



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## **Release Notes**

# **Firmware Release 2.92 (NT)**

with Service Pack 2

**for R&S<sup>®</sup> ESPI Test Receivers**

with order number: **1142.8007.xx**

**Release Note Revision: 3**

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# History

Date	Rel Note Rev	Changes
26 Feb 2007	1	First revision for V2.92
05 Mar 2007	2	SP1
20 Mar 2007	3	SP2

## General Topics

### Firmware Update

#### Generation of the update disk set

The files needed for the firmware update are grouped according to the disk contents:

Disk 1:	disk1.bin	(self-extracting ZIP file; needs to be renamed to disk1.exe before unpacking)
Disk 2:	data2.cab	(packed contents of disk 2, will be automatically unpacked by FW update)
Disk 3:	data3.cab	(packed contents of disk 3, will be automatically unpacked by FW update)
Disk 4:	data4.cab	(packed contents of disk 4, will be automatically unpacked by FW update)
Disk 5:	data5.cab	(packed contents of disk 5, will be automatically unpacked by FW update)
Disk 6:	data6.cab	(packed contents of disk 6, will be automatically unpacked by FW update)
Disk 7:	data7.cab	(packed contents of disk 7, will be automatically unpacked by FW update)
Disk 8:	data8.cab	(packed contents of disk 8, will be automatically unpacked by FW update)

#### The contents of disk 1 are packed in a self-extracting ZIP file and need to be unzipped.

For this purpose the following steps are necessary:

1. Create a temporary directory on your local PC (e.g. ESPITEMP on drive C:)
2. Copy disk1.bin into that directory and rename it to disk1.exe
3. Execute disk1.exe. Under Windows 95/98/NT/XP this is done best using the following sequence:  
`<CTRL><ESC> - RUN - C:\ESPITEMP\DISK1 - <ENTER>`  
 or  
`<CTRL><ESC> - AUSFÜHREN - C:\ESPITEMP\DISK1 - <ENTER>` for a German Windows version.  
 The files will be unzipped.

4. Delete disk1.exe from the temporary directory.  
 The temporary directory will now contain the following files:

_inst32i.ex_	_isdel.exe	_setup.dll	_sys1.cab	_user1.cab
Data.tag	data1.cab	lang.dat	layout.bin	os.dat
Setup.exe	Setup.ini	setup.ins	setup.lid	

**Please make sure that all the filenames are spelt correctly on your disks before you try to use them for the firmware update. Especially the trailing underscore ('\_') as used in \_inst32i.ex\_ is essential for correct operation of the update program.**

5. Copy the contents of the temporary directory onto update disk #1.

**The contents of the other disks are already packed in the format required by the firmware update program and need no further processing.** The files only need to be copied onto disks #2 to #8, the number in the filename indicating the corresponding disk number (data2.cab => disk #2 etc).

## Preparing the installation via LAN:

For the installation via LAN please set up the following directory structure.

Copy all files as mentioned in the previous section in the directories Disk1 – Diskxx.



- 
- Notes:**
- The directory path shall not contain more the 64 characters.
  - If the explorer is used to copy the floppy disks onto the device harddisk close the firmware application before starting the copy process (use keyboard and ALT-F4 to close the firmware application)! Otherwise the installation process or the installed firmware may work incorrectly!
  - If the message "uninstaller setup failed to initialize, ..." occurs during the installation process, the disks must be copied again onto the harddisk with the firmware application closed, and the C:\R\_S\INSTR\uninst.isu file must be deleted.
- 

## Performing the firmware update on the instrument

The firmware update process is performed in the following steps:

- Switch on the instrument and wait until the Analyzer has resumed operation.
- For updates from LAN use the SETUP | NEXT | FIRMWARE UPDATE | UPDATE PATH softkey to specify the path for the location of the disk directory (e.g. F:\MyTemp). For floppy usage the default A:\ must not be changed
- Press SETUP → NEXT → FIRMWARE UPDATE
- Confirm the query "Do you really want to update the firmware?" with OK
- Insert update disk #1 to #8 as requested (for LAN just confirm the copy process)
- The instrument will perform several automatic shutdowns, until the new firmware is installed properly.  
**Do not switch the instrument off until the update process has finished completely.**

After switching on the instrument for the first time after a successful firmware update, the following system message might occur once:

System Message  
CDS: Error...

In this case the unit needs to be switched off and on again. This system message does not appear again.

**Note:** *If the unit is not restarted as described, system error correction data (CAL TOTAL) of a later date will be lost when switching the unit on again.*

## Firmware installation of the R&S FS-K7 FM demodulator software

The R&S FS-K7 FM demodulator software package is included in the basic instrument firmware. It therefore needs no separate firmware update procedure.

### Enabling the option via option key code entry

For activation of the R&S FS-K7 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 ESPI or delivered as a part of the R&S FS-K7 option package. The key sequence for entering the license key 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.  
The most probable reason will be that the instrument is not equipped with firmware version 1.72 or higher.

## Firmware installation of the R&S ESPI-K50 Trigger for Coverage Measurements

The R&S ESPI-K50 Trigger for Coverage Measurements software package is included in the basic instrument firmware. It therefore needs no separate firmware update procedure.

### Enabling the option via option key code entry

For activation of the R&S ESPI-K50 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 ESPI or delivered as a part of the R&S ESPI-K50 option package.

The key sequence for entering the license key 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.  
The most probable reason will be that the instrument is not equipped with firmware version 1.37 or higher.

## Modified Functions

The following modifications to functions released in earlier firmware versions are included in version 2.82:

### 1. Receiver: Improved frequency tuning with Quasipeak Detector.

The level bargraph will not longer be blanked when the frequency is tuned manually.

### 2. Analyzer: 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 *SETUPITRANSDUCER* menu is set to AUTO thus the best dynamic performance is obtained.

### 3. Analyzer: 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.

### 4. Analyzer: 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.

### 5. Display of RBW type

The selected type of the resolution bandwidth is displayed as label on the right side of the diagram.

3DB	NORMAL (3dB)
6DB	NORMAL (3dB)
FFT	FFT
CHN	CHANNEL
RRC	RRC

### 6. 1 MHz 6 dB Resolution Bandwidth

The 1 MHz 6 dB resolution bandwidth has been adjusted to improve the impulse bandwidth.

### 7. Overwriting and deletion of save sets must be confirmed

The following modifications to functions released in earlier firmware versions are included in version 2.32 (SP5):

### 1. ITEMS TO SAVE/RECALL is nonvolatile

The settings for ITEMS TO SAVE/RECALL in the FILE menu is kept when the instrument is switched off and on.

### 2. Receiver: Measurement Time with 2 digits resolution

The measurement time can be set with 2 digits resolution in the range 100  $\mu$ s to 100 s, e.g. 980 ms, 990 ms, 1 s, 1.1 s.

### 2. Hardcopy screen comment changed to one comment, not one per screen

### 3. Change to SMR setting files for external generator control

This change enables significant improvements in frequency settling with logarithmic frequency step sizes.

### 4. Receiver: Scan results are kept when changing to analyzer mode

The measurement results of a previous scan are kept in memory and displayed again when the instrument is switched to analyzer mode and back to receiver mode.

**5. Receiver: Downrange limit for Quasipeak Detector**

The level limit for the autoranging function has been increased. Attenuation is now decreased earlier to get a better signal to noise ratio.

**6. Receiver: Audio not longer disabled with Quasipeak settling time**

## Problems Eliminated

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

1. (V2.82) **Error Message: Your trial period will expire**  
This error message now is only displayed when the option for a trial period is installed.
2. (V2.32) **Reception of a spurious signal with 100 Hz and 200 Hz RBW**  
A spurious signal 1.8666 MHz away from the real signal has been removed.
3. (V2.32) **Display of RBW filter type with active OBW function**  
Switching on the OBW function with RBW filter type FFT, the displayed filter type remained FFT instead of 3DB. .
4. (V2.32) **Remote Control: Block ready bit after Scan continue**  
The block ready bit in the status reporting system is now correctly set after continuing a scan.
5. (V2.32) **Transducer factor with unit dBpW**  
Transducer factors with unit dBpW are not longer based on the unit dBμV.
6. (V2.32) **Squelch setting after power on**  
The squelch setting is now properly restored after power on.
7. (V2.32) **Coupled Reference Level in Split Screen**  
Switching on REF LEVEL COUPLED in the DISP menu could give an offset in the displayed level values.
8. (V2.82) **FSP-B9: Amplitude droop of tracking generator output signal at 9kHz fixed**  
This problem was reported for B9 board revisions with HWC 01 (see table SETUP - SYSTEM INFO - HARDWARE INFO, column HWC).

## Known Problems

none



# Modifications to the Operating Manual

The order numbers for the current manual sets are

- 1142.8142.11-02  
1142.8142.81-01 (German)
- 1142.8142.12- 02  
1142.8142.82-01 (English).
- 1142.8142.19- 02  
1142.8142.89-01 (English, letter format).

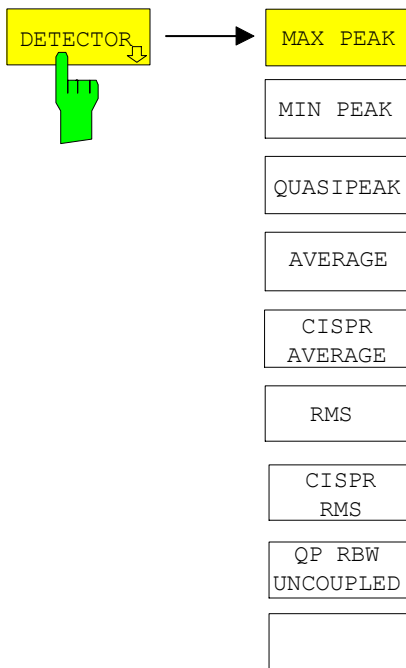
The corresponding PDF-Files are separately available on the service board.

Modifications to the operating manual are described in the supplement included in the operating manual and available on our web page.

The firmware options FS-Kxx come with their own operating manual and release notes. Please refer to the corresponding release notes for more information on changes to these packages.

Last minute changes to the operating manual

## Menu MEAS (Receiver)



The *DETECTOR* softkey opens a submenu to select the detector and combinations of detectors.

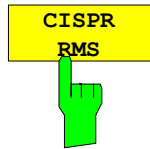
A maximum of three detectors can be switched on simultaneously.

**Note:** *This softkey is also available in the Receiver-menu.*



The *CISPR AVERAGE* softkey activates the weighting average detector according to CISPR 16-1. The IF bandwidth is automatically set to the required value according to the receiving frequency. This coupling can be cancelled by the *QP RBW UNCOUPLED* softkey.

IEC/IEEE-bus command:            DET:REC CAV



The CISPR RMS softkey activates the weighting average detector according to a proposed amendment of CISPR 16-1-1 (CISPR/A/628/CD). The IF bandwidth is automatically set to the required value according to the receiving frequency. This coupling can be cancelled by the QP RBW UNCOUPLED softkey.

IEC/IEEE-bus command:        DET:REC CRMS

- The CISPR average detector supplies a weighted average. When measuring the average according to CISPR 16-1, the maximum value of the linear average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument). The lowpass time constants and the IF bandwidths are fixed depending on the frequency. The main parameters are listed in the following table:

	CISPR Band A	CISPR Band B	CISPR Band C/D	CISPR Band E
Frequency range	< 150 kHz	150 kHz to 30 MHz	> 30 MHz	> 1000 MHz
IF bandwidth	200 Hz	9 kHz	120 kHz	1 MHz
Lowpass time constant	160 ms	160 ms	100 ms	100 ms

- The CISPR rms detector supplies a weighted average. When measuring the average according to CISPR 16-1, the maximum value of the linear average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument). The lowpass time constants and the IF bandwidths are fixed depending on the frequency. The main parameters are listed in the following table:

	CISPR Band A	CISPR Band B	CISPR Band C/D	CISPR Band E
Frequency range	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 1000 MHz	> 1000 MHz
IF bandwidth	200 Hz	9 kHz	120 kHz	1 MHz
Lowpass time constant	160 ms	160 ms	100 ms	100 ms
Corner frequency	10 Hz	100 Hz	100 Hz	1 kHz

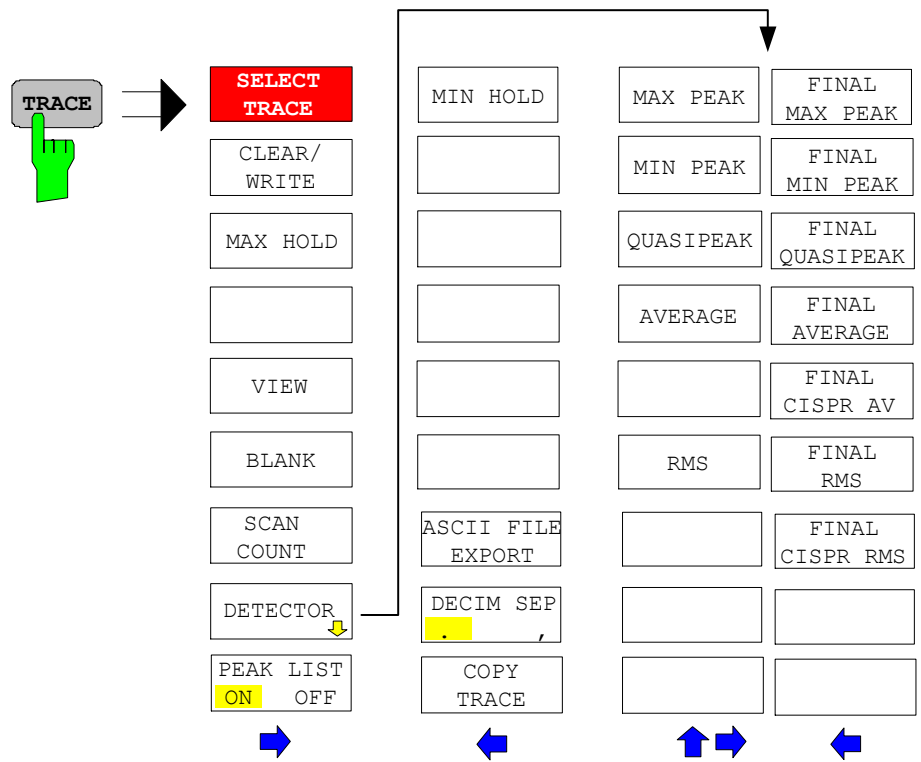
Effect of measurement time:

CISPR average measurement:

With a CISPR average or a CISPR rms measurement, the maximum value of the weighted signal during the measurement time is displayed. The relatively long time constants used with CISPR average and CISPR rms detectors result in long measurement times in order to obtain a correct measurement result. If unknown signals are measured, the measurement time should be at least one second so that pulses down to a frequency of 5 Hz are correctly weighted.

After a frequency change or a modification of the attenuation, the receiver waits until the lowpass has settled before the measurement time starts. The measurement time is selected depending on the IF bandwidth and the characteristics of the signal to be measured. Unmodulated sinusoidal signals as well as signals with high modulation frequency can be measured within a short time. Slowly fluctuating signals or pulse signals require longer measurement times.

Menu TRACE (Receiver)



FINAL  
CISPR AV

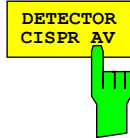
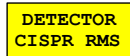
The *FINAL CISPR AV* selects the weighting average detector according to CISPR 16-1 for the final measurement.

IEC/IEEE bus command :DET:FME CAV



The FINAL CISPR RMS selects the weighting rms detector according to CISPR 16-1 for the final measurement.  
IEC/IEEE bus command :DET:FME CRMS

## Menu TRACE – DETECTOR – NEXT (Analyzer)



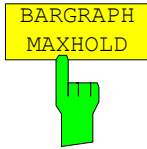
The *DETECTOR CISPR RMS* softkey activates the weighting detector according to a proposed amendment of CISPR 16-1-1 (CISPR/A/628/CD). The CISPR RMS average detector supplies a weighted reading of the input signal. When measuring the RMS-average according to the proposed amendment of CISPR 16-1-1, the maximum value of the RMS-average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse repetition frequency. It is calibrated with the RMS value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument).

The *DETECTOR CISPR AVERAGE* softkey activates the weighting average detector according to CISPR 16-1-1. The CISPR average detector supplies a weighted average. When measuring the average according to CISPR 16-1-1, the maximum value of the linear average during the measurement time is displayed. The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse repetition frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument).

Both softkeys are only available in zero span mode. The bandwidth is limited to the values 200Hz, 9kHz, 120kHz and 1 MHz. In order to use the normal bandwidths again, the detector must be changed e.g. AUTO SELECT.

IEC/IEEE-bus command:  
DETECTOR<1|2> CRMS  
DETECTOR<1|2> CAVERAGE

## Menu DISPLAY (Receiver)



The BARGRAPH MAXHOLD softkey changes the display of the results of the bar graph measurement such that both the highest level for each detector and the frequency at which it is measured are displayed. The MAX Hold value will not be automatically reset by the instrument until BARGRAPH MAXHOLD is switched off or until, for example, the test receiver mode is deactivated as a result of switching to the spectrum analyzer.

Thus, you can also trace fluctuating interference signals in the frequency, and the highest measured value will remain on screen together with the associated frequency.

The BARGRAPH MAXHOLD softkey changes the display of the results of the bar graph measurement such that both the highest level for each detector and the frequency at which it is measured are displayed. The MAX Hold value will not be automatically reset by the instrument until BARGRAPH MAXHOLD is switched off or until, for example, the test receiver mode is deactivated as a result of switching to the spectrum analyzer.

Thus, you can also trace fluctuating interference signals in the frequency, and the highest measured value will remain on screen together with the associated frequency.

IEC/IEEE-bus command      `DISP:BARG:PHOL ON`



The *BARGRAPH RESET* softkey resets the stored maximum values of the bargraph measurement.

IEC/IEEE-bus command      `DISP:BARG:PHOL:RES`

## Menu SPAN (Spectrum Analyzer)



The *FREQ AXIS* softkey switches between default linear frequency axis and logarithmic frequency axis. The default state is LIN.

IEC/IEEE-bus command:

`DISPlay:WINDow<1|2>:TRACe:X:SPACing LINear | LOGarithmic`

## Menu MEAS – CHAN PWR ACP or MULT CHAN ACP (Spectrum Analyzer)



The *CP/ACP STANDARD* softkey opens a list of selectable standards. WLAN 802.11A and WLAN 802.11B is appended to that list.

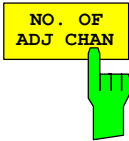
**Notes:**

*FAST ACP is not available if a WLAN standard is selected.*

IEC/IEEE-bus command:

`CALC:MARK:FUNC:POW:PRES "AWLan" | "BWLan"`

**Menu MEAS – CHAN PWR ACP / MULT PWR ACP – CP/ACP CONFIG (Analyzer)**



The *NO. OF ADJ CHAN* softkey enables input of the number ±n of adjacent channels which are taken into account for the adjacent channel power measurement.

Numbers between 0 and 12 can be entered.

IEC/IEEE bus command:

```
:SENS:POW:ACH:ACP 0..12
```

This increased number of adjacent channels is realized through all the relevant settings like:

**ACLR LIMIT CHECK**

```
:CALC:LIM:ACP:ACH:RES?  
:CALC:LIM:ACP:ALT1..11:RES?
```

The following summary bits are introduced to *STAT:QUES:ACPL:*

- Bit 14 : ALT3..11 LOWER or UPPER FAIL (screen B)
- Bit 6 : ALT3..11 LOWER or UPPER FAIL (screen A)

**EDIT ACLR LIMITS**

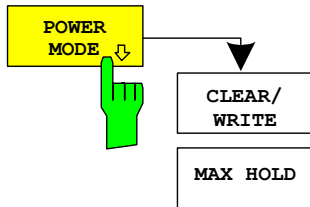
```
:CALC:LIM:ACP:ACH:STAT ON  
:CALC:LIM:ACP:ACH:ABS -10dBm, -10dBm  
:CALC:LIM:ACP:ACH:ABS:STAT ON  
:CALC:LIM:ACP:ALT1..11 0dB, 0dB  
:CALC:LIM:ACP:ALT1..11:STAT ON  
:CALC:LIM:ACP:ALT1..11:ABS -10dBm, -10dBm  
:CALC:LIM:ACP:ALT1..11:ABS:STAT ON
```

**ADJ CHAN BANDWIDTH**

```
:SENS:POW:ACH:BWID:ALT1..11 30kHz
```

**ADJ CHAN SPACING**

```
:SENS:POW:ACH:SPAC:ALT1..11 4MHz
```



The POWER MODE sub menu allows to change between the normal (CLEAR/WRITE) and the max hold power mode. In the CLEAR/WRITE mode the channel power and the adjacent channel powers are calculated directly from the current trace. In MAX HOLD mode the power values are still derived from the current trace, but they are compared with a maximum algorithm to the previous power value. The greater value is remained.

IEC/IEEE bus command:

```
:CALC:MARK:FUNC:POW:MODE WRIT|MAXH
```

**Menu MEAS – MULTI CARR ACP – CP/ACP CONFIG (Spectrum Analyzer)**

With the softkey NO. OF TX CHAN now up to 12 carriers can be measured.

IEC/IEEE-bus command:

[ :SENSE<1|2> ] :POWER:ACHannel:TXChannel:COUNT 1..12

**Menu TRIG**

With the softkey *EXTERN* the external trigger source can be selected. From firmware V2.60/3.60 on also the external trigger level can be adjusted in the range from 0.5V to 3.5V. The default value is 1.4V.

IEC/IEEE-bus command:

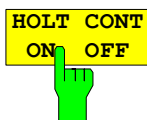
:TRIGGER[:SEQUENCE]:LEVEL[:EXTERNAL] <numeric\_value>

**Menu TRIG - NEXT**

The *DELAY COMP ON/OFF* softkey enables the filter group delay compensation for the external trigger. If a bursted signal is analyzed in zero span and the delay compensation is on, a change of the RBW will not change the rising slope of the signal. Default is OFF.

IEC/IEEE-bus command:

TRIG:HOLD:ADJ:AUTO <boolean>

**Menu TRACE – NEXT (Spectrum Analyzer)**

The *HOLD CONT* softkey defines whether the traces in min hold and max hold mode are reset after some definite parameter changes.

OFF The traces are reset after some definite parameter changes (default)

ON This mechanism is switched off.

In general, parameter changes require a restart of the measurement before results are evaluated (e. g. with markers). For those changes that are known to require a new measurement (e. g. modification of the span), the trace is automatically reset so that erroneous evaluations of previous results are avoided.

This mechanism can be switched off for those exceptional cases where the described behavior is unwelcome.

IEC/IEEE-bus command

:DISPLAY[:WINDOW<1|2>]:TRACE<1..4>:MODE:HCON ON|OFF

## Menu SETUP – TRANSDUCER



When a transducer factor is used, the trace is moved by a calculated shift. However, an upward shift reduces the dynamic range for the displayed values. With the softkey REFLVL ADJ an automatic reference level offset adaptation allows to restore the original dynamic range by also shifting the reference level by the maximum value of the transducer factor.

IEC/IEEE-bus command:

```
[ :SENSe<1|2>: ]CORRection:TRANsducer:ADJust:RLEVel [ :STATE
]
ON | OFF
```

**Note:** Command `SENS:CORR:TRAN:SEL` has to be sent prior to this command

## Menu MKR - NEXT (Analyzer)



With the softkey *LINK MKR1 AND DELTA1* the delta marker1 can be linked to marker1, so if the x-axis value of the marker1 is changed the delta marker1 will follow on the same x-position. The link is default off, and can be switched on.

**Example for setup:**

- PRESET
- TRACE | MAX HOLD
- TRACE | SELECT TRACE | 2 | AVERAGE
- MKR (Switches marker1 on)
- MARKER NORM DELTA | DELTA (Delta Marker 1 ON)
- MKR-> | MKR->TRACE | 2
- LINK MKR1 AND DELTA1

Now select the Marker1 (by switching MARKER1 from DELTA back to NORM) and when changing the x-axis value (by knob wheel or UP/DOWN keys) the delta marker1 will follow automatically.

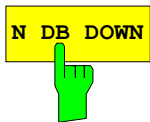
The delta marker1 x-value can not be changed away from 0 as long as the link functionality is active.

IEC/IEEE-bus command:

```
CALCulate<1|2>:DELTAmarker<1..4>:LINK ON | OFF
```

The suffix at `DELTAmarker` can only be 1 or not present, because the functionality is only available for marker1.

## Menu MKR FCTN (Analyzer)



The softkey *N DB DOWN* is now also available in zero span mode. The pulse width result (PWIDTH) is shown at the display.

IEC/IEEE-bus command:

```
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:
STATE ON|OFF
```

*//switches ndb down on or off*

```
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:RESult?
```

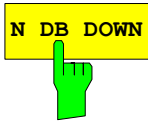
*//queries the result pulse width*

```
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:TIME?
```

*//queries the two marker x-values in seconds  
separated by a comma*



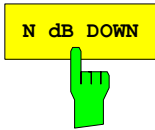
## Menu MKR FCTN (Spectrum Analyzer)



The softkey *N DB DOWN* is now also available in zero span mode. The pulse width result (PWIDTH) is shown at the display.

IEC/IEEE-bus command:

```
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:STATe  ON|OFF
//switches ndbdown on or off
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:RESult?
//queries the result pulse width
:CALCulate<1|2>:MARKer<1..4>:FUNction:NDBDown:TIME?
//queries the two marker x-values in seconds
separated by a comma
```



The *N dB DOWN* softkey activates the temporary markers T1 and T2 which are *n* dB below the active reference marker. Marker T1 is placed to the left and marker T2 at the right of the reference marker. The value *n* can be input in a window.

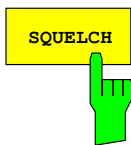
If a negative value is entered than the markers are placed *n* dB above the active reference marker. This is then a *n* dB up function which can be used for notch filter measurements,

The default setting is 3 dB.

IEC/IEEE-bus command:

```
:CALC:MARK1:FUNC:NDBD:STAT ON
:CALC:MARK1:FUNC:NDBD -3dB 'n dB up function with negative
values
```

## Menu MKR FCT - MARKER DEMOD - SQUELCH (Analyzer)



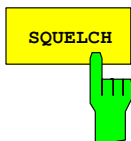
The *SQUELCH* softkey enables the input of a level threshold below which the audible AF is cut off. The squelch function is associated with the internal trigger function (TRIGGER menu), which will be switched on automatically with the squelch. Squelch level and trigger level do have the same value.

The default setting for the squelch is off.

IEC/IEEE-bus command:

```
:CALC:MARK1:FUNC:DEM:SQU ON | OFF
:CALC:MARK1:FUNC:DEM:SQU:LEV 80 PCT
```

## Menu MEAS - DEMOD - SQUELCH (Receiver)



The *SQUELCH* softkey enables the input of a level threshold below which the audible AF is cut off. The squelch function is associated with the internal trigger function (TRIGGER menu), which will be switched on automatically with the squelch. Squelch level and trigger level do have the same value.

The default setting for the squelch is off.

IEC/IEEE-bus command:

```
:SENS:DEM:SQU ON | OFF
:SENS:DEM:SQU:LEV 80 PCT
```

## Menu SETUP – SYSTEM INFO MEAS – STATISTICS

For new delivered devices the specifications version (document of the hardware properties) is shown. For already delivered device dashes (---) are displayed.

## Menu MEAS – STATISTICS – CCDF ON / APD ON – SCALING (Analyzer)



The softkey *Y-UNIT* *%/ABS* defines the scaling type on the y-axis. The default case are the absolute probability. This can be changed to percent values. The softkeys *Y-AXIS MIN* and *Y-AXIS MAX* are using values based on the *Y-UNIT* setting.

IEC/IEEE-bus command:

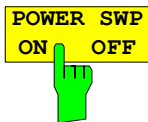
```
:CALC:STAT:SCAL:Y:UNIT PCT | ABS
```

The 0.1%, 1% and 10% value from the CCDF measurement are shown in the bottom screen half. Those values can also queried via remote:

IEC/IEEE-bus command:

```
:CALCulate<1|2>:STATistics:CCDF:X<1..4>? P0_1 | P1 | P10
```

## Menu NETWORK with option R&S FSP-B9



The softkey *POWER SWP ON/OFF* activates or deactivates the power sweep. If the power sweep is ON the enhancement label TGPWR is shown and the analyzer is set in zero span mode (span = 0Hz). During the sweep time of the zero span the power at the internal tracking generator is changed linear from start power to stop power. The start and stop power values are shown on the right side below the diagram.

IEC/IEEE-bus command:

```
:SOUR:POW:MODE SWE  
:SOUR:POW:MODE FIX
```

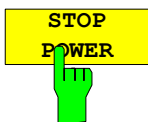


The softkey *START POWER* defines the start power of the power sweep.

The start power can be set between -30 and +0 dBm for the R&S FSP and between -30 dBm and +5 dBm for the R&S FSU. With the option FSU-B12 the power can be set between -100 and + 5 dBm.

IEC/IEEE-bus command:

```
:SOUR:POW:STAR -20dBm
```



The softkey *STOP POWER* defines the stop power of the power sweep.

The stop power can be set between -30 and +0 dBm for the R&S FSP and between -30 dBm and +5 dBm for the R&S FSU. With the option FSU-B12 the power can be set between -100 and + 5 dBm. The stop value can be smaller than the start value.

IEC/IEEE-bus command:

```
:SOUR:POW:STOP -10dBm
```

**Menu SETUP - GENERAL SETUP - GPIB**



The *GPIB LANGUAGE* softkey opens a list of selectable remote-control languages:

- SCPI
- 8560E
- 8561E
- 8562E
- 8563E
- 8564E
- 8565E
- 8566A
- 8566B
- 8568A
- 8568B
- 8594E

**Notes:**

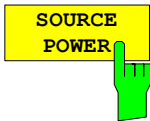
*Selecting a language different from "SCPI" will set the GPIB address to 18 if it was 20 before.*

*Start / stop frequency, reference level and # of sweep points will be adapted to the selected instrument model.*

IEC/IEEE-bus command:

```
SYST:LANG "SCPI" | "8560E" | "8561E" | "8562E" |
"8564E" | "8565E" | "8566A" | "8566B" | "8568A" |
"8568B" | "8594E"
```

**Menu NETWORK with option R&S FSP-B10**

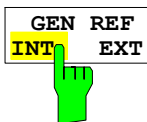


The *SOURCE POWER* softkey activates the input of the generator output level. The value range depends on the selected generator (See table of chapter "Configuration of the External Generator").

If both option External Generator Control FSP-B10 and option Tracking Generator B9 are installed, the softkey will modify the output power of the generator currently in use.

The default output power is -20 dBm.

IEC/IEEE-bus command:            SOUR:EXT:POW -20dBm



The *GEN REF INT/EXT* softkey selects the reference signal for the external generator. Selection EXT allows connecting the external generator to an external reference frequency source. By default the external generator will use its internal frequency reference.

IEC/IEEE-bus command:            SOUR:EXT1:ROSC INT | EXT



The FREQUENCY SWEEP softkey opens a table for setting the generator level as well as the multiplier and the offset used to derive the generator frequency from the analyzer frequency.

Since version 3.7x the external generator can also be used to sweep in the reverse direction. This can be achieved by setting a negative offset in the following formula:

$$F_{Generator} = \left| F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset} \right|$$

Example for reverse sweep:

$$F_{AnalyzerStart} = 100 \text{ MHz}$$

$$F_{AnalyzerStop} = 200 \text{ MHz}$$

$$F_{Offset} = -300 \text{ MHz}$$

$$Numerator = Denominator = 1$$

$$\rightarrow F_{GeneratorStart} = 200 \text{ MHz}$$

$$\rightarrow F_{GeneratorStop} = 100 \text{ MHz}$$

If the offset is adjusted in a way that the sweep of the generator crosses the 0 Hz Frequency, it is indicated by the additional statement "via 0 Hz".

Example for reverse sweep via 0 Hz

$$F_{AnalyzerStart} = 100 \text{ MHz}$$

$$F_{AnalyzerStop} = 200 \text{ MHz}$$

$$F_{Offset} = -150 \text{ MHz}$$

$$Numerator = Denominator = 1$$

$$\rightarrow F_{GeneratorStart} = 50 \text{ MHz}$$

$$\rightarrow F_{GeneratorStop} = 50 \text{ MHz via 0 Hz}$$

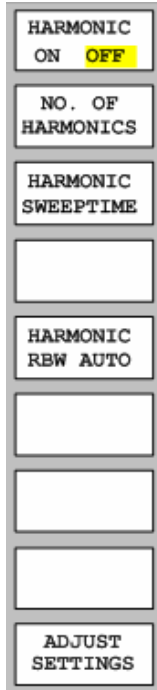
IEC/IEEE-bus command:

SOUR:EXT:FREQ:NUM 1

SOUR:EXT:FREQ:DEN 1

SOUR:EXT:FREQ:OFFS -300MHZ

## Menu MEAS – NEXT – HARMONIC DIST (Analyzer)



The softkey *HARMONIC DISTORTION* opens this menu and activates the harmonic distortion measurement. With this measurement it is possible to measure easily the harmonics e.g. from a VCO. In addition the THD (total harmonic distortion) is calculated in % and dB.

There are 2 possible modes within the harmonic measurement. When entering the harmonic measurement from a frequency sweep (span > 0 Hz) an automatic search for the first harmonic is carried out within that given frequency range. Also a level adjust will be carried out. Is the zero span mode active before entering the harmonic measurement, the center frequency is unchanged.

IEC/IEEE-bus command:

```
:CALCulate:MARKer:FUNCTion:HARMonics:STATe ON | OFF
```

With the softkey *NO. OF HARMONICS* the number of harmonics which shall be measured can be adjusted. The range is from 1 to 26.

IEC/IEEE-bus command:

```
:CALCulate:MARKer:FUNCTion:HARMonics:NHARmonics
<numerical value>
```

The *HARMONIC SWEEPTIME* softkey allows to set the value how long the zero span measurement on each harmonic frequency shall take place. This is an alias softkey to the normal sweep time of the zero span, therefore the same parser command is to be used.

In the upper screen the zero span sweeps on all harmonics are shown, separated by a grid line. This allows a very good overview about the measurement. In the lower screen the mean RMS results are displayed in numerical values and the THD values can be seen in the marker info field.

The resolution bandwidth will be automatically adjusted:  $RBW_n = RBW_1 * n$ , if that RBW is not available the next higher value is used. This feature can be disabled with the softkey *HARMONIC RBW AUTO*.

IEC/IEEE-bus command:

```
:CALCulate:MARKer:FUNCTion:HARMonics:BANDwidth:AUTO
ON | OFF
```

With the adjust setting function the frequency search in the frequency range from before starting the harmonic measurement (if harmonic measurement was started from frequency sweep) and the level adjust can be activated.

IEC/IEEE-bus command:

```
:CALCulate:MARKer:FUNCTion:HARMonics:PRESet
```

The results can be obtained via IEC/IEEE-bus via the following commands:

Trace read out via the normal trace subsystem. The first harmonic frequency can be read out via the center frequency command.

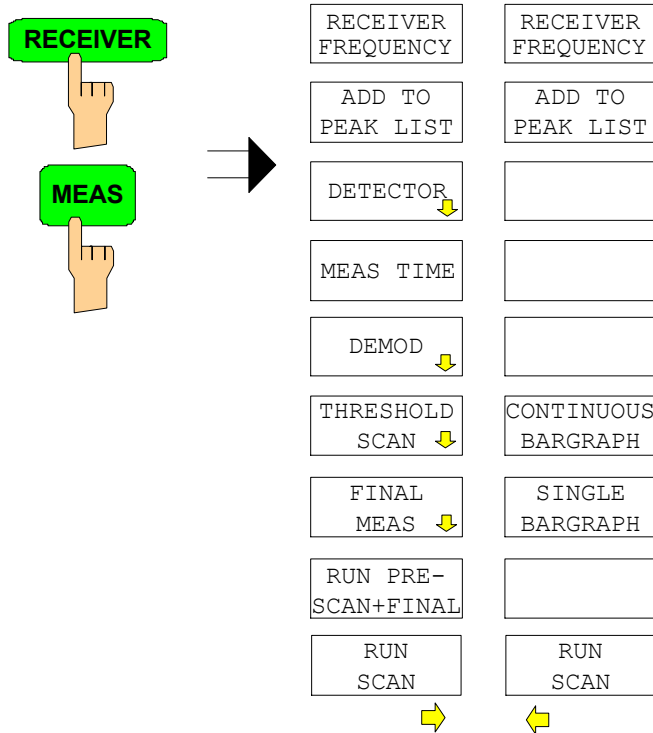
THD value comma separated in % and dB:

```
:CALCulate:MARKer:FUNCTion:HARMonics:DISToRTion? TOTAL
```

Comma separated list of harmonic levels, for each harmonic one value:

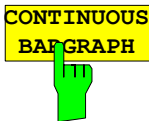
```
:CALCulate:MARKer:FUNCTion:HARMonics:LIST?
```

Hotkey RECEIVER, Menu MEAS (Receiver)



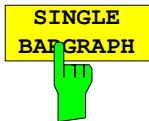
The softkey *RUN PRESCAN+FINAL* is starting a sequence, consisting of a prescan, the peak search-function and the final measurement.

IEC/IEEE-bus command: `INITiate:EMITest`



The *CONTINUOUS BARGRAPH* softkey selects the continuous measurement mode.

IEC/IEEE-bus command: `INITiate:CONTinuous ON`



Pressing the *SINGLE BARGRAPH* softkey triggers a single level measurement.

The enhancement label *SGL* displayed at the screen edge indicates that the single-measurement mode is set.

IEC/IEEE-bus command: `INITiate:CONTinuous OFF`



The *ADD TO PEAK LIST* softkey adds the current receiver frequency to the peak list (see also Section "Data Reduction and Peak List").

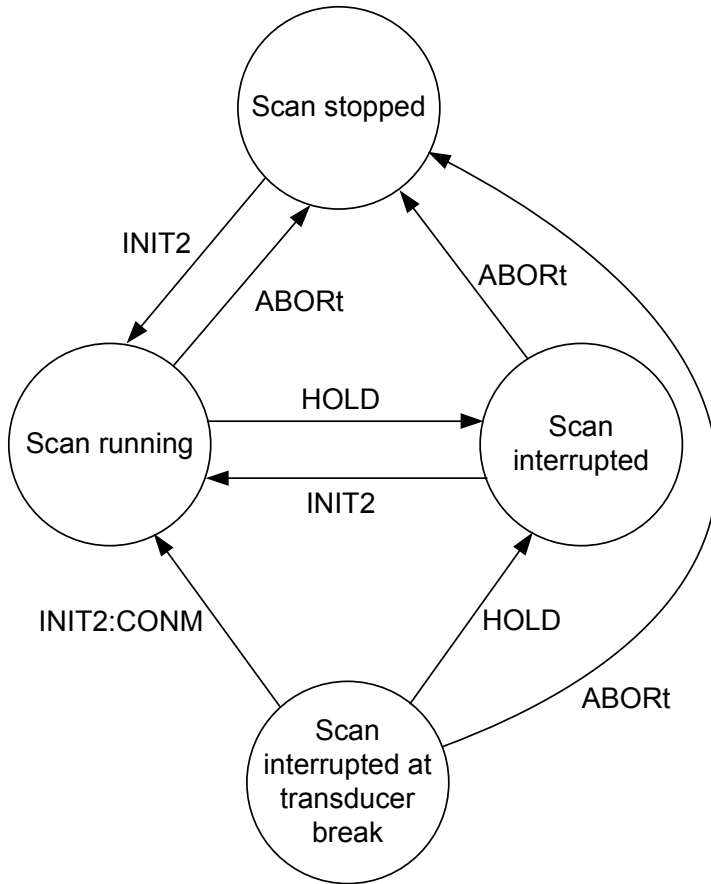
IEC/IEEE-bus command: `--`

### Remote Control – VXI11 support

The VXI-11 channel is now also supported. To remote control the instrument via LAN beside RSIB also the TCPIP connection is possible.

### Remote Control – Description of Commands – INITiate Subsystem

Controlling a scan in Receiver Mode.



### Remote Control – Description of Commands – CALCulate:LIMit Subsystem

#### CALCulate<1|2>:LIMit<1...8>:CATalog?

This command queries all the names of the limit lines saved on the hard disc.

The syntax of the output is:

<sum of file length of all following files>, <free spaces on hard disc>, <1<sup>st</sup> file name>, <1<sup>st</sup> file length>, <2<sup>nd</sup> file name>, <2<sup>nd</sup> file length>, ..., <n<sup>th</sup> file name>, <n<sup>th</sup> file . length>

**Example:** " :CALC:LIM:CAT?"

**Characteristics:** \*RST value: -  
SCPI: device-specific

**Mode:** R, A

## Remote Control – Description of Commands – SENSE:CORRection Subsystem

### [SENSe<1|2>:]CORRection:TRANsducer:CATalog?

This command reads out the names of all transducer factors stored on the internal drive.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,  
<1st file name>,<1st file length>,<2nd file name>,<2nd file length>,,,,,<nth file name>,  
<nth file length>

**Example:** "CORR:TRAN:CAT?"

**Characteristics:** \*RST value: -  
SCPI: device-specific

**Mode:** R, A

### [SENSe<1|2>:]CORRection:TSET:CATalog?

This command reads out the names of all transducer sets stored on the internal drive.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,  
<1st file name>,<1st file length>,<2nd file name>,<2nd file length>,,,,,<nth file name>,  
<nth file length>

**Example:** "CORR:TSET:CAT?"

**Characteristics:** \*RST value: -  
SCPI: device-specific

**Mode:** R, A

## Remote Control – Description of Commands – TRACe Subsystem

### TRACe:POINts LIMit, 1 to 10000

This command defines the maximum number of measurement points which are transferred in one block after the query command `TRACe? SCAN`. The total amount of bytes which is transferred depends on the number of active traces.

**Example:** "TRAC:POIN LIM, 8000"  
'A maximum of 8000 measurement values per trace will be transferred with a single query

**Characteristics:** \*RST value: 1000  
SCPI: device-specific

**Mode:** R



## Remote Control – Description of Commands – CALCulate:PEAKsearch Subsystem

### CALCulate:PEAKsearch:ADD <numeric\_value>

This command adds a frequency value to the peaklist in receiver mode. (RECEIVER – FINAL MEAS – EDIT PEAK LIST). Only frequencies in the currently displayed frequency range of the receiver scan are allowed.

**Example:**       "CALC:PEAK:ADD 93 MHZ"  
                  'The frequency 93 MHz as added to the peak list

**Characteristics:** \*RST value: -  
                      SCPI: device-specific

**Mode:**           R

### CALCulate:PEAKsearch:CLEAr[:IMMEDIATE]

The peaklist in receiver mode (RECEIVER – FINAL MEAS – EDIT PEAK LIST) is cleared.

**Example:**       "CALC:PEAK:CLE"  
                  'The peak list is cleared

**Characteristics:** \*RST value: -  
                      SCPI: device-specific

**Mode:**           R

## Remote Control – Description of Commands – SYSTEM Subsystem

### SYSTEM:IDENTify:FACTory

With this command it is possible to reset the \*IDN string to the factory default (Softkey: ID STRING FACTORY).

**Example:**       ":SYST:IDEN:FACT?"

## Remote Control – Description of Commands – SENSE:LIST Subsystem

### [SENSe<1|2>:]LIST:POWer:SET:AVERAge:TYPE LINear | LOGarithmic

With this command the average type of the sense list measurement can be set either to linear (default) or logarithmic. In linear mode voltages are averaged in logarithmic mode levels.

**Example:**       "LIST:POW:SET:AVER LOG" 'sets log averaging for list measurement.

**[SENSe<1|2>:]LIST:POWer[:SEQUence]** <analyzer freq>,<ref level>,<rf att>,<el att>,<filter type>,<rbw>,<vbw>,<meas time>,<trigger level>,...

The LIST:POW command supports now the following filter types:

<filter type>:	NORMAL:	normal resolution filter
	CFILter:	channel filter. These are especially steep-edged filters, which are used for example in Fast ACP measurement to ensure the band-limiting of a transmission channel in the time domain.
	RRC:	Root Raised Cosine filter. This special filter form

is used to determine the channel power for some mobile radio standards.

For allowed <rbw> setting for <filter type> = CFILter and <filter type> = RRC see table "List of available channel filters" in section "Setting Bandwidths and Sweep Time – Key BW".

### Remote Control – Description of Commands – TRACe Subsystem

#### TRACe<trace #>:IMMEDIATE:LEVel? and TRACe<trace #>:IMMEDIATE:RESult?

These query command returns instantaneous measurement results. During a sweep which shall not have a synchronization on the sweep end last measured value can be read out. This makes sense if measurement values shall be obeyed during long sweep times. The LEVel? command only returns the level, where the RESult? command returns comma separated the x and y value. For a better time resolution the number of sweep points can be increased.

<b>Example:</b>	"INIT:CONT OFF"	'switches to single sweep mode
	"INIT"	'starts a sweep (without waiting for the sweep end!)
	"TRAC1:IMM:LEV?"	'queries the level of the last measured measurement point

### Remote Control – Description of Commands – SENSE:MPOWER Subsystem

[SENSe<1|2>:]MPOWER[:SEQUence] <analyzer freq>,<rbw>,<meas time>,<trigger source>, <trigger level>,<trigger offset>,<type of meas>,<# of meas>

For MPOW also the RRC and CFILter can be used by defining the filter type with the command: [SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:TYPE NORMAl | FFT | CFILter | RRC before using the MPOW command.

### Remote Control – Description of Commands – MMEMory Subsystem

#### MMEMory:CATalog:LONG? <path>

This command queries the directories and files in the given path.

**Parameter:** <path>::= DOS path

**Example:** "MMEM:CAT:LONG? 'D:\USER\DATA' 'queries the contents of directory D:\USER\DATA

**Return value:** <used\_bytes\_in\_this\_directory>,<free\_bytes\_on\_this\_disk>,"<file\_name>,<file\_type>,<filesize\_in\_bytes>","<file\_name>,<file\_type>,<filesize\_in\_bytes>"," ...

with

<file_name>	name of file or directory
<file_type>	file type: DIR (directory), ASCii (ASCII file), BINary (binary file) and STATe (file with device settings)
<filesize_in_bytes>	size of file, 0 for directories

## Remote Control – Description of Commands – SENSE:SWEep Subsystem

### [SENSe<1|2>:]SWEep:COUNT:CURRENT?

This query command returns the current number of started sweeps. A sweep count value should be set and the device should be in single sweep mode.

**Example:**

"SWE:COUNT 64"	'sets sweep count to 64
"INIT:CONT OFF"	'switches to single sweep mode
"INIT"	'starts a sweep (without waiting for the sweep end!)
"SWE:COUN:CURR?"	'queries the number of started sweeps

[

### Supported 85xx-commands

85xx - command	Modification	Description
KS(	new command	Lock registers
KS)	new command	Unlock registers
KS91	new command	Read amplitude error
SMOOTH	new command	Smooth trace
MKP	new command	Marker position
MKA	new command	Marker amplitude
MKTYPE AMP	new command	Marker type
CHPWRBW	new command	Channel power bandwidth
CHNPWR	new command	Channel power

85xx - command	Modification	Description
AMB ON OFF	new command	Trace A minus B
APB	new command	Trace A plus B
BL, BML	new command	B - display line --> B
BTC	new command	Transfer B to C
BXC	new command	Exchange B and C
D1	new command <sup>1)</sup>	Display size normal
DEMOTD	new command	Demodulation time
DLE	new command	Display line enable
MKDR	new command	Delta Marker reverse
MKT	new command	Marker to time point
O2	new command	Trace readout
PU	new command <sup>1)</sup>	Pen up
RCLOSCAL	new command	Recall open/short reference trace into trace B, set instrument to the stored open/short reference state.
RCLT TRA TRB, <number>	new command	Recall Trace Data
RCLTHRU	new command	Recall the thru-reference trace into trace B, set instrument to stored thru-reference state.
SAVET TRA TRB, <number>	new command	Save Trace Data
SQUELCH	new command <sup>1)</sup>	Squelch
STOREOPEN	new command	Set open/short reference
STORESHORT	new command	Set open/short reference
STORETHRU	new command	Set thru reference
SWPCPL SA SR	new command <sup>1)</sup>	
THE	new command	Threshold enable
TRSTAT	new command	The TRSTAT command returns trace states to the controller: clear-write, off, view, or blank.
VTL	new command	Video trigger level

85xx - command	Modification	Description
ADJALL	new command	Adjust all
ADJCRT	new command <sup>1)</sup>	Adjust CRT
ADJIF	new command <sup>1)</sup>	Auto adjust IF
AUTOCP	new command	Coupling default
AXB	new command	Exchange trace A and B
COUPLE AC DC	new command	Select input coupling
DEMOCAGC	new command <sup>1)</sup>	Demodulation AGC
EX	new command	Exchange trace A and B
FREF	new command	Reference frequency internal/external
GRAT ON OFF	new command <sup>1)</sup>	Grid on/off
KS/	new command <sup>1)</sup>	Manual peaking
KSK	new command	Marker to next peak
KSO	new command	Deltamarker to span
KSQ	new command	Band lock off
KSp	new command	Character display on
KS <sub>n</sub>	new command <sup>1)</sup>	Grid on
KSo	new command	Character display off
KSr	new command	Create service request
KSt	new command	Band lock on
KSv	new command	Signal ident on
L0	new command	Display line off
LB	new command	Label
LF	new command	Preset with low frequency band selection
LL	new command <sup>1)</sup>	Cursor to lower left corner
MKDR?	new command	Delta marker reverse query
MKFC ON OFF	new command	Marker frequency count
MKSP	new command	Deltamarker to span
NORMALIZE	new command	Normalize trace
NRPOS	new command	Normalize trace position

85xx - command	Modification	Description
OT	<ul style="list-style-type: none"> <li>OT after CF or SP now returns Center/Span values rather than Start/Stop</li> <li>string 27 now indicates the current sweep status</li> </ul>	Output annotations
PA	new command <sup>1)</sup>	Plot absolute
PD	new command <sup>1)</sup>	Pen down
PLOTORG	new command <sup>1)</sup>	Plot origin
PLOTSRC	new command <sup>1)</sup>	Plot source
PRINT	Accept numeric parameter	Print
PSDAC	new command <sup>1)</sup>	Preselector DAC
PSTATE	new command <sup>1)</sup>	Protect state
RBR	new command	Resolution bandwidth/span ratio
RLCAL	new command <sup>1)</sup>	Reference level cal
SWPOUT	new command <sup>1)</sup>	Sweep Output
T2	new command <sup>1)</sup>	Line trigger
TM LINE	new command <sup>1)</sup>	Trigger Line
UR	new command <sup>1)</sup>	Cursor to upper right corner

<sup>1)</sup> Command accepted, but ignored

85xx - command	Supported subset	Known differences
ERR?		Erases the error bit in the status register but always returns 0.
M3	M3 M3 <numeric_value>      HZ KHZ MHZ GHZ M3 DN M3 UP M3?	default value value range step size. Noise measurement activated with KSM is automatically switched off with any M3-command..
MKPT	MKPT MKPT HI MKPT NH MKPT NR MKPT NL	
OA		
OT		
RESET		
REV?		
TRA?		
TRB?		
TDF	TDF P	

### Model dependent default settings

When selecting a 85xx model language the GPIB address will be automatically set to 18, if the FSP default address ( 20 ) is active. Other values than 20 will be left unchanged. On return to GPIB language SCPI the current GPIB address will be preserved.

The following table shows the default settings which will be set when selecting the GPIB language or when using the commands IP, KST and RESET.

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	DC (FSU) AC (FSP)
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC
8564E	601	0 Hz	40 GHz	0 dBm	AC
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC

**Note on selected stop frequency:**

The stop frequency indicated in the table will be limited by the maximum stop frequency of the analyzer.

**Note on the selected number of trace points:**

The adaptation of the number of trace points will only be performed on the LOCAL -> REMOTE transition.

## Trace data output formats

Two formats are supported for trace data output: display units (command O1) and physical values (commands O3 or TDF P). With format "display units" the level data will be converted into value range and resolution of the 8566/8568 models. On transition to REMOTE state the number of trace points will be reconfigured in order to be conforming to the selected instrument model (1001 for 8566A/B and 8568 A/B, 601 for 8560E to 8565E, 401 for 8594E).

## GPIB status reporting system

The assignment of the status bits performed by commands R1, R2, R3, R4, RQS is supported since firmware V1.80. Commands STB and a serial poll on the GPIB will return an 8 bit value with the following bit assignment:

Bit enabled by RQS
1 (Units key pressed)
2 (End of Sweep)
3 (Device Error)
4 (Command Complete)
5 (Illegal Command)
6 (Service Request)

Bits 0 and 7 are unused and always set to 0.

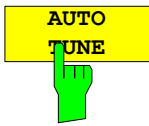
Please note that the FSP reports any key pressed on the front panel rather than only the unit keys if bit 1 was enabled.

Another difference is the behaviour of bit 6 when using the STB? query. On the HP analyzers this bit monitors the state of the SRQ line on the bus. On the FSP this is not possible. Therefore this bit is set, as soon as one of the bits 1 to 5 is set. It won't be reset by performing a serial poll.



FS-K7 Extensions

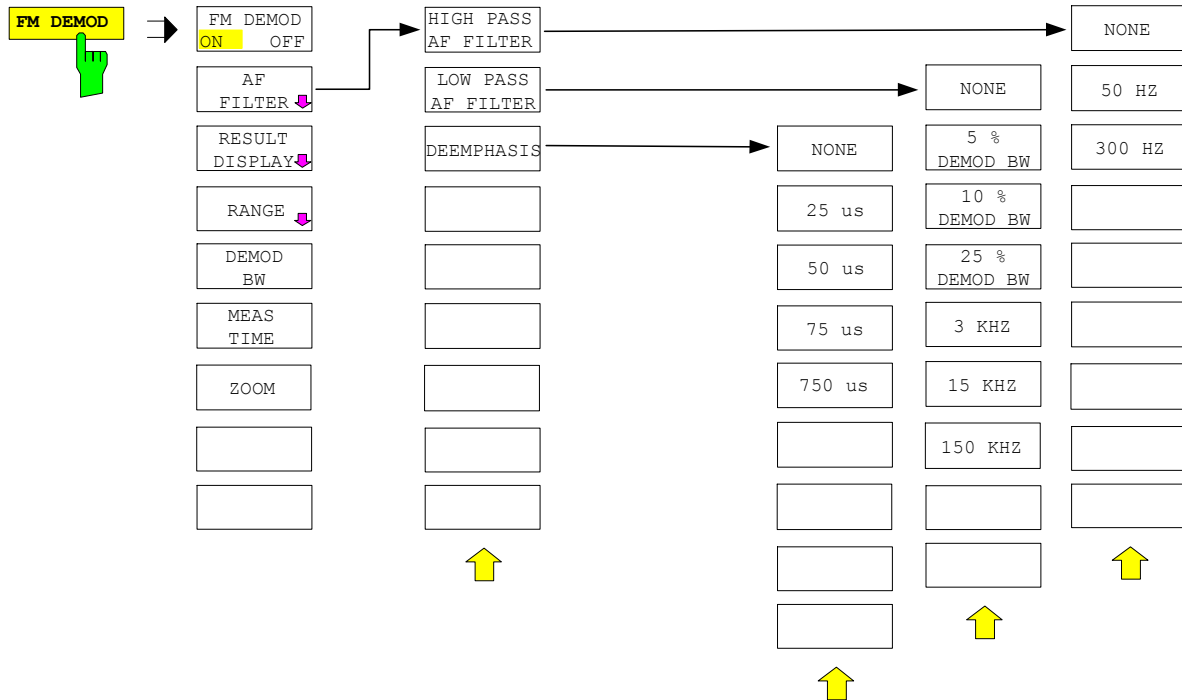
Menu FREQUENCY



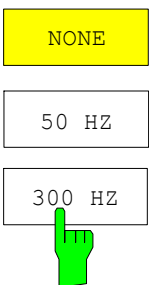
This softkey activates an automatic signal search.

IEC/IEEE-bus command: SENS:FREQ:CW:AFC ONCe

The FS-K7 has been extended about AF filters. The bandwidth of the demodulated signal can be reduced by highpass or lowpass filters and also a deemphasis can be switched on.



HIGH PASS AF FILTER



The 50 HZ and 300 HZ softkeys switch on a highpass filter with the given limit to separate the DC component. The filters are indicated by the 3 dB cutoff frequency. The filters are designed as 2nd-order Butterworth filter (12 dB/octave).

The NONE softkey deactivates the AF highpass filter. Default is NONE.

The R&S FSP requires the option FSP-B70 for the highpass filter.

The highpass filter are active in the following demodulation bandwidth range:  
 50 Hz            200 Hz ≤ demodulation bandwidth ≤ 4 MHz  
 300 Hz          800 Hz ≤ demodulation bandwidth ≤ 16 MHz

IEC/IEEE-bus command:  
 [SENSe:]FILTEr:HPASs[:STATe] ON | OFF  
 [SENSe:]FILTEr:HPASs:FREQuency 50 Hz | 300 Hz

### LOW PASS AF FILTER



The 5 %, 10% and 25% HZ softkeys switch on a relative lowpass filter. The filter (3 dB) can be selected in % of the demodulation bandwidth. The filters are designed as 5th-order Butterworth filter (30 dB/octave).

The 3 KHZ, 15 KHZ and 150 KHZ softkeys switch on a absolute lowpass filter. The filter are indicated by the 3 dB cutoff frequency. The 3 kHz and 15 kHz filters are designed as 5th-order Butterworth filter (30 dB/octave). The 150 kHz filter is designed as 8th-order Butterworth filter (48 dB/octave).

The NONE softkey deactivates the AF lowpass filter. Default is NONE.

The FSP requires the option FSP-B70 for the absolute lowpass filter 3 kHz, 15 kHz and 150 kHz. The relative lowpass filters are always available.

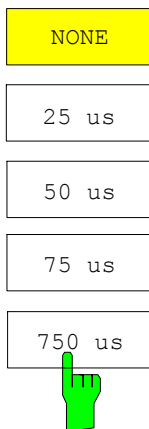
The relative lowpass filters are active for all demodulation bandwidth's. The absolute lowpass filters are active in the following demodulation bandwidth range:

3 kHz	6.4 kHz ≤ demodulation bandwidth ≤ 4 MHz
15 kHz	50 kHz ≤ demodulation bandwidth ≤ 16 MHz
150 kHz	400 kHz ≤ demodulation bandwidth ≤ 16 MHz

IEC/IEEE-bus command:

```
[SENSe:]FILTeR:LPASs[:STATe] ON | OFF
[SENSe:]FILTeR:LPASs:FREQuency 3 kHz | 15 kHz | 150 kHz
```

### DEEMPHASIS



The 25 us, 50 us, 75 us and 750 us softkeys switch on a deemphasis with the given time constant.

The NONE softkey deactivates the deemphasis. Default is NONE.

The R&S FSP requires the option FSP-B70 for the deemphasis.

The deemphasis is active in the following demodulation bandwidth range:

25 μs	25 kHz ≤ demodulation bandwidth ≤ 30 MHz
50 μs	6.4 kHz ≤ demodulation bandwidth ≤ 18 MHz
75 μs	6.4 kHz ≤ demodulation bandwidth ≤ 18 MHz
750 μs	800 Hz ≤ demodulation bandwidth ≤ 4 MHz

The following table shows the required demodulation bandwidth for an error less than 0.5 dB up to a maximum AF frequency.

Deemphasis	25 μs	50 μs	75 μs	750 μs
Maximum AF Frequency	25 kHz	12 kHz	8 kHz	800 Hz
Required demodulation bandwidth	>= 200 kHz	>= 100 kHz	>= 50 kHz	>= 6.4 kHz

For higher AF frequencies the demodulation bandwidth must be increased.

IEC/IEEE-bus command:

```
[SENSe:]FILTeR:DEMPHasis[:STATe] ON | OFF
[SENSe:]FILTeR:DEMPHasis:TCONstant 25 us | 50 us |
75 us | 750 us
```

The FS-K7 has been extended about the AM result display. With active FM demodulator (ADEM ON or INST:SEL ADEM) the AM evaluation can be activated with the command CALC:FEED 'XTIM:AM:REL'. The settings and measurement result queries are similar as in the FM evaluation. The diagram scaling is in the unit % instead of Hz.

command for FM

```
CALC:FEED 'XTIM:FM'
CALC:FEED 'XTIM:FMS'
CALC:FEED 'XTIM:FM:AFSP'
CALC:MARK:FUNC:ADEM:FM:RES
ADEM:FM:TYPE
ADEM:FM:RES
TRIG:SOUR FM
TRIG:LEV:FM
```

command for AM

```
CALC:FEED 'XTIM:AM:REL'
CALC:FEED 'XTIM:AMS:REL'
CALC:FEED 'XTIM:AM:REL:AFSP'
CALC:MARK:FUNC:ADEM:AM:RES
ADEM:AM:REL:TYPE
ADEM:AM:REL:RES
TRIG:SOUR AMR
TRIG:LEV:AM:REL
```

The other commands of the AM evaluation are identical to the FM evaluation. In addition to the FM evaluation the modulation depth of AM modulated signals can be queried with `CALC:MARK:FUNC:MDEP:RES?`.

The PM demodulation has been extended about the following new functions:



The *ZERO PHASE REF POINT* softkey activates the input of the reference point, where the phase is set to 0 rad.

IEC/IEEE-bus command: `SENS:ADEM:PM:RPO:X 10us`



The *PHASE WRAP ON/OFF* softkey activates the phase wrapping to  $-\pi \dots +\pi$  ( $-180^\circ \dots +180^\circ$ ).

IEC/IEEE-bus command: `CALC:FORM PHAS | UPAS`



The *PM UNIT RAD/DEG* softkey selects the unit for PM traces.

IEC/IEEE-bus command: `UNIT:ANGL RAD | DEG`

The range of the demodulation bandwidth has been extended down to 100 Hz.

new demodulation bandwidth	sampling rate
6.4 kHz	7.8125 kHz
3.2 kHz	3.90625 kHz
1.6 kHz	1.953125 kHz
800 Hz	976.5625 Hz
400 Hz	488.28125 Hz
200 Hz	244.140625 Hz
100 Hz	122.0703125 Hz

Information to Demod BW 8 MHz:

This filter is only flat for about 6 MHz, it has a 3dB decay at 7 MHz.

## Appendix: Contact to our hotline

Any questions and ideas concerning the instrument are welcome to our hotline:

### USA & Canada

Monday to Friday (except US public holidays)  
8:00 AM – 8:00 PM Eastern Standard Time (EST)  
Tel. from USA 888-test-rsa (888-837-8772) (opt 2)  
From outside USA +1 410 910 7800 (opt 2)  
Fax +1 410 910 7801  
E-mail [Customer.Support@rsa.rohde-schwarz.com](mailto:Customer.Support@rsa.rohde-schwarz.com)

### East Asia

Monday to Friday (except Singaporean public holidays)  
8:30 AM – 6:00 PM Singapore Time (SGT)  
Tel. +65 6 513 0488  
Fax + 65 6 846 1090  
E-mail [Customersupport.asia@rohde-schwarz.com](mailto:Customersupport.asia@rohde-schwarz.com)

### Rest of the World

Monday to Friday (except German public holidays)  
08:00 – 17:00 Central European Time (CET)  
Tel. from Europe +49 (0) 180 512 42 42  
From outside Europe +49 89 4129 13776  
Fax +49 (0) 89 41 29 637 78  
E-mail [CustomerSupport@rohde-schwarz.com](mailto:CustomerSupport@rohde-schwarz.com)