

Model 4200-SCS Semiconductor Characterization System

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Declassification and Security Instructions

Introduction

If you have data security concerns, this document tells you how to clear or sanitize the Model 4200-SCS Semiconductor Characterization System's memory devices. It also explains how to declassify an instrument that is not functioning.

The procedures in this document are written to meet the requirements specified in:

- NISPOM, DoD 5220.22-M, chapter 8
- ISFO Process Manual for Certification and Accreditation of Classified Systems under NISPOM

Contact information

If you have any questions after you review the information in this documentation, please contact your local Keithley Instruments office, sales partner, or distributor, or call Keithley Instruments corporate headquarters (toll-free inside the U.S. and Canada only) at 1-800-935-5595, or from outside the U.S. at +1-440-248-0400. For worldwide contact numbers, visit the [Keithley Instruments website](http://www.tek.com/keithley) (<http://www.tek.com/keithley>).

Products

This document contains procedures for the following Keithley Instruments models:

- 4200-SCS Semiconductor Characterization System
- 4200-SMU Medium-Power SMU
- 4210-SMU High-Power SMU
- 4210-CVU Capacitance-Voltage Unit
- 4220-PGU Pulse-Generator Unit
- 4225-PMU Pulse-Measure Unit
- 4200-PA Remote Preamplifier
- 4225-RPM Remote Preamplifier/Switch Module

Terminology

The following terms may be used in this document:

- **Clear:** Removes data on media or in memory before reusing it in a secured area. Clears all reusable memory to deny access to previously unsecured information.
- **CPLD:** Complex Programmable Logic Device. Similar to an FPGA (Field Programmable Gate Array) a CPLD is a logic device consisting of a sea of logic gates, routing lines, and logic switches to customize routing and Boolean logic functions implemented in the sea of logic gates. Typically, a CPLD holds the configuration of all this programmable logic in a non-volatile memory, such as flash memory.
- **Demo setups:** Demonstration modules that come loaded on the instrument; you cannot modify them.
- **Direct method of modification:** You can modify data directly.
- **Erase:** Equivalent to clear (see above).
- **HDD:** Hard disk drive. This is usually the main permanent storage device for a piece of computing equipment. Hard disk drives are the conventional medium for storage and consist of one or more rotating magnetic disks.



- **Indirect method of modification:** The instrument system resources modify the data; you cannot modify it.
- **Instrument declassification:** Procedures that must be completed before an instrument can be removed from a secure environment. Declassification procedures include memory sanitization and memory removal.
- **Media storage and data export device:** Devices that can be used to store or export data from the instrument, such as a USB port.
- **Nonvolatile memory:** Data is retained when the instrument power is turned off.
- **Protected user data area:** Contains data that is protected by a password.
- **Remove:** Clears instrument data by physically removing the memory device from the instrument.
- **Sanitize:** Eradicates instrument data from media and memory so it cannot be recovered by other means or technology. This is typically used when the device will be moved (temporarily or permanently) from a secured area to a non-secured area.
- **Scrub:** Directly retrieve and clear the contents of the memory device.
- **User accessible:** You can directly retrieve the contents of the memory device.
- **User data:** Measurement data that represents signals that you connect to the instrument.
- **User-modifiable:** You can write to the memory device during normal instrument operation using the front-panel interface or remote control.
- **User settings:** Instrument settings that you can change.
- **Volatile memory:** Temporary memory; data is lost when the instrument is turned off.

Description of memory

Model 4200-SCS instruments and accessories use various volatile and nonvolatile memory components. The [Memory devices](#) section gives detailed instructions specific to each product listed in the [Products](#) section above.

The following list of products that can be found installed in the 4200-SCS system or shipped as accessories with the 4200-SCS system contain volatile and nonvolatile memory individually listed for each product.

4200-SCS SINGLE BOARD COMPUTER: Contains nonvolatile and volatile memory devices used for the main computer.

- (1) BIOS nonvolatile flash device (U27)
- (1) BIOS settings volatile battery-backed RAM device (U27)
- (1) Intel CPU with volatile cache RAM installed in socket CPU1
- (2) 2 GB volatile DDR3 RAM DIMM modules installed in sockets J4 and J6

4200-SCS HARD DRIVE: Contains files and data for Windows® 7 operating system. Contains programs, files, and data for the 4200 KTE Interactive Software factory- and user-created projects and tests. Contains calibration data, readings, and other data.

- (1) 1 TB nonvolatile magnetic rotating disk style hard drive (HDD)

TRIGGER MASTER CPLDs (U100 and U101 on 4200-150 board): Contains triggering logic.

- (2) Nonvolatile CPLD

TRIGGER MASTER Trigger RAM (U102): Contains trigger sequence codes.

- (1) 32 KB volatile static RAM

4200-SMU and 4210-SMU products: Contains instrument logic, calibration data, readings, and other data.

- (1) 512 KB nonvolatile flash memory (U22)
- (1) 16 KB nonvolatile EEPROM (U17)
- (2) 128 KB volatile static RAM (U12 and U14)
- (2) 256 KB nonvolatile flash memory (U15 and U16)

4200-CVU and 4210-CVU products: Contains instrument logic, calibration data, readings, and other data.

- (1) 512 KB nonvolatile flash memory (U119)
- (1) 4 MB nonvolatile flash memory (U116)
- (1) 8 MB volatile SDRAM memory (U114)
- (4) 512 KB volatile static RAM memory (U910, U911, U912, U913)

4220-PGU and 4225-PMU products: Contains instrument logic, calibration data, readings, and other data.

- (1) 512 KB nonvolatile flash memory (U22) on 4220-PGU board
- (1) 4 MB nonvolatile flash memory (U116) on 4220-PGU board
- (1) 8 MB volatile SDRAM memory (U114) on 4220-PGU board
- (2) 512 KB volatile static RAM memory (U714, U715) on 4220-PGU board

The following parts are only found on the 4225-PMU product:

- (2) 1 GB volatile DDR2 SO-DIMM memory modules (installed in sockets U951 and U952) on 4225-PMU board

4200-PA product: Contains instrument logic and calibration data.

- (1) Microcontroller with 16 KB nonvolatile flash memory, 768 bytes volatile static RAM memory, and 256 bytes nonvolatile EEPROM memory (U1)

4225-RPM product: Contains instrument logic, calibration data, readings, and other data.

- (1) Microcontroller with 64 KB nonvolatile flash memory and 16 KB of volatile static RAM memory (U500)

Memory devices

The following tables list the volatile and nonvolatile memory devices in the standard instrument and listed options.

Volatile memory devices

The following tables list 4200-SCS system, instrument, and accessory volatile memory devices and relevant memory-related information.

4200-SCS single board computer

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
BIOS settings volatile battery-backed RAM device	Battery-backed temporary memory used to store BIOS settings for proper computer operation in the product	Yes	BIOS setup	U27	Use BIOS setup to restore factory defaults or remove coin cell battery from its socket	Remove coin cell battery from its socket
Intel CPU with volatile cache RAM	Temporary memory used by the Intel microprocessor to run the operating system and application software	Yes	Use of operating system and included application software	CPU1	Turn instrument power off	Turn instrument power off
2 GB volatile DDR3 RAM DIMM modules	Temporary memory used by the Intel microprocessor to run the operating system and application software	Yes	Use of operating system and included application software	J4 and J6	Turn instrument power off	Turn instrument power off

Trigger master

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
32 KB volatile static RAM	Temporary memory used by the trigger logic CPLDs	No	None	U102	Turn instrument power off	Turn instrument power off

4200-SMU and 4210-SMU instrument cards

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
128 KB volatile static RAM	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U12 and U14	Turn instrument power off	Turn instrument power off

4200-CVU and 4210-CVU instrument cards

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
8 MB volatile SDRAM memory	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U114	Turn instrument power off	Turn instrument power off
512 KB volatile static RAM memory	Temporary memory used by the instrument logic to facilitate instrument sourcing and measuring capabilities	No	None	U910, U911, U912, U913	Turn instrument power off	Turn instrument power off

4220-PGU instrument card

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
8 MB volatile SDRAM memory	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U114	Turn instrument power off	Turn instrument power off
512 KB volatile static RAM memory	Temporary memory used by the instrument logic to facilitate instrument sourcing and measuring capabilities	No	None	U714, U715	Turn instrument power off	Turn instrument power off

4225-PMU instrument card

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
8 MB volatile SDRAM memory	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U114 on 4220-PGU board	Turn instrument power off	Turn instrument power off
512 KB volatile static RAM memory	Temporary memory used by the instrument logic to facilitate instrument sourcing and measuring capabilities	No	None	U714, U715 on 4220-PGU board	Turn instrument power off	Turn instrument power off
1 GB volatile DDR2 SO-DIMM memory modules	Temporary memory used by the instrument logic to facilitate instrument sourcing and measuring capabilities	No	None	Installed in sockets U951 and U952 on 4225-PMU board	Turn instrument power off	Turn instrument power off

4200-PA accessory

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
Microcontroller internal 768 bytes volatile static RAM	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U1	Turn instrument power off	Turn instrument power off

4225-RPM accessory

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
Microcontroller internal 16 KB static RAM	Temporary memory used by the microprocessor controller for internal processor operations (on the microprocessor chip)	No	None	U500	Turn instrument power off	Turn instrument power off

Nonvolatile memory devices

The following table lists nonvolatile memory devices and relevant memory-related information for all products listed in the [Products](#) section. If the table indicates that a device can be cleared by the user, see the detailed instructions in [Clearing Data](#).

4200-SCS single board computer

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
BIOS nonvolatile flash device	Contains BIOS boot program	No	n/a	U27	Not clearable via any methods available to customer or vendor	Remove chip

4200-SCS hard drive

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
1 TB nonvolatile magnetic rotating disk style hard drive (HDD)	Contains calibration data and user settings	Yes	Normal use of embedded computer via operating system or application software	Behind DVD drive inside 4200-SCS chassis, mounted vertically.	Follow the Clearing Data procedures	Follow the Sanitizing data procedures

Trigger master

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
2000 logic gate capacity nonvolatile CPLD	Contains trigger logic	No	n/a	U100 and U101	Not clearable via any methods available to customer or vendor	Remove chip

4200-SMU and 4210-SMU instrument cards

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
512 KB nonvolatile flash memory	Contains instrument logic	Yes	n/a	U22	Requires Xilinx IMPACT programming tool and JTAG connection to J8 on 4220-PGU board	Remove chip
16 KB nonvolatile EEPROM	Contains instrument logic	No	n/a	U17	Not clearable via any methods available to customer or vendor	Remove chip
256 KB nonvolatile flash memory	Contains calibration data	Yes		U15 and U16	Not clearable via any methods available to customer or vendor	Remove chip

4200-CVU and 4210-CVU instrument cards

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
512 KB nonvolatile flash memory	Contains instrument logic	No	n/a	U119	Requires Xilinx IMPACT programming tool and JTAG connection to J8 on 4220-PGU board	Remove chip
4 MB nonvolatile flash memory	Contains calibration data	Yes	n/a	U116	Not clearable via any methods available to customer or vendor	Remove chip

4220-PGU instrument card

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
512 KB nonvolatile flash memory	Contains instrument logic	Yes	n/a	U22	Requires Xilinx IMPACT programming tool and JTAG connection to J8 on 4220-PGU board	Remove chip
4 MB nonvolatile flash memory	Contains calibration data	Yes	n/a	U116	Not clearable via any methods available to customer or vendor	Remove chip

4225-PMU instrument card

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
512 KB nonvolatile flash memory	Contains instrument logic	Yes	n/a	U22	Requires Xilinx IMPACT programming tool and JTAG connection to J8 on 4220-PGU board	Remove chip
4 MB nonvolatile flash memory	Contains calibration data	Yes	n/a	U116	Not clearable via any methods available to customer or vendor	Remove chip

4200-PA accessory

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
Microcontroller internal 16 KB nonvolatile flash memory	Contains calibration data	No	n/a	U1	Not clearable via any methods available to customer or vendor	Remove chip
Microcontroller internal 256 bytes nonvolatile EEPROM memory	Contains calibration data	No	n/a	U1	Not clearable via any methods available to customer or vendor	Remove chip

4225-RPM accessory

Type and minimum size	Function	User modifiable	Data input method	Location	To clear	To sanitize
Microcontroller internal 64 KB nonvolatile flash memory	Contains calibration data	No	n/a	U500	Not clearable via any methods available to customer or vendor	Remove chip

Clearing data

Clearing data on the 4200-SCS hard drive

Follow clearing instructions found in NISPOM, DoD 5220.22-M, chapter 8.

Sanitizing data

The following subsections describe how to clear data from the various individual nonvolatile storage devices found in the 4200-SCS system, its instrument cards, and accessories.

Sanitizing data on 4200-SCS hard drive

Follow sanitization instructions found in NISPOM, DoD 5220.22-M, chapter 8.

Sanitizing data on a nonfunctional system

To sanitize a nonfunctional instrument, remove all of the following items from the system and return it to Keithley Instruments for installation of replacement boards.

- Instrument cards plugged into main backplane PCI slots
- Single board computer plugged into main backplane
- Trigger master card plugged into main backplane ISA slot
- Hard disk drive