

# R&S<sup>®</sup> SMCVB-K160

# DRM

# User Manual



1179107002

This document describes the following software options:

- R&S®SMCVB-K160  
1434.3819.02

This manual describes firmware version FW 4.70.176.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 Preface

## 1.1 About this Manual

This user manual provides all the information **specific to the DRM option R&S SMCVB-K160**. All general instrument functions and settings common to all applications and operating modes are described in the main R&S SMCV100B user manual.

The main focus in this manual is on the provided settings and the tasks required to generate a signal. The following topics are included:

- **Welcome to the DRM option R&S SMCVB-K160**  
Introduction to and getting familiar with the option
- **About the DRM**  
Background information on basic terms and principles in the context of the signal generation
- **DRM Configuration and Settings**  
A concise description of all functions and settings available to configure signal generation with their corresponding remote control command
- **Remote Control Commands**  
Remote commands required to configure and perform signal generation in a remote environment, sorted by tasks  
(Commands required to set up the instrument or to perform common tasks on the instrument are provided in the main R&S SMCV100B user manual)  
Programming examples demonstrate the use of many commands and can usually be executed directly for test purposes
- **Glossary**  
Alphabetical list of often used terms and abbreviations and specifications
- **List of remote commands**  
Alphabetical list of all remote commands described in the manual
- **Index**

### Contents and scope

This description assumes R&S SMCV100B equipped with all available options. Depending on your model and the installed options, some of the functions may not be available on your instrument.

### Notes on screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as much 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.

## 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](http://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 the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

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](http://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](http://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](http://www.rohde-schwarz.com/application/smcv100b)

## 2 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](http://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.

## 2.1 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".



## 2.2 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 storing 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.

## 2.3 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.

## 3 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](#).

### 3.1 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)

## 4 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](#)..... 11
- [Input Signal Settings](#)..... 12
- [Coding Settings](#)..... 14
- [Global Connector Settings](#)..... 18

### 4.1 General Settings

Access:

- ▶ Select "Baseband > DRM".



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

Settings:

- [State](#)..... 11
- [Set To Default](#)..... 11
- [Save/Recall](#)..... 12

**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 filename and the directory, in that the settings are stored, are user-definable; the file extension is however predefined.

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

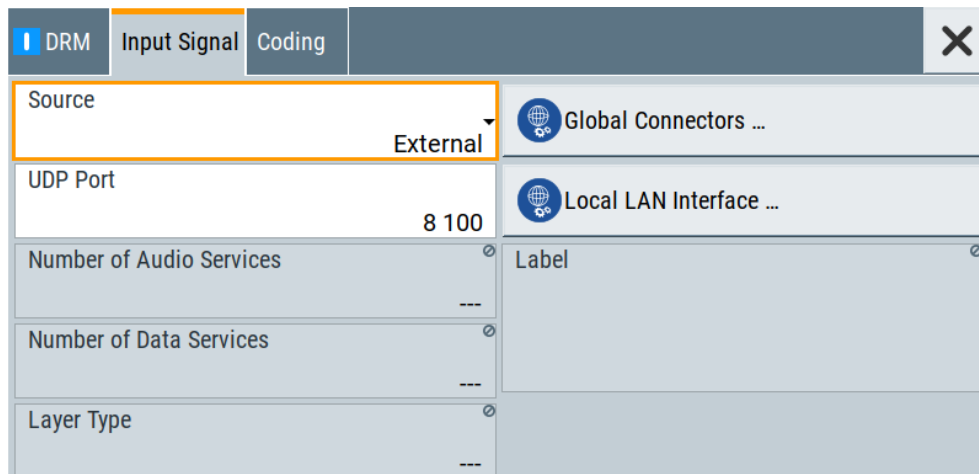
[ :SOURce<hw> ] :BB:DRM:SETTing:LOAD on page 21

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

## 4.2 Input Signal Settings

Access:

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



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

### Settings:

Source.....	13
UDP Port.....	13
Select File.....	13
Number of Audio Services.....	13
Number of Data Services.....	13

Layer Type.....	14
Label.....	14
Local LAN Interface.....	14

### 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.

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.

## 4.3 Coding Settings

Access:

- ▶ Select "Baseband > DRM > Coding".

The tab provides settings for coding.

**Settings:**

- [General Settings](#)..... 15
- [Code Rate Settings](#)..... 16

### 4.3.1 General Settings

Access:

- ▶ Select "Coding > General".



The tab provides general settings necessary to configure the coding.

#### Settings:

<a href="#">Robustness Mode</a> .....	15
<a href="#">Constellation MSC</a> .....	15
<a href="#">Constellation SDC</a> .....	15
<a href="#">Interleaver Depth</a> .....	16
<a href="#">Channel Bandwidth</a> .....	16

#### 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 15:

- "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 15:

- "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

**4.3.2 Code Rate Settings**

Access:

- ▶ Select "Coding > Code Rate".

MSC		
Protection Profile	Protection Level	Code Rate
1	--	--
2	--	--
3	--	--

SDC		
Protection Profile	Protection Level	Code Rate
1	--	--

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

**Settings:**

Code Rate MSC table.....	17
L Protection Profile.....	17
L Protection Level.....	17
L Code Rate.....	17
Code Rate SDC table.....	17
L Protection Profile.....	17
L Protection Level.....	17
L Code Rate.....	17



**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 <b>EEP</b> is used, the lower protected part (LPP) is displayed. See " <a href="#">Protection Profile</a> " on page 17.
"HPP"	If <b>UEP</b> 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**

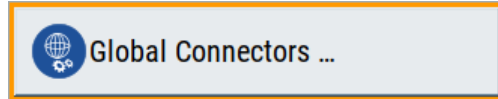
Displays the overall code rate of the **SDC**.

Remote command:

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

## 4.4 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.

## 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: Storing current configuration

```
:SOURce1:BB:DRM:SETTing:STORe "/var/user/my_DRM"
// Stores 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:

<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:PRESet</a> .....	20
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:STATe</a> .....	20
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SETTing:CATalog?</a> .....	21
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SETTing:DELeTe</a> .....	21
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SETTing:LOAD</a> .....	21
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SETTing:STORe</a> .....	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 "Storing current configuration"](#) on page 20.

**Usage:** Event

**Manual operation:** See ["Set To Default"](#) on page 11

---

### **[\[:SOURce<hw>\]:BB:DRM:STATe <State>](#)**

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

#### Parameters:

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

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

**Manual operation:** See ["State"](#) on page 11

---

**[ :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 "Storing current configuration"](#) on page 20.

**Usage:** Query only

**Manual operation:** See ["Save/Recall"](#) on page 12

---

**[ :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 "Storing current configuration"](#) on page 20.

**Usage:** Setting only

**Manual operation:** See ["Save/Recall"](#) on page 12

---

**[ :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

**Usage:** Setting only

**Manual operation:** See ["Save/Recall"](#) on page 12

---

**[ :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 "Storing current configuration"](#) on page 20.

**Usage:** Setting only  
**Manual operation:** See "Save/Recall" on page 12

## 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:

<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SOURce</a> .....	22
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:PORT</a> .....	23
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:FILENAME</a> .....	23
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:LABEL?</a> .....	23
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:NUMaudio?</a> .....	24
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:NUMData?</a> .....	24
<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:TYPE?</a> .....	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 13

**[[: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 13

**[[: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 13

**[[: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 <br>.

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

**Usage:** Query only  
**Manual operation:** See "[Label](#)" on page 14

#### **[: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 13

#### **[: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 13

#### **[: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 14

## 5.3 Coding Commands

### Example: Querying coding parameters

```
// Query general coding parameters of the DRM input stream.
:SOURcel:BB:DRM:BANDwidth?
// Response: K100
:SOURcel:BB:DRM:MODE?
// Response: E
:SOURcel: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.
:SOURcel:BB:DRM:MSC:CONStel?
// Response: Q64N
// The constellation is 64QAM non-hierarchical.
// Query MSC channel 1 parameters.
:SOURcel:BB:DRM:MSC:PROFile1?
// Response: LPP
:SOURcel:BB:DRM:MSC:LEVel1?
// Response: 1
:SOURcel:BB:DRM:MSC:RATE1?
// Response: R057

// Query service description channel (SDC) parameters.
:SOURcel:BB:DRM:SDC:CONStel?
// Response: Q16
// The constellation is 16QAM.
// Query SDC channel 1 parameters.
:SOURcel:BB:DRM:SDC:PROFile1?
// Response: EEP
:SOURcel:BB:DRM:SDC:LEVel1?
// Response: 1
:SOURcel:BB:DRM:SDC:RATE1?
// Response: R057
```

### Commands:

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

### 5.3.1 General Commands

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<code>[:SOURce&lt;hw&gt;]:BB:DRM:MODE?</code> .....	26
<code>[:SOURce&lt;hw&gt;]:BB:DRM:INTerleaver?</code> .....	27

---

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

Queries the channel bandwidth.

##### Return values:

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

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

**Usage:** Query only

**Manual operation:** See ["Channel Bandwidth"](#) on page 16

---

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

Queries the robustness mode of the signal.

##### Return values:

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

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

**Usage:** Query only

**Manual operation:** See ["Robustness Mode"](#) on page 15

---

#### **[[: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 16

### 5.3.2 MSC Commands

<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:MSC:CONStel?</a> .....	27
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---

#### **[[: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 15

**[: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 17

**[: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 17

**[: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 17**5.3.3 SDC Commands**

<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SDC:CONStel?</a> .....	29
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<a href="#">[:SOURce&lt;hw&gt;]:BB:DRM:SDC:RATE&lt;ch&gt;?</a> .....	30

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

Queries the constellation of the SDC.

**Return values:**

&lt;DrmConstSdc&gt; 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 15**[:SOURce<hw>]:BB:DRM:SDC:LEVel<ch>?**

Queries the protection level of the SDC.

**Return values:**

&lt;DrmSdcLev&gt; 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 17

---

**[: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 17

---

**[: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<sub>xy</sub> 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 17

## 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/](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/](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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