

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<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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## 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 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)

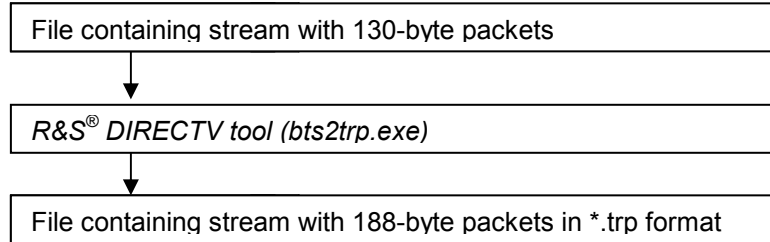
## 3 Hardware and Software Requirements

*R&S<sup>®</sup>DIRECTV 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.

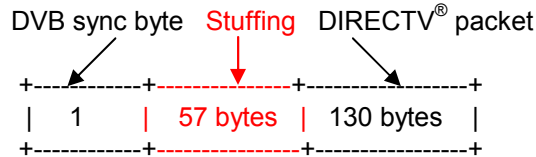
**R&S® DIRECTV tool for converting 130-byte-based DIRECTV® streams to ISO 13818-1 (188 bytes) MPEG format**

## 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 playout.



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.

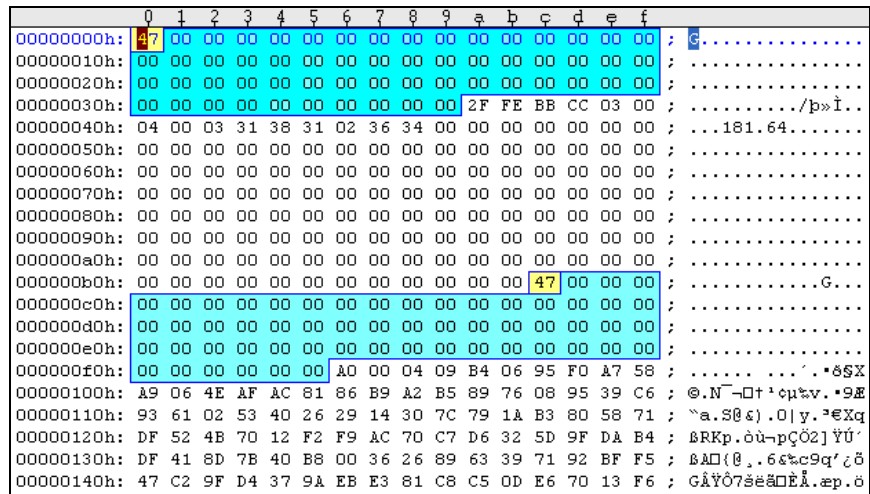


Fig. 1 0x47 sync byte and 0x00 stuffing bytes after conversion

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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*.

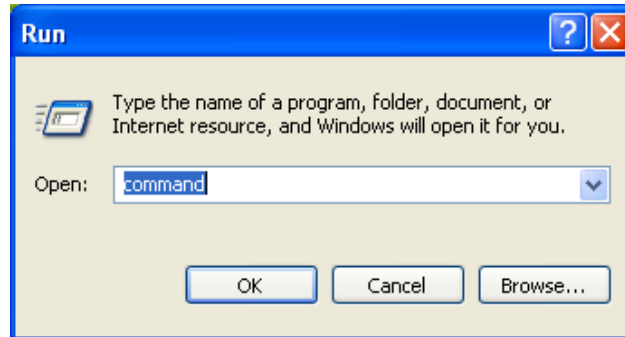


Fig. 2 Run window

3. The following screen will appear:

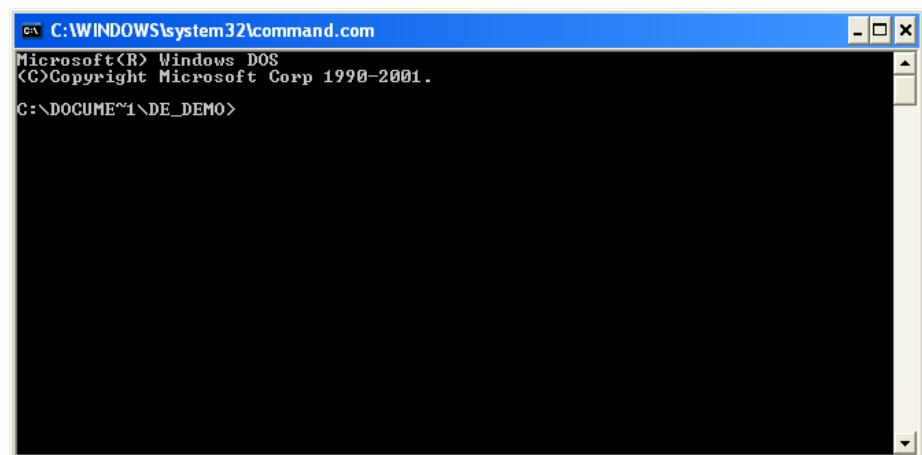


Fig. 3 Console application (also known as the Command window)

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>

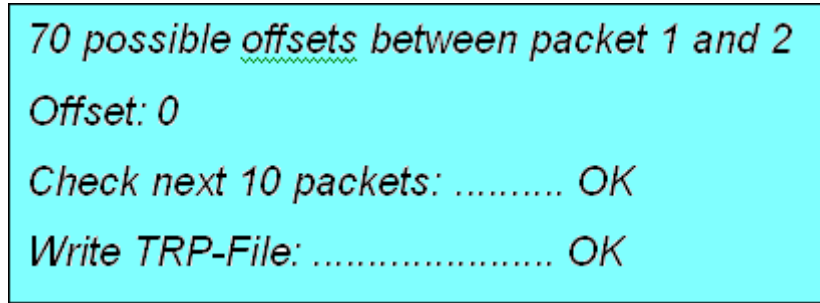
## **R&S<sup>®</sup> DIRECTV tool for converting 130-byte-based DIRECTV<sup>®</sup> streams to ISO 13818-1 (188 bytes) MPEG format**

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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<sup>®</sup> DIRECTV tool

## **6 Procedure for R&S<sup>®</sup> 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<sup>®</sup>SFU-B6*) of the *R&S<sup>®</sup>SFU* or copied to another transport stream player such as the *R&S<sup>®</sup>DVRG*. In the first case, the *R&S<sup>®</sup>SFU-B4*, *R&S<sup>®</sup>SFU-B6*, and *R&S<sup>®</sup>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*

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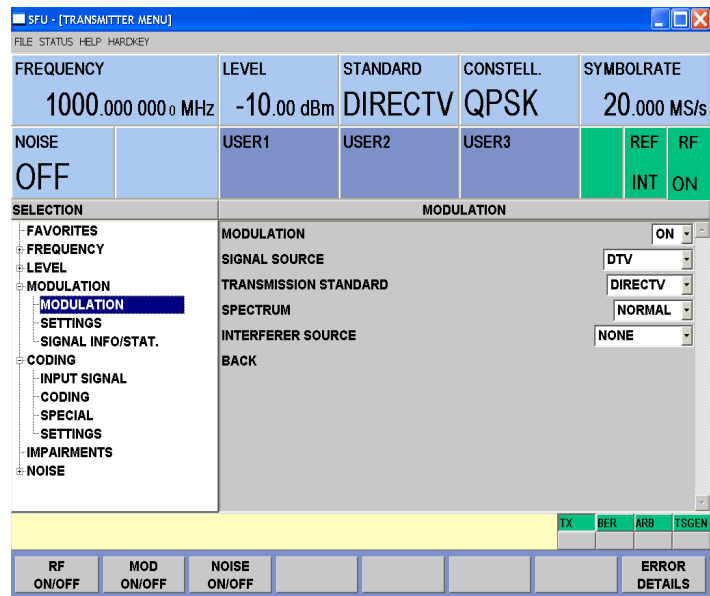


Fig. 5 Settings in the MODULATION menu

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

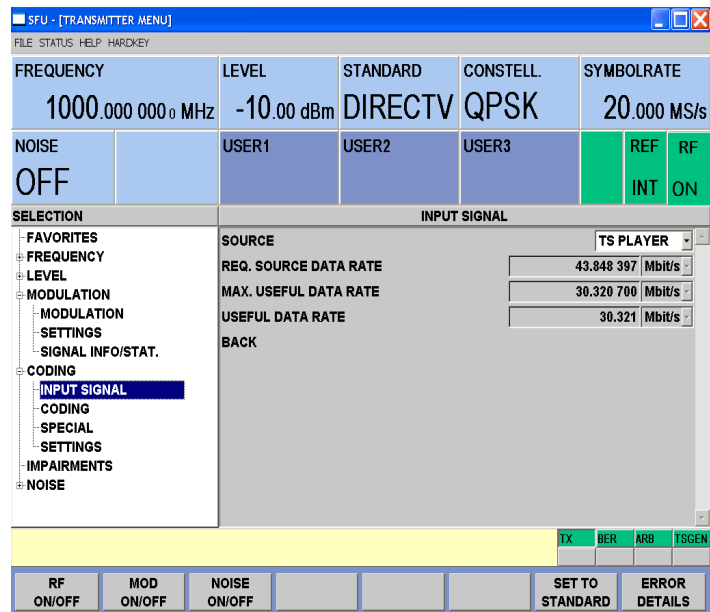


Fig. 6 Settings in CODING menu

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

- Settings in TS GENERATOR:

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

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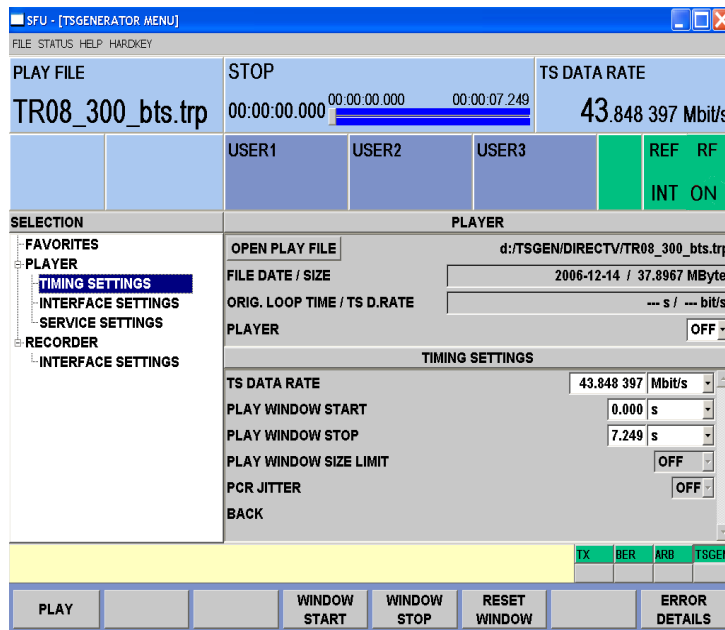


Fig.73 TRP player settings in TSGen

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.

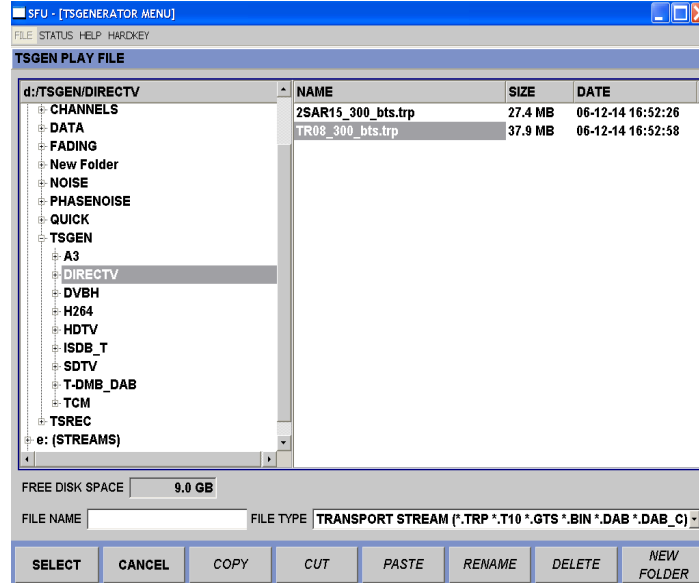


Fig. 8 Selecting a file to play

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.



## 7 Summary

The R&S<sup>®</sup>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<sup>®</sup> standard with the instrument's R&S<sup>®</sup>SFU-K9 DIRECTV<sup>®</sup> Legacy Modulation Coder or the R&S<sup>®</sup>SFU-K108 AMC coder (\*). R&S<sup>®</sup> DIRECTV tool offers a simple and speedy way to convert DIRECTV<sup>®</sup> 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<sup>®</sup>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<sup>®</sup>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@rohde-schwarz.com](mailto:Broadcasting-TM-Applications@rohde-schwarz.com).

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## 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/DSSNG 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	2110.4680.02
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	Multinnoise 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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