of files).

On the Agilent MXG, press: **File > More > Security > Erase All > Confirm Erase**

On the Agilent ESG/PSG/E8663B, press: **Utility > Memory Catalog > More (1 of 2) > Security > Erase All > Confirm Erase**

NOTE This function is different than the one that deletes all user files but does not reset the table editors:
Agilent MXG: **File > Delete All Files**
Agilent ESG/PSG/E8663B: **Utility > Memory Catalog > More (1 of 2) > Delete All Files**

Erase and Overwrite All

This function performs the same actions as **Erase All** and then clears and overwrites the various memory types in accordance with Department of Defense (DoD) standards, as described below.

SRAM	<i>(Not applicable to the Agilent MXG)</i> All addressable locations are overwritten with random characters.
CPU Flash	All addressable locations are overwritten with random characters and then the flash blocks are erased. This accomplishes the same purpose of a chip erase, however, only the areas that are no longer in use are erased and the factory calibration files are left intact. System files are restored after erase.
Hard Disk	<i>(Not applicable to the Agilent MXG)</i> All addressable locations are overwritten with a single character. (This is insufficient for top secret data, according to DoD standards. For top secret data, the hard drive must be removed and destroyed.)

On the Agilent MXG, press: **File > More > Security > Erase and Overwrite All > Confirm Overwrite**

On the Agilent ESG/PSG/E8663B, press: **Utility > Memory Catalog > More (1 of 2) > Security > Erase and Overwrite All > Confirm Overwrite**

Erase and Sanitize All

This function performs the same actions as **Erase and Overwrite All** and then adds more overwriting actions. After executing this function, you must manually perform some additional steps for the sanitization to comply with Department of Defense (DoD) standards. These actions and steps are described below.

SRAM	<i>(Not applicable to the Agilent MXG)</i> After applying this function, the instrument must remain in the secure area for a period longer than the classified data resided in memory. This measure is necessary to conform to DoD standard 5220.22-M. Alternatively, the SRAM battery can be removed then manually reinserted, however, this requires opening the instrument.
CPU Flash	Overwrites all addressable locations with random characters and then erases the flash blocks. This accomplishes the same purpose as a chip erase. System files are restored after erase.
BBG Persistent Memory (Flash)	<i>(Agilent MXG vector instruments only)</i> Overwrites all addressable locations with random characters and then erases the flash blocks. This accomplishes the same purpose as a chip erase. System files are restored after erase.
Hard Disk	<i>(Not applicable to the Agilent MXG)</i> All addressable locations are overwritten with a single character and then a random character. (This is insufficient for top secret data, according to DoD standards. For top secret data, the hard drive must be removed and destroyed.)

On the Agilent MXG, press: **File > More > Security > Erase and Sanitize All > Confirm Sanitize**

On the Agilent ESG/PSG/E8663B, press: **Utility > Memory Catalog > More (1 of 2) > Security > Erase and Sanitize All > Confirm Sanitize**

Removing Persistent State Information Not Removed During Erase

Persistent State

The persistent state settings contain instrument setup information that can be toggled within predefined limits such as display intensity, contrast and the GPIB address. In vector models, the user IQ Cal is also saved in this area.

The following key presses or SCPI commands can be used to clear the IQ cal file and to set the operating states that are not affected by a signal generator power-on, preset, or *RST command to their factory default:

Instrument Setup

- On the Agilent MXG front panel, press: **Utility > Power On/Preset > Restore System Settings to Default Values > Confirm Restore Sys Settings to Default Values**
- On the ESG/PSG/E8663B front panel, press: **Utility > Power On/Preset > Restore System Defaults > Confirm Restore Sys Defaults**
- Or send this command to the Agilent MXG/ESG/PSG/E8663B: `:SYSTEM:PRESet:PERSistent`

LAN Setup

The LAN setup (hostname, IP address, subnet mask, and default gateway) information is not defaulted with a signal generator power-on or *RST command. This information can only be changed or cleared by entering new data.

User IQ Cal File (Vector Models Only)

When a user-defined IQ calibration has been performed, the cal file data is removed by setting the cal file to default, as follows:

- On the front panel, press: **I/Q > I/Q Calibration > Revert to Default Cal Settings**
- Or send this command to the Agilent MXG: `:CAL:IQ:DEF`
- And send these commands to the Agilent ESG/PSG/E8663B:
 - `:CAL:IQ:DEF`
 - `:CAL:WBIQ:DEF`

Using the Secure Mode

The secure mode automatically applies the selected **Security Level** action the next time the instrument's power is cycled.

Setting the Secure Mode Level

1. On the Agilent MXG, press: **File > More > Security > Security Level**
On the Agilent ESG/PSG/E8663B, press: **Utility > Memory Catalog > More (1 of 2) > Security > Security Level**
2. Choose from the following selections:
 - None** – equivalent to a factory preset, no user information is lost
 - Erase** – equivalent to **Erase All**
 - Overwrite** – equivalent to **Erase and Overwrite All**
 - Sanitize** – equivalent to **Erase and Sanitize All**

Activating the Secure Mode

CAUTION Once you activate secure mode (by pressing **Confirm**), you cannot deactivate or decrease the security level; the erasure actions for that security level execute at the next power cycle. Once you activate secure mode, you can only increase the security level until you cycle power. For example, you can change **Erase** to **Overwrite**, but not the reverse.

After the power cycle, the security level selection remains the same, but the secure mode is not activated.

On the Agilent MXG, press: **File > More > Security > Enter Secure Mode > Confirm**

On the Agilent ESG/PSG/E8663B, press: **Utility > Memory Catalog > More (1 of 2) > Security > Enter Secure Mode > Confirm**

The **Enter Secure Mode** softkey changes to **Secure Mode Activated**.

If Your Instrument is Not Functioning

If the instrument is not functioning and you are unable to use the security functions, you may physically remove the processor board and hard disk, if installed, from the instrument. Once these assemblies are removed, proceed as follows:

For removal and replacement procedures, refer to the *Service Guide*.

Processor Board

Either

- Discard the processor board and send the instrument to a repair facility. A new processor board will be installed and the instrument will be repaired and calibrated. If the instrument is still under warranty, you will not be charged for the new processor board.
or
- If you have another working instrument, install the processor board into that instrument and erase the memory. Then reinstall the processor board back into the non-working instrument and send it to a repair facility for repair and calibration. If you discover that the processor board does not function in the working instrument, discard the processor board and note that it caused the instrument failure on the repair order. If the instrument is still under warranty, you will not be charged for the new processor board.

A4 Memory Chip (Agilent MXG vector instruments only)

Either

- Discard the board and send the instrument to a repair facility. A new board will be installed and the instrument will be repaired and calibrated. If the instrument is still under warranty, you will not be charged for the new board.
or
- If you have another working instrument, install the board into that instrument and erase the memory. Then reinstall the board back into the non-working instrument and send it to a repair facility for repair and calibration. If you discover that the board does not function in the working instrument, discard the board and note that it caused the instrument failure on the repair order. If the instrument is still under warranty, you will not be charged for the new board.

Hard Disk (Agilent ESG/PSG/E8663B option only)

Either

- Discard the hard disk and send the instrument to a repair facility. Indicate on the repair order that the hard disk was removed and must be replaced. A new hard disk will be installed and the instrument will be repaired and calibrated. If the instrument is still under warranty, you will not be charged for the new hard disk.
or
- Keep the hard disk and send the instrument to a repair facility. When the instrument is returned, reinstall the hard disk.

Using the Secure Display

NOTE Front panel control of this feature is *not* available on PSG E82x7C signal generators with firmware revisions earlier than C.03.76. The feature can be activated remotely, however, using SCPI commands. Refer to the “System Commands” chapter of the *SCPI Command Reference* for more information.

This function prevents unauthorized personnel from reading the instrument display and tampering with the current configuration through the front panel. The display blanks, except for the ***** SECURE DISPLAY ACTIVATED ***** message, and the front panel keys are disabled. Once this function is activated, the power must be cycled to re-enable the display and front panel keys.

To apply this function:

On the Agilent MXG: **Utility > Display > More > Activate Secure Display > Confirm Secure Display**

On the Agilent ESG/PSG/E8663B: **Utility > Display > More (1 of 2) > Activate Secure Display > Confirm Secure Display**

Figure 1 Signal Generator Screen with Secure Display Activated



