



SCPI

Broadcast Test System: R&S® SFU

R&S® SFQ to R&S® SFU SCPI Transcription + Cross-Reference List

Application Note

For customers who have already used automated R&S® SFQ setups in development and production, the implementation of the successor instrument results in a need to adjust the SCPI commands formerly used.

This document provides an overview on how SCPI commands that are used with the R&S® SFQ change with the new test transmitter as well as a cross-reference list in the form of an EXCEL sheet.



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1 Overview

For customers who have already used automated R&S®SFQ setups in development and production, the implementation of the successor instrument makes it necessary to adjust the SCPI commands formerly used.

This document provides an overview on how SCPI commands that are used with the R&S®SFQ change with the new broadcast test system as well as a cross-reference list in the form of an EXCEL sheet.

The purpose of the cross-reference list is to match up the commands between the two instrument generations as well as possible. Of course, not all commands have a counterpart in the other instrument. This Application Note is a guideline for transcribing remote programs from the R&S®SFQ to the R&S®SFU.

In many cases it is advisable to refer to the manual to determine the detailed functionality of a command.

2 Comparison of the R&S®SFQ and R&S®SFU Features

The R&S®SFQ was developed ten years ago. Since then, of course, the need for specific functionality, coders and interfaces has changed.

Some of the R&S®SFQ's features are therefore obsolete and are no longer supported by the successor instrument. To a much larger extent, the R&S®SFU implements the latest technologies and standards, due to the new hardware and software architecture and the ongoing development process especially in digital television.

The R&S®SFU is designed to meet all present-day needs in development and production. This, of course, includes test setups in which the R&S®SFQ was used.

The most important features of the two test transmitter generations are listed in the following:

R&S®SFQ-Specific Features

- FM coder
- Memory card
- Serial, monitor and sound interfaces, as well as other features

R&S®SFU-Specific Features

- Coders for DVB-H / S2, DMB-T, T-DMB / DAB, etc
- Transport stream generator/player
- Enhanced fading simulation
- Interferer management
- Phase noise
- Additional TS streams
- LAN and USB interfaces
- ... and a lot more, depending on the customer's needs

3 SCPI Subsystem Comparison R&S®SFQ vs. R&S®SFU

As previously mentioned, the R&S®SFQ's software and hardware platform is entirely different from that of the R&S®SFU. Most of the features provided by the R&S®SFQ can be found in the successor instrument.

The history of the R&S®SFQ's firmware and options has led to various header notations related to the supported standards.

In addition, the technologies incorporated in the R&S®SFQ have in some ways been dramatically improved.

As a result, there are different SCPI commands for equivalent functionality. The following explanations highlight the main differences in the most common subsystems of the SCPI implementations related to the R&S®SFQ.

General Remarks

Remote Control Interfaces

Besides the well-known GPIB interface, the R&S®SFU offers another means of operating the instrument by remote control. The VXI11 interface, physically the Ethernet connection, allows you to send, query or read strings, commands, etc, in accordance with SCPI.

Modulation Nomenclature

In the past, the standards known today were not used within the SCPI syntax to refer to digital modulation functions for cable, satellite and terrestrial transmission. Instead, basic modulation techniques such as QAM, QPSK and COFDM were used to designate the functionality.

In order to ensure easy readability of the SCPI commands, significant headers that indicate the purpose of the modulation have been introduced for the R&S®SFU and, in further firmware versions, in part for the R&S®SFQ.

The following table lists the R&S®SFQ subheaders for specific modulation standards and shows the corresponding naming conventions in the R&S®SFU:

R&S®SFQ	R&S®SFU
COFDM, DVBT	DVBT
QAM, DVBC	DVBC
QPSK, SAT	DVBS
J83B	J83B
VSB	VSB

It is important to mention that some commands can be written with either COFDM or DVBT, for example. Others, however, can only be written in one way. Generally the listed subheaders on R&S®SFQ side are not interchangeable. Please refer to the provided EXCEL sheet and the user manual for further explanations.

CALibration System

The notation changed for the most common commands in the calibration system. Also, not all calibrations applied on the R&S®SFQ can be/need to be applied the same way on the successor instrument. Please refer to the EXCEL sheet and the manual.

IEEE Interface Commands

If the IEEE488.2 interface is used on the R&S®SFU, of course, all interface commands are available as they are on the R&S®SFQ.

If the LAN interface via VXI11 is used, these interface commands can no longer be directly applied. The interface commands are related only to the available lines on the IEEE488.2 interface. To have an equivalent alternative for the R&S®SFU, additional commands whose syntax starts with "&" are offered.

For example:

The replacement of IEEE488.2's "Local Lockout": "&LLO"
--

READ System

The READ system consists of a series of read-only commands that provide internally computed values.

Most of the commands refer to the IQ coder. As mentioned at the beginning of this section, the most important differences regarding the transcription from the R&S®SFQ to the R&S®SFU are based on the naming conventions for the headers.

The existing commands for BER measurement on the R&S®SFQ can also be used for the successor instrument.

SENSe System

The SENSe system offers the possibility to configure the measurement inputs of the instrument. On the R&S®SFQ, there are only input configurations for measuring the bit error ratio (BER). There is no comparable mode specification for the BER measurement on a parallel input on the R&S®SFU side.

SOURce System

The SOURce system contains commands for modulation, frequency, noise, fading, power and sweep functionality.

SOURce:Channel Subsystem

The channel-specific commands on the R&S®SFQ also exist on the R&S®SFU, but the functionality itself will be available in future firmware releases.

SOURce:DM Subsystem

One important change involves the “:DM” subheader. The modulation types and their levels can be specified with “[SOURce:]DM:FORMat” on the R&S®SFQ. In contrast, “[SOURce:]DM:FORMat” on the R&S®SFU only specifies the modulation type; the level of modulation is defined by “[SOURce]:IQCoder:<Standard>:CONStel”.

The example below shows the differences between configuring a COFDM signal, where the single carriers are modulated with non-hierarchical 16QAM:

R&S®SFQ	R&S®SFU
[SOURce:]DM:FORMat T161	[SOURce:]DM:FORMat DVBT [SOURce]:IQCoder:DVBT:CONStel T16

SOURce:FM Subsystem

The FM functionality is not available on the R&S®SFU side.

SOURce:Frequency Subsystem

The configuration of the frequency settings for normal mode (fixed frequency) on the R&S®SFQ is for the most common cases the same as that on the successor instrument. Differences exist regarding frequency shift and VSB frequency settings.

This subsystem also contains commands for the sweep mode configuration on the R&S®SFQ. These functionalities can be found under “[SOURce]:SWEep[:FREQuency]” for the R&S®SFU.

Please refer to the EXCEL sheet.

SOURce:FSIMulator Subsystem

As part of the SOURce tree, the fading parts of the R&S®SFQ and R&S®SFU have some differences. Due to the extended fading simulation capability on the R&S®SFU, one major difference has to be mentioned:

Unlike its predecessor, the R&S®SFU can have up to eight fading groups with up to five fading paths each. The R&S®SFQ, in contrast, can only define 12 fading paths, and is unable to define any groups.

With regard to the SCPI syntax, the ability to define groups results in an additional subheader for the fading simulation on the R&S®SFU side that is not present on the R&S®SFQ:

R&S®SFQ	R&S®SFU
[SOURce]: FSIMulator: PATH[1 ... 12]: FDOPpler[?]	[SOURce]: FSIMulator: DELay:GROup{1 8}: PATH{1 5}:FDOPpler?

SOURce:IQCoder Subsystem

As previously mentioned, most of the changes are related to the notations and the supported standards.

SOURce:NOISe Subsystem

Minor changes concern commands of the NOISe subsystem. Especially CN shift and noise mode commands changed within the R&S®SFU.

SOURce:Power Subsystem

This subsystem contains commands to configure the power settings for the output or internal handling. The names of the main settings for automatic level control are different. Please also refer to the manuals of the instruments in order to determine differences in the specific functions.

SOURce:SWEEp Subsystem

Strictly speaking, the SWEEp subsystem consists of two commands on the R&S®SFQ. The other important configuration commands can be found directly in the Frequency subsystem. On the R&S®SFU, all sweep-related commands are under “[SOURce]:SWEEp[:FREQUENCY]”.

ROUT System

The ROUT system contains commands for logical and electrical connections of the R&S®SFQ. There is no ROUT subsystem on the R&S®SFU. The necessary functionalities are therefore split up into several other subsystems. Please refer to the EXCEL sheet.

STATus System

The STATus system provides access to the STATus Reporting System in accordance with the SCPI standard. These functionalities are also available on the R&S®SFU.

SYSTEM System

Here the global instrument settings are specified. This includes the configuration of communication ports, time and date settings, formatting, error handling, etc.

Due to the different software and hardware platforms, the R&S®SFU offers only a few functionalities that are equivalent to those of the R&S®SFQ.

UNIT System

This subsystem contains just one command. It specifies the unit for queries and commands via remote control. There is no counterpart on the R&S®SFU.

4 The EXCEL Sheet

Structure

The EXCEL sheet looks like this:

SFQ	EQUAL COMMANDS	SFU
CALibration:		
CALibration:ALL		CALibration:ALL[MEASure]?
CALibration:DC:OFFSet:INTerm		N.A.
CALibration:DC:OFFSet:INTerm		N.A.
N.A.		CALibration:FREQuency[MEASure]?
N.A.		CALibration:FREQuency[MEASure]:DATE?
CALibration:MODulation[?]		CALibration:IQModulator:FULL?
CALibration:MODulation:DATE?		CALibration:IQModulator:FULL:DATE?
CALibrate:MODulation:ONCE		CALibration:IQModulator:LOCAL?
N.A.		CALibration:IQModulator:LOCAL:DATE?
CALibration:ISDR[DATE?]		N.A.
CALibration:ISDR[?]		N.A.
CALibration:LEVel[?]		CALibration:LEVel[MEASure]?
CALibration:LEVel:DATE?		CALibration:LEVel[MEASure]:DATE?
N.A.		CALibration:LEVel:STATE[?]
CALibration:NOISE[?]		N.A.
CALibration:NOISE:ALL:DATE?		N.A.
CALibration:NOISE:ALL[?]		N.A.
CALibration:SYNTHeSis[?]		N.A.
CALibration:SYNTHeSis:DATE?		N.A.

As shown above, the sheet consists of three columns:

- The first column contains the SCPI commands for the R&S®SFQ only
- The second column shows compatible R&S®SFQ and R&S®SFU commands
- The third column contains the SCPI commands for the R&S®SFU only

The rows are thematically arranged and combined by headlines showing either the type of command or a specific header and subheader.

The following marks are used to specify the SCPI commands:

- <cmd>: Command only
- <cmd> + ?: Query only
- <cmd> + [?]: Command + query
- []: Optional keywords
- { }: Parameters in braces may be included in the command one or more times, or not at all.

Using the EXCEL Sheet

Use the search function of your reader to find the corresponding commands for the R&S®SFQ to R&S®SFU transcription.

5 Abbreviations

BER	Bit Error Ratio
CMD	Command
CN	Carrier to Noise
COFDM	Coded Orthogonal Frequency Division Multiplexing
FM	Frequency Modulation
IEEE	Institute of Electrical and Electronics Engineers
LAN	Local Area Network
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
SCPI	Standard Commands for Programmable Instruments
TS	Transport Stream
USB	Universal Serial Bus

6 Additional Information

Our Application Notes are periodically updated. Please visit the Rohde & Schwarz website in order to download new versions.

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

7 Ordering Information

BROADCAST TEST SYSTEM	R&S® SFU	2110.2500.02
DOCUMENTATION	R&S® SFU-DCV	2082.0490.30
EXTENSION BOARD 1	R&S® SFU-B1	2110.7424.02
MEMORY-ERWEITERUNG 1	R&S® SFU-B3	2110.7447.02
MEMORY-ERWEITERUNG 2	R&S® SFU-B4	2110.7453.02
USER I/O	R&S® SFU-B5	2110.7460.02
2nd HARDDISK	R&S® SFU-B6	2110.7501.02
EXTENSION BOARD 10	R&S® SFU-B10	2110.7747.02
ETI INPUT	R&S® SFU-B11	2110.7553.02
FADING SIMULATOR, 20 PATHS	R&S® SFU-B30	2110.7530.02
FADING SIMULATOR EXTENSTION	R&S® SFU-B31	2110.7547.02
HIGHER OUTPUT POWER	R&S® SFU-B90	2110.8008.02
CODER DVB-T/H, 2K/4K/8K-COFDM	R&S® SFU-K1	2110.7301.02
CODER DVB-C	R&S® SFU-K2	2110.7324.02
CODER DVB-S/DVB-DSNG,	R&S® SFU-K3	2110.7330.02
CODER ATSC/8VSB	R&S® SFU-K4	2110.7353.02
CODER J.83B	R&S® SFU-K5	2110.7360.02
CODER TDS-OFDM (DMB-T CHINA)	R&S® SFU-K7	2110.7382.02
CODER DVB-S2 BROADCAST SERVICE	R&S® SFU-K8	2110.7399.02
CODER DIRECTV	R&S® SFU-K9	2110.7401.02
CODER MEDIAFLO	R&S® SFU-K10	2110.7524.02
CODER T-DMB/DAB	R&S® SFU-K11	2110.7518.02
TS-GENERATOR, SDTV TEST-	R&S® SFU-K20	2110.7476.02
TRP-RECORDER AND PLAYER	R&S® SFU-K21	2110.7482.02
TRP-PLAYER	R&S® SFU-K22	2110.7499.02
DYNAMICAL FADING UND ERHOEHTE	R&S® SFU-K30	2110.7560.02
ARB GENERATOR	R&S® SFU-K35	2110.7601.02
INTERFERER MANAGEMENT	R&S® SFU-K37	2110.7647.02
NOISE GENERATOR AWGN, DIGITAL	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	R&S® SFU-K43	2110.7682.02
SW FOR POWER MEASUREMENT	R&S® SFU-K55	2110.7753.02
BER-MEASUREMENT	R&S® SFU-K80	2110.7782.02
EXTENDED ANALOG-I/Q IN	R&S® SFU-K80	2110.7953.02
REALTIME DISABLED	R&S® SFU-K81	2110.7960.02
REALTIME ENABLED	R&S® SFU-K82	2110.7976.02
CODER AMC	R&S® SFU-K108	2110.7418.02
MULTI ATV PREDEFINED	R&S® SFU-K199	2110.8089.02
T-DMB STREAMS	R&S® SFU-K221	2110.4348.02
T-DMB WAVEFORM	R&S® SFU-K351	2110.4277.02

For additional information about measurement equipment, see the Rohde & Schwarz website www.rohde-schwarz.com.



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