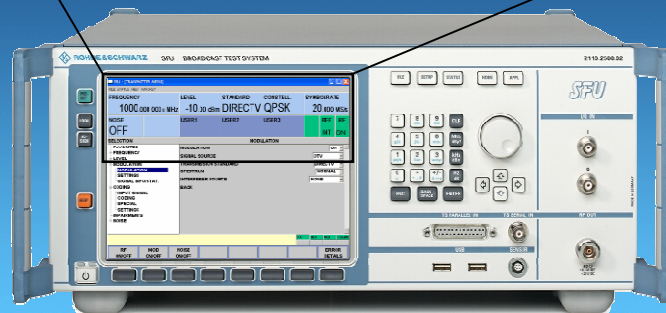


| SFU - [TRANSMITTER MENU] |               |            |           |             |
|--------------------------|---------------|------------|-----------|-------------|
| FILE STATUS HELP HARDKEY |               |            |           |             |
| FREQUENCY                | LEVEL         | STANDARD   | CONSTELL. | SYMBOLRATE  |
| 1000.000 000 0 MHz       | -10.00 dBm    | DIRECTV    | QPSK      | 20.000 MS/s |
| NOISE                    | USER1         | USER2      | USER3     | REF RF      |
| OFF                      |               |            |           | INT ON      |
| SELECTION                |               | MODULATION |           |             |
| FAVORITES                | MODULATION    |            |           | ON          |
| FREQUENCY                | SIGNAL SOURCE |            |           | DTV         |
| LEVEL                    |               |            |           |             |



Products: Broadcast Test System R&S® SFU

# R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format for R&S® SFU TRP player

## Application Note

*DIRECTV*®, a digital TV broadcast system, makes use of transport packets with a length of 130 bytes rather than the more common 188 bytes used in MPEG TS streams. The inputs on the R&S® SFU do not accept transport streams in the *DIRECTV*® format. This Application Note introduces R&S® *DIRECTV tool* and explains how it can be used to convert existing 130-byte-based *DIRECTV*® transport stream content to 188-byte-based ISO 13818-1 streams that are compatible with the R&S® SFU SPI input or the internal R&S® SFU TRP player. This tool is intended for Rohde & Schwarz customers who are licensed to operate an R&S® SFU-K9 *DIRECTV coder* or R&S® SFU-K108 *AMC coder* (\*).



**R&S® DIRECTV tool for converting 130-byte-based  
DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG  
format**

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# ***R&S<sup>®</sup> DIRECTV<sup>®</sup> tool for converting 130-byte-based DIRECTV<sup>®</sup> streams to ISO 13818-1 (188 bytes) MPEG format***

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## **1 Overview**

As the field of digital transmission has evolved, many digital TV broadcast standards have arisen. One of them is *DIRECTV<sup>®</sup>*, a standard owned by a private direct broadcast satellite service with the same name based in California, USA. The *DIRECTV<sup>®</sup>* standard uses transport streams with transport packets that have a length of 130 bytes. This differs from the more common 188-byte-based ISO 13818-1 MPEG streams. The packet length of 130 bytes is incompatible with the interfaces of the *R&S<sup>®</sup>SFU*.

*R&S<sup>®</sup>DIRECTV<sup>®</sup> tool* is provided by Rohde & Schwarz as a means of converting existing 130-byte-based *DIRECTV<sup>®</sup>* transport streams to 188-byte-based ISO 13818-1 MPEG streams that are compatible with the *R&S<sup>®</sup>SFU* inputs. The tool is intended for Rohde & Schwarz customers who are licensed to operate an *R&S<sup>®</sup> SFU-K9 DIRECTV<sup>®</sup> coder* or *SFU-K108 AMC coder* (\*).

The converted streams can be played either on the *R&S<sup>®</sup>SFU-K22 TRP player* or with an external player such as the *R&S<sup>®</sup>DVRG* connected to the SPI input of the *R&S<sup>®</sup>SFU*.

## **2 Where to get the application software?**

Please contact the Customer Support Center and provide the serial number of your device. CS will grant you access to one of our file servers via HTTP.

### **Customer Support Europe**

**Telephone:** +49 180 512 4242

**Fax:** +49 89 4129 63778

**E-mail:** [customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)

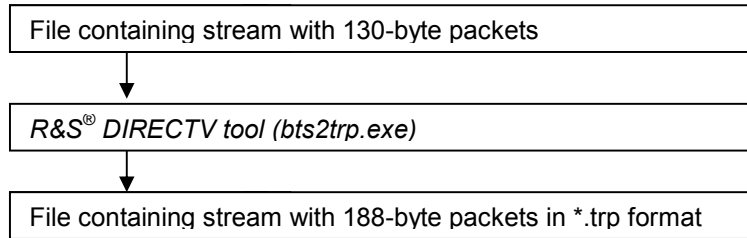
## **3 Hardware and Software Requirements**

*R&S<sup>®</sup>DIRECTV<sup>®</sup> tool* is a console application that runs on a *Microsoft Windows Win32 console*. It consumes very few computer resources and thus does not have any particular PC requirements.

# R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format

## 4 How R&S® DIRECTV Tool Operates

The conversion process is shown in the following schematic diagram:



R&S® DIRECTV tool converts streams containing 130-byte packets to 188-byte format by adding 57 stuffing bytes to the existing packets as shown below. The tool then encapsulates the 57 stuffing bytes and the 130 bytes of the DIRECTV® content packet as payload in an MPEG packet with a single-byte header (0x47) for payout.



The ISO 13818-1 standard 0x47 MPEG sync header and 188-byte length allow the SPI interface to synchronize and normally process the stream. When the R&S® SFU is in DIRECTV® modulation mode, the internal coder removes the MPEG sync header and 57 stuffing bytes again before transmission. Therefore, only the original DIRECTV® content will be transmitted by the instrument.

The hex editor image below shows the first two packets of a converted transport stream. The 0x47 sync byte as well as the 57 0x00 stuffing bytes preceding the original 130 DIRECTV® packets are clearly visible.

|            | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | a  | b  | c  | d  | e  | f  |                     |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|
| 00000000h: | 47 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; G.....            |
| 00000010h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000020h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000030h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; ...../p>I..       |
| 00000040h: | 04 | 00 | 03 | 31 | 38 | 31 | 02 | 36 | 34 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; ...181.64.....    |
| 00000050h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000060h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000070h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000080h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 00000090h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 000000a0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 000000b0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 47 | 00 | 00 | 00 | ; .....G...         |
| 000000c0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 000000d0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 000000e0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....             |
| 000000f0h: | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | ; .....*8SX         |
| 00000100h: | A9 | 06 | 4E | AF | AC | 81 | 86 | B9 | A2 | B5 | 89 | 76 | 08 | 95 | 39 | C6 | ; @.N~□t'cp%v.*9E   |
| 00000110h: | 93 | 61 | 02 | 53 | 40 | 26 | 29 | 14 | 30 | 7C | 79 | 1A | B3 | 80 | 58 | 71 | ; ^a.S@ε).0 y.²eXq  |
| 00000120h: | DF | 52 | 4B | 70 | 12 | F2 | F9 | AC | 70 | C7 | D6 | 32 | 5D | 9F | DA | E4 | ; BRKp.òù~pÇÓ2] YÜ' |
| 00000130h: | DF | 41 | 8D | 7B | 40 | B8 | 00 | 36 | 26 | 89 | 63 | 39 | 71 | 92 | BF | F5 | ; BΔ□(0,.6ε%e9q'¿ò  |
| 00000140h: | 47 | C2 | 9F | D4 | 37 | 9A | EB | E3 | 81 | C8 | C5 | 0D | E6 | 70 | 13 | F6 | ; GÀÿÔ7sèã0ÈĀ.æp.ò  |

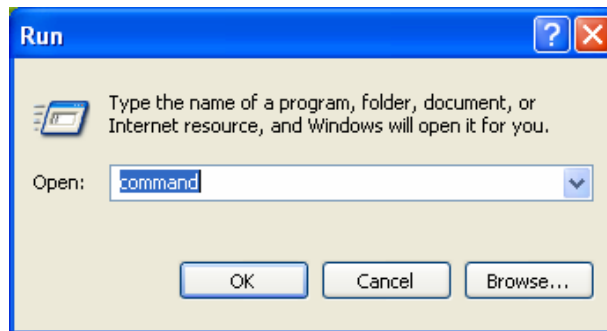
Fig. 1 0x47 sync byte and 0x00 stuffing bytes after conversion

## **R&S<sup>®</sup> DIRECTV tool for converting 130-byte-based DIRECTV<sup>®</sup> streams to ISO 13818-1 (188 bytes) MPEG format**

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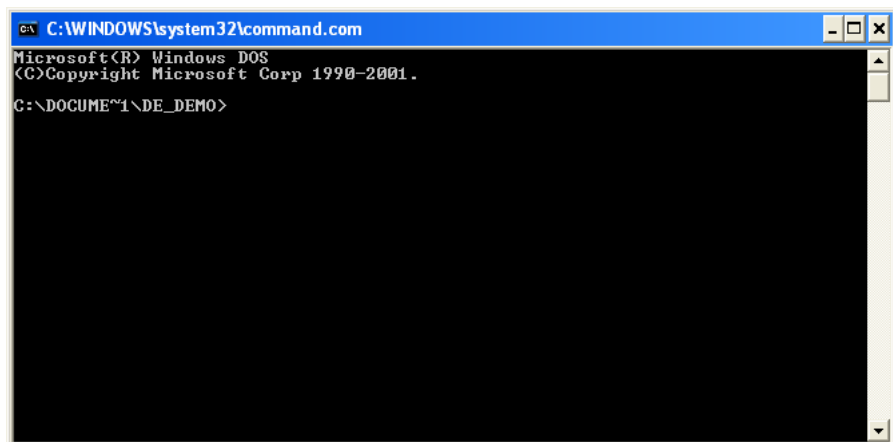
### **5 How to Install and Use R&S<sup>®</sup> DIRECTV Tool**

1. Copy the tool (*bts2trp.exe*) together with the readme file to a dedicated folder, e.g. *C:\Program Files\DirectTV*, on your PC. The tool can also be copied onto the *R&S<sup>®</sup> SFU* itself if necessary.
2. Go to *Windows->Start* and click *Run*. Enter 'command' to open the *Win32 console* (also known as the *Command window*) and click *OK*.



*Fig. 2 Run window*

3. The following screen will appear:



*Fig. 3 Console application (also known as the Command window)*

4. Change the current folder to the dedicated one where *R&S<sup>®</sup> DIRECTV tool* is located.

Example:        *CD\*  
                  *CD C:\Program Files\DirectTV*

5. Copy the file that you want to convert to the same dedicated folder.
6. Launch the conversion tool by entering the following command line:  
Command line structure:

*bts2trp <input filename.extension> <output filename.trp>*

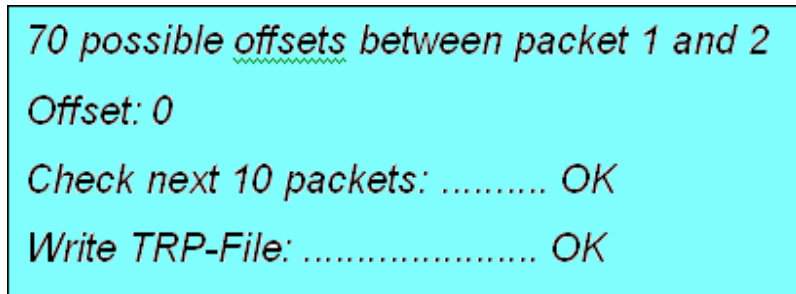
## **R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format**

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Example: `bts2trp TR08_300.bts TR08_300_bts.trp`

In the above case, `TR08_300.bts` is the name of the input file (source file) with packets that are 130 bytes in length. `TR08_300_bts.trp` is the converted file.

7. If the conversion was successful, the following output will appear, and an additional file that has the extension `.trp` and contains the converted stream will be present in the folder.



```
70 possible offsets between packet 1 and 2
Offset: 0
Check next 10 packets: ..... OK
Write TRP-File: ..... OK
```

Fig. 4 Console output of R&S® DIRECTV tool

## **6 Procedure for R&S® TRP Player**

The output of the tool is a binary file in `.trp` format, which is to be loaded (or directly converted) onto the second hard disk (`R&S®SFU-B6`) of the `R&S®SFU` or copied to another transport stream player such as the `R&S®DVRG`. In the first case, the `R&S®SFU-B4`, `R&S®SFU-B6`, and `R&S®SFU-K22` options are required in order to store and play the stream.

1. Select `APPL: Tx` (TV Test Transmitter).
2. Change the frequency and level in the `Tx` window according to the application.
3. In the `MODULATION` menu:  
Select `SIGNAL SOURCE: DTV`  
`TRANSMISSION STANDARD: DIRECTV`

**R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format**

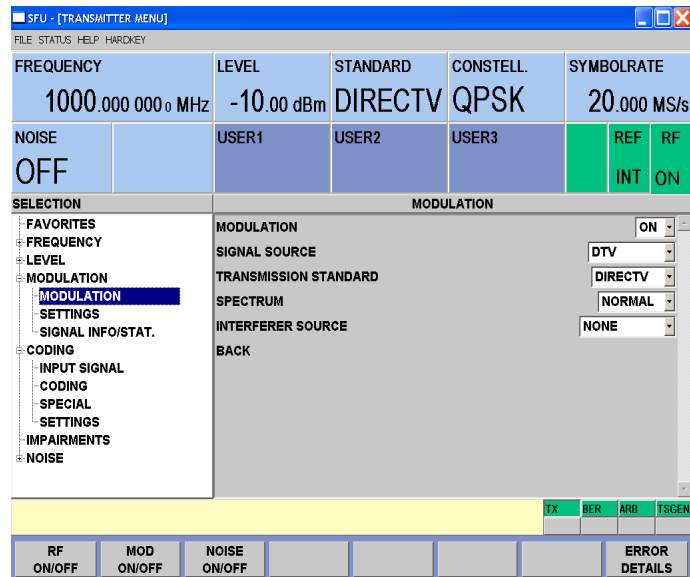


Fig. 5 Settings in the MODULATION menu

4. In the CODING menu:  
 SOURCE: TS PLAYER or SPI front/back and note the reading of REQ. SOURCE DATA RATE

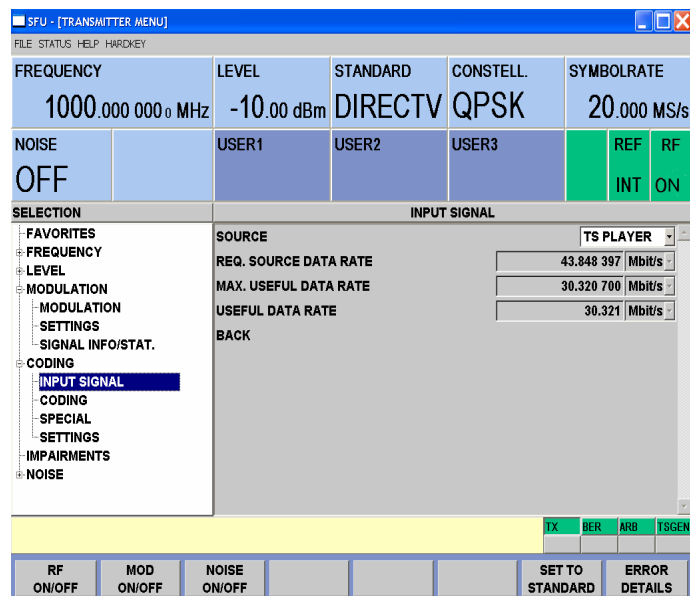


Fig. 6 Settings in CODING menu

5. If the source is TS PLAYER, select APPL: TS PLAYER.

6. Settings in TS GENERATOR:

Change the TS data rate of the R&S®TRP player to the previously noted REQ. SOURCE DATA RATE reading.

## R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format

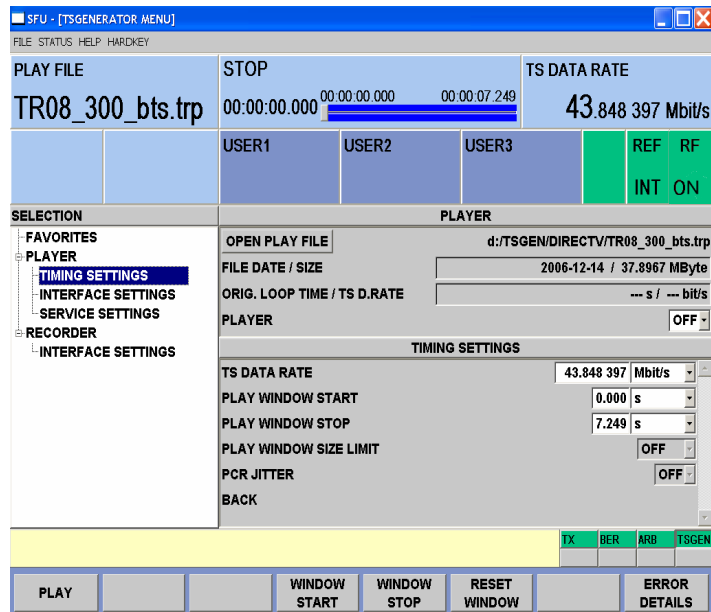


Fig.73 TRP player settings in TSGen

To choose a file, click *OPEN PLAY FILE* and select the converted *DIRECTV®* file (.trp format). *OPEN PLAY FILE* will be functional only if no other file is being played. If any other file is played, first STOP the running file.

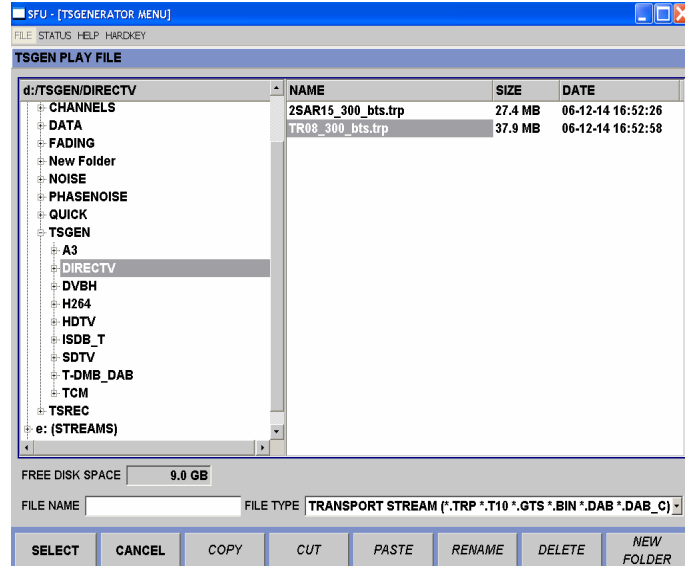


Fig. 8 Selecting a file to play

After selecting the desired stream, click the *PLAY* button. The played stream will then be coded and RF-modulated in accordance with the *DIRECTV®* transmission standard. The RF output can be connected to the DUT (tuner or an STB) for testing.



## ***R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format***

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### **7 Summary**

The R&S® SFU front and rear panel SPI interfaces accept ISO/IEC 13818-1 MPEG-compliant streams with a packet size of 188 bytes. This could pose certain difficulties for engineers working on the DIRECTV® standard with the instrument's R&S® SFU-K9 DIRECTV® Legacy Modulation Coder or the R&S® SFU-K108 AMC coder (\*). R&S® DIRECTV tool offers a simple and speedy way to convert DIRECTV® 130-byte-oriented streams to 188-byte packetized streams that can be streamed, without any further requirements, to the instrument's SPI interfaces. They can also be played on the internal R&S® SFU-K22 TRP player.

### **8 References**

1. ISO/IEC 13818-1: "Information technology – Generic coding of moving pictures and associated audio information"
2. User manual of the R&S® SFU, e.g. MAN12SFU0600.pdf or later
3. [www.directv.com](http://www.directv.com)

### **9 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@rsd.rohde-schwarz.com](mailto:Broadcasting-TM-Applications@rsd.rohde-schwarz.com).

**R&S® DIRECTV tool for converting 130-byte-based  
DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG  
format**

## 10 Ordering Information

| Type         | Designation                            | Order no.       |
|--------------|--|-----------------|
| R&S SFU      | Broadcast Test System                  | 2110.2500.02    |
| R&S SFU-B1   | Coder Extension 1                      | 2110.7424.02    |
| R&S SFU-B10  | Coder Extension 10                     | 2110.7747.02    |
| R&S SFU-B11  | ETI Input/Output                       | 2110.7553.03    |
| R&S SFU-B30  | Fading Simulator                       | 2110.7530.02    |
| R&S SFU-B31  | Fading Simulator Extension to 40 Paths | 2110.7547.02    |
| R&S SFU-B4   | Memory Extension 2                     | 2110.7453.02    |
| R&S SFU-B5   | User I/O                               | 2110.7460.02    |
| R&S SFU-B6   | Additional Hard Disk                   | 2110.7501.02/03 |
| R&S SFU-B90  | High Power and Overvoltage Protection  | 2110.8008.02    |
| R&S SFU-K1   | DVB-T/H Coder                          | 2110.7301.02    |
| R&S SFU-K10  | MediaFLO Coder                         | 2110.7524.02    |
| R&S SFU-K108 | AMC Coder                              | only on request |
| R&S SFU-K11  | T-DMB/DAB Coder                        | 2110.7518.02    |
| R&S SFU-K120 | DMB-TH Coder                           | 2110.7760.02    |
| R&S SFU-K190 | ATV Standard B/G Coder                 | 2110.8050.02    |
| R&S SFU-K191 | ATV Standard D/K Coder                 | 2110.8037.02    |
| R&S SFU-K192 | ATV Standard I                         | 2110.8043.02    |
| R&S SFU-K193 | ATV Standard M/N Coder                 | 2110.8066.02    |
| R&S SFU-K194 | ATV Standard L Coder                   | 2110.8072.02    |
| R&S SFU-K199 | Multi ATV Predefined                   | 2110.8089.02    |
| R&S SFU-K2   | DVB-C Coder                            | 2110.7324.02    |
| R&S SFU-K20  | TS Generator                           | 2110.7476.02    |
| R&S SFU-K21  | TS Recorder                            | 2110.7482.02    |
| R&S SFU-K22  | TRP Player                             | 2110.7499.02    |
| R&S SFU-K221 | T-DMB/DAB Streams                      | 2110.4348.02    |
| R&S SFU-K23  | Video Generator                        | 2110.7799.02    |
| R&S SFU-K3   | DVB-S/DSNG Coder                       | 2110.7330.02    |
| R&S SFU-K30  | Enhanced Fading                        | 2110.7560.02    |
| R&S SFU-K32  | DAB Gaussian Fading                    | 2110.7630.02    |
| R&S SFU-K35  | ARB Generator                          | 2110.7601.02    |
| R&S SFU-K351 | T-DMB/DAB Waveforms                    | 2110.4277.02    |
| R&S SFU-K352 | DVB-H Waveforms                        | 2110.4425.02    |
| R&S SFU-K353 | DRM Waveforms                          | 2110.4554.02    |
| R&S SFU-K354 | DTV Interferers                        | 2110.4690.02    |
| R&S SFU-K356 | Cable Interferers                      | 2110.3212.02    |
| R&S SFU-K4   | ATSC/8VSB Coder                        | 2110.7353.02    |
| R&S SFU-K37  | Interferer Management                  | 2110.7647.02    |
| R&S SFU-K40  | Noise AWGN                             | 2110.7653.02    |
| R&S SFU-K41  | Phase Noise                            | 2110.7660.02    |
| R&S SFU-K42  | Impulsive Noise                        | 2110.7676.02    |
| R&S SFU-K43  | Multinoise Use                         | 2110.7682.02    |
| R&S SFU-K5   | J.83/B Coder                           | 2110.7360.02    |
| R&S SFU-K6   | ISDB-T Coder                           | 2110.7376.02    |
| R&S SFU-K60  | BER Measurements                       | 2110.7782.02    |
| R&S SFU-K7   | DMB-T Coder                            | 2110.7382.02    |
| R&S SFU-K8   | DVB-S2 Coder                           | 2110.7399.02    |
| R&S SFU-K80  | Extended IQ                            | 2110.7953.02    |
| R&S SFU-K81  | Realtime Disabled                      | 2110.7960.02    |
| R&S SFU-K82  | Realtime Enabled                       | 2110.7976.02    |
| R&S SFU-K9   | DIRECTV                                | 2110.7401.02    |
| R&S SFU-U43  | Upgrade Kit for R&S SFU-K43            | 2110.7699.02    |
| R&S DV-DVBH  | DVB-H Stream Library                   | 2085.8704.02    |
| R&S DV-H264  | H.264 Stream Library                   | 2085.7650.02    |
| R&S DV-HDTV  | HDTV Sequences                         | 2085.7650.02    |
| R&S DV-ISDBT | ISDB-T Stream Library                  | 2085.9146.02    |
| R&S DV-TCM   | Test Card M Streams                    | 2085.7708.02    |

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