

R&S® SMCVB-K156

T-DMB/DAB

User Manual



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Version 03

ROHDE & SCHWARZ
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This document describes the following software options:

- R&S®SMCVB-K156 T-DMB/DAB (1434.3731.xx)

This manual describes firmware version FW 4.90.002.xx and later of the R&S®SMCV100B.

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Mühlhofstr. 15, 81671 München, Germany

Phone: +49 89 41 29 - 0

Email: info@rohde-schwarz.com

Internet: www.rohde-schwarz.com

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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 T-DMB/DAB Option

The R&S SMCVB-K156 is a firmware application that adds functionality to generate signals in accordance with the T-DMB/DAB digital standard.

The R&S SMCVB-K156 option features:

- T-DMB/DAB 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 T-DMB/DAB Dialog

To open the dialog with T-DMB/DAB settings

- ▶ In the block diagram of the R&S SMCV100B, select "Baseband > T-DMB/DAB".

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 Documentation Overview

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

www.rohde-schwarz.com/manual/smcv100b

1.2.1 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.

1.2.2 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.

1.2.3 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>

1.2.4 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.

1.2.5 Printed Safety Instructions

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

1.2.6 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

1.2.7 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 open-source acknowledgment document provides verbatim license texts of the used open source software.

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

1.2.8 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 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.

1.4 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 T-DMB/DAB Option

DAB, DAB+ and T-DMB are OFDM-based terrestrial standards. DAB and DAB+ are designed for audio broadcasting. DAB+ uses advanced audio compression techniques. T-DMB is designed for audio and video broadcasting.

The transmission standard complies with specification [ETSI EN 300 401](#) specification. The input interface complies with specification [ETS 300 799](#).

2.1 Required Options

The equipment layout for generating T-DMB/DAB signals includes:

- Base unit
- Option Enable Broadcast Standard (R&S SMCVB-K519)
- Option T-DMB/DAB (R&S SMCVB-K156)

2.2 About DAB/T-DMB

The R&S SMCV100B enables you to generate signals in accordance with the Digital Audio Broadcasting (DAB)/Terrestrial Digital Multimedia Broadcasting (T-DMB) standard.

The generated signals are compliant with ETSI EN 300 401 standard. Via the user-friendly graphical interface of R&S SMCV100B, you can adjust several DAB signal parameters. You are enabled to generate a signal corresponding to one of the four standard transport modes, Transmission Mode I, II, III or IV. You can also choose to enable or disable channel coding, time interleaving and/or pseudo noise scrambling.

The R&S SMCV100B allows you to choose between different data sources. You can either use some of the predefined data sources (two different pseudo noise sequences, fixed all “0”, fixed all “1”) or you can use your own ETI (Ensemble Transport Interface) compliant source file. To create an ETI compliant source file, you can for instance use the R&S STI Ensemble Mux DM001 or the R&S ETI Builder. However, the ETI source file must fulfill some prerequisites.

The DAB system is designed for delivery of high-quality digital audio programs and data services for mobile, portable and fixed reception from terrestrial or satellite transmitters in the Very High Frequency (VHF)/Ultra High Frequency (UHF) frequency bands as well as for distribution through cable networks.

The DAB system is designed to provide spectrum and power efficient techniques in terrestrial transmitter network planning, known as the Single Frequency Network (SFN) and the gap-filling technique. The DAB system is suitable for satellite as well as hybrid/mixed terrestrial/satellite broadcasting, using a simple, nearly omni-directional receiving antenna. The DAB system meets the required sharing criteria with other radio communication services.

2.2.1 DAB Network

The figure below illustrates the outline of a DAB network.

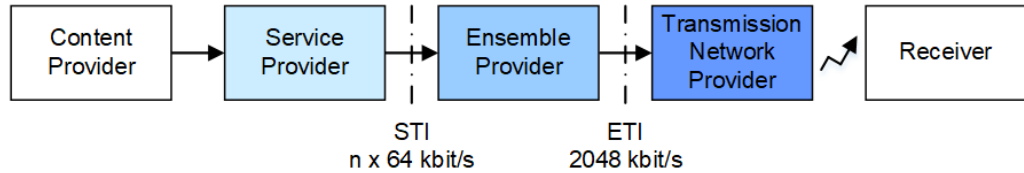


Figure 2-1: DAB network

The DAB network has three main parts: the service or service component provider, the multiplex or ensemble provision and the transmission network provision.

The interfaces between these three blocks are scope of ETSI standards. The STI (Service Transport Interface) is defined to provide a standardized way of transporting DAB service components, service information and control messages in a DAB collection network.

The Ensemble Transport Interface (ETI) links the Multiplexer of the Ensemble Provider with the transmitters of the Transmission Network Provider.

2.2.2 DAB Transmission System

The following block diagram shows the components of the DAB transmission system.

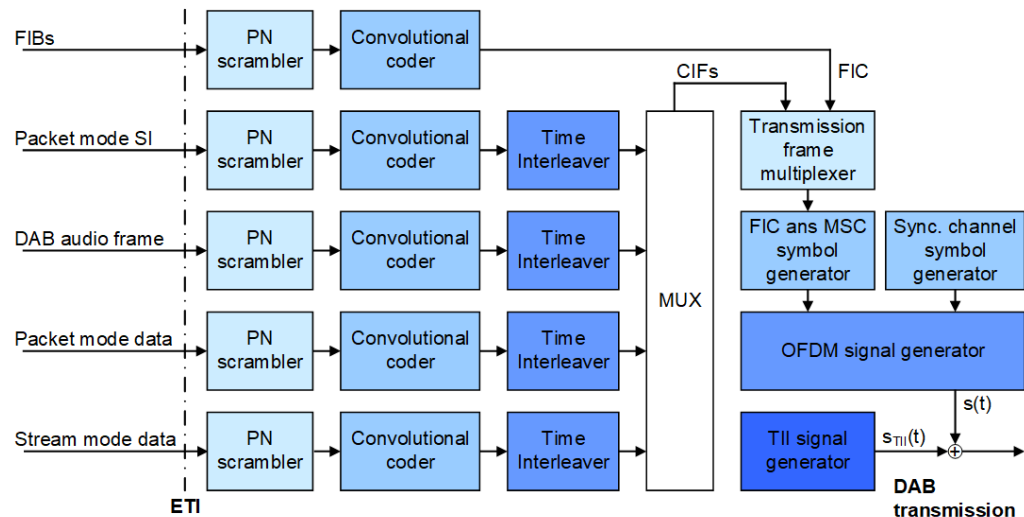


Figure 2-2: Components of the Transmission System DAB

The DAB transmission signal is defined as the sum of two signals; the main signal $s(t)$ and an optional signal $s_{TII}(t)$ as illustrated in the figure above.

2.2.3 Transport Mechanisms

The DAB system is designed to carry several digital audio signals together with data signals. Audio and data signals are considered to be service components which can be grouped together to form services.

The DAB system transmission frame consists of three different channels:

- Main Service Channel (MSC)
- Fast Information Channel (FIC)
- Synchronization Channel

2.2.3.1 Transmission channels

The MSC is a time-interleaved data channel used to carry the audio and data service components, together with possible supporting and additional data service components. The MSC is divided into a number of sub-channels. Each of the sub-channels is individually convolutionally coded with equal or unequal error protection. Each sub-channel may carry one or more service components.

The FIC is a non time-interleaved data channel with fixed equal error correction. FIC carries information about the organization of the MSC sub-channels, such as information on the multiplex structure and, when necessary, its reconfiguration. Optionally FIC may include service information, conditional access management information and data service.

The Synchronization Channel provides a phase reference and is used internally for demodulator functions such as transmission frame synchronization, automatic frequency control, transmitter identification, and channel state estimation.

The Synchronization channel, the Fast Information Channel and the Main Service Channel form a transmission frame (see [Figure 2-3](#)). The MSC occupies the major part of the transmission frame.

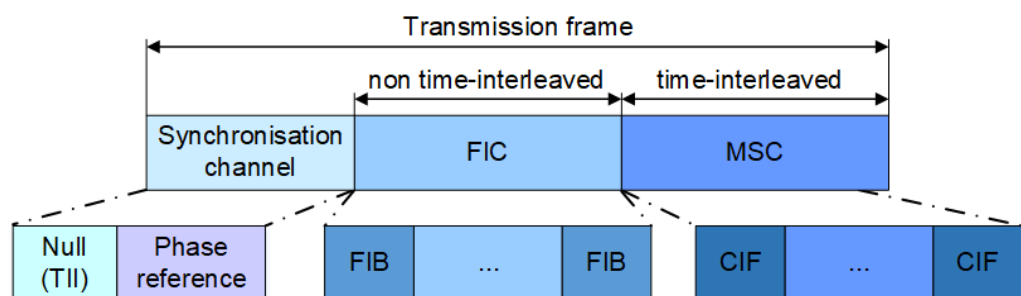


Figure 2-3: DAB transmission frame

Each transmission frame is divided into a sequence of OFDM symbols, each symbol consisting of a number of carriers.

The Fast Information Block (FIB) and the Common Interleaved Frame (CIF) are introduced in order to provide transmission mode independent data transport packages associated with the FIC and MSC respectively.

The data, carried in the MSC, is divided at source into regular 24 ms bursts corresponding to the sub-channel data capacity of each CIF. The CIF contains 55 296 bits, divided at 864 capacity units, 64 bits each.

Fast Information Block (FIB) is a data burst of 256 bits. The sequence of FIBs is carried by the Fast Information Channel FIC. The structure of the FIB is common to all transmission modes.

The synchronization channel symbols comprise the null symbol and the phase reference symbol. The null symbols are also used to allow a limited number of OFDM carriers to convey the Transmitter Identification Information (TII).

2.2.3.2 Transport Modes

Transmission mode is specific set of transmission parameters (e.g. number of carriers, OFDM symbol duration). Four transmission modes (i.e. I, II, III and IV) are defined to allow the system to be used for different network configurations and a range of operating frequencies. Depending on the transport mode, the transmission frame has different organization and length, i.e. the transmission frame is specific to the four transmission modes.

The table below gives the transmission frame duration and the number of FIBs and CIFs which are associated with each transmission frame for the four transport modes.

Table 2-1: Transmission Mode Characteristics

Transport Mode	Duration of transmission frame	Number of FIBs per transmission frame	Number of CIFs per transmission frame	Number of carriers	Carrier Spacing
I	96 ms	12	4	1536	1 KHz
II	24 ms	3	1	384	4 KHz
III	24 ms	4	1	192	8 KHz
IV	48 ms	6	2	768	2 KHz

2.2.4 Pseudo Noise Scrambling

Prior to convolution encoding, the transmitted signal can be scrambled by a modulo-2 addition with a PRBS.

The PRBS polynomial is of degree 9 and specified as $P(X) = x^9 + x^5 + 1$.

The initialization word is applied in such a way that the first bit of the PRBS is obtained when the outputs of all shift register stages are set to value "1".

2.2.5 Convolutional Coding

The process of convolution coding is applied at the output of each PN scrambler. The channel encoding process is based on punctured convolutional coding, which allows both equal and unequal error protection. Unequal error protection (UEP) is designed

for audio services, equal error protection (EEP) for audio and data services. The sampling frequency is respectively 48 kHz and 24 kHz.

The convolutional coder is a punctured convolution code, based on a mother convolutional code with constraint length 7 and rate 1/4.

The generator polynomials are $G_1=(1,0,1,1,0,1,1)$, $G_2=(1,1,1,1,0,0,1)$, $G_3=(1,1,0,0,1,0,1)$ and $G_4=(1,0,1,1,0,1,1)$.

To avoid the need for additional signaling overhead, the data in the FIC are encoded with fixed, equal channel coding, with a constant 1/3 coding rate.

The puncturing procedures applied for the coding in the MSC is a combination of protection profile and protection level. There are number of permissible protection profiles defined for each of the allowed bit rates. Each protection profile is associated with a protection level. Protection level 1 is the highest level within the same profile.

Error protection	Protection Profile	Bit rate	Protection Level	Code Rate
UEP	four different protection profiles	14 different bit rates	1, 2, 3, 4, 5	0,34..0,75 (64 different data rates - protection level combinations)
EEP	A	Multiples of 8 kbit/s	1-A	1/4
			2-A	3/8
			3-A	1/2
			4-A	3/4
	B	Multiples of 32 kbit/s	1-B	4/9
			2-B	4/7
			3-B	2/3
			4-B	4/5

2.2.6 Time Interleaving

Time interleaving is applied prior to block generation at the output of each convolutional encode contributing to the sub-channels in the MSC. It is not applied to the FIC.

The time interleaving process covers 16 CIFs, 24 ms each. This results in an overall processing delay of 384 ms.

3 T-DMB/DAB Configuration and Settings

Access:

- ▶ Select "Baseband > T-DMB/DAB".

The remote commands required to define these settings are described in [Chapter 5, "Remote-Control Commands"](#), on page 46.

Settings:

• General Settings	14
• Input Signal Settings	15
• Network Settings	23
• SFN Settings	25
• Special Settings	27
• Global Connector Settings	28
• TS Player	28
• Local IP Data Network Settings	38

3.1 General Settings

Access:

- ▶ Select "Baseband > T-DMB/DAB".



The tab provides functionality for calling default settings, save and recall settings.

Settings:

State	14
Set To Default	15
Save/Recall	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:TDMB:STATe on page 47

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:TDMB:PRESet` on page 47

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:TDMB:SETTing:CATalog?` on page 47

`[:SOURce<hw>] :BB:TDMB:SETTing:DELeTe` on page 48

`[:SOURce<hw>] :BB:TDMB:SETTing:LOAD` on page 48

`[:SOURce<hw>] :BB:TDMB:SETTing:STORe` on page 48

3.2 Input Signal Settings

Access:

- ▶ Select "Baseband > T-DMB/DAB > Input Signal".

The dialog provides access to settings necessary to configure the input signal.

Input signal tasks

The settings allow you to perform the following tasks:

- Selecting an ETI source (external ETI Input, TS player as ETI player or internal ETI test signal).
- Displaying information about the selected ETI signal (e.g. MID, NST)

How to: [Chapter 4.1, "Configuring the Input Signal"](#), on page 41 .

An external ETI signal (physical HDB3-coded) can be fed in at the "User 1" connector.



Common input signal settings

The setting of the following parameters is used for all broadcast standards.

- "Source"
- "Input"

Settings:

• General Settings	16
• Info	18
• IP Channel x Settings	19

3.2.1 General Settings

Access:

- ▶ Select "Input Signal > General".

T-DMB/DAB	Input Signal	Network	SFN	Special Off	
Source	External	Number of Streams	0	General	
Global Connectors ...		Mode Identity (MID)	0	Info	
Input	IP			IP Channel 1	
IP ETI Channel	1				
ETI Signal	Invalid				

The tab provides general settings necessary to configure the input signal.

Settings:

Source	16
Input	17
Input Format	17
IP ETI Channel	17
ETI Signal	18
Number of Streams	18
Mode Identity (MID)	18

Source

Sets ETI signal source.

- "External" Uses the external ETI signal present at the input connector.
Signal requirements:
- ETI (NI), ETI (NA 5592) or ETI (NA 5376) signal
 - HDB3-coded
 - Nominal voltage level: ± 2.37 V
 - Internally terminated with a 75 Ω load
 - Data rate: 2.048 Mbit/s
- "TS Player" Uses an internal transport stream with ETI 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 3.7, "TS Player"](#), on page 28
 - [Supported TS player file types](#)
- Provide suitable play files, for example, install the stream libraries T-DMB/DAB streams (R&S SMCVB-KS10) and DAB+ streams (R&S SMCVB-KS11).
- "Test Signal" Requires "Network > Network Mode > MFN".
Uses an internal ETI test signal with audio content.

Remote command:

`[:SOURce<hw>] :BB:TDMB:SOURce` on page 50

Input

Requires "Source > External".

Sets the external input interface.

Remote command:

`[:SOURce<hw>] :BB:TDMB:INPut` on page 49

Input Format

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

Displays the format of the input signal.

"ETI" Fixed input format.

Remote command:

`[:SOURce<hw>] :BB:TDMB:INPut:FORMat` on page 49

IP ETI Channel

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

Selects the IP ETI channel. You can select one out of two IP ETI channels as input at the "IP Data" interface.

To configure a particular channel, see [Chapter 3.2.3, "IP Channel x Settings"](#), on page 19.

Remote command:

`[:SOURce<hw>] :BB:TDMB:INPut:ETIChannel` on page 49

ETI Signal

Displays, if a valid ETI signal is present and the signal type.

"Invalid" No ETI signals present.

"ETI (NI)" ETI NI signal.

"ETI (NA 5592)"
ETI NA 5592 signal.

"ETI (NA 5376)"
ETI NA 5376 signal.

Remote command:

[:SOURce<hw>] :BB:TDMB:ETIinput? on page 49

Number of Streams

Displays the number of streams contained in the ETI signal.

The signal can contain up to 64 streams. If the ETI signal is invalid, the number of streams is "0".

Remote command:

[:SOURce<hw>] :BB:TDMB:NST? on page 50

Mode Identity (MID)

Displays the DAB mode identity.

The MID information in the ETI data stream determines the transmission mode.

Remote command:

[:SOURce<hw>] :BB:TDMB:MID? on page 50

3.2.2 Info

Access:

- ▶ Select "Input Signal > Info".

Subchannel Id (Hex)	Protection Profile	Protection Level	Data Rate / kbit/s

The tab displays the STC and SSTC information on the input signal.

Settings:

Info.....	19
L Subchannel Id (Hex).....	19
L Protection Profile.....	19
L Protection Level.....	19
L Data Rate / kbit/s.....	19

Info

The table displays individual parameters for each subchannel. The subchannels range from 1 to Number of Streams, see "[Number of Streams](#)" on page 18.

STC/SSTC parameters are "Subchannel Id (Hex)", "Protection Profile", "Protection Level" and "Data Rate / kbit/s".

Subchannel Id (Hex) ← Info

Displays the subchannel identifiers.

Remote command:

`[:SOURCE<hw>] :BB:TDMB:SCID<ch>` on page 51

Protection Profile ← Info

Displays the protection profile.

"UEP" Unequal error protection

"EEP" Equal error protection

Remote command:

`[:SOURCE<hw>] :BB:TDMB:PROTECTION:PROFILE<ch>?` on page 51

Protection Level ← Info

Displays the protection level. The level depends on the protection profile.

"1" to "5" Requires "Protection Profile > UEP".

"1A" to "4A" or "1B" to "4B"
Requires "Protection Profile > EEP".

"Undefined" No protection profile detected.

Remote command:

`[:SOURCE<hw>] :BB:TDMB:PROTECTION:LEVEL<ch>?` on page 51

Data Rate / kbit/s ← Info

Displays the uncoded data rate in kbit/s.

Remote command:

`[:SOURCE<hw>] :BB:TDMB:DATARATE<ch>?` on page 51

3.2.3 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 necessary to configure IP channel x.

You can configure settings for 2 IP channels $x = 1$ to 2 individually, see also "Input Signal > General > IP ETI 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	"T-DMB/DAB"	Yes
"ATSC 3.0"	No	"DVB-S"	Yes
"DTMB"	Yes	"DVB-S2"	Yes
"DVB-T"	Yes	"DRM"	No
"DVB-T2"	Yes	"Audio AM"	No
"ISDB-T"	Yes	"Audio FM"	No

See also:

- [Chapter 4.1.1, "How to Apply an External IP Input Signal"](#), on page 41
- [Chapter 3.8, "Local IP Data Network Settings"](#), on page 38

Settings:

Input IP.....	21
Alias.....	21
Type.....	21
Multicast Address.....	21
Port.....	21
IGMPv3 Source Address.....	22
Ping Source Address.....	22
Ping Result.....	22
Local IP Data Network.....	22

Input IP

Activates/deactivates the IP input.

Remote command:

`[:SOURce<hw>] :BB:INPut:IP<ch> [:STATe]` on page 53

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 53

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 54

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 54

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 53

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\[:SOURCE\]:ADDRes](#) on page 54

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 54

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 55

Local IP Data Network

Accesses local IP data network settings, see [Chapter 3.8, "Local IP Data Network Settings"](#), on page 38.

3.3 Network Settings

Access:

- ▶ Select "Baseband > T-DMB/DAB > Network".

T-DMB/DAB	Input Signal	Network	SFN	Special Off	X
Network Mode		SFN			
TII		<input type="checkbox"/>			
TII Main Id		0			
TII Sub Id		1			

The tab provides network mode and TII settings.

Settings:

Network Mode.....	23
TII.....	24
TII Main ID.....	24
TII Sub ID.....	24

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 an **SFN**, 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). In addition, it is necessary in an SFN network to 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 23, and time stamps (TIST) inserted into the **ETI** stream. The maximum delay in the network is set on the ETI multiplexer and represents the maximum delay which can occur in the program data supply at the most remote transmitter in the network. If a time stamp was received at the SFN transmitter, its modulator will measure the dynamic delay with respect to 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 will compute the local delay value which the supplied ETI stream must undergo to attain data synchronicity in the network. Note that it is critical for the incoming ETI stream to be absolutely identical for all of the transmitters in the network, that means it may not be changed in any way. Note that the modulator operates with TIST level 5 at any time.
- "MFN" In a **MFN**, 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.

Remote command:

[:SOURce<hw>] :BB:TDMB:NET on page 55

TII

Enables/disables the transmission of the **TII** signal.

The TII signal is used to identify each individual transmitter.

"On" Transmits a TII signal during the null symbol.

"Off" Transmits no TII signal.

Remote command:

[:SOURce<hw>] :BB:TDMB:TII:STATe on page 56

TII Main ID

Defines the **TII** main ID.

Remote command:

[:SOURce<hw>] :BB:TDMB:TII:MAIN on page 55

TII Sub ID

Defines the **TII** sub ID.

Remote command:

[:SOURce<hw>] :BB:TDMB:TII:SUB on page 56

3.4 SFN Settings

Access:

1. Select "Baseband > T-DMB/DAB > Network > Network Mode > SFN".
2. Select "T-DMB/DAB > SFN".

T-DMB/DAB	Input Signal	Network	SFN	Special Off		X	
Network Compensation			0.0 µs	Static Delay			0.0 µs
Tx Processing Delay			0.0 µs	Total Delay			100 000.0 µs
Tx Compensation Delay			100 000.0 µs	Max. Deviation Time			10.0 µs
Tx Delay			100 000.0 µs				

The tab provides settings necessary to configure SFN operation.

Settings

Network Compensation.....	25
Tx Processing Delay.....	25
Tx Compensation Delay.....	26
Tx Delay.....	26
Static Delay.....	26
Total Delay.....	26
Max. Deviation Time.....	26

Network Compensation

Displays the compensating delay.

If the delay is added to the network path delay, the overall delay is constant and of known value. The value of the compensating delay is set by examining incoming time-stamps compared to a local time standard. The value of the compensating delay is adjusted so that the frame carrying the timestamp is delivered at the correct time.

Remote command:

[:SOURce<hw>] :BB:TDMB:DElay:NETWork? on page 57

Tx Processing Delay

Displays the minimum signal turnaround time through the transmitter.

A minimum delay implies "Tx Compensation Delay = 0 µs". The minimum delay is determined by the signal processing in the COFDM and depends on the DAB mode.

"Tx Processing Delay" = "Tx Delay" - "Tx Compensation Delay"

Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:PROCeSS? on page 57

Tx Compensation Delay

Displays the time span by which signal processing is artificially delayed to achieve a constant "Tx Delay".

"Tx Compensation Delay" = "Tx Delay" - "Tx Processing Delay"

Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:COMPeNsation? on page 56

Tx Delay

Sets the signal turnaround time through the transmitter.

You can set a delay of up to one second.

"Tx Delay" = "Tx Compensation Delay" + "Tx Processing Delay"

Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:DELaY on page 56

Static Delay

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

The static delay is also called "user delay offset". You can shift transmission start by up to one second.

Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:STATic on page 58

Total Delay

Displays the total cycle time of the signal through the transmitter.

"Total Delay" = "Static Delay" + "Tx Delay" + "Network Compensation"

Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:TOTal? on page 58

Max. Deviation Time

Sets the maximum permitted deviation of the transmission time relative to the internally regulated reference frequency.

If the configured value is exceeded, the absolute transmission time is recalculated. Recalculation causes a brief signal failure (mute), that means the transmit signal is reset and transmission is restarted.

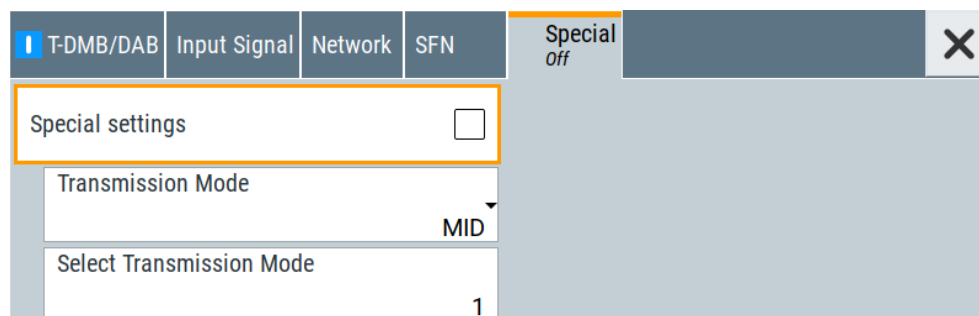
Remote command:

[:SOURce<hw>] :BB:TDMB:DELaY:DEVIation on page 57

3.5 Special Settings

Access:

- ▶ Select "Baseband > T-DMB/DAB > Special".



The tab provides settings, that differ from the specification of the broadcast standard.



Settings different from the broadcast standard can be useful for research and development. Applying these settings requires "Special Settings > On".

If you set a parameter different from the specification, the warning icon is displayed left to the parameter.

If special settings are active, decoding by a DUT is maybe not successful.

Settings:

Special Settings.....	27
Transmission Mode.....	27
Select Transmission Mode.....	28

Special Settings

Enables/disables special settings.

The setting allows you to switch between standard-compliant and user-defined channel coding.

Remote command:

`[:SOURce<hw>] :BB:TDMB [:SPECial] :SETTings [:STATe]` on page 58

Transmission Mode

Sets the transmission mode.

"MID" Uses the transmission mode corresponding to the MID information in the ETI signal. Default state.

"Manual" Uses the transmission mode set via "Select Transmission Mode".

Remote command:

`[:SOURce<hw>] :BB:TDMB [:SPECial] :TRANsmiSSion:MODE` on page 59

Select Transmission Mode

Requires "Transmission Mode > Manual".

Selects the transmission mode.

[Table 3-2](#) illustrates, how the selected transmission mode affects OFDM and framing parameters.

Table 3-2: Transmission mode settings

Transmission mode	1	2	3	4
OFDM symbols per transmission frame	76	76	153	76
Number of carriers	1536	384	192	768
Transmission frame duration	96 ms	24 ms	24 ms	48 ms
Null symbol duration	1297 µs	324 µs	168 µs	648 µs
OFDM symbol duration	1246 µs	312 µs	156 µs	623 µs
Carrier spacing	1 kHz	4 kHz	8 kHz	2 kHz
Guard interval	246 µs	62 µs	31 µs	123 µs

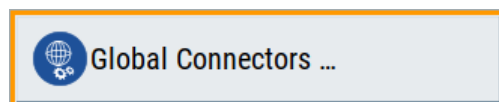
Remote command:

```
[ :SOURce<hw> ] :BB:TDMB [ :SPECial ] :TRANsmiSSion:MODE:SELECT
```

on page 59

3.6 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.

3.7 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 stream files includes:

- Base unit, including arbitrary waveform generator (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)
- Optional 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 "How to Work with Waveform Libraries" in the R&S SMCV100B user manual.

For information on the content of a stream library, see 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 > T-DMB/DAB > 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	"T-DMB/DAB"	Yes
"ATSC 3.0"	Yes	"DVB-S"	Yes
"DTMB"	Yes	"DVB-S2"	Yes
"DVB-T"	Yes	"DRM"	No

Baseband standard	"Source > TS Player"	Baseband standard	"Source > TS Player"
"DVB-T2"	Yes	"Audio AM"	No
"ISDB-T"	Yes	"Audio FM"	No

The remote commands required to define these settings are described in [Chapter 5.6, "TSGen Subsystem"](#), on page 59.

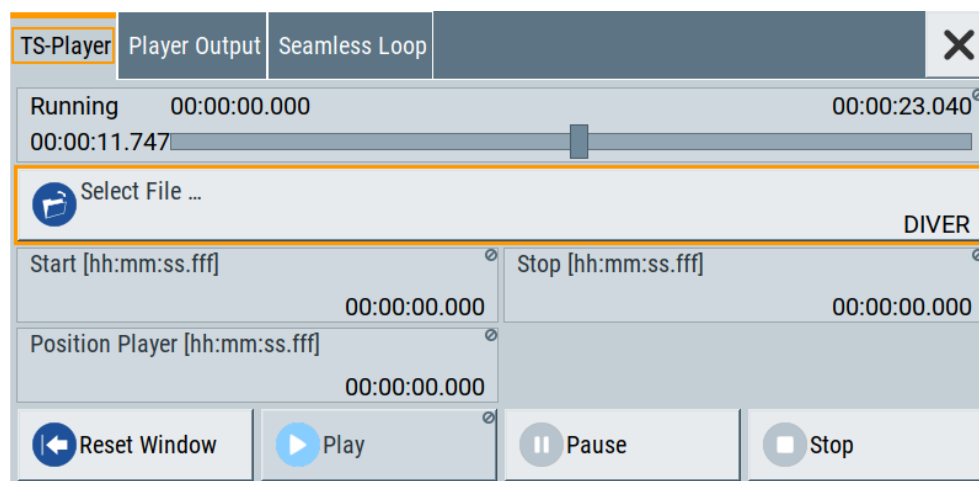
Settings:

- [TS Player Settings](#)..... 30
- [Player Output Settings](#)..... 33
- [Seamless Loop Settings](#)..... 36

3.7.1 TS Player Settings

Access:

1. Follow the steps in ["To access the "TS Player" application"](#) on page 29.
2. Select "TS Player > TS-Player".



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

Settings:

- [Running/Position Player \[hh:mm:ss.fff\]](#)..... 31
- [Select File](#)..... 31
- [Start \[hh:mm:ss.fff\]](#)..... 32
- [Position Player \[hh:mm:ss.fff\]](#)..... 32
- [Stop \[hh:mm:ss.fff\]](#)..... 32
- [Reset Window](#)..... 32

Play.....	32
Pause.....	33
Stop.....	33

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 64

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
*.atasc_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
*.isdbs_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	-

File extension	Stream libraries	Remark	Option
*.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 62

:TSGen:READ:PLAYfile:LENGth? on page 66

:TSGen:READ:FMEMory on page 66

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 64

Position Player [hh:mm:ss.fff]

Displays the current play position in the file.

Remote command:

:TSGen:CONFigure:SEEK:POSition on page 64

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 64

Reset Window

Resets "Start/Stop/Position Player" parameters.

Remote command:

:TSGen:CONFigure:SEEK:RESet on page 64

Play

Plays the selected file.

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

Remote command:

:TSGen:CONFigure:COMMand<ch> on page 61

Pause

Pauses the player.

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

Remote command:

:TSGen:CONFigure:COMMand<ch> on page 61

Stop

Stops the player and returns to the start position.

Remote command:

:TSGen:CONFigure:COMMand<ch> on page 61

3.7.2 Player Output Settings

Access:

- ▶ Select "TS Player > Player Output".

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

3.7.2.1 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 necessary to configure general player output properties.

Data Rate.....	33
Orig. Data Rate.....	34
Packet Length.....	34
Nullpacket Stuffing.....	34
Stop Data.....	34

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 66

Orig. Data Rate

Displays the calculated original TS data rate.

Remote command:

`:TSGen:READ:ORIGtsrate` on page 66

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:TSPacket` on page 65

Nullpacket Stuffing

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

Enables or disables nullpacket stuffing.

The output data rate of the TS player equals the original data rate. The equality ensures 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 ("PCR, DTS/PTS > On"). |
| "Off" | Deactivate stuffing, if you want to use the same data rate as the original data rate. |

Remote command:

`:TSGen:CONFigure:STUFFing` on page 65

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 65

3.7.2.2 Stuffing Settings

The tab comprises settings necessary to configure stuffing.

Settings

Test TS Packet	35
PID Test Packet	36
PID (Hex)	36
Payload Test/Stuff	36
PRBS	36

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) 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) followed by 207 payload bytes.

Remote command:

[:TSGen:CONFigure:TSPacket](#) on page 65

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 62

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 62

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 61

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:

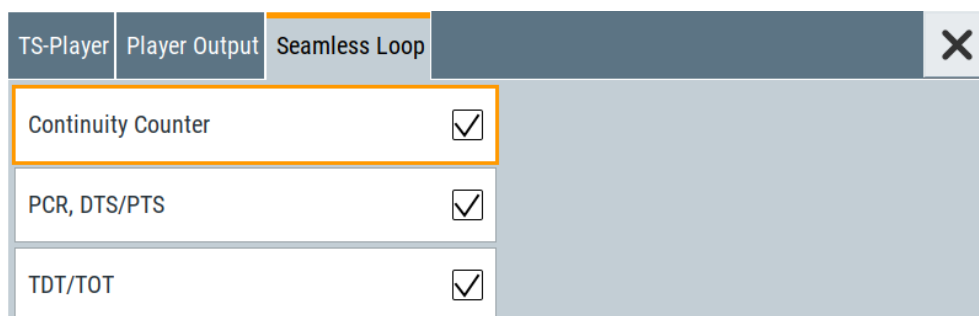
[:TSGen:CONFigure:PRBS\[:SEquence\]](#) on page 63

3.7.3 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 necessary to configure settings for playing the file in a loop.

Settings:

Continuity Counter	37
PCR, DTS/PTS	37
TDT/TOT	37

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 63

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 63

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 63

3.8 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 necessary to configure the board address.

The remote commands necessary to configure local IP data network settings are described in [Chapter 5.7, "BCIP Subsystem"](#), on page 67.

How to: [Chapter 4.1.1, "How to Apply an External IP Input Signal"](#), on page 41

Settings:

Network Status	38
Restart Network	39
Hostname	39
Address Mode	39
IP Address	39
Protocol	40
Subnet Mask	40
Show Connector	40
MAC Address	40

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 69

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 69

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 68

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 68

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 68

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 69

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 68

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 69

4 Performing T-DMB/DAB 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](#).....41

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](#)..... 41
- [How to Apply an External ETI Input Signal](#)..... 43
- [How to Generate an Internal ETI Signal](#)..... 45

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".

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 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 ETI 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 41.



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

Source External	General
Global Connectors ...	
Input IP	
IP Channel 1	
Stuffing <input checked="" type="checkbox"/>	Info
	Test Signal
	IP Channel 1

1 = IP channel notation: IP ETI Channel

2. Optionally, activate "Stuffing" to adjust the ETI data rate.
3. Specify the IP ETI channel properties, e.g. for "IP ETI 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) Activate the IP channel, select "Input IP > On".

Input Signal		
Input IP <input checked="" type="checkbox"/>	Alias	General
Type	Service	
Multicast	Multicast Address	Info
	224.3.2.1	
Port	IGMPv3 Source Address	Test Signal
6 002	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 ETI data, that is input at the "IP Data" connector.

4.1.2 How to Apply an External ETI Input Signal

To connect to the external ETI input interface

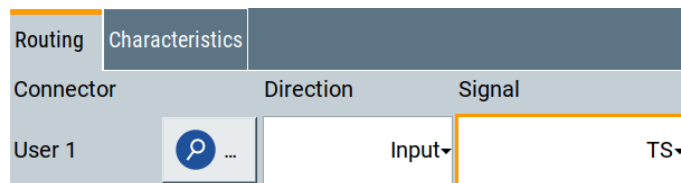
1. Use a double-shielded 75 Ω BNC cable for connection between R&S SMCV100B and the external **MPEG** ETI data source.
 See also Section "Cable selection and electromagnetic interference (EMI)" in the R&S SMCV100B Getting Started user manual.

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 non-screwable connectors (BNC)" in the R&S SMCV100B Getting Started user manual.

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

The R&S SMCV100B is **connected** to an **MPEG** ETI 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 an ETI input signal:
 - a) Select "Direction > Input".
 - b) Select "Signal > ETI".

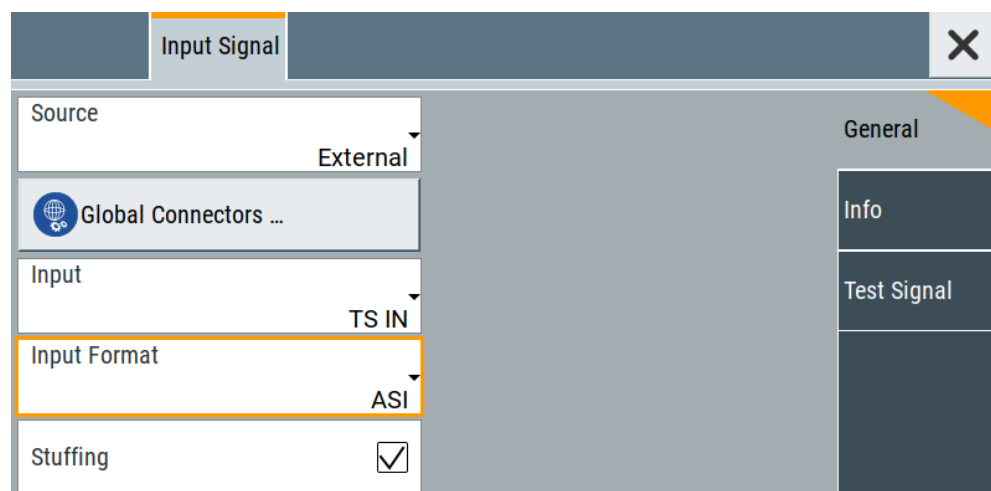


To configure an external ETI input signal

The R&S SMCV100B is **prepared** for receiving an ETI input signal at the "User 1" connector.

- ▶ Specify general ETI input signal properties:
 - a) Select "Input Signal > General > Source > External".
 - b) Select "Input > TS IN".

The "Input Format > ETI" is fixed.



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

4.1.3 How to Generate an Internal ETI Signal

To play an ETI 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 ETI data files opens.
3. Click "Play" to play the default file `DIVER.trp`.
Playing the file requires no option. Alternatively, play files with extension `*.dab` and `*.eti`.

5 Remote-Control Commands

The following commands are required to generate signals with the T-DMB/DAB 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

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 T-DMB/DAB are described here:

- [General Commands](#).....47
- [Input Commands](#).....49
- [Network Commands](#).....55
- [SFN Delay Commands](#)..... 56
- [Special Commands](#)..... 58
- [TSGen Subsystem](#)..... 59
- [BCIP Subsystem](#).....67

5.1 General Commands

Example: Storing current configuration

```
:SOURCE1:BB:TDMB:SETTING:STORE "/var/user/my_TDMB"
// Saves the file "my_TDMB.tdmb" in the directory as above.
*RST
:SOURCE1:BB:TDMB:SETTING:CATALOG?
// Response: "my_TDMB"
:SOURCE1:BB:TDMB:SETTING:LOAD "/var/user/my_TDMB"

:SOURCE1:BB:TDMB:STATE 1
:SOURCE1:BB:TDMB:SETTING:DELETE "/var/user/my_TDMB"
```

Commands

[:SOURCE<hw>]:BB:TDMB:PRESet	47
[:SOURCE<hw>]:BB:TDMB:STATE	47
[:SOURCE<hw>]:BB:TDMB:SETTING:CATALOG?	47
[:SOURCE<hw>]:BB:TDMB:SETTING:DELETE	48
[:SOURCE<hw>]:BB:TDMB:SETTING:LOAD	48
[:SOURCE<hw>]:BB:TDMB:SETTING:STORE	48

[:SOURCE<hw>]:BB:TDMB: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:TDMB:STATE`.

Example: See [Example "Storing current configuration"](#) on page 47.

Usage: Event

Manual operation: See ["Set To Default"](#) on page 15

[:SOURCE<hw>]:BB:TDMB:STATE <State>

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

Parameters:

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

Manual operation: See ["State"](#) on page 14

[:SOURCE<hw>]:BB:TDMB:SETTING:CATALOG?

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

Return values:

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

Returns a string of filenames separated by commas.

Example:

See [Example "Storing current configuration"](#) on page 47.

Usage:

Query only

Manual operation: See ["Save/Recall"](#) on page 15

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

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

Parameters:

<Filename> "<filename>"

Filename or complete file path; file extension can be omitted

Example:

See [Example "Storing current configuration"](#) on page 47.

Usage:

Setting only

Manual operation: See ["Save/Recall"](#) on page 15

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

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

Parameters:

<Filename> "<filename>"

Filename or complete file path; file extension can be omitted

Example:

See [Example "Storing current configuration"](#) on page 47.

Manual operation: See ["Save/Recall"](#) on page 15

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

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

Parameters:

<Filename> "<filename>"

Filename or complete file path

Example:

See [Example "Storing current configuration"](#) on page 47.

Manual operation: See ["Save/Recall"](#) on page 15

5.2 Input Commands

• General Commands.....	49
• Info Commands.....	50
• IP Subsystem.....	52

5.2.1 General Commands

[:SOURce<hw>]:BB:TDMB:ETIinput?	49
[:SOURce<hw>]:BB:TDMB:INPut	49
[:SOURce<hw>]:BB:TDMB:INPut:FORMat	49
[:SOURce<hw>]:BB:TDMB:INPut:ETIChannel	49
[:SOURce<hw>]:BB:TDMB:MID?	50
[:SOURce<hw>]:BB:TDMB:NST?	50
[:SOURce<hw>]:BB:TDMB:SOURce	50

[\[:SOURce<hw>\]:BB:TDMB:ETIinput?](#)

Displays whether a valid ETI signal is present and the signal type.

Return values:

<EtISignal> INValid | ENI | E559 | E537

Usage: Query only

Manual operation: See "[ETI Signal](#)" on page 18

[\[:SOURce<hw>\]:BB:TDMB:INPut <TdmblInput>](#)

Sets the external input interface.

Parameters:

<TdmblInput> IP | TS

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

[\[:SOURce<hw>\]:BB:TDMB:INPut:FORMat <TdmBFormat>](#)

Sets the format of the input signal.

Parameters:

<TdmBFormat> ETI

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

[\[:SOURce<hw>\]:BB:TDMB:INPut:ETIChannel <ETIChannel>](#)

Selects the [ETI](#) channel that is received over the IP interface.

Parameters:

<ETIChannel> 1 | 2
 *RST: 1

Manual operation: See "[IP ETI Channel](#)" on page 17

[[:SOURce<hw>]:BB:TDMB:MID?

Displays the DAB mode identity.

A mode identity of 0 corresponds to an invalid ETI signal.

Return values:

<ModelIdentity> integer
 Range: 0 to 4
 *RST: 0

Usage: Query only

Manual operation: See "[Mode Identity \(MID\)](#)" on page 18

[[:SOURce<hw>]:BB:TDMB:NST?

Displays the number of streams (NST) contained in the ETI signal.

Return values:

<NumOfStreams> integer
 Range: 0 to 64
 *RST: 0

Usage: Query only

Manual operation: See "[Number of Streams](#)" on page 18

[[:SOURce<hw>]:BB:TDMB:SOURce <TdmbSource>

Sets the modulation source for the input signal.

Parameters:

<TdmbSource> EXTERNAL | TSPLayer | TESTsignal
 *RST: EXTERNAL

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

5.2.2 Info Commands

[:SOURce<hw>]:BB:TDMB:DATarate<ch>?	51
[:SOURce<hw>]:BB:TDMB:PROTection:LEVel<ch>?	51
[:SOURce<hw>]:BB:TDMB:PROTection:PROFile<ch>?	51
[:SOURce<hw>]:BB:TDMB:SCID<ch>.....	51

[:SOURCE<hw>]:BB:TDMB:DATArate<ch>?

Return values:

<DataRate> integer
 Range: 0 to 1824
 *RST: 0

Usage: Query only

Manual operation: See "[Data Rate / kbit/s](#)" on page 19

[:SOURCE<hw>]:BB:TDMB:PROTECTION:LEVEL<ch>?

Queries the protection level. The level depends on the protection profile.

Return values:

<ProtLevel> UNDEFINED | EP1A | EP2A | EP3A | EP4A | EP1B | EP2B | EP3B | EP4B | UP1 | UP2 | UP3 | UP4 | UP5

UP1|UP2|UP3|UP4|UP5

Protection level 1 to 5 with [UEP](#) protection profile

EP1A|EP2A|EP3A|EP4A

Protection level 1A to 4A with [EEP](#) protection profile

EP1B|EP2B|EP3B|EP4B

Protection level 1B to 4B with [EEP](#) protection profile

UNDEFINED

No protection profile detected

Usage: Query only

Manual operation: See "[Protection Level](#)" on page 19

[:SOURCE<hw>]:BB:TDMB:PROTECTION:PROFILE<ch>?

Queries the protection profile.

Return values:

<ProtProfile> UEP | EEP
UEP
 Unequal error protection
EEP
 Equal error protection

Usage: Query only

Manual operation: See "[Protection Profile](#)" on page 19

[:SOURCE<hw>]:BB:TDMB:SCID<ch> <SubChannelId>

Queries the subchannel identifiers per subchannel.

Parameters:

<SubChannelId> integer
 Range: 0 to 63
 *RST: 0

Example: See

Manual operation: See ["Subchannel Id \(Hex\)"](#) on page 19

5.2.3 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 5.7, "BCIP Subsystem"](#), on page 67.

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.
:SOURCE:BB:INPut:IP2:STATE ON
// Specify alias as "Alias 2".
:SOURCE:BB:INPut:IP2:ALIAS "Alias 2"

//*****
// Define Unicast properties.
//*****
:SOURCE:BB:INPut:IP2:TYPE UNI
// Local IP data interface is configured for Unicast reception
:SOURCE:BB:INPut:IP2:PORT 6002

//*****
// Define Multicast properties.
//*****
:SOURCE:BB:INPut:IP2:TYPE MULT
// Local IP data interface is configured for Multicast reception
:SOURCE:BB:INPut:IP2:MULTICAST:ADDRESS?
// Response: "226.0.0.0"
:SOURCE:BB:INPut:IP2:IGMP:SOURCE:ADDRESS?
// Response: "0.0.0.0"
:SOURCE:BB:INPut:IP2:IGMP:SOURCE:ADDRESS "192.168.10.1"
:SOURCE:BB:INPut:IP2:IGMP:SOURCE:PING
```

```
:SOURce1:BB:INPut:IP2:IGMP:SOURce:RESult?
// Response: "Ping: Successful"
```

Commands

[:SOURce<hw>]:BB:INPut:IP<ch>[:STATe]	53
[:SOURce<hw>]:BB:INPut:IP<ch>:ALias	53
[:SOURce<hw>]:BB:INPut:IP<ch>:PORT	53
[:SOURce<hw>]:BB:INPut:IP<ch>:TYPE	54
[:SOURce<hw>]:BB:INPut:IP<ch>:MULTicast:ADDResS	54
[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:ADDResS	54
[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:PING	54
[:SOURce<hw>]:BB:INPut:IP<ch>:IGMP[:SOURce]:RESult?	55

[:SOURce<hw>]:BB:INPut:IP<ch>[:STATe] <Alias>

Activates/deactivates the "IP Channel x" as IP input.

Specify the current IP ETI Channel with the command

SOURce1:BB:DigStd:INPut:ETIChannel. DigStd stands for the IP ETI Channel in the corresponding broadcast standard.

Parameters:

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

Example: See [Example "Configure IP channel 2 properties"](#) on page 52.

Manual operation: See ["Input IP"](#) on page 21

[: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 52.

Manual operation: See ["Alias"](#) on page 21

[: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 52.

Manual operation: See ["Port"](#) on page 21

[: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 53.

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.

See:

[\[:SOURce<hw>\]:BB:INPut:IP<ch>:MULTicast:ADDRESS](#) on page 54

[\[:SOURce<hw>\]:BB:INPut:IP<ch>:PORT](#) on page 53

*RST: UNIcast

Example: See [Example "Configure IP channel 2 properties"](#) on page 52.

Manual operation: See ["Type"](#) on page 21

[: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 52.

Manual operation: See ["Multicast Address"](#) on page 21

[: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 52.

Manual operation: See ["IGMPv3 Source Address"](#) on page 22

[: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 55.

Example: See [Example "Configure IP channel 2 properties"](#) on page 52.

Usage: Event

Manual operation: See ["Ping Source Address"](#) on page 22

[: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 54.

Return values:

<PingResult> string
Returns ping messages.

Example: See [Example "Configure IP channel 2 properties"](#) on page 52.

Usage: Query only

Manual operation: See ["Ping Result"](#) on page 22

5.3 Network Commands

[:SOURce<hw>]:BB:TDMB:NET	55
[:SOURce<hw>]:BB:TDMB:TII:MAIN	55
[:SOURce<hw>]:BB:TDMB:TII:STATe	56
[:SOURce<hw>]:BB:TDMB:TII:SUB	56

[:SOURce<hw>]:BB:TDMB:NET <NetwMode>

Sets the network mode.

Parameters:

<NetwMode> MFN | SFN

Manual operation: See [" Network Mode"](#) on page 23

[:SOURce<hw>]:BB:TDMB:TII:MAIN <TiiMain>

Defines the [TII](#) main ID.

Parameters:

<TiiMain> integer
Range: 0 to 69
*RST: 0

Manual operation: See [" TII Main ID"](#) on page 24

[[:SOURce<hw>]:BB:TDMB:TII:STATe <TiiState>

Enables/disables the transmission of the TII signal.

Parameters:

<TiiState> 0 | 1 | OFF | ON

Manual operation: See " TII" on page 24

[[:SOURce<hw>]:BB:TDMB:TII:SUB <TiiSub>

Defines the TII sub ID.

Parameters:

<TiiSub> integer
 Range: 1 to 23
 *RST: 1

Manual operation: See " TII Sub ID" on page 24

5.4 SFN Delay Commands

[[:SOURce<hw>]:BB:TDMB:DELAy:COMPensation?.....	56
[[:SOURce<hw>]:BB:TDMB:DELAy:DELAy.....	56
[[:SOURce<hw>]:BB:TDMB:DELAy:DEViation.....	57
[[:SOURce<hw>]:BB:TDMB:DELAy:NETWork?.....	57
[[:SOURce<hw>]:BB:TDMB:DELAy:PROCCess?.....	57
[[:SOURce<hw>]:BB:TDMB:DELAy:STATic.....	58
[[:SOURce<hw>]:BB:TDMB:DELAy:TOTal?.....	58

[[:SOURce<hw>]:BB:TDMB:DELAy:COMPensation?

Displays the time span by which signal processing is artificially delayed in order to achieve a constant "TX Delay".

Return values:

<DelayComp> float
 Range: -1.0000000 to 1.0000000
 Increment: 0.0000001
 *RST: 0
 Default unit: s

Usage: Query only

Manual operation: See "Tx Compensation Delay" on page 26

[[:SOURce<hw>]:BB:TDMB:DELAy:DELAy <DelayTx>

Sets the signal turnaround time through the transmitter.

Parameters:

<DelayTx> float
 Range: 0.0000000 to 1.0000000
 Increment: 0.0000001
 *RST: 0
 Default unit: s

Manual operation: See "[Tx Delay](#)" on page 26

[[:SOURce<hw>]:BB:TDMB:DELay:DEViation <DelayDev>

Sets the maximum permitted deviation of the transmission time relative to the internally regulated reference frequency.

Parameters:

<DelayDev> integer
 Range: 0.000001 to 0.0005000
 Increment: 0.0000001
 *RST: 0.00001
 Default unit: s

Manual operation: See "[Max. Deviation Time](#)" on page 26

[[:SOURce<hw>]:BB:TDMB:DELay:NETWork?

Queries the compensating delay.

If the delay is added to the network path delay, the overall delay is constant and of known value.

Return values:

<NetwDelay> float
 Range: 0.0000000 to 1.0000000
 Increment: 0.0000001
 *RST: 0

Usage: Query only

Manual operation: See "[Network Compensation](#)" on page 25

[[:SOURce<hw>]:BB:TDMB:DELay:PROCCess?

Queries the minimum signal turnaround time through the transmitter.

Return values:

<DelayProc> float
 Range: 0.0000000 to 1.0000000
 Increment: 0.0000001
 *RST: s

Usage: Query only

Manual operation: See ["Tx Processing Delay"](#) on page 25

[[:SOURce<hw>]:BB:TDMB:DELAy:STATic <DelayStatic>

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

Parameters:

<DelayStatic> float
 Range: -1.0000000 to 1.0000000
 Increment: 0.0000001
 *RST: 0
 Default unit: s

Manual operation: See ["Static Delay"](#) on page 26

[[:SOURce<hw>]:BB:TDMB:DELAy:TOTAl?

Queries the total cycle time of the signal through the transmitter.

Return values:

<DelayTotal> float
 Range: -1.0000000 to 3.0000000
 Increment: 0.0000001
 *RST: 0
 Default unit: s

Usage: Query only

Manual operation: See ["Total Delay"](#) on page 26

5.5 Special Commands

[:SOURce<hw>]:BB:TDMB[:SPECial]:SETTings[:STATe]	58
[:SOURce<hw>]:BB:TDMB[:SPECial]:TRANsmission:MODE	59
[:SOURce<hw>]:BB:TDMB[:SPECial]:TRANsmission:MODE:SELECT	59

[[:SOURce<hw>]:BB:TDMB[:SPECial]:SETTings[:STATe] <SpecialSett>

Enables/disables special settings.

The setting allows you to switch between standard-compliant and user-defined channel coding.

Parameters:

<SpecialSett> 0 | 1 | OFF | ON

Manual operation: See ["Special Settings"](#) on page 27

```
[:SOURce<hw>]:BB:TDMB[:SPECial]:TRANsmiSSion:MODE <TransMode>
```

Sets the transmission mode.

Parameters:

```
<TransMode>      MID | MANual
```

Manual operation: See "[Transmission Mode](#)" on page 27

```
[:SOURce<hw>]:BB:TDMB[:SPECial]:TRANsmiSSion:MODE:SELECT  
  <ModeSelect>
```

Selects the transmission mode.

Parameters:

```
<ModeSelect>      integer  
                   Range:    1 to 4  
                   *RST:     1
```

Manual operation: See "[Select Transmission Mode](#)" on page 28

5.6 TSGen Subsystem

The TSGen subsystem contains the commands for configuring the TS player.

Example: Play 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: Configure and monitor 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:PIDTestpack VAR
:TSGen:CONFigure:PID 8100
// Corresponds to a PID = 1FA4 in hexadecimal format.
:TSGen:CONFigure:PAYLoad PRBS
:TSGen:CONFigure:PRBS:SEQuence P23_1

//*****
// Monitor TS player output data.
//*****
:TSGen:CONFigure:COMMand STOP
// TSPRate can only be changed if player is in stop mode
:TSGen:CONFigure:TSPRate 350E6 // net data rate = 350 MBit/s
:TSGen:CONFigure:COMMand PLAY

:TSGen:CONFigure:PLENght?
// Response: P188 // packet length = 188 byte
:TSGen:READ:ORIGtsrate?
// Response: 5018502 bit/s

```

Example: Configure seamless loop parameters

```

:TSGen:CONFigure:SEAMless:CC ON
:TSGen:CONFigure:SEAMless:PCR OFF
:TSGen:CONFigure:SEAMless:TT ON

```

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:TSGen:CONFigure:COMMand<ch>

Triggers playing, pausing and stopping of the TS player file selected with **:TSGen:CONFigure:PLAYfile**.

Setting parameters:

<PlayerStatus> STOP | PLAY | PAUSE
 *RST: STOP

Example: See [Example "Play a TS player file"](#) on page 59.

Usage: Event

Manual operation: See ["Play"](#) on page 32

: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 "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Payload Test/Stuff"](#) on page 36

: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 "Configure and monitor TS player output"](#)
on page 60.

Manual operation: See ["PID \(Hex\)"](#) on page 36

:TSGen:CONFigure:PIDTestpack <PIDTestpack>

Sets the PID, if `:TSGen:CONFigure:TSPacket` is H184 | H200 | H204.

Parameters:

<PIDTestpack> VARIABLE | NULL
*RST: NULL

Example: See [Example "Configure and monitor TS player output"](#)
on page 60.

Manual operation: See ["PID Test Packet"](#) on page 36

:TSGen:CONFigure:PLAYfile <PlayFile>

Specifies the file path and filename of the TS player file.

Parameters:

<PlayFile> string

Example: See [Example "Play a TS player file"](#) on page 59.

Manual operation: See ["Select File"](#) on page 31

:TSGen:CONFigure:PLENght <PLength>

Queries the packet length of the loaded file.

Parameters:

<PLength> P188 | P204 | P208 | INV
*RST: INV

Example: See [Example "Configure and monitor TS player output"](#)
on page 60.

:TSGen:CONFigure:PRBS[:SEQUence] <PRBS>

Sets the length of the PRBS sequence.

Parameters:

<PRBS> P15_1 | P23_1
*RST: P23_1

Example: See [Example "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["PRBS"](#) on page 36

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

Example: See [Example "Configure seamless loop parameters"](#) on page 60.

Manual operation: See ["Continuity Counter"](#) on page 37

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

Example: See [Example "Configure seamless loop parameters"](#) on page 60.

Manual operation: See ["PCR, DTS/PTS"](#) on page 37

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

Example: See [Example "Configure seamless loop parameters"](#) on page 60.

Manual operation: See ["TDT/TOT"](#) on page 37

: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 "Play a TS player file"](#) on page 59.

Manual operation: See ["Running/Position Player \[hh:mm:ss:fff\]"](#) on page 31

:TSGen:CONFigure:SEEK:RESet

Resets the following parameters to their default state:

- [:TSGen:CONFigure:SEEK:STARt](#) on page 64
- [:TSGen:CONFigure:SEEK:STOP](#) on page 64

Example: See [Example "Play a TS player file"](#) on page 59.

Manual operation: See ["Reset Window"](#) on page 32

: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 "Play a TS player file"](#) on page 59.

Manual operation: See ["Start \[hh:mm:ss:fff\]"](#) on page 32

: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 "Play a TS player file"](#) on page 59.

Manual operation: See ["Stop \[hh:mm:ss.fff\]"](#) on page 32

: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 "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Stop Data"](#) on page 34

:TSGen:CONFigure:STUFfing <Stuffing>

Enables or disables nullpacket stuffing.

Parameters:

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

Example: See [Example "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Nullpacket Stuffing"](#) on page 34

: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 "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Packet Length"](#) on page 34

:TSGen:CONFigure:TSRate <TSRate>

Sets the output data rate of the player.

Parameters:

<TSRate> integer
 Range: 1 to 35E7
 *RST: 5018502

Example: See [Example "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Data Rate"](#) on page 33

: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 "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Select File"](#) on page 31

:TSGen:READ:ORIGtsrate <ORIGtsrate>

Displays the calculated original TS data rate.

Parameters:

<ORIGtsrate> integer
 Range: 1 to 350000000
 *RST: 5018502

Example: See [Example "Configure and monitor TS player output"](#) on page 60.

Manual operation: See ["Orig. Data Rate"](#) on page 34

:TSGen:READ:PLAYfile:LENGth?

Queries calculated original loop time.

Return values:

<Length> integer
 Range: 0 to 100
 *RST: 0

- Example:** See [Example "Configure and monitor TS player output"](#) on page 60.
- Usage:** Query only
- Manual operation:** See ["Select File"](#) on page 31

5.7 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

<code>:SYSTEM:COMMunicate:BCIP<hw>:NETWork:COMMon:HOSTname</code>	68
<code>:SYSTEM:COMMunicate:BCIP<hw>:NETWork:IPAddress</code>	68
<code>:SYSTEM:COMMunicate:BCIP<hw>:NETWork:IPAddress:MODE</code>	68
<code>:SYSTEM:COMMunicate:BCIP<hw>:NETWork:IPAddress:SUBNet:MASK</code>	68

:SYSTem:COMMunicate:BCIP<hw>:NETWork:MACAddress.....	69
:SYSTem:COMMunicate:BCIP<hw>:NETWork:PROTocol.....	69
:SYSTem:COMMunicate:BCIP<hw>:NETWork:REStart.....	69
:SYSTem:COMMunicate:BCIP<hw>:NETWork:STATus.....	69

: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 67.

Manual operation: See ["Hostname"](#) on page 39

:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress

Sets the IP address.

Parameters:

<IpAddress> string
 Range: 0.0.0.0 to 255.255.255.255
 *RST: 0.0.0.0

Example: See [Example "Retrieving information on local network-related settings"](#) on page 67.

Manual operation: See ["IP Address"](#) on page 39

: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 67.

Manual operation: See ["Address Mode"](#) on page 39

:SYSTem:COMMunicate:BCIP<hw>:NETWork:IPADdress:SUBNet:MASK

Sets the subnet mask.

Parameters:

<Mask> string
 Range: 0.0.0.0 to 255.255.255.255
 *RST: 0.0.0.0

Example: See [Example "Retrieving information on local network-related settings"](#) on page 67.

Manual operation: See ["Subnet Mask"](#) on page 40

: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 67.

Manual operation: See ["MAC Address"](#) on page 40

: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 67.

Manual operation: See ["Protocol"](#) on page 40

:SYSTem:COMMunicate:BCIP<hw>:NETWork:REStart

Triggers a restart of the network.

Example: See [Example "Retrieving information on local network-related settings"](#) on page 67.

Usage: Event

Manual operation: See ["Restart Network"](#) on page 39

:SYSTem:COMMunicate:BCIP<hw>:NETWork:STATus <NetworkStatus>

Queries the network connection state.

Parameters:

<NetworkStatus> 0 | 1 | OFF | ON

*RST: n.a. (no preset. default: 0)

Example:

See [Example "Retrieving information on local network-related settings"](#) on page 67.

Manual operation:

See ["Network Status"](#) on page 38

Glossary: Abbreviations

A

ASI: Asynchronous Serial Interface

C

COFDM: Coded Orthogonal Frequency Division Multiplex

D

DAB: Digital Audio Broadcasting

DHCP: Dynamic Host Configuration Protocol

E

EEP: Equal Error Protection

ETI: Ensemble Transport Interface

H

HDB3: High Density Bipolar code of order 3

I

IGMP: Internet Group Management Protocol

IGMPv3: Internet Group Management Protocol version 3

M

MAC: Media Access Control

MFN: Multi-frequency Network

MID: Mode Identity

MPEG: Moving Picture Experts Group

<https://mpeg.chiariglione.org/>

N

NA: Network Adapted

More: See [ITU-T G.704](#).

NI: Network Independent

More: See [ITU-T G.703](#).

NST: Number of Streams

O

OFDM: Orthogonal Frequency Division Multiplex

P

PID: Packet Identifier

PRBS: Pseudo-Random Bit Sequence

R

RTP: Real-time Transport Protocol

S

SFN: Single-frequency Network

SMPTE: Society of Motion Picture and Television Engineers
<https://www.smpte.org/>

SSTC: Sub-channel Stream Characteristics

STC: Stream Characteristics

T

TCP: Transmission Control Protocol

TII: Transmitter Identification Information

TS: Transport Stream

U

UDP: User Datagram Protocol

UEP: Unequal Error Protection

Glossary: Specifications

E

ETS 300 799: Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)

https://www.etsi.org/deliver/etsi_i_ets/300700_300799/300799/

ETSI EN 300 401: Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers

https://www.etsi.org/deliver/etsi_en/300400_300499/300401/

I

ITU-T G.703: ITU-T Recommendation G.703

Physical/electrical characteristics of hierarchical digital interfaces

<https://www.itu.int/rec/T-REC-G.703/en>

ITU-T G.704: ITU-T Recommendation G.704

Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

<https://www.itu.int/rec/T-REC-G.704/en>

ITU-T O.151: ITU-T Recommendation O.151

<https://www.itu.int/rec/T-REC-O.151-199210-I/en>

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