



ROHDE & SCHWARZ

Test and Measurement
Division

Release Notes

3G FDD BTS/3GPP HSDPA BTS/ 3GPP HSPA+ BTS

Application Firmware

R&S FS-K72/FS-K74/FS-K74+

Release 4.40

for R&S FSP, FSU, FSQ, FSG, FSMR, FSUP, FMU
Analyzer Firmware 4.4x

New Features:

- Average Relative Code Domain Error (Avg. RCDE) of 64QAM slots display

Release Note Revision: 1

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History

Date	Rel Note Rev	Changes
November 20, 2008	1	First revision for R&S FS-K72/R&S FS-K74/R&S FS-K74+ version 4.40.

General Topics

Hardware Requirements

Please note that R&S FS-K72/K74/K74+ requires options R&S FSP-B15 and R&S FSP-B70 in order to run on an R&S FSP. If either of the required hardware options is not installed the unit will not accept the license key for the corresponding firmware application.

Compatibility of R&S FS-K72/K74/K74+

The following table shows the compatible versions of the basic analyzer firmware and the 3G FDD BTS Application Firmware R&S FS-K72, the 3GPP Application Firmware R&S FS-K74 (FS-K74 is supported since version 2.28/3.28) and the 3GPP Application Firmware R&S FS-K74+ (FS-K74+ is supported since version 4.30):

Table of compatible versions:

R&S FS-K72/K74 Application Firmware	R&S FSP Basic 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
4.40	4.40	4.41	4.45	-	-	-	4.49
4.30	4.30	4.31	4.35	-	-	4.38	4.39
4.20 SP1	4.20	4.21	4.25	-	4.27	-	4.29
4.20	4.20	4.21	4.25	-	-	-	4.29
4.17	-	-	-	-	4.17	-	-
4.10	4.10	4.11	4.15	4.16	-	-	-
4.01	-	-	-	-	-	4.08	-
4.00	4.00	4.01	4.05	-	-	-	-
3.90 SP1	3.90	3.91	3.95	3.96	3.99	-	-
3.90	3.90	3.91	3.95	3.96	-	-	-
3.80	3.80	3.81	3.85	3.86	-	-	-
3.70	3.70	3.71	3.75	3.76 SP1	-	-	-
3.60	3.60	3.61	3.65	3.66 SP1	-	-	-
3.50	3.50	3.51	3.55	-	-	-	-
3.40	3.40	3.41	3.45	-	-	-	-
3.35	-	-	3.35	-	-	-	-
3.30	3.30	3.31	-	-	-	-	-
3.28	3.20	3.21	3.25	-	-	-	-
3.24	3.10	3.11	3.15	-	-	-	-
3.20	3.00	-	3.05	-	-	-	-
2.60	2.60	2.61	-	-	-	-	-
2.40	2.40	2.41	2.45	-	-	-	-
2.35	-	-	2.35	-	-	-	-
2.30	2.30	2.31	-	-	-	-	-
2.28	2.20	2.21	2.25	-	-	-	-
2.24	2.10	2.11	2.15	-	-	-	-
1.21	-	-	2.05	-	-	-	-
1.20	1.80	1.81	1.85	-	-	-	-
1.12	1.70	1.71	1.75	-	-	-	-
1.11	1.60	1.61	1.65	-	-	-	-
1.10	1.50	1.51	-	-	-	-	-
1.00	-	1.41	-	-	-	-	-

Application firmware versions 3.xx are running on R&S FSPs with order # 1164.4391.xx or R&S FSU with order # 1166.1660.xx or R&S FSQ with operating system XP.

Application firmware version 2.xx are running on R&S FSPs with order # 1093.4495.xx or R&S FSU with order # 1129.9003.xx or R&S FSQ with operating system NT.

Firmware Update of R&S FS-K72/K74/K74+

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 instrument or delivered as a part of the R&S FS-K72 3G FDD BTS, R&S FS-K74 HSDPA BTS and R&S FS-K74+ HSPA+ BTS 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.

- Each application firmware R&S FS-K72 3G FDD BTS, R&S FS-K74 HSDPA BTS and R&S FS-K74+ HSPA+ BTS has its own option key. The K72 3G FDD BTS is a prerequisite for installing the K74 HSDPA BTS and the K74+ HSPA+ BTS application firmware
- Installing FS-K72: option key for FS-K72 must be entered
- Installing FS-K74: option key for FS-K72 **and** option key for FS-K74 must be entered
- Installing FS-K74+: option key for FS-K72 **and** option key for FS-K74+ must be entered **or** option keys for FS-K72, FS-K74 **and** FS-K74+ must be entered
- 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

None.

Modified Functions

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

1. [V1.11] New functions: Antenna Diversity, Sync Type CPICH / SCH
2. [V1.12] Carrier Frequency Error now determined on per slot basis
3. [V1.12] New result display types: Composite Constellation, Power vs. Symbol
4. [V1.12] New: Support for Compressed Mode signals
5. [V1.20] Margin check of xdB margin below Spectrum Emission Mask Limit Lines
6. [V3.20/V1.20] Output of frequency and response value if margin check failed
7. [V3.20/V1.21] Improved sensitivity for code channels with low SN ratio (6dB SNR of a code class 8 channel is sufficient to detect the channel in auto search mode)
8. [V3.20/V1.21] Pilot symbol check added.
9. [V3.20/V1.21] For signalling a detection of a pilot symbol that is different from that of the 3GPP standard the 5th Bit of the status register is used.
10. [V3.24/V2.24] Code Domain Error Power measurement is now available
11. [V3.24/V2.24] Improved Resolution of Trigger to Frame measurement
12. [V3.24/V2.24] Improved absolute accuracy of Trigger to Frame measurement
13. [V3.24/V2.24] Trace statistic available on result summary parameters (MIN Hold, MAX Hold, Averaging)
14. [V3.24/V2.24] Improved compressed mode handling
15. [V3.28/V2.28] Support of FS-K74 HSDPA BTS Test including automatic channel search
16. [V3.28/V2.28] Unit circle display in constellation diagrams
17. [V3.28] Option FS-K9 power sensor support for RF measurement
18. [V3.30/V2.30] New function: Multi-Frame Evaluation
19. [V3.30/V2.30] Detection of SCCPCH is now available
20. [V3.30/V2.30] Improved detection sensitivity for HSDPA channels
21. [V3.30/V2.30] Spectrum emission mask – IEC readout of worst fail position
22. [V3.30/V2.30] Auto channel detection of compressed mode channels
23. [V3.40/V2.40] IEC readout of frame bit-stream
24. [V3.40/V2.40] Slot power difference of power versus slot measurement
25. [V3.40/V2.40] Adjacent channel leakage power ratio (ACLR) for multi carrier signals
26. [V3.40/V2.40] Peak list evaluation of spectrum emission mask
27. [V3.40/V2.40] Advanced auto level adjust of multi carrier signals
28. [V3.40/V2.40] Autolevel Adjust for channel power measurement and statistic measurement
29. [V3.50/V2.60] Extended scrambling code range
30. [V3.50/V2. 60] Advanced channel type estimation for compressed mode
31. [V3.50/V2. 60] Display of slot format type A and type B
32. [V3.50/V2. 60] Display of TPC Symbols in the first slot of a compressed gap
33. [V3.50/V2. 60] Constellation re-arrangement for 16 QAM in dependence on constellation parameter B
34. [V3.50/V2. 60] Absolute and relative slot power display and differential slot power display added
35. [V3.50/V2. 60] Extended trigger range
36. [V3.50/V2. 60] RF combination measurement (RF Combi)

- 37. [V3.60/V2.60] Display of frequency error versus slot, phase discontinuity versus slot, symbol magnitude error and symbol phase error
- 38. [V3.60/V2.60] Result Summary: added value RHO
- 39. [V3.60/V2.60] Scrambling code input in hex and also in decimal
- 40. [V3.60/V2.60] HSDPA mode can be switched OFF / ON
- 41. [V3.60/V2.60] Measurement of timing offset in predefined channel mode
- 42. [V3.60/V2.60] Multi carrier ACP measurement with independent inter carrier spacing support
- 43. [V3.60/V2.60] SEM: Extended range definition for peak list and adjustable transition frequency
- 44. [V3.60/V2.60] External trigger level adjustable from 0.5 to 3.5 V
- 45. [V3.60/V2.60] Carrier frequency step size softkey available
- 46. [V3.70/V2.80] Scrambling code auto search
- 47. [V3.70/V2.80] Channel table compare mode
- 48. [V3.70/V2.80] Remote command to read out total power versus slot
- 49. [V3.70/V2.80] ACLR/MACLR: number of adjacent channels increased to 12, power mode to max hold the power results
- 50. [V3.70/V2.80] RF COMBI: noise correction mode
- 51. [V3.80/V2.80] Support for HSUPA within R&S FS-K74
- 52. [V3.80/V2.80] Trace view available within code domain analyzer
- 53. [V3.90] List result of scrambling code search
- 54. [V4.00] Vector error of Error Vector Magnitude (EVM) versus chip
- 55. [V4.00] Magnitude error of Error Vector Magnitude (EVM) versus chip
- 56. [V4.00] Phase error of Error Vector Magnitude (EVM) versus chip
- 57. [V4.00] Spectrum emission mask: List evaluation in lower screen now supported
- 58. [V4.00SP1] New remote command TRACe:DATA? ATRACE2
- 59. [V4.10] New remote command CALC:MARK:FUNC:WCDP:RES? PSYMBOL | AChannels
- 60. [V4.20] Support for instrument R&S FSG.
- 61. [V4.20] Soft key REF VALUE Y AXIS available for CDP measurements.
- 62. [V4.30] New option R&S FS-K74+ with support of 64QAM
- 63. [V4.30] Relative Code Domain Error (RCDE) display
- 64. [V4.30] User definable CPICH code number and pattern
- 65. [V4.30] Average power of inactive channels display
- 66. [V4.40] Average RCDE display

Problems Eliminated

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

1. (V4.30) Power versus Slot in case of relative display.

Up to version 4.30 the R&S FS-K72/K74/K74+ used for relative display of Power versus Slot always the total power of the slot currently being analyzed. Since this leads to incorrect behavior in case of signals with changing total power the reference value has been changed to the total power of each individual slot. That means that the power of one slot of the channel currently analyzed will now be referenced to the total power of the same slot.

Known problems

1. (V4.20) Auto detection of channels with low data rate:

If a data channel contains a large number of suppressed symbols (DTX), the channel can not be detected. This is caused by an inherent modulation type analyzer. If the sent symbol constellation does not match a constellation according to 3GPP (QPSK, 16QAM), the channel is marked as invalid channel.

Modifications to the Operating Manual

The R&S FS-K72/K74/K74+ 3G FDD BTS analyzer functions are included in a separate manual set. Please refer to the following order numbers:

- 1154.7023.42-07 English
- 1154.7023.44-07 German

Modified Chapters for manual operation

Display Mode – **RESULTS** hotkey

RESULTS hotkey



The *RESULT SUMMARY* softkey selects the numeric display of all results. The display is subdivided as follows:

Result Summary		SR 240 ksps	
		Chan Code 12	
CF 2.9 GHz	CPICH Slot 0	Chan Slot 0	
GLOBAL RESULTS FOR FRAME 0:		Carrier Freq Error	402.64 mHz
Total Power	-24.42 dBm	Trigger to Frame	344.179089 μs
Chip Rate Error	-0.84 ppm	Avg Pow Ina Chan	-58.44 dB
IQ Offs / Imb	0.06 / 0.07 %	Pk CDE (15 ksps)	-49.72 dB
Composite EVM	3.66 %	Avg RCDE (64QAM)	-29.30 dB
Rho	0.99866	No of Active Chan	44
CHANNEL RESULTS		RCDE	-29.34 dB
Symbol Rate	240.00 ksps	Timing Offset	0 Chips
Channel Code	12	Channel Slot No	0
No of Pilot Bits	0	Modulation Type	64QAM
Channel Power Rel	-0.97 dB	Channel Power Abs	-35.57 dBm
Symbol EVM	3.37 % rms	Symbol EVM	7.14 % Pk

Fig. 28 Result summary

The upper part contains the results for the total signal:

CPICH Slot No: Outputs the number of the CPICH slot at which the measurement is performed (see *SELECT CPICH SLOT* softkey).

Total Power: Outputs the total signal power (average power of total evaluated 3GPP FDD frame).

Carrier Freq Error: Outputs the frequency error relative to the center frequency of the analyzer. The absolute frequency error is the sum of the analyzer and DUT frequency error. The specified value is averaged via one slot; the frequency offset of the slot selected under *SELECT CPICH SLOT* applies.

The maximum frequency error that can be compensated is specified in the table below as a function of the sync mode. Transmitter and receiver should be synchronized as far as possible (see chapter 2, Getting Started).

Table 1 Maximum compensated frequency error

SYNC TYPE	ANTENNA DIV	Max. Freq. Offset
CPICH	X	5.0 kHz
SCH	OFF	1.6 kHz
SCH	ANT 1	330 Hz
SCH	ANT 2	330 Hz

- Chip Rate Error: Outputs the chip rate error in ppm.
As a result of a high chip rate error, symbol errors arise and the CDP measurement is possibly not synchronized to the 3GPP FDD signal. The result is valid even if synchronization of the analyzer and signal failed.
- IQ Offs/Imb: DC offset and I/Q imbalance of signals in %
- Trigger to Frame: This result outputs the time difference between the beginning of the recorded signal section to the start of the analyzed 3GPP FDD frame. In the case of triggered data collection, this difference is identical with the time difference of frame trigger (+ trigger offset) – frame start. If synchronization of the analyzer and W-CDMA signal fails, the value of Trigger to Frame is not significant.
- Avg Pow Ina Chan:
The power in code domain of all inactive channels is averaged to give the user an overview of the difference between active and inactive channels.
- Composite EVM: The composite EVM is the difference between the test signal and the ideal reference signal (see *COMPOSITE EVM* softkey). The composite EVM value for the selected slot is specified in the *RESULT SUMMARY*.
- Pk CDE: The *PEAK CODE DOMAIN ERROR* measurement specifies a projection of the difference between the test signal and the ideal reference signal onto the selected spreading factor (see *PEAK CODE DOMAIN ERR* softkey). The Pk CDE value for the selected slot is indicated in the *RESULT SUMMARY*. The spreading factor onto which projection is made is shown beneath the measurement result.
- Rho: Quality parameter rho for every slot.
- Avg RCDE (64QAM) :
Average RCDE of the complete frame for all channel slots with 64QAM modulation
- No of Active Chan:
Indicates the number of active channels detected in the signal. Both the detected data channels and the control channels are considered active channels.

The results of measurements on the selected channel (red in the diagram) are displayed in the lower part of the RESULT SUMMARY.

- Symbol Rate: Symbol rate at which the channel is transmitted.
- Timing Offset: Offset between the start of the first slot in the channel and the start of the analyzed 3GPP FDD frame.
- Channel Code: Number of the spreading code of the selected channel.
- Channel Slot No: The channel slot number is obtained by combining the value of the *SELECT CPICH SLOT* softkey and the channel's timing offset.
- No of Pilot Bits: Number of pilot bits of the selected channel.
- Modulation Type : Modulation type of an HSDPA channel. High speed physical data channels can be modulated with QPSK, 16QAM or 64QAM modulation. The modulation type is measured only if the HSDPA option (K74 or K74+) is installed.
- Chan Pow rel. / abs.:
Channel power, relative (referenced to CPICH or total signal power) and absolute.
- Symbol EVM Pk / rms:
Peak or average of the results of the error vector magnitude measurement (see SYMBOL EVM softkey). The measurement provides information on the EVM of the channel (marked red) in the CDP diagram in the slot (marked red) of the power-versus-slot diagram at the symbol level.
- RCDE: RELATIVE CODE DOMAIN ERROR for the complete frame of the selected channel.

IEC/IEEE bus command: `CALC2:FEED "XTIM:CDP:ERR:SUMM"`

Query of result:

```
CALC2:MARK:FUNC:WCDP:BTS:RES?
PTOT | FERR | TFR | TOFF | MACC |
PCDerror | EVMRms | EVMPeak | CERRor | CSLot |
SRATe | CHANnel | CDPabsolute | CDPRelative |
IQOffset | IQIMbalance | MTYPe | RHO | PSYMBOL |
ACHannels | MPIC | RCDerror | ARCDerror
TRAC2:DATA? TRAC2
:SENS:CDP:SLOT?
```

Modified Chapters for remote operation

CALCulate:MARKer – Subsystem

COMMAND	PARAMETER	UNIT	COMMENT
CALCulate<1 2> :MARKer<1...4> :FUNCTION :CPICh :PCCPch :POWer :MODE :RESult? :PHZ :WCDPower [:BTS] :RESult?	WRITe MAXHold ACPower CPOWer MCACpower OBANdwidth OBWidth CN CN0 ON OFF PTOTal FERRor TFRame TOFFset MACCuracy PCDerror EVMRms EVMPeak CERRor CSLot SRATe CHANnel CDPabsolute CDPRelative IQOffset IQIMbalance MTYPE RHO PSYMBOL ACHannels MPIC RCDerror ARCDerror		Query only

:CALCulate<1>:MARKer<1>:FUNCTION:WCDPower[:BTS]:RESult?

PTOTal | FERRor | TFRame | TOFFset | MACCuracy | PCDerror | EVMRms | EVMPeak |
 CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOffset | IQIMbalance
 | MTYPE | RHO | PSYMBOL | ACHannels | MPIC | RCDerror | ARCDerror

This command queries the measured and calculated results of the 3GPP FDD code domain power measurement.

PTOTal	total power	FERRor	frequency error in Hz
TFRame	trigger to frame	TOFFset	timing offset
MACCuracy	composite EVM	PCDerror	peak code domain error
EVMRms	error vector magnitude RMS	EVMPeak	error vector magnitude peak
CERRor	chip rate error	CSLot	channel slot number
SRATe	symbol rate	CHANnel	channel number
CDPabsolute	channel power absolute	CDPRelative	channel power relative
IQOffset	I/Q offset	IQIMbalance	I/Q imbalance
MTYPE	modulation type	PSYMBOL	Number of pilot bits
RHO	rho value for every slot	ACHannels	Number of active channels
MPIC	Mean Power of Inactive Chan.	RCDerror	Relative Code Domain Error
ARCDerror	Average RCDE for 64QAM		

Example: ":CALC:MARK:FUNC:WCDP:RES? PTOT"

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

Table of Softkeys with Assignment of IEC/IEEE Commands

CODE DOM POWER	<pre>:INSTrument<1>[:SElect] WCDPower or :CONFigure:WCDPower:MEASurement WCDPower Query of results : :TRACe:DATA? TRACe1 TRACe2 ABITstream PWCDp CTABle CWCDp TPVSlot or :CALCulate<1 2>:MARKer<1>:FUNctIon:WCDPower:RESult? PTOTal FERRor TFRame TOFFset MACCuracy PCDerror EVMRms EVMPeak CERRor CSLot SRATe CHANnel CDPabsolute CDPRelative IQOffset IQIMbalance MTYPe RHO PSYMBOL ACHannels MPIC RCDerror ARCDerror or marker function (in marker submenu)</pre>
RESULT SUMMARY	<pre>:CALCulate2:FEED 'XTIM:CDP:ERR:SUMMARY' Query of results : :CALCulate:MARKer:FUNctIon:WCDPower[:BTS]:RESult? PTOTal FERRor TFRame TOFFset MACCuracy PCDerror EVMRms EVMPeak CERRor CSLot SRATe CHANnel CDPabsolute CDPRelative IQOffset IQIMbalance MTYPe RHO PSYMBOL ACHannels MPIC RCDerror ARCDerror</pre>

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