

# R&S<sup>®</sup> SMF100A

## Microwave Signal Generator

### Release Notes

### Firmware Version 2.15.095.12

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81671 Munich, Germany

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The following abbreviations are used throughout this document:

R&S<sup>®</sup>SMF100A is abbreviated as R&S SMF100A.

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# 1 Information on the Current Version and History

## General information

This document describes the procedure to apply a firmware update to the R&S® SMF100A Microwave Signal Generator. It furthermore describes the differences between the several firmware versions. The most current firmware version can be obtained from [www.rohde-schwarz.com](http://www.rohde-schwarz.com).

## Instruments covered

This firmware version is suitable for all instruments of type **R&S® SMF100A**, including all module revisions, options and firmware licenses.

## Identify current firmware version

The current instrument firmware revision is displayed during the startup sequence of the instrument. In addition, it is provided in the **SETUP** Software/Options dialog and it is part of the SCPI \*IDN instrument identification string.

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### NOTICE

#### Potential malfunction of assembly!

It is strongly recommended to **do no firmware downgrade below** the version the device was originally delivered with. Improved module revisions as well as modified structure of calibration data may not be supported by previous firmware versions.

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## 1.1 Special hints for particular instrument- and firmware versions

### Instruments equipped with SMB-B22 (Enhanced Phase Noise Performance)

It is strongly recommended to update to version 2.15.095.12 or later due to an issue regarding the internal reference PLL. It might not synchronize as expected when instrument is powered on with reference oscillator set to "Internal".

### Instruments with firmware 2.04.243.04 or earlier

To update these instruments to the current firmware version, the update procedure based on the ISO image file is required, as described in chapter 2.3.

Furthermore, due to structural modifications in the PCI FPGA, after upgrading the instrument **it can not be downgraded to 2.04.243.04 or earlier**.

## Instruments with firmware prior to 2.05.47.10

Due to customer demands, starting with firmware version 2.05.47.10 **the reference oscillator settings are moved out of the scope of `PRESET` and `*RST`**. This change has been made since the reference oscillator loop takes several seconds to synchronize and unintentional modification following `*RST` leads to long measurement times and disturbance of other instruments relying on the reference.

In general the focus of `*RST` is to reset states regarding internal instrument operation while leaving settings which are associated to the measurement and remote control environment.

So in addition to the reference oscillator the following settings are out of the scope of `*RST`:

- RF Level Limit
- Current level unit and EMF state
- Remote control settings including GPIB address and emulation mode
- Network settings
- Keyboard and Screen Saver settings
- Start / Stop GUI update
- Power On settings
- Security settings

With exception of the security settings these settings can easily being reset to factory values by means of the function **Factory Preset**, located at the bottom of the `SETUP` Menu. Factory Preset includes the scope of `PRESET`. Security settings (e.g. passwords and enable/disable states of USB and LAN) are not affected to maintain instrument security. For remote operation the command `SYST:FPRreset` is provided. Be aware that executing this command likely terminates the remote connection.

Furthermore, beginning with Version 2.05.47.10 the behavior of the key `WINBAR` has been changed. It now directly toggles between the open setting dialogs. It is not necessary to service the rotary knob.

## 1.2 Detailed firmware version description

Altogether, the new firmware offers the following functional improvements. Details regarding new functionality can be obtained from the build-in help system.

### Version 2.15.095.12

Released April 2010

#### New Functionality

Topic	Ref-No.
SMF-K27 (Pulse Train): Train length doubled to 2.047 and repetition factor now implemented by FPGA. The factor can be set up to 65.535 without reduction of train length, allowing significant more complex pulse trains. Minimal pulse length is reduced to zero (Null-Pulse). So pauses of up to 327 seconds can be embedded by a single entry in the pulse train table.	8492
Added emulation mode for instruments E8257m E8267 and E8663 (Agilent PSG)	8447
SMF-K28 (Power Analysis): New trigger modes "Internal" and "External"	8288
Frequency and Level displays can be annotated in <b>SETUP</b> Security	8201
New RF OFF mode in attenuator menu minimizes RF leakage when RF is switched OFF	8138
Synchronization of external pulse modulator input to internal instrument reference can be disabled	8137
Level unit is preserved during power off	7957
SMF-K28 (Power Analysis): User specific level offset	7934
Keyboard can be deactivated to prevent unauthorized modification of instrument settings. Configuration in <b>SETUP</b> Security or by SYSTem:KLOCK ON OFF	7882
Display can be deactivated to hide instrument settings. Configuration in <b>SETUP</b> Security or by SYSTem:DLOCK ON OFF.	7882
New emulation for HP836xx instrument series	7713
SMF-K28 (Power Analysis): Added Gate Mode	7610
SMF-K28 (Power Analysis): Added mathematical functions and reference trace	7510
Instrument now can be accessed via Microsoft Windows network	7441
Instrument now can be remote controlled via RS232 by means of a standard external USB to RS232 adaptor. Settings are located in <b>SETUP</b> Remote Channel Settings.	7387
Remote emulation: Support of arbitrary *IDN and *OPT strings.	7334
Added emulation mode for HP8662	7298
New SCPI command :SYSTem:SHUTdown powers off instrument via remote control	7214
External USB keyboards: Support of international keyboard layouts	7133
Support of up to four power sensors in Power Viewer and Power Analysis. New <b>SETUP</b> NRP-Z Info dialog provides properties of all power sensors connected. In Addition, sensor firmware can be updated via instrument.	7010
New sweep mode "External Start/Stop" for RF- LF- and Level-Sweeps	4479

**Modified Functionality**

<b>Several significant improvements of LIST MODE, improved stability, faster learning and support of long lists (10.000)</b>	8400
Revised and simplified configuration of emulation settings in Remote Channel Settings dialog	7894
Level Limit setting not affected by <b>PRESET</b> to protect devices under test	7801
Revised and simplified network settings dialog including connection state indicator. Option "Peer to Peer" removed since this feature is covered by the "Auto(DHCP)" mode now.	7781
Frequency offset can be set up to 67GHz	7496
List Mode Step: RESET-Button did not work as expected	7468
Improved Security concept (menu <b>SETUP</b> Security Settings)	7449
Improved startup time of instrument	7442
To avoid unintentional instrument settings, values entered by keyboard or front panel will be discarded when input is aborted without confirmation by <b>ENTER</b> or unit key	7383
Improved level accuracy at short pulses (500ns)	7312
Coincidental mapping of power sensors in Power-Viewer dialog	7294
Improved file selector and file manager	5996

**Fixed issues**

HP83620 Emulation: Blank signal polarity fixed	8468
LFO2:STATE and LFO2:FREQ did not work as expected	8448
After power on, instruments equipped with SMF-B22 did not synchronize to internal reference as expected. Sometimes message "synchronization error on reference pll" is displayed.	8422
Unjustified error message when switching impedance of external modulation inputs	8317
SMF-K27 (Pulse Train): Some time/pause relations lead to incorrect timing in pulse train mode	7964
Network settings (e.g. IP-Address) were lost when configured while no network is attached	7761
License key management issue in case of BIOS battery failure	7738
Missing error message when attempting to disable USB mass storage while storage is attached	7695
SAV/RCL of NRP-Z power viewer settings fails under some circumstances	7652
Sporadic lockups in raw ethernet channel	7612
Several issues regarding SCPI MMEM subsystem	7488
List Mode Step: Reset button does not work	7468
Firmware restarts when executing READ:POW? while no sensor is connected	7454
Settings of trapezoid generator not in scope of SAV/RCL	7219
Loopgain Adjustment can not be performed on instruments with SMF-K0 but without SMF-B20	7416
Several minor issues when modifying sweep settings	6282
Mouse pointer disappeared even if wheel is handled	6277

**Known Issues**

With EMF State active, the current level unit is not preserved when instrument is powered off.	8476
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Due to modified entries in a specific system file, downgrading this firmware to 2.05.244 series or earlier leads to error messages like "General database Error" and "Value out of range". Workaround: Temporarily modify GPIB channel address. This action recreates the file in a consistent manner.	8475
The EMF state is not reset by Factory Preset Workaround: Reset EMF-State manually in RF Level/EMF Dialog	8141

**Version 2.05.244.25**

Released: December 2009

**Fixed issues**

Removed unattended error message at 19GHz 0dBm	7837
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**Version 2.05.244.23**

Released: August 2009

**Modified Functionality**

Improved Pulse Modulation shape when RF is below 1GHz (DCON range)	7837
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**Fixed issues**

Compatibility issue with production- and service test equipment	7819
Under some circumstances, error message "EXT1 /EXT2 ADC overdriven" appears while EXT1 / EXT2 are not selected.	7632

**Version 2.05.244.18**

Released: February 2009

**New Functionality**

Emulation of HP 83732A	7422
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**Fixed issues**

Err -300 Synchronisation error on reference pll... on some instruments during startup	7479
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**Version 2.05.244.15**

Released: January 2009

**New Functionality**

Run status of ramp sweep can be queried: <i>[:SOURce]:SWEep[:FREQuency]:RUNNING?</i>	7360
Support of Options SMF-B32 and SMF-B34 up to 43.5 GHz (improved High Power Output)	7264
User Correction: Warning if frequency is out of bounds	6889
Hardcopy available now (Key HCOPY), for details refer to local help	6307

**Fixed issues**

Unintentional update of a specific system file during boot sequence. Risk of instrument malfunction in case of sudden power loss (e.g. "Device Key missing").	7390
Flickering progress bar during internal adjustments	7248

**Version 2.05.244.12**

Released: December 2008

**New Functionality**

<b>Significantly improved Power Analyzer (SMF-K28), including Pulse Analyzer capabilities</b>	<b>7309</b>
<b>Added HP8673 emulation</b>	<b>7215</b>
Modulation Chirp: Added external Input/Trigger capability	7208
Current remote emulation mode is displayed in info-line	7121
List mode STEP now can be remote controlled: [:SOURce]:LIST:INDEX <nr> addresses the specified index [:SOURce]:LIST:TRIGger:EXEC executes a single list step	7061
Support of Options SMF-B32 and SMF-B34 up to 22GHz (improved High Power Output)	6964
APIPA/Zeroconf to support automatic configuration in networks without DHCP	6854
Instrument can be configured to suppress RF level when external reference is out of range	6830
List Mode: New Button "Learn List Mode data"	6401
Sweep shape "Triangle" for RF, Level and LF sweeps	6328
NPR-Z Power sensor: New error message in case of power sensor overload	6275
New command SYSTem:REStart restarts instrument firmware	5863

**Modified Functionality**

List Mode: Max value of dwell time increased due to customer demand	7262
In case of external reference, internal adjustments are performed using this reference	6697
Frequency and level setting time improved	6236
Run status of sweep now can be queried: [:SOURce]:SWEep[:FREQuency]:RUNNING?	5900

**Fixed issues**

Level collapse at high setting values (> 29dBm) under rare circumstances	7311
LF-Generator / Noise: Time units can not be entered by front panel	7212
List Mode: Blank signal too short, removes while RF is not settled accurately	7205
Storing files using MMEM instructions fails if file already exists (affects SAV/RCL)	7197
V/GHz Plug: Setting of 0.5V/GHz does not work	6833
Pulse Generator: Settings conflict regarding "Period" even when triggered externally	6824



**Version 2.05.47.34**

Released: September 2008

**Fixed issues**

Possible level overshoot at 1GHz when crossing this frequency during ramp sweep	6977
Switching between external to internal reference may lead to RF frequency shift	6976
RF frequency does not match displayed value after switching off ramp sweep	6973

**Version 2.05.47.32**

Released: July 2008

**New Functionality**

<b>New modulation type “Chirp”</b>	6348
Support of module FSYN variants 04 and 06	6308

**Modified Functionality**

Reduced level leakage during POWER OFF	6626
Significantly reduced phase jump on most frequency settings	6344

**Fixed issues**

Instruments without B20: Firmware crash when activating Power Viewer Permanent	6810
Ext ALC did not work below 1GHz	6773
Black screen when pressing digit key and unit key at the same time	6729
Ramp Sweep: No unit allowed when setting Sweep Time via remote control	6722
External level control: NRVS not applicable, removed from Power Meter Type selection	6721
Frequency Variation Step: Minimal value was 1MHz, corrected to 0Hz to enable small steps	6720
List Mode EXT STEP: First frequency step faulty in 2.05.47.25	6695
TTL-Mode did not work with R&S analyzers due to above error	6695
Ramp Sweep mode Single: Sweep starts with second step frequency	6610
Sometimes LAN not available after power on due to race condition	6604

**Version 2.05.47.25**

Released: April 2008

**Fixed issues**

Check Front Panel: Dialog did not fit screen, STATUS key did not work	6560
Pulse Modulation: 0.3dB level overshoot in ALC ON mode	6517
Entering numeric values: Malfunction of unit selector when serving with arrow keys	6491
Unintended error message when leaving list mode	6448
Pulse Generator: Wrong preset value of Double Pulse Delay	6440

List Mode: Out of memory when learning lists longer than 2.000 elements	6419
EMF state did not work as expected	6417
Pulse Train: Some SCPI commands did not work as expected	6396
List Mode: Failed at 11GHz under certain circumstances	6392
Reference Oscillator settings has been reset after power on	6377
Pulse Generator: Width of SYNC signal is extended if suitable	6292
FM not active after power on or *RCL under certain circumstances	6197
Screen saver did not switch off backlight	5903

## Version 2.05.47.10

Released: February 2008

### New Functionality

<b>Support of option SMF-K28: NRP-Z Power Analysis</b>	6302
<b>Support of option SMF-K27: Pulse Train Generator</b>	6300
New parameter "Blank Mode" in Menu Auxiliary I/O	6258
New function "Factory Preset" (Setup-Menu) resets settings not covered by PRESET Key	6223
Automatic User correction with NRP-Z Sensor	6107
NRP-Z Power Viewer: Build-in support of NRP-Z series power sensors	6106
Current setting of step attenuator are displayed in block diagram	6033
<b>Support of up to four USB mass memory devices (e.g. USB sticks) for user data</b>	5440
<b>Support of List Mode for fast frequency and level settings</b>	5313

### Modified Functionality

PRESET (*RST) does not affect reference oscillator settings any more	6210
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### Fixed issues

Unintentional phase noise near maximum level on some instruments	6374
Unjustified message "Synthesis step frequency multiplier unlocked" during ramp sweep	6355
Ramp sweep exceeds stop frequency under certain circumstances	6345
Blank signal did not cover X-ramp during ramp sweep	6345
Double blank pulse during ramp sweep under certain circumstances	6345
Hostname entry field now accepts '-' character	6329
Unjustified error message following "IP" command of 834x emulation on some instruments	6326
Lower limit of RF level inappropriate for instruments without step attenuator	6320
SAV/RCL did not work since file selector didn't recognize setting file extension	6189
Screen saver did not work reliable	6179
Dialogs minimized to WinBar using a mouse could not be made visible again	5525
Toggle key did not work on RF ON/OFF	5430

**Version 2.04.303.04**

Released: October 2007

**New Functionality**

User specific *IDN? response string in Remote Channel Settings	5869
<b>Support of option SMF-B2 (Down Converter), Frequency Range 100kHz – 1GHz</b>	5854
Support of Marker Sweep	5819

**Modified Functionality**

Improved emulation of HP8340 microwave generators	5122
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**Fixed issues**

Attenuator setting issue on instruments with SMF-B31, SMF-B144 but <b>without</b> SMF-B2	6124
Empty and persistent progress bar window in case of Scan AM with two LF Gens active	6057
Spikes on X-Output	6044
Several rare failures due to internal communication problems	6040
<b>FSK did not work</b>	5941
“Unhandled Interrupt” message on some instruments after power on	5898
Incorrect (too short) blank signal during frequency sweep	5890

**Version 2.04.277.02**

Released: June 2007

**New Functionality**

<b>Support of option SMF-K4 (Ramp-Sweep) including X-output and markers</b>	5307
<b>Support of options SMF-B144 and SMF-B27 (43.5GHz)</b>	5306
Support of STOP connector (interrupts running sweeps incl. Ramp-Sweep)	5837
Additional sweep-modes “Extern Single” and “Extern Step”	5622
Added sweep-marker	5316

**Fixed issues**

“Query interrupted” condition on USB remote interface stopped instrument	5572
Malfunction of REARRange key fixed	5520
“Phase Offset” setting did not work	5252

**Version 2.04.243.04**

Released: May 2007

**New Functionality**

Support of option SMF-B84 (Removable USB Device Interface, Remote-Control via USBTMC)	5574
Support of option SMF-B81 (Rear Connectors)	5326
Added external level control by detector and power meter	5309

Emulation of HP8340 microwave generators	5122
Emulation of HP8360 an HP8370 microwave generators	5121
Firmware update using USB stick for upcoming firmware versions	

### Modified Functionality

Improved settling times for frequency and level	
Improved DWELL time for sweeps	5573
Pulse generator: Several minimum values improved	5411

### Fixed issues

Missing progress bar during internal adjustments and FPGA update	5575
High level on RF plug during calibration (fixed for instruments with step attenuator)	5520
Changing screen saver waiting time had no effect	5438
Security: Disabling LAN and USB had no effect	5437
Security: User password and VNC password could not be changed	5436
Preset value of puls mode source set to intern	5428
RF OFF setting has been ignored after power on	5425
Lower limit of level setting has been wrong on instruments without step attenuator	5418
Wrong setting of pulse input impedance	5414
Missing RF level after changing LF generator settings	5410
Several problems regarding pulse modulation	5409
Instruments without SMF-K83 (IEEE interface): Deadlock during power down sequence	5343
IP address lost after reboot	5284
Missing error message "Output unlevelled"	5263
Missing "REMOTE"-state on VXI.11	5233
Malfunction on frequency setting 11.999...999GHz	5116
"Flickering display" after some hours of inactivity	5079
Problems with cursor position on frequency input	5041
Amplitude modulation depth had been limited to 50% in case of single modulation source	4856
Malfunction of LOCAL key in some situations	4821
SCPI Error Queue: Missing additional explanations	4703

## Version 2.04.154

Released: January 2007

### New Functionality

Support of option SMF-B31 (High Output Power)	5305
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### Fixed issues

Rotary knob changed direction on level variation across attenuator steps	5045
Fast level variation with rotary knob influenced lower digits	5022
Deadlock on GPIB operation under some circumstances	4948

Menu items could be modified even in REMOTE state
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4931
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**Version 2.04.140**

Initial firmware version, released December 2006

## 2 Firmware Update

### 2.1 Update Information

Rohde&Schwarz provides **two different** methods for applying a firmware update to the SMF100A.

The first is based on a Rohde&Schwarz firmware update file and provides a smart and fast update. There is no need to uninstall the current firmware. Instrument settings are preserved during the update, including user data and network settings. This update procedure requires that the instrument is operational and its **current firmware version is at least 2.04.243.04**.

The second is based on an ISO-image file and provides a complete system-recovery of the SMF. Mass memory is new formatted, operating system and firmware will be reinstalled, user data is lost. **This procedure is required if the current firmware version is less than 2.04.243.04**. It furthermore is required if instruments mass memory storage is not initialized (e.g. due to a replacement) or if the device is not operational for other reason.

### 2.2 Firmware update using R&S firmware update file



To perform this procedure, USB Device must be enabled in security settings. Press the **SETUP** key, select **Security** and check **USB Device** setting

#### Required equipment

**Software:** Firmware update file **SMF\_2.15.095.12.rsu**

**Hardware:** USB memory stick with enough free space to save the update file (about 30 - 50 MByte).

The memory stick does not need to be bootable and previous data on the stick is not affected. Several update files may reside on the stick in parallel. During update procedure the stick is not modified by the instrument.

#### Prepare Memory Stick

- Download update file to a PC.
- Connect USB stick to PC and copy the update file **into the root directory**.
- Wait until copy procedure has finished and remove USB stick.

#### Install new firmware on R&S<sup>®</sup> SMF100A:

- Switch on instrument.
- Wait until instrument is operational.
- Connect USB stick to instrument.

- Wait a few seconds until message box appears. Confirm by pressing the rotary knob.
- Select firmware version using the arrow keys and press knob to start update.
- Wait until "Software update successful" message box appears. This may take several minutes.
- Press any front panel key to shut down instrument and remove USB stick.
- Restart instrument by pressing the power button.

*Depending on the current firmware version, this update procedure alternatively can be initiated by applying the USB memory stick while the instrument is powered off. In this case the update procedure is triggered right after powering on the instrument.*

## Check for PCI FPGA update

During reboot the firmware automatically checks whether an update of the internal PCI-FPGA is required.

- If the PCI-FPGA is up to date, instrument firmware starts as usual. Wait until firmware is operational and continue with internal adjustments
- If an update is required, follow instructions and wait until firmware confirms success. The update may take several minutes.

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### NOTICE

#### Risk of instrument malfunction!

Do not interrupt the PCI FPGA update and do not switch off power during update until instrument confirms success.

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- To apply the new FPGA configuration data a power off/on cycle is required. Press OK to shut down the instrument and wait until yellow stand by led lights up.
  - Restart instrument using the power button and wait until instrument is operational.

## Execute internal adjustments

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### NOTICE

#### Risk of damage for device under test!

During adjustment, assemblies **without step attenuator** (SMF-B26 or SMF-B27) temporarily provide high power at the RF plug. This may cause damage to the device under test (DUT). Furthermore, those instruments require that the RF plug is terminated by 50 ohm during adjustment. So it is recommended to disconnect the DUT and replace it by a 50 ohm terminating resistor.

- 
- Press the **PRESET** key on the instrument front panel.
  - Press the **SETUP** key, select Internal Adjustments and execute **Adjust All**. This procedure updates all internal instrument adjustments and will take several minutes. Adjustments requiring external measurement equipment are not affected by the firmware update and need not to be performed.

## 2.3 Firmware update using ISO image

### NOTICE

#### Potential loss of data!

User Data and user specific instrument settings will be lost during this procedure. Instrument serial number, software license keys and all adjustments requiring external measuring equipment are not affected.

### Required equipment

#### Software:

- ISO image for firmware update SMF\_2.15.095.12.iso

#### Hardware:

- **External** USB CD or DVD ROM burner with USB cable.
- 1CD Recordable.
- PC with burn program that can burn ISO images onto CD.

#### About ISO image

This is a standardized file format for creating CD images. A CD image is a single file encapsulating the whole data of a CD including directories and files. Unpacking the image to a CD restores the original data. Almost any CD burning program is able to write CDs based on ISO images.

### Update procedure

#### Burn ISO image onto CD

On most computers, burning an ISO image can be initiated by simply double clicking the ISO image file. If this is not the case, the manual procedure is similar to the following instructions. Nero Burning ROM (StartSmart) is used in this example.

- Connect the external USB CD/DVD drive to the PC
- Insert CD recordable
- Start Nero StartSmart
- Select medium „CD“
- Select „Create Data CD“
- From the **Files menu**, open file SMF\_2.15.095.12.iso
- Click "Burn"
- When finished, close Nero and disconnect external USB CD/DVD drive

#### Install new firmware on R&S®SMF100A:

- Instrument must be switched off
- Connect the external USB CD/DVD drive to the SMF
- Switch on Instrument



- The instrument boots from external drive
- Follow the instructions on screen
- Disconnect the external USB device
- Reboot instrument



If the CD refuses to boot please ensure that you have burned the ISO-image as an “image” and not as a single file. Check the CD regarding presence of several files like BOOT.CAT, FULLIMG.GZ, ISOBOOT, ISOLINUX.BIN, ISOLINUX.CFG, ISOROOT

### Check for PCI FPGA update

- During reboot the firmware automatically checks whether an update of the internal PCI-FPGA is required.
- If the PCI-FPGA is up to date, instrument firmware starts as usual. Wait until firmware is operational and continue with internal adjustments
- If an update is required, follow instructions and wait until firmware confirms success. The update may take several minutes.

#### NOTICE

##### Risk of instrument malfunction!

Do not interrupt the PCI FPGA update and do not switch off power during update until instrument confirms success.

- To apply the new FPGA configuration data a power off/on cycle is required. Press OK to shut down the instrument and wait until yellow stand by led lights up.
- Restart instrument using the power button and wait until instrument is operational.

### Execute internal adjustments

#### NOTICE

##### Risk of damage for device under test!

During adjustment, assemblies **without step attenuator** (SMF-B26 or SMF-B27) temporarily provide high power at the RF plug. This may cause damage to the device under test (DUT). Furthermore, those instruments require that the RF plug is terminated by 50 ohm during adjustment. So it is recommended to disconnect the DUT and replace it by a 50 ohm terminating resistor.

- Press the **PRESET** key on the instrument front panel.
- Press the **SETUP** key, select Internal Adjustments and execute **Adjust All**. This procedure updates all internal instrument adjustments and will take several minutes. Adjustments requiring external measurement equipment are not affected by the firmware update and need not to be performed.

## 3 Open Source Acknowledgement

This instrument firmware makes use of valuable open source software packages. The most important of them are listed together with their corresponding open source license information in a separate Open Source Acknowledgement document. This document also contains the verbatim license texts and can be downloaded from [www.rohde-schwarz.com](http://www.rohde-schwarz.com).

The OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>) includes cryptographic software written by Eric Young (eay@cryptsoft.com) and software written by Tim Hudson (tjh@cryptsoft.com).  
LINUX® is a trademark of Linus Torvalds.

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

## 4 Customer Support

### Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

### Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

#### USA & Canada

Monday to Friday	(except US public holidays)
8:00 AM – 8:00 PM	Eastern Standard Time (EST)
Tel. from USA	888-test-rsa (888-837-8772) (opt 2)
From outside USA	+1 410 910 7800 (opt 2)
Fax	+1 410 910 7801
E-mail	<a href="mailto:CustomerSupport@rohde-schwarz.com">CustomerSupport@rohde-schwarz.com</a>

#### East Asia

Monday to Friday	(except Singaporean public holidays)
8:30 AM – 6:00 PM	Singapore Time (SGT)
Tel.	+65 6 513 0488
Fax	+65 6 846 1090
E-mail	<a href="mailto:CustomerSupport@rohde-schwarz.com">CustomerSupport@rohde-schwarz.com</a>

#### Rest of the World

Monday to Friday	(except German public holidays)
08:00 – 17:00	Central European Time (CET)
Tel. from Europe	+49 (0) 180 512 42 42*
From outside Europe	+49 89 4129 13776
Fax	+49 (0) 89 41 29 637 78
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\* 0.14 €/Min within the German fixed-line telephone network, varying prices for the mobile telephone network and in different countries.