

R&S[®]SMCVB-K160

DRM

User Manual



1179107002
Version 05

ROHDE & SCHWARZ
Make ideas real



This document describes the following software options:

- R&S®SMCVB-K160 DRM (1434.3819.xx)

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

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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 DRM option

The R&S SMCVB-K160 is a firmware application that adds functionality to generate signals in accordance with the DRM digital standard.

The R&S SMCVB-K160 option features:

- DRM 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 DRM dialog

To open the dialog with DRM settings

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

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 DRM stream library files. See "[To load and play a DRM stream library file](#)" on page 18.

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 DRM option

The DRM system is designed for digital audio broadcasting in the bands below 300 MHz using [OFDM](#) modulation and [MPEG](#) audio coding techniques.

The DRM system is specified in [ETSI ES 201 980](#). DCP operation is specified in [ETSI TS 102 821](#).

2.1 Required options

The equipment layout for generating DRM signals includes:

- Base unit
- Option Enable Broadcast Standard (R&S SMCVB-K519)
- Option DRM (R&S SMCVB-K160)
- Optional DRM stream library option (R&S SMCVB-KS16)

3 DRM configuration and settings

Access:

- ▶ Select "Baseband > DRM".

The remote commands required to define these settings are described in [Chapter 5, "Remote control commands"](#), on page 19.

Settings:

- [General settings](#)..... 10
- [Input signal settings](#)..... 11
- [Coding settings](#)..... 13
- [Global connector settings](#)..... 17

3.1 General settings

Access:

- ▶ Select "Baseband > DRM".



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

Settings:

- [State](#)..... 10
- [Set To Default](#)..... 10
- [Save/Recall](#)..... 11

State

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

Remote command:

[:SOURce<hw>] :BB:DRM:STATe on page 20

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:DRM:PRESet on page 20

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:DRM:SETTing:CATalog? on page 21

[:SOURce<hw>] :BB:DRM:SETTing:DElete on page 21

[:SOURce<hw>] :BB:DRM:SETTing:LOAD on page 21

[:SOURce<hw>] :BB:DRM:SETTing:STORE on page 21

3.2 Input signal settings

Access:

- ▶ Select "Baseband > DRM > Input Signal".

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

Settings:

Source.....	12
UDP Port.....	12
Select File.....	12
Number of Audio Services.....	12
Number of Data Services.....	12

Layer Type.....	13
Label.....	13
Local LAN Interface.....	13

Source

Sets the modulation source for the input signal.

The input signal is a **MDI** stream built upon the **DCP** stack.

"External" Uses a **UDP/IP** stream input at the "LAN" connector of the host PC of the R&S SMCV100B.
Access the **LAN**

"DCP File" Reads the input stream from a *.dcp file. The binary file contains the MDI data encapsulated in DCP packets.

Remote command:

[:SOURce<hw>] :BB:DRM:SOURce on page 22

UDP Port

Requires "Source > External".

Sets the **UDP** port.

Enter the port number on that the UDP/IP receiver listens for UDP datagrams. The port is the same port number that the UDP sender uses. If the port is unknown, try the default port "8100".

Remote command:

[:SOURce<hw>] :BB:DRM:PORT on page 23

Select File

Requires "Source > DCP 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 name of the loaded DCP file is displayed next to the button. By default, the file Default.dcp is loaded.

How to: "[To load and play a DRM stream library file](#)" on page 18

Remote command:

[:SOURce<hw>] :BB:DRM:FILENAME on page 23

Number of Audio Services

Displays the number of audio services contained in the input stream.

Remote command:

[:SOURce<hw>] :BB:DRM:NUMaudio? on page 24

Number of Data Services

Displays the number of data services contained in the input stream.

Remote command:

[:SOURce<hw>] :BB:DRM:NUMData? on page 24

Layer Type

Displays the type of audio in the transmission.

"Base" Decodable by all DRM receivers.

"Enhancement" Only decodable by receivers with appropriate capabilities.

Remote command:

[:SOURce<hw>] :BB:DRM:TYPE? on page 24

Label

Displays the label of the transmitted service.

The maximum length specified for each service is 16 characters. The services are separated by line-breaks.

Example: Labels of a DRM signal with four services

"DRM Service A"

"DRM Service B"

"DRM Service C"

"DRM Service D"

Remote command:

[:SOURce<hw>] :BB:DRM:LABel? on page 23

Local LAN Interface

Accesses the network settings tab.

The tab allows you to configure network parameters for IP signal input at the "LAN" connector.

The settings are also relevant for remote access to the R&S SMCV100B. See the chapter "Network Settings" in the R&S SMCV100B user manual.

3.3 Coding settings

Access:

- ▶ Select "Baseband > DRM > Coding".

The tab provides settings for coding.

Settings:

- [General settings](#)..... 14
- [Code rate settings](#)..... 15

3.3.1 General settings

Access:

- ▶ Select "Coding > General".



The tab provides general settings necessary to configure the coding.

Settings:

Robustness Mode	14
Constellation MSC	14
Constellation SDC	14
Interleaver Depth	15
Channel Bandwidth	15

Robustness Mode

Displays the robustness mode of the signal. The different robustness modes "A" to "E" provide different OFDM parameter sets, each of them adapted to different propagation conditions.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:MODE?](#) on page 26

Constellation MSC

Displays the constellation of the main service channel (MSC).

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:MSC:CONStel?](#) on page 27

Constellation SDC

Displays the constellation of the service description channel (SDC).

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:SDC:CONStel?](#) on page 29

Interleaver Depth

Displays the interleaver depth.

The depth depends on the robustness mode, see "[Robustness Mode](#)" on page 14:

- "Robustness Mode > A to D": "400 ms" or "2 s" interleaver depth
- "Robustness Mode > E": "600 ms" interleaver depth

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:INTERleaver?](#) on page 27

Channel Bandwidth

Displays the channel bandwidth.

The bandwidth depends on the robustness mode, see "[Robustness Mode](#)" on page 14:

- "Robustness Mode > A to D": "4.5 kHz", "5 kHz", "9 kHz", "10 kHz", "18 kHz", or "20 kHz" channel bandwidth
- "Robustness Mode > E": "100 kHz" channel bandwidth

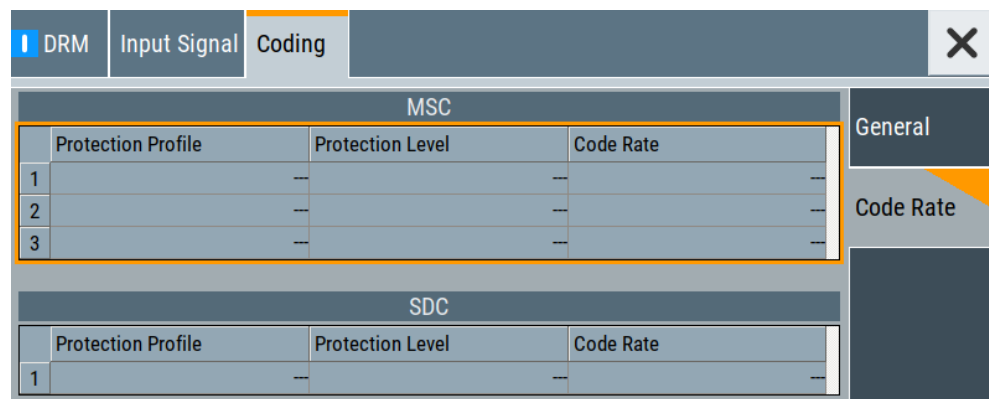
Remote command:

[\[:SOURCE<hw>\]:BB:DRM:BANDwidth?](#) on page 26

3.3.2 Code rate settings

Access:

- ▶ Select "Coding > Code Rate".



The tab displays code rate parameters of [MSC](#) and [SDC](#).

Settings:

Code Rate MSC table.....	16
L Protection Profile.....	16
L Protection Level.....	16
L Code Rate.....	16
Code Rate SDC table.....	16
L Protection Profile.....	16
L Protection Level.....	16
L Code Rate.....	16

Code Rate MSC table

In the table, the corresponding code rate parameters of the main service channel (MSC) are shown.

Protection Profile ← Code Rate MSC table

Displays the protection profile used in the transmission.

"LPP"	If EEP is used, the lower protected part (LPP) is displayed. See " Protection Profile " on page 16.
"HPP"	If UEP is used, the higher protected part (HPP) and LPP are displayed.
"VSPP"	Very strongly protected part. The profile is displayed for stream 0, if hierarchical modulation is used.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:MSC:PROFile<ch>?](#) on page 28

Protection Level ← Code Rate MSC table

Displays the protection level used in each of the protection profiles.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:MSC:LEVel<ch>?](#) on page 28

Code Rate ← Code Rate MSC table

Displays the overall code rate used in each of the protection profiles.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:MSC:RATE<ch>?](#) on page 28

Code Rate SDC table

In the table, the corresponding code rate parameters of the service description channel (SDC) are shown.

Protection Profile ← Code Rate SDC table

Displays the protection profile of the **SDC**.

"EEP"	Fixed value
-------	-------------

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:SDC:PROFile<ch>?](#) on page 30

Protection Level ← Code Rate SDC table

Displays the protection level of the **SDC**.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:SDC:LEVel<ch>?](#) on page 29

Code Rate ← Code Rate SDC table

Displays the overall code rate of the **SDC**.

Remote command:

[\[:SOURCE<hw>\]:BB:DRM:SDC:RATE<ch>?](#) on page 30

3.4 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.

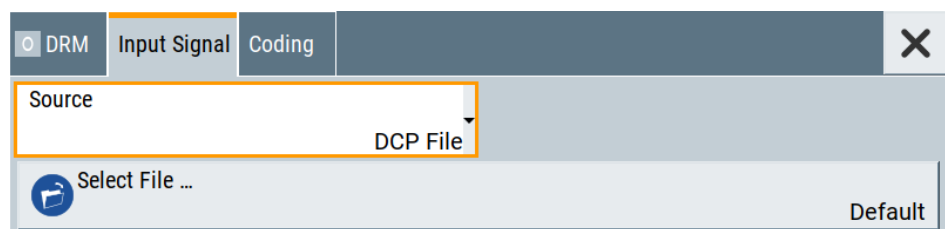
4 Performing DRM signal generation tasks

This chapter tells you how to configure the R&S SMCV100B to generate signals from DRM DCP files.

To load and play a DRM 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 (`*.dcp_c`). Loading the library file at the R&S SMCV100B requires installation of the DRM stream library option (R&S SMCVB-KS16).
2. To load the file at the R&S SMCV100B, navigate to the "DRM" digital standard dialogs:
 - a) Select "Baseband" > "Audio Broadcast" > "DRM".
 - b) Select "Input Signal" > "Source" > "DCP File".



- c) Select "Select File" > "Select DRM DCP File".
To select the file, navigate to the storage location (1).
3. Select "DRM" > "State" > "On", to activate the baseband signal.
The R&S SMCV100B activates the baseband signal processes the stream file.
4. In the block diagram, select "RF" > "On".
The stream file is modulated onto the RF carrier and output at the "RF 50 Ω" connector.

For more information on DRM stream files, see the "R&S SMCVB-KS16 DRM Streams User Manual".

5 Remote control commands

The following commands are required to generate signals with the DRM 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 is 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
<ch>	1 to 3 1	MSC channels SDC channels

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 DRM are described here:

- [General commands](#).....20
- [Input commands](#).....22
- [Coding commands](#)..... 25

5.1 General commands

Example: Saving current configuration

```
SOURce1:BB:DRM:SETTing:STORe "/var/user/my_DRM"
// Saves the file "my_DRM.DRM" in the directory as above.
```

```
*RST
```

```
SOURce1:BB:DRM:SETTing:CATalog?
// Response: "my_DRM"
SOURce1:BB:DRM:SETTing:LOAD "/var/user/my_DRM"
SOURce1:BB:DRM:STATe ON
SOURce1:BB:DRM:SETTing:DELeTe "/var/user/my_DRM"
```

Commands:

[:SOURce<hw>]:BB:DRM:PRESet	20
[:SOURce<hw>]:BB:DRM:STATe	20
[:SOURce<hw>]:BB:DRM:SETTing:CATalog?	21
[:SOURce<hw>]:BB:DRM:SETTing:DELeTe	21
[:SOURce<hw>]:BB:DRM:SETTing:LOAD	21
[:SOURce<hw>]:BB:DRM:SETTing:STORe	21

[\[:SOURce<hw>\]:BB:DRM: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:DRM:STATe`.

Example: See [Example "Saving current configuration"](#) on page 20.

Usage: Event

Manual operation: See ["Set To Default"](#) on page 10

[\[:SOURce<hw>\]:BB:DRM: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 20.

Manual operation: See ["State"](#) on page 10

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

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

Return values:

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

Returns a string of filenames separated by commas.

Example: See [Example "Saving current configuration"](#) on page 20.

Usage: Query only

Manual operation: See ["Save/Recall"](#) on page 11

[:SOURce<hw>]:BB:DRM:SETTing:DELEte <DrmDelete>

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

Parameters:

<DrmDelete> "<filename>"

Filename or complete file path; file extension can be omitted

Example: See [Example "Saving current configuration"](#) on page 20.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 11

[:SOURce<hw>]:BB:DRM:SETTing:LOAD <DrmRecall>

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

Parameters:

<DrmRecall> "<DrmRecall>"

Filename or complete file path; file extension can be omitted

Example: See [Example "Saving current configuration"](#) on page 20.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 11

[:SOURce<hw>]:BB:DRM:SETTing:STORe <DrmSave>

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

Parameters:

<DrmSave> "<filename>"

Filename or complete file path

Example: See [Example "Saving current configuration"](#) on page 20.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 11

5.2 Input commands

Example: Configuring the input signal

```
// Configure DRM input stream.
SOURCE1:BB:DRM:SOURCE?
// Response: "EXT"
SOURCE1:BB:DRM:PORT?
// Response: "8100"
SOURCE1:BB:DRM:SOURCE
SOURCE1:BB:DRM:FILENAME "/var/user/DRM1"
// Loads the file "DRM1.dcp".

// Query properties of the DRM input stream.
SOURCE1:BB:DRM:LABEL?
// Response: "DRM Service No.A<br>DRM Service No.B<br>DRM Service
// No.C<br>DRM Service No.D"
// 4 DRM services present: DRM Service No.A, DRM Service No.B,
// DRM Service No.C, DRM Service No.D
// The services are separated by <br>.
SOURCE1:BB:DRM:NUMAUDIO?
// Response: "4"
SOURCE1:BB:DRM:NUMDATA?
// Response: "4"
SOURCE1:BB:DRM:TYPE?
// Response: "BASE"
```

Commands:

[:SOURCE<hw>]:BB:DRM:SOURCE	22
[:SOURCE<hw>]:BB:DRM:PORT	23
[:SOURCE<hw>]:BB:DRM:FILENAME	23
[:SOURCE<hw>]:BB:DRM:LABEL?	23
[:SOURCE<hw>]:BB:DRM:NUMAUDIO?	24
[:SOURCE<hw>]:BB:DRM:NUMDATA?	24
[:SOURCE<hw>]:BB:DRM:TYPE?	24

[\[:SOURCE<hw>\]:BB:DRM:SOURCE <DrmSource>](#)

Sets the modulation source for the input signal.

Parameters:

<DrmSource> EXTERNAL | FILE

EXtErnal

Uses a **UDP/IP** stream input at the "LAN" connector of the host PC of the R&S SMCV100B.

FILE

Reads the input stream from a *.dcp file. The binary file contains the MDI data encapsulated in **DCP** packets.

*RST: FILE

Example: See [Example"Configuring the input signal"](#) on page 22.

Manual operation: See ["Source"](#) on page 12

[:SOURce<hw>]:BB:DRM:PORT <DrmPort>

Sets the **UDP** port. Enter the port number on that the **UDP/IP** receiver listens for UDP datagrams.

Parameters:

<DrmPort> integer
 Range: 0 to 65535
 *RST: 8100

Example: See [Example"Configuring the input signal"](#) on page 22.

Manual operation: See ["UDP Port"](#) on page 12

[:SOURce<hw>]:BB:DRM:FILEname <DrmDcpFile>

Loads the specified **DCP** file.

Parameters:

<DrmDcpFile> string
 Filename or complete file path; file extension (*.dcp) can be omitted.
 *RST: /var/user/

Example: SOURce1:BB:DRM:FILEname "/var/user/DRM1"
 Loads the file DRM1.dcp.

Manual operation: See ["Select File"](#) on page 12

[:SOURce<hw>]:BB:DRM:LABel?

Queries the label of the transmitted service.

Return values:

<DrmLabel> string
 Each service has a maximum length of 16 characters separated by
.

Example: See [Example"Configuring the input signal"](#) on page 22.

Usage: Query only
Manual operation: See "[Label](#)" on page 13

[:SOURCE<hw>]:BB:DRM:NUMAudio?

Queries the number of audio services contained in the input stream.

Return values:

<DrmNumAudio> 0 | 1 | 2 | 3 | 4 | INV
0|1|2|3|4
 Available number of audio services
INV
 Invalid number of audio services

Example: See [Example "Configuring the input signal"](#) on page 22.

Usage: Query only

Manual operation: See "[Number of Audio Services](#)" on page 12

[:SOURCE<hw>]:BB:DRM:NUMData?

Queries the number of data services contained in the input stream.

Return values:

<DrmNumData> 0 | 1 | 2 | 3 | 4 | INV
0|1|2|3|4
 Available number of data services
INV
 Invalid number of data services

Example: See [Example "Configuring the input signal"](#) on page 22.

Usage: Query only

Manual operation: See "[Number of Data Services](#)" on page 12

[:SOURCE<hw>]:BB:DRM:TYPE?

Queries the type of audio in the transmission.

Return values:

<DrmLayerType> BASE | ENHancement | INV
BASE
 Decodable by all DRM receivers.
ENHancement
 Only decodable by receivers with appropriate capabilities.
INV
 Invalid type

Example: See [Example "Configuring the input signal"](#) on page 22.

Usage: Query only
Manual operation: See "Layer Type" on page 13

5.3 Coding commands

Example: Querying coding parameters

```
// Query general coding parameters of the DRM input stream.
SOURCE1:BB:DRM:BANDwidth?
// Response: "K100"
SOURCE1:BB:DRM:MODE?
// Response: "E"
SOURCE1:BB:DRM:INTERleaver?
// Response: "MS6"
// The DRM input stream signal comprises a bandwidth of 100 kHz,
// robustness mode E and an interleaver depth of 600 ms.

// Query main service channel (MSC) parameters.
SOURCE1:BB:DRM:MSC:CONSTel?
// Response: "Q64N"
// The constellation is 64QAM non-hierarchical.
// Query MSC channel 1 parameters.
SOURCE1:BB:DRM:MSC:PROFile1?
// Response: "LPP"
SOURCE1:BB:DRM:MSC:LEVe11?
// Response: "1"
SOURCE1:BB:DRM:MSC:RATE1?
// Response: "R057"

// Query service description channel (SDC) parameters.
SOURCE1:BB:DRM:SDC:CONSTel?
// Response: "Q16"
// The constellation is 16QAM.
// Query SDC channel 1 parameters.
SOURCE1:BB:DRM:SDC:PROFile1?
// Response: "EEP"
SOURCE1:BB:DRM:SDC:LEVe11?
// Response: "1"
SOURCE1:BB:DRM:SDC:RATE1?
// Response: "R057"
```

Commands:

- [General commands](#).....26
- [MSC commands](#).....27
- [SDC commands](#).....29

5.3.1 General commands

<code>[:SOURce<hw>]:BB:DRM:BANDwidth?</code>	26
<code>[:SOURce<hw>]:BB:DRM:MODE?</code>	26
<code>[:SOURce<hw>]:BB:DRM:INTerleaver?</code>	27

`[:SOURce<hw>]:BB:DRM:BANDwidth?`

Queries the channel bandwidth.

Return values:

<code><DrmBandwidth></code>	K045 K05 K09 K10 K18 K20 K100 INV
	K045
	4.5 kHz
	K05
	5 kHz
	K09
	9 kHz
	K10
	10 kHz
	K18
	18 kHz
	K20
	20 kHz
	K100
	100 kHz
	INV
	Invalid channel bandwidth

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

Manual operation: See ["Channel Bandwidth"](#) on page 15

`[:SOURce<hw>]:BB:DRM:MODE?`

Queries the robustness mode of the signal.

Return values:

<code><DrmMode></code>	A B C D E INV
	A B C D E
	Available robustness modes.
	INV
	Invalid mode.
	*RST: INV

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

[:SOURce<hw>]:BB:DRM:INTerleaver?

Queries the interleaver depth.

Return values:

<DrmInterleaver> MS4 | MS6 | S2 | INV

MS4

400 ms

MS6

600 ms

S2

2 s

INV

Invalid interleaver depth

Example: See [Example "Querying coding parameters"](#) on page 25.

Usage: Query only

Manual operation: See ["Interleaver Depth"](#) on page 15

5.3.2 MSC commands

[:SOURce<hw>]:BB:DRM:MSC:CONStel?	27
[:SOURce<hw>]:BB:DRM:MSC:LEVel<ch>?	28
[:SOURce<hw>]:BB:DRM:MSC:PROFile<ch>?	28
[:SOURce<hw>]:BB:DRM:MSC:RATE<ch>?	28

[:SOURce<hw>]:BB:DRM:MSC:CONStel?

Queries the constellation of the [MSC](#).

Return values:

<DrmConstMsc> Q64N | Q64I | Q64Q | Q16 | Q4 | INV

Q64N

64QAM non-hierarchical

Q64I

64QAM hierarchical on I

Q64Q

64QAM hierarchical on I and Q

Q16

16QAM non-hierarchical

Q4

4QAM non-hierarchical

INV

Invalid constellation

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

[:SOURce<hw>]:BB:DRM:MSC:LEVel<ch>?

Queries the protection level used in each of the protection profiles.

Return values:

<DrmMscLev> 0 | 1 | 2 | 3 | INV
0|1|2|3
 Available protection levels
INV
 Invalid protection level

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

[:SOURce<hw>]:BB:DRM:MSC:PROFile<ch>?

Queries the protection profile used in the transmission.

Return values:

<DrmMscProf> HPP | LPP | VSPP | INV
HPP
 Higher protected part
LPP
 Lower protected part
VSPP
 Very strongly protected part
INV
 Invalid protection profile

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

[:SOURce<hw>]:BB:DRM:MSC:RATE<ch>?

Queries the overall code rate used in each of the protection profiles.

Return values:

<DrmMscRate> R025 | R033 | R040 | R041 | R045 | R048 | R050 | R055 | R057 |
 R058 | R060 | R062 | R066 | R071 | R072 | R078 | INV

R0xy

0xy constitutes a code rate of 0.xy

INV

Invalid code rate

Example: See [Example"Querying coding parameters"](#) on page 25.**Usage:** Query only**Manual operation:** See ["Code Rate"](#) on page 16**5.3.3 SDC commands**

[:SOURce<hw>]:BB:DRM:SDC:CONStel?	29
[:SOURce<hw>]:BB:DRM:SDC:LEVel<ch>?	29
[:SOURce<hw>]:BB:DRM:SDC:PROFile<ch>?	30
[:SOURce<hw>]:BB:DRM:SDC:RATE<ch>?	30

[:SOURce<hw>]:BB:DRM:SDC:CONStel?

Queries the constellation of the SDC.

Return values:

<DrmConstSdc> Q16 | Q4 | INV

Q16

16QAM

Q4

4QAM

INV

Invalid constellation

Example: See [Example"Querying coding parameters"](#) on page 25.**Usage:** Query only**Manual operation:** See ["Constellation SDC"](#) on page 14**[:SOURce<hw>]:BB:DRM:SDC:LEVel<ch>?**

Queries the protection level of the SDC.

Return values:

<DrmSdcLev> 0 | 1 | INV

0|1

Available protection levels

INV

Invalid protection level

Example: See [Example"Querying coding parameters"](#) on page 25.**Usage:** Query only

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

[:SOURCE<hw>]:BB:DRM:SDC:PROFile<ch>?

Queries the protection profile of the [SDC](#).

Return values:

<DrmSdcProf> EEP | INV
 EEP
 Equal error protection
 INV
 Invalid protection profile

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

[:SOURCE<hw>]:BB:DRM:SDC:RATE<ch>?

Queries the overall code rate of the [SDC](#).

Return values:

<DrmSdcRate> R025 | R033 | R040 | R041 | R045 | R048 | R050 | R055 | R057 |
 R058 | R060 | R062 | R066 | R071 | R072 | R078 | INV
 R0xy
 0_{xy} constitutes a code rate of 0.xy
 INV
 Invalid code rate

Example: See [Example"Querying coding parameters"](#) on page 25.

Usage: Query only

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

Glossary: Abbreviations

D

DCP: Distribution and Communications Protocol
See [ETSI TS 102 821](#).

DHCP: Dynamic Host Configuration Protocol

DRM: Digital Radio Mondiale
See [ETSI ES 201 980](#).

E

EEP: Equal Error Protection

H

HPP: Higher Protected Part

I

IP: Internet Protocol

L

LAN: Local Area Network

LPP: Lower Protected Part

M

MAC: Media Access Control

MDI: Multiplex Distribution Interface

MPEG: Moving Picture Experts Group
<https://mpeg.chiariglione.org/>

MSC: Main Service Channel

O

OFDM: Orthogonal Frequency-Division Multiplexing

P

PCR: Program Clock Reference

PID: Packet Identifier

PRBS: Pseudo-Random Bit Sequence

PSK: Phase Shift Keying

Q

QAM: Quadrature Amplitude Modulation

QPSK: Quaternary Phase Shift Keying

R

RTP: Real-Time Transport Protocol

S

SDC: Service Description Channel

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

T

TCP: Transmission Control Protocol

TS: Transport Stream

U

UDP: User Datagram Protocol

UEP: Unequal Error Protection

V

VSPP: Very Strongly Protected Part

Glossary: Specifications

E

ETSI ES 201 980: Digital Radio Mondiale (DRM); System Specification
https://www.etsi.org/deliver/etsi_es/201900_201999/201980/

ETSI TS 102 821: Digital Radio Mondiale (DRM); Distribution and Communications Protocol (DCP)
https://www.etsi.org/deliver/etsi_es/201900_201999/201980/

I

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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[:SOURce<hw>]:BB:DRM:LABel?	23
[:SOURce<hw>]:BB:DRM:MODE?	26
[:SOURce<hw>]:BB:DRM:MSC:CONStel?	27
[:SOURce<hw>]:BB:DRM:MSC:LEVel<ch>?	28
[:SOURce<hw>]:BB:DRM:MSC:PROFile<ch>?	28
[:SOURce<hw>]:BB:DRM:MSC:RATE<ch>?	28
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