ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

SPECTRUM ANALYZER

FSEA20/30
1065.6000.20/30

FSEM20/30
1080.1505.20/1079.8500.30

FSEB20/30
1066.3010.20/30

FSEK20/30
1088.1491.20/1088.3494.30

- ▶ **Contents**
- ▶ **Find Topics**
- ▶ **Front and Rear View of FSE**
- ▶ **Brief Introduction: How to use this CD-ROM**
- ▶ **Release Notes for Firmware Version 1.65**

Printed in the Federal
Republic of Germany

Contents Overview

▶ **Contents**
  Index

▶ **Data Sheet**

▶ **Safety Instructions**

▶ **EC Certificate of Conformity**
  Supplement to Data Sheet

▶ **Front and Rear View of FSE**

1	**Chapter 1:**	**Preparation for Use**
2	**Chapter 2:**	**Manual Operation**
3	**Chapter 3:**	**Remote Control**
4	**Chapter 4:**	**Maintenance**
5	**Chapter 5:**	**Performance Test**
6	**Annex A:**	**Interfaces**
7	**Annex B:**	**List of Error Messages**
8	**Annex C:**	**List of Commands**
9	**Annex D:**	**Programming Example**
10	**Annex E:**	**Emulation**

Diagrams, Lists, Overviews...

▶ **Table of contents**

▶ **List of figures**

▶ **List of tables**

▶ **Front view of FSE**

▶ **Rear view of FSE**

▶ **Menu overview**

▶ **List of commands (remote control)**

▶ **Softkeys with IEC/IEEE-bus assignment**

▶ **List of error messages**

Contents

Index

Data Sheet

1 Preparing for Operation

1.1 Description of Front and Rear Panel Views 1.1-1
1.1.1 Front View 1.1-1
1.1.2 Rear View 1.1-13

1.2 Start-Up 1.2-1
1.2.1 Unpacking the Instrument 1.2-1
1.2.2 Instrument Setup 1.2-1
1.2.2.1 Stand-alone Operation 1.2-1
1.2.2.2 19" Rack Installation 1.2-1
1.2.3 EMI Protection Measures 1.2-2
1.2.4 Connecting to AC Power 1.2-2
1.2.5 AC Power Line Fuses 1.2-2
1.2.6 Instrument On/Off 1.2-2
1.2.7 Battery-Powered Memory 1.2-1

1.3 Functional Test 1.3-1

1.4 Connecting a Mouse 1.4-1

1.5 Connecting an External Keyboard 1.5-1

1.6 Connecting an Output Device 1.6-1

1.7 Firmware Update 1.7-1

1.8 Options 1.8-1
1.8.1 Option FSE-B17 – Second IEC/IEEE Interface 1.8-1
1.8.1.1 Installing the software 1.8-1
1.8.1.2 Operation 1.8-1
1.8.2 Option FSE-B5 - FFT Filter 1.8-2
1.8.2.1 Prerequisites 1.8-2
1.8.2.2 Enabling the option 1.8-2
1.8.3 Option FSE B16 – Ethernet Adapter 1.8-3
1.8.3.1 Hardware Installation 1.8-3
1.8.3.1.1 BNC (Thin Ethernet, CheaperNet; FSE-B16 Var. 03) 1.8-3
1.8.3.1.2 AUI (Thick Ethernet; FSE B16 Var. 02) 1.8-4
1.8.3.1.3 RJ45 (UTP, 10BaseT, Western Connector) 1.8-4

1.8.3.2 Software Installation 1.8-5
    1.8.3.2.1 Installation of Network Drivers 1.8-5
        a) ODI 1.8-5
        b) NDIS 1.8-6
        c) Packet Drivers 1.8-8
    1.8.3.2.2 Installation of Network Operating System 1.8-8
        a) NOVELL NETWARE 1.8-8
        b) MICROSOFT NET 1.8-10
        c) TCP/IP 1.8-10
        d) KERMIT 1.8-11
1.8.3.3 Operation 1.8-11
    1.8.3.3.1 NOVELL 1.8-11
    1.8.3.3.2 MICROSOFT 1.8-13
    1.8.3.3.3 TCP/IP 1.8-15
    1.8.3.3.4 FTP 1.8-15
    1.8.3.3.5 KERMIT 1.8-16

2 Manual Operation

2.1 Measurement Examples 2.1-1

2.1.1 Level and Frequency Measurements 2.1-1
    2.1.1.1 Measurement Task 2.1-1
    2.1.1.2 Important Spectrum Analyzer Functions 2.1-2
    2.1.1.3 Sweep, Level and Frequency Measurements – Example 1 .... 2.1-2
    2.1.1.4 Sweep, Level and Frequency Measurements – Example 2 .... 2.1-6
    2.1.1.5 Level Measurement Accuracy 2.1-8
2.1.2 Measurement of Harmonic Separation 2.1-9
    2.1.2.1 Measurement Task 2.1-9
    2.1.2.2 Important Spectrum Analyzer Functions 2.1-10
    2.1.2.3 Measurement Procedure - Harmonic Separation – Example 1 .... 2.1-11
    2.1.2.4 Measurement Procedure - Harmonic Separation – Example 2 .... 2.1-16
    2.1.2.5 Measurement Procedure - Harmonic Separation – Example 3 .... 2.1-20
2.1.3 Measurement of Intermodulation Distortions 2.1-24
    2.1.3.1 Measuring Task 2.1-24
    2.1.3.2 Important Spectrum-Analyzer Functions 2.1-25
    2.1.3.3 Measurement 2.1-26
2.1.4 Time-domain Measurements with Pulsed Signals 2.1-31
    2.1.4.1 Measuring Task 2.1-31
    2.1.4.2 Important Spectrum Analyzer Functions 2.1-31
    2.1.4.3 Measurement 2.1-32

2.2 Menu Overview 2.2-1

2.2.1 System Key Group 2.2-1

2.2.2 Configuration Key Group 2.2-3

2.2.3 Hardcopy Key Group 2.2-5

2.2.4 Frequency Key Group 2.2-6

2.2.5 Level Key Group, Input Key 2.2-8

2.2.6 Marker Key Group 2.2-10

2.2.7 Lines Key Group 2.2-14

2.2.8 Trace Key Group 2.2-15

2.2.9 Sweep Key Group 2.2-16

2.2.10 Memory Key Group 2.2-18

2.2.11 User Key Group 2.2-20

2.3 Basic Steps of Operation 2.3-1

2.3.1 The Screen 2.3-2

2.3.1.1 Diagram Area 2.3-3
2.3.1.2 Split Screen 2.3-9
2.3.1.3 Softkey Area 2.3-10

2.3.2 Changing the Menu 2.3-11

2.3.3 Setting the Parameters 2.3-13

2.3.3.1 Data Entry 2.3-13
2.3.3.1.1 Numeric Keypad on the Front Panel 2.3-13
2.3.3.1.2 Roll-key and Cursor Keys 2.3-14
2.3.3.2 Entry Windows 2.3-15
2.3.3.2.1 Setting Up the Entry Window 2.3-15
2.3.3.2.2 Editing of Numeric Parameters 2.3-16
2.3.3.2.3 Editing of Alphanumeric Parameters 2.3-17
2.3.3.2.4 Help Line Editor 2.3-17
2.3.3.3 Table Entry 2.3-17
2.3.3.3.1 Shifting Mode 2.3-18
2.3.3.3.2 Editing Mode 2.3-18

2.3.4 Disabling the Control Elements - HOLD Key 2.3-19

2.3.5 Setting the Stepsize - STEP Key 2.3-20

2.3.6 Mouse and External Keyboard Control 2.3-21

2.3.6.1 External Keyboard Control 2.3-21
2.3.6.2 Data Entry Windows with Mouse Control 2.3-21
2.3.6.3 Mouse Control of Further Display Elements 2.3-21

2.4 General Configuration – *SYSTEM* and *CONFIGURATION* Key Groups 2.4-1

2.4.1 FSE Initial Configuration – *PRESET* Key 2.4-1

2.4.2 Display Configuration – *DISPLAY Key* 2.4-2

2.4.2.1 Display Screen Mode Selection 2.4-3
2.4.2.2 Measurement Window Coupling 2.4-4
2.4.2.3 Display Screen Configuration 2.4-5

2.4.3 FSE Calibration – *CAL Key* 2.4-8

2.4.3.1 Calibration Function Calls 2.4-9
2.4.3.2 Calibration Results 2.4-11

2.4.4 Instrument Status and Measurement Parameters – *INFO Key* 2.4-12

2.4.4.1 Firmware Versions 2.4-12
2.4.4.2 Hardware Configuration and Options 2.4-13
2.4.4.3 Self Test 2.4-14
2.4.4.4 System Messages 2.4-15

2.4.5 Mode Selection – *MODE Key* 2.4-16

2.4.6 Preliminary Setup and Interface Configuration – *SETUP Key* 2.4-18
2.4.6.1 Using Transducers 2.4-18
2.4.6.1.1 Activating Transducer Factors and Transducer Sets 2.4-19
2.4.6.1.2 New Entry and Editing of Transducer Factors.......................... 2.4-21
2.4.6.1.3 New Entry and Editing of Transducer Sets............................... 2.4-25
2.4.6.2 External Reference Oscillator.. 2.4-29
2.4.6.3 Enabling Firmware Options.. 2.4-29
2.4.6.4 Programming the Interface Configuration and Time 2.4-30
2.4.6.4.1 IEC Bus Address Selection 2.4-31
2.4.6.4.2 Switching the Beeper ON/OFF 2.4-31
2.4.6.4.3 User Port Configuration 2.4-32
2.4.6.4.4 Serial Interface Configuration 2.4-33
2.4.6.4.5 Setting Date and Time... 2.4-36
2.4.6.4.6 Mouse Configuration 2.4-37
2.4.6.4.7 External Keyboard Configuration... 2.4-38
2.4.6.5 Service Functions... 2.4-39

2.5 Status Display-Remote/Manual Control – *STATUS Key Group* 2.5-1

2.6 Measurement Documentation – *HARDCOPY* Key Group.. 2.6-1

2.6.1 Printing Data – *START* Key... 2.6-1
2.6.2 Printing Configuration – *SETTINGS* Key... 2.6-2
2.6.2.1 Selection of Displayed Elements and Colour Settings 2.6-3
2.6.2.2 Selection of Hardcopy Format.. 2.6-4
2.6.2.3 Entry of Comment Text 2.6-5
2.6.2.4 Selection and Configuration of the Output Device....................................... 2.6-6

2.7 Saving and Recalling Data Sets – *MEMORY* Key Group 2.7-1

2.7.1 Configuration of Memory – *CONFIG Key*.. 2.7-3
2.7.2 Saving Data Sets – *SAVE Key*.. 2.7-5
2.7.2.1 Selecting the Data Set for Storage.. 2.7-6
2.7.2.2 Selecting the Partial Data Set for Storage.................................... 2.7-8
2.7.3 Recalling of Data Sets – *RECALL* Key... 2.7-9
2.7.3.1 Selecting the Data Set for Recalling.. 2.7-10
2.7.3.2 Building a Data Set.. 2.7-12

2.8 Macros – *USER Key* 2.8-1

2.8.1 Fundamentals.. 2.8-1
2.8.2 Starting Macros 2.8-2
2.8.3 Defining Macros 2.8-3

2.9 Analyzer Mode 2.9-1

2.9.1 Frequency and Span Selection – *FREQUENCY Key Group* 2.9-1
2.9.1.1 Start Frequency – *START Key*... 2.9-1
2.9.1.2 Stop Frequency – *STOP Key* 2.9-2
2.9.1.3 Center Frequency – *CENTER Key*.. 2.9-3
2.9.1.4 Center Frequency Step Size.. 2.9-5
2.9.1.5 Frequency Span – *SPAN Key* 2.9-7
2.9.1.6 Display Zoom.. 2.9-9

2.9.2 Level Display and RF Input Configuration – *LEVEL Key Group*.............................. 2.9-10
2.9.2.1 Reference Level – *REF* key.. 2.9-10
2.9.2.2 Display Units.. 2.9-12
2.9.2.3 Level Range – *RANGE* Key... 2.9-15
2.9.2.4 RF Input Configuration – *INPUT* Key 2.9-16
2.9.3 Marker Functions – *MARKER Key Group*... 2.9-19
2.9.3.1 Main Markers– *NORMAL Key*.. 2.9-19
2.9.3.1.1 LF Demodulation 2.9-23
2.9.3.1.2 Frequency Measurement.. 2.9-25
2.9.3.1.3 Noise Power Density Measurement 2.9-26
2.9.3.1.4 Channel Power Measurements 2.9-27
2.9.3.1.4.1 Channel Configuration 2.9-28
2.9.3.1.4.2 Channel Power Measurement 2.9-31
2.9.3.1.4.3 Signal / Noise Power Measurement...................... 2.9-33
2.9.3.1.4.4 Adjacent Channel Power.. 2.9-35
2.9.3.1.4.5 Occupied Bandwidth Measurement....................... 2.9-36
2.9.3.1.4.6 Parameters for Channel Power Measurements / Configuration.. 2.9-37
2.9.3.1.5 Marker Step Size 2.9-39
2.9.3.2 Delta Markers – *DELTA Key* 2.9-40
2.9.3.2.1 Phase Noise Measurement 2.9-43
2.9.3.2.2 Delta-Marker Step Size - *STEP Key*.. 2.9-44
2.9.3.3 Search Functions – SEARCH Key 2.9-45
2.9.3.3.1 Summary Marker 2.9-51
2.9.3.4 Instrument Parameter Changes via Markers – *MKR ➔ Key* 2.9-54
2.9.4 Setup of Display and Limit Lines – *LINES* Key Field... 2.9-56
2.9.4.1 Display Lines – *D LINES Key* 2.9-56
2.9.4.2 Limit Lines – *LIMITS Key*... 2.9-59
2.9.4.2.1 Limit Line Selection 2.9-60
2.9.4.2.2 Entry and Editing of Limit Lines... 2.9-63
2.9.5 Trace Selection and Setup –*TRACE Key Group*.. 2.9-68
2.9.5.1 Measurement Function Selection - *TRACE 1 to 4* key 2.9-68
2.9.5.2 Detector Selection 2.9-73
2.9.5.3 Quasi Analog Display 2.9-77
2.9.5.4 Mathematical Functions for Traces 2.9-77
2.9.6 Sweep Control – *SWEEP Key Group*... 2.9-79
2.9.6.1 Coupled Settings – *COUPLING* Key 2.9-79
2.9.6.1.1 Setting and Coupling the Coupling Resolution, Video Bandwidth and Sweep Time... 2.9-80
2.9.6.1.2 Sweep Coupling Ratio 2.9-85
2.9.6.2 Sweep Trigger – *TRIGGER Key*.. 2.9-87
2.9.6.3 Sweep Setup – *SWEEP* Key 2.9-89
2.9.6.3.1 Gated Sweep... 2.9-91
2.9.6.3.2 Sweep Blanking – Gap Sweep 2.9-97

3 Remote Control

3.1 Introduction 3.1-1

3.2 Brief Instructions 3.2-1

3.3 Switchover to Remote Control 3.3-1

3.3.1 Remote Control via IEC Bus 3.3-1
  3.3.1.1 Setting the Device Address 3.3-1
  3.3.1.2 Indications during Remote Control 3.3-1
  3.3.1.3 Return to Manual Operation 3.3-2
3.3.2 Remote Control via RS-233.2-Interface 3.3-3
  3.3.2.1 Setting the Transmission Parameters 3.3-3
  3.3.2.2 Indications during Remote Control 3.3-3
  3.3.2.3 Return to Manual Operation 3.3-3

3.4 IEC-Bus Messages 3.4-1

3.4.1 Interface Messages 3.4-1
3.4.2 Device Messages (Commands and Device Responses) 3.4-2

3.5 Structure and Syntax of the Device Messages 3.5-1

3.5.1 SCPI Introduction 3.5-1
3.5.2 Structure of a Command 3.5-1
3.5.3 Structure of a Command Line 3.5-4
3.5.4 Responses to Queries 3.5-4
3.5.5 Parameter 3.5-5
3.5.6 Overview of Syntax Elements 3.5-6

3.6 Description of Commands 3.6-1

3.6.1 Notation 3.6-1
3.6.2 Common Commands 3.6-4
3.6.3 ABORt Subsystem 3.6-7
3.6.4 CALCulate Subsystem 3.6-7
  3.6.4.1 CALCulate:DELTamarker Subsystem 3.6-8
  3.6.4.2 CALCulate:DLINe Subsystem 3.6-14
  3.6.4.3 CALCulate:FEED Subsystem 3.6-17
  3.6.4.4 CALCulate:FORMat Subsystem 3.6-18
  3.6.4.5 CALCulate:LIMit Subsystem 3.6-19
  3.6.4.6 CALCulate:MARKer Subsystem 3.6-32
  3.6.4.7 CALCulate:MATH Subsystem 3.6-51
  3.6.4.8 CALCulate:UNIT Subsystem 3.6-52
3.6.5 CALibration Subsystem 3.6-53
3.6.6 CONFigure Subsystem 3.6-55
  3.6.6.1 CONFigure:BTS Subsystem 3.6-55
  3.6.6.2 CONFigure:BURSt Subsystem 3.6-59
  3.6.6.3 CONFigure:MS Subsystem 3.6-61

3.6.6.4 CONFigure:SPECtrum Subsystem 3.6-64
3.6.6.5 CONFigure:SPURious Subsystem 3.6-66
3.6.7 DIAGnostic Subsystem 3.6-68
3.6.8 DISPlay Subsystem 3.6-69
3.6.9 FETCh Subsystem 3.6-78
3.6.9.1 FETCh:BURSt Subsystem 3.6-78
3.6.9.2 FETCh:SPECtrum Subsystem 3.6-82
3.6.9.3 FETCh:SPURious Subsystem 3.6-84
3.6.10 FORMat Subsystem 3.6-86
3.6.11 HCOPy Subsystem 3.6-87
3.6.12 INITiate Subsystem 3.6-92
3.6.13 INPut Subsystem 3.6-93
3.6.14 INSTrument Subsystem 3.6-95
3.6.15 MMEMory Subsystem 3.6-97
3.6.16 OUTPut Subsystem 3.6-107
3.6.17 READ Subsystem 3.6-109
3.6.17.1 READ:BURSt Subsystem 3.6-109
3.6.17.2 READ:SPECtrum Subsystem 3.6-116
3.6.17.3 READ:SPURious Subsystem 3.6-118
3.6.18 SENSe Subsystem 3.6-120
3.6.18.1 SENSe:ADEMod Subsystem 3.6-120
3.6.18.2 [SENSe:]AVERage Subsystem 3.6-122
3.6.18.3 SENSe:BANDwidth Subsystem 3.6-123
3.6.18.4 SENSe:CORRection-Subsystem 3.6-126
3.6.18.5 SENSe:DETector Subsystem 3.6-134
3.6.18.6 SENSe:DDEMod Subsystem 3.6-135
3.6.18.7 SENSe:FILTer Subsystem 3.6-141
3.6.18.8 SENSe:FREQuency Subsystem 3.6-144
3.6.18.9 Mixer - Subsystem 3.6-148
3.6.18.10 SENSe:MSUMmary Subsystem 3.6-152
3.6.18.11 SENSe:POWer Subsystem 3.6-154
3.6.18.12 SENSe:ROSCillator Subsystem 3.6-157
3.6.18.13 SENSe:SWEep Subsystem 3.6-158
3.6.18.14 SENSe:TV Subsystem 3.6-162
3.6.19 SOURce Subsystem 3.6-163
3.6.20 STATus Subsystem 3.6-166
3.6.21 SYSTem Subsystem 3.6-177
3.6.22 TRACe Subsystem 3.6-182
3.6.23 TRIGger Subsystem 3.6-184
3.6.24 UNIT Subsystem 3.6-189

3.7 Instrument Model and Command Processing 3.7-1
3.7.1 Input Unit 3.7-1
3.7.2 Command Recognition 3.7-2

3.7.3 Data Set and Instrument Hardware ... 3.7-2
3.7.4 Status Reporting System ... 3.7-2
3.7.5 Output Unit ... 3.7-3
3.7.6 Command Sequence and Command Synchronization ... 3.7-3

3.8 Status Reporting System ... 3.8-1

3.8.1 Structure of an SCPI Status Register ... 3.8-1
3.8.2 Overview of the Status Registers ... 3.8-3
3.8.3 Description of the Status Registers ... 3.8-4
  3.8.3.1 Status Byte (STB) and Service Request Enable Register (SRE) ... 3.8-4
  3.8.3.2 IST Flag and Parallel Poll Enable Register (PPE) ... 3.8-5
  3.8.3.3 Event-Status Register (ESR) and Event-Status-Enable Register (ESE) ... 3.8-5
  3.8.3.4 STATus:OPERation Register ... 3.8-6
  3.8.3.5 STATus:QUEStionable Register ... 3.8-7
  3.8.3.6 STATus QUEStionable:ACPLimit Register ... 3.8-8
  3.8.3.7 STATus QUEStionable:FREQuency Register ... 3.8-9
  3.8.3.8 STATus QUEStionable:LIMit Register ... 3.8-10
  3.8.3.9 STATus QUEStionable:LMARgin Register ... 3.8-11
  3.8.3.10 STATus QUEStionable:POWer Register ... 3.8-12
  3.8.3.11 STATus QUEStionable:SYNC Register ... 3.8-13
  3.8.3.12 STATus QUEStionable:TRANsducer Register ... 3.8-14
3.8.4 Application of the Status Reporting Systems ... 3.8-15
  3.8.4.1 Service Request, Making Use of the Hierarchy Structure ... 3.8-15
  3.8.4.2 Serial Poll ... 3.8-15
  3.8.4.3 Parallel Poll ... 3.8-16
  3.8.4.4 Query by Means of Commands ... 3.8-16
  3.8.4.5 Error-Queue Query ... 3.8-16
3.8.5 Resetting Values of the Status Reporting System ... 3.8-17

3.9 Table of Softkeys with IEC/IEEE-Bus Command Assignment ... 3.9-1

3.9.1 Basic Instrument - Signal Analysis Mode ... 3.9-1
  3.9.1.1 FREQUENCY Key Group ... 3.9-1
  3.9.1.2 LEVEL Key Group ... 3.9-3
  3.9.1.3 INPUT Key ... 3.9-4
  3.9.1.4 MARKER Key Group ... 3.9-4
  3.9.1.5 LINES Key Group ... 3.9-9
  3.9.1.6 TRACE Key Group ... 3.9-10
  3.9.1.7 SWEEP Key Group ... 3.9-12
3.9.2 Basic Instrument - General Device Settings ... 3.9-15
  3.9.2.1 DATA VARIATION Key Group ... 3.9-15
  3.9.2.2 SYSTEM Key Group ... 3.9-15
  3.9.2.3 CONFIGURATION Key Group ... 3.9-18
  3.9.2.4 STATUS Key Group ... 3.9-20
  3.9.2.5 HARDCOPY Key Group ... 3.9-21
  3.9.2.6 MEMORY Key Group ... 3.9-22
  3.9.2.7 USER Key ... 3.9-24

3.9.3 Vector Signal Analysis Mode (Option FSE-B7) 3.9-25
    3.9.3.1 CONFIGURATION Key Group – Digital Demodulation................................ 3.9-25
    3.9.3.2 CONFIGURATION Key Group – Analog Demodulation.............................. 3.9-28
    3.9.3.3 FREQUENCY Key Group.. 3.9-29
    3.9.3.4 LEVEL Key Group.. 3.9-30
    3.9.3.5 INPUT Key Group 3.9-31
    3.9.3.6 MARKER Key Group.. 3.9-31
    3.9.3.7 LINES Key Group... 3.9-33
    3.9.3.8 TRACE Key Group... 3.9-34
    3.9.3.9 SWEEP Key Group 3.9-35
    3.9.3.10 SWEEP Key Group - Digital Demodulation.. 3.9-35
    3.9.3.11 SWEEP Key Group - Analog Demodulation... 3.9-36
3.9.4 Tracking Generator Mode (Option FSE-B8 to B11) 3.9-37
    3.9.4.1 CONFIGURATION Key Group 3.9-37
3.9.5 TV-Demodulation Mode (Option FSE-B3).. 3.9-38
    3.9.5.1 CONFIGURATION Key Group 3.9-38
    3.9.5.2 SWEEP Key Group 3.9-38
3.9.6 GSM BTS Analysis Mode (Option FSE-K11).. 3.9-39
    3.9.6.1 CONFIGURATION Key Group 3.9-39
3.9.7 GSM MS Analysis Mode (Option FSE-K10) 3.9-44
    3.9.7.1 CONFIGURATION Key Group 3.9-44
3.9.8 External Mixer (Option FSE-B21).. 3.9-49
    3.9.8.1 INPUT Key.. 3.9-49

4 Maintenance and Troubleshooting

4.1 Maintenance 4.1-1
4.1.1 Mechanical Maintenance 4.1-1
4.1.2 Electrical Maintenance 4.1-1
4.1.2.1 Testing the Level Measuring Accuracy 4.1-1
4.1.2.2 Testing the Frequency Accuracy 4.1-1

4.2 Monitoring the Function of the FSE 4.2-1
4.2.1 Switch-on Test 4.2-1
4.2.2 Monitoring of the Synthesizers and Signal Levels 4.2-1
4.2.3 Error Messages of the Synthesizer 4.2-2
4.2.4 Overload Messages 4.2-2

4.3 Function Description of the Overall Instrument 4.3-1
4.3.1 Introduction 4.3-1
4.3.2 Modules of the Analog Unit 4.3-1
4.3.3 Modules of the Digital Unit 4.3-1
4.3.4 Description of the Analog Unit 4.3-2
4.3.5 Processor Structure 4.3-3
4.3.5.1 Tasks of the Level Transputer 4.3-3
4.3.5.2 Tasks of the Frequency Transputer 4.3-3

4.4 Selftest 4.4-1
4.4.1 Operation 4.4-1
4.4.2 Testing the Processor Functions 4.4-1
4.4.3 Testing the Synthesizers 4.4-1
4.4.4 Testing the Signal Path 4.4-2

5 Checking the Rated Specifications

5.1 Measuring Equipment and Accessories 5.1-1

5.2 Test Instructions 5.2-1

5.2.1 Checking the Calibration Source at 120 MHz 5.2-1
5.2.2 Checking the Frequency Accuracy of the Reference Oscillator 5.2-2
5.2.3 Checking the Return Loss at the RF Input 5.2-3
5.2.4 Checking Imunity to Interference 5.2-5
  5.2.4.1 1st IF Image Frequency Rejection 5.2-5
  5.2.4.2 2nd IF Image Frequency Rejection 5.2-6
  5.2.4.3 1st IF Rejection 5.2-6
5.2.5 Checking Non-linearities 5.2-7
  5.2.5.1 Third-Order Intercept 5.2-7
  5.2.5.2 Second-Order Harmonic Distortion 5.2-8
5.2.6 Checking IF Filters 5.2-10
  5.2.6.1 Checking the Level Error 5.2-10
  5.2.6.2 Checking 3-dB Bandwidths 5.2-11
  5.2.6.3 Checking the Shape Factor 5.2-12
5.2.7 Checking LO Feedthrough, Noise Display 5.2-13
  5.2.7.1 LO Feedthrough 5.2-13
  5.2.7.2 Noise Display 5.2-13
5.2.8 Checking the Frequency Response 5.2-14
5.2.9 Checking the Display Linearity 5.2-16
5.2.10 Checking the Attenuator 5.2-17
5.2.11 Checking the IF Gain Switching 5.2-18
5.2.12 Checking the Phase Noise 5.2-20
5.2.13 Checking the Tracking Generator – Option FS-B8/B9/B10/B11 .... 5.2-22
  5.2.13.1 Checking the Output Level 5.2-22
  5.2.13.2 Checking the Frequency Response 5.2-22
  5.2.13.3 Checking the I/Q Modulator 5.2-23

5.3 Performance Test Report 5.3-1

5.4 Test Instructions (option FSE-B22 included) 5.4-1

5.4.1 Checking the Calibration Source at 120 MHz 5.4-1
5.4.2 Checking IF Filters 5.4-2
  5.4.2.1 Checking the Level Error 5.4-2
5.4.3 Checking the Frequency Response 5.4-3
5.4.4 Checking the Display Linearity 5.4-5
5.4.5 Checking the Attenuator 5.4-6

5.5 Performance Test Report (option FSE-B22 included) 5.5-1

6 Annex A - Interfaces

A.1 IEC Bus Interface A-1

Interface Characteristics A-1

Bus Lines A-2

IEC Bus Messages A-3

Interface Messages A-3

Instrument Messages A-4

A.2 RS-23A-C Interface A-5

Interface Characteristics A-5

Signal Lines A-5

Transmission Parameters A-6

Interface Functions A-7

Handshake A-7

A.3 User Interface (USER) A-8

A.4 Printer Interface (LPT) A-9

A.5 Measurement Converters (PROBE CODE) A-10

A.6 Probe Connector (PROBE POWER) A-10

A.7 AF-Output (AF OUTPUT) A-11

A.8 IF Output 21.4 MHz (21.4 MHz OUT) A-11

A.9 Video Output (VIDEO OUT) A-11

A.10 Reference Output/Input (EXT REF IN/OUT) A-11

A.11 Sweep Output (SWEEP) A-11

A.12 External Trigger Input (EXT TRIGGER/GATE) A-11

A.13 Noise Source Control (NOISE SOURCE) A-12

A.14 External Keyboard (KEYBOARD) A-12

A.15 Mouse Connector (MOUSE) A-12

A.16 Monitor Connector (MONITOR) A-13

7 Annex B – List of Error Messages

B.1 SCPI-Specific Error Messages B-1

8 Annex C – Alphabetical List of Commands

9 Annex D – Programming Examples

D.1 Including IEC-Bus Library for QuickBasic D-1

D.2 Initialization and Default Status D-1

D.2.1 Initiate Controller D-1

D.2.2 Initiate Instrument D-1

D.3 Transmission of Instrument Setting Commands D-2

D.4 Switchover to Manual Control D-2

D.5 Reading out Instrument Settings D-2

D.6 Positioning a Marker and Displaying Values D-2

D.7 Command synchronization D-3

D.8 Service Request D-4

10 Annex E - Emulations

E.1 Mouse Control of Display Elements E-1

E.2 Front Panel Keyboard Emulation E-2

Tables

Table 1.6-1 Interface Connectors for Output Devices ... 1.6-1
Table 1.6-2 Factory settings for *DEVICE 1 a*nd *DEVICE 2* in the *HARDCOPY-DEVICE SETTINGS* menu. ... 1.6-2

Table 2.1-1 Important PRESET settings ... 2.1-1

Table 2.3-1 Assignment of traces to windows with split screen ... 2.3-9
Table 2.3-2 Factory-set color assignment of soft keys ... 2.3-10

Table 2.7-1 Relationship between extensions, contents and designations of partial data sets ... 2.7-2

Table 3.7-1 Synchronisation using *OPC *OPC? and *WAI ... 3.7-3

Table 3.8-1 Meaning of the bits in the status byte ... 3.8-4
Table 3.8-2 Meaning of the bits in the event status register ... 3.8-5
Table 3.8-3 Meaning of the bits in the STATus.OPERation register ... 3.8-6
Table 3.8-4 Meaning of bits in STATus:QUEStionable register ... 3.8-7
Table 3.8-5 Meaning of bits in STATus:QUEstionable:ACPLimit register ... 3.8-8
Table 3.8-6 Meaning of bits in STATus:QUEstionable:FREQuency register ... 3.8-9
Table 3.8-7 Meaning of bits in STATus:QUEstionable:LIMit register ... 3.8-10
Table 3.8-8 Meaning of bits in STATus: QUEstionable:LMARgin register ... 3.8-11
Table 3.8-9 Meaning of bits in STATus:QUEstionable:POWer register ... 3.8-12
Table 3.8-10 Meaning of bits in STATus: QUEstionable:SYNC register ... 3.8-13
Table 3.8-11 Meaning of bits in STATus: QUEstionable:TRANsducer register ... 3.8-14
Table 3.8-12 Resettting instrument functions ... 3.8-17

Table A-1 Interface functions ... A-3
Table A-2 Universal Commands ... A-4
Table A-3 Addressed Commands ... A-4
Table A-4 Control strings or control characters of the RS-232 interface ... A-7

Figures

Fig. 1.1-1 Front View ... 1.1-2
Fig. 1.1-2 Rear View ... 1.1-12

Fig. 2.1-1 200-MHz signal. The measured values are displayed in the marker field. ... 2.1-4
Fig. 2.1-2 Frequency measurement using the internal frequency counter. ... 2.1-6
Fig. 2.1-3 The The MARKER ZOOM function requires the entry of the measurement frequency range (span) ... 2.1-8
Fig. 2.1-4 Theoretical display curve of fundamental and first harmonic with a k2 intercept of 50 dBm. ... 2.1-9
Fig. 2.1-5 The 10-MHz-fundamental and harmonics to 55 MHz ... 2.1-14
Fig. 2.1-6 First harmonic separation: approx. 40 dB referred to the fundamental ... 2.1-15
Fig. 2.1-7 Fundamental with REFERENCE FIXED marker ... 2.1-18
Fig. 2.1-8 Measurement of the first harmonic ... 2.1-19
Fig. 2.1-9 SPLIT-SCREEN Mode ... 2.1-21
Fig. 2.1-10 Alternate representation of fundamental and first harmonic ... 2.1-23
Fig. 2.1-11 Intermodulation products P_{S1} and P_{S2} ... 2.1-24
Fig. 2.1-12 Dependance of the spurious product level from the level of the information signals ... 2.1-25
Fig. 2.1-13 Measuring diagram in low distortion mode ... 2.1-29
Fig. 2.1-14 Parameter beim Meßwertausblendung – Gap Sweep ... 2.1-31
Fig. 2.1-15 Representation of pulse sequence with video trigger ... 2.1-35
Fig. 2.1-16 Measured-value blanking for simultaneous display of rising and falling edge of a pulse signal. ... 2.1-37

Fig. 2.3-1 Subdivision of screen 2.3-2
Fig. 2.3-2 Subdivision of the FSE screen in analyzer mode (without measuring diagram) 2.3-3
Fig. 2.3-3 Measuring diagram 2.3-3
Fig. 2.3-4 Subdivision of the screen in Split Screen mode 2.3-9
Fig. 2.3-5 Setup of the softkey area 2.3-10
Fig. 2.3-6 Theory of menu selection 2.3-11
Fig. 2.3-7 Switching between main menu and supplementary menu 2.3-12
Fig. 2.3-8 Setup of an entry window 2.3-15
Fig. 2.3-9 Setup of numeric parameters 2.3-15
Fig. 2.3-10 Help line editor 2.3-17
Fig. 2.3-11 Shifting mode 2.3-18

Fig. 2.4-1 Split screen mode, screens uncoupled 2.4-2
Fig. 2.4-2 Linear frequency axis and linear interpolation 2.4-23

Fig. 2.9-1 Determination of the channel width 2.9-31
Fig. 2.9-2 Example: Measurement of the signal/noise power 2.9-34
Fig. 2.9-3 Measurement of the adjacent channel power 2.9-35
Fig. 2.9-4 Example for level measurements at different 2.9-48
Fig. 2.9-5 Pulsed signal GATE 2.9-91
Fig. 2.9-6 TDMA-signal with GATE ON 2.9-91
Fig. 2.9-7 Interaction of the parameters *GATE MODE*, *GATE DELAY* and *GATE LENGTH* 2.9-92
Fig. 2.9-8 Setting the GATE DELAY and GATE LENGTH times in the time domain using the GD and GL lines. 2.9-95
Fig. 2.9-9 Setting the GATE DELAY and GATE LENGTH times in the time domain using the GD and GL lines. 2.9-97
Fig 2.9-10 Trace blanking in sweep mode.– Gap Sweep 2.9-98
Fig. 2.9-11 Display of a burst without gaps 2.9-98
Fig. 2.9-12 Display of a burst with a gap 2.9-99

Fig. 3.5-1 Tree structure the SCPI command systems using the SENSe system as an example 3.5-2

Fig. 3.7-1 Instrument model in the case of remote control by means of the IEC bus 3.7-1

Fig. 3.8-1 The status-register model 3.8-1
Fig. 3.8-2 Overview of the status registers 3.8-3

Fig. A-1 Pin assignment of IEC-Bus interface A-1
Fig. A-2 Pin assignment of the RS-232-C interface A-5
Fig. A-3 Wiring of the data lines for software handshake A-7
Fig. A-4 Wiring of the data, control and acknowledge lines for hardware handshake A-8
Fig. A-5 Pin assignments for the USER connector. A-8
Fig. A-6 Pin assignments for the LPT connector. A-9
Fig A.-7 Pin assignment for the 12-pin Tuchel connector. A-10
Fig. A-8 Pin assignments of the KEYBOARD connector. A-12
Fig A-9 Pin assignments for the MOUSE connector. A-12
Fig. A-10 Pin assignments of the MONITOR connector. A-13

Index

A

- Abort
  - hardcopy 2.6-1
  - macro 2.5-1
- Adjacent channel power measurement
  - absolut/relativ 2.9-32
- Addressed command A.4
- AF demodulation 2.4-16
- Alphanumeric parameter, editing 2.3-17
- Ascii # 3.5-6
- Average 2.9-70
  - single sweep 2.9-71
  - sweep count 2.9-70

B

- Bandwidth
  - channel 2.9-30
  - occupied 2.9-36
  - resolution 2.9-80
  - video 2.9-81
- Beeper 2.4-31
- Block data 3.5-6
- Boolean parameter 3.5-5

C

- Calibrate 2.4-8
- Center frequency 2.9-3
- Channel
  - bandwidth 2.9-30
  - power measurement 2.9-31
  - spacing 2.9-30
- Clear/Write 2.9-69
- Colon 2.5-6
- COM1/2 interface 2.4-33
- Comma 3.5-6
- Command
  - # 3.5-6
  - addressed A.4
  - colon 3.5-6
  - comma 3.5-6
  - header 3.5-2
  - line 3.5-4
  - long form 3.5-3
  - overlapping execution 3.7-3
  - query 3.5-4
  - question mark 2.5-3; 5-6
  - quotation mark 3.5-6
  - recognition 3.7-2
  - sequence 3.7-3
  - short form 3.5-3
  - structure 3.5-1
  - suffix 3.5-3
  - synchronization 3.7-3
  - syntax elements 3.5-6
  - univeral 3.1-4
  - white space 3.5-6
- CONDition register part 3.8-2
- Configuration 2.4-18
  - save 2.7-1
- Copy file 2.7-4
- Coupling 2.9-79
  - default settings 2.9-82
  - define 2.9-86
- Cursor keys 2.3-14

D

- D Lines 2.4-14
- Data set
  - creation 2.7-9
  - partial 2.7-8
  - recall 2.7-9
  - save 2.7-5
- Date input 2.4-36
- dB*/MHz 2.9-13
- DCL 2.7-2
- Delete file 2.7-4
- Delta marker 2.9-40
  - step size 2.9-44
- Demodulation 2.9-23
- Detector 2.9-75
- Device
  - reset (hardcopy) 2.6-10
  - reset (overall) 2.4-1
- DIFOVL 2.3-4
- Directory
  - create 2.7-4
  - rename 2.7-4
- Disable
  - front panel 2.3-19
  - keyboard 2.3-19
- Diskette format 2.7-4
- Display
  - configuration 2.4-2
  - mode 2.3-8
- Documentation 2.6-1

E

- ENABle register part 3.8-2
- Enhancement labels 2.3-6
- Entry
  - abortion 2.3-16
  - alphanumeric parameters 2.3-17
  - numeric parameter 2.3-16
  - table 2.3-17
  - termination 2.3-16
  - window 2.3-15
    - mouse control 2.3-21
- Error-queue query 3.8-16
- ESE (event status enable register) 3.8-5
- ESR (event status register) 3.8-5
- Ethernet 1.8-3
- EVENt register part 3.8-2
- Event status enable register (ESE) 3.8-5
- Event status register (ESR) 3.8-5
- Ext Trig/gate input A.11
- ExtRef 2.3-4

F

- FFT filter 2.9-83
  - installation 2.8-2
- File
  - copy 2.7-4
  - delete 2.7-4
  - rename 2.7-4
  - sort 2.7-4
- Firmware
  - update 1.7-1
  - version 2.4-12
- Format floppy 2.7-3

Frequency
  axis labeling 2.3-7
  counter 2.9-25
  line 2.9-56
  measurement window 2.9-1
  offset 2.9-4
  zoom 2.9-9
Front panel
  disable 2.3-19
  keyboard emulation E.2
Fuse 1.2-3

G

Gap sweep 2.9-99
Gate sweep 2.9-99
GET (Group Execute Trigger) 2.7-2

H

Handshake A.7
Hardcopy
  abort 2.6-1
  comments 2.6-5
  format 2.6-10
  output device 2.6-6
  position 2.6-4
  settings 2.6-2
  start 2.6-1
Hardware
  options installed 2.4-12
  settings indication 2.3-5
Header 2.5-2
Help line editor 2.3-17

I

IEC bus
  address 2.4-31
    output device 2.6-9
  interface A.1
  option FSE-B17 1.8-1
IF 21.4 MHz Out A.11
IFOVLD 2.3-4
Indication
  hardware settings 2.3-5
  instrument settings 2.3-6
  marker information 2.3-5
Input
  buffer 3.7-1
  Ext Trig/Gate A.11
  Ext Ref In/Out A.11
Instrument settings, indication 2.3-6
Interface
  printer A.9
  IEC-bus A.3
  RS-232-C A.7
Interrupt 3.8-15
IST flag 3.8-5

K

Key
  CAL 2.4-8
  CENTER 2.9-3
  CONFIG 2.7-3
  COUPLING 2.9-79
  cursor 2.3-14
  D LINES 2.9-56
  DELTA 2.9-40
  DISPLAY 2.4-2
  HOLD 2.3-19
  INFO 2.4-12
  INPUT 2.9-16
  LIMITS 2.9-59
  LOCAL 2.5-1
  MENU 2.3-12
  MKR 2.9-54
  MODE 2.4-15
  NORMAL 2.9-19
  numeric keypad 2.3-13
  PRESET 2.4-1
  RANGE 2.9-15
  RECALL 2.7-9
  REF 2.9-10
  roll-key 2.3-14
  SAVE 2.7-5
  SEARCH 2.9-45
  SETTINGS 2.6-2
  SETUP 2.4-18
  SPAN 2.9-7
  START (frequency) 2.9-1
  START (hardcopy) 2.6-1
  STEP 2.3-20
  STOP 2.9-2
  SWEEP 2.9-90
  TRACE1 to 4 2.9-68
  TRIGGER 2.9-88
  USER 2.8-1
Keyboard
  configuration 2.4-38
  connection 1.5-1
  connector A.12
  disable 2.3-19
  external 2.3-21; E.2

L

Level
  line 2.9-58
  maximum 2.9-11
  mixer 2.9-17
  range 2.9-15
  reference 2.9-10
  unit 2.9-12
LF demodulation 2.9-23
Limit line
  copy 2.9-62
  delete 2.9-62
  edit 2.9-63
  save 2.9-67
  select 2.9-60
  shift 2.9-67
  value 2.9-66
Line
  display 1,2 2.9-58
  frequency 1, 2 2.9-58
  limit 2.9-60
  reference 2.9-58
  threshold 2.9-58
  time 1, 2 2.9-58
LO LvD 2.3-4
LO Lvl 2.3-4
LO unl 2.3-4
LPT interface A.9

M

- Macro
  - abort 2.5-1
  - definition 2.8-3
  - start 2.8-1
- Maintenance 4.1-1
- Manual control
  - switch to 2.5-1; 3.3-2
- Marker
  - center 2.9-54
  - demodulation 2.9-24
  - indication 2.3-5
  - info 2.9-23
  - n-dB-down 2.9-50
  - normal 2.9-19
  - peak 2.9-46; 2.9-54
  - search limit 2.9-49
  - signal track 2.9-22
  - step size 2.9-40
  - zoom 2.9-23
- Max hold 2.9-71
- MAX / REF LVL 2.3-4
- Mean power (GSM burst) 2.9-52
- Measurement
  - save 2.7-1
  - converter connector A.10
  - window 2.4-2
- Memory
  - battery-powered 1.2-1
  - configuration 2.7-3
- Menu
  - overview 2.2-1
  - switching 2.3-11
- Min hold 2.9-72
- Minimum search 2.9-46
- Mixer level 2.9-17
- Mode 2.4-15
- Modification level of modules 2.4-12
- Monitor connector A.13
- Mouse
  - configuration 2.4-37
  - connection 1.4-1
  - connector A.12
  - control 2.3-21
  - display elements E.1

N

- Noise power density measurement 2.9-26
- Noise Source output A.12
- Notch filter 2.9-85
- NTRansition register part 3.8-2
- Numeric keypad 2.3-13
- Numeric parameter, editing 2.3-16
- Numerical values (command) 3.5-5

O

- Occupied bandwidth 2.9--36
- OCXO 2.3-4
- Offset frequency 2.9-4
- Option
  - FSE-B5 - FFT Filter 1.8-2
  - FSE-B7 - Vector Signal Analysis 2.4-15
  - FSE-B15 - Computer Function 1.4-1
  - FSE-B16 – Ethernet Adapter 1.8-3
  - FSE-B17 - IEC Bus Interface 1.8-1
- Output
  - AF A.11
  - buffer 3.7-3
  - device
    - formfeed 2.6-11
    - paperfeed 2.6-11
  - IF A.11
  - noise source control A.12
  - reference A.11
  - sweep A.11
  - video out A.11
- OVLD 2.3-4

P

- Parallel poll 3.8-16
- Parallel poll enable register (PPE) 3.8-5
- Parameter
  - block data 3.5-6
  - boolean 3.5-5
  - numerical values 3.5-5
  - string 3.5-6
  - text 3.5-6
- Path 2.7-3
- Peak
  - excursion 2.9-47
  - search 2.9-46
- Performance test 5.1-1
- Plotter connection 1.6-1
- Power mean 2.9-52
- Power measurement
  - adjacent channel 2.9-35
  - automatic optimisation of settings 2.9-37
  - bandwidth, occupied 2.9-36
  - channel 2.9-31
  - channel configuration 2.9-26
  - signal/noise 2.9-32
- PPE (parallel poll enable register) 3.8-5
- Preset 2.4-1
- Pre-trigger 2.9-100
- Printer
  - connection 1.6-1
  - connector A.9
- Probe Code connector A.10
- Probe Power connector A.10
- PTRansition register part 3.8-2

Q

- Quasi analog display 2.9-77
- Query 3.5-4; 3.8-16
- Question mark 3.5-4; 3.5-6
- Quotation mark 3.5-6

R

- Rack installation 1.2-1
- Recall data set 2.7-9
- Reference
  - external 2.4-29
  - line 2.9-58
  - level 2.9-10
    - offset 2.9-11
- Remote control
  - IEC-bus 3.3-1
  - indication 2.5-1; 3.3-1
  - RS-232-C 3.3-3
  - switch over 3.3-1
- Rename
  - directory 2.7-4
  - file 2.7-4
- Reset
  - device 2.4-1

- status register 3.8-16

Resolution bandwidth 2.9-80
RF attenuation
- auto 2.9-17
- auto low distortion 2.9-17
- auto low noise 2.9-17

RF Input 2.9-16
Rms value 2.9-52
Roll-key 2.3-14
RS-232-C A.5

S

Save
- configuration 2.7-1
- data set 2.7-5
- limit line 2.9-67
- measurement 2.7-1

SCPI introduction 3.5-1
Screen 2.3-2
- split screen 2.3-9
- subdivision 2.3-3

Search
- limit 2.9-49
- minimum 2.9-46
- peak 2.9-46
- peak excursion 2.9-47

Self test 2.4-14; 4.4-1
Serial interface configuration 2.4-33
Serial poll 3.8-15
Service functions 2.4-39
Service request indication 2.5-1
Service request (SRQ) 3.8-4; 3.8-15
Service request enable register (SRE) 3.8-4
Setup 2.4-18
Soft key
- % POWER BANDWIDTH 2.9-30
- AC VIDEO COUPLING 2.9-82
- ACP STANDARD 2.9-29
- ACTIVE MKR / DELTA 2.9-46
- ACTIVE SCREEN A/B 2.4-3
- ADJACENT CHAN POWER 2.9-35
- ADJUST CP SETTINGS 2.9-37
- ADJUST TO TRACE 2.9-78
- ALL DELTA OFF 2.9-41
- ALL MARKER OFF 2.9-22
- ALL SUM MKR OFF 2.9-53
- AM 2.9-24
- AMPERE 2.9-14
- ANALOG TR ON/OFF 2.9-77
- ANALYZER 2.4-16
- area 2.3-10
- ATTEN AUTO LOW DIST 2.9-17
- ATTEN AUTO LOW NOISE 2.9-17
- ATTEN AUTO NORMAL 2.9-17
- AUTO 0.1 * RBW 2.9-5
- AUTO 0.1 * SPAN 2.9-5
- AUTO 0.5 * RBW 2.9-6
- AUTO 0.5 * SPAN 2.9-6
- AUTO RECALL 2.7-10
- AUTO SELECT (detector) 2.9-75
- AUTO X * RBW 2.9-6
- AUTO X * SPA 2.9-6
- AVERAGE 2.9-70
- AVERAGE ON/OFF (sum marker) 2.9-52
- BLANK 2.9-70
- BRIGHTNESS 2.4-5
- C/N 2.9-33
- C/No 2.9-33
- CAL CORR ON/OFF 2.4-10
- CAL LO SUPP 2.4-9
- CAL LOG 2.4-9
- CAL RES BW 2.4-9
- CAL RESULTS 2.4-11
- CAL SHORT 2.4-9
- CAL TOTAL 2.4-9
- CENTER FIXED 2.9-1; 2.9-2; 2.9-8
- CENTER MANUAL 2.9-3
- CH FILTER ON/OFF 2.9-29
- CHANNEL BANDWIDTH 2.9-30
- CHANNEL POWER 2.9-31
- CHANNEL SPACING 2.9-30
- CLEAR ALL MESSAGES 2.4-15
- CLEAR MESSAGE 2.4-15
- CLEAR/WRITE 2.9-69
- COLOR ON/ OFF 2.6-3
- COM PORT 1/2 .... 2.4-33
- COMMENT SCREEN A/B 2.6-5
- CONFIG DISPLAY 2.4-5
- CONTINUOUS SWEEP 2.9-90
- COPY 2.7-4
- COPY (TRACE) 2.9-72
- COPY LIMIT LINE 2.9-62
- COPY SCREEN 2.6-3
- COPY TABLE 2.6-3
- COPY TRACE 2.6-3
- COUNTER RESOL 2.9-26
- COUPLING CONTROL 2.4-4
- COUPLING DEFAULT 2.9-82
- COUPLING RATIO 2.9-86
- CP/ACP ABS/REL 2.9-32
- DATA ENTRY FIELD 2.4-7
- DATA ENTRY X 2.4-7
- DATA ENTRY Y 2.4-7
- DATA ENTRY OPAQUE 2.4-7
- DATA SET CLEAR 2.7-7
- DATA SET CLEAR ALL 2.7-7
- DATA SET LIST 2.7-6
- DATE 2.4-36
- dB*/MHz 2.9-13
- dBµA 2.9-13
- dBµV 2.9-13
- dBm 2.9-13
- dBmV 2.9-13
- dBpW 2.9-13
- DEFAULT COLORS 2.4-6
- DEFAULT CONFIG 2.7-8
- DEFAULT POSITION 2.4-7
- DEFINE MACRO 2.8-3
- DEFINE PAUSE 2.8-3
- DELETE 2.7-4
- DELETE FACTOR/SET 2.4-21
- DELETE LIMIT LINE 2.9-62
- DELETE MACRO 2.8-4
- DELETE VALUE (limit line) 2.9-66
- DELTA → STEPSIZE 2.9-40
- DELTA 1 to 4 .... 2.9-40
- DELTA ABS REL 2.9-41
- DETECTOR 2.9-75
- DETECTOR AVERAGE 2.9-76
- DETECTOR MAX PEAK 2.9-75
- DETECTOR MIN PEAK 2.9-75
- DETECTOR RMS 2.9-76
- DETECTOR SAMPLE 2.9-75
- DISABLE ALL ITEMS 2.7-8; 2.7-12
- DISPLAY COMMENT 2.4-6
- DISPLAY LINE 1/2 .... 2.9-58
- EDIT COMMENT 2.7-6
- EDIT ACP LIMITS 2.9-30
- EDIT LIMIT LINE 2.9-64
- EDIT NAME 2.7-6; 2.7-10
- EDIT PATH 2.7-3; 7-6; 2.7-10

ENABLE ALL ITEMS 2.7-8; 2.7-12
ENABLE DEV1 / DEV2 2.6-12
ENABLE OPTION 2.4-30
ENTER PASSWORD 2.4-40
ENTER TEXT 2.6-5
EXCLUDE LO ON/OFF 2.9-47
EXECUTE TESTS 2.4-14
EXT REF FREQUENCY 2.4-29
EXT VIDEO ON / OFF 2.9-82
EXTERN (trigger) 2.9-89
EXTERNAL KEYBOARD 2.4-38
FIRMWARE OPTIONS 2.4-13
FIRMWARE VERSION 2.4-12
FM 2.9-24
FORMAT DISK 2.7-4
FREE RUN 2.9-88
FREQ AXIS LIN/LOG 2.9-8
FREQUENCY LINE 1/2 2.9-58
FREQUENCY OFFSET 2.9-4
FREQUENCY ON/OFF 2.4-6
FULL PAGE 2.6-4
FULL SCREEN 2.4-3
FULL SPAN 2.9-7
GAP LENGTH 2.9-101
GAP SWEEP ON/OFF 2.9-99
GAP SWEEP SETTINGS 2.9-100
GATE ADJUST 2.9-96
GATE DELAY 2.9-94
GATE EXTERN 2.9-95
GATE LENGTH 2.9-94
GATE LEVEL 2.9-93
GATE MODE LEVEL/EDGE 2.9-93
GATE ON / OFF 2.9-92
GATE POL 2.9-93
GATE RF POWER 2.9-95
GATE SETTINGS 2.9-93
GENERAL SETUP 2.4-30
GPIB ADDRESS 2.4-31
GRID ABS/REL 2.9-11; 2.9-15
HARDCOPY DEVICE 2.6-6
HARDWARE+OPTIONS 2.4-13
HOLD CONT ON/OFF 2.9-72
HORIZONTAL SCALING 2.4-4
INPUT CAL 2.4-39
INPUT RF 2.4-39
INPUT SELECT 2.9-18
INSERT VALUE (limit line) 2.9-66
KEY CLICK ON/OFF 2.4-31
LAST SPAN 2.9-8
LINE (trigger) 2.9-88
LINEAR/% 2.9-15
LINEAR/dB 2.9-15
LOCK ALL 2.3-19
LOCK DATA 2.3-19
LOG 10dB/20dB/50dB/100dB/120dB 2.9-15
LOG MANUAL 2.9-15
LOGO ON/OFF 2.4-6
LOWER LEFT 2.6-4
LOWER RIGHT 2.6-4
MACRO 1 to 7 2.8-2
MACRO TITLE 2.8-4
MAIN PLL BANDWIDTH 2.9-84
MAKE DIRECTORY 2.7-4
MARKER 1 to 4 2.9-20
MARKER DEMOD 2.9-24
MARKER INFO 2.9-23
MARKER ZOOM 2.9-23
MAX HOLD 2.9-71
MAX LEVEL AUTO 2.9-11
MAX LEVEL MANUAL 2.9-11
MEAN 2.9-52
MIN 2.9-46
MIN HOLD 2.9-72
MIXER LEVEL 2.9-17
MKR → STEPSIZE 2.9-40
MKR -> CENTER 2.9-54
MKR -> CF STEPSIZE 2.9-55
MKR -> REF LEVEL 2.9-55
MKR -> START 2.9-55
MKR -> STOP 2.9-55
MKR -> TRACE 2.9-55
MKR DEMOD ON/OFF 2.9-24
MKR STOP TIME 2.9-24
MODE COUPLED 2.4-4
MOUSE 2.4-37
MOVE ZOOM START 2.9-9
MOVE ZOOM STOP 2.9-9
MOVE ZOOM WINDOW 2.9-9
N dB DOWN 2.9-50
NAME (limit line) 2.9-65
NEW LIMIT LINE 2.9-64
NEXT MIN 2.9-47
NEXT MIN LEFT 2.9-47
NEXT MIN RIGHT 2.9-47
NEXT PEAK 2.9-46
NEXT PEAK LEFT 2.9-46
NEXT PEAK RIGHT 2.9-46
NOISE 2.9-26
NOISE SOURCE 2.4-39
OCCUPIED PWR BANDW 2.9-36
OPTIONS 2.4-29
PEAK 2.9-46
PEAK EXCURSION 2.9-47
PEAK HOLD ON/OFF 2.9-52
POWER MEAS SETTINGS 2.9-28
PRE TRIGGER (gap sweep) 2.9-100
PREDEFINED COLORS 2.4-6
PROBE CODE ON/OFF 2.9-14
RBW / VBW MANUAL 2.9-87
RBW / VBW NOISE 2.9-87
RBW / VBW PULSE 2.9-87
RBW / VBW SINE [1] 2.9-86
RBW <= NORM/FFT 2.9-83
RECORD ON/OFF 2.8-3
REF LEVEL 2.9-11
REF LEVEL OFFSET 2.9-11
REF POINT FREQUENCY 2.9-42
REF POINT LEVEL 2.9-42
REF POINT LVL OFFSET 2.9-42
REF POINT TIME 2.9-42
REFERENCE FIXED 2.9-41
REFERENCE INT/EXT 2.4-29
REFERENCE LINE 2.9-58
REFERENCE POINT 2.9-42
RENAME 2.7-4
RES BW AUTO 2.9-80
RES BW MANUAL 2.9-81
RF ATTEN MANUAL 2.9-16
RF INPUT 50 OHM 2.9-18
RF INPUT 75 OHM/RAM 2.9-18
RF INPUT 75 OHM/RAZ 2.9-18
RF POWER (trigger) 2.9-89
RMS (sum marker) 2.9-52
SATURATION 2.4-6
SAVE LIMIT LINE 2.9-67
SCREEN COUPLING 2.4-4
SCREENS UNCOUPLED 2.4-4
SEARCH LIMIT ON/OFF 2.9-49
SELECT ITEMS 2.7-8; 2.7-12
SELECT LIMIT LINE 2.9-60
SELECT MACRO 2.8-4
SELECT MARKER 2.9-46
SELECT OBJECT 2.4-5

SELECT QUADRANT 2.6-4
SELFTEST 2.4-14
SERVICE 2.4-39
SET CP REFERENCE 2.9-32
SET NO. OF ADJ CHAN'S 2.9-28
SETTINGS DEVICE 1/2 2.6-7
SGL SWEEP DISP OFF 2.9-91
SHAPE FACT 60dB/3dB 2.9-50
SHAPE FACT 60dB/6dB 2.9-50
SHIFT X LIMIT LINE 2.9-67
SHIFT Y LIMIT LINE 2.9-67
SIGNAL COUNT 2.9-25
SIGNAL TRACK 2.9-22
SINGLE SWEEP 2.9-90
SLOPE POS/NEG 2.9-89
SORT MODE 2.7-4
SPAN / RBW AUTO [50] 2.9-87
SPAN / RBW MANUAL 2.9-87
SPAN FIXED 2.9-1; 2.9-2; 2.9-4
SPAN MANUAL 2.9-7
SPLIT SCREEN 2.4-3
START FIXED 2.9-2; 2.9-4; 2.9-8
START MANUAL 2.9-1
STEPSIZE = CENTER 2.9-6
STEPSIZE MANUAL 2.9-6
STOP FIXED 2.9-1; 2.9-4; 2.9-8
STOP MANUAL 2.9-2
SUM MKR 2.9-51
SUMMARY MARKER 2.9-51
SWEEP COUNT 2.9-53; 2.9-71; 2.9-91
SWEEP TIME AUTO 2.9-82
SWEEP TIME MANUAL 2.9-82
SYSTEM MESSAGES 2.4-15
T1-REF 2.9-78
T1-T2+REF 2.9-78
T1-T3+REF 2.9-78
THRESHOLD LINE 2.9-58
TIME 2.4-36
TIME 2.4-6
TIME LINE 1/2 2.9-58
TINT 2.4-6
TITLE 2.6-5
TRACE MATH 2.9-77
TRACE MATH OFF 2.9-78
TRACKING GENERATOR 2.4-16
TRANSD SET RANGES 2.4-27
TRANSD SET UNIT 2.4-26
TRANSDUCER FACTOR 2.4-20
TRANSDUCER SET 2.4-20
TRC COLOR AUTO INC 2.6-3
TRD FACTOR NAME 2.4-23
TRD FACTOR UNIT 2.4-23
TRD SET NAME 2.4-26
TRG TO GAP TIME 2.9-101
TRIGGER DELAY 2.9-89
TRIGGER LEVEL (gap sweep) 2.9-100
TV DEMOS GENERATOR 2.4-16
UNIT 2.9-12
UNLOCK 2.3-19
UPDATE MESSAGES 2.4-15
UPPER LEFT 2.6-4
UPPER RIGHT 2.6-4
USER PORT A/B 2.4-32
VALUES (limit line) 2.9-66
VECTOR ANALYZER 2.4-17
VERTICAL SCALING 2.4-4
VIDEO (trigger) 2.9-88
VIDEO BW AUTO 2.9-81
VIDEO BW MANUAL 2.9-81
VIEW 2.9-69
VOLT 2.9-14
VOLUME 2.9-24
WATT 2.9-14
X OFFSET (limit line) 2.9-62
Y OFFSET (limit line) 2.9-62
ZERO SPAN 2.9-7
ZOOM 2.9-9
ZOOM OFF 2.9-9
Span 2.9-7
  measurement window 2.9-1
Split screen mode 2.3-9; 2.4-3
SRE (service request enable register) 3.8-4
SRQ (service request) 3.8-4; 3.8-15
Start frequency 2.9-1
Start-Up 2.2-1
Status byte (STB) 3.8-4
Status register
  CONDition part 3.8-2
  ENABle part 3.8-2
  ESE 3.8-5
  ESR 3.8-5
  EVENt part 3.8-2
  NTRansition part 3.8-2
  overview 3.8-3
  PPE 3.8-5
  PTRansition part 3.8-2
  SRE 3.8-4
  STATus OPERation 3.8-6
  STATus QUEStionable 3.8-7
    ACPLimit register 3.8-8
    FREQuency register 3.8-9
    LIMit register 3.8-10
    LMARgin register 3.8-11
    POWer register 3.8-12
    SYNC register 3.8-13
    TRANsducer register 3.8-14
  STB 3.8-4
  structure 3.8-1
  sum bit 3.8-2
Status reporting system 3.8-1
  resetting values 3.8-17
STATus:OPERation register 3.8-6
STATus:QUEStionable register 3.8-7
    ACPLimit 3.8-8
    FREQuency 3.8-9
    LIMit 3.8-10
    LMARgin 3.8-11
    POWer 3.8-12
    SYNC 3.8-13
    TRANsducer 3.8-14
Status information
  DIFOVL 2.3-4
  ExtRef 2.3-4
  IFOVLD 2.3-4
  LO LvD 2.3-4
  LO Lvl 2.3-4
  LO unl 2.3-4
  MAX / REF LVL 2.3-4
  OCXO 2.3-4
  OVLD 2.3-4
  UNCAL 2.3-4
  UNLD 2.3-4
STB (status byte) 3.8-4
Step size
  center frequency 2.9-5
  delta marker 2.9-44
  marker 2.9-40
  setting 2.3-20
Stop frequency 2.9-2
String 3.5-6
Suffix 3.5-3
Sum bit 3.8-2

Sweep
- *count* *2.9-71; 2.9-91*
- *coupling* *2.9-79*
- *gap* *2.9-99*
- *gap length* *2.9-101*
- *gated* *2.9-92*
- *mode* *2.9-90*
- *single* *2.9-90*
- *time* *2.9-82*

Syntax elements, command *3.5-6*
System messages *2.4-15*

T

Table entry *2.3-17*
Text parameter *3.5-6*
Time *2.4-36*
Trace *2.9-68*
- *copy* *2.9-72*
- *detector* *2.9-73*
- *mathematics* *2.9-77*

Transducer *2.4-18*
- *entry* *2.4-21*
- *set* *2.4-25*
- *switch on* *2.4-19*

Transmission parameters RS-232-C *A.6*
Trigger
- *delay* *2.9-89*
- *free run* *2.9-88*
- *gap sweep* *2.9-99*
- *line* *2.9-88*
- *pre-trigger* *2.9-100*
- *RF power* *2.9-89*
- *slope* *2.9-89*
- *video* *2.9-88*

Troubleshooting *4.1-1*

U

UNCAL *2.3-4*
UNLD *2.3-4*
Units *2.9-12*
Universal command *A.4*
User interface *A.8*
User port configuration *2.4-32*

V

Vector analyzer mode *2.4-17*
Video bandwidth *2.9-81*
View *2.9-69*
Volume *2.9-24*

W

White space *3.5-6*

Z

Zero span *2.9-7*
Zoom *2.9-9; 2.9-69*

Index

Chapter 2.11

(for list of commands see annex C)

A

Attenuator (tracking generator) *2.11-2*

C

Calibration *2.11-10*

E

External modulation *2.11-12*

F

Frequency converting measurement *2.11-11*

I

I/Q Modulation *2.11-14*

L

Level
  control, external *2.11-13*
  offset *2.11-2*

M

Measurement
  frequency-converting *2.11-11*
  transmission *2.11-3*
  reflection *2.11-9*
Modulation
  I/Q *2.11-14*

N

Normalization.. *2.11-5*

O

Output level
  Control *2.11-2*

R

Reference
  position *2.11-6*
  value *2.11-7*
Reflection measurement *2.11-9*
  calibration *2.11-9*

S

Soft key
  CAL REFL OPEN *2.11-9*
  CAL REFL SHORT *2.11-9*
  CAL TRANS... *2.11-4*
  EXT ALC *2.11-13*
  EXT AM *2.11-13*
  EXT FM *2.11-13*
  EXT I/Q *2.11-14*
  FREQUENCY OFFSET *2.11-11*
  MODULATION *2.11-12*
  NORMALIZE *2.11-5*
  POWER OFFSET *2.11-2*
  REF VALUE *2.11-7*
  REF VALUE POSITION *2.11-6*
  SOURCE CAL *2.11-3*
  SOURCE ON/OFF *2.11-2*
  SOURCE POWER *2.11-2*
  TRACKING GEN *2.11-2*

T

Transmission measurement *2.11-3*
  calibration *2.11-3*

Spectrum Analyzers FSE

20 Hz to 40 GHz

- Spectrum analysis with ultra-wide dynamic range
  Noise figure = 15 dB/T.O.I. = 15 dBm
  and
- Universal analysis of digital and analog modulated signals (option)
  BPSK, QPSK, π/4-DQPSK, QAM
  MSK, GMSK, AM, FM, PM
- High-speed synthesizer
  5 ms for full span (FSEA, FSEB)
- Refresh rate, quasi-analog
  25 sweeps/s
- Large LC TFT display
  24 cm/9.5", active
- Future-proof modular design
  Customized solutions through wide variety of options

ROHDE & SCHWARZ

The spectrum analyzers from Rohde & Schwarz

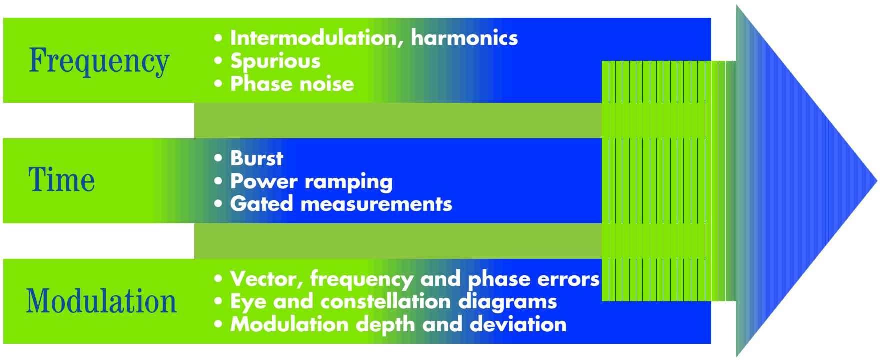
Overview

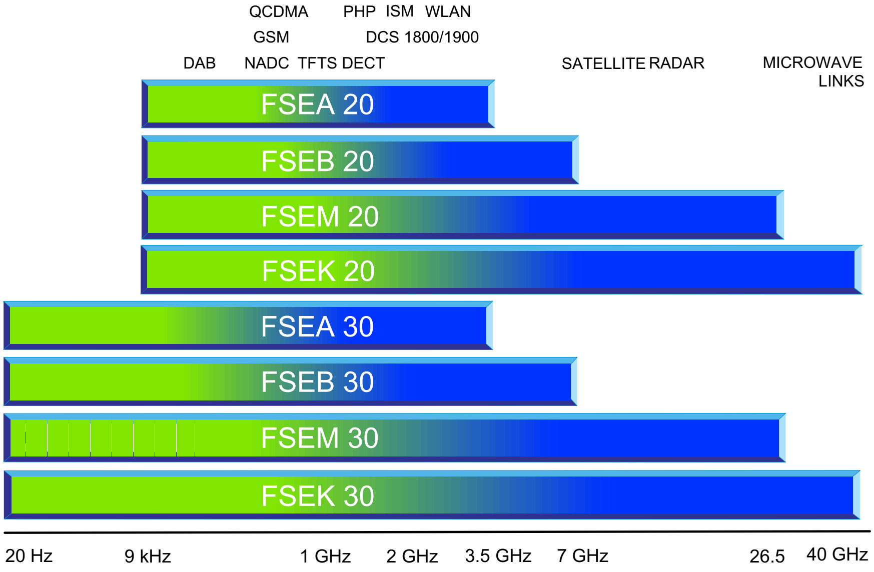
The FSE spectrum analyzers from Rohde & Schwarz have been optimized both for general-purpose measurements and meeting the stringent requirements of testing advanced digital communication systems. Extremely high measurement speed, future-proof modular design and excellent characteristics put the analyzers right at the top of today's market – at a price of a medium-range product.

Characteristics

- Combines the following functions: spectrum analysis *and* analysis of digitally modulated signals (option)
- Fastest synthesizer worldwide incorporated in a spectrum analyzer
- Adaptation of all models to your specific requirements by means of a wide range of options.

  Easy upgrading of basic models into top-class models


Frequency
• Intermodulation, harmonics
• Spurious
• Phase noise
Time
• Burst
• Power ramping
• Gated measurements
Modulation
• Vector, frequency and phase errors
• Eye and constellation diagrams
• Modulation depth and deviation



Modular design for a safe investment

The FSE "option building blocks"

Option/function/software	Designation	FSEA 20	FSEA 30	FSEB 20	FSEB 30	FSEM 20	FSEM 30	FSEK 20	FSEK 30
Frequency from 20 Hz	–	–	●	–	●	–	●	–	●
Frequency to 3.5 GHz	–	●	●	–	–	–	–	–	–
7-GHz Frequency Extension	FSE-B2	❍	❍	●	●	–	–	–	–
TV Demodulator	FSE-B3 1)	❍	❍	❍	❍	❍	❍	❍	❍
Low Phase Noise and OCXO	FSE-B4	❍	●	❍	●	❍	●	❍	●
FFT Filter	FSE-B5	❍	●	❍	●	❍	●	❍	●
Vector Signal Analyzer	FSE-B7	❍	❍	❍	❍	❍	❍	❍	❍
Tracking Generator 3.5 GHz	FSE-B8	❍	❍	–	–	–	–	–	–
Tracking Generator 3.5 GHz with I/Q Modulator	FSE-B9	❍	❍	–	–	–	–	–	–
Tracking Generator 7 GHz	FSE-B10	–	–	❍	❍	–	❍	–	❍
Tracking Generator 7 GHz with I/Q Modulator	FSE-B11	–	–	❍	❍	–	❍	–	❍
Switchable Attenuator for Tracking Generator	FSE-B12	❍	❍	❍	❍	❍	❍	❍	❍
Controller	FSE-B15	❍	❍	❍	❍	❍	❍	❍	❍
Ethernet Interface	FSE-B16	❍	❍	❍	❍	❍	❍	❍	❍
2nd IEC/IEEE-Bus Interface	FSE-B17	❍	❍	❍	❍	❍	❍	❍	❍
Removable Harddisk	FSE-B18 1)	❍	❍	❍	❍	❍	❍	❍	❍
Second Harddisk for FSE-B18	FSE-B19	❍	❍	❍	❍	❍	❍	❍	❍
Increased Level Accuracy up to 2 GHz	FSE-B22 1)	❍	❍	❍	❍	❍	❍	❍	❍
Broadband Output 741.4 MHz	FSE-B23 1)	❍	❍	❍	❍	❍	❍	❍	❍
Noise Measurement Software	FSE-K3	❍	❍	❍	❍	❍	❍	❍	❍
GSM Application Firmware	FSE-K10/ -K11	❍	❍	❍	❍	❍	❍	❍	❍

● Incorporated in basic model ❍ Can be retrofitted (option)

1) Factory-fitted only.

FSE options and their applications

Digital mobile radio systems	Analog mobile radio systems	TV and CATV	AM and FM sound broadcasting	General-purpose RF measurements		
❍				❍	FSE-B2	7-GHz Frequency Extension
		●			FSE-B3	TV Demodulator
❍	●			●	FSE-B4	Low Phase Noise and OCXO
●	❍		●		FSE-B7	Vector Signal Analyzer
		❍		❍	FSE-B8/9/ 10/11	Tracking Generator
❍				❍	FSE-B15	Controller
❍	❍			❍	FSE-K3	Noise Measurement Software
❍					FSE-K10/11	GSM Application Firmware

● Required ❍ Recommended

Getting down to analysis

Specifications in brief

- Resolution bandwidths
  10 Hz to 10 MHz (models .20),
  1 Hz to 10 MHz (models .30),
  adjustable in steps of
  1/2/3/5/10
- Displayed noise floor
  –150 dBm (typ.) in
  10-Hz bandwidth
- 3rd-order intercept point +15 dBm
- 1-dB compression point
  of RF input >+10 dBm
- Phase noise at 10 kHz from carrier: –123 dBc/Hz (FSEA 30)
- Total measurement error
  up to 1 GHz <1 dB,
  up to 7 GHz 1.5 dB
- AM/FM demodulator
  (with built-in loudspeaker and
  headphones connector)
- Internal RF trigger (trigger threshold approx. –20 dBm)
- 5 ms full-span sweep time
  with fully synchronized sweep
  (FSEA, FSEB), 150 ms with FSEM
- 1 µs zero-span sweep time
- Pretrigger and trigger delay
- Gated sweep

Vector analysis for digital communication

The analyzers of the FSE family combine the capabilities of high-end RF or microwave spectrum analysis with those of universal digital-signal demodulation and analysis. This becomes possible with the vector signal analyzer option. The spectrum analyzer function offers the wide dynamic range necessary for many measurements on digitally modulated signals (eg burst measurements), and the vector signal analyzer option adds demodulation capability to bit stream level for

– BPSK	– QPSK
– π/4-DQPSK	– 16QAM
– (G)MSK	– (G)FSK

All this is backed up by a variety of display types:

- Eye diagrams
- Vector and constellation diagrams
- Frequency and phase error
- Vector error

With a spectrum analyzer of the FSE family, you are perfectly equipped for the future of digital communication.

Modularity safeguards investments

Series FSE analyzers are of modular design throughout. From the wide variety of options, you can choose exactly those needed for your particular application (see table on folding page).

You thus get an instrument tailor-made to your requirements and pay for no more than what you actually need. At the same time, you can feel sure that FSE will grow with your tasks and requirements as virtually all options can be retrofitted and model .20 units can easily be upgraded later to almost the same performance as provided by top-class models .30. Even extending the frequency range from 3.5 to 7 GHz is no problem with option FSE-B2.

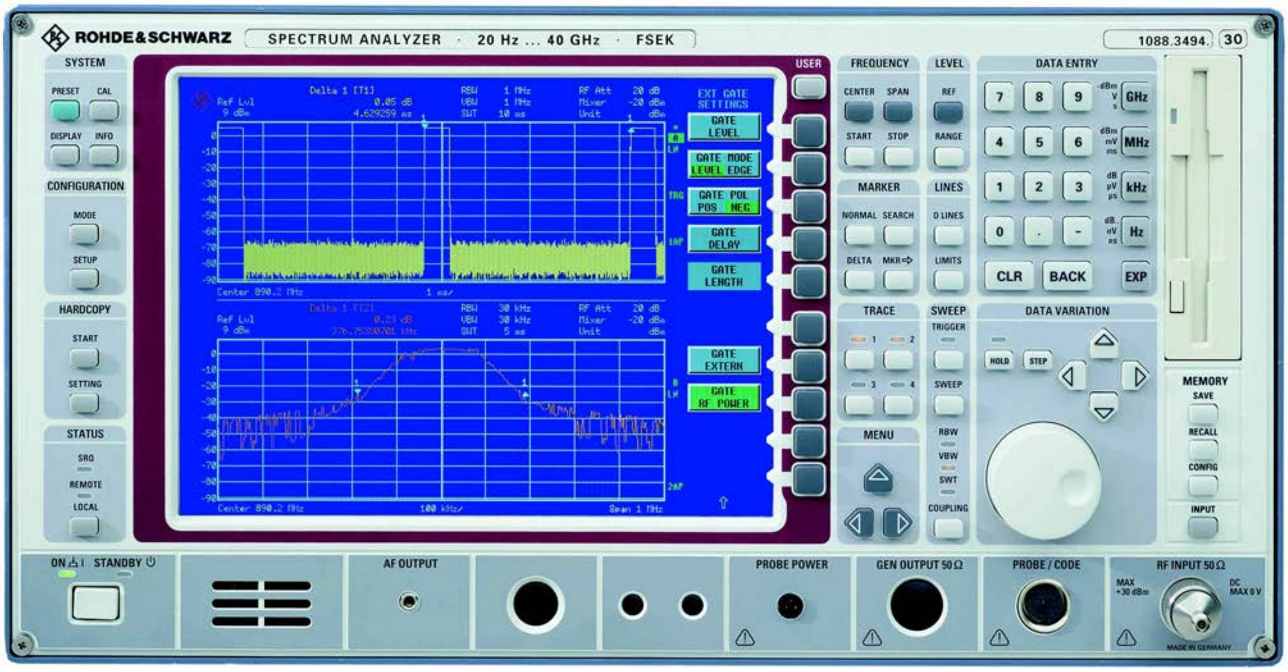
Your decision for Spectrum Analyzer FSE is a decision for a safe investment.

A triple record holder in speed

FSE breaks the speed record in three fields:

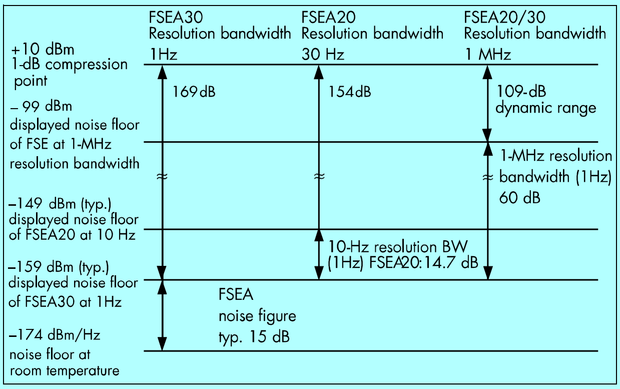
- FSE features a minimum full-span sweep time of 5 ms (for FSEA and FSEB) with a fully synchronized sweep. This means that added speed is not at the expense of frequency accuracy but even enhances it.
- The shortest zero-span sweep time is 1 µs (100 ns/div) – ideal for high-resolution measurements on pulse edges.
- Up to 25 sweeps per second is an optimal prerequisite for rapid and easy alignments and for applications in production.

With its high measurement speed and great ease of operation, FSE will solve even highly complex measurement tasks in the shortest possible time.

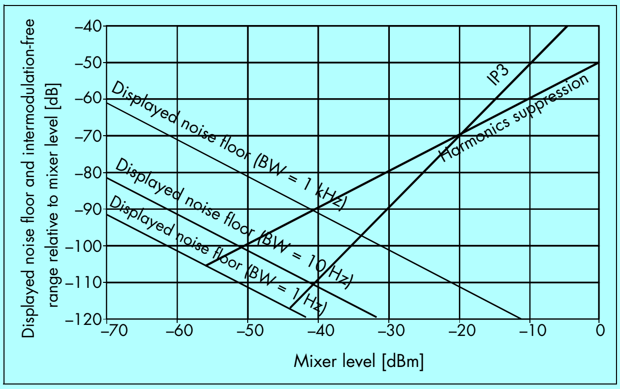

ROHDE&SCHWARZ
SPECTRUM ANALYZER · 20 Hz ... 40 GHz · FSEK
1088.3494. 30
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
USER
FREQUENCY
CENTER
SPAN
START
STOP
LEVEL
REF
RANGE
MARKER
NORMAL
SEARCH
DELTA
LINES
D LINES
LIMITS
TRACE
SWEEP
TRIGGER
COUPLING
RBW
VBW
SWT
MENU
DATA ENTRY
GHz
MHz
kHz
Hz
CLR
BACK
EXP
DATA VARIATION
HOLD
STEP
MEMORY
SAVE
RECALL
CONFIG
INPUT
ON
STANDBY
AF OUTPUT
PROBE POWER
GEN OUTPUT 50 Ω
PROBE / CODE
RF INPUT 50 Ω
MAX +30 dBm
DC MAX 0 V
MADE IN GERMANY
EXT GATE SETTINGS
GATE LEVEL
GATE MODE LEVEL EDGE
GATE POL POS NEG
GATE DELAY
GATE LENGTH
GATE EXTERN
GATE RF POWER

Spectrum Analyzer
FSEK30

The features in detail


FSEA30
Resolution bandwidth
1 Hz
FSEA20
Resolution bandwidth
30 Hz
FSEA20/30
Resolution bandwidth
1 MHz
+10 dBm
1-dB compression point
– 99 dBm
displayed noise floor of FSE at 1-MHz resolution bandwidth
–149 dBm (typ.)
displayed noise floor of FSEA20 at 10 Hz
–159 dBm (typ.)
displayed noise floor of FSEA30 at 1 Hz
–174 dBm/Hz
noise floor at room temperature
169 dB
154 dB
109-dB
dynamic range
1-MHz resolution bandwidth (1 Hz) 60 dB
10-Hz resolution BW (1 Hz) FSEA20: 14.7 dB
FSEA
noise figure
typ. 15 dB

Dynamic range, noise and 1-dB compression point for models of Spectrum Analyzer FSE



Dynamic range, noise, 3rd-order intercept point

Tops in dynamic range

FSE is outstanding for its extremely low noise floor without any impairment to the dynamic range at large signal levels. This can be seen, for example, from the 1-dB compression point of +10 dBm, which yields a dynamic range of 109 dB even at a resolution bandwidth of 1 MHz, allowing GSM and DECT power ramps to be determined.

The extremely wide intermodulation-free dynamic range of typ. 116 dB (models .30) and 105 dB (models .20) not only ensures reliable measurements on highly linear amplifiers, it also enables detailed analysis of complex broadband signals.

Taking as a figure of merit of an analyzer the difference between its 3rd-order intercept point and its noise figure, FSEA can offer a value of around 0 dB. Put this figure to the test.

From AF to microwave

FSEM/K open up the microwave range through to 26.5/40 GHz and retain the excellent characteristics of the 3.5 and 7 GHz basic models:

- Continuous full-span sweep
- Fundamental mixing, low noise floor as well as wide dynamic range up to 26.5 GHz
- Fully synchronized sweep with high frequency accuracy even for FULL SPAN (26.5/40 GHz)
- RF input adapters for N or PC 3.5-mm, or with FSEK K male/female connector

Unattained measuring convenience

FSE makes measuring easy for you, offering a large number of convenient test functions:

- 4 markers, 4 delta markers
- Marker functions for direct measurement of
  - phase noise and noise power density (/Hz)
  - NEXT MIN/PEAK, NEXT MIN/PEAK RIGHT, NEXT MIN/PEAK LEFT
  - bandwidths and shape factor
- Measurement of channel power, adjacent channel power and occupied bandwidth
- Frequency counter with selectable resolution
- LOW NOISE, NORMAL and LOW DISTORTION modes to cater for low-intermodulation and low-noise operation
- One-button hardcopy on printer or plotter

Model	**Frequency range**	**On-Screen Dynamic Range**	**Resolution bandwidths**	**Low phase noise and OCXO**	**1-Hz resolution bandwidth**	**FFT Filter**
FSEA20	9 kHz to 3.5 GHz	95 dB	10 Hz to 10 MHz, 4-pole filters	❍	❍	❍
FSEA30	20 Hz to 3.5 GHz	105 dB	1 Hz to 10 MHz, 5-pole filters	●	●	●
FSEB20	9 kHz to 7 GHz	95 dB	10 Hz to 10 MHz, 4-pole filters	❍	❍	❍
FSEB30	20 Hz to 7 GHz	105 dB	1 Hz to 10 MHz, 5-pole filters	●	●	●
FSEM20	9 kHz to 26.5 GHz	95 dB	10 Hz to 10 MHz, 4-pole filters	❍	❍	❍
FSEM30	20 Hz to 26.5 GHz	105 dB	1 Hz to 10 MHz, 5-pole filters	●	●	●
FSEK20	9 kHz to 40 GHz	95 dB	10 Hz to 10 MHz, 4-pole filters	❍	❍	❍
FSEK30	20 Hz to 40 GHz	105 dB	1 Hz to 10 MHz, 5-pole filters	●	●	●

Differences between FSE models in detail ● Incorporated in basic model ❍ Can be retrofitted

- Simultaneous measurement of four active traces
- Level, frequency and user-definable limit lines as evaluation help with pass/fail information
- Split screen with independent measurement windows
- Quasi-analog display

Frequency accuracy – to the point

Tuning on FSE is absolutely synchronous to the reference frequency for each span including full span. This means that every point on the frequency axis is determined with the accuracy of the internal reference frequency and the pixel resolution. Thus, when reducing the span for detailed signal analysis, the tiresome readjustment of the center frequency is no longer needed.

FSE in its basic configuration includes an AM/FM audio demodulator. Unknown signals can thus easily be identified via headphones or the built-in loudspeaker. Modulation measurements are possible using the optional Vector Signal Analyzer FSE-B7.

Limit lines facilitate checking if results are within predefined tolerances. Virtually any number of limit lines can be defined with high accuracy by means of 50 points to meet even the most exacting requirements.

Scalar network analysis

The optional tracking generators (see data sheet for FSE-B8/9/10/11) are an ideal tool for determining frequency response, attenuation or VSWR and feature the following characteristics:

- Wide dynamic range for attenuation measurements (up to 120 dB)
- Frequency range from 9 kHz to 3.5/7 GHz
- Frequency offset up to ± 200 MHz for measurements on frequency-converting modules

To generate digitally modulated signals the tracking generators with built-in I/Q modulator are ideal. An external two-channel Arbitrary Waveform Generator (eg ADS from Rohde & Schwarz) serves as modulation source.

By adding the optional Vector Signal Analyzer FSE-B7, FSE can be expanded to a test assembly enabling direct measurement of the influence of amplifiers or filters on phase error for instance.

The features in detail

Designation	Type	Use	Functions
Noise Measurement Software	FSE-K3	Noise figure measurements	• Measurement of noise figure and temperature to Y-factor method • 2nd-stage correction • Conversion measurements • Frequency range same as basic unit, starting from 100 kHz • Editor for ENR tables • Runs under Windows® 3.1 on the internal controller (option) or on an external PC
Application Firmware [1])	FSE-K10, Mobile FSE-K11, BTS	Mobile radio, transmitter measurements to GSM standards 11.10 and 11.20	• Power ramp and power template • Spectrum due to modulation/switching • Spurious emissions • Mean carrier power • Phase/frequency error (with option FSE-B7)

[1]) See data sheet FSE-K10/-K11

Operation – as you like it

Despite their comprehensive functionalities the analyzers feature great ease of operation. Basic functions and frequently used help tools such as markers can be called at a keystroke. The full operating convenience based on a wide variety of evaluation routines and marker functions can be accessed via the menus.

All essential parameters and results can be seen at a glance. All test data, scale factors and setting parameters are logically arranged and thus easy to find. Setups, traces and graticules displayed in colour make for error-free analysis of complex results.

All models are equipped with a large 24-cm (9.5") TFT colour display with VGA resolution (640 x 480 pixels).

The USER key allows FSE operation to be tailored to your specific requirements. With this key, you can compile the functions mainly needed for your measurement tasks, doing away with frequent menu changes and speeding up measurements on the whole.

Test results – perfectly documented

FSE affords uncomplicated logging of results. It supports a wide variety of printers or plotters:

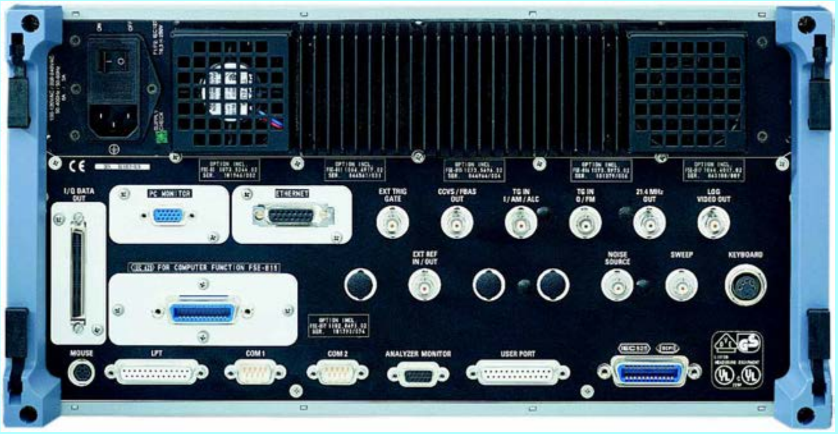
- FX-80 and compatibles
- Printers with HP-PCL
- HP-GL
- Postscript

Print files can not only be output via an interface but also be stored on diskette or the internal harddisk. With PCX, WMF and HP-GL print formats being available, there is no problem in further processing print files in standard text processing systems. Using Controller FSE-B15, it is particularly easy to generate test reports and integrate the results. Texts can then be processed under Windows® on FSE itself.

FSE works as a Controller

The optional Controller FSE-B15 provides a further VGA card, a memory extension to 16 Mbyte, a serial mouse and a keyboard. FSE-B15 is available in English and German and is supplied installed in FSE when ordered together with the unit. The option opens up the world of Windows®-3.1 applications (standard mode), eg statistics programs or spreadsheet analysis. FSE can even be linked to a network using the optional Ethernet Interface FSE-B16.

Complete setups, traces, limit lines and macros can be stored non-volatile on the internal harddisk or on diskette with the built-in 1.44-Mbyte drive.



Rear of Spectrum Analyzer FSE

Quality management at Rohde&Schwarz

Lasting customer satisfaction is our primary objective. The quality management system of Rohde&Schwarz meets the requirements of ISO 9001 and encompasses largely all fields of activity of the company.

Certified Quality System
ISO 9001
DQS REG. NO 1954-04

FSE in automatic test systems

FSE is ideal for use in automatic test systems, affording not only fast processing of results but also an IEC/IEEE-bus command set conforming to SCPI.

Moreover, with optional Controller FSE-B15 and a second IEC/IEEE-bus card (option FSE-B17), FSE can be used as a controller for test systems, thus eliminating the need for further units and saving space in the system cabinet.

Low overall costs

In designing FSE, special emphasis was placed on keeping after-sales costs to a minimum:

- Temperature-controlled blowers
- Calibration interval up to 2 years
- Built-in calibration routines
- Numerous selftest routines
- Modular design

Calibration routines

Built-in calibration routines ensure that FSE remains within defined tolerances and thus maintains its accuracy of measurement. The routines are not performed automatically by the instrument but can be started by the user, thus avoiding ongoing measurements to be interrupted.

The results of calibration routines are output by FSE in the form of comprehensive correction tables. Comparing these tables over an extended period of time, the user can detect changes early and take corrective steps in time. This enhances confidence in the unit's reliability and measurement accuracy.

A particular asset in system applications is the internally selectable, high-precision level calibration source, which reduces the number of cables required.

Selftest – the built-in diagnostic system

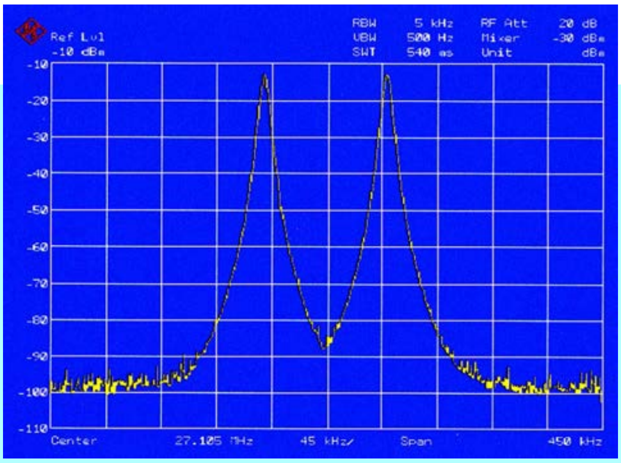
The instrument selftest rapidly locates any faults down to module level. Defective modules can be replaced nearly without adjustments or extra test equipment being required. This in conjunction with the quick spare parts service from Rohde&Schwarz reduces any repair or down-time costs that might arise. The low operating costs go easy on your budget.

Modular design – easy retrofitting of options

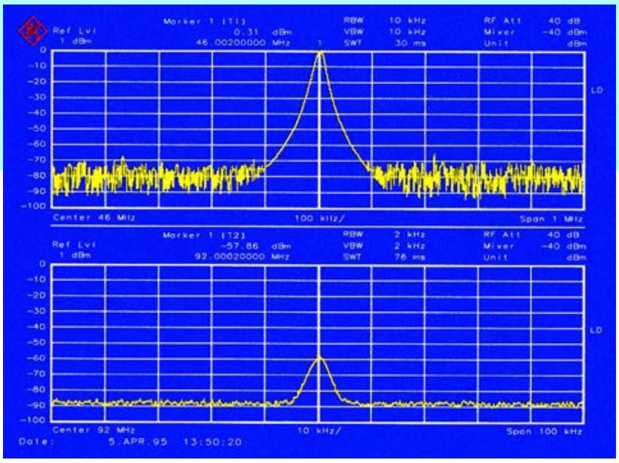
The easy concept for fitting the most important options, ie Vector Signal Analyzer, Low Phase Noise and OCXO, 7-GHz Frequency Extension, as well as the easy, adjustment-free incorporation of the remaining options make it possible to retrofit the instrument with a minimum of downtime or installation costs being involved.

Applications

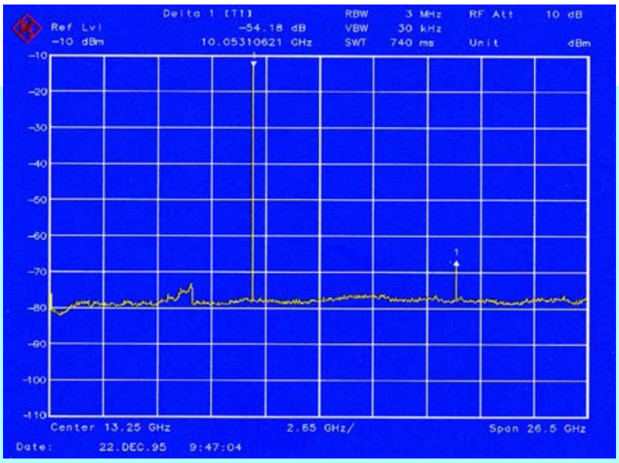
General-purpose RF measurements


Ref Lvl
-10 dBm
RBW 5 kHz
VBW 500 Hz
SWT 540 ms
RF Att 20 dB
Mixer -30 dBm
Unit dBm
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 27.105 MHz
45 kHz/
Span 450 kHz

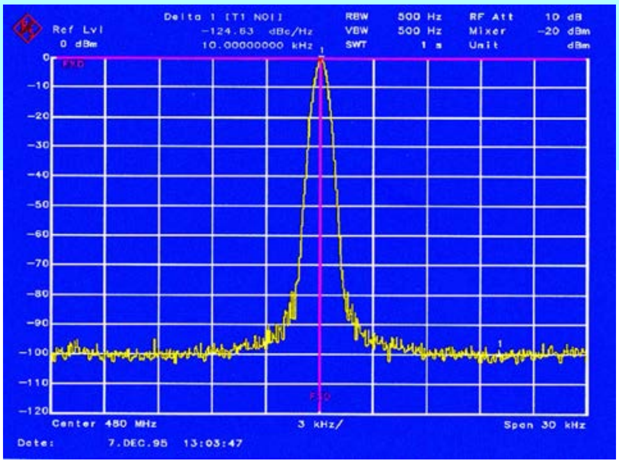
1


Ref Lvl
1 dBm
Marker 1 [T1]
0.31 dBm
46.00200000 MHz
RBW 10 kHz
VBW 10 kHz
SWT 30 ms
RF Att 40 dB
Mixer -40 dBm
Unit dBm
LO
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 46 MHz
100 kHz/
Span 1 MHz
Ref Lvl
1 dBm
Marker 1 [T2]
-57.86 dBm
92.00020000 MHz
RBW 2 kHz
VBW 2 kHz
SWT 76 ms
RF Att 40 dB
Mixer -40 dBm
Unit dBm
LO
Center 92 MHz
10 kHz/
Span 100 kHz
Date: 5.APR.95 13:50:20

2


Ref Lvl
-10 dBm
Delta 1 [T1]
-54.18 dB
10.05310621 GHz
RBW 3 MHz
VBW 30 kHz
SWT 740 ms
RF Att 10 dB
Unit dBm
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1
Center 13.25 GHz
2.65 GHz/
Span 26.5 GHz
Date: 22.DEC.95 9:47:04

3


Ref Lvl
0 dBm
Delta 1 [T1 NOI]
-124.63 dBc/Hz
10.00000000 kHz
RBW 500 Hz
VBW 500 Hz
SWT 1 s
RF Att 10 dB
Mixer -20 dBm
Unit dBm
FXD
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
1
Center 480 MHz
3 kHz/
Span 30 kHz
Date: 7.DEC.95 13:03:47

4

Two-tone measurements (1)

FSE facilitates intermodulation measurements with its wide intermodulation-free dynamic range, which reduces measurement errors. This feature is enhanced by the LOW DISTORTION mode, which ensures optimum RF attenuation. Evaluation of results is rapid and easy by means of markers and delta markers.

Harmonics measurements with split screen (2)

The split-screen function has been provided for the convenient analysis of results. In harmonics measurements, for example, the fundamental and the first harmonic can be displayed simultaneously with high resolution.

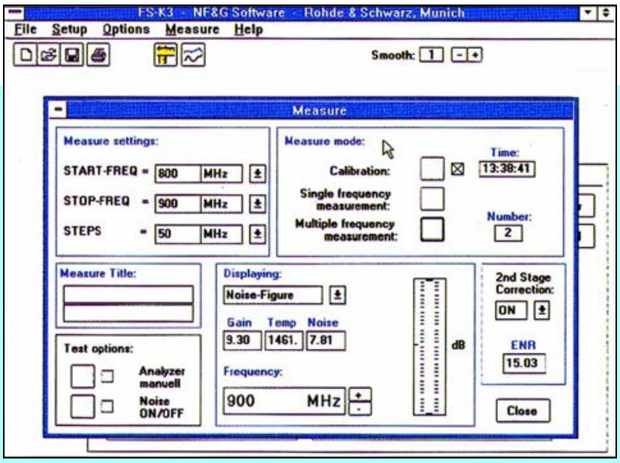
Low noise floor even in the microwave range (3)

Thanks to fundamental mixing FSEM features the same constantly low noise floor as an RF analyzer up to 26.5 GHz. As a consequence, FSEM offers not only a wide dynamic range, but also a considerably increased speed for measuring small signals in the microwave range: Larger resolution bandwidths and high sensitivity reduce sweep time while maintaining the S/N ratio. This is of great advantage when measuring spurious and harmonics alike.

FSE phase noise as a function of carrier spacing (4)

With a phase noise of –123 dBc/Hz at 10 kHz from the carrier, the synthesizer incorporated in FSEA 30 is ideal for measuring the phase noise of oscillators or the adjacent-channel power of radio equipment. FSEA 20, on the other hand, is ideal for applications where phase noise in the vicinity of the carrier plays a less important role. Thanks to the modular design of the instrument, FSEA 20, FSEB 20, FSEM 20 and FSEK 20 can easily be retrofitted with the synthesizers of models .30.

Noise figure measurements



Smooth: 1

Measure settings:
START-FREQ = 800 MHz
STOP-FREQ = 900 MHz
STEPS = 50 MHz

Measure mode:
Calibration: ☐ ☒
Single frequency measurement: ☐
Multiple frequency measurement: ☐
Time: 13:38:41
Number: 2

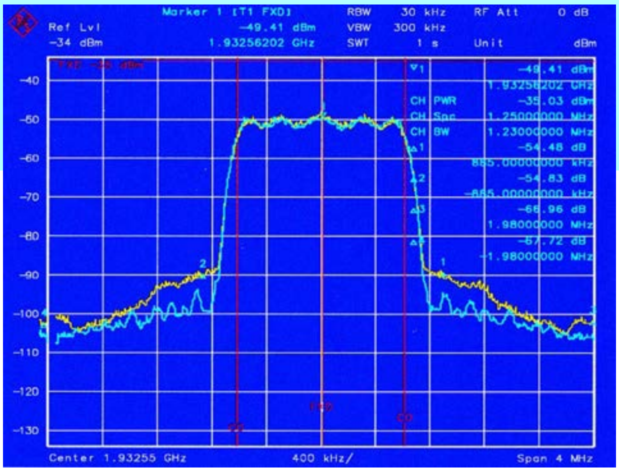
Measure Title:

Test options:
☐ Analyzer manuell
☐ Noise ON/OFF

Displaying: Noise-Figure
Gain 9.30
Temp 1461.
Noise 7.81
Frequency: 900 MHz
dB

2nd Stage Correction: ON
ENR 15.03

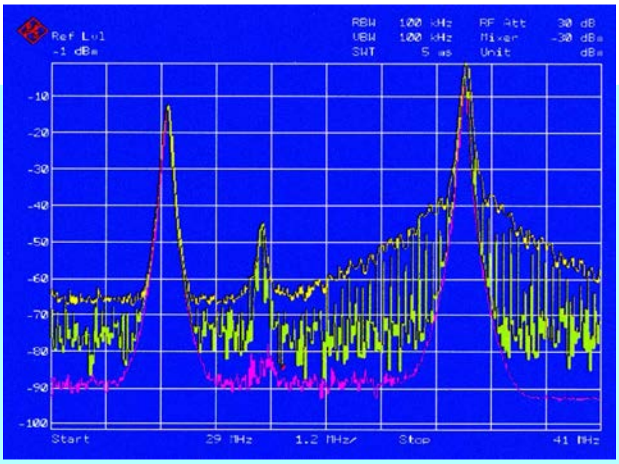
1



Ref Lvl -34 dBm
Marker 1 [T1 FXD] -49.41 dBm 1.93256202 GHz
RBW 30 kHz
VBW 300 kHz
SWT 1 s
RF Att 0 dB
Unit dBm
▽1 -49.41 dBm 1.93256202 GHz
CH PWR -35.03 dBm
CH Spc 1.25000000 MHz
CH BW 1.23000000 MHz
Δ1 -54.48 dB 885.00000000 kHz
Δ2 -54.83 dB -885.00000000 kHz
Δ3 -66.96 dB 1.98000000 MHz
Δ4 -67.72 dB -1.98000000 MHz
Center 1.93255 GHz
400 kHz/
Span 4 MHz

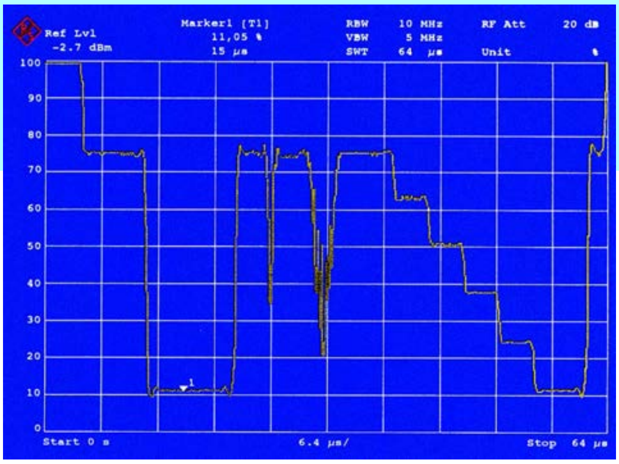
2

TV measurements



Ref Lvl -1 dBm
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 30 dB
Mixer -30 dBm
Unit dBm
Start 29 MHz
1.2 MHz/
Stop 41 MHz

3



Ref Lvl -2.7 dBm
Marker1 [T1] 11,05 % 15 µs
RBW 10 MHz
VBW 5 MHz
SWT 64 µs
RF Att 20 dB
Unit %
Start 0 s
6.4 µs/
Stop 64 µs

4

Noise Measurement Software FSE-K3 (1)

FSE-K3 turns your FSE into a noise measurement system offering the advantages of an analyzer (see also data sheet 757.2380):

- From the large number of resolution bandwidths available, you can choose the right one for your application, even for measurements on narrowband DUTs
- With ambiguous results, you can check your test system for EM pick-up or nonharmonics
- The lower frequency limit is 100 kHz
- Measurements on frequency-converting DUTs are supported with the use of an external generator

RMS detector: power measurement without correction factors as shown in **FIG 2** where the power of a CDMA signal in the transmission and the adjacent channels is measured. The two traces show the influence of the DUT on the adjacent-channel power. Measuring power and adjacent-channel power of digitally modulated signals requires a spectrum analyzer to be equipped with special detectors and test routines. FSE is the first and the only spectrum analyzer that features a real power detector with wide dynamic range – the RMS detector. Like a thermocouple power meter, this detector guarantees stable and accurate test results without any correction factors. Considerably higher test throughput is achieved than with the usual sample detector. Using the available default settings for ACP measurements in line with common standards (NADC, PDC, CDMA, etc) precise test results are obtained easily and fast.

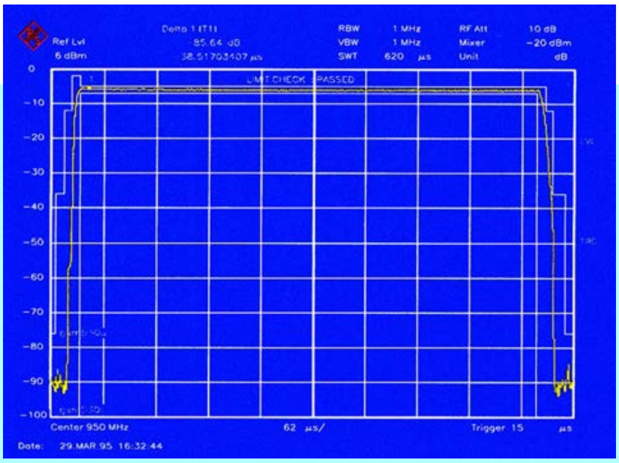
TV signal in zero span and TV trigger (3 and 4)

With a maximum resolution bandwidth of 10 MHz, implemented with the optional TV Demodulator FSE-B3, and the high resolution of 100 ns/div, FSE meets all requirements for the analysis of TV signals. In addition, FSE-B3 provides the following functions:

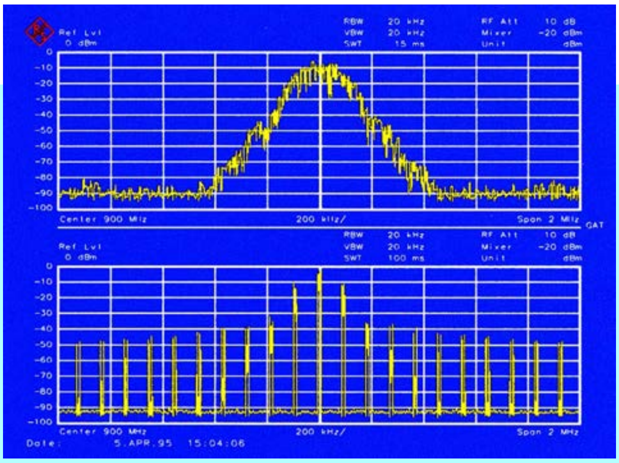
- Frame trigger
- Line trigger with selection of line

Applications

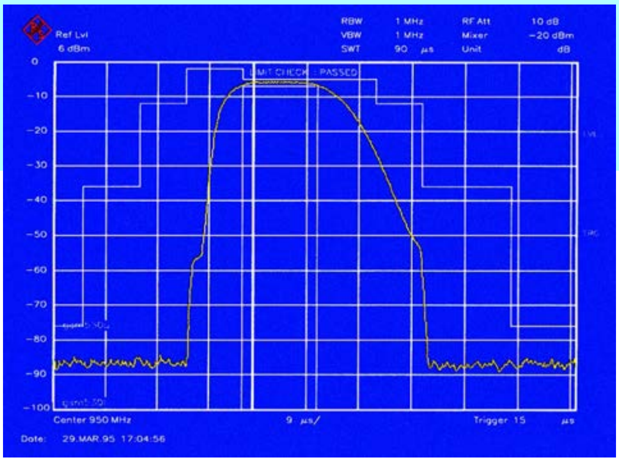
Mobile radio – digital and analog


Ref Lvl
6 dBm
LIMIT CHECK : PASSED
Center 950 MHz
62 µs/
Trigger 15 µs
Date: 29.MAR.95 16:32:44

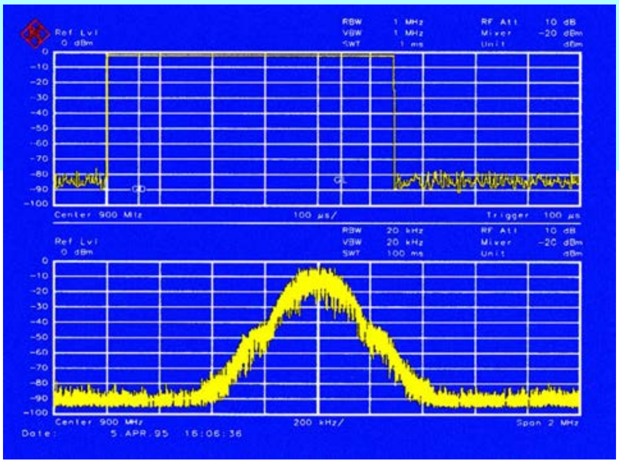
1


Ref Lvl
0 dBm
Center 900 MHz
200 kHz/
Span 2 MHz
Date: 5.APR.95 15:04:06

3


Ref Lvl
6 dBm
LIMIT CHECK : PASSED
Center 950 MHz
9 µs/
Trigger 15 µs
Date: 29.MAR.95 17:04:56

2


Ref Lvl
0 dBm
Center 900 MHz
100 µs/
Trigger 100 µs
200 kHz/
Span 2 MHz
Date: 5.APR.95 16:06:36

4

- CCVS output for connecting a monitor, adaptable to all standards

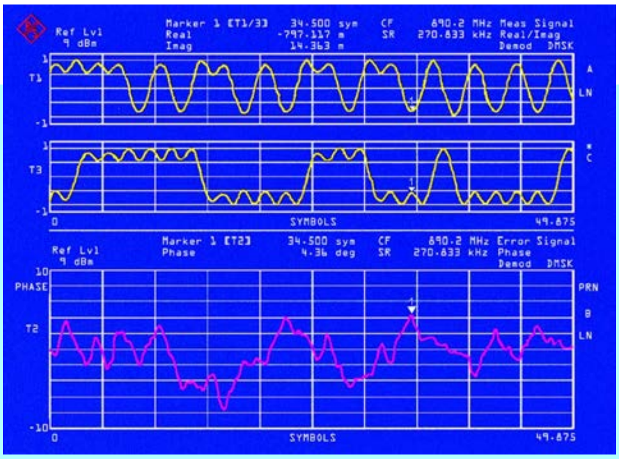
Moreover, the quasi-analog display provides luminance-signal information, enabling the detection of intermodulation products in the TV spectrum.

RF power trigger replaces external trigger (no illustration)
An internal broadband level detector (center frequency ±50 MHz) with a fixed switching threshold of approx. –20 dBm at the first mixer is used as a trigger source. With this detector it is possible, for example, to perform "Spectrum due to switching" and "Spectrum due to modulation" measurements to GSM specifications without an external trigger. Likewise, the detector replaces the external trigger needed in the gated sweep mode.

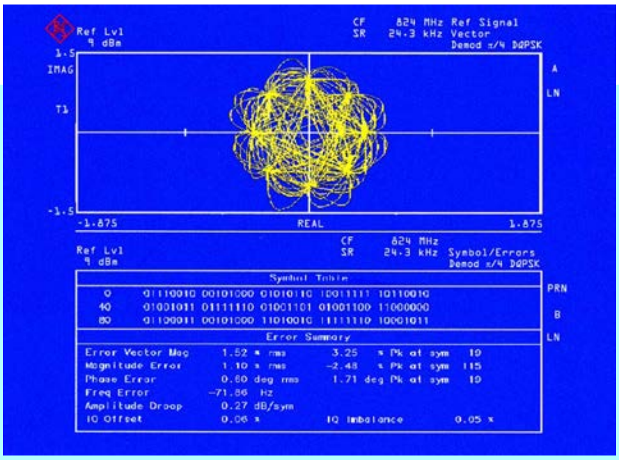
Gap sweep: simultaneous measurement of pulse rise and fall times with high time resolution (1 and 2)
The fast sweep time of 100 ns/div as well as the gap sweep and pretrigger functions of Spectrum Analyzer FSE make it possible to measure the rise and fall times of an RF pulse simultaneously and with high time resolution. The center of the pulse, which is of no interest, is blanked. Even at a resolution bandwidth of 1 MHz FSE offers a dynamic range of over 80 dB thanks to the high 1-dB compression point of +10 dBm.

Gated sweep (3 and 4)
The gated sweep function is indispensable for analyzing TDMA signals used in modern communication systems. With this function, the spectrum of burst signals can be investigated without any interference being caused by switching the signals on and off. The selected gate time determines over what interval a pulse is to be analyzed. Selection of the gate time is very easy and convenient in the time domain display (zero span) of the pulse.

Vector signal analysis

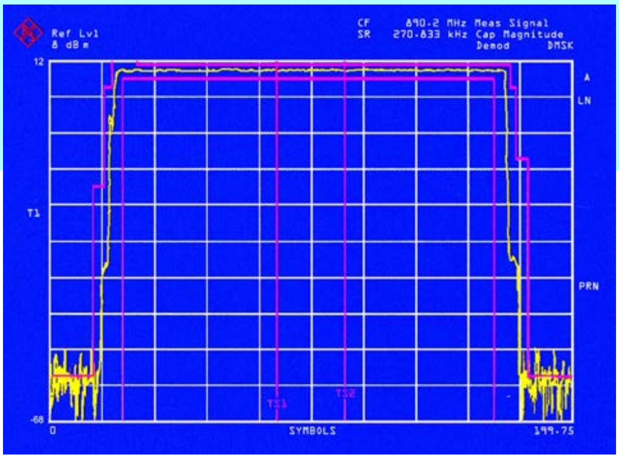

Ref Lvl
9 dBm
Marker 1 [T1/3]
Real
Imag
34.500 sym
-797.117 m
14.363 m
CF
SR
690.2 MHz
270.833 kHz
Meas Signal
Real/Imag
Demod DMSK
T1
T3
A
LN
C
0
SYMBOLS
49.875
Marker 1 [T2]
Phase
34.500 sym
4.36 deg
690.2 MHz
270.833 kHz
Error Signal
Phase
Demod DMSK
10
PHASE
T2
PRN
B
-10

1


Ref Lvl
9 dBm
CF
SR
824 MHz
24.3 kHz
Ref Signal
Vector
Demod π/4 DQPSK
1.5
IMAG
T1
-1.5
-1.875
REAL
1.875
A
LN
Symbol/Errors
PRN
B

```
Ref Lvl                       CF     824 MHz
 9 dBm                        SR    24.3 kHz  Symbol/Errors
                                              Demod π/4 DQPSK
                        Symbol Table
   0     01110010 00101000 01010110 10011111 10110010
  40     01001011 01111110 01001101 01001100 11000000
  80     01100011 00101000 11010010 11111110 10001011
                        Error Summary
 Error Vector Mag      1.52 % rms      3.25   % Pk at sym   10
 Magnitude Error       1.10 % rms     -2.48   % Pk at sym  115
 Phase Error           0.80 deg rms    1.71 deg Pk at sym   10
 Freq Error          -71.86  Hz
 Amplitude Droop       0.27 dB/sym
 IQ Offset             0.06 %         IQ Imbalance        0.05 %
```

3


Ref Lvl
8 dBm
CF
SR
690.2 MHz
270.833 kHz
Meas Signal
Cap Magnitude
Demod DMSK
12
T1
-68
A
LN
PRN
TS1
TS2
0
SYMBOLS
199.75

2

1 I/Q signal and phase error measurements over 50 symbols of a GSM mobile

2 Measurement of GSM power ramps to standards with high-precision time reference through synchronization to mid-amble

3 Measurement of modulation error of π/4-DQPSK signals (NADC)

Universal analysis of digital signals
Spectrum Analyzer FSE in conjunction with the optional Vector Signal Analyzer FSE-B7 is ideal for demodulating and measuring digitally modulated signals with frequencies up to 3.5 GHz, 7 GHz, 26.5 or 40 GHz. This universal tool offers a wide variety of settings:

- Demodulation of all common mobile-radio signals
- Freely selectable symbol rates
- Type of filter
- Roll-off factor or BT product of filter
- Synchronization bit sequences
- Predefined, application-specific settings for all common standards, eg GSM, PCS 1900, NADC, CDMA (IS95)

Versatile display of results

- In-phase and quadrature signals
- Magnitude and phase
- Vector and constellation diagrams
- Eye and trellis diagrams
- Sum fault: amplitude, frequency, phase, vector

Power ramp measurements
To perform power ramp measurements on TDMA systems such as GSM or DECT in line with standards, reference must be made to synchronization sequences (pre- or mid-amble) in order to establish a time reference. Making such measurements to standard is not possible using conventional analyzers – it is no problem with FSE!

Accurate AM, FM and φM measurements
Featuring high-accuracy measurement of the modulation depth and frequency deviation coupled with the display of demodulated signals in the time domain, FSE not only enables testing of analog and dual-mode radio equipment but also the determination of fast transient response in frequency and amplitude (see separate data sheet Vector Signal Analyzer FSE-B7, order number 757.2167).

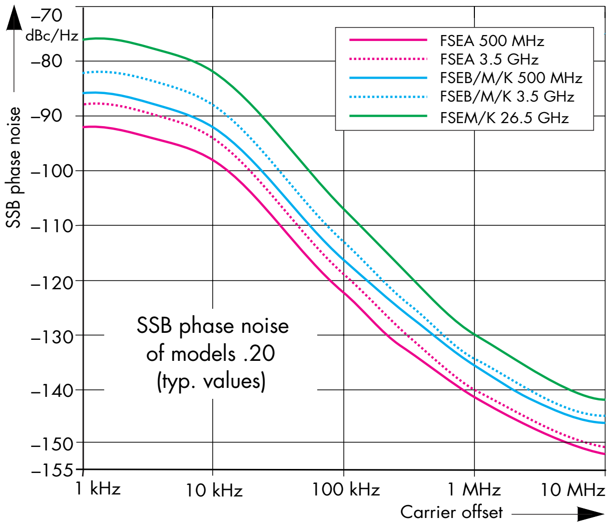
Spectrum Analyzer FSE and the optional vector signal analyzer provide universal test capabilities in one unit.

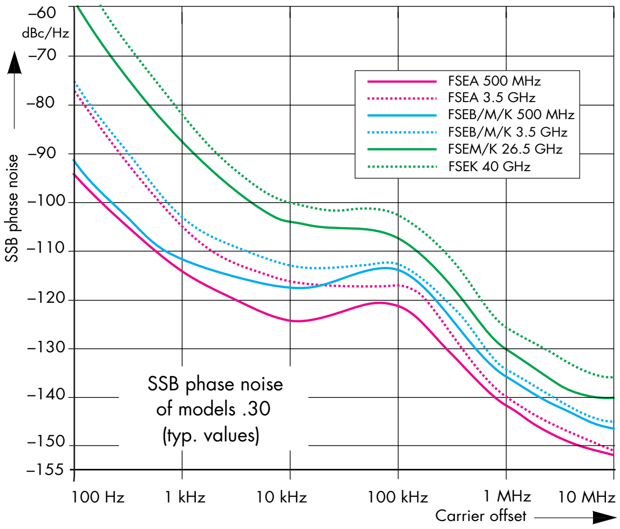
Specifications

	FSEA 20	FSEA 30	FSEB 20	FSEB 30	FSEM 20	FSEM 30	FSEK 20	FSEK 30
Specifications are guaranteed under the following conditions: 30 minutes warmup time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed. Data without tolerances: typical values only. Data designated "nominal" apply to design parameters and are not tested.								
Frequency								
Frequency range	9 kHz to 3.5 GHz	20 Hz to 3.5 GHz	9 kHz to 7 GHz	20 Hz to 7 GHz	9 kHz to 26.5 GHz	20 Hz to 26.5 GHz	9 kHz to 40 GHz	20 Hz to 40 GHz
Frequency resolution	0.01 Hz							
Reference frequency								
Internal, nominal								
Aging per day 1)	–	1×10^{-9}	–	1×10^{-9}	–	1×10^{-9}	–	1×10^{-9}
Aging per year 1)	1×10^{-6}	2×10^{-7}	1×10^{-6}	2×10^{-7}	1×10^{-6}	2×10^{-7}	1×10^{-6}	2×10^{-7}
Temperature drift (0 to 50 °C)	1×10^{-6}	5×10^{-8}	1×10^{-6}	5×10^{-8}	1×10^{-6}	5×10^{-8}	1×10^{-6}	5×10^{-8}
Total error (per year)	2.5×10^{-6}	2.5×10^{-7}	2.5×10^{-6}	2.5×10^{-7}	2.5×10^{-6}	2.5×10^{-7}	2.5×10^{-6}	2.5×10^{-7}
With option FSE-B4								
Aging per day 1)	1×10^{-9}	–	1×10^{-9}	–	1×10^{-9}	–	1×10^{-9}	–
Aging per year 1)	2×10^{-7}	–	2×10^{-7}	–	2×10^{-7}	–	2×10^{-7}	–
Temperature drift (0 to 50 °C)	5×10^{-8}	–	5×10^{-8}	–	5×10^{-8}	–	5×10^{-8}	–
Total error (per year)	2.5×10^{-7}	–	2.5×10^{-7}	–	2.5×10^{-7}	–	2.5×10^{-7}	–
External	10 MHz or n × 1 MHz, n=1 to 16							
Frequency display	with marker							
Resolution	0.1 Hz to 10 kHz (dependent on span)							
Error (sweep time >3× auto sweep time)	±(marker frequency × reference error + 0.5% × span + 10% × resolution bandwidth + 10 Hz + 1/2 (last digit))							
Frequency counter	measures the marker frequency							
Resolution	0.1 Hz to 10 kHz (selectable)							
Count accuracy (S/N >25 dB)	±(frequency × reference error + 10 Hz + 1/2 (last digit))							
Display range for frequency axis	0 Hz, 10 Hz to full span							
Resolution/error of display range	0.1 Hz/1%							
Spectral purity (dBc/Hz) SSB phase noise, f ≤500 MHz,	for f >500 MHz see diagrams below							
carrier offset 100 Hz	–	<–87	–	<–81	–	<–81	–	<–81
1 kHz	<–85	<–107	<–79	<–100	<–79	<–100	<–79	<–100
10 kHz	<–95	<–120	<–90	<–114	<–90	<–114	<–90	<–114
100 kHz 2)	<–119	<–117	<–113	<–111	<–113	<–111	<–113	<–111
1 MHz 2)	<–135	<–135	<–129	<–129	<–129	<–129	<–129	<–129
With option FSE-B4	for models .20 with option FSE-B4 values of models .30 apply							
Sweep time								
Span = 0 Hz	1 µs to 2500 s in 5% steps							
Span ≥10 Hz	5 ms to 16000 s in steps ≤10 %							
Error	1%							
Picture refresh rate (span ≤7 GHz)	>20 updates/s with 1 trace, >15 updates/s with 2 traces							
Sampling rate	50 ns (20-MHz A/D converter)							
Number of pixels	500							
Time measurement	with marker and cursor lines							
Resolution	50 ns							
Sweep trigger	free run, single, line, video, gated, delayed, external							
Zero span	additionally pretrigger, posttrigger, trigger delay							

1) After 30 days of operation.

2) Valid for span >100 kHz.





Specifications

	FSEA 20	FSEA 30	FSEB 20	FSEB 30	FSEM 20	FSEM 30	FSEK 20	FSEK 30
Resolution bandwidths								
3-dB bandwidths (in 1/2/3/5 steps)	10 Hz to 10 MHz	1 Hz to 10 MHz	10 Hz to 10 MHz	1 Hz to 10 MHz	10 Hz to 10 MHz	1 Hz to 10 MHz	10 Hz to 10 MHz	1 Hz to 10 MHz
FFT Filter (in 1/2/3/5 steps) (see also folding page)	–	1 Hz to 1 kHz	–	1 Hz to 1 kHz	–	1 Hz to 1 kHz	–	1 Hz to 1 kHz
Bandwidth error ≤3 MHz	<10%							
5 MHz	<15%							
10 MHz	+25%, –10%							
Shape factor 60:3 dB								
<1 kHz	<6							
1 kHz to 2 MHz	<15	<12	<15	<12	<15	<12	<15	<12
>2 MHz	<7							
Video bandwidths	1 Hz to 10 MHz in 1/2/3/5 steps							
Level								
Display range	noise floor displayed to 30 dBm							
Maximum input level								
RF attenuation 0 dB								
DC voltage	0 V							
CW RF power	20 dBm (=0.3 W)							
Pulse spectral density	97 dBµV/MHz							
RF attenuation ≥10 dB								
DC voltage	0 V							
CW RF power	30 dBm (=1 W)							
Max. pulse voltage	150 V				50 V			
Max. pulse energy (10 µs)	1 mWs				0.5 mWs			
1-dB compression of input mixer (0-dB RF attenuation)	+10 dBm nominal							
Displayed average noise floor (dBm) (0-dB RF attenuation, RBW 10 Hz, VBW 1 Hz, 20 averages, trace average, span 0 Hz, termination 50 Ω), frequency:								
20 Hz	–	<–80	–	<–74	–	<–74	–	<–74
1 kHz	–	<–110	–	<–104	–	<–104	–	<–104
10 kHz	<–90	<–125	<–84	<–119	<–84	<–119	<–84	<–119
100 kHz	<–110	<–135	<–104	<–129	<–104	<–129	<–104	<–129
1 MHz	<–130, typ. –135	<–145, typ. –150	<–125, typ. –130	<–142, typ. –145	<–124, typ. –129	<–142, typ. –145	<–124, typ. –129	<–142, typ. –145
10 MHz to 3.5/6 GHz	<–145, typ. –150		<–142, typ. <–147		<–138, typ. –140			
6 to 7 GHz	–	–	<–139	<–139	<–135, typ. –138			
7 to 18 GHz	–	–	–	–	<–138, typ. –140		<–134, typ. –139	
18 to 26.5 GHz	–	–	–	–	<–135, typ. –138		<–131, typ. –136	
26.5 to 30 GHz	–	–	–	–	–	–	<–120, typ. –125	
30 to 40 GHz	–	–	–	–	–	–	<–116, typ. –122	
Max. dynamic range	**10 Hz bandwidth**	**1 Hz bandwidth**	**10 Hz bandwidth**	**1 Hz bandwidth**	**10 Hz bandwidth**	**1 Hz bandwidth**	**10 Hz bandwidth**	**1 Hz bandwidth**
Displ. noise floor to 1-dB compression	155 dB	165 dB	152 dB	162 dB	150 dB	160 dB	150 dB	160 dB
Max. harmonics suppres., f >50 MHz	>90 dB							
Max. intermodulation-free range								
50 MHz to 3.5 GHz (nominal)	105 dB	115 dB	–	–	–	–	–	–
150 MHz to 7/26.5 GHz (nominal)	–	–	105 dB	115 dB	103 dB	112 dB	103 dB	112 dB
Intermodulation								
3rd-order intercept point (T.O.I.), Δf >5 × resolution BW or >10 kHz	≥12 dBm, typ. 15 dBm for f >50 MHz		≥12 dBm, typ. 15 dBm for f >150 MHz				≥12 dBm, typ. 15 dBm for f >150 MHz; ≥10 dBm for f >7 GHz	
Intermodulation-free range at –40 dBm mixer level	105 dB							
Intercept point k2 (dBm)	>25, typ. >40 for f <50 MHz, >45, typ. >50 for f >50 MHz		>25 for f <150 MHz, >35 typ. >40 for f >150 MHz, >45 typ.				>25 for f <150 MHz, >40 for f >150 MHz	
Immunity to interference								
Image frequency (dB)	>75	>80, typ.>90	>80, typ. >90				>80	
Intermediate frequency (dB)	>80	>100	>75				>80	
Spurious response (f >1 MHz, without input signal, 0-dB attenuation)								
Span <30 MHz	<–100 dBm	<–110 dBm	<–100 dBm	<–110 dBm	<–100 dBm	<–110 dBm	<–100 dBm	<–110 dBm
Span ≥30 MHz	<–100 dBm							
f_{in} = 25.175 MHz, 5.7172 GHz	<–100 dBm							
f_{in} = 60 MHz	<–100 dBm	<–110 dBm	<–100 dBm					
Other interfering signals (mixer level <–10 dBm)	<–80 dBm		<–75 dBm					

Specifications

	FSEA 20	FSEA 30	FSEB 20	FSEB 30	FSEM 20	FSEM 30	FSEK 20	FSEK 30
Level display								
Measurement display	500 × 400 pixels (with one diagram displayed); max. 2 diagrams with independent settings							
Log level range	10 to 200 dB, in steps of 10 dB							
Lin level range	10% of reference level per division (10 divisions) or logarithmic scaling							
Trace	max. 4 traces with 1 diagram, 2 traces per diagram with 2 diagrams, simultaneous measurement with all traces							
Trace detector	max peak, min peak, auto peak (normal), sample, rms, average							
Trace functions	clear/write, max hold, min hold, average							
Setting range of reference level								
Log level display	–130 to 30 dBm, in steps of 0.1 dB							
Linear level display	7.0 nV to 7.07 V in steps of 1%							
Units of level axis	dBm, dBµV, dBmV, dBµA, dBpW (log and lin level display) mV, µV, mA, µA, pW, nW (linear level display)							
Level measurement error –40 dBm, RF attenuation 20 dB, ref. level –15 dB, RBW 5 kHz	**The values are guaranteed for bandwidths from 10 Hz to 30 kHz and 100 kHz to 10 MHz**							
Absolute error at 120 MHz	<0.3 dB							
Freq. response (10 dB RF atten.)								
<1 GHz	<0.5 dB							
1 to 3.5/7 GHz	<1 dB							
7 to 18 GHz	–	–	–	–	<2 dB[1]			
18 to 26.5 GHz	–	–	–	–	<2.5 dB[1]			
26.5 to 40 GHz	–	–	–	–	–	–	<3 dB[1]	
Attenuator error	<0.3 dB							
IF gain error	<0.2 dB (typ. 0.1 dB)							
Linearity error								
Log level display								
(RBW ≥1 kHz, analog, S/N >15 dB)								
0 to –50 dB	<0.3 dB							
–50 to –70 dB	<0.5 dB							
–70 to –80 dB	<1 dB	–	<1 dB	–	<1dB	–	<1dB	–
–70 to –95 dB	–	<1 dB	–	<1 dB	–	<1 dB	–	<1 dB
Linear level display	5% of ref. level							
Bandwidth switching error								
1 Hz to 30 kHz/100 to 300 kHz	<0.2 dB/<0.2 dB							
1 to 10 MHz	<0.3 dB							
Total measurement error (0 to –50 dB, S/N >15 dB, span/RBW <100)								
<1 GHz	<1 dB							
1 to 3.5/7 GHz	<1.5 dB							
7 to 18 GHz	–	–	–	–	<2.5 dB[1]			
18 to 26.5 GHz	–	–	–	–	<3 dB[1]			
26.5 to 40 GHz	–	–	–	–	–	–	<3.5 dB[1]	
Pulse amplitude error (single pulses)								
Bandwidth <1 MHz/≥1 MHz	<0.5 dB, nominal/<2 dB, nominal							
Trigger functions								
Trigger	free run, line, video, RF, external							
Delayed sweep								
Trigger source	free run, line, video, RF, external							
Delay time	100 ns to 10 s, resolution 1 µs min. (or 1% of delay time)							
Error of delay time	±(1 µs + (0.1% × delay time))							
Delayed sweep time	2 µs to 1000 s							
Gated sweep								
Trigger source	external, RF							
Gate delay	1 µs to 100 s							
Gate length	1 µs to 100 s, resolution min. 1 µs or 1%							
Error of gate length	±(1 µs + (0.05% × gate length))							
Gap sweep (span = 0 Hz)								
Trigger source	free run, line, video, RF, external							
Pretrigger	1 µs to 100 s, 50 resolution, dependent on sweep time							
Trigger to gap time	1 µs to 100 s, 50 ns resolution, dependent on sweep time							
Gap length	1 µs to 100 s, 50 ns resolution							
Audio demodulation								
AF demodulation types	AM and FM							
Audio output	speaker and phone jack							
Marker stop time	100 ms to 60 s							
Squelch	adjustable by means of level line							

[1] For RF frequencies >7 GHz: error after calling peaking function. For sweep times <10 ms/GHz: additional error 1.5 dB.

Specifications

	FSEA 20	FSEA 30	FSEB 20	FSEB 30	FSEM 20	FSEM 30	FSEK 20	FSEK 30
Inputs & outputs (front panel)								
RF input	N female, 50 Ω				adapter system, 50 Ω, N male and female, 3.5 mm male and female		adapter system, 50 Ω, N male and female, K male and female	
VSWR (RF attenuation >0 dB)								
f <3.5 GHz	<1.5							
f <7 GHz	–		<2.0					
f <26.5 GHz	–	–	–	–	<3		<2.5	
f <40 GHz	–	–	–	–	–	–	<2.5	
Attenuator	0 to 70 dB, selectable in 10-dB steps							
Probe power supply	+15 V DC, –12.6 V DC and ground, max. 150 mA							
Power supply and coding connector for antennas etc (antenna code)	12-contact Tuchel							
Supply voltages	±10 V, max. 100 mA, ground							
AF output	Z_{out} = 10 Ω, jack plug							
Open-circuit voltage	adjustable up to 1.5 V							
Inputs & outputs (rear panel)								
IF 21.4 MHz	Z_{out} = 50 Ω, BNC female, bandwidth >1 kHz or resolution bandwidth							
Level	0 dBm at reference level, mixer level >–60 dBm							
Video output	Z_{out} = 50 Ω, BNC female							
Voltage (bandwidth ≥1 kHz)	0 to 1 V, full scale (open-circuit voltage); log scaling							
Reference frequency								
Output, usable as input	BNC female							
Output frequency	10 MHz							
Level	10 dBm nominal							
Input	1 to 16 MHz, integer MHz							
Required level	>0 dBm from 50 Ω							
Sweep output	BNC female, 0 to 10 V, proportional to displayed frequency							
Power supply connect. f. noise source	BNC female, 0 and 28 V, switch-selected							
External trigger/gate input	BNC female, >10 kΩ							
Voltage	–5 to +5 V, adjustable							
IEC/IEEE-bus control	interface to IEC-625-2 (IEEE 488.2)							
Instruction set	SCPI 1994.0							
Connector	24-contact Amphenol female							
Interface functions	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C11							
Serial interface	RS-232-C (COM 1 and COM 2), 9-contact female connectors							
Mouse interface	PS/2 compatible							
Plotter	via IEC/IEEE bus or RS-232-C							
Plotter language	HP-GL							
Printer interface	parallel (Centronics compatible) or serial (RS-232-C)							
Keyboard connector	5-contact DIN female for MF-2 keyboard							
User interface	25-contact Cannon female							
Connector f. external monitor (VGA)	15-contact female							
General data								
Display	24-cm LC TFT color display (9.5")							
Resolution	640 × 480 pixels (VGA resolution)							
Pixel failure rate	<2 x 10^{-5}							
Mass memory	1.44-Mbyte 3 1/2" diskette (built-in disk drive), harddisk							
Operating temperature range								
Nominal temperature range	+5 to +40°C							
Limit temperature range	+0 to +50°C							
Storage temperature range	–40 to +70°C							
Climatic loading	+40°C at 95% relative humidity (IEC 68–2–3)							
Mechanical stress								
Sinusoidal vibration	5 to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 to 150 Hz; to IEC 68-2-6, IEC 68-2-3, IEC 1010-1, MIL-T-28800D, class 5							
Random vibration	10 to 300 Hz, acceleration 1.2 g_{rms}							
Shock	40 g shock spectrum, to MIL-STD-810C and MIL-T-28800D, classes 3 and 5							
Recommended calibration interval	1 year (2 years for operation with external reference)							
RFI suppression	to EMC directive of EU (89/336/EEC) and German EMC legislation							
Power supply								
AC supply	200 to 240 V: 50 to 60 Hz, 100 to 120 V: 50 to 400 Hz, class of protection I to VDE 411							
Power consumption	170 VA	180 VA	185 VA	195 VA	220 VA	230 VA	220 VA	230 VA
Safety	to EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, IEC 1010-1							
Test mark	VDE, GS, UL, cUL							
Dimensions in mm (W x H x D)	435 × 236 × 460 (5 units of height)					435 × 236 × 570	435 x 236 x 460	435 x 236 x 570
Weight	21.5 kg	22.7 kg	21.8 kg	23.2 kg	23.8 kg	25.2 kg	24.4 kg	25.8 kg

Fax Reply Spectrum Analyzers FSE

☐ **Please send me an offer**

☐ **I would like a demonstration**

☐ **Please call me**

☐ **I would like to receive your free-of-charge CD-ROM catalog**
(including Test&Measurement Products +
Sound and TV Broadcasting)

Others: ______________________________
____
____

Name: ______________________________
Company/Department: ______________________________
Position: ______________________________
Address: ______________________________
____
____
Country: ______________________________
Telephone: ______________________________
Fax: ______________________________
E-mail: ______________________________

ROHDE & SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Mühldorfstraße 15 · D-81671 München
P.O.B. 801469 · D-81614 München · Telephone +4989 4129-0 · Fax +4989 4129-3777 · Internet: http://www.rsd.de

Printed in Germany 298 (Bi dr)

PD 757.1519.25 · Printed on chlorine-free paper · Subject to change

Specifications

Increased Level Accuracy FSE-B22

Total level error	≤0.5 dB with 10 dB RF attenuation ≤0,6 dB with 20/30/40 dB RF attenuation
Specifications are valid for:	
Temperature range	20 to 30 °C
Frequency range	10 MHz to 2 GHz
Resolution bandwidths	5 to 30 kHz/300 kHz/1 MHz
Signal level	–10 to –50 dB below reference level
Stop frequency	≤2 GHz
Sweep time	≥3 x auto sweep time

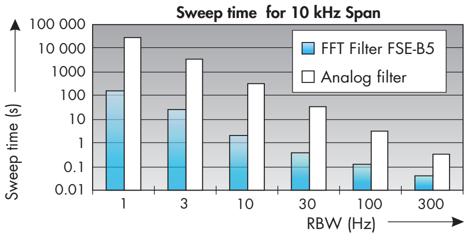
TV Demodulator FSE-B3

(All specifications apply to design parameters and are not tested)

Video output	
Output voltage into 75 Ω	$1\ V_{pp}$
Video polarity	positive/negative (switchable, eg standard B/G, L)
Frequency response 0 to 4.43 MHz	–2 dB
Video S/N ratio (rms, to CCIR, level >3 mV)	55 dB
Nonlinearity in case of 10 to 75% modulation	
Differential gain	10%
Differential phase	10 °
2-T-k factor	3%
Triggering	
TV trigger	vertical and horizontal TV sync signals, any line within a 625- or 525-line system
Standards	B/G, D/K, I, L, M

FFT Filter FSE-B5 (standard in models .30)

Resolution bandwidths (RBW)	
3 dB bandwidths, in 1/2/3/5 steps	1 Hz to 1 kHz
Bandwidth error, nom.	2%
Shape factor 60:3 dB, nom.	2.5
Display range for frequency axis	
Min. span	25 x RBW
Max. span	100 000 x RBW, max. 2 MHz
Level measurement error	
Additional total level error referred to RBW 5 kHz	<1 dB
Max. display range	100 dB
Immunity to interference	
Spurious response	≤100 dBm



FFT Filter FSE-B5

- High frequency resolution due to very small shape factor of 2.5
- Extremely short measurement time, up to 150 times faster than with conventional filters

Ordering information

Order designation	Type	Order No.
Spectrum Analyzer 9 kHz to 3.5 GHz	FSEA20	1065.6000.20
Spectrum Analyzer 20 Hz to 3.5 GHz	FSEA30	1065.6000.30
Spectrum Analyzer 9 kHz to 7 GHz	FSEB20	1066.3010.20
Spectrum Analyzer 20 Hz to 7 GHz	FSEB30	1066.3010.30
Spectrum Analyzer 9 kHz to 26.5 GHz	FSEM20	1080.1505.20
Spectrum Analyzer 20 Hz to 26.5 GHz	FSEM30	1079.8500.30
Spectrum Analyzer 9 kHz to 40 GHz	FSEK20	1088.1491.20
Spectrum Analyzer 20 Hz to 40 GHz	FSEK30	1088.3494.30

Accessories supplied
Power cable, operating manual, spare fuses;
FSEM: test-port adapter 3.5 mm female (1021.0512.00) and N female (1021.0535.00)
FSEK: test-port adapter K female, N female

Ordering information continued overleaf

Recommended extras

(continued)

Order designation	Type	Order No.
Options (also see tables on folding page)		
7-GHz Frequency Extension for FSEA	FSE-B2	1073.5044.02
TV Demodulator	FSE-B3	1073.5244.02
Low Phase Noise and OCXO (for models .20)	FSE-B4	1073.5396.02
FFT Filter 1 Hz to 1 kHz (for models .20)	FSE-B5	1073.5544.02
Vector Signal Analyzer	FSE-B7	1066.4317.02
Tracking Generator 3.5 GHz	FSE-B8	1066.4469.02
Tracking Generator 3.5 GHz with I/Q Modulator	FSE-B9	1066.4617.02
Tracking Generator 7 GHz	FSE-B10	1066.4769.02
Tracking Generator 7 GHz with I/Q Modulator	FSE-B11	1066.4917.02
Switchable Attenuator for Tracking Generator	FSE-B12	1066.5065.02
Controller for FSE, German (mouse and keyboard included)	FSE-B15	1073.5696.02
Controller for FSE, English (mouse and keyboard included)	FSE-B15	1073.5696.03
Ethernet Interface 15-contact AUI connector	FSE-B16 1)	1073.5973.02
Thin-wire BNC connector	FSE-B16 1)	1073.5973.03
2nd IEC/IEEE-Bus Interface for FSE	FSE-B17 1)	1066.4017.02
Removable Harddisk	FSE-B18 2)	1088.6993.02
Second Harddisk for FSE-B18 (firmware included)	FSE-B19	1088.7248.02
Increased Level Accuracy up to 2 GHz	FSE-B22 2)	1106.3480.02
Broadband Output 741.4 MHz	FSE-B23 2)	1088.7348.02
Software		
Noise Measurement Software, Windows	FSE-K3	1057.2996.02
GSM Application Firmeware, Mobile	FSE-K10	1057.3092.02
GSM Application Firmware, BTS	FSE-K11	1057.3392.02
Recommended extras		
Service Kit	FSE-Z1	1066.3862.02
DC Block, 5 to 7000 MHz (Type N)	FSE-Z3	4010.3895.00
DC Block, 10 kHz to 18 GHz, Type N	FSE-Z4	1084.7443.02
Microwave Measurement Cable and Adapter Set for FSEM	FS-Z15	1046.2002.02
Service Manual	–	1065.6016.24
Headphones	–	0708.9010.00
German Keyboard	PSA-Z2	1007.3001.31
American Keyboard	PSA-Z2	1007.3001.02
PS/2 Mouse	FSE-Z2	1084.7043.02
Color Monitor, 15", 230 V	PMC3	1082.6004.02
Printer, 24-pin printer head	PDN	0351.4512.04
IEC/IEEE-Bus Cable, 1 m	PCK	0292.2013.10
IEC/IEEE-Bus Cable, 2 m	PCK	0292.2013.20
19" Rack Adapter		
with front handles	ZZA-95	0396.4911.00
without front handles	ZZA-951	0396.9488.00
Set of Front Handles	ZZG-95	0396.5176.00
Transit Case	ZZK-954	1013.9395.00
Transit Case (FSEM 30 and FSEK 30 only)	ZZK-955	1013.9408.00
Trolley	ZZK-1	1014.0510.00
Matching Pads, 75 Ω		
L section	RAM	0358.5414.02
Series resistor, 25 Ω	RAZ	0358.5714.02
Accessories for current, voltage and field-strength measurement	see accessories for Test Receiver ESS, data sheet PD 756.9768	
SWR Bridge, 5 to 3000 MHz	ZRB2	0373.9017.52
SWR Bridge, 40 kHz to 4 GHz	ZRC	1039.9492.52
High-Power Attenuators, 100 W, 3/6/10/20/30 dB	RBU 100	1073.8820.XX (XX=03/06/10/20/30)
High-Power Attenuators, 50 W 3/6/10/20/30 dB	RBU 50	1073.8895.XX (XX=03/06/10/20/30)
Preamplifier, 9 kHz to 30 MHz	ESH3-Z3	0827.8016.52
Preamplifier, 20 to 1000 MHz	ESV-Z3	0397.7014.52
For FSEM/K only: Test-Port Adapter, N (male)	–	1021.0541.00
Test-Port Adapter, 3.5 mm (male)	–	1021.0529.00
For FSEK only: Test-Port Adapter, N (male)	–	1036.4783.00
K (male)	–	1036.4802.00

---

1) Options FSE-B16 and FSE-B17 require option FSE-B15.

2) Cannot be retrofitted, factory-fitted only.

Important Hints before Operation:

For instruments without the computer function FSE-B15:

- The disks used must have been formatted by the FSE itself or by MS-DOS. Pre-formatted disks can cause errors.

For instruments with the computer function FSE-B15:

- The drives D: and Q: are reserved for system software and must not be altered. Any changes in the drives D: and Q: can cause function errors.
- When operating a PS/2 mouse, a mouse driver has to be loaded via the designated entry in the autoexec.bat file.
- The files AUTOEXEC.BAT and CONFIG.SYS are write protected. User-specific programs which are to be executed automatically during the system startup must be entered in the file C:\AUTOUSER.BAT. Network drivers for option FSE-B16 must be entered in the file C:\NETWORK.BAT.
- After switching on the instrument, the startup process can be interrupted if required. This is achieved by pressing any key on the external keyboard repeatedly until "ABORT SYSTEM BOOT [Y/N?]" is queried on the display. The instrument works then in the DOS mode.

For all instruments:

- Aborting a hardcopy is not possible when printout is in progress. Print jobs in the queue can be deleted before printout has been started by pressing the HARDCOPY START key until the message "Hardcopy in progress. Abort?" is displayed. The length of the queue is two jobs.

Safety Instructions

This unit has been designed and tested according to the standards outlined overleaf and has left the manufacturer's premises in a state fully complying with the safety standards.
In order to maintain this state and to ensure safe operation, observe the following instructions, symbols and precautions.

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   Pollution severity 2, overvoltage category 2, IP degree of protection 2X, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.
2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).
3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made (installation and cabling of the unit to be performed only by qualified technical personnel).
4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.
5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.
6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.
7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.

   If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

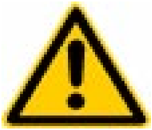
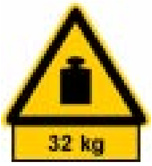
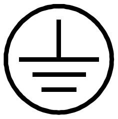
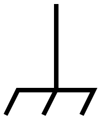
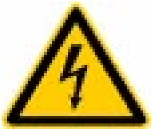
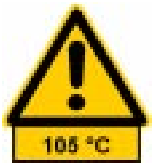
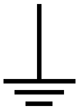
   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.,

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

10. Any additional safety instructions given in this manual are also to be observed.

Safety-related symbols used on equipment and documentation from R&S:

						
Observe operating instructions	Weight indication for units >18 kg	PE terminal	Ground terminal	Danger! Shock hazard	Warning! High temperatures Warning! Hot surfaces	Ground

Patent Information

This product contains technology licensed by Marconi Instruments LTD. under US patent 4609881 and under the corresponding patent in Germany and elsewhere.

ROHDE&SCHWARZ
EC Certificate of Conformity

CE

Certificate No.: 9502052

This is to certify that:

Equipment type	Order No.	Designation
FSE-B1	1073.4990.02	Color Display
FSE-B10	1066.4769.02	Tracking Generator
FSE-B11	1066.4917.02	Tracking Generator
FSE-B12	1066.5065.02	Output Attenuator
FSE-B15	1073.5696.02/.03	Computer Function
FSE-B16	1073.5973.02/.03	Ethernet Interface
FSE-B17	1066.4017.02	2nd IEC BUS Interface
FSE-B2	1073.5044.02	7 GHz Frequency Extension
FSE-B21	1084.7243.02	External Mixer Output
FSE-B3	1073.5244.02	TV Demodulator
FSE-B4	1073.5396.02	OCXO 10 MHz and Low Phase Noise
FSE-B7	1066.4317.02	Signal Vectoranalysis
FSE-B77	1102.8493.02	Signal-Vectoranalysis
FSE-B8	1066.4469.02	Tracking Generator
FSE-B9	1066.4617.02	Tracking Generator
FSE-Z2	1084.7043.02	PS/2 Mouse

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electromagnetic compatibility
  (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN50081-1 : 1992
EN50082-1 : 1992

Affixing the EC conformity mark as from 1995

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich, 1998-04-06

Central Quality Management FS-QZ / Becker

ROHDE&SCHWARZ

EC Certificate of Conformity

CE

Certificate No.: 9502052

This is to certify that:

Equipment type	Order No.	Designation
FSE-B1	1073.4990.02	Color Display
FSE-B10	1066.4769.02	Tracking Generator
FSE-B11	1066.4917.02	Tracking Generator
FSE-B12	1066.5065.02	Output Attenuator
FSE-B15	1073.5696.02/.03	Computer Function
FSE-B16	1073.5973.02/.03	Ethernet Interface
FSE-B17	1066.4017.02	2nd IEC BUS Interface
FSE-B2	1073.5044.02	7 GHz Frequency Extension
FSE-B3	1073.5244.02	TV Demodulator
FSE-B4	1073.5396.02	OCXO 10 MHz and Low Phase Noise
FSE-B7	1066.4317.02	Signal Vectoranalysis
FSE-B77	1102.8493.02	Signal-Vectoranalysis
FSE-B8	1066.4469.02	Tracking Generator
FSE-B9	1066.4617.02	Tracking Generator
FSE-Z2	1084.7043.02	PS/2 Mouse

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electromagnetic compatibility (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN50081-1 : 1992
EN50082-1 : 1992

Affixing the EC conformity mark as from 1995

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich, 1997-07-15

Central Quality Management FS-QZ / Becker