R&S®RTO6
Oscilloscope
Instrument Security Procedures

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Version 01

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Make ideas real

This document describes the types of memory and their use in the R&S®RTO6.
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1 Overview

Securing important information is crucial in many applications.

Generally, highly secured environments do not allow any test equipment to leave the area unless it can be proven that no user information leaves with the test equipment, e.g. to be calibrated.

"Regarding sanitization, the principal concern is ensuring that data is not unintentionally released" [1].

This document provides a statement regarding the volatility of the memory types used and specifies the steps required to sanitize an instrument.

The procedures in this document follow "NIST Special Publication 800-88: Guidelines for Media Sanitization" [1].

In addition, recommendations are provided to safeguard information on the R&S RTO6.

References

See the following literature for further information.

[1] **Kissel Richard L. [et al.]** Guidelines for Media Sanitization = Special Publication (NIST SP) = NIST SP - 800-88 Rev 1. - Gaithersburg : [s.n.], December 17, 2014.

[2] **National Industrial Security Program Authorization Office** Defense Security Service (DSS) Assessment and Authorization Process Manual (DAAPM). - May 6, 2019.

[3] **ACSC Australian Cyber Security Centre** Australian Government Information Security Manual, January 2020.

2 Instrument models covered

Table 2-1: R&S RTO6 models

Product name	Order number
R&S RTO64	1802.0001K04

3 Security terms and definitions

Terms defined in Guidelines for Media Sanitization

NIST Special Publication 800-88 [1]

- **Sanitization**
  "Media sanitization refers to a process that renders access to target data on the media infeasible for a given level of effort."
- **Clear**
  "Clear applies logical techniques to sanitize data in all user-addressable storage locations for protection against simple non-invasive data recovery techniques; typically applied through the standard Read and Write commands to the storage device, such as by rewriting with a new value or using a menu option to reset the device to the factory state (where rewriting is not supported)."
- **Purge**
  "Purge applies physical or logical techniques that render Target Data recovery infeasible using state of the art laboratory techniques."
- **Destroy**
  "Destroy renders Target Data recovery infeasible using state of the art laboratory techniques and results in the subsequent inability to use the media for storage of data."

Control of media

Another option is to keep physical media holding sensitive information within the classified area, see [1], paragraph 4.4.

Volatile memory

"Memory components that do not retain data after removal of all electrical power sources, and when reinserted into a similarly configured system, are considered volatile memory components." [2]

The volatile memory in the instrument does not have battery backup. It loses its contents when power is removed from the instrument.

If the instrument is battery operated, e.g. handhelds, it retains data in the volatile memory as long as the battery is installed.

Typical examples are RAM, e.g. SDRAM.

Non-volatile memory

"Components that retain data when all power sources are discontinued are non-volatile memory components." [2].

In the context of this document, non-volatile memory components are non-user accessible internal memory types, e.g. EEPROM, Flash, etc.

Media

Media are types of non-volatile memory components. Media are user-accessible and retain data when you turn off power.

In the context of this document, media types are Hard Disk Drives (HDD), Solid State Drives (SSD), Memory Cards, e.g. SD, microSD, CFast, etc., USB removable media, e.g. Pen Drives, Memory Sticks, Thumb Drives, etc. and similar technologies.

4 Statement of volatility

The R&S RTO6 contains various memory components. See the subsequent sections for a detailed description regarding type, size, usage and location.

Notes on memory sizes

Due to the continuous development of memory components, the listed values of memory sizes may not represent the current, but the minimal configuration.

4.1 Volatile memory

Volatile memory modules are considered as non-accessible internal storage devices, as described in Security terms and definitions > Volatile memory.

Table 4-1: Types of volatile memory

Memory type	Location	Size	Content / Function	User modifiable
SDRAM/DDR4	CPU board	16 Gbyte	Temporary information storage for operating system and instrument firmware	Yes
SDRAM/DDR2/3	Digital board	≥ 1792 Mbyte	• Waveform data • Measurement data	Yes
SRAM	Front panel board	128 kbyte	Operating system	No
SDRAM/DDR2/3	R&S RTO6-B1, B6	≥ 2 Gbit	Waveform data	Yes

4.2 Non-volatile memory

Non-volatile memory modules are considered as non-accessible internal storage devices, as described in Security terms and definitions > Non-volatile memory.

Table 4-2: Types of non-volatile memory

Memory type	Location	Size	Content / Function	User modifiable
Flash	Frontend board	4,3 Mbit	• Serial number and product options • Calibration correction data • FPGA configuration	No
Flash	Digital board	32 Mbyte	• Component information • FPGA configuration	No
Flash	Front panel board	128 kbyte	• Component information • Firmware	No
Flash	CPU board	8 Mbyte	BIOS	No
Flash	R&S RTO6-B1, B6, B7	≥ 128 Mbit	• Component information • FPGA configuration	No

4.3 Media

Media memory modules are considered as non-volatile storage devices, as described in Security terms and definitions > Media.

Table 4-3: Types of media memory modules

Memory type	Location	Size	Content / Function	User modifiable
Solid-State Drive (SSD) (removable)	Rear of the R&S RTO6	256 Gbyte	• Operating system and instrument firmware • Firmware options with option license keys • Instrument states and setups • Waveform data and limit lines • Measurement results and screen images	Yes

5 Instrument sanitization procedure

5.1 Volatile memory

You can purge the volatile memory by following the procedure below. The sanitizing procedure complies to the definition of NIST [1], see "Terms defined in Guidelines for Media Sanitization" on page 4.

To turn off and remove power

1. Turn off the R&S RTO6.
2. Disconnect the power plug.

   Provided the instrument remains without power for at least five minutes, all volatile memory modules lose their contents, see [1].

5.2 Non-volatile memory

The non-volatile memories do not contain user data. Therefore no sanitization procedure is required.

5.3 Media

You sanitize the oscilloscope by removing the SSD.

To remove the SSD

1. **NOTICE!** Do not remove the SSD during operation.

   Turn off the oscilloscope and disconnect the power plug.
2. Remove the classified SSD, which contains all user data:

a) Locate the SSD.

b) Unscrew the two knurled screws.
c) Remove the SSD at the rear of the instrument.

3. Keep the memory devices under organizational control.

   The oscilloscope can now leave the secured area.

6 Functionality outside secured area

After removing the classified SSD with user data, the instrument does not work.

To restore functionality outside secured area

► Install a non-classified SSD (without any user data).

The R&S RTO6 can start the operating system.

To return to the secured area

► Before reentering the secured area, remove the non-classified SSD (without any user data).

To restore functionality inside secured area

1. Install the classified SSD with user data.
2. Connect the instrument to the power supply.

   The R&S RTO6 is ready for use.

7 Validity of instrument calibration

The EEPROM is the only memory type used to hold permanent adjustment values required to maintain the validity of the R&S RTO6's calibration. Therefore, the sanitizing procedure does not affect the validity of the instrument's calibration.

To perform a self-alignment after exchanging the SSD

1. Warm up the instrument before you start the self-alignment. The minimum warm-up time is indicated in the data sheet.
2. Open the "Menu" and select "Settings" > "Maintenance".
3. In the "Alignment" tab, tap "Start Alignment".

   The alignment is performed, the process might take several minutes. A message box informs you about the running process, wait until this message box closes. The overall pass/fail result is shown in the "Overall alignment state" field. The results of the individual alignment steps for each input channel are indicated in the "Results" tab.

Glossary

C

CFast: Compact Fast - compact flash mass memory device.

D

DRAM: Dynamic Random Access Memory.

H

HDD: Hard disk drive.

M

microSD: Micro Solid-state Drive - memory card.

S

SD: Solid-state drive - memory card.

SSD: ATA Solid-state drives (including PATA, SATA, eSATA, mSATA,...).