



Products: R&S Spectrum Analyzer FSEA, FSEB, FSEM, FSEK, FSIQ

Instrument Security for R&S[®] FSEA/B/M/K and R&S[®] FSIQ Spectrum Analyzer

Application Note

This application note describes the different memory types and locations that user information can be stored in a spectrum analyzer R&S[®] FSEA, R&S[®] FSEB, R&S[®] FSEM, R&S[®] FSEK or R&S[®] FSIQ, as well as the different ways in which it can be erased/cleared for security reasons.



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1 Overview

In many cases it is imperative that the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ spectrum analyzers are 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, requires some measures when the spectrum analyzer has to be transported to a non-secure environment, e.g. for calibration.

This application note describes the types of memory used in the spectrum analyzers R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ and describes a method to maintain security under these conditions. Please note that some of this information is dependent on the revision of the CPU board and the Windows® operating system used in your spectrum analyzer. For purposes of this document, these are divided into "DOS/Windows® 3.1" and "Windows® NT" instruments.

2 Instrument Models Covered

R&S Spectrum Analyzers

R&S® FSEA	R&S® FSEB	R&S® FSEM	R&S® FSEK	R&S® FSIQ
FSEA20	FSEB20	FSEM20	FSEM20	FSIQ3
FSEA30	FSEB30	FSEM21	FSEM21	FSIQ7
		FSEM30	FSEM30	FSIQ26
		FSEM31	FSEM31	FSIQ40

3 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. Rohde & Schwarz 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.

4 Battery Information

There are no batteries in the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ spectrum analyzers other than the one on the CPU board used to power the clock in the chipset and the CMOS-SRAM memory.

5 Types of Memory

SDRAM

The R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ spectrum analyzers have 16, 32 or 64 MByte of SDRAM in one or two SODIMMs on the CPU board.

In addition there are four RISC processor units (Transputer) with 1MByte and 4MByte SDRAM memory.

In the case of a R&S® FSIQ with Option B70 there is one Transputer with 4MByte SDRAM and one DSP with 4MByte SDRAM (I/Q memory) included.

SDRAM is volatile memory and it loses its memory as soon as power is removed. **This is not a security concern.**

SRAM

The three DSPs in the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ spectrum analyzers have 64 kByte of SRAM each.

In the case of a R&S® FSIQ with Option B70 there is additionally 2 MByte of SRAM memory for the DSP included.

SRAM is volatile memory and it loses its memory as soon as power is removed. **This is not a security concern.**

EEPROM

Each board assembly has one serial EEPROM device. These devices hold 256 Bytes up to 2 kBytes and contain information related to the installed hardware, such as board serial number, options, correction constants, etc., and are not generally user accessible. This data is required to make the spectrum analyzer functional. This data can be changed only by the factory or by service personnel when performing adjustments. **No user data is stored in these locations.**

FLASH

The CPU board of the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ spectrum analyzers has one 512 kByte flash memory device which contains the BIOS. The BIOS is used by the Windows® operating system. **No user data is stored in the flash memory.**

CMOS-SRAM

This 128 kByte memory device resides on the CPU board of the instruments. The CMOS-SRAM stores system information like last state settings, remote interface configuration and printer settings. This memory has battery back-up, so it is not lost when power is removed from the instrument. **This is a security concern.**

Hard Drive

The main non-volatile device is the hard drive. Hard drives vary from 4 GByte up to 20 GByte. The hard drive is used to store:

- Ø Instrument operating system (DOS/Windows® 3.1 or Windows® NT)
- Ø Instrument firmware and firmware options (measurement personalities) with option license keys
- Ø Instrument states and setups
- Ø Trace data
- Ø Limit Lines, Transducer tables
- Ø Screen images

The hard drive content is non-volatile, so nothing is lost when power is removed from the instrument. **The hard drive is a security concern.**

6 Maintaining Security

Clearing the different types of memory

SDRAM

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

SRAM

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

CMOS-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 this memory itself.

Cold Boot procedure

To clear the CMOS-SRAM memory follow these steps:

- Ø Turn the instrument Off
- Ø Turn the instrument back On while holding down the decimal point key [.] on the number keypad on the front panel
- Ø Continue to hold this key for 10 seconds after pressing the "On" button
- Ø The instrument will now clear it's CMOS-SRAM memory and then power up

This procedure will clear any last state information and forces the instrument to power up with the factory default settings. Information such as the current time and date will not be erased by this procedure.

Hard Drive Memory

All user specific data like

- Ø Instrument states and setups
- Ø Trace data
- Ø Limit Lines, Transducer tables
- Ø Screen images

is stored on the internal hard disk. Simply deleting these files is not sufficient from a security perspective.

For deleting files there are several Windows programs available to "shred" files according to the DoD 5220 standard which are working with the NSA approved algorithm. One example of these that has been tested by Rohde & Schwarz is FileShredder - see operating manual for details on installing Windows software on the instrument.

The FileShredder program works by overwriting the file seven (7) times with an alternating pattern of bits which not only stops all software programs from retrieving data contents, but also helps to prevent physical magnetic data sensors from retrieving a proper image of the data. This is standard government regulation for secure data erasure and conforms to Department of Defense specification DOD-5220.22.

Point your browser to the following web site for download and additional information:

http://www.winappslist.com/security/file_wipers1.htm

Removable Hard Drive

Erasing all user data on a hard drive without also destroying the operating system is a tedious and cumbersome task. The best method for maintaining security, when the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ spectrum analyzer 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 spectrum analyzer to still function properly in non-secured areas or for use when servicing.

For this purpose the Option FSE-B18 'Removable Hard Disk' was offered from Rohde & Schwarz in conjunction with a second hard disk (Option FSE-B19). Note that this option is non-retrofitable.

As shipped from the factory, all R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ spectrum analyzers have very little unique information stored on the hard drive. This allows one hard drive to function on most any instrument, assuming it is the appropriate type of analyzer.

Step-by-Step Security

Keep the appropriate spare hard drive (B19) in a non-secure area. It is recommended to clearly mark this hard drive as "Unsecured" together with instrument model/serial number information.

In the event the secure R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ needs to be used elsewhere, or, if it needs servicing:

- Ø Clear the memory (CMOS-SRAM) with the Cold Boot procedure as described above.
- Ø Remove the secure hard drive (label it as secured if desired) and keep it in the secured area.
- Ø Remove the instrument from the secured area and install the "unsecured" hard drive.

The R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ can now be used elsewhere or sent for servicing without fear of leaking any sensitive information.

R&S® FSEA/B/M/K and R&S® FSIQ - Instrument Security

If the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ needs to be returned to the secured area, follow the steps below:

- Ø Remove the unsecure hard drive and keep it in a non-secured area.
- Ø Transport the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK or R&S® FSIQ to the secured area and install the secured hard drive.
- Ø Perform the Cold Boot procedure as described above.
- Ø Start the self alignment procedure by pressing the CAL key and the softkey CAL TOTAL.

USB

USB ports can pose a security threat in high-security locations. The built-in floppy drives can also be an issue, but solutions such as floppy locks, already exist for this.

USB ports are not available on the R&S® FSEA, R&S® FSEB, R&S® FSEM, R&S® FSEK and R&S® FSIQ spectrum analyzer. In addition, both DOS/Windows® 3.1 and Windows® NT do not support USB at all.

7 Additional Information

Please contact your support center for comments and further suggestions:

Hotline Europe

Telephone: +49 180 512 4242

Fax: +49 89 4129 63778

Internet: [Contact us](#)

Hotline America

Telephone: 1-888-TESTRSA (1-888-837-8772) selection 2

From outside the USA: +1-410-910-7988

Email: customer.support@rsa.rohde-schwarz.com

Hotline Asia

Telephone: +65 6846 3716 (9am-6pm, Mon-Fri, excluding Public Holiday)

Fax: +65 6846-0029

E-mail: info@rssg.rohde-schwarz.com



ROHDE & SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Mühldorfstraße 15 · D-81671 München · P.O.B 80 14 69 · D-81614 München ·
Telephone +49 89 4129 -0 · Fax +49 89 4129 - 13777 · Internet: <http://www.rohde-schwarz.com>

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