

Products: R&S® SFU Broadcast Test System, R&S® SFE Broadcast Tester, R&S® SFE100 Test Transmitter

Converting MediaFLO™ Waveform Files to R&S® SFU / SFE / SFE100 ARB Format Using IQWIZARD/WinIQSIM™ for R&S® SFx-K35 ARB

Application Note

This application note introduces the methods to convert MediaFLO™ waveform files to ARB format to be used with R&S® Broadcast Signal Generators SFx-K35 ARB Generator. R&S® IQWIZARD and WinIQSIM™ software are used, providing a quick and simple file conversion method.



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1 Overview

With the recent exponential growth in wireless device capabilities, mobile TV is now getting a lot of attention in the industry. MediaFLO™ developed and standardized by QUALCOMM promises an efficient way to broadcast video and multimedia contents to vast numbers of wireless devices.

MediaFLO™ waveform files are available from the FloForum or directly from QUALCOMM (<http://www.floforum.org> / <http://www.qualcomm.com>). This application note introduces the methods to convert that kind of waveform files to ARB format to be used with R&S® Broadcast Signal Generators SFx-K35 ARB Generator. R&S® IQWIZARD and WinIQSIM™ software are used, providing a quick and simple file conversion method.

Trademarks: MediaFLO™ is trademark of QUALCOMM, Inc.

2 Hardware and Software Requirements

Hardware Requirements

Test Instrument

Main Unit	R&S® SFU / SFE / SFE100	Broadcast Signal Generator
Software Options	R&S® SFx-K35 ¹	ARB Generator

The Software runs on a PC with

	Minimum	Recommended
CPU	CPU 1 GHz	CPU 2 GHz or higher
RAM	128 Mbyte	1 Gbyte or higher
Hardisk	50 Mbyte free space	1 Gbyte free space

Software Requirements

Windows 2000/XP	Microsoft Operating System	
R&S® IQWizard	Application Software	Version 4.5.8 or higher
R&S® WinIQSIM™	Software Tool	Version 4.40 or higher

¹ For R&S® SFE / SFE100, option R&S® SFE-K350 / SFE100-K350 is also required.

3 Hardware Set-up

Connecting the instruments

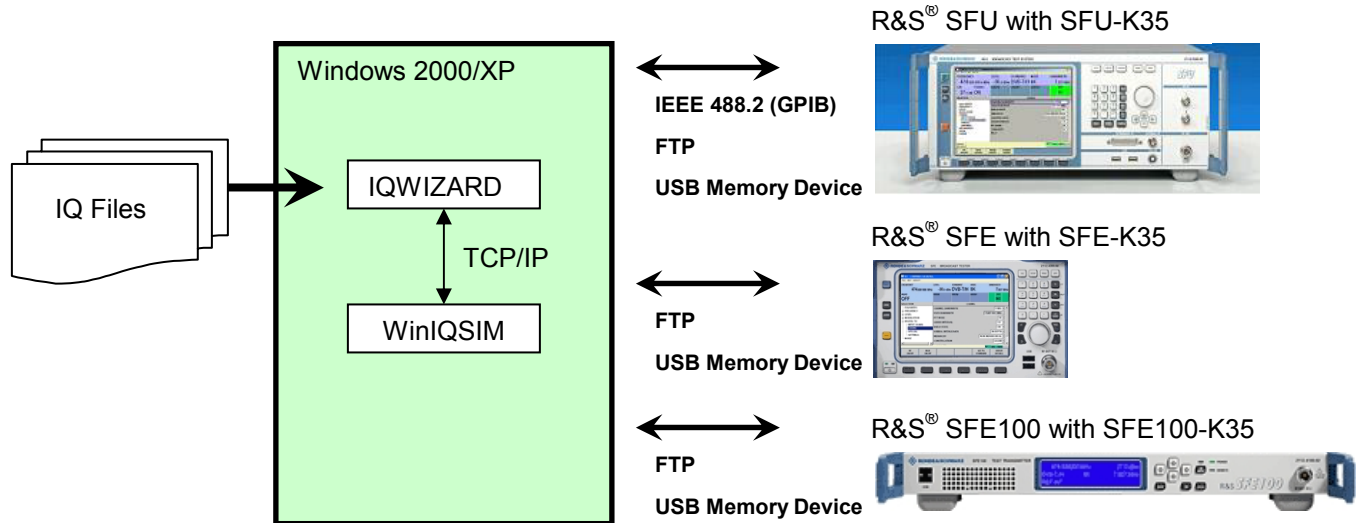


Figure 1, Setup and connections

Converted files can be transferred into R&S® SFU directly within WinIQSIM™ via IEEE 488.2 (GPIB) interface. It is also possible to transfer the files via FTP or an USB memory device. The IEEE 488.2 (GPIB) interface is not available for R&S® SFE / SFE100.

4 Software Installation

R&S® IQWIZARD

R&S® IQWizard [1] is a tool for loading IQ signal files in various formats and downloading IQ data from a R&S® FSx Spectrum Analyzer or R&S® ESx Receiver. The obtained IQ data in memory can be stored in various formats or be transmitted to an R&S® SFU / AMIQ / SMIQ / SMU with WinIQSIM™.

The installation file IQWIZARD_X.X.X.exe can be downloaded from <http://www.rohde-schwarz.com/appnote/1MA28.html>, whereas X.X.X stand for the latest version available. 4.5.8 or higher is recommended.

WinIQSIM™

WinIQSIM™ is a software tool capable of receiving IQ data via TCP/IP software interface and calculating and transferring it to an R&S® SFU / AMIQ IQ Modulation Generator. R&S® IQWizard and WinIQSim must run simultaneously to enable data transfer.

WinIQSIM™ installation file can be downloaded from the following links:

<http://www2.rohde-schwarz.com/product/winiqsim.html>

WinIQSIM™ version 4.40 or higher is recommended.

Install both softwares as guided by the installation wizard.

5 Converting MediaFLO™ Waveform Files to R&S® SFX ARB Format

IQ data in various formats, including MediaFLO™, can be loaded and converted to be used with R&S® SFX-K35 ARB Generator.

MediaFLO™ waveform file conversion can be accomplished with R&S® IQWIZARD and WinIQSIM™ software.

R&S® IQWIZARD allows IQ data from various formats to be loaded. It is also possible to capture IQ data directly from a R&S spectrum analyzer. WinIQSIM™ is then used to generate IQ data according to the respective standards to be used in R&S® SFU / SFE / SFE100.

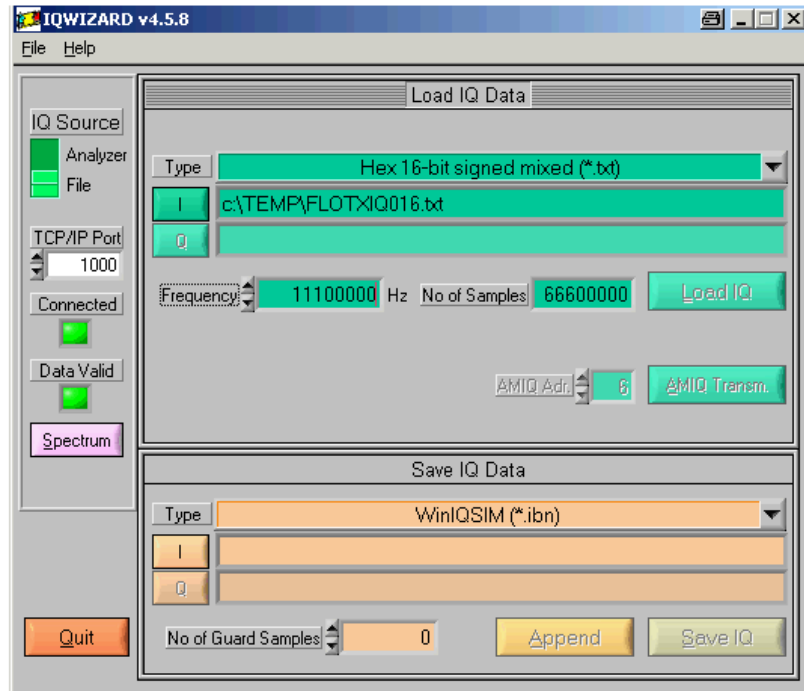


Figure 2, R&S® IQWIZARD Main Menu

1. To start converting waveform files, run R&S® IQWIZARD software. Beginning from **Load IQ Data** frame as shown in *Figure 2*, follow the steps below to load the IQ waveform file to be converted :
 - a. Click "**Type**" within the **Load IQ Data** frame and select "Hex 16-bit Signed Mixed (*.txt)"
 - b. Click "I" and select the desired file.
 - c. Set frequency according to the bandwidth:

Bandwidth [MHz]	5	6	7	8
Frequency [MHz]	9.25	11.1	12.95	14.8
 - d. Click "Load IQ" to begin the file loading process. It will take a couple of minutes depending on the file size.
2. Next, run WinIQSIM™ software to continue with the conversion process. From "**System!**" Menu, select "**Import**" and the following screen is displayed:

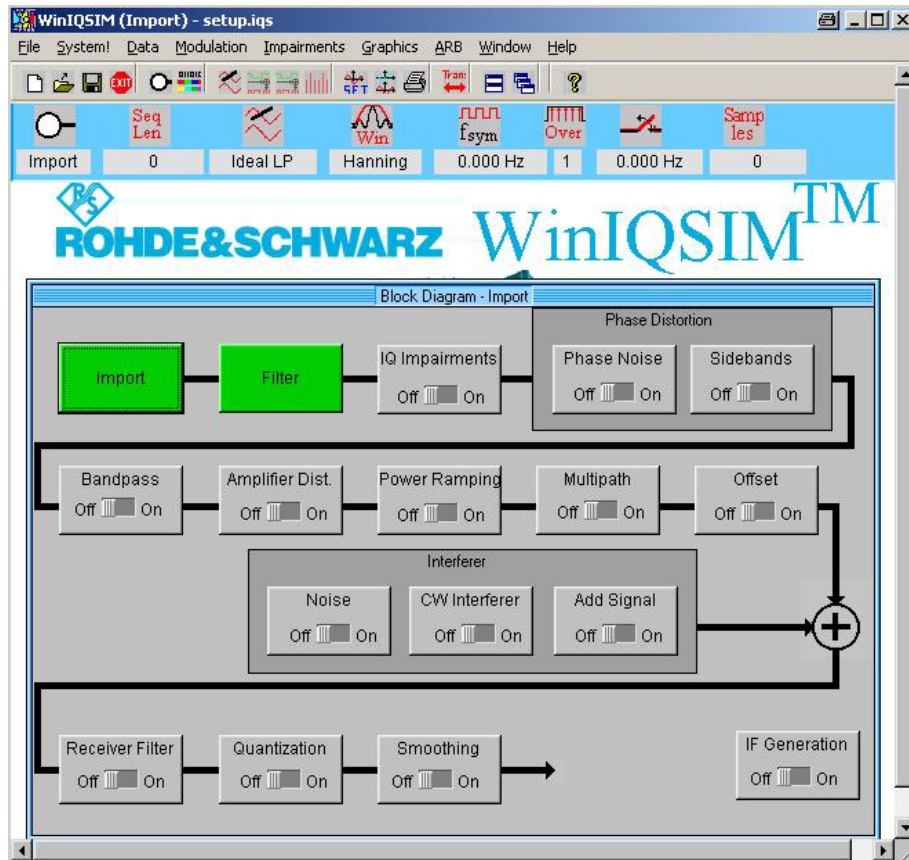


Figure 3, WinIQSIM™ with Import Block Diagram

- To begin importing IQ data from R&S® IQWIZARD, click the green “Import” button in WinIQSIM™ Block Diagram. This will bring up the **Import Info** dialog box as shown in Figure 4. Configure the parameters accordingly and click “Update Settings”.

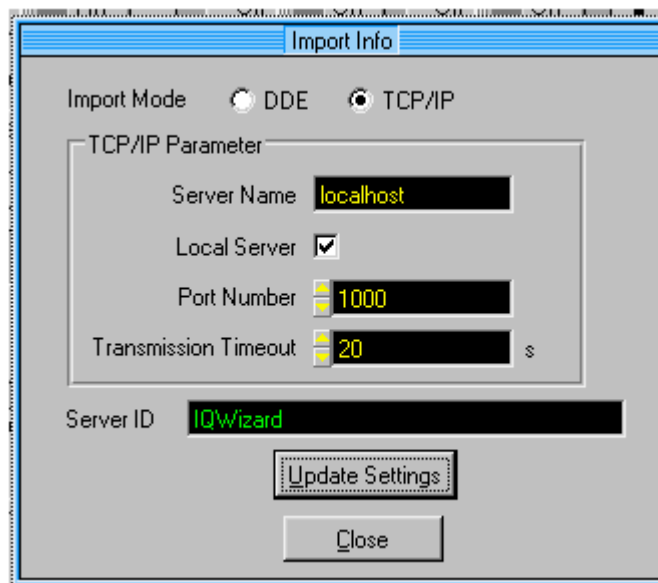
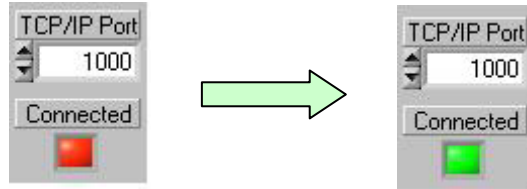


Figure 4, R&S® IQWIZARD Import Info Dialog Box

- In R&S® IQWIZARD software set TCP/IP port number to that configured in WinIQSIM™. A green LED indicates that the link is setup successfully.



- For this conversion process, no filtering is required. It can be turned Off from WinIQSIM™ green “Filter” button in the Block Diagram.
- In WINIQSIM™ “ARB” menu, select “Target ARB” to be SFU-K35.
- SFU Waveform Transmission** dialog box can now be selected with the following:

ARB --- > SFU(ARB)--- > Transmission

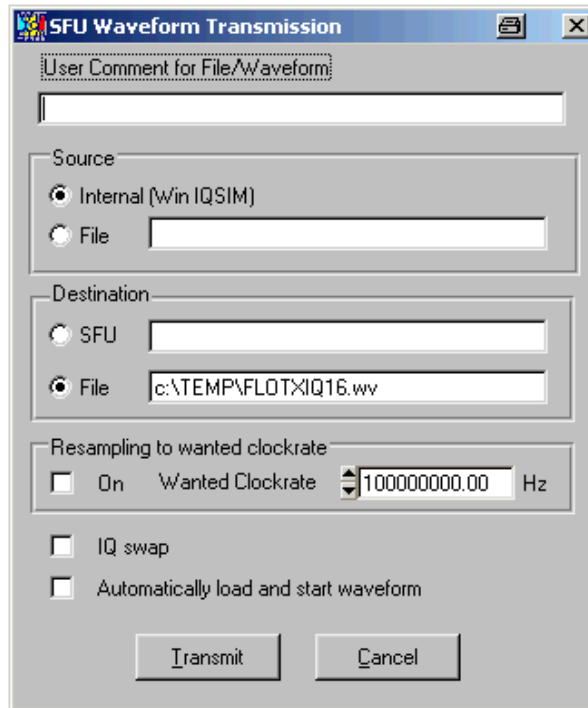
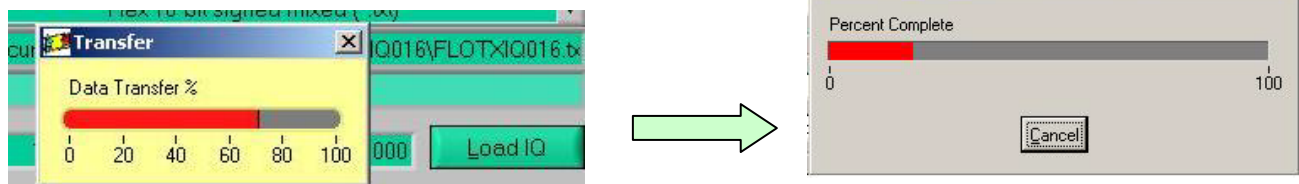


Figure 5, SFU Waveform Transmission dialog box.

- Select Source to “**Internal (WinIQSIM)**”. Specify a **Destination File** where the converted file will be saved. Once this is done, click “**Transmit**” to begin the file generation process. Typical time taken to convert a file of 1 Gbyte in size takes approximately 50 minutes on a PC with 3 GHz CPU and 2 Gbyte of RAM. A file with .wv extension will be created once the conversion is completed.



9. Transfer the converted .wv file into R&S® SFU via IEEE 488.2 (GPIB), FTP or USB memory device. Refer to page 34 of Application Note 7BM57 [2] for further details. In case of R&S® SFE / SFE100 you have to use FTP or an USB memory device for the .wv file transfer.
10. A sample of the MediaFLO™ signal generated with R&S® SFU is shown as below.

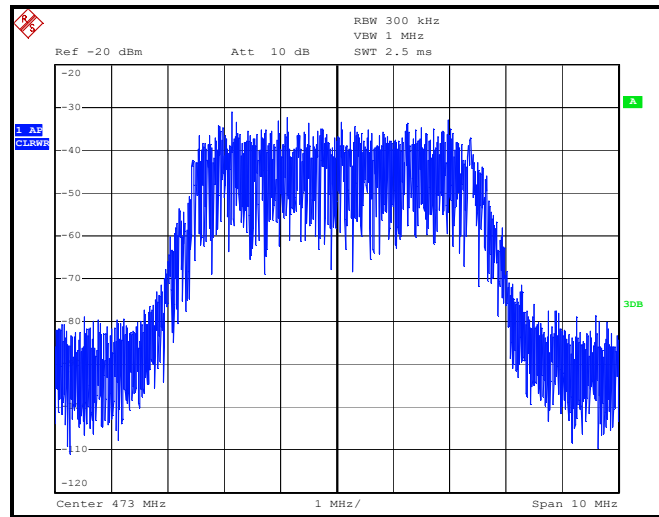


Figure 6, MediaFLO™ signal generated by R&S® SFU

6 Summary

With R&S® IQWIZARD and WinIQSIM™, MediaFLO™ waveform files can be converted to R&S® SFx ARB format allowing a wide range of signal simulation possibilities. Additional options allow comprehensive simulations of reproducible environment in laboratories. Interference and noise, including AWGN, phase noise and impulsive noise, could be easily added in this highly flexible platform. Refer to R&S® SFU / SFE / SFE100 product brochures for a complete range of functions possible.

7 Literature & References

1. 1MA28, R&S® IQWizard IQ Signal Measurement and Conversion
2. 7BM57, R&S® SFU & WinIQSIM™ Functions and uses of the Arbitrary Function Generator (ARB)
3. FLO Technology Overview, QUALCOMM, Inc.
4. R&S® SFU Broadcast Test System Product Brochures, SFU-bro_en.pdf

8 Additional Information

Our Application Notes are regularly revised and updated.
Check for any changes at <http://www.rohde-schwarz.com>.

Please send any comments or suggestions about this Application Note to
Broadcasting-TM-Applications@rohde-schwarz.com.

9 Ordering Information

R&S® SFU

Designation	Type	Order No.
Broadcast Test System including power cable, hardcopy of quick start guide, CD-ROM (includes operating manuals and quick start guide)	R&S®SFU	2110.2500.02
Options		
Basic configuration		
Realtime Disabled (option available only at initial delivery)	R&S®SFU-K81	2110.7960.02
Realtime Enabled (only if R&S®SFU-K81 is installed)	R&S®SFU-K82	2110.7976.02
RF path		
High Power	R&S®SFU-B90	2110.8008.03
Digital modulation systems		
DVB-T/H Coder	R&S®SFU-K1	2110.7301.02
DVB-C/ISDB-C Coder	R&S®SFU-K2	2110.7324.02
DVB-S/DVB-DSNG Coder	R&S®SFU-K3	2110.7330.02
DVB-S2 Coder (requires an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K8	2110.7399.02
ATSC/ 8VSB Coder	R&S®SFU-K4	2110.7353.02
ATSC/ A-VSB Coder	R&S®SFU-K14	only on request
ATSC M/H ² Coder	R&S®SFU-K18	only on request
J.83/B Coder	R&S®SFU-K5	2110.7360.02
ISDB-T/ISDB-T _B /ISDB-T _{SB} Coder	R&S®SFU-K6	2110.7376.02
MediaFLO™ Coder (requires an installed R&S®SFU-B10)	R&S®SFU-K10	2110.7524.02
T-DMB/DAB Coder	R&S®SFU-K11	2110.7518.02
DMB-T (TDS-OFDM) Coder (requires an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K7	only on request
DTMB/DMB-TH (TDS-OFDM) Coder (requires an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K12	2110.7760.02
Coder CMMB ²³ (requires an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K15	2110.7818.02
DIRECTV Legacy Modulation Coder (requires an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K9	2110.7401.02
AMC Coder (requires an installed R&S®SFU-K8 (DVB-S2) and an installed R&S®SFU-B1 or R&S®SFU-B10)	R&S®SFU-K108	only on request
Coder Extension 1	R&S®SFU-B1	2110.7424.02
Coder Extension 10	R&S®SFU-B10	2110.7747.02
Analog modulation systems		
Coder AM/FM RDS (requires an installed R&S®SFU-B2)	R&S®SFU-K170	2110.7830.02
ATV Standard B/G Coder (requires an installed R&S®SFU-B2)	R&S®SFU-K190	2110.8050.02
ATV Standard D/K Coder (requires an installed R&S®SFU-B2)	R&S®SFU-K191	2110.8037.02
ATV Standard I Coder (requires an installed R&S®SFU-B2)	R&S®SFU-K192	2110.8043.02
ATV Standard M/N Coder (requires an installed R&S®SFU-B2)	R&S®SFU-K193	2110.8066.02
ATV Standard L Coder (requires an installed R&S®SFU-B2)	R&S®SFU-K194	2110.8072.02
Multi ATV Predefined (requires an installed R&S®SFU-B3)	R&S®SFU-K199	2110.8089.02
Coder Extension 2 preinstalled in R&S®SFU from serial no. 101000	R&S®SFU-B2	2110.7430.02

² In preparation.

Simulation		
Fading Simulator	R&S®SFU-B30	2110.7530.02
Fading Simulator Extension to 40 Paths (requires an installed R&S®SFU-B30)	R&S®SFU-B31	2110.7547.02
Enhanced Fading (requires an installed R&S®SFU-B30)	R&S®SFU-K30	2110.7560.02
Gaussian Fading (requires an installed R&S®SFU-B30) (included in R&S®SFU-B30 option)	R&S®SFU-K32	2110.7630.02
ARB Generator (requires an installed R&S®SFU-B3)	R&S®SFU-K35	2110.7601.02
Memory Extension 1 preinstalled in R&S®SFU from serial no. 101000	R&S®SFU-B3	2110.7447.02
T-DMB/DAB Waveforms (can be used with R&S®SFU-K35)	R&S®SFU-K351	2110.4277.02
DVB-H Waveforms (can be used with R&S®SFU-K35)	R&S®SFU-K352	2110.4425.02
DRM Waveforms (can be used with R&S®SFU-K35)	R&S®SFU-K353	2110.4554.02
DTV Interferers (can be used with R&S®SFU-K35)	R&S®SFU-K354	2110.4690.02
MediaFLO™ Waveforms (can be used with R&S®SFU-K35)	R&S®SFU-K355	2110.2974.02
Cable Interferers (can be used with R&S®SFU-K35)	R&S®SFU-K356	2110.3212.02
HD Radio™ Waveforms (can be used with R&S®SFU-K35, Ibisquity license required)	R&S®SFU-K357	only on request
CMMB Waveforms ³ (can be used with R&S®SFU-K35)	R&S®SFU-K358	only on request
Interferer Management	R&S®SFU-K37	2110.7647.02
AWGN Noise	R&S®SFU-K40	2110.7653.02
Phase Noise	R&S®SFU-K41	2110.7660.02
Impulsive Noise	R&S®SFU-K42	2110.7676.02
Multinoise Use (requires at least one installed R&S®SFU-K40, R&S®SFU-K41, or R&S®SFU-K42)	R&S®SFU-K43	2110.7682.02
Custom OFDM (generates customer-specific OFDM signals)	R&S®SMU-K15	1160.6402.02
Baseband inputs/outputs		
Extended I/Q	R&S®SFU-K80	2110.7953.02
ETI Input/Output	R&S®SFU-B11	2110.7553.03
Digital baseband		
TS Generator including SDTV streams	R&S®SFU-K20	2110.7476.02
DVB-H Stream Library (requires an installed R&S®SFU-K20)	R&S®DV-DVBH	2085.8704.02
Test Card M Streams (requires an installed R&S®SFU-K20)	R&S®DV-TCM	2085.7708.02
HDTV Sequences (requires an installed R&S®SFU-K20)	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library (requires an installed R&S®SFU-K20)	R&S®DV-H264	2085.9052.02
ISDB-T Stream Library (requires an installed R&S®SFU-K20)	R&S®DV-ISDBT	2085.9146.02
TRP Player (requires an installed R&S®SFU-B6 and an installed R&S®SFU-B4)	R&S®SFU-K22	2110.7499.02
TS/ETI Recorder (requires an installed R&S®SFU-K22, R&S®SFU-B6, and R&S®SFU-B4)	R&S®SFU-K21	2110.7482.02
Memory Extension 2	R&S®SFU-B4	2110.7453.02

³ In preparation.

Additional Hard Disk for instruments with serial numbers <101000	R&S®SFU-B6	2110.7501.02
Additional Hard Disk for instruments with serial numbers >101000	R&S®SFU-B6	2110.7501.03
T-DMB/DAB Streams (requires an installed R&S®SFU-K22)	R&S®SFU-K221	2110.4348.02
DAB+ Streams (requires an installed R&S®SFU-K22)	R&S®SFU-K223	2110.4760.02
MediaFLO™ Streams (requires an installed R&S®SFU-K22)	R&S®SFU-K222	2110.2968.02
ISDB-T Streams (requires an installed R&S®SFU-K22)	R&S®SFU-K224	2110.4777.02

Analog baseband		
Video Generator (included in R&S®SFU-K190 to -K194)	R&S®SFU-K23	2110.7799.02
ATV Video Signals (can be used with R&S®SFU-K190 to R&S®SFU-K194)	R&S®ATV Video	2110.4831.02
Impedance Matching Pad 75/50 Ohms (can be used with R&S®SFU-K190 to R&S®SFU-K194)	R&S®SFU-Z19	2110.7276.02
Measurement and analysis functions		
RF Power Measurements (can be used with R&S®NRP-Zxx power sensors)	R&S®SFU-K55	2110.7753.02
BER Measurements (cannot be used at all or only to a limited extent for DVB-S2, DIRECTV, DTMB, DMB-TH, and MediaFLO™)	R&S®SFU-K60	2110.7782.02
Other expansions		
User I/O (additional input/output) (supported by R&S®SFU firmware versions <V1.70)	R&S®SFU-B5	2110.7460.02
Upgrade Kit for R&S®SFU-K43	R&S®SFU-U43	2110.7699.02

R&S® SFE

Order designation	Type	Order No.
Broadcast Tester including power cable, Quick Start Guide, CD-ROM (includes operating manuals)	R&S® SFE	2112.4300.02
Options		
Digital modulation systems		
DVB-T/H Coder	R&S® SFE-K1	2113.4010.02
DVB-C/ISDB-C Coder	R&S® SFE-K2	2113.4032.02
DVB-S/DVB-DSNG Coder	R&S® SFE-K3	2113.4055.02
DVB-S2 Coder	R&S® SFE-K8	2113.4132.02
ATSC/8VSB Coder	R&S® SFE-K4	2113.4078.02
J.83/B Coder	R&S® SFE-K5	2113.4090.02
ISDB-T/ISDB-Tsb/ISDB-T _B Coder	R&S® SFE-K6	2113.4110.02
MediaFLO™ Coder	R&S® SFE-K10	2113.4178.02
T-DMB/DAB Coder	R&S® SFE-K11	2113.4190.02
DTMB / DMB-TH Coder	R&S® SFE-K12	2113.4210.02
DirectTV Legacy Modulation Coder	R&S® SFE-K9	2113.4155.02
Analog modulation systems		
AM/FM/RDS Coder	R&S® SFE-K170	2113.4432.02
ATV Standard B/G Coder	R&S® SFE-K190	2113.4655.02
ATV Standard D/K Coder	R&S® SFE-K191	2113.4678.02
ATV Standard I Coder	R&S® SFE-K192	2113.4690.02
ATV Standard M/N Coder	R&S® SFE-K193	2113.4710.02
ATV Standard L Coder	R&S® SFE-K194	2113.4732.02
ATV Multistandard	R&S® SFE-K195	2113.4755.02
ARB/waveforms		
ARB Waveform Generator requires an installed R&S® SFE-B3 option	R&S® SFE-K35	2113.4932.02
Memory Expansion	R&S® SFE-B3	2112.4500.02
R&S® WinIQSIM™ Support	R&S® SFE-K350	2113.4955.02
T-DMB/DAB Waveforms can be used with the R&S® SFE-K35 option	R&S® SFU-K351	2110.4277.04
DVB-H Waveforms can be used with the R&S® SFE-K35 option	R&S® SFU-K352	2110.4425.02
DRM Waveforms can be used with the R&S® SFE-K35 option	R&S® SFU-K353	2110.4554.02
DTV Waveforms can be used with the R&S® SFE-K35 option	R&S® SFU-K354	2110.4690.02
MediaFLO™ Waveforms can be used with the R&S® SFE-K35 option	R&S® SFU-K355	2110.2974.02
Cable Interferers can be used with the R&S® SFE-K35 option	R&S® SFU-K356	2110.3212.02
Simulation		
AWGN Generator	R&S® SFE-K40	2113.4910.02

Baseband inputs/outputs		
Extended I/Q Input	R&S®SFE-K80	2113.5251.02
Digital baseband		
TS Generator including SDTV streams	R&S®SFE-K20	2113.4878.02
DVB-H Stream Library requires the R&S®SFE-K20 option	R&S®DV-DVBH	2085.8704.02
Test Card M Streams requires the R&S®SFE-K20 option	R&S®DV-TCM	2085.7708.02
HDTV Sequences requires the R&S®SFE-K20 option	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library requires the R&S®SFE-K20 option	R&S®DV-H264	2085.9052.02
ISDB-T Stream Library requires the R&S®SFE-K20 option	R&S®DV-ISDBT	2085.9146.02
TRP Player requires an installed R&S®SFE-B6 option	R&S®SFE-K22	2113.5274.02
Second Hard Disk (Compact Flash)	R&S®SFE-B6	2112.4522.02
T-DMB/DAB Streams requires the R&S®SFE-K22 option	R&S®SFU-K221	2113.4348.02
MediaFLO™ Streams requires the R&S®SFE-K22 option	R&S®SFU-K222	2110.2968.02
Analog baseband		
Video Generator	R&S®SFE-K23	2113.4890.02
ATV Video Signals	R&S®ATV Video	2110.4831.02
Measurement and analysis		
BER Measurement possible for DVB-S2, DirecTV, DTMB, and MediaFLO™ to a limited extent or not possible at all	R&S®SFE-K60	2113.5151.02

R&S® SFE100

Order designation	Type	Order No.
Test Transmitter For digital standards or ARB generator, including power cable, Quick Start Guide, CD-ROM (includes operating manuals)	R&S®SFE100	2112.4100.02
Test Transmitter For analog standards, including power cable, Quick Start Guide, CD-ROM (includes operating manuals)	R&S®SFE100	2112.4100.03

Options		
Digital modulation systems		
DVB-T/H Coder	R&S®SFE100-K1	2113.4003.02
DVB-C/ISDB-C Coder	R&S®SFE100-K2	2113.4026.02
DVB-S/DVB-DSNG Coder	R&S®SFE100-K3	2113.4049.02
DVB-S2 Coder	R&S®SFE100-K8	2113.4126.02
ATSC/8VSB Coder	R&S®SFE100-K4	2113.4061.02
J.83/B Coder	R&S®SFE100-K5	2113.4084.02
ISDB-T/ISDB-Tsb/ISDB-T _B Coder	R&S®SFE100-K6	2113.4103.02
MediaFLO™ Coder	R&S®SFE100-K10	2113.4161.02
T-DMB/DAB Coder	R&S®SFE100-K11	2113.4184.02
DTMB Coder	R&S®SFE100-K12	2113.4203.02
DirecTV Legacy Modulation Coder	R&S®SFE100-K9	2113.4149.02
Analog modulation systems		
ATV Standard B/G Coder	R&S®SFE100-K190	2113.4649.02
ATV Standard D/K Coder	R&S®SFE100-K191	2113.4661.02
ATV Standard I Coder	R&S®SFE100-K192	2113.4684.02
ATV Standard M/N Coder	R&S®SFE100-K193	2113.4703.02
ATV Standard L Coder	R&S®SFE100-K194	2113.4726.02
ARB/waveforms		
ARB Waveform Generator requires an installed R&S®SFE100-B3 option	R&S®SFE100-K35	2113.4926.02
Memory Extension	R&S®SFE100-B3	2112.4400.02
R&S®WinIQSIM™ Support	R&S®SFE100-K350	2113.4949.02
T-DMB/DAB Waveforms can be used with the R&S®SFE100-K35 option	R&S®SFU-K351	2110.4277.04
DVB-H Waveforms can be used with the R&S®SFE100-K35 option	R&S®SFU-K352	2110.4425.02
DRM Waveforms can be used with the R&S®SFE100-K35 option	R&S®SFU-K353	2110.4554.02
DTV Interferers can be used with the R&S®SFE100-K35 option	R&S®SFU-K354	2110.4690.02
MediaFLO™ Waveforms can be used with the R&S®SFE100-K35 option	R&S®SFU-K355	2110.2974.02
Cable Interferers can be used with the R&S®SFE100-K35 option	R&S®SFU-K356	2110.3212.02

Baseband inputs/outputs		
Extended I/Q Input	R&S®SFE100-K80	2113.5245.02
Digital baseband		
TS Generator including SDTV streams	R&S®SFE100-K20	2113.4861.02
DVB-H Stream Library requires the R&S®SFE100-K20 option	R&S®DV-DVBH	2085.8704.02
Test Card M Streams requires the R&S®SFE100-K20 option	R&S®DV-TCM	2085.7708.02
HDTV Sequences requires the R&S®SFE100-K20 option	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library requires the R&S®SFE100-K20 option	R&S®DV-H264	2085.9052.02
ISDB-T Stream Library requires the R&S®SFE100-K20 option	R&S®DV-ISDBT	2085.9146.02
TRP Player requires an installed R&S®SFE100-B6 option	R&S®SFE100-K22	2113.5268.02
Second Hard Disk	R&S®SFE100-B6	2112.4539.02
T-DMB/DAB Streams requires the R&S®SFE100-K22 option	R&S®SFU-K221	2113.4348.02
MediaFLO™ Streams requires the R&S®SFE100-K22 option	R&S®SFU-K222	2110.2968.02
Analog baseband		
Video Generator	R&S®SFE100-K23	2113.4884.02
ATV Video Signals	R&S®ATV Video	2110.4831.02
Other extras		
High Power	R&S®SFE100-B90	2112.4900.02



ROHDE & SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Mühldorfstraße 15 · D-81671 München · P.O.B 80 14 69 · D-81614 München ·
Telephone +49 89 4129 -0 · Fax +49 89 4129 - 13777 · Internet: <http://www.rohde-schwarz.com>

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