New Instrument Password "894129"

ROHDE&SCHWARZ

Test and Measurement Division

Release Notes

Firmware Release 4.65 (XP)

with Service Pack 3

for FSQ Spectrum Analyzers (Windows XP embedded)

New Features:

- **Auto Login Password for user INSTRUMENT is changed to "894129" for security reasons**
- **Resolution Bandwidth 6.25 kHz supported**
- **Support for Noise Correction outside of ACP measurement**
- **Multi Carrier ACP with up to 18 TX Channels**
- **Multi Carrier ACP now supports save/recall of user standards**
- **Spurious Emissions Measurement now supports save/recall of user standards**
- **SEM measurement: Supports for save/recall of user defined standards**
- **SEM measurement: Ref Level dialog available to adjust the sweep list's level settings**
- **SEM measurement: Additional WIMAX configuration files available**
- **Extended Marker Peak List function includes automatic peak list update**
- **FS-K7: New Fundamental Frequency AUTO/MANUAL setting for SINAD and THD measurement**
- **FS-K9: Indication of the power meter's model and serial number**
- **FS-K9: Support for Power Sensor NRP-Z86**
- **PSA / 89600 Emulation available**
- **Remote Control: Support for Status Operation Register Bits MEASuring / SWEeping**

Release Note Revision: 8

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History

Date	Rel Note Rev	Changes
11 May 2010	1	First revision for V4.65.
19 October 2010	2	Hot line phone number for calls from Europe modified. Improvements with Service Pack 1 added.
25 November 2010	3	Additional improvement for FSQ-K70 with Service Pack 1.
12 December 2010	4	New application versions added to the options list.
17 January 2011	5	K91 Version modified and known issue added.
30 January 2011	6	New functions and improvements with Service Pack 2 added. Known issue concerning FS-K8 added.
09 February 2011	7	Extended remote command description for TRACE? LIST for SEM Measurement.
07 March 2011	8	Improvements with Service Pack 3 and a known issue added, new chapter "Customer Support".

General Topics

Firmware Update

This firmware may only be installed on instruments equipped with Windows XP Embedded.

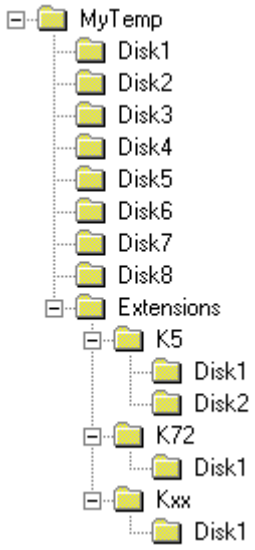
Generation of the update set

Since basic firmware version V4.35 a ZIP file with basic system firmware and the newest available applications is provided. This ZIP file is available in the instruments FIRMWARE section of the Service Board on GLORIS.

Preparing installation via USB stick or LAN:

- Download the update set ZIP file.
- Extract the contents of the ZIP file to a temporary folder, e.g. C:\MyTemp.

  Other files (e.g. release rotes) shall not be stored in these directories. These files would be copied on harddisk and may cause a disk full problem on drive E:.
- Now copy the content of the temporary folder including all sub folders to a USB stick.
- The USB stick is now ready to for performing the update.



Following extension's sub folder are used for the instrument's applications:

- K5
- K10
- K30
- K40
- K70
- K72 (includes K73, K74, K74+)
- K76 (includes K77)
- K82 (includes K83)
- K84 (includes K85)
- K90 (includes K91)
- K92 (includes K93, K94)
- K100 (includes K101, K104, K105)
- K110

Performing the firmware update on the instrument

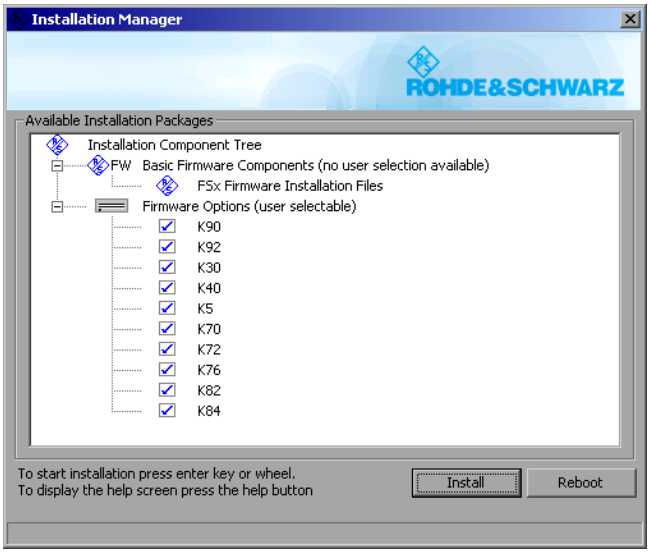
A new method to install the base system and all required applications is available, if the installed base system firmware is V4.15 or newer. For updating to version 4.15 or newer first update the bases system only to get the new update manager. Then update the base system and all applications using the new update manager.

Base System Update from version < 4.15 to 4.15 or newer:
Skip this step, if the installed base system firmware is V4.15 or newer. The firmware update process is performed in the following steps:

- Switch the instrument on and wait until the Analyzer has resumed operation.
- Use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH softkey to specify any path for the location of the disk directory (e.g. F:\MyTemp).
- Press SETUP → NEXT → FIRMWARE UPDATE
- Confirm the query "Do you really want to update the firmware?" with OK
- Confirm the copy process.
- The instrument will perform several automatic shutdowns, until the new base system firmware is installed properly.
  Do not switch the instrument off until the update process has been finished completely.

Complete Update with update manager:
- Use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH softkey to specify any path for the location of the disk directory (e.g. F:\MyTemp).
- Press SETUP → NEXT → FIRMWARE UPDATE
- Confirm the query "Do you really want to update the firmware?" with OK

The *Installation Manager* will terminate the analyzer application, search for available application update set and will show a selection list.



- Deselect applications, not to be installed and start the installation process with INSTALL. REBOOT will abort the update and restart the analyzer application without any changes.
- The instrument will perform several automatic shutdowns, until the new firmware and all applications are installed properly.

  Do not switch the instrument off until the update process has been finished completely.

After a successful firmware update it is necessary to execute the instument's self alignment process by pressing CAL and softkey CAL TOTAL.

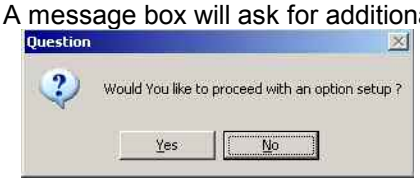
Known Issues during Firmware Update

Firmware update with FSQ-B18/19 (Removable Harddisk):

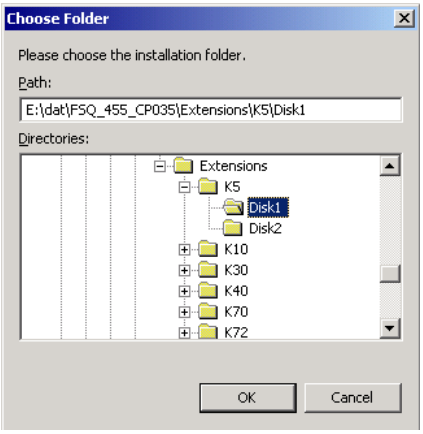
- At the final step of the setup, backup files are stored for the 'Analyzer Firmware Backup' (option during the start-up of the instrument). This backup is only available for analyzers equipped with hard disks. Therefore an error message "Add folder icon failed" occurs twice if the options FSU-B18/B19/B20 are installed.
  Workaround: Accept that message via the 'OK' button twice. The firmware update will continue without any problem! -> This problem is solved with version 3.55 or later.

- A message box

  is opened during firmware update and the update process is aborted.
  The disk space required for the installation process exceeds the disk space available with option FSQ-B18/19.
  Workaround: Perform the update by following steps in that case:
  - Switch the instrument on with an external keyboard/mouse connected.
  - Close the analyzer application by pressing "ALT F4".
  - Open the Windows Explorer
  - Remove folder **D:\R_S.fw\restore** and all sub folders.
  - Select the disk1 sub folder of the base system's update set to be installed.
  - Start SETUP.EXE (of sub folder DISK1).
    The installation of the base system is now started.
    A message box will ask for additional applications to be installed:



  - Confirm with YES. Setup will now be restarted to install the next application.
  - Now select sub folder EXTENSIONS/K5/DISK1and press "OK" to install K5.



  - Repeat the previous two steps ("YES" for "proceed with an option setup" and selection of DISK1 of the next application) for the applications K10, K30, K40, K70, K72, K76, K82, K84, K90, K92, K100 and K110.
  - After installation of K110 the dialog "proceed with an option setup" has to be answered with NO. In case of a wrong selection please reselect K110\disk1 again and use "NO" next time.

The setup procedure will now finish the installation process.

Note: The restore of the previously installed firmware version is not possible due to limited disk space.

Messagebox: Can't open front panel driver, errorcode=0x2

For some constellations this messagebox occurs after the last reboot of the device. In that case:

- Switch the instrument off by pressing the ON/standby switch at the front panel.
- Switch the power off at the rear panel.
- Wait until the Standby LED on the front panel turns from yellow to black (off).
- Switch the power on at the rear panel.
- Switch the instrument on by pressing the ON/standby switch at the front panel.

If the message box still appears, connect an external keyboard and select the "Instrument Driver Actuator" from the Windows Start Menu.

Automatic FSQ-B100 Hardware Configuration update may request for user action.

If a changed hardware configuration file is detected in the FSQ-B100 board, the board will be reprogrammed during reboot after firmware update. A window requestinq a shutdown will be displayed in that case. The following list shows the bases system firmware and the related B100 configuration file version:

Firmware Version	B100 HW Configuration Version
V3.95, V3.95, V3.95 SP2 V4.05, V4.05 SP1, V4.05 SP2	V3.08
V4.15, V4.15 SP2, V4.15 SP3	V3.09
V4.25, V4.25 SP1	V3.29
V4.35, V4.35 SP1, V4.45, V4.45 SP1	V3.34
V4.45 SP2	V3.36
V4.55	V3.39
V4.55 SP1, V4.55 SP2 V4.65, V4.65 SP1, V4.65 SP2, V4.65 SP3	V3.36

Warning: Due to the requested user action there will be a problem for remote updates if a changed B100 configuration file is detected.

Firmware installation of the R&S FS-K7 FM demodulator, R&S FS-K8 BLUETOOTH Analyzer software, R&S FS-K15 VOR/ILS Avionics Measurements Application and R&S FS-K9 Power Sensor Measurement

The R&S FS-K7, R&S FS-K8, R&S FS-K9 and R&S FS-K15 application software package are included in the basic instrument firmware. It therefore needs no separate firmware update procedure.

Enabling these options via option key code entry

This section can be skipped if the option key was entered once.
For activation of these application software packages a license key for validation must be entered. The license key is printed either on a label on the rear panel of the R&S FSQ or delivered as a part of the software package.
The key sequence for entering the license key for every option is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

Use the numeric keypad to input the option key number and press ENTER.

- On a successful validation the message "option key valid" will appear.
- If the validation failed, the option software is not installed.

Compatibility to other Firmware Option Packages

The following firmware option packages are available with their own disks and they can be installed separately. Please refer to their release notes.

R&S FSQ V4.65 SP3 is compatible to the following firmware option releases:

R&S FS-K5	R&S FS-K10	R&S FS-K30	R&S FS-K40	R&S FSQ-K70	R&S FS-K72 FS-K73 FS-K74 FS-K74+	R&S FS-K76 FS-K77
4.60	4.61	4.60 SP2	4.60	4.60	4.61	4.60

R&S FS-K82 FS-K83	R&S FS-K84 FS-K85	R&S FSQ-K90 FSQ-K91	R&S FSQ-K92 FSQ-K93 FSQ-K94	R&S FSQ-K100 FSQ-K101 FSQ-K104 FSQ-K105	R&S FSQ-K110
4.60 SP1	4.60	4.62 SP1	4.61	4.61 SP1	4.61

Hint:
Applications with the version number 3.xx / 4.xx are only compatible with basic firmware 3.yy / 4.yy (see table above).
Do not install application firmware with versions 1.xx or 2.xx on an R&S FSQ with basic firmware 3.yy or 4.yy!

New Functions in Version 4.65

- **Auto Login Password for user INSTRUMENT is changed to "894129" for security reasons**
- **Support for Noise Correction outside of ACP measurement**
- **Multi Carrier ACP with up to 18 TX Channels**
- **Multi Carrier ACP: Support for save/recall of user defined standards**
- **Spurious Emissions Measurement: Support for save/recall of user defined standards**
- **SEM measurement: Supports for save/recall of user defined standards**
- **SEM measurement: Ref Level dialog available to adjust the sweep list's level settings**
- **SEM measurement: Additional WIMAX configuration files available for Downlink ETSI (5MHz / 10MHz)**
- **Extended Marker Peak List function includes automatic peak list update**
- **FS-K7: New Fundamental Frequency AUTO/MANUAL setting for SINAD and THD measurement**
- **FS-K9: Indication of the power meter's serial number**
- **Resolution Bandwidth 6.25 kHz supported (with Service Pack 2)**
- **FS-K9: Support for Power Sensor NRP-Z86 available (with Service Pack 2).**
- **PSA / 89600 Emulation available (with Service Pack 2)**
- **Support for the Status Operation Register Bits MEASuring/SWEeping (with Service Pack 2)**

Improvements

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. (V4.55) Option Key "FS-K5 Upgrade" does not enable the option FS-K10.
Note: This issue is already fixed in V4.55 SP1

2. (V4.55 SP1) Option Key disabled after reboot.
The option key was manually enabled in the SETUP – GENERAL SETUP – OPTIONS list. After reboot of the instrument, the option is disabled again.
Note: This issue is already fixed in V4.55 SP2

3. (V4.45) The remote command "MMEM:DATA" ignores the default folder, set by "MMEM:CDIR".
The following command sequence should store data in the file 'filenname' in folder d:\user\settings:

```
MMEM:MDIR 'd:\\user\\settings'
MMEM:CDIR 'd:\\user\\settings';*opc?
MMEM:DATA 'filename',#<Blockdaten>
```

The file is created in folder "d:\r_s.fw\instr" instead. The command to change the path had no effect.
Using a filename with path included, works fine, e.g.
MMEM:DATA 'd:\\user\\settings\\filename',#<Blockdaten>.
Note: This issue is already fixed in V4.55 SP2

4. (V4.55 SP1) The operating hour is set to 100.000 hours.
Note: This issue is already fixed in V4.55 SP2

5. (V4.55 SP1) Spurious Signal at 758.12 MHz eliminated (with Center Frequency 620 MHz).
The spurious appears with a Center Frequency of 620 MHz, a Resolution Bandwidth of 50 kHz, a Video Bandwidth of 300 kHz, a Sweeptime of 5 sec and 10001 Sweep Points.
Note: This issue is already fixed in V4.55 SP2

6. (V4.55) Capturing I/Q data with a Sample Rate above 81.6MHz and Analog Baseband Input does not work if the number of samples is above 16 MSamples (with option R&S FSQ-B100/B102).

Note: This issue is already fixed in V4.55 SP2

7. (V4.45) Switching back to the internal LCD display does not work if the single display "MONITOR" is configured during power on and no external monitor is connected.
This problem only occurs for certain display revisions. Press SETUP –SYSTEM INFO – HW INFO. The HWC in line FSQ indicates 01 if this display revision is installed.
Note: This issue is already fixed in V4.55 SP2

8. (V4.55) ACP Measurement: Wrong power measurement values are displayed if the recall of a save set with active noise correction is performed and the noise correction is switched off afterwards.
Note: This issue is already fixed in V4.55 SP2

9. (V4.55) ACP Measurement: Wrong unit indication for absolute power results with more than 3 adjacent channels
The measured ACP powers are indicated with unit dB instead of unit dBm, if following settings are used:
- CP/ACP ABS
- Number of Adjacent Channels > 3

The numerical results are not affected.

10. (V4.55)Spurious Emission Measurement: The electronic attenuator is not switched off
The Spurious Emission Measurment configuration does not support the electronic attenuator (FSU-B25) but is not automatically switched off. This is now corrected.

11. (V4.55)SEM Measurement: The required Number of Sweep Points is not set.
The follow configuration files for EUTRA/LTE Uplink needs 30001 sweep points to be set:
- BW_01_4_MHz.xml
- BW_03_0_MHz.xml
- BW_05_0_MHz.xml

The number of sweep points is no automatically adjusted to this value. This has now been corrected.
Note: The number of sweep points is not set to it's previous value if the SEM measurement is switched off or another SEM standard file is loaded.

12. (V4.55)Gated Statstics Measruement: Waring "Gate periode exceeds I/Q capture time" is indicated.
The validation of the gate settings range is now corrected and the size of the available statistics I/Q capture buffer is increased.

13. (V4.55)FSP-B10: The analyzer application crashes if the external tracking generator is switched on, the Gated Sweep is active and the Gate Adjust softkey is pressed.
Note: This issue is already fixed in V4.55 SP2

14. (V4.55) FSP-B10: Wrong limitation of the maximum number of sweep points using TTL interface.
E.g. a SMA100 supports up to 2000 as the maximum number of sweep points using TTL interface for External Generator Option. The analyzer application erroneously allows 2001 points in that case due to a rounding problem.

15. (V4.55)FSP-B10: SMF does not go to LOCAL state after being used as external tracking generator.

16. (V4.55)FSQ-B17: Wrong maximum number of Samples for TRACE:IQ sub system and Digital Baseband Input.
Note: This issue is already fixed in V4.55 SP1

17. (V4.55) FSQ-B17: Instrument firmare locks up using Digital Baseband Input with a connected Ex-IQ-Box.

Note: This issue is already fixed in V4.55 SP2

18. (V4.55) FSQ-B17: The remote command to configure the digital input sample rate does not automatically switch the AUTO SET mode of this parameter to OFF.

Note: This issue is already fixed in V4.55 SP2

19. (V4.55) FSQ-B17: The Level Auto Adjust functions are available with Digital Base Band input.

Note: This issue is already fixed in V4.55 SP2

20. (V4.55) FSU-B21: Wrong state indication for CVL table usage after recall.

After recall of a save set with external mixer on and conversion loss table (CVL) active, the band table does not indicate the usage of the CVL table. But the correction values of the CVL table are taken into account.

21. (V4.55) FSQ-B72: The self-alignment procedure for FSQ-B72 is changed to avoid an internal overload condition.

22. (V4.45) FS-K7: The analyzer application crashes if MC Phase measurement is active and traces are read via remote control with certain combinations of instrument settings.

Note: This issue is already fixed in V4.55 SP2

23. (V4.55) FS-K7: Wrong X Scaling indication (grid and marker) using Digital Baseband Input and result RF Spectrum.

Improvements with Service Pack 1

Service Pack 1 corrects the following issues. The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. (V4.65) Noise Correction: Setting the TRACE mode to VIEW deactivates the noise correction.

2. (V4.65) A frequency domain sweep does not terminate.

This issue may happen for certain combinations of Center Freqency, Span, Resolution Bandwidth, Video Bandwidth and Sweeptime and is now fixed.

3. (V4.65) FSQ-K70: Modulation Accuracy – FSK DEV ERROR Peak evaluation does not ignore the sign of the current value.

As a result negative values are not correctly taken into account.

Improvements with Service Pack 2

Service Pack 2 corrects the following issues. All previous service packs are included.

1. (V4.35) Marker Function Reference Fixed can not be switched off.

It is not possible to switch off the marker function REFERENCE FIXED after follwing order of key strokes:

- MARKER – REFERENCE FIXED (activates Reference Fixed)
- MKR FCTN – NOISE MEAS (activates Noise Marker)
- MKR FCTN – NOISE MEAS (de activates Noise Marker)

2. (V4.65) The Option Key (de)activation state change is lost after reboot.

Once installed, it is possible to enable/disable an option key in dialog SETUP – GENERAL SETUP - OPTIONS. A reboot is required for a few options. The message box "The system must be rebooted to effect

the changes. Reboot now?" will be indicated in that case. With versions 4.65/4.65 SP1 the state change will get lost after reboot.

Improvements with Service Pack 3

Service Pack 3 corrects the following issues. All previous service packs are included.

1. (V4.65 SP2) A measurement in frequency domain does not reach the end of sweep for certain instrument settings:
- **Filter Type FFT**
- **large Number of Sweep Points (e.g. 30001)**
- **small Bandwidth (e.g. 100 Hz)**
- **large Span (above 3 GHz)**

2. (V4.65 SP2) Reduced execution speed for Center Frequency/Span changes if a lot of transducer set files exist on the instruments harddisk,

3. (V4.65 SP2) B10: A GPIB address change for the external signal generator is ignored.
The analyzer application is using the previous address until the external source is switch off and on again.

4. (V4.65 SP1) FSQ-B71: The softkey LOW PASS 36 MHz of menu SETUP – SIGNAL SOURCE – ANALOG BASEBAND is not visible.

5. (V4.65 SP2) FS-K5: An IF Overload condition is indicated after performing the Level & Time Auto Adjust with certain EDGE signals.

6. (V4.55) FS-K8: Some results in EDR Spurious Emissions measurement do not include the Reference Level Offset.

Known Issues

This chapter includes firmware problems related to the basic instrument firmware.

For issues related to option packages R&S FS-Kxx please refer to the corresponding release notes of the individual option package.

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. (V3.15) Wrong SELECT ITEMS TO SAVE/RECALL selection names with FSQ-K90/91 installed.
For option FSQ-K90/K91 (WLAN), it is possible to select FSQ-K90/K91 specific items to save or recall:
- WLAN Results
- WLAN IQ Data
- WLAN User Limits

2. (V3.45) The recall of data sets, saved with version 2.35, does not work.

3. (V4.45) The Network Configuration dialogs (menu SETUP – GENERAL SETUP – CONFIGURE NETWORK) seem to lock up if no LAN is connected.
A timeout of 60s is effective in some cases if no LAN is connected to the instrument and therefore the firmware seems to lock up.
Work around: Connect the instrument to a local network before modification of the LAN configuration.

4. (V4.45) FSQ-B17: Continuous Digital Baseband output data stream is halted after configuration of the EX IQ Box.

The analyzer stops to send digital baseband data to the R&S B17 output (MEAS - IQ MODE switched on and DIG IQ OUTSTREAM active) and the Ex-IQ-Box configuration is changed after activation of the Digital IQ Output Stream.

Work around: Reactivate the IQ MODE and the DIG IQ OUTSTREAM by pressing the related softkeys after leaving the EXIQ configuration dialog.

5. (V4.45) FSQ-B17: The EX-IQ-Box is not recognized when connected during firmware update.

Work around: Disconnect and reconnect the USB cable of the EX-IQ-Box.

6. (V4.55) FSQ-B17 with Ex-IQ-Box: Sample Rate AUTO SET does not work for Logic Type SSI.

The DUTs I/Q data sample rate depends on the SSI clock signal from the Device under Test and therefore the Ex-IQ-Box is not able to transfer the Digital Input Sample Rate to the analyzer.

Work around: Do not use the default AUTO SET mode and configure the Digital Input Sample Rate to the input data rate (e.g. menu SETUP – SIGNAL SOURCE – DIGITAL IN SAMPLE RATE).

7. (V4.55) FSQ-B17 with Ex-IQ-Box: No additional warning is indicated to update the EX-IQ-Box firmware.

Firmware 4.55 SP1 includes a new Ex-IQ-Box firmware (00-00-13-155). An update of the Ex-IQ-Box firmware to this version is required. This is indicated only by an enabled softkey FIRMWARE UPDATE of the EX-IQ-Box configuration menu. No additional warning is visible.

Work around: Check the softkey FIRMWARE UPDATE of menu EX-IQ-BOX and perform the update if the softkey is enabled. The EX-IQ-Box has to be connected to the instrument before.

8. (V4.65) FSQ-B17: **Capturing I/Q data with the Digital Baseband Input does not work if the number of samples is above 16 MSamples (with option R&S FSQ-B100/B102).**

Work around: Decrease the capture length.

9. (V4.65 SP2) A reduced display update speed occurs in remote operation for certain application changes if the display update is switched on.

Changing from mobile applications K5/K7x/K8x to K10/K9x/K10x several times leads to a reduced display update speed in remote operation if the display update is switched on ("SYST:DISP:UPD ON"). The manual operation is not affected.

Work around: Switch back to analyzer before activation of the next application.

Example:

```
*RST;:SYST:DISP:UPD ON
INST:SEL BWCD                    ' activate K72
… do some measurements in K72
INST:SEL SAN                     ' back to analyzer first, before entering K40 as
                                 ' a work around

INST:SEL PNO                     'activate K40
… do some measurements in K40
INST:SEL SAN                     ' back to analyzer
```

Modified Functions

The version numbers in brackets indicate the version in which the function was modified.

1. (V3.15) Hardcopy screen comment changed to one comment, not one per screen

2. (V3.35) Change to SMR setting files for external generator control:
This change enables significant improvements in frequency settling with logarithmic frequency step sizes.

3. (V3.45) Active transducer and adjust reference level procedure:
If transducers are active and the adjust reference level procedure (in measurements like ACP, occupied bandwidth, signal statistics, etc.) is invoked, the *REFLVL ADJ AUTO/MANUAL* of the SETUP|TRANSDUCER menu is set to AUTO thus the best dynamic performance is obtained.

4. (V3.55) External reference frequency is not any longer changeable via knob wheel to prevent changing that value by chance.

5. (V3.55 SP2) Spurious Emissions measurement - Limit check uses weaker limit.
When a limit line is defined in steps, the weaker limit is used at the frequency point with the straight vertical section.

6. (V3.65) Marker peak list in continuous sweep mode.
In continuous sweep mode the marker peak list is not any longer executing a single sweep and then peak list search, but the peak list will immediately work on the current trace. This allows peak list functionality on averaged or max holded traces in continuous sweep mode. The single sweep mode is unchanged.

7. (V3.65 SP2) Dithering disabled for I/Q measurement in extended bandwidth mode.
The internal dither signal is switched off for I/Q data measurement (TRACE:IQ sub-system) and sample rates between 20.4 MHz and 40.8 MHz, if filter flatness WIDE is selected (TRAC:IQ:FILT:FLAT WIDE).

8. (V3.65) RS232 serial remote control commands added.
Since version 3.65 the instrument goes in remote mode rather than in local mode when a command is send through the RS232 remote interface. This means the display disappears and the LOCAL softkey appears as when the GPIB bus is used. To change between local and remote mode the commands @LOC and @REM can be sent to the instrument.

9. (V3.65) FFT Analyzer Mode for option FSQ-B71 is available.

10. (V3.65) VXI-11 channel is supported to remote control the instrument.

11. (V3.75) Harmonic measurement
The mixer level within the harmonic measurement is changed to -10 dBm.
The value update in the lower screen happens during the sweep and not only at sweep end.

12. (V3.75) TRACE:IQ - Lower limit for sample rate is now 400 Hz.

13. (V3.75) RF Attenuation setting unchanged when switching to baseband input.

14. (V3.85) Modifications to HP commands
- Command IP resets format to O3
- Reading a trace with TRA; TRB or TRC is possible even if trace is blank
- Great changes of span (e.g. from 2GHz to 100 kHz) will not loose signal when marker track is on
- The R&S FSQ has now a mixer level of -10dBm instead of -25dBm

15. (V3.85) new available remote control commands
SENS:CORR:CVL:CAT?
SENS:LIST:RANG:COUN?

16. (V3.85) FSQ-B71 Digital Down Converter available for Baseband Input.
The R&S FSQ-B71 Option (baseband input) is capable of mixing signals from low carrier frequencies (e.g. low IF signals) towards baseband.

17. (V3.85) FSQ-B71 FFT Analyzer: Trace Average Mode changed from LOG to LIN.
In FFT analyzer mode the Trace Average Mode can now be independently configured. The default setting is LIN. In previous versions, the setting of the analyzer mode (default LOG) was used.

18. (V3.95) CCDF measurement result table extended with 0.01% value.

19. (V3.95) New marker functions AUTO MAX PEAK and AUTO MIN PEAK.

20. (V3.95) HP emulation: HP Models 71100C, 71200C and 71209A are using 800 sweep points

21. (V4.05) Additional number of sweep points 201, 401, 801 and 1601.

22. (V4.05) HP emulation: Additional HP Models 8568A_DC and 8568B_DC using DC coupling.

23. (V4.05) HP emulation: GENERAL SETTINGS - GPIB menu extended by IF GAIN NORM / PULS.

24. (V4.05) The new spurious emissions measurement LIST EVALUATION is available.

25. (V4.05) FS-K7: The THD Unit is selectable (dB / %) in the AM signal / AF spectrum result.

26. (V4.05) New function MARKER FILE EXPORT.

27. (V4.05) FFT Analyzer: New trigger modes I LEVEL, Q LEVEL.

28. (V4.05) Signal Track: Enhanced sensitivity in marker tracking function.
The marker is now set to the signal peak after very single sweep. This only occurred in earlier versions if the difference between signal peak and center frequency exceeded 20 % of the Resolution Bandwidth.

29. (V4.05 SP1) HP emulation: Behaviour of KSK and MKPK changed in single sweep mode.
The commands KSK (next peak) and MKPK NH|NL|NR (next high, next left, next right) do not perform a new sweep in single sweep mode.

30. (V4.05 SP2) IF SHIFT B, additional shift for resolution bandwidth < 200 kHz.

31. (V4.15) Improved Firmware Update.

32. (V4.15) New enhancement label to indicate filter type.

3DB	Gauss filter 3dB
6DB	EMI filter 6dB
FFT	FFT filter
CHN	Channel filter
RRC	RRC filter

33. (V4.15) Gated statistics measurements APD, CCDF.

34. (V4.15) FS-K8 Enhanced Data Rate (EDR) supported.

35. (V4.15) Support for Power Sensor NRP-Z81 is available.

36. (V4.15) GPIB: Basic remote control of the signal generator which is connected to the additional FSP-B10 GPIB Interface.

37. (V4.15) GPIB: SCPI format for binary block data extended for byte counts > 999.999.999 bytes.

38. (V4.15) GPIB: New commands available

:[SENSe<1|2>:]CORRection:TRANsducer:ACTive?	returns active transducer
:CALCulate<1|2>:LIMit<1...8>:ACTive?	returns active limit line(s)

39. (V4.15) Trigger Line for video trigger is now also visible outside of the trigger menu.

40. (V4.15) Support for FSQ-K100/K101 is available.

41. (V4.15) Extended resolution for the number of sweep points.
In addition to currently allowed values an increment of 100 is possible now for number of points ≥ 201.

42. (V4.15) Support for FSQ-B17 Digital Baseband Output available.

43. (V4.15) HP emulation: The OL command returns the mixer level in byte 23.

44. (V4.15) HP emulation: The commands MKPK NH | NL | NR and KSK do not perform a sweep start when marker is already switched on.

45. (V4.15) HP emulation: The commands SNGLS and CONTS are setting the command complete bit (bit 4) in STB.

46. (V4.15) HP emulation: New softkey SETUP - GENERAL SETUP - GPIB - SWEEP REP ON/OFF".

47. (V4.15) HP emulation: New commands: VARDEF, CTA, ADD, SUB, MPY, DIV.

48. (V4.15) HP emulation: New command NORMLIZE for tracking generator.

49. (V4.15) HP emulation: The command LF performs a reset.

50. (V4.15) LXI Class C support.

51. (V4.15SP1) New CPU Board 1091.3104 supported.

52. (V4.25) New Save/Recall menu and dialogs available.

53. (V4.25) Easy access to Windows XP Start menu is available.

54. (V4.25) The required sweeptime is reduced for video bandwidth < resolution bandwidth.

55. (V4.25) ASCII Export function is available for Marker Peak List.

56. (V4.25) Adjustable marker position knob stepsize is available.

57. (V4.25) New trace average function Power is available.

58. (V4.25) HP emulation: Personality Spurious supported.

59. (V4.25) HP emulation: Personality Phase Noise supported.

60. (V4.25) FSP-B10: Upper frequency limit of SMF100A is now 43.5 GHz .

61. (V4.25) The Aquisition Time (for FFT filter) is now readable with remote command "SENS:SWE:TIME?".

62. (V4.25) Automatic FSQ-B100 Hardware Configuration update.
If an old hardware configuration file is detected in the FSQ-B100 board, the board will be reprogrammed during reboot after firmware update. A window requestinq a shutdown will be displayed in that case.
Warning: Due to the requested user action there will be a problem for remote updates if a new B100 configuration file is detected.

63. (V4.25 SP1) For local lockout the alias remote command SYSTem:KLOCk ON | OFF is provided.

64. (V4.25 SP1) Function TRACe:IQ:FILTer NORMal | WIDE changed.
Since version 4.25 SP1 the extension of the filter flatness is possible for the sample rate range 10.2 MHz < sample rate ≤ 20.4 MHz.

65. (V4.25 SP1) FSP-B10: Support for SMA100, SMB100 (1/2/3/6GHz), SMF (22/43GHz) SMJ (3/6GHz).

66. (V4.25 SP1) FSP-B10: Support for SMF100a - TTL mode.

67. (V4.25 SP1) FSU-B21 with Order Number 1157.1126.03 supported.

68. (V4.35) International keyboard driver package supported (German, Spanish, French, Italian and Portuguese).

69. (V4.35) New Filter Type 5-POLE DIGITAL supported for Analyzer Mode.

70. (V4.35) ACP: Extended upper limits for Channel Bandwidth (5 GHz) and Channel Spacing (20 GHz).

71. (V4.35) ACP: Overlapping Adjacent Channels allowed now for parallel measurements.

It is now possible to configure overlapping adjacent channels. Based on a common carrier channel setting, it is now possible to measure with two slitely different ADJ channel settings with one measurement.

Example: TX Channel / TX Bandwidth (common for both measurement A and B)
ADJ used for measurement A
ALT1 used for measurement A

ALT2 used as ADJ for measurement B
ALT3 used as ALT1 for measurement B

72. (V4.35) ACP: Result output format changed for number of ADJ channels > 3.

73. (V4.35) Additional soft keys are available to change the LAN configuration.

74. (V4.35) Save dialog reports a warning, if no item to save is selected.

75. (V4.35) The increment behaviour of the step keys for parameter SWEEP POINTS is changed.
The behaviour of the knob wheel still has the highest possible resolution.

76. (V4.35) Dummy Video Bandwidt 0 Hz returned for active FFT filter.

77. (V4.35) Availability changed for Spurious Measurement.
The Spurious Measurement is not available if the ACP measurement is active.

78. (V4.35) Remote: TRACE:IQ: Extended I/Q Sample Rate range for FSQ-B72 (400 MHz) and FSQ-B71 (200 MHz)

79. (V4.35) HP emulation: Additional remote commands are supported.
The following commands are supported: ML, MEAS, SUM, LIMIPURGE, EDITLIML, LIMIREL, SDEL, SADD, LIMF, LIMU, LIML, LIMM, LIMD, LIMTFL, LIMTSL, SDON, EDITDONE, LIMISAV, LIMIRCL, LIMITEST, LIMIFAIL

80. (V4.35) HP emulation: A new softkey COUPLING FSP/HP is now available to change the Span/RBW and RBW/VBW default coupling.

81. (V4.35) HP emulation: The default for Sweep Repeate is now OFF for 856x and 859x.

82. (V4.35) FSU-B9: The number of sweep points allowed in analyzer mode is now supported in NETWORK mode, too.

83. (V4.35) FSQ-B17: Digital Baseband Input supports resampling for TRACE:IQ sub system.

84. (V4.35) FSQ-B17: R&S Ex-IQ-Box Control provided.

85. (V4.35) FS-K7: New measurement function MC PHASE RESPONSE.

86. (V4.35) FS-K7 and FSQ-K70: Digital Baseband Input supported.

87. (V4.35) FS-K7: Deemphasis is now additionally supported for active Weighting AF Filter CCTTT and CCIR.

88. (V4.35) Support added for new option VOR/ILS Avionics Measurements Application R&S FS-K15.

89. (V4.35) Support added for new option 3GPP HSPA+ Application Firmware R&S FS-K74+.

90. (V4.35) Support added for option FSQ-K91n.

91. (V4.35) Application Setup Recovery restores previous settings after application exit.

92. (V4.35) Support added for option FSQ-K94.

93. (V4.45) Configurable Spectrum Emission Mask measurement is available in analyzer mode.

94. (V4.45) ACP measurement: User definable standards available.

95. (V4.45) ACP measurement: New standards for E-UTRA / LTE.

96. (V4.45) External Reference: Selectable PLL bandwidth and new "Fall Back to Internal" mode EXT [INT].

97. (V4.45) TOI Measurement: New TOI marker search function added (TOI MKR CALC/SRCH).

98. (V4.45) Additional overload indication OVTRC is available.

99. (V4.45) Auto Login Password changed for user instrument to "123456".
It is now possible to enter the password after remote desktop connection by the front panel.

100. (V4.45) General Setup: Baudrate 19200 for the serial COM interface is now selectable.

101. (V4.45) Harmonic Measurement: Additional remote command to get the used resolution bandwidth settings:
CALCulate1:MARKer1:FUNCtion:HARMonics:BANDwidth[:LIST]?

102. (V4.45) FS-K9: Support for Power Sensors NRP-Z56, NRP-Z57 and NRP-Z92.

103. (V4.45) FSP-B10: Support for SMBV100a, SMA100a and SMB (TTL mode).

104. (V4.45) Support for FS-K73+.

105. (V4.45) Additional support for options R&S FSQ-K100, K101, K102, K104, K105, K106 (E-UTRA / LTE) (as external or internal application).

106. (V4.45) HP emulation
- command OL expanded
- no difference between local and remote sweep points

107. (V4.45) HP emulation for 8560E, 8561E, 8562E, 8563E, 8564E, 8565E
- Spurious Measurement: threshold line is take into account for calculating of resolution bandwidth and noise level, message box “RBW/VBW coupling adjusted” suppressed
- Harmonic Measurement: modified algorithm for finding harmonics
- Phase Noise Measurement: some minor adjustments
- Support of 4 markers
- Corrections of RBW calculation if FFT-Filter is switched on
- Command MKNOISE, MKTRACK: correction of return value
- Sweep time adjusted for gated sweep (command GATE)

108. (V4.45) HP emulation for 8566A/B, 8568A/B
- Support of 4 markers

109. (V4.45) HP emulation for 8591E, 8594E
- sweep time adjusted for gated sweep (command GATE)

110. (V4.45 SP1) Support for new option FS-K110 TETRA II.

111. (V4.45 SP1) Support for new board revisions of Wideband Detector Unit, Bandwidth Extension (FSQ-B72) and I/Q Memory Extension (FSQ-B100/B102).

The presence of these boards can be checked by pressing *SETUP – SYSTEM INFO – HARDWARE*. A certain bit of the hardware code, listed in column *HWC* indicates the new board revision:

WBDET (Wideband Detector Board)	**with HWC Bit 1 = 1** *)
Bandwidth Ext (FSQ-B72)	**with HWC Bit 0 = 1** **)
IQ_MEM_EXT (FSQ-B100/B102)	**with HWC Bit 0 = 1** **)

*) **HWC value divided by 2 is odd.**
) **HWC value is odd.

Warning: A backgrade to earlier firmware versions is not possible in the following cases:
- New Bandwidth Ext (FSQ-B72) **and/or** new IQ_MEM_EXT (FSQ-B100/B102).
- New WBDET **and** Digital Baseband Input/Output (FSQ-B17) is installed.

112. (V4.45 SP2) Support for new GSM/EDGE/EDGE Evolution Measurement Application R&S FS-K10.

113. (V4.55) New functions to temporary disable/enable option license keys.

114. (V4.55) New remote command "SYSTem:SHUTdown" to shutdown the instrument.

115. (V4.55) New Status Bit for Overload Trace (OVTRC) in the STATus:QUEStionable:POWer Register.

116. (V4.55) New function EXPORT/IMPORT DEV DATA to export and import device specific data (e.g. option licence keys).

117. (V4.55) New Channel Filter 7.5 kHz available.

118. (V4.55) ACP/Multi Carrier ACP with selectable Weighting Filter for TX, ACP and ALT channels supported.

Since version 4.5x the following remote commands to not ignore the numeric suffix at CHAN or ALT accordingly.

SENS:POW:ACH:FILT:STAT:CHAN<1 to 12>
SENS:POW:ACH:FILT:STAT:ALT<1 to 11>
SENS:POW:ACH:FILT:ALPH:CHAN<1 to 12>
SENS:POW:ACH:FILT:ALPH:ALT<1 to 11>

119. (V4.55) Occupied Bandwidth measurement: New command ":CALC:MARK:FUNC:POW:RES? AOB | AOBW" returns the position and level of marker T1 and T2.

120. (V4.55) Transducer: New function VIEW TRANSDUCER available

121. (V4.55) Trace Export: Additional ASCII File entries "Preamplifier" and "Transducer"

122. (V4.55) HP emulation: New command "SER?" available to query the serial number

123. (V4.55) New "Instrument Driver Actuator" in the Windows Start menu

124. (V4.55) FSQ-B17: Remote command ":OUTPut<1|2>:DIQ[:STATe]" is only available now with TRACE:IQ:STAT ON.

125. (V4.55) FSQ-B17: The softkey DIG OUT ON/OFF is visible in several applications without being fully supported.

The generation of a continuous digital baseband output stream is only supported using the I/Q Measurement mode (menu MEAS – IQ MODE, remote sub system TRACE:IQ). But the softkey DIG OUT ON/OFF was available in other operationg modes as well (e.g. K7, K70).

126. (V4.55) FSU-B21: Import of conversion loss tables from USB stick supported.

127. (V4.55) FSQ-B71: FFT Analyzer: I – Q Phase Difference Measurement / Frequency Domain available.

128. (V4.55) FS-K7: Maximum Meas Time increased by factor 8 for instruments with a system memory size of ≥ 1GByte.

129. (V4.55) FS-K8: EDR Spuriuos: Remote Control read access allowed for Span, Start- and Stopfrequency.

130. (V4.55) Gated Statistics Measurement: Additional settings checks added (e.g. if the period time does not fit to the I/Q capture length).

131. (V4.55) Direct Ex-IQ-Box Configuration Dialog access via SETUP – SIGNAL SOURCE.

The remote command "INST:SEL EXIQ", required in earlier versions to configure the EX-IQ-Box, is ignored.

132. (V4.55) New sub menus available for signal path dependent softkeys with options FSQ-B17 (Digital Baseband) and FSQ-B71 (Analog Baseband).

133. (V4.55) LXI Class C Support is now integral part of the base system firmware.

134. (V4.55SP2) It is possible now to read the current marker count state with remote command "CALC:MARK:COUN:STAT?" even if it is not possible to activate the marker count function.

135. (V4.55SP2) Ex-IQ-Box: The Word Alignment Default has been modified from MSB to LSB.

This change allows to connect an Ex-IQ-Box 1409.5505.02 (with 20 bit) to an Ex-IQ-Box 1409.5505K04 (with 18 bit) using the new default settings.

136. (V4.65) Auto Login Password for user INSTRUMENT is changed to "894129" for security reasons.

137. (V4.65) CONFIGURE NETWORK: An error message pops up if no LAN cable is connected.
"NOT CONNECTED" is now visible.

138. (V4.65) Support for Noise Correction outside of ACP measurement .

139. (V4.65) Multi Carrier ACP: Number of TX channels increased from 12 to 18.

140. (V4.65) Multi Carrier ACP: Support for save/recall of user defined standards.

141. (V4.65) SEM measurement: Supports for save/recall of user defined standards.

142. (V4.65) SEM Measurement: Required Number of Sweep Points is not set.
The follow configuration for EUTRA/LTE Uplink needs 30001 sweep points to be set.
- BW_01_4_MHz.xml
- BW_03_0_MHz.xml
- BW_05_0_MHz.xml

The number of sweep points is no automatically adjusted to this value.
Note: The number of sweep points is not set to it's previous value if the SEM measurement is switched off or another SEM standard file is loaded.

143. (V4.65) SEM measurement: Ref Level dialog available to adjust the sweep list's level settings.

144. (V4.65) SEM measurement: Additional WIMAX configuration files available for DL ETSI (5MHz / 10MHz).

145. (V4.65) Extended Marker Peak List function including automatic peak list update.

146. (V4.65) FFT Analyzer: Indication of the Phase Offset for Freq. Domain - MAGNITUDE/PHASE.

147. (V4.65) HP emulation: new commands available
- Command SYSTem:REVision[:STRing] <new REV? response> to modify the response for the remote command REV?
- Command SYSTem:REVision:FACTory to select the default response for the remote command REV?
- Plotter commands PA, PD and PU

148. (V4.65) FS-K7: New Fundamental Frequency AUTO/MANUAL setting for SINAD and THD measurement.

149. (V4.65) FS-K9: Indication of the power meter's serial number.

150. (V4.65SP1) New function REGISTRY READ ONLY supported.

151. (V4.65 SP1) Support for new board revisions of Wideband Detector Unit.
The presence of these boards can be checked by pressing *SETUP – SYSTEM INFO – HARDWARE*. A certain bit of the hardware code, listed in column *HWC* indicates the new board revision:

WBDET (Wideband Detector Board) with HWC Bit 2 = 1 *)

*) **HWC value divided by 4 is odd.**

Warning: A backgrade to earlier firmware versions is not possible in that case.

152. (V4.65SP2) Resolution Bandwidth 6.25 kHz supported.
Hint: The resolution bandwidth calculation with RBW AUTO ON (span coupling) may now result in a slightly different bandwidth setting compared to previous version for certain span ranges.

153. (V4.65SP2) FS-K9: Support for Power Sensor NRP-Z86 available.

154. (V4.65SP2) PSA / 89600 Emulation available.

155. (V4.65SP2) Support for the Status Operation Register Bits MEASuring/SWEeping.

Modifications to the Operating Manual

The order numbers for the manual set is:

Operating Manual "Signal Analyzer FSQ3/8/26/40":

- 1155.5047.11-09 (German) and
- 1155.5047.12-09 (English).

The corresponding PDF-Files are separately available on the service board.

Last minute changes to the operating manual

Manual Operation

Quick Start Guide – Login

Windows XP requires that users identify themselves by entering a user name and password in a login window. The instrument provides a factory-installed auto login function, i.e. login is carried out automatically in the background. The ID used for auto login has administrator rights. As user name *instrument* (lowercase) is set. The valid password depends on the firmware version installed.

User:	"instrument"	(lower case)	
Password:	"instrument"	(lower case)	< V4.45
	"123456"		V4.45, V4.55
	"894129"		≥ V4.65

Note: The default password is modified by performing a firmware upgrade. A backgrade to an older firmware version will not restore the old password as it is not known to this firmware version. A password differing from the default value will not be modified during firmware update.

Quick Start Guide – Operating System Properties – Special Links

The windows start menu includes following special links

- "*Instrument Driver Actuator*"

  This link forces Windows XP to reload all instrument specific drivers.
  Use this link if a new hardware is not recognized or a problem with the frontpanel keyboard is reported.

- "*LXI Configuration*"

  This link opens a dialog to enable/disable LXI.

- "*R&S Analyzer Interface*"

  This link starts the analyzer application.

- "*Start – Program – Accessories – Sytem Tools – Activate Registry Readonly*"

  This link activates function REGISTRY READONLY. Handle this function with care!

  This function is only available if the Registry Write Filter package is installed. The installation package is available for Windows XP SP2 or SP3.

  More details see chapter SETUP – GENERAL SETUP.

- "*Start – Program – Accessories – Sytem Tools – Dectivate Registry Readonly*"

  This link deactivates function REGISTRY READONLY.

  This function is only available if the Registry Write Filter package is installed. The installation package is available for Windows XP SP2 or SP3.

  More details see chapter SETUP – GENERAL SETUP.

Menu SETUP – GENERAL SETUP - NEXT

REGISTRY READ ONLY

The softkey *REGISTRY READ ONLY* activates/deactivates a write protection for the Windows XP registry. Any modification in the windows registry is cashed into RAM and will get lost after reboot if *REGISTRY READ ONLY* is active.

This function is only available if the Registry Write Filter package is installed. The installation package is available for Windows XP SP2 or SP3.

The active write protection is also indicated in dialog SETUP – SYSTEM INFO – STATISTICS.

Hint: In addition, it is possible to deactivate/activate the function with the following links: *Start – Programs – Accessories – System Tools*
Activate Registry Readonly
Deactivate Registry Readonly

Warning: Do not perform any firmware/driver installation if the REGISTRY READONLY function is active! This will result in an incomplete installation.

Remote command: ---

Remote Control – Description of the Status Registers

STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last reading. It can be read using commands "`STATus:OPERation:CONDition?`" or "`STATus:OPERation[:EVENt]?`".

Bit No.	Meaning
0	**CALibrating** This bit is set as long as the instrument is performing a calibration.
1 to 2	These bits are not used
3	**SWEeping** This bit is set while the instrument performs a sweep. It is supported in analyzer mode only (Full Screen, frequency domain and time domain).
4	**MEASuring** This bit is set while the instrument performs a measurement. It is supported in analyzer mode only (Full Screen, frequency domain and time domain).
5 to 7	These bits are not used
8	**HardCOPy in progress** This bit is set while the instrument is printing a hardcopy.
9	This bit is not used
10	**Sweep Break** This bit is set when end of sweep range is reached (spurious measurement, mode analyzer). Command “INIT:CONM” has to be used to proceed.
11 to 14	These bits are not used
15	This bit is always 0

Remote Control – Description of Commands

TRACe subsystem

:TRACe<1|2>:DATA TRACE1 | TRACE2 | TRACE3 | LIST | SPURious | ABITstream | PWCDp | CTABle, <block> | <numeric_value>

This command transfers trace data from the control computer to the instrument, the query reads trace data out of the instrument.
The numeric suffix at TRACe<1|2> selects the measurement window.

Parameter: **TRACE1** to **TRACE3** selects trace 1 to 3.

LIST reads the peak list in the spurious measurement LIST EVALUATION (for details on this measurement see page 220) or in the spectrum emission mask measurement.
The suffix at TRACe<1|2> is irrelevant.
As results a list of <result of range 1>,< result of range 2>,..< result of range n> are returned.
Every single range has following format:
<No>,<Start>,<Stop>,<rbw>,<freq>,<Levelabs>,<Levelrel>,<Delta>,<Limitcheck>, <unused1>,<unused2>
Where:

No	Range number
Start Range	start frequency
Stop Range	stop frequency
Rbw	Resolution bandwidth
Freq	Frequency of the peak in the range
Levelabs	Absolute peak power of the range in dBm
Levelrel	Reserved (0.0)
Delta	Delta of the peak power to the limit line in dB
Limitcheck	Limit check state (0 = PASSED, 1 = FAILED)
Unused1	Reserved (0.0)
Unused2	Reserved (0.0)

These values are defined via the [SENSe<1|2>:]LIST:RANGe<1...20> subsystem (spurious measurement) or the [SENSe<1|2>:]ESPectrum:RANGe<1...20> subsystem (spectrum emission mask measurement).

SPURious reads the peak list in the spurious measurement. As results a list of frequency, level and delta to limit line values is returned. A delta limit of +200dB indicates no limit check is active.

ABITstream reads the bit streams of all 15 slots one after another.

PWCDp can be set for base station tests only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Trace 1. The pilot length is transmitted in addition to the same five values as transmitted for TRACE1. The pilot length is specified in symbols. Six values are transmitted for each assigned channel: <class>,<channel number>,<absolute level>,<relative level>,<timing offset> (R&S FS-K72) or <I/Q mapping> (R&S FS-K73), <pilot length>,...
The pilot length is specified in bit.

CATABle can be set only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Trace 1. The same data as for TRACE1 are output. In addition, the pilot length as the 6th value and active/inactive (1/0) as the 7th value are output for option R&S FS-K72. With option R&S FS-K73, active/inactive (1/0) is output as the 6th value. For R&S FS-K72 seven values are transmitted for each assigned channel: <class>,<channel number>,<absolute level>,<relative level>,<timing offset>, <pilot length>,<active/inactive>,...
R&S FS-K73 six values are transmitted for each assigned channel:

<class>,<channel number>,<absolute level>,<relative level>, <IQ mapping>,<active/inactive>,...

Return value: The returned values are scaled in the current level unit. Returned FM-modulated measurement values (activated option R&S FS-K7) are scaled in Hz.

Example: "TRAC TRACE1,"+A$ (A$: data list in the current format)
"TRAC? TRACE1"

Characteristics: *RST-Wert:
SCPI: conforming

PSA Emulation with commands especially for the Agilent 89600 Software

Supported 89600 commands	Status
*CAL?	available in V4.65 SP2 and above
*CLS	available in V4.65 SP2 and above
*ESE	available in V4.65 SP2 and above
*ESR?	available in V4.65 SP2 and above
*IDN?	available in V4.65 SP2 and above
*IST?	available in V4.65 SP2 and above
*OPC	available in V4.65 SP2 and above
*OPT?	available in V4.65 SP2 and above
*PCB	available in V4.65 SP2 and above
*PRE	available in V4.65 SP2 and above
*PSC	available in V4.65 SP2 and above
*RST	available in V4.65 SP2 and above
*SRE	available in V4.65 SP2 and above
*STB?	available in V4.65 SP2 and above
*TRG	available in V4.65 SP2 and above
*TST?	available in V4.65 SP2 and above
*WAI	available in V4.65 SP2 and above
:CALibration:AUTO OFF|ON|ALERt	available in V4.65 SP2 and above
:CALibration:TCORrections AUTO|ON|OFF	available in V4.65 SP2 and

Supported 89600 commands	Status
	above
:CONFigure:WAVeform	available in V4.65 SP2 and above
:DIAGnostic:EABY ON|OFF	available in V4.65 SP2 and above
:DIAGnostic:LATCh:VALue <numeric>	available in V4.65 SP2 and above
:DIAGnostic:LATCh:SELect <string>	available in V4.65 SP2 and above
:DISPlay:ANNotation:TITLe:DATA <string>	available in V4.65 SP2 and above
:DISPlay:ENABle OFF|ON	available in V4.65 SP2 and above
:DISPlay:WINDow:TRACe:Y:[SCALe]:PDIVision <numeric>	available in V4.65 SP2 and above
:DISPlay:WINDow:TRACe:Y:[SCALe]:RLEVel <numeric>	available in V4.65 SP2 and above
:DISPlay:WINDow:TRACe:Y:[SCALe]:RLEVel:OFFSet <numeric>	available in V4.65 SP2 and above
:FORMat:BORDer NORMal|SWAPped	available in V4.65 SP2 and above
:FORMat[:DATA] ASCii|REAL|UINT|MATLAB,<numeric>	available in V4.65 SP2 and above
:INITiate:CONTinuous OFF|ON	available in V4.65 SP2 and above
:INITiate[:IMMediate]	available in V4.65 SP2 and above
:INSTrument:CATalog?	available in V4.65 SP2 and above
:INSTrument:NSELect <numeric>	available in V4.65 SP2 and above
:MMEMory:CATalog? <dir_name>	available in V4.65 SP2 and above
:MMEMory:COPY <'file_name1'>,<'file_name2'>	available in V4.65 SP2 and above
:MMEMory:DATA <'file_name'>,<definite_length_block>	available in V4.65 SP2 and above
:MMEMory:DELete <'file_name'>	available in V4.65 SP2 and above
:MMEMory:LOAD:STATe 1,<'file_name'>	available in V4.65 SP2 and above
:MMEMory:LOAD:TRACe 1,<'file_name'>	available in V4.65 SP2 and above
:MMEMory:MDIRectory <'dir_name'>	available in V4.65 SP2 and above
:MMEMory:MOVE <'file_name1'>,<'file_name2'>	available in V4.65 SP2 and above
:MMEMory:STORe:STATe 1,<'file_name'>	available in V4.65 SP2 and above
:MMEMory:STORe:TRACe <numeric>,<'file_name'>	available in V4.65 SP2 and above
:READ:WAVform?	available in V4.65 SP2 and above

Supported 89600 commands	Status
[:SENSe]:FREQuency:CENTer <numeric>	available in V4.65 SP2 and above
[:SENSe]:FREQuency:STARt <numeric>	available in V4.65 SP2 and above
[:SENSe]:FREQuency:STOP <numeric>	available in V4.65 SP2 and above
[:SENSe]:FREQuency:SPAN <numeric>	available in V4.65 SP2 and above
[:SENSe]:POWer:ATTenuation <numeric>	available in V4.65 SP2 and above
[:SENSe]:ROSCillator:EXTernal:FREQuency <numeric>	available in V4.65 SP2 and above
[:SENSe]:ROSCillator:OUTPut OFF|ON	available in V4.65 SP2 and above
[:SENSe]:ROSCillator:SOURce INTernal|EXTernal|EAUTo	available in V4.65 SP2 and above
[:SENSe]:SPECtrum:TRIGger:SOURce EXTernal<1|2>|IF|IMMediate	available in V4.65 SP2 and above
[:SENSe]:WAVeform:ADC:RANGe P6	available in V4.65 SP2 and above
[:SENSe]:WAVeform:APER?	available in V4.65 SP2 and above
[:SENSe]:WAVeform:AVERage:TACount <numeric>	available in V4.65 SP2 and above
[:SENSe]:WAVeform:BWIDth:ACTive?	available in V4.65 SP2 and above
[:SENSe]:WAVeform:BWIDth:TYPE FLAT|GAUSsian	available in V4.65 SP2 and above
[:SENSe]:WAVeform:IFGain <numeric>	available in V4.65 SP2 and above
[:SENSe]:WAVeform:IFPath NARRow|WIDE	available in V4.65 SP2 and above
[:SENSe]:WAVeform:NCPTrace ON|OFF	available in V4.65 SP2 and above
[:SENSe]:WAVeform:PDIT ON|OFF	available in V4.65 SP2 and above
[:SENSe]:WAVeform:SRATe <numeric>	available in V4.65 SP2 and above
[:SENSe]:WAVeform:SWEep:TIME <numeric>	available in V4.65 SP2 and above
[:SENSe]:WAVeform:TRIGger:EOFFset?	available in V4.65 SP2 and above
[:SENSe]:WAVeform:TRIGger:INTerpolation ON|OFF	available in V4.65 SP2 and above
[:SENSe]:WAVeform:TRIGger:SOURce EXTernal<1|2>|IF|IMMediate	available in V4.65 SP2 and above
:STATus:QUEStionable:CONDition?	available in V4.65 SP2 and above
:STATus:QUEStionable:ENABle <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:NTRansition <number>	available in V4.65 SP2 and above

Supported 89600 commands	Status
:STATus:QUEStionable:PTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable[:EVENt]?	available in V4.65 SP2 and above
:STATus:QUEStionable:CALibration:CONDition?	available in V4.65 SP2 and above
:STATus:QUEStionable:CALibration:ENABle <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:CALibration:NTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:CALibration:PTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:CALibration[:EVENt]?	available in V4.65 SP2 and above
:STATus:QUEStionable:FREQuency:CONDition?	available in V4.65 SP2 and above
:STATus:QUEStionable:FREQuency:ENABle <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:FREQuency:NTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:FREQuency:PTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:FREQuency[:EVENt]?	available in V4.65 SP2 and above
:STATus:QUEStionable:INTegrity:CONDition?	available in V4.65 SP2 and above
:STATus:QUEStionable:INTegrity:ENABle <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:INTegrity:NTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:INTegrity:PTRansition <number>	available in V4.65 SP2 and above
:STATus:QUEStionable:INTegrity[:EVENt]?	available in V4.65 SP2 and above
:STATus:OPERation:CONDition?	available in V4.65 SP2 and above
:STATus:OPERation:ENABle <integer>	available in V4.65 SP2 and above
:STATus:OPERation:NTRansition <integer>	available in V4.65 SP2 and above
:STATus:OPERation:PTRansition <integer>	available in V4.65 SP2 and above
:STATus:OPERation[:EVENt]?	available in V4.65 SP2 and above
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <integer>	available in V4.65 SP2 and above
:SYSTem:DATE <year>,<month>,<day>	available in V4.65 SP2 and above
:SYSTem:ERRor[:NEXT]?	available in V4.65 SP2 and above
:SYSTem:KLOCK?	available in V4.65 SP2 and above

Supported 89600 commands	Status
:SYSTem:MESSage <string>	available in V4.65 SP2 and above
:SYSTem:PRESet	available in V4.65 SP2 and above
:SYSTem:TIME <hour>,<minute>,<second>	available in V4.65 SP2 and above
:SYSTem:VERSion?	available in V4.65 SP2 and above
:TRACe:COPY <src_trace>,<dest_trace>	available in V4.65 SP2 and above
:TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, <definite_length_block> | <comma_separated_ASCII_data>	available in V4.65 SP2 and above
:TRACe:MODE WRITe|MAXHold|MINHold|VIEW|BLANk	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:DELay <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:DELay:STATe OFF|ON|0|1	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:EXTermal:DELay <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:EXTermal:LEVel <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:EXTermal:SLOPe POSitive|NEGative	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:HOLDoff <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:IF:DELay <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:IF:LEVel <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:IF:SLOPe POSitive|NEGative	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:SLOPe POSitive|NEGative	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:SOURce IMMediate|VIDeo|EXTernal<1|2>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:VIDeo:LEVel <numeric>	available in V4.65 SP2 and above
:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency <freq>	available in V4.65 SP2 and above

R&S FS-K7 Extensions

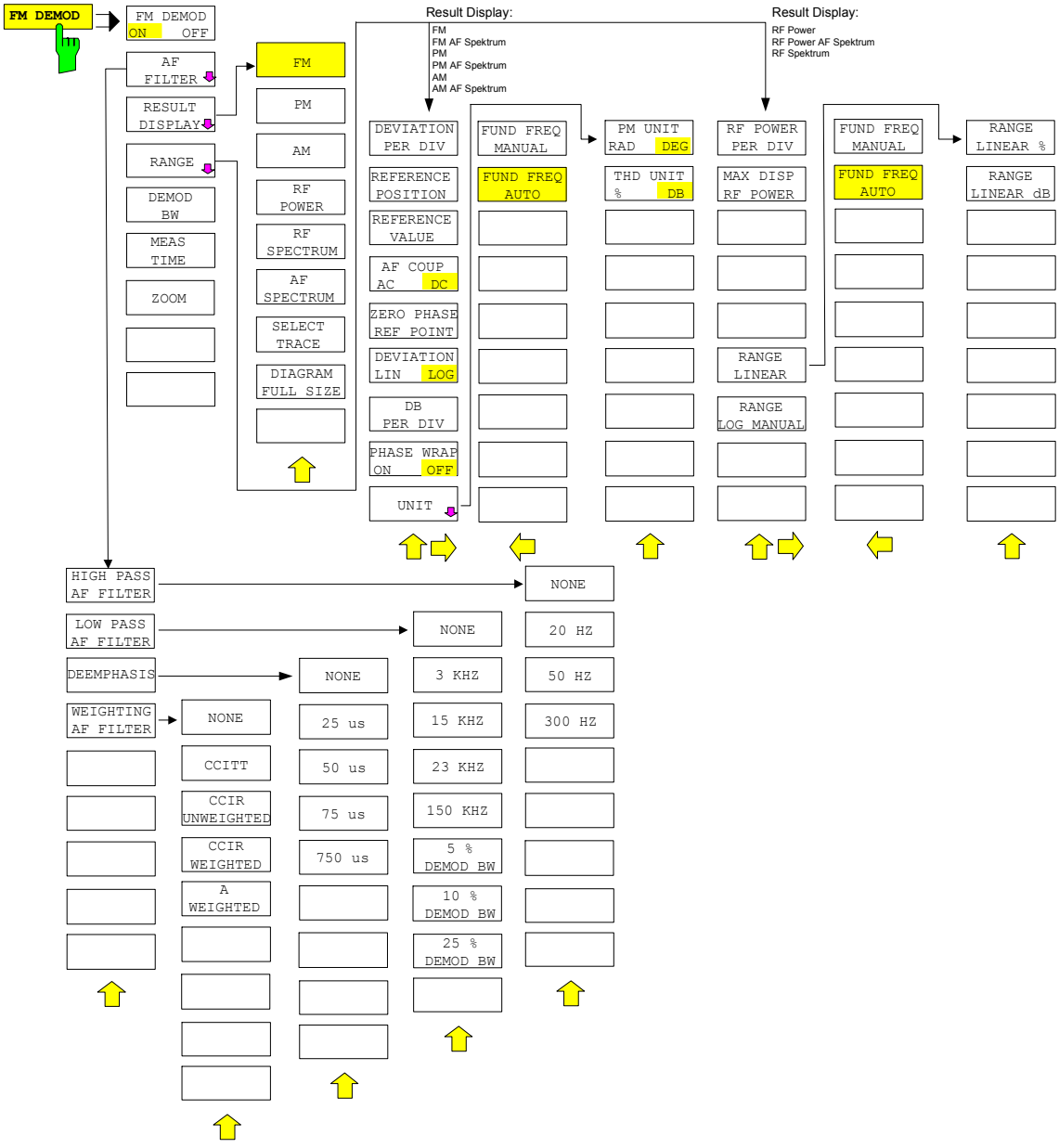
Operating Manual "FM Measurement Demodulator R&S FS-K7":

- 1141.1821.42-06 (English). and
- 1141.1821.41-06 (German)

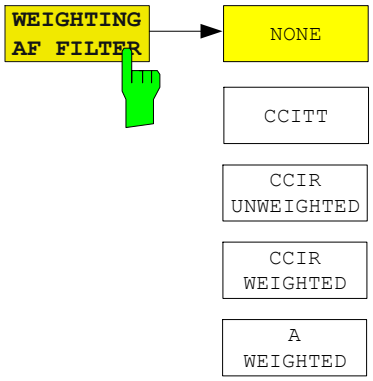
The corresponding PDF-Files are separately available on the service board.

Last minute changes to the R&S FS-K7 operating manual

FM Demodulator Main Menu



Selection of Filter and Deemphasis – AF FILTER Menu



The *WEIGHTING AF FILTER softkey* opens the submenu for selecting the weighting filter.

NONE: Deactivates the weighting filter. This is the default setting.

CCITT: Switches on a CCIT P.53 weighting filter. The weighting filter is active in the following demodulation bandwidth range:

20 kHz ≤ demodulation bandwidth ≤ 3 MHz

CCIR UNWEIGHTED: Switches on the CCIR unweighted filter, which is the combination of the 20 Hz highpass and 23 kHz low pass filter. The weighting filter is active in the following demodulation bandwidth range:

50 kHz ≤ demodulation bandwidth ≤ 1.6 MHz

CCIR WEIGHTED: Switches on the CCIR weighted filter. The weighting filter is active in the following demodulation bandwidth range:

100 kHz ≤ demodulation bandwidth ≤ 3 MHz

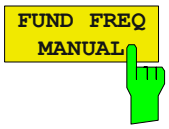
A WEIGHTED: Switches on the A weighted filter. The weighting filter is active in the following demodulation bandwidth range:

100 kHz ≤ demodulation bandwidth ≤ 800 kHz

Remote commands:

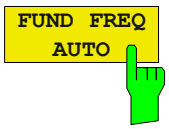
```
:SENSe:FILTer:CCIR[:UNWeighted][:STATe] ON | OFF
:SENSe:FILTer:CCIR:WEIGhted[:STATe] ON | OFF
:SENSe:FILTer:CCITt[:STATe] ON | OFF
:SENSe:FILTer:AWEighted[:STATe] ON | OFF
```

Menu RANGE – NEXT



The *FUND FREQ MANUAL / FUND FREQ AUTO* softkeys switches between automatic or manual selection of the fundamental frequency used for the SINAD and THD calculations. With automatic selection the peak in the AF spectrum is used as the fundamental frequency.

When switching from AUTO to MANUAL the current modulation frequency result is used as a default if the measurement result is available at this time.



These softkeys are available, if result *AF SPECTRUM* is switched on.

Remote commands:

```
:CALC:ADEM:THD:FREQ:FUND:AUTO ON | OFF
:CALC:ADEM:THD:FREQ:FUND:VALue <numeric value>
```

CALCulate<1|2>:ADEMod:THD:FREQuency:FUNDamental:AUTO[:STATe] ON | OFF

This command switches between automatic or manual selection of the fundamental frequency used for the SINAD and THD calculations. With automatic selection the peak in the AF spectrum is used as the fundamental frequency.

When switching the auto state off, the current modulation frequency result is used as a default for CALC:ADEM:THD:FREQ if the measurement result is available at this time.

This command is available, if Result *AF SPECTRUM* is switched on.

Example:
```
"CALC:ADEM:THD:FREQ:FUND:AUTO OFF"    ' deactivates the auto se
                                      ' lection and uses the
                                      ' current Modulation Freq.
                                      ' as fundamental frequency.
"CALC:ADEM:THD:FREQ:FUND:VAL 1kHz"    ' set the fundamental
                                      ' frequency.
```

Characteristics: *RST-Wert: ON
SCPI: device-specific

CALCulate<1|2>:ADEMod:THD:FREQuency:FUNDamental:VALue ON | OFF

This command sets the fundamental frequency used for the SINAD and THD calculations.

The query command is available only with "CALC:ADEM:THD:FREQ:FUND:AUTO OFF".

Example:
```
"CALC:ADEM:THD:FREQ:FUND:AUTO OFF"    ' deactivates the auto se
                                      ' lection and uses the
                                      ' current Modulation Freq.
                                      ' as fundamental frequency.
```

Characteristics: *RST-Wert: ON
SCPI: device-specific

The numeric suffix <1 to 4> at marker is irrelevant with this command.

:SENSe<1|2>:FILTer:AWeighted[:STATe] ON | OFF

This command activates/deactivates the A weighted filter. The weighting filter is active in the following demodulation bandwidth range:
100 kHz ≤ demodulation bandwidth ≤ 800 kHz

Example:
```
":SENS:FILT:AW ON"                    ' activates the A weighted filter
```

Characteristics: *RST-Wert: OFF
SCPI: device-specific

The numeric suffix <1|2> is irrelevant with this command.

:SENSe<1|2>:FILTer:CCIR[:UNWeighted][:STATe] ON | OFF

This command activates/deactivates the CCIR unweighted filter which is the combination of the 20 Hz highpass and 23 kHz low pass filter. The filter is active in the following demodulation bandwidth range:
50 kHz ≤ demodulation bandwidth ≤ 1.6 MHz

Example:
```
"SENS:FILT:CCIR ON"                   ' activates the unweighted CCIR filter
```

Characteristics: *RST-Wert: OFF
SCPI: device-specific

The numeric suffix <1|2> is irrelevant with this command.

:SENSe<1|2>:FILTer:CCIR:WEIGhted[:STATe] ON | OFF

This command activates/deactivates the CCIR weighted filter. The filter is active in the following demodulation bandwidth range:

100 kHz ≤ demodulation bandwidth ≤ 3 MHz

Example: "SENS:FILT:CCIR:WEIG ON" ' activates the weighted CCIR filter

Characteristics: *RST-Wert: OFF
SCPI: device-specific

The numeric suffix <1|2> is irrelevant with this command.

R&S FS-K8 Extensions

Operating Manual "Application Firmware for Bluetooth Measurements R&S FS-K8":

- 1157.2597.42-03 (English). and
- 1157.2597.41-03 (German)

The corresponding PDF-Files are separately available on the service board.

Last minute changes to the R&S FS-K8 operating manual

None.

R&S FS-K9 Extensions

In addition to the normal function of *MEAS->REF* and *REFERENCE VALUE* softkeys the unit of the power sensor display is changed from the absolut unit dBm or Watt to the relative unit dB or %. Use the *UNIT/SCALE* key if absolute units are required again.

Software Manual "Measurements with Power Sensors, Application Firmware R&S FS-K9":

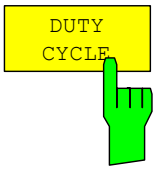
- 1157.3029.42-04 (English). and
- 1157.3029.44-04 (German)

The corresponding PDF-Files are separately available on the service board.

Last minute changes to the R&S FS-K9 operating manual

None.

Menu PWR METER - NEXT

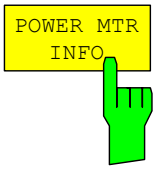


The DUTY CYCLE softkey opens a dialog to set the duty cycle to a percent value for the correction of pulsemodulated signals. With the correction activated, the sensor calculates the signal pulse power from this value and the mean power. The softkey is highlighted if the correction is switched on.
Press the softkey again to switch the Duty Cycle correction off.

Valid entries are from 0.001 % to 99.999%; the stepsize is 0.1 %; the maximum resolution for numerial entries is 0.001 dB. The default setting is 99.999%

Remote command:

SENSe1:PMETer:DCYCle:STATe ON | OFF
SENSe1:PMETer:DCYCle: VALue 0.001 … 99.999 PCT



The POWER MTR INFO softkey open a list showing details of the power sensor:

POWER METER INFO	
Type	NRP-Z11
Serial Number	100057
Order Number	1138.3004.02

Remote command: -

:[SENSe<1|2>:]PMETer:DCYCle:STATe ON | OFF

This command controls the calculation of the signal pulse power from the mean power. The duty cycle has to be set by SENS:PMET:DCYC:VAL according to characteristics of the input signal if the calculation is switched on.

Example:
```
":SENS:PMET:STAT ON"          ' activate power meter
":SENS:PMET:DCYC:STAT ON"     ' switch the correction on
":SENS:PMET:DCYC:VAL 50.0"    ' set the duty cycle to 50 %
```

Properties:
*RST value: OFF
SCPI: device-specific

:[SENSe<1|2>:]PMETer:DCYCle:VALue 0.001 … 99.999

This command sets the duty cycle to a percent value for the correction of pulsemodulated signals. With the correction activated (SENS:PMET:DCYC:STAT ON), the sensor calculates the signal pulse power from this value and the mean power. Valid entries are from 0.001% to 99.999%; the stepsize is 0.1%; the maximum resolution for numerial entries is 0.001%. The default setting is 99.999%

Example:
```
":SENS:PMET:STAT ON"          ' activate power meter
":SENS:PMET:DCYC:STAT ON"     ' switch the correction on
":SENS:PMET:DCYC:VAL 50.0"    ' set the duty cycle to 50 %
```

Properties:
*RST value: 99.999 PCT
SCPI: device-specific

R&S FS-K15 Extensions

The R&S FS-K15 VOR/ILS Avionics Measurements Application functions are included in a separate manual set. Please refer to the following order numbers:

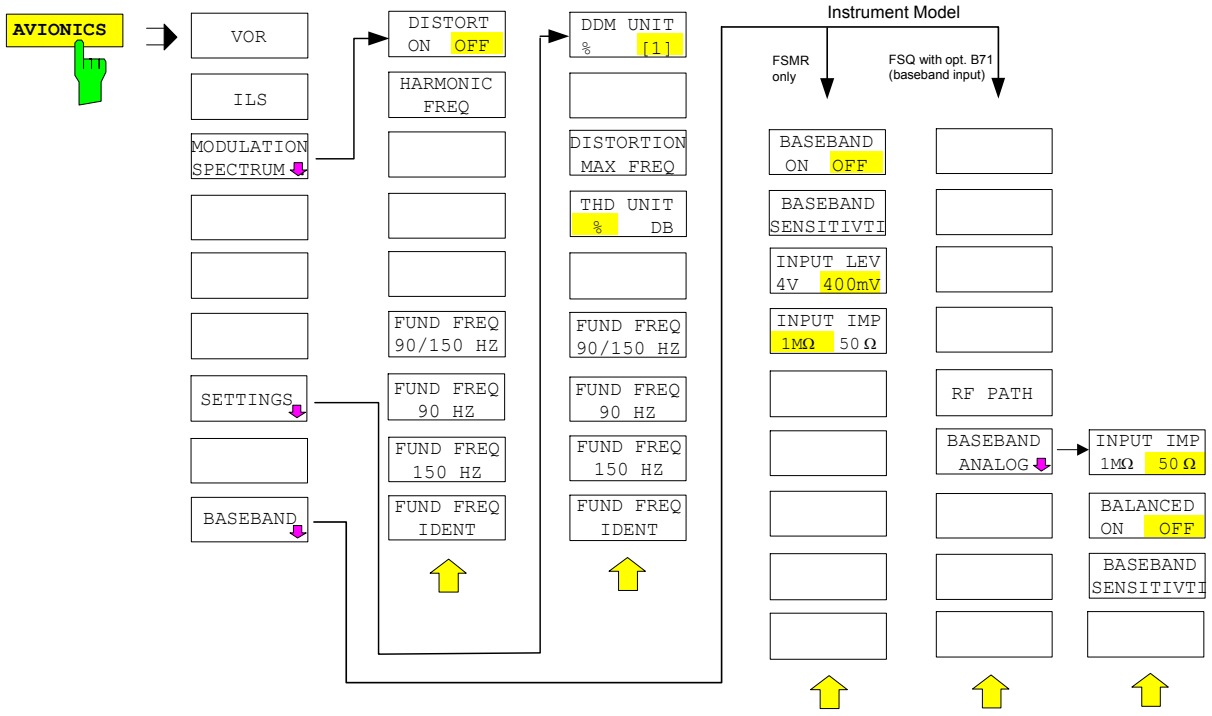
Operating Manual "VOR/ILS Avionics Measurements Application Firmware R&S FS-K15":

- 1302.0942.42-02 (English)

The corresponding PDF-File ist separately available on the service board.

Last minute changes to the R&S FS-K15 operating manual

Avionics Demodulator Mode



All FSQ baseband specific softkeys are moved to a separate sub menu.

R&S FSQ-B71 Extensions

Last minute changes to the operating manual "Analog Baseband Input R&S FSQ-B71"

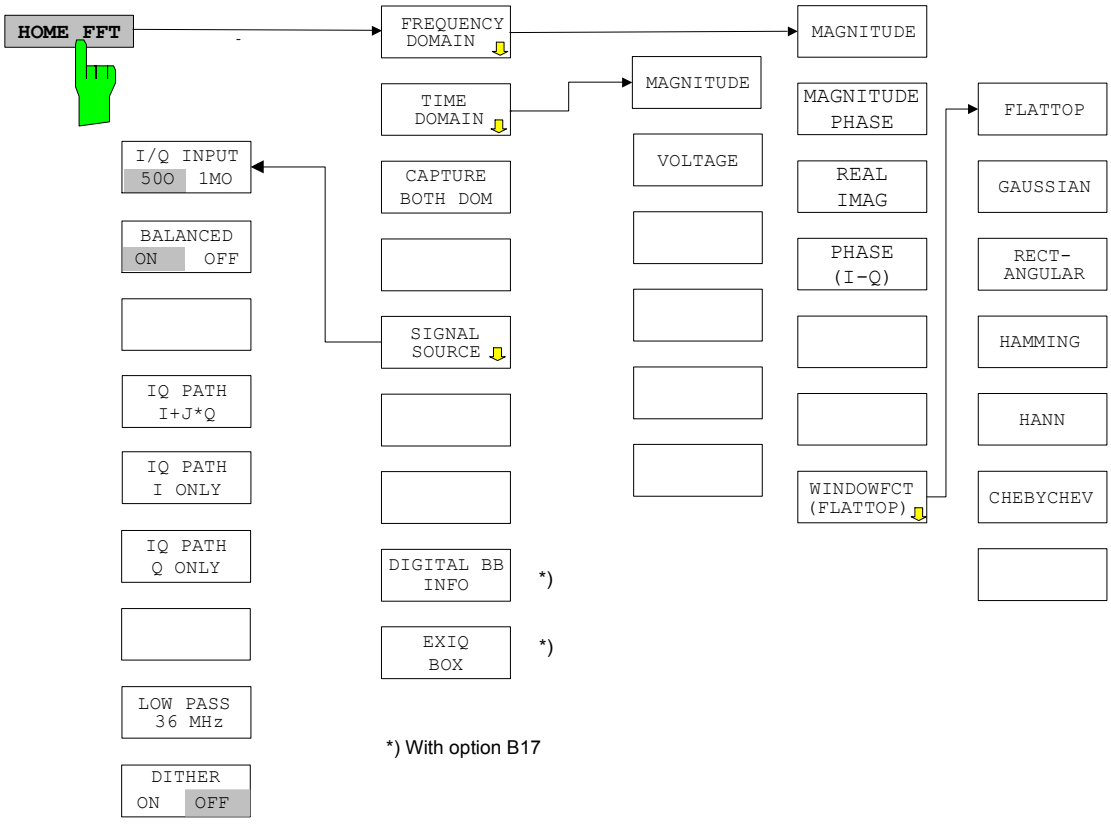
The order numbers for the manual set is:

Operating Manual "Analog Baseband Input R&S FSQ-B71":

- 1157.0220.52-03 (English). and
- 1157.0220.54-03 (German)

The corresponding PDF-Files are separately available on the service board.

Overview of menus



*) With option B17

Menu SETUP – SIGNAL SOURCE - NEXT

SETUP	SIGNAL SOURCE ⇩	YIG FILTER ON OFF	
		RF PATH	
		BASEBAND ANALOG ⇩	I/Q INPUT 50Ω / 1MΩ
			BALANCED ON / OFF
			IQ PATH I+j*Q
			IQ PATH I ONLY
			IQ PATH Q ONLY
			LOW PASS 36 MHz
			DITHER ON / OFF
		BASEBAND DIGITAL ⇩	
		DIGITAL BB INFO	
		EX-IQ-Box	

RF PATH

The softkey RF PATH selects the RF Input Path of the analyzer. This softkey is not available for the FFT analyzer mode.

Note: This softkey is only available with option FSQ-B17 or FSQ-B71.

Remote command: INPut<1|2>:SELect AIQ | DIQ | RF

BASEBAND ANALOG

The softkey BASEBAND ANALOG opens a menu to configure the analog baseband input.

Note: This softkey is only available with option R&S FSQ-B71. Refer to the R&S FSQ-B71 Manual for more details.

Remote command: INPut<1|2>:SELect AIQ | DIQ | RF

BASEBAND DIGITAL

The softkey BASEBAND DIGITAL opens a menu to configure the digital baseband input.

Note: This softkey is only available with option R&S FSQ-B17. Refer to the R&S FSQ-B17 Manual for more details.

DIGITAL BB INFO

The softkey DIGITAL BB INFO opens a window to display the status information of the connected digital baseband device (input or output).

Note: This softkey is only available with option R&S FSQ-B17. Refer to the R&S FSQ-B17 Manual for more details.

EXIQ BOX

The softkey opens a dialog to configure an R&S EX-IQ-Box connected to the digital baseband Input or Output.

Note: This softkey is only available with option R&S FSQ-B17. Refer to the R&S FSQ-B17 Manual for more details.

Digital Down Converter for low carrier frequency using Baseband Inputs

The R&S FSQ-B71 Option (baseband input) is capable of mixing signals from low carrier frequencies (e.g. low IF signals) towards baseband. The allowd center frequency range is -35 MHz to +35 MHz. Both real-valued and complex-valued signals are supported.
The baseband signal is sampled, mixed from desired center frequency towards baseband and resampled towards the desired sample rate (cf. R&S FSQ-B71 functional description).

Limitation of center frequency range depending on signal bandwidth:
Center frequency and sample rate are adjustable independently, though there are some restrictions to take care of:
The lower limit of the center frequency depends on the sideband suppression that is needed for a particular measurement application. To avoid overlap of the two sidebands of a real-valued signal, the theoretical lower limit of the intermediate frequency is **half the signal bandwidth**.

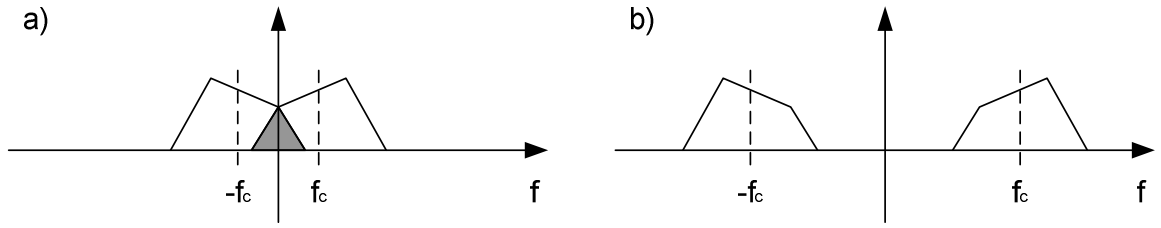


Fig. 1 Dependency between signal bandwidth and carrier frequency

The carrier frequency f_c in Fig. 1 - a) is lower than half the signal bandwidth, resulting in sideband overlap. The carrier frequency f_c in Fig. 1 - b) is high enough to separate the two sidebands.

In practice, the intermediate frequency must be increased for lower sideband crosstalk (limited filter edge steepness). All spectral components of the opposite sideband must be above the decimation filter stop band frequency. Thus, the center frequency must be higher than **0.5 x (stop band frequency + 0.5 x signal bandwidth)**.The stop band frequency depends on the desired ouput sample rate and is specified in the following table:

Sampling rate from	to	Decimation filter stop band frequency
81.6 MHz	>40.8 MHz	0.53 sample rate
40.8 MHz	>20.4 MHz	0.42 sample rate
20.4 MHz	>10.2 MHz	0.53 sample rate
10.2 MHz	>5.1 MHz	0.53 sample rate
5.1 MHz	>2.55 MHz	0.53 sample rate
2.55 MHz	>1.275 MHz	0.53 sample rate
1.275 MHz	>0.6375 MHz	0.53 sample rate
0.6375 MHz	>318.75 kHz	0.53 sample rate
318.75 kHz	>159.375 kHz	0.53 sample rate
159.375 kHz	>79.6875 kHz	0.53 sample rate
79.6875 kHz	>39.84375 kHz	0.53 sample rate
39.84375 kHz	>19.921875 kHz	0.53 sample rate
19.921875 kHz	10 kHz	0.53 sample rate

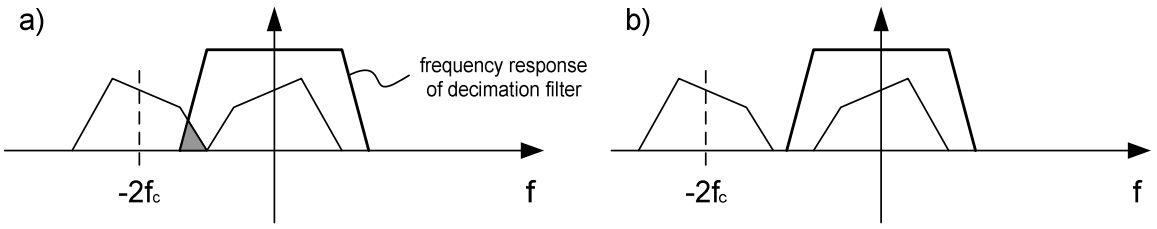


Fig. 2 Unwanted part of the opposite sideband real valued signals

In the signal shown in Fig. 2 - a) an unwanted part of the opposite sideband remains after decimation filtering, while figure Fig. 2 - b) depicts a decimation filtered signal free from sideband crosstalk.

The upper limit of the carrier frequency is specified by the available baseband input bandwidth. The entire signal spectrum must fit into the baseband input bandwidth, so the carrier frequency may not exceed **± 0.5 x (baseband input bandwidth – signal bandwidth)**

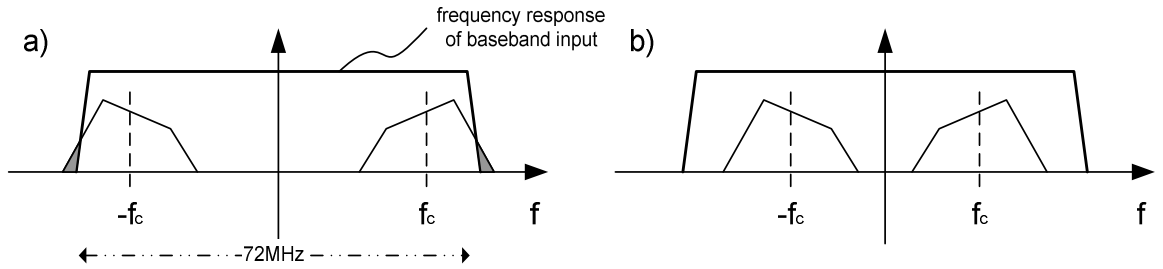
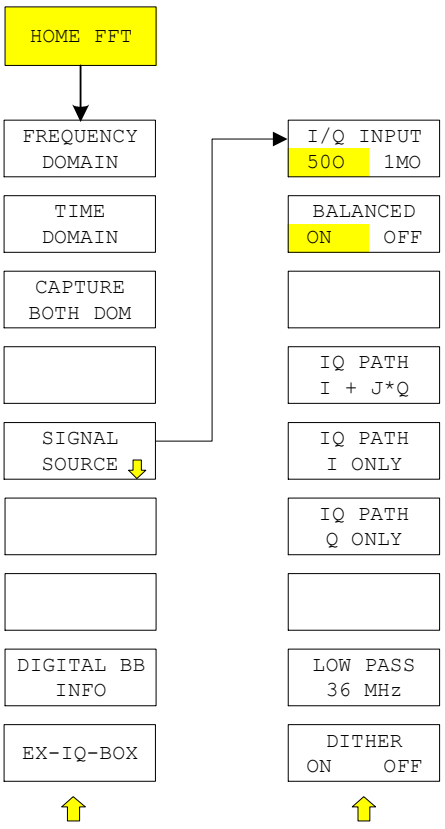


Fig. 3 Signal bandwidth exceeds baseband input bandwidth of option FSQ-B71.

In Fig. 3 - a) the signal spectrum is cut, because it exceeds the baseband input bandwidth of . Fig. 3 - b) shows a signal fitting entirely into the baseband input bandwidth.

Signal bandwidth limitation for real-valued input signals:
A theoretical upper bandwidth limit for an input signal on the lowest possible intermediate frequency (= 0.5 x signal bandwidth) is given by **the half of the baseband input bandwidth (Fig. 4)**.



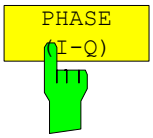
Since firmware version V3.85, it is possible to set the type of baseband input signal (menu SETUP) and the center frequency in the range of 0 …. 35 MHz (I only, Q only) or -35 MHz to 35 MHz (I+j*Q).

This function is supported in all applications but FS-K30 and FS-K40.

The PRESET settings are:
- signal path: I+j*Q
- center frequency: 0 Hz

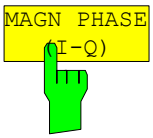
Remote command:
```
INP:IQ:TYPE   IJQ | I | Q
```

Menu FFT HOME – FREQUENCY DOMAIN



Softkey PHASE activates the phase difference measurement between two scalar input signals connected to input I and input Q. Select signal source *I Only* to get the phase difference I-Q and *Q Only* for Q-I.
This function is only available if BOTH DOMAIN is switched on and if signal source is not set to I+j*Q.

IEC/IEEE bus command: CALCulate:FORMat DPHase



Softkey MAGN PHASE activates the phase difference/magnitude difference measurement between two scalar input signals connected to input I and input Q. Select signal source *I Only* to get the phase difference I-Q and *Q Only* for Q-I.
The upper window (Screen A) shows the phase difference. The lower window (Screen B) shows the magnitude difference.

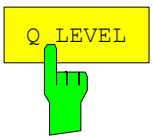
This function is only available if BOTH DOMAIN is switched on and if signal source is not set to I+j*Q.

IEC/IEEE bus command: CALCulate:FORMat DMPHase

Menu TRIGGER

I LEVEL uses the real part of the signal as a trigger source. This function is only available in time domain - voltage, if BOTH DOMAIN is switched off. In case of trigger instability increase sweep time.

IEC/IEEE bus command: TRIGger[:SEQ]:SOURce IONLy



Q LEVEL uses the imaginary part of the signal as a trigger source. This function is only available in time domain - voltage, if BOTH DOMAIN is switched off. . In case of trigger instability increase sweep time.

IEC/IEEE bus command: TRIGger[:SEQ]:SOURce QONLy

R&S FSQ-B17 Extensions

General Hints

Using R&S AMU and R&S SMU as a signal source/sink for Digital Baseband Input/Output

To directly connect the signal generator R&S AMU or R&S SMU to the digital baseband input of the analyzer with option FSQ-B17 a minimum generator firmware version is required:

R&S AMU 2.10.111.53 (or newer)
R&S SMU 2.10.111.53 (or newer)

Last minute changes to the R&S FSQ-B17 operating manual

Operating Manual "Digital Baseband Interface R&S FSQ-B17":

- 1303.4098.12-01 (English)

The corresponding PDF-Files are separately available on the service board.

Operation of the R&S FSQ-B17 I/Q Input

The signal processing of the digital IQ data is split into an online section and a post processing section. Within the online section, the R&S FSQ-B17 receives the LVDS data stream from the channel link interface. A FIFO separates the LVDS clock domain from the analyzers clock domain. The enabled data values are stored in the IQ memory block.
The post processing part contains a lowpass filter, a resampler and a level adjustment block to convert the data to the desired target sample rate and to adapt the reference level. The following table lists the different clock and data rates and their valid frequency ranges.

f_{clk}	$66\,\mathrm{MHz} \le f_{clk} \le 90\,\mathrm{MHz}$	Clock rate of the LVDS interface
f_{sys}	$f_{sys} = 81.6\,\mathrm{MHz}$	System frequency of the analyzer
f_{en}	$f_{en} \le \min\left(f_{clk}, f_{sys}\right)$	Average rate of enabled data words within the LVDS stream
$f_{s,in}$	$f_{s,in} = f_{en}$ for realtime systems, otherwise arbitrary	Digital input sample rate
$f_{s,out}$	$\frac{f_{s,in}}{4080} \le f_{s,out} \le 254 \cdot f_{s,in}$	Target sample rate after resampling

The lowpass filter preceding the resampler prevents aliasing from the resampling process. It restricts the useful bandwidth of the digital signal to

$$\boxed{B = 0.76 \cdot f_{s,in}}.$$

From the analyzers point of view, the digital IQ data is just a stream containing numbers which is stored for further processing. To perform actual measurements on this data, a time and magnitude grid has to be imposed on the data vector by the following two parameters:

Manual Control	Remote Control	Unit	
DIGITAL IN SAMPLERATE	:INPut<1|2>:DIQ:SRATe <numeric_value>	Hz	Sample rate of the digital signal, i.e. the reciprocal of the time between two successive samples
DIGITAL IN FULL SCALE	:INPut<1|2>:DIQ:RANGe[:UPPer] <numeric_value>	Volt	Voltage of a digital full scale value

On the other hand, a measurement application within the analyzer expects a specific target sample rate and a reference level, by which the amplitudes are normalized. The necessary conversion is done by the resampler and the level adjustment in the post processing step:

$$\text{ResamplingFactor} = \frac{f_{s,out}}{f_{s,in}} = \frac{\text{Target Sample Rate}}{\text{Digital In Sample Rate}},$$

$$\text{Gain Factor} = \frac{A_{out}}{A_{in}} = \frac{1/\text{Reference Voltage}}{1/\text{Full Scale Voltage}} = \frac{\text{Full Scale Voltage}}{\text{Reference Voltage}}.$$

Menu SETUP – SIGNAL SOURCE

SETUP	SIGNAL SOURCE ⇩	RF PATH	
		BASEBAND ANALOG ⇩	
		BASEBAND DIGITAL ⇩	DIGITAL IN FULL SCALE
			DIGITAL IN SAMPLE RATE
			FULL SCALE AUTO SET
			SAMPLE RATE AUTO SET
			DIGITAL BB INFO
			EX-IQ-Box
		DIGITAL BB INFO	
		EX-IQ-Box	

RF PATH

The softkey RF PATH selects the RF Input Path of the analyzer. This softkey is not available for the FFT analyzer mode.

Note: This softkey is only available with option FSQ-B17 or FSQ-B71.

Remote command: INPut<1|2>:SELect AIQ | DIQ | RF

BASEBAND ANALOG

The softkey BASEBAND ANALOG opens a menu to configure the analog baseband input.

Note: This softkey is only available with option FSQ-B71.

Remote command: INPut<1|2>:SELect AIQ | DIQ | RF

BASEBAND DIGITAL

The softkey BASEBAND DIGITAL opens a menu to configure the digital baseband input.

Note: This softkey is only available with option FSQ-B17

Remote command: INPut<1|2>:SELect AIQ | DIQ | RF

DIGITAL BB INFO

The softkey DIGITAL BB INFO opens a window to display the status information of the connected digital baseband device (input or output).

Dependent on the capability of the digital base band signal source the I/Q data's sample rate and/or the full scale value are passed to LVDS input interface of the analyzer and displayed in the Digital Baseband Info table. The analyzer automatically adjusts the related input parameters (DIGITAL IN FULL SCALE and DIGITAL IN SAMPLE RATE) if the AUTO SET functions are switched on.

This softkey is only available with option FSQ-B17.

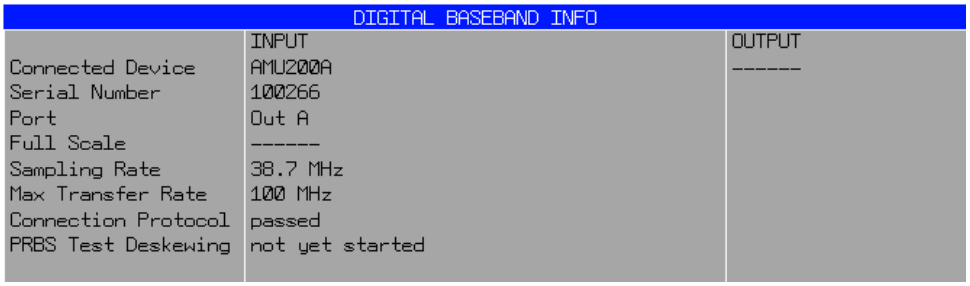


Fig. 1: R&S AMU200 used as a Digital Baseband Signal Source

The dialog lists the following items:

- **Connected Device:** The name of the connected device
- **Serial Number:** The serial number of the connected device
- **Port Name:** The port name of the connected device
- **Full Scale Value:** The full scale value of the I/Q data sent by the connected device.
  "----" indicates this information is not sent by the connected device. FULL SCALE AUTO SET can not be used in that case and you have to manually configure this instrument setting.
  "**auto**" indicates an active AUTO SET function. A warning appears if the value exceeds the allowed range of the analyzer.
- **Sample Rate:** The sample rate of the I/Q data sent by the connected device.
  "----" indicates this information is not sent by the connected device. SAMPLE RATE AUTO SET can not be used in that case and you have to manually configure this instrument setting.
  "**auto**" indicates an active AUTO SET function. A warning appears if the value exceeds the allowed range of the analyzer.
- **Max Transfer Rate:** The Maximum interface clock rate to transfer the I/Q data using the B17 connection.
- **Connection Protocol:** Indicates the state of the connection protocol. The analyzer is able to communicate with the sending/receiving device.

- **PRBS Test Deskewing:** An alignment process is started when the B17 input or output is connected to a digital baseband source/sink. The current state of this process is listed here. Possible indications are "not yet started", "failed" or "passed".

  Note: This alignment is only started with operation modes supporting the digital baseband input.

Fig. 1 shows the result of an R&S AMU200A connected to the analyzer's digital baseband input. The sample rate of the I/Q data is 38.7 MHz. The Full Scale Value is not sent by the AMU and therefore the digital input full scale value has to be manually set. The connection protocol was successfully passed and the self alignment process was not yet started (cable connected in analyzer mode).

DIGITAL BASEBAND INFO			
	INPUT		OUTPUT
Connected Device	AMU200A		------
Serial Number	100266		
Port	Out A		
Full Scale	------		
Sampling Rate	38.7 MHz	auto	
Max Transfer Rate	100 MHz		
Connection Protocol	passed		
PRBS Test Deskewing	passed		

Fig. 2: R&S AMU200, connection with analyzer established

In Fig. 2 the self alignment was successfully finished and indicated with "passed".

DIGITAL BASEBAND INFO			
	INPUT		OUTPUT
Connected Device	ExBox		------
Serial Number	100064		
Port	IQ OUT		
Full Scale	------		
Sampling Rate	100 MHz	auto	
Max Transfer Rate	------		
Connection Protocol	passed		
PRBS Test Deskewing	passed		
ExIQ-Box PLL	locked		

Fig. 3: The R&S Ex-IQ-Box connected to the digital baseband input

An additional PLL status line is available, if an Ex-IQ-Box is connected (see Fig. 3).

DIGITAL BASEBAND INFO		
	INPUT	OUTPUT
Connected Device	------	ExBox
Serial Number		100064
Port		IQ IN
Full Scale		0.223607 V
Sampling Rate		100 MHz
Max Transfer Rate		------
Connection Protocol		passed
PRBS Test Deskewing		done
EX-IQ-Box PLL		locked

Fig. 4: The R&S Ex-IQ-Box connected to the digital baseband output

Remote command:

:INPut<1|2>:DIQ:CDEVice?

:OUTPut<1|2>:DIQ:CDEVice?

:STAT:QUES:DIQ:COND?

EX-IQ-BOX

The softkey EXIQ BOX opens a dialog to configure an R&S EX-IQ-Box connected to the digital baseband Input or Output.

This softkey is only available with option FSQ-B17.

Note: In earlier firmware versions this dialog was open with a hotkey and you therefore had to leave the current application to configure the Ex-IQ-Box. Since V4.5x a new softkey is supported in the SETUP – SIGNAL SOURCE menu and/or in other application specific menus like VSA HOME (Vector Signal Analyzer Mode).

DIGITAL IN FULL SCALE

The softkey DIGITAL IN FULL SCALE opens a dialog to define the voltage corresponding to the maximum input value of the digital baseband input (value 7FFF hex). The default is 1 Volt.

The FULL SCALE AUTO SET function is switched off if the full scale value is manually configured.

This softkey is only available with option FSQ-B17.

DIGITAL IN SAMPLE RATE

The softkey DIGITAL IN SAMPLE RATE defines the input date sample rate read by the digital baseband input. The default value is 81.6 MHz.

The SAMPLE RATE AUTO SET function is switched off if the input data sample rate is manually configured.

This softkey is only available with option FSQ-B17.

FULL SCALE AUTO SET

SAMPLE RATE AUTO SET

Dependent on the capability of the digital base band signal source the I/Q data's sample rate and/or the full scale value are passed to the LVDS input interface of the analyzer. The analyzer automatically adjusts the related input parameters (DIGITAL IN FULL SCALE and DIGITAL IN SAMPLE RATE) if the AUTO SET functions for the Digital Input Full Scale Value or the Digital Input Sample Rate are active.

A conflict between the received values (full scale, sample rate) and the instrument's supported parameter ranges is indicated by a red colored "BDI" enhancement label at the right side of the grid.

The same happens if the AUTO SET function is active but the sending device does not support this feature. The related AUTO SET function has to be switched off and the parameter has to be manually configured in that case.

These softkeys are only available with option FSQ-B17.

Remote command: INPut<1|2>:DIQ:RANGe:AUTO ON | OFF

INPut<1|2>:DIQ:SRATe:AUTO ON | OFF

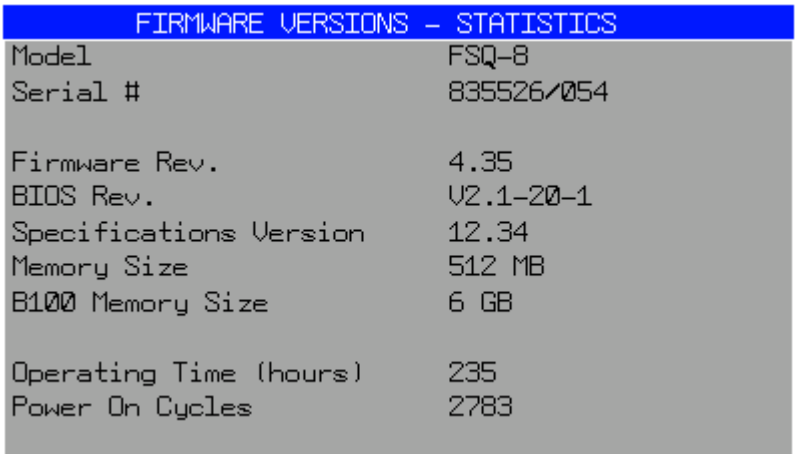
Option FSQ-B100 I/Q Memory Extension

Since version V3.95 SP2 the options FSQ-B100/B102 I/Q Memory Extension are supported.
The available memory is listed in table SETUP - SYSTEM INFO STATISTICS, B100 Memory size.

I/Q Memory Extensions	Maximum memory size:
FSQ-B100	235 MSamples
FSQ-B100 + FSQ-B102	705 MSamples

The order numbers are:
1169.5244.02 FSQ-B100 I/Q Memory Extension - 235 MSamples
1169.5444.04 FSQ-B100 I/Q Memory Extension - extends to 705 MSamples

Press SETUP - SYSTEM INFO - STATISTICS to check the available I/Q memory:



The B100 Memory Size is rounded to Giga Bytes and listed in row *B100 Memory Size*:
2 GB for FSQ-B100 only
6 GB for FSQ-B100 + FSQ-B102

Following functions in the base system and listed applications are affected:

Application:	**Base System (TRACE:IQ sub system)**			
RF Input				
Sample Rate SR	**Maximum Number of Samples**			**Comment**
	No B100	**B100 only**	**B100 + B102**	
81.6 MHz < SR ≤ 400 MHz	16.776.704	234.880.512	704.642.560	with FSQ-B72
81.6 MHz < SR ≤ 100 MHz	16.776.704	234.880.512	704.642.560	without FSQ-B72
816 kHz < SR ≤ 81.6 MHz	16.776.704	469.761.536	1.409.285.632	
400 Hz ≤ SR ≤ 816 kHz	16.776.704	335.543.808	1.006.632.448	
Analog Baseband Input				
Sample Rate SR	**Maximum Number of Samples**			**Comment**
	No B100	**B100 only**	**B100 + B102**	
81.6 MHz ≤ SR ≤ 200 MHz	16.776.704	234.880.512	704.642.560	
40.8 MHz ≤ SR < 81.6 MHz	$= floor\left\{\left[MaxBuf - ceil\left(512 * \frac{81.6MHz}{SR}\right)\right] * \frac{SR}{81.6MHz}\right\}$ with: SR: Sample Rate [Hz] MaxBuf: =			
	16.777.216	234.881.024	704.643.072	
e.g. SR =				
81.0 MHz	16.653.341	233.153.445	600.461.360	
80.0 MHz	16.447.738	230.275.000	690.826.028	
70.0 MHz	14.391.707	201.490.562	604.472.711	
60.0 MHz	12.335.675	172.706.122	518.119.393	
50.0 MHz	10.279.644	143.921.683	431.766.075	
42.0 MHz	8.634.819	120.894.132	362.683.421	
41.0 MHz	8.429.216	118.015.688	354.048.089	
40.8 MHz	8.388.096	117.440.000	352.321.024	
816 kHz < SR < 40.8 MHz	16.776.704	469.761.536	1.409.285.632	
400 Hz ≤ SR ≤ 816 kHz	16.776.704	335.543.808	1.006.632.448	

Digital Baseband Input

Dig Input Sample Rate / Sample Rate Ratio $RR = \frac{DigInSR}{SR}$	Maximum Number of Samples			Comment
	No B100	**B100 only**	**B100 + B102**	
$\frac{1}{254}$ ≤ RR ≤ 1.0	16.776.704	167.771.648	503.315.968	
1.0 < RR < 4080	$= floor\left\{\left[MaxBuf - ceil\left(512 * \frac{DigInSR}{SR}\right)\right] * \frac{SR}{DigInSR}\right\}$ with: DigInSR: Digital Input Sample [Hz] SR: (Output) Sample Rate [Hz] MaxBuf: =			
	16.777.216	167.772.160	503.316.480	
e.g. RR =				
1.5	11.184.298	111.847.594	335.543.808	
2.0	8.388.096	83.885.568	251.657.728	
4.0	4.193.792	41.942.528	125.828.608	
5.0	3.354.931	33.553.920	100.662.784	
10.0	1.677.209	16.776.704	50.331.136	
20.0	838.348	8.388.096	25.165.312	
50.0	335.032	3.354.931	10.065.817	
100.0	167.260	1.677.209	5.032.652	

Application:	**FSQ-K70 (VSA)**			
RF Input				
Symbol Rate SR	**Maximum RECORD LENGTH [Symbols]**			**Comment**
	No B100	**B100 only**	**B100 + B102**	
20.4 MHz < SR ≤ 100 MHz	4.194.104	58.720.056	176.160.568	with FSQ-B72
20.4 MHz < SR ≤ 25 MHz	4.194.104	58.720.056	176.160.568	without FSQ-B72
10.2 MHz < SR ≤ 20.4 MHz	4.194.104	58.720.056	176.160.568	
204 kHz < SR ≤ 10.2 MHz	4.194.104	117.440.312	352.321.336	
100 Hz ≤ SR ≤ 204 kHz	4.194.104	83.885.880	251.658.040	
Analog Baseband Input				
Sample Rate SR	**Maximum Number of Samples**			**Comment**
	No B100	**B100 only**	**B100 + B102**	
20.4 MHz ≤ SR ≤ 50 MHz	4.194.104	58.720.056	176.160.568	
10.2 MHz ≤ SR < 20.4 MHz	$= floor\left(\left\{\left[MaxBuf - ceil\left(512 * \frac{81.6MHz}{SR}\right)\right] * \frac{SR}{81.6MHz}\right\} * \frac{1}{4}\right) - 72$ with: SR: Symbol Rate [Hz] MaxBuf [Samples]: =			
	16.777.216	234.881.024	704.643.072	
e.g. SR =				
20.4 MHz	4.194.104	58.720.056	176.160.568	
20.25 MHz	4.163.263	58.288.289	174.865.268	
20.0 MHz	4.111.862	57.568.678	172.706.435	
17.5 MHz	3.597.854	50.372.568	151.118.105	
15.0 MHz	3.083.846	43.176.458	129.529.776	
12.5 MHz	2.569.839	35.980.348	107.941.446	
10.5 MHz	2.158.632	30.223.461	90.670.783	
10.25 MHz	2.107.232	29.503.850	88.511.950	
10.2 MHz	2.096.952	29.359.928	88.080.184	
204 kHz < SR < 10.2 MHz	4.194.104	117.440.312	352.321.336	
100 Hz ≤ SR ≤ 204 kHz	4.194.104	83.885.880	251.658.040	

Digital Baseband Input

Dig Input Sample Rate / Sample Rate Ratio $RR = \frac{DigInSR}{4 * SR}$ with: DigInSR: Digital Input Sample [Hz] SR: (Output) Symbol Rate [Hz]	**Maximum Number of Samples**			**Comment**
	No B100	**B100 only**	**B100 + B102**	
$\frac{1}{254}$ ≤ RR ≤ 1.0	4.194.104	41.942.840	125.828.920	
1.0 < RR < 4080	$= floor\left\{\left[MaxBuf - ceil\left(512 * \frac{DigInSR}{4 * SR}\right)\right] * \frac{SR}{DigInSR}\right\} - 72$ with: DigInSR: Digital Input Sample [Hz] SR: (Output) Symbol Rate [Hz] MaxBuf: =			
	16.777.216	167.772.160	503.316.480	
e.g. RR =				
1.5	2.796.002	27.961.826	83.885.880	
2.0	2.096.952	20.971.320	62.914.360	
4.0	1.048.376	10.485.560	31.457.080	
5.0	838.660	8.388.408	25.165.624	
10.0	419.230	4.194.104	12.582.712	
20.0	209.515	2.096.952	6.291.256	
50.0	83.686	838.660	2.516.382	
100.0	41.743	419.230	1.258.091	

Note: Maximum Record Length noted for Points/Symbol ≤ 4. If Points/Symbol is increased, the maximum Record Length is reduced by the same factor.

Application	Mode	User Parameter / Comments	Maximum I/Q Capture Length	
			B100 + B102	**B100 only**
FS-K72/74 **FS-K73**	3G FDD BS 3G FDD UE	**Maximum CAPTURE LENGTH** for RF and Analog Baseband Input	3.000 frames	1.000 frames
FS-K76 **FS-K77**	TDS BS TDS UE	**Maximum SET COUNT** for RF and Analog Baseband Input (1 set = 63 slots)	5.700 sets	1.900 sets
		Number of captured chips	310.262.400 Chips	103.420.800 Chips
		Capture time	242,4 sec	80,8 sec
FS-K82 **FS-K83**	CDMA2k BS CDMA2k MS	**Maximum SET COUNT** for RF and Analog Baseband Input (1 set = 64 PCGs *))	1.140 sets	380 sets
		Number of captured chips	112.066.560 Chips	37.355.520Chips
		Capture time	91.2 sec	30.4 sec
FS-K84 **FS-K85**	1xEVDO BS 1xEVDO MS	**Maximum SET COUNT** for RF and Analog Baseband Input (K84: 1 set = 32 slots) (K85: 1 set = 64 half slots)	1.710 sets	570 sets
		Number of captured chips	112.066.560 Chips	37.355.520 Chips
		Capture time	91.2 sec	30.4 sec

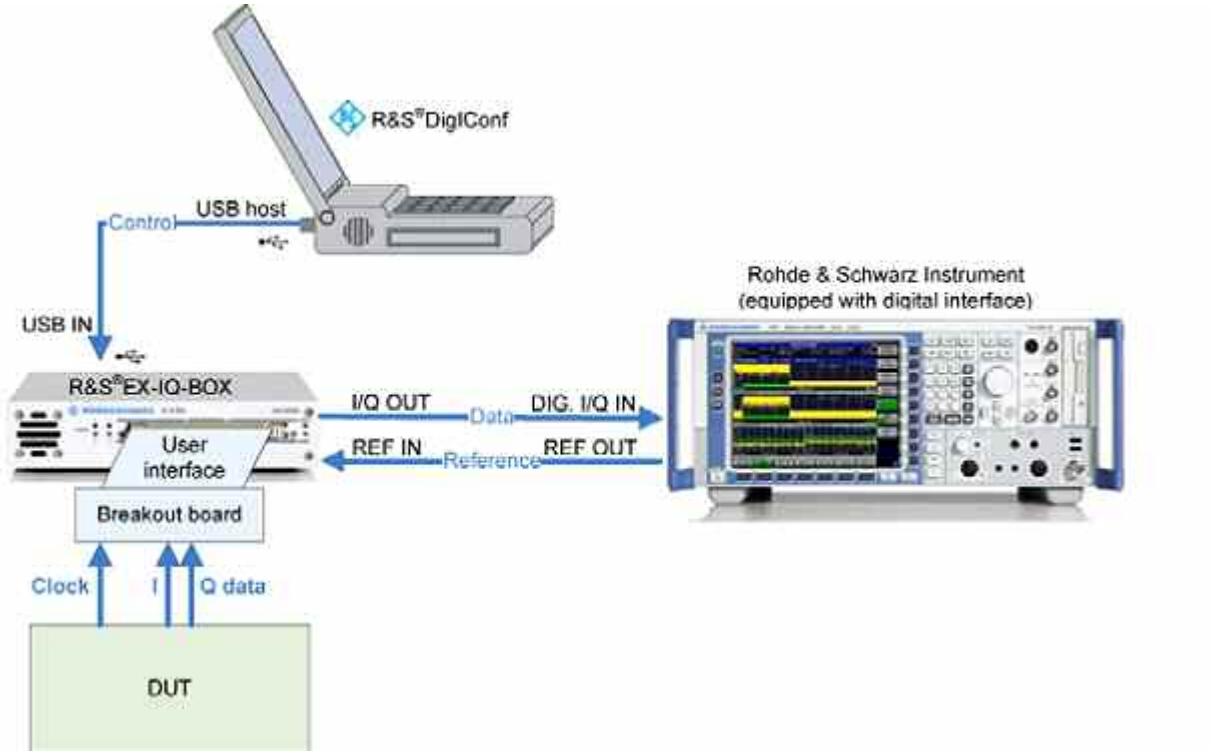
Notes:
*) PCG: Power Control Group

R&S EX-IQ-Box Extensions

The Ex-IQ-Box is now available in two models:

- **1409.5505.02**
- **1409.5505K04**

The R&S FSQ currently supports the build-in configuration of the Ex-IQ-Box for model 02 only (menu SETUP – SIGNAL SOURCE – EX-IQ-BOX).
The configuration of model K04 requires the software R&S DigIConv to be installed on a separate PC (see below).



Last minute changes to the EX-IQ-Box operating manual

Operating Manual "External Signal Interface Module R&S EX-IQ-Box":

- 1409.5505.32-04 (English)

The corresponding PDF-File is separately available on the service board.

FSx/FMU Settings - Menu EX-IQ-Box - NEXT

SUPPORT

This section of the user manual describes the Support function, which stores necessary data files to be sent to Rohde & Schwarz support center.
On pressing the *Support* softkey a popup dialog box is displayed and the following data is stored on the harddisk, D:\USER\SUPPORT\KEXIQ*.*:

- *.reg Registry file
- *.bin, *.bak instrument configuration files
- *.txt EX-IQ-Box Database Setting

Note: Attach all the files under D:\USER\SUPPORT\\KEXIQ *.* to an email and send to our hotline.

Remote command: --

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.

Europe, Africa, Middle East

Phone +49 89 4129 12345
customersupport@rohde-schwarz.com

North America

Phone 1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

Latin America

Phone +1-410-910-7988
customersupport.la@rohde-schwarz.com

Asia/Pacific

Phone +65 65 13 04 88
customersupport.asia@rohde-schwarz.com