

R&S®NRP-Z Series

Power Sensors

Instrument Security Procedures



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Instrument Security Procedures

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1 Overview

In many cases, it is imperative that the R&S NRP-Zxx Power Sensors are used in a secured environment. Generally these 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. Security concerns can arise when devices need to leave a secured area e.g. to be calibrated or serviced.

This document describes the types of memory and their usage in the R&S NRP-Zxx. It provides a statement regarding the volatility of all memory types and specifies the steps required to declassify an instrument through memory clearing or sanitization procedures. These sanitization procedures are designed for customers who need to meet the requirements specified by the US Defense Security Service (DSS).

2 Instrument Models Covered

Product name	Order number
R&S NRP-Z11	1138.3004.02 1138.3004.04
R&S NRP-Z21	1137.6000.02
R&S NRP-Z22	1137.7506.02
R&S NRP-Z23	1137.8002.02
R&S NRP-Z24	1137.8502.02
R&S NRP-Z27	1169.4102.02
R&S NRP-Z28	1170.8008.02

Product name	Order number
R&S NRP-Z31	1169.2400.02 1169.2400.04
R&S NRP-Z37	1169.3206.02
R&S NRP-Z41	1171.8801.02
R&S NRP-Z51	1138.0005.02 1138.0005.03 1138.0005.62
R&S NRP-Z52	1138.0505.02 1138.0505.18 1138.0505.62
R&S NRP-Z55	1138.2008.02 1138.2008.03 1138.2008.04
R&S NRP-Z56	1171.8201.02
R&S NRP-Z57	1171.8401.02
R&S NRP-Z58	1173.7031.02
R&S NRP-Z61	1171.7505.02
R&S NRP-Z81	1137.9009.02
R&S NRP-Z85	1411.7501.02
R&S NRP-Z86	1417.0109.40 1417.0109.44
R&S NRP-Z91	1168.8004.02 1168.8004.04 1168.8004.08
R&S NRP-Z92	1171.7005.02 1171.7005.42
R&S NRP-Z98	1170.8508.02
R&S NRP-Z211	1417.0409.02 1417.0409.04
R&S NRP-Z221	1417.0309.02
R&S NRP-Z311	1171.8601.02
R&S FSH-Z1	1155.4505.02
R&S FSH-Z18	1165.1909.02

3 Security Terms and Definitions

Clearing

The term "clearing" is defined in Section 8-301a of DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)". Clearing is the process of eradicating the data on media so that the data can no longer be retrieved using the standard interfaces on the instrument. Therefore, clearing is typically used when the instrument is to remain in an environment with an acceptable level of protection.

Sanitization

The term "sanitization" is defined in Section 8-301b of DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)". Sanitization is the process of removing or eradicating stored data so that the data cannot be recovered using any known technology. Instrument sanitization is typically required when an instrument is moved from a secure to a non-secure environment, such as when it is returned for service of calibration.

The memory sanitization procedures described in this document are designed for customers who need to meet the requirements specified by the US Defense Security Service (DSS). These requirements are specified in the "Clearing and Sanitization Matrix" in Section 14.1.16 of the ISFO "Manual for the Certification and Accreditation of Classified Systems under the NISPOM".

Instrument declassification

The term "instrument declassification" refers to procedures that must be undertaken before an instrument can be removed from a secure environment, for example when the instrument is returned for calibration. Declassification procedures include memory sanitization or memory removal, or both. The declassification procedures described in this document are designed to meet the requirements specified in DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)", Chapter 8.

4 Types of Memory and Information Storage in the R&S NRP-Zxx

The Power Sensor contains various memory components.

The following table provides an overview of the memory components that are part of your instrument. For a detailed description regarding type, size, usage and location, refer to the subsequent sections.

Memory type	Size	Content	Volatility	User data	Sanitization procedure
CMOS-SRAM ¹	1Mbyte	Used by the processor for firmware operation	Volatile	Yes	Turn off instrument power (disconnect USB)
SDRAM ² (MAIN processor)	16 Mbyte	Used by the processor for firmware operation	Volatile	Yes	Turn off instrument power (disconnect USB)
EEPROM ²	2 x 26 bytes		Non-volatile	No	None required
Flash	2 Mbytes ¹ 8 Mbytes ²	<ul style="list-style-type: none"> • Boot loader • Calibration data • Firmware • S-parameter data 	Non-volatile	Yes	Secure Erase procedure (see Chapter 5, "Secure Erase Procedures" , on page 7)
¹ All except the R&S NRP-Z81/-Z85/-Z86 ² R&S NRP-Z81/-Z85/-Z86 only					

4.1 Volatile Memory

The volatile memory in the instrument does not have battery backup. It loses its contents as soon as power is removed from the instrument (disconnect USB). The volatile memory is not a security concern.

Removing power from this memory meets the memory sanitization requirements specified in the "Clearing and Sanitization Matrix" in Section 5.2.5.5.5 of the ISFO Process Manual for the Certification and Accreditation of Classified Systems under the NIS-POM.

CMOS-SRAM

All except R&S NRP-Z81/-Z85/-Z86

The CMOS-RAM is used by the processor to operate the firmware. It has a size of 1 Mbyte.

Sanitization procedure: Turn off instrument power (disconnect USB)

SDRAM (MAIN processor)

R&S NRP-Z81/-Z85/-Z86 only

The SDRAM is used by the processor to operate the firmware. It has a size of 16 Mbyte.

Sanitization procedure: Turn off instrument power (disconnect USB)

4.2 Non-Volatile Memory

The Power Sensors contain various non-volatile memories. Out of these, only the Flash memory contains user data.

EEPROM

R&S NRP-Z81/-Z85/-Z86 only

The EEPROMs on each of the two potentiometer chips have a size of 26 bytes each. They do not contain information and cannot be accessed.

Sanitization procedure: None required (no user data)

Flash

The size of the Flash memory depends on the Power Sensor model.

- All except R&S NRP-Z81/-Z85/-Z86:
2 Mbyte
- R&S NRP-Z81/-Z85/-Z86:
8 Mbyte

The Flash memory is partitioned into different sections, each of which contains different information.

Boot Loader	Firmware FPGA	Calibration Data	S-Parameter User Data
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Figure 4-1: Logical sections of the Flash memory

- **Boot loader:**
This section contains boot code to start the firmware during power-on. This section is initialized during production and during firmware updates. It cannot be accessed and is not modified during instrument operation.
- **Firmware, including FPGA:**
This section contains program code and constant data. This section cannot be accessed and is not modified during instrument operation.
- **Calibration data, S-parameter and user data:**
This section contains the calibration data required to operate a Power Sensor and the S-parameter data that contains information about the used frequency ranges. You can upload S-parameter data into the sensor and download S-parameter data from the sensor.
Only this section of the Flash memory contains user data.

Note that the Flash memory does not contain any kind of setup information (for example recently used RF frequency) or other measurement parameters or results.

Sanitization procedure: Secure Erase procedure

5 Secure Erase Procedures

Because the CMOS-RAM and SDRAM are erased when power is removed from the Power Sensor, they do not pose a security risk. The EEPROM contains no user data. Therefore, it is deemed that it does not pose a risk either.

The Flash memory is the only memory type that does not lose its contents when power is removed and can contain user data.

You can sanitize the Flash memory with the NrpzSanitizer software, which is available from Rohde & Schwarz. The software removes all user data from the Flash memory. Contact the Power Sensor product management for more information.

To sanitize the Flash memory, you have to connect the Power Sensor to a PC on which the software is installed.

The software triggers the following actions.

- The firmware is temporarily saved in the SRAM (or SDRAM in case of the R&S NRP-Z81/-Z85/-Z86).
- A full sector erase command as per manufacturer data sheet is applied to every single sector of the Flash memory. This explicitly includes sectors that might be declared as defect.
- Every addressable location of the Flash memory is overwritten by a single character.
- Another full sector erase command as per manufacturer data sheet is applied to every single sector of the Flash memory, including defect sectors.
- The contents of the Flash memory are recreated and firmware is restored.

The Secure Erase procedure meets the memory sanitization requirements specified in the "Clearing and Sanitization Matrix" in Section 14.1.16 of the ISFO Process Manual for the Certification and Accreditation of Classified Systems under the NISPOM.

6 Instrument Declassification

Before you can remove the Power Sensor from a secured area (for example to perform service or calibration), all classified user data needs to be removed. You can declassify the Power Sensor as follows.

Following these steps removes all user data from the Power Sensor. The Power Sensor can now leave the secured area.

1. Connect the Power Sensor via USB to a PC on which the NrpzSanitizer software is installed.
2. Start the NrpzSanitizer software and select the "Elements to Sanitize".
 - "Reset S-Parameter to a Clean Dataset"
 - "Sanitize Power Sensor"

Note that this option completely erases all data on the Power Sensor (firmware, bootloader, FPGA, S-Parameter etc.).

3. Select "Execute" to sanitize the Power Sensor.
See [Chapter 5, "Secure Erase Procedures"](#), on page 7 for more information about the effects of the sanitization.
4. After memory sanitization, disconnect the Power Sensor from USB to remove power supply.

These declassification procedures meet the needs of customers working in secured areas.

Validity of instrument calibration after declassification

Since calibration data is lost during the declassification procedure, the Power Sensor needs to be recalibrated. Please contact your local Rohde & Schwarz service center.

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