CDMA2000® incl. 1xEV-DV Digital Standard for R&S®Signal Generators

Operating Manual

1171.5225.12 — 19

ROHDE&SCHWARZ

This document describes the following software options:

- R&S®SMBV-K46
  1415.8083.xx

- R&S®SMU-K46
  1160.9876.02

- R&S®AMU-K46
  1402.6506.02

- R&S®SMATE-K46
  1404.5507.02

- R&S®SMJ-K46
  1409.1016.02

This manual version corresponds to firmware version:

FW 3.50.082.xx and later of the R&S®SMBV100A

FW 3.20.286.xx and later of the R&S®SMU200A, R&S®SMATE200A, R&S®SMJ100A and R&S®AMU200A

The following abbreviations are used throughout this manual: R&S®SMBV100A is abbreviated as R&S SMBV, R&S®SMU200A is abbreviated as R&S SMU, R&S®AMU200A is abbreviated as R&S AMU, R&S®SMATE200A is abbreviated as R&S SMATE, R&S®SMJ100A is abbreviated as R&S SMJ, R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2; the license types 02/03/07/11/13/16/12 are abbreviated as xx.

Contents

1 Preface

1.1 Documentation Overview

This section provides an overview of the R&S Signal Generator user documentation. You find it on the product page at:

http://www.rohde-schwarz.com/product/SMBV100A.html > "Downloads"

Quick start guide

Introduces the R&S Signal Generator 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.

Online help

Offers quick, context-sensitive access to the complete information for the base unit and the software options directly on the instrument.

Operating manual

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 quick start guide manual.
- Software option manual
  Contains the description of the specific functions of an option. Basic information on operating the R&S Signal Generator is not included.

The **online version** of the operating manual provides the complete contents for immediate display on the Internet.

Service manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS, https://gloris.rohde-schwarz.com).

Instrument security procedures manual

Deals with security issues when working with the R&S Signal Generator in secure areas.

Basic safety instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

Data sheet and brochure

The data sheet contains the technical specifications of the software options, see "Digital Standards for Signal Generators - Data sheet" on the web site. It also lists the options and their order numbers.

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

Release notes and open source acknowledgment (OSA)

The release notes of the base units 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 the product page of the base unit, e.g. at:

http://www.rohde-schwarz.com/product/SMBV100A.html > "Downloads" > "Firmware"

Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics, see http://www.rohde-schwarz.com/appnotes.

1.2 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.

Convention	Description
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.3 Notes on Screenshots

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

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 Introduction

The R&S SMx/AMU-K46 is a firmware application that adds functionality to generate signals in accordance with the standard CDMA2000.

> To play back a signal from a waveform file created by the simulation software R&S WinIQSIM2, the corresponding R&S WinIQSIM2 digital standard option must be installed.

CDMA2000 is the North American standard for the third mobile radio generation (3G). It is a further development of the North American mobile radio system of the second-generation IS95 (CDMA). The R&S Signal Generator supports the CDMA2000 standard 3GPP2 C.S0002-C, version 1.0, May 2002 (release C). CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA –USA).

The R&S Signal Generator generates the CDMA2000 signals with a chip rate of 1,2288 Mcps, corresponding to the so-called "Spreading Rate 1".

The CDMA2000 signals of the base station are generated in a combination of realtime mode (realtime channels) and arbitrary waveform mode. Simulation of bit and block errors can be activated for the channels generated in real time. In arbitrary waveform mode, the signal is first calculated and then output.

The CDMA2000 signals of mobile station 1 (MS1) are always generated in realtime mode, the signals of the three remaining mobile stations always in arbitrary waveform mode.

In R&S SMBV, the CDMA2000 signal is generated in arbitrary waveform mode, i.e. the signal is first calculated and then output.

The R&S Signal Generator simulates CDMA2000 at the physical channel level. The following list gives an overview of the provided options for generating a CDMA2000 signal:

- Configuration of up to four base stations or four mobile stations
- Realtime generation of one traffic channel and the SYNC channel on the downlink
- All special channels and up to 78 channels on the downlink (depending on the radio configuration)
- Packet channel according to 1xEV-DV on the downlink
- Operating modes "Traffic", "Access", "Enhanced Access" and "Common Control" on the uplink
- "Misuse For Output Power Control" parameter for varying the original normal transmit power over time
- Simulation of up to 64 additional mobile stations
- Clipping for reducing the crest factor
- All channel coding modes included in IS-2000 (Frame Quality Indicator, Convolutional Encoder, Turbo Encoder, Symbol Puncture, Interleaver, etc.)
- Feeding through of bit errors (to test a BER tester) and block errors (to test a BLER tester)

R&S SMBV does not support realtime channels and bit and block errors insertion.

Parameter	Value
Spreading rate	1.2288 MHz
Channel types	Downlink: • Forward Pilot (F-PICH) • Sync (F-SYNC) • Paging (F-PCH) • Transmit Diversity Pilot (F-TDPICH) • Auxiliary Pilot (F-APICH) • Auxiliary Transmit Diversity Pilot (F-ATDPCH) • Broadcast (F-BCH) • Quick Paging (F-QPCH) • Common Power Control (F-CPCCH) • Common Assignment (F-CACH) • Forward Common Control (F-CCCH) • Packet Channels • Forward Packet Data Control (F-PDCCH) • Forward Packet Data (F-PDCH) • Traffic Channels • Forward Dedicated Control (F-DCCH) • Forward Fundamental (F-FCH) • Forward Supplemental (F-SCH) Uplink: • Reverse Pilot (R-PICH) • Access (R-ACH) • Enhanced Access (R-EACH) • Reverse Common Control (R-CCCH) • Traffic Channel • Reverse Dedicated Control (R-DCCH) • Reverse Fundamental (R-FCH) • Reverse Supplemental Code (R-SCCH) • Reverse Supplemental (R-SCH)
Channel count	In downlink 4 base stations each with up to 78 code channels (depending on the radio configuration). In uplink 4 mobile stations with up to 8 code channels (depending on the radio configuration).
Radio configuration	RC 1 to RC 5 & RC10
Frame length	Radio frame: 5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 160 ms (depending on the channel type and the radio configuration)
PN offset	0 to 511
Quasi Orthogonal Walsh Set	Set 1 to set 3
Channel coding	All channel coding modes included in IS-2000 (Frame Quality Indicator, Convolutional Encoder, Turbo Encoder, Symbol Puncture, Interleaver, etc.)
Long Code Mask	0 to 3FF FFFF FFFF hex

3 Modulation System CDMA2000

The following simplified diagram is used to explain the system principle of CDMA200 in the forward (down) and reverse (up) link. The exact system configuration depends on parameters like link direction, spreading rate, mode, radio configuration and channel type. A detailed description cannot be given in this manual. For further information, refer to the IS2000 standard.

3.1 Modulation System CDMA2000 in the Downlink (Forward)

The following block diagram shows the components of the CDMA2000 transmission system in the downlink.
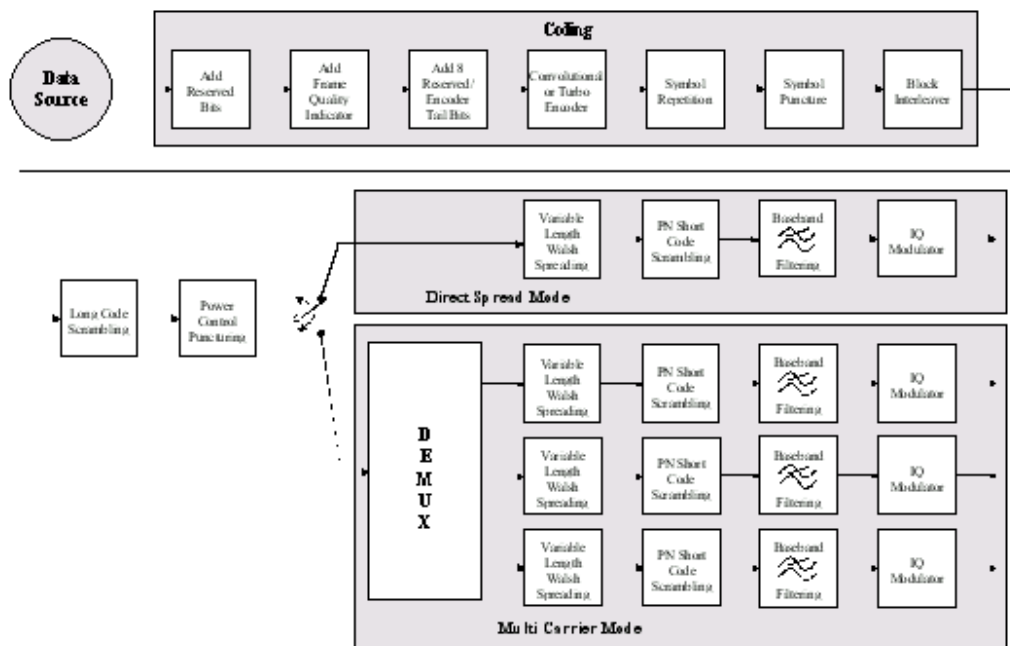
Figure 3-1: Components of the CDMA2000 transmission system in the downlink (forward)

3.2 Modulation System CDMA2000 in the Uplink (Reverse)

The following block diagram shows the components of the CDMA2000 transmission system in the uplink.
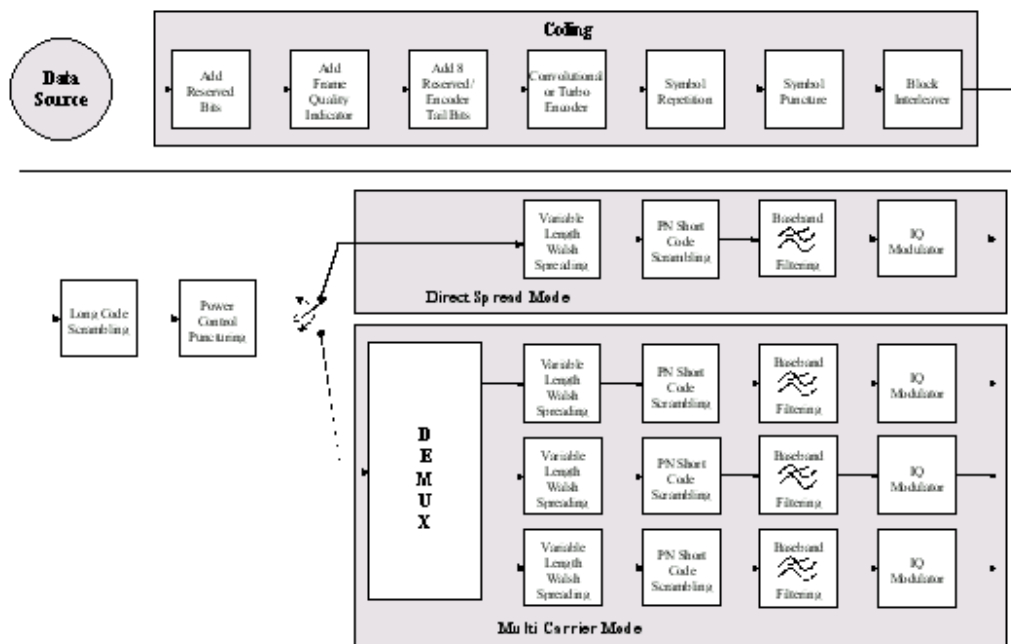
Figure 3-2: Components of the CDMA2000 transmission system in the uplink (reverse)

3.3 Data Source - Uplink and Downlink

The data fields of all channels can be filled from all possible data sources: pattern (all1, all0, user-defined up to 64 bits), PRBS data, data lists and external data.

3.4 Channel Coding - Uplink and Downlink

In contrast to 3GPP FDD, channel coding with CDMA2000 is part of the physical layer. The channel coding procedure can slightly vary depending on channel type, frame length and data rate. The basic coding procedure is illustrated by the coding block in the diagram above.

For a more exact definition, refer to the standard.

Add reserved bits:	filled with "0" bits
Add frame quality indicator:	calculation and insertion of a CRC (cyclic redundancy code) checksum for error identification.
Add 8 reserved/encoder	
Tail bits:	reserved, tail bits which set the subsequent coder to a defined final state.
Convolutional or turbo encoder:	error correction code, depending on data rate and other parameters either by convolutional coding or turbo codes.

Symbol repetition:	symbol repetition is used together with bock symbol puncture for adapting the convolutional or turbo coder output data rate to the required input data rate of the interleaver.
Symbol puncture:	symbol puncturing (elimination) is used together with bock symbol repetition for adapting the convolutional or turbo coder output data rate to the required input data rate of the interleaver.
Block interleaver:	block-wise permutation of input data sequence of interleaver to reduce bit errors.

3.5   Long-Code Scrambling Generator - Downlink

The long-code generator is also referred to as scrambling code generator since it scrambles the chip sequence in a user-specific way (long-code mask).
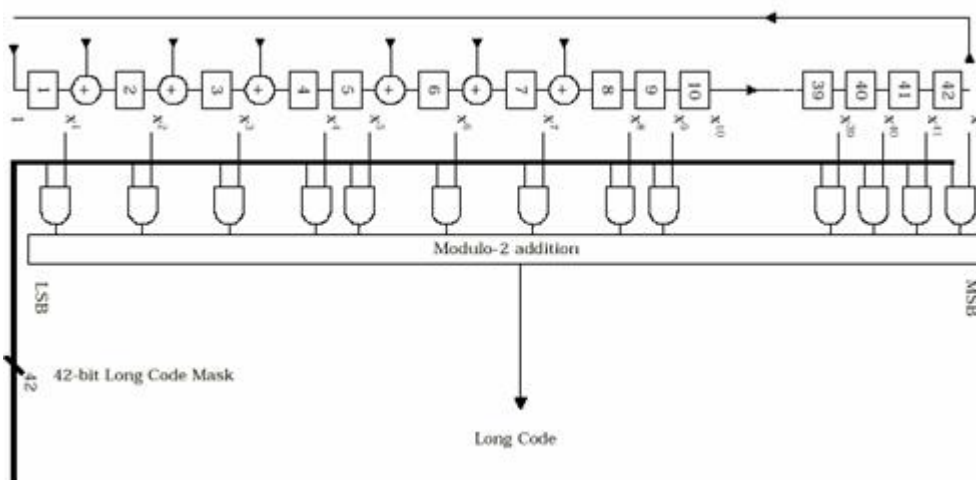
Figure 3-3: Long-code generator CDMA2000

The long-code generator is a feedback 42-bit shift register with its status vector linked to a user-specific long-code mask to form the specific long-code sequence.

The generator polynomial of the shift-register section of the long-code generator is:

$$p(x) = x^{42}+x^{35}+x^{33}+x^{31}+x^{27}+x^{26}+x^{25}+x^{22}+x^{21}+x^{19}+x^{18}+x^{17}+x^{16}+x^{10}+x^{7}+x^{6}+x^{5}+x^{3}+x^{2}+x^{1}+1$$

A real long code is used in the forward link. In the reverse link, a complex long code with I and Q component is required. The long code for the I component is derived directly from the 1X generator, that for the Q component corresponds to the I long code delayed by one chip.

3.6 Power Control Puncturing - Downlink

To control the output power of the mobile station, the BS sends power control bits in the traffic channel at an 800 Hz rate instead of the scrambled data bits. Depending on the power control bits, the mobile station increases or reduces its output power.

3.7 Variable-Length Walsh Spreading - Downlink

Spreading of the CDMA2000 signal is performed in this block. Walsh codes with a variable spreading factor are used. The spreading factor and the Walsh code depend on the spreading rate, channel type, frame length and data rate. To extend the base-station capacity, so-called 'quasi-orthogonal Walsh sets' can be used in addition to the Walsh codes. The input data stream of the spreading unit is already complex (I + jQ). If a standard Walsh code is used, spreading is performed by multiplying the input symbol (modulo 2 multiplication) with the real Walsh code. The quasi-orthogonal Walsh code results in complex spreading through an additional rotation of the output phase (the spreading code then consists of a real and an imaginary part).

3.8 PN Short-Code Scrambling - Downlink

The (complex) input data stream of the PN short-code scrambler is multiplied by a complex PN sequence (I_{PN} + j Q_{PN}). This is also called 'quadrature spreading'. With channels of the radio configurations 1 and 2, whose generation is comparable with that of IS-95 systems, this block splits up the input stream in I and Q components.

The base-station-specific parameter PN offset determines the start phase of these PN short-code sequences. This permits signals of different base stations to be distinguished.

Generator polynomial for I and Q components of the PN short code:

$P_I(x) = x^{15}+x^{13}+x^9+x^8+x^7+x^5+1$

$P_Q(x) = X^{15}+x^{12}+x^{11}+x^{10}+x^6+x^5+x^4+x^3+1$

The period of a PN short-code sequence is 26.666 ms.

3.9 Spreading - Uplink

Increasing the data rate or spreading in the reverse link is performed in different ways depending on the radio configuration and the channel type.

3.9.1   Variable Length Walsh Spreading

Walsh codes with a variable spread factor are used for spreading. The spreading factor and the Walsh code depend on the spreading rate, channel type, frame length and the data rate. Spreading is obtained by multiplication of the input symbol (modulo 2 multiplication) by the real Walsh code.

3.9.2   64-Ary Orthogonal Modulator

Groups of 6 input bits are used for addressing a line of the Walsh code table with the spread code length of 64. This 'modulator' increases the data rate by a factor of 64/6. This type of rate increase comes from IS-95 and is used in the radio configurations 1 and 2.

3.10   Scrambling - Uplink

In the scrambling block of the uplink system, the spread data stream is scrambled by means of the long code and the PN short code. Different methods are used for the radio configurations 1, 2 and RC3 to RC5.

3.10.1   Scrambling for Radio Configuration 1 and 2
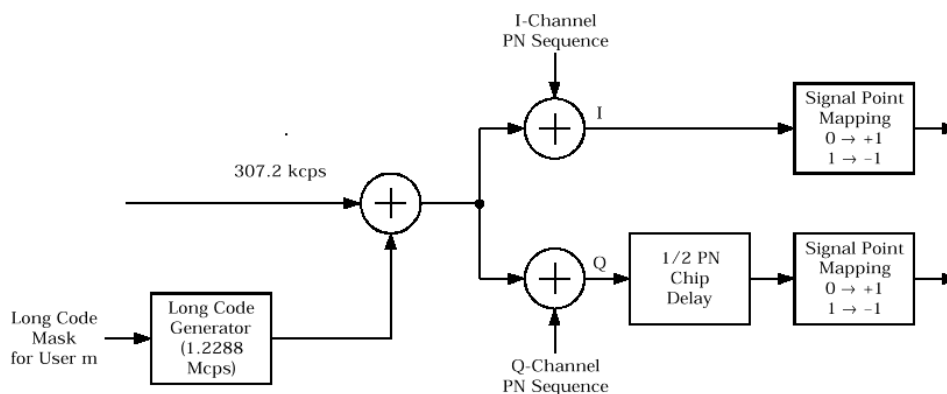
Figure 3-4: Scrambling in the uplink RC 1 and RC2

The output data stream of the spreading block is scrambled with the **long code**. The rate is increased in addition by a factor of four. The long-code generator is also referred to as scrambling code generator since it scrambles the chip sequence in a user-specific way (long-code mask). This generator exactly corresponds to the generation described in Chapter 3.5, "Long-Code Scrambling Generator - Downlink", on page 14 for the downlink.

The real input data stream of the **PN short-code** scrambler is multiplied by a complex PN sequence ($I_{PN} + j\, Q_{PN}$). This procedure is also called 'quadrature spreading'. With

channels of the radio configurations 1 and 2, whose generation is comparable with that of IS-95 systems, this block splits up the input stream in I and Q components.

In contrast to the downlink, no variable PN offset parameter is available for the PN short code in the reverse link. The PN offset is always 0.

Different generation rules are used for the PN short codes depending on the mode and spreading rate. The generator polynomials of the PN short codes correspond to the polynomials in the downlink (see Chapter 3.8, "PN Short-Code Scrambling - Downlink", on page 15). The I and Q data streams consisting of {0, 1} sequences are then mapped to {+1, -1} in the **signal point mapping** block.

Because of the delay of the Q component, offset QPSK constellation known from the reverse link of IS-95 is obtained from the QPSK constellation. Due to the Q delay, the transfer of the I and Q signal components from one chip to the next is never synchronous. For this reason, there are no zero crossings in the transfer from one chip to the next. This behavior can be seen in the vector diagram below.
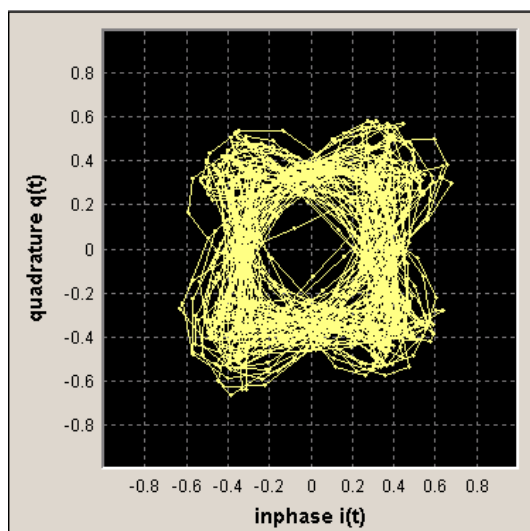
Figure 3-5: Scrambling in the uplink RC 1 and RC2

3.10.2 Scrambling for Radio Configuration 3, 4 and 5
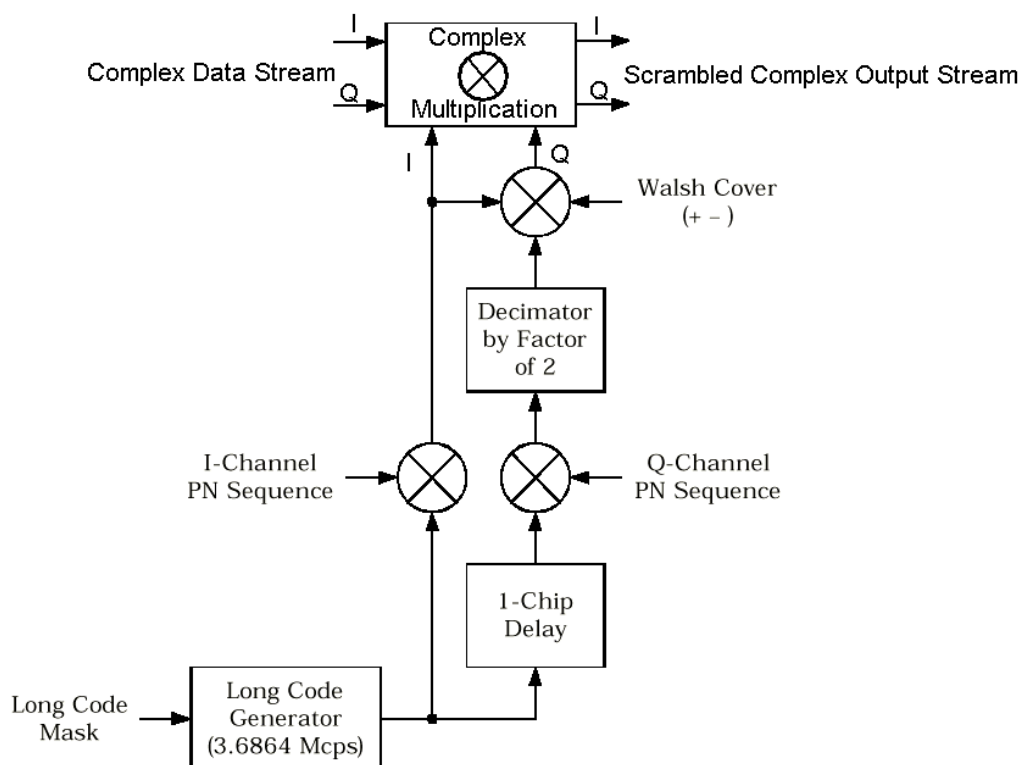
Figure 3-6: Scrambling in the uplink RC3, RC4 and RC5

Here too, the long-code generator defined in Chapter 3.5, "Long-Code Scrambling Generator - Downlink", on page 14 for the downlink is used. A complex long-code sequence is required. For this purpose, the output sequence of the generator is used as the I component and the sequence delayed by one chip as the Q component.

The I component of the long code is then multiplied by the I component of the PN short code. The same applies for the Q component. The definition of the PN short code is given in Chapter 3.8, "PN Short-Code Scrambling - Downlink", on page 15.

The subsequent operations decimate by factor of 2 and link the Q component to the Walsh sequence (+-) and the I component. They serve for reducing the zero crossings of the I/Q signal at the end of the whole scrambling process. Thus a behavior similar to behavior in the uplink of 3GPP is obtained. It is also known as **HPSK** (hybrid phase shift keying).

The resulting I/Q output stream is obtained by complex multiplication (modulo 2) of the I/Q input sequence of the scrambler by the complex scramble sequence. The complex scramble sequence is obtained from the long code and the PN short code. The constellation obtained is a combination of QPSK and offset QPSK.

In this mode, the traffic data streams of a channel are mapped either to the I or to the Q path of the complex data stream (see Figure 3-6). With these so-called BPSK channels, the channel component at the scrambler input consists of a real or an imaginary

component. As can be seen in the table below, the constellation after complex scrambling is again at the angle bisector.

Table 3-1: Output combinations with BPSK channels

d(n) \ S-Code(n)	-1-j	-1+j	+1-j	+1+j
-1	+1+j	+1-j	-1+j	-1-j
+1	-1-j	-1+j	+1-j	+1+j
-j	-1+j	+1+j	-1-j	+1-j
+j	+1-j	-1-j	+1+j	-1+j

3.11 Baseband Filtering - Uplink and Downlink

This block performs baseband filtering (pulse shaping and band limiting) of the I/Q signal. In addition to the filters specified in the standard, the signal generator also provides equalizer filters with a better adjacent-channel leakage ratio.

3.12 I/Q Modulator - Uplink and Downlink

The I/Q modulator defined in the IS2000 standard differs from the definition in this implementation. The definition on which the implementation is based is used by virtually all digital communication standards, except IS95 and IS2000.

In the final step, the filtered IQ signal is modulated to the desired RF in a different way in the I/Q modulator:
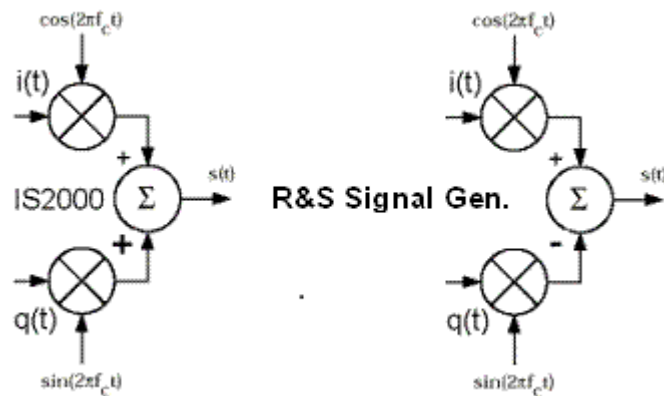
Figure 3-7: Definition of I/Q modulator in IS2000 and the R&S Signal Generator

IS2000 = the RF signal s(t) is derived from the baseband I/Q signal as $s(t)=i(t)\cos(2\pi f_c t) + q(t)\sin(2\pi f_c t)$

R&S SMx/AMU = the RF signal s(t) is based on the definition $s(t)=i(t)\cos(2\pi f_c t)-q(t)\sin(2\pi f_c t)$

To generate baseband signals according to IS2000 (CDMA200 standard) invert the Q-part of the signal, i.e. select "I/Q Modulator > I/Q Swap > On".

3.13   Constellation of I/Q Signals - Downlink

Depending on radio configuration and channel type, the signal components in the different channels create different subconstellations.

3.13.1   BPSK channels

With some channel types (in RC1/2 and in the pilot channel), the data stream is split up in I and Q components in the **PN short code scrambling** block. The input data stream of this block is a real +/-1 sequence similar to BPSK. The complex output data sequence is then as follows:

$S_{out}(n) = d_{in}(n) (PN_I(n) + j PN_Q(n))$, with $d_{in}(n)$, $PN_I(n)$, $PN_Q(n) \in \{-1, +1\}$.

This yields four different output combinations for S_{out}:

(-1 –j), (-1 +j), (+1 –j), (+1 +j),

i.e. all points are on one of the two angle bisectors at the I/Q level.
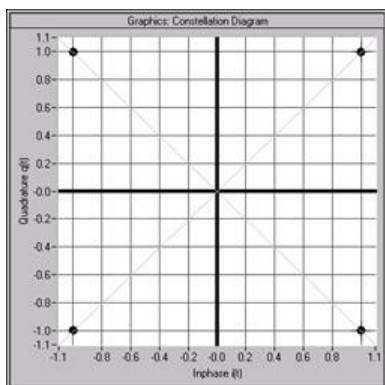
Figure 3-8: Constellation diagram of a BPSK channel with 0 dB power

3.13.2   QPSK channels

With other channel types, the input data stream of the **PN short code scrambling** block is a complex ±1 ±j sequence similar to QPSK. The complex output data sequence is then as follows:

$S_{out}(n) = (d_I(n) + jd_Q(n)) (PN_I(n) + j PN_Q(n))$, with $d_I(n)$, $d_Q(n)$, $PN_I(n)$, $PN_Q(n) \in \{-1, +1\}$.

Table 3-2: Output combinations with QPSK channels

PN(n) \ d(n)	-1-j	-1+j	+1-j	+1+j
-1-j	+2j	+2	-2	-2j
-1+j	+2	-2j	+2j	-2
+1-j	-2	+2j	-2j	+2
+1+j	-2j	-2	+2	+2j

This again yields four different output combinations for S_{out}:

-2j, 2j, -2, 2,

i.e. all points are on one of the two axes at the I/Q level.
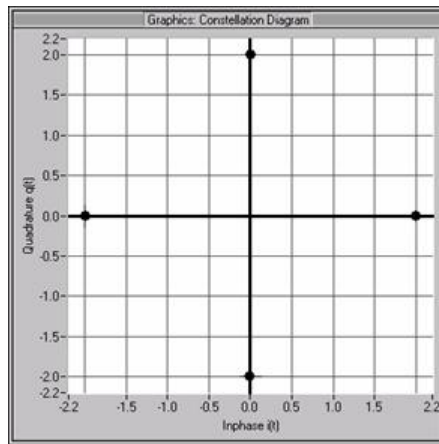
Figure 3-9: Constellation diagram of a QPSK channel with 0 dB power

3.14 Power Control - Downlink and Uplink

After spreading and scrambling, a channel-specific power factor p is applied to the signal. For example, a value of -6 dB therefore results in half the level (or 1/4 power).

4 User Interface
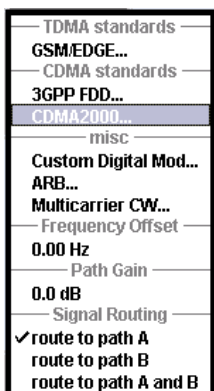
The dialog for setting the CDMA2000 digital standard is either called from the baseband block or from the dialog tree under Baseband.

The dialog is split into several sections for configuring the standard. The choice of transmission direction determines which displays and parameters are made available in the lower section.

The upper section of the dialog is where the CDMA2000 digital standard is enabled, the default settings are called and the transmission direction selected.

The valid CDMA2000 version and the spreading rate in use are displayed.

Many of the buttons lead to subdialogs for loading and saving the CDMA2000 configuration and for setting the filter, trigger and clock parameters.

The lower dialog section is where either the base station signal or the mobile station signal is configured, depending on the transmission direction selected.
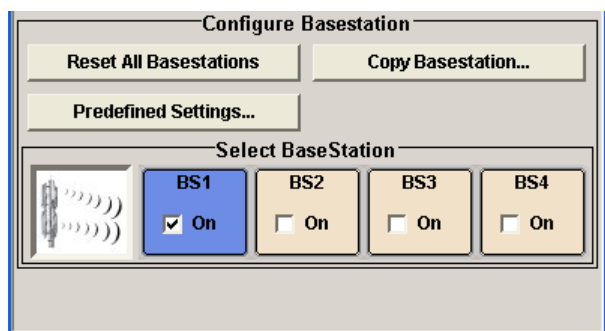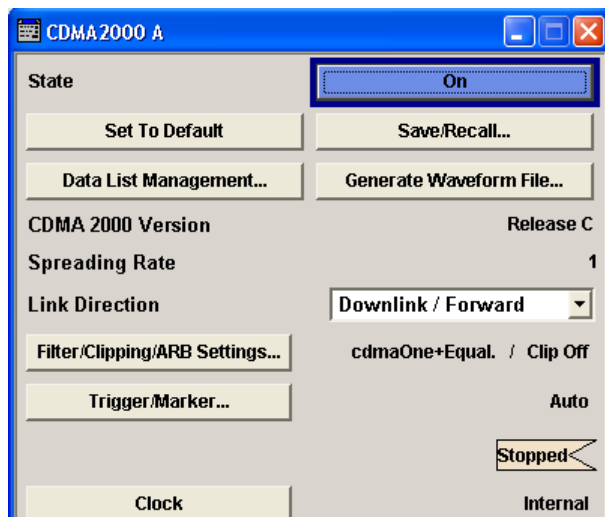
4.1 General Settings for CDMA2000 Signals

The upper dialog section is where the CDMA2000 digital standard is enabled and reset and where all the settings valid for the signal in both transmission directions are made.

State

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

Remote command:

[:SOURce<hw>]:BB:C2K:STATe on page 92

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 "Set to default"
Link Direction	Downlink
Filter	CdmaOne + Equalizer
Clipping	Off
Trigger	Auto
Clock	Internal
Base Station Configuration	
State	Off
Radio Configuration Traffic Channels 1 and 2	RC3
Radio Configuration other Traffic Channels	RC1
Time Delay	0 chips
PN Offset	0
Transmit Diversity	Off
Quasi Orthogonal Walsh Set	1
Mobile Station Configuration	
State	Off
Mode	Traffic
Radio Configuration	RC3
Channel Coding	Complete
LC Mask (hex)	0
State (all Channels)	Off
Power Control	Off

Remote command:

[:SOURce<hw>]:BB:C2K:PRESet on page 90

Save/Recall ...

Calls the "Save/Recall" dialog.

From the Save/Recall dialog,"" the "File Select" windows for saving and recalling CDMA2000 configurations and the "File Manager" can be called.

CDMA2000 configurations are stored as files with the predefined file extension *.cdma2k. The file name and the directory they are stored in are user-definable.

The complete settings in the "CDMA2000" dialog are saved and recalled.

"Recall CDMA2000 Setting"

Opens the File Select window for loading a saved CDMA2000 configuration.
The configuration of the selected (highlighted) file is loaded by pressing the "Select" button.

"Save CDMA2000 Setting"

Opens the "File Select" window for saving the current CDMA2000 signal configuration.
The name of the file is specified in the File name entry field, the directory selected in the save into field. The file is saved by pressing the "Save" button.
The "Fast Save" checkbox determines whether the instrument performs an absolute or a differential storing of the settings. Enable this function to accelerate the saving process by saving only the settings with values different to the default ones. "Fast Save" is not affected by the "Preset" function.

"File Manager"　　Calls the "File Manager".
The "File Manager" is used to copy, delete and rename files and to create directories.

Remote command:

[:SOURce<hw>]:BB:C2K:SETTing:CATalog? on page 90
[:SOURce<hw>]:BB:C2K:SETTing:LOAD on page 91
[:SOURce<hw>]:BB:C2K:SETTing:STORe on page 91
[:SOURce<hw>]:BB:C2K:SETTing:STORe:FAST on page 92
[:SOURce<hw>]:BB:C2K:SETTing:DELete on page 91

Data List Management

Calls the "Data List Management" dialog. This dialog is used to create and edit a data list.
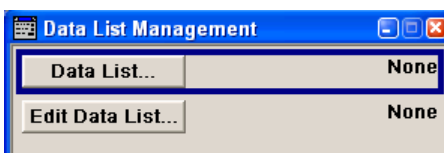
All data lists are stored as files with the predefined file extension `*.dm_iqd`. The file name and the directory they are stored in are user-definable.

The data lists must be selected as a data source from the subdialogs under the individual function, e.g. in the channel table of the base stations.

Note: All data lists are generated and edited by means of the `SOURce:BB:DM` subsystem commands. Files containing data lists usually end with `*.dm_iqd`. The data lists are selected as a data source for a specific function in the individual subsystems of the digital standard.

Example: Creating and editing the data list

`:SOUR:BB:DM:DLIS:SEL "d_list1"`

`:SOUR:BB:DM:DLIS:DATA #B11110101010100000011111....`

`:SOUR:BB:DM:DLIS:DATA:APP #B11110101010100000011111....`

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA`
on page 121
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:DSELect` on page 122
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA` on page 128
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA:DSELect` on page 128
`[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA` on page 147
`[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:DSELect` on page 148
`[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA` on page 154
`[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:DSELect` on page 154

Generate Waveform File
Opens the subdialog for storing the current CDMA2000 signal as ARB signal in a waveform file. This file can be loaded in the ARB dialog and processed as multicarrier or multisegment signal.

The file name is entered in the subdialog. The file is stored with the predefined file extension `*.wv`. The file name and the directory it is stored in are user-definable.

Remote command:
`[:SOURce<hw>]:BB:C2K:WAVeform:CREate` on page 93

CDMA 2000 Version
Displays the current version of the CDMA2000 standard.

The default settings and parameters provided are oriented towards the specifications of the version displayed.

Remote command:
`[:SOURce]:BB:C2K:VERSion?` on page 93

Spreading Rate

Displays the spreading rate.

Mode Spreading Rate 1 ("Direct Spread 1X") is used:

The **Chip Rate** parameter which determines the rate of the spread symbols that is used for signal output, can be varied in the Filter, Clipping, ARB Settings dialog (see Chapter 4.3, "Filter / Clipping / ARB Settings", on page 31).

Remote command:

[:SOURce<hw>]:BB:C2K:CRATe? on page 88

Link Direction

Selects the transmission direction.

The settings of the base station or the mobile station are provided in the following dialog section in accordance with the selection.

"Downlink/ Forward Link"

> The transmission direction selected is base station to mobile station. The signal corresponds to that of a base station.

"Uplink/ Reverse Link"

> The transmission direction selected is mobile station to base station. The signal corresponds to that of a mobile station.

Remote command:

[:SOURce<hw>]:BB:C2K:LINK on page 89

Filtering/Clipping/ARB Settings

Calls the dialog for setting baseband filtering, clipping and the sequence length of the arbitrary waveform component. The current setting is displayed next to the button.

The dialog is described in Chapter 4.3, "Filter / Clipping / ARB Settings", on page 31.

Remote command:

n.a.

Trigger/Marker

Calls the dialog for selecting the trigger source, for configuring the marker signals and for setting the time delay of an external trigger signal (see Chapter 4.4, "Trigger/ Marker/Clock Settings", on page 35).

The currently selected trigger source is displayed to the right of the button.

Remote command:

n.a.

Execute Trigger

Executes a trigger manually. A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

Remote command:

[:SOURce<hw>]:BB:C2K:TRIGger:EXECute on page 99

Clock

Calls the dialog for selecting the clock source and for setting a delay (see Chapter 4.4, "Trigger/Marker/Clock Settings", on page 35).

Remote command:
n.a.

4.2 Configure Base Station or Mobile Station

Depending on the transmission direction selection, the central section of the dialog provides the "Configure Base Station" section or the "Configure Mobile Station" section.
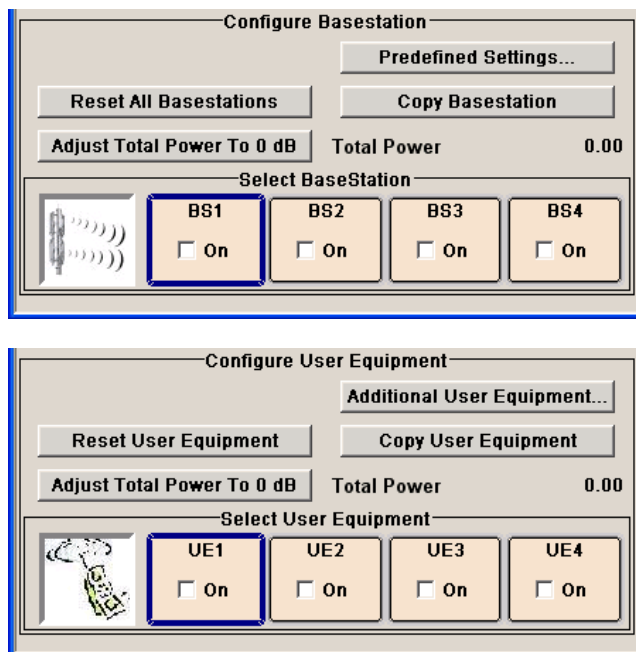
Reset All Base Stations
Resets all base stations to the predefined settings. The following table gives an overview of the settings. The preset value for each parameter is specified in the description of the remote-control commands.

Parameter	Value
Base Station Configuration	
State	Off
Time Delay	0 chips
PN Offset	0
Transmit Diversity	Off
Quasi-orthogonal Walsh set	1
State (all channels)	Off
Frame Length (0-5 / 0-7/ 0-10)	26.6 ms / 40 ms / 5 ms
Frame Length (all other channels)	20 ms

Parameter	Value
Data Rate (0-6,0-10,0-11,1-1,1-4,2-1,2-4)	9.6 kbps
Data Rate (0-7,0-9,1-2,1-3,2-2,2-3)	19.2 kbps
Data Rate (all other channels)	1.2 kbps
Walsh (0-2 / 0-5)	16 / 32
Walsh (1-1 / 1-2 / 1-3 / 2-1 / 2-2 / 2-3)	8 / 17 /18 /9 / 19 /20
Walsh (all other channels)	0
Power (0-1 / 0-6)	-7 dB / -6.62 dB
Power (0-5 , 1-1, 2-1 / 1-2, 1-3, 2-2, 2-3)	-12.72 dB / -9.72 dB
Power (all other channels)	0 dB
Data Source (0-1, 0-2, 0-3, 0-4)	All0
Data Source (all other channels)	PN9
Channel Coding (all Channels)	Complete

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation:PRESet`

Reset All Mobile Stations
Resets all mobile stations to the predefined settings. The following table gives an over-view of the settings. The preset value for each parameter is specified in the description of the remote-control commands.

Parameter	Value
Mobile Station Configuration	
State	Off
Mode	Traffic
Radio Configuration	3
Channel Coding	Complete
LC Mask (hex)	0
State (all Channels)	Off
Frame Length	20 ms
Data Rate (2 / 3, 4, 5)	9.6 kbps / 1.5 kbps
Walsh (0 / 8 / 4 / 2 /6)	0 / 8 / 4 / 2 / 6
Spread (2 / 3, 4, 5)	32 / 16
Power	0 dB
Data Source	PN9

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation:PRESet on page 146

Copy ...

Copies the settings of a base or mobile station to a second base or mobile station. A window opens for creating the destination station.

"Downlink / Forward" link direction	"Uplink / Reverse" link direction
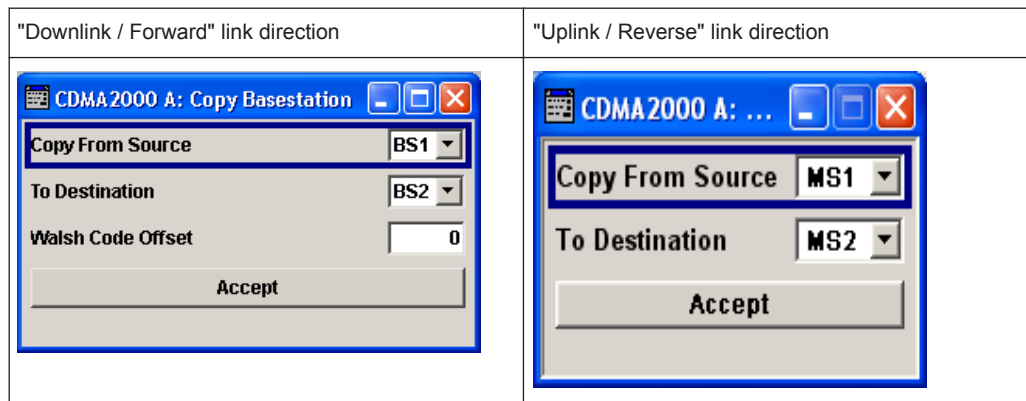
"Copy from Source"

> Selects the base station or mobile station whose settings are to be copied.

"To Destination"

> Selects the base station or mobile station whose settings are to be overwritten.

"Walsh Code Offset (Base Station only)"

> Enters the offset to be applied when copying the base station to the Walsh codes of the destination base station. The minimum value is 0 (Walsh codes are identical), the maximum value is 255.

"Accept"   Starts the copy process.

Remote command:

[:SOURce<hw>]:BB:C2K:COPY:SOURce on page 88

[:SOURce<hw>]:BB:C2K:COPY:DESTination on page 87

[:SOURce<hw>]:BB:C2K:COPY:COFFset on page 87

[:SOURce<hw>]:BB:C2K:COPY:EXECute on page 87

Predefined Settings

Accesses the dialog for setting predefined configurations in "Downlink / Forward" direction, see Chapter 4.5, "Predefined Settings - Downlink", on page 44.

Additional Mobile Station

Accesses the dialog for simulating up to 64 additional mobile stations, see Chapter 4.6, "Additional Mobile Station - Uplink", on page 47.

Adjust Total Power to 0dB

Sets the power of an enabled channel so that the total power of all the active channels is 0 dB. This does not change the power ratio among the individual channels.

This parameter is available when the "CDMA2000 > State > On".

Remote command:
[:SOURce<hw>]:BB:C2K:POWer:ADJust on page 90

Total Power
Displays the total power of the active channels.

The total power is calculated from the power ratio of the powered up code channels with modulation on. If the value is not equal to 0 dB, the individual code channels are internally adapted so that the "Total Power" for achieving the set output level is 0 dB. Power ratios between the channels are retained.

Remote command:
[:SOURce<hw>]:BB:C2K:POWer[:TOTal]? on page 90

Select ...
Selects the base or mobile station and opens a dialog for editing the selected base or mobile station.

The dialogs are described in Chapter 4.7, "Base Station Configuration", on page 48 and Chapter 4.10, "Mobile Station Configuration (MS)", on page 76.

Remote command:
(the base station or mobile station is selected by the keyword index BSTation<i> or MSTation<i>.)

Base Station/Mobile Station State
Activates a base or mobile station.
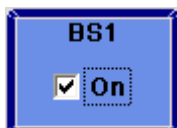
Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:STATe on page 142
[:SOURce<hw>]:BB:C2K:MSTation<st>:STATe on page 154

4.3 Filter / Clipping / ARB Settings

► To access this dialog, select "Main dialog > Filter/Clipping/ARB Settings".
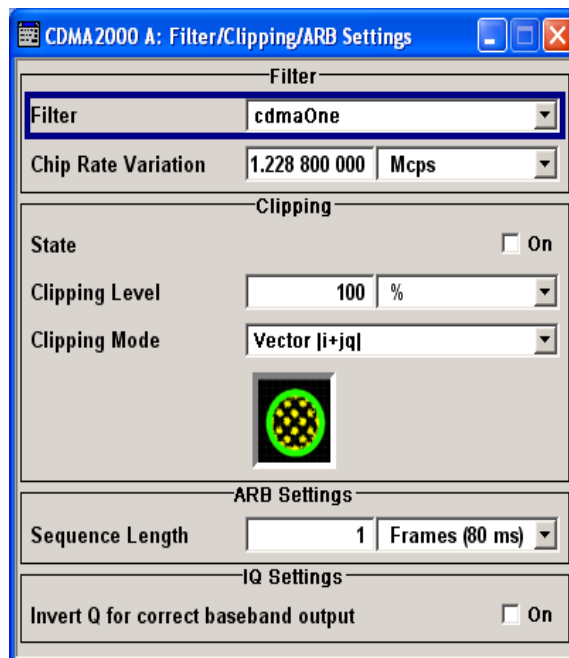
The dialog comprises the settings, necessary to configure the baseband filter, to enable clipping and adjust the sequence length of the arbitrary waveform component.

4.3.1 Filter Settings

Provided are the following settings:

Filter
Selects the baseband filter.

Remote command:
[:SOURce<hw>]:BB:C2K:FILTer:TYPe on page 94

Roll Off Factor or BxT
Sets the filter parameter.

The filter parameter ("Folloff Factor" or "BxT") depends on the currently selected filter type. This parameter is preset to the default for each of the predefined filters.

Remote command:
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:APCO25 on page 94
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:COSine on page 94
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:GAUSs on page 94
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:PGAuss on page 95

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:RCOSine on page 96
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:SPHase on page 96

Cutoff Frequency Factor
Sets the value for the cutoff frequency factor. The cutoff frequency of the filter can be adjusted to reach spectrum mask requirements.

Remote command:
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:LPASs on page 95
[:SOURce<hw>]:BB:C2K:FILTer:PARameter:LPASSEVM on page 95

Chip Rate Variation
Enters the chip rate.

Remote command:
[:SOURce<hw>]:BB:C2K:CRATe:VARiation on page 89

4.3.2 Clipping Settings

Provided are the following settings for configuring clipping:

Clipping State
Switches baseband clipping on and off.

Baseband clipping is a simple and effective way of reducing the crest factor of the signal. Since clipping is done before to filtering, the procedure does not influence the spectrum. The EVM however increases.

CDMA signals can have high crest factors particularly with many channels and long sequences. High crest factors entail two basic problems:
● The nonlinearity of the power amplifier (compression) causes intermodulation which expands the spectrum (spectral regrowth).
● Since the level in the D/A converter is relative to the maximum value, the average value is converted with a relatively low resolution. This results in a high quantization noise.

Both effects increase the adjacent-channel power.

With baseband clipping, all the levels are limited to a settable value ("Clipping Level"). This level is specified as a percentage of the highest peak value.

Since clipping the signal not only changes the peak value but also the average value, the effect on the crest factor is unpredictable.

Example:

This example shows the effect of the Clipping on the crest factor for typical scenarios.

The following pictures demonstrate the effect of clipping with vector mode (|i+q|), using a signal configuration with two active channels.
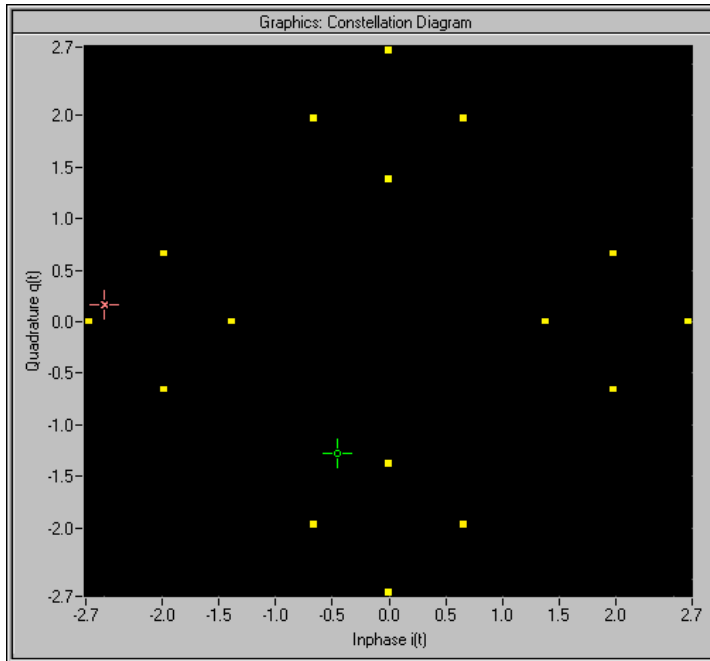
Figure 4-1: Constellation diagram of the signal without clipping, shows the level mapping .
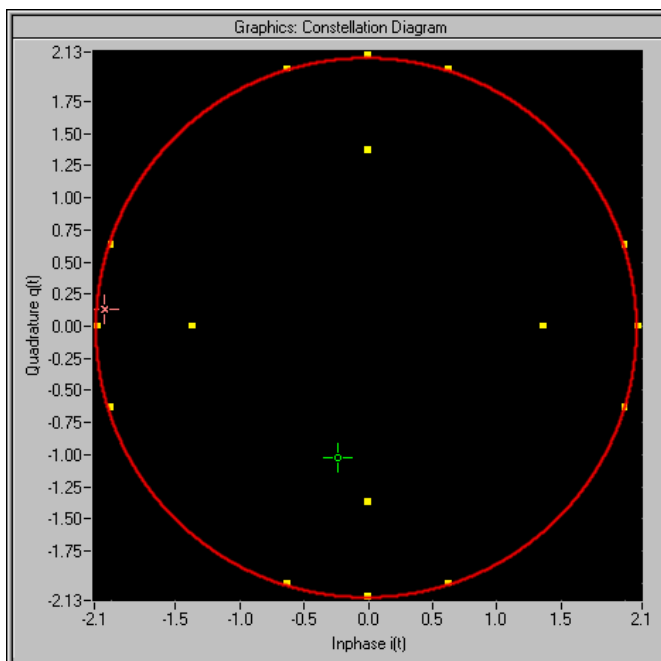
Figure 4-2: Constellation diagram with clipping level 80 %, vector mode (|i+q|) The circle emphasizes the changed constellation points.

Remote command:

`[:SOURce<hw>]:BB:C2K:CLIPping:STATe` on page 97

Clipping Level

Sets the limit for clipping.

This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Remote command:

`[:SOURce<hw>]:BB:C2K:CLIPping:LEVel` on page 96

Clipping Mode

Selects the clipping method. A graphic illustration of the way in which this two methods work is given in the dialog.

- "Vector | i + jq |"
  The limit is related to the amplitude | i + q |. The I and Q components are mapped together, the angle is retained.
- "Scalar | i | , | q |"
  The limit is related to the absolute maximum of all the I and Q values | i | + | q |. The I and Q components are mapped separately, the angle changes.

Remote command:

`[:SOURce<hw>]:BB:C2K:CLIPping:MODE` on page 97

4.3.3 ARB Settings

Provided are the following settings for configuring the ARB settings:

Sequence Length ARB

Changes the sequence length of the arbitrary waveform component of the signal. This component is calculated in advance and output in the arbitrary waveform generator.

The number of chips is determined from this sequence length (1 Frame = 80 ms) and the chip rate. At 1.2288 MChips/s, a frame equals 98.304 chips.

In pure amplifier tests with several channels and no realtime channels, it is possible to improve the statistical properties of the signal by increasing the sequence length.

Note: Unlike for 3GPP, in the case of CDMA2000 the length of a frame is not uniformly defined. This implementation uses a frame length of 80 ms. Division into 80 ms frames was chosen because in this time grid the frame lengths for both the SYNC channel, with its cycle duration of 26.67 ms, and all other channels work out to 5 ms, 10 ms, 20 ms or 80 ms. The F-BCH has a frame length of 160 ms. In order to use this channel, an even number of 80 ms frames has to be set.

Remote command:

`[:SOURce<hw>]:BB:C2K:SLENgth` on page 92

4.3.4 I/Q Setting

Provided are the following settings for configuring the IQ settings:

Invert Q for Correct Baseband Output

Inverts Q-part of the baseband signal, see Chapter 3.12, "I/Q Modulator - Uplink and Downlink", on page 19.

With its default CDMA2000 settings, the R&S Signal Generator generates a standard compliant *RF* signal.

If a standard compliant *baseband* signal is required, enable this parameter to invert the Q-part of the baseband signal.

If both, the RF signal and baseband signal have to be compliant with the CDMA2000 standard:

● Set "Invert Q for Correct Baseband Output > On"
● Set "I/Q Mod > I/Q Settings > I/Q Swap > On"

Remote command:
`[:SOURce<hw>]:BB:C2K:IQSWap[:STATe]` on page 89

4.4 Trigger/Marker/Clock Settings

To access this dialog, select "Main Menu > Trigger/Marker".

The "Trigger In" section is where the trigger for the signal is set. Various parameters are provided for the settings, depending on which trigger source - internal or external - is selected. The status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.
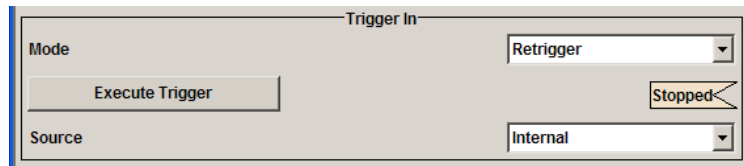
The "Marker Mode" section is where the marker signals at the MARKER output connectors are configured.
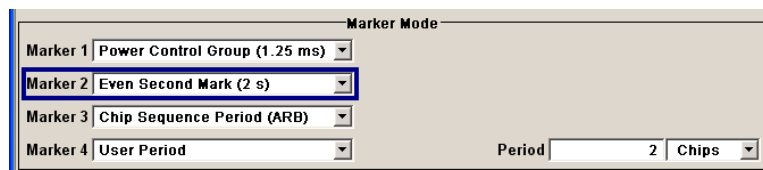
The "Marker Delay" section is where a marker signal delay can be defined, either without restriction or restricted to the dynamic range.
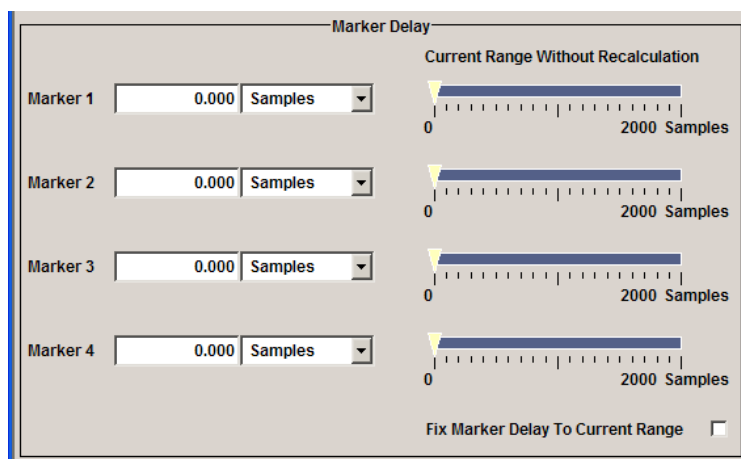
The "Clock Settings" section is where the clock source is selected and - in the case of an external source - the clock type.
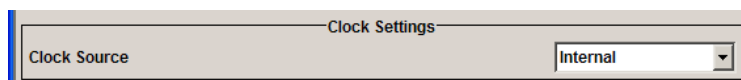
The buttons in the last section lead to subdialog for general trigger, clock and mapping settings.

4.4.1 Trigger In

The "Trigger In" section is where the trigger for the signal is set. Various parameters are provided for the settings, depending on which trigger source - internal or external - is selected. The status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.

Trigger Mode
Selects trigger mode, i.e. determines the effect of a trigger event on the signal generation.

- "Auto"
  The signal is generated continuously.
- "Retrigger"
  The signal is generated continuously. A trigger event (internal or external) causes a restart.
- "Armed Auto"
  The signal is generated only when a trigger event occurs. Then the signal is generated continuously.
  An "Arm" stops the signal generation. A subsequent trigger event (internal with or external) causes a restart.
- "Armed Retrigger"

The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
An "Arm" stops signal generation. A subsequent trigger event (internal with or external) causes a restart.

- "Single"
  The signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at "Signal Duration".
  Every subsequent trigger event (internal or external) causes a restart.

Remote command:
[:SOURce<hw>]:BB:C2K[:TRIGger]:SEQuence on page 98

Signal Duration Unit

Defines the unit for the entry of the length of the signal sequence to be output in the "Single" trigger mode. Available units are chip sequence length (CLS), chips or frames.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:SLUNit on page 102

Signal Duration

Defines the length of the signal sequence to be output in the "Single" trigger mode.

It is possible to output deliberately just part of the signal, an exact sequence of the signal, or a defined number of repetitions of the signal.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:SLENgth on page 101

Running/Stopped

With enabled modulation, displays the status of signal generation for all trigger modes.

- "Running"
  The signal is generated; a trigger was (internally or externally) initiated in triggered mode.
- "Stopped"
  The signal is not generated and the instrument waits for a trigger event.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:RMODe? on page 101

Arm

Stops the signal generation until subsequent trigger event occurs.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:ARM:EXECute on page 99

Execute Trigger

Executes a trigger manually. A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:EXECute on page 99

Trigger Source

Selects trigger source. This setting is effective when a trigger mode other than "Auto" has been selected.

- "Internal"
  The trigger event is executed by "Execute Trigger".
- "Internal (Baseband A/B)"
  (two-path instruments)
  The trigger event is the trigger signal from the second path
- "External (Trigger 1/2)"
  The trigger event is the active edge of an external trigger signal, supplied at the TRIGGER 1/2 connector.
  Use the "Global Trigger/Clock Settings" dialog to define the polarity, the trigger threshold and the input impedance of the trigger signal.

Remote command:

[:SOURce<hw>]:BB:C2K:TRIGger:SOURce on page 99

Sync. Output to External Trigger

(enabled for "Trigger Source" External)

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

For two or more R&S SMBV working in a master-slave mode, configure this parameter depending on the provided system trigger event and the properties of the output signal. See the table below for an overview of the required settings.

Table 4-1: Typical applications

System trigger	Application	"Sync. Output to External Trigger"
Common External Trigger event for the master and the slave instruments	All instruments are synchronous to the external trigger event	On
	All instruments are synchronous among themselves but starting the signal from first symbol is more important than synchronicity with external trigger event	Off
Internal trigger signal of the master R&S SMBV for the slave instruments	All instruments are synchronous among themselves	Off

"On"   Corresponds to the default state of this parameter.
                        The signal calculation starts simultaneously with the external trigger
                        event but because of the instrument's processing time the first sam-
                        ples are cut off and no signal is outputted. After elapsing of the inter-
                        nal processing time, the output signal is synchronous to the trigger
                        event.
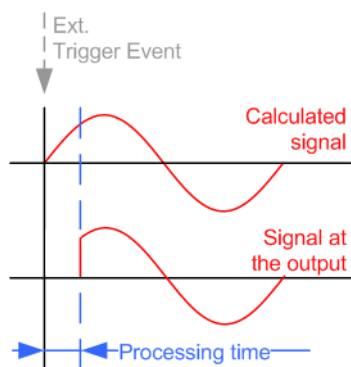
"Off"   The signal output begins after elapsing of the processing time and
                        starts with sample 0, i.e. the complete signal is outputted.
                        This mode is recommended for triggering of short signal sequences
                        with signal duration comparable with the processing time of the
                        instrument.
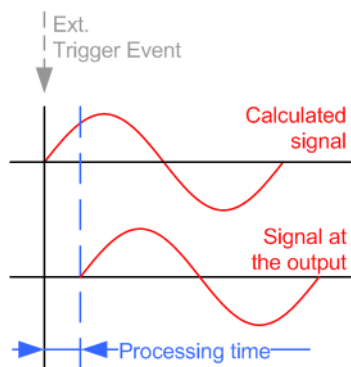
Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:EXTernal:SYNChronize:OUTPut
on page 99

Trigger Delay

Sets the trigger signal delay in samples on external triggering.

This enables the R&S Signal Generator to be synchronized with the device under test
or other external devices.

For two-path instruments, the delay can be set separately for each of the two paths.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger[:EXTernal<ch>]:DELay on page 100
[:SOURce<hw>]:BB:C2K:TRIGger:OBASeband:DELay on page 100

Trigger Inhibit

Sets the duration for inhibiting a new trigger event subsequent to triggering. The input is to be expressed in samples.

In the "Retrigger" mode, every trigger signal causes signal generation to restart. This restart is inhibited for the specified number of samples.

This parameter is only available on external triggering or on internal triggering via the second path.

For two-path instruments, the trigger inhibit can be set separately for each of the two paths.

Remote command:

[:SOURce<hw>]:BB:C2K:TRIGger[:EXTernal<ch>]:INHibit on page 101
[:SOURce<hw>]:BB:C2K:TRIGger:OBASeband:INHibit on page 100

4.4.2   Marker Mode

The marker output signal for synchronizing external instruments is configured in the "Marker Settings" section "Marker Mode".

The R&S SMBV supports only two markers.

Marker Mode

Selects a marker signal for the associated MARKER output.
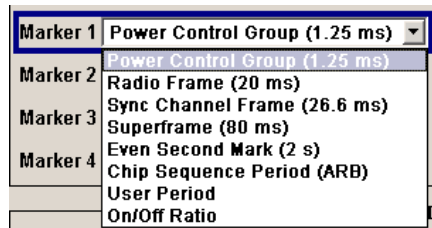
"Power Control Group (1.25 ms)"	A marker signal is generated at the start of each Power Control group (every 1.25 ms).
"Radio Frame (20 ms)"	A marker signal is generated every 20 ms (traffic channel frame clock).
"Sync Channel Frame (26.6 ms)"	A marker signal is generated at the beginning of each Sync Channel Frame (every 26.6 ms).
"Superframe (80 ms)"	A marker signal is generated every 80 ms (super frame clock).
"Even Second Mark (2 s)"	A marker signal is generated every 2 seconds.
"Chip Sequence Period (ARB)"	A marker signal is generated at the beginning of every arbitrary wave-form sequence (depending on the set sequence length). The marker signal is generated regardless of whether an ARB component is used.

"ON/OFF Period"   A regular marker signal that is defined by an on/off ratio is generated. A period lasts one on and off cycle.

| ON time | OFF time | ON time | OFF time |

The "ON Time" and "OFF Time" are each expressed as a number of samples and are set in an input field which opens when on/off ratio is selected.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:ONTime on page 104
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:OFFTime on page 104

"User Period"   A marker signal is generated at the beginning of every user-defined period. The period is defined in "Period".

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:PERiod on page 104

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:MODE on page 103

4.4.3 Marker Delay

The delay of the signals on the MARKER outputs is set in the "Marker Delay" section.

The R&S SMBV supports only two markers.

Marker x Delay
Enters the delay between the marker signal at the marker outputs and the start of the frame or slot.

The input is expressed as a number of symbols/samples.

If the setting "Fix marker delay to dynamic range" is enabled, the setting range is restricted to the dynamic range. In this range, the delay of the marker signals can be set without restarting the marker and signal.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay on page 103

Current Range without Recalculation
Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and signal.

The delay can be defined by moving the setting mark.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay:MINimum? on page 103
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay:MAXimum? on page 103

Fix marker delay to current range
Restricts the marker delay setting range to the dynamic range. In this range, the delay can be set without restarting the marker and signal.

Remote command:
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut:DELay:FIXed on page 102

4.4.4 Clock Settings

The "Clock Settings" is used to set the clock source and a delay if necessary.

Sync. Mode
(for R&S SMBV only)

Selects the synchronization mode.

This parameter is used to enable generation of precise synchronous signal of several connected R&S SMBVs.

Note: If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type.
Avoid unnecessary cable length and branching points.

"None"   The instrument is working in standalone mode.

"Sync. Master" The instrument provides all connected instrument with its synchroni-
                zation (including the trigger signal) and reference clock signal.
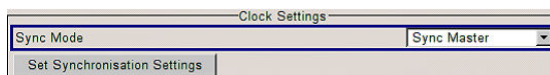
"Sync. Slave"   The instrument receives the synchronization and reference clock sig-
                nal from another instrument working in a master mode.
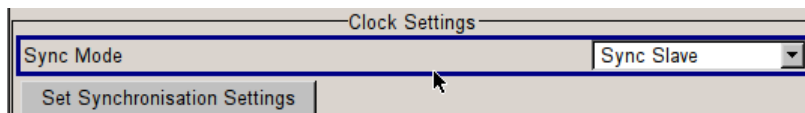
Remote command:
[:SOURce<hw>]:BB:C2K:CLOCk:SYNChronization:MODE on page 107

Set Synchronization Settings
(for R&S SMBV only)

Performs automatically adjustment of the instrument's settings required for the syn-
chronization mode, selected with the parameter "Synchronization Mode".

Remote command:
[:SOURce<hw>]:BB:C2K:CLOCk:SYNChronization:EXECute on page 106

Clock Source
Selects the clock source.

"Internal"   The internal clock reference is used to generate the symbol clock.

"External"   The external clock reference is fed in as the symbol clock or multiple thereof via the CLOCK connector.
The symbol rate must be correctly set to accuracy of +/-2 % (see data sheet).
The polarity of the clock input can be changed with the aid of "Global Trigger/Clock Settings".
In the case of two-path instruments, this selection applies to path A.

Remote command:
[:SOURce<hw>]:BB:C2K:CLOCk:SOURce on page 106

Clock Mode
Enters the type of externally supplied clock.

"Chip"   A chip clock is supplied via the CLOCK connector.

"Multiple"   A multiple of the chip clock is supplied via the CLOCK connector; the chip clock is derived internally from it.
The "Multiplier" window provided allows the multiplication factor to be entered.

Remote command:
[:SOURce<hw>]:BB:C2K:CLOCk:MODE on page 105

Clock Multiplier
Enters the multiplication factor for clock type "Multiple".

Remote command:
[:SOURce<hw>]:BB:C2K:CLOCk:MULTiplier on page 105

Measured External Clock
Provided for permanent monitoring of the enabled and externally supplied clock signal.

Remote command:
CLOCk:INPut:FREQuency?

4.4.5 Global Settings

The buttons in this section lead to dialogs for general trigger, clock and mapping settings.

Global Trigger/Clock Settings
Calls the "Global Trigger/Clock/Input Settings" dialog.

This dialog is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs.

The parameters in this dialog affect all digital modulations and standards, and are described in chapter "Global Trigger/Clock/Input Settings" in the Operating Manual.

User Marker / AUX I/O Settings
Calls the "User Marker AUX I/O Settings" dialog, used to map the connector on the rear of the instruments.

See also "User Marker / AUX I/O Settings" in the Operating Manual.

4.5 Predefined Settings - Downlink

The "Predefined Settings" can be reached via the "CDMA2000" main dialog. It is only available when the Downlink transmission direction is selected.

In the top section of the dialog, the radio configuration of the test scenario and the used special channels are selected.

The channel table of base station 1 is filled (preset) with the set parameters.

With the "Predefined Settings" function, it is possible to create highly complex scenarios with just a few keystrokes. This function is of use if, say, just the envelope of the signal is of interest.

A separate set of settings of all predefined parameters is provided for each radio configuration. If the radio configuration is changed, the set of traffic channel settings belonging to this RC is automatically indicated.
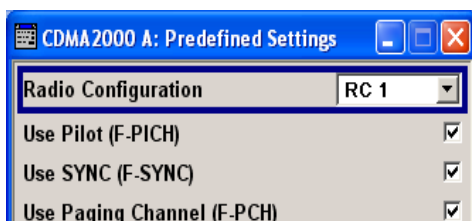
In the "Traffic Channel Settings" section, the number and the structure of the traffic channels used in the test scenario is set. The selected structure is valid for all activated traffic channels.

The indicated parameters depend on the radio configuration. Their settings are specific for the selected radio configuration.
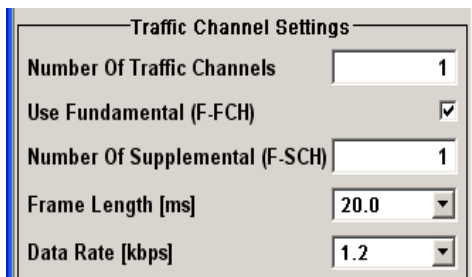
Additionally, the desired range for the crest factor is selected. Button "Accept" presets the channel table of base station 1 with the predefined parameters.

Radio Configuration - Predefined Settings
Selects the radio configuration (RC).

The R&S Signal Generator provides a separate set of settings of all predefined traffic channel parameters for each radio configuration. If the radio configuration is changed, the set of traffic channel table values belonging to this RC is automatically activated.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:RCONfiguration on page 109

Use Pilot (F-PICH) - Predefined Settings

Selects if pilot channel F-PICH is used in the scenario or not.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:PICHannel[:STATe] on page 109

Use Sync (F-Sync) - Predefined Settings

Selects if sync channel F-SYNC is used in the scenario or not.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:SCHannel[:STATe] on page 109

Use Paging Channel (F-PCH) - Predefined Settings

Selects if paging channel F-PCH is used in the scenario or not.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:PCHannel[:STATe] on page 108

Number of Traffic Channels - Predefined Settings

Sets the number of activated traffic channels. Channels F-DCCH, F-FCH, and F-SCH form a traffic channel.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:COUNt on page 110

Use Dedicated Control (F-DCCH) - Predefined Settings

Selects if the dedicated control channel F-DCCH is activated for the traffic channel or not. PN9 is used as a data source for F-DCCH.

The set state is specific for the selected radio configuration.

F-DCCH cannot be activated for radio configuration RC1 and RC2.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:DCCHannel[:STATe]
on page 111

Use Fundamental (F-FCH) - Predefined Settings

Selects if the fundamental channel F-FCH is activated for the traffic channel or not. PN9 is used as data source for F-FCH. The set value is specific for the selected radio configuration.

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:FCHannel[:STATe]
on page 111

Number of Supplemental (F-SCH) - Predefined Settings

Sets the number of activated supplemental channels F-SCH. PN9 is used as data source for F-SCH. The set value is specific for the selected radio configuration.

The maximum number depends on the selected radio configuration:
- RC1 and RC2: 0 ... 7
- RC3, RC4, and RC5: 0 ... 2

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:SCHannel:COUNt
on page 112

Frame Length - Predefined Settings
Sets the frame length of the traffic channel. The set value is specific for the selected radio configuration.

The value range for the frame length depends on the selected radio configuration:
- RC1 and RC2: 20 ms
- RC3 to RC5: 5, 20, 40 ms and 80 ms

Remote command:

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:FLENgth on page 111

Data Rate - Predefined Settings
Sets the data rate for F-FCH and all F-SCH. The set value is specific for the selected radio configuration.

The value range depends on the set frame length.

Remote command:
[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:DATA:RATE on page 110

Crest Factor - Predefined Settings
Selects the desired range for the crest factor of the test scenario. The crest factor of the signal is kept in the desired range by automatically setting appropriate Walsh Code Numbers.

"Minimum"   The crest factor is minimized by assigning Walsh codes which are chosen as close as possible.

"Average"   An average crest factor is set. The Walsh codes are distributed uniformly over the code domain.

"Worst"   The crest factor is set to an unfavorable value (i.e. maximum) by assigning Walsh codes which are separated as widely as possible.

Remote command:
[:SOURce<hw>]:BB:C2K:PPARameter:CRESt on page 108

Accept - Predefined Settings
Presets the channel table of base station 1 with the parameters defined in the "Predefined Settings" dialog. Base station one is switched on, the other base stations are switched off.

Remote command:
[:SOURce<hw>]:BB:C2K:PPARameter:EXECute on page 108

4.6 Additional Mobile Station - Uplink

Subdialog "Additional User Equipment" can be reached via the "CDMA2000" main dialog. It is only available when the Uplink transmission direction is selected.

It is possible to simulate up to 64 additional mobile stations and thus to generate a signal that corresponds to the received signal for a base station with high capacity utilization.

The fourth mobile station (MS4) serves as a template for all other stations. The following parameters are the only ones modified for the additional mobile stations:

- LC Mask Step (different for all stations)
- Power (different to MS4, but identical among themselves)
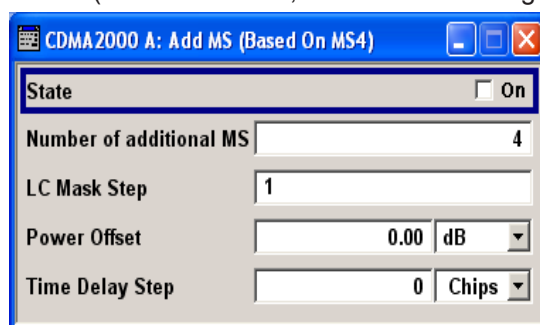
State
Activates additional mobile stations. At "State Off", all the additional mobile stations are switched off.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:STATe on page 146

Number of Additional MS
Sets the number of additional mobile stations. As many as 64 additional mobile stations can be simulated.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:COUNt on page 145

LC Mask Step
Enters the step width for increasing the LC mask of the additional mobile stations. The start value is the scrambling code of MS4.

The Long Code generator mask serves for channel-specific and user-specific scrambling of the code channel.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:LCMask:STEP on page 145

Power Offset
Sets the power offset of the active channels of the additional mobile stations to the power outputs of the active channels of MS4.

The resultant power must fall within the range 0 ... - 80 dB. If the value is above or below this range, it is limited automatically.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:POWer:OFFSet on page 145

Time Delay Step
Enters the step width for the time delay of the additional mobile stations to one another. The start value returns the time delay of MS4. Entry is made in chips and can be a maximum of one frame.

The time delay allows mobile stations to be simulated even if the arrival of their signals is not synchronized at the base station.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:TDELay:STEP on page 146

4.7 Base Station Configuration

The "Base Station Configuration" dialog is called by selecting base station "BS1" ... "BS4" in the "CDMA2000" dialog. Base stations can be configured independently of one another.

The dialog comprises the "Common Settings" section, in which the general parameters of the base station are set, a row containing the buttons "Code Domain..." and "Channel Graph...", which calls the appropriate graphics and the most important part, the channel table.

CDMA2000 A: Basestation1

Common Settings

State	Off	Transmit Diversity	Off
Time Delay	0 Chips	Diversity Mode	OTD
PN Offset	0	Quasi orth. Walsh Set	1

Code Domain...   Channel Graph...

	Channel Type	Real Time	RC	Frame Length [ms]	Data Rate [kbps]	Walsh	Q. Orth.	Power [dB]	Data	Dlist Pattern	More Params	State	Dom Conf
0-1	F-PICH			20.0	NotUsd	0		-7.00	All 0		Config..	On	
0-2	F-TDPICH			20.0	NotUsd	16		0.00	All 0		Config..	Off	
0-3	F-APICH			20.0	NotUsd	0		0.00	All 0		Config..	Off	
0-4	F-ATDPICH			20.0	NotUsd	0		0.00	All 0		Config..	Off	
0-5	F-SYNC	Off		26.6	1.2	32		-12.72	PN 9		Config..	On	
0-6	F-PCH			20.0	9.6	1		-6.72	PN 9		Config..	On	
0-7	F-BCH			40.0	19.2	0		0.00	PN 9		Config..	Off	
0-8	F-QPCH			20.0	4.8	0		0.00	PN 9		Config..	Off	
0-9	F-CPCCH			20.0	19.2	0		0.00	PN 9		Config..	Off	
0-10	F-CACH			5.0	9.6	0		0.00	PN 9		Config..	Off	
0-11	F-CCCH			20.0	9.6	0		0.00	PN 9		Config..	Off	
0-12	F-PDCCH		10			0		0.00	PN 9		Config..	Off	
0-13	F-PDCCH		10			0		0.00	PN 9		Config..	Off	
0-14	F-PDCH		10					0.00	PN 9		Config..	Off	
1-1	F-FCH	Off	3	20.0	9.6	8	Off	-12.72	PN 9		Config..	On	
1-2	F-SCH1	Off	3	20.0	19.2	17	Off	-9.72	PN 9		Config..	On	
1-3	F-SCH2	Off	3	20.0	19.2	18	Off	-9.72	PN 9		Config..	On	
1-4	F-DCCH	Off	3	20.0	9.6	0	Off	0.00	PN 9		Config..	Off	
2-1	F-FCH		3	20.0	9.6	9	Off	-12.72	PN 9		Config..	On	
2-2	F-SCH1		3	20.0	19.2	19	Off	-9.72	PN 9		Config..	On	

4.7.1 Common Settings

The general parameters of the base station are set in the "Common Settings" section.

State - BS
Activates or deactivates the selected base station.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:STATe on page 142

Transmit Diversity - BS
Switches transmit diversity on and off.

The signal can be sent simultaneously on several antennas. Various forms of transmit diversity are described in the CDMA2000 standard. Different coding is used to divide the signal between the two antennas. As a result, the receiver can decode the traffic signal from the two input signals and is less liable to fading and other interference. The R&S Signal Generator can simulate the signal of one of the two antennas.

To activate transmit diversity, the antennas whose signals are to be simulated must be specified. The signal is generated differently depending on the selected antenna.

Additionally two diversity schemes for the calculation of the signals are available for selection at "Diversity Mode".

"Off"   No transmit diversity

"Antenna 1"   Calculates and applies the output signal for antenna 1. The diversity
                   scheme is selected at "Diversity Mode".

"Antenna 2"   Calculates and applies the output signal for antenna 2. The diversity
                   scheme is selected at "Diversity Mode".

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:TDIVersity on page 143

Diversity Mode - BS
Selects the diversity scheme for "Transmit Diversity".

The diversity scheme defines the calculation mode of the signal for the selected
antenna (at Transmit Diversity).

"OTD"   Orthogonal Transmit Diversity Mode. A forward link transmission
                   method which distributes forward link channel symbols among multi-
                   ple antennas and spreads the symbols with a unique Walsh or quasi-
                   orthogonal function associated with each antenna.

"STS"   Space Time Spreading Mode. A forward link transmission method
                   which transmits all forward link channel symbols on multiple antennas
                   and spreads the symbols with complementary Walsh or quasi-orthog-
                   onal functions.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:TDIVersity:MODE on page 143

Time Delay - BS
Enters the time delay of the signal of the selected basestation compared to the signal
of BS1.

Note: For BS1, this value is always 0 and read-only.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:TDELay on page 143

PN Offset - BS
Enters the PN offset (short code).

The PN offset determines the start phase of these PN short-code sequences (see
Chapter 3.8, "PN Short-Code Scrambling - Downlink", on page 15).

This permits signals of different basestations to be distinguished.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:PNOFfset on page 142

Quasi orth Walsh Set - BS
Selects the Quasi Orthogonal Walsh Set. The standard defines three different sets.

The so-called 'quasi-orthogonal Walsh sets' can be used in addition to the Walsh
codes. They increase the number of possible channels and thus extend the basesta-
tion capacity. When the quasi-orthogonal Walsh code is used, spreading the data
stream results in complex spreading also through an additional rotation of the output
phase (the spreading code then consists of a real and an imaginary part).

In the channel table, a decision can be made for each channel whether the Walsh code of the standard set or of the quasi-orthogonal set should be used. The quasi-orthogonal Walsh codes are used if "On" is activated in column "Q. Orth".

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:QWSet` on page 142

Code Domain Graph - BS
Opens the code domain display to check the signal visually (see Chapter 4.7.2, "Code Domain and Channel Graphs", on page 51).

Remote command:
n.a.

4.7.2 Code Domain and Channel Graphs

The Walsh codes of variable length used by CDMA2000 are the so-called Hadamard codes.

The structure of these codes is explained below. The code matrix of the order N+1 is obtained from the matrix N by extending the latter to the right and downwards through copying and downwards to the right by copying and inversion.

Figure 4-3: Generation scheme of Walsh code

Walsh codes of the lengths 4, 8, 16, 32, 64, and 128 are used in CDMA2000 with spreading rate 1. The greater the spreading factor / Walsh code length, the smaller the useful symbol rate prior to spreading and vice versa.

In contrast to the spreading codes of 3GPP, Walsh codes of short lengths (low spreading factor) do not occupy a block area in a Walsh matrix of larger spreading factor. Several lines (ratio of the two spreading factors) are occupied in the matrix with a higher spreading factor, distributed over the whole matrix. This behavior is illustrated in the diagram below. This results from the structuring scheme of the Walsh codes that are obtained by copying and inverting the next smaller matrix.
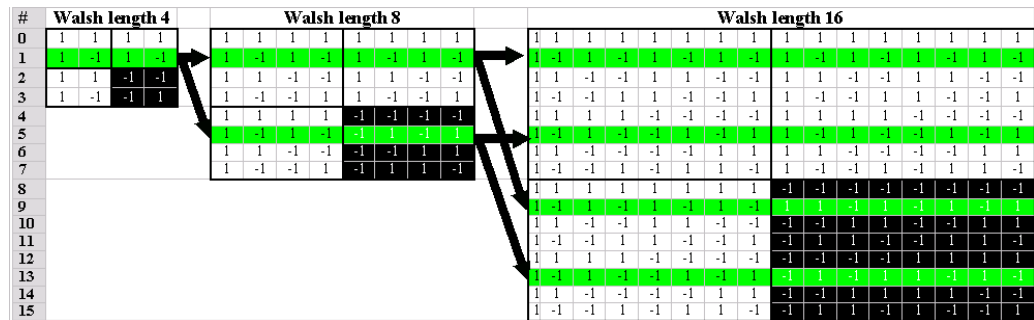

Figure 4-4: Walsh code tree

If a Walsh code with the length 4 and index 1 is used, codes 1 and 5 are disabled at the length 8, and codes 1, 5, 9 and 13 at the length 16 because codes of greater length contain the output code of shorter length (or its inversion).

When using such conflicting Walsh codes simultaneously, the signals of the associated code channels are mixed so that they can no longer be separated in the receiver. Orthogonality then is lost.

The matrix range with the highest spreading factor (i.e. 128), which is based on the spreading code selected in the code tree, is then defined as domain of a specific Walsh spreading code. Using a spreading code means that its entire domain is used.

The "Code Domain" graphic shows the assignment of active code channels in the code domain. The upper part shows the code domain of the standard Walsh set, the lower part the code domain of quasi-orthogonal Walsh sets.

The code numbers are plotted on the X axes, the colored bars show the code channels. The legend at the left of the graph indicates the assignment of colors to the spreading factors. An additional color is reserved for the packet channel F-PDCH because this channel can be assigned to more than one code channel. The height of the bars indicates the power of the code channel.
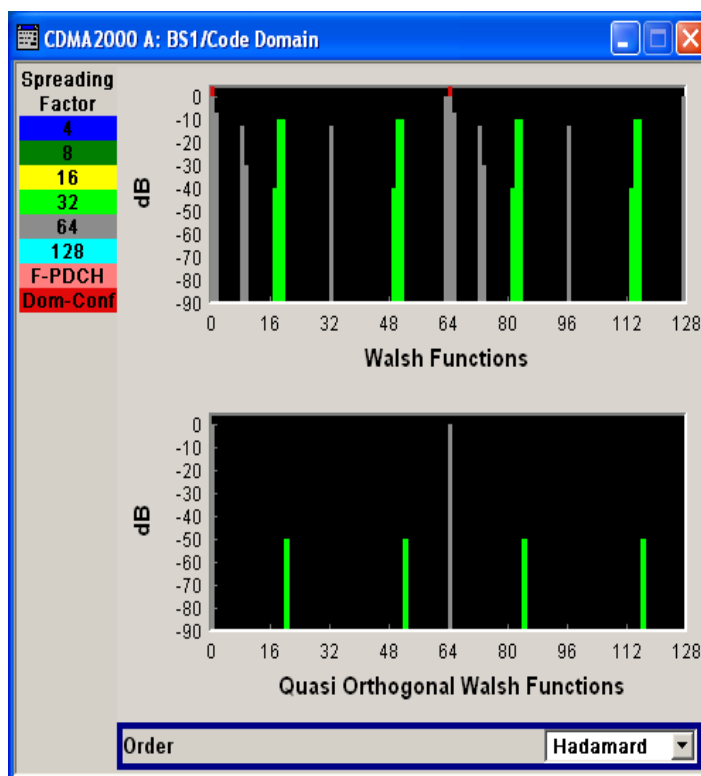
In this display assignment of the domains can be seen at a glance. Compared to 3GPP it is however much more difficult to see whether the code domains of different channels overlap, i.e. whether there is a domain conflict. This is due to the structure of the Walsh codes described above. The reason is that no block areas are occupied in the domain but several areas of minimum width are distributed over the whole domain.

Therefore, the occurrence of a domain conflict is indicated by a red dot marking of the involved channels. In addition, in the channel table, a code domain conflict is indicated in the column "Do Conf" on the far right of the graph by a red dot and the orange-colored column.
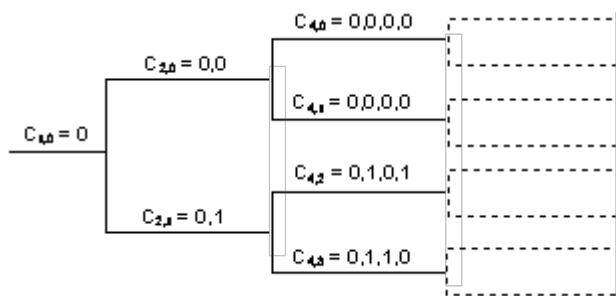

The graph is calculated from the settings that have been made. A change in the settings results at once in a change of the graphical display.

Order - Code Domain BS
Switches the order of the spreading codes.

"Hadamard"   The code channels are displayed in the order determined by the Hadamard matrix. The codes are numbered as Walsh codes according to the standard.

"Bit reversed"   The code channels are displayed in the order defined by the Orthogonal Variable Spreading Factor (OVSF) code tree (3GPP code).
The Walsh codes and their generation scheme are closely related to the spreading codes of 3GPP. Basically, the same spreading sequences are used, only the order in the respective code trees is different. According to 3GPP TS 25.213, the following code tree is used:

$$C_{4,0} = 0,0,0,0$$
$$C_{2,0} = 0,0$$
$$C_{4,1} = 0,0,0,0$$
$$C_{1,0} = 0$$
$$C_{4,2} = 0,1,0,1$$
$$C_{2,1} = 0,1$$
$$C_{4,3} = 0,1,1,0$$

To find a 3GPP code that corresponds to a CDMA2000 code, the bit-inverted line (line index) has to be selected in the 3GPP matrix of identical spreading factor.

Example:

The 3GPP spreading code matching line 10 of the 16-bit Walsh code matrix is searched for. The binary form of the line index 10 (with 4 bits, because of Walsh length $16 = 2^4$) is 1010. The bit-inverted index is 0101, i.e. 5 in decimal notation. This means that the Walsh code No. 10 with the length 16 corresponds to the 3GPP spreading code 5 of the same length (spreading factor).

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict:MODE on page 133

Channel Graph - Basestation
Opens the channel graph display to check the configured signal visually.

The channel graph display shows the active code channels. The channel number is plotted on the X axis. The red bars represent the special channels, the green bars the traffic channels. The channel index is plotted on the X-axes. The height of a bar shows the relative power of a channel.

The graph is calculated from the settings that have been made.
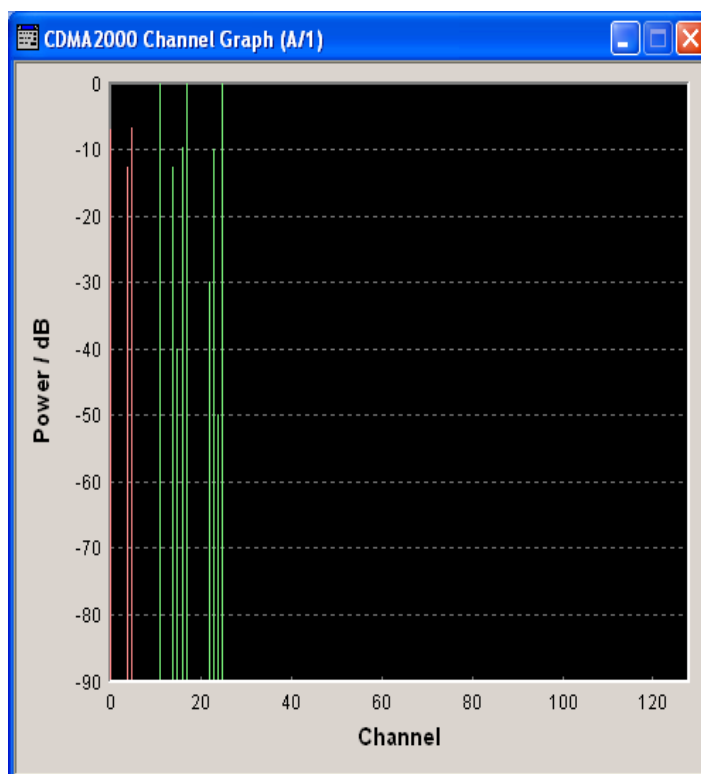
Remote command:
n.a.

4.7.3   Channel Table - BS

The "Channel table" is located in the lower part of the dialog. In the channel table, you can set the channel parameters individually.

Up to 78 channels are available for each base station. Channels 0 to 1 to 0 to 11 are assigned to the special channels which are responsible for the correct communication between base station and mobile station. The packet channels (0-12 to 0-14) and the traffic channels (1-0 and above) transmit the data.

A traffic channel is used for transmitting the radio link information, i.e. for communication with the addressee. The traffic channels consist of a dedicated channel, a fundamental channel and, depending on the radio configuration, of up to seven supplemental channels.

The packet data channel and the packet data control channels are used for transmitting data packets usually at higher data rates than is the case with purely circuit-mode traffic channels. The radio configuration of these channels is defined as 10 in accordance with the CDMA2000 standard.

The number of sub channels and the sub channel types of a traffic channel depend on the selected radio configuration. The radio configuration can be set separately for each traffic channel and is the same for all sub channels of this traffic channel. It determines among other things the channel coding types, the frame lengths and the data rates that

can be used and the settings of fixed parameter , e.g. CRC length. The R&S Signal Generator provides a separate set of settings of all channel table parameters for each radio configuration. Thus, when the radio configuration is changed, the current set of settings is internally stored for the old radio configuration. The complete set of settings belonging to the new radio configuration is activated and indicated in the channel table.

Channel 0-5 (F-SYNC) and the first traffic channel can be generated in real time.

R&S SMBV does not support realtime channels.

	Channel Type	Real Time	RC	Frame Length [ms]	Data Rate [kbps]	Walsh	Q. Orth.	Power [dB]	Data	Dlist Pattern	More Params	State	Dom Conf
1	F-PICH			20.0	1.2	0	Off	0	PN 9		Config..	On	
2	F-TDPICH			20.0	1.2	0	Off	0	PN 9		Config..	On	
3	F-APICH			20.0	1.2	0	Off	0	PN 9		Config..	On	
4	F-ATDPICH			20.0	1.2	0	Off	0	PN 9		Config..	On	
5	F-SYNC	On		20.0	2.4	0	Off	0	PN 9		Config..	On	
6	F-PCH			20.0	9.6	0	Off	0	PN 9		Config..	On	
7	F-BCH			20.0	9.6	0	Off	0	All 1		Config..	On	
8	F-QPCH			20.0	1.2	0	Off	0	PN 9		Config..	On	
9	F-CPCCH			20.0	1.2	0	Off	0	PN 9		Config..	On	
10	F-CACH			20.0	1.2	0	Off	0	PN 9		Config..	On	
11	F-CCCH			20.0	1.2	0	Off	0	PN 9		Config..	On	
12	F-PDCCH		10			0	Off	0	PN 9		Config..	Off	
13	F-PDCCH		10			0	Off	0	PN 9		Config..	On	

Channel Number
Displays the channel numbers.

The channel number is made up of two numbers. If the first number is 0 it identifies the special channels, i.e. the control channels and packet channels. A first number of 1 to 8 designates the traffic channels. The second number refers consecutively to the special channels or the subchannels of a traffic channel.

All available channels are always displayed, even the channels that are inactive. The number of subchannels per traffic channel 1 (four or eight) depends on the chosen radio configuration.

Each channel is switched on and off by the "On/Off" button in the "State" column.

Remote command:
In remote control, the channel is selected via the suffix to the keywords `:CGRoup<n>:COFFset<n>`.
`CGRoup0` selects the special channels group, `CGRoup1 to 8` the traffic channel.
`COFFset1 to 14` selects either the special channel or the code channel of a traffic channel. E
For example, `:CGRoup0:COFFset14` selects the packet channel F-PDCH, `:CGRoup3:COFFset1` selects the F-FCH of traffic channel 3.

Channel Type
Indication of the channel type (see following table).

Table 4-2: List of supported channel types and their sequence in the CDMA2000 channel table

Index	Short form	Name	Function
0-1	F-PICH	Forward Pilot Channel	The base station continuously transmits the pilot channel. This channel provides capabilities for soft **handoff** and coherent detection. Handoff is a procedure where a mobile with an on-going call changes channel and/or base station under the supervision of the network. The Walsh code is 0.
0-2	F-TDPICH	Forward Transmit Diversity Pilot Channel	The base station continuously transmits this pilot channel from the secondary antenna when transmit diversity is enabled.
0-3	F-APICH	Forward Auxiliary Pilot Channel	This pilot channel transmits the base station as an option.
0-4	F-ATDPICH	Forward Auxiliary Transmit Diversity Pilot Channel	The base station optionally transmits this pilot channel from the secondary antenna when transmit diversity is enabled.
0-5	F-SYNC	Forward Synchronization Channel	The synchronization channel enables the mobile station to synchronize with the base station. It contains the PN offset, the system time and the long code status, information about the paging channel, together with the system ID and the network ID. The Walsh code is 32.
0-6	F-PCH	Forward Paging Channel	The paging channel carries control information specific to a mobile station when the network does not know where the mobile station is located.
0-7	F-BCCH	Forward Broadcast Channel	The broadcast channel is used to broadcast system- and cell-specific information.
0-8	F-QPCH	Forward Quick Paging Channel	The paging channel contains short form information for the mobile station, particularly if the latter is not transmitting.
0-9	F-CPCCH	Forward Common Power Control Channel	
0-10	F-CACH	Forward Common Assignment Channel	
0-11	F-CCCH	Forward Common Control Channel	General channel for transmitting control information. It also provides a mean for paging functions but it supports different data rates. It provides capability for short burst data communications.
0-12/13	F-PDCCH	Forward Packet Data Control Channel	The F-PDCCH carries the control information for the F-PDCH.
0-14	F-PDCH	Forward Packet Data Channel	Packet-oriented data channel, supports high data rates
1-1	F-FCH	Forward Fundamental Channel	Subchannel of a traffic channel. Contains control data and user data.
1-2	F-SCCH1	Forward Supplemental Code Channel	Subchannel of a traffic channel. Enables higher data rates for control and user data.

Index	Short form	Name	Function
1-2	F-SCH1	Forward Supplemental Channel	Subchannel of a traffic channel. Enables higher data rates for control and user data.
...			
1-4	F-DCCH	Forward Dedicated Control Channel (RC3, RC4 and RC5)	Subchannel of a traffic channel. It transports specific control information.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TYPE?
on page 132

Real Time - BS1

(not available in R&S SMBV)

Activates realtime generation of the channel. This option is only available for the sync channel F-SYNC and the first traffic channel. The set state for the first traffic channel is specific for the selected radio configuration.

Tip: Feed through artificial bit errors and block errors to the CRC checksum to all the data sources to test the BER/BLER testers that are integrated in the BS.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:
REALtime:STATe on page 127

Radio Configuration (RC)

Selects radio configuration of the traffic channel.

The radio configuration determines the channel types, the frame lengths, the channel coding types and the data rates that can be used.

The radio configuration is the same for all sub channels of a traffic channel. If the radio configuration is modified for one of the sub channels, the new value is then automatically used by all other subchannels of this traffic channel.

The radio configuration for the packet channels F-PDCCH and F-PDCH is fixed to RC10.

The R&S Signal Generator provides a separate set of settings of all channel table parameters for each radio configuration. Changing the radio configuration causes the settings belonging to the new RC value to be activated in the channel table (the settings belonging to the old RC value are stored).

The radio configuration determines the permissible frame lengths. The frame length defines the permitted data rate and channel coding type which in turn determine the permitted Walsh codes.

This causes a hierarchy within the following parameters:

"Frame Length" -> "Data Rate + Channel Coding Type" -> "Walsh Code"

Changing one of the parameters in this hierarchy automatically causes the lower-level settings to be changed if they are no longer permitted following the change to the higher-level parameter.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:RCONfiguration` on page 133

Frame Length- BS

Enters the frame length of the channel. The set value is specific for the selected radio configuration.

The value range depends on the channel type and radio configuration. The frame length of the F-SCH is fixed to 26.6.ms. The maximum frame length is 160 ms, the minimum frame length is 5 ms.

The frame length affects the data rates and the channel coding types that are possible within a channel. Changing the frame length can lead to a change of data rate and/or the channel coding type and this in turn can bring about a change of the Walsh code.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:` `FLENgth` on page 125

Data Rate

Enters the data rate of the channel. The set value is specific for the selected radio configuration.

The R&S Signal Generator supports all data rates between 1.2 kbps and 1,036.8 kbps defined in the standard.

The value range depends on the frame length. If the frame length is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

The data rate affects the Walsh code (spreading factor) that is possible within a channel. If a data rate is changed so that the selected Walsh code becomes invalid, the next permissible value is automatically set.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:` `RATE` on page 123

Walsh Code

Assigns the Walsh code to the channel (see Chapter 3.7, "Variable-Length Walsh Spreading - Downlink", on page 15, and see "Code Domain Graph - BS" on page 51). The set value is specific for the selected radio configuration.

The code channel is spread with the set Walsh code (spreading code).

The value range of the Walsh code depends on the frame length, the channel coding type and the data rate.

If one of these parameters is changed so that the set Walsh code gets invalid, the next permissible value is automatically set.

The standard assigns a fixed Walsh code to some channels (F-PICH, for example, always uses Walsh code 0). Generally, the Walsh code can only be varied within the range specified by the standard.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:WCODe` on page 132

Quasi Orthogonal Walsh Code State

Activates/deactivates the use of the quasi-orthogonal Walsh codes for the channel. The set state is specific for the selected radio configuration.

Depending on the channel type and other parameters, the standard does not allow the use of quasi-orthogonal codes. In this case, the selection field is dimmed.

The quasi-orthogonal Walsh code set is selected for all channels of the base station in the upper area of the CDMA200 dialog.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>: QWCode:STATe on page 127

Power

Sets the channel power in dB. The set value is specific for the selected radio configuration.

The power entered is relative to the powers outputs of the other channels. If "Adjust Total Power to 0 dB" is executed (top level of the CDMA dialog), all the power data is relative to 0 dB.

The set "Power" value is also the start power of the channel for "Misuse For Output Power Control".

Note: The maximum channel power of 0 dB applies to non-blanked channels (duty cycle 100%).
With blanked channels, the maximum value can be increased to values greater than 0 dB. Where the maximum value is calculated as:

$10*log_{10}1/duty\_cycle$

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:POWer on page 126

Data

Selects data source. The set value is specific for the selected radio configuration.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  - Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA`
on page 121

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:`
`PATTern` on page 123

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:`
`DSELect` on page 122

More Params

Provides access to a dialog covering additional parameters of the selected channel
(see Chapter 4.8, "More Parameters - BS Channel Table", on page 61).

Remote command:
n.a.

Channel State

Activates or deactivates the channel. The set state is specific for the selected radio
configuration.

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:STATe`
on page 127

Domain Conflict

Displays whether the channel has a code domain conflict with another channel. If there
is a conflict, a red dot appears and the column is colored soft orange. If there is no
conflict, the column is colored soft blue. The indicated value is specific for the selected
radio configuration.

To access the graphical display of code domain occupancy by all the active code chan-
nels, use the "Code Domain" button (also see "Code Domain Graph - BS" on page 51).

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict[:STATe]?` on page 134
`[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict:RESolve` on page 134

## 4.8 More Parameters - BS Channel Table

The "More Parameters" dialog can be called in the BS channel table in column "More
Params" with button "Config...". The indicated values and the settings are specific for
the selected radio configuration.

The settings for the packet channel F-PDCH channel and all other channels are differ-
ent (see Chapter 4.9, "More Parameters for F-PDCH - BS", on page 71). The dialog
for the special channels and the traffic channels is described below.

The upper section is where the channel number, channel type and Walsh length of the
selected channel is displayed.
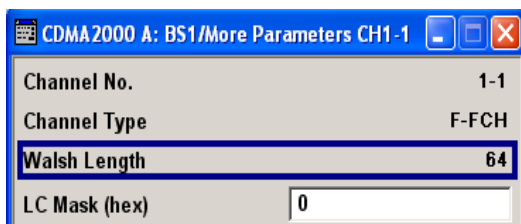
The "Power Control" section is where the settings for the power control bits are made.

This section is only available for the traffic sub channels F-FCH and F-DCCH.
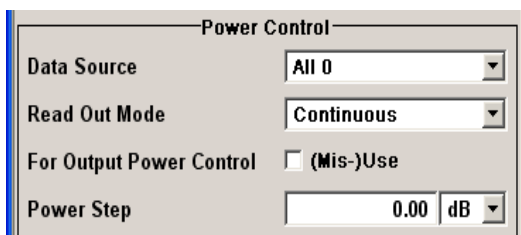
The "Channel Coding" section is where the channel coding settings are made.
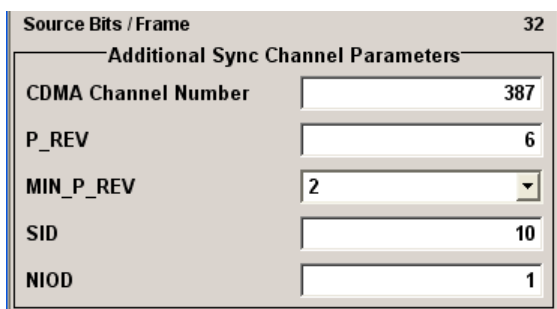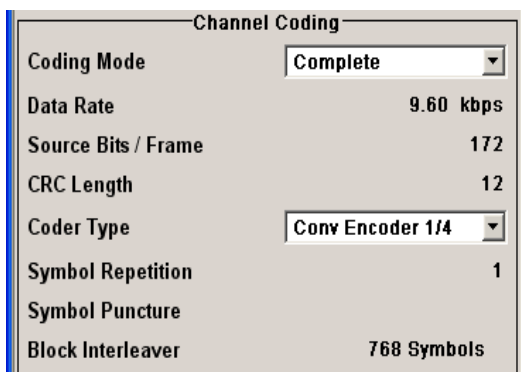
The "Bit/Block Error Insertion" section is where the bit/block error simulation is configured and activated.

This section is only available for the realtime channels.

4.8.1 General Settings

In the upper section, the channel number, channel type and Walsh length of the selected channel are displayed.

Channel No - More Parameters BS
Displays the channel number of the channel.

Remote command:
n.a.

Channel Type - More Parameters BS
Displays the type of the channel.

Remote command:
n.a.

Walsh Length - More Parameters BS
Displays the Walsh code of the channel. The indicated value is specific for the selected radio configuration.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:
WLENgth? on page 133

LC Mask (hex) - More Parameters BS
Enters the mask of the long-code generator in hexadecimal form. The set value is specific for the selected radio configuration.

The long-code mask is a 42-bit value. The mask serves for channel-specific and user-specific scrambling of the code channel.

The LC Mask is the same for all sub channels of a traffic channel. If the mask is modified for one of the sub channels, the new value is then automatically used by all other subchannels of this traffic channel.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:LCMask
on page 126

4.8.2 Power Control

In this section, you can configure the settings for the power control bits. These bits are used to control the transmission power.

This section is only available for the traffic sub channels F-FCH and F-DCCH.

Data Source - Power Control - BS
Defines the data source for the power control bits of the channel. The set value is specific for the selected radio configuration.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  - Use the standard "File Manager" function to transfer external data lists to the instrument.

    See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:
DATA on page 128
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:
DATA:PATTern on page 129
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:
DATA:DSELect on page 128

Read Out Mode (Power Control) - BS
Defines power control bits usage. The set value is specific for the selected radio configuration.

With CDMA, the power control bits are used to signal the increase or reduction in transmit power to the called station.

The BS sends power control bits in the traffic channel at an 800 Hz rate instead of the scrambled data bits. The mobile station increases or decrease its output power depending on these power control bits. One to four data bits (depending on the data rate) are replaced a corresponding number of power control bits ("0...0" or "1...1").

With all read out modes, 1 bit is taken from the power control, multiplied and entered into the bitstream. The difference between the modes lies in the usage of the power control bits.

These different modes can be used to set a BS to a specific output power (e.g. with the pattern 11111) and then let it oscillate around this power. This then allows power measurements to be carried out at the BS (at quasi-constant power).

Together with the option misuse output power control (see Misuse for Output Power Control - BS), this parameter can also be used to generate various output power profiles.

"Continuous"   The power control bits are used cyclically.

"Single + All 0"   The power control bits are used once, and then the power control sequence is continued with 0 bits.

"Single + All 1"   The power control bits are used once, and then the power control sequence is continued with 1 bit.

"Single + alt. 01"

The power control bits are used once. The power control sequence is continued with 0 bits and 1 bit alternately (in multiples, depending on the data rate, for example, 00001111).

"Single + alt. 10"

The power control bits are used once. The power control bit sequence is continued with 1 bit and 0 bits alternately (in multiples, depending on the data rate, for example, 11110000).

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:READ` on page 131

Misuse for Output Power Control - BS
Activates "(Mis-) Use " of the power control data. The set value is specific for the selected radio configuration.

The power control bits are used to signal the increase or reduction of transmit power to the called station.

If "(Mis-) Use for Output Power Control" is activated, the specified pattern is used to vary the intrinsic transmit power over time. Every 1.25 ms (800 Hz) a bit of this pattern is removed in order to increase (bit = "1") or reduce (bit = "0") the channel power by the specified "Power Step". The upper limit is 0 dB and the lower limit -80 dB.

The following envelope is produced with the settings:
● Channel power = 0 dB
● Power step = 1.0 dB
● Pattern = "001110100000011"
● "TPC Read Out Mode = Continuous"

Note: The first bit is assigned to the first power control section. In this first section, the start power specified in the channel table is always used. Only in the next power control section (with the second power control bit) will the defined power change be effective.
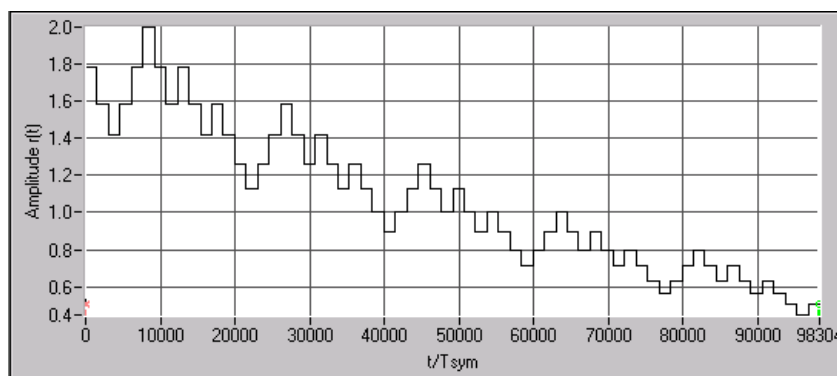
Figure 4-5: Dynamic change of channel power (continuous)

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:
MISuse on page 130

Power Step (DPCCH) - BS
Sets the step width of the power change in dB for "(Mis-) use TPC for output power control".

The set value is specific for the selected radio configuration.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:
PSTep on page 130

4.8.3 Channel Coding

In this section, you can configure the settings for the channel coding. The indicated values and the settings are specific for the selected radio configuration.

In contrast to 3GPP FDD, channel coding with CDMA2000 is part of the physical layer. The channel coding procedure can slightly vary depending on channel type, frame length and data rate.

Channel Coding Mode - More Params BS
Activates or deactivates channel coding. The set state is specific for the selected radio configuration.

"Off"   Channel coding is deactivated.
               Channel coding is not performed. The data sources of the individual channels apply their data stream directly to the long-code scrambler. The data source supplies the traffic data with the data rate that would be available at the long-code scrambler after coding is switched on. This effective data rate, which is used for reading off from the data source, is indicated with the parameter "Effective Data Rate". The Data Rate parameter displayed in the channel table continues to affect the "Effective Data Rate", but no longer agrees with it.

"Complete"   The complete channel coding is performed. The channel coding pro-
                    cedure can slightly vary depending on channel type, frame length and
                    data rate.

"Without Inter-   Except for the block interleaver, the whole channel coding procedure
leaving"   is carried out. In this mode, the frame structure and the convolutional
                    coder of a receiver can be tested.

"Interleaving   In this mode, only a block interleaver is used for coding. This allows
Only"   the deinterleaver in the receiver to be tested independently of the
                    remaining (de-)coding process.
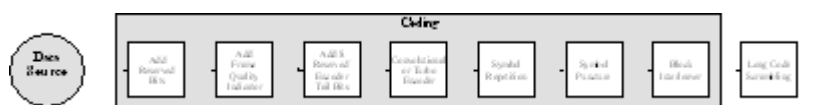
Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:
CCODing:MODE on page 119

Effective Data Rate - More Params BS

Indicates the effective data rate. The value is specific for the selected radio configuration.

For coding modes "Interleaving Only" and "Coding Off", the effective data rate differs from the set data rate. This is because no increase in the data rate is brought about by the convolution coder. The data rate set in the channel table is therefore not correct.

For coding modes "Without Interleaving" and "Complete", the data rate in the channel table agrees with the effective data rate. This is because there is an increase in the data rate due to the convolution coder.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:
CCODing:DATA:RATE? on page 119

Source Bits / Frame - More Params BS

Indicates the number of input bits per frame for the channel coder. The indicated value is specific for the selected radio configuration.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:
CCODing:BITFrame? on page 118

CRC Length - More Params BS

Indicates the CRC (cyclic redundancy code) type (length) for error identification. The indicated value is specific for the selected radio configuration.

Remote command:
n.a.

Channel Coder Type - More Params BS

Selects error protection. The set value is specific for the selected radio configuration.

Which coder types are available depends on the channel type and other channel settings such as frame length.

If one of these parameters is changed so that the set channel coding type gets invalid, the next permissible value is automatically set.

"Off"	No error protection. This selection is available for the pilot channels only.
"Conv Encoder"	Convolution coder with generator polynomials defined by CDMA. The numeric value defines the rate of the convolution coder.
"Turbo Encoder"	Turbo coder of rate 1/3 in accordance with the CDMA specifications. The numeric value defines the rate of the turbo coder.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>: CCODing:TYPE on page 121

Symbol Repetition - More Params BS

Indicates the symbol repetition rate. The value is specific for the selected radio configuration.

Symbol repetition is used together with block symbol puncture for adapting the convolutional or turbo coder output data rate to the required input data rate of the interleaver.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>: CCODing:SREPetition? on page 120

Symbol Puncture - More Params BS

Indicates the symbol puncture rate. The value is specific for the selected radio configuration.

Symbol puncturing (elimination) is used together with block symbol repetition for adapting the convolutional or turbo coder output data rate to the required input data rate of the interleaver.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>: CCODing:SPUNcture? on page 120

Block Interleaver - More Params BS

Displays the number of symbols that the interleaver processes per block. The indicated value is specific for the selected radio configuration.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>: CCODing:BINTerleaver? on page 117

4.8.4 Additional Sync Channel Parameters

1. To access this dialog, select "CDMA 2000 > General > Link Direction > Downlink / Forward".

2. Select "Base Stations > Select Base Station > BS1...BS4".

3. Select "Channel Table > F-SYNC > More Params > Config".

```
Source Bits / Frame                    32
┌─Additional Sync Channel Parameters─┐
CDMA Channel Number        [       387]
System Time                [         0]
LC State (hex)             [0000 0000 000]
P_REV                      [         6]
MIN_P_REV                  [2            ▼]
SID                        [        10]
NID                        [         1]
```

This section contains the additional parameters for the channel type F-SYNC.

CDMA Channel Number - More Params BS
Displays the CDMA channel number which corresponds to the RF.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:CNUMber on page 115

System Time - More Params BS
(available for R&S SMBV only)

Displays the system time.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:STIMe on page 117

LC State (hex) - More Params BS
(available for R&S SMBV only)

Defines the long code state in hexadecimal format.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:LCSTate on page 115

P_REV - More Params BS
Displays the Protocol revision level that specifies the CDMA2000 system release number.

The table below gives the cross-reference between the P_REV values and the CDMA2000 releases.

P_REV	CDMA2000 release
1	Korean PCS(Band Class4), USPCS(Band Class1)
2	IS-95
3	TBS74
4	IS-95A
5	IS-95B
6	IS2000 Release 0

P_REV	CDMA2000 release
7	IS2000 Release A
8	IS2000 Release B

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:PREV on page 116

MIN_P_REV - More Params BS
Displays the minimum protocol revision level.

The BS sets this field to prevent mobile stations which cannot be supported by the BS from accessing the CDMA system.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:MPRev on page 115

SID - More Params BS
Displays the system identification.

The BS sets the system identification number.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:SID on page 116

NID - More Params BS
Displays the network identification.

The NID serves as a subidentifier of a CDMA system as defined by the owner of the SID.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation:SYNC:NID on page 116

4.8.5 Error Insertion

(not available in R&S SMBV)

In the "Bit/Block Error Insertion" sections, errors can be inserted into the data source and into the CRC checksum. This can be used to check the bit and block error rate testers.

These functions are available for realtime channels only.

Bit Error State - More Params BS

Activates or deactivates bit error generation.

Bit errors are inserted into the data fields of the realtime channels.

When the data source is read out, bits are deliberately inverted at random points in the data bitstream with the specified error rate so that invalid signal is simulated.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor:BIT:STATe` on page 124

Bit Error Rate - More Params BS

Sets the bit error rate.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor:BIT:RATE` on page 124

Block Error State - More Params BS

Activates or deactivates the block error generation.

The CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate an invalid signal.

Block error generation is only possible with channel coding enabled.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor:BLOCk:STATe` on page 125

Block Error Rate - More Params BS

Sets the block error rate.

Remote command:

`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor:BLOCk:RATE` on page 124

4.9 More Parameters for F-PDCH - BS

The "More Parameters" dialog for packet channel F-PDCH can be called in the BS channel table in column "More Params" with button "Config...".

The settings for the packet channel F-PDCH channel and all other channels are different (see Chapter 4.8, "More Parameters - BS Channel Table", on page 61). The dialog for the special channels and the traffic channels is described below.

The channel coding for the F-PDCHs is always carried out in full (see 3GPP2 C.S0002-C figure 3.1.3.1.1.1-19).

The parameters of both F-PDCCHs (such as Number of Slots per Subpacket, Subpacket Position) are implicitly defined by the F-PDCH settings, since both these channels are always transmitted simultaneously with the F-PDCH. The "More Parameters"

dialog for these F-PDCCHs is therefore mostly for display, it only enables you to select the channel coding mode.

The left part is used to enter the general settings for the packet channel.

The right, upper part contains a table for setting the parameters of the subpackets. Up to eight subpackets can be transmitted for each regular packet.

The right, lower part displays the current configuration of the packet channel in graphical form.
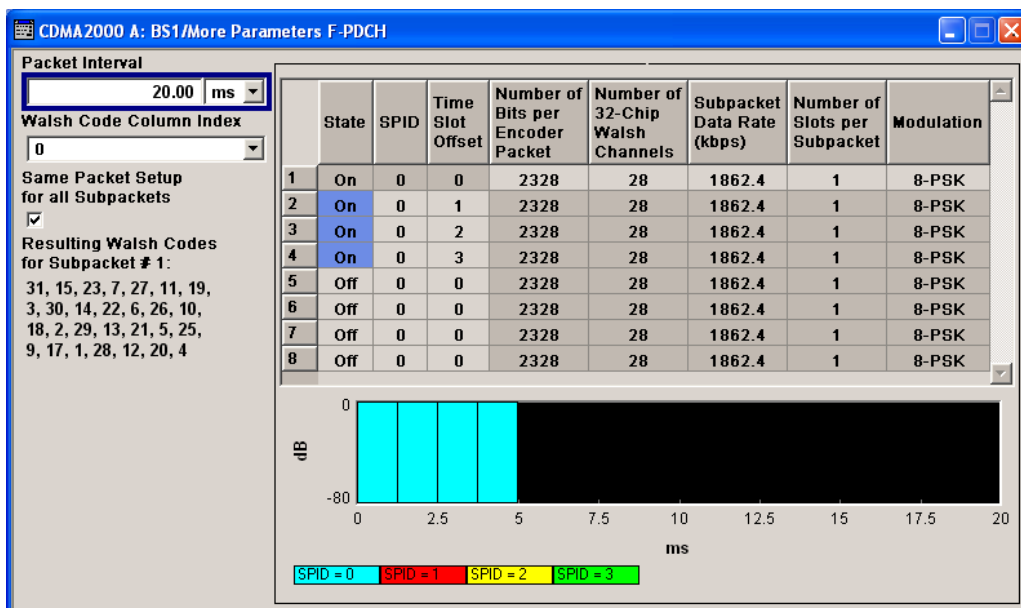
4.9.1 General Settings for Packet Channel

In the left section, you can configure the general settings for the packet channel.

Packet Interval - More Params F-PDCHs BS
Selects the interval at which new data packets arrive.

New F-PDCH packets are generated in this interval. Within an interval, up to eight subpackets of a data packet can be transmitted with any required time offset.

The value range is dependent on the set sequence length (ARB settings). The values 80 ms, 40 ms, 20 ms, 10 ms and 5 ms can always be set, and the maximum value is 2000 ms. All intermediate values must satisfy the condition

Sequence Length = * 80ms/2^n

where n is a whole number.

Example:

Sequence length = one 80 ms frame.

The possible values for the packet interval are 80 ms, 40 ms, 20 ms, 10 ms and 5 ms.

Sequence length = three 80 ms frames.

The possible values for the packet interval are 240 ms, 120 ms, 80 ms, 40 ms, 20 ms, 10 ms and 5 ms.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:PINTerval on page 134

Walsh Code Column Index - More Params F-PDCHs BS
Selects the standard-compliant set of available Walsh codes for the F_PDCH (see 3GPP2 C.S0003-C, table 2-35).

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:WINDex on page 141

Same Packet Setup... - More Params F-PDCHs BS
Activates that all subpackets are generated with the same settings.

If enabled, you can only set the parameters of subpackage1 (number of bits, etc., see Subpacket Table Settings). The same settings are automatically assigned to all sub-packets.

The "Off" setting allows individual settings for each subpacket.

Remote command:
[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:PSETup on page 135

4.9.2 Subpacket Table Settings

The middle part contains a table for setting the parameters of the subpackets. Up to eight subpackets can be transmitted for each regular packet (Encoder Packet).

	State	SPID	Time Slot Offset	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Subpacket	Modulation
1	On	0	0	2328	28	1862.4	1	8-PSK
2	On	0	1	2328	28	1862.4	1	8-PSK
3	On	0	2	2328	28	1862.4	1	8-PSK
4	On	0	3	2328	28	1862.4	1	8-PSK
5	Off	0	0	2328	28	1862.4	1	8-PSK
6	Off	0	0	2328	28	1862.4	1	8-PSK
7	Off	0	0	2328	28	1862.4	1	8-PSK
8	Off	0	0	2328	28	1862.4	1	8-PSK

Subpacket Number - More Params F-PDCHs BS
Denotes the index number of the subpackets in the selected channel. Each packet can include up to eight subpackets.

The subpacket is selected by the suffix to `SUBPacket` in remote control.

Subpacket State - More Params F-PDCHs BS
Activates a subpacket.

Subpacket 1 is always active. The rest can be turned on and off.

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:STATe`
on page 140

Subpacket ID (SPID) - More Params F-PDCHs BS
Selects the subpacket ID.

The subpacket ID controls the subpacket symbol selection and adopts one of four possible subpackets from the encoder packet.

The ID of the first subpacket is fixed at 0. The ID can be chosen for each of the rest.

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:ID`
on page 135

Time Slot Offset - More Params F-PDCHs BS
Sets the starting time of the subpacket relative to the starting time of the packet interval.

The first subpacket always has an offset of 0, which cannot be changed.

The value range for the individual subpackets depends on the settings of the other subpackets:

The time slot offsets of the remaining subpackets must be entered in ascending order. Also it is not permitted to transmit two packets simultaneously.

Example:

Subpacket 2 is transmitted in time slot 5 and is four slots long. Subpacket 3 can only be transmitted in time slot 9 and no sooner.

In total, the value range is 0 to (Packet Interval/1.25 ms -Number of Slots per Subpacket).

Example:

Packet Interval = 20 ms, Number of Slots per Subpacket = 2. The value range is 0 to 14.

The entry for "Number of Slots per Subpacket" defines the length of a packet.

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:`
`TOFFset` on page 141

PDCH Subpacket Table Parameters - More Params F-PDCHs BS
Only certain combinations of this parameter with the parameters of the last five table columns are possible. These combinations are shown in the selection list in the form of a table for all five parameters.

Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Subpacket	Modulation
2328	28	1862.4	1	8-PSK
2328	28	1862.4	1	8-PSK
3864	27	1545.6	2	QPSK
3096	26	2476.8	1	16-QAM
3864	26	3091.2	1	16-QAM
1560	25	1248.0	1	QPSK
2328	25	1862.4	1	8-PSK
3096	25	1238.4	2	QPSK
3864	25	1545.6	2	8-PSK
2328	23	931.2	2	QPSK
2328	23	1862.4	1	16-QAM

"Number of Bits per Encoder Packet"

Sets the number of bits per encoder packet.

The "Number of Bits per Encoder Packet" defines the number of data bits that can be read from the data source for an encoder packet. Due to the channel coding, this number is multiplied by a factor of about 5. The subsequent subpacket symbol selection then divides these bits into four different subpackets which can be selected via the SPID parameter.

The "Number of Bits per Encoder Packet" can only be changed for subpacket 1. This value must be identical for the remaining subpackets, since they are all part of a single encoder packet.

"Number of 32-Chip Walsh Channels"

Selects the number of 32-chip Walsh channels.

"Subpacket Data Rate (kbps)"

Selects the data rate of the subpacket.

The data rate is the result of the "Number of Bits per Encoder Packet" divided by the duration of the subpacket (= "Number of Slots per Subpacket"). Therefore only specified combinations of the "Subpacket Data Rate" with the "Number of Slots per Subpacket" at a specified "Number of Bits per Encoder Packet" are possible.

"Number of Slots per Subpacket"

Selects the number of slots per subpacket. This parameter defines the duration of the subpacket. A slot equals 1.25 ms.

The "Number of Slots per Subpacket" is the result of the "Number of Bits per Encoder Packet" divided by the data rate. Therefore only specified combinations of the Subpacket Data Rate with the "Number of Slots per Subpacket" at a specified "Number of Bits per Encoder Packet" are possible.

"Modulation"   Indication of the modulation type.

The modulation type is fix for each combination of the above parameters.

Remote command:

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:
PARameters on page 136

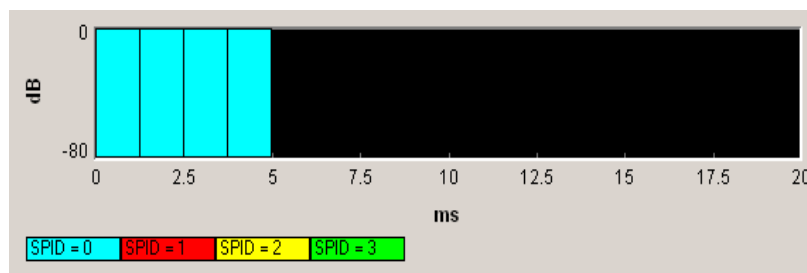**Resulting Walsh Codes for Subpacket - More Params F-PDCHs BS**
Indicates the resulting Walsh codes for the sub packet.

Remote command:
`[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:`
`WCODes?` on page 141

4.9.3 Subpacket Graph

Displays the current configuration of the packet channel and its active subpackets
graphically.

The X axis is the length of the set packet interval in ms, i.e. the duration of the trans-
mission of an encoder packet.

The relative power of the subpackets is represented on the Y axis. The subpackets are
shown as bars and are one, two or four time slots wide according to the configuration.
The position on the X axis corresponds to the selected time slot offset.

The color of the bar depends on the sub packet ID (SPID). The assignment of colors to
SPIDs is shown below the graph.

4.10 Mobile Station Configuration (MS)

The "Mobile Station Configuration" dialog is called by selecting mobile station "MS1 ...
MS4" in the CDMA2000 dialog.

The dialog is divided into the sections "Common Settings", "Power Control" and "Chan-
nel Table".

The structure of the channel table depends on the selected operating mode and - for
the traffic channel - on the selected radio configuration.

4.10.1 Common Settings - MS

The "Common Settings" section is where the general settings for the selected mobile station are made.

State - MS

Activates or deactivates the selected mobile station. The number of the selected mobile station is specified in the dialog header.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:STATe on page 154

Operation Mode - MS

Selects the mode in which the mobile station is to work.

The operation mode defines the generated channel types. The lower part of the dialog changes in accordance with the mode. The following modes are available:

"Traffic"   In this mode, the instrument generates a single traffic channel. A traffic channel consists of up to eight sub channels depending on the selected radio configuration.
                  This mode corresponds to the standard mode of a mobile station during voice and data transmission.

"Access"   In this mode, the instrument generates an access channel (R-ACH). This channel is needed to set up the connection between the mobile station and the base station.

"Enhanced   In this mode, the instrument generates an enhanced access channel
Access"   (R-ACH) and a pilot channel (R-PICH). These channels are used to set up the connection between the mobile station and the BS.

"Common   In this mode, the instrument generates a common control channel (R-
Control"   ACH) and a pilot channel (R-PICH).

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:MODE on page 152

Radio Configuration - MS

Selects the radio configuration for the traffic channel.

In the reverse link, the channel scenario with the spreading codes of the individual channels is predefined by selecting the radio configuration. For this reason, the channel table does not contain selection parameters for the Walsh code.

A separate set of settings of all channel table parameters is provided for each radio configuration. Changing the radio configuration causes the settings belonging to the new RC value to be activated in the channel table. The settings belonging to the old RC value are not lost.

The radio configuration determines the permissible frame lengths and the frame length defines the permitted data rate.

Changing the frame length automatically causes the data rate to be changed if it is no longer permitted.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:RCONfiguration on page 153

Channel Coding - MS
Activates or deactivates channel coding.

"Off"	Channel coding is deactivated.
"Complete"	The complete channel coding is performed. The channel coding procedure can slightly vary depending on channel type, frame length and data rate.
"Without Interleaving"	Except for the block interleaver, the whole channel coding procedure is carried out.
"Interleaving Only"	In this mode, only block interleaver is used for coding.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:CCODing:MODE on page 147

LC Mask (hex) - MS
Enters the mask of the long-code generator in hexadecimal form.

The long-code mask is a 42-bit value. The mask serves for channel-specific and user-specific scrambling of the code channel.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:LCMask on page 152

4.10.2 Power Control - MS

The "Power Control" section is where the settings for the power control bits are made.

In the uplink, the bits are used exclusively for controlling the mobile station output power by activating the "(Mis-)Use Power Control" function. Power control puncturing of the data bits of the traffic channels for controlling the base station power is not performed.

This section is only available for the traffic channel.

Data Source (Power Control) - MS

Defines the data source for the power control bits of the channel.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  - Use the standard "File Manager" function to transfer external data lists to the instrument.

    See also "Main Dialog > Data List Management".

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA on page 154

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:PATTern on page 155

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:DSELect on page 154

Read Out Mode (Power Control) - MS

Defines a read-out mode of power control bits.

Together with the parameter Misuse for Output Power Control - MS, this parameter can also be used to generate various output power profiles.

"Continuous"	The power control bits are used cyclically.
"Single + All 0"	The power control bits are used once and then the power control sequence is continued with 0 bits.
"Single + All 1"	The power control bits are used once and then the power control sequence is continued with 1 bit.
"Single + Alt. 01"	The power control bits are used once and then the power control sequence is continued with 0 bits and 1 bit alternately.
"Single + Alt. 10"	The power control bits are used once and then the power control sequence is continued with 1 bit and 0 bits alternately.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:READ on page 156

Misuse for Output Power Control - MS

Activates "(Mis-) Use" of the power control data.

In the uplink, the power control bits are used exclusively for controlling the mobile station output power. Power control puncturing is not defined for controlling the BS power.

If "(Mis-) Use for Output Power Control" is activated, the specified pattern is used to vary the intrinsic transmit power over time. Every 1.25 ms (800 Hz) a bit of this pattern is removed in order to increase (bit = "1") or reduce (bit = "0") the channel power by the specified "Power Step". The upper limit is 0 dB and the lower limit -80 dB.

The following envelope is produced with the settings:
● Channel power = 0 dB
● Power step = 1.0 dB
● Pattern = "001110100000011"
● "TPC Read Out Mode = Continuous"

Note: The first bit is assigned to the first power control section. In this first section, the start power specified in the channel table is always used. Only in the next power control section (with the second power control bit) will the defined power change be effective.
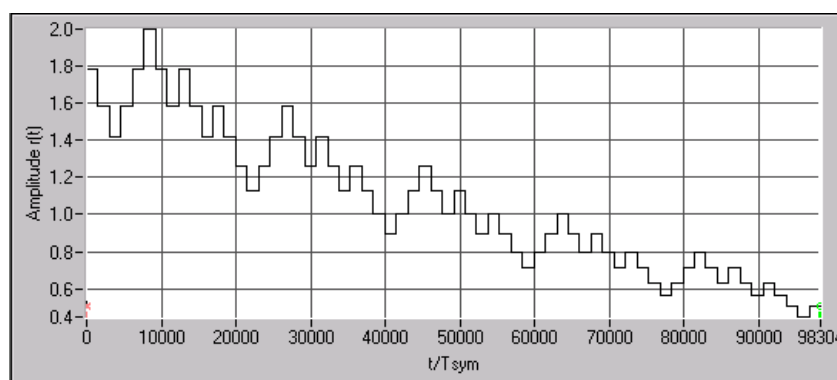

Figure 4-6: Dynamic change of channel power (continuous)

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:MISuse on page 155

Power Step - MS
Sets the step width of the power change in dB for "(Mis-) use TPC for output power control".

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:PSTep on page 156

4.10.3 Channel Table - MS

The "channel table" is located in the lower part of the dialog. The channel table is where the individual channel parameters are set.

The structure of the channel table depends on the selected operating mode and - for the traffic channel - on the selected radio configuration. Also, for the traffic channels, the indicated values and the settings are specific for the selected radio configuration.

In uplink, the employed Walsh code is determined by the radio configuration and cannot be chosen.

The following combinations between the operating modes of the four mobile stations are allowed:

	Traffic, RC1 & RC 2	Traffic, RC3 & RC 4	Access	Enhanced access	Common Control
Traffic, RC1 & RC 2	X		X		
Traffic, RC3 & RC 4		X		X	X
Access	X		X		
Enhanced access		X		X	X
Common control		X		X	X

Channel Number- MS
Displays the channel number.

All channels of the selected operating mode are listed. The channels are switched on and off with the "On/Off" button in the "State" column.

Remote command:
n.a.

Channel Type - MS
Indicates the channel type (see Table 4-3). The possible channel types depend on the selected operating mode of the mobile station.

Table 4-3: List of supported channel types

Short form	Name	Function
Traffic		
R-PICH	Reverse Pilot Channel	Provides the capabilities for coherent detection.
R-DCCH	Reverse Dedicated Control Channel	Transports mobile-specific control information.
R-FCH	Reverse Fundamental Channel	Similar to F-FCH; designed to transport dedicated data.
R-SCH	Reverse Supplemental Channel (RC 3...5)	Allocated dynamically to meet a required data rate.
R-SCCH	Reverse Supplemental Code Channel (RC 1 / 2)	Allocated dynamically to meet a required data rate.
Access		
R-ACH	Reverse Access Channel	Required connection set up between the mobile station and the base station.
Enhanced Access		

Short form	Name	Function
R-EACH	Reverse Enhanced Access Channel	Required connection set up between the mobile station and the base station.
R-PICH	Reverse Pilot Channel	Provides the capabilities for coherent detection.
Common Control		
R-CCCH	Reverse Common Control Channel	Similar to R-ACH but it is meant to transport control information.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:TYPE? on page 151

Frame Length - MS

Sets the frame length of the channel. For the traffic channels, the indicated value is specific for the selected radio configuration.

The value range depends on the channel type and the selected radio configuration. The frame length of some channels is fixed. The maximum frame length is 80 ms, the minimum frame length is 5 ms.

The frame length affects the data rates that are possible within a channel. If a frame length is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:FLENgth on page 150

Data Rate - MS

Sets the data rate of the channel. For the traffic channels, the indicated value is specific for the selected radio configuration.

The R&S Signal Generator supports all data rates between 1.2 kbps and 1,036.8 kbps defined in the standard.

The value range depends on the frame length. If one of these parameters is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:RATE
on page 149

Walsh - MS

Assigns the Walsh code to the channel (see Chapter 3.9, "Spreading - Uplink", on page 15). For the traffic channels, the indicated value is specific for the selected radio configuration.

The code channel is spread with the set Walsh code (spreading code). The Walsh codes to be used are specified by the standard and cannot be chosen.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:WCODe? on page 152

Spread- MS

Indication of the spreading factor of the channel. For the traffic channels, the indicated value is specific for the selected radio configuration.

The spreading factor corresponds to the length of the employed Walsh code. The Walsh codes to be used are specified by the standard and cannot be chosen.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:SPReading?
on page 150

Power - MS

Enters the channel power in dB. For the traffic channels, the set value is specific for the selected radio configuration.

The power entered is relative to the power's output of the other channels. If "Adjust Total Power to 0 dB" is executed (top level of the CDMA2000 dialog), all the power data is relative to 0 dB.

The set power value is also the start power of the channel for "Misuse For Output Power Control".

Note: The maximum channel power of 0 dB applies to non-blanked channels (duty cycle 100%). With blanked channels, the maximum value can be increased (by "Adjust Total Power") to values greater than 0 dB.

Remote command:
[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:POWer on page 150

Data - MS

Selects data source. For the traffic channels, the set value is specific for the selected radio configuration.

The following standard data sources are available:
* "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
* "PNxx"
  An internally generated pseudo-random noise sequence.
* "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
* "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA on page 147

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:PATTern
on page 149

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:DSELect
on page 148

Channel State - MS

Activates/deactivates the channel. For the traffic channels, the indicated value is specific for the selected radio configuration.

Remote command:

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:STATe on page 151

5 Remote-Control Commands

The following commands are required to perform signal generation with the CDMA2000 options in a remote environment. We assume that the R&S Signal Generator has already been set up for remote operation in a network as described in the R&S Signal Generator documentation. Knowledge of the remote control operation and the SCPI command syntax is assumed.

Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the R&S Signal Generator operating manual.

The commands in the `SOURce:BB:C2K` subsystem are described in several sections, separated into general remote commands, commands for base station settings and commands for mobile station settings.

Common suffixes

The following common suffixes are used in remote commands:

Suffix	Value range	Description
`SOURce<hw>`	[1]|2	available baseband signals
`OUTPut<ch>`	1 .. 4	available markers R&S SMBV supports two markers
`EXTernal<ch>`	1|2	external trigger connectors
`BSTation<st>`	[1]|2|3|4	base station
`CGRoup<di0>` `COFFset<ch>`	0|[1]|..8 [1]..13	See "Suffixes" on page 112
`MSTation<st>`	[1]|2|3|4	mobile station
`CHANnel<ch>`	0|[1]|..8	uplink channel

Placeholder <root>

For commands that read out or save files in the default directory, the default directory is set using command `MMEM:CDIRectory`. The examples in this description use the place holder `<root>` in the syntax of the command.

- `D:\` - for selecting the internal hard disk of a Windows instrument
- `E:\` - for selecting the memory stick which is inserted at the USB interface of a Windows instrument
- `/var/user/` - for selecting the internal flash card of a Linux instrument
- `/usb/` - for selecting the memory stick which is inserted at the USB interface of a Linux instrument.

> **ⓘ** Tasks (in manual or remote operation) that are also performed in the base unit in the same way are not described here.
>
> In particular, this includes:
>
> - Managing settings and data lists, i.e. storing and loading settings, creating and accessing data lists, accessing files in a particular directory, etc.
> - Information on regular trigger, marker and clock signals as well as filter settings, if appropriate.
> - General instrument configuration, such as configuring networks and remote operation
> - Using the common status registers
>
> For a description of such tasks, see the R&S Signal Generator operating manual.

The following commands specific to the CDMA2000 are described here:

5.1 Primary Commands

[:SOURce<hw>]:BB:C2K:COPY:COFFset <COffset>

The command sets the offset for the Walsh code in the destination base station. The minimum value is 0 (Walsh codes are identical), the maximum value is 255.

This command is only available in the downlink (SOUR:BB:C2K:LINK FORW/DOWN).

Parameters:

<COffset>	integer
	Range: 0 to 255
	Increment: 1
	*RST: 0

Example: BB:C2K:COPY:COFF 10

the Walsh code is shifted by 10 when the source base station is copied to the destination base station.

Manual operation: See "Copy ..." on page 29

[:SOURce<hw>]:BB:C2K:COPY:DESTination <Destination>

The command selects the station to which data is to be copied. Whether the data is copied to a base station or a mobile station depends on which transmission direction is selected (command C2K:LINK UP | DOWN).

Parameters:

<Destination>	1	2	3	4
	Range: 1 to 4
	*RST: 2

Example: BB:C2K:LINK DOWN

selects the downlink transmit direction (base station to mobile station).

BB:C2K:COPY:SOUR 1

selects base station 1 as the source.

BB:C2K:COPY:DEST 4

selects base station 4 as the destination.

BB:C2K:COPY:EXEC

starts copying the parameter set of base station 1 to base station 4.

Manual operation: See "Copy ..." on page 29

[:SOURce<hw>]:BB:C2K:COPY:EXECute

The command starts the copy process. The dataset of the source station is copied to the destination station. Whether the data is copied to a base station or a mobile station depends on which transmission direction is selected (command :BB:C2K:LINK UP | DOWN).

Example:	BB:C2K:COPY:EXEC
	starts copying the parameter set of the selected source station to the selected destination station.

Usage:	Event

Manual operation:	See "Copy ..." on page 29

[:SOURce<hw>]:BB:C2K:COPY:SOURce <Source>

The command selects the station that has data to be copied. Whether the station copied is a base or mobile station depends on which transmission direction is selected (command C2K:LINK UP | DOWN).

Parameters:

<Source>	1 | 2 | 3 | 4
	Range: 1 to 4
	*RST: 1

Example:	BB:C2K:LINK UP
	selects the uplink transmit direction (mobile station to base station).
	BB:C2K:COPY:SOUR 1
	selects mobile station 1 as the source.
	BB:C2K:COPY:DEST 4
	selects mobile station 4 as the destination.
	BB:C2K:COPY:EXEC
	starts copying the parameter set of mobile station 1 to mobile station 4.

Manual operation:	See "Copy ..." on page 29

[:SOURce<hw>]:BB:C2K:CRATe?

The command queries the spreading rate. The output chip rate which determines the rate of the spread symbols as is used for signal output can be set with the command SOUR:BB:C2K:CRAT:VAR.

Return values:

<CRate>	R1M2
	*RST: R1M2

Example:	BB:C2K:CRAT?
	queries the system chip rate.
	Response:R1M2
	the system chip rate is 1.2288 Mcps.

Usage:	Query only

Manual operation:	See "Spreading Rate" on page 26

[:SOURce<hw>]:BB:C2K:CRATe:VARiation <Variation>

Sets the output chip rate.

The output chip rate changes the output clock and the modulation bandwidth, as well as the synchronization signals that are output. It does not affect the calculated chip sequence.

Parameters:

<Variation>	float
	Range: 400 to 5E6
	Increment: 1E-3
	*RST: 1.2288E6

Example:	`BB:C2K:CRAT:VAR 4086001`
	sets the chip rate to 4.08 Mcps.

Manual operation:	See "Chip Rate Variation" on page 32

[:SOURce<hw>]:BB:C2K:IQSWap[:STATe] <State>

This command inverts the Q-part of the baseband signal if set to ON. The signal on the baseband outputs meets the cdma2000 standard. In order to generate an RF signal that conforms to the standard, the "I/Q Swap" function in the "I/Q Modulator" menu must be enabled ("On") (`SOURce:IQ:SWAP ON`).

Parameters:

<State>	0	1	OFF	ON
	*RST: OFF

Example:	`BB:C2K:IQSW:STAT ON`
	inverts the Q-part of the baseband signal.

Manual operation:	See "Invert Q for Correct Baseband Output" on page 35

[:SOURce<hw>]:BB:C2K:LINK <Link>

The command defines the transmission direction. The signal either corresponds to that of a base station (`FORWard | DOWN`) or that of a mobile station (`REVerse | UP`).

Parameters:

<Link>	DOWN	UP	FORWard	REVerse
	*RST: DOWN

Example:	`BB:C2K:LINK DOWN`
	the transmission direction selected is base station to mobile station. The signal corresponds to that of a base station.

Manual operation:	See "Link Direction" on page 26

[:SOURce<hw>]:BB:C2K:POWer:ADJust

The command sets the power of the active channels in such a way that the total power of the active channels is 0 dB. This does not change the power ratio among the individual channels.

Example:	BB:C2K:POW:ADJ
	The total power of the active channels is set to 0 dB, the power ratio among the individual channels is unchanged.
Usage:	Event
Manual operation:	See "Adjust Total Power to 0dB" on page 29

[:SOURce<hw>]:BB:C2K:POWer[:TOTal]?

The command queries the total power of the active channels. After "Power Adjust", this power corresponds to 0 dB.

Return values:

<Total>	float	
	Range:	-80 dB to 30 dB
	Increment:	0.01 dB
	*RST:	0 dB
Example:	BB:C2K:POW?	
	queries the total power of the active channels.	
	Response: -22.5	
	the total power is -25 dB.	
Usage:	Query only	
Manual operation:	See "Total Power " on page 30	

[:SOURce<hw>]:BB:C2K: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:C2K:STATe.

Example:	SOURce1:BB:C2K:PRESet
Usage:	Event
Manual operation:	See "Set to Default" on page 23

[:SOURce<hw>]:BB:C2K:SETTing:CATalog?

Queries the files with settings in the default directory. Listed are files with the file extension *.cdma2k.

For general information on file handling in the default and in a specific directory, see section "MMEMory Subsystem" in the R&S SMx/AMU operating manual.

Return values:

<Catalog>	<filename1>,<filename2>,...
	Returns a string of filenames separated by commas.

Example:	`MMEM:CDIR '<root>cdma'`
	`SOURce1:BB:C2K:SETTing:CATalog?`
	`// Response: "cdma_up", "cdma_down"`
	`SOURce1:BB:C2K:SETTing:DELete "cdma_down"`
	`SOURce1:BB:C2K:SETTing:LOAD "cdma_up"`

Usage:	Query only
Manual operation:	See "Save/Recall ..." on page 24

[:SOURce<hw>]:BB:C2K:SETTing:DELete <Filename>

Deletes the selected file from the default or the specified directory. Deleted are files with extension `*.cdma2k`.

Setting parameters:

<Filename>	string

Example:	See `[:SOURce<hw>]:BB:C2K:SETTing:CATalog?` on page 90
Usage:	Setting only
Manual operation:	See "Save/Recall ..." on page 24

[:SOURce<hw>]:BB:C2K:SETTing:LOAD <Filename>

Loads the selected file from the default or the specified directory. Loaded are files with extension `*.cdma2k`.

Setting parameters:

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

Example:	See `[:SOURce<hw>]:BB:C2K:SETTing:CATalog?` on page 90
Usage:	Setting only
Manual operation:	See "Save/Recall ..." on page 24

[:SOURce<hw>]:BB:C2K:SETTing:STORe <Filename>

Stores the current settings into the selected file; the file extension (`*.cdma2k`) is assigned automatically.

Setting parameters:

<Filename>	string
	Filename or complete file path

Example: BB:C2K:SETT:STOR 'CDMA_UP'

Usage: Setting only

Manual operation: See "Save/Recall ..." on page 24

[:SOURce<hw>]:BB:C2K:SETTing:STORe:FAST <Fast>

Determines whether the instrument performs an absolute or a differential storing of the settings.

Enable this function to accelerate the saving process by saving only the settings with values different to the default ones.

Note: This function is not affected by the "Preset" function.

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

Manual operation: See "Save/Recall ..." on page 24

[:SOURce<hw>]:BB:C2K:SLENgth <SLength>

Sets the sequence length of the arbitrary waveform component of the CDMA2000 signal in the number of frames.

Parameters:
<SLength>   integer
                      Range: 1 to max
                      *RST: 1

Example: BB:C2K:SLEN 10
                      sets the sequence length to 10 frames.

Manual operation: See "Sequence Length ARB" on page 34

[:SOURce<hw>]:BB:C2K:STATe <State>

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

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

Example: SOURce1:BB:C2K:STATe ON

Manual operation: See "State" on page 23

[:SOURce<hw>]:BB:C2K:WAVeform:CREate <Filename>

This command creates a waveform using the current settings of the "CDMA2000" menu. The file name is entered with the command. The file is stored with the predefined file extension `*.wv`. The file name and the directory it is stored in are user-definable.

Setting parameters:

<Filename>	string

Example:	`MMEM:CDIR "<root>waveform"`
	sets the default directory to <root>waveform.
	`BB:C2K:WAV:CRE "cdma_bs"`
	creates the waveform file `cdma_bs.wv` in the default directory.

Usage:	Setting only

Manual operation:	See "Generate Waveform File" on page 25

[:SOURce]:BB:C2K:VERSion?

The command queries the version of the CDMA standard underlying the definitions.

Return values:

<Version>	string

Example:	`BB:C2K:VERS?`
	queries the CDMA version.
	`Response: Release C`
	CDMA Release 5

Usage:	Query only

Manual operation:	See "CDMA 2000 Version" on page 25

5.2 Filter/Clipping Settings

5.2.1 Filter Settings

[:SOURce<hw>]:BB:C2K:FILTer:TYPe <Type>

The command selects the filter type.

Parameters:

<Type>	RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | PGAuss | LPASs | DIRac | ENPShape | EWPShape | LPASSEVM
	*RST: Downlink:COEF; Uplink: CONE

Example: `BB:C2K:FILT:TYPE CONE`

sets the filter type CdmaOne. This filter type is defined by the standard for the uplink.

Manual operation: See "Filter" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:APCO25 <Apco25>

The command sets the roll-off factor for filter type APCO25.

Parameters:

<Apco25>	float	
	Range:	0.05 to 0.99
	Increment:	0.01
	*RST:	0.20

Example: `BB:C2K:FILT:PAR:APCO25 0.2`

sets the roll-off factor to 0.2 for filter type APCO25.

Manual operation: See "Roll Off Factor or BxT" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:COSine <Cosine>

The command sets the roll-off factor for the Cosine filter type.

Parameters:

<Cosine>	float	
	Range:	0.00 to 1.0
	Increment:	0.01
	*RST:	0.35

Example: `BB:C2K:FILT:PAR:COS 0.35`

sets the roll-off factor to 0.35 for filter type Cosine.

Manual operation: See "Roll Off Factor or BxT" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:GAUSs <Gauss>

The command sets the roll-off factor for the Gauss filter type.

Parameters:

<Gauss>	float

Range: 0.15 to 2.5
Increment: 0.01
*RST: 0.5

Example: `BB:C2K:FILT:PAR:GAUS 0.5`

sets B x T to 0.5 for the Gauss filter type.

Manual operation: See "Roll Off Factor or BxT" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:LPASs <LPass>

The command sets the cut-off frequency factor for the Lowpass (ACP Opt.) filter type.

Parameters:

<LPass>	float

Range: 0.05 to 2
Increment: 0.01
*RST: 0.5

Example: `BB:C2K:FILT:PAR:LPAS 0.5`

The cut-off frequency factor is set to 0.5.

Manual operation: See "Cutoff Frequency Factor" on page 32

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:LPASSEVM <LPassEvm>

The command sets the cut-off frequency factor for the Lowpass (EVM Opt.) filter type.

Parameters:

<LPassEvm>	float

Range: 0.05 to 2
Increment: 0.01
*RST: 0.5

Example: `BB:C2K:FILT:PAR:LPASSEVM 0.5`

The cut-off frequency factor is set to 0.5.

Manual operation: See "Cutoff Frequency Factor" on page 32

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:PGAuss <PGauss>

The command sets the roll-off factor for the Pure Gauss filter type.

Parameters:

<PGauss>	float

Range: 0.15 to 2.5
Increment: 0.01
*RST: 0.5

Example: `BB:C2K:FILT:PAR:GAUS 0.5`

sets B x T to 0.5 for the Pure Gauss filter type.

Manual operation: See "Roll Off Factor or BxT" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:RCOSine <RCosine>

The command sets the roll-off factor for the Root Cosine filter type.

Parameters:

<RCosine>　　　　　float

Range:　　　0.00 to 1.0
Increment:　0.01
*RST:　　　0.22

Example: `BB:C2K:FILT:PAR:RCOS 0.22`

sets the roll-off factor to 0. 22 for filter type Root Cosine.

Manual operation: See "Roll Off Factor or BxT" on page 31

[:SOURce<hw>]:BB:C2K:FILTer:PARameter:SPHase <SPhase>

The command sets B x T for the Split Phase filter type.

Parameters:

<SPhase>　　　　　float

Range:　　　0.15 to 2.5
Increment:　0.01
*RST:　　　2.00

Example: `BB:C2K:FILT:PAR:SPH 0.5`

sets B x T to 0.5 for the Split Phase filter type.

Manual operation: See "Roll Off Factor or BxT" on page 31

5.2.2 Clipping Settings

[:SOURce<hw>]:BB:C2K:CLIPping:LEVel <Level>

The command sets the limit for level clipping (Clipping). This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Level clipping is activated with the command `[:SOURce<hw>]:BB:C2K:CLIPping:STATe`

Parameters:

<Level>	integer
	Range: 1 PCT to 100
	Increment: 1
	*RST: 100 PCT

Example: `BB:C2K:CLIP:LEV 80PCT`
sets the limit for level clipping to 80% of the maximum level.
`BB:C2K:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping Level" on page 34

[:SOURce<hw>]:BB:C2K:CLIPping:MODE <Mode>

The command sets the method for level clipping (Clipping).

Parameters:

<Mode>   VECTor | SCALar

VECTor
The reference level is the amplitude | i+jq |

SCALar
The reference level is the absolute maximum of the I and Q values.

*RST: VECTor

Example: `BB:C2K:CLIP:MODE SCAL`
selects the absolute maximum of all the I and Q values as the reference level.
`BB:C2K:CLIP:LEV 80PCT`
sets the limit for level clipping to 80% of this maximum level.
`BB:C2K:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping Mode" on page 34

[:SOURce<hw>]:BB:C2K:CLIPping:STATe <State>

The command activates level clipping (Clipping). The value is defined with the command `[:SOURce<hw>]:BB:C2K:CLIPping:LEVel`, the mode of calculation with the command `[:SOURce<hw>]:BB:C2K:CLIPping:MODE`.

Parameters:

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

Example: `BB:C2K:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping State" on page 32

5.3 Trigger Settings

EXTernal<ch>

The numeric suffix to `EXTernal<ch>` distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

Example: Trigger configuration

```
SOURce1:BB:C2K:TRIGger:SOURce INTernal
SOURce1:BB:C2K:TRIGger:SEQuence ARETrigger
SOURce1:BB:C2K:STAT ON
SOURce1:BB:C2K:TRIGger:EXECute
SOURce1:BB:C2K:TRIGger:ARM:EXECute
SOURce1:BB:C2K:TRIGger:RMODe?
// stopped
SOURce1:BB:C2K:TRIGger:EXECute
SOURce1:BB:C2K:TRIGger:RMODe?
// run

// SOURce1:BB:C2K:TRIGger:SEQuence SING
// SOURce1:BB:C2K:TRIGger:SLUNit SEQ
// SOURce1:BB:C2K:TRIGger:SLENgth 2

// SOURce1:BB:C2K:TRIGger:SEQuence AAUT
// SOURce1:BB:C2K:TRIGger:SOURce EXT
// SOURce1:BB:C2K:TRIGger:EXTernal:SYNChronize:OUTPut 1
// SOURce1:BB:C2K:TRIGger:EXTernal1:INHibit 100
// SOURce1:BB:C2K:TRIGger:EXTernal1:DELay 10
```

[:SOURce<hw>]:BB:C2K[:TRIGger]:SEQuence <Sequence>

Selects the trigger mode:

- `AUTO` = auto
- `RETRigger` = retrigger
- `AAUTo` = armed auto
- `ARETrigger` = armed retrigger

- `SINGle` = single

Parameters:

<Sequence>   AUTO | RETRigger | AAUTo | ARETrigger | SINGle

                              *RST: AUTO

Example: See Example "Trigger configuration" on page 98

Manual operation: See "Trigger Mode" on page 36

[:SOURce<hw>]:BB:C2K:TRIGger:SOURce <Source>

Selects the trigger source:

- `INTernal`: manual trigger or `*TRG`.
- `EXTernal|BEXTernal`: trigger signal on the TRIGGER 1/2 connector.
- `OBASeband`: trigger signal from the other path

Parameters:

<Source>   INTernal|OBASeband|BEXTernal|EXTernal

                              *RST: INTernal

Example: `SOURce1:BB:C2K:TRIGger:SOURce EXTernal`
                              sets external triggering via the TRIGGER 1 connector.

Manual operation: See "Trigger Source" on page 38

[:SOURce<hw>]:BB:C2K:TRIGger:ARM:EXECute

Stops signal generation; a subsequent trigger event restarts signal generation.

Example: See Example "Trigger configuration" on page 98

Usage: Event

Manual operation: See "Arm" on page 37

[:SOURce<hw>]:BB:C2K:TRIGger:EXECute

Executes a trigger.

Example: See Example "Trigger configuration" on page 98

Usage: Event

Manual operation: See "Execute Trigger" on page 26

[:SOURce<hw>]:BB:C2K:TRIGger:EXTernal:SYNChronize:OUTPut <Output>

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

See also "Sync. Output to External Trigger" on page 38 for a detailed description of the applications of this setting.

Parameters:

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

Example: See Example "Trigger configuration" on page 98

Manual operation: See "Sync. Output to External Trigger" on page 38

[:SOURce<hw>]:BB:C2K:TRIGger:OBASeband:DELay <Delay>

Sets the trigger delay (expressed as a number of chips) for triggering by the trigger signal from the second path (two-path instruments only).

Parameters:

<Delay>	float
	Range: 0 to 65535
	Increment: 0.01
	*RST: 0

Example: `BB:C2K:TRIG:SOUR OBAS`
sets for path A the internal trigger executed by the trigger signal from the second path (path B).
`BB:C2K:TRIG:OBAS:DEL 50`
sets a delay of 50 symbols for the trigger.

Manual operation: See "Trigger Delay" on page 39

[:SOURce<hw>]:BB:C2K:TRIGger:OBASeband:INHibit <Inhibit>

For triggering via the other path, specifies the duration by which a restart is inhibited.

Parameters:

<Inhibit>	integer
	Range: 0 to 67108863
	*RST: 0

Example: `BB:C2K:TRIG:SOUR OBAS`
sets for path A the internal trigger executed by the trigger signal from the second path (path B).
`BB:C2K:TRIG:INH 200`
sets a restart inhibit for 200 chips following a trigger event.

Manual operation: See "Trigger Inhibit" on page 40

[:SOURce<hw>]:BB:C2K:TRIGger[:EXTernal<ch>]:DELay <Delay>

The command specifies the trigger delay (expressed as a number of chips)for external triggering.

Parameters:

<Delay>   float

Range: 0 to 65535
Increment: 0.01 chips
*RST: 0

Example: BB:C2K:TRIG:SOUR EXT
sets an external trigger via the TRIGGER 1 connector.
BB:C2K:TRIG:DEL 50
sets a delay of 50 symbols for the trigger.

Manual operation: See "Trigger Delay" on page 39

[:SOURce<hw>]:BB:C2K:TRIGger[:EXTernal<ch>]:INHibit <Inhibit>

The command specifies the number of chips by which a restart is to be inhibited following a trigger event. This command applies only in the case of external triggering.

Parameters:

<Inhibit>   integer

Range: 0 to 67108863
Increment: 1 chip
*RST: 0

Example: BB:C2K:TRIG:SOUR EXT
selects an external trigger via the TRIGGER 1 connector.
BB:C2K:TRIG:INH 200
sets a restart inhibit for 200 chips following a trigger event.

Manual operation: See "Trigger Inhibit" on page 40

[:SOURce<hw>]:BB:C2K:TRIGger:RMODe?

Queries the signal generation status.

Return values:

<RMode>   STOP | RUN

Example: See Example "Trigger configuration" on page 98

Usage: Query only

Manual operation: See "Running/Stopped" on page 37

[:SOURce<hw>]:BB:C2K:TRIGger:SLENgth <SLength>

Defines the length of the signal sequence that is output in the SINGle trigger mode.

Parameters:

<SLength>   integer

Range: 1 to INT_MAX
*RST: 98304

Example:　　　　　　　See Example "Trigger configuration" on page 98

Manual operation:　　See "Signal Duration" on page 37

[:SOURce<hw>]:BB:C2K:TRIGger:SLUNit <SlUnit>

Defines the unit for the entry of the signal sequence length.

Parameters:

<SlUnit>　　　　　　　FRAMe | CHIP | SEQuence

　　　　　　　　　　　*RST:　　　SEQuence

Example:　　　　　　　See Example "Trigger configuration" on page 98

Manual operation:　　See "Signal Duration Unit" on page 37

5.4 Marker Settings

Example: Configure and enable standard marker signals

```
SOURce1:BB:C2K:TRIGger:OUTPut2:MODE RAT
SOURce1:BB:C2K:TRIGger:OUTPut2:ONTime 20
SOURce1:BB:C2K:TRIGger:OUTPut2:OFFTime 200

SOURce1:BB:C2K:TRIGger:OUTPut3:MODE USER
SOURce1:BB:C2K:TRIGger:OUTPut3:PERiod 100

SOURce1:BB:C2K:TRIGger:OUTPut3:DELay 1000

SOURce1:BB:C2K:TRIGger:OUTPut:DELay:FIXed 1
SOURce1:BB:C2K:TRIGger:OUTPut1:DELay:MINimum?
// 0
SOURce1:BB:C2K:TRIGger:OUTPut1:DELay:MAXimum?
// 2000
```

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut:DELay:FIXed <Fixed>

Restricts the marker delay setting range to the dynamic range.

Parameters:

<Fixed>   0 | 1 | OFF | ON

                           *RST: 0

Example: See Example "Configure and enable standard marker signals"
                           on page 102

Manual operation: See "Fix marker delay to current range" on page 41

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay <Delay>

Defines the delay between the signal on the marker outputs and the start of the signals.

Parameters:

<Delay>   float

                           Range: 0 to max
                           Increment: 1E-3
                           *RST: 0

Example: See Example "Configure and enable standard marker signals"
                           on page 102

Manual operation: See "Marker x Delay" on page 41

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay:MINimum?
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:DELay:MAXimum?

Queries the min/max marker delay.

Return values:

<Maximum>   float

Example: See Example "Configure and enable standard marker signals"
                           on page 102

Usage: Query only

Manual operation: See "Current Range without Recalculation" on page 41

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode>	PCGRoup | RFRame | SCFRame | SFRame | ESECond | CSPeriod | RATio | USER | TRIGger

Marker signal that marks:

PCGRoup
The start of each power control group (every 1.25 ms).

RFRame
Every 20 ms (traffic channel clock).

SCFRame
The start of each sync channel frame (every 26.6 ms).

SFRame
Every 80 ms (super frame clock).

ESECond
Every 2 s (even second mark).

CSPeriod
The start of each arbitrary waveform sequence

RATio
Off / On times

USER
The beginning of every user-defined period

TRIGger
A received internal or external trigger signal is output at the marker connector.

*RST: PCGRoup

Example:	See Example "Configure and enable standard marker signals" on page 102
Manual operation:	See "Marker Mode" on page 40

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:ONTime <OnTime>
[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:OFFTime <OffTime>

Sets the duration during which the marker output is on or off.

Parameters:

<OffTime>	integer
	Range: 1 to 16777215
	*RST: 1

Example:	See Example "Configure and enable standard marker signals" on page 102
Manual operation:	See "Marker Mode" on page 40

[:SOURce<hw>]:BB:C2K:TRIGger:OUTPut<ch>:PERiod <Period>

Sets the repetition rate for the signal at the marker outputs.

Parameters:

<Period>	integer
	Range: 2 to UINT_MAX
	*RST: 2

Example: See Example "Configure and enable standard marker signals" on page 102

Manual operation: See "Marker Mode" on page 40

5.5 Clock Settings

This section lists the remote control commands, necessary to configure the clock.

[:SOURce<hw>]:BB:C2K:CLOCk:MODE <Mode>

Sets the type of externally supplied clock.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Parameters:

<Mode>	CHIP	MCHip
	*RST: CHIP

Example: SOURce1:BB:C2K:CLOCk:MODE CHIP

Manual operation: See "Clock Mode" on page 43

[:SOURce<hw>]:BB:C2K:CLOCk:MULTiplier <Multiplier>

Sets the multiplier for clock type "Multiplied" (:BB:C2K:CLOCk:MODE MCHip) in the case of an external clock source.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Parameters:

<Multiplier>	integer
	Range: 1 to 64
	*RST: 4

Example:	`SOURce1:BB:C2K:CLOCk:SOURce EXTernal`
	selects the external clock source.
	`BB:C2K:CLOCk:MODE MCHip`
	selects clock type "Multiplied", i.e. the supplied clock has a rate which is a multiple of the chip rate.
	`BB:C2K:CLOCk:MULTiplier 12`
	the multiplier for the external clock rate is 12.

Manual operation:	See "Clock Multiplier" on page 43

[:SOURce<hw>]:BB:C2K:CLOCk:SOURce <Source>

The command selects the clock source.

For two-path instruments, selecting `EXTernal` is only possible for path A, since the external clock source is permanently allocated to path A. Selection `AINternal` is only possible for path B.

Parameters:

<Source>	INTernal | EXTernal | AINTernal **INTernal** The internal clock reference is used. **EXTernal** The external clock reference is supplied to the CLOCK connector. Commands `[:SOURce<hw>]:BB:C2K:CLOCk:MODE` and `[:SOURce<hw>]:BB:C2K:CLOCk:MULTiplier` are used to enter the type of the external clock. **AINTernal** The clock source of path A is used for path B. *RST: INTernal

Example:	`:BB:C2K:CLOC:SOUR EXT`
	selects the external clock source. The clock is supplied via the CLOCK connector.
	`BB:C2K:CLOC:MODE MCH`
	selects clock type "Multiplied", i.e. the supplied clock has a rate which is a multiple of the chip rate.
	`BB:C2K:CLOC:MULT 12`
	the multiplier for the external clock rate is 12.

Manual operation:	See "Clock Source" on page 42

[:SOURce<hw>]:BB:C2K:CLOCk:SYNChronization:EXECute

Adjusts of the instrument's settings according to the selected synchronization mode.

Example:	See `[:SOURce<hw>]:BB:C2K:CLOCk:SYNChronization:MODE` on page 107
Usage:	Event
Manual operation:	See "Set Synchronization Settings" on page 42

[:SOURce<hw>]:BB:C2K:CLOCk:SYNChronization:MODE <Mode>

(for R&S SMBV only)

Selects the synchronization mode.

This parameter is used to enable generation of precise synchronous signal of several connected R&S SMBVs.

Note: If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type. Avoid unnecessary cable length and branching points.

Parameters:

<Mode>   NONE | MASTer | SLAVe

                            NONE
                            The instrument is working in stand-alone mode.

                            MASTer
                            The instrument provides all connected instrument with its syn-
                            chronization (including the trigger signal) and reference clock
                            signal.

                            SLAVe
                            The instrument receives the synchronization and reference clock
                            signal from another instrument working in a master mode.

                            *RST: NONE

Example: BB:C2K:CLOC:SYNC:MODE MAST
                            The instrument is configured to work as a master one.
                            BB:C2K:CLOC:SYNC:EXEC
                            All synchronization's settings are set accordingly.

Manual operation: See "Sync. Mode" on page 42

5.6 Predefined Settings

The R&S Signal Generator gives you the opportunity to generate predefined test set-
tings for base station 1. These predefined settings enable the creation of highly com-
plex scenarios for the downlink by presetting the channel table of base station 1. The
settings take effect only after execution of command [:SOURce<hw>]:BB:C2K:
PPARameter:EXECute.

[:SOURce<hw>]:BB:C2K:PPARameter:CRESt <Crest>

This command selects the desired range for the crest factor of the test scenario. The crest factor of the signal is kept in the desired range by automatically setting appropriate Walsh codes and timing offsets.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

The setting of command `[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:WCODe` is adjusted according to the selection.

Parameters:

<Crest>   MINimum | AVERage | WORSt

MINimum
The crest factor is minimized. The Walsh codes are spaced as closely as possible.

AVERage
An average crest factor is set. The Walsh codes are distributed uniformly over the code domain.

WORSt
The crest factor is set to an unfavorable value (i.e. maximum). The Walsh codes are as wildly spaced as possible.

*RST: MINimum

Example: BB:C2K:PPAR:CRES WORS
Sets the crest factor to an unfavorable value.

Manual operation: See "Crest Factor - Predefined Settings" on page 46

[:SOURce<hw>]:BB:C2K:PPARameter:EXECute

This command presets the channel table of base station 1 with the parameters defined by the `PPARameter` commands.

Example: BB:C2K:PPAR:EXEC
configures the signal sequence as defined by the `:BB:C2K:PPARameter` commands.

Usage: Event

Manual operation: See "Accept - Predefined Settings" on page 46

[:SOURce<hw>]:BB:C2K:PPARameter:PCHannel[:STATe] <State>

The command activates/deactivates the paging channel.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

Parameters:

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

Example: `BB:C2K:PPAR:PCH ON`
activates F-PCH.

Manual operation: See "Use Paging Channel (F-PCH) - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:PICHannel[:STATe] <State>

The command activates/deactivates the pilot channel.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

Parameters:

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

Example: `BB:C2K:PPAR:PICH ON`
activates F-PICH.

Manual operation: See "Use Pilot (F-PICH) - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:RCONfiguration <RConfiguration>

Selects the radio configuration for the traffic channel.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

Parameters:

<RConfiguration>	1 | 2 | 3 | 4 | 5
	*RST: 1

Example: `BB:C2K:PPAR:RCON 1`
selects radio configuration 1.

Manual operation: See "Radio Configuration - Predefined Settings" on page 44

[:SOURce<hw>]:BB:C2K:PPARameter:SCHannel[:STATe] <State>

Activates/deactivates the F-SYNC.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

Parameters:

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

Example:	`BB:C2K:PPAR:SCH ON`
	activates the F-SYNC.

Manual operation:	See "Use Sync (F-Sync) - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:COUNt <Count>

This command sets the number of activated traffic channels.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`.

Parameters:

<Count>	integer
	Range: 0 to 8
	*RST: 1

Example:	`BB:C2K:PPAR:TCH:COUN 2`
	the predefined signal contains 2 traffic channels.

Manual operation:	See "Number of Traffic Channels - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:DATA:RATE <Rate>

This command sets the data rate of F-FCH and F-SCH. The set value is specific for the selected radio configuration.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`. It is specific for the selected radio configuration.

The value range depends on the frame length. If the frame length is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

The data rate affects the Walsh code (spreading factor) that are possible within a channel. If a data rate is changed so that the selected Walsh code becomes invalid, the next permissible value is automatically set.

Parameters:

<Rate>	DR1K2 | DR1K3 | DR1K5 | DR1K8 | DR2K4 | DR2K7 | DR3K6 | DR4K8 | DR7K2 | DR9K6 | DR14K4 | DR19K2 | DR28K8 | DR38K4 | DR57K6 | DR76K8 | DR115K2 | DR153K6 | DR230K4 | DR259K2 | DR307K2 | DR460K8 | DR518K4 | DR614K4 | DR1036K8 | NUSed
	*RST: DR1K2

Example:	`BB:C2K:PPAR:TCH:DATA:RATE D240K`
	sets the data rate of F-FCH and F-SCH to 240 ksps.

Manual operation:	See "Data Rate - Predefined Settings" on page 46

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:DCCHannel[:STATe] <State>

Activates/deactivates the dedicated control channel. F-DCCH cannot be selected for RC1 and RC2.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`. It is specific for the selected radio configuration.

Parameters:

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

Example:	`BB:C2K:PPAR:TCH:DCCH ON`
	Activates F-DCCH.

Manual operation:	See "Use Dedicated Control (F-DCCH) - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:FCHannel[:STATe] <State>

Activates/deactivates the fundamental channel.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`. It is specific for the selected radio configuration.

Parameters:

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

Example:	`BB:C2K:PPAR:TCH:FCH ON`
	activates F-FCH.

Manual operation:	See "Use Fundamental (F-FCH) - Predefined Settings" on page 45

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:FLENgth <FLength>

The command activates/deactivates the fundamental channel. The set value is specific for the selected radio configuration.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`. It is specific for the selected radio configuration.

The frame length affects the data rates that are possible within a channel. Changing the frame length can lead to a change of data rate and this in turn can bring about a change of Walsh code.

Parameters:

<FLength>	20 | 40 | 80
	*RST: 20 ms

Example:	`BB:C2K:PPAR:TCH:FLEN 20 ms`
	Sets the frame length of the code channels to 20 ms.

Manual operation: See "Frame Length - Predefined Settings" on page 46

[:SOURce<hw>]:BB:C2K:PPARameter:TCHannel:SCHannel:COUNt <Count>

Sets the number of supplemental channels. The maximum number of supplemental channels depends on the selected radio configuration.

The setting takes effect only after execution of command `[:SOURce<hw>]:BB:C2K:PPARameter:EXECute`. It is specific for the selected radio configuration.

Parameters:

<Count>   integer

                            Range: 0 to 7
                            *RST: 1

Example: `BB:C2K:PPAR:TCH:SCH:COUN 2`
                            selects two F-SCHs.

Manual operation: See "Number of Supplemental (F-SCH) - Predefined Settings" on page 45

5.7 Base Stations Settings

The `SOURce:BB:C2K:BSTation` system contains commands for setting base stations.

The commands of this system only take effect if the CDMA2000 standard is activated, the DOWN transmission direction is selected and the particular base station is enabled:

● `SOURce:BB:C2K:STATe ON`

● `SOURce:BB:C2K:LINK DOWN`

● `SOURce:BB:C2K:BSTation2:STATe ON`

Suffixes

The channel table for the base station is configured from 14 special channels and up to eight traffic channels. Each traffic channel consists of four to eight code channels. The type and number of code channels depends on the radio configuration chosen for the traffic channel.

The individual channels are selected in SCPI via the suffixes to keywords `CGRoup` and `COFFset`.

The special channels have the suffix 0 to `CGRoup` and 1 to 14 to `COFFset` corresponding to the channel index 0 to 1 to 0 to 14 in the channel table.

The code channels of a traffic channel are addressed by means of suffixes 1 to 8 for the traffic channel and 1 to 8 to `COFFset` for the sub channels of the selected traffic channel. Thus `CGRoup2:COFFset1` is the code channel F-FCH of the traffic channel 2 and equates to the channel index 2 to 1 in the channel table.

Table 5-1: Structure of the traffic channel for different radio configurations.

	Radio Configuration 1, 2	Radio Configuration 3, 4, 5
1-1 (`CGRoup1:COFFset1`)	F-FCH	F-FCH
1-2 (`CGRoup1:COFFset2`)	F-SCH1	F-SCH1
1-3 (`CGRoup1:COFFset3`)	F-SCH2	F-SCH2
1-4 (`CGRoup1:COFFset4`)	F-SCH3	F-DCCH
1-5 (`CGRoup1:COFFset5`)	F-SCH4	-
1-6 (`CGRoup1:COFFset6`)	F-SCH5	-
1-7 (`CGRoup1:COFFset7`)	F-SCH6	-
1-8 (`CGRoup1:COFFset8`)	F-SCH7	-

Regardless of the radio configuration, in all traffic channels the `COFFset1` corresponds to the F-FCH, and the `COFFset2` and `COFFset3` correspond to the F-SCH1 and F-SCH2, respectively. In radio configurations 1 and 2 the `COFFset4` corresponds to the F-SCH3, and in radio configurations 3, 4, 5 to the F-DCCH. `COFFset5`, `COFFset6`,`COFFset7` and `COFFset8` exist only in radio configurations 1 and 2, where they correspond to the F-SCH4 to F-SCH7.

For the code channels of a traffic channels, the settings of the channel table parameters are specific for the selected radio configuration. I.e. a complete set of settings exists for each of the five possible radio configurations.

See also "Common suffixes" on page 85.

[:SOURce<hw>]:BB:C2K:BSTation:PRESet

A standardized default for all the base stations (*RST values specified for the commands).

See "Reset All Base Stations" on page 27 for an overview.

Example: SOURce1:BB:C2K:BSTation:PRESet

| **Usage:** | Event |

| **Manual operation:** | See "Reset All Base Stations" on page 27 |

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:CNUMber <CNumber>

Sets the CDMA Channel Number which corresponds to the RF.

Parameters:

<CNumber>	integer
	Range: 0 to 2047
	*RST: 387

| **Example:** | BB:C2K:BST:SYNC:CNUM 400 |
| | sets the channel number |

| **Manual operation:** | See "CDMA Channel Number - More Params BS" on page 69 |

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:LCSTate <LcState>

(available for R&S SMBV instruments only)

Defines the long code state in hexadecimal format.

Parameters:

<LcState>	42 bit
	Range: 0 to 3FFFFFFFFFF
	*RST: 0

| **Example:** | BB:C2K:BST:SYNC:LCST #H0001F3A002E1 |
| | sets the Long Code state parameter. |

| **Manual operation:** | See "LC State (hex) - More Params BS" on page 69 |

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:MPRev <MPrev>

Sets the Minimum Protocol Revision Level.

The base station sets this field to prevent mobile stations which cannot be supported by the base station from accessing the CDMA system.

Parameters:

<MPrev>	2	8
	Range: 2 to 8
	*RST: 2

| **Example:** | BB:C2K:BST:SYNC:MPR 3 |
| | Sets the MIN_P_REV parameter |

| **Manual operation:** | See "MIN_P_REV - More Params BS" on page 70 |

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:NID <Nid>

Sets the Network Identification.

The NID serves as a sub-identifier of a CDMA system as defined by the owner of the SID.

Parameters:

<Nid>   integer

                         Range: 0 to 65535
                         *RST: 1

Example: BB:C2K:BST:SYNC:NID 5

                         sets the network identification parameter

Manual operation: See "NID - More Params BS" on page 70

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:PREV <Prev>

Sets the Protocol Revision Level, i.e. specifies the CDMA2000 system release number.

The table below gives the cross-reference between the P_REV values and the CDMA2000 Releases.

P_REV	CDMA2000 Release
1	Korean PCS(Band Class4), USPCS(Band Class1)
2	IS-95
3	TBS74
4	IS-95A
5	IS-95B
6	IS2000 Release 0
7	IS2000 Release A
8	IS2000 Release B

Parameters:

<Prev>   integer

                         Range: 1 to 8
                         *RST: 6

Example: BB:C2K:BST:SYNC:PREV 4

                         sets the P_REV parameter

Manual operation: See "P_REV - More Params BS" on page 69

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:SID <Sid>

Displays the System Identification.

The base station sets the system identification number.

Parameters:

<Sid>   integer

                         Range: 0 to 32767
                         *RST: 10

Example: BB:C2K:BST:SYNC:SID 10

                         sets the system identification parameter

Manual operation: See "SID - More Params BS" on page 70

[:SOURce<hw>]:BB:C2K:BSTation:SYNC:STIMe <SystTime>

(available for R&S SMBV instruments only)

Displays the system time.

Parameters:

<SystTime>   integer

                         Range: 0 to 68719476735
                         *RST: 0

Example: BB:C2K:BST:SYNC:STIM 4

                         sets the system time.

Manual operation: See "System Time - More Params BS" on page 69

**[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing:
    BINTerleaver?**

The command queries the number of symbols per block which are processed by the
interleaver. This value is only available for channel coding modes "Complete" and
"Without Interleaving"
(SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP |
NOIN).

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<BInterleaver>   48 | 96 | 128 | 144 | 192 | 288 | 384 | 576 | 768 | 1152 | 1536 |
                         2304 | 3072 | 4608 | 6144 | 9216 | 12288 | 18432 | 36864 |
                         NONE

Example: BB:C2K:BST:CGR3:COFF1:CCOD:MODE COMP

                         selects channel coding mode "Complete" for F-FCH of the third
                         traffic channel.
                         BB:C2K:BST:CGR3:COFF1:CCOD:BINT?
                         queries the number of symbols per block which are processed
                         by the interleaver.
                         Response: 384
                         384 symbols per block are processed.

Usage: Query only

Manual operation: See "Block Interleaver - More Params BS" on page 68

**[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing:
  BITFrame?**

Queries the number of input bits per frame for the channel coder. This value is only available for channel coding modes "Complete" and "Without Interleaving" (`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP | NOIN`).

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<BitFrame>	integer
	Range: 16 to 20712
	*RST: 16
Example:	`BB:C2K:BST:CGR3:COFF1:CCOD:MODE COMP`
	selects channel coding mode "Complete" for F-FCH of the third traffic channel.
	`BB:C2K:BST:CGR3:COFF1:CCOD:BITF?`
	queries the number of input bits per frame.
	`Response: 16`
	16 bits per frame.
Usage:	Query only
Manual operation:	See "Source Bits / Frame - More Params BS" on page 67

**[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing:
  CRC?**

Queries the CRC (cyclic redundancy code) type (length). This value is only available for channel coding modes "Complete" and "Without Interleaving" (`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP | NOIN`).

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<Crc>	integer
	Range: 0 to 16
	*RST: 0
Example:	`BB:C2K:BST:CGR1:COFF1:CCOD:MODE COMP`
	selects channel coding mode "Complete" for F-FCH of the first traffic channel.
	`BB:C2K:BST:CGR1:COFF1:CCOD:CRC?`
	queries the CRC type.
	`Response: 6`
	CRC type 6 is used.
Usage:	Query only

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing: DATA:RATE?

The command queries the effective data rate in Hz. This value is only available for channel coding modes "Off" and "Interleaving Only"
(`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE OFF | OINT`).

When channel coding is switched off, the effective data rate differs from the data rate set in the channel table. The data are read out with the effective rate.

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<Rate>	float

Example:	`BB:C2K:BST:CGR3:COFF1:CCOD:MODE OINT`
	selects channel coding mode "Interleaving Only" for F-FCH of the third traffic channel.
	`BB:C2K:BST:CGR3:COFF1:CCOD:DATA:RATE?`
	queries the effective data rate.
	`Response: 19200`
	the effective data is 19.2 kbps.
Usage:	Query only
Manual operation:	See "Effective Data Rate - More Params BS" on page 67

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing: MODE <Mode>

Selects channel coding mode. For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Mode>	OFF | COMPlete | NOINterleaving | OINTerleaving
	OFF
	Channel coding is deactivated.
	COMPlete
	The complete channel coding is performed. The channel coding procedure can slightly vary depending on channel type, frame length and data rate.
	OINTerleaving
	Except for the block interleaver, the whole channel coding procedure is carried out. In this mode, the frame structure and the convolutional coder of a receiver can be tested.
	NOINterleaving
	In this mode, only block interleaver is used for coding. This allows the deinterleaver in the receiver to be tested independently of the remaining (de-)coding process.
	*RST: COMPlete

Example:	`BB:C2K:BST:CGR3:COFF1:CCOD:MODE OFF` Deactivates channel coding for F-FCH of the third traffic channel.
Manual operation:	See "Channel Coding Mode - More Params BS" on page 66

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing: SPUNcture?

The command queries the symbol puncture rate. This value is only available for channel coding modes "Complete" and "Without Interleaving"
(`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP | NOIN`).

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<SPuncture>	8OF24 | 1OF5 | 1OF9 | 4OF12 | 2OF18 | 2OF6 | T2OF18 | T4OF12 | NONE
	xOFy a symbol puncture rate of x out of y is used
	TxOFy a symbol puncture rate of x out of y Turbo is used

Example:	`BB:C2K:BST:CGR3:COFF1:CCOD:MODE COMP`
	selects channel coding mode "Complete" for F-FCH of the third traffic channel.
	`BB:C2K:BST:CGR3:COFF1:CCOD:SPUN?`
	queries the symbol puncture rate.
	`Response: 8OF24`
	a symbol puncture rate of 8 out of 24 is used.

Usage:	Query only
Manual operation:	See "Symbol Puncture - More Params BS" on page 68

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing: SREPetition?

Queries symbol repetition rate. This value is only available for channel coding modes "Complete" and "Without Interleaving"
(`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP | NOIN`).

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<SRepetition>	integer	
	Range:	1 to 16
	*RST:	0

Example: `BB:C2K:BST:CGR3:COFF1:CCOD:MODE COMP`
selects channel coding mode "Complete" for F-FCH of the third traffic channel.
`BB:C2K:BST:CGR3:COFF1:CCOD:SREP?`
queries symbol repetition rate.
`Response: 8`
a symbol repetition rate of 8 is used.

Usage: Query only

Manual operation: See "Symbol Repetition - More Params BS" on page 68

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:CCODing: TYPE <Type>

The command sets the channel coding type.

This value is only available for channel coding modes "Complete" and "Without Interleaving" (`SOURce:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:CCODing:MODE COMP | NOIN`). For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Type>   CON2 | CON3 | CON4 | CON6 | TUR2 | TUR3 | TUR4 | TUR5 | OFF | DEFault

NONE
No error protection

TURx
Turbo Coder of rate 1/x in accordance with the CDMA specifications.

CONx
Convolution Coder of rate 1/x with generator polynomials defined by CDMA.

*RST: Channel-specific

Example: `BB:C2K:BST:CGR3:COFF2:CCOD:MODE COMP`
selects channel coding mode "Complete" for F-SCH1 of the third traffic channel.
`BB:C2K:BST:CGR3:COFF2:CCOD:TYPE TURB4`
selects turbo coder with a rate of 1/4 for F-SCH1 of the third traffic channel.

Manual operation: See "Channel Coder Type - More Params BS" on page 67

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA <Data>

The command selects the data source for the specified channel.

For the traffic channels, this value is specific for the selected radio configuration.

The data source for the power control bits is selected with the command `:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:TPC:DATA`.

Parameters:

<Data>   ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `:BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:DATA:DSEL`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `:BB:C2K:BST:CGRoup:COFFset:DATA:PATT`.

*RST: F-PICH; F-TDPICH; F-APICH; F-ATDPICH: ALL0; all other channels: PN9

Example: `BB:C2K:BST2:CGR3:COFF1:DATA PATT`
Selects as the data source for the F-FCH of the third traffic channel of base station 2, the bit pattern defined with the following command:
`BB:C2K:BST2:CGR3:COFF1:DATA:PATT #H3F,8`
Defines the bit pattern.

Manual operation: See "Data List Management " on page 24

**[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:
     DSELect** <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<DSelect>   string

Example: `BB:C2K:BST2:CGR3:COFF1:DATA DLIS`
selects the Data Lists data source for the F-FCH of the third traffic channel of basestation2.
`MMEM:CDIR "<root>Lists"`
selects the directory for the data lists.
`BB:C2K:BST2:CGR3:COFF1:DATA:DLIS "cdma_list1"`
selects file "`cdma_list1`" as the data source. This file must be in specified directory and it must have the file extension `*.dm_iqd`.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA: PATTern <Pattern>

Sets the bit pattern for the PATTern selection. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use. The maximum length is 64 bits.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:
<Pattern>   64 bits

Example: `BB:C2K:BST2:CGR3:COFF1:DATA:PATT #H800FE038,30`
defines the bit pattern.

Manual operation: See "Data" on page 60

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DATA:RATE <Rate>

The command sets the data rate for the specified channel. The value range depends on the channel type, the selected radio configuration and the frame length. Parameter NUSed is returned for channel 0-1 to 0-4.

For the traffic channels, this value is specific for the selected radio configuration.

The value range depends on the frame length. If the frame length is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

The data rate affects the Walsh code (spreading factor) that are possible within a channel. If a data rate is changed so that the selected Walsh code becomes invalid, the next permissible value is automatically set.

Parameters:
<Rate>   DR1K2 | DR1K3 | DR1K5 | DR1K8 | DR2K4 | DR2K7 | DR3K6 |
                    DR4K8 | DR7K2 | DR9K6 | DR14K4 | DR19K2 | DR28K8 |
                    DR38K4 | DR57K6 | DR76K8 | DR115K2 | DR153K6 |
                    DR230K4 | DR307K2 | NUSed

                    *RST: Channel-specific

Example:	`BB:C2K:BST2:CGR3:COFF1:DATA:RATE DR4K8`
	sets a data rate of 4.8 kbps for F-FCH of the third traffic channel of base station 2.
Manual operation:	See "Data Rate" on page 59

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor: BIT:RATE <Rate>

(not available in R&S SMBV)

Sets the bit error rate.

Parameters:

<Rate>	float
	Range: 1E-7 to 0.1
	Increment: 1E-7
	*RST: 1E-3
Example:	see `[:SOURce<hw>]:BB:C2K:BSTation<st>: CGRoup<di0>:COFFset<ch>:DERRor:BLOCk:STATe` on page 125
Manual operation:	See "Bit Error Rate - More Params BS" on page 71

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor: BIT:STATe <State>

(not available in R&S SMBV)

Activates bit error generation.

Parameters:

<State>	0	1	OFF	ON
Example:	see `[:SOURce<hw>]:BB:C2K:BSTation<st>: CGRoup<di0>:COFFset<ch>:DERRor:BLOCk:STATe` on page 125
Manual operation:	See "Bit Error State - More Params BS" on page 71

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor: BLOCk:RATE <Rate>

(not available in R&S SMBV)

Sets the block error rate.

Block error generation is only possible when channel coding is activated. For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Rate>	float

Range: 1E-4 to 0.1
Increment: 1E-4
*RST: 0.1

Example: see `[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor:BLOCk:STATe` on page 125

Manual operation: See "Block Error Rate - More Params BS" on page 71

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:DERRor: BLOCk:STATe <State>

(not available in R&S SMBV)

Activates or deactivates block error generation.

Parameters:

<State>	0	1	OFF	ON

Example:
```
BB:C2K:BST:CGR1:COFF3:REAL:STAT ON
// activates the generation of F-SCH2
// of the first traffic channel of BS1
BB:C2K:BST:CGR1:COFF3:CCOD:MODE COMP
// activates complete channel coding
BB:C2K:BST:CGR1:COFF3:DERR:BLOC:RATE 1E-2
// sets the block error rate
BB:C2K:BST:CGR1:COFF3:DERR:BLOC:STAT ON
// activates block error generation
BB:C2K:BST:CGR1:COFF3:DERR:BIT:RATE 1E-4
// sets a bit error rate
BB:C2K:BST:CGR1:COFF3:DERR:BIT:STAT ON
// activates bit error generation
```

Manual operation: See "Block Error State - More Params BS" on page 71

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:FLENgth <FLength>

The command sets the frame length of the selected channel. The value range is channel specific.

For the traffic channels, this value is specific for the selected radio configuration.

The value range of the frame length depends on the channel type and the selected radio configuration.

The frame length affects the data rates that are possible within a channel. Changing the frame length can lead to a change of data rate and this in turn can bring about a change of Walsh code.

Parameters:

<FLength>	5 | 10 | 20 | 26.6 | 40 | 80 | 160 | NUSed

26 ms

Frame length of 26.6. Also all inputs 26.6 ms and 26.7 ms are allowed.

	*RST:	F-SYNC: 26.6; F_BCH: 40 ms; F_CACH: 5 ms; all other channels: 20 ms

Example:	`BB:C2K:BST:CGR3:COFF4:FLEN 5 ms`
	Sets the frame length of sub channel 3 ms to 4 ms to 5 ms.
Manual operation:	See "Frame Length- BS" on page 59

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:LCMask <LcMask>

The command sets the mask of the Long Code Generator of the base station.

For the traffic channels, this value is specific for the selected radio configuration.

The LC Mask is the same for all sub channels of a traffic channel. If the mask is modified for one of the sub channels, the new value is then automatically used by all other subchannels of this traffic channel.

Parameters:

<LcMask>	integer

	Range:	#H0 to #H3FF FFFF FFFF
	*RST:	#H0

Example:	`BB:C2K:BST1:CGR2:COFF1:LCM #H55`
	Sets the Long Code Mask to #H55.
Manual operation:	See "LC Mask (hex) - More Parameters BS" on page 63

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:POWer <Power>

Sets the channel power relative to the powers of the other channels. This setting also determines the starting power of the channel for Misuse Output Power Control.

With the command `[:SOURce<hw>]:BB:C2K:POWer:ADJust`, the power of all the activated channels is adapted so that the total power corresponds to 0 dB. This does not change the power ratio among the individual channels.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Power>	float

	Range:	-80 to depends on channel
	Increment:	0.01
	*RST:	0

Example: `BB:C2K:BST2:CGR3:COFF4:POW -10dB`

Sets the channel power of sub channel 3 to 4 of base station 2 dB to -10 dB relative to the power of the other channels.

Manual operation: See "Power" on page 60

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:QWCode: STATe <State>

Activates/deactivates the use of the quasi orthogonal Walsh codes for the channel.

The quasi orthogonal Walsh Code set is selected for all channels of the base station with command `[:SOURce<hw>]:BB:C2K:BSTation<st>:QWSet`.

For the traffic channels, this value is specific for the selected radio configuration. It is only available for radio configuration 3 and higher.

Parameters:

<State>   0 | 1 | OFF | ON

                      *RST: 0

Example: `BB:C2K:BST1:QWS 3`

selects quasi orthogonal Walsh code set 3 for base station 1.

`BB:C2K:BST1:CGR3:COFF4:QWC:STAT ON`

activates the use of the quasi orthogonal Walsh code for sub channel 3-4.

Manual operation: See "Quasi Orthogonal Walsh Code State" on page 60

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:REALtime: STATe <State>

(not available in R&S SMBV)

Activates/deactivates realtime generation of the selected channel. Realtime generation is possible for F-SYNC and the first traffic channel of base station 1.

For the traffic channel, this value is specific for the selected radio configuration.

Parameters:

<State>   0 | 1 | OFF | ON

                      *RST: 0

Example: `BB:C2K:BST:CGR0:COFF5:REAL:STAT ON`

activates realtime generation of F-SYNC of base station 1.

Manual operation: See "Real Time - BS1" on page 58

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:STATe <State>

This command activates/deactivates the selected channel.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

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

Example: BB:C2K:BST2:CGR1:COFF2:STAT OFF
Deactivates sub channel 1 to 2 of base station 1.

Manual operation: See "Channel State" on page 61

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA <Data>

Sets the data source for the power control bits of the selected F-FCH or F-DCCH.

Power control is available for sub channel types F-FCH and F-DCCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Data>   ZERO \| ONE \| PATTern \| DLISt

DLISt
A data list is used. The data list is selected with the command
`[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA:DSELect`.

ZERO \| ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA:PATTern`. The maximum length is 64 bits.

*RST: ZERO

Example: BB:C2K:BST2:CGR1:RCON 4
Selects radio configuration4 for the first traffic channel of base station 2. This setting is valid for all sub channels of this traffic channel. With RC4, the traffic channel includes an F-DCCH.
BB:C2K:BST2:CGR1:COFF4:TPC:DATA PATT
Selects as the data source for the power control bits of F-DCCH the bit pattern defined with the following command.
BB:C2K:BST2:CGR1:COFF4:TPC:DATA:PATT #HF0C20,19
Defines the bit pattern.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

Power control is available for sub channel types F-DCCH and F-FCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<DSelect>　　　　　　　　string

Example:　　　　　　　`BB:C2K:BST2:CGR1:RCON 4`

selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes a F-DCCH.

`:BB:C2K:BST2:CGR1:COFF4:TPC:DATA DLIS`

selects the DLISt data source.

`MMEM:CDIR "<root>Lists"`

selects the directory for the data lists.

`BB:C2K:BST2:CGR1:COFF4:TPC:DATA:DSEL "cdma_ch4"`

selects the file `cdma_ch4` as the data source. This file must be in specified directory and it must have the file extension `*.dm_iqd`.

Manual operation:　　　See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:DATA: PATTern <Pattern>

Sets the bit pattern for the `PATTern` selection. The maximum bit pattern length is 64 bits.

Power control is available for sub channel types F-DCCH and F-FCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Pattern>　　　　　　　64 bits

Example:　　　　　　　`BB:C2K:BST2:CGR1:RCON 4`

selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes a F-DCCH.

`BB:C2K:BST2:CGR1:COFF4:TPC:DATA:PATT #H3F,8`

defines the bit pattern for the power control-bits.

Manual operation:　　　See "Data Source - Power Control - BS" on page 64

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:MISuse
      <MisUse>

The command activates "mis-" use of the power control bits of the selected F-DCCH or F- FCH for controlling the channel powers of these channels.

Power control is available for sub channel types F-DCCH and F-FCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

The bit pattern (see commands `:BB:C2K:BSTation<n>:CGRoup<n>:COFFset<n>:TPC...`) of the power control bits of each channel is used to control the channel power. A "1" leads to an increase of channel powers, a "0" to a reduction of channel powers. Channel power is limited to the range 0 dB to -80 dB. The step width of the change is defined with the command `[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>: COFFset<ch>:TPC:PSTep`.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

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

Example:	`BB:C2K:BST2:CGR1:RCON 4`
	selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes a F-DCCH.
	`BB:C2K:BST2:CGR1:COFF4:TPC:MIS ON`
	activates regulation of channel power for DCCH of the first traffic channel of base station 2 via the power control bit pattern.
	`BB:C2K:BST2:CGR1:COFF4:TPC:PST 1 dB`
	sets the step width for the change of channel powers to 1 dB.

Manual operation:	See "Misuse for Output Power Control - BS" on page 65

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:PSTep
      <PStep>

The command defines the step width for the change of channel powers in the case of "mis-" use of the power control bits.

Power control is available for sub channel types F-DCCH and F-FCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<PStep>	float
	Range: -10 dB to 10 dB
	Increment: 0.01 dB
	*RST: 0 dB

Example: BB:C2K:BST2:CGR1:RCON 4

selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes a F-DCCH.

BB:C2K:BST2:CGR1:COFF4:TPC:PST 1 dB

sets the step width for the change of channel powers to 1 dB.

Manual operation: See "Power Step (DPCCH) - BS" on page 66

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TPC:READ
    <Read>

The command sets the read out mode for the bit pattern of the power control bits.

The bit pattern is defined with the commands :BB:C2K:BST<n>:CGRoup<n>:COFFset<n>:TPC....

Power control is available for sub channel types F-DCCH and F-FCH. F-DCCH is only generated for radio configurations 3, 4 and 5.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Read>   CONTinuous | S0A | S1A | S01A | S10A

CONTinuous
The bit pattern is used cyclically.

S0A
The bit pattern is used once, then the power control bit sequence continues with 0 bits.

S1A
The bit pattern is used once, then the power control bit sequence continues with 1 bit.

S01A
The bit pattern is used once and then the power control bit sequence is continued with 0 bits and 1 bit alternately.

S10A
The bit pattern is used once and then the power control bit sequence is continued with 1 bit and 0 bits alternately.

*RST: CONTinuous

Example: BB:C2K:BST2:CGR1:RCON 4

Selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes an F-DCCH.

BB:C2K:BST2:CGR1:COFF4:TPC:READ S0A

'the bit pattern is used once, after which a 0 sequence is generated (applies to F-DCCH of the first traffic channel of base station 2).

Manual operation: See "Read Out Mode (Power Control) - BS" on page 64

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:TYPE?

Queries the channel type.

The channel type is firmly fixed for channel numbers 0-1 to 0-14 (`CGR0: COFF1 to CGR0:COFF14`), i.e. for the special channels (control and packet channels). The remaining channel numbers are assigned to the individual code channels of the eight possible traffic channels. In this case, the first traffic channel occupies the range 1-1 to 1-8 (`CGR1:COFF1 to CGR1:COFF8`), the second occupies the range 2-1 to 2-8 (`CGR2:COFF1 to CGR2:COFF8`), etc. Since the type and number of code channels depends on the radio configuration of the channel, the channels x-2 to x-8 are variously occupied. X-1 is always the fundamental channel (F-FCH) of the traffic channel.

Return values:

<Type>	F-PICH | F-SYNC | F-PCH | F-TDPICH | F-APICH | F-ATDPICH | F-BCH | F-QPCH | F-CPCCH | F-CACH | F-CCCH | F-DCCH | F-FCH | F-SCH | F-PDCCH | F-PDCH

Example: `BB:C2K:BST2:CGR0:COFF12:TYPE?`
Queries type of channel 0 to 12 of base station 2.
`Response: F-PDCCH`

Usage: Query only

Manual operation: See "Channel Type" on page 56

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:WCODe <WCode>

Assigns the Walsh Code to the channel. The standard assigns a fixed walsh code to some channels (F-PICH, for example, always uses Walsh code 0). Generally, the Walsh code can only be varied within the range specified by the standard.

For the traffic channels, this value is specific for the selected radio configuration.

The value range of the Walsh code depends on the frame length, the channel coding type and the data rate.

If one of these parameters is changed so that the set Walsh code gets invalid, the next permissible value is automatically set.

Parameters:

<WCode>	integer
	Range: 0 to 255
	*RST: 0

Example: `BB:C2K:BST1:CGR3:COFF5:WCOD 23`
Assigns Walsh code 23 to sub channel 3 to 5 of base station 1.

Manual operation: See "Walsh Code" on page 59

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:WLENgth?

Queries the Walsh Code length of the channel. For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<WLength>   integer

Range: 0 to 255
*RST: 0

Example: BB:C2K:BST1:CGR3:COFF5:WLEN?
queries Walsh code length of sub channel 3-5 of base station 1.
Response: 64
the Walsh code length is 64.

Usage: Query only

Manual operation: See "Walsh Length - More Parameters BS" on page 63

[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:RCONfiguration
        <RConfiguration>

Selects the radio configuration for the traffic channel. The settings of the channel table parameters are specific for the selected radio configuration.

Parameters:

<RConfiguration>   1 | 2 | 3 | 4 | 5

*RST: Traffic channel 1/2: 3; all other traffic channels: 1

Example: BB:C2K:BST2:CGR1:RCON 4
selects radio configuration RC4 for the first traffic channel of base station 2. This setting is valid for all sub channels of the traffic channel. With RC4, the traffic channel includes a F-DCCH.

Manual operation: See "Radio Configuration (RC)" on page 58

[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict:MODE <Mode>

The command switches the order of the spreading codes.

Parameters:

<Mode>   HAD | BREV

HAD
the code channels are displayed in the order determined by the Hadamard matrix. The codes are numbered as Walsh codes according to the standard.

BREV
the code channels are displayed in the order defined by the Orthogonal Variable Spreading Factor (OVSF) code tree (3GPP code).

*RST: HAD

Example:	`BB:C2K:BST2:DCON:MODE HAD`
	selects that the codes are numbered as Walsh codes according to the standard.

Manual operation:	See "Order - Code Domain BS" on page 53

[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict:RESolve

The command resolves existing domain conflicts by modifying the Walsh codes of the affected channels.

Example:	`BB:C2K:BST2:DCON:STAT?`
	queries whether a code domain conflict exists for base station 2.
	`Response: 1`
	there is a conflict.
	`BB:C2K:BST2:DCON:RES`
	resolves the code domain error by modifying the Walsh codes of the affected channels.

Usage:	Event

Manual operation:	See "Domain Conflict" on page 61

[:SOURce<hw>]:BB:C2K:BSTation<st>:DCONflict[:STATe]?

The command queries whether there is (response 1) or is not (response 0) a conflict (overlap) in the hierarchically-structured Walsh codes.

Return values:

<State>	0	1	OFF	ON

Example:	`BB:C2K:BST2:DCON:STAT?`
	queries whether a code domain conflict exists for base station 2.
	`Response: 0`
	there is no conflict.

Usage:	Query only

Manual operation:	See "Domain Conflict" on page 61

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:PINTerval <PInterval>

The command sets the interval between two data packets for F-PDCH. The range depends on the ARB settings sequence length (`:BB:C2K:SLENgth`). The values 80 ms, 40 ms, 20 ms, 10 ms and 5 ms can always be set, and the maximum value is 2000 ms. All intermediate values must satisfy the condition:

Sequence Length * 80ms/2^n, where n is a whole number.

Parameters:

<PInterval>	float	
	Range:	5 ms to 2000 ms
	Increment:	0.005
	*RST:	20 ms

Example: 　　　　`BB:C2K:BST2:PDCH:PINT 10 ms`

sets an interval of 10 ms between two data packets.

Manual operation: 　See "Packet Interval - More Params F-PDCHs BS" on page 72

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:PSETup <PSetup>

Selects for F-PDCH if all subpackets are generated using the same settings or if the settings of subchannel 1 are valid for all sub channels. However, the value of "Number of Bits per Encoder Packet" is a quality of the complete encoder packet, therefore it is always set for all sub packet channels via the entry for sub channel 1.

Parameters:

<PSetup>　　　　0 | 1 | OFF | ON

ON
Packet parameters can be changed only for sub packet 1, all sub packets are generated with these settings.

OFF
Packet parameters can be set individually for each sub packet.

*RST:　　1

Example: 　　　　`BB:C2K:BST2:PDCH:PSET OFF`

selects that all sub packets can be configured separately.

Manual operation: 　See "Same Packet Setup... - More Params F-PDCHs BS" on page 73

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:ID <Id>

The command selects the sub packet ID for F_PDCH. The sub packet ID determines the sub packet symbol selection and selects one of four available subpackets of the encoder packets. The SPID of sub packet 1 is always 1.

Parameters:

<Id>	0	1	2	3	
	Range:	0 to 3
	*RST:	0

Example: 　　　　`BB:C2K:BST2:PDCH:SUBP3:ID 3`

selects SPID 3 for sub packet 3.

Manual operation: 　See "Subpacket ID (SPID) - More Params F-PDCHs BS" on page 74

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:PARameters
      <Parameters>

Selects a fixed combination of parameters "Bits per Encoder Packet", "Number of 32-Chip Walsh Channels", "Subpacket Data Rate", "Number of Slots per Subpackets" and "Modulation Order". These combinations are shown in the following list in the form of a table for all five parameters.

The complete range of 127 possible combinations is only available for subpacket 1. If "Same Packet Setup for all Subpackets" is enabled (SOUR:BB:C2K:BST2:PDCH: PSET ON), this command is only valid for subpacket 1.

Parameter of command SOUR:BB: C2K:BST: PDCH:PAR	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Sub-packet	Modulation Order
1	2328	28	1862.4	1	8-PSK
2	3864	27	1545.6	2	QPSK
3	3096	26	2476.8	1	16-QAM
4	3864	26	3091.2	1	16-QAM
5	1560	25	1248.0	1	QPSK
6	2328	25	1862.4	1	8-PSK
7	3096	25	1238.4	2	QPSK
8	3864	25	1545.6	2	8-PSK
9	2328	23	931.2	2	QPSK
10	2328	23	1862.4	1	16-QAM
11	3096	23	2476.8	1	16-QAM
12	3864	23	1545.6	2	8-PSK
13	1560	22	1248.0	1	QPSK
14	3096	22	1238.4	2	QPSK
15	1560	21	1248.0	1	8-PSK
16	3096	21	1238.4	2	8-PSK
17	3096	21	2476.8	1	16-QAM
18	3864	21	1545.6	2	8-PSK
19	1560	20	624.0	2	QPSK
20	2328	20	465.6	4	QPSK
21	2328	20	931.2	2	QPSK
22	2328	20	1862.4	1	16-QAM
23	3096	20	619.2	4	QPSK

Parameter of command SOUR:BB: C2K:BST: PDCH:PAR	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Sub-packet	Modulation Order
24	408	19	326.4	1	QPSK
25	792	19	316.8	2	QPSK
26	792	19	633.6	1	QPSK
27	1560	19	1248.0	1	8-PSK
28	3096	19	1238.4	2	8-PSK
29	3864	19	772.8	4	QPSK
30	3864	19	1545.6	2	16-QAM
31	2328	18	1862.4	1	16-QAM
32	1560	17	1248.0	1	8-PSK
33	2328	17	931.2	2	QPSK
34	3096	17	1238.4	2	8-PSK
35	3864	17	1545.6	2	16-QAM
36	2328	16	1862.4	1	16-QAM
37	3096	16	619.2	4	QPSK
38	3864	16	772.8	4	QPSK
39	792	15	633.6	1	QPSK
40	1560	15	624.0	2	QPSK
41	1560	15	1248.0	1	16-QAM
42	2328	15	931.2	2	8-PSK
43	3096	15	1238.4	2	16-QAM
44	3864	15	1545.6	2	16-QAM
45	1560	14	312.0	4	QPSK
46	2328	14	465.6	4	QPSK
47	3864	14	772.8	4	QPSK
48	3864	14	1545.6	2	16-QAM
49	792	13	633.6	1	QPSK
50	1560	13	624.0	2	QPSK
51	1560	13	1248.0	1	16-QAM
52	2328	13	931.2	2	8-PSK
53	3096	13	619.2	4	QPSK
54	3096	13	1238.4	2	16-QAM

Parameter of command SOUR:BB:C2K:BST:PDCH:PAR	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Sub-packet	Modulation Order
55	3864	13	1545.6	2	16-QAM
56	1560	12	1248.0	1	16-QAM
57	3096	12	1238.4	2	16-QAM
58	3864	12	772.8	4	8-PSK
59	408	11	326.4	1	QPSK
60	792	11	158.4	4	QPSK
61	792	11	316.8	2	QPSK
62	792	11	633.6	1	QPSK
63	1560	11	624.0	2	QPSK
64	1560	11	1248.0	1	16-QAM
65	2328	11	465.6	4	QPSK
66	2328	11	931.2	2	16-QAM
67	3096	11	619.2	4	QPSK
68	3096	11	1238.4	2	16-QAM
69	3864	11	772.8	4	8-PSK
70	792	10	633.6	1	8-PSK
71	1560	10	624.0	2	8-PSK
72	2328	10	931.2	2	16-QAM
73	3096	10	619.2	4	8-PSK
74	792	9	633.6	1	8-PSK
75	1560	9	312.0	4	QPSK
76	1560	9	624.0	2	8-PSK
77	2328	9	465.6	4	QPSK
78	2328	9	931.2	2	16-QAM
79	3096	9	619.2	4	8-PSK
80	3864	9	772.8	4	16-QAM
81	408	8	163.2	2	QPSK
82	408	8	326.4	1	QPSK
83	792	8	316.8	2	QPSK
84	792	8	633.6	1	16-QAM
85	1560	8	624.0	2	16-QAM

Parameter of command SOUR:BB: C2K:BST: PDCH:PAR	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Sub-packet	Modulation Order
86	2328	8	465.6	4	8-PSK
87	2328	8	931.2	2	16-QAM
88	3096	8	619.2	4	16-QAM
89	3864	8	772.8	4	16-QAM
90	408	7	326.4	1	QPSK
91	792	7	316.8	2	QPSK
92	792	7	633.6	1	16-QAM
93	1560	7	312.0	4	QPSK
94	1560	7	624.0	2	16-QAM
95	2328	7	465.6	4	8-PSK
96	3096	7	619.2	4	16-QAM
97	3864	7	772.8	4	16-QAM
98	408	6	326.4	1	QPSK
99	792	6	158.4	4	QPSK
100	792	6	316.8	2	QPSK
101	792	6	633.6	1	16-QAM
102	1560	6	312.0	4	QPSK
103	1560	6	624.0	2	16-QAM
104	2328	6	465.6	4	16-QAM
105	3096	6	619.2	4	16-QAM
106	408	5	163.2	2	QPSK
107	408	5	326.4	1	8-PSK
108	792	5	316.8	2	8-PSK
109	1560	5	312.0	4	8-PSK
110	2328	5	465.6	4	16-QAM
111	408	4	81.6	4	QPSK
112	408	4	163.2	2	QPSK
113	408	4	326.4	1	16-QAM
114	792	4	158.4	4	QPSK
115	792	4	316.8	2	16-QAM
116	1560	4	312.0	4	16-QAM

Parameter of command SOUR:BB: C2K:BST: PDCH:PAR	Number of Bits per Encoder Packet	Number of 32-Chip Walsh Channels	Subpacket Data Rate (kbps)	Number of Slots per Sub-packet	Modulation Order
117	2328	4	465.6	4	16-QAM
118	408	3	81.6	4	QPSK
119	408	3	163.2	2	QPSK
120	408	3	326.4	1	16-QAM
121	792	3	158.4	4	QPSK
122	792	3	316.8	2	16-QAM
123	1560	3	312.0	4	16-QAM
124	408	2	81.6	4	QPSK
125	408	2	163.2	2	16-QAM
126	792	2	158.4	4	16-QAM
127	408	1	81.6	4	16-QAM

Parameters:

<Parameters>	1 to 127
	*RST: 1

Example:	BB:C2K:BST2:PDCH:SUBP1:PAR 48
	selects combination of parameters with index 48 (see following table).

Manual operation:	See "PDCH Subpacket Table Parameters - More Params F-PDCHs BS" on page 74

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:STATe <State>

This command activates/deactivates the selected sub packet for F_PDCH. Sub packet 1 is always active.

Parameters:

<State>	0	1	OFF	ON
	*RST: OFF

Example:	BB:C2K:BST2:PDCH:SUBP3:STAT ON
	activates sub packet 3.

Manual operation:	See "Subpacket State - More Params F-PDCHs BS" on page 74

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:TOFFset
　　　<TOffset>

Sets start of the sub packet relative to the start of the packet interval. The offset is entered in slots. Sub packet 1 has offset 0. The value range for the individual subpackets depends on the settings of the other subpackets. The time slot offsets of the other sub packet have to be entered in ascending order. Also, two packets cannot be sent at the same time.

In total the maximum value depends on the selected packet interval and the number of slots per sub packet as follows:

Packet Interval/1.25 ms - Number of Slots per Subpacket.

Parameters:

<TOffset>	integer	
	Range:	0 to max
	*RST:	0|1|2|3

Example:	`BB:C2K:BST2:PDCH:SUBP3:TOFF 4`
	enters at time slot offset of 4 slots. Sub packet 3 is sent 4 slots after the begin of the packet interval.

Manual operation:	See "Time Slot Offset - More Params F-PDCHs BS" on page 74

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:SUBPacket<di>:WCODes?

The command queries the resulting Walsh codes for the selected sub packet of F-PDCH. Packet channels may be assigned to more than one code channel.

Return values:

<WCodes>	string

Example:	`BB:C2K:BST2:PDCH:SUBP3:RES:WCOD?`
	queries the resulting Walsh codes for sub packet 3 of F-PDCH of base station 2.
	`Response: "31, 15, 23"`
	the resulting walsh codes are 31,15,23.

Usage:	Query only

Manual operation:	See "Resulting Walsh Codes for Subpacket - More Params F-PDCHs BS" on page 76

[:SOURce<hw>]:BB:C2K:BSTation<st>:PDCHannel:WINDex <WIndex>

The command selects a standard Walsh set for F-PDCH. Four different sets are defined in the standard.

Parameters:

<WIndex>	0 | 1 | 2 | 3
	*RST: 　0

Example: `BB:C2K:BST2:PDCH:WIND 2`
                      selects set 2 for PDCH of base station 2.

Manual operation: See "Walsh Code Column Index - More Params F-PDCHs BS"
                      on page 73

[:SOURce<hw>]:BB:C2K:BSTation<st>:PNOFfset <PnOffset>

The command sets the PN offset (short code) of the base station. The PN offset permits signals of different base stations to be distinguished.

Parameters:

<PnOffset>   integer

                     Range: 0 to 511
                     *RST: 0

Example: `BB:C2K:BST3:PNOF 123`
                      sets a PN offset of 123 for base station 3.

Manual operation: See "PN Offset - BS" on page 50

[:SOURce<hw>]:BB:C2K:BSTation<st>:QWSet <QwSet>

The command selects the quasi orthogonal Walsh code set. The standard defines three different sets.

The quasi-orthogonal Walsh codes are used for a given channel if `[:SOURce<hw>]:BB:C2K:BSTation<st>:CGRoup<di0>:COFFset<ch>:QWCode:STATe` is ON.

Parameters:

<QwSet>   integer

                     Range: 1 to 3
                     *RST: 1

Example: `BB:C2K:BST2:QWS 2`
                      selects set 2 for base station 2.

Manual operation: See "Quasi orth Walsh Set - BS" on page 50

[:SOURce<hw>]:BB:C2K:BSTation<st>:STATe <State>

The command activates and deactivates the specified base station.

Parameters:

<State>   0 | 1 | OFF | ON

                     *RST: OFF

Example: `BB:C2K:BST2:STAT OFF`
                      deactivates base station 2.

Manual operation: See "Base Station/Mobile Station State" on page 30

[:SOURce<hw>]:BB:C2K:BSTation<st>:TDELay <TDelay>

Sets the time shift of the selected base station compared to base station 1.

Parameters:

<TDelay>   integer

Range: 0 to dynamic
*RST: 0
Default unit: chip

Example: BB:C2K:BST2:TDEL 256

shifts base station 2 by 256 chips compared to base station 1.

Manual operation: See "Time Delay - BS" on page 50

[:SOURce<hw>]:BB:C2K:BSTation<st>:TDIVersity <TDiversity>

The command activates and deactivates signal calculation with transmit diversity (OFF). To activate transmit diversity, the antenna must be specified whose signals are to be simulated (ANT1 or ANT2).

The diversity scheme is selected using command [:SOURce<hw>]:BB:C2K: BSTation<st>:TDIVersity:MODE.

Parameters:

<TDiversity>   OFF | ANT1 | ANT2

OFF
No transmit diversity.

ANT1
Calculate and apply the output signal for antenna 1.

ANT2
Calculate and apply the output signal for antenna 2.

*RST: OFF

Example: BB:C2K:BST2:TDIV ANT2
Activates transmit diversity, the signal of antenna 2 is simulated.

Manual operation: See "Transmit Diversity - BS" on page 49

[:SOURce<hw>]:BB:C2K:BSTation<st>:TDIVersity:MODE <Mode>

The command selects the diversity scheme.

Command [:SOURce<hw>]:BB:C2K:BSTation<st>:TDIVersity activates transmit diversity and selects the antenna.

Parameters:

<Mode>   OTD | STS

                      OTD
                      Orthogonal Transmit Diversity Mode.

                      STS
                      Space Time Spreading Mode.

                      *RST: OTD

Example: BB:C2K:BST2:TDIV:MODE OTD
                      selects scheme OTD for Transmit Diversity.
                      BB:C2K:BST2:TDIV ANT2
                      activates transmit diversity, the signal of antenna 2 is simulated.

Manual operation: See "Diversity Mode - BS" on page 50

5.8 Mobile Station Settings

The SOURce:BB:C2K:MSTation system contains commands for setting mobile stations.

The commands of this system only take effect when the CDMA2000 standard is activated, the UP transmission direction is selected and the particular mobile station is enabled:

* SOURce:BB:C2K:STATe ON
* SOURce:BB:C2K:LINK UP
* SOURce:BB:C2K:MSTation2:STATe ON

For the code channels of a traffic channels, the settings of the channel table parameters are specific for the selected radio configuration. I.e. a complete set of settings exists for each of the four possible radio configurations.

[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:COUNt <Count>

Sets the number of additional mobile stations.

Parameters:

<Count>	integer
	Range: 1 to 64
	*RST: 4

Example: `BB:C2K:MST:ADD:COUN 20`
sets 20 additional mobile stations.
`BB:C2K:MST:ADD:POW:OFFS -3.0`
sets the power offset to -3 dB.
`BB:C2K:MST:ADD:LCM:STEP #H1`
sets the step width for increasing the LC mask to 1.
`BB:C2K:MST:ADD:STAT ON`
connects the 20 mobile stations to the CDMA signal.

Manual operation: See "Number of Additional MS" on page 47

[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:LCMask:STEP <Step>

Sets the step width for increasing the LC mask of the additional mobile stations. The start value is the LC mask of MS4.

Parameters:

<Step>	24 bits
	*RST: #H1

Example: `BB:C2K:MST:ADD:LCM:STEP #H55`
sets the step width for increasing the long code mask to #H55.

Manual operation: See "LC Mask Step" on page 47

[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:POWer:OFFSet <Offset>

The command sets the power offset of the active channels of the additional mobile stations relative to the power of the active channels of the reference station MS4.

The offset applies to all the additional mobile stations. The resultant overall power must fall within the range 0 ... - 80 dB. If the value is above or below this range, it is limited automatically.

Parameters:

<Offset>	float	
	Range:	-80 dB to 0 dB
	Increment:	0.01 dB
	*RST:	0 dB

Example: BB:C2K:MST:ADD:POW:OFFS −3.0

sets the offset to -3 dB.

Manual operation: See "Power Offset" on page 47

[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:STATe <State>

The command activates additional mobile stations.

Parameters:

<State>	0	1	OFF	ON	
	*RST:	OFF

Example: BB:C2K:MST:ADD:STAT ON

connects the additional mobile stations to the CDMA2000 signal.

Manual operation: See "State" on page 47

[:SOURce<hw>]:BB:C2K:MSTation:ADDitional:TDELay:STEP <Step>

Sets the step width for the time delay of the additional mobile stations to one another. The start value returns the time delay of MS4.

Parameters:

<Step>	integer	
	Range:	0 to 1535 (1 frame)
	Increment:	1
	*RST:	0
	Default unit: chip	

Example: BB:C2K:MST:ADD:TDEL:STEP 256

shifts each of the mobile stations 256 chips apart, starting from the time delay of MS4.

Manual operation: See "Time Delay Step" on page 48

[:SOURce<hw>]:BB:C2K:MSTation:PRESet

A standardized default for all the mobile stations (*RST values specified for the commands).

See "Reset All Mobile Stations" on page 28 for an overview.

Example:	SOURce1:BB:C2K:MSTation:PRESet
Usage:	Event
Manual operation:	See "Reset All Mobile Stations" on page 28

[:SOURce<hw>]:BB:C2K:MSTation<st>:CCODing:MODE <Mode>

The command selects the channel coding mode.

Parameters:

<Mode>	OFF | COMPlete | NOINterleaving | OINTerleaving
	OFF Channel coding is deactivated.
	COMPlete The complete channel coding is performed. The channel coding procedure can slightly vary depending on channel type, frame length and data rate.
	OINTerleaving Except for the block interleaver, the whole channel coding procedure is carried out.
	NOINterleaving In this mode, only block interleaver is used for coding.
	*RST: COMPlete
Example:	BB:C2K:MST:CCOD:MODE OFF Deactivates channel coding for mobile station 1.
Manual operation:	See "Channel Coding - MS" on page 78

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA <Data>

The command sets the data source for the specified channel.

The data source for the power control bits is selected with the command [:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA. For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Data>   ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 |
                          PN21 | PN23 | DLISt

                          PNxx
                          The pseudo-random sequence generator is used as the data
                          source. Different random sequence lengths can be selected.

                          DLISt
                          A data list is used. The data list is selected with the command
                          `[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:`
                          `DATA:DSELect`.

                          ZERO | ONE
                          Internal 0 and 1 data is used.

                          PATTern
                          Internal data is used. The bit pattern for the data is defined by
                          the command `[:SOURce<hw>]:BB:C2K:MSTation<st>:`
                          `CHANnel<ch>:DATA:PATTern`.

                          *RST: PN9

Example: `BB:C2K:MST1:CHAN2:DATA PN16`
                          Selects as the data source for channel 2 of mobile station 1,
                          internal PRBS data with a sequence length of 2^{16}-1.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<DSelect>   string

Example: `BB:C2K:MST1:CHAN1:DATA DLIS`
                          selects the Data Lists data source.
                          `MMEM:CDIR "<root>Lists"`
                          selects the directory for the data lists.
                          `BB:C2K:MST1:CHAN1:DATA:DSEL "dpdch_13"'`
                          selects file '`cdma_13`' as the data source. This file must be in
                          specified directory and it must have the file extension
                          `*.dm_iqd`.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:PATTern <Pattern>

Sets the bit pattern for the data component when the PATTern data source is selected. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use. The maximum length is 64 bits.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Pattern>	64 bits

Example: `BB:C2K:MST1:CHAN1:DATA PATT`
selects Pattern data source.
`BB:C2K:MST1:CHAN1:DATA:PATT #H800FFFF80003FFE, 60`
defines the bit pattern.

Manual operation: See "Data - MS" on page 83

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:DATA:RATE <Rate>

The command sets the data rate for the specified channel. The value range depends on the channel type, the selected radio configuration and the frame length.

For the traffic channels, this value is specific for the selected radio configuration.

The value range of the data rate depends on the channel type and the frame length. If the frame length is changed so that the set data rate becomes invalid, the next permissible value is automatically set.

Parameters:

<Rate>	DR1K2 | DR1K3 | DR1K5 | DR1K8 | DR2K4 | DR2K7 | DR3K6 | DR4K8 | DR7K2 | DR9K6 | DR14K4 | DR19K2 | DR28K8 | DR38K4 | DR57K6 | DR76K8 | DR115K2 | DR153K6 | DR230K4 | DR259K2 | DR307K2 | DR460K8 | DR518K4 | DR614K4 | DR1036K8 | NUSed
	*RST: R-DCCH: DR9K6; R-FCH: DR1K5; R-SCH: DR1K5; R-ACC: DR4K8

Example: `BB:C2K:MST2:MODE TRAF`
selects operating mode traffic.
`BB:C2K:MST2:RCON 3`
selects radio configuration 3 for the traffic channel.
`BB:C2K:MST2:CHAN3:DATA:RATE DR4K8`
sets a data rate of 4.8 kbps for channel 3 f mobile station 2 (R-FCH in this configuration).

Manual operation: See "Data Rate - MS" on page 82

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:FLENgth <FLength>

The command sets the frame length of the selected channel. The value range depends on the channel type and the selected radio configuration

For the traffic channels, this value is specific for the selected radio configuration.

The frame length affects the data rates that are possible within a channel. Changing the frame length may lead to a change of data rate.

Parameters:

<FLength>   5 | 10 | 20 | 26.6 | 40 | 80

                      *RST: 20 ms

Example: `BB:C2K:MST:CHAN3:FLEN 5 ms`

                      sets the frame length of sub channel 3 to 5 ms.

Manual operation: See "Frame Length - MS" on page 82

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:POWer <Power>

Sets the channel power relative to the powers of the other channels. This setting also determines the starting power of the channel for Misuse Output Power Control.

With the command `[:SOURce<hw>]:BB:C2K:POWer:ADJust`, the power of all the activated channels is adapted so that the total power corresponds to 0 dB. This does not change the power ratio among the individual channels.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<Power>   float

                      Range: -80 to 0
                      Increment: 0.01
                      *RST: 0

Example: `BB:C2K:MST2:CHAN3:POW -10dB`

                      Sets the channel power of sub channel 3 of mobile station 2 dB to -10 dB relative to the power of the other channels.

Manual operation: See "Power - MS" on page 83

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:SPReading?

Queries the spreading factor of the channel. The spreading factor corresponds to the length of the employed Walsh code. The Walsh codes to be used are specified by the standard and cannot be chosen.

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<Spreading>   integer

                      Range: 0 to 255
                      *RST: 0

Example:	`BB:C2K:MST2:CHAN1:SPR?`
	Queries the spreading factor of channel 1 of mobile station 2.
	`Response: 32`
Usage:	Query only
Manual operation:	See "Spread- MS" on page 83

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:STATe <State>

This command activates/deactivates the selected channel.

For the traffic channels, this value is specific for the selected radio configuration.

Parameters:

<State>	0 | 1 | OFF | ON
	*RST: OFF
Example:	`BB:C2K:MST2:CHAN2:STAT OFF`
	deactivates sub channel 2 of mobile station 2.
Manual operation:	See "Channel State - MS" on page 84

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:TYPE?

The command queries the channel type. The channel type depends on the selected operating mode and, for the sub channels of the traffic channel, from the selected radio configuration.

Return values:

<Type>	R-PICH | R-ACH | R-EACH | R-CCCH | R-DCCH | R-FCH | R-SCCH | R-SCH2 | R-SCH1
	R-ACH
	Access Channel.
	R-EACH
	Enhanced Access Channel
	R-CCCH
	Common Control Channel
	R-PICH
	Pilot Channel.
	R-DCCH
	Dedicated Control Channel
	R-FCH
	Fundamental Channel
	R-SCHx
	Supplemental Channel 1 | 2
	R-SCCH
	Supplemental Control Channel

Example:	BB:C2K:MST2:CHAN2:TYPE?
	queries type of channel 2.
	Response: R-SCCH
	channel 2 is a Supplemental Control Channel.
Usage:	Query only
Manual operation:	See "Channel Type - MS" on page 81

[:SOURce<hw>]:BB:C2K:MSTation<st>:CHANnel<ch>:WCODe?

Queries the Walsh code. The standard assigns a fixed walsh code to some channels.

For the traffic channels, this value is specific for the selected radio configuration.

Return values:

<WCode>	integer
	Range: 0 to 255
	*RST: 0
Example:	BB:C2K:MST1:CHAN3:WCOD?
	Queries the Walsh code of channel 3 of mobile station 1.
	Response: 3
	The Walsh code is 3.
Usage:	Query only
Manual operation:	See "Walsh - MS" on page 82

[:SOURce<hw>]:BB:C2K:MSTation<st>:LCMask <LcMask>

Sets the mask of the Long Code Generator of the mobile station.

Parameters:

<LcMask>	42 bits
	*RST: #H0
Example:	BB:C2K:MST1:LCM #H55
	sets the Long Codes to #H55.
Manual operation:	See "LC Mask (hex) - MS" on page 78

[:SOURce<hw>]:BB:C2K:MSTation<st>:MODE <Mode>

The command selects operating mode for the mobile station. The channel-specific parameters are set with commands SOUR:BB:C2K:MST<n>:CHANnel<n>:...n.

Parameters:

<Mode>	TRAFfic | ACCess | EACCess | CCONtrol

TRAFfic
The mobile station generates a single traffic channel A traffic channel consists of up to eight sub channels depending on the selected radio configuration (R-FCH, R-SCCH, R-SCH, R-DCCH). This mode corresponds to the standard mode of a mobile station during voice and data transmission.

ACCess
The mobile station generates an access channel (R-ACH). This channel is needed to set up the connection between the mobile station and the base station.

EACCess
The mobile station generates an enhanced access channel (R-ACH) and a pilot channel (R-PICH).

CCONtrol
The mobile station generates a common control channel (R-ACH) and a pilot channel (R-PICH).

*RST: TRAFfic

Example: `BB:C2K:MST1:MODE TRAF`
Switches the mobile station into standard mode - voice and data transmission.

Manual operation: See "Operation Mode - MS" on page 77

[:SOURce<hw>]:BB:C2K:MSTation<st>:RCONfiguration <RConfiguration>

The command selects the radio configuration for the traffic channel.

The settings of the channel table parameters are specific for the selected radio configuration.

A separate set of settings of all channel table parameters for each radio configuration is provided. If the radio configuration is changed, the set of channel table values belonging to this RC is automatically activated.

Parameters:

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

Example: `BB:C2K:MST2:MODE TRAF`
switches mobile station 2 into standard mode - voice and data transmission.
`BB:C2K:MST2:RCON 3`
selects radio configuration 3. With RC3, the traffic channel includes five sub channels.

Manual operation: See "Radio Configuration - MS" on page 77

[:SOURce<hw>]:BB:C2K:MSTation<st>:STATe <State>

The command activates and deactivates the specified mobile station.

Parameters:

<State>   0 | 1 | OFF | ON

                           *RST: OFF

Example: BB:C2K:MST2:STAT OFF

                           deactivates mobile station 2.

Manual operation: See "Base Station/Mobile Station State" on page 30

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA <Data>

Sets the data source for the power control bits of the traffic channels.

Parameters:

<Data>   ZERO | ONE | PATTern | DLISt

                           DLISt
                           A data list is used. The data list is selected with the command
                           [:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:
                           DSELect.

                           ZERO | ONE
                           Internal 0 and 1 data is used.

                           PATTern
                           Internal data is used. The bit pattern for the data is defined by
                           the command [:SOURce<hw>]:BB:C2K:MSTation<st>:
                           TPC:DATA:PATTern. The maximum length is 64 bits.

                           *RST: ZERO

Example: BB:C2K:MST2:TPC:DATA PATT
                           Selects Pattern data source for the power control bits. The bit
                           pattern is defined with the following command.
                           BB:C2K:MST2:TPC:DATA:PATT #H3F,8
                           Defines the bit pattern.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions *.dm_iqd in a directory of the user's choice. The directory applicable to the following commands is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect>   <data list name>

Example: `BB:C2K:MST2:TPC:DATA DLIS`
selects the DLISt data source.
`MMEM:CDIR "<root>Lists"`
selects the directory for the data lists.
`BB:C2K:MST2:TPC:DATA:DSEL 'cdma_ch4'`
'selects the file "`cdma_ch4`" as the data source.This file must be
in specified directory and it must have the file extension
`*.dm_iqd`.

Manual operation: See "Data List Management " on page 24

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:DATA:PATTern <Pattern>

Sets the bit pattern for the `PATTern` selection. The maximum bit pattern length is 64
bits.

Parameters:
<Pattern>   64 bits

Example: `BB:C2K:MST2:TPC:DATA:PATT #H3F, 8`
defines the bit pattern for the power control-bits.

Manual operation: See "Data Source (Power Control) - MS" on page 79

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:MISuse <MisUse>

The command activates/deactives the use of the power control data for controlling the
mobile station output power. On the uplink, the power control bits are used exclusively
for controlling the mobile station output power. Power control puncturing is not defined
for controlling the base station power.

The bit pattern (see commands `:BB:C2K:MSTation<n>:TPC...`) of the power con-
trol bits w is used to control the channel power. A "1" leads to an increase of channel
powers, a "0" to a reduction of channel powers. Channel power is limited to the range 0
dB to -80 dB. The step width of the change is defined with the command `[:`
`SOURce<hw>]:BB:C2K:MSTation<st>:TPC:PSTep`.

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

Example: `BB:C2K:MST2:TPC:MIS ON`
activates regulation of channel power for mobile station 2 via the
power control bit pattern.
`BB:C2K:MST2:TPC:PST 1 dB`
sets the step width for the change of channel powers to 1 dB.

Manual operation: See "Misuse for Output Power Control - MS" on page 79

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:PSTep <PStep>

The command defines the step width for the change of channel powers in the case of "mis-" use of the power control bits.

Parameters:

<PStep>   float

                          Range: -10 to 10 dB
                          Increment: 0.01 dB
                          *RST: 0 dB

Example: BB:C2K:MST2:TPC:PST 0.1 dB

                          sets the step width for the change of channel powers to 1 dB.

Manual operation: See "Power Step - MS" on page 80

[:SOURce<hw>]:BB:C2K:MSTation<st>:TPC:READ <Read>

The command sets the read out mode for the bit pattern of the power control bits.

The bit pattern is defined with the commands :BB:C2K:MST<n>:TPC....

Parameters:

<Read>   CONTinuous | S0A | S1A | S01A | S10A

                          CONTinuous
                          The bit pattern is used cyclically.

                          S0A
                          The bit pattern is used once, then the power control bit sequence continues with 0 bits.

                          S1A
                          The bit pattern is used once, then the power control bit sequence continues with 1 bit.

                          S01A
                          The bit pattern is used once and then the power control bit sequence is continued with 0 bits and 1 bit alternately.

                          S10A
                          The bit pattern is used once and then the power control bit sequence is continued with 1 bit and 0 bits alternately.

                          *RST: CONTinuous

Example: BB:C2K:MST2:TPC:READ S0A

                          The bit pattern is used once, after which a 0 sequence is generated (applies to R-DCCH of mobile station 2).

Manual operation: See "Read Out Mode (Power Control) - MS" on page 79

List of Commands

Index

Symbols

A

B

C

D

E

F

G