



ROHDE & SCHWARZ

Test and Measurement
Division

Release Notes

R&S FSQ-K70

Vector Signal Analysis Application Firmware

Release 4.30

with Service Pack 1

for R&S FSU, FSQ, FSG, FMU, FSUP
Analyzer Firmware 4.3x

New Features:

- Extended Symbol Rate with option FSQ-B72 and FSQ-B71.
- FSQ-B17: Digital Baseband Input supported.
- New windows dialogs for File Import/Export functions

Release Note Revision: 2

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History

Date	Rel Note Rev	Changes
06 March 2008	1	First revision for Vector Analysis Application Firmware 4.30.
10 July 2008	2	Problems eliminated with Service Pack 1 added.

General Topics

Hardware Requirements

Please note at least revision 04.08 of Wideband Detector Board is required for R&S FSQ-K70. This can be checked in the SETUP SYSTEM INFO menu with softkey HARDWARE INFO.

For component WB DETECTOR is required:

revision	sub revision	
4	≥ 8	or
> 5		

Compatibility of the R&S FSQ-K70 Vector Analysis Application Firmware with other Firmware Releases

The following table shows the compatible versions of the basic analyzer firmware and the Vector Analysis Application Firmware:

Table of compatible versions:

R&S FSQ-K70 Application Firmware	R&S FSU Basic Firmware	R&S FSQ Basic Firmware	R&S FSMR Basic Firmware	R&S FSUP Basic Firmware	R&S FMU Basic Firmware	R&S FSG Basic Firmware
4.30 SP1	4.31 SP1	4.35 SP1	-	-	-	4.39 SP2
4.30	4.31	4.35	-	-	-	4.39
4.20 SP2	4.21 SP1	4.25 SP1	-	-	4.28	4.29 SP3
4.20 SP1	4.21	4.25	-	-	-	4.29
4.20	4.21	4.25	-	-	-	4.29
4.10	4.11	4.15	-	4.17	-	-
4.01	-	-	-	-	4.08	-
4.00 SP2	4.01 SP3	4.05 SP3	-	-	-	-
4.00 SP1	-	-	4.06	-	-	-
4.00	4.01	4.05	-	-	-	-
3.90 SP1	-	3.95 SP2	-	-	-	-
3.90	-	3.95	3.96	-	-	-
3.80	-	3.85				
3.70	-	3.75	-	-	-	-
3.60	-	3.65	-	-	-	-
3.50 SP1	-	3.55 SP2	-	-	-	-
3.50	-	3.55	-	-	-	-
3.40	-	3.45	-	-	-	-
3.30	-	3.35	-	-	-	-
3.28	-	3.25	-	-	-	-
3.24	-	3.15	-	-	-	-
3.21	-	3.05 SP1	-	-	-	-
3.20	-	3.05	-	-	-	-
2.30	-	2.35	-	-	-	-
2.28	-	2.25	-	-	-	-
2.24	-	2.15	-	-	-	-
1.21	-	2.05	-	-	-	-
1.00	-	1.85	-	-	-	-
-	-	1.65	-	-	-	-
-	-	1.55	-	-	-	-

The FSQ-K70 application firmware versions 3.xx or 4.xx requires Windows XP. For NT based instruments a Windows-XP upgrade kit FSQ-U2, order # 1162.9696.02 is available.

Note:

Applications with version number 3.xx or 4.xx are only compatible with basic firmware 3.yy or 4.yy (see table above). Do not install them on basic firmware versions below 3.00!

Firmware Update of the R&S FSQ-K70 Vector Analysis Application Firmware

Since basic firmware version 4.2x a ZIP file with the update sets of the basic system firmware and all available applications is provided. This ZIP file is available in the instruments FIRMWARE section, e.g. R&S FSU of the Service Board on GLORIS.

Please follow the steps described in the instrument's basic firmware release note to perform a complete firmware update.

Enabling the Application Firmware via License Key Code Entry

This section can be skipped if the option key was entered once.

After installing the application firmware package 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 R&S FS-K70 Vector Analysis Application Firmware package.

The key sequence for entering the license key is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

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

- On a successful validation the message 'option key valid' will appear.
- If the validation failed, the application firmware is not installed.

The most probable reason will be that the instrument is not equipped with the correct basic firmware version. Therefore a message box will appear asking for installation of the correct basic firmware version.

If the application firmware package was not installed prior to entering the license key code, a message will appear asking for installation of the application firmware package.

In any case please make sure that the correct basic firmware version and the application firmware package is installed prior to entering the license key code.

New Functions in Version 4.30

- Extended Symbol Rate with option FSQ-B72 and FSQ-B71.
- FSQ-B17: Digital Baseband Input supported.
- FSQ-B17: New windows dialogs for File Import/Export available.

Modified Functions

The behaviour of the following functions changed compared to earlier versions [the number in brackets indicates the firmware version that introduced the individual change]:

1. (V3.60) **EXPORT STANDARD: Query before overwriting existing file in manual operation.**
2. (V3.60) **Menu HOME VSA - FACTORY DEFAULTS now support PATTERNS, too.**
3. (V3.60) **Expanded range for Symbol Rate. The lower limit is now 100 Hz.**
4. (V3.60) **A trace in VIEW state in analyzer mode is set to CLR/WRITE when leaving the vector analysis mode.**
5. (V3.80) **Expanded range for FSK Ref. Deviation. The upper limit is now $1.5 \cdot \text{Symbol Rate}$.**
6. (V3.80) **Measurements at low frequencies using baseband inputs of option FSQ-B71 by a digital down conversion are now supported.**
7. (V3.80) **Absolute marker position for marker 1 added for measurement result AM/AM - AM/PM conversion.**
8. (V3.80) **SAVE AS STANDARD additionally stores statistics parameter settings (X-AXIS QUANTIZE, X-axis and Y-axis scaling).**
9. (V3.80) **Default focus for NEW PATTERN dialog is change to pattern name.**
10. (V3.90) **Support of option FSQ-B100: Extended Record Length.**
11. (V4.00) **External trigger level in steps 0.1V over the complete range of 0.5V to 3.5V.**
12. (V4.20) **Support for instrument R&S FSG.**
13. (V4.20) **Result SYMBOLS & MOD ACC: Calculation of SNR (signal-to-noise ratio) changed.**
Before version 4.20, the SNR calculation is dependent on the EVM CALC setting (MAX SYMBOL / SIGNAL MEAN POWER). Since version 4.20 the SNR value is only referenced to the mean power. EVM CALC setting is ignored for SNR calculation.
14. (V4.20) **Trace Export of I/Q Data (RAW DATA) in WAVEFORM format.**
15. (V4.30) **Softkeys Signal Source Type (I+j*Q, I Only, Q Only) are only available if baseband input is selected.**
16. (V4.30) **Multi Mode: Changing the Zoom Start window has no effect.**
The Capture Buffer Trace is not updated according to the new zoom window position, if the zoom start position is changed at the current zoom window is located at the end of the I/Q capture buffer.
17. (V4.30) **Statistics measurement: New function field indicates voltage/level interval**
The interval used for the statistics evaluation is indicated with a new function field at the left top corner of the grid replacing the reference level indication.

18. (V4.30) New windows dialogs available for File Import/Export functions

New dialog with browser functions are now available to export traces or configure the import / export path for Standards, Pattern, Filters, Equalizers..

Problems Eliminated with 4.30

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

1. (V4.10) Wrong input signal power indication in analyzer mode after leaving VSA mode.

An incorrect internal level setting leads to a wrong signal power indication after following settings:

- Enter Vector Signal Analysis mode (VSA)
- Set Reference Level to 0 dBm
- Exit VSA

Changing the Reference Level in Analyzer Mode to the same value corrects the internal setting and the power indication is correct now.

Note: This problem is already fixed in V4.20 SP1.

2. (V4.20) The I/Q data capturing does not work after the export of trace data in the wave form format is done.

Note: This problem is already fixed in V4.20 SP2.

3. (V4.10) Missing EXTREF indication for measurement Result Signal - REAL/IMAG combined with SPLIT SCREEN.

An "EXTREF" enhancement label indicates an UNLOCK condition due to a missing external reference. If SPLIT SCREEN is active and one of the screens is using a REAL/IMAG measurement format, the update of this indication is erroneously suppressed. The remote control status information (Status Questionable Frequency register) is not affected and returns the correct status information.

Note: This problem is already fixed in V4.20 SP2.

4. (V4.10) Unstable demodulation of USER-QAM for TX filters with narrow bandwidth.

This problem only occurs with TX filters designed for EDGE Evolution signals (for "higher symbol rate" and the "narrow pulse shape").

Note: This problem is already fixed in V4.20 SP2.

5. (V4.20) Option FSU-B24 is not supported.

Note: This problem is already fixed in V4.20 SP2.

6. (V4.10) Remote command :SENSe1:DDEMod:FILTer:CATalog? does not return 'RC', 'RRC', 'GAUSS'.**7. (V4.10) X-AXIS QUANTISATION value of 1 is allowed for statistics measurements.**

More than one quantization range is required to draw a useful statistics curve but the parameter was limited to ≥ 1 .

8. (V4.10) A Limit Line with Y-Scaling ABS and unit dB is not selectable.

If the unit is changed from dBm to dB, the Y-scaling REL is automatically selected. For some of the measurement results (e.g. Meas Signal MAGNITUDE and Y Unit LOG dB) this combination is required to get a compatible limit line definition.

9. (V4.20) The scaling parameter Ref Position and Ref Value do not fit the grid scaling in SPECTRUM display after switching SPECTRUM OFF and ON again.**10. (V4.10) The configuration of the Burst Search with parameter THRESHOLD ABS does not work.****11. (V4.20) Softkey Trace Export Format DATA RAW shows wrong format after PRESET.**

After Preset the format is reset to ASCII but the softkey text indicates WAVEFORM if this format is set to WAVEFORM before the preset is performed.

Problems Eliminated with Service Pack 1

Service Pack 1 fixes the following problems.

- 1. (V4.20) ADJUST REF LVL restores wrong measurement result if AM & PM Conversion is selected.**
- 2. (V4.30) Remote command SYSTem:DISPlay:UPDate ON | OFF resets measurement results.**

Measurement results are marked as invalid, when the command SYST:DISP:UPD is sent after performing a single sweep. No result query is possible in that case.

Known problems with option R&S FSQ-K70 Vector Analysis

None.

Modifications to the Operating Manual and Supplements

The R&S FSQ-K70 analyzer functions are included in a separate new manual set. Please refer to the following order numbers:

- 1161.8073.42-09 (English)
- 1161.8073.41-09 (German)

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

Last minute changes to the operating manual

Menu MEAS RESULT - NEXT

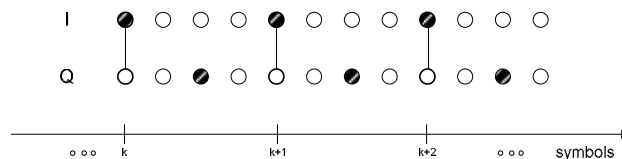


The “*OFFSET EVM ON/OFF*” softkey influences the calculation of the error vector magnitude trace for Offset-QPSK only. It has no effect for all other modulations. It has no effect on results based on the MEAS or the REF signal.

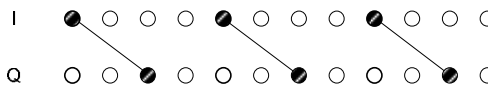
At which samples will the difference between MEAS and REF signal be measured:

- **OFFSET EVM ON:** The error vector magnitude is calculated at the symbol instants of the I-part and the symbol instants of the Q-part of the Offset-QPSK signal.
In other words: The half symbol duration delay of the Q-part is compensated.
In firmware versions prior to the introduction of this softkey, this method was always used for Offset-QPSK.
- **OFFSET EVM OFF:** The error vector magnitude is calculated at the symbol instants of the I-part and the corresponding sample of the Q-part of the signal. But the latter is not a symbol instant.
In other words: The Offset-QPSK signal is treated like a QPSK signal for the error vector magnitude calculation, the Q-delay is not compensated.

OFFSET EVM OFF



OFFSET EVM ON



● = symbol instants in I or Q

Example how samples are selected depending on “OFFSET EVM ON/OFF” (shown for oversampling 4).

This softkey does not only influence the way how the difference between the MEAS and the REF signal is calculated (Numerator of the EVM formula). If the softkey “EVM CALC” is not set to “MAX SYMBOL”, but to “SIGNAL MEAN

POWER”, the calculation of the normalization factor C (denominator of the EVM formula) is also switched to work in the same fashion. So the half symbol duration delay of the Q-part of the REF signal is either compensated or not.

This normalization factor C is not only used for EVM-based results, but also in the *SNR (MER)* calculation.

So in the case of Offset-QPSK this softkey “*OFFSET EVM ON/OFF*” has an effect on all these results:

- Error vector magnitude (EVM) trace
- All the numerical EVM results in the *Modulation Accuracy* table. Therefore the EVM in the table is either titled “*EVM offset*” or “*EVM no offset*”.
- The *SNR (MER)* in the *Modulation Accuracy* table, because of the changing normalization factor C.

Note: The EVM result in the Modulation Accuracy table is listed as “EVM Offset” and “EVM No Offset” respectively.

IEC/IEEE bus command

:SENS:DDEM_ECAL:OFFS ON | OFF

Trace-based Evaluations

Test parameter	Formula
Error Vector Magnitude = EVM	$EVM(t) = \frac{ EV(t) }{C}$; In case of Offset-QPSK please observe the influence of the softkey “ <i>Offset EVM ON/OFF</i> ” on nominator and denominator.

Summary - Evaluations

SNR (MER) (Signal-to-noise ratio)	$SNR = 10 \log_{10} \left(\frac{\text{signal power}}{\text{noise power}} \right) = \frac{\frac{1}{N} \sum_{n=0}^{N-1} REF(n \cdot T_{symbol}) ^2}{\frac{1}{N} \sum_{n=0}^{N-1} MEAS(n \cdot T_{symbol}) - REF(n \cdot T_{symbol}) ^2}$ <p>The SNR (signal-to-noise ratio) is the quotient of the signal power of the ideal signal (REF signal) and the noise power. The signal power is calculated as the mean power of the ideal signal (REF signal) at symbol decision points. The</p>
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	<p>noise power is calculated as the mean power of the error signal, i.e. the difference of the measured signal and the corresponding ideal signal (MEAS-REF signal), at symbol decision points. For VSB, only the power of the real part is considered.</p> <p>The definition of the SNR has been changed with firmware version 4.20. In older versions the SNR was calculated in the same way as the EVM and did depend on the softkey "EVM CALC".</p> <p>The parameter "EVM calc" does always influence the calculation of EVM.</p>
Normalization constant C (not VSB)	$C = \sqrt{\frac{1}{K} \sum_K REF(k) ^2} = \text{sqrt(mean power of the symbol decision instants)}$ <p>But if the softkey "EVM CALC" is set to "MAX SYMBOL POWER", the factor C is not calculated as given above, but set to the constant ideal value of the maximum symbol magnitude.</p> <p>In case of Offset-QPSK please observe the additional influence of the softkey "OFFSET EVM ON/OFF" on the determination of the symbol instants in the I- and Q-part of the REF signal.</p>
Normalization constant C (VSB only)	$C = \sqrt{\frac{1}{K} \sum_K \text{Re}\{REF(k)\} ^2} = \text{sqrt(mean power of the symbol decision instants).}$ <p>But if the softkey "EVM CALC" is set to "MAX SYMBOL POWER", the factor C is not calculated as given above, but set to the constant ideal value of the maximum symbol magnitude.</p>
RMS_EVM (not VSB)	$RMS_EVM = \sqrt{\frac{1}{K} \sum EVM(k)^2}$ <p>In case of Offset-QPSK please observe the influence of the softkey "Offset EVM" on the EVM trace.</p>
RMS_EVM (VSB only)	$RMS_EVM = \sqrt{\frac{1}{K} \sum \text{Re}\{EVM(k)\}^2}$
Origin_Offset (logarithmic measure for IQ_Offset)	$OriginOffset = 10 \log_{10} \left(\frac{ IQ_Offset ^2}{C^2} \right)$ <p>Note: For the normalization of the "Origin Offset" the denominator C does not depend on the softkey "EVM CALC" and "OFFSET EVM". The calculation assumes that they are set to "MEAN SIGNAL POWER" respectively "OFFSET EVM OFF".</p>

Remote Control Commands

:**[SENSe<1|2>:]DDEMod:ECALc:OFFSet** ON | OFF

This command controls the calculation of the error vector magnitude trace for Offset-QPSK only. It has no effect for all other modulations. It has no effect on results based on the MEAS or the REF signal.

Parameter: ON: The error vector magnitude is calculated at the symbol instants of the I-part and the symbol instants of the Q-part of the Offset-QPSK signal.
In other words: The half symbol duration delay of the Q-part is compensated.
In firmware versions prior to the introduction of this softkey, this was method was always used for Offset-QPSK.

OFF: The error vector magnitude is calculated at the symbol instants of the I-part and the corresponding sample of the Q-part of the signal. But the latter is not a symbol instant.

In other words: The Offset-QPSK signal is treated like a QPSK signal for the error vector magnitude calculation, the Q-delay is not compensated.

Refer to the manual operation section for additional details.

This command is only available for Offset-QPSK-Modulation.

Example: "DDEMod:QPSK:FORM OFFS" 'select Offset-QPSK demodulation
"DDEMod:ECAL:OFFS OFF" 'set offset EVM calc to OFF

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

:**[SENSe<1|2>:]DDEMod:FORMat** QPSK | PSK | MSK | QAM | FSK | VSB | UQAM

This command selects the digital demodulation mode.

Parameter:	QPSK	Quad Phase Shift Key
	PSK	Phase Shift Key
	MSK	Minimum Shift Key
	QAM	Quadrature Amplitude Modulation
	FSK	Frequency Shift Key
	VSB	Vestigial Sideband
	UQAM	User QAM, only available with user mapping files

Example: "DDEMod:FORM QPSK" 'Switch QPSK demodulation on.

Characteristics: *RST value: Depends on the demodulation standard.
SCPI: device-specific

:[SENSe<1|2>:]DDEMod:UQAM:FORMat '<UQAM_Mapping>'

This command selects the specific demodulation mapping for UQAM .

Parameter: <UQAM_Mapping> ' Mapping name

Example: "DDEMod:FORM UQAM" ' Switch UQAM demodulation on.

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

Operating mode: VSA

This command is only available for UQAM demodulation. Related mapping files have to be imported.

:[SENSe<1|2>:]DDEMod:UQAM:NState?

This command returns the specific modulation level for User QAM.

Parameter: -

Example: "DDEMod:FORM UQAM" 'Switch User QAM demodulation on.

"DDEMod:UQAM:FORM 'special'" 'Selects user mapping 'special'.

"DDEMod: UQAM:NState?" 'returns the modulation level.

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

This command is only available for UQAM demodulation.

Appendix: Contact to our hotline

Any questions or ideas concerning the instrument are welcome by 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

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

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