R&S®SMCVB-K155
AM/FM/RDS
User Manual

1179101202
Version 03

ROHDE&SCHWARZ
Make ideas real

This document describes the following software options:

- R&S®SMCVB-K155 AM/FM/RDS (1434.3719.xx)

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

Mühldorfstr. 15, 81671 München, Germany
Phone: +49 89 41 29 - 0
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

1179.1012.02 | Version 03 | R&S®SMCVB-K155

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

Contents

1 Welcome to the AM/FM/RDS Option

The R&S SMCVB-K155 is a firmware application that adds functionality to generate signals in accordance with the AM/FM/RDS digital standards.

The R&S SMCVB-K155 option features:

- Audio AM broadcast signal generation
- Audio FM broadcast signal generation
- Audio FM RDS/RBDS 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 AM/FM/RDS Dialog

To open the dialog with AM/FM/RDS settings

► In the block diagram of the R&S SMCV100B, select "Baseband > AM/FM/RDS".

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 AM/FM/RDS Option

Use the AM/FM/RDS coder option to generate broadcast signals in FM and AM.

In FM, you can generate a mono or a stereo signal. For stereo signals generated according to the multiplex method, an RDS coder is available and is used to code fixed data. Many parameters can be changed over wide setting ranges. See Chapter 4, "Audio FM Configuration and Settings", on page 17.

In AM, you can generate amplitude modulated signals. See Chapter 3, "Audio AM Configuration and Settings", on page 12.

To generate an audio FM broadcast signal

1. Select "Baseband > Audio FM > State > On".
2. Select "RF > RF Level > State > On".

To generate an audio AM broadcast signal

1. Select "Baseband > Audio AM > State > On".
2. Select "RF > RF Level > State > On".

2.1 Required Options

The equipment layout for generating AM/FM/RDS signals includes:

- Base unit
- Option Enable Broadcast Standard (R&S SMCVB-K519)
- Option AM/FM/RDS (R&S SMCVB-K155)

3 Audio AM Configuration and Settings

Access:

► Select "Baseband > Audio AM".

This section provides an overview on the AM settings.

The remote commands required to define these settings are described in Chapter 6.1, "Audio AM Commands", on page 56.

How to:"To generate an audio AM broadcast signal" on page 11

Settings:

3.1 General Settings

Access:

► Select "Baseband > Audio AM > Audio AM".

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

Settings:

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

Remote command:
`[:SOURce<hw>]:BB:RADio:AM:STATe` on page 56

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:RADio:AM:PRESet on page 56

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:RADio:AM:SETTing:CATalog on page 56
[:SOURce<hw>]:BB:RADio:AM:SETTing:DELete on page 56
[:SOURce<hw>]:BB:RADio:AM:SETTing:LOAD on page 57
[:SOURce<hw>]:BB:RADio:AM:SETTing:STORe on page 57

3.2 AM Modulator Settings

Access:

► Select "Baseband > Audio AM > AM Modulator".

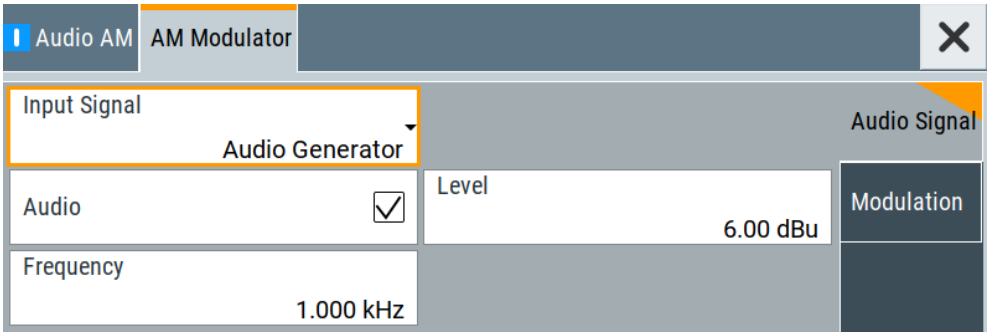
The dialog provides settings necessary to configure the AM modulator.

Settings:

3.2.1 Audio Signal Settings

Access:

► Select "AM Modulator > Audio Signal".



The tab provides input and audio settings of the signal, that is fed into the AM modulator.

Settings:

Input Signal
Sets the audio source for the AM modulator signal.

"External" Uses an external audio signal input at the "User 2" connector. The audio source is fixed to "Source > S/PDIF".

"Audio Generator" Uses an internal audio generator as the signal source. You can enable the audio channel, set the audio level and set the audio frequency.

"Audio Player" Uses a file, that is saved to the memory of the R&S SMCV100B. You can load a file, set the audio channel and set the attenuation.

"Off" Disables the audio source for the AM modulator.

Remote command:
`[:SOURce<hw>]:BB:RADio:AM:INPut` on page 59

Audio
Requires "Input Signal > Audio Generator/Audio Player".

Enables or disables the audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:AUDio:AF on page 59

Frequency
Requires "Input Signal > Audio Generator".

Sets the frequency.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:AUDGen:FRQ on page 58

Level
Requires "Input Signal > Audio Generator/Audio Player".

Sets the level.

The nominal level, at which the modulation depth adjusts to the nominal modulation depth, is 6 dBu. If the level is set to 6 dBu, the generated modulation depth corresponds to the set value.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:AUDGen:LEV on page 58

Load File
Requires "Input Signal > Audio Player".

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.

You can load files with extension `*.wv` and `*.wav`. Load, e.g. the predefined file `default_sine_1khz.wv`. The name of the loaded file is displayed next to the button.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:APLayer:LIBRary:CATalog on page 58
[:SOURce<hw>]:BB:RADio:AM:APLayer:LIBRary:SELect on page 58

Attenuation
Requires "Input Signal > Audio Player".

Sets the attenuation.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:APLayer:ATT on page 57

Source
Requires "Input Signal > External".

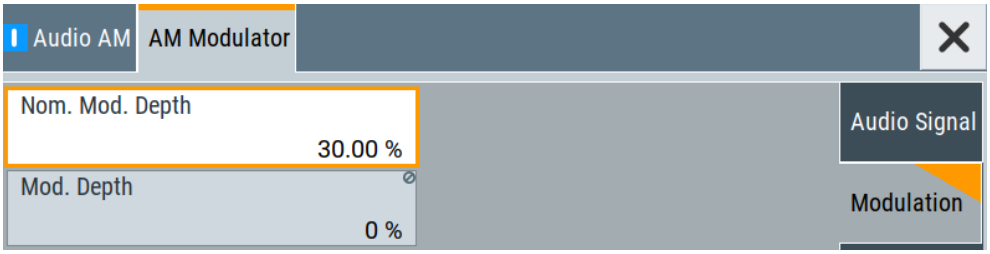
Displays the audio source, that is fixed to S/PDIF.

Remote command:
[:SOURce<hw>]:BB:RADio:AM:SOURce on page 60

3.2.2 Modulation Settings

Access:

► Select "AM Modulator > Modulation".



The tab provides AM modulation settings.

Settings:

Nom. Mod. Depth
Sets the nominal modulation depth.

The depth denotes the referenced depth and depends on the input signal, see "Input Signal" on page 14.

Remote command:
`[:SOURce<hw>]:BB:RADio:AM:DEPTh` on page 59

Mod. Depth
Displays the modulation depth.

Remote command:
`[:SOURce<hw>]:BB:RADio:AM:MODulation:DEPTh?` on page 59

4 Audio FM Configuration and Settings

Access:

► Select "Baseband > Audio FM".

This section provides an overview on the FM and RDS settings. The variety of settings depends on whether the FM mode. For "Mode > Stereo", you can further specify left and the right channel settings, see "Mode" on page 24.

The remote commands required to define these settings are described in Chapter 6, "Remote-Control Commands", on page 55.

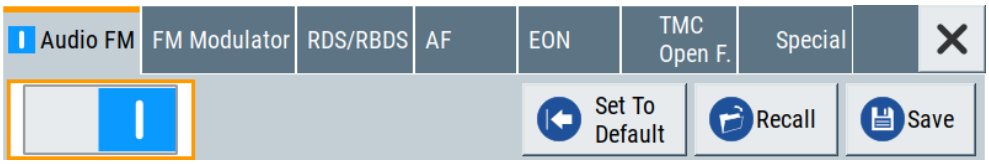
How to: "To generate an audio FM broadcast signal" on page 11

Settings:

4.1 General Settings

Access:

► Select "Baseband > Audio FM > Audio FM".



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

Settings:

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

Remote command:
[:SOURce<hw>]:BB:RADio:FM:STATe on page 61

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:RADio:FM:PRESet on page 60

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:RADio:FM:SETTing:CATalog on page 61
[:SOURce<hw>]:BB:RADio:FM:SETTing:DELete on page 61
[:SOURce<hw>]:BB:RADio:FM:SETTing:LOAD on page 61
[:SOURce<hw>]:BB:RADio:FM:SETTing:STORe on page 61

4.2 FM Modulator Settings

Access:

► Select "Baseband > Audio FM > FM Modulator".

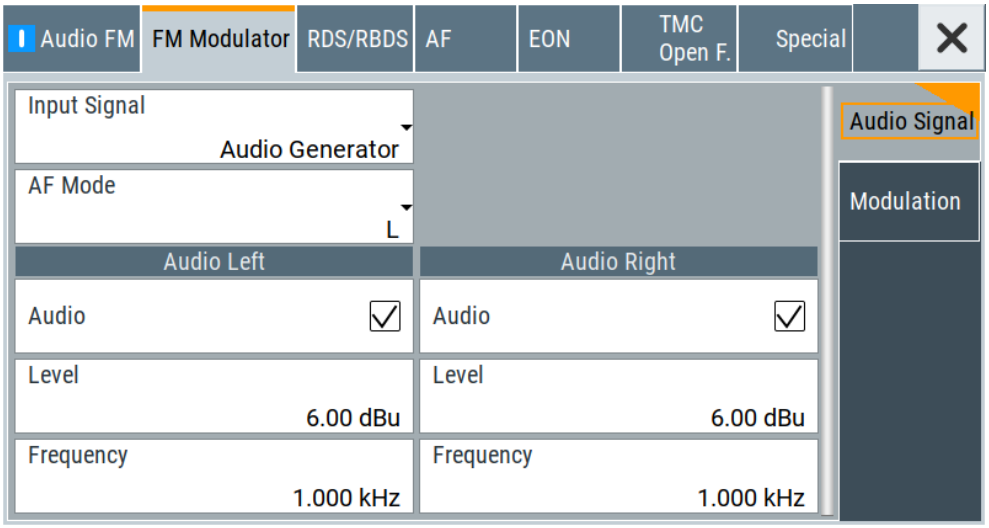
The dialog provides access to settings necessary to configure the input signal and the FM modulator.

Settings:

4.2.1 Audio Signal Settings

Access:

► Select "FM Modulator > Audio Signal".



The tab provides input and audio settings of the signal, that is fed into the FM modulator.

Settings:

Input Signal
Sets the audio source for the FM modulator signal.

"External" Uses an external audio signal input at the "User 2" connector. The audio source is fixed to "Source > S/PDIF".

"Audio Generator"
Uses an internal audio generator as the signal source.
You can enable the audio channel, set the audio level and set the audio frequency for mono and stereo modulation mode.

"Audio Player" Uses a file, that is saved to the memory of the R&S SMCV100B.
You can load a file, set the audio channel and set the attenuation.

"Off" Disables the audio source for the FM modulator.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:INPut` on page 65

AF Mode
Requires "Input Signal > Audio Generator" and "Modulation > Mode > Stereo".

Sets the relationship of the two audio channels with respect to each other.

"L" Only the audio signal from the left audio channel is processed further. The right audio channel is ignored.

"R" Only the audio signal from the right audio channel is processed further. The left audio channel is ignored.

"L = R" The audio signal for the left and right channel is identical. Only the audio signal of the left channel is used, the audio signal of the right channel is ignored. Therefore, only the settings for the left channel are available.
As a result, the stereo signal (L-R)/2 disappears as upper and lower sideband around the suppressed 38 kHz carrier.

"L = -R" The phase of the audio signal for the left and right channel is offset by 180 degrees. Only the audio signal of the left channel is used, the audio signal of the right channel is ignored. Therefore, only the settings for the left channel are available.
As a result, the mono signal (L+R)/2 disappears in the frequency range up to 15 kHz.

"L ≠ R" The audio signals from the left and right audio channel are processed according to the coding standard for a stereo multiplex signal.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:AUDio:MODE` on page 64

Audio Left
Displaying the panel requires "Modulation > Mode > Stereo".

The panel groups level and frequency parameters of the left audio channel. The description of the parameters also applies for "Mode > Mono", since the left audio channel is the mono audio channel.

Audio ← Audio Left
Enables or disables the audio channel.

You can enable 1 or 2 audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", enable left or right audio channel separately.
- If "Modulation > Mode > Mono", enable the audio channel, that is the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDio:AF1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDio:AF2 on page 63

Level ← Audio Left
Requires "Input Signal > Audio Generator".

Sets the level.

The nominal level, at which the modulation depth adjusts to the nominal modulation depth, is 6 dBu. If the level is set to 6 dBu, the generated modulation depth corresponds to the set value.

You can set levels for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right audio levels separately.
- If "Modulation > Mode > Mono", set the level related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV2 on page 63

Frequency ← Audio Left
Requires "Input Signal > Audio Generator".

Sets the frequency.

You can set frequencies for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right audio frequencies separately.
- If "Modulation > Mode > Mono", set the frequency related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ2 on page 63

Attenuation ← Audio Left
Requires "Input Signal > Audio Player".

Sets the attenuation.

You can set the attenuation for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right attenuations separately.
- If "Modulation > Mode > Mono", set the attenuation related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT1 on page 62
[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT2 on page 62

Audio Right
Displaying the panel requires "Modulation > Mode > Stereo".

The panel groups level and frequency parameters of the right audio channel.

Audio ← Audio Right
Enables or disables the audio channel.

You can enable 1 or 2 audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", enable left or right audio channel separately.
- If "Modulation > Mode > Mono", enable the audio channel, that is the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDio:AF1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDio:AF2 on page 63

Level ← Audio Right
Requires "Input Signal > Audio Generator".

Sets the level.

The nominal level, at which the modulation depth adjusts to the nominal modulation depth, is 6 dBu. If the level is set to 6 dBu, the generated modulation depth corresponds to the set value.

You can set levels for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right audio levels separately.
- If "Modulation > Mode > Mono", set the level related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV2 on page 63

Frequency ← Audio Right
Requires "Input Signal > Audio Generator".

Sets the frequency.

You can set frequencies for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right audio frequencies separately.
- If "Modulation > Mode > Mono", set the frequency related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ1 on page 63
[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ2 on page 63

Attenuation ← Audio Right
Requires "Input Signal > Audio Player".

Sets the attenuation.

You can set the attenuation for one or two audio channels depending on the modulation mode:
- If "Modulation > Mode > Stereo", set left or right attenuations separately.
- If "Modulation > Mode > Mono", set the attenuation related to the left audio channel.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT1 on page 62
[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT2 on page 62

Load File
Requires "Input Signal > Audio Player".

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.

You can load files with extension `*.wv` and `*.wav`. Load, e.g. the predefined file `default_sine_1khz.wv`. The name of the loaded file is displayed next to the button.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:APLayer:LIBRary:CATalog` on page 62
`[:SOURce<hw>]:BB:RADio:FM:APLayer:LIBRary:SELect` on page 63

Source
Requires "Input Signal > External".

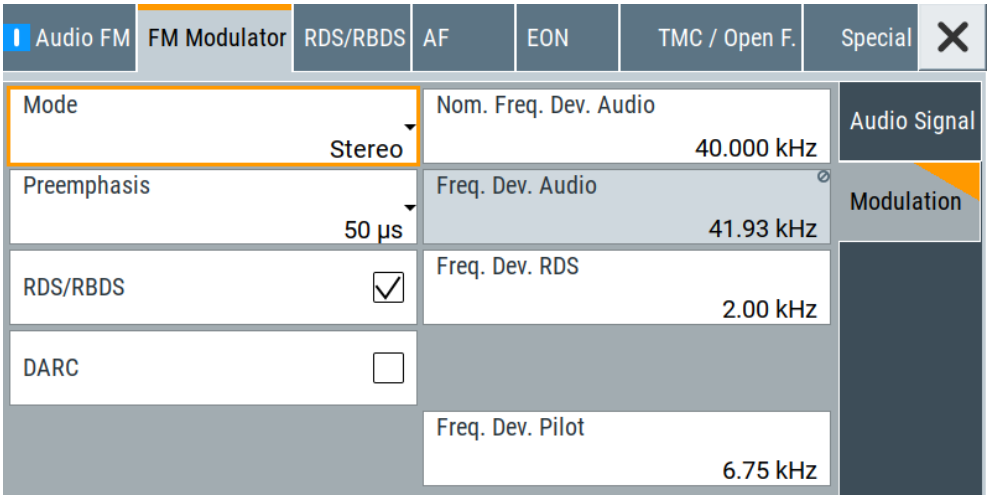
Displays the audio source, that is fixed to S/PDIF.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:AUDio:SOURce?` on page 64

4.2.2 Modulation Settings

Access:

► Select "FM Modulator > Modulation".



The tab provides FM modulation settings.

Settings:

Mode
Sets the FM mode.

"Stereo" Feeds a stereo signal to the modulator according to the multiplex method with:
- Pilot tone: 19 kHz tone. You can disable the pilot tone and set the pilot deviation. See "Pilot" on page 52 and "Freq. Dev. Pilot" on page 24.
- RDS: 57 kHz, see "RDS/RBDS" on page 25.

"Mono" Feeds a mono signal to the modulator with band limitation 15 kHz.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:MODE` on page 65

Preemphasis
Sets the preemphasis factor for the signal to noise ratio improvement.

To improve the SNR, the technique boosts high-frequency components at the modulator and reduces them at the demodulator.

Example:

The level increase at an input frequency of 15 kHz and a pre-emphasis of 50 µs is 13.66 dB. At a pre-emphasis of 75 µs, the SNR is 17.07 dB.

The audio input level for audio generator and audio player therefore needs to be reduced in line with the pre-emphasis.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:AUDio:PREemphasis` on page 64

Nom. Freq. Dev. Audio
Defines the signal deviation, that is the deviation only caused by the audio signals.

The nominal deviation is 6 dBu.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:AUDio:NDEViation` on page 64

Freq. Dev. Audio
Displays the actual frequency deviation.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:AUDio:DEViation?` on page 64

Freq. Dev. Pilot
Defines the resulting 19 kHz frequency deviation of the pilot tone irrespective of the audio signals.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:PILot:DEViation` on page 66

RDS/RBDS
Requires "Mode > Stereo".

Enables/disables RDS/RBDS.

If enabled, adds a 57 kHz RDS signal to the multiplex signal in accordance with the specification EN 62106.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS[:STATe]` on page 68

Freq. Dev. RDS
Requires "Mode > Stereo" and "RDS/RBDS > On".

Defines the resulting frequency deviation of the radio data system irrespective of the audio signals.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:DEViation` on page 66

DARC
Requires "Mode > Stereo".

Enables/disables DARC.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:DARC[:STATe]` on page 85

Freq. Dev. DARC
Requires "Mode > Stereo" and "DARC > On".

Sets the DARC frequency deviation.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:DARC:DEViation` on page 85

4.3 RDS/RBDS Settings

Requires "Baseband > Audio FM > FM Modulator > Mode > Stereo" and "Baseband > Audio FM > FM Modulator > RDS/RDBS > On".

Access:

► Select "Baseband > Audio FM > RDS/RDBS".

The dialog provides general, MS, DI and CT RDS/RBDS settings.

The integrated RDS coder provides a versatile and flexible means of generating an RDS data stream. It enables data for all the important group types to be entered as menu inputs.

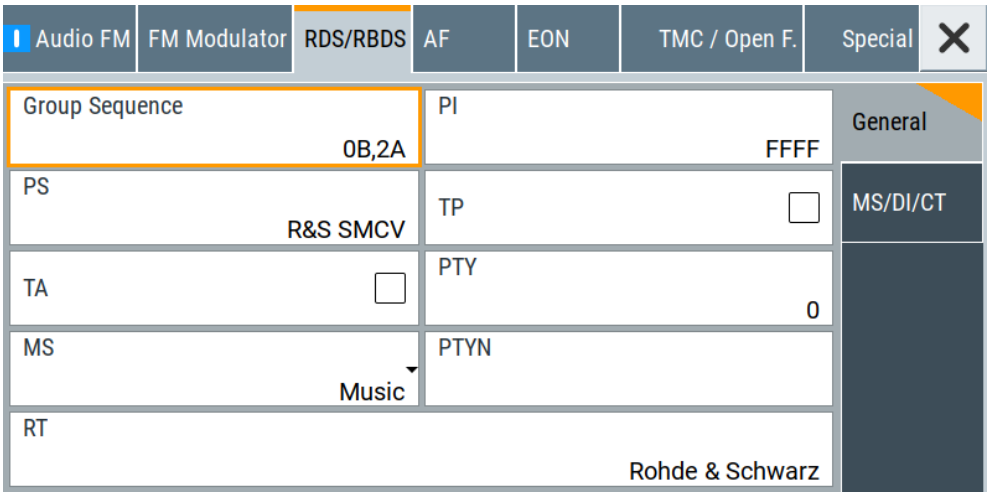
For group types provided for ODA, see Chapter 4.6.2, "Open Format Settings", on page 49. You can define the data content of blocks 2, 3 and 4 using hexadecimal input. The all-purpose input design means that there is no need to distinguish between RDS and RBDS.

Settings:

4.3.1 General Settings

Access:

► Select "RDS/RDBS > General".



The tab provides general settings necessary to configure the RDS.

Settings:

Group Sequence
Defines the group sequence, that specifies the order of groups.

The group sequence is mandatory within the RDS data. The input field accepts up to 38 groups. A group consists of a group number and a version ("0A" to "15B"). Separate groups by setting a comma or a space.

If you enter a group number without specifying version A or B, the software adds version A automatically.

The RDS/RBDS transmission rate is approximately 11.4 group types per second. For this reason, the repetition rate per time unit is determined decisively from the group sequence inputs.

Note: Settings on the "RDS/RBDS" tab only take effect, if you enter the related group in the group sequence.
Once the entered groups have been fully transmitted, the group sequence is repeated.

"4A"	Requires "MS/DI/CT > CT > On". Reserved group. Inserts the current CT automatically at each full minute.
"14B"	Reserved group for appropriate EON setting. The group is automatically sent 8 times. For more information, see specification EN 62106.
"15A"	Reserved group for ODA.
"15B"	Reserved group for appropriate setting. The group is automatically sent 8 times. For more information, see specification EN 62106.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:GROup:SEQuence` on page 66

PI
Sets the program identification, that is a 16-bit value in hexadecimal representation.

The usage differs for RDS and RBDS operation:

- RDS: The PI consists of a code enabling the receiver to distinguish between countries and regions in that the same program is transmitted, and the programs themselves.
  It 16-bit value comprises the country code (bit 15 to bit 12), the program type (bit 11 to bit 8) and the program reference number (bit 7 to bit 0).
- RBDS: In North america, the program identification code is used differently. In part, the broadcasting stations define the program identification code themselves.
  The PI is transmitted in each group type. For A group types, the PI is transmitted in block 1. For B group types, it is transmitted in block 1 and block 3.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:PI` on page 67

PS
Sets the program service name.

Group types "0A" or "0B" transmit the PS in addition to the PI. The PS is transmitted in block 4 in both version A and version B.

You can enter an 8-character PS code, e.g. "R&S SMCV". For allowed character sets, see Figure A-1.

Note: Not all receivers can display the full character set. For an overview of the displayed information, see Table A-1 and Table A-2.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:PS` on page 67

TP
Enable/disables the traffic program flag.

A program carries regular traffic reports and is identified by the TP bit. It specifies, that TA is set, if a traffic announcement occurs. The information is transmitted in block 2 of each group.

If enabled, the "TA" can identify traffic announcements.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TP[:STATe]` on page 68

TA
Enables/disables the traffic announcement flag.

If enabled, transmits the TA in block 2 of group types "0A", "0B" and "15B" to identify a traffic announcement.

If the TA is set or reset, group type "15B" is transmitted 8 times to guarantee transmission, even if difficult reception conditions are present.

Table 4-1: Implication of TP/TA combinations

TP	TA	Implication
"Off"	"Off"	The program contains no traffic program.
"Off"	"On"	The program points to EON on a transmitter with traffic program. Required setting for EON.
"On"	"Off"	The program provides a TP and sets TA to 1, if a traffic announcement occurs.
"On"	"On"	A regular traffic announcement is indicated.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TA` on page 68

PTY
Sets the program type.

The program type refers to the transmission content identifier and is transmitted in block 2 of each group type. 32 possible program types are defined (0 to 31). After entering the number, the assigned program type is displayed.

For RDS and RBDS, different group types are available, see Table A-1 and Table A-2.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:PTY` on page 67

PTYN
Sets the program type name.

The PTYN allows to specify the PTY. For example, for RDS "PTY > 4" implies a "Sport" program, that you can further specify by "Football".

PTYN is optional and is transmitted in group type "10A", blocks 3 and 4. PTYN is only transmitted if group type "10A" is specified in "Group Sequence".

You can enter an 8-character PTYN. For allowed character sets, see Figure A-1.

Note: Not all receivers can display the full character set. For an overview of the displayed information, see Table A-1 and Table A-2.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:PTYN on page 67

RT
Sets the radio text.

RT comprises data messages transmitted in the following group types:
- Group type "2A": Up to 64 characters transmitted in blocks 3 and 4
- Group type "2B": Up to 32 characters transmitted in block 4

Use characters as shown in Figure A-1. It takes 16 group types "2A" to transmit 64 characters (eight characters per group type). Transmission can take time, if there are several group types specified in "Group Sequence".

Further input inverts the A/B text flag in group type "2A" block 1 or "2B" block 2, signaling to the receiver that another RT is being carried. Sending the RT requires group type "2A" or "2B" specified in "Group Sequence".

If more than 32 characters are entered and group type "2B" is specified under "Group Sequence", the radio text is transmitted as far as the 32nd character and the rest of the characters are ignored. An error message is displayed.

Note: Not all receivers can display the full character set. For an overview of the displayed information, see Table A-1 and Table A-2.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:RT on page 68

MS
Identifies if the transmission contains music or speech.

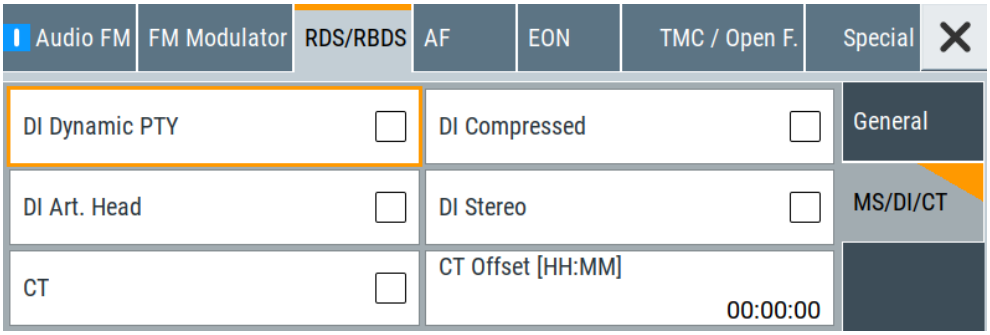
Use the MS flag to actuate different volume settings in the receiver depending on the MS. The flag is transmitted in group types "0A", "0B" and "15B". Also, set "Group Sequence > 0A,0B" to transmit MS information via group types "0A" and "0B".

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:MS on page 67

4.3.2 MS/DI/CT Settings

Access:

► Select "RDS/RDBS > MS/DI/CT".



The tab provides settings necessary to configure decoder identification and clock time parameters.

Settings:

DI Dynamic PTY
Enables/disables dynamic PTY decoder identification.

For DI, the functionality allows dynamic toggling of the PTY of the current program or the program referenced via EON in group type "14A", variant 13.

DI is transmitted in group types "0A", "0B" and "15B". Also, set "Group Sequence > 0A, 0B" to transmit MS information via group types "0A" and "0B".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:DI:DYNamic` on page 70

DI Compressed
Enables/disables compressed decoder identification.

For DI, the functionality allows transmission with compressed content. The content belongs to the current program or the program referenced via EON in group type "14A", variant 13.

DI is transmitted in group types "0A", "0B" and "15B". Also, set "Group Sequence > 0A, 0B" to transmit MS information via group types "0A" and "0B".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:DI:COMPressed` on page 69

DI Art. Head
Enables/disables "artificial head" decoder identification.

For DI, the functionality uses artificial head or dummy head transmission of the program. The program denotes the current program or the program referenced via EON in group type "14A", variant 13.

DI is transmitted in group types "0A", "0B" and "15B". Also, set "Group Sequence > 0A, 0B" to transmit MS information via group types "0A" and "0B".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:DI:ARTificial` on page 69

DI Stereo
Enables/disables stereo decoder identification.

For DI, the functionality uses mono or stereo transmission of the program. The program denotes the current program or the program referenced via EON in group type "14A", variant 13.

DI is transmitted in group types "0A", "0B" and "15B". Also, set "Group Sequence > 0A, 0B" to transmit MS information via group types "0A" and "0B".

"On" Stereo transmission

"Off" Mono transmission

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:DI:STEReo` on page 70

CT
Enables/disables the clock time and date information.

The time and date are transmitted in universal time coordinated format (UTC) together with the local offset, and in modified Julian day format (MJD).

CT information is transmitted every full minute. For this purpose, the RDS/RBDS coder deduces date and time information and the set time zone from the operating system time.

For testing, change the CT by setting the "CT Offset".

"On" Transmits time information in group type "4A".

"Off" Group type "4A" is not transmitted.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:CT` on page 69

CT Offset
Sets the clock time offset.

For certain test transmissions, you can add an offset to the set system time and time zone. Adding the CT offset can be useful for transmissions of certain events on the TMC and for setting their duration.

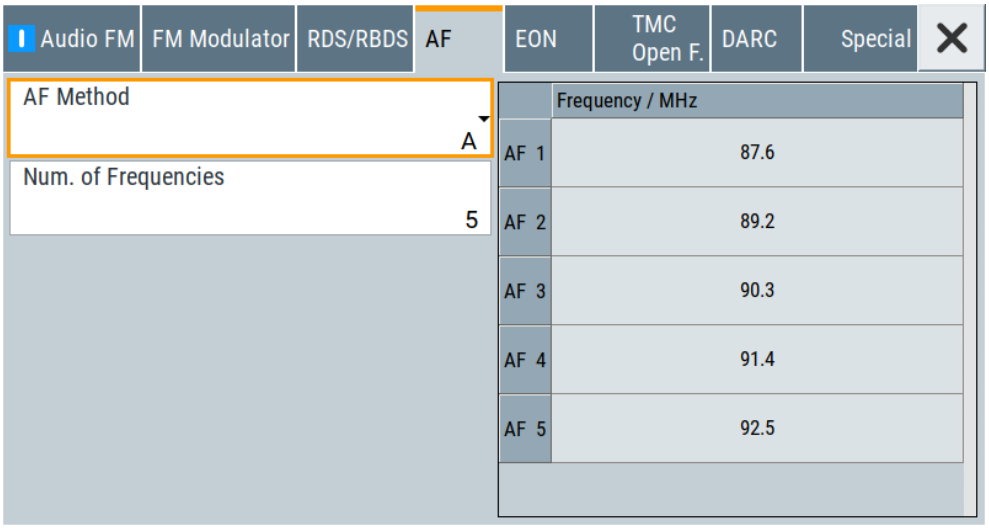
Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:CTOFfset` on page 69

4.4 AF Settings

Requires "Baseband > Audio FM > FM Modulator > Mode > Stereo" and "Baseband > Audio FM > FM Modulator > RDS/RDBS > On".

Access:

► Select "Baseband > Audio FM > AF".



The tab provides settings necessary to configure alternative frequencies list (AF) parameters.

AF gives information about which transmitters are broadcasting the same program in the same or adjacent reception areas. Af also enables receivers with a corresponding memory to reduce switchover times to another transmitter difficult reception conditions.

Settings:

AF Method
Sets the AF method.

For RDS/RBDS, two methods exist to make the AF known.

"A"

A list can specify up to 25 entries referenced to the transmission frequency. The list includes the frequencies in the same transmitter network that are carrying the same program and are located within a certain geographical area.
The frequencies are transmitted using group type "0A".
The actual number of frequencies, follows, is sent first, and then the alternative frequencies. Every frequency is transmitted with the aid of an 8-bit code, see Table A-3 and Table A-4.
Frequencies from the LW and MW bands are not supported.

Example: Applying method A

5 frequencies are transmitted as alternatives to the current transmission frequency.

3 groups of group type "0A" are needed for this information.

1st group type 0A	#5	AF1
2nd group type 0A	AF2	AF3
3rd group type 0A	AF5	AF5

"B" Alternative frequencies are transmitted using method B in the following cases:

- The transmitter and its associated repeaters have more than 25 alternative frequencies.
- Several local regions have different program content.

In such cases, the respective alternative frequencies are transmitted as alternatives to several transmission frequencies. Frequency information is transmitted in the form of frequency pairs, giving the set transmission frequency and the associated alternative frequency in each case.
The sequence of the frequencies is important in this method. Sometime the higher frequency is transmitted first, which refers to a frequency having the same program content (ascending). If the lower frequency is transmitted first, a regional variant using the alternative frequency is being transmitted (descending).
Frequencies from the LW and MW bands are not supported.

Example: Applying method B

A list containing 5 different alternative frequencies is transmitted using method B.

Block 3 of the first group type "0A" specifies the number of frequencies that follow and the transmission frequency to which the alternative frequencies are referenced. The number of frequencies to follow is therefore 11.

1st group type 0A	#11	89.3
2nd group type 0A	89.3	99.5
3rd group type 0A	89.3	101.7
4th group type 0A	88.8	89.3
5th group type 0A	102.6	89.3
6th group type 0A	89.3	89.0

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:METHod` on page 71

Num. of Frequencies
Requires "AF Method > A".

Defines the number of alternative frequencies.

You can transmit a maximum of 26 code words including the information on the number of frequencies that follow, before the transmission is repeated.

"0" Code `0xE0CD` is transmitted in block 3 of group "0A". `E0` means that no alternative frequencies are available, see Table A-3 and Table A-4. `CD` is a "filler code".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:A:NUMBer` on page 71

Frequency table
Displays alternative frequency number `AF <num>` and frequency of up to 26 alternative frequencies in a table using AF method A.

The number of lines in the frequency table corresponds to the set number of frequencies, see "Num. of Frequencies" on page 34.

Frequencies from the LW and MW bands are not supported.

Note: If you use the rotary knob to change an alternative frequency, an ENTER is transmitted with every list item. The mechanism causes unwanted frequency information to be transmitted.
If using the rotary knob remains your preferred input method, remove group type "0A" from the group sequence beforehand.

Frequency ← Frequency table
Sets the frequency of the corresponding AF number.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:A:FREQuency<ch>?` on page 71

Num. of Lists
Requires "AF Method > B".

Defines the number of lists of frequencies used for method B. You can set maximum five lists.

"0" Code `0xE0CD` is transmitted in block 3 of group "0A". `E0` means that no alternative frequencies are available, see Table A-3 and Table A-4. `CD` is a "filler code".

Select Editlist
Selects the list, that is displayed in the "Fequency | Order" table, see "Frequency Order table" on page 36.

Num. of Frequencies
Defines the number of individual frequencies for each list of up to five lists. In method B, transmission is not identified in the RDS coder.

The receiver is able to recognize this method by the tuning frequency contained in each frequency pair, see "Tuning Frequency" on page 36.

"0" The list is ignored.

"12" A maximum of 26 code words is transmitted, including the information on the tuning frequency and the number of frequencies that follow, before the transmission is repeated.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:NUMBer` on page 72
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:NUMBer` on page 72
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:NUMBer` on page 72
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:NUMBer` on page 72
`[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:NUMBer` on page 72

Tuning Frequency
Defines the tuning frequency. The specified tuning frequency is transmitted to form a frequency pair with each entered frequency.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:TFRequency on page 73
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:TFRequency on page 73
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:TFRequency on page 73
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:TFRequency on page 73
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:TFRequency on page 73

Frequency Order table
For the selected list, displays alternative frequency number AF <num>, frequency and order using AF method B.

The number of lines in the frequency table corresponds to the set number of frequencies, see "Num. of Frequencies" on page 35.

The table also indicates whether the specified alternative frequency carries a different regional program.

Frequency ← Frequency Order table
Sets the frequency of the corresponding AF number of the selected list, see "Select Editlist" on page 35.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:FREQuency<ch> on page 72
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:FREQuency<ch> on page 72
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:FREQuency<ch> on page 72
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:FREQuency<ch> on page 72
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:FREQuency<ch>?
on page 72

Order ← Frequency Order table
Sets the frequency order of the corresponding AF number of the selected list, see "Select Editlist" on page 35.

"Asc." Ascending order, the same program is carried.

"Desc." Descending order, the alternative frequency points to a program that has regional variants.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:DESC<ch> on page 71
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:DESC<ch> on page 71
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:DESC<ch> on page 71
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:DESC<ch> on page 71
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:DESC<ch> on page 71

4.5 EON Settings

Access:

► Select "Baseband > Audio FM > EON".

The dialog provides enhanced other network settings.

EON-related information is used to update information saved in the receiver about programs other than the program being received (if other networks are enabled).

In addition to the alternative frequencies, program name, traffic program identification and traffic announcement identification, you can also transmit the program type and program contribution identification for all the other program chains.

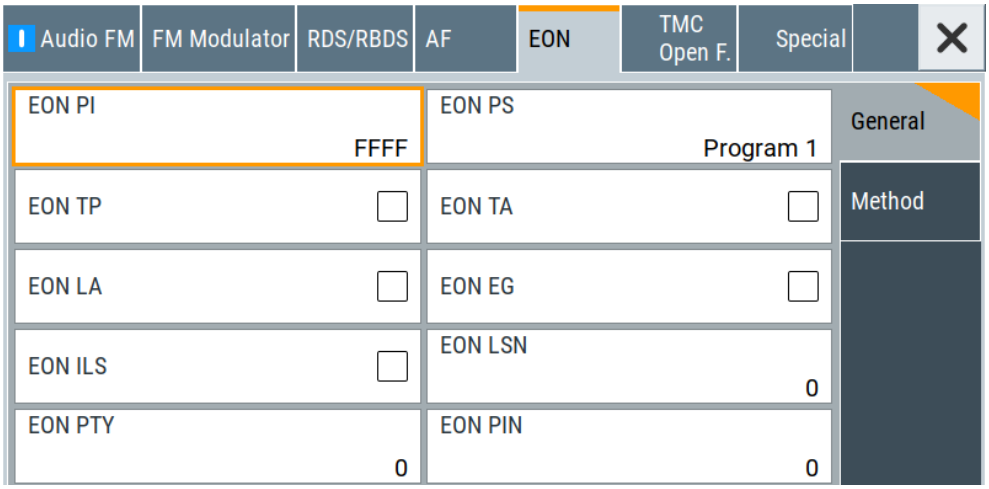
Reference to each respective program is provided by the associated PI. The link information enables the receiver to handle several program chains as a single chain during shared program times.

Settings:

4.5.1 General Settings

Access:

► Select "EON > General".



The tab provides settings necessary to configure general EON settings.

Settings:

EON PI
Sets the enhanced other network program identification.

The PI code of the referenced transmitter is transmitted in group type "14A", block 4. The PI code comprises a 16-bit value in hexadecimal representation.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PI` on page 74

EON PS
Sets the enhanced other network program service name.

The PS is transmitted in group type "14A". For 8 characters, group type "14A" must be transmitted 4 times. For allowed character sets, see Figure A-1.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PS` on page 75

EON TP
Enables the enhanced other network traffic program.

If enabled, traffic announcements can be identified by "EON TA", see "EON TA" on page 38.

An EON TP. carrying regular traffic reports, is identified by the traffic program bit. It specifies that the TA is set, if a traffic announcement occurs.

The information is transmitted in group type "14A", block 2.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:TP` on page 76

EON TA
Enables the enhanced other network traffic announcement.

If enabled, transmits the traffic announcement flag in block 3, variant 13 of group type "14A" to identify a traffic announcement of an EON referenced program.

If the traffic announcement flag is set or reset, group type "14B" is transmitted 8 times to guarantee transmission, even if difficult reception conditions are present.

Note: For EON, the signaling for the TP must be disabled and the TA must be enabled. For details on implication of TP/TA combinations, see Table 4-1.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:Ta on page 75

EON LA
Enables the enhanced other network linkage actuator.

"On" Transmits the linkage actuator bit in block 3, variant 12 of group "14A". This bit informs the receiver that the program chain identified by the PI (enabled) in block 4 of group type "14A" is linked to the program combination referenced by the LSN.

"Off" Displays a possible future link.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:LA on page 74

EON EG
Enables the enhanced other network extended generic indicator.

If enabled, the EG informs the receiver, that the program chain identified by the PI (enabled) in block 4 of group type "14A" belongs to a group of related program chains. These groups have interlinked services, but do not necessarily carry the same program.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:EG on page 74

EON ILS
Enables the enhanced other network international linkage set indicator.

"On" Informs the receiver that an international link exists.

Usage	Bit allocation in Block 3															
Group type 14A	b_{15}	b_{14}	b_{13}	b_{12}	b_{11}	b_{10}	b_9	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
International Link	LA	EG	X	1	Linkage Set Number (LSN)											
					CI				LI							

Figure 4-1: Structure of variant 12 of block 3 in group type 14A for international linkage

For of an international linkage, the LSN must contain two elements.
- The CI: Bits b11 to b8 in block 3 must carry the country code of 1 or 2 participating countries.
- The LI - international linkage set number: Bits b7 to b0 are used to link program chains internationally.

"Off" National linkage.

Usage	Bit allocation in Block 3															
Group type 14A	b_{15}	b_{14}	b_{13}	b_{12}	b_{11}	b_{10}	b_9	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
National Link	LA	EG	X	0	Linkage Set Number (LSN)											

Figure 4-2: Structure of variant 12 of block 3 in group type 14A for national linkage

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:ILS on page 74

EON LSN
Sets the enhanced other network linkage set number.

The LSN is used to interlink two or more programs nationally or internationally. The LSN comprises a 12-bit value in hexadecimal representation. The LSN code is transmitted in block 3, variant 12 of group type "14A".

"000" Used to indicate an error situation in which two or more programs with "EON LSN" = "000" are not linked to one another.

"≠000" If the programs that are intended to be linked to a group are identical, "LA" is enabled (if "LA" = "On") or on standby (if "LA" = "Off"), depending on the status of the linkage actuator, see also "EON LA" on page 39.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:LSN on page 74

EON PTY
Sets the enhanced other network program type.

The content identifier for the EON program transmission is called the program type and is transmitted in group type "14A", block 3, variant 13.

A total of 32 possible program types (o to 31) are defined. After entering the appropriate number, the assigned program type is displayed. For RDS and RBDS different group types are available, see Table A-1 and Table A-2.

"31" Reserved for an alarm identifier. Any input that is not within the range is rejected.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PTY on page 75

EON PIN
Sets the enhanced other network program item number.

The PIN code specifies the planned day, hour and minute for the start of the EON program transmission, as published by the broadcaster. The PIN comprises 16-bit number in hexadecimal representation as in Table 4-2.

Table 4-2: Format

D	D	D	D	D	H	H	H	H	H	M	M	M	M	M	M
D = day, H = hour, M = minute															

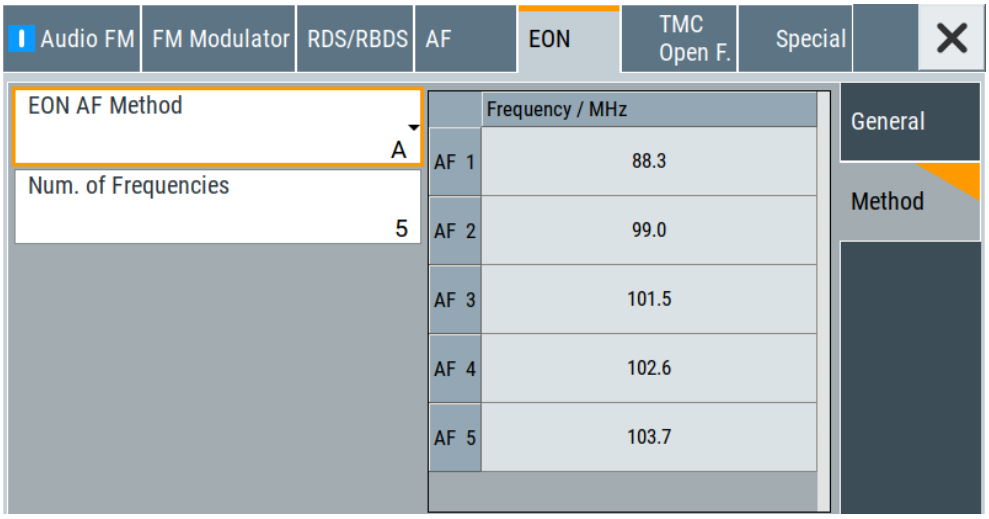
If you want to send an invalid PIN, set at least the day information bits DDDDD to zero.

Remote command:
[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PIN on page 75

4.5.2 Method Settings

Access:

► Select "EON > Method".



The tab provides settings necessary to configure EON alternative frequencies list parameters.

Settings:

EON AF Method
Sets the AF method in an enhanced other network.

The alternative frequencies table gives information about the transmission frequencies belonging to the program identification code in group type "14A", block 4.

Similar to alternative frequencies in the tuning network, for EON exist two methods for transmitting the alternative frequencies.

Frequencies from the LW and MW bands are not supported.

"A" Yo can specify up to 25 frequencies referenced to the transmission frequency. The frequencies are transmitted with group type "14A", block 3, variant 4. The coding method is the same as for the alternative frequencies in group type "0A".
Specify number of frequencies and frequency values using EON AF method A. See "Num. of Frequencies" on page 42 and "Frequency table" on page 42.

"Mapped Freq." Similar to method B for coding the alternative frequencies in group type "0A", a frequency pair is transmitted. Up to 4 frequency pairs are transmitted in group type "14A", block 3, variants 5 to 8. The first frequency (bit 15 to bit 8) corresponds to the transmission frequency of the transmitter with the PI code in block 1. The second frequency (bit 7 to bit 0) corresponds to the transmission frequency of the EON service.
However, there is no sequence of lower and higher frequencies for specifying local differences.
Variant 9 of group type "14A", block 3, with frequency codes from the MW and LW bands, is not supported.
Specify number of frequencies, tuning frequency and mapped frequency values using EON AF method "Mapped Freq.". See "Num. of Frequencies" on page 43, "Tuning Frequency" on page 43 and "Frequency table" on page 43.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:METHod` on page 77

Num. of Frequencies
Requires "EON AF Method > A".

Defines the number of alternative frequencies.

You can transmit a maximum of 26 code words including the information on the number of frequencies that follow, before the transmission is repeated. Enter frequency values in the frequency table, see "Frequency table" on page 42.

"0" Code `0xE0CD` is transmitted in block 3 of group "0A". `E0` means that no alternative frequencies are available, see Table A-3 and Table A-4. `CD` is a "filler code".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:A:NUMBer` on page 76

Frequency table
Requires "EON AF Method > A".

Displays alternative frequency number `AF <num>` and frequency of up to 25 frequencies referenced to the transmission frequency. The table includes the frequencies in the same EON transmitter network that are carrying the same program and are located within a certain geographical area.

The table includes the frequencies in the same EON transmitter network that are carrying the same program and are located within a certain geographical area.

The number of lines in the frequency table corresponds to the set number of frequencies, see "Num. of Frequencies" on page 42.

The frequencies are transmitted with group type "14A", block 3, variant 4. The coding method is the same as for the alternative frequencies in group type "0A".

Frequency ← Frequency table
Requires "EON AF Method > A".

Sets the frequency of the corresponding EON AF number for method A.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:A:FREQuency<ch>` on page 76

Num. of Frequencies
Requires "EON AF Method > Mapped Freq.".

Defines the number of alternative frequencies.

"0" Variants 5 to 8 are not transmitted in group type "14A", block 3.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:B:FREQuency<ch>` on page 76

Tuning Frequency
Requires "EON AF Method > Mapped Freq.".

Defines the tuning frequency. The specified tuning frequency is transmitted to form a frequency pair with each entered frequency.

Defines the tuning frequency.

The specified tuning frequency is transmitted to form a frequency pair with each frequency entered.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:B:TFRequency` on page 77

Frequency table
Requires "EON AF Method > Mapped Freq.".

Displays alternative frequency number and frequency of up to 26 alternative frequencies in a table.

The number of lines in the frequency table corresponds to the set number of frequencies, see "Num. of Frequencies" on page 42.

Frequency ← Frequency table
Requires "EON AF Method > Mapped Freq.".

Sets the frequency of the corresponding EON AF number for AF mapped frequency method.

Frequencies from the LW and MW bands are not supported.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:A:FREQuency<ch>` on page 76

4.6 TMC / Open Format Settings

Access:

► Select "Baseband > Audio FM > TMC / Open F.".

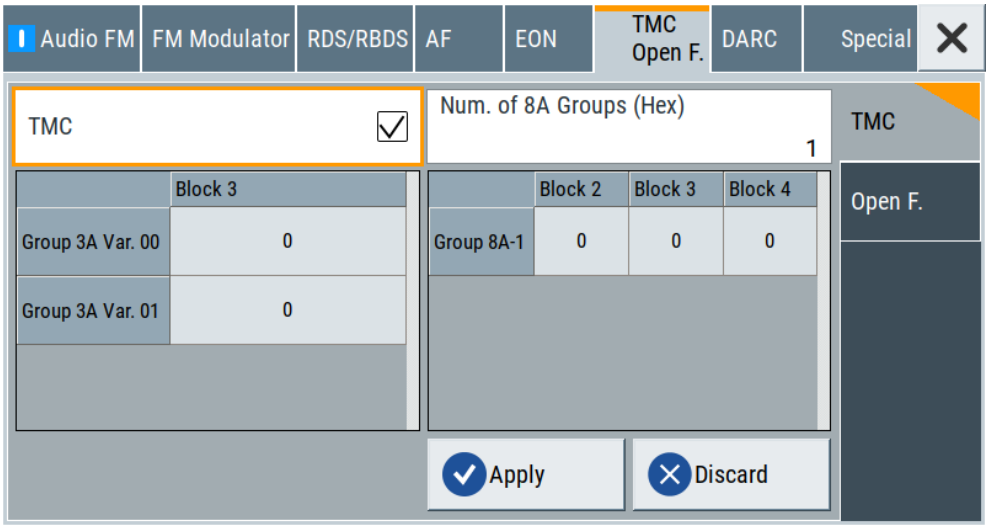
The dialog provides settings necessary to configure traffic message channel parameters and open format parameters for ODA.

Settings:

4.6.1 TMC Settings

Access:

► Select "TMC / Open F. > TMC".



The tab provides TMC settings.

Use the settings to send traffic messages as single group messages or multi group messages.

A single group message is transmitted in one group type "8A", a multi group message needs up to 5 group types "8A". It can take up to 6 group types "8A" to transmit the tuning information.

TMC transmission is announced in group type "3A". We recommend that you send group type "3A" at regular intervals.

TMC data messages are coded as specified in EN ISO 14819-1.

Settings:

TMC
Enables the traffic message channel.

"On" The data you entered is accepted.

"Off" The behavior depends on "Open Format", see "Open Format" on page 49:

- "Open Format > On": If the "Group Sequence" includes group types "3A" and "8A", the last 5 bits of block 2, as well as blocks 3 and 4, are filled up with zeros.
- "Open Format > Off": You can edit the group types "3A" and "8A" without restriction.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC[:STATe]` on page 79

Block 3 table
The settings in the table take effect, if "TMC > Off".

The table contains rows "Group 3A Var. 00" and "Group 3A Var. 01". Both parameters comprise 16-bit values in hexadecimal representation.

In principle, group "3A" is sent in turn with variant 0 and variant 1. The input data is held in block 3, see Table 4-3 and following sections.

The last 5 bits of block 2 are transmitted with the group application code "10000".

Block 4 of this group type is stuffed with `0xCD46`. This code tells the receiver that the following group types 8A contain TMC information.

Table 4-3: Contents of group 3A, block 3, variant 0

Y15	Y14	Y13	Y12	Y11 – Y6	Y5	Y4	Y3	Y2	Y1	Y0
0	0	X	X	LTN	AFI	M=0	I	N	R	U

Table 4-4: Contents of group 3A, block 3, variant 1

Y15	Y14	Y13 - Y12	Y11 – Y6	Y5 - Y4	Y3 - Y2	Y1 - Y0
0	1	G	SID	X	X	X

Table 4-5: Parameters in block 3 and their meaning

Parameter	Description	Possible values
LTN	Location table number	6 bits, see EN ISO 14819-3
AFI	Alternative frequency indicator	1: All the frequencies in a transmitter network with the same PI carry the same RDS TMC service. 0: Not all the frequencies in a transmitter network with the same PI carry the same RDS TMC service.
M	Transmission mode	0: Basic mode; Y5 to Y0 of variant 1 are irrelevant. 1: Enhanced mode; transmission of group types "8A" is linked to fixed times (not supported).
I	International (INTER-ROAD)	
N	National	
R	Regional	
U	Urban	
G	Gap parameter	00: At least 3 non-8A groups between 2 "8A" group types 01: At least 5 non-8A groups between 2 "8A" group types 10: At least 8 non-8A groups between 2 "8A" group types 11: At least 11 non-8A groups between 2 "8A" group types
SID	Service identifier of the TMC service	

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G3A:VAR<ch>` on page 78

Num. of 8A Groups (Hex)
Defines the number of TMC A8 groups.

The number comprises the total number of group types "8A" contained in blocks 2, 3 and 4, see "Block 2 | Block 3 | Block 4" on page 46.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A:NUMBer` on page 79

Block 2 | Block 3 | Block 4
Defines the content of group types "8A".

It can hold 3 types of information.

- Single group message
  Short traffic messages can be transmitted with a group type "8A".
  Bit 3, block 2, in the group type "8A" is set to *1*.
  The single group message is identified by X4 = 0, X3 = 1.

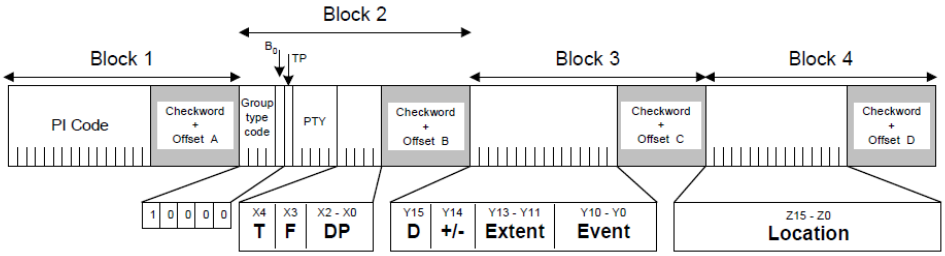


Figure 4-3: TMC group type 8A: single group message

T = 0 = Indicates a user message
F = 1 = Indicates a single group message
DP = Duration and persistence value
D = 0 = Indicates that no diversion recommended
D = 1 = Indicates a recommended diversion
+/- = 0 = Indicates the positive direction
+/- = 1 = Indicates the negative direction

- Multi group message
  Longer traffic messages need several group types "8A" for the traffic information. A distinction is made between the 1st, 2nd, 3rd, 4th or 5th group type "8A".
  The 1st group is identified by X4 = 0, X3 = 0, Y15 = 1.

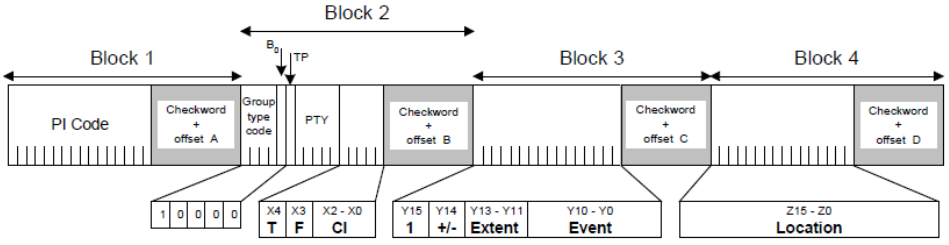


Figure 4-4: TMC group type 8A: multi group message, first group

T = 0 = Indicates a user message
F = 0 = Indicates a multi group message
CI = Continuity index for distinguishing between the individual messages
+/- = 0 = Indicates the positive direction
+/- = 1 = Indicates the negative direction

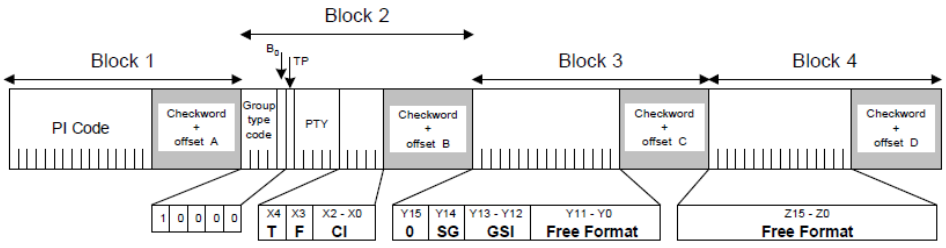


Figure 4-5: TMC group type 8A: multi group message, second and subsequent groups

T = 0 = Indicates a user message
F = 0 = Indicates a multi group message
CI = Continuity index for distinguishing between the individual messages

SG = 0 = Indicates the 3rd, 4th or 5th group
SG = 1 = Indicates the 2nd group
GSI = Group sequence value

- Tuning information
  This feature is not for transmitting the content of traffic messages. Instead it carries general information about the TMC service, such as the service provider name, the associated program identification, the assigned frequency and various system parameters.

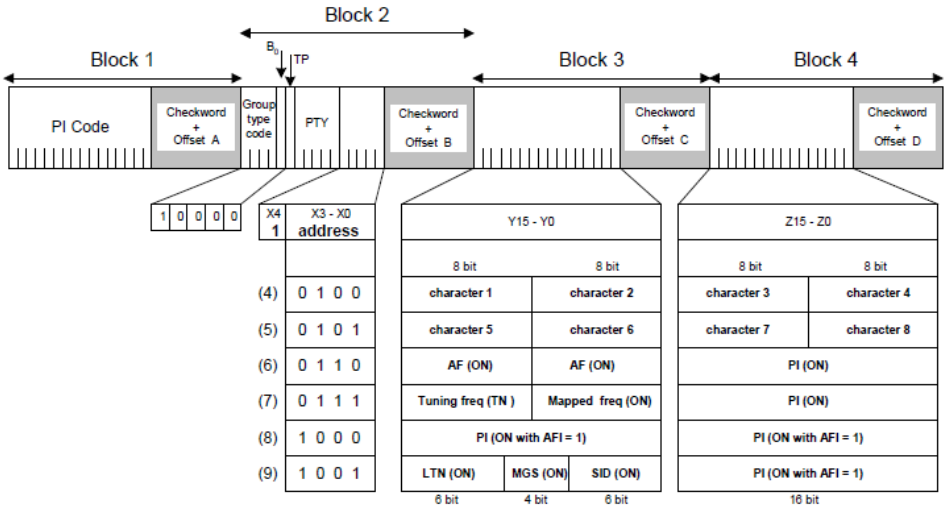


Figure 4-6: TMC group type 8A: tuning information

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk2` on page 78
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk3a` on page 78
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk4` on page 79

Apply
Sends the TMC message.

Since it takes a certain amount of time to send a TMC message, during the transmission process, an hourglass symbol is displayed left from the subtab name and the "Apply" button.

When using remote control, it is particularly important to know whether a message that has been entered has yet been transmitted and when a new TMC message can be sent.

If the group types "3A" and "8A" are not included in the "Group Sequence", an error message is displayed. The transmission stops until the group types "3A" and "8A" have been entered.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:APPLy` on page 78
`[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:READy?` on page 79

Discard
Discards the configured group type 8A settings.

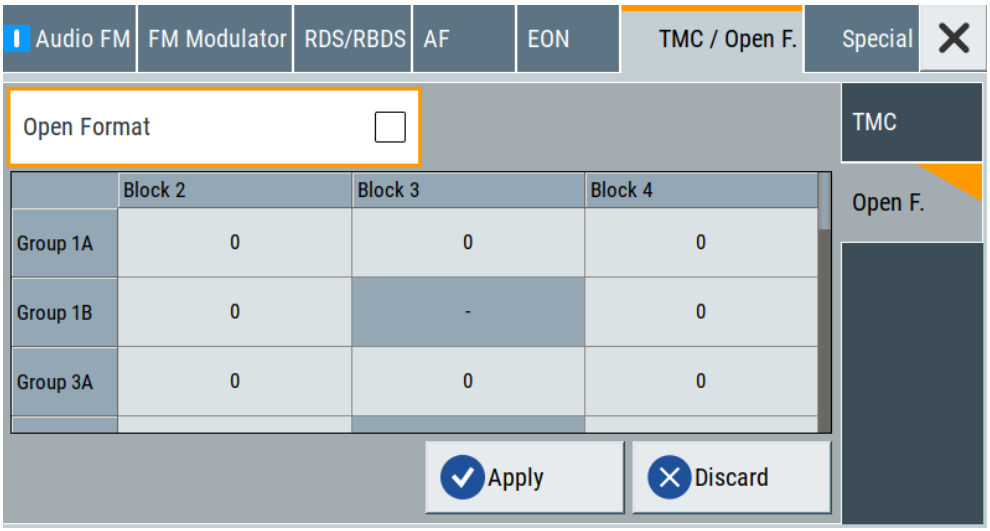
Discarding triggers a reset of the following parameters:
- "Num. of 8A Groups (Hex)", see "Num. of 8A Groups (Hex)" on page 46.
- "Block 2 | Block 3 | Block 4", see "Block 2 | Block 3 | Block 4" on page 46

Remote command:
n.a.

4.6.2 Open Format Settings

Access:

► Select "TMC / Open F. > Open F.""System > L1".



The tab provides settings necessary to configure open format parameters for ODA.

Settings:

Open Format
Enables the open format.

"On" Sends the data entered in the "Block 2 | Block 3 | Block 4" table, see "Block 2 | Block 3 | Block 4" on page 50.

"Off" Stuffs the group types with zeros. Stuffing is performed for group types specified in "Group Sequence", see "Group Sequence" on page 26.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF[:STATe]` on page 80

Block 2 | Block 3 | Block 4
Contains all group types specified in the RDS/RBDS group sequence.

See "Group Sequence" on page 26.

In A group types, blocks 2, 3 and 4 can be described using hexadecimal data. In block 2, last 5 bits are used; in blocks 3 and 4, 16 bits are used.

In B group types, block 3 cannot be described, because in the group types the program identification is automatically entered.

If "TMC > Off", you can only edit the group types "3A" and "8A".

After entering the desired data, press "Apply".

"Block 2" column	8-bit value in hexadecimal representation.
"Block 3" column	Only available for group types A. 16-bit value in hexadecimal representation.
"Block 4" column	16-bit value in hexadecimal representation.

Remote command:
Block 2 commands:
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk2` on page 81 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk2` on page 81
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk2` on page 81 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk2` on page 81
Block 3 commands:
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk3` on page 82 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk3` on page 82
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk3?` on page 82 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk3?` on page 83
Block 4 commands:
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk4` on page 83 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk4` on page 84
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk4` on page 84 to `[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk4` on page 84

Apply
If group types are part of the "Group Sequence", clicking "Apply" triggers transmission start.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:APPLy` on page 80

Discard
Discards the configured group type 8A settings.

Discarding triggers a reset of the parameters in table "Block 2 | Block 3 | Block 4", see "Block 2 | Block 3 | Block 4" on page 50.

Remote command:
n.a.

4.7 DARC Settings

Requires "Baseband > Audio FM > FM Modulator > Mode > Stereo" and "Baseband > Audio FM > FM Modulator > DARC""> On".

Access:

► Select "Baseband > Audio FM > DARC".

The dialog provides DARC settings.

Settings:

Information
Sets the information type, that is transmitted for DARC operation in line with specification EN 300 751.

"Off"	No information type transmitted.
"PRBS"	PRBS data
"Data"	Data as specified in "Data BIC 1/2/3".

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:DARC:INFormation` on page 85

Data BIC 1/2/3
Specifies data for block identification codes 1 to 3.

Example:

"Data BIC 1 = Rohde & Schwarz"

"Data BIC 2 = Signal Generator"

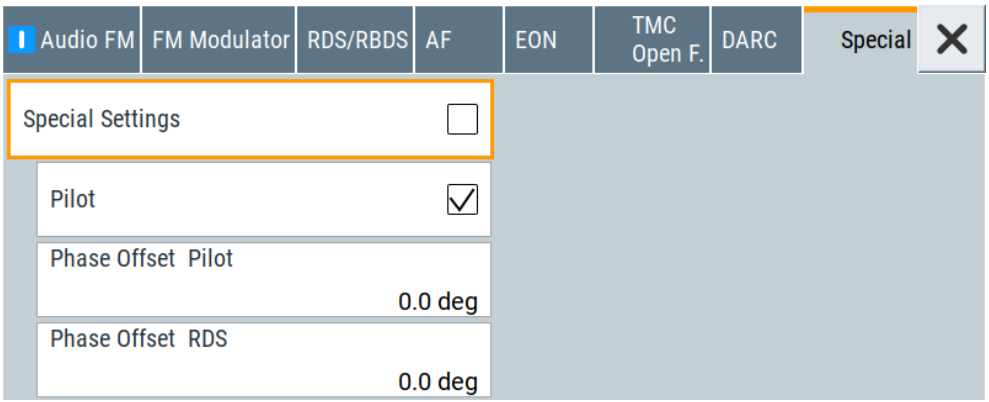
"Data BIC 1 = SMCV100B"

Remote command:
`[:SOURce<hw>]:BB:RADio:FM:DARC:BIC<ch>` on page 84

4.8 Special Settings

Access:

► Select "Baseband > Audio FM > 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.

Settings:

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:RADio:FM[:SPECial]:SETTings[:STATe]` on page 86

Pilot
Enables/disables the 19 kHz pilot tone.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM[:SPECial]:PILot[:STATe]` on page 86

Phase Offset Pilot
Sets the phase offset of the 19 kHz pilot tone.

Applying the phase offset requires "Pilot > On". The offset is applied relative to the suppressed 38 kHz carrier with an accuracy of 0.1 deg.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM[:SPECial]:PILot:PHASe` on page 85

Phase Offset RDS
Sets the phase offset of the suppressed 57 kHz RDS carrier.

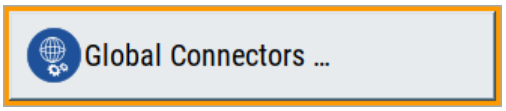
Applying the phase offset requires "FM Modulator > Modulation > RDS/RBDS > On". The offset is applied relative to the suppressed 38 kHz carrier with an accuracy of 0.1 deg.

The reference point is the 19 kHz pilot tone with a phase shift setting of 0.0 deg.

Remote command:
`[:SOURce<hw>]:BB:RADio:FM[:SPECial]:RDS:PHASe` on page 86

5 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.

6 Remote-Control Commands

The following commands are required to generate signals with the AM/FM/RDS 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 AM/FM/RDS are described here:

6.1 Audio AM Commands

6.1.1 General Commands

[:SOURce<hw>]:BB:RADio:AM: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:AM|FM|FM:RDS:STATe`.

Usage: Event

Manual operation: See "Set To Default" on page 12

[:SOURce<hw>]:BB:RADio:AM: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 12

[:SOURce<hw>]:BB:RADio:AM:SETTing:CATalog

Queries the files with settings in the default directory. Listed are files with the file extension `*.am/fm/rds`.

Manual operation: See "Save/Recall" on page 13

[:SOURce<hw>]:BB:RADio:AM:SETTing:DELete <AmDel>

Deletes the selected file from the default or the specified directory. Deleated are files with extension `*.am/fm/rds`.

Setting parameters:

<AmDel> "<filename>"
Filename or complete file path; file extension can be omitted

Usage: Setting only

Manual operation: See "Save/Recall" on page 13

[:SOURce<hw>]:BB:RADio:AM:SETTing:LOAD <AmRcl>

Loads the selected file from the default or the specified directory. Loaded are files with extension `*.am/fm/rds`.

Parameters:

<AmRcl> "<AmRcl>"
Filename or complete file path; file extension can be omitted

Manual operation: See "Save/Recall" on page 13

[:SOURce<hw>]:BB:RADio:AM:SETTing:STORe <AmSav>

Saves the current settings into the selected file; the file extension (`*.am/fm/rds`) is assigned automatically.

Parameters:

<AmSav> "<filename>"
Filename or complete file path

Manual operation: See "Save/Recall" on page 13

6.1.2 Modulation Commands

[:SOURce<hw>]:BB:RADio:AM:APLayer:ATT <Attenuation>

Sets the attenuation.

Parameters:

<Attenuation> float

Range: 0 to 30
Increment: 0.01
*RST: 0

Manual operation: See "Attenuation" on page 15

[:SOURce<hw>]:BB:RADio:AM:APLayer:LIBRary:CATalog

Queries the files with settings in the default directory. Listed are files with the file extension `*.wv` and `*.wav`.

Manual operation: See "Load File" on page 15

[:SOURce<hw>]:BB:RADio:AM:APLayer:LIBRary:SELect <SEL>

Selects the audio file. If no file of the specified name exists, an error message is displayed. You can select files with the file extension `*.wv` and `*.wav`.

Parameters:

<SEL> string

Filename or complete file path; file extension can be omitted

Manual operation: See "Load File" on page 15

[:SOURce<hw>]:BB:RADio:AM:AUDGen:FRQ <Freq>

Sets the frequency.

Parameters:

<Freq> float

Range: 0.03 to 15
Increment: 0.001
*RST: 1
Default unit: kHz

Manual operation: See "Frequency" on page 15

[:SOURce<hw>]:BB:RADio:AM:AUDGen:LEV <Level>

Sets the level.

Parameters:

<Level> float

Range: -60 to 12
Increment: 0.01
*RST: 6
Default unit: dBu

Manual operation: See "Level" on page 15

[:SOURce<hw>]:BB:RADio:AM:AUDio:AF <Audio>

Enables or disables the audio channel.

Parameters:

<Audio> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "Audio" on page 14

[:SOURce<hw>]:BB:RADio:AM:DEPTh <Depth>

Sets the nominal modulation depth.

Parameters:

<Depth> float

Range: 0 to 100
Increment: 0.01
*RST: 30

Manual operation: See "Nom. Mod. Depth" on page 16

[:SOURce<hw>]:BB:RADio:AM:INPut <Input>

Sets the audio source for the AM modulator signal.

Parameters:

<Input> EXTernal | AGENerator | APLayer | OFF

EXTernal
Uses an external audio signal input at the "User 2" connector. The audio source is fixed to "Source > S/PDIF", see [:SOURce<hw>]:BB:RADio:AM:SOURce on page 60.

AGENerator
Uses an internal audio generator as the signal source.

APLayer
Uses an audio player file, that is saved to the memory of the R&S SMCV100B.

OFF
Disables the audio source for the AM modulator.

*RST: AGENerator

Manual operation: See "Input Signal" on page 14

[:SOURce<hw>]:BB:RADio:AM:MODulation:DEPTh?

Displays the modulation depth.

Return values:
<ModDepth> integer
Range: 0 to 100
*RST: 30

Usage: Query only

Manual operation: See "Mod. Depth" on page 16

[:SOURce<hw>]:BB:RADio:AM:SOURce <Source>

Queries the audio source.

Parameters:
<Source> SPDif
S/PDIF is fixed.
*RST: SPDif

Manual operation: See "Source" on page 15

6.2 Audio FM Commands

6.2.1 General Commands

[:SOURce<hw>]:BB:RADio:FM: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:AM|FM|FM:RDS:STATe`.

Usage: Event

Manual operation: See "Set To Default" on page 18

[:SOURce<hw>]:BB:RADio:FM: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 17

[:SOURce<hw>]:BB:RADio:FM:SETTing:CATalog <FmCat>

Queries the files with settings in the default directory. Listed are files with the file extension `*.am/fm/rds`.

Return values:
<FmCat> <filename1>,<filename2>,...
Returns a string of filenames separated by commas.

Manual operation: See "Save/Recall" on page 18

[:SOURce<hw>]:BB:RADio:FM:SETTing:DELete <FMDel>

Deletes the selected file from the default or the specified directory. Deleated are files with extension `*.am/fm/rds`.

Setting parameters:
<FMDel> "<filename>"
Filename or complete file path; file extension can be omitted

Usage: Setting only

Manual operation: See "Save/Recall" on page 18

[:SOURce<hw>]:BB:RADio:FM:SETTing:LOAD <FmRcl>

Loads the selected file from the default or the specified directory. Loaded are files with extension `*.am/fm/rds`.

Parameters:
<FmRcl> "<FmRcl>"
Filename or complete file path; file extension can be omitted

Manual operation: See "Save/Recall" on page 18

[:SOURce<hw>]:BB:RADio:FM:SETTing:STORe <FmSav>

Saves the current settings into the selected file; the file extension (`*.am/fm/rds`) is assigned automatically.

Parameters:

<FmSav> "<filename>"

Filename or complete file path

Manual operation: See "Save/Recall" on page 18

6.2.2 Modulation Commands

[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT1 <ATTL>
[:SOURce<hw>]:BB:RADio:FM:APLayer:ATT2 <ATTR>

Sets the attenuation.

Parameters:

<ATTR> float

Range: 0 to 30
Increment: 0.01
*RST: 0
Default unit: dB

Manual operation: See "Attenuation" on page 21

[:SOURce<hw>]:BB:RADio:FM:APLayer:LIBRary:CATalog

Queries the files with settings in the default directory. Listed are files with the file extension `*.wv` and `*.wav`.

Return values:

<FmLibCat> <filename1>,<filename2>,...

Returns a string of filenames separated by commas.

Manual operation: See "Load File" on page 22

[:SOURce<hw>]:BB:RADio:FM:APLayer:LIBRary:SELect <SEL>

Selects the audio file. If no file of the specified name exists, an error message is displayed. You can select files with the file extension `*.wv` and `*.wav`.

Parameters:

<SEL> string

Filename or complete file path; file extension can be omitted

Manual operation: See "Load File" on page 22

[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ1 <FreqL>
[:SOURce<hw>]:BB:RADio:FM:AUDGen:FRQ2 <FreqR>

Sets the frequency.

Parameters:

<FreqR> integer

Range: 30 to 15000
*RST: 1000
Default unit: Hz

Manual operation: See "Frequency" on page 21

[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV1 <LevelL>
[:SOURce<hw>]:BB:RADio:FM:AUDGen:LEV2 <LevelR>

Sets the level.

Parameters:

<LevelR> float

Range: -60 to 12
Increment: 0.01
*RST: 6
Default unit: dBu

Manual operation: See "Level" on page 21

[:SOURce<hw>]:BB:RADio:FM:AUDio:AF1 <AudioL>
[:SOURce<hw>]:BB:RADio:FM:AUDio:AF2 <AudioR>

Enables or disables the audio channel.

Parameters:

<AudioR> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "Audio" on page 20

[:SOURce<hw>]:BB:RADio:FM:AUDio:DEViation?

Queries the actual frequency deviation.

Return values:
<FreqDevAudio> float
Range: 0 to 999.99
Increment: 0.01
*RST: 0
Default unit: kHz

Usage: Query only

Manual operation: See "Freq. Dev. Audio" on page 24

[:SOURce<hw>]:BB:RADio:FM:AUDio:MODE <AFMode>

Sets the relationship of the two audio channels with respect to each other.

Parameters:
<AFMode> LEFT | RIGHt | RELeft | REMLeft | RNELeft
*RST: LEFT

Manual operation: See "AF Mode" on page 20

[:SOURce<hw>]:BB:RADio:FM:AUDio:NDEViation <MonFreqDevAudio>

Defines the signal deviation, that is the deviation only caused by the audio signals.

Parameters:
<MonFreqDevAudio> float
Range: 0 to 100
Increment: 0.001
*RST: 40
Default unit: kHz

Manual operation: See "Nom. Freq. Dev. Audio" on page 24

[:SOURce<hw>]:BB:RADio:FM:AUDio:PREemphasis <Preemphasis>

Sets the preemphasis factor for the signal to noise ratio improvement.

Parameters:
<Preemphasis> OFF | D50us | D75us
*RST: D50us

Manual operation: See "Preemphasis" on page 24

[:SOURce<hw>]:BB:RADio:FM:AUDio:SOURce?

Queries the audio source.

Return values:

<Source> SPDif

S/PDIF is fixed.

*RST: SPDif

Usage: Query only

Manual operation: See "Source" on page 23

[:SOURce<hw>]:BB:RADio:FM:INPut <Input>

Sets the audio source for the FM modulator signal.

Parameters:

<Input> EXTernal | AGENerator | APLayer | OFF

EXTernal
Uses an external audio signal input at the "User 2" connector. The audio source is fixed to "Source > S/PDIF", see `[:SOURce<hw>]:BB:RADio:FM:AUDio:SOURce?` on page 64.

AGENerator
Uses an internal audio generator as the signal source.

APLayer
Uses an audio player file, that is saved to the memory of the R&S SMCV100B.

OFF
Disables the audio source for the FM modulator.

*RST: AGENerator

<Input> OFF | APLayer | AGENerator | EXTernal

*RST: AGENerator

Manual operation: See "Input Signal" on page 19

[:SOURce<hw>]:BB:RADio:FM:MODE <Mode>

Sets the FM mode.

Parameters:

<Mode> MONO | STEReo

MONO
Feeds a mono signal to the modulator with band limitation 15 kHz.

STEReo
Feeds a stereo signal to the modulator.

*RST: STEReo

Manual operation: See "Mode" on page 24

[:SOURce<hw>]:BB:RADio:FM:PILot:DEViation <FreqDevPilot>

Defines the resulting 19 kHz frequency deviation of the pilot tone irrespective of the audio signals.

Parameters:

<FreqDevPilot> float

Range: 0 to 15
Increment: 0.01
*RST: 6.75
Default unit: kHz

Manual operation: See "Freq. Dev. Pilot" on page 24

6.3 FM RDS General Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:DEViation <FreqDevRDS>

Defines the resulting frequency deviation of the radio data system irrespective of the audio signals.

Parameters:

<FreqDevRDS> float

Range: 0 to 10
Increment: 0.01
*RST: 2
Default unit: kHz

Manual operation: See "Freq. Dev. RDS" on page 25

[:SOURce<hw>]:BB:RADio:FM:RDS:GROup:SEQuence <GroupSequence>

Parameters:

<GroupSequence> string

Manual operation: See "Group Sequence" on page 26

[:SOURce<hw>]:BB:RADio:FM:RDS:MS <MS>

Identifies if the transmission contains music or speech.

Parameters:

<MS> MUSic | SPEech
*RST: MUSic

Manual operation: See "MS" on page 29

[:SOURce<hw>]:BB:RADio:FM:RDS:PI <PI>

Sets the program identification, that is a 16-bit value in hexadecimal representation.

Parameters:

<PI> integer
Range: #H0000 to #HFFFF
*RST: #HFFFF

Manual operation: See "PI" on page 27

[:SOURce<hw>]:BB:RADio:FM:RDS:PS <PS>

Sets the program service name.

Parameters:

<PS> string
Up to eight characters in ASCII format, see Figure A-1.
*RST: "R&S SMCV"

Example:
```
SOURce1:BB:RADio:FM:RDS:PS?
// Response: "R&S SMCV"
```

Manual operation: See "PS" on page 27

[:SOURce<hw>]:BB:RADio:FM:RDS:PTY <PTY>

Sets the program type.

Parameters:

<PTY> integer
Range: 0 to 31
*RST: 0

Manual operation: See "PTY" on page 28

[:SOURce<hw>]:BB:RADio:FM:RDS:PTYN <PTYN>

Sets the program type name.

Parameters:

<PTYN> string

Up to eight characters in ASCII format, see Figure A-1.

Example: `SOURce1:BB:RADio:FM:RDS:PTYN Football`
Sets the program type name "Football".

Manual operation: See "PTYN" on page 28

[:SOURce<hw>]:BB:RADio:FM:RDS:RT <RT>

Sets the radio text.

Parameters:

<RT> string

*RST: "Rohde & Schwarz
Up to 64 characters in ASCII format, see Figure A-1.

Manual operation: See "RT" on page 29

[:SOURce<hw>]:BB:RADio:FM:RDS:TA <TA>

Enables/disables the traffic announcement flag.

Parameters:

<TA> 0 | 1 | OFF | ON

*RST: 0

Manual operation: See "TA" on page 28

[:SOURce<hw>]:BB:RADio:FM:RDS:TP[:STATe] <TP>

Enable/disables the traffic program flag.

Parameters:

<TP> 0 | 1 | OFF | ON

*RST: 0

Manual operation: See "TP" on page 28

[:SOURce<hw>]:BB:RADio:FM:RDS[:STATe] <RDSState>

Enables/disables RDS/RBDS.

Parameters:

<RDSState> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "RDS/RBDS" on page 25

6.4 FM RDS CT/DI Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:CT <CT>

Enables/disables the clock time and date information.

Parameters:

<CT> 0 | 1 | OFF | ON

*RST: 0

Manual operation: See "CT" on page 31

[:SOURce<hw>]:BB:RADio:FM:RDS:CTOFfset <CtOffset>

Sets the clock time offset.

Parameters:

<CtOffset> string

Range: 00:00 to 99:59
Increment: 00:01
*RST: 00:00

Example: `SOURce1:BB:RADio:FM:RDS:CTOFfset 01:23:45`
Sets a time offset of 1 hour, 23 minutes and 45 seconds to the CT.

Manual operation: See "CT Offset" on page 31

[:SOURce<hw>]:BB:RADio:FM:RDS:DI:ARTificial <DiArtifical>

Enables/disables "artificial head" decoder identification.

Parameters:

<DiArtifical> 0 | 1 | OFF | ON

*RST: 0

Manual operation: See "DI Art. Head" on page 31

[:SOURce<hw>]:BB:RADio:FM:RDS:DI:COMPressed <DiCompressed>

Enables/disables compressed decoder identification.

Parameters:
<DiCompressed> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "DI Compressed" on page 30

[:SOURce<hw>]:BB:RADio:FM:RDS:DI:DYNamic <DiDynamic>

Enables/disables dynamic PTY decoder identification.

Parameters:
<DiDynamic> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "DI Dynamic PTY" on page 30

[:SOURce<hw>]:BB:RADio:FM:RDS:DI:STEReo <DiStereo>

Enables/disables stereo decoder identification.

Parameters:
<DiStereo> 0 | 1 | OFF | ON
ON
Stereo transmission
OFF
Mono transmission
*RST: 0

Manual operation: See "DI Stereo" on page 31

6.5 FM RDS AF Method Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:METHod <AFMethod>

Parameters:

<AFMethod> B | A

*RST: A

Manual operation: See "AF Method" on page 32

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:A:FREQuency<ch>? <AFFreqA>

Sets the alternative frequencies in AF method A.

Suffix:

<ch> 1 to 25
Selects the alternative frequency.

Parameters:

<AFFreqA> float

Range: 87.6 to 107.9
Increment: 0.1
*RST: MHz

Manual operation: See "Frequency" on page 35

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:A:NUMBer <AFNumFreqA>

Defines the number of alternative frequencies.

Parameters:

<AFNumFreqA> integer

Range: 0 to 25
*RST: 0

Manual operation: See "Num. of Frequencies" on page 34

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:DESC<ch> <AfList1Order>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:DESC<ch> <AfList2Order>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:DESC<ch> <AfList3Order>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:DESC<ch> <AfList4Order>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:DESC<ch> <AfList5Order>

Sets the frequency order of the corresponding AF number of the selected list.

Suffix:
LIST<ch> 1 to 5
Select the list.

DESC<ch> 1 to 12
Selects the AF number.

Parameters:
<AfList5Order> ASC | DESC

ASC
Ascending order, the same program is carried.

DESC
Descending order, the alternative frequency points to a program that has regional variants.

*RST: ASC

Manual operation: See "Order" on page 36

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:FREQuency<ch> <AfList1Freq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:FREQuency<ch> <AfList2Freq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:FREQuency<ch> <AfList3Freq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:FREQuency<ch> <AFList4Freq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:FREQuency<ch>? <AfList5Freq>

Sets an alternative frequency of a list in AF method B.

Suffix:
LIST<ch> 1 to 5
Select the list.

FREQuency<ch> 1 to 12
Selects the AF number.

Parameters:
<AfList5Freq> float

Range: 87.6 to 107.9
Increment: 0.1
*RST: 87.6
Default unit: MHz

Manual operation: See "Frequency" on page 36

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:NUMBer <AfBList1NoFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:NUMBer <AfBList2NoFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:NUMBer <AfBList3NoFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:NUMBer <AfBList4NoFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:NUMBer <AfBList5NoFreq>

Sets the number of frequencies of a list in AF method B.

Suffix:
LIST<ch> 1 to 5
Select the list.

Parameters:
<AfBList5NoFreq> integer
Range: 0 to 12
*RST: 0

Manual operation: See "Num. of Frequencies" on page 35

[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST1:TFRequency <AfList1TunFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST2:TFRequency <AfList2TunFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST3:TFRequency <AfList3TunFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST4:TFRequency <AfList4TunFreq>
[:SOURce<hw>]:BB:RADio:FM:RDS:AF:B:LIST5:TFRequency <AfList5TunFreq>

Sets the tuning frequency of a list in AF method B.

Suffix:
LIST<ch> 1 to 5
Selects the list.

Parameters:
<AfList5TunFreq> float
Range: 87.6 to 107.9
Increment: 0.1
*RST: 87.6
Default unit: MHz

Manual operation: See "Tuning Frequency" on page 36

6.6 FM RDS EON Commands

6.6.1 General Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:EG <EonEG>

Enables the enhanced other network extended generic indicator.

Parameters:
<EonEG> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "EON EG" on page 39

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:ILS <EonILS>

Enables the enhanced other network international linkage set indicator.

Parameters:
<EonILS> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "EON ILS" on page 39

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:LA <EonLA>

Enables the enhanced other network linkage actuator.

Parameters:
<EonLA> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "EON LA" on page 39

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:LSN <EonLSN>

Sets the enhanced other network linkage set number.

The LSN comprises a 12-bit value in decimal representation.

Parameters:
<EonLSN> integer
Range: 0 to 4095
*RST: 0

Manual operation: See "EON LSN" on page 40

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PI <EonPI>

Sets the enhanced other network program identification.

Parameters:
<EonPI> integer
Range: 0 to 65535
*RST: 65535

Example: `SOURce1:BB:RADio:FM:RDS:EON:PI 53539`
Sets an EON PI of `0xD123` in hexadecimal representation.

Manual operation: See "EON PI" on page 38

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PIN <EonPIN>

Sets the enhanced other network program item number.

Parameters:
<EonPIN> integer
Range: 0 to 65535
*RST: 0

Example: `SOURce1:BB:RADio:FM:RDS:EON:PIN 2688`
Sets an EON PIN to to day = 1, hour = 10, minute = 0.

Manual operation: See "EON PIN" on page 40

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PS <EonPS>

Sets the enhanced other network program service name.

Parameters:
<EonPS> string
*RST: "Program1"

Manual operation: See "EON PS" on page 38

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:PTY <EonPTY>

Sets the enhanced other network program type.

Parameters:
<EonPTY> integer
Range: 0 to 31
*RST: 0

Manual operation: See "EON PTY" on page 40

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:Ta <EonTA>

Enables the enhanced other network traffic announcement.

Parameters:
<EonTA> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "EON TA" on page 38

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:TP <EonTP>

Enables the enhanced other network traffic program.

Parameters:
<EonTP> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "EON TP" on page 38

6.6.2 Method Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:A:FREQuency<ch> <EonAFAFreq>

Sets the alternative frequencies in EON, AF method A.

Suffix:
<ch> 1 to 25
Selects the alternative frequency.

Parameters:
<EonAFAFreq> float
Range: 87.6 to 107.9
Increment: 0.1
*RST: 87.6
Default unit: MHz

Manual operation: See "Frequency" on page 43

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:A:NUMBer <EonAFANumFreq>

Defines the number of alternative frequencies.

Parameters:
<EonAFANumFreq> integer
Range: 0 to 25
*RST: 0

Manual operation: See "Num. of Frequencies" on page 42

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:B:FREQuency<ch> <EonAFBFreq>

Sets the alternative frequencies in EON for AF mapped frequencies method.

Suffix:
<ch> 1 to 25
Selects the alternative frequency.

Parameters:
<EonAFBFreq> float
Range: 87.6 to 107.9
Increment: 0.1
*RST: 87.6
Default unit: MHz

Manual operation: See "Num. of Frequencies" on page 43

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:B:NUMBer <EonAFBNumFreq>

Parameters:
<EonAFBNumFreq> integer
Range: 0 to 4
*RST: 0

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:B:TFRequency <EonAFTFreq>

Sets the tuning frequency of EON in AF mapped frequencies method.

Parameters:
<EonAFTFreq> float
Range: 87.6 to 107.9
Increment: 0.1
*RST: 87.6
Default unit: MHz

Manual operation: See "Tuning Frequency" on page 43

[:SOURce<hw>]:BB:RADio:FM:RDS:EON:AF:METHod <EonAFMethod>

Parameters:
<EonAFMethod> MAPF | A
*RST: A

Manual operation: See "EON AF Method" on page 41

6.7 FM RDS TMC Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:APPLy

Parameters:
<TMCApply> select
*RST: 0

Manual operation: See "Apply" on page 48

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G3A:VAR<ch> <G3AVar>

Sets the traffic message channel 3A group variants.

Suffix:
<ch> 1 to 2
Selects the group type variant.

Parameters:
<G3AVar> integer
Range: 0 to 65535
*RST: 0

Manual operation: See "Block 3 table" on page 45

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk2 <G8ABlk2>

Parameters:
<G8ABlk2> integer
Range: 0 to 31
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 46

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk3a <GA8Blk3>

Parameters:
<GA8Blk3> integer
Range: 0 to 65535
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 46

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A<ch>:BLOCk4 <G8ABlk4>

Parameters:
<G8ABlk4> integer
Range: 0 to 65535
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 46

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:G8A:NUMBer <G8ANo>

Defines the number of TMC A8 groups.

Parameters:
<G8ANo> integer
Range: 1 to 6
*RST: 1

Manual operation: See "Num. of 8A Groups (Hex)" on page 46

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC:READy?

Return values:
<TMCReady> 0 | 1 | OFF | ON
*RST: 0

Usage: Query only

Manual operation: See "Apply" on page 48

[:SOURce<hw>]:BB:RADio:FM:RDS:TMC[:STATe] <TMCState>

Enables the traffic message channel.

Parameters:
<TMCState> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "TMC" on page 45

6.8 FM RDS OPF Commands

6.8.1 General Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF[:STATe] <OpenFormatState>

Enables the open format.

Parameters:
<OpenFormatState> 0 | 1 | OFF | ON
*RST: 0

Manual operation: See "Open Format" on page 49

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:APPLy

Triggers transmission of open format data.

Manual operation: See "Apply" on page 50

6.8.2 Block 2 Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:GA:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13A:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk2 <OFG1ABlk2>

Sets block 2 of the open format group types A.

Parameters:

<OFG1ABlk2> integer

Range: 0 to 31
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G4B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G10B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12B:BLOCk2 <OFG1ABlk2>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk2 <OFG1ABlk2>

Sets block 2 of the open format group types B.

Parameters:

<OFG1ABlk2> integer

Range: 0 to 31
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

6.8.3 Block 3 Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:GA:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13A:BLOCk3 <OpenFormatBlk3>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk3 <OpenFormatBlk3>

Sets block 3 of the open format group types A.

Parameters:

<OpenFormatBlk3> integer

Range: 0 to 65535
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G4B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8B:BLOCk3?

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G10B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12B:BLOCk3?
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk3?

Sets block 3 of the open format group types B.

Return values:
<OpenFormatBlk3> integer
Range: 0 to 65535
*RST: 0

Usage: Query only

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

6.8.4 Block 4 Commands

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:GA:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7A:BLOCk4 <OpenFormatBlk4>

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13A:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G15A:BLOCk4 <OpenFormatBlk4>

Sets block 4 of the open format group types A.

Parameters:

<OpenFormatBlk4> integer

Range: 0 to 65535
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G1B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G3B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G4B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G5B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G6B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G7B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G8B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G9B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G10B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G11B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G12B:BLOCk4 <OpenFormatBlk4>
[:SOURce<hw>]:BB:RADio:FM:RDS:OPF:G13B:BLOCk4 <OpenFormatBlk4>

Sets block 4 of the open format group types B.

Parameters:

<OpenFormatBlk4> integer

Range: 0 to 65535
*RST: 0

Manual operation: See "Block 2 | Block 3 | Block 4" on page 50

6.9 DARC Commands

[:SOURce<hw>]:BB:RADio:FM:DARC:BIC<ch> <DarcBIC>

Specifies data for block identification codes 1 to 3.

Suffix:
<ch> BIC 1 to 3

Parameters:
<DarcBIC> string

Manual operation: See "Data BIC 1/2/3" on page 51

[:SOURce<hw>]:BB:RADio:FM:DARC:DEViation <FreqDevDarc>

Parameters:
<FreqDevDarc> float

Range: 0 to 10
Increment: 0.01
*RST: 7.50

Manual operation: See "Freq. Dev. DARC" on page 25

[:SOURce<hw>]:BB:RADio:FM:DARC:INFormation <DarcInf>

Parameters:
<DarcInf> OFF | PRBS | DATa

*RST: OFF

Manual operation: See "Information" on page 51

[:SOURce<hw>]:BB:RADio:FM:DARC[:STATe] <Darc>

Parameters:
<Darc> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "DARC" on page 25

6.10 FM Special Commands

[:SOURce<hw>]:BB:RADio:FM[:SPECial]:PILot:PHASe <OffsetPilot>

Sets the phase offset of the 19 kHz pilot tone.

Parameters:

<OffsetPilot> float

Range: -180 to 180
Increment: 0.1
*RST: 0

Manual operation: See "Phase Offset Pilot" on page 52

[:SOURce<hw>]:BB:RADio:FM[:SPECial]:PILot[:STATe] <Pilot>

Enables/disables the 19 kHz pilot tone.

Parameters:

<Pilot> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "Pilot" on page 52

[:SOURce<hw>]:BB:RADio:FM[:SPECial]:SETTings[:STATe] <SpecialSettings>

Enables/disables special settings.

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

Parameters:

<SpecialSettings> 0 | 1 | OFF | ON

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

Manual operation: See "Special Settings" on page 52

[:SOURce<hw>]:BB:RADio:FM[:SPECial]:RDS:PHASe <OffsetRDS>

Sets the phase offset of the suppressed 57 kHz RDS carrier.

Parameters:

<OffsetRDS> float

Range: -180 to 180
Increment: 0.1
*RST: 0

Manual operation: See "Phase Offset RDS" on page 53

Annex

A RDS Data Entry Information

Some FM signal parameters require specific data entries. This chapter provides the necessary information.

- To define names, e.g. of a PS, or to enter an RT, use the character set as in Figure A-1.
- For RDS/RBDS, program type codes and their associated names are listed in the following tables: Table A-1, Table A-2
- For RDS and RBDS, the frequency coding for alternative frequencies is listed in the following tables: Table A-3, Table A-4

		b7	0	0	0	0	0	0	1	1	1	1	1	1	1	1
		b6	0	0	1	1	1	1	0	0	0	0	1	1	1	1
		b5	1	1	0	0	1	1	0	0	1	1	0	0	1	1
		b4	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b3	b2	b1	b0	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	SPACE	0	@	P	‖	p	á	â	ª	º	À	Ã	Ã	ã
0	0	0	1	!	1	A	Q	a	q	à	ã	α	`	Á	Ã	Å	å
0	0	1	0	"	2	B	R	b	r	é	ê	©	´	Ē	Ē	Æ	æ
0	0	1	1	#	3	C	S	c	s	è	ë	‰	'	Ē	Ē	Œ	œ
0	1	0	0	¤	4	D	T	d	t	í	î	Ğ	±	Í	Î	ŷ	ŵ
0	1	0	1	%	5	E	U	e	u	ì	ï	ě	İ	Ì	Ï	Ý	ý
0	1	1	0	&	6	F	V	f	v	ó	ô	ň	ń	Ó	Ô	Ő	õ
0	1	1	1	'	7	G	W	g	w	ò	ö	ő	ű	Ò	Ö	Ø	ø
1	0	0	0	(	8	H	X	h	x	ú	û	π	µ	Ú	Ů	þ	þ
1	0	0	1	)	9	I	Y	i	y	ù	ü	€	¿	Ù	Ů	Ð	ŋ
1	0	1	0	*	:	J	Z	j	z	Ň	ñ	£	÷	Ř	ř	Ŕ	ŕ
1	0	1	1	+	;	K	[	k	{	Ç	ç	$	°	Č	č	Ć	ć
1	1	0	0	,	<	L	\	l	|	Ş	ş	←	¼	Š	š	Ś	ś
1	1	0	1	-	=	M	]	m	}	ß	ğ	↑	½	Ž	ž	Ź	ź
1	1	1	0	.	>	N	—	n	¯	¡	ı	→	¾	Đ	đ	Ŧ	ŧ
1	1	1	1	/	?	O	_	o		Ĳ	ij	↓	§	Ŀ	ŀ	ð	

Figure A-1: Character sets for names

Table A-1: Program type codes for RDS

No.	Code	Program type	8-character display	16-character display
0	00000	No type or undefined	None	None
1	00001	News	News	News
2	00010	Current affairs	Affairs	Current Affairs
3	00011	Information	Info	Information
4	00100	Sport	Sport	Sport
5	00101	Education	Educate	Education
6	00110	Drama	Drama	Drama
7	00111	Culture	Culture	Cultures

No.	Code	Program type	8-character display	16-character display
8	01000	Science	Science	Science
9	01001	Varied	Varied	Varied Speech
10	01010	Pop music	Pop M	Pop Music
11	01011	Rock music	Rock M	Rock Music
12	01100	Easy listening music	Easy M	Easy Listening
13	01101	Light classical	Light M	Light Classics M
14	01110	Serious classical	Classics	Serious Classics
15	01111	Other music	Other M	Other Music
16	10000	Weather	Weather	Weather & Metr
17	10001	Finance	Finance	Finance
18	10010	Children's programs	Children	Children's Progs
19	10011	Social affairs	Social	Social Affairs
20	10100	Religion	Religion	Religion
21	10101	Phone in	Phone In	Phone In
22	10110	Travel	Travel	Travel & Touring
23	10111	Leisure	Leisure	Leisure & Hobby
24	11000	Jazz music	Jazz	Jazz Music
25	11001	Country music	Country	Country Music
26	11010	National music	National M	National Music
27	11011	Oldies music	Oldies	Oldies Music
28	11100	Folk music	Folk M	Folk Music
29	11101	Documentary	Document	Documentary
30	11110	Alarm test	TEST	Alarm Test
31	11111	Alarm	Alarm !	Alarm - Alarm !

Table A-2: Program type codes for RBDS

No.	Code	Program type	8-character display	16-character display
0	0	No type or undefined	None	None
1	1	News	News	News
2	10	Information	Inform	Information
3	11	Sports	Sports	Sports
4	100	Talk	Talk	Talk
5	101	Rock	Rock	Rock
6	110	Classic rock	Cls_Rock	Classic_Rock

No.	Code	Program type	8-character display	16-character display
7	111	Adult hits	Adlt_Hit	Adult_Hits
8	1000	Soft rock	Soft_Rck	Soft_Rock
9	1001	Top 40	Top_40	Top_40
10	1010	Country	Country	Country
11	1011	Oldies	Oldies	Oldies
12	1100	Soft	Soft	Soft
13	1101	Nostalgia	Nostalgia	Nostalgia
14	1110	Jazz	Jazz	Jazz
15	1111	Classical	Classicl	Classical
16	10000	Rhythm and blues	R_&_B	Rhythm_and_Blues
17	10001	Soft rhythm and blues	Soft_R&B	Soft_R_&_B
18	10010	Foreign language	Language	Foreign_Language
19	10011	Religious music	Rel_Music	Religious_Music
20	10100	Religious talk	Rel_Talk	Religious_Talk
21	10101	Personality	Persnlty	Personality
22	10110	Public	Public	Public
23	10111	College	College	College
24-28	11000 to 11100	Unassigned		
29	11101	Weather	Weather	Weather
30	11110	Emergency test	Test	Emergency_Test
31	11111	Emergency	ALERT !	ALERT!_ALERT!

Table A-3: VHF code table

Number	Binary code	Carrier frequency
0	0000 0000	Not to be used
1	0000 0001	87.6 MHz
2	0000 0010	87.7 MHz
:	:	:
204	1100 1100	107.9 MHz

Table A-4: Special meanings code table

Number	Binary code	Special meaning
0	0000 0000	Not to be used
205	1100 1101	Filler code

Number	Binary code	Special meaning
206	1100 1110	Not assigned
:	:	:
223	1101 1111	Not assigned
224	1110 0000	No AF exists
225	1110 0001	1 AF follows
:	:	:
249	1111 1001	25 AFs follow
250	1111 1010	An LF/MF frequency follows
251	1111 1011	Not assigned
:	:	:
255	1111 1111	Not assigned

Glossary: Abbreviations

A

AF: Alternative Frequencies list

AM: Amplitude Modulation

B

BIC: Block Identification Code

C

CI: Country Identifier

CT: Clock Time and date

D

DARC: Data Radio Channel
See EN 300 751.

DI: Decoder Identification

E

EG: Extended Generic indicator

EON: Enhanced Other Networks information

F

FM: Frequency Modulation

I

ILS: International Linkage Set

L

LA: Linkage Actuator

LI: Linkage Identifier

LSN: Linkage Set Number

LW: Long Wave

M

MS: Music Speech switch

MW: Medium Wave

O

ODA: Open Data Applications

P

PI: Program Identification

PIN: Program Item Number

PRBS: Pseudo-Random Bit Sequence

PS: Program Service name

PTY: Program Type

PTYI: Dynamic Program Type Indicator

PTYN: Program Type Name

R

RBDS: Radio Broadcast Data System

RDS: Radio Data System

RT: Radio Text

S

S/PDIF: Sony/Philips Digital Interface

SNR: Signal to Noise Ratio

T

TA: Traffic Announcement flag

TMC: Traffic Message Channel

TP: Traffic Program flag

Glossary: Specifications

E

EN 300 751: Radio broadcasting systems; DAta Radio Channel (DARC); System for wireless infotainment forwarding and teledistribution
https://www.etsi.org/deliver/etsi_en/300700_300799/300751/

EN 62106: Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz

EN ISO 14819-1: Intelligent transport systems — Traffic and travel information messages via traffic message coding — Part 1: Coding protocol for Radio Data System — Traffic Message Channel (RDS-TMC) using ALERT-C

List of commands

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