

R&S[®]SMCVB-K164

DVB-T2

User Manual



1179097402
Version 05

ROHDE & SCHWARZ
Make ideas real



This document describes the following software options:

- R&S®SMCVB-K164 DVB-T2 (1434.3890.xx)

This manual describes firmware version FW 5.20.043.xx and later of the R&S®SMCV100B.

© 2023 Rohde & Schwarz GmbH & Co. KG
Muehldorfstr. 15, 81671 Muenchen, Germany
Phone: +49 89 41 29 - 0
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

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1179.0974.02 | Version 05 | R&S®SMCVB-K164

The following abbreviations are used throughout this manual: R&S®SMCV100B is abbreviated as R&S SMCVB, R&S®WinIQSIM2 is abbreviated as R&S WinIQSIM2

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1 Welcome to the DVB-T2 option

The R&S SMCVB-K164 is a firmware application that adds functionality to generate signals in accordance with the DVB-T2 digital standard.

Key features

The R&S SMCVB-K164 option features:

- DVB-T2 signal generation

This user manual contains a description of the functionality that the application provides, including remote control operation.

All functions not discussed in this manual are the same as in the base unit and are described in the R&S SMCV100B user manual. The latest version is available at:

www.rohde-schwarz.com/manual/SMCV100B

Installation

You can find detailed installation instructions in the delivery of the option or in the R&S SMCV100B service manual.

1.1 Accessing the DVB-T2 dialog

To open the dialog with DVB-T2 settings

- ▶ In the block diagram of the R&S SMCV100B, select "Baseband > DVB-T2".

A dialog box opens that displays the provided general settings.

The signal generation is not started immediately. To start signal generation with the default settings, select "State > On".

1.2 What's new

This manual describes firmware version FW 5.20.043.xx and later of the R&S®SMCV100B.

Compared to the previous version, it provides information on how to load and play stream library files. See "[To load and play a stream library file](#)" on page 75.

1.3 Documentation overview

This section provides an overview of the R&S SMCV100B user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/smcv100b

1.3.1 Getting started manual

Introduces the R&S SMCV100B and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

1.3.2 User manuals and help

Separate manuals for the base unit and the software options are provided for download:

- **Base unit manual**
Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.
- **Software option manual**
Contains the description of the specific functions of an option. Basic information on operating the R&S SMCV100B is not included.

The contents of the user manuals are available as help in the R&S SMCV100B. The help offers quick, context-sensitive access to the complete information for the base unit and the software options.

All user manuals are also available for download or for immediate display on the Internet.

1.3.3 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

<https://gloris.rohde-schwarz.com>

1.3.4 Instrument security procedures

Deals with security issues when working with the R&S SMCV100B in secure areas. It is available for download on the internet.

1.3.5 Printed safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

1.3.6 Data sheets and brochures

The data sheet contains the technical specifications of the R&S SMCV100B. It also lists the options and their order numbers and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/smcv100b

1.3.7 Release notes and open source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The software makes use of several valuable open source software packages. An open-source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/smcv100b

1.3.8 Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/smcv100b

1.3.9 Videos

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: <https://www.youtube.com/@RohdeundSchwarz>

1.4 Scope



Tasks (in manual or remote operation) that are also performed in the base unit in the same way are not described here.

In particular, it includes:

- Managing settings and data lists, like saving and loading settings, creating and accessing data lists, or accessing files in a particular directory.
- Information on regular trigger, marker and clock signals and filter settings, if appropriate.
- General instrument configuration, such as checking the system configuration, configuring networks and remote operation
- Using the common status registers

For a description of such tasks, see the R&S SMCV100B user manual.

1.5 Notes on screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as many as possible of the provided functions and possible interdependencies between parameters. The shown values may not represent realistic usage scenarios.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

2 About the DVB-T2 option

The transmission standard complies with the specification [ETSI EN 302 755](#) and [ETSI TS 102 773](#). A subset of all possible parameters found in the specification can be set on the R&S SMCV100B.

2.1 Required options

The equipment layout for generating DVB-T2 signals includes:

- Base unit
- Option Enable Broadcast Standard (R&S SMCVB-K519)
- Option DVB-T2 (R&S SMCVB-K164)

3 DVB-T2 configuration and settings

This section provides an overview on the DVB-T2 settings.

Access:

- ▶ Select "Baseband > DVB-T2".

The remote commands required to define these settings are described in [Chapter 5, "Remote-control commands"](#), on page 79.

Settings:

• General settings	12
• Input signal settings	15
• Mode & stream settings	29
• BICM settings	34
• OFDM settings	38
• System settings	42
• SFN settings	49
• Frame info	53
• Data generation settings	57
• Global connector settings	58
• TS player	58
• Local IP data network settings	68

3.1 General settings

Access:

- ▶ Select "Baseband > DVB-T2".

DVB-T2	Input Signal	Mode & Stream	BICM	OFDM	System	Frame Info	
T2-MI On	No of PLPs 1						X
<input checked="" type="checkbox"/>							Set To Default
							Recall
							Save
T2-MI Interface							Data Generation ...
T2-MI PID (Hex)							Test Cases ...
							None
T2-MI SID (Hex)							Reset Log File
Transport stream packet unlocked							

The tab provides default settings, save and recall settings and settings to configure T2-MI interface parameters.

The remote commands required to define these settings are described in [Chapter 5.1, "General commands"](#), on page 80.

Settings:

State.....	13
Set To Default.....	13
Save/Recall.....	13
T2-MI Interface.....	14
T2-MI PID (Hex).....	14
T2-MI SID (Hex).....	14
Data Generation.....	14
Test Cases.....	14
└ Filter Test Cases.....	14
Reset Log File.....	14
Status Info.....	15

State

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

Remote command:

[:SOURce<hw>] :BB:T2DVb:STATe on page 80

Set To Default

Calls the default settings. The values of the main parameters are listed in the following table.

Parameter	Value
State	Not affected by the "Set to Default"

Remote command:

[:SOURce<hw>] :BB:T2DVb:PRESet on page 80

Save/Recall

Accesses the "Save/Recall" dialog, that is the standard instrument function for saving and recalling the complete dialog-related settings in a file. The provided navigation possibilities in the dialog are self-explanatory.

The settings are saved in a file with predefined extension. You can define the filename and the directory, in that you want to save the file.

See also, chapter "File and Data Management" in the R&S SMCV100B user manual.

Remote command:

[:SOURce<hw>] :BB:T2DVb:SETTing:CATalog? on page 81

[:SOURce<hw>] :BB:T2DVb:SETTing:DELeTe on page 81

[:SOURce<hw>] :BB:T2DVb:SETTing:LOAD on page 81

[:SOURce<hw>] :BB:T2DVb:SETTing:STORe on page 81

T2-MI Interface

Activates the T2-MI modulator interface.

"On" Uses the incoming T2-MI stream to configure the modulator.

"Off" Uses the incoming MPEG transport stream directly as payload for single PLP transmission.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:INTerface` on page 84

T2-MI PID (Hex)

Requires "T2-MI Interface > On".

Sets the PID.

The PID belongs to MPEG transport stream packets, that contain T2-MI data.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:PID` on page 84

T2-MI SID (Hex)

Requires "T2-MI Interface > On".

Sets the T2-MI transport SID.

Use the SID, when transmitting a composite signal, in accordance with annex I of the specification [ETSI EN 302 755](#).

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:SID` on page 85

Data Generation

Accesses the "DVB-T2 Data Generation" dialog.

See [Chapter 3.9, "Data generation settings"](#), on page 57.

Test Cases

Accesses a standard file-select dialog to select DVB-T2 test cases.

For available test cases, see [Chapter A, "DVB-T2 test cases"](#), on page 143.

Filter Test Cases ← Test Cases

Filters the list of available test cases.

Reset Log File

Requires "T2-MI Interface > On".

Resets the log file.

Status information of the T2-MI analyzer as displayed in "Status Info" is saved to a log file. The log file `DVBT2_T2MI_Status_Info_TX.txt` is saved to the directory `var/user/log`.

See also, chapter "File and Data Management" in the R&S SMCV100B user manual.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:RESetlog` on page 85

Status Info

Displays the status of the T2-MI analyzer by an error message. "No Error" implies correct behavior of the analyzer. Status information of the T2-MI analyzer is saved to a log file, see "[Reset Log File](#)" on page 14.

To ensure correct behavior, fix occurring errors successively.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:ANALyzer? on page 84

3.2 Input signal settings

Access:

- ▶ Select "Baseband > DVB-T2 > Input Signal".

The dialog provides settings to configure the input signal.

Input signal tasks

The settings allow you to perform the following tasks:

- Selecting an [MPEG TS](#) or [T2-MI](#) source
- Displaying information about the selected stream (e.g. data rate)
- Configuring the internal MPEG TS test packets

How to: [Chapter 4.1, "Configuring the input signal"](#), on page 71

Settings:

- [General settings](#)..... 16
- [PLP info](#).....19
- [T2-MI data packet timing settings](#).....21
- [Test signal settings](#).....24
- [IP channel x settings](#).....26

3.2.1 General settings

Access:

- ▶ Select "Input Signal > General".

DVB-T2 T2-MI On	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	✕	
T2-MI Interface <input checked="" type="checkbox"/>		Source					General	
Number of PLPs 1		Global Connectors ...					PLP Info	
T2-MI PID (Hex) 1000		Input					T2-MI Data Packet Timing	
T2-MI SID (Hex) 0		IP TS Channel					Test Signal	
							IP Channel 1	

The tab provides general settings to configure the input signal.

Settings:

T2-MI Interface.....	16
Source.....	16
Number of PLPs.....	17
Input.....	17
Input Format.....	17
IP TS Channel.....	18
T2-MI PID (Hex).....	18
T2-MI SID (Hex).....	18
Stuffing.....	18
Test Signal.....	18

T2-MI Interface

Activates the T2-MI modulator interface.

"On" Uses the incoming T2-MI stream to configure the modulator.

"Off" Uses the incoming MPEG transport stream directly as payload for single PLP transmission.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:INTerface on page 84

Source

Sets the modulation source for the input signal.

- "External" Uses a transport stream, that is input at the "TS IN"/"IP Data" interface.
- For more information about connecting to the interfaces, see also:
- "TS IN" interface: Section "Configuring the Global Connectors" in the R&S SMCV100B user manual.
 - "IP Data" interface: [Chapter 3.12, "Local IP data network settings"](#), on page 68.
- "TS Player" Uses an internal transport stream with TS packet data played from a file. The player requires no option. Playing encrypted files with extension `_c` requires a stream library option R&S SMCVB-KSx.
- See also:
- [Chapter 3.11, "TS player"](#), on page 58
 - [Supported TS player file types](#)
- "Test Signal" Requires "T2-MI Interface > Off". Uses an internal test signal as specified in [Chapter 3.2.4, "Test signal settings"](#), on page 24.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:SOURce` on page 83

Number of PLPs

Displays the number of PLPs.

The available number of PLPs depends on the setting of "T2-MI Interface":

- If "T2-MI Interface > Off", the number of PLPs is "1" (single PLP).
- If "T2-MI Interface > On", maximum "1 to 20" PLPs are supported.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:NPLP?` on page 87

Input

Requires "Source > External".

Sets the external input interface.

- "TS IN" Input for serial transport stream data. The signal is input at the "User 1" connector.
- "IP" Input for IP-based transport stream data (TSoverIP). The signal is input at the "IP Data" connector.

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut` on page 83

Input Format

Requires "Source > External" and "Input > TS IN".

Sets the format of the input signal.

- "ASI" [ASI format](#)
- "SMPTE 310" [SMPTE 310 format](#)

Remote command:

`[:SOURce<hw>] :BB:T2DVb:INPut:FORMat` on page 84

IP TS Channel

Requires "Source > External" and "Input > IP".

Selects the IP-based transport stream (TS) channel. You can select 1 out of 4 IP TS channels as input at the "IP Data" interface.

To configure a particular channel, see [Chapter 3.2.5, "IP channel x settings"](#), on page 26.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:TSChannel` on page 85

T2-MI PID (Hex)

Requires "T2-MI Interface > On".

Sets the [PID](#).

The PID belongs to MPEG transport stream packets, that contain T2-MI data.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:PID` on page 84

T2-MI SID (Hex)

Requires "T2-MI Interface > On".

Sets the T2-MI transport [SID](#).

Use the SID, when transmitting a composite signal, in accordance with annex I of the specification [ETSI EN 302 755](#).

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:SID` on page 85

Stuffing

Requires "External/TS Player" and "T2-MI Interface > Off".

Activates stuffing.

"On" Inserts null packets and corrects the [PCR](#) values.

"Off" The data rate of the transport stream source must match the data rate required for the current modulation parameters.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:INPut:STUFFing` on page 88

Test Signal

Requires "T2-MI Interface > Off" and "Source > Test Signal".

Defines the test signal data.

"Test TS Packet"

Standardized packet data used as modulation data in the transport stream. To configure the packet structure, select the side tab "Test Signal > Test TS Packet".

Uses a null packet as the test signal. To configure the null packet, see [Chapter 3.2.4, "Test signal settings"](#), on page 24.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:INPut:TESTsignal` on page 92

3.2.2 PLP info

Access:

- ▶ Select "Input Signal > PLP Info".

	PLP 0
PLP Input Format	TS
Useful Data Rate / Mbit/s	0.000

The tab displays the "PLP <num>" table, that contains individual **PLP** information of up to 20 PLPs.

The information comprises input parameters for each PLP.

Settings:

PLP <num> table.....	19
L PLP Input Format.....	19
L Packet Length.....	19
L Stuffing.....	20
L Max. Useful Data Rate / Mbit/s.....	20
L Measured Data Rate / Mbit/s.....	20
L Useful Data Rate / Mbit/s.....	20

PLP <num> table

Displays individual parameters for each PLP <num>. The table displays information of up to 20 PLPs with <num> ranging from 0 to 19.

PLP Input Format ← PLP <num> table

Displays the input format of each PLP <num> for all input sources.

"GFPS/GCS/GSE" require "T2-MI Interface > On".

To edit the input format, select "Input Signal > General > Input Format".

"TS"	Transport stream
"GFPS"	Generic fixed-length packetized stream
"GCS"	Generic continuous stream
"GSE"	Generic stream encapsulation

Remote command:

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:INPut:FORMat on page 87

Packet Length ← PLP <num> table

Requires "T2-MI Interface > Off" and "Source > External".

Displays the packet length of the external transport stream in bytes.

If the packet length does not match the specified length, the output signal is erroneous.

"Packet Length > Invalid" is displayed.

"188" 188 byte packets specified for serial input ("Input > TS IN") and parallel input ("Input > IP").

"Invalid" Packet length ≠ 188 bytes, i.e. the length is not a specified length.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:PACKetlength?` on page 88

Stuffing ← PLP <num> table

Requires "External/TS Player" and "T2-MI Interface > Off".

Activates stuffing.

"On" Inserts null packets and corrects the PCR values.

"Off" The data rate of the transport stream source must match the data rate required for the current modulation parameters.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:INPut:STUFfing` on page 88

Max. Useful Data Rate / Mbit/s ← PLP <num> table

Requires "T2-MI Interface > Off" and "Source > External/TS Player".

Displays the maximum data rate, that is derived from the current modulation parameter settings.

The value is the optimal value at the TS input interface, that is necessary for the modulator.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:USEFul [:RATE] :MAX?` on page 89

Measured Data Rate / Mbit/s ← PLP <num> table

Requires "T2-MI Interface > Off" and "Source > External".

Displays the measured value of the data rate r_{meas} of one of the following:

- External transport stream including null packets input at "User 1" connector
- External transport stream including null packets input at "IP Data/LAN" connector (TSoverIP)

The value r_{meas} equals the sum of useful data rate r_{useful} and the rate of null packets r_0 :

$$r_{\text{meas}} = r_{\text{useful}} + r_0$$

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch> [:INPut] :DATarate?` on page 89

Useful Data Rate / Mbit/s ← PLP <num> table

Requires "Source > External/TS Player".

Displays the data rate of useful data r_{useful} of the external transport stream. The data rate is measured at the input of the installed input interface.

The value is measured or computed depending on the setting of "T2-MI Interface":

- If "T2-MI Interface > Off" and "Source > External/TS Player", the value is measured.
- If "T2-MI Interface > On", the value is computed.

Remote command:

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:USEFul [:RATE] ? on page 88

3.2.3 T2-MI data packet timing settings

Access:

1. Select "Input Signal > T2-MI Interface > On".
The "T2-MI Data Packet Timing" side-tab appears.
2. Select "Input Signal > T2-MI Data Packet Timing"

DVB-T2 T2-MI On	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info		X
Measurement Mode		T2-MI Tmax1		0.000 ms		General		
Absolute		T2-MI Tmin1		0.000 ms		PLP Info		
T2-MI Tmax2		T2-MI Tmin2		0.000 ms		T2-MI Data Packet Timing		
T2-MI Tmax3		T2-MI Tmin3		0.000 ms		Test Signal		
T2-MI Tmax4		T2-MI Tmin4		0.000 ms				

The tab provides packet timing settings for data input at the T2-MI interface.

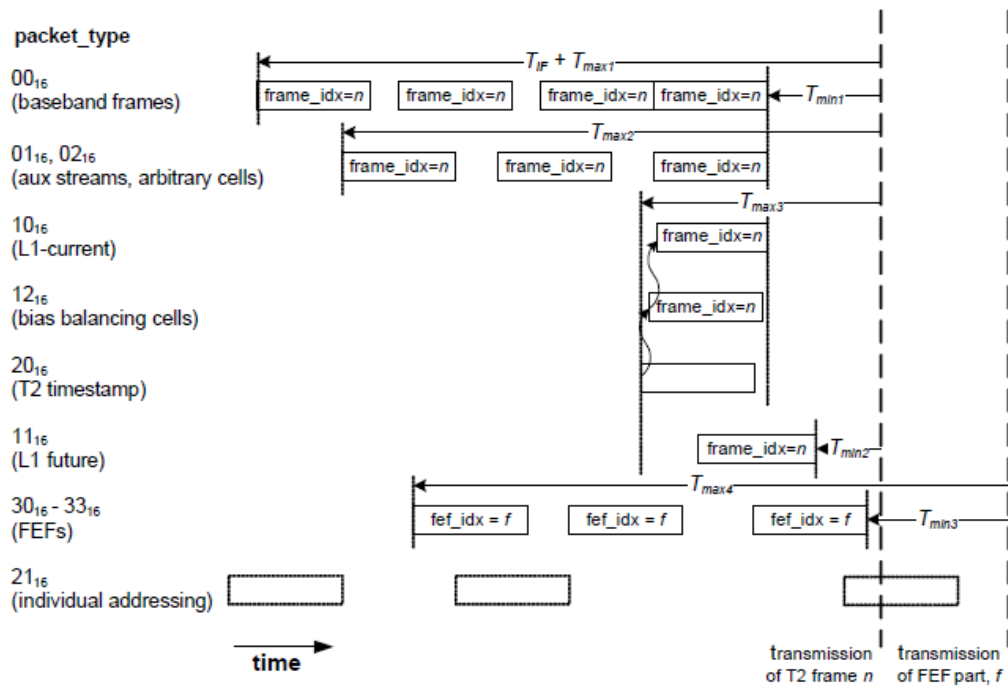


All operations on frame_idx are modulo N_{T2} .

Individual addressing functions (packet_type 21₁₆) can be sent at any time.

The T2 timestamp refers to the transmission time of the super frame, although it is sent at any time.

The figure below shows a single PLP. If using multiple PLPs, the interleaving frame duration T_{IF} and hence the timing requirements for the type 00₁₆ packets can be different for different PLPs.



Settings:

All following settings require "T2-MI Interface > On".

Measurement Mode..... 22

T2-MI T_{min1} 22

T2-MI T_{min2} 23

T2-MI T_{min3} 23

T2-MI T_{max1} 23

T2-MI T_{max2} 23

T2-MI T_{max3} 24

T2-MI T_{max4} 24

Measurement Mode

Specifies the measurement mode to configure the evaluation of T2-MI timing parameters.

- "Absolute" Displays the absolute values of the measured T2-MI timing parameters.
- "Delta" Displays the measured delta values of two consecutive T2-MI packets for each T2-MI timing parameter.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:MEASuremode on page 90

T2-MI T_{min1}

Displays the current value of T_{min1} .

T2-MI packets arrive at the modulator not later than $T_{\min1}$ before starting transmission of the corresponding T2 frame, if:

- T2-MI packets are of type: 00_{16} , 01_{16} , 02_{16} , 10_{16} , 12_{16} , 20_{16}
- `frame_idx` is given

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:MIN:T1?` on page 90

T2-MI $T_{\min2}$

Displays the current value of $T_{\min2}$.

T2-MI packets arrive at the modulator not later than $T_{\min2}$ before starting transmission of the corresponding T2 frame, if:

- T2-MI packets are of type: 11_{16}
- `frame_idx` is given

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:MIN:T2?` on page 90

T2-MI $T_{\min3}$

Displays the current value of $T_{\min3}$.

T2-MI packets arrive at the modulator not later than $T_{\min3}$ before starting transmission of the corresponding FEF part, if:

- T2-MI packets are of type: 30_{16} , 31_{16} , 32_{16} , 33_{16}
- `fef_idx` is given

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:MIN:T3?` on page 90

T2-MI $T_{\max1}$

Displays the current value of $T_{\max1}$.

T2-MI packets arrive at the modulator not earlier than $T_{IF} + T_{\max1}$ before starting transmission of the corresponding T2 frame, if:

- T2-MI packets are of type: 00_{16} type
- `frame_idx` is given

T_{IF} is the duration of one interleaving frame for the corresponding PLP.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:MAX:T1?` on page 91

T2-MI $T_{\max2}$

Displays the current value of $T_{\max2}$.

T2-MI packets arrive at the modulator not earlier than $T_{\max2}$ before starting transmission of the corresponding T2 frame, if:

- T2-MI packets are of type: 01_{16} , 02_{16}
- `frame_idx` is given

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:INPut:T2MI:MAX:T2?` on page 91

T2-MI T_{max3}

Displays the current value of T_{max3} .

T2-MI packets arrive at the modulator not earlier than T_{max3} before starting transmission of the corresponding T2 frame, if:

- T2-MI packets are of type: 10_{16} , 11_{16} , 12_{16} , 20_{16}
- `frame_idx` is given

Remote command:

[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:MAX:T3? on page 91

T2-MI T_{max4}

Displays the current value of T_{max4} .

T2-MI packets arrive at the modulator not earlier than T_{max4} before starting transmission of the corresponding FEF part, if:

- One of the following types: 30_{16} , 31_{16} , 32_{16} , 33_{16}
- Given `fef_idx`

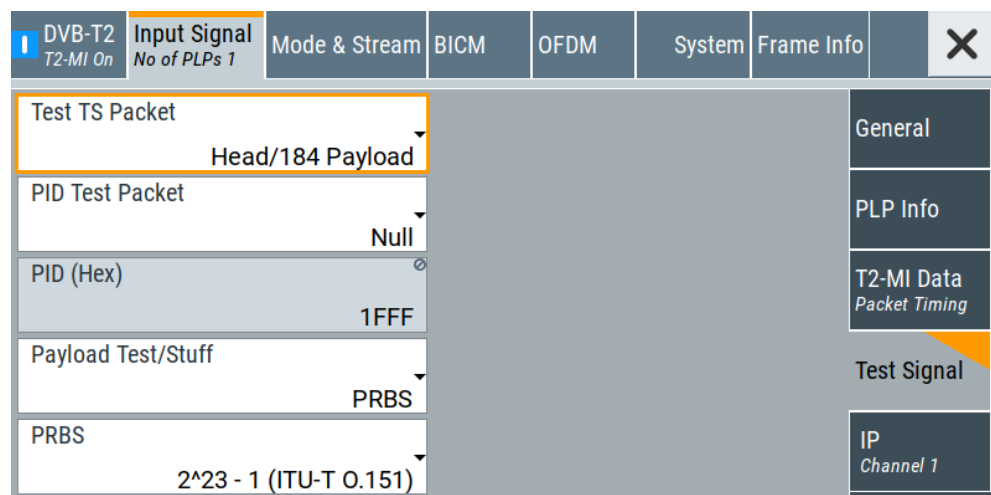
Remote command:

[:SOURce<hw>] :BB:T2DVb:INPut:T2MI:MAX:T4? on page 91

3.2.4 Test signal settings

Access:

- ▶ Select "Input Signal > Test Signal".



The tab provides settings to configure the test signal.

Settings:

Test TS Packet.....	25
PID Test Packet.....	25
PID (Hex).....	25
Payload Test/Stuff.....	25
PRBS.....	25

Test TS Packet

Specifies the structure of the test transport stream packet that is fed to the modulator.

"Head/184 Payload"

A sync byte (0x47) followed by three header bytes and 184 payload bytes.

"Sync/187 Payload"

A sync byte (0x47) followed by 187 payload bytes.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:TSPacket on page 93

PID Test Packet

If a header is present in the test packet ("Test TS Packet > Head/184 Payload"), you can specify a fixed or variable packet identifier (PID).

"Null" The header of the test transport stream packets has a fixed setting of null packet header 1FFF (hex).

"Variable" Uses the header value defined with "PID (Hex)" on page 25.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PIDTestpack on page 92

PID (Hex)

Sets the PID.

If "PID Test Packet > Null", "PID (Hex) = 1FFF" is fixed.

If "PID Test Packet > Variable", you can edit the value.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PID on page 92

Payload Test/Stuff

Defines the payload area content of the TS packet.

You can select PRBS or exclusively data in hexadecimal format as payload.

For "Source > Test Signal", the packet is a test packet.

For "Stuffing > On", the packet is a null packet. Null packets are inserted into the external transport stream to adapt the stream data rate. See also "Measured Data Rate / Mbit/s" on page 20

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PAYLoad on page 92

PRBS

Sets the length of the PRBS sequence.

You can select a PRBS 15 or a PRBS 23 sequence as specified by ITU-T O.151.

Remote command:

[:SOURce<hw>] :BB:T2DVb:PRBS [:SEquence] on page 93

3.2.5 IP channel x settings

Access:

1. Select "Input Signal > General".
2. Select "Source > External"
3. Select "Input > IP"
4. Select "Input Signal > IP Channel x"

Input IP <input type="checkbox"/>	Alias	Alias 1	General
Type Unicast	Multicast Address	226.0.0.0	Info
Port 6 002	IGMPv3 Source Address	0.0.0.0	Test Signal
Ping Source Address	Local IP Data Network ...		IP Channel 1
Ping Result			

The tab provides settings to configure IP channel x.

You can configure settings for 4 IP channels $x = 1$ to 4 individually, see also "Input Signal > General > IP TS Channel".



IP channel settings affect input IP data of the local IP data network. The settings are independent from the used broadcast standard configuration.

Saving/recalling a certain IP channel or local IP data network configuration is not possible via the broadcast standard-specific functionality.

Use the global save/recall functionality instead, see section "Saving and Recalling Instrument Settings" in the R&S SMCV100B user manual.

The table below shows the availability of the tab in the broadcast standard configuration.

Table 3-1: IP channel configuration support in broadcast standards

Baseband standard	"IP Channel x"	Baseband standard	"IP Channel x"
"ATSC/ATSC-M/H"	Yes	"DVB-S"	Yes
"ATSC 3.0"	No	"DVB-S2"	Yes
"DTMB"	Yes	"DVB-C"	Yes
"DVB-T"	Yes	"J.83/B"	Yes
"DVB-T2"	Yes	"DRM"	No
"ISDB-T"	Yes	"Audio AM"	No
"T-DMB/DAB"	Yes	"Audio FM"	No

See also:

- [Chapter 4.1.1, "How to apply an external IP input signal"](#), on page 71
- [Chapter 3.12, "Local IP data network settings"](#), on page 68

Requirements

At your IP source, set the "transport stream packets per internet protocol packet" (TP per IP) parameter as follows:

- If TP packet length = 188 bytes: Set TP per IP to 7 or 6.
- If TP packet length = 204/208 bytes: Set TP per IP to 6.

We recommend that you use a separate LAN infrastructure to stream the transport streams via IP to the IP connector of the baseband board. Also, avoid TS packet losses during IP transmission.

Settings:

Input IP	27
Alias	27
Type	28
Multicast Address	28
Port	28
IGMPv3 Source Address	28
Ping Source Address	28
Ping Result	28
Local IP Data Network	29

Input IP

Activates/deactivates the IP input.

Remote command:

[\[:SOURCE<hw>\]:BB:INPut:IP<ch>\[:STATE\]](#) on page 94

Alias

Sets a unique name for the IP connection.

The definition of a name is optional but facilitates identification in the measurement views. The name input fits maximum 16 characters in ASCII format.

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:ALIAS` on page 95

Type

Sets the input signal type.

- "Unicast" Analyzes all unicast IP packets that arrive at the specified "Port".
- "Multicast" When an IP address is in the multicast address range, an attempt is made to join a multicast group using **IGMP**. Set "Multicast Address" and "Port".

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:TYPE` on page 95

Multicast Address

Editing requires "Type > Multicast".

Sets the destination IP address (IPv4) of the IP connection.

You can set addresses from "224.0.0.0" to "239.255.255.255".

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:MULTicast:ADDRESS` on page 96

Port

Sets the destination UDP port.

Due to **UDP/RTP** autosensing, we recommend that you set a port offset of at least 6 between neighboring IP TS channels.

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:PORT` on page 95

IGMPv3 Source Address

Requires "Type > Multicast".

Sets the **IGMPv3** source address.

If you need to filter the data sent to the multicast address, specify the source address. A source address different from "0.0.0.0" accepts only data originating from the specified IP address.

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:IGMP [:SOURce] :ADDRESS` on page 96

Ping Source Address

Clicking "Ping Source Address" triggers pinging of the IGMPv3 source address.

If you set a different value from "IGMPv3 Source Address = 0.0.0.0" and click the button, the software checks if the address is reachable.

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch>:IGMP [:SOURce] :PING` on page 96

Ping Result

Displays the result after pinging the source address.

If "Ping Result > Ping: Successful", the source address is available in the network.

If "Ping Result > Ping: Transmit Failed. xxx", the source address is not available in the network. "xxx" can be, e.g. "General Failure". Try another "IGMPv3 Source Address".

Remote command:

[:SOURce<hw>] :BB:INPut:IP<ch>:IGMP[:SOURce]:RESult? on page 96

Local IP Data Network

Accesses local IP data network settings, see [Chapter 3.12, "Local IP data network settings"](#), on page 68.

3.3 Mode & stream settings

Access:

- ▶ Select "Baseband > DVB-T2 > Mode & Stream".

The tab provides settings to configure mode and stream adaptation parameters.

Settings:

- [PLP 0 settings](#).....29
- [PLP info](#).....31

3.3.1 PLP 0 settings

Access:

- ▶ Select "Mode & Stream > PLP 0".

The screenshot shows a configuration window with several tabs: DVB-T2 (T2-MI Off), Input Signal (No of PLPs 1), Mode & Stream (selected), BICM, OFDM, System, Frame Info, and a close button (X). The 'Mode & Stream' tab is active and displays the following settings for PLP 0:

PLP ID (Hex)	00	PLP 0
PLP Group ID (Hex)	01	PLP Info
PLP Type	D. Type 1	
BB Mode	HEM	

The tab provides settings to configure mode and stream parameters of "PLP 0".

Editing "PLP 0" settings requires "T2-MI Interface > Off".

Settings:

PLP ID (Hex).....	30
PLP Group ID (Hex).....	30
PLP Type.....	30
BB Mode.....	30

PLP ID (Hex)

Sets the PLP ID. The PLP ID has to be unique.

You can set the PLP ID in hexadecimal representation.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:ID on page 100

PLP Group ID (Hex)

Sets the PLP group ID for multi-PLP, i.e. the number of PLPs is greater than 1.

Multi-PLP requires number of PLPs > 1, see "Number of PLPs" on page 17.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:GROup on page 99

PLP Type

Sets the PLP type.

The type depends on the number of PLPs in the setup.

"Common"	Requires a multi-PLP setup. Common PLP of the PLP Group.
"D. Type 1"	Data type 1. Fixed for a single-PLP setup. Configurable for a multi-PLP stream.
"D. Type 2"	Requires a multi-PLP setup. Data type 2.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:TYPE on page 102

BB Mode

Defines the baseband mode.

"HEM"	High efficiency mode.
"NM"	Normal mode.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:BB_Mode on page 98

3.3.2 PLP info

Access:

- ▶ Select "Mode & Stream > PLP Info".

	PLP 0
PLP ID (Hex)	00
PLP Group ID (Hex)	01
PLP Type	D. Type 1
BB Mode	HEM
ISSY	Off
Null Packet Deletion	Off
In-Band Signaling	Off
Other In-Band PLPs	0
CM Type	CCM

The tab displays the "PLP <num>" table, that contains individual [PLP](#) information of up to 20 PLPs.

The information comprises mode and stream parameters for each PLP.

To configure "PLP Info" "Mode & Stream" parameters

1. Select "DVB-T2 > T2-MI Interface > Off".
2. Select "Mode & Stream > PLP 0".

You can configure the parameters only for "PLP 0".

Settings:

PLP <num> table.....	32
L PLP ID (Hex).....	32
L PLP Group ID (Hex).....	32
L PLP Type.....	32
L BB Mode.....	32
L ISSY.....	32
L Null Packet Deletion.....	33
L In-Band Signaling.....	33
L In-Band Signaling A.....	33
L In-Band Signaling B.....	33
L Other In-Band PLPs.....	33
L CM Type.....	33
L Static Flag.....	34
L Static Padding Flag.....	34

PLP <num> table

Displays individual parameters for each PLP <num>. The table displays information of up to 20 PLPs with <num> ranging from 0 to 19.

Note: Numbering in remote control commands.

The suffix `PLP<ch>` ranges from 1 to 20, the PLP number `num` ranges from 0 to 19.

See ["Common suffixes"](#) on page 79.

How to: ["To configure "PLP Info" "Mode & Stream" parameters"](#) on page 31

PLP ID (Hex) ← PLP <num> table

Sets the PLP ID. The PLP ID has to be unique.

You can set the PLP ID in hexadecimal representation.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:ID](#) on page 100

PLP Group ID (Hex) ← PLP <num> table

Sets the PLP group ID for multi-PLP, i.e. the number of PLPs is greater than 1.

Multi-PLP requires number of PLPs > 1, see ["Number of PLPs"](#) on page 17.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:GRoup](#) on page 99

PLP Type ← PLP <num> table

Sets the PLP type.

The type depends on the number of PLPs in the setup.

"Common"	Requires a multi-PLP setup. Common PLP of the PLP Group.
"D. Type 1"	Data type 1. Fixed for a single-PLP setup. Configurable for a multi-PLP stream.
"D. Type 2"	Requires a multi-PLP setup. Data type 2.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:TYPE](#) on page 102

BB Mode ← PLP <num> table

Defines the baseband mode.

"HEM" High efficiency mode.

"NM" Normal mode.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:BB_Mode](#) on page 98

ISSY ← PLP <num> table

Displays the **ISSY** state.

"OFF" ISSY is not active. ISSY indicator field is 0.

"Short" ISSY is active. ISSY indicator field is 1. The synchronizer uses a short **ISCR**.

"Long" ISSY is active. ISSY indicator field is 1. The synchronizer uses a long ISCR.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:ISSY? on page 101

Null Packet Deletion ← PLP <num> table

Displays the null packet deletion state.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:NPD? on page 101

In-Band Signaling ← PLP <num> table

Requires "System > L1 T2 Version = 1.1.1", see "L1 T2 Version" on page 46.

Displays the in-band signaling state.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:IBS? on page 99

In-Band Signaling A ← PLP <num> table

Requires "System > L1 T2 Version ≠ 1.1.1", see "L1 T2 Version" on page 46.

Displays the in-band signaling type A state.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:IBS:A? on page 100

In-Band Signaling B ← PLP <num> table

Requires "System > L1 T2 Version ≠ 1.1.1", see "L1 T2 Version" on page 46.

Displays the in-band signaling type B state.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:IBS:B? on page 100

Other In-Band PLPs ← PLP <num> table

Displays the number of other PLPs signaled within the in-band signaling of the PLP for multi-PLP.

Multi-PLP requires number of PLPs > 1, see "Number of PLPs" on page 17.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:OIBPlp? on page 101

CM Type ← PLP <num> table

Displays the CM type for multi-PLP.

Multi-PLP requires number of PLPs > 1, see "Number of PLPs" on page 17.

Displays the CM type for multi-PLP (number of PLPs > 1).

- "CCM" Constant coding and modulation.
The setting implies identical settings for all PLPs of the following parameters:
- "FEC Frame" on page 35
 - "Code Rate" on page 35
 - "Constellation" on page 36
 - "Const. Rotation" on page 36
- "ACM" Variable coding and modulation.
The term ACM is retained for compatibility with DVB-S2 specified in ETSI EN 302 307. Not all PLPs use the same coding and modulation.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:CMTYPE? on page 98

Static Flag ← PLP <num> table

Indicates if the scheduling for the current PLP varies from T2 frame to T2 frame or remains static.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:STAFflag? on page 102

Static Padding Flag ← PLP <num> table

Indicates if BBFrame padding other than for in-band signaling is used for the current PLP.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:PADFlag? on page 102

3.4 BICM settings

Access:

- ▶ Select "Baseband > DVB-T2 > BICM".

The tab provides settings to configure bit-interleaved coding and modulation (BICM) parameters.

Settings:

- [PLP 0 settings](#).....35
- [PLP info](#).....37

3.4.1 PLP 0 settings

Access:

- ▶ Select "BICM > General".

DVB-T2 T2-MI Off	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	✕
FEC Frame	Normal	Time Interleaver Type	0	PLP 0			
Code Rate	3/5	Frame Interval (I _{Jump})	1	PLP Info			
Constellation	256QAM	Time Interleaver Length	3				
Const. Rotation	<input checked="" type="checkbox"/>	First Frame Index	0				

The tab provides settings to configure BICM parameters of "PLP 0".

Settings:

FEC Frame.....	35
Code Rate.....	35
Constellation.....	36
Const. Rotation.....	36
Time Interleaver Type.....	36
Frame Interval (I _{Jump}).....	36
Time Interleaver Length.....	36
First Frame Index.....	36

FEC Frame

Editing the parameter requires "T2-MI Interface > Off".

Sets the FEC frame.

"Normal" $N_{LDPC} = 64800$

"Short" $N_{LDPC} = 16200$

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:FECFRAME on page 105

Code Rate

Editing the parameter requires "T2-MI Interface > Off".

Sets the code rate.

"1/3"/"2/5" Code rates not available for "System > Network > Transmission System > SISO/MISO".

See "Transmission System" on page 44.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:RATE on page 106

Constellation

Editing the parameter requires "T2-MI Interface > Off".

Defines the constellation.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:CONStel` on page 104

Const. Rotation

Editing the parameter requires "T2-MI Interface > Off".

Sets the constellation rotation state.

"On" Transmits the constellation rotated, i.e. the Q path is delayed vs. the I path. For each constellation, there is a different (but fixed) angle of rotation.

"Off" Transmits non-rotated constellation.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:CROtation` on page 104

Time Interleaver Type

Editing the parameter requires "T2-MI Interface > Off".

Defines the time interleaver type.

"0" Maps each interleaving frame directly to a T2 frame.

"1" Maps each interleaving frame to more than one T2 frame.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:TIL:TYPE` on page 106

Frame Interval (I_{Jump})

Defines the time interleaver frame interval (I_{Jump}).

"1" Used if the PLP appears in each frame. Fixed setting for single PLP.

"2" to "255" Requires a multi-PLP setup.
If frame interval is 2, for example, an interleaving frame is distributed among two successive T2 frames with an even frame index. For limitations, see specification [ETSI EN 302 755](#).

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:TIL:FINT` on page 106

Time Interleaver Length

Defines the time interleaver length within the time interleaving frame.

If a length of "0" is set and if "Time Interleaver Type" = "0", time interleaving is disabled.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:TIL:LENGth` on page 106

First Frame Index

Displays the index of the first frame of the super frame, in that the current PLP occurs.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:PLP<ch>:FRAMEindex` on page 105

3.4.2 PLP info

Access:

- ▶ Select "BICM > PLP Info".

FEC Frame	Normal
Code Rate	3/5
Constellation	256QAM
Const. Rotation	On
Time Interleaver Type	0
Frame Interval (lJump)	1
Time Interleaver Length	3
First Frame Index	0
FEC Blocks per IF	0
Max. Number of Blocks	0

The tab displays the "PLP <num>" table, that contains individual **PLP** information of up to 20 PLPs.

The information comprises **BICM** parameters for each PLP.

To configure "PLP Info" BICM parameters

1. Select "DVB-T2 > T2-MI Interface > Off".
2. Select "BICM > PLP 0".

You can configure the parameters only for "PLP 0".

Settings:

PLP <num> table.....	37
L FEC Blocks per IF.....	37
L Max. Number of Blocks.....	38

PLP <num> table

Displays individual parameters for each PLP <num>. The table displays information of up to 20 PLPs with <num> ranging from 0 to 19.

Note: Numbering in remote control commands.

The suffix **PLP<ch>** ranges from 1 to 20, the PLP number **num** ranges from 0 to 19.

See "**Common suffixes**" on page 79.

How to: "**To configure "PLP Info" BICM parameters**" on page 37

FEC Blocks per IF ← PLP <num> table

Displays the number of FEC blocks per interleaving frame.

Remote command:

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:BLOCKs? on page 104

Max. Number of Blocks ← PLP <num> table

Displays the maximum number of FEC blocks per interleaving frame.

Remote command:

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:MAXBlocks? on page 105

3.5 OFDM settings

Access:

- ▶ Select "Baseband > DVB-T2 > OFDM".

DVB-T2 T2-MI Off	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	✕	
Channel Bandwidth				8 MHz	Used Bandwidth			7.767 857 1 MHz
Bandwidth Variation				0 ppm	T2 Frames per Super Frame (N_T2)			2
FFT Size				32K Ext.	OFDM Symbols per T2 Frame (L_F)			60
Guard Interval				1/128	Data Symbols per T2 Frame (L_DATA)			59
Pilot Pattern				PP7	Subslices per T2 Frame (N_SUB)			1

The dialog provides settings to configure OFDM settings.

Settings:

Channel Bandwidth.....	38
Used Bandwidth.....	39
Bandwidth Variation.....	40
FFT Size.....	40
Guard Interval.....	40
Pilot Pattern.....	40
T2 Frames per Super Frame (N_T2).....	41
OFDM Symbols per T2 Frame (L_F).....	41
Data Symbols per T2 Frame (L_DATA).....	41
Subslices per T2 Frame (N_SUB).....	41

Channel Bandwidth

Selects the channel bandwidth.

The channel bandwidth correlates with the used bandwidth, that is smaller. See Table 3-2.

Remote command:

[:SOURce<hw>] :BB:T2DVb:CHANnel [:BANDwidth] on page 108

Used Bandwidth

Displays the used bandwidth.

The used bandwidth depends on the channel bandwidth, the FFT size and the carrier mode as described in [Table 3-2](#).

You can set the carrier mode via "FFT Size", e.g. "32K Ext." means 32K FFT size using extended carrier mode.

Table 3-2: Dependencies of the used bandwidth

"Channel Bandwidth"	Elementary frequency	"Used Bandwidth" Normal carrier mode	"Used Bandwidth" Extended carrier mode
1.7 MHz	131/71 MHz	1.535156 MHz	1.567589 MHz
5 MHz	40/7 MHz	4.754464 MHz	4.854911 MHz
6 MHz	48/7 MHz	5.705357 MHz	5.825893 MHz
7 MHz	56/7 MHz	6.656250 MHz	6.796875 MHz
8 MHz	64/7 MHz	7.607143 MHz	7.767857 MHz

Example: Bandwidth coupling (R&S SMCVB-K62)

This example assumes an R&S SMCV100B equipped with the white gaussian noise (AWGN) option R&S SMCVB-K62 additional to the basic equipment, see [Chapter 2.1, "Required options"](#), on page 11.

In the OFDM settings tab, set the channel bandwidth as needed. The corresponding "Used Bandwidth" is displayed.

DVB-T2 T2-MI Off	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	X
Channel Bandwidth				Used Bandwidth			
8 MHz				7.767 857 1 MHz			

If you activate "Bandwidth Coupling" to couple bandwidths of the AWGN signal with the DVB-T2 baseband signal, the AWGN "System Bandwidth" adapts to the set "Used Bandwidth".

General	Noise Power / Output Results	X
State	<input checked="" type="checkbox"/>	Mode
		Additive Noise
System Bandwidth	7.767 9 MHz	Min Noise/System Bandwidth Ratio
		1.000
Noise Bandwidth	7.767 9 MHz	Bandwidth Coupling
		<input checked="" type="checkbox"/>

For more information, see chapter "AWGN settings" in the R&S SMCV100B base unit user manual.

Remote command:

`[:SOURCE<hw>] :BB:T2DVb:USED [:BANDwidth] ?` on page 110

Bandwidth Variation

Requires "Requires T2-MI Interface > Off".

Changes the used bandwidth in the range of ± 1000 ppm.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:BANDwidth:VARiation on page 108

FFT Size

Editing the parameter requires "T2-MI Interface > Off".

Defines the FFT size.

Note:

Not all possible combinations of the FFT size with the following parameters are allowed:

- "Guard Interval" on page 40
- "Pilot Pattern" on page 40

"1K/2K/4K/8K/16K/32K"

1K/2K/4K/8K/16K/32K FFT size using normal carrier mode

"8K Ext./16K Ext./32K Ext."

8K/16K/32K FFT size using extended carrier mode

Remote command:

[:SOURCE<hw>] :BB:T2DVb:FFT:MODE on page 108

Guard Interval

Editing the parameter requires "T2-MI Interface > Off".

Sets the guard interval length.

The length Δ is expressed in fractions of the active OFDM symbol duration T_U , e.g.

$$\Delta / T_U = 19/256$$

Note:

Not all possible combinations of the guard interval with the following parameters are allowed:

- "FFT Size" on page 40
- "Pilot Pattern" on page 40

Remote command:

[:SOURCE<hw>] :BB:T2DVb:GUARd:INTerval on page 109

Pilot Pattern

Editing the parameter requires "T2-MI Interface > Off".

Sets the pilot pattern.

You can select pattern "PP1" to "PP8".

Note:

Not all possible combinations of the pilot pattern with the following parameters are allowed:

- "FFT Size" on page 40
- "Guard Interval" on page 40

Remote command:

[:SOURCE<hw>] :BB:T2DVb:PILOt on page 110

T2 Frames per Super Frame (N_T2)

Editing the parameter requires "T2-MI Interface > Off".

Sets the number of T2 frames per super frame.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:NT2Frames on page 110

OFDM Symbols per T2 Frame (L_F)

Displays the computed number of OFDM symbols per T2 frame L_F .

L_F equals the sum of number of data symbols per T2 frame L_{Data} plus the number of P2 symbols L_{P2} :

$$L_F = L_{Data} + L_{P2}$$

The sum constitutes the number of P2 symbols and the data symbols without the P1 symbol. The number of P2 symbols in a T2 frame depends on the "FFT Size".

Remote command:

[:SOURCE<hw>] :BB:T2DVb:LF? on page 109

Data Symbols per T2 Frame (L_DATA)

Editing the parameter requires "T2-MI Interface > Off".

Sets the number of data symbols per T2 frame.

L_{Data} equals the difference of number of OFDM symbols per T2 frame L_F minus the number of P2 symbols L_{P2} :

$$L_{Data} = L_F - L_{P2}$$

Note:

The value of L_{Data} depends on the following parameters:

- "Guard Interval" on page 40
- "FFT Size" on page 40
- "T2 Frame Duration (T_F)" on page 54

The maximum allowed T2 frame duration is 250 ms

The number of P2 symbols in a T2 frame depends on the "FFT Size".

Remote command:

[:SOURCE<hw>] :BB:T2DVb:LDATa on page 109

Subslices per T2 Frame (N_SUB)

Sets the number of subslices per T2 frame.

The number of subslices is "1" for "T2-MI Interface > Off".

The set value depends on the constellation and the FEC type of all data type 2 PLPs.

"1" Fixed setting for single PLP.

"1" to "6480" Configurable setting for multi-PLP.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:NSUB on page 109

3.6 System settings

Access:

- ▶ Select "Baseband > DVB-T2 > System".

The dialog provides settings to configure DVB-T2 system parameters.

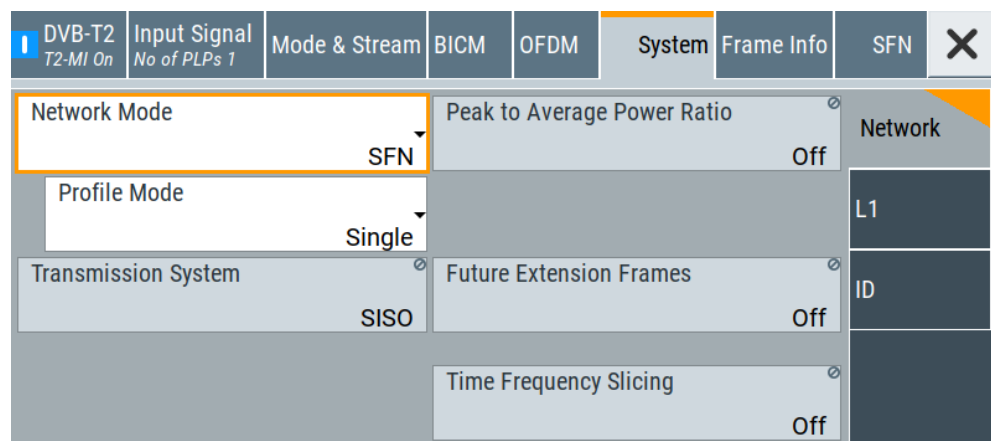
Settings:

- [Network settings](#).....42
- [L1 settings](#).....46
- [ID settings](#)..... 48

3.6.1 Network settings

Access:

- ▶ Select "System > Network".



The tab provides network settings.

Settings:

- [Network Mode](#)..... 43
 - [Profile Mode](#)..... 43
- [Transmission System](#)..... 44
 - [MISO Group Mode](#)..... 44
 - [MISO Group](#)..... 44
- [Peak To Average Power Ratio](#)..... 44
- [Future Extension Frames](#)..... 45
 - [FEF Type \(Hex\)](#)..... 45
 - [FEF Length](#)..... 45

L FEF Interval.....	45
L FEF Payload.....	45
Time Frequency Slicing.....	45

Network Mode

Sets the network mode.

Note: GPS receiver required.

Correct SFN synchronization requires a [GPS](#) receiver:

- Connect the 1PPS output of the GPS receiver to the "User 2" connector of the R&S SMCV100B.
- Connect the 10 MHz output of the GPS receiver to the "Ref. In" connector of the R&S SMCV100B.

At the R&S SMCV100B, set "RF > Reference Frequency > Reference Frequency > Source > External".

"SFN" In [SFN](#) mode, all transmitters in a network are tuned to the same frequency and have frequency coupling (based on the 10 MHz reference output of a GPS receiver). Also, compensate any signal delays that occur in the program data supply. This involves the use of a GPS receiver, see also "[GPS receiver required](#)" on page 43, and timestamps inserted into the T2-MI transport stream. The maximum delay in the network is set on the T2 gateway. It represents the maximum delay which can occur in the program data supply at the most remote transmitter in the network.

If a timestamp was received at the SFN transmitter, its modulator measures the dynamic delay regarding its own received seconds pulse from the local GPS receiver. From this information, together with the processing delay (of the modulator), the RF delay (from modulator to antenna) and the optional static delay, it computes the local delay. The supplied transport stream must undergo the computed local delay value to attain data synchronicity in the network. Note, that it is critical for the incoming transport stream to be identical for all the transmitters in the network, i.e. it may not be changed in any way. See also "[Total Delay](#)" on page 50.

"MFN" In [MFN](#) mode, there is no mandatory coupling between an individual transmitter and the incoming transport stream (based on the seconds pulse from a GPS receiver). In addition, the transmitters are not synchronized with one another based on a common reference and output frequency. You can select the modulation parameters of the transmitters involved in the network. In addition, the incoming transport stream can be adapted to the data rate requirements of the modulation parameter settings.

Remote command:

[:SOURce<hw>] :BB:T2DVb:NETWorkmode on page 114

Profile Mode ← Network Mode

Requires "Network Mode > SFN".

Sets the profile mode.

If the modulator operates in a multiple profile environment and is used to generate an RF combined T2 base/T2 lite composite signal, can be used to mute P1FEF.

- "Single" Modulator operates in normal mode. P1FEF is generated according to DVB-T2 specification [ETSI EN 302 755](#).
- "Multi" Modulator operates in multiple profile environment mode. P1FEF is muted to allow T2 base/T2 lite signal overlay on RF level.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:PROFile](#) on page 115

Transmission System

Editing the parameter requires "T2-MI Interface > Off".

Sets the transmission system.

- "SISO" Enables the [SISO](#) transmission.
- "MISO" Enables the [MISO](#) transmission.
- "Non-T2" Enables the non-T2 transmission.
- "T2 Lite SISO" Enables the T2-Lite SISO transmission.
- "T2 Lite MISO" Enables the T2-Lite MISO transmission.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:TXSYs](#) on page 115

MISO Group Mode ← Transmission System

Requires "Transmission System > MISO/T2 Lite MISO".

Sets the [MISO](#) group mode, that allows to set the MISO group of the modulator manually.

- "Manual" Fixed MISO group mode. Allows manual setting of the "MISO Group".

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:MISO:MODE?](#) on page 114

MISO Group ← Transmission System

Requires "Transmission System > MISO/T2 Lite MISO".

Sets the [MISO](#) group.

- "1" Modulator transmits with MISO group 1.
- "2" Modulator transmits with MISO group 2.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:MISO\[:GROup\]](#) on page 114

Peak To Average Power Ratio

Editing the parameter requires "T2-MI Interface > Off".

Sets the technique to reduce the peak to average power ratio.

The current firmware does not support [ACE](#).

- "Off" Technique disabled.
- "TR" Tone reservation enabled. I/Q values of the [TR](#) carriers are set to zero.

Remote command:

[:SOURce<hw>] :BB:T2DVb:PAPR on page 114

Future Extension Frames

Enables/disables FEF.

"Off" Disables FEF.

"On" Requires "T2-MI Interface > On".
Enables FEF and shows the following subparameters.

Remote command:

[:SOURce<hw>] :BB:T2DVb:FEF on page 112

FEF Type (Hex) ← Future Extension Frames

Displays the type of the associated FEF part.

Remote command:

[:SOURce<hw>] :BB:T2DVb:FEF:TYPE on page 114

FEF Length ← Future Extension Frames

Displays the length of the associated FEF part as the number of elementary periods T. The length is measured from the start of the P1 symbol of the FEF part to the start of the P1 symbol of the next T2 frame.

The FEF length is "0" for "T2-MI Interface > Off" because FEF is only supported for "T2-MI Interface > On". FEF is enabled or disabled by the information received from the T2-MI stream.

Remote command:

[:SOURce<hw>] :BB:T2DVb:FEF:LENGTH on page 113

FEF Interval ← Future Extension Frames

Displays the number of T2 frames between two FEF parts. The specification [ETSI EN 302 755](#) states, that the T2 frame is the first frame in a T2 super frame which contains both FEF parts and T2 frames.

Remote command:

[:SOURce<hw>] :BB:T2DVb:FEF:INTERval on page 112

FEF Payload ← Future Extension Frames

Sets the FEF payload.

"Null" I/Q values of the FEF payload are set to zero.

"Noise" I/Q values of the FEF payload are modulated in the frequency domain using a PRBS and transformed into the time domain by IFFT.
The technique allows generating payload with a power level equal to the T2 frame.

Remote command:

[:SOURce<hw>] :BB:T2DVb:FEF:PAYLoad on page 113

Time Frequency Slicing

Displays that time frequency slicing (TFS) is disabled.

The current firmware does not support TFS.

"Off" Fixed setting.

Remote command:

[:SOURce<hw>] :BB:T2DVb:TFS on page 115

3.6.2 L1 settings

Access:

► Select "System > L1".

DVB-T2 T2-MI Off	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	
L1 T2 Version		T2 Base Lite		Off		Network	
1.1.1							
L1 Post Modulation		Num. Aux. Streams		0		L1	
64QAM							
L1 Repetition		L1 RF Signaling		Off		ID	
Off							
L1 Post Extension							
Off							
L1 Post Scrambled							
Off							

The tab provides common layer 1 (L1) settings.

Settings:

L1 T2 Version.....	46
L1 Post Modulation.....	47
L1 Repetition.....	47
L1 Post Extension.....	47
L1 Post Scrambled.....	47
T2 Base Lite.....	47
Num. Aux. Streams.....	47
L1 RF Signaling.....	48
└ Frequency.....	48

L1 T2 Version

Editing the parameter requires "T2-MI Interface > Off".

Sets the version of T2 specification [ETSI EN 302 755](#), that is used for transmission.

"1.1.1"/"1.2.1"/"1.3.1"

Version V1.1.1/V1.2.1/V1.3.1

Remote command:

[:SOURce<hw>] :BB:T2DVb:L:T2Version on page 119

L1 Post Modulation

Editing the parameter requires "T2-MI Interface > Off".

Sets the modulation of the L1 post signal.

You can select between constellations [BPSK/QPSK/16QAM/64QAM](#).

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:L:CONStel](#) on page 117

L1 Repetition

Editing the parameter requires "T2-MI Interface > Off".

Enables/disables L1 repetition.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:L:REPetition](#) on page 117

L1 Post Extension

Displays the L1 post extension state.

The current firmware does not support L1 post extension.

"Off" Fixed setting.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:L:EXTension](#) on page 117

L1 Post Scrambled

Editing the parameter requires "T2-MI Interface > Off".

Enables/disables L1 post scrambling according to T2 version 1.3.1 of specification [ETSI EN 302 755](#).

See also "[L1 T2 Version](#)" on page 46.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:L:SCRambled](#) on page 118

T2 Base Lite

Editing the parameter requires "T2-MI Interface > Off".

Enables/disables T2 base lite signaling according to T2 version 1.3.1 of specification [ETSI EN 302 755](#).

See also "[L1 T2 Version](#)" on page 46.

"Off" Disables the T2 base lite signaling.

"On" Requires "T2-MI Interface > On".
Enables the T2 base lite signaling.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:L:T2Baselite](#) on page 119

Num. Aux. Streams

Displays the number of auxiliary streams.

The current firmware does not support auxiliary streams.

"0" Fixed setting.

Remote command:

[:SOURce<hw>] :BB:T2DVb:NAUX on page 119

L1 RF Signaling

Displays the RF signaling state in L1.

The setting depends on the setting of the "T2-MI Interface".

"Off" Requires "T2-MI Interface > Off".
Transmitted frequency: 0x0000 0000

"On" Requires "T2-MI Interface > On".
The frequency is received from the T2-MI stream. The value is displayed under "Frequency" on page 48.

Remote command:

[:SOURce<hw>] :BB:T2DVb:L:RFSignalling on page 118

Frequency ← L1 RF Signaling

Requires "T2-MI Interface > On".

Displays the signaled frequency in the L1 signaling.

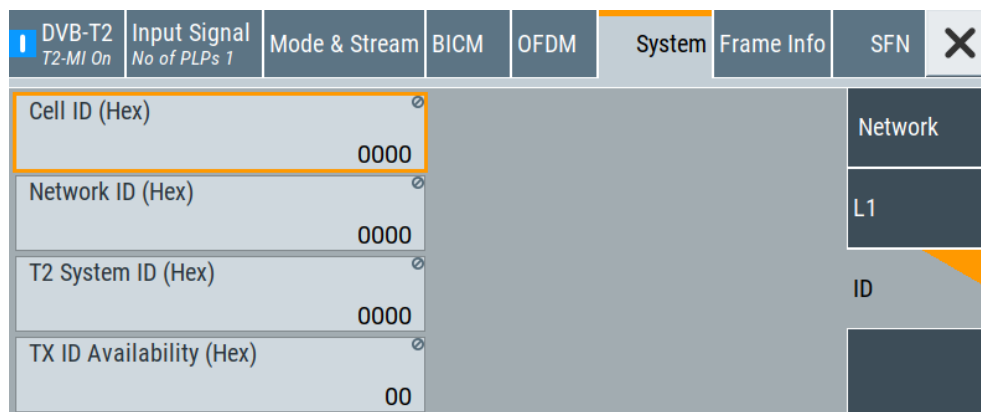
Remote command:

[:SOURce<hw>] :BB:T2DVb:L:RFSignalling:FREQUENCY? on page 118

3.6.3 ID settings

Access:

- ▶ Select "System > ID".



The tab system ID settings.

Settings:

Cell ID (Hex).....	49
Network ID (Hex).....	49
T2 System ID (Hex).....	49
TX ID Availability (Hex).....	49

Cell ID (Hex)

Editing the parameter requires "T2-MI Interface > Off".

Sets the cell identification (ID).

The cell ID is a 16-bit value in hexadecimal representation.

Remote command:

[:SOURce<hw>] :BB:T2DVb:ID:CELL on page 120

Network ID (Hex)

Editing the parameter requires "T2-MI Interface > Off".

Sets the network identification.

The network ID is a 16-bit value in hexadecimal representation.

Remote command:

[:SOURce<hw>] :BB:T2DVb:ID:NETWork on page 120

T2 System ID (Hex)

Editing the parameter requires "T2-MI Interface > Off".

Sets the T2 system identification.

The T2 system ID is a 16-bit value in hexadecimal representation.

Remote command:

[:SOURce<hw>] :BB:T2DVb:ID:T2SYstem on page 121

TX ID Availability (Hex)

Displays if transmitter identification signals are available within the current geographic cell. The parameter is an 8-bit value in hexadecimal representation.

If no transmitter identification signals are used, the parameter is "0x00". All other bit combinations are reserved for future use.

Remote command:

[:SOURce<hw>] :BB:T2DVb:ID:TXID:AVAIL on page 121

3.7 SFN settings

Requires "DVB-T2 > T2-MI Interface > On" and "System > Network Mode > SFN".

Access:

- ▶ Select "Baseband > DVB-T2 > SFN".

The tab provides settings to configure SFN parameters.

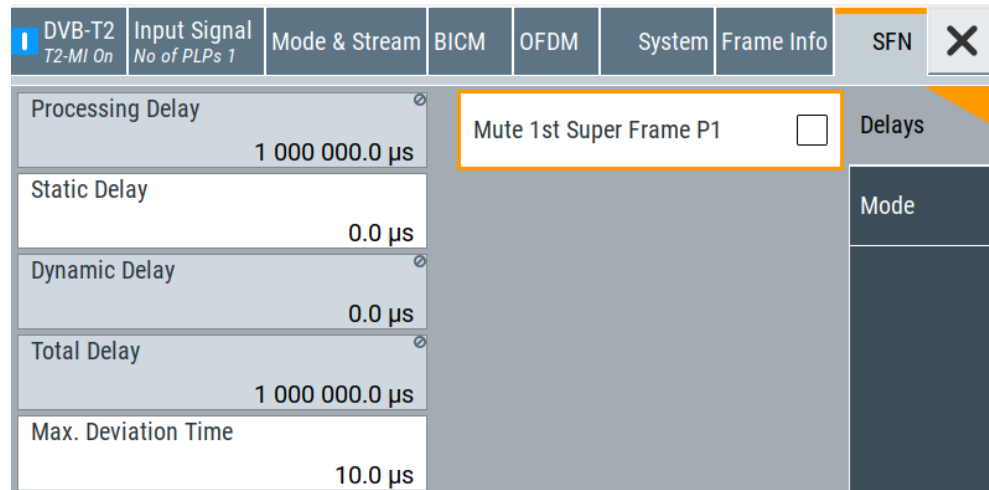
Settings

- Delays..... 50
- Mode..... 51

3.7.1 Delays

Access:

- ▶ Select "SFN > Delays".



The tab provides settings to configure the SFN delay parameters.

Settings

Processing Delay.....	50
Static Delay.....	50
Dynamic Delay.....	50
Total Delay.....	50
Max. Deviation Time.....	51
Mute 1st Super Frame P1.....	51

Processing Delay

Displays the delay from the modulator input up to the SFN delay (FIFO).

Remote command:

[:SOURce<hw>] :BB:T2DVb:DELaY:PROCeSS? on page 123

Static Delay

Sets the delay to shift the time of transmission positively or negatively.

Remote command:

[:SOURce<hw>] :BB:T2DVb:DELaY:STATic on page 124

Dynamic Delay

Displays the transmission delay currently generated by the SFN delay (FIFO).

Remote command:

[:SOURce<hw>] :BB:T2DVb:DELaY:DYNamic? on page 123

Total Delay

Displays the sum of all individual delays.

"Total Delay" = "Process Delay" + "Static Delay" + "Dynamic Delay"

Remote command:

[:SOURCE<hw>] :BB:T2DVb:DElay:TOTal? on page 124

Max. Deviation Time

Sets the maximum permissible delay.

The delay Δt_{\max} depends on the time of emission $TOE_{\text{timestamp}}$ from timestamp, the static delay t_{static} and the actual time of emission TOE_{actual} as follows:

$$\Delta t_{\max} = TOE_{\text{timestamp}} + t_{\text{static}} - TOE_{\text{actual}}$$

If the above sum is greater than the "Max. Deviation Time", the SFN delay (FIFO) restarts. The transmit signal is reset and transmission is restarted.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:DElay:DEviation on page 122

Mute 1st Super Frame P1

Activates muting the P1 symbol of the first T2 frame in a super frame. To mute the P1 symbol, the symbol is set to zero.

Activate muting, e.g., to synchronize different modulators in the same SFN, using an oscilloscope.

Remote command:

[:SOURCE<hw>] :BB:T2DVb:DElay:MUtep1 on page 123

3.7.2 Mode

Access:

- ▶ Select "SFN > Mode".

The tab provides settings to configure the SFN mode parameters.

Settings

Timestamp Mode.....	51
Update Timestamp.....	52
UTC Date.....	52
UTC Time.....	52
Offset.....	52
Seconds Since 2000.....	52

Timestamp Mode

Displays the type of the currently received T2-MI timestamps.

Note:

If you use T2-MI timestamp packets with absolute time information for SFN operation, make sure that the following prerequisites are met:

- The R&S SMCV100B is connected to an NTP time server for time synchronization.

- The R&S SMCV100B uses the automatic time synchronization of the Linux operation system.

For automatic time synchronization, access "System Configuration > Setup > Maintenance > Date/Time". In the "NTP Settings" panel, enter the NTP address and activate "Use Time From NTP Server".

Date / Time		X	
Date [DD.MM.YYYY]	29.05.2020	Time [hh:mm:ss]	16:59:51
Time Zone	UTC		
NTP Settings			
NTP Address	10.111.1.17	Use Time From NTP Server	<input checked="" type="checkbox"/>

"Relative" Received T2-MI stream has T2-MI packets with relative timestamps.

"Absolute" Received T2-MI stream has T2-MI packets with absolute timestamps. If received, the following subparameters are displayed.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:DElay:TSP:MODE?](#) on page 125

Update Timestamp

Clicking the button triggers an update of the UTC time and date reference.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:DElay:TSP:UPDate](#) on page 126

UTC Date

Displays the UTC date from the last UTC reference update.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:DElay:TSP:DATE?](#) on page 124

UTC Time

Displays the UTC time from the last UTC reference update.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:DElay:TSP:TIME?](#) on page 126

Offset

Modifies the UTC/GPS leap seconds offset.

Remote command:

[\[:SOURCE<hw>\]:BB:T2DVb:DElay:TSP:OFFSet](#) on page 125

Seconds Since 2000

Displays the elapsed time in seconds since 2000. The value is based on the value of the last UTC reference update.

Remote command:

[:SOURce<hw>] :BB:T2DVb:DELaY:TSP:SEConds? on page 125

3.8 Frame info

Access:

- ▶ Select "Baseband > DVB-T2 > Frame Info".

The tab provides information on frame and symbol duration parameters.

Settings:

- [Frame](#).....53
- [Symbols](#).....54
- [L1 signaling](#).....55
- [Data cells](#).....56

3.8.1 Frame

Access:

- ▶ Select "Frame Info > Frame".

DVB-T2 T2-MI On	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	SFN	✕
Super Frame Duration (T _{SF})						433.888 ms	Frame	
T2 Frame Duration (T _F)						216.944 ms	Symbols	
Fut. Ext. Frame Duration (T _{FEF})						0.000 ms	L1 Signaling	
							Data Cells	

The tab displays frame duration parameters.

Settings:

- [Super Frame Duration \(T_{SF}\)](#).....53
- [T2 Frame Duration \(T_F\)](#).....54
- [Future Extension Frame Duration \(T_{FEF}\)](#).....54

Super Frame Duration (T_{SF})

Displays the super frame duration.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:TSF? on page 128

T2 Frame Duration (T_F)

Displays the T2 frame duration.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:TF? on page 127

Future Extension Frame Duration (T_{FEF})

Displays the future extension frame duration.

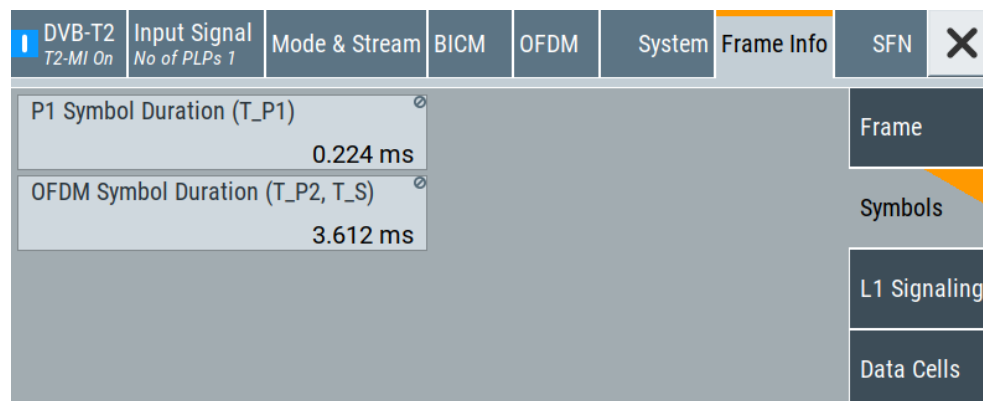
Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:TFEF? on page 127

3.8.2 Symbols

Access:

- ▶ Select "Frame Info > Symbols".



The tab displays symbol duration parameters.

Settings:

P1 Symbol Duration (T_{P1}).....	54
OFDM Symbol Duration (T_{P2} , T_S).....	54

P1 Symbol Duration (T_{P1})

Displays the P1 symbol duration.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:TP1? on page 128

OFDM Symbol Duration (T_{P2} , T_S)

Displays the P2 and OFDM data symbol duration.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:TP2|TS? on page 128

3.8.3 L1 signaling

Access:

- ▶ Select "Frame Info > L1 Signaling".

DVB-T2 T2-MI On	Input Signal No of PLPs 1	Mode & Stream	BICM	OFDM	System	Frame Info	SFN	X
L1 Pre Signaling Bits						200 bits	Frame	
L1 Pre Signaling Cells						1 840 cells	Symbols	
L1 Post Signaling Bits						350 bits	L1 Signaling	
L1 Post Signaling Cells						250 cells	Data Cells	

The tab displays L1-pre signaling and L1-post signaling parameters.

Settings:

L1 Pre Signaling Bits.....	55
L1 Pre Signaling Cells.....	55
L1 Post Signaling Bits.....	55
L1 Post Signaling Cells.....	55

L1 Pre Signaling Bits

Displays the L1-pre signaling length in bits.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:PREBits? on page 130

L1 Pre Signaling Cells

Displays the L1-pre signaling length in cells.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:PRECells? on page 130

L1 Post Signaling Bits

Displays the L1-post signaling length in bits.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:POSBits? on page 129

L1 Post Signaling Cells

Displays the L1-post signaling length in cells.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:POSCells? on page 130

3.8.4 Data cells

Access:

- ▶ Select "Frame Info > Data Cells".

PLP Data Cells	
Per T2 Frame (D_PLP)	1 637 178 cells
Current T2 Frame (D_PLP_USED)	1 636 200 cells

The tab displays payload information of the **PLP** data cells.

Settings:

PLP Data Cells.....	56
L Per T2 Frame (D _{PLP}).....	56
L Current T2 Frame (D _{PLP_USED}).....	56

PLP Data Cells

Displays information on PLP data cells.

Per T2 Frame (D_{PLP}) ← PLP Data Cells

Displays the possible number of PLP data cells per T2 frame.

Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:DP? on page 131

Current T2 Frame (D_{PLP_USED}) ← PLP Data Cells

Displays the current number of PLP data cells in the T2 frame.

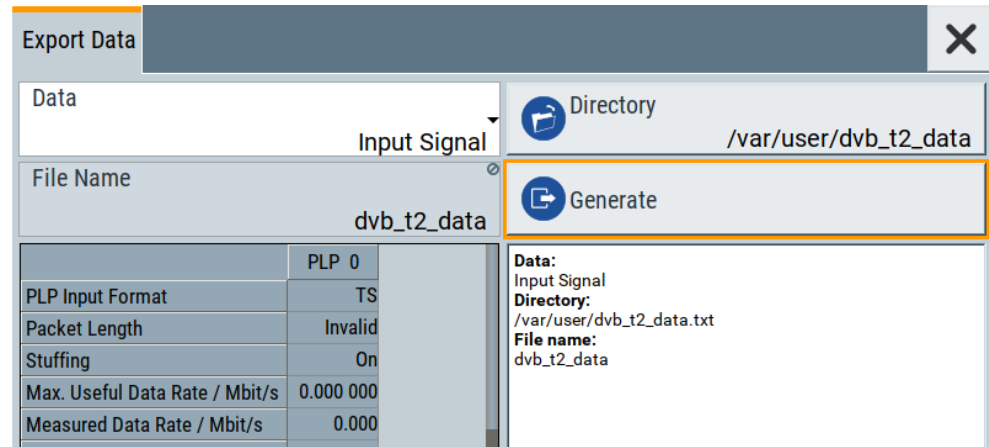
Remote command:

[:SOURce<hw>] :BB:T2DVb:INFO:DPUSed? on page 131

3.9 Data generation settings

Access:

- ▶ Select "Baseband > DVB-T2 > Data Generation".



The "Export Data" tab provides settings to generate data of the DVB-T2 signal characteristics. You can generate data from the input signal, Mode & Stream and BICM and export the data to a file.

Settings:

Data.....	57
File Name.....	57
Directory.....	57
Generate.....	58
File Info panel.....	58
PLP <num> table.....	58

Data

Sets the data source, for that the data is generated.

The table displays information on the PLPs for each data source "Input Signal/Mode & Stream/BICM", see .

Remote command:

n.a.

File Name

Displays the file name, for that the data is generated.

Remote command:

n.a.

Directory

Accesses the directory of the export data.

A standard "File Select" dialog opens.

Remote command:
n.a.

Generate

Triggers export data generation.

Remote command:
n.a.

File Info panel

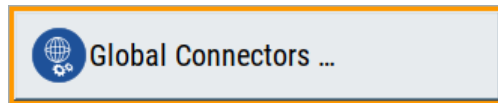
Displays information on the selected file, such as data source, directory and filename.

PLP <num> table

Displays individual parameters for each PLP <num>. The table displays information of up to 20 PLPs with <num> ranging from 0 to 19.

3.10 Global connector settings

The "Input Signal" dialog, the "Trigger/Marker/Clock" dialog and "Trigger In", "Marker" and "Clock" tabs in "Baseband > ARB/Custom Digital Mod" configuration dialogs provide quick access to the related connector settings. Click the "Global Connectors" button to access the settings.



See also chapter "Global connector settings" in the user manual.

3.11 TS player

The "TS Player" application allows you to play stream files for simulation of dedicated transport stream (TS) scenarios. Also, the R&S SMCV100B offers stream libraries containing stream files with a wide range of ready-made signals for testing systems with different transmission parameters. For supported file types, see [Table 3-3](#).

Key features

The key features for playing stream files with "TS Player" application are:

- Support of numerous broadcast transmission standards
- Streaming of high-quality video contents
- Streaming of high-quality audio contents
- Efficient use with dedicated streams

Required options

The equipment layout for processing files of waveform libraries includes:

- R&S SMCV100B base unit (64 MSample ARB memory, 60 MHz RF bandwidth)
- Broadcast standard option for the "TS Player" application (R&S SMCVB-Kxxx)
- Enable Broadcast Standards option (R&S SMCVB-K519)
- Stream library option (R&S SMCVB-KSxx)

For more information, see data sheet.

To access and download a stream library file

The steps to access a stream library and to download stream library files is analogous as for waveform libraries. See chapter "Installation" in the user manual of the stream library at:

www.rohde-schwarz.com/manual/smcv100b/ksxx-kvxx-stream-and-waveform-libraries-user-manuals-manuals-gb1_78701-972224.html

To access the "TS Player" application

1. Select "Baseband > DVB-T2 > Input Signal".
2. Select "Source > TS Player".
3. Select "TS Player" button.

Opens the TS player dialog, where you can load files.

Support in broadcast standard configuration

Various broadcast baseband standards of the R&S SMCV100B support the "TS Player" application. For an overview, see the table below.

Baseband standard	"Source > TS Player"	Baseband standard	"Source > TS Player"
"ATSC/ATSC-M/H"	Yes	"DVB-S"	Yes
"ATSC 3.0"	Yes	"DVB-S2"	Yes
"DTMB"	Yes	"DVB-C"	Yes
"DVB-T"	Yes	"J.83/B"	Yes
"DVB-T2"	Yes	"DRM"	No
"ISDB-T"	Yes	"Audio AM"	No
"T-DMB/DAB"	Yes	"Audio FM"	No

The remote commands required to define these settings are described in [Chapter 5.9, "TSGen subsystem"](#), on page 131.

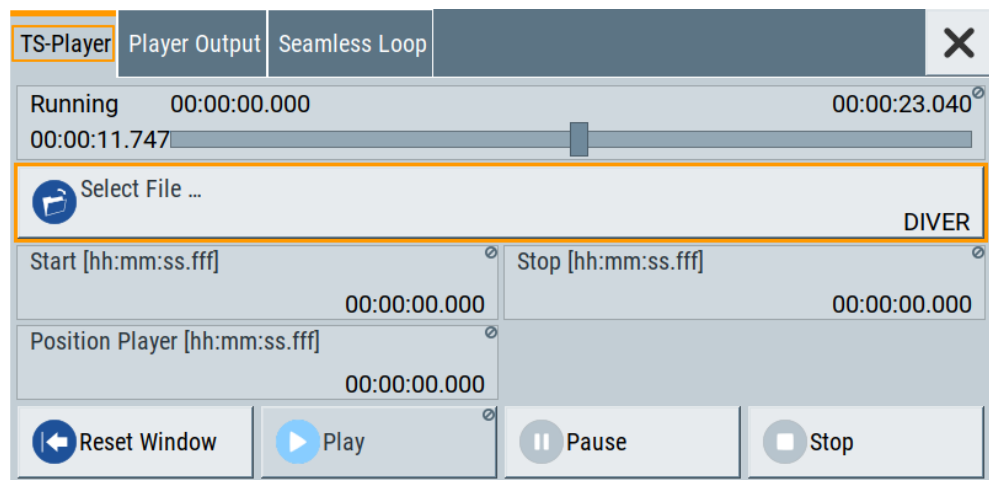
Settings:

- [TS Player settings](#)..... 60
- [Player output settings](#)..... 63
- [Seamless loop settings](#)..... 66

3.11.1 TS Player settings

Access:

1. Follow the steps in "[To access the "TS Player" application](#)" on page 59.
2. Select "TS Player > TS-Player".



The tab provides settings to configure the general settings of the TS player application.

Settings:

- [Running/Position Player \[hh:mm:ss:fff\]](#)..... 60
- [Select File](#)..... 61
- [Start \[hh:mm:ss.fff\]](#)..... 62
- [Position Player \[hh:mm:ss.fff\]](#)..... 62
- [Stop \[hh:mm:ss.fff\]](#)..... 62
- [Reset Window](#)..... 62
- [Play](#)..... 62
- [Pause](#)..... 62
- [Stop](#)..... 62

Running/Position Player [hh:mm:ss:fff]

Displays the current position in time, while playing the file.

You can set an individual position via [Position Player \[hh:mm:ss.fff\]](#).

Remote command:

:TSGen:CONFigure:SEEK:POSition on page 136

Select File

Provides access to the standard "File Select" function of the instrument. The provided navigation possibilities in the dialog are self-explanatory.

See also, chapter "File and Data Management" in the R&S SMCV100B User Manual.

The dialog allows you to select user-defined, predefined and recent files. [Table 3-3](#) lists file extensions of supported files.

Table 3-3: Supported TS player file types

File extension	Stream libraries	Remark	Option
*.atsc_c	ATSC/ATSC & Mobile DTV	Encrypted	R&S SMCVB-KS13
*.dab	T-DMB/DAB	Unencrypted	-
*.dab_c	T-DMB/DAB	Encrypted	R&S SMCVB-KS10
*.dabp_c	DAB+	Encrypted	R&S SMCVB-KS11
*.eti	T-DMB/DAB	Unencrypted	-
*.xeti	T-DMB/DAB	Unencrypted	-
*.emc_c	EMC	Encrypted	R&S SMCVB-KS15
*.isdbt_c	ISDB-T	Encrypted	R&S SMCVB-KS12
*.pcap	-	Captured IPv4 stream for ATSC 3.0 player	-
*.t2mi ¹⁾	-	Unencrypted	-
*.t2mi_c	DVB-T2 MI	Encrypted	R&S SMCVB-KS14
*.t2trp_c	DVB-T2 MI	Encrypted	R&S SMCVB-KS14
*.trp	-	Unencrypted	-
*.trp_c	-	Encrypted Included in various stream libraries	R&S SMCVB-KS12 R&S SMCVB-KS17 R&S SMCVB-KS18 R&S SMCVB-KS19 R&S SMCVB-KS20
*.bin	-	Unencrypted	-
*.ts	-	Unencrypted	-
*.mpg	-	Unencrypted	-
*.t10	-	-	-

¹⁾ For T2MI stream files, the data rate of a T2MI file is determined automatically, if the following applies:

- Data rate is not part of the TRP file header information.
- PCR information is not available.
- T2MI TRP file is not encrypted, that means not of type *.t2mi_c.
- TRP file has the *.t2mi file extension.

Remote command:

:TSGen:CONFigure:PLAYfile on page 135
:TSGen:READ:PLAYfile:LENGth? on page 139
:TSGen:READ:FMEMory on page 138

Start [hh:mm:ss.fff]

Sets the start position in the loaded player file. Data which chronologically precedes the start position is not replayed by the player.

The entered time stamp must chronologically always precede the entry under [Stop](#).

Remote command:

:TSGen:CONFigure:SEEK:START on page 137

Position Player [hh:mm:ss.fff]

Displays the current play position in the file.

Remote command:

:TSGen:CONFigure:SEEK:POSition on page 136

Stop [hh:mm:ss.fff]

Sets the end position in the player file. Data which chronologically follows the end position is not replayed by the player.

When the player reaches the "Stop" position, it returns to the "Start" position (continuous play).

The entered time stamp must chronologically always follow the entry under [Play](#).

Remote command:

:TSGen:CONFigure:SEEK:STOP on page 137

Reset Window

Resets "Start/Stop/Position Player" parameters.

Remote command:

:TSGen:CONFigure:SEEK:RESet on page 136

Play

Plays the selected file.

For supported file types, see [Table 3-3](#).

Remote command:

:TSGen:CONFigure:COMMand on page 133

Pause

Pauses the player.

After pausing, you can resume playing the file by clicking "Play" again.

Remote command:

:TSGen:CONFigure:COMMand on page 133

Stop

Stops the player and returns to the start position.

Remote command:

:TSGen:CONFigure:COMManD on page 133

3.11.2 Player output settings

Access:

- ▶ Select "TS Player > Player Output".

The tab provides settings to configure the output of the TS player.

3.11.2.1 General settings

TS-Player	Player Output	Seamless Loop	
Data Rate	5.018 502 Mbit/s	Orig. Data Rate	5.018 502 Mbit/s
Packet Length	188		
Nullpacket Stuffing	<input type="checkbox"/>		
Stop Data	None		

The tab provides settings to configure general player output properties.

Data Rate.....	63
Orig. Data Rate.....	63
Packet Length.....	64
Nullpacket Stuffing.....	64
Stop Data.....	64

Data Rate

Sets the output data rate of the player.

Note: If "Nullpacket Stuffing > Off", we recommend that you set the output data rate equal to the original data rate.

If you want to use a different data rate, activate "Nullpacket Stuffing". The function ensures that the data stream is replayed in the same way as it was recorded. The time references in the tables of the TS stream are also correct during replay.

Remote command:

:TSGen:CONFigure:TSRate on page 138

Orig. Data Rate

Displays the calculated original TS data rate.

Remote command:

[:TSGen:READ:ORIGtsrate](#) on page 139

Packet Length

Requires a *.trp, *.trp_c, *.emc or *.emc_c file loaded into the "TS Player" dialog. *.trp files are previously recorded files.

Displays the packet length of the loaded TS player file.

Remote command:

[:TSGen:CONFigure:PLENgtH](#) on page 135

Nullpacket Stuffing

Requires a *.trp, *.trp_c, *.emc or *.emc_c file loaded into the "TS Player" dialog. *.trp files are previously recorded files.

Activates nullpacket stuffing.

By default nullpacket stuffing is deactivated. The output data rate of the TS player equals the original data rate as defined in the TS player file. Equal rates ensure that the time references in the tables of the played TS stream are correct during replay.

"On" Activate stuffing, if you need a higher rate than the original data rate. Null packets are inserted into the data stream.

To ensure correct time references in the stream tables, activate program clock reference correction. See "[PCR, DTS/PTS](#)" on page 67.

"Off" Deactivate stuffing, if you want to use the same data rate as the original data rate.

Remote command:

[:TSGen:CONFigure:STUFFing](#) on page 137

Stop Data

Requires a *.trp, *.trp_c, *.emc or *.emc_c file loaded into the "TS Player" dialog. *.trp files are previously recorded files.

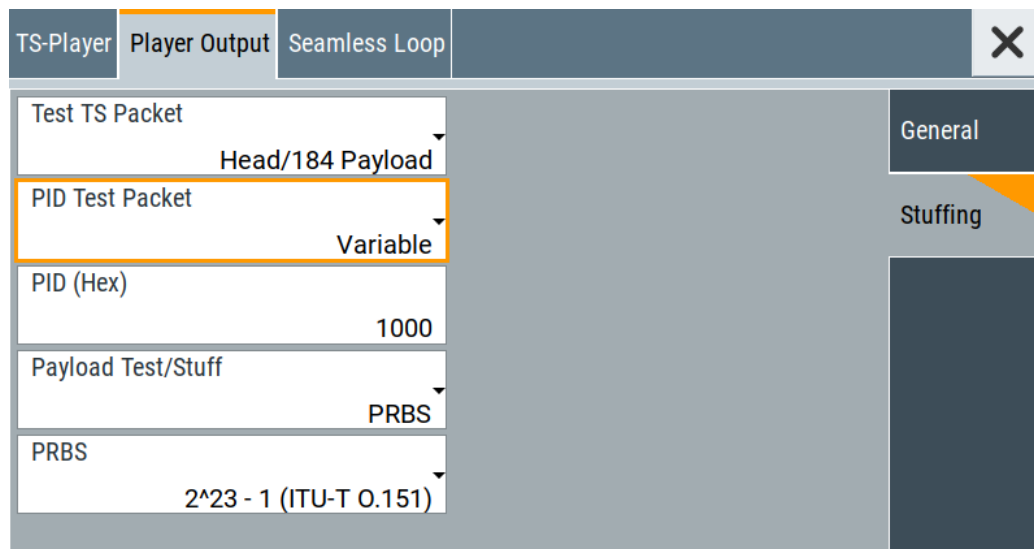
Ensures that a standardized TS data stream is always output at the TS output at the rear of the R&S SMCV100B.

In pause or stop status, the TS generator generates "test packets", which have data and header parts that can be configured using the [Test TS Packet](#).

Remote command:

[:TSGen:CONFigure:STOPdata](#) on page 137

3.11.2.2 Stuffing settings



The tab provides settings to configure stuffing.

Settings

Test TS Packet	65
PID Test Packet	66
PID (Hex)	66
Payload Test/Stuff	66
PRBS	66

Test TS Packet

Specifies the structure of the test transport stream packet that is fed to the modulator.

"Head/184 Payload"

A sync byte (0x47) followed by three header bytes and 184 payload bytes.

"Sync/187 Payload"

A sync byte (0x47) followed by 187 payload bytes.

"Head/200 Payload"

A sync byte (0x47) followed by three header bytes and 200 payload bytes.

"Sync/203 Payload"

A sync byte (0x47) followed by 203 payload bytes.

"Head/204 Payload"

A sync byte (0x47) followed by three header bytes and 204 payload bytes.

"Sync/207 Payload"

A sync byte (0x47) followed by 207 payload bytes.

Remote command:

[:TSGen:CONFigure:TSPacket](#) on page 138

PID Test Packet

If a header is present in the test packet ("Test TS Packet > Head/184 Payload"), you can specify a fixed or variable packet identifier (PID).

- "Null" The header of the test transport stream packets has a fixed setting of null packet header 1FFF (hex).
- "Variable" Uses the header value defined with [PID \(Hex\)](#).

Remote command:

[:TSGen:CONFigure:PIDTestpack](#) on page 134

PID (Hex)

Sets the [PID](#).

If "PID Test Packet > Null", "PID (Hex) = 1FFF" is fixed.

If "PID Test Packet > Variable", you can edit the value.

Remote command:

[:TSGen:CONFigure:PID](#) on page 134

Payload Test/Stuff

Defines the payload area content of the [TS](#) packet.

- "PRBS" [PRBS](#) data in accordance with [ITU-T O.151](#)
See also chapter "Internal Modulation Data" in the R&S SMCV100B User Manual.
- "0x00" Exclusively 00 (hex) data
- "0xFF" Exclusively FF (hex) data

Remote command:

[:TSGen:CONFigure:PAYLoad](#) on page 134

PRBS

Sets the length of the PRBS sequence.

You can select a PRBS 15 or a PRBS 23 sequence as specified by [ITU-T O.151](#).

Remote command:

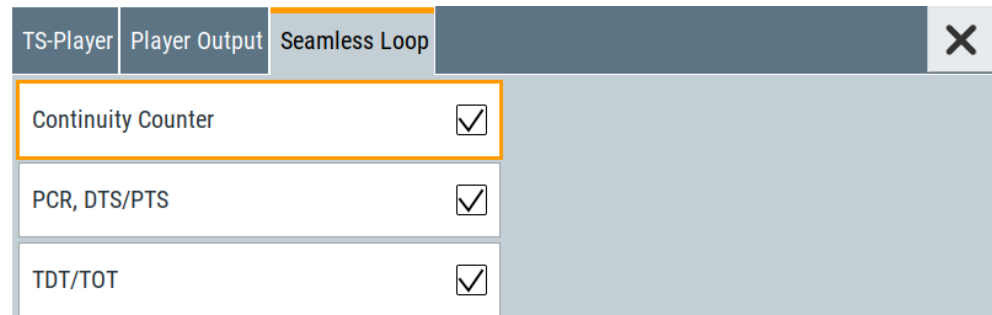
[:TSGen:CONFigure:PRBS\[:SEquence\]](#) on page 135

3.11.3 Seamless loop settings

Displaying the tab requires a *.trp, *.trp_c, *.emc or *.emc_c file loaded into the "TS Player" dialog. *.trp files are previously recorded files.

Access:

- ▶ Select "TS Player > Seamless Loop".



The tab provides settings to configure settings for playing the file in a loop.

Settings:

Continuity Counter.....	67
PCR, DTS/PTS.....	67
TDT/TOT.....	67

Continuity Counter

Activates the correction of the continuity counters in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

Remote command:

:TSGen:CONFigure:SEAMless:CC on page 135

PCR, DTS/PTS

Activates the correction of time stamps in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

If you set "Nullpacket Stuffing = On" and "PCR, DTS/PTS = On", the time stamps in the streams are corrected when nullpackets are inserted into the stream.

Remote command:

:TSGen:CONFigure:SEAMless:PCR on page 136

TDT/TOT

Activates the correction of the time and date table in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

Remote command:

:TSGen:CONFigure:SEAMless:TT on page 136

3.12 Local IP data network settings

Access:

1. Select "Input Signal > General > Source > External".
2. Select "Input Signal > General > Input > IP"
3. Select "Input Signal > IP Channel x > Local IP Data Network".

Board Name		
Hostname smcv100b-565371-IP-Data		
Board Address		
Address Mode Auto (DHCP)	Protocol UDP	Show Connector ...
IP Address 10.214.2.24	Subnet Mask 255.255.252.0	MAC Address 90:b8:21:71:2e

The tab provides access to local IP data settings to configure the board address.

The remote commands to configure local IP data network settings are described in [Chapter 5.10, "BCIP subsystem"](#), on page 139.

How to: [Chapter 4.1.1, "How to apply an external IP input signal"](#), on page 71

Settings:

Network Status	68
Restart Network	69
Hostname	69
Address Mode	69
IP Address	69
Protocol	70
Subnet Mask	70
Show Connector	70
MAC Address	70

Network Status

Indicates that the instrument is connected to the network.

If the instrument is disconnected, try "Restart Network".

Remote command:

:SYSTem:COMMunicate:BCIP<hw>:NETWork:STATus on page 142

Restart Network

Terminates the network connection of the instrument and sets it up again later. You can use this function to fix network problems.

Note: This function restarts only the connection of the instrument to the network. It does not impact the network itself.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:REStart` on page 142

Hostname

Displays the hostname.

Displayed is the board name, that is the name of the IP data board of the R&S SMCV100B, e.g. SMCV100B-123456-IP-Data.

Each instrument is delivered with an assigned hostname, a logical name which can be used instead of the IP address. With the default network settings, the IP address is allocated by the DHCP server. This address can change each time the instrument is reconnected. Unlike the IP address, the hostname name does not change.

Note:

This function is password-protected. Unlock the protection level 1 to access it.

We recommend that you do not change the default network settings or the hostname to avoid problems with the network connection.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:COMMon:HOSTName` on page 140

Address Mode

Selects the mode for assigning the IP address.

"Auto (DHCP)"

Assigns the IP address automatically, provided the network supports **DHCP**.

"Static"

Enables you to assign the IP address manually.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:MODE` on page 141

IP Address

Displays the IP address of the instrument in the local IP data network.

By default, the R&S SMCV100B is configured to use dynamic TCP/IP configuration and to obtain the whole address information automatically.

If the network does not support DHCP or the attempt does not succeed, the instrument tries to obtain the IP address via Zeroconf (APIPA) protocol. IP addresses assigned via Zeroconf start with the number blocks 169.254.*.*.

Note: An IP address that is assigned via the Zeroconf protocol although the network requires an IP address assigned via the DHCP server can cause network connection failures.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress` on page 141

Protocol

Sets the protocol type of the input IP data.

The current firmware supports **UDP** and **UDP/RTP**.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:PROToCol` on page 141

Subnet Mask

Displays the bit group of the subnet in the host identifier.

To assign the subnet mask manually, select "Address Mode > Static".

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:SUBNet:MASK`
on page 141

Show Connector

Accesses a dialog that displays the physical location of the selected connector on the front/rear panel of the instrument.

MAC Address

Displays the MAC address, a unique identifier of the network adapter in the R&S SMCV100B.

Remote command:

`:SYSTem:COMMunicate:BCIP<hw>:NETWork:MACaddress` on page 141

4 Performing DVB-T2 signal generation tasks

This chapter tells you how to configure the R&S SMCV100B to generate signals for simple receiver tests.

- [Configuring the input signal](#).....71
- [Monitoring the input signal](#)..... 76

4.1 Configuring the input signal

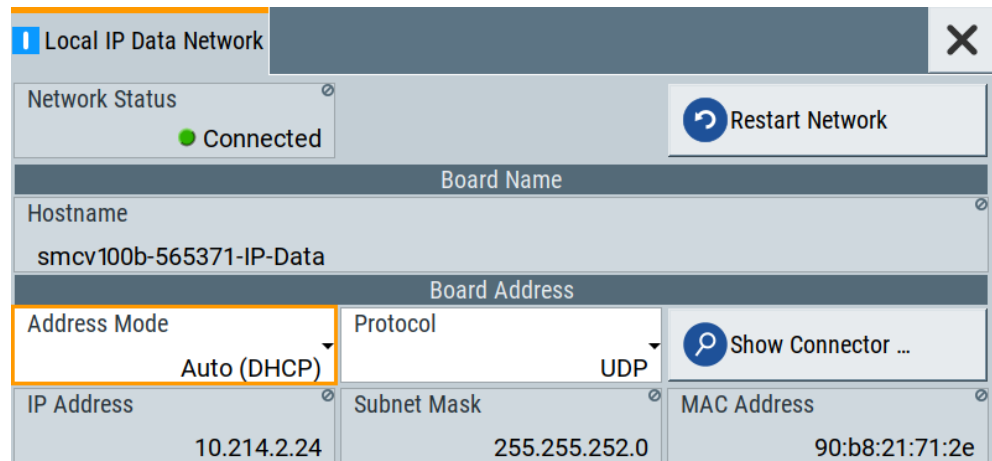
This chapter provides an overview of the different input signals, that the R&S SMCV100B uses as modulation data.

- [How to apply an external IP input signal](#).....71
- [How to apply an external TS input signal](#).....74
- [How to generate an internal TS signal](#).....75

4.1.1 How to apply an external IP input signal

To connect the R&S SMCV100B to local IP data network

1. Connect the IP source to the "IP Data" connector of the R&S SMCV100B.
See chapter "Connecting to IP Data Interface" in the R&S SMCV100B Getting Started user manual.
2. Select "Input Signal > General > Source > External".
3. Select "Input Signal > General > Input > IP".
4. In the "IP Channel x" side tab, click "Local IP Data Network".
By default, the R&S SMCV100B assigns the IP address automatically using DHCP ("Address Mode > Auto (DHCP)").
5. If "Network Status > Disconnected", try "Restart Network".



The R&S SMCV100B is connected to the local IP data network.

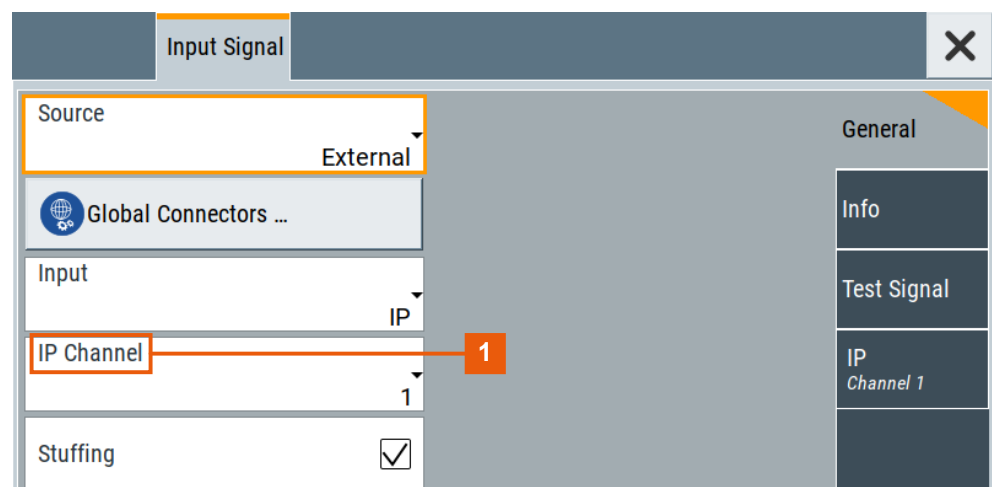
6. If DHCP does not assign an IP address, assign the IP address manually.
See chapter "How to Assign the IP Address" in the R&S SMCV100B user manual.
7. Specify the protocol type of the input IP data.
The current firmware supports [UDP](#) and [UDP/RTP](#).

To configure an external IP input signal

The R&S SMCV100B is connected to a local IP data network, see ["To connect the R&S SMCV100B to local IP data network"](#) on page 71.

1. Specify general IP input signal properties:
 - a) Select "Input Signal > General > Source > External".
 - b) Select "Input > IP".
 - c) Specify the IP TS Channel, e.g. "IP TS Channel > 1".

The "IP Channel 1" side tab appears, where you can configure the IP connection for channel 1 and channel-independent local IP network settings.



1 = IP channel notation: IP TS Channel

2. Optionally, if supported, activate "Stuffing" to adjust the TS data rate.
3. Specify IP TS channel properties, e.g. for "IP TS Channel > 1":
 - a) Define the input type, e.g. "Type > Multicast".
 - b) Specify the "Multicast Address" that is the destination IPv4 address of the IP connection.
Note: Use the destination address also in the IP data source, e.g. a stream program.
 - c) Specify the port that is the destination port of the IP connection.
Note: Use the destination port also in the IP data source.
 - d) Specify the **IGMPv3** source address that is the source IPv4 address of the IP connection.
 A source address different from "0.0.0.0" accepts only data originating from the specified IP address.
 - e) Optionally, to check availability of the "IGMPv3 Source Address", click "Ping Source Address"
 - If "Ping Result > Ping: Successful", the source address is available.
 - If "Ping Result > Ping: Transmit Failed. Destination Host Unreachable", try another address.
 - f) Optionally, specify a name for the IP connection, e.g. "Alias > Service".
 - g) Select "Input IP > On", to activate the IP channel.

Input Signal		
Input IP <input checked="" type="checkbox"/>	Alias	General
Type	Service	Info
Multicast	Multicast Address	Test Signal
Port	224.3.2.1	
6 002	IGMPv3 Source Address	
	123.4.5.6	
Ping Source Address	Local IP Data Network ...	IP Channel 1
Ping Result		

The R&S SMCV100B is prepared for receiving IP TS data that is input at the "IP Data" connector.

Monitor IP data stream properties in the "Info" side tab, see [Chapter 4.2.1, "How to monitor external IP input data"](#), on page 77.

4.1.2 How to apply an external TS input signal

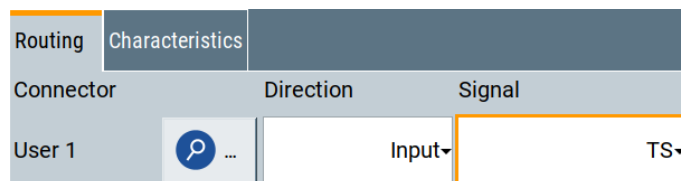
To connect to the external TS input interface

1. Use a double-shielded 75 Ω BNC cable for connection between R&S SMCV100B and the external [MPEG](#) TS data source.
See also Section "Cable selection and electromagnetic interference (EMI)" in the R&S SMCV100B Getting Started user manual.
2. At the R&S SMCV100B, connect the cable to the "User 1" connector.
The connector is on the rear panel of the R&S SMCV100B.
How to: Section "To connect to pluggable connectors" in the R&S SMCV100B Getting Started user manual.

To specify the TS input interface at the R&S SMCV100B

The R&S SMCV100B is [connected](#) to an [MPEG](#) TS data source via the "User 1" connector.

1. Select "Input Signal > General > Source > External".
2. Select "General > Global Connectors".
3. In the "Global Connectors" dialog, configure the "User 1" connector for a TS input signal:
 - a) Select "Direction > Input".
 - b) Select "Signal > TS".

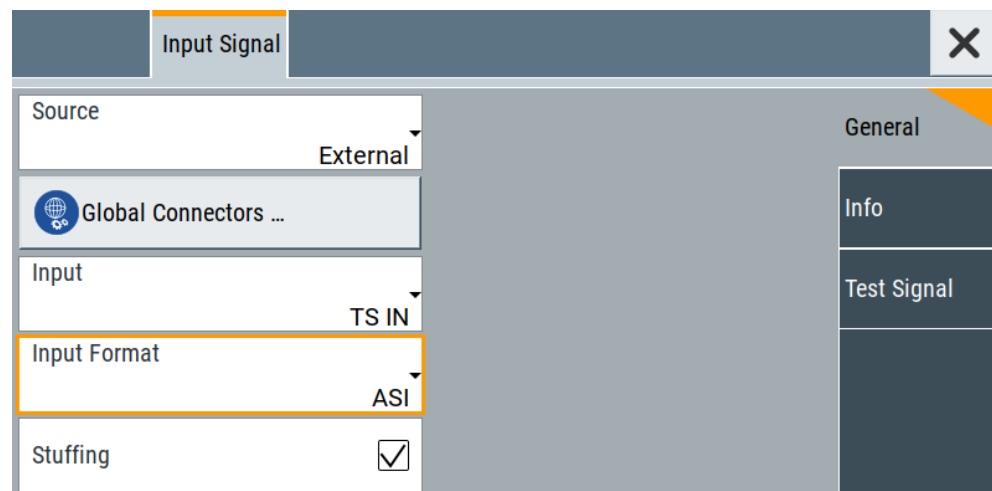


To configure an external TS input signal

The R&S SMCV100B is [prepared](#) for receiving a TS input signal at the "User 1" connector.

1. Specify general TS input signal properties:
 - a) Select "Input Signal > General > Source > External".
 - b) Select "Input > TS IN".
 - c) Specify the format of the input signal:
 - Select "ASI", if you have a source supporting [ASI](#) format.
 - Select "SMPTE 310", if you have a source supporting [SMPTE 310](#) format.
2. Optionally, activate "Stuffing" to adjust the TS data rate.

You can further specify the payload of the stuffing data, see "Test Signal > Payload Test/Stuff."



The R&S SMCV100B is prepared for receiving TS data that is input at the "User 1" connector.

Monitor TS data stream properties in the "Info" side tab, see [Chapter 4.2.2, "How to monitor an external TS input signal"](#), on page 77.

4.1.3 How to generate an internal TS signal

To play a TS file with the "TS Player"

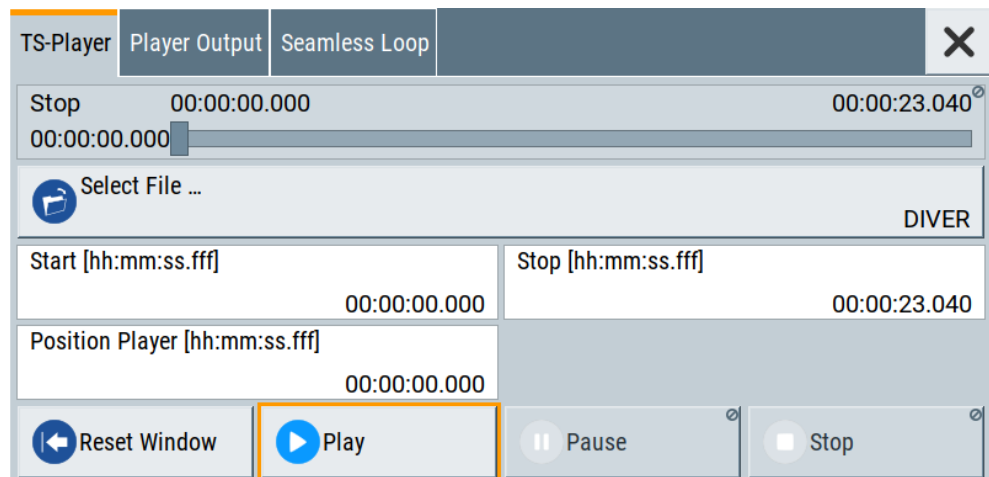
1. Select "Input Signal > Source > TS Player".
The "TS Player" button appears below.
2. Click "TS Player".
The "TS Player" dialog for playing TS data files opens.
3. Click "Play" to play the default file `DIVER.trp`.
Playing the file requires no option.

To load and play a stream library file

1. Load the file from its storage location:
 - External storage device (HDD, memory stick): Load the file from the `/usb/` directory.
 - Internal memory (SSD): Load the file from the user directory `/var/user/`

Note: Library files are encrypted files. Loading the library file at the R&S SMCV100B requires installation of the corresponding library option. See ["Required options"](#) on page 59.

2. To load the file at the R&S SMCV100B, open the "TS Player" application in digital broadcast standard ("**<Broadcast_Standard>**") dialogs:
 - a) Select "Baseband" > "**<Broadcast_Standard>**" > "Input Signal".
 - b) Select "Source" > "TS Player".
 - c) Select "TS Player" button.
 - d) Select "Select File".
3. To select the file, navigate to the storage location (1).
4. Select "TS-Player" > "Play".



The R&S SMCV100B processes the stream file.

5. Select "**<Broadcast_Standard>**" > "State" > "On", to activate the baseband signal.
6. In the block diagram, select "RF" > "On".

The stream file is modulated onto the RF carrier and output at the "RF 50 Ω" connector.

4.2 Monitoring the input signal

This chapter provides an overview of the different input signals, that the R&S SMCV100B uses as modulation data.

- [How to monitor external IP input data](#)..... 77
- [How to monitor an external TS input signal](#)..... 77
- [How to monitor an internal TS player signal](#)..... 78

4.2.1 How to monitor external IP input data

The R&S SMCV100B receives external IP input data as described in [Chapter 4.1.1, "How to apply an external IP input signal"](#), on page 71.

- ▶ Select "Input Signal > Info"

Input Signal		
Packet Length	188	General
Max. Useful Data Rate	27.144 385 Mbit/s	Info
Meas. Data Rate	5.096 Mbit/s	Test Signal
Useful Data Rate	4.562 Mbit/s	IP Channel 1

The "Info" side tab displays physical properties of the input IP stream data.

The standard packet length is 188 byte. The maximum useful data rate is specified by the broadcast standard.

The measured data rate is lower and depends on the [TS](#) source settings. The useful data rate is lower than the measured data rate due to null packets present in the transport stream.

If "Stuffing > On", the useful data rate can be lower than the maximum useful data rate.

4.2.2 How to monitor an external TS input signal

The R&S SMCV100B receives external TS input data as described in [Chapter 4.1.2, "How to apply an external TS input signal"](#), on page 74.

- ▶ Select "Input Signal > Info"

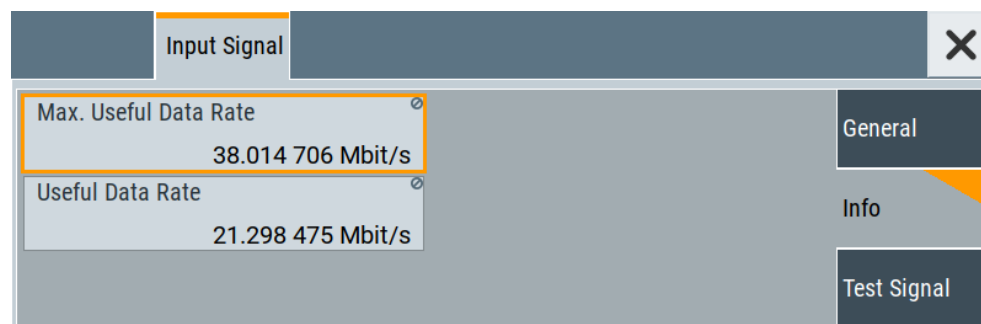
Input Signal		
Packet Length	188	General
Max. Useful Data Rate	19.392 659 Mbit/s	Info
Measured Data Rate	13.058 Mbit/s	Test Signal
Useful Data Rate	12.998 Mbit/s	

The "Info" side tab displays physical properties of the input TS stream data.

4.2.3 How to monitor an internal TS player signal

The R&S SMCV100B receives internal TS input data as described in [Chapter 4.1.3, "How to generate an internal TS signal"](#), on page 75.

- ▶ Select "Input Signal > Info"



The "Info" side tab displays physical properties of the TS player stream data.

5 Remote-control commands

The following commands are required to generate signals with the DVB-T2 option in a remote environment. We assume that the R&S SMCV100B has already been set up for remote operation in a network as described in the R&S SMCV100B documentation. A knowledge about the remote control operation and the SCPI command syntax are assumed.



Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote-Control Commands" in the R&S SMCV100B user manual.

Common suffixes

The following common suffixes are used in the remote commands:

Suffix	Value range	Description
SOURce<hw>	1	Available baseband signals
PLP<ch>	1 to 20	Available number PLPs

Programming examples

This description provides simple programming examples. The purpose of the examples is to present **all** commands for a given task. In real applications, one would rather reduce the examples to an appropriate subset of commands.

The programming examples have been tested with a software tool which provides an environment for the development and execution of remote tests. To keep the example as simple as possible, only the "clean" SCPI syntax elements are reported. Non-executable command lines (e.g. comments) start with two // characters.

At the beginning of the most remote control program, an instrument preset/reset is recommended to set the instrument to a definite state. The commands *RST and SYSTem:PRESet are equivalent for this purpose. *CLS also resets the status registers and clears the output buffer.

The following commands specific to the DVB-T2 are described here:

• General commands	80
• Input commands	82
• Mode and stream commands	97
• BICM commands	103
• OFDM commands	107
• System commands	111
• SFN delay commands	121
• Frame info commands	126
• TSGen subsystem	131
• BCIP subsystem	139

5.1 General commands

Example: Saving current configuration

```
SOURce1:BB:T2DVb:SETTing:STORe "/var/user/my_dvbt2"
// Saves the file "my_dvbt2.dvbt2" in the directory as above.
*RST

SOURce1:BB:T2DVb:SETTing:CATalog?
// Response: "my_dvbt2"
SOURce1:BB:T2DVb:SETTing:LOAD "/var/user/my_dvbt2"
SOURce1:BB:T2DVb:STATe 1
SOURce1:BB:T2DVb:SETTing:DELeTe "/var/user/my_dvbt2"
```

Commands

[:SOURce<hw>]:BB:T2DVb:PRESet	80
[:SOURce<hw>]:BB:T2DVb:STATe	80
[:SOURce<hw>]:BB:T2DVb:SETTing:CATalog?	81
[:SOURce<hw>]:BB:T2DVb:SETTing:DELeTe	81
[:SOURce<hw>]:BB:T2DVb:SETTing:LOAD	81
[:SOURce<hw>]:BB:T2DVb:SETTing:STORe	81

[:SOURce<hw>]:BB:T2DVb:PRESet

Sets the parameters of the digital standard to their default values (*RST values specified for the commands).

Not affected is the state set with the command `SOURce<hw>:BB:T2DVb:STATe`.

Example: See [Example "Saving current configuration"](#) on page 80.

Usage: Event

Manual operation: See ["Set To Default"](#) on page 13

[:SOURce<hw>]:BB:T2DVb:STATe <State>

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

Parameters:

<State> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example "Saving current configuration"](#) on page 80.

Manual operation: See ["State"](#) on page 13

[:SOURce<hw>]:BB:T2DVb:SETTing:CATalog?

Queries the files with settings in the default directory. Listed are files with the file extension *.dvbt2.

Return values:

<FileNames> <filename1>,<filename2>,...

Returns a string of filenames separated by commas.

Example: See [Example "Saving current configuration"](#) on page 80.

Usage: Query only

Manual operation: See ["Save/Recall"](#) on page 13

[:SOURce<hw>]:BB:T2DVb:SETTing:DELeTe <Delete>

Deletes the selected file from the default or the specified directory. Deleted are files with extension *.dvbt2.

Parameters:

<Filename> "<filename>"

Filename or complete file path; file extension can be omitted

Example: See [Example "Saving current configuration"](#) on page 80.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 13

[:SOURce<hw>]:BB:T2DVb:SETTing:LOAD <Recall>

Loads the selected file from the default or the specified directory. Loaded are files with extension *.dvbt2.

Parameters:

<Filename> "<filename>"

Filename or complete file path; file extension can be omitted

Example: See [Example "Saving current configuration"](#) on page 80.

Manual operation: See ["Save/Recall"](#) on page 13

[:SOURce<hw>]:BB:T2DVb:SETTing:STORe <Save>

Saves the current settings into the selected file; the file extension (*.dvbt2) is assigned automatically.

Parameters:

<Filename> "<filename>"

Filename or complete file path

Example: See [Example "Saving current configuration"](#) on page 80.

Manual operation: See ["Save/Recall"](#) on page 13

5.2 Input commands

The section contains the commands for configuring the input signal. It also contains commands for querying IP input information.

For configuring IP channel settings and local IP data network parameters, see:

- [Chapter 5.2.5, "IP subsystem"](#), on page 93
- [Chapter 5.10, "BCIP subsystem"](#), on page 139

Commands

• General commands	82
• PLP info commands	86
• T2-MI packet timing commands	89
• Test signal commands	91
• IP subsystem	93

5.2.1 General commands

Example: Querying general T2-MI interface parameters

```
SOURce1:BB:T2DVb:INPut:T2MI:INTErface?
// Response: "0"
```

```
SOURce1:BB:T2DVb:INPut:T2MI:INTErface ON
SOURce1:BB:T2DVb:INPut:T2MI:ANALyzer?
// Response: "No error"
```

```
SOURce1:BB:T2DVb:INPut:T2MI:RESetlog
SOURce1:BB:T2DVb:INPut:T2MI:PID #H1000
SOURce1:BB:T2DVb:INPut:T2MI:SID #H0
```

Example: Configuring general input signal properties

```
SOURce1:BB:T2DVb:SOURce EXT

//*****
// Incoming MPEG transport stream for single PLP transmission.
//*****
SOURce1:BB:T2DVb:INPut:T2MI:INTErface 0

//*****
// Incoming T2-MI stream.
//*****
SOURce1:BB:T2DVb:INPut:T2MI:INTErface 1
// Input transport stream for single-PLP or multi-PLP transmission.
```

```

//*****
// Prepare for IP based transport stream
//*****
SOURce1:BB:T2DVb:INPut?
// Response: "TS"
SOURce1:BB:T2DVb:INPut:FORMat?
// Response: "ASI"
SOURce1:BB:T2DVb:INPut IP
SOURce1:BB:T2DVb:INPut:TSCHeNnel 2

//*****
// Query incoming stream properties
//*****
SOURce1:BB:T2DVb:INPut:NPLP?
// Response: "1"
SOURce1:BB:T2DVb:INPut:T2MI:ANALyzer?
// Response: "No error"

```

For configuring IP channel settings and local IP data network parameters, see:

- [Chapter 5.2.5, "IP subsystem"](#), on page 93
- [Chapter 5.10, "BCIP subsystem"](#), on page 139

Commands

[:SOURce<hw>]:BB:T2DVb:SOURce.....	83
[:SOURce<hw>]:BB:T2DVb:INPut.....	83
[:SOURce<hw>]:BB:T2DVb:INPut:FORMat.....	84
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:ANALyzer?.....	84
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:INTerface.....	84
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:PID.....	84
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:RESetlog.....	85
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:SID.....	85
[:SOURce<hw>]:BB:T2DVb:INPut:TSCHeNnel.....	85

[:SOURce<hw>]:BB:T2DVb:SOURce <Dvbt2Source>

Sets the modulation source for the input signal.

Parameters:

<Dvbt2Source> EXTErnal | TSPLayer | TESTsignal
 *RST: EXTErnal

Manual operation: See ["Source"](#) on page 16

[:SOURce<hw>]:BB:T2DVb:INPut <Dvbt2Input>

Sets the external input interface.

Parameters:

<Dvbt2Input> TS | IP
 *RST: TS

Manual operation: See ["Input"](#) on page 17

[:SOURCE<hw>]:BB:T2DVb:INPut:FORMat <Dvbt2InpFormat>

Sets the input format of the input signal.

Parameters:

<Dvbt2InpFormat> ASI | SMPTE
*RST: ASI

Example: See [Example"Configuring general input signal properties"](#) on page 82.

Manual operation: See ["Input Format"](#) on page 17

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:ANALyzer?

Queries the status of the T2-MI analyzer by an error message.

Return values:

<Analyzer> string
No error
Implies correct behavior of the analyzer.
*RST: No error

Example: See [Example"Querying general T2-MI interface parameters"](#) on page 82.

Usage: Query only

Manual operation: See ["Status Info"](#) on page 15

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:INTerface <Interface>

Activates the T2-MI modulator interface.

Parameters:

<Interface> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Querying general T2-MI interface parameters"](#) on page 82.

Example: See [Example"Querying T2-MI packet timing parameters"](#) on page 89.

Manual operation: See ["T2-MI Interface"](#) on page 14

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:PID <Pid>

Sets the [PID](#).

The PID belongs to MPEG transport stream packets, that contain T2-MI data.

Parameters:

<Pid> integer
 Range: #H0 to #H1FFF
 *RST: #H1000

Example: See [Example"Querying general T2-MI interface parameters"](#) on page 82.

Manual operation: See ["T2-MI PID \(Hex\)"](#) on page 14

[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:RESetlog

Resets the log file.

Example: See [Example"Querying general T2-MI interface parameters"](#) on page 82.

Usage: Event

Manual operation: See ["Reset Log File"](#) on page 14

[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:SID <Sid>

Sets the T2-MI transport [SID](#).

Use the SID, when transmitting a composite signal, in accordance with annex I of the specification [ETSI EN 302 755](#).

Parameters:

<Sid> integer
 Range: #H0 to #H7
 *RST: #H0

Example: See [Example"Querying general T2-MI interface parameters"](#) on page 82.

Manual operation: See ["T2-MI SID \(Hex\)"](#) on page 14

[:SOURce<hw>]:BB:T2DVb:INPut:TSCHannel <Dvbt2TsChannel>

Selects the IP-based transport stream (TS) channel. You can select 1 out of 4 IP TS channels as input at the "IP Data" interface.

To configure a particular channel, see [Chapter 3.2.5, "IP channel x settings"](#), on page 26.

Parameters:

<Dvbt2TsChannel> 1 | 2 | 3 | 4
 *RST: 1

Example: See [Example"Configuring general input signal properties"](#) on page 82.

Manual operation: See ["IP TS Channel"](#) on page 18

5.2.2 PLP info commands

Example: Querying PLP input properties

```

SOURCE1:BB:T2DVb:SOURCE EXT

//*****
// Query properties of external input signals at TS IN interface.
//*****
SOURCE1:BB:T2DVb:INPUT TS
SOURCE1:BB:T2DVb:INPUT:T2MI:INTERFACE?
// Response: "0"

SOURCE1:BB:T2DVb:INPUT:NPLP?
// Response: "1"

// Single-PLP transmission. PLP<ch> = PLP1 in SCPI denotes PLP 0 in GUI.
SOURCE1:BB:T2DVb:PLP1:INPUT:FORMAT?
// Response: "TS"
SOURCE1:BB:T2DVb:PLP1:PACKETLENGTH?
// Response: "P188"
SOURCE1:BB:T2DVb:PLP1:INPUT:STUFFING?
// Response: "1"
SOURCE1:BB:T2DVb:PLP1:USEFUL:RATE:MAX?
// Response in Bit/s: "36140759"
SOURCE1:BB:T2DVb:PLP1:INPUT:DATARATE?
// Response in Bit/s: "5018504"
SOURCE1:BB:T2DVb:PLP1:USEFUL:RATE?
// Response in Bit/s: "4550760"

//*****
// Query properties of external input signals at IP Data interface.
//*****
SOURCE1:BB:T2DVb:INPUT IP
SOURCE1:BB:T2DVb:INPUT:TSCHEMEL 1
SOURCE1:BB:T2DVb:INPUT:T2MI:INTERFACE?
// Response: "1"

SOURCE1:BB:T2DVb:INPUT:NPLP?
// Response: "19"
// Multi-PLP transmission.

SOURCE1:BB:T2DVb:PLP19:INPUT:FORMAT?
// Response: "GFPS"
// PLP 18 (GUI) input format is a generic fixed-length packetized stream.

SOURCE1:BB:T2DVb:PLP19:USEFUL:RATE?
// Response in Bit/s: "100344"

//*****
// Query properties of internal TS player input signals.

```

```

//*****
SOURCE1:BB:T2DVb:SOURCE TSPL
SOURCE1:BB:T2DVb:PLP1:INPut:FORMat?
// Response: "TS"

SOURCE1:BB:T2DVb:PLP1:USEFul:RATE:MAX?
// Response in Bit/s: "38583461"

SOURCE1:BB:T2DVb:PLP1:USEFul:RATE?
// Response in Bit/s: "4566952"

```

Commands

[:SOURCE<hw>]:BB:T2DVb:INPut:NPLP?	87
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:INPut:FORMat	87
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:INPut:STUFFing	88
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:PACKetlength?	88
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:USEFul[:RATE]?	88
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:USEFul[:RATE]:MAX?	89
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>[:INPut]:DATarate?	89

[:SOURCE<hw>]:BB:T2DVb:INPut:NPLP?

Queries the number of physical layer pipes (PLP).

Return values:

<Nplp> integer
 Range: 1 to 20
 *RST: 1

Example: See [Example"Querying PLP input properties"](#) on page 86.

Usage: Query only

Manual operation: See ["Number of PLPs"](#) on page 17

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:INPut:FORMat <Format>

Queries the input format of each PLP <num> for all input sources.

Parameters:

<Format> GFPS | GCS | GSE | TS
GFPS
 Generic fixed-length packetized stream
GCS
 Generic continuous stream
GSE
 Generic stream encapsulation
TS
 Transport stream
 *RST: TS

Example: See [Example"Querying PLP input properties"](#) on page 86.

Manual operation: See ["PLP Input Format"](#) on page 19

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:INPut:STUFFing <Stuffing>

Activates stuffing.

Parameters:

<Stuffing> OFF | ON

ON

Inserts null packets and corrects the PCR values.

OFF

The data rate of the transport stream source must match the data rate required for the current modulation parameters.

*RST: ON

Example: See [Example"Querying PLP input properties"](#) on page 86.

Manual operation: See ["Stuffing"](#) on page 18

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:PACKetlength?

Queries the packet length of the external transport stream in bytes.

Return values:

<Packetlength> P188 | INValid

P188

188 byte packets specified for serial input and parallel input.

INValid

Packet length does not match the specified length.

Example: See [Example"Querying PLP input properties"](#) on page 86.

Usage: Query only

Manual operation: See ["Packet Length"](#) on page 19

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:USEFul[:RATE]?

Queries the data rate of useful data r_{useful} of the external transport stream. The data rate is measured at the input of the installed input interface.

Return values:

<Rate> integer

Range: 0 to 999999999

*RST: 0

Example: See [Example"Querying PLP input properties"](#) on page 86.

Usage: Query only

Manual operation: See ["Useful Data Rate / Mbit/s"](#) on page 20

[[:SOURce<hw>]:BB:T2DVb:PLP<ch>:USEFul[:RATE]:MAX?

Queries the maximum data rate, that is derived from the current modulation parameter settings.

The value is the optimal value at the TS input interface, that is necessary for the modulator.

Return values:

<Max> integer
Range: 0 to 999999999

Example: See [Example"Querying PLP input properties"](#) on page 86.

Usage: Query only

Manual operation: See ["Max. Useful Data Rate / Mbit/s"](#) on page 20

[[:SOURce<hw>]:BB:T2DVb:PLP<ch>[:INPut]:DATarate?

Queries the measured value of the data rate of one of the following:

- External transport stream including null packets input at "User 1" connector
- External transport stream including null packets input at "IP Data/LAN" connector (TSoverIP)

The value equals the sum of useful data rate r_{meas} and the rate of null packets r_0 :

$$r_{\text{meas}} = r_{\text{meas}} + r_0$$

Return values:

<Datarate> integer
Range: 0 to 999999999

Example: See [Example"Querying PLP input properties"](#) on page 86.

Usage: Query only

Manual operation: See ["Measured Data Rate / Mbit/s"](#) on page 20

5.2.3 T2-MI packet timing commands

Example: Querying T2-MI packet timing parameters

```
SOURce1:BB:T2DVb:INPut:T2MI:INTerface ON
```

```
SOURce1:BB:T2DVb:INPut:T2MI:MEASuremode ABSOLUTE
```

```
// All following responses to timing commands are in seconds.
```

```
SOURce1:BB:T2DVb:INPut:T2MI:MIN:T1?
```

```
// Response: "0.297277"
```

```
SOURce1:BB:T2DVb:INPut:T2MI:MIN:T2?
```

```
// Response: "0.155838"
```

```
SOURce1:BB:T2DVb:INPut:T2MI:MIN:T3?
```

```
// Response: "0"
SOURCE1:BB:T2DVb:INPut:T2MI:MAX:T1?
// Response: "0.254925"
SOURCE1:BB:T2DVb:INPut:T2MI:MAX:T2?
// Response: "0"
SOURCE1:BB:T2DVb:INPut:T2MI:MAX:T3?
// Response: "0.303451"
SOURCE1:BB:T2DVb:INPut:T2MI:MAX:T4?
// Response: "0"
```

Commands

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MEASuremode	90
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T3?	90
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T2?	90
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T1?	90
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MAX:T4?	91
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MAX:T3?	91
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MAX:T2?	91
[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MAX:T1?	91

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MEASuremode <Measuremode>

Specifies the measurement mode to configure the evaluation of T2-MI timing parameters.

Parameters:

<Measuremode> ABSOLUTE | DELTA
*RST: ABSOLUTE

Example: See [Example"Querying T2-MI packet timing parameters"](#) on page 89.

Manual operation: See ["Measurement Mode"](#) on page 22

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T3?

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T2?

[:SOURCE<hw>]:BB:T2DVb:INPut:T2MI:MIN:T1?

Queries the current value of minimum time parameters $T_{\min1}/T_{\min2}/T_{\min3}$.

Return values:

<MinT1> float
Range: -99.999999 to 99.999999
Increment: 0.000001
*RST: 0
Default unit: s

Example: See [Example"Querying T2-MI packet timing parameters"](#) on page 89.

Usage: Query only

Manual operation: See "T2-MI T_{min1} " on page 22

```
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:MAX:T4?
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:MAX:T3?
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:MAX:T2?
[:SOURce<hw>]:BB:T2DVb:INPut:T2MI:MAX:T1?
```

Queries the current value of the maximum time parameters $T_{max1}/T_{max2}/T_{max3}/T_{max4}$.

Return values:

```
<MaxT1>          float
                  Range:    -99.999999 to 99.999999
                  Increment: 0.000001
                  *RST:     0
                  Default unit: s
```

Example: See [Example "Querying T2-MI packet timing parameters"](#) on page 89.

Usage: Query only

Manual operation: See "T2-MI T_{max1} " on page 23

5.2.4 Test signal commands

Example: Configuring test signal properties

```
SOURce1:BB:T2DVb:INPut:T2MI:INTerface OFF

SOURce1:BB:T2DVb:SOURce TEST
SOURce1:BB:T2DVb:PLP1:INPut:TESTsignal?
// Response: "TTSP"
SOURce1:BB:T2DVb:PLP1:INPut:FORMat?
// Response: "TS"

//*****
// Configure test signal properties.
//*****
SOURce1:BB:T2DVb:TSPacket H184
SOURce1:BB:T2DVb:PIDTestpack NULL
SOURce1:BB:T2DVb:PID?
// Response in decimal representation: "8191"
// Response in hexadecimal representation: "1FFF"
SOURce1:BB:T2DVb:PIDTestpack VAR
SOURce1:BB:T2DVb:PID 4607
// Corresponds to 11FF in hexadecimal representation.
SOURce1:BB:T2DVb:PAYLoad PRBS
SOURce1:BB:T2DVb:PRBS P23_1
```

Commands

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:INPut:TESTsignal	92
[:SOURce<hw>]:BB:T2DVb:PAYLoad	92
[:SOURce<hw>]:BB:T2DVb:PID	92
[:SOURce<hw>]:BB:T2DVb:PIDTestpack	92
[:SOURce<hw>]:BB:T2DVb:PRBS[:SEQUence]	93
[:SOURce<hw>]:BB:T2DVb:TSPacket	93

[\[:SOURce<hw>\]:BB:T2DVb:PLP<ch>:INPut:TESTsignal](#) <TestSignal>

Defines the test signal data.

Parameters:

<TestSignal> TTSP
 *RST: TTSP

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["Test Signal"](#) on page 18

[\[:SOURce<hw>\]:BB:T2DVb:PAYLoad](#) <Payload>

Defines the payload area content of the TS packet.

Parameters:

<Payload> PRBS | H00 | HFF
 *RST: PRBS

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["Payload Test/Stuff"](#) on page 25

[\[:SOURce<hw>\]:BB:T2DVb:PID](#) <Pid>

Sets the [PID](#).

Parameters:

<Pid> integer
 Range: 0 to 8191
 *RST: 8191

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["PID \(Hex\)"](#) on page 25

[\[:SOURce<hw>\]:BB:T2DVb:PIDTestpack](#) <PidTSPacket>

If a header is present in the test packet ("Test TS Packet > Head/184 Payload"), you can specify a fixed or variable packet identifier (PID).

Parameters:

<PidTSPacket> NULL | VARIable
 *RST: NULL

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["PID Test Packet"](#) on page 25

[:SOURce<hw>]:BB:T2DVb:PRBS[:SEQUence] <Prbs>

Sets the length of the PRBS sequence.

You can select a PRBS 15 or a PRBS 23 sequence as specified by [ITU-T O.151](#).

Parameters:

<Prbs> P23_1 | P15_1
 *RST: P23_1

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["PRBS"](#) on page 25

[:SOURce<hw>]:BB:T2DVb:TSPacket <TSPacket>

Specifies the structure of the test transport stream packet that is fed to the modulator.

Parameters:

<TSPacket> H184 | S187
 *RST: H184

Example: See [Example"Configuring test signal properties"](#) on page 91.

Manual operation: See ["Test TS Packet"](#) on page 25

5.2.5 IP subsystem

The `SOURce:BB:INPut:IP` subsystem contains the commands for configuring input IP data from a local IP data network.

To configure local IP data network parameters, see [Chapter 5.10, "BCIP subsystem"](#), on page 139.

Common suffixes

The following common suffixes are used in the `SOURce:BB:INPut:IP` remote commands:

Suffix	Value range	Description
IP<ch>	1 to 4	IP channel number

Example: Configure IP channel 2 properties

```
// Use the data from IP channel 2 as input for modulation data.
SOURCE1:BB:INPut:IP2:STATe ON
// Specify alias as "Alias 2".
SOURCE1:BB:INPut:IP2:ALias "Alias 2"

//*****
// Define Unicast properties.
//*****
SOURCE1:BB:INPut:IP2:TYPe UNI
// Local IP data interface is configured for Unicast reception
SOURCE1:BB:INPut:IP2:PORT 6002

//*****
// Define multicast properties.
//*****
SOURCE1:BB:INPut:IP2:TYPe MULT
// Local IP data interface is configured for Multicast reception
SOURCE1:BB:INPut:IP2:MULTicast:ADDRess?
// Response: "226.0.0.0"
SOURCE1:BB:INPut:IP2:IGMP:SOURCce:ADDRess?
// Response: "0.0.0.0"
SOURCE1:BB:INPut:IP2:IGMP:SOURCce:ADDRess "192.168.10.1"
SOURCE1:BB:INPut:IP2:IGMP:SOURCce:PING
SOURCE1:BB:INPut:IP2:IGMP:SOURCce:RESult?
// Response: "Ping: Successful"
```

Commands

[:SOURCE<hw>]:BB:INPut:IP<ch>[:STATe]	94
[:SOURCE<hw>]:BB:INPut:IP<ch>:ALias	95
[:SOURCE<hw>]:BB:INPut:IP<ch>:PORT	95
[:SOURCE<hw>]:BB:INPut:IP<ch>:TYPe	95
[:SOURCE<hw>]:BB:INPut:IP<ch>:MULTicast:ADDRess	96
[:SOURCE<hw>]:BB:INPut:IP<ch>:IGMP[:SOURCce]:ADDRess	96
[:SOURCE<hw>]:BB:INPut:IP<ch>:IGMP[:SOURCce]:PING	96
[:SOURCE<hw>]:BB:INPut:IP<ch>:IGMP[:SOURCce]:RESult?	96

[\[:SOURCE<hw>\]:BB:INPut:IP<ch>\[:STATe\]](#) <Alias>

Activates/deactivates the "IP Channel x" as IP input.

Specify the current IP TS Channel with the command

`SOURCE1:BB:DigStd:INPut:TSCHannel`. `DigStd` stands for the IP TS Channel in the corresponding broadcast standard.

Parameters:

<Alias> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["Input IP"](#) on page 27

[:SOURce<hw>]:BB:INPut:IP<ch>:ALias <Alias>

Specifies an alias, i.e. name for the IP connection.

Parameters:

<Alias> string

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["Alias"](#) on page 27

[:SOURce<hw>]:BB:INPut:IP<ch>:PORT <Port>

Sets the port of the input IP data at the "IP Data" connector.

Parameters:

<Port> integer
 Range: 0 to 65535
 *RST: 6002

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["Port"](#) on page 28

[:SOURce<hw>]:BB:INPut:IP<ch>:TYPE <Type>

Sets the IP input type.

Parameters:

<Type> UNicast | MULTicast

UNicast

Analyzes all unicast IP packets that arrive at the specified port.
 See [\[:SOURce<hw>\]:BB:INPut:IP<ch>:PORT](#) on page 95.

MULTicast

When an IP address is in the multicast address range, an attempt is made to join a multicast group using **IGMP**. Set multi-cast address and port.

See:

[\[:SOURce<hw>\]:BB:INPut:IP<ch>:MULTicast:ADDRESS](#)
 on page 96

[\[:SOURce<hw>\]:BB:INPut:IP<ch>:PORT](#) on page 95

*RST: UNicast

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["Type"](#) on page 28

[:SOURce<hw>]:BB:INPut:IP<ch>:MULTicast:ADDRess

Sets the destination IP address (IPv4) of the IP connection.

Parameters:

<Address> string
Range: 224.0.0.0 to 239.255.255.255

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["Multicast Address"](#) on page 28

[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:ADDRess

Specifies the IGMP source address of the network.

Parameters:

<Address> string

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Manual operation: See ["IGMPv3 Source Address"](#) on page 28

[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:PING

Triggers pinging of the IGMP source address in the local IP data network. Query the result via [\[:SOURce<hw>\]:BB:INPut:IP<ch>:IGMP\[:SOURce\]:RESult?](#) on page 96.

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Usage: Event

Manual operation: See ["Ping Source Address"](#) on page 28

[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:RESult?

Queries the result of pinging the IGMP source address.

See [\[:SOURce<hw>\]:BB:INPut:IP<ch>:IGMP\[:SOURce\]:PING](#) on page 96.

Return values:

<PingResult> string
Returns ping messages.

Example: See [Example"Configure IP channel 2 properties"](#) on page 94.

Usage: Query only

Manual operation: See ["Ping Result"](#) on page 28

5.3 Mode and stream commands

The section contains the commands for configuring mode and stream parameters of individual PLPs.

Example: Configuring mode and stream parameters

```
//*****
// Enable setting of PLP 0 parameters by deactivating the T2-MI interface.
//*****
SOURCE1:BB:T2DVb:INPut:T2MI:INTerface OFF

//*****
// Set PLP 0 mode and stream parameters.
//*****
SOURCE1:BB:T2DVb:PLP1:ID 0
SOURCE1:BB:T2DVb:PLP1:GRoup 0
SOURCE1:BB:T2DVb:PLP1:TYPE?
// Response: "DT1"
// Fixed type for single-PLP transmission.
SOURCE1:BB:T2DVb:PLP1:BB_Mode HEM
// Enables high-efficiency baseband mode.

//*****
// Query PLP 0 mode and stream parameters.
//*****
SOURCE1:BB:T2DVb:PLP1:ISSY?
// Response: "0"
// The synchronizer uses a short input stream clock reference.
SOURCE1:BB:T2DVb:PLP1:NPD?
// Response: "0"
// Null packet deletion is off.
// Query in-band signaling state.
SOURCE1:BB:T2DVb:PLP1:IBS?
// Response: "0"
SOURCE1:BB:T2DVb:L:T2Version V121
// Setting L1 T2 version V1.2.1 allows querying in-band sign. types A/B states.
SOURCE1:BB:T2DVb:PLP1:IBS:A?
// Response: "0"
SOURCE1:BB:T2DVb:PLP1:IBS:B?
// Response: "0"

//*****
// Query parameters related to multi-PLP transmission.
//*****
SOURCE1:BB:T2DVb:INPut:NPLP?
// Response: "4"
// Indicates multi-PLP transmission with four PLPs.
// Query the number of other PLPs signaled within in-band signaling.
SOURCE1:BB:T2DVb:PLP1:OIBPlp?
// Response: "0"
```

```

SOURCE1:BB:T2DVb:PLP1:CMType?
// Response: "ACM"
SOURCE1:BB:T2DVb:PLP1:STAFlag?
// Response: "1"
// Static scheduling for PLP 0 from T2 frame to T2 frame.
SOURCE1:BB:T2DVb:PLP1:PADFlag?
// Response: "0"
// BBFrame padding disabled for PLP 0.

```

Commands

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:BB_Mode	98
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:CMType?	98
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:GROup	99
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:IBS?	99
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:IBS:A?	100
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:IBS:B?	100
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:ID	100
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:ISSY?	101
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:NPD?	101
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:OIBPlp?	101
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:PADFlag?	102
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:STAFlag?	102
[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:TYPE	102

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:BB_Mode <BBMode>](#)

Defines the baseband mode.

Parameters:

<BBMode> HEM | NM
 *RST: HEM

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Manual operation: See ["BB Mode"](#) on page 30

[\[:SOURCE<hw>\]:BB:T2DVb:PLP<ch>:CMType?](#)

Queries the **CM** type for multi-PLP. Multi-PLP requires number of PLPs > 1, see [\[:SOURCE<hw>\]:BB:T2DVb:INPut:NPLP?](#) on page 87.

Return values:

<CMType> CCM | ACM

CCM

Constant coding and modulation. The setting implies identical settings for all PLPs of the commands:

`[:SOURce<hw>] :BB:T2DVb:PLP<ch>:FECFrame`
on page 105

`[:SOURce<hw>] :BB:T2DVb:PLP<ch>:RATE` on page 106

`[:SOURce<hw>] :BB:T2DVb:PLP<ch>:CONStel`
on page 104

`[:SOURce<hw>] :BB:T2DVb:PLP<ch>:CROTation`
on page 104

ACM

Variable coding and modulation. Not all PLPs use the same coding and modulation.

*RST: CCM

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["CM Type"](#) on page 33

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:GROUp <Group>

Sets the PLP group ID for multi-PLP, i.e. the number of PLPs is greater than 1.

See `[:SOURce<hw>] :BB:T2DVb:INPut:NPLP?` on page 87.

Parameters:

<Group> integer
Range: 0 to 255
*RST: 1

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Manual operation: See ["PLP Group ID \(Hex\)"](#) on page 30

[:SOURce<hw>] :BB:T2DVb:PLP<ch>:IBS?

Queries the in-band signaling state.

Return values:

<IBS> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["In-Band Signaling"](#) on page 33

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:IBS:A?

Queries the in-band signaling type A state.

Query requires L1 T2 specification version higher than V1.1.1, see [:SOURce<hw>] : BB:T2DVb:L:T2Version on page 119.

Return values:

<IBSA> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["In-Band Signaling A"](#) on page 33

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:IBS:B?

Queries the in-band signaling type B state.

Query requires L1 T2 specification version higher than V1.1.1, see [:SOURce<hw>] : BB:T2DVb:L:T2Version on page 119.

Return values:

<IBSB> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["In-Band Signaling B"](#) on page 33

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:ID <PlpId>

Sets the PLP ID. The PLP ID has to be unique.

Parameters:

<PlpId> integer
Range: 0 to 255
*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Manual operation: See ["PLP ID \(Hex\)"](#) on page 30

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:ISSY?

Queries the **ISSY** state.

Return values:

<Issy> OFF | SHORt | LONG

OFF

ISSY is not active. ISSY indicator field is 0.

SHORt

ISSY is active. ISSY indicator field is 1. The synchronizer uses a short **ISCR**.

LONG

ISSY is active. ISSY indicator field is 1. The synchronizer uses a long **ISCR**.

*RST: OFF

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See "[ISSY](#)" on page 32

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:NPD?

Queries the null packet deletion state.

Return values:

<NPD> 1 | ON | 0 | OFF

*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See "[Null Packet Deletion](#)" on page 33

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:OIBPlp?

Queries the number of other PLPs signaled within the in-band signaling of the PLP for multi-PLP. Multi-PLP requires number of PLPs > 1, see [\[:SOURce<hw>\]:BB:T2DVb:INPut:NPLP?](#) on page 87.

Return values:

<OIBPlps> integer

Range: 0 to 255

*RST: 0

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["Other In-Band PLPs"](#) on page 33

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:PADFlag?

Queries if BBFrame padding other than for in-band signaling is used for the current PLP.

Return values:

<PaddingFlag> 1 | ON | 0 | OFF
*RST: 1

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["Static Padding Flag"](#) on page 34

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:STAFflag?

Queries if the scheduling for the current PLP varies from T2 frame to T2 frame or remains static.

Return values:

<StaticFlag> 1 | ON | 0 | OFF
*RST: 1

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Usage: Query only

Manual operation: See ["Static Flag"](#) on page 34

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:TYPE <Type>

Sets the PLP type.

The type depends on the number of PLPs in the setup.

Parameters:

<Type> DT1 | DT2 | COMMon

COMMon

Common PLP of the PLP Group. Requires a multi-PLP setup, see [\[:SOURce<hw>\]:BB:T2DVb:INPut:NPLP?](#) on page 87.

DT1

Data type 1. Fixed for a single-PLP setup. Configurable for a multi-PLP setup.

DT2

Data type 2. Requires a multi-PLP setup.

*RST: DT1

Example: See [Example "Configuring mode and stream parameters"](#) on page 97.

Manual operation: See ["PLP Type"](#) on page 30

5.4 BICM commands

The section contains the commands for configuring BICM.

Example: Configure BICM parameters

```
//*****
// Enable setting of PLP 0 parameters by deactivating the T2-MI interface.
//*****
SOURCE1:BB:T2DVb:INPut:T2MI:INterface OFF

//*****
// Set PLP 0 coding and modulation parameters.
//*****
SOURCE1:BB:T2DVb:PLP1:FECFrame NORM
// Sets the FEC frame N_LDPC = 64800.
SOURCE1:BB:T2DVb:PLP1:RATE R3_5
// Sets the code rate 3/5.
SOURCE1:BB:T2DVb:PLP1:CONStel T256
// Sets 256 QAM constellation.
SOURCE1:BB:T2DVb:PLP1:CROTation?
// Response: "0"
// Constellation rotation is disabled.

//*****
// Set PLP 0 interleaving parameters.
//*****
SOURCE1:BB:T2DVb:PLP1:TIL:TYPE 0
// Set time interleaver type 0.
SOURCE1:BB:T2DVb:PLP1:TIL:FINT?
// Response: "1"
// Time interleaver frame interval is fixed to 1 for single-PLP transmission.
SOURCE1:BB:T2DVb:PLP1:TIL:LENGth 3
// Set the time interleaver length to 3.
SOURCE1:BB:T2DVb:PLP1:FRAMEindex?
// Response: "0"
// Index of the first frame of the superframe is 0.
SOURCE1:BB:T2DVb:PLP1:BLOCKs?
// Response: "202"
// 202 FEC blocks per interleaving frame.
SOURCE1:BB:T2DVb:PLP1:MAXBLOCKs?
// Response: "202"
// 202 FEC blocks is maximum per interleaving frame.
```

Commands

[:SOURce<hw>]:BB:T2DVb:PLP<ch>:BLOCks?	104
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:CONStel	104
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:CROTation	104
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:FECFrame	105
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:FRAMEindex	105
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:MAXBlocks?	105
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:RATE	106
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:TIL:FINT	106
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:TIL:LENGth	106
[:SOURce<hw>]:BB:T2DVb:PLP<ch>:TIL:TYPE	106

[\[:SOURce<hw>\]:BB:T2DVb:PLP<ch>:BLOCks?](#)

Queries the number of FEC blocks per interleaving frame.

Return values:

<FECBlocks> integer
 Range: 0 to 1023
 *RST: 0

Example: See [Example"Configure BICM parameters"](#) on page 103.

Usage: Query only

Manual operation: See ["FEC Blocks per IF"](#) on page 37

[\[:SOURce<hw>\]:BB:T2DVb:PLP<ch>:CONStel](#) <Constellation>

Defines the constellation.

Parameters:

<Constellation> T4 | T16 | T64 | T256
 T4
 QPSK
 T16|T64|T256
 16/64/256QAM
 *RST: T256

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["Constellation"](#) on page 36

[\[:SOURce<hw>\]:BB:T2DVb:PLP<ch>:CROTation](#) <CRotation>

Sets the constellation rotation state.

Parameters:

<CRotation> 1 | ON | 0 | OFF

ON

Transmits the constellation rotated, i.e. the Q path is delayed vs. the I path. For each constellation, there is a different (but fixed) angle of rotation.

OFF

Transmits non-rotated constellation.

*RST: 1

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["Const. Rotation"](#) on page 36

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:FECFrame <NPFecFrame>

Sets the FEC frame.

Parameters:

<NPFecFrame> NORMAL | SHORT

NORMAL

$N_{LDPC} = 64800$

SHORT

$N_{LDPC} = 16200$

*RST: NORMAL

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["FEC Frame"](#) on page 35

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:FRAMEindex <FFIndex>

Queries the index of the first frame of the super frame, in that the current PLP occurs.

Parameters:

<FFIndex> integer

Range: 0 to 255

*RST: 0

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["First Frame Index"](#) on page 36

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:MAXBlocks?

Queries the maximum number of FEC blocks per interleaving frame.

Return values:

<FECBlocksMax> integer

Range: 0 to 1023

*RST: 0

Example: See [Example"Configure BICM parameters"](#) on page 103.

Usage: Query only
Manual operation: See ["Max. Number of Blocks"](#) on page 38

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:RATE <Coderate>

Sets the code rate.

Parameters:

<Coderate> R1_2 | R3_5 | R2_3 | R3_4 | R4_5 | R5_6 | R1_3 | R2_5
 *RST: R3_5

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["Code Rate"](#) on page 35

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:TIL:FINT <FrameInterval>

Defines the time interleaver frame interval (I_{Jump}).

For limitations, see specification [ETSI EN 302 755](#).

Parameters:

<FrameInterval> integer
 Range: 1 to 255
 *RST: 1

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["Frame Interval \(\$I_{\text{Jump}}\$ \)"](#) on page 36

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:TIL:LENGTH <TILLength>

Defines the time interleaver length within the time interleaving frame.

For limitations, see specification [ETSI EN 302 755](#).

Parameters:

<TILLength> integer
 Range: 0 to 255
 *RST: 3

Example: See [Example"Configure BICM parameters"](#) on page 103.

Manual operation: See ["Time Interleaver Length"](#) on page 36

[:SOURCE<hw>]:BB:T2DVb:PLP<ch>:TIL:TYPE <TILType>

Defines the time interleaver type.

Parameters:

<TILType> integer

0

Maps each interleaving frame directly to a T2 frame.

1

Maps each interleaving frame to more than one T2 frame.

Range: 0 to 1

*RST: 0

Example: See [Example "Configure BICM parameters"](#) on page 103.**Manual operation:** See ["Time Interleaver Type"](#) on page 36

5.5 OFDM commands

The section contains the commands for configuring **OFDM** symbol parameters.

Example: Configuring OFDM parameters

```
//*****
// Configure bandwidth parameters.
//*****
SOURCE1:BB:T2DVb:CHANnel:BANDwidth BW_1_7
// Sets 1.7 MHz channel bandwidth
// Query the used bandwidth in MHz.
SOURCE1:BB:T2DVb:USED:BANDwidth?
// Response in Hz: "1535156.3"
// The used bandwidth value indicates, that extended carrier mode is active.
SOURCE1:BB:T2DVb:FFT:MODE?
// Response: "M32E"
// 32K FFT size using extended carrier mode.
SOURCE1:BB:T2DVb:BANDwidth:VARiation 10
// Sets a bandwidth variation of 10 ppm.

//*****
// Set/query OFDM parameters with deactivated the T2-MI interface.
//*****
SOURCE1:BB:T2DVb:GUARd:INTerval G19256
// Sets guard interval to 19/256.
SOURCE1:BB:T2DVb:PILOt PP4
// Sets the pilot pattern to PP4.
SOURCE1:BB:T2DVb:NT2Frames 10
// Sets 10 T2 frames per super frame.
SOURCE1:BB:T2DVb:LDAta 9
// Sets 9 data symbols per T2 frame.
SOURCE1:BB:T2DVb:LF?
// Response: "10"
// 10 OFDM symbols per T2 frames.
SOURCE1:BB:T2DVb:NSUB?
// Response: "1"
// Subsllices per T2 frame is fixed to 1 for single-PLP transmission.
```

Commands

[:SOURce<hw>]:BB:T2DVb:BANDwidth:VARiation	108
[:SOURce<hw>]:BB:T2DVb:CHANnel[:BANDwidth]	108
[:SOURce<hw>]:BB:T2DVb:FFT:MODE	108
[:SOURce<hw>]:BB:T2DVb:GUARd:INTerval	109
[:SOURce<hw>]:BB:T2DVb:LDATA	109
[:SOURce<hw>]:BB:T2DVb:LF?	109
[:SOURce<hw>]:BB:T2DVb:NSUB	109
[:SOURce<hw>]:BB:T2DVb:NT2Frames	110
[:SOURce<hw>]:BB:T2DVb:PILot	110
[:SOURce<hw>]:BB:T2DVb:USED[:BANDwidth]?	110

[:SOURce<hw>]:BB:T2DVb:BANDwidth:VARiation <BandwidthVar>

Changes the used bandwidth in the range of ± 1000 ppm.

Parameters:

<BandwidthVar>	integer
	Range: -1000 to 1000
	*RST: 0
	Default unit: ppm

Example: See [Example "Configuring OFDM parameters"](#) on page 107.

Manual operation: See ["Bandwidth Variation"](#) on page 40

[:SOURce<hw>]:BB:T2DVb:CHANnel[:BANDwidth] <ChannelBW>

Selects the channel bandwidth.

Parameters:

<ChannelBW>	BW_2 BW_5 BW_6 BW_7 BW_8
	*RST: BW_8

Example: See [Example "Configuring OFDM parameters"](#) on page 107.

Manual operation: See ["Channel Bandwidth"](#) on page 38

[:SOURce<hw>]:BB:T2DVb:FFT:MODE <FFTSize>

Defines the [FFT](#) size.

Parameters:

<FFTSize>	M1K M2K M4K M8K M8E M16K M16E M32K M32E
	M1K M2K M4K M8K M16K M32K
	1K/2K/4K/8K/16K/32K FFT size using normal carrier mode
	M8E M16E M32E
	8K/16K/32K FFT size using extended carrier mode
	*RST: M32E

Example: See [Example "Configuring OFDM parameters"](#) on page 107.

Manual operation: See ["FFT Size"](#) on page 40

[[:SOURce<hw>]:BB:T2DVb:GUARd:INTerval <GuardInterval>

Sets the guard interval length.

Parameters:

<GuardInterval> G1_4 | G1_8 | G1_16 | G1_32 | G1128 | G19128 | G19256
 *RST: G1128

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Manual operation: See ["Guard Interval"](#) on page 40

[[:SOURce<hw>]:BB:T2DVb:LDAa <DataSymbols>

Sets the number of data symbols per T2 frame.

Parameters:

<DataSymbols> integer
 Range: 0 to 4095
 *RST: 59

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Manual operation: See ["Data Symbols per T2 Frame \(L_DATA\)"](#) on page 41

[[:SOURce<hw>]:BB:T2DVb:LF?

Queries the computed number of OFDM symbols per T2 frame.

Return values:

<OfdmSymbols> integer
 Range: 0 to 4095
 *RST: 4

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Usage: Query only

Manual operation: See ["OFDM Symbols per T2 Frame \(L_F\)"](#) on page 41

[[:SOURce<hw>]:BB:T2DVb:NSUB <Subslices>

Sets the number of subslices per T2 frame.

The number of subslices is "1" for "T2-MI Interface > Off".

Parameters:

<Subslices> integer
 Range: 0 to 32767
 *RST: 1

Example: :SOuRce1:BB:T2DVb:INPut:T2MI:INTErface 0
 :SOuRce1:BB:T2DVb:NSUB?
 \\ Response: "1"

Example: See also [Example"Configuring OFDM parameters"](#) on page 107.

Manual operation: See "[Subslices per T2 Frame \(N_SUB\)](#)" on page 41

[:SOuRce<hw>]:BB:T2DVb:NT2Frames <NT2Frames>

Sets the number of T2 frames per super frame.

Parameters:

<NT2Frames> integer
 Range: 2 to 255
 *RST: 2

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Manual operation: See "[T2 Frames per Super Frame \(N_T2\)](#)" on page 41

[:SOuRce<hw>]:BB:T2DVb:PILot <PilotPattern>

Sets the pilot pattern.

Parameters:

<PilotPattern> PP1 | PP2 | PP3 | PP4 | PP5 | PP6 | PP7 | PP8
 *RST: PP7

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Manual operation: See "[Pilot Pattern](#)" on page 40

[:SOuRce<hw>]:BB:T2DVb:USED[:BANDwidth]?

Queries the used channel bandwidth.

The used bandwidth depends on the channel bandwidth, the FFT size and the carrier mode as described in [Table 3-2](#).

Return values:

<UsedBW> integer
 Range: 0.0 to 9999999.9

Example: See [Example"Configuring OFDM parameters"](#) on page 107.

Usage: Query only

Manual operation: See "[Used Bandwidth](#)" on page 39

5.6 System commands

The section contains the commands for configuring the DVB-T2 system.

- [Network commands](#)..... 111
- [L1 commands](#)..... 116
- [ID commands](#)..... 120

5.6.1 Network commands

Example: Configuring network parameters

```
//*****
// Configure common T2 network settings
//*****
SOURCE1:BB:T2DVb:INPut:T2MI:INTerface OFF

SOURCE1:BB:T2DVb:PAPR TR
// Enables tone reservation (TR).

SOURCE1:BB:T2DVb:TXSYs MISO
// Sets for multi input single output (MISO) transmission system.
SOURCE1:BB:T2DVb:MISO:MODE?
// Response: "MAN"
// Manual MISO mode is enabled.
SOURCE1:BB:T2DVb:MISO:GRoup G2
// Modulator transmits with MISO group 2.

SOURCE1:BB:T2DVb:FEF?
// Response: "0"
// Future extension frames are disabled.
SOURCE1:BB:T2DVb:TFS?
// Response: "0"
// Time frequency slicing is disabled.

//*****
// Query future extension frame (FEF) parameters.
//*****
SOURCE1:BB:T2DVb:INPut:T2MI:INTerface ON
// T2-MI stream with FEF settings is needed for the following commands

SOURCE1:BB:T2DVb:FEF?
// Response: "1"
// Future extension frames are enabled.
SOURCE1:BB:T2DVb:FEF:TYPE?
// Response: "0"
// FEF part has type 0.
SOURCE1:BB:T2DVb:FEF:LENGth?
// Response: "555000"
// FEF length is 555000 elementary periods T.
```

```

SOURCE1:BB:T2DVb:FEF:INTerval?
// Response: "1"
// One T2 frame between two FEF parts.
SOURCE1:BB:T2DVb:FEF:PAYLoad?
// Response: "NULL"
// I/Q values of the FEF payload are zero.

//*****
// Configure single-frequency network properties.
//*****

SOURCE1:BB:T2DVb:INPut:T2MI:INterface ON
SOURCE1:BB:T2DVb:NETWorkmode SFN

SOURCE1:BB:T2DVb:PROFile MULTI
// Modulator operates in multiple profile operation mode.

```

For single-frequency network delays and mode commands, see [Chapter 5.7, "SFN delay commands"](#), on page 121.

Commands

[:SOURCE<hw>]:BB:T2DVb:FEF	112
[:SOURCE<hw>]:BB:T2DVb:FEF:INTerval	112
[:SOURCE<hw>]:BB:T2DVb:FEF:LENGth	113
[:SOURCE<hw>]:BB:T2DVb:FEF:PAYLoad	113
[:SOURCE<hw>]:BB:T2DVb:FEF:TYPE	114
[:SOURCE<hw>]:BB:T2DVb:MISO:MODE?	114
[:SOURCE<hw>]:BB:T2DVb:MISO[:GROup]	114
[:SOURCE<hw>]:BB:T2DVb:NETWorkmode	114
[:SOURCE<hw>]:BB:T2DVb:PAPR	114
[:SOURCE<hw>]:BB:T2DVb:PROFile	115
[:SOURCE<hw>]:BB:T2DVb:TFS	115
[:SOURCE<hw>]:BB:T2DVb:TXSYs	115

[:SOURCE<hw>]:BB:T2DVb:FEF <FEF>

Enables/disables FEF.

Parameters:

<FEF> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example "Configuring network parameters"](#) on page 111.

Manual operation: See ["Future Extension Frames"](#) on page 45

[:SOURCE<hw>]:BB:T2DVb:FEF:INTerval <FEFInterval>

Queries the number of T2 frames between two FEF parts. The T2 frame shall always be the first frame in a T2 super frame which contains both FEF parts and T2 frames.

Parameters:

<FEFInterval> integer
 Range: 0 to 255
 *RST: 0

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["FEF Interval"](#) on page 45

[:SOURCE<hw>]:BB:T2DVb:FEF:LENGTH <FEFLength>

Queries the length of the associated FEF part as the number of elementary periods T, from the start of the P1 symbol of the FEF part to the start of the P1 symbol of the next T2 frame.

The FEF length is "0" for "T2-MI Interface > Off".

Parameters:

<FEFLength> integer
 Range: 0 to 16777215
 *RST: 0

Example: :SOURCE1:BB:T2DVb:INPut:T2MI:INterface 0
 :SOURCE1:BB:T2DVb:INPut:FEF:LENGTH?
 \\ Response: "0"

Example: See also [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["FEF Length"](#) on page 45

[:SOURCE<hw>]:BB:T2DVb:FEF:PAYLoad <FEFPayload>

Sets the FEF payload.

Parameters:

<FEFPayload> NULL | NOISe

NULL

I/Q values of the FEF payload are zeroes.

NOISe

I/Q values of the FEF payload are modulated in the frequency domain using a PRBS and transformed into the time domain by [IFFT](#).

The technique allows generating payload with a power level equal to the T2 frame.

*RST: NULL

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["FEF Payload"](#) on page 45

[:SOURce<hw>]:BB:T2DVb:FEF:TYPE <FEFType>

Queries the type of the associated FEF part.

Parameters:

<FEFType> integer
 Range: 0 to 15
 *RST: 0

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["FEF Type \(Hex\)"](#) on page 45

[:SOURce<hw>]:BB:T2DVb:MISO:MODE?

Sets the [MISO](#) group mode, that allows to set the MISO group of the modulator manually.

Return values:

<GroupMode> MANual
 *RST: MANual

Example: See [Example"Configuring network parameters"](#) on page 111.

Usage: Query only

Manual operation: See ["MISO Group Mode"](#) on page 44

[:SOURce<hw>]:BB:T2DVb:MISO[:GROup] <MisoGroup>

Sets the [MISO](#) group.

Parameters:

<MisoGroup> G1 | G2
 *RST: G1

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["MISO Group"](#) on page 44

[:SOURce<hw>]:BB:T2DVb:NETWorkmode <Networkmode>

Sets the network mode.

Parameters:

<Networkmode> MFN | SFN
 *RST: MFN

Manual operation: See ["Network Mode"](#) on page 43

[:SOURce<hw>]:BB:T2DVb:PAPR <PapR>

Sets the technique to reduce the peak to average power ratio.

Parameters:

<Papr> OFF | TR
 *RST: OFF

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["Peak To Average Power Ratio"](#) on page 44

[[:SOURce<hw>]:BB:T2DVb:PROFile <Profilemode>

Sets the profile mode.

Mutes P1FEF, if the modulator operates in a multi profile environment and is used to generate a RF combined T2Base/T2Lite composite signal.

Parameters:

<Profilemode> SINGLE | MULTI
 *RST: SINGLE

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["Profile Mode"](#) on page 43

[[:SOURce<hw>]:BB:T2DVb:TFS <TFS>

Queries the TFS state.

The current firmware does not support TFS.

Parameters:

<TFS> OFF
OFF
 Fixed response of the query.
 *RST: OFF

Example: See [Example"Configuring network parameters"](#) on page 111.

Manual operation: See ["Time Frequency Slicing"](#) on page 45

[[:SOURce<hw>]:BB:T2DVb:TXSYs <TransmissionSys>

Sets the transmission system.

Parameters:

<TransmissionSys> T2LM | T2LS | NONT2 | MISO | SISO
T2LM
 T2 Lite MISO
T2LS
 T2 Lite SISO
NONT2
 Non-T2

MISO
MISO
SISO
SISO
*RST: SISO

Example: See [Example "Configuring network parameters"](#) on page 111.

Manual operation: See ["Transmission System"](#) on page 44

5.6.2 L1 commands

Example: Configuring L1 parameters

```
//*****
// Setting L1 parameters requires disabling T2-MI interface.
//*****
SOURCE1:BB:T2DVb:INPut:T2MI:INTerface OFF

SOURCE1:BB:T2DVb:L:T2Version V111
// Sets T2 version to V1.1.1.
SOURCE1:BB:T2DVb:L:CONStel T64
// Sets L1 post modulation to 64QAM constellation.
SOURCE1:BB:T2DVb:L:REPetition ON
SOURCE1:BB:T2DVb:L:EXTension?
// Response: "0"
// L1 post extension is off.
SOURCE1:BB:T2DVb:L:SCRambled?
// Response: "0"
// L1 post scrambling is off. Set version V1.3.1 to activate it.
SOURCE1:BB:T2DVb:L:T2Version V131
SOURCE1:BB:T2DVb:L:SCRambled ON
SOURCE1:BB:T2DVb:L:T2Baselite?
// Response: "0"
// T2 base lite transmission not acitve.
SOURCE1:BB:T2DVb:NAUX?
// Response: "0"
// Number of auxiliary frames is fixed to zero.
SOURCE1:BB:T2DVb:L:RFSignalling?
// Response: "0"
// RF signaling is disabled.
SOURCE1:BB:T2DVb:L:RFSignaling:FREQuency?
// Response: "0"
```

Commands

[:SOURCE<hw>]:BB:T2DVb:L:CONStel	117
[:SOURCE<hw>]:BB:T2DVb:L:EXTension	117
[:SOURCE<hw>]:BB:T2DVb:L:REPetition	117

[:SOURce<hw>]:BB:T2DVb:L:RFSignalling:FREQuency?	118
[:SOURce<hw>]:BB:T2DVb:L:RFSignalling	118
[:SOURce<hw>]:BB:T2DVb:L:SCRambled	118
[:SOURce<hw>]:BB:T2DVb:L:T2Baselite	119
[:SOURce<hw>]:BB:T2DVb:L:T2Version	119
[:SOURce<hw>]:BB:T2DVb:NAUX	119

[:SOURce<hw>]:BB:T2DVb:L:CONStel <L1PostMod>

Sets the modulation of the L1 post signal.

Parameters:

<L1PostMod> T2 | T4 | T16 | T64
T2
 BPSK
T4
 QPSK
T16
 16QAM
T64
 64QAM
 *RST: T64

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See "[L1 Post Modulation](#)" on page 47

[:SOURce<hw>]:BB:T2DVb:L:EXTension <L1PostExt>

Queries the L1 post extension state.

The current firmware does not support L1 post extension.

Parameters:

<L1PostExt> OFF
OFF
 Fixed response of the query.
 *RST: OFF

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See "[L1 Post Extension](#)" on page 47

[:SOURce<hw>]:BB:T2DVb:L:REPetition <L1Repetition>

Enables/disables L1 repetition.

Parameters:

<L1Repetition> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See "[L1 Repetition](#)" on page 47

[:SOURce<hw>]:BB:T2DVb:L:RFSignalling:FREQUENCY?

Queries the signaled frequency in the L1 signaling.

Return values:

<L1Freq> integer
 Range: 0 to 4294967295
 *RST: 0
 Default unit: Hz

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Usage: Query only

Manual operation: See "[Frequency](#)" on page 48

[:SOURce<hw>]:BB:T2DVb:L:RFSignalling <RFSignalling>

Queries the RF signaling state in L1.

The setting depends on the setting of the "T2-MI Interface":

- "T2-MI Interface > Off": 0x0000 0000 is sent.
- "T2-MI Interface > On": The value from the T2-MI stream is sent.

Parameters:

<RFSignalling> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See "[L1 RF Signaling](#)" on page 48

[:SOURce<hw>]:BB:T2DVb:L:SCRambled <L1PostScr>

Enables/disables L1 post scrambling according to T2 version 1.3.1 of specification [ETSI EN 302 755](#).

You can query the used version via `[:SOURce<hw>]:BB:T2DVb:L:T2Version` on page 119.

Parameters:

<L1PostScr> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See "[L1 Post Scrambled](#)" on page 47

[:SOURce<hw>]:BB:T2DVb:L:T2Baselite <T2Baselite>

Enables/disables T2 base lite signaling according to T2 version 1.3.1 of specification [ETSI EN 302 755](#).

You can query the used version via `[:SOURce<hw>] :BB:T2DVb:L:T2Version` on page 119.

Parameters:

<T2Baselite> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See ["T2 Base Lite"](#) on page 47

[:SOURce<hw>]:BB:T2DVb:L:T2Version <T2Version>

Sets the version of T2 specification [ETSI EN 302 755](#), that is used for transmission.

Parameters:

<T2Version> V111 | V121 | V131
 *RST: V121

Example: See [Example"Configuring mode and stream parameters"](#) on page 97.

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See ["L1 T2 Version"](#) on page 46

[:SOURce<hw>]:BB:T2DVb:NAUX <NumAuxStr>

Queries the number of auxiliary streams.

The current firmware does not support auxiliary streams.

Parameters:

<NumAuxStr> integer
 0
 Fixed response of the query.
 *RST: 0

Example: See [Example"Configuring L1 parameters"](#) on page 116.

Manual operation: See ["Num. Aux. Streams"](#) on page 47

5.6.3 ID commands

Example: Configuring ID parameters

```
SOURcel:BB:T2DVb:ID:CELL #H0123
// Sets the hexadecimal cell ID 0123.
SOURcel:BB:T2DVb:ID:NETWork #H4567
// Sets the hexadecimal network ID 4567.
SOURcel:BB:T2DVb:ID:T2SYstem #H89AB
// Sets the hexadecimal T2 sytsem ID 89AB.
SOURcel:BB:T2DVb:ID:TXID:AVAIL?
// Response: "0"
// No transmitter identification signals within the current geographic cell.
```

Commands

[:SOURce<hw>]:BB:T2DVb:ID:CELL	120
[:SOURce<hw>]:BB:T2DVb:ID:NETWork	120
[:SOURce<hw>]:BB:T2DVb:ID:T2SYstem	121
[:SOURce<hw>]:BB:T2DVb:ID:TXID:AVAIL	121

[\[:SOURce<hw>\]:BB:T2DVb:ID:CELL <CellId>](#)

Sets the cell identification (ID).

Parameters:

<CellId> integer
 16-bit value in hexadecimal representation.
 Range: #H0 to #HFFFF
 *RST: #H0

Example: See [Example"Configuring ID parameters"](#) on page 120.

Manual operation: See ["Cell ID \(Hex\)"](#) on page 49

[\[:SOURce<hw>\]:BB:T2DVb:ID:NETWork <NetworkId>](#)

Sets the network identification.

Parameters:

<NetworkId> integer
 16-bit value in hexadecimal representation.
 Range: #H0 to #HFFFF
 *RST: #H0

Example: See [Example"Configuring ID parameters"](#) on page 120.

Manual operation: See ["Network ID \(Hex\)"](#) on page 49

[:SOURce<hw>]:BB:T2DVb:ID:T2SYstem <T2SystemId>

Sets the T2 system identification.

Parameters:

<T2SystemId> integer
 16-bit value in hexadecimal representation.
 Range: #H0 to #HFFFF
 *RST: #H0

Example: See [Example"Configuring ID parameters"](#) on page 120.

Manual operation: See ["T2 System ID \(Hex\)"](#) on page 49

[:SOURce<hw>]:BB:T2DVb:ID:TXID:AVAIL <Avail>

Queries if transmitter identification signals are available within the current geographic cell.

Parameters:

<Avail> integer
 8-bit value in hexadecimal representation.
 Range: #H0 to #HFF
 *RST: #H0

Example: See [Example"Configuring ID parameters"](#) on page 120.

Manual operation: See ["TX ID Availability \(Hex\)"](#) on page 49

5.7 SFN delay commands

The section contains the commands for configuring single-frequency network delays.

Example: Configuring single-frequency network delay parameters

```
//*****
// Activate SFN network mode.
//*****
SOURce1:BB:T2DVb:INPut:T2MI:INTerface ON
SOURce1:BB:T2DVb:NETWorkmode SFN

//*****
// Configure timestamp parameters.
//*****
SOURce1:BB:T2DVb:DElay:TSP:MODE?
// Response: "ABS"
// Timestamp mode is relative.
SOURce1:BB:T2DVb:DElay:TSP:UPDate
// Updates the UTC time and date reference.
SOURce1:BB:T2DVb:DElay:TSP:DATE?
```

```

// Response: "2020-02-26"
SOURCE1:BB:T2DVb:DElay:TSP:TIME?
// Response: "10:01.15"
//SOURCE1:BB:T2DVb:DElay:TSP:OFFSet -2
// Sets an offset of -2 seconds.
SOURCE1:BB:T2DVb:DElay:TSP:SEConds?
// Response in seconds: "636026505"
// 636026505 seconds elapsed since 2000.

//*****
// Configure delay parameters.
//*****
SOURCE1:BB:T2DVb:DElay:PROCCess?
// Response: "0.3522332"
// Processing delay is 0.3522332 seconds.
SOURCE1:BB:T2DVb:DElay:STATic 0.000003
// The start of transmission is shifted to 3 µs later.
SOURCE1:BB:T2DVb:DElay:DYNamic?
// Response: "1.5111824"
// Dynamic delay is 1.5111824 seconds.
// Query the total delay in µs, that is the sum of processing and dynamic delay.
SOURCE1:BB:T2DVb:DElay:TOTAL?
// Response: "1.8638689"
// Total delay is 1.8638689 seconds.

// Set a maximum permissible delay of, e.g., 10 µs.
SOURCE1:BB:T2DVb:DElay:DEVIation 0.00001
// Mutes the P1 symbol of the first T2 frame in a super frame.
SOURCE1:BB:T2DVb:DElay:MUTep1 1

```

Commands

[:SOURCE<hw>]:BB:T2DVb:DElay:DEVIation	122
[:SOURCE<hw>]:BB:T2DVb:DElay:DYNamic?	123
[:SOURCE<hw>]:BB:T2DVb:DElay:MUTep1	123
[:SOURCE<hw>]:BB:T2DVb:DElay:PROCCess?	123
[:SOURCE<hw>]:BB:T2DVb:DElay:STATic	124
[:SOURCE<hw>]:BB:T2DVb:DElay:TOTAL?	124
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:DATE?	124
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:MODE?	125
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:OFFSet	125
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:SEConds?	125
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:TIME?	126
[:SOURCE<hw>]:BB:T2DVb:DElay:TSP:UPDate	126

[:SOURCE<hw>]:BB:T2DVb:DElay:DEVIation <MaxDevTime>

Sets the maximum permissible delay.

Parameters:

<MaxDevTime> float
 Range: 1E-6 to 500E-6
 Increment: 0.0000001
 *RST: 10E-6

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Manual operation: See ["Max. Deviation Time"](#) on page 51

[[:SOURce<hw>]:BB:T2DVb:DElay:DYNamic?

Queries the transmission delay currently generated by the SFN delay (FIFO).

Return values:

<DynDelay> float
 Range: 0 to 8.0
 Increment: 0.0000001
 *RST: 0

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Usage: Query only

Manual operation: See ["Dynamic Delay"](#) on page 50

[[:SOURce<hw>]:BB:T2DVb:DElay:MUTep1 <MuteP1>

Activates muting the P1 symbol of the first T2 frame in a super frame. To mute the P1 symbol, the symbol is set to zero.

Parameters:

<MuteP1> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Manual operation: See ["Mute 1st Super Frame P1"](#) on page 51

[[:SOURce<hw>]:BB:T2DVb:DElay:PROcEss?

Queries the delay from the modulator input up to the SFN delay (FIFO).

Return values:

<ProcDelay> float
 Range: 0 to 4.0
 Increment: 0.0000001
 *RST: 0

- Example:** See [Example"Configuring single-frequency network delay parameters"](#) on page 121.
- Usage:** Query only
- Manual operation:** See ["Processing Delay"](#) on page 50

[:SOURce<hw>]:BB:T2DVb:DELay:STATic <StaticDelay>

Sets the delay to shift the time of transmission positively or negatively.

Parameters:

<StaticDelay> float
 Range: -4.0 to 4.0
 Increment: 0.0000001
 *RST: 0

- Example:** See [Example"Configuring single-frequency network delay parameters"](#) on page 121.
- Manual operation:** See ["Static Delay"](#) on page 50

[:SOURce<hw>]:BB:T2DVb:DELay:TOTal?

Queries the sum of processing delay and dynamic delay.

Return values:

<TotalDelay> float
 Range: -4.0 to 16.0
 Increment: 0.0000001
 *RST: 0

- Example:** See [Example"Configuring single-frequency network delay parameters"](#) on page 121.
- Usage:** Query only
- Manual operation:** See ["Total Delay"](#) on page 50

[:SOURce<hw>]:BB:T2DVb:DELay:TSP:DATE?

Queries the UTC date from the last UTC reference update.

Return values:

<TSPDate> string
 Format <yyyy>--<mm>--<dd>

- Example:** See [Example"Configuring single-frequency network delay parameters"](#) on page 121.
- Usage:** Query only
- Manual operation:** See ["UTC Date"](#) on page 52

[:SOURce<hw>]:BB:T2DVb:DElay:TSP:MODE?

Queries the type of the currently received T2-MI timestamps.

Return values:

<TimestampMode> RELative | ABSolute

RELative

Received T2-MI stream has T2-MI packets with relative time-stamps.

ABSolute

Received T2-MI stream has T2-MI packets with absolute time-stamps. If received, the following subparameters are displayed.

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Usage: Query only

Manual operation: See ["Timestamp Mode"](#) on page 51

[:SOURce<hw>]:BB:T2DVb:DElay:TSP:OFFSet <TSPOffset>

Modifies the UTC/GPS leap seconds offset.

Parameters:

<TSPOffset> integer
Range: -255 to 255
*RST: 0

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Manual operation: See ["Offset"](#) on page 52

[:SOURce<hw>]:BB:T2DVb:DElay:TSP:SEConds?

Queries the elapsed time in seconds since 2000. The value is based on the value of the last UTC reference update.

Return values:

<TSPSeconds> integer
Range: 0 to 1099511627775
*RST: 0

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Usage: Query only

Manual operation: See ["Seconds Since 2000"](#) on page 52

[:SOURce<hw>]:BB:T2DVb:DELay:TSP:TIME?

Queries the UTC time from the last UTC reference update.

Return values:

<TSPTime> string
 Format <hour>:<minute>:<second>

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Usage: Query only

Manual operation: See ["UTC Time"](#) on page 52

[:SOURce<hw>]:BB:T2DVb:DELay:TSP:UPDate

Triggers an update of the UTC time and date reference.

Example: See [Example"Configuring single-frequency network delay parameters"](#) on page 121.

Usage: Event

Manual operation: See ["Update Timestamp"](#) on page 52

5.8 Frame info commands

The section contains the commands for querying frame information.

- [Frame and symbol duration commands](#)..... 127
- [L1 signaling commands](#)..... 129
- [Data cell commands](#)..... 131

5.8.1 Frame and symbol duration commands

Example: Querying frame and symbol duration information

```

SOURCE1:BB:T2DVb:INFO:TSF?
// Response in s: "0.433888"
// Super frame duration is 33.888 ms.
SOURCE1:BB:T2DVb:INFO:TF?
// Response in s: "0.216944"
// T2 frame duration is 216.944 ms.
SOURCE1:BB:T2DVb:INFO:TFF?
// Response in s: "0"
// Future extension frame duration is 0 s.
SOURCE1:BB:T2DVb:INFO:TP1?
// Response in s: "0.000224"
// P1 symbol duration is 0.224 ms.
SOURCE1:BB:T2DVb:INFO:TP2?
SOURCE1:BB:T2DVb:INFO:TS?
// Response for both commands in s: "0.003612"
// P2 symbol and OFDM data symbol duration is 3.612 ms.

```

Commands

[:SOURCE<hw>]:BB:T2DVb:INFO:TF?	127
[:SOURCE<hw>]:BB:T2DVb:INFO:TFF?	127
[:SOURCE<hw>]:BB:T2DVb:INFO:TSF?	128
[:SOURCE<hw>]:BB:T2DVb:INFO:TP1?	128
[:SOURCE<hw>]:BB:T2DVb:INFO:TP2 TS?	128

[\[:SOURCE<hw>\]:BB:T2DVb:INFO:TF?](#)

Queries the T2 frame duration.

Return values:

<T2FrameDur>	float
	Range: 0 to 0.999999
	Increment: 0.000001
	*RST: 0

Example: See [Example "Querying frame and symbol duration information"](#) on page 127.

Usage: Query only

Manual operation: See ["T2 Frame Duration \(\$T_F\$ \)"](#) on page 54

[\[:SOURCE<hw>\]:BB:T2DVb:INFO:TFF?](#)

Queries the future extension frame duration.

Return values:

<FEFDur> integer
 Range: 0 to 9.999999
 Increment: 0.000001
 *RST: 0

Example: See [Example"Querying frame and symbol duration information"](#) on page 127.

Usage: Query only

Manual operation: See ["Future Extension Frame Duration \(\$T_{FEF}\$ \)"](#) on page 54

[[:SOURce<hw>]:BB:T2DVb:INFO:TSF?

Queries the super frame duration.

Return values:

<SuperFrameDur> float
 Range: 0 to 999.999999
 Increment: 0.000001
 *RST: 0

Example: See [Example"Querying frame and symbol duration information"](#) on page 127.

Usage: Query only

Manual operation: See ["Super Frame Duration \(\$T_{SF}\$ \)"](#) on page 53

[[:SOURce<hw>]:BB:T2DVb:INFO:TP1?

Queries the P1 symbol duration.

Return values:

<P1SymbolDur> float
 Range: 0 to 0.001000
 Increment: 0.000001
 *RST: 0

Example: See [Example"Querying frame and symbol duration information"](#) on page 127.

Usage: Query only

Manual operation: See ["P1 Symbol Duration \(\$T_{P1}\$ \)"](#) on page 54

[[:SOURce<hw>]:BB:T2DVb:INFO:TP2|TS?

Queries the P2 and OFDM data symbol duration.

Return values:

<OfdmSymbolDur> float
 Range: 0 to 0.010000
 Increment: 0.000001
 *RST: 0

Example: See [Example "Querying frame and symbol duration information"](#) on page 127.

Usage: Query only

Manual operation: See ["OFDM Symbol Duration \(\$T_{P2}\$, \$T_S\$ \)"](#) on page 54

5.8.2 L1 signaling commands

Example: Querying L1 signaling parameters

```
SOURcel:BB:T2DVb:INFO:PREBits?
// Response: "200"
// L1-pre signaling length is 200 bit.
SOURcel:BB:T2DVb:INFO:PRECells?
// Response: "1800"
// L1-pre signaling length is 1800 cells.
SOURcel:BB:T2DVb:INFO:POSBits?
// Response: "350"
// L1-post signaling length is 350 bit.
SOURcel:BB:T2DVb:INFO:POSCells?
// Response: "750"
// L1-post signaling length is 750 cells.
```

Commands

[:SOURce<hw>]:BB:T2DVb:INFO:POSBits?	129
[:SOURce<hw>]:BB:T2DVb:INFO:POSCells?	130
[:SOURce<hw>]:BB:T2DVb:INFO:PREBits?	130
[:SOURce<hw>]:BB:T2DVb:INFO:PRECells?	130

[\[:SOURce<hw>\]:BB:T2DVb:INFO:POSBits?](#)

Queries the L1-post signaling length in bits.

Return values:

<L1PostSigBits> integer
 Range: 0 to 262175
 *RST: 0

Example: See [Example "Querying L1 signaling parameters"](#) on page 129.

Usage: Query only

Manual operation: See ["L1 Post Signaling Bits"](#) on page 55

[[:SOURce<hw>]:BB:T2DVb:INFO:POSCells?

Queries the L1-post signaling length in cells.

Return values:

<L1PostSigCells> integer
 Range: 0 to 262143
 *RST: 0

Example: See [Example"Querying L1 signaling parameters"](#) on page 129.

Usage: Query only

Manual operation: See "[L1 Post Signaling Cells](#)" on page 55

[[:SOURce<hw>]:BB:T2DVb:INFO:PREBits?

Queries the L1-pre signaling length in bits.

Return values:

<L1PreSigBits> integer
 Range: 0 to 200
 *RST: 0

Example: See [Example"Querying L1 signaling parameters"](#) on page 129.

Usage: Query only

Manual operation: See "[L1 Pre Signaling Bits](#)" on page 55

[[:SOURce<hw>]:BB:T2DVb:INFO:PRECells?

Queries the L1-pre signaling length in cells.

Return values:

<L1PreSigCells> integer
 Range: 0 to 1840
 *RST: 0

Example: See [Example"Querying L1 signaling parameters"](#) on page 129.

Usage: Query only

Manual operation: See "[L1 Pre Signaling Cells](#)" on page 55

5.8.3 Data cell commands

Example: Querying the number of data cells

```
SOURce1:BB:T2DVb:INFO:DP?
// Response: "1637178"
// Maximum number of PLP data cells per T2 frame is 1637178.
SOURce1:BB:T2DVb:INFO:DPUSed?
// Response: "1636200"
// Current T2 frame has 1636200 data cells.
```

Commands

[:SOURce<hw>]:BB:T2DVb:INFO:DP?	131
[:SOURce<hw>]:BB:T2DVb:INFO:DPUSed?	131

[:SOURce<hw>]:BB:T2DVb:INFO:DP?

Queries the maximum possible number of PLP data cells in the T2 frame.

Return values:

<Dplp>	integer
	Range: 0 to 1E7
	*RST: 0

Example: See [Example"Querying the number of data cells"](#) on page 131.

Usage: Query only

Manual operation: See ["Per T2 Frame \(D_{PLP}\)"](#) on page 56

[:SOURce<hw>]:BB:T2DVb:INFO:DPUSed?

Queries the current number of PLP data cells in the T2 frame.

Return values:

<Dplused>	integer
	Range: 0 to 1E7
	*RST: 0

Example: See [Example"Querying the number of data cells"](#) on page 131.

Usage: Query only

Manual operation: See ["Current T2 Frame \(D_{PLP_USED}\)"](#) on page 56

5.9 TSGen subsystem

The TSGen subsystem contains the commands for configuring the TS player.

Example: Playing a TS player file

```
//*****
// Select a file, e.g. a user-defined setting.
//*****
TSGen:CONFigure:PLAYfile "/var/user/my_test_player_test.trp"
// Selects the file "my_test_player_test" with extension *.trp.

//*****
// Within the file, define a section, that you want to play.
// You can set start/stop position for a maximum section length of 10 hours.
//*****
TSGen:CONFigure:SEEK:START 60000 // milliseconds
// Section start is after one minute from the original file start.
// The first minute is ignored.
TSGen:CONFigure:SEEK:STOP 120000 // milliseconds
// Section stop is after one minute from the original file start.
// The total section length is one minute.

//*****
// Navigate to a certain position within the file/section of the file.
//*****
TSGen:CONFigure:SEEK:POSITION 100000 // milliseconds
// The current player position of file/section of the file is at 1 minute 40 seconds.

//*****
// Reset play-related settings
//*****
TSGen:CONFigure:SEEK:RESet

//*****
// Pause, stop, play the file.
//*****
TSGen:CONFigure:COMMand PAUS
// Pauses playing the file.
TSGen:CONFigure:COMMand STOP
// Stops playing the file.
TSGen:CONFigure:COMMand PLAY
// Activates playing the file.
```

Example: Configuring and monitoring TS player output

```
//*****
// Configure general and stuffing parameters of the TS player output.
//*****
TSGen:CONFigure:STUFFing ON
TSGen:CONFigure:STOPdata TTSP
TSGen:CONFigure:TSPacket H184
TSGen:CONFigure:PIDTestpacket VAR
TSGen:CONFigure:PID 8100
// Corresponds to a PID = 1FA4 in hexadecimal representation.
TSGen:CONFigure:PAYLoad PRBS
TSGen:CONFigure:PRBS:SEquence P23_1
```

```

//*****
// Monitor TS player output data.
//*****
// You can only change the data rate, if you stop the TS player.
TSGen:CONFigure:COMMand STOP
TSGen:CONFigure:TSRate 350E6
// Corresponds to a net data rate of 350 MBit/s.
TSGen:CONFigure:COMMand PLAY

TSGen:CONFigure:PLENght?
// Response: "P188"
// Packet length is 188 bytes.
TSGen:READ:ORIGtsrate?
// Response in bit/s: "5018502"

```

Example: Configuring seamless loop parameters

```

TSGen:CONFigure:SEAMless:CC ON
TSGen:CONFigure:SEAMless:PCR OFF
TSGen:CONFigure:SEAMless:TT ON

```

Commands

:TSGen:CONFigure:COMMand.....	133
:TSGen:CONFigure:PAYLoad.....	134
:TSGen:CONFigure:PID.....	134
:TSGen:CONFigure:PIDTestpack.....	134
:TSGen:CONFigure:PLAYfile.....	135
:TSGen:CONFigure:PLENght.....	135
:TSGen:CONFigure:PRBS[:SEQuence].....	135
:TSGen:CONFigure:SEAMless:CC.....	135
:TSGen:CONFigure:SEAMless:PCR.....	136
:TSGen:CONFigure:SEAMless:TT.....	136
:TSGen:CONFigure:SEEK:POSition.....	136
:TSGen:CONFigure:SEEK:RESet.....	136
:TSGen:CONFigure:SEEK:STARt.....	137
:TSGen:CONFigure:SEEK:STOP.....	137
:TSGen:CONFigure:STOPdata.....	137
:TSGen:CONFigure:STUFfing.....	137
:TSGen:CONFigure:TSPacket.....	138
:TSGen:CONFigure:TSRate.....	138
:TSGen:READ:FMEMory.....	138
:TSGen:READ:ORIGtsrate.....	139
:TSGen:READ:PLAYfile:LENGth?.....	139

:TSGen:CONFigure:COMMand <PlayerStatus>

Triggers playing, pausing and stopping of the TS player file selected with `:TSGen:CONFigure:PLAYfile`.

Parameters:

<PlayerStatus> STOP | PAUSE | PLAY | RESET
 *RST: STOP

Example: See [Example"Playing a TS player file"](#) on page 132.

Manual operation: See ["Play"](#) on page 62
 See ["Pause"](#) on page 62
 See ["Stop"](#) on page 62

:TSGen:CONFigure:PAYLoad <PayLoad>

Determines the payload of the test packet. Also influences the payload of the generated stuffing packets while the TS player is running.

Parameters:

<PayLoad> HFF | H00 | PRBS
 *RST: PRBS

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Payload Test/Stuff"](#) on page 66

:TSGen:CONFigure:PID <PID>

The available values depend on the settings of [:TSGen:CONFigure:PIDTestpack](#).

If [:TSGen:CONFigure:PIDTestpack](#) is set to NULL,
 then [:TSGen:CONFigure:PID](#) is 1FFF (hex).

Otherwise the values are variable.

Parameters:

<PID> integer
 Range: 0 to 8191
 *RST: 8191

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["PID \(Hex\)"](#) on page 66

:TSGen:CONFigure:PIDTestpack <PIDTestpack>

Sets the PID, if [:TSGen:CONFigure:TSPacket](#) is H184 | H200 | H204.

Parameters:

<PIDTestpack> VARIABLE | NULL
 *RST: NULL

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["PID Test Packet"](#) on page 66

:TSGen:CONFigure:PLAYfile <PlayFile>

Specifies the file path and filename of the TS player file.

Parameters:

<PlayFile> string

Example: See [Example"Playing a TS player file"](#) on page 132.

Manual operation: See ["Select File"](#) on page 61

:TSGen:CONFigure:PLENgtH <PLength>

Queries the packet length of the loaded file.

Parameters:

<PLength> P188 | P204 | P208 | INV
 *RST: INV

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Packet Length"](#) on page 64

:TSGen:CONFigure:PRBS[:SEQuence] <PRBS>

Sets the length of the PRBS sequence.

Parameters:

<PRBS> P15_1 | P23_1
 *RST: P23_1

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["PRBS"](#) on page 66

:TSGen:CONFigure:SEAMless:CC <CC>

Activates the correction of the continuity counters in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

Parameters:

<CC> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring seamless loop parameters"](#) on page 133.

Manual operation: See ["Continuity Counter"](#) on page 67

:TSGen:CONFigure:SEAMless:PCR <PCR>

Activates the correction of time stamps in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

Parameters:

<PCR> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Configuring seamless loop parameters"](#) on page 133.

Manual operation: See ["PCR, DTS/PTS"](#) on page 67

:TSGen:CONFigure:SEAMless:TT <TT>

Activates the correction of the time and date table in the replayed TS data stream. The correction allows you to decode the stream without interruption when the play file is looping.

Parameters:

<TT> 1 | ON | 0 | OFF
*RST: 0

Example: See [Example"Configuring seamless loop parameters"](#) on page 133.

Manual operation: See ["TDT/TOT"](#) on page 67

:TSGen:CONFigure:SEEK:POSition <Position>

Sets the position, that is the current playing time position.

You can select a value in a 10-hour range.

Parameters:

<Position> float
Range: 0 to 36000000
Increment: 0.1
*RST: 0

Example: See [Example"Playing a TS player file"](#) on page 132.

Manual operation: See ["Running/Position Player \[hh:mm:ss.fff\]"](#) on page 60
See ["Position Player \[hh:mm:ss.fff\]"](#) on page 62

:TSGen:CONFigure:SEEK:RESet

Resets the following parameters to their default state:

- [:TSGen:CONFigure:SEEK:START](#) on page 137
- [:TSGen:CONFigure:SEEK:STOP](#) on page 137

Example: See [Example"Playing a TS player file"](#) on page 132.

Usage: Event

Manual operation: See ["Reset Window"](#) on page 62

:TSGen:CONFigure:SEEK:START <Start>

Sets an individual start time.

You can select a value in a 10-hour range.

Parameters:

<Start> float
 Range: 0 to 36000000
 Increment: 0.1
 *RST: 0

Example: See [Example"Playing a TS player file"](#) on page 132.

Manual operation: See ["Start \[hh:mm:ss.fff\]"](#) on page 62

:TSGen:CONFigure:SEEK:STOP <Stop>

Sets an individual stop time.

You can select a value in a 10-hour range.

Parameters:

<Stop> float
 Range: 0 to 36000000
 Increment: 0.1
 *RST: 23040.2

Example: See [Example"Playing a TS player file"](#) on page 132.

Manual operation: See ["Stop \[hh:mm:ss.fff\]"](#) on page 62

:TSGen:CONFigure:STOPdata <StopData>

Ensures that a standardized TS data stream is always output at the TS output at the rear of the R&S SMCV100B.

Parameters:

<StopData> TTSP | NONE
 *RST: NONE

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Stop Data"](#) on page 64

:TSGen:CONFigure:STUFFing <Stuffing>

Activates nullpacket stuffing.

Parameters:

<Stuffing> 1 | ON | 0 | OFF
 *RST: 0

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Nullpacket Stuffing"](#) on page 64

:TSGen:CONFigure:TSPacket <TSPaket>

Sets the structure of the generated test packets in pause or stop status.

Parameters:

<TSPaket> H184 | H200 | H204 | S187 | S203 | S207
S187|S203|S207
 A sync byte (0x47) followed by 187/203/207 payload bytes.
H184|H200|H204
 A sync byte (0x47) followed by three header bytes and 184/200/204 payload bytes.
 *RST: H184

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Test TS Packet"](#) on page 65

:TSGen:CONFigure:TSRate <TSRate>

Sets the output data rate of the player.

Parameters:

<TSRate> integer
 Range: 1 to 35E7
 *RST: 5018502

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Data Rate"](#) on page 63

:TSGen:READ:FMEMemory <FMemory>

Queries the file size of the TS player file.

Parameters:

<FMemory> integer
 Range: 0 to 10
 *RST: 0

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Select File"](#) on page 61

:TSGen:READ:ORIGtsrate <ORIGtsrate>

Displays the calculated original TS data rate.

Parameters:

<ORIGtsrate> integer
 Range: 1 to 350000000
 *RST: 5018502

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Manual operation: See ["Orig. Data Rate"](#) on page 63

:TSGen:READ:PLAYfile:LENGth?

Queries calculated original loop time.

Return values:

<Length> integer
 Range: 0 to 100
 *RST: 0

Example: See [Example"Configuring and monitoring TS player output"](#) on page 132.

Usage: Query only

Manual operation: See ["Select File"](#) on page 61

5.10 BCIP subsystem

The `SYSTEM:COMMunicate:BCIP` subsystem contains the commands for configuring local IP data network parameters.

Common suffixes

The following common suffixes are used in the remote commands:

Suffix	Value range	Description
BCIP<hw>	1	Available local IP LAN interfaces

Example: Retrieving information on local network-related settings

```
//*****
// Monitor IP interface 1 local network status.
//*****
SYSTem:COMMunicate:BCIP1:NETWork:STATus?
// Response: "0"
// The instrument is diconnected from the local IP network.
SYSTem:COMMunicate:BCIP1:NETWork:REStart
SYSTem:COMMunicate:BCIP1:NETWork:STATus?
// Response: "1"

//*****
// Query local IP data network properties.
//*****
SYSTem:COMMunicate:BCIP1:NETWork:COMMOn:HOSTname?
// Response: "SMCV100B-123456-IP-Data"
SYSTem:COMMunicate:BCIP1:NETWork:IPAdDress:MODE STAT
SYSTem:COMMunicate:BCIP1:NETWork:IPAdDress "10.113.0.104"
SYSTem:COMMunicate:BCIP1:NETWork:IPAdDress:SUBNet:MASK "255.255.252.0"
SYSTem:COMMunicate:BCIP1:NETWork:MACAdDress?
// Response: "00 90 B8 21 89 F8"
SYSTem:COMMunicate:BCIP1:NETWork:PROTOcol?
// Response: "UDP"
```

Commands

:SYSTem:COMMunicate:BCIP<hw>:NETWork:COMMOn:HOSTname.....	140
:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPAdDress.....	141
:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPAdDress:MODE.....	141
:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPAdDress:SUBNet:MASK.....	141
:SYSTem:COMMunicate:BCIP<hw>:NETWork:MACAdDress.....	141
:SYSTem:COMMunicate:BCIP<hw>:NETWork:PROTOcol.....	141
:SYSTem:COMMunicate:BCIP<hw>:NETWork:REStart.....	142
:SYSTem:COMMunicate:BCIP<hw>:NETWork:STATus.....	142

:SYSTem:COMMunicate:BCIP<hw>:NETWork:COMMOn:HOSTname <Hostname>

Sets an individual hostname for the vector signal generator.

Note: We recommend that you do not change the hostname to avoid problems with the network connection. If you change the hostname, be sure to use a unique name.

Parameters:

<Hostname> string

Example: See [Example "Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["Hostname"](#) on page 69

:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress

Sets the IP address.

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["IP Address"](#) on page 69

:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:MODE <IPMode>

Selects manual or automatic setting of the IP address.

Parameters:

<IPMode> AUTO | STATic
*RST: AUTO

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["Address Mode"](#) on page 69

:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:SUBNet:MASK

Sets the subnet mask.

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["Subnet Mask"](#) on page 70

:SYSTem:COMMunicate:BCIP<hw>:NETWork:MACAddress <MACAddress>

Queries the MAC address of the network adapter.

Parameters:

<MACAddress> string
Range: 00:00:00:00:00:00 to ff:ff:ff:ff:ff:ff

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["MAC Address"](#) on page 70

:SYSTem:COMMunicate:BCIP<hw>:NETWork:PROTocol <Protocol>

Specifies the network protocol.

Parameters:

<Protocol> UDP
*RST: UDP

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["Protocol"](#) on page 70

:SYSTem:COMMunicate:BCIP<hw>:NETWork:REStart

Triggers a restart of the network.

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Usage: Event

Manual operation: See ["Restart Network"](#) on page 69

:SYSTem:COMMunicate:BCIP<hw>:NETWork:STATus <NetworkStatus>

Queries the network connection state.

Parameters:

<NetworkStatus> 1 | ON | 0 | OFF

*RST: n.a. (no preset. default: 0)

Example: See [Example"Retrieving information on local network-related settings"](#) on page 140.

Manual operation: See ["Network Status"](#) on page 68

Annex

A DVB-T2 test cases

Test case type	Test case	Remark
DTG	DVBT2_DTG_xyz	117 test cases, xyz = 000 to 109, 162 to 168
	DVBT2_DTG_xyz_MISO_Groupa	104 test cases, xyz = 110 to 161 a = 1 to 2
NorDig UTP 2.4	DVBT2_NORDIG_3_xy_z	-
NorDig UTS 2.2.2	DVBT2_NORDIG_3_xy_z	-
DVB V&V	DVBT2_VV_xyz_OFCOMa	7 test cases, xyz = 001, 003, 012 to 016 a = 1 to 7
	DVBT2_VV_xyz	13 test cases, xyz = 004 to 011, 017, 019, 034 to 036
	DVBT2_VV_xyz_MISO_Groupa	2 test cases, xyz = 018 a = 1 to 7

Glossary: Abbreviations

A

ACE: Active Constellation Extension

ACM: Adaptive Coding and Modulation

ASI: Asynchronous Serial Interface

B

BICM: Bit-Interleaved Coding and Modulation

BPSK: Binary Phase Shift Keying

C

CM: Coding and Modulation

D

DHCP: Dynamic Host Configuration Protocol

DVB-H: Digital Video Broadcast - Handheld

DVB-T: Digital Video Broadcast - Terrestrial

F

FEC: Forward Error Correction

FEF: Future Extension Frame(s)

FFT: Fast Fourier Transform

FIFO: First In First Out

G

GPS: Global Positioning System

I

IFFT: Inverse Fast Fourier Transform

IGMP: Internet Group Management Protocol

IGMPv3: Internet Group Management Protocol version 3

ISCR: Input Stream Clock Reference

ISSY: Input Stream Synchronizer

M

MAC: Media Access Control

MFN: Multi-frequency Network

MISO: Multiple Input Single Output

MPE FEC: Multiprotocol encapsulation forward error correction

MPEG: Moving Picture Experts Group
<https://mpeg.chiariglione.org/>

N

NTP: Network Time Protocol

O

OFDM: Orthogonal Frequency-Division Multiplexing

P

PCR: Programme Clock Reference

PID: Packet Identifier

PLP: Physical Layer Pipe

PRBS: Pseudo-Random Bit Sequence

Q

QAM: Quadrature Amplitude Modulation

QPSK: Quaternary Phase Shift Keying

R

RTP: Real-Time Transport Protocol

S

SFN: Single-frequency Network

SID: Stream Identifier

SISO: Single Input Single Output

SMPTE: Society of Motion Picture and Television Engineers

<https://www.smpte.org/>

T

T2-MI: T2 Modulator interface

TCP: Transmission Control Protocol

TFS: Time Frequency Slicing

TPS: Transmission Parameter Signalling

TR: Tone Reservation

TS: Transport Stream

U

UDP: User Datagram Protocol

UTC: Universal Time Coordinated

V

VSB: Vestigial Sideband Modulation

Glossary: Specifications

E

ETSI EN 302 307: Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)

https://www.etsi.org/deliver/etsi_en/302300_302399/302307/

ETSI EN 302 755: Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)

https://www.etsi.org/deliver/etsi_en/302700_302799/302755/

ETSI TS 102 773: Digital Video Broadcasting (DVB); Modulator Interface (T2-MI) for a second generation digital terrestrial television broadcasting system (DVB-T2)

https://www.etsi.org/deliver/etsi_ts/102700_102799/102773/

I

ITU-T O.151: ITU-T Recommendation O.151

<https://www.itu.int/rec/T-REC-O.151-199210-I/en>

List of commands

:SYSTem:COMMunicate:BCIP<hw>:NETWork:COMMon:HOSTname.....	140
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:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:MODE.....	141
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:SYSTem:COMMunicate:BCIP<hw>:NETWork:MACAddress.....	141
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