

R&S[®] SMW-K50x/-K315

Extended Sequencer

User Manual



1177626902
Version 20

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Make ideas real



This manual describes the following software option:

- R&S®SMW-K501 Extended sequencing (1314.9218.xx)
- R&S®SMW-K502 Wideband extended sequencing (1413.9260.xx)
- R&S®SMW-K503 Real time control interface (1414.3620.xx)
- R&S®SMW-K504 Real time control interface (EDR) (1414.3665.xx)
- R&S®SMW-K506 Agile sequencing (1413.3555.xx)
- R&S®SMW-K315 Pulse-on-pulse simulation (1414.6529.xx)

This manual describes firmware version FW 5.30.047.xx and later of the R&S®SMW200A.

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Muehdorfstr. 15, 81671 Muenchen, Germany

Phone: +49 89 41 29 - 0

Email: info@rohde-schwarz.com

Internet: www.rohde-schwarz.com

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The following abbreviations are used throughout this manual: R&S®SMW200A is abbreviated as R&S SMW, R&S®Pulse Sequencer is abbreviated as R&S Pulse Sequencer, R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2; the license types 02/03/07/11/13/16/12 are abbreviated as xx.

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1 Welcome to the extended sequencer

The extended sequencer (R&S SMW-K501/-K502/-K503/-K504/-K506) is a firmware application that allows the R&S SMW to generate complex signal sequences in real-time.

The signal sequences can be configured in one of the following ways:

- Manually in XML files (R&S SMW-K501, user mode)
- With the R&S Pulse Sequencer software (R&S SMW-K501/K502, pulse sequencer or direction finding modes)
- Via an external simulation tool (R&S SMW-K503, real time control interface mode) where the control words are streamed via 1 Gbit/s LAN (TCP or UDP).
- Via an external simulation tool (R&S SMW-K506, agile sequencing mode) where the control words are streamed via 10 Gbit/s LAN (UDP) (HS DIG I/Q).

Supported operating modes and their key features

The extended sequencer options provide different operating modes for creating an extended sequence and generating the signal in the R&S SMW.

- "User Mode"
The extended sequencing is specified by a set of xml based command lists. This mode is only supported by the standard baseband R&S SMW.
The main features of this mode are:
 - Multi-segment waveform sequencing with loops and nested loops
 - Waveform segment signal generation with variable repetition intervals and repetition count per segment
 - Attenuation profiles with optional interpolation
 - Frequency hopping with various phase options
 - Reduced calculation time and file size compared to simple ARB file creation
 - Support of up to two entities
 - Long simulation times
- "Pulse Sequencer" and "Direction Finder" modes
These modes handle the signals configured with the R&S Pulse Sequencer software.
The software enables you to configure pulse signals for test scenarios of any complexity, e.g. to simulate the signals of different emitter and receiver configurations, including antennas and antenna scanning. The "Direction Finder" mode supports direction finding scenarios with multiple antennas and individual positioning to simulate dynamic antenna moving
- "Real Time Control Interface" mode
In this mode, the R&S SMW is enhanced by a dedicated 1 GBit/s LAN interface for PDW streaming.
PDWs are streamed via an external LAN interface to control a real time sequencer of the R&S SMW-B9. Either, precalculated waveform can be played back, or certain signals such as rectangular pulses, barker codes and chirps can be generated in real time.

- "Agile Sequencing" mode
In this mode, the R&S SMW is enhanced by a dedicated 10 Gbit/s LAN (UDP) interface for ADW streaming.
ADWs are streamed via the LAN interface (HS DIG I/Q connector) to control the agile sequencer of the R&S SMW-B9. Prestored waveforms can be played back.

See [Chapter 2, "About the extended sequencer"](#), on page 13 for details on the components and the functionality of the extended sequencing application.

This user manual contains a description of the functionality that the application provides, including remote control operation.

All functions not discussed in this manual are the same as in the base unit and are described in the R&S SMW user manual. The latest version is available at:

www.rohde-schwarz.com/manual/SMW200A

Installation

You can find detailed installation instructions in the delivery of the option or in the R&S SMW service manual.

For information on the R&S Pulse Sequencer software, see www.rohde-schwarz.com/product/pulse-sequencer.html.

1.1 Accessing the extended sequencer dialog

Access:

- ▶ Select "Baseband" > "Misc" > "Extended Sequencer".

A dialog box opens that displays the provided general settings.

The signal generation is not started immediately. To start signal generation with the default settings, select "State" > "On".

1.2 What's new

This manual describes firmware version FW 5.30.047.xx and later of the R&S®SMW200A.

Compared to the previous version, it provides the following new features:

- Added mode to play back user written PDW files, see
 - [Chapter 2.6, "About playback from file mode"](#), on page 30
 - [Chapter 3.7, "Playback from file mode settings"](#), on page 68
- Added time based trigger function, see ["Time Based Trigger"](#) on page 79

1.3 Documentation overview

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

www.rohde-schwarz.com/manual/smw200a

1.3.1 Getting started manual

Introduces the R&S SMW and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

1.3.2 User manuals and help

Separate manuals for the base unit and the software options are provided for download:

- **Base unit manual**
Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.
- **Software option manual**
Contains the description of the specific functions of an option. Basic information on operating the R&S SMW is not included.

The contents of the user manuals are available as help in the R&S SMW. The help offers quick, context-sensitive access to the complete information for the base unit and the software options.

All user manuals are also available for download or for immediate display on the Internet.

1.3.3 Tutorials

The R&S SMW provides interactive examples and demonstrations on operating the instrument in form of tutorials. A set of tutorials is available directly on the instrument.

1.3.4 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

<https://gloris.rohde-schwarz.com>

1.3.5 Instrument security procedures

Deals with security issues when working with the R&S SMW in secure areas. It is available for download on the internet.

1.3.6 Printed safety instructions

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

1.3.7 Data sheets and brochures

The data sheet contains the technical specifications of the R&S SMW. It also lists the options and their order numbers and optional accessories.

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

See www.rohde-schwarz.com/brochure-datasheet/smw200a

1.3.8 Release notes and open source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The software makes use of several valuable open source software packages. An open source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/smw200a

1.3.9 Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/smw200a and www.rohde-schwarz.com/manual/smw200a

1.3.10 Videos

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: <https://www.youtube.com/@RohdeundSchwarz>



On the menu bar, search for your product to find related videos.



Figure 1-1: Product search on YouTube

1.4 Scope



Tasks (in manual or remote operation) that are also performed in the base unit in the same way are not described here.

In particular, it includes:

- Managing settings and data lists, like saving and loading settings, creating and accessing data lists, or accessing files in a particular directory.
- Information on regular trigger, marker and clock signals and filter settings, if appropriate.
- General instrument configuration, such as checking the system configuration, configuring networks and remote operation
- Using the common status registers

For a description of such tasks, see the R&S SMW user manual.

1.5 Notes on screenshots

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

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

2 About the extended sequencer

When generating signals with the ARB, signal is calculated as one large waveform, including environmental effects like attenuation and frequency hopping. In contrast to the ARB signal generation, the extended sequencing function separates waveform segments, antenna attenuation and frequency hopping. This method provides shorter calculation times and less file size, as illustrated in the following example.

Example: Operating principle of an ARB waveform compared to extended sequencing

This example illustrates the differences between a waveform signal created for playback with the ARB, compared with the waveform sequence processed in the user mode of the extended sequencer.

- ARB waveform with antenna attenuation

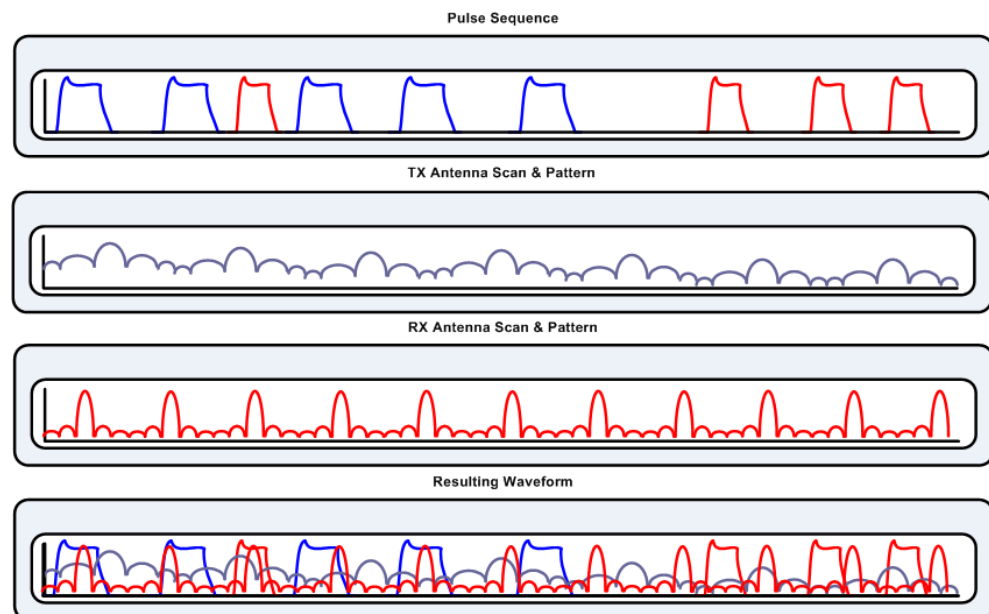


Figure 2-1: ARB waveform

In ARB mode, the attenuation profiles and frequency hopping are calculated sample by sample. In addition, some segments in the waveform are repeated and pauses between the segments are filled with zero samples. At a high clock rate, the resulting file size is large, as shown in the following example.

Example: antenna scan of 4 s at 200 MHz clock rate:

- $200 \text{ MSamples/s} \times 4 \text{ bytes} \times 4 \text{ s} = 2.9 \text{ GByte}$

- Extended sequencing waveform with antenna attenuation

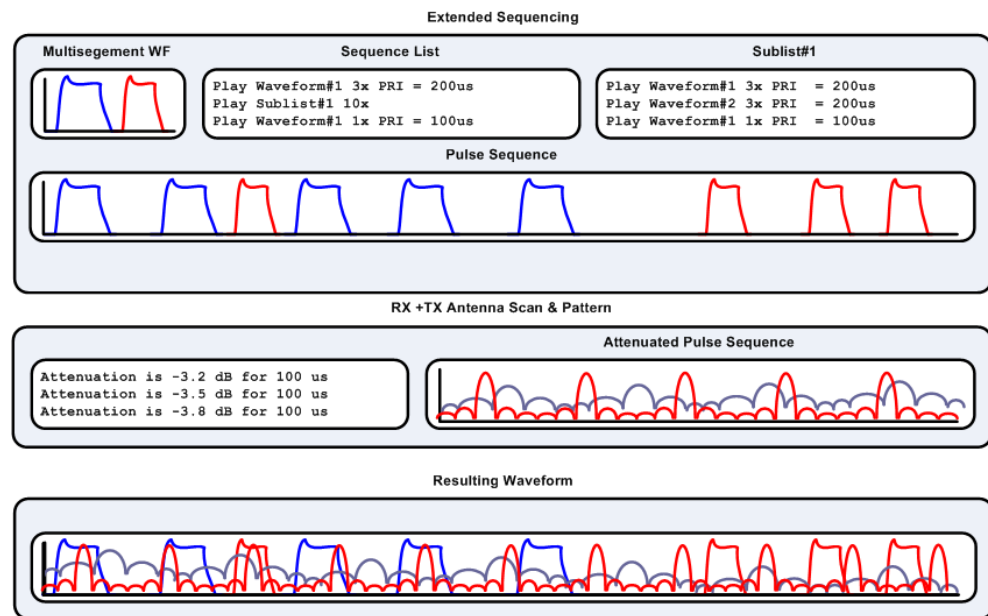


Figure 2-2: Extended sequencing with antenna attenuation

All occurring waveform segments are stored in a multi-segment waveform file. The sequence list determines at what time which waveform segment is played. Pauses are filled with zero samples without occupying memory size in the waveform. Antenna attenuations and frequency hopping are loaded separately and added to the generated waveform segment sequence directly in the R&S SMW. This way of composing the multi-segment waveform signal saves very much memory size especially for long sequences.

Example: Antenna scan of 20 s at 200 MHz clock rate:

- 2 waveforms x 200 MSamples x 4 byte X 500 μ s = 800 kByte
- 2 antennas with 10000 entries and interpolation x 150 bytes = 1.5 MByte (approximately 20 s simulation time)

2.1 Required options

The equipment for processing of extended waveform segment sequences includes the options:

User mode options

- Standard baseband generator (R&S SMW-B10) per signal path
- Baseband main module (R&S SMW-B13/-B13T)
- Frequency option (e.g. R&S SMW-B1003)
- Extended sequencing (R&S SMW-K501) per signal path

Pulse sequencer mode options

- Standard or wideband baseband generator (R&S SMW-B10/-B9) per signal path
- Baseband main module (R&S SMW-B13/-B13T) or wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Extended sequencing (R&S SMW-K501) or wideband extended sequencing (R&S SMW-K502) per signal path
- Pulse sequencing (R&S SMW-K300) per signal path
- Enhanced pulse sequencing (R&S SMW-K301) per signal path

Direction finding mode options

- Standard or wideband baseband generator (R&S SMW-B10/-B9) per signal path
- Baseband main module (R&S SMW-B13/-B13T) or wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Extended sequencing (R&S SMW-K501) or wideband extended sequencing (R&S SMW-K502) per signal path
- Pulse sequencing (R&S SMW-K300) per signal path
- Enhanced pulse sequencing (R&S SMW-K301) per signal path
- Direction finding (R&S SMW-K308) per signal path

Real-time control interface options

- Wideband baseband generator (R&S SMW-B9) per signal path (incl. one ADV DATA/CTRL interface per installed option)
- Wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Wideband extended sequencing (R&S SMW-K502) per signal path
- Real-time control interface (R&S SMW-K503) per signal path
- Real-time control interface (EDR) (R&S SMW-K504) per signal path

Playback from file mode options

- Wideband baseband generator (R&S SMW-B9) per signal path (incl. one ADV DATA/CTRL interface per installed option)
- Wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Wideband extended sequencing (R&S SMW-K502) per signal path
- Real-time control interface (R&S SMW-K503) per signal path

Agile sequencing mode options

- Wideband baseband generator (R&S SMW-B9) per signal path (incl. one HS DIG I/Q interface per installed option)

- Wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Agile sequencing (R&S SMW-K506) per signal path

Pulse-on-pulse simulation options

- 2x wideband baseband generator (R&S SMW-B9)
(incl. one ADV DATA/CTRL interface per installed option)
- Wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003 and R&S SMW-B2003)
- 2x (or optional 4x) fading simulator (R&S SMW-B15)
(one sequencer per installed option)
- 2x wideband extended sequencing (R&S SMW-K502)
- Pulse-on-pulse simulation (R&S SMW-K315)
- Depending on the mode:
 - 2x pulse sequencing (R&S SMW-K300) and
2x enhanced pulse sequencing (R&S SMW-K301)
(pulse sequencer mode)
 - 2x real-time control interface (R&S SMW-K503)
(PDW streaming)

2.2 About user mode

Option: see "[User mode options](#)" on page 14.

The user mode supports user-specific sequencing of multi-segment waveform segments via XML commands specified in a sequencing list. In addition to the sequencing features you can also specify antenna attenuation and frequency hopping using XML commands stored in separate lists.

The files are loaded into the R&S SMW via USB, file sharing access or remote control, see section "File and Data Management" in the R&S SMW user manual.

The R&S SMW generates the resulting signal sequence by playing back the sequential elements of the sequence list, including the attenuation profiles and frequency hopping over time.

2.2.1 XML command structure

- [Sequence list and subsequence list](#).....17
- [Time list](#).....20
- [Attenuation over time list](#).....22
- [Hopping over time list](#).....24

2.2.1.1 Sequence list and subsequence list

The **sequence list** determines the sequential sequences and loops and nested loops. It consists of entries which refer to a *multi-segment waveform* or a *subsequence*. Each entry includes either a fixed off time, or relates to a time list with varying off times.



A *multi-segment waveform* is a composed signal containing several multiple independent waveforms called segments. Each segment represents an independent waveform that can be referenced in the sequence. Thus you can quickly alternate between different waveforms and generate, e.g., pulse train signals with staggered pulse widths.

You can create and download a multi-segment waveform file even directly with the R&S SMW or the simulation software R&S WinIQSIM2. For information on how to proceed, see the base unit user manuals, e.g. section "Using the Arbitrary Waveform Generator" in the R&S SMW user manual.

The file format of a sequence list is `*.ps_seq`.

The structure of a **subsequence list** is the same as in a sequence list. You can refer to waveform files, to further subsequences and to time lists, and thus implement nested loops.

The file format of a subsequence list is `*.ps_sub`.



Segments of a multi-segment waveform used in the sequence or the subsequences must always refer to the same waveform file.

An entry in the sequence or subsequence list file can:

- Refer to one specific segment of a multi-segment waveform.
- Reference a subsequence file, for example to implement a loop.
A subsequence list is mapped with the tag `<subsequence_flag>`.
- Include off time and repetition value pairs (waveform segment repetition interval), defining the periods between the waveform segments and how many times a segment is repeated.

The repetition interval can be defined:

- As a static value, i.e. a specified duration (off time) and repetition count.
- In a time variation list file that is referenced, e.g. to implement different off time variations between waveform segments, see [Chapter 2.2.1.2, "Time list"](#), on page 20.

- Provide the use of an entry marker (optional).

For details and programming examples, see "[Programming examples of sequence and subsequence lists](#)" on page 18.

[Table 2-1](#) describes the used tags and parameters.

Programming examples of sequence and subsequence lists

Example: Sequence list file PulseTrain_StaggerPRI.ps_seq

```
<?xml version="1.0" encoding="utf-8"?>
<sequence_list>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:0</waveform>
    <subsequence></subsequence>
    <timelist_flag>>true</timelist_flag>
    <off_time></off_time>
    <timelist>JitterPRI</timelist>
    <repetitions>2</repetitions>
    <duration></duration>
  </entry>
  <entry>
    <subsequence_flag>>true</subsequence_flag>
    <subsequence>Loop</subsequence>
    <timelist_flag>>false</timelist_flag>
    <off_time>300</off_time>
    <repetitions>8</repetitions>
  </entry>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:2</waveform>
    <timelist_flag>>false</timelist_flag>
    <off_time>400</off_time>
    <repetitions>30</repetitions>
    <marker>>true</marker>
  </entry>
</sequence_list>
```

Example: Sub-Sequence file Loop.ps_sub

```

<?xml version="1.0" encoding="utf-8"?>
<sequence_list>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:4</waveform>
    <timelist_flag>>false</timelist_flag>
    <off_time>20</off_time>
    <repetitions>2</repetitions>
  </entry>
  <entry>
    <subsequence_flag>>true</subsequence_flag>
    <subsequence>SubSequence</subsequence>
    <timelist_flag>>true</timelist_flag>
    <timelist>timelist</timelist>
    <repetitions>2</repetitions>
  </entry>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:3</waveform>
    <timelist_flag>>false</timelist_flag>
    <off_time>30</off_time>
    <repetitions>5</repetitions>
  </entry>
</sequence_list>

```

Example: Sub-Sequence file SubSequence.ps_sub

```

<?xml version="1.0" encoding="utf-8"?>
<sequence_list>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:4</waveform>
    <timelist_flag>>false</timelist_flag>
    <off_time>100us</off_time>
    <repetitions>2</repetitions>
  </entry>
  <entry>
    <subsequence_flag>>false</subsequence_flag>
    <waveform>k501_test_mswv:3</waveform>
    <timelist_flag>>false</timelist_flag>
    <off_time>300us</off_time>
    <repetitions>5</repetitions>
  </entry>
</sequence_list>

```

Table 2-1: Format of *.ps_seq and *.ps_sub file

Container tag	Tag name	Description
<sequence_list>		List of sequences
<entry>		Description of a sequence
	<subsequence_flag>	Indicates whether the entry is a waveform or a nested subsequence: <ul style="list-style-type: none"> • false - primary sequence/waveform, defined with the <waveform> tag • true - subsequence, defined with the <subsequence> tag
	<waveform>	Indicates the multi-segment waveform file (*.msv) in the format <name>[:<segment#>], where: <ul style="list-style-type: none"> • <name> is the filename; file extension is optional • <segment#> sets the segment to be played
	<subsequence>	Filename of the referenced subsequence file; file extension *.ps_sub is optional.
	<timelist_flag>	Indicates whether a time variation file is used: <ul style="list-style-type: none"> • false - there is no time variation file; the off time is set with the <off_time> tag • true - a time variation file exists, defined with the <time_list> tag
	<off_time>	Waveform segment off time Units: [s], ms, us Note: <ul style="list-style-type: none"> • If no unit is set, the value refers to the clock rate of the waveform. E.g., 100 MHz clock rate, 30 Clks = 3 µs. • The <off_time> number of decimal places relates to the waveform clock rate and is rounded accordingly
	<time_list>	Filename of the time variation file; the file extension *.ps_pri is optional.
	<repetitions>	Number of waveform segments the <entry> applies to.
	<marker>	Defines the use of an entry marker. <ul style="list-style-type: none"> • true - enables the entry marker. The length of the marker signal is defined by "Duration" in the "Marker" settings dialog of the R&S SMW. • false - disables the entry marker. This flag is optional, if not set, false is the default setting.

2.2.1.2 Time list

Time lists define variable off times between the waveform segments. They include any number of entries with off times, and can be used to perform off time variations between waveform segments.

The file format of time lists is *.ps_pri.

Time list files:

- Consist of entries with off time and repetition value pairs.
- Can have any number of entries.
- Are referenced in sequence lists and subsequence lists, mapped with the tag <time_list>.

See the examples [Programming examples of time lists](#) for XML file contents.

Table 2-2 describes the used tags and parameters.

Programming examples of time lists

Example: Time list file JitterPRI.ps_pri

```
<?xml version="1.0" encoding="utf-8"?>
<time_list>
  <entry>
    <off_time>15</off_time>
    <repetitions>3</repetitions>
  </entry>
  <entry>
    <off_time>20</off_time>
    <repetitions>2</repetitions>
  </entry>
  <entry>
    <off_time>10</off_time>
    <repetitions>1</repetitions>
  </entry>
</time_list>
```

Example: Time list file Timelist.ps_pri

```
<?xml version="1.0" encoding="utf-8"?>
<time_list>
  <entry>
    <off_time>200us</off_time>
    <repetitions>1</repetitions>
  </entry>
  <entry>
    <off_time>300us</off_time>
    <repetitions>2</repetitions>
  </entry>
  <entry>
    <off_time>400us</off_time>
    <repetitions>3</repetitions>
  </entry>
  <entry>
    <off_time>500us</off_time>
    <repetitions>4</repetitions>
  </entry>
  <entry>
    <off_time>600us</off_time>
    <repetitions>2</repetitions>
  </entry>
</time_list>
```

Table 2-2: Format of *.ps_pri file

Container tag	Tag name	Description
<time_list>		Lists the waveform segment off time values and how many times a segment is to be repeated (repetition rate).
<entry>		Time variation
	<off_time>	Waveform segment off time Units: [s], ms, us Note: <ul style="list-style-type: none"> If no unit is set, the value refers to the clock rate of the waveform. E.g., 100 MHz clock rate, 30 Clks = 3 µs. The <off_time> number of decimal places relates to the waveform clock rate and is rounded accordingly
	<repetitions>	Number of waveform segments to be repeated with the <off_time>.

2.2.1.3 Attenuation over time list

Attenuation over time lists simulate the time-dependent gain variation caused by, e.g., the antenna rotation or IPM level profiles. You can refer to an attenuation over time list both for the transmitter and the receiver.

The file format is *.ps_att.

Attenuation over time list files:

- Contain entries with duration and attenuation value pairs.
- Provide optional entries to interpolate linearly between the attenuation values entries.
- Provide optional entries to synchronize the attenuation values to waveform segments.
- Exist optionally once per transmitter and receiver.

The attenuation over time list files are not referenced in the sequence list. These files are loaded separately and directly processed in the signal generation by the R&S SMW. The processing of the attenuation over time list is not coupled to sequence elements, certain waveform segments or hopping over time lists. All lists start simultaneously with the sequence list, i.e. at t=0.

See the examples [Programming examples of attenuation over time lists](#) for XML file contents.

[Table 2-3](#) describes the used tags and parameters.

Programming examples of attenuation over time lists

Example:

```
<attenuation_over_time_list>
  <options>
    <interpolation>true</interpolation>
    <synchronization>>false</synchronization>
  </options>
  <entry>
    <duration>1us</duration>
    <attenuation>3</attenuation >
  </entry>
  <entry>
    <duration>2us</duration>
    <attenuation>6</attenuation >
  </entry>
  <entry>
    <duration>1us</duration>
    <attenuation>0</attenuation >
  </entry>
</attenuation_over_time_list>
```

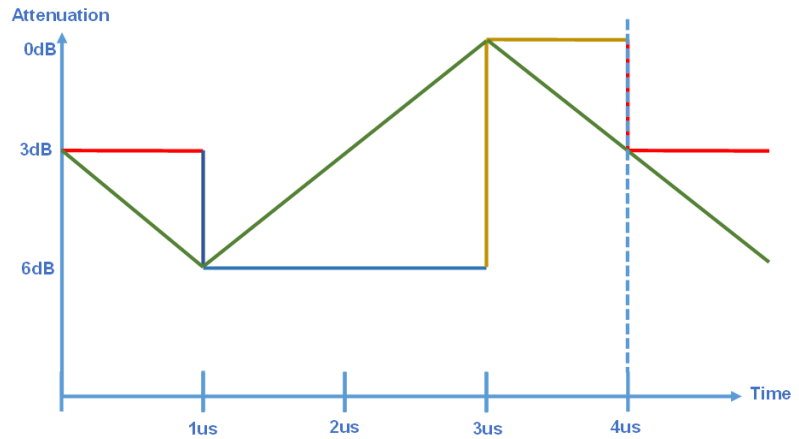


Figure 2-3: Example of an attenuation list with interpolation

Example: Attenuation over time file GainList.ps_att

```
<?xml version="1.0" encoding="utf-8"?>
<attenuation_over_time_list>
  <options>
    <interpolation>true</interpolation>
    <synchronization>true</synchronization>
  </options>
  <entry>
    <duration>120µs</duration>
    <attenuation>0</attenuation>
  </entry>
  <entry>
    <duration>200µs</duration>
    <attenuation>3</attenuation>
  </entry>
  <entry>
    <duration>300µs</duration>
    <attenuation>6</attenuation>
  </entry>
</attenuation_over_time_list>
```

Table 2-3: Format of *.ps_att file

Container tag	Tag name	Description
<attenuation_over_time_list>		Describes the attenuation over time variations.
<options>		
	<interpolation>	Enables/disables linear interpolation: <ul style="list-style-type: none"> • false - there is no interpolation • true - the attenuation is interpolated linearly between the attenuation values, defined with the <duration> and <attenuation> tags

Container tag	Tag name	Description
	<synchronization>	Enables/disables synchronization of waveform segment start. <ul style="list-style-type: none"> • <code>true</code> - the attenuation switches to the next entry when the subsequent waveform segment starts The <interpolation> and <duration> entries have no effect, i.e. the entries are not considered. • <code>false</code> - synchronization is disabled, i.e. the values set in the <interpolation> and <duration> tags are effective
<entry>		
	<duration>	Time span the attenuation value applies to. The attenuation over time starts with the simulation start time. The duration values in the attenuation list are independent from off times defined for the waveform segment signal, and the time spans defined in hopping over time lists. Units: [s], ms, us Note: If no unit is set, the value refers to the 200 MHz system clock, i.e. 100 Clks = 500 ns. The time span must be at least 10 Clks = 50 ns.
	<attenuation>	Absolute level, in dB. The value is applied for the time span: from the selected <duration> until the <duration> of the subsequent <entry>.

2.2.1.4 Hopping over time list

The **frequency hopping over time** list determines the frequency signal variation of the frequency variation of the waveform sequence. The file extension of a hopping over time list is `*.ps_hop`.

Hopping over time lists:

- Exist optionally once.
- Provide optional entries to determine the phase behavior of the signal phase when switching between the frequencies, see "[Sequence phase mode](#)" on page 24.
- Provide optional to synchronize the frequency variation to pulses.

The hopping over time list file is not referenced in the sequence list. The file is loaded separately and directly processed in the signal generation by the R&S SMW. The processing of the hopping over time list is not coupled to sequence elements of certain waveform segments. All lists start simultaneously with the sequence list, i.e. at $t=0$.

For details and programming examples, see "[Programming examples of hopping over time lists](#)" on page 26.

Sequence phase mode

- Phase mode *continuous*, set with tag `<phase>continuous</phase>`.

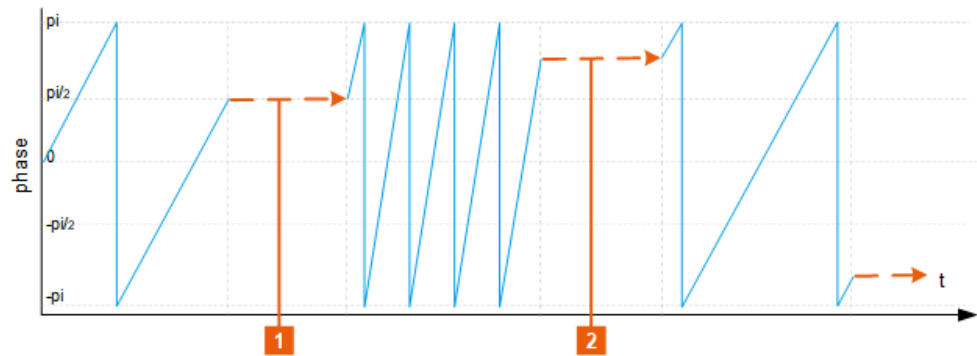


Figure 2-4: Phase mode = Continuous (relative)

1, 2 = With "Phase = 0 deg", the phase offset is also 0 deg.

When changing the frequency in a hopping list, the phase of the last sample of a waveform segment is also the start phase of the next one.

- Phase mode *memory*, set with tag `<phase>memory</phase>`

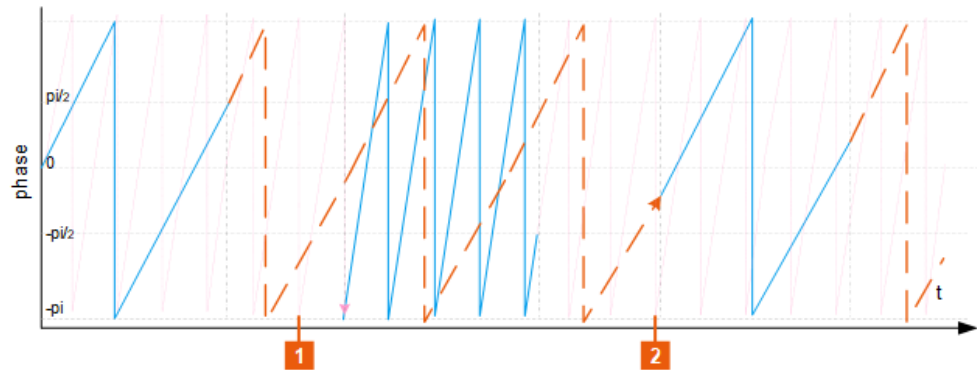


Figure 2-5: Phase mode = Memory

1, 2 = Alternating switching between the outputs of frequency synthesizers (two signals in the example).

At the beginning of each waveform segment, the phase is set to a state the frequency would have had if it had been continuously running. A maximum of 16 different frequencies is supported in this mode.

- Phase mode *absolute*, set with tag `<phase>absolute</phase>`

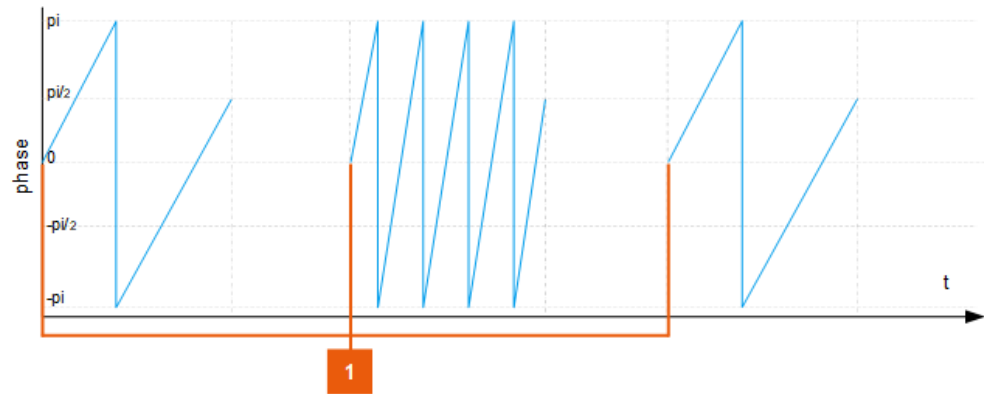


Figure 2-6: Phase mode = Absolute

1 = Start phase of all waveform segments is 0 deg

When changing the frequency in a hopping list, the start phase of the next entry is always zero deg.

Programming examples of hopping over time lists

Example:

```
<hopping_list>
<options>
  <phase>absolute</phase>
  <synchronization>>false</synchronization>
</options>
<entry>
  <duration>1us</duration>
  <freq_offset>2MHz</freq_offset>
</entry>
<entry>
  <duration>2us</duration>
  <freq_offset>1MHz</freq_offset>
</entry>
<entry>
  <duration>1us</duration>
  <freq_offset>3MHz</freq_offset>
</entry>
</hopping_list>
```

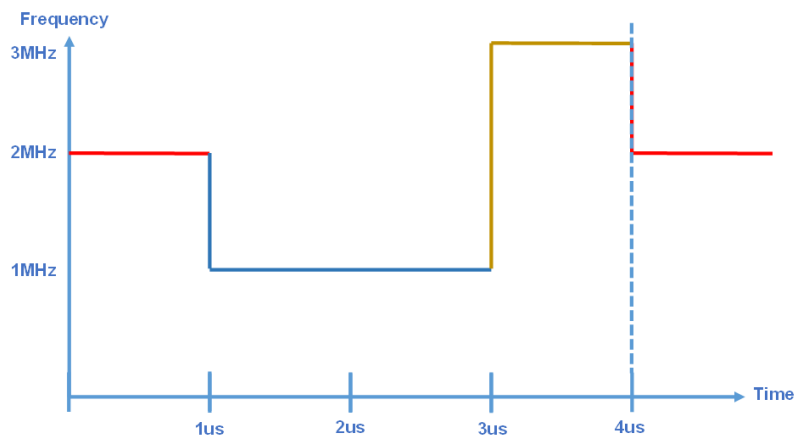


Figure 2-7: Example of a hopping over time list

Example: Frequency hopping file F-Hops.ps_hop

```

<?xml version="1.0" encoding="utf-8"?>
<hopping_list>
  <options>
    <synchronization>true</synchronization>
    <phase>continuous</phase>
  </options>
  <entry>
    <duration>2 ms</duration>
    <frequency_offset>0.14 kHz</frequency_offset>
  </entry>
  <entry>
    <duration>1 ms</duration>
    <frequency_offset>0.33 kHz</frequency_offset>
  </entry>
  <entry>
    <duration>1 ms</duration>
    <frequency_offset>1.25 kHz</frequency_offset>
  </entry>
</hopping_list>

```

Table 2-4 describes the used tags and parameters.

Table 2-4: Format of *.ps_hop file

Container tag	Tag name	Description
<hopping_list>		Describes the frequency hopping of one transmitter.
<options>		
	<phase>	Sets the phase at each waveform segment start when the frequency is changing: <ul style="list-style-type: none"> absolute: start phase of all waveform segments is 0 deg continuous: the phase of the last sample of a waveform segment is the start phase of the next one memory: the start phase is set to a value the frequency would have had if it had been continuously running
	<synchronization>	Enables/disables synchronization of frequency: <ul style="list-style-type: none"> true - the frequency switches to the next value with the subsequent waveform segment start The <duration> entry has no effect. false - synchronization is disabled, the frequency changes according to the time set in the <duration> is tag.
<entry>		

Container tag	Tag name	Description
	<duration>	Time span a frequency offset value applies to. The frequency hopping starts with the simulation start time. The duration values in the hopping over time list are independent from off times defined for the waveform segment signal, and the time spans defined in attenuation over time lists. Units: [s], ms, us Note: <ul style="list-style-type: none"> If no unit is set, the value refers to the system clock rate (200 MHz). E.g., 100 MHz clock rate, 100 Clks = 500 ns <duration> must be at least 10 Clks
	<frequency_offset>	Frequency offset, relative to the carrier frequency. Units: [Hz], kHz, MHz, GHz

2.3 About pulse sequencer mode

Option: see ["Pulse sequencer mode options"](#) on page 15.

In this mode, the R&S Pulse Sequencer is used as a graphical frontend for the simulation of complex signal scenarios. The software generates waveform files and sequencing information in a Rohde & Schwarz proprietary format, that is played back by the R&S SMW.

If both, the R&S SMW and the R&S Pulse Sequencer are connected in a LAN, the software transmits the files automatically to the R&S SMW, starts signal generation and activates signal output. See section "Playing the Generated Waveform Files" in the R&S Pulse Sequencer user manual for information in detail. Without LAN connection, you can provide the files via USB, or the standard methods for accessing the instruments file system.

See also, section "File and Data Management" in the R&S SMW user manual.

2.4 About direction finding mode

Option: see ["Direction finding mode options"](#) on page 15.

As in the direction finding mode, the R&S Pulse Sequencer software is used a graphical frontend for the simulation of complex signal scenarios.

If both, the R&S SMW and the R&S Pulse Sequencer are connected in a LAN, the software transmits the files automatically to the R&S SMW, starts signal generation and activates signal output. See section "Playing the Generated Waveform Files" in the R&S Pulse Sequencer user manual for information in detail. Without LAN connection, you can provide the files via USB, or the standard methods for accessing the instruments file system.

See also, section "File and Data Management" in the R&S SMW user manual.

2.5 About real time control interface mode

Option: see "[Real-time control interface options](#)" on page 15.

The real-time control interface enhances the R&S SMW by a dedicated 1Gbit/s LAN interface for PDW streaming in a Rohde & Schwarz proprietary format. It is necessary to map your own proprietary PDW format into the Rohde & Schwarz proprietary PDW format, see [Figure 2-8](#).

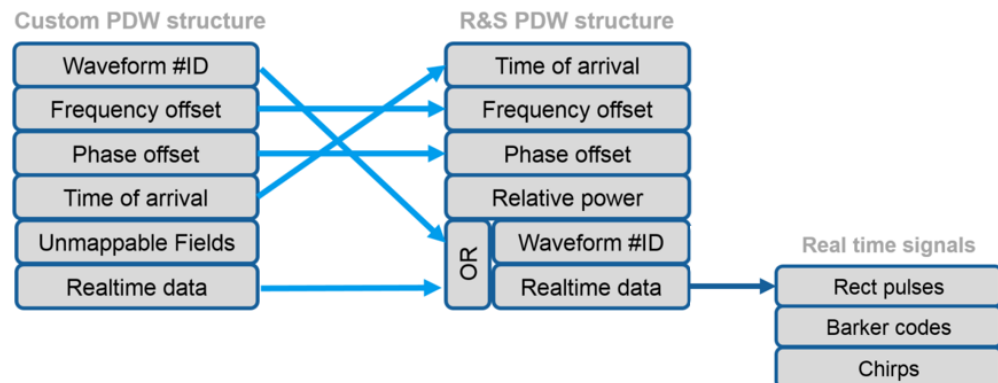


Figure 2-8: Mapping of custom PDW structure

Using an external simulator, you can stream PDWs to the R&S SMW to create your desired RF signals for the device under test (DUT).

Depending on the options installed in the R&S SMW, a typical setup is shown on [Figure 2-9](#).

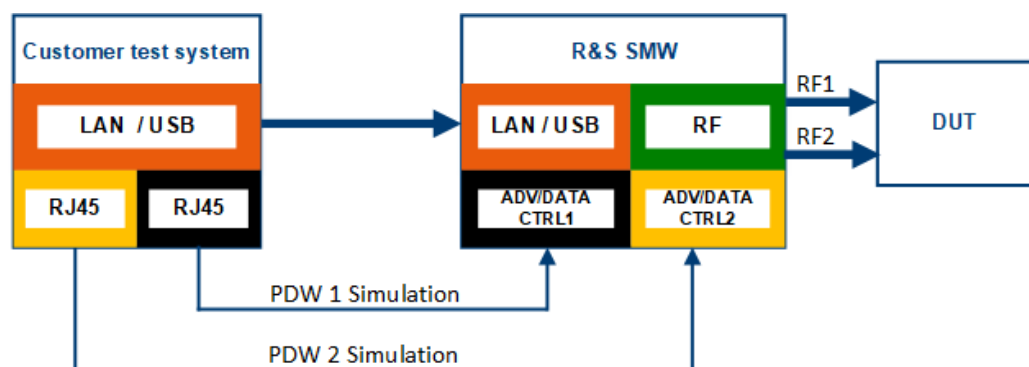
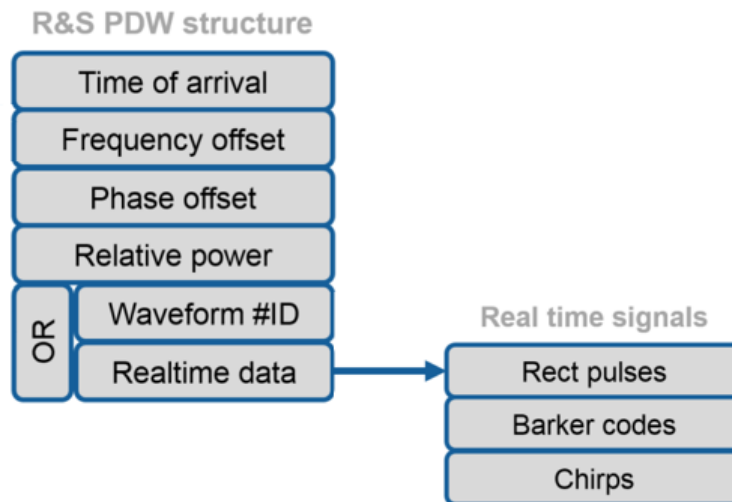


Figure 2-9: Typical setup for PDW streaming

The PDW structure consists of two variants, namely PDW #1 and PDW #2.

- PDW #1 is referred as basic PDW format.
- PDW #2 is an extension of PDW #1 with additional features. PDW #2 is referred as extended PDW format.

Both structures contain the following information in a binary Rohde & Schwarz specific format:



- Time of arrival (TOA)
- Frequency offset
- Phase offset
- Amplitude (attenuation) offset
- Segment information for precalculated waveform playback or real-time data

The following signals can be generated in real time and do not require a precalculated waveform:

- Rectangular pulses with variable pulse width
- Barker codes (R2a, R2b, R3, R4a, R4b, R5, R7, R11, R13)
- Frequency chirps (up, down, triangle)

This information is processed to determine the time at which the signal is played. It is also used to determine the properties regarding frequency, phase and amplitude offset relative to the fixed generator setting configured in the R&S SMW.

For detailed description on the PDW formats and timing, see the description [Interface Control Document](#) (application note 1GP133).

2.6 About playback from file mode

Option: see "[Playback from file mode options](#)" on page 15

In this mode, you can load user written PDW files from a directory to the R&S SMW.

Load the following files:

- *.ps_def: PDW definition file
- *.wv: Waveform file for simulation
- *.ps_adr: Address lookup file

You can trigger the start of playing back the simulation.

Working in this mode does not require a LAN connection.

For detailed description on the PDW formats and timing, see the description [Interface Control Document](#) (application note 1GP133).

2.7 About agile sequencing mode

Option: see "[Agile sequencing mode options](#)" on page 15.

The agile sequencing mode enhances the R&S SMW by a 10 Gbit/s low latency UDP interface (HS DIG I/Q) for ADW (ARB Descriptor Word) streaming in a proprietary Rohde & Schwarz file format.

This mode requires prestored ARB segments on the R&S SMW. Using an external simulator, you can stream ADWs to the R&S SMW to play back the ARB segments in desired order to create an RF signal for the device under test (DUT).

[Figure 2-10](#) and [Figure 2-11](#) show a typical setup.

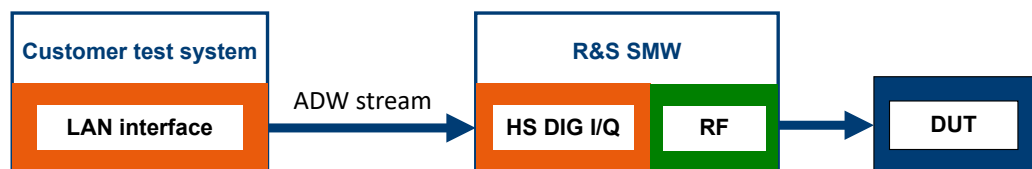


Figure 2-10: Typical setup for ADW streaming (Operation Mode > Instant)

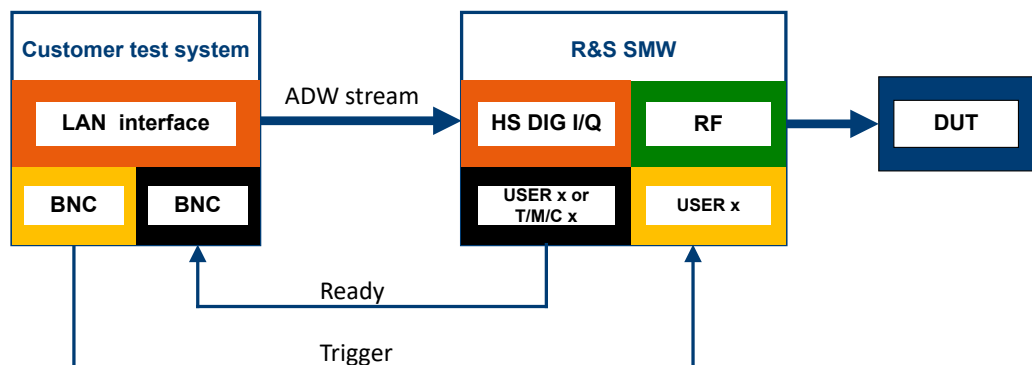


Figure 2-11: Typical setup for ADW streaming (Operation Mode > Deterministic)

The ADW structure contains the following information in a binary Rohde & Schwarz specific format:

Flags
Frequency offset
Phase offset
Relative power
Waveform #ID
Burst extension

Figure 2-12: General ADW structure

- Flags: Marker, play mode
- Frequency offset
- Phase offset
- Relative power: Amplitude (attenuation) offset
- Waveform #ID: Segment information for determining the ARB segment
- Burst extension

This information is processed to determine the time at which the ARB segment is played back. It is also used to determine the properties regarding frequency, phase and amplitude offset relative to the fixed generator setting configured in the R&S SMW.

For detailed description of the ADW format, see the [Interface Control Document](#) (application note 1GP134).

The operation modes in agile sequencing mode differ regarding how the ARB segments are played back.

- "Instant"
The ARB segment determined by the ADW stream is processed and transferred to the RF output immediately with low latency.

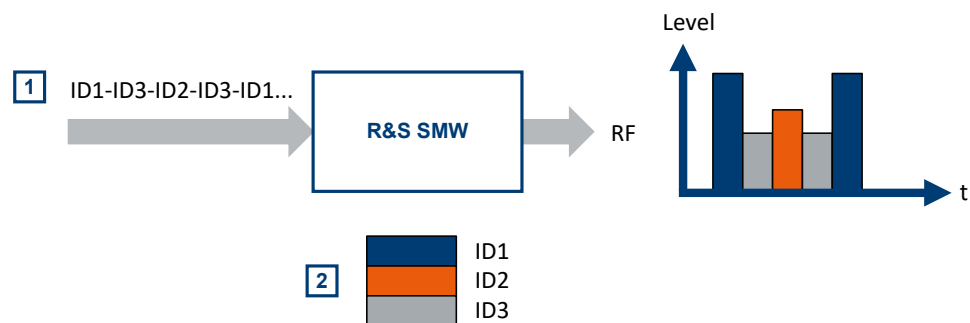


Figure 2-13: Agile sequencing operation mode Instant

1 = ADW stream

2 = Prestored ARB segments

- "Deterministic"
The ARB segment determined by the ADW stream is processed, then a "ready" signal is generated which indicates that the ARB segment is ready to be played back. After issuing an external trigger, the preloaded ARB segment will be played back with a deterministic delay between trigger and output.

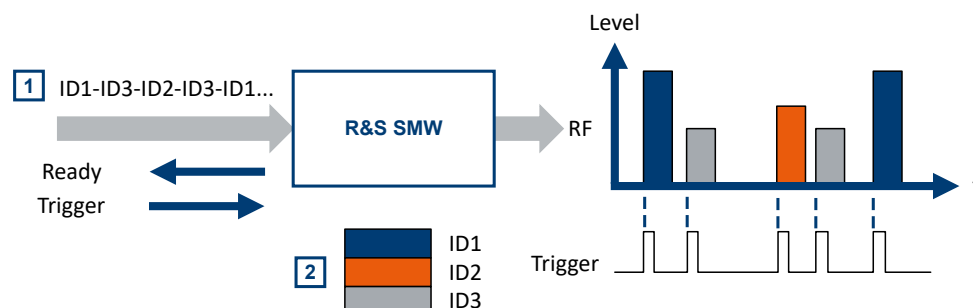


Figure 2-14: Agile sequencing operation mode Deterministic

1 = ADW stream
2 = Prestored ARB segments

2.8 About fast frequency switching mode

The fast frequency switching mode in the extended sequencer works in combination with the list mode of the R&S SMW. Using a time control descriptor word (TCDW), you can switch to a new frequency on the "RF A" output of the R&S SMW in less than 1 ms.

You can create a frequency list or store a list from an external file with file extension *.txt on the R&S SMW. In the frequency list, a list index corresponds with a defined frequency and its additional parameters power and dwell time.

The TCDW sends a trigger pulse to "T/M/C1", which triggers the list mode of the R&S SMW. The list index in the TCDW structure determines the frequency set on the "RF A" output for the device under test (DUT).

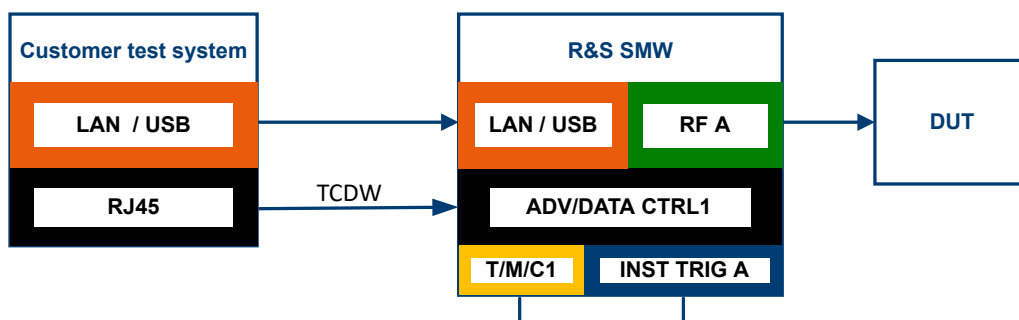


Figure 2-15: Typical setup for TCDW streaming in fast frequency switching mode

The TCDW structure contains information in a binary Rohde & Schwarz specific format. For description of the TCDW, see the [R&S SMW-K503/-K504 interface control document](#).

How to: [Chapter 3.16, "Configuring fast frequency switching mode"](#), on page 89

Phase coherent test setup with two R&S SMW

You can configure a phase coherent test setup with two R&S SMW to work with two inputs on the device under test (DUT) simultaneously, e.g. to measure the angle of arrival. This setup requires configuration in multi-instrument mode, with "R&S SMW 1" as primary instrument and "R&S SMW 2" as secondary instrument.

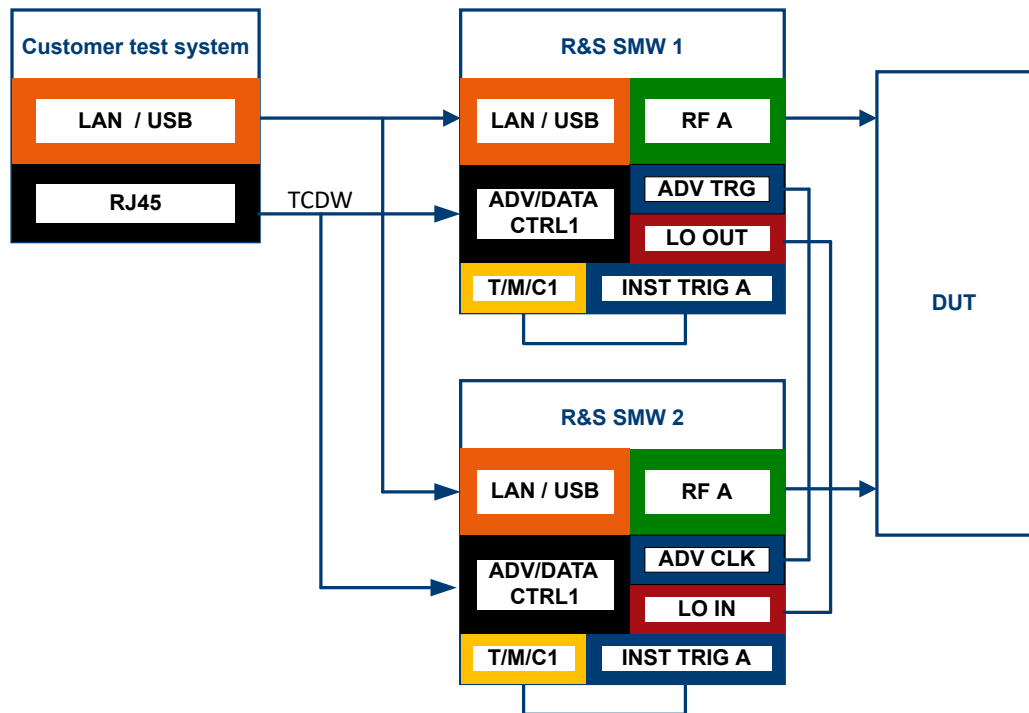


Figure 2-16: Phase coherent test setup with two R&S SMW

For a phase coherent test setup with two R&S SMW, consider the following:

1. Synchronize the basebands via "ADV TRG" and "ADV CLK"
2. Make sure the local oscillator signal in the test setup meets the required level of 7 dBm to 13 dBm.

If necessary, add an amplifier to your test setup.

Note: When using more than two R&S SMW in your test setup, connect the "LO OUT" connector of the primary R&S SMW to the respective "LO IN" connectors of the secondary R&S SMW via star distribution.

How to: ["To configure a phase coherent test setup with two R&S SMW200A"](#) on page 90

For a configuration example via remote commands, see [Example "Configuring fast frequency switching mode"](#) on page 103.

2.9 About pulse-on-pulse simulation

Option: see "Pulse-on-pulse simulation options" on page 16.

This option allows you to generate the signals of *up to 6 emitters* simultaneously and output them at the two RF outputs. The signals can be then fed to the receiver individually or combined via external combiner.

This mode of signal generation is known as **pulse-on-pulse or co-pulse simulation** and is available as extension of the extended sequencer functionality in R&S SMW.

Pulse-on-pulse simulation is the best choice, if your task is to test the radar behavior in a *realistic multi-emitter scenario*, where pulse dropping is not allowed.

Principle

Figure 2-17 illustrates how to pulse-on-pulse signals are generated and processed in R&S SMW.

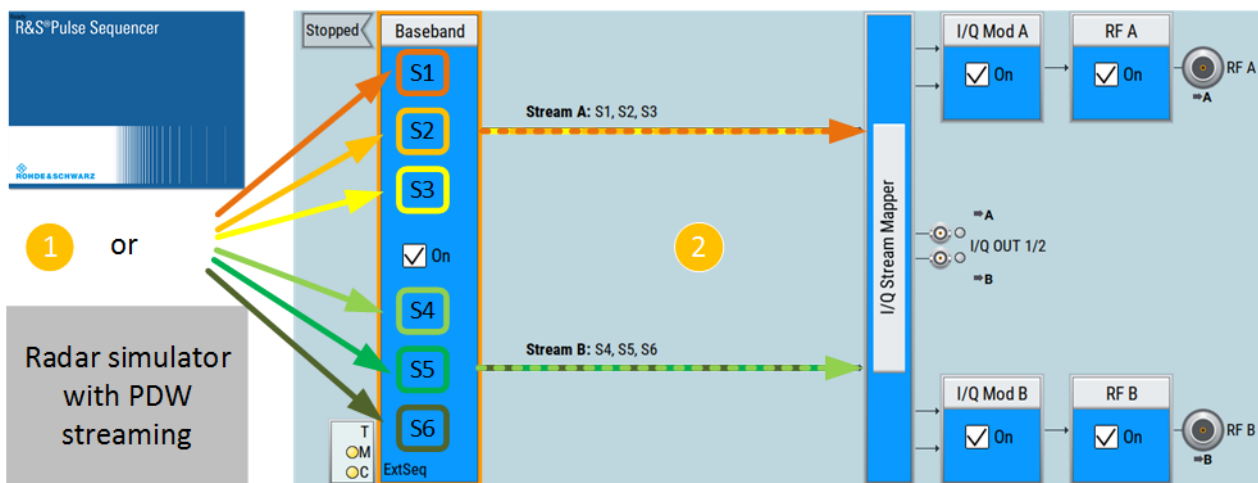


Figure 2-17: Principle of the pulse-on-pulse simulation

1 = Configuration via R&S Pulse Sequencer or radar simulator

2 = Block diagram in R&S SMW

S1 to S6 = Sequencers, where per default sequencers S1 to S3 is routed to RF A and S4 to S6 - to RF B.

Depending on the installed options, you can stream PDWs or create emitter signals in one of the modes, listed in Table 2-5. Irrespectively of the used method, radar signals must operate within the baseband bandwidth of the R&S SMW.

Table 2-5: Operation modes

Required options	Method	Configuration in	Description
R&S SMW-K300/-K301	Manual	R&S Pulse Sequencer	The R&S Pulse Sequencer controls the R&S SMW.
		R&S SMW "Extended Sequencer"	Signal configuration directly in the R&S SMW
R&S SMW-K503/-K504	PDW streaming	R&S SMW "Extended Sequencer"	The radar simulator controls the R&S SMW.

You can feed up to 6 PDW signals or the signals of up to 6 emitters to the R&S SMW. In the R&S SMW, these signals are referred as sequencers and denoted as S1 to S6. Per default, two streams are configured (stream A and B) and three sequencers are assigned to each of them (S1 to S3 and S4 to S6). This mapping of sequencer to the streams is performed automatically; the algorithm allocates as many sequencers as possible for the current configuration. The sequencer signals mapped to the same stream are added.

The streams are routed to the outputs "RF A" and "RF B" but this routing can be changed. If necessary, streams can be added equally weighted and routed to one of the outputs.

Moreover, streams can be activated or deactivated (muted) real time. Changes in the state are performed on-the-fly, without signal recalculation.

3 Extended sequencer configuration and settings

You can use the extended sequencer functions in standard and advanced system configuration mode. This description shows the dialogs in *advanced mode with coupled BB sources*. The settings in standard mode are identical despite you configure only one baseband signal.

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
2. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "BB Source Config = Coupled".
3. Select "Baseband" > "Misc" > "Extended Sequencer".

The remote commands required to define these settings are described in [Chapter 4, "Remote-control commands"](#), on page 93.

Settings:

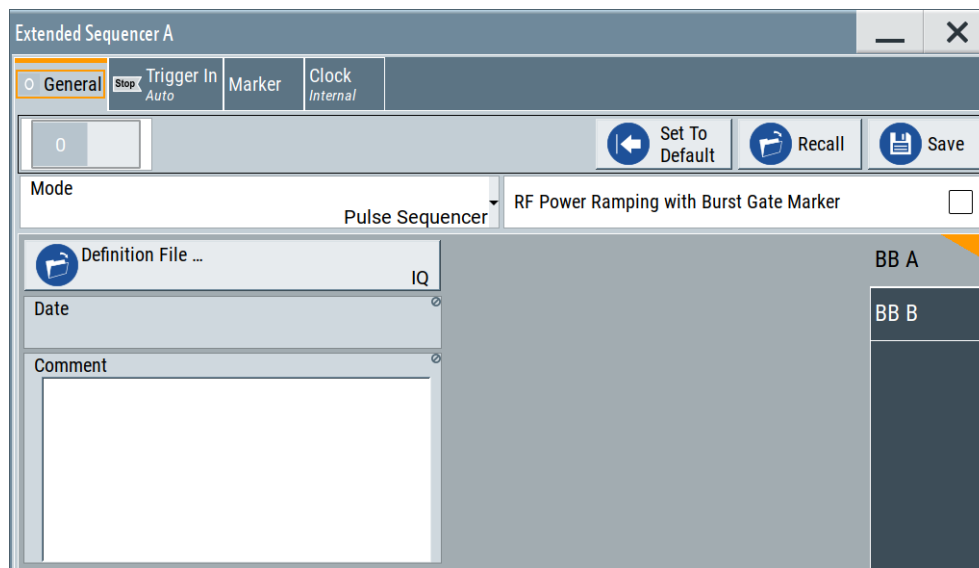
• General settings	37
• User mode settings	40
• Pulse sequencer mode settings	43
• Direction finding mode settings	45
• Real time control interface mode settings	46
• Extended sequencer advanced mode settings	52
• Playback from file mode settings	68
• Agile sequencing mode settings	69
• Waveform list settings	74
• Trigger settings	76
• Marker settings	82
• Clock settings	85
• Local and global connectors settings	86
• Overview settings	87
• Statistics display	88
• Configuring fast frequency switching mode	89

3.1 General settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".

- Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer" > "General".



This tab provides access to the default and the "Save/Recall" settings and allows the loading of files according to the extended sequencer modes.

If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

The remote commands required to define these settings are described in [Chapter 4.2, "General commands"](#), on page 104.

Settings:

State.....	38
Set to Default.....	39
Save/Recall.....	39
Mode.....	39

State

Enables the extended sequencer, i.e. the processing of waveform segment sequence files.

Enabling this application disables all the digital standards and digital modulation modes in the same baseband.

Remote command:

[:SOURce<hw>] :BB:ESEQuencer:STATe on page 104

Set to Default

Calls the default settings. The values of the main parameters are listed in the following table.

Parameter	Value
State	Not affected by the "Set to Default"
Mode	"User"
Trigger	"Auto"
Marker	"Restart"
Clock	"Internal"

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:PRESet](#) on page 106

Save/Recall

Accesses the "Save/Recall" dialog, that is the standard instrument function for saving and recalling the complete dialog-related settings in a file. The provided navigation possibilities in the dialog are self-explanatory.

The settings are saved in a file with predefined extension. You can define the filename and the directory, in that you want to save the file.

See also, chapter "File and Data Management" in the R&S SMW user manual.

- "*.eseq" Stores the current settings. This format does not include the used extended sequencer files.
- "*.ps_arc" Stores all used extended sequencer files in addition to the configured settings. The stored file includes the waveform file, the sequence list file and subsequence, attenuation, time and frequency hopping list files.
This format enables you to transfer the entire configuration to another instrument in a single step. There is no need to import the list files separately.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:SETTing:LOAD](#) on page 107

[\[:SOURce<hw>\]:BB:ESEQuencer:SETTing:STORe](#) on page 107

[\[:SOURce<hw>\]:BB:ESEQuencer:SETTing:DELeTe](#) on page 107

[\[:SOURce<hw>\]:BB:ESEQuencer:SETTing:CATaLog?](#) on page 107

[\[:SOURce<hw>\]:BB:ESEQuencer:ARCHive:CATaLog?](#) on page 106

[\[:SOURce<hw>\]:BB:ESEQuencer:ARCHive:LOAD](#) on page 106

[\[:SOURce<hw>\]:BB:ESEQuencer:ARCHive:STORe](#) on page 106

Mode

Selects the mode for processing extended sequencing files.

- "User" Enables you to load user-defined waveform segment sequence files, see [Chapter 3.2, "User mode settings"](#), on page 40.
The R&S Pulse Sequencer software is not required for creating the files.

"Pulse Sequencer"

Processes sequence files created with the R&S Pulse Sequencer software. This signal generation software combines all the configured components and scenarios in one file, see [Chapter 3.3, "Pulse sequencer mode settings"](#), on page 43.

Connected via LAN, the software automatically transfers the file to the R&S SMW and activates the signal generation.

"Direction Finding"

Processes direction finding files created with the R&S Pulse Sequencer software, see [Chapter 3.4, "Direction finding mode settings"](#), on page 45.

Similar to the pulse sequencer mode, you can transmit the direction finding file via LAN to the R&S SMW and enable signal generation.

"Real Time Control Interface"

Option: R&S SMW-K503/-K504

Generates real-time signals or plays back stored waveform segment files via external timed pulse descriptor word (PDW) streaming, see [Chapter 3.5, "Real time control interface mode settings"](#), on page 46.

"Playback from File"

Option: R&S SMW-K502 and R&S SMW-K503

Processes user written PDW files, see [Chapter 3.7, "Playback from file mode settings"](#), on page 68.

"Agile Sequencing"

Option: R&S SMW-K506

Processes prestored ARB segments via external ARB descriptor word (ADW) streaming, see [Chapter 3.8, "Agile sequencing mode settings"](#), on page 69

Remote command:

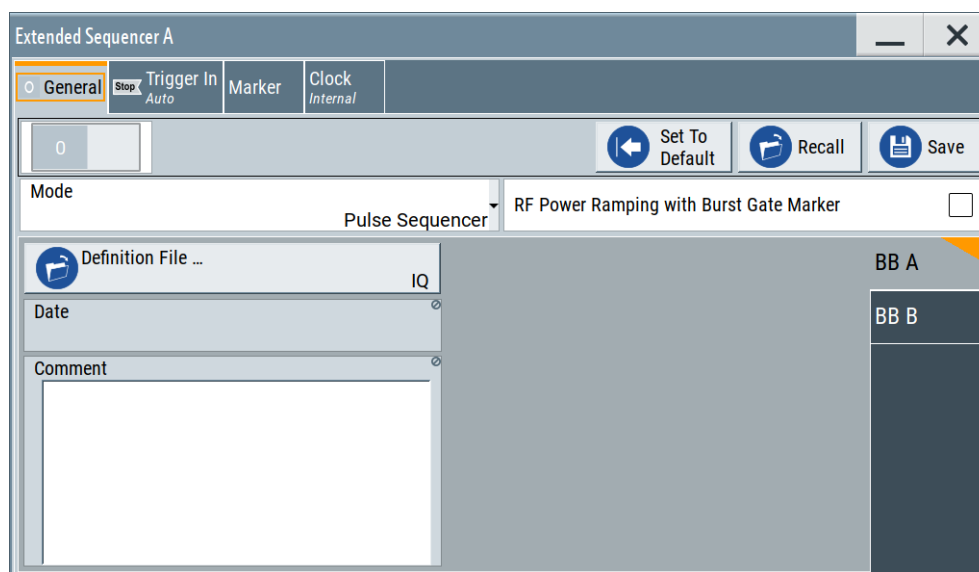
`[:SOURCE<hw>] :BB:ESEQuencer:MODE` on page 105

3.2 User mode settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "User".

In this mode, you can load the XML files for generating user-defined waveform segment sequence signals.



If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

- To load a file, select "Sequence", "Attenuation over Time List x" or "Hopping over Time List".

Each of the functions accesses the standard "File Select" function of the instrument. The provided navigation possibilities in the dialogs are self-explanatory. See also, chapter "File and Data Management" in the R&S SMW user manual.

- To enable a loaded file, enable the corresponding check box ("On").

For detailed information on the xml structure, programming examples and tag description, see [Chapter 2.2, "About user mode"](#), on page 16.

The remote commands required to define the user mode settings are described in [Chapter 4.3, "User mode commands"](#), on page 108.

Settings:

Sequence	41
Use Attenuation over Time List	42
Attenuation over Time List x	42
Use Hopping over Time List	42
Hopping over Time List	42

Sequence

Provides access to load the sequence list file for generating a user-defined waveform segment sequence.

See [Chapter 2.2.1.1, "Sequence list and subsequence list"](#), on page 17 and [Chapter 2.2.1.2, "Time list"](#), on page 20 for details to the xml formats.

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER:SEQuence:FILE:CATalog?
```

on page 108

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER [ :BB<st> ] :SEQuence:FILE [ :SElect ]
```

on page 108

Use Attenuation over Time List

This function is enabled if an attenuation over time file is loaded.

Activate the function to generate signal based on the information in the loaded file.

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER [ :BB<st> ] :AOTime<ch>:STATe
```

on page 109

Attenuation over Time List x

Provides access to load the attenuation over time list files for simulating a varying attenuation. Two independent lists can be used to simulate transmitter and receiver attenuation for instance.

See [Chapter 2.2.1.3, "Attenuation over time list"](#), on page 22 for details to the xml format of a list with antenna gain values.

To enable the loaded file, enable the check box (On).

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER:AOTime:FILE:CATalog? on page 109
```

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER [ :BB<st> ] :AOTime<ch>:FILE [ :SElect ] on page 109
```

Use Hopping over Time List

This function is enabled if a hopping over time file is loaded.

Activate the function to generate signal based on the information in the loaded file.

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER [ :BB<st> ] :HOTime:STATe on page 110
```

Hopping over Time List

Provides access to load the frequency hopping list file for varying the frequency of the waveform segments in the sequence.

See [Chapter 2.2.1.4, "Hopping over time list"](#), on page 24 for details to the xml format of a list with varying frequencies and phase options.

To enable the loaded file, enable the check box (On).

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER:HOTime:FILE:CATalog? on page 109
```

```
[ :SOURce<hw> ] :BB:ESEQuencer:USER [ :BB<st> ] :HOTime:FILE [ :SElect ] on page 110
```

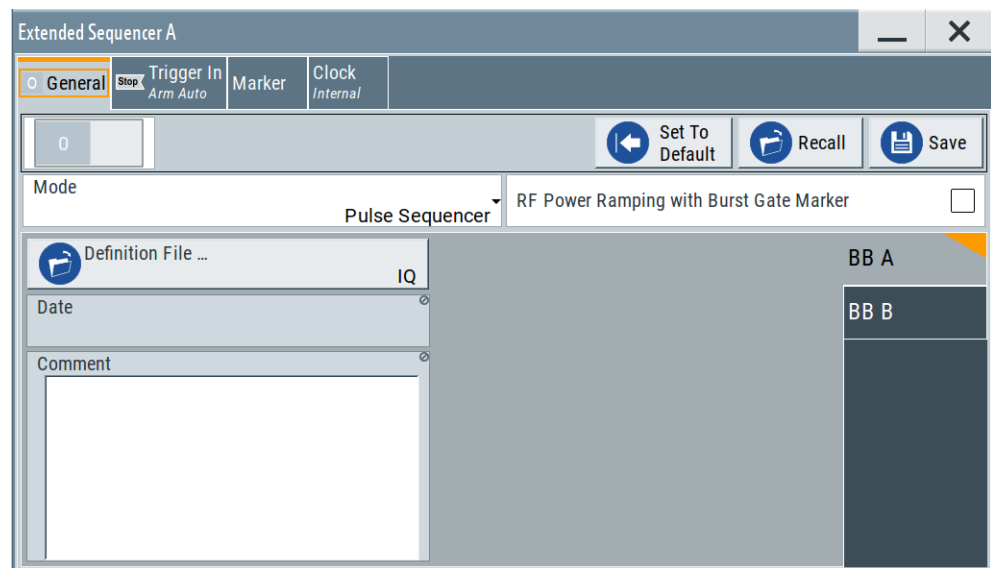
3.3 Pulse sequencer mode settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Pulse Sequencer".

This mode enables you to load a segment waveform sequence file, created by the R&S Pulse Sequencer software. These files have a proprietary Rohde & Schwarz file format.

For more about the pulse sequencer mode, see [Chapter 2.3, "About pulse sequencer mode"](#), on page 28.



If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

The remote commands required to define the user mode settings are described in [Chapter 4.4, "Pulse sequencer mode commands"](#), on page 110.

Settings:

RF Power Ramping with Burst Marker.....	44
Definition File.....	44
Date.....	44
Comment.....	44

RF Power Ramping with Burst Marker

Option: R&S SMW-K22

If activated, a marker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer :PRAMp :STATe` on page 105

Definition File

Accesses the standard "File Select" function of the instrument to load a waveform segment sequence file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer :FILE:CATalog?` on page 111

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:BB<st>] :FILE [:SELEct]`
on page 111

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:SEQuencer<st>] :FILE [:SELEct]` on page 111

Date

Displays information on the date of the loaded file.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:BB<st>] :DATE?` on page 111

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:SEQuencer<st>] :DATE?`
on page 111

Comment

Displays comment information of the loaded file.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:BB<st>] :COMMENT?`
on page 111

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer :PSEQuencer [:SEQuencer<st>] :COMMENT?`
on page 111

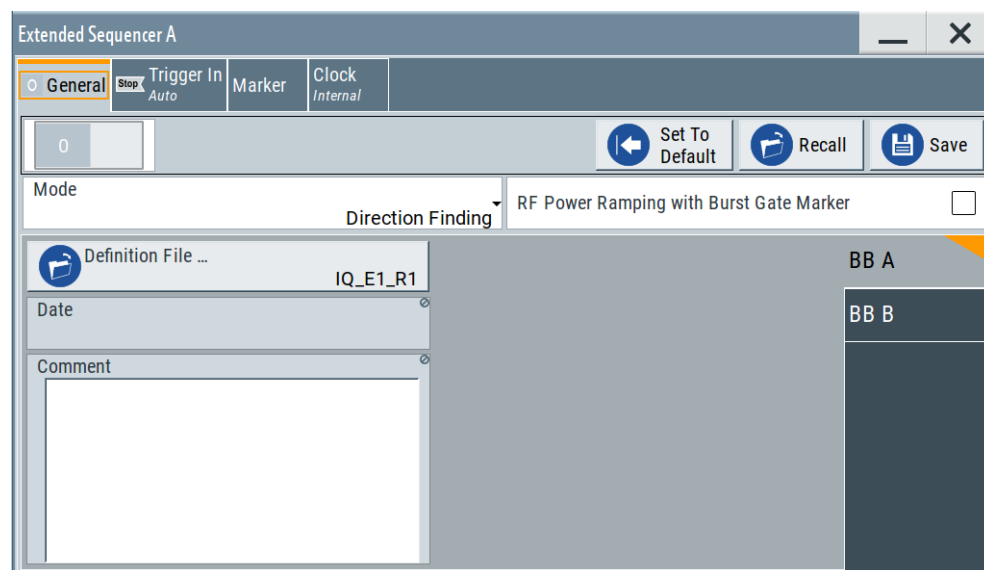
3.4 Direction finding mode settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Direction Finding".

This mode enables you to load a specific direction finding file, created by the R&S Pulse Sequencer software. These files have a proprietary Rohde & Schwarz file format.

For more about the extended sequencer in direction finding mode, see [Chapter 2.4, "About direction finding mode"](#), on page 28.



If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

The remote commands required to define the user mode settings are described in [Chapter 4.5, "Direction finding commands"](#), on page 112.

Settings:

RF Power Ramping with Burst Marker	46
Definition File	46
Date, Comment	46

RF Power Ramping with Burst Marker

Option: R&S SMW-K22

If activated, a marker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:PRAMp:STATe` on page 105

Definition File

Accesses the standard "File Select" function of the instrument to load a direction finding file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing:FILE:CATalog?` on page 112

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:BB<st>]:FILE[:SElect]`

on page 113

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:SEQuencer<st>]:FILE[:SElect]` on page 113

Date, Comment

Displays additional information on the loaded direction finding file.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:BB<st>]:DATE?` on page 113

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:BB<st>]:COMMENT?` on page 112

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:SEQuencer<st>]:DATE?`

on page 113

`[:SOURce<hw>] :BB:ESEQuencer:DFINDing[:SEQuencer<st>]:COMMENT?`

on page 112

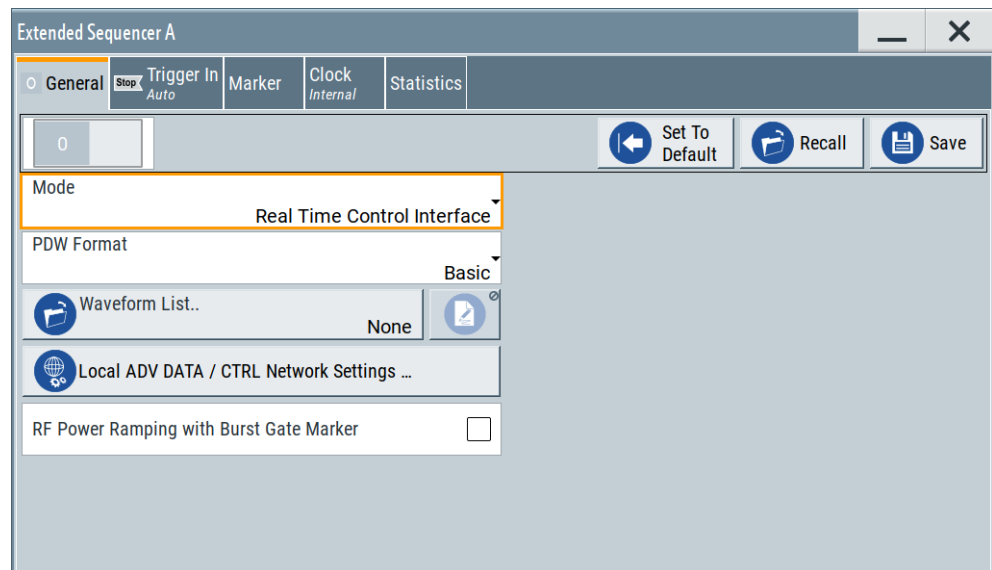
3.5 Real time control interface mode settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Real Time Control Interface".

This mode enables you to load precalculated waveform files which are individually addressable and playback in the R&S SMW.

For more information on this mode, see [Chapter 2.5, "About real time control interface mode"](#), on page 29.



If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

The remote commands required to define the real time control interface mode settings are described in [Chapter 4.6, "Real time control interface commands"](#), on page 113.

Settings:

- [Configuration for real time control interface](#)..... 47
- [Local ADV DATA/CTRL network settings](#)..... 49

3.5.1 Configuration for real time control interface

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Real Time Control Interface".

Settings:

PDW Format.....	48
Waveform List.....	48
Edit.....	48
Clear.....	48
Local ADV DATA/CTRL Network Setting.....	48
RF Power Ramping with Burst Marker.....	48

PDW Format

Select PDW format.

There are two PDW formats available "Basic" and "Expert".

For details, see the description [Interface Control Document](#).

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:PDWFormat` on page 114

Waveform List

Accesses the standard "File Select" function of the instrument to load a waveform file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLIST:FILE` on page 116

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLIST:FILE:CATalog?` on page 116

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLIST:FILE`
on page 116

Agile sequencing mode:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLIST:FILE`
on page 128

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:WLIST:FILE:CATalog?`
on page 128

Edit

Accesses the segment table dialog of the loaded waveform list.

For description of the available settings, see [Chapter 3.9, "Waveform list settings"](#), on page 74.

Clear

Clear the loaded waveform list.

Remote command:

n.a.

Local ADV DATA/CTRL Network Setting

Accesses the "Local ADV DATA/CTRL Network Setting" dialog for configuring the ADV DATA/CTRL network settings.

See [Chapter 3.5.2, "Local ADV DATA/CTRL network settings"](#), on page 49.

RF Power Ramping with Burst Marker

Option: R&S SMW-K22

If activated, a maker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

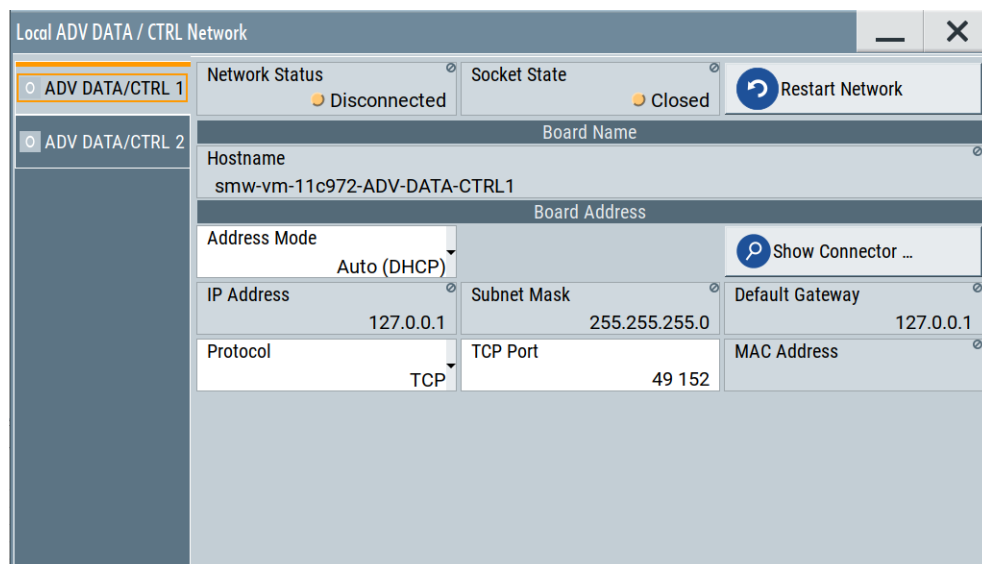
Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PRAMp:STATe on page 105

3.5.2 Local ADV DATA/CTRL network settings

Access:

1. Select "Baseband" > "Misc" > "Extended Sequencer".
2. Select "Mode" > "Real Time Control Interface".
3. Select "Local ADV DATA/CTRL Network Settings".



Depending on the installed options, up to two ADV DATA/CTRL dialogs are displayed. See [Chapter 2.1, "Required options"](#), on page 14.

This dialog comprises the settings of the general network environment and specific identification parameters of the instrument in the network.

The remote commands required to configure these settings are described in [Chapter 4.9, "Network commands"](#), on page 123.

Settings:

Network Status	50
Socket State	50
Restart Network	50
Hostname	50
Address Mode	51
IP Address	51
Subnet Mask	51

Default Gateway.....	52
MAC Address.....	52
Protocol.....	52
TCP Port/UDP Port.....	52

Network Status

Indicates that the instrument is connected to the network.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:STATus?` on page 124

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:STATus?`
on page 124

Socket State

Indicates whether the socket is open and thus if the connection between the external PDW simulator and the instrument is established.

See [Chapter 3.1, "General settings"](#), on page 37.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:SOCKET:STATe?` on page 124

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:SOCKET:STATe?` on page 124

Restart Network

Terminates the network connection of the instrument and sets it up again. You can use this function to fix network problems.

Note: This function restarts only the connection of the instrument to the network. It does not impact the network itself.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:REStart` on page 126

Hostname

Displays the hostname.

Each instrument is delivered with an assigned hostname, a logical name which can be used instead of the IP address. With the default network settings, the IP address is allocated by the DHCP server. This address can change each time the instrument is reconnected. Unlike the IP address, the hostname name does not change.

Note:

This function is password-protected. Unlock the protection level 1 to access it.

We recommend that you do not change the default network settings or the hostname to avoid problems with the network connection.

If you change the hostname, be sure to use a unique name.

Remote command:

`:SYSTEM:COMMunicate:BB<hw>:NETWork[:COMMON]:HOSTname` on page 126

Extended sequencer advanced mode:

`[:SOURCE<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:HOSTname?` on page 126

Address Mode

Selects the mode for assigning the IP address.

NOTICE! Risk of network failure.

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses

Errors can affect the entire network.

"Auto (DCHP)"

Assigns the IP address automatically, provided the network supports DHCP (Dynamic Host Configuration Protocol).

"Static"

Enables you to assign the IP address manually.

Remote command:

`:SYSTEM:COMMunicate:BB<hw>:NETWork:IPAddress:MODE` on page 124

IP Address

Displays the IP address of the instrument in the network.

By default, the R&S SMW is configured to use dynamic TCP/IP configuration and to obtain the whole address information automatically.

If the network does not support DHCP or the attempt does not succeed, the instrument tries to obtain the IP address via Zeroconf (APIPA) protocol. IP addresses assigned via Zeroconf start with the number blocks 169.254.*.*.

Note: An IP address that is assigned via the Zeroconf protocol although the network requires an IP address assigned via the DHCP server can cause network connection failures.

See "Resolving Network Connection Failure" in the R&S SMW user manual.

To assign the IP address manually, select **IP Address** > "Static".

Remote command:

`:SYSTEM:COMMunicate:BB<hw>:NETWork:IPAddress` on page 124

Extended sequencer advanced mode:

`[:SOURCE<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:IPAddress?` on page 124

Subnet Mask

Displays the bit group of the subnet in the host identifier.

To assign the subnet mask manually, select **IP Address** > "Static".

Remote command:

`:SYSTEM:COMMunicate:BB<hw>:NETWork[:IPAddress]:SUBNet:MASK`
on page 126

Default Gateway

Displays the gateway address.

This address identifies the router on the same network as the instrument that is used to forward traffic to destinations beyond the local network.

To assign the gateway address manually, select **"Address Mode"** on page 51 > "Static".

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork[:IPAddress]:GATeway` on page 125

MAC Address

Indicates the MAC (Media Access Control) address, a unique identifier of the network adapter in the R&S SMW.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:MACaddress` on page 125

Protocol

Selects the communication protocol for the network traffic.

"TCP" A reliable communication protocol, TCP is a connection-oriented protocol that ensures the transfer of a data between end to end communication.

"UDP" UDP is a connectionless and unreliable transport protocol which is used when a reliable delivery is not required. In general, UDP is faster than TCP in terms of data send over the IP.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:PROTocol` on page 125

TCP Port/UDP Port

Define the port number use for network traffic.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:NETWork:PORT` on page 125

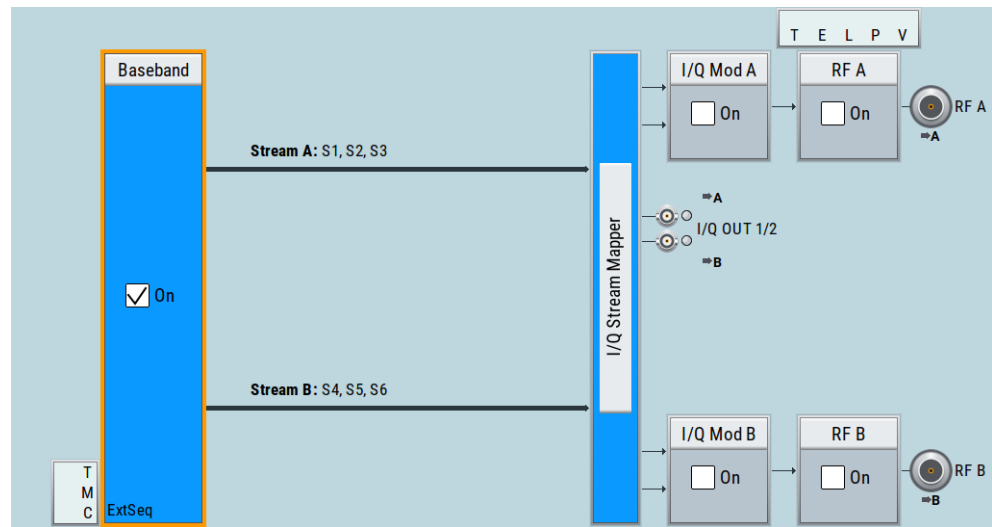
3.6 Extended sequencer advanced mode settings

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".

This mode enables the R&S SMW to work in an advanced extended sequencer mode. The fading simulator, the AWGN, the BB input and all baseband digital standards are disabled.

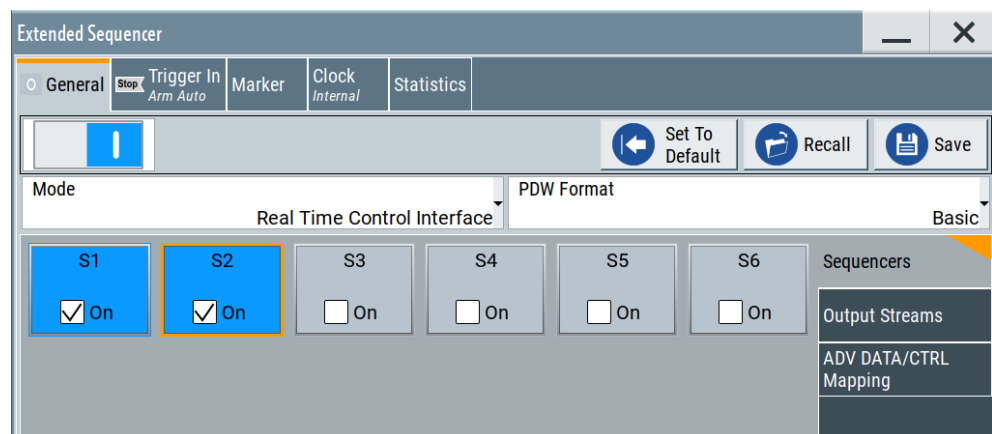
The block diagram indicates the configured streams and the sequencers assigned to them.



2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "General > Mode" > "Real Time Control Interface".

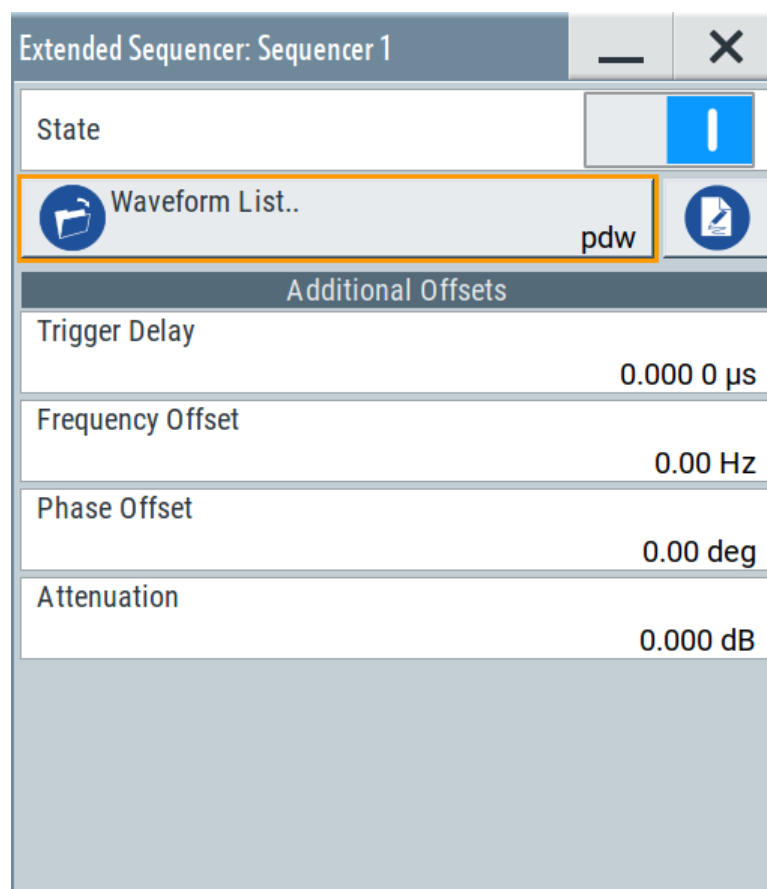
In advanced extended sequencer mode, the extended sequencer supports the "Pulse Sequencer", "Direction Finding", "Real Time Control Interface" and "Playback from File" mode. This description follows the real time control interface settings.

For background information on the extended sequencer in the "Real Time Control Interface" mode, see [Chapter 2.5, "About real time control interface mode"](#), on page 29.



4. Select "Sequencers > S1 > On" to activate the sequencer.
The blue color indicates active sequencer.
5. Click one of the sequencer blocks to access the corresponding settings, e.g. "Sequencers > S1".
The settings in the upper part of the dialog resables the settings provided in the **same mode** if advanced extended sequencer is not used.
The meaning of the settings and the operation are the same as in the normal extended sequencer mode.

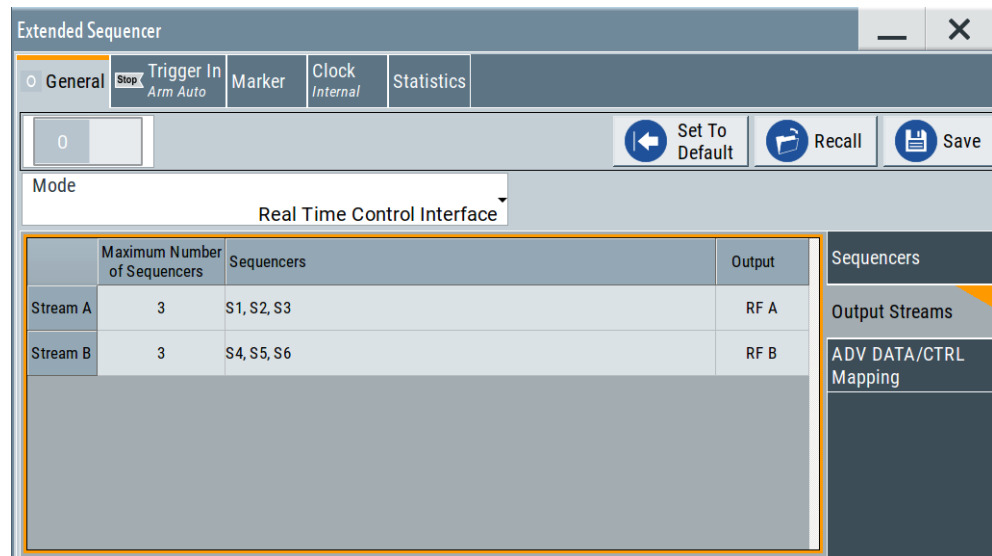
Dedicated to the advanced extended sequencer mode are merely the "Additional Offsets" setting as well as the remote control commands.



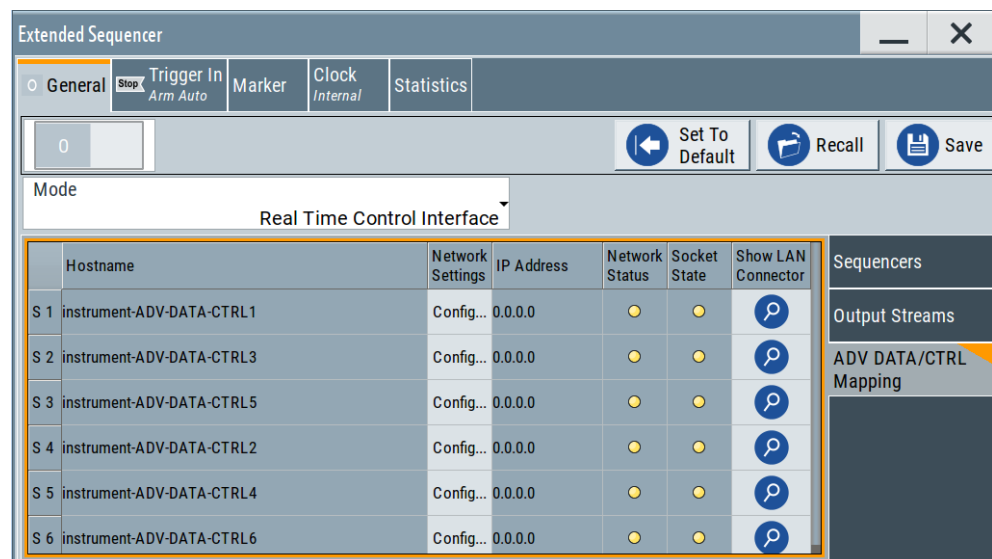
For description, see "[Extended Sequencer > Sequencer settings](#)" on page 59.

6. Select "Extended Sequencer > General > Output Streams".
Per default, two streams are configured (stream A and B) and three sequencers are assigned to each of them (S1 to S3 and S4 to S6). The streams are routed to RF A/RF B respectively.

Use the settings to reconfigure the default sequencers-to-stream mapping.



7. Select "Extended Sequencer > General > ADV DATA/CTRL Mapping".
In this dialog, you can configure the input interfaces.



8. Select "Extended Sequencer > Statistics".
Displayed is statistics data of the PDW streaming performance.

	System Time /s	Write Count /Bytes	Read Count /Bytes	Executed /PDWs	Dropped /PDWs	Buffer Filled /Bytes	Buffer Remain /Bytes
S 1	0	0	0	0	0	0	0
S 2	0	0	0	0	0	0	0
S 3	0	0	0	0	0	0	0
S 4	0	0	0	0	0	0	0
S 5	0	0	0	0	0	0	0
S 6	0	0	0	0	0	0	0

9. To access the signal control functions for trigger and marker, perform one of the following:

- a) On the block diagram, select "T/M/C".
- b) Select "Extended Sequencer > Trigger/Marker/Clock".

The trigger and clock settings are the same as in other extended sequencer modes, because you trigger the signal start once and expect that the sequencers run simultaneously.

See: [Chapter 3.10, "Trigger settings"](#), on page 76 and [Chapter 3.12, "Clock settings"](#), on page 85.

Marker settings are dedicated per sequencer.

Sequencer	Marker	Mode	Duration /Samples (417ps)	Delay /Samples (417ps)	Connector	Show Connector
S 1	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	
S 2	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	
S 3	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	

The remote commands required to define the real time control interface mode settings are described in [Chapter 4.6, "Real time control interface commands"](#), on page 113.

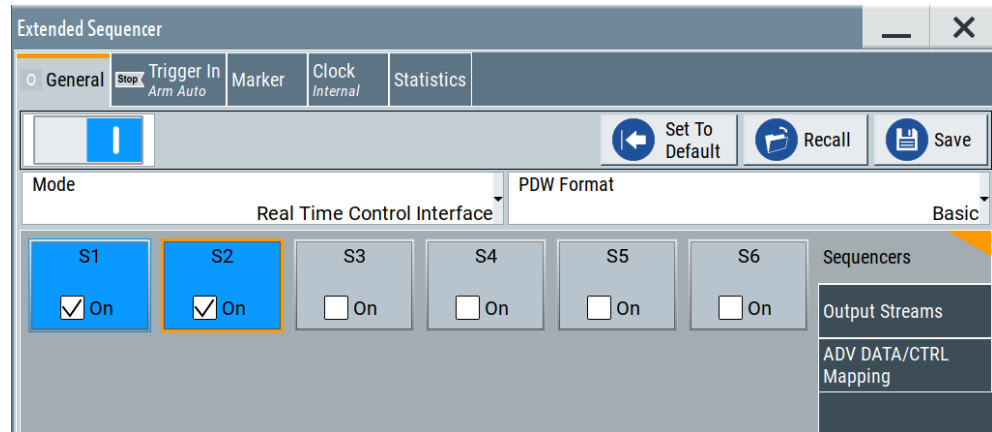
Settings:

- [Sequencers settings](#).....57
- [Output streams settings](#).....61
- [ADV DATA/CTRL mapping settings](#).....63
- [Statistics settings](#).....65
- [Marker settings](#).....66

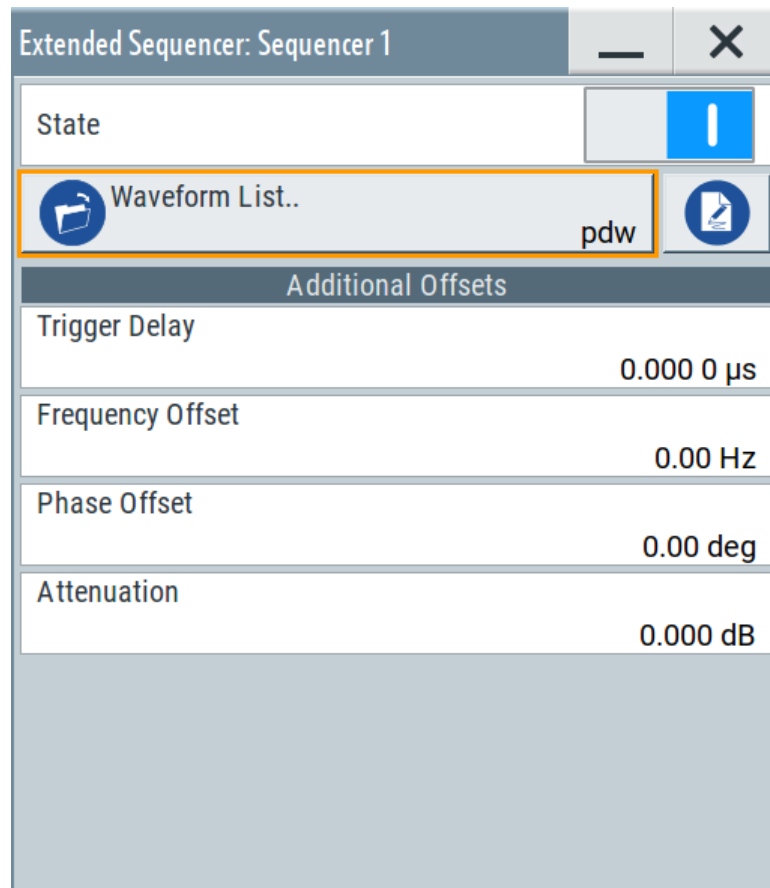
3.6.1 Sequencers settings

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".
2. Select "Baseband" > "Misc" > "Extended Sequencer".



3. Select "General > Sequencers > S1 > On" to activate the sequencer. Active sequencers are displayed in blue color. You can change the state in real time, e.g. to mute a sequencer. Signal calculation is not restarted.
4. Click one of the sequencer blocks to access the corresponding settings, e.g. "Sequencers > S1".
The settings in the upper part of the dialog resables the settings provided in the **same mode** if advanced extended sequencer is not used.
The meaning of the settings and the operation are the same as in the normal extended sequencer mode.
Dedicated to the advanced extended sequencer mode are merely the "Additional Offsets" setting as well as the remote control commands.



For description, see "[Extended Sequencer > Sequencer settings](#)" on page 59.

Settings:

S1 to S6.....	58
Extended Sequencer > Sequencer settings	59
L State	59
L Advanced extended sequencer settings for Mode > Pulse Sequencer	59
L Advanced extended sequencer settings for Mode > Direction Finding	59
L Advanced extended sequencer settings for Mode > Playback from File	60
L PDW Format	60
L Waveform List	60
L Edit	60
L Clear	61
L Trigger Delay	61
L Frequency Offset	61
L Phase Offset	61
L Attenuation	61

S1 to S6

Enables the selected sequencer.

Active sequencers are displayed in blue color. You can change the state in real time, e.g. to mute a sequencer. Signal calculation is not restarted.

Selecting one of the blocks access the settings of the selected sequencer, see "[Extended Sequencer > Sequencer settings](#)" on page 59.

Number of available sequencers depend on the installed options, see "[Pulse-on-pulse simulation options](#)" on page 16.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:SEQuencer<st>:STATe` on page 120

Extended Sequencer > Sequencer settings

The settings in the upper part of the dialog resables the settings provided in the **same mode** if advanced extended sequencer is not used.

The meaning of the settings and the operation are the same as in the normal extended sequencer mode.

Dedicated to the advanced extended sequencer mode are merely the "Additional Offsets" setting as well as the remote control commands.

State ← Extended Sequencer > Sequencer settings

Enables the sequencer.

Active sequencers are displayed in blue color. You can change the state in real time, e.g. to mute a sequencer. Signal calculation is not restarted.

Works like the enabling the sequencer via the "Sequencers" > [S1 to S6](#) blocks.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:SEQuencer<st>:STATe` on page 120

Advanced extended sequencer settings for Mode > Pulse Sequencer ← Extended Sequencer > Sequencer settings

The dedicated settings "Definition File", "Date" and "Comment" work like the settings with the same names in "Mode > Pulse Sequencer". The remote control commands are, however, different.

See:

- "[Definition File](#)" on page 44.
- "[Date](#)" on page 44.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:PSEQuencer [:SEQuencer<st>] :FILE [:SELEct]` on page 111

`[:SOURce<hw>] :BB:ESEQuencer:PSEQuencer [:SEQuencer<st>] :DATE?` on page 111

`[:SOURce<hw>] :BB:ESEQuencer:PSEQuencer [:SEQuencer<st>] :COMMENT?` on page 111

Advanced extended sequencer settings for Mode > Direction Finding ← Extended Sequencer > Sequencer settings

The dedicated settings "Definition File", "Date" and "Comment" work like the settings with the same names in "Mode > Direction Finding". The remote control commands are, however, different.

See:

- "[Definition File](#)" on page 46.

- ["Date, Comment"](#) on page 46.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:DFINding [:SEQuencer<st>] :FILE [:SElect]` on page 113

`[:SOURce<hw>] :BB:ESEQuencer:DFINding [:SEQuencer<st>] :DATE?` on page 113

`[:SOURce<hw>] :BB:ESEQuencer:DFINding [:SEQuencer<st>] :COMMENT?` on page 112

Advanced extended sequencer settings for Mode > Playback from File ← Extended Sequencer > Sequencer settings

The dedicated settings "Definition File", "Date" and "Comment" work like the settings with the same names in "Mode > Playback from File". The remote control commands are, however, different.

See:

- ["Definition File"](#) on page 68.
- ["Date"](#) on page 69.
- ["Comment"](#) on page 69.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :FILE [:SElect]` on page 118

`[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :DATE?` on page 119

`[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :COMMENT?` on page 119

PDW Format ← Extended Sequencer > Sequencer settings

See ["PDW Format"](#) on page 48.

Waveform List ← Extended Sequencer > Sequencer settings

Accesses the standard "File Select" function of the instrument to load a waveform file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:FILE` on page 116

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:FILE:CATalog?` on page 116

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLISt:FILE` on page 116

Agile sequencing mode:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLISt:FILE` on page 128

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:WLISt:FILE:CATalog?` on page 128

Edit ← Extended Sequencer > Sequencer settings

Accesses the segment table dialog of the loaded waveform list.

For description of the available settings, see [Chapter 3.9, "Waveform list settings"](#), on page 74.

Clear ← Extended Sequencer > Sequencer settings

Clear the loaded waveform list.

Remote command:

n.a.

Trigger Delay ← Extended Sequencer > Sequencer settings

Delays the trigger event for the selected sequencer.

Use this setting to postpone the signal generation start of the sequencer signals relative to each other.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:SEQuencer<st>:TDELay](#) on page 120

Frequency Offset ← Extended Sequencer > Sequencer settings

Enters the frequency offset for the selected sequencer and thus shifts the signal relative to the center frequency.

Use this function to shift the signal bandwidths of the sequencer signals relative to each other.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:SEQuencer<st>:FOFFset](#) on page 121

Phase Offset ← Extended Sequencer > Sequencer settings

Enters the phase offset for the selected sequencer, relative to the signals of the other sequencers.

Use this parameter to change the start phase of the signal of the particular sequencer.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:SEQuencer<st>:POFFset](#) on page 120

Attenuation ← Extended Sequencer > Sequencer settings

Applies an additional attenuation to attenuate the level of the selected sequencer.

Remote command:

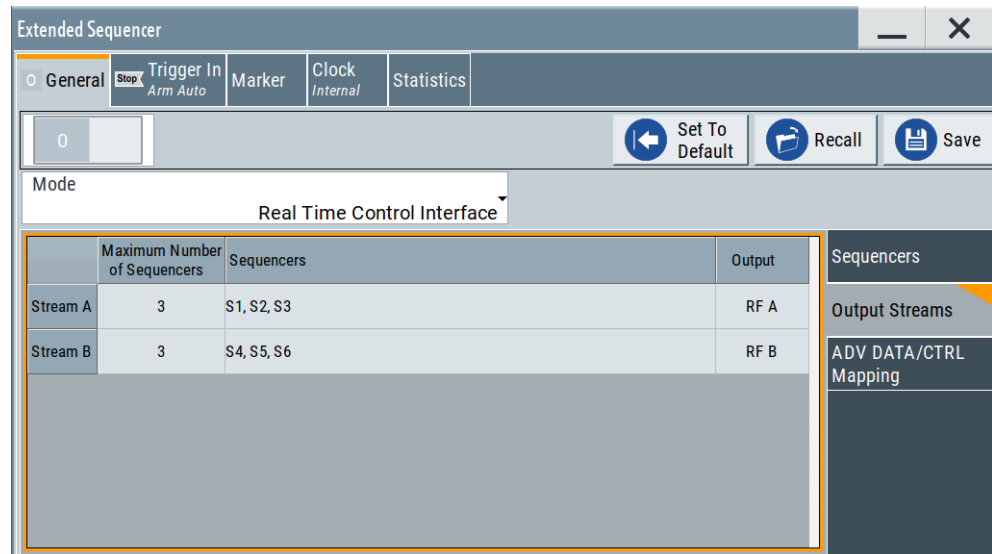
[\[:SOURce<hw>\]:BB:ESEQuencer:SEQuencer<st>:ATTenuation](#) on page 121

3.6.2 Output streams settings

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Extended Sequencer > General > Output Streams".

Per default, two streams are configured (stream A and B) and three sequencers are assigned to each of them (S1 to S3 and S4 to S6). The streams are routed to RF A/RF B respectively.



The sequencers-to-streams mapping is performed automatically; the algorithm allocates as many sequencers as possible for the current configuration. The sequencers signals mapped to the same stream are added. Streams are routed to the available outputs. If necessary, streams can be added equally weighted and routed to one of the outputs.

Settings:

Stream A/B.....	62
Maximum Number of Sequencers.....	62
Sequencers.....	62
Sequencers Assigned to Stream A/B.....	63
Output.....	63

Stream A/B

Designation of the streams.

Number of streams depends on the installed options.

Remote command:

Via suffix `STReam<di>`

See also: `[:SOURCE<hw>] :BB:ESEQuencer:STRCount` on page 121

Maximum Number of Sequencers

Sets how many sequencers can be mapped to the stream at most.

The R&S SMW maps the sequencers to the streams automatically, aiming to achieve best use of the available resources, like the dynamic range or the available bandwidth.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:STReam<di>:SEQCount` on page 122

Sequencers

Indicates the sequencers mapped to the selected stream.

The signals of the sequencers mapped to the same stream are added. If not deliberately attenuated ([Attenuation](#)), sequencers are added equally weighted.

To change the mapping, click the indicated list of sequencers. Enable sequencers to change the mapping, see ["Sequencers Assigned to Stream A/B"](#) on page 63.

Sequencers Assigned to Stream A/B

Access: select "Extended Sequencer > General > Output Streams > Sequencers".

	Maximum Number of Sequencers	Sequencers	Output
Stream A	3	S1, S2, S3	RF A
Stream B	3	<div style="border: 1px solid gray; padding: 2px;"> Sequencers Assigned to Stream A X </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S1 <input checked="" type="checkbox"/></div> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S2 <input checked="" type="checkbox"/></div> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S3 <input checked="" type="checkbox"/></div> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S4 <input type="checkbox"/></div> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S5 <input type="checkbox"/></div> <div style="border: 1px solid gray; padding: 2px; text-align: center;">S6 <input type="checkbox"/></div> </div>	RF B

Enable sequencers to change the mapping.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:STReam<di>:SEQuencer<st>:STATe`
on page 122

Output

Selects the RF output the stream is routed to.

You can route streams to the same or to different outputs. If routed to the same output, streams are added equally weighted. To disable the stream output, set "Output = None".

Stream mapping to the RF outputs via the "I/Q Stream Mapper" is disabled; perform stream configuration in the "Extended Sequencer > General > Output Streams" dialog.

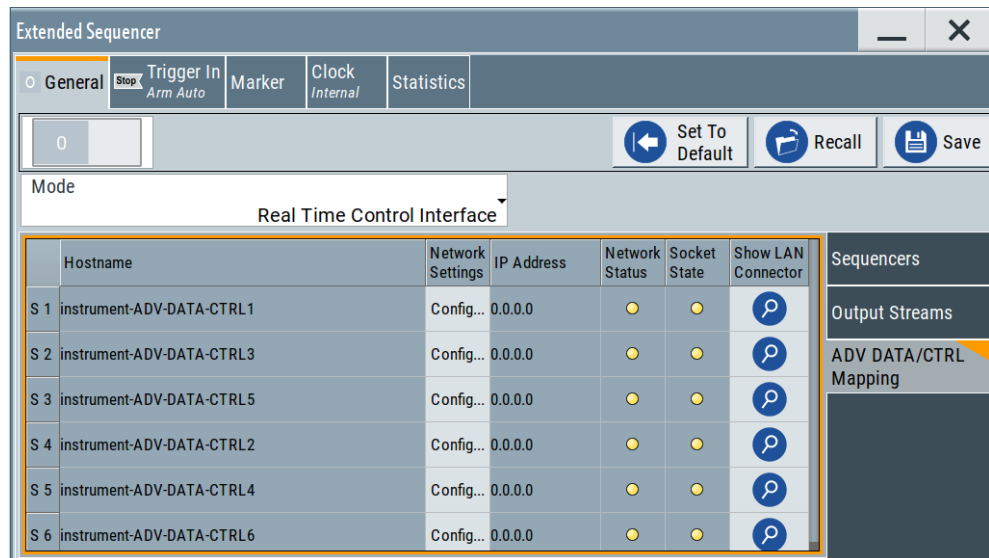
Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:STReam<di>:OUTPut` on page 122

3.6.3 ADV DATA/CTRL mapping settings

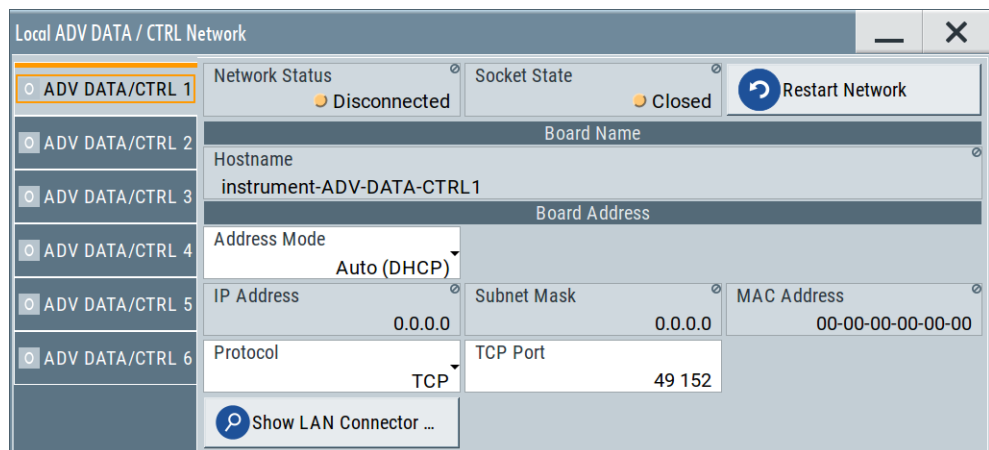
Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Real Time Control Interface".
4. Select "Extended Sequencer > General > ADV DATA/CTRL Mapping".



This dialog shows overview information regarding the network environment, like the identification of the available interfaces in the network and their status.

- To configure the settings of the individual ADV DATA/CTRL interfaces, select "S x > Network Settings > Config".



Depending on the installed options, up to six ADV DATA/CTRL tabs are displayed. The provided settings are the same as in "Real Time Control Interface" mode, see [Chapter 3.5.2, "Local ADV DATA/CTRL network settings"](#), on page 49.

Settings:

[Mapping Table](#).....64

Mapping Table

Shows overview information regarding the network environment, like:

- S x Indicates the sequencer.
- Remote command:
- Via suffix SEQuencer<st>

"Hostname", "IP Address", "Network Status", "Socket State"

Identification and status information on the selected ADV DATA/CTRL interface.

Resembles the information displayed in "Network Settings" > "Config" dialog.

Displayed are only the interfaces of mapped sequencers. Mapped sequencers are sequencers that are assigned to a stream ("Output Streams" > [Sequencers Assigned to Stream A/B](#)) and if the stream is mapped to an RF A/RF B output ("Output Streams" > [Output](#)).

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:HOSTname? on page 126`

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:IPAddress? on page 124`

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:STATus? on page 124`

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :NETWork:SOCKet:STATe? on page 124`

"Network Settings" > "Config"

Comprises the network settings of the selected ADV DATA/CTRL interface.

The provided settings are the same as in "Real Time Control Interface" mode, see [Chapter 3.5.2, "Local ADV DATA/CTRL network settings"](#), on page 49.

"Show LAN Connector"

Accesses a dialog that displays the physical location of the selected connector on the front/rear panel of the instrument.

3.6.4 Statistics settings

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Real Time Control Interface".
4. Select "Extended Sequencer > Statistics".

Displayed is statistics data of the PDW streaming performance.

	System Time /s	Write Count /Bytes	Read Count /Bytes	Executed /PDWs	Dropped /PDWs	Buffer Filled /Bytes	Buffer Remain /Bytes
S 1	0	0	0	0	0	0	0
S 2	0	0	0	0	0	0	0
S 3	0	0	0	0	0	0	0
S 4	0	0	0	0	0	0	0
S 5	0	0	0	0	0	0	0
S 6	0	0	0	0	0	0	0

Settings:

[Statistics](#).....66

Statistics

Displays the system time, read/write count of the PDW bytes, the number of executed and dropped PDW and the buffer performance in the coder board.

For details, see the [Interface Control Document](#), sections about PDW timing.

Remote command:

```
[ :SOURce<hw> ] :BB:ESEQuencer:RTCI [ :SEQuencer<st> ] :STReam: STIme | DROP | EXEC | WRDWrite | WRDRead | BUFRemain | BUFFilled? on page 115
```

3.6.5 Marker settings

Access:

1. Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Extended Sequencer Advanced".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Extended Sequencer > Marker".

Marker settings are dedicated per sequencer.

Sequencer	Marker	Mode	Duration /Samples (417ps)	Delay /Samples (417ps)	Connector	Show Connector
S 1	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	
S 2	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	
S 3	Marker 1	Restart		1	0 T/M/C 1	
	Marker 2	Restart		1	0 T/M 2	

The marker settings are displayed in a table form. Apart from the fact that only two markers are available per sequencer, the marker settings are the same as in the other modes, see [Chapter 3.11, "Marker settings"](#), on page 82.

In advanced extended sequencer mode, the marker signals are output at the local T/M/C connectors.

Settings:

[Sequencer](#).....67
[Marker](#).....67
[Mode, Duration, Delay](#).....67
[Connector](#).....67
[Show Connector](#).....67

Sequencer

Indicates the sequencer.

Remote command:

Via suffix SEQuencer<st>

Marker

You can configure two marker signals per sequencer.

Mode, Duration, Delay

Work like the settings in other modes, see:

- ["Marker Mode"](#) on page 83
- ["Marker x Delay"](#) on page 84

Connector

Indicates the connector at that the marker signal is output.

In advanced extended sequencer mode, the marker signals are output at the local T/M/C connectors.



Show Connector

Accesses a dialog that displays the physical location of the selected connector on the front/rear panel of the instrument.

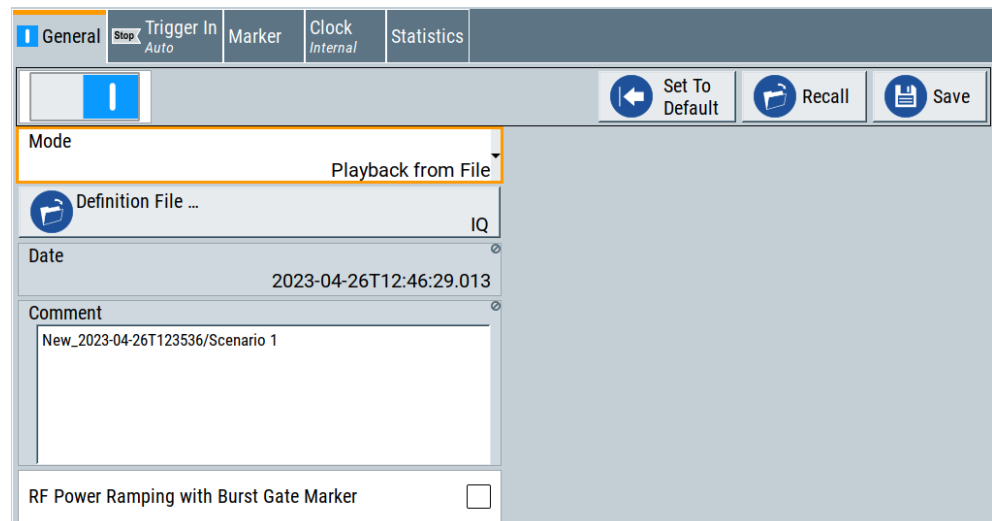
3.7 Playback from file mode settings

Access:

1. Select standard system configuration with separated sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Standard".
 - Select "Signal Outputs" > "Analog Only".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Playback from File".

This mode enables you to play back user written PDW files.

For more about the playback from file mode, see [Chapter 2.6, "About playback from file mode"](#), on page 30.



The remote commands required to define the user mode settings are described in [Chapter 4.7, "Playback from file commands"](#), on page 118.

Settings:

Definition File	68
Date	69
Comment	69
RF Power Ramping with Burst Marker	69

Definition File

Accesses the standard "File Select" function of the instrument to load a PDW file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback:FILE:CATalog? on page 118

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:BB<st>] :FILE [:SElect]

on page 118

Extended sequencer advanced mode:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :FILE [:

SElect] on page 118

Date

Displays information on the date of the loaded file.

Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:BB<st>] :DATE? on page 119

Extended sequencer advanced mode:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :DATE?

on page 119

Comment

Displays comment information of the loaded file.

Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:BB<st>] :COMMENT? on page 119

Extended sequencer advanced mode:

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :COMMENT?

on page 119

RF Power Ramping with Burst Marker

Option: R&S SMW-K22

If activated, a marker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

Remote command:

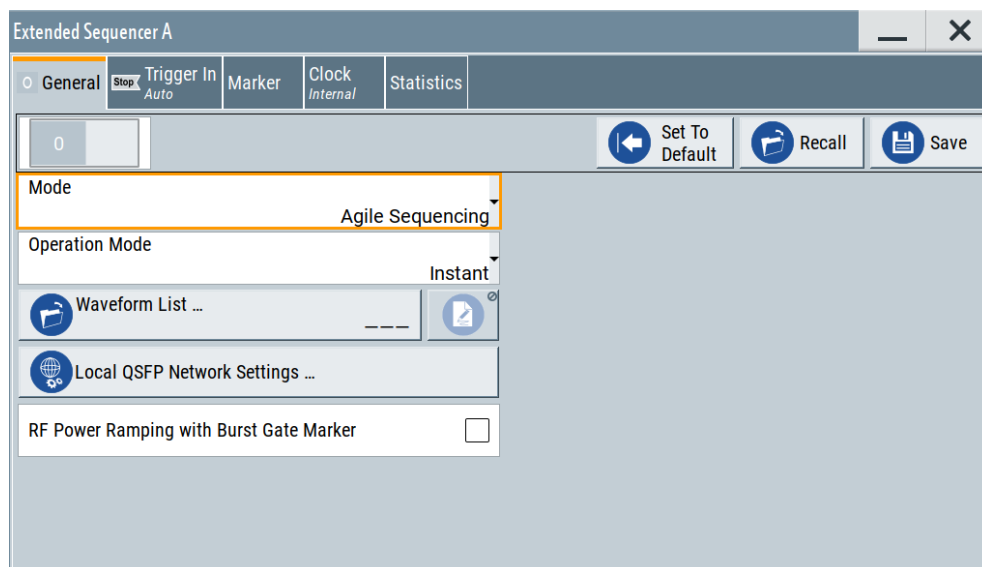
[:SOURce<hw>] :BB:ESEQuencer:PRAMP:STATe on page 105

3.8 Agile sequencing mode settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Agile Sequencing".

For more about the extended sequencer in agile sequencing mode, see [Chapter 2.7, "About agile sequencing mode"](#), on page 31.



If the current instrument configuration uses coupled sources, the dialog consists of **up to eight side tabs**, whereas the number of tabs corresponds to the number of selected "Entities". The tab name displays the baseband the settings are related to.

The remote commands required to define the agile sequencing mode settings are described in [Chapter 4.10, "Agile sequencing commands"](#), on page 127.

Settings:

- [General agile sequencing settings](#).....70
- [Local QSFP network settings](#).....72

3.8.1 General agile sequencing settings

Access:

1. Select advanced system configuration with coupled sources:
 - Select "System Config" > "System Configuration" > "Fading/Baseband Config" > "Mode = Advanced".
 - Set "Entities = 2", "Basebands = 1" and "Streams = 1".
 - Select "BB Source Config" > "Coupled Sources".
 - Select "Apply".
2. Select "Baseband" > "Misc" > "Extended Sequencer".
3. Select "Mode" > "Agile Sequencing".

Settings:

Operation Mode	71
Waveform List	71
Edit	71
Clear	71
Local QSFP Network Settings	71
RF Power Ramping with Burst Marker	72

Operation Mode

Select operation mode.

- "Instant" The signal generator plays back prestored ARB segments according to the ADW reception with low latency.
- "Deterministic" The signal generator plays back prestored ARB segments according to the ADW after a "ready" signal is acknowledged and the next ARB segment is triggered.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:OMODE` on page 127

Waveform List

Accesses the standard "File Select" function of the instrument to load a waveform file. The provided navigation possibilities in the dialog are self-explanatory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLIST:FILE` on page 116

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLIST:FILE:CATALog?` on page 116

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLIST:FILE`
on page 116

Agile sequencing mode:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLIST:FILE` on page 128

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:WLIST:FILE:CATALog?`
on page 128

Edit

Accesses the segment table dialog of the loaded waveform list.

For description of the available settings, see [Chapter 3.9, "Waveform list settings"](#), on page 74.

Clear

Clear the loaded waveform list.

Remote command:

n.a.

Local QSFP Network Settings

Access the "Local QSFP Network Settings" dialog for configuring the network settings of the HS DIG I/Q connector.

See [Chapter 3.8.2, "Local QSFP network settings"](#), on page 72.

RF Power Ramping with Burst Marker

Option: R&S SMW-K22

If activated, a marker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

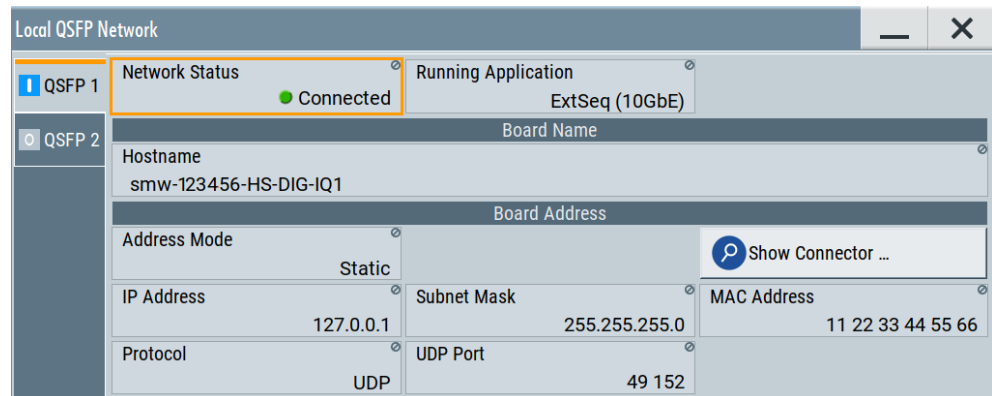
Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PRAMp:STATe on page 105

3.8.2 Local QSFP network settings

Access:

1. Select "Baseband" > "Misc" > "Extended Sequencer".
2. Select "Mode" > "Agile Sequencing".
3. Select "Local QSFP Network Settings".



Depending on the installed options, up to two QSFP tabs are displayed. See [Chapter 2.1, "Required options"](#), on page 14.

The dialog provides settings to configure the QSFP+ network environment and specific identification parameters of the instrument in the network.

The remote commands required to configure these settings are described in [Chapter 4.11, "QSFP+ network commands"](#), on page 130.

Settings:

Network Status	73
Running Application	73
Hostname	73
Address Mode	73
IP Address	73
Subnet Mask	73
MAC Address	74
Protocol	74
UDP Port	74

Network Status

Indicates that the instrument is connected to the network.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:STATus?` on page 131

Running Application

Indicates the application that currently uses the QSFP+ network configuration.

"ExtSeq Extended sequencer using 10 Gbit ethernet connection.
(10GbE)"

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:APPLication?` on page 131

Hostname

Displays the hostname. The hostname consists of the R&S SMW short name <instrument>, the serial number <serial number> and the connector of the QSFP+ interface <HS-DIG-IQx>.

Each instrument is delivered with an assigned hostname, a logical name which can be used instead of the IP address. With the default network settings, the IP address is allocated by the DHCP server. This address can change each time the instrument is reconnected. Unlike the IP address, the hostname name does not change.

Note:

This function is password-protected. Unlock the protection level 1 to access it.

We recommend that you do not change the default network settings or the hostname to avoid problems with the network connection.

If you change the hostname, be sure to use a unique name.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:COMMON]:HOSTname?`
on page 131

Address Mode

Indicates that IP addresses are assigned in static mode, i.e. the IP address is assigned manually.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPAddress:MODE` on page 132

IP Address

Assign the IP address manually.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPAddress` on page 132

Subnet Mask

Assign the subnet mask manually.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:IPAddress]:SUBNet:MASK`
on page 132

MAC Address

Indicates the MAC (Media Access Control) address, a unique identifier of the network adapter in the R&S SMW.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:MACAddress?` on page 133

Protocol

Displays the communication protocol for the network traffic.

UDP is a connectionless and unreliable transport protocol which is used when a reliable delivery is not required. In general, UDP is faster than TCP in terms of data send over the IP.

Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PROTocol` on page 133

UDP Port

Define the port number used for network traffic.

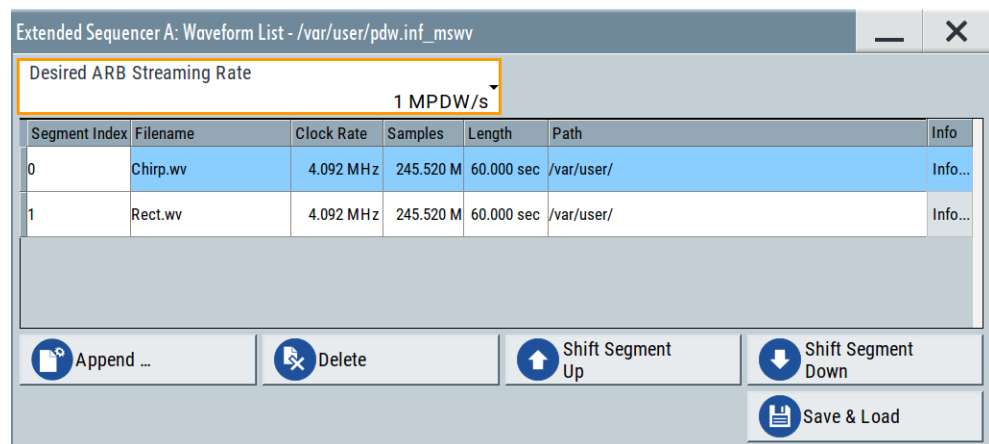
Remote command:

`:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PORT` on page 133

3.9 Waveform list settings

Access:

1. Select "Baseband" > "Misc" > "Extended Sequencer".
2. Select "Mode" > "Real Time Control Interface" / "Agile Sequencing".
3. Select "Waveform List > New".
4. Enter a filename for the list.
5. Select "Edit".



This section explains the settings necessary to create and adjust the contents of the waveform list.

Desired ARB Streaming Rate

Requires "Mode > Real Time Control Interface"

The desired ARB streaming rate directly influences the minimum common clock rate all waveforms are resampled to. The higher the rate, the higher the common sample rate. Higher sample rate allows a higher ARB PDW streaming rate (lower internal resampling delay) but increases the required memory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLIST:DASR` on page 116

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLIST:DASR`
on page 116

Desired ARB Sample Rate

Requires "Mode > Agile Sequencing"

The desired ARB sample rate directly influences the minimum common clock rate all waveforms are resampled to. The higher the rate, the higher the common sample rate. Higher sample rate optimizes the ADW to output latency (lower internal resampling delay) but increases the required memory.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:WLIST:DASR` on page 128

Waveform List, Append/Delete/Up/Down/Save&Load.

The table lists the individual waveforms (segments) of the selected waveform list. The information about the segments is retrieved from the tags of the corresponding waveform files.

Table 3-1: GUI elements in the waveform list

Function	Description
"Segment#"	Indication of segment index. Within the manual and remote control configuration, this segment index indicates the segment explicitly. Find details in the description Interface Control Document
"Filename"	Indication of the waveform file name of the segment.
"Clock Rate"	Indication of the clock rate of the selected waveform.
"Samples"	Indication of the number of samples in the segment.
"Length"	Indication of the segment duration.
"Path"	Indication of the location of the waveform file used for the corresponding segment.
"Info"	Opens a dialog with detailed information about the currently selected waveform.

"Append" Opens the standard "File Select" dialog for navigation and selection of the waveform file to be added to the end of the existing list. Only non-multi segment waveforms can be loaded.

"Delete"	Removes the selected entry from the table. The waveform file itself is however not deleted.
"Shift Seg.# Up/Down"	Rearranges the segments, i.e. moves the selected segment up and down.
"Save & Load"	The waveform list is saved and loaded to the RAM of the coder board. For details, see the description Interface Control Document .

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WAVE:FILE:CATalog?` on page 115

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:SEGMENT:CATalog?`

on page 117

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:SEGMENT:APPend` on page 117

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:SEGMENT:DELete` on page 117

`[:SOURce<hw>] :BB:ESEQuencer:RTCI:WLISt:SAVE` on page 118

Extended sequencer advanced mode:

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLISt:SEGMENT:APPend` on page 117

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLISt:SEGMENT:DELete` on page 117

`[:SOURce<hw>] :BB:ESEQuencer:RTCI [:SEQuencer<st>] :WLISt:SAVE` on page 118

Agile sequencing mode:

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:WAVE:FILE:CATalog?` on page 127

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLISt:SEGMENT:CATalog?` on page 129

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLISt:SEGMENT:APPend` on page 129

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLISt:SEGMENT:DELete` on page 129

`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :WLISt:SAVE` on page 129

3.10 Trigger settings

Access:

- ▶ Select "Baseband" > "Misc" > "Extended Sequencer" > "Trigger In".

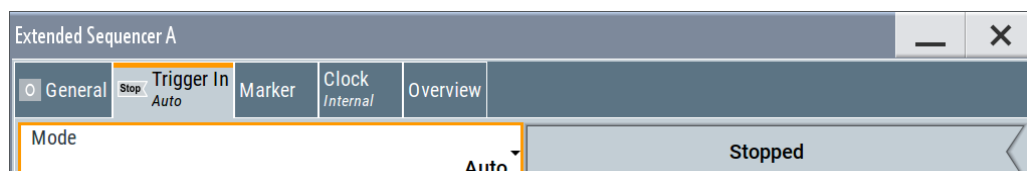
This tab provides access to the settings required to select and configure the trigger, like the trigger source, mode, and to arm or trigger an internal trigger manually. The current signal generation status is displayed in the header of the tab together with

information on the enabled trigger mode. As in the "Marker" and "Clock" tabs, this tab provides also access to the settings of the related connectors.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



The provided trigger signals are not dedicated to a particular connector. Trigger signals can be mapped to one or more USER x or T/M connectors.

Use the [Local and global connectors settings](#) to configure the signal mapping, the polarity, the trigger threshold and the input impedance of the input connectors.

To route and enable a trigger signal, proceed as follows:

- Define the signal source and the effect of a trigger event.
Select "Trigger In" > "Mode" and "Trigger In" > "Source".
- Define the connector where the selected signal is provided.
Use the "Global Connectors" settings.

Settings:

Trigger Settings Common to All Basebands	77
Trigger Mode	78
Running/Stopped	78
Arm	79
Time Based Trigger	79
Trigger Time	79
Execute Trigger	79
Trigger Source	79
Sync. Output to External Trigger/Sync. Output to Trigger	80
External / Trigger Inhibit	81
(External) Delay Unit	81
(Specified) External Delay/(Specified) Trigger Delay	81
Actual Trigger Delay/Actual External Delay	82
Disable External Trigger	82

Trigger Settings Common to All Basebands

To enable simultaneous signal generation in all basebands, the R&S SMW couples the trigger settings in the available basebands in any instrument's configuration involving signal routing with signal addition. For example, in MIMO configuration, routing and summing of basebands or of streams.

The icon indicates that common trigger settings are applied.

You can access and configure the common trigger source and trigger mode settings in any of the basebands. An arm or a restart trigger event applies to all basebands, too. You can still apply different delay to each of the triggers individually.

Trigger Mode

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

For more information, refer to chapter "Basics" in the R&S SMW user manual.

For "Extended Sequencer > General > Mode = Real Time Control Interface", supported are:

- "Auto"
- "Armed Auto"

For "Extended Sequencer > General > Mode = Agile Sequencing", supported are:

- "Operation Mode > Instant": "Auto"
- "Operation Mode > Deterministic": "Retrigger"

"Auto" The signal is generated continuously.

"Retrigger" The signal is retrIGGERed. The system time starts over from 0.

"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 causes the system time starts over from 0. The PDWs are not played again.

"Armed Retrigger" The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes the system time starts over from 0. The PDWs are not played again. An "Arm" stops signal generation. A subsequent trigger event (internal with or external) causes the system time starts over from 0. 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 the system time starts over from 0. The PDWs are not played again.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer\[:TRIGger\]:SEQuence](#) on page 139

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:ESEQuencer:TRIGger:RMODe?](#) on page 136

Arm

Stops the signal generation until subsequent trigger event occurs.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:ARM:EXECute` on page 134

Time Based Trigger

Requires trigger "Mode" > "Armed Auto"/"Single".

Activates time-based triggering with a fixed time reference.

The R&S SMW triggers signal generation when its operating system time ("Current Time") matches a specified time trigger ("Trigger Time"). As trigger source, you can use an internal trigger or an external global trigger.

How to: Chapter "Time-based triggering" in the R&S SMW user manual.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:TIME [:STATe]` on page 140

Trigger Time

Requires trigger "Mode" > "Armed Auto"/"Single".

Sets date and time for a time-based trigger signal.

Set a trigger time that is later than the "Current Time". The current time is the operating system time of the R&S SMW. If you set an earlier trigger time than the current time, time-based triggering is not possible.

How to: Chapter "Time-based triggering" in the R&S SMW user manual.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:TIME:TIME` on page 140

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:TIME:DATE` on page 139

Execute Trigger

For internal trigger source, executes a trigger manually.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:EXECute` on page 134

Trigger Source

For "General > Mode = Agile Sequencing" and "Operation Mode = Deterministic", trigger source "External Global Trigger" is supported.

The following sources of the trigger signal are available:

- "Internal"
The trigger event is executed manually by the "Execute Trigger".
- "Internal (Baseband A/B)"
The trigger event is provided by the trigger signal from the other basebands. If common trigger settings are applied, this trigger source is disabled.
- "External Global Trigger"
The trigger event is the active edge of an external trigger signal provided and configured at the USER x connectors.
- "External Local Trigger"
The trigger event is the active edge of an external trigger signal provided and configured at the local T/M/C connector.

With coupled trigger settings, the signal has to be provided at the T/M/C1/2/3 connectors.

- "External Local Clock"

The trigger event is the active edge of an external local clock signal provided and configured at the local T/M/C connector.

With coupled trigger settings, the signal has to be provided at the T/M/C1 connector.

- "Baseband Sync In"

Option: R&S SMW-B9

In primary-secondary instrument mode, secondary instruments are triggered by the active edge of the synchronization signal.

"External Local Clock/Trigger" require R&S SMW-B10.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:TRIGger:SOURce](#) on page 136

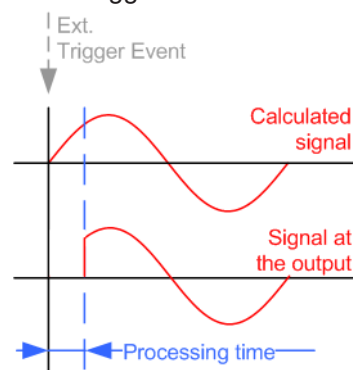
Sync. Output to External Trigger/Sync. Output to Trigger

Enables signal output synchronous to the trigger event.

- "On"

Corresponds to the default state of this parameter.

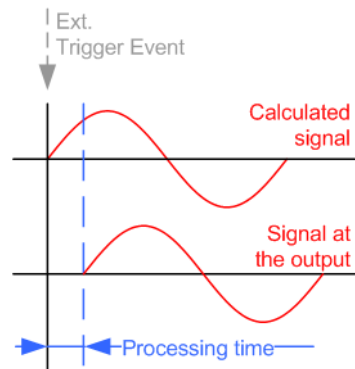
The signal calculation starts simultaneously with the trigger event. Because of the processing time of the instrument, the first samples are cut off and no signal is output. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.



- "Off"

The signal output begins after elapsing of the processing time. Signal output starts with sample 0. The complete signal is output.

This mode is recommended for triggering of short signal sequences. Short sequences are sequences with signal duration comparable with the processing time of the instrument.



In primary-secondary instrument mode, this setting ensures that once achieved, synchronization is not lost if the baseband signal sampling rate changes.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:EXTernal:SYNChronize:OUTPut`
on page 135

External / Trigger Inhibit

Applies for external trigger signal or trigger signal from the other path.

Sets the duration with that any following trigger event is suppressed. In "Retrigger" mode, for example, a new trigger event does not cause a restart of the signal generation until the specified inhibit duration does not expire.

For more information, see chapter "Basics" in the R&S SMW user manual.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger[:EXTernal]:INHibit` on page 138
`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:OBASeband:INHibit` on page 135

(External) Delay Unit

Determines whether the trigger delay is expressed in samples or directly defined as a time period (seconds).

The parameter [Actual Trigger Delay/Actual External Delay](#) displays the delay converted in time.

Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger:DELAy:UNIT` on page 134

(Specified) External Delay/(Specified) Trigger Delay

The name of the parameter and the units the delay is expressed in, changes depending on the parameter ["\(External\) Delay Unit"](#) on page 81.

Delays the trigger event of the signal from:

- The external trigger source
- The other path
- The other basebands (internal trigger), if common trigger settings are used.

Use this setting to:

- Synchronize the instrument with the device under test (DUT) or other external devices
- Postpone the signal generation start in the basebands compared to each other
- Compensate delays and align the signal generation start in multi-instrument setup

For more information, see chapter "Basics on ..." in the R&S SMW user manual.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger [:EXTernal] :DELay` on page 137

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger [:EXTernal] :TDELay` on page 138

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger:OBASeband:DELay` on page 135

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger:OBASeband:TDELay` on page 136

Actual Trigger Delay/Actual External Delay

Indicates the resulting external trigger delay in "Time" unit.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger [:EXTernal] :RDELay?` on page 138

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger:OBASeband:RDELay?` on page 135

Disable External Trigger

Option: R&S SMW-K503

Access: "Mode > Real Time Control Interface", "Trigger > Mode > Armed Auto" and "Trigger > Source > External Global Trigger 1"

This setting is useful to synchronize the extended sequencer to an external trigger signal that runs continuously (e.g. a 1 pps signal).

Example:

To synchronize the extended sequencer to an external trigger signal (e.g. 1 pps signal):

- Disable the external trigger.
 - Select "General > Mode > Real Time Control Interface".
 - Select "Trigger In > Mode > Armed Auto".
 - Select "Trigger In > Source > External Global Trigger 1".
 - Select "Disable External Trigger > On".
- Wait for the 1 pps pulse one second before the desired scenario starts.
- Enable the external trigger ("Disable External Trigger > Off").
 - The R&S SMW starts synchronously with the next 1 pps pulse.

Remote command:

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger [:EXTernal] :DISable` on page 137

3.11 Marker settings

Access:

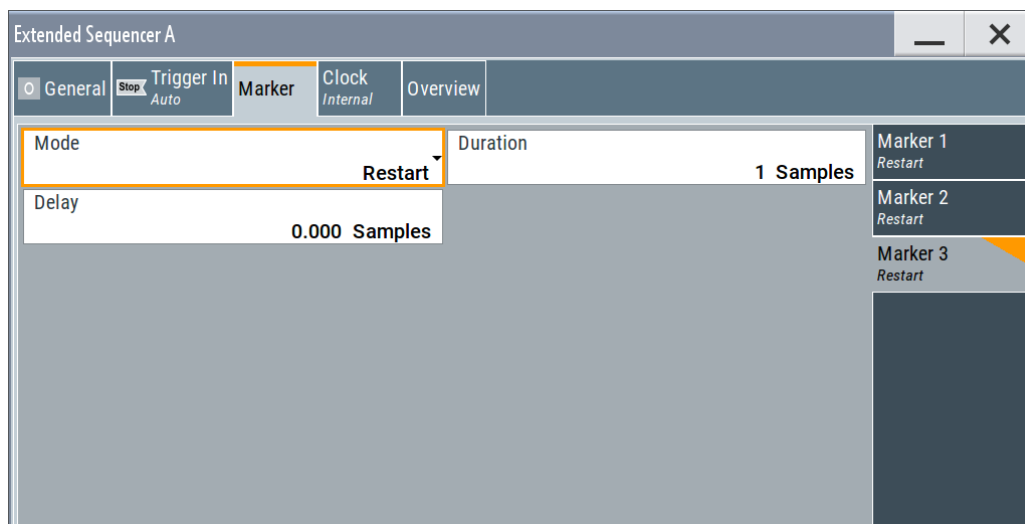
- ▶ Select "Baseband" > "Misc" > "Extended Sequencer" > "Marker".

This tab provides access to the settings required to select and configure the marker output signal, like the marker mode or marker delay settings.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



Routing and enabling a marker

The provided marker signals are not dedicated to a particular connector. They can be mapped to one or more USER x or T/M connectors.

To route and enable a marker signal, perform the following *general steps*:

- Define the shape of the generated marker, i.e. select the "Marker > Mode".
- Define the connector where the selected signal is provided.
Use the [Local and global connectors settings](#).

Settings:

Marker Mode	83
Marker x Delay	84
Pre Time/Post Time	85

Marker Mode

Marker configuration for up to 3 markers. The settings are used to select the marker mode defining the shape and periodicity of the markers. The contents of the dialog change with the selected marker mode.

"Unchanged (Waveform Marker 1)"

Access: select "Extended Sequencer > General > Mode = User"
Uses the marker #1 signal of the waveform, if defined.

"Restart"

Generates a marker signal every time the sequence restarts (auto trigger). The signal is high from the sequence start until the selected "Duration".

"Entry"	<p>Access: select "Extended Sequencer > General > Mode = User"</p> <p>Creates a marker signal when it is enabled within an entry tag of a sequence entry. "Duration" sets the length of the marker signal.</p>
"Pulse"	<p>Creates a marker signal with the same width as the pulse width. Use this signal to control the pulse modulator and to get a higher on/off ratio at the RF signal.</p>
"PDW"	<p>Depending on the installed option:</p> <ul style="list-style-type: none"> • Option: R&S SMW-K502 Uses the marker signals as defined in the R&S Pulse Sequencer. • Option: R&S SMW-K503 Creates marker signals according to the marker bit field inside the two PDW headers. Markers have the same length as the corresponding pulse. For information on PDW #1 (basic) and PDW #2 (expert), see the description Interface Control Document. <p>In both cases, use this signal, for example, as an external event trigger signal.</p>
"ADW"	<p>Option: R&S SMW-K506</p> <p>Required: "Extended Sequencer > General > Mode = Agile Sequencing" and "Operation Mode = Instant"</p> <p>Creates marker signals according to the marker bit field inside the ADW header.</p> <p>For a detailed description of the ADW format, see the Interface Control Document (application note 1GP134).</p>
"Ready"	<p>Option: R&S SMW-K506</p> <p>Required: "Extended Sequencer > General > Mode = Agile Sequencing" and "Operation Mode = Deterministic"</p> <p>Creates marker signal "ready" upon receiving and decoding the ADW. Indicates that the ARB segment is ready to be played back.</p> <p>For a detailed description of the ADW format, see the Interface Control Document (application note 1GP134).</p>
"List Index"	<p>Option: R&S SMW-K503/-K504</p> <p>Requires "Extended Sequencer > General > Mode > Real Time Control Interface", "RF > List Mode > Mode > Extern PDW Index" and "RF > List Mode > Run Mode > Learned (Frozen RF Settings)".</p> <p>Creates a marker signal according to the list index in the pulse descriptor word.</p> <p>For detailed description of the TCDW format, see the R&S SMW-K503/-K504 interface control document.</p>

Remote command:

`[:SOURCE<hw>] :BB:ESEQUencer:TRIGGER [:SEQUencer<st>] :OUTPUT<ch> :
MODE` on page 141

`[:SOURCE<hw>] :BB:ESEQUencer:TRIGGER [:SEQUencer<st>] :OUTPUT<ch> :
DURATION` on page 142

Marker x Delay

Delays the marker signal at the marker output relative to the signal generation start.

Variation of the parameter "Marker x" > "Delay" causes signal recalculation.

Remote command:

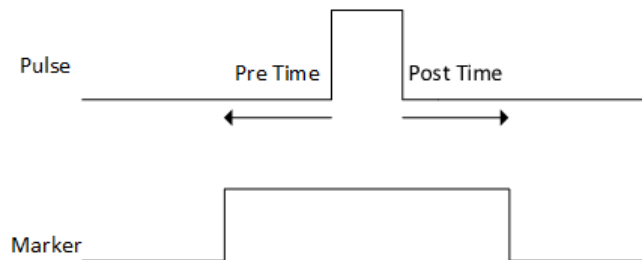
`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger [:SEQuencer<st>] :OUTPut<ch> : DELay` on page 142

Pre Time/Post Time

Requires general mode: "Pulse Sequencer"/"Direction Finding"/"Real Time Control Interface"

Requires marker mode: "Pulse"/"PDW"

Sets "Pre Time" or "Post Time" in clock cycles. If "Pre Time" and "Post Time" are defined, the marker will start before the pulse and last after the pulse.



Remote command:

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger [:SEQuencer<st>] :OUTPut<ch> : PRE` on page 143

`[:SOURCE<hw>] :BB:ESEQuencer:TRIGger [:SEQuencer<st>] :OUTPut<ch> : POST` on page 143

3.12 Clock settings

Access:

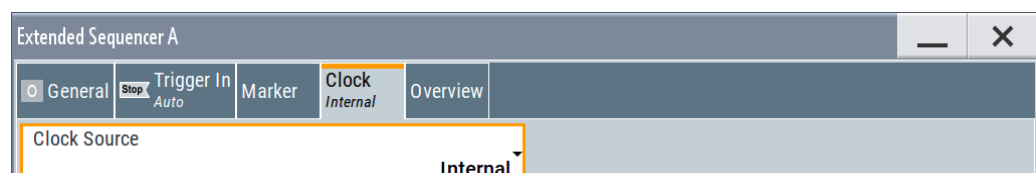
- ▶ Select "Baseband" > "Misc" > "Extended Sequencer" > "Clock".

This tab provides access to the settings required to select and configure the clock signal, like the clock source and clock mode.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.





Defining the clock

The provided clock signals are not dedicated to a particular connector. They can be mapped to one or more USER x and T/M/C connectors.

Use the [Local and global connectors settings](#) to configure the signal mapping, the polarity, the trigger threshold, and the input impedance of the input connectors.

To route and enable a trigger signal, perform the following *general steps*:

- Define the signal source, that is select the "Clock > Source".
- Define the connector where the selected signal is provided.
Use the [Local and global connectors settings](#).

Settings:

Clock Source	86
Clock Mode	86
Measured External Clock	86

Clock Source

Selects the clock source.

- "Internal"
The instrument uses its internal clock reference.
- "External Local Clock"
Option: R&S SMW-B10
The instrument expects an external clock reference at the local T/M/C connector.

"External Local Clock" requires R&S SMW-B10.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:CLOCK:SOURce](#) on page 143

Clock Mode

Option: R&S SMW-B10

Sets the type of externally supplied clock.

Remote command:

[\[:SOURce<hw>\]:BB:ESEQuencer:CLOCK:MODE](#) on page 143

Measured External Clock

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

Remote command:

[CLOCK:INPut:FREQuency?](#)

3.13 Local and global connectors settings

Accesses a dialog to configure local connectors or global connectors.

The button is available in the following dialogs or tabs:

- "Trigger / Marker / Clock" dialog that is accessible via the "TMC" block in the block diagram.

- "Trigger In", "Marker" and "Clock" tabs that are accessible via the "Baseband" block in the block diagram.



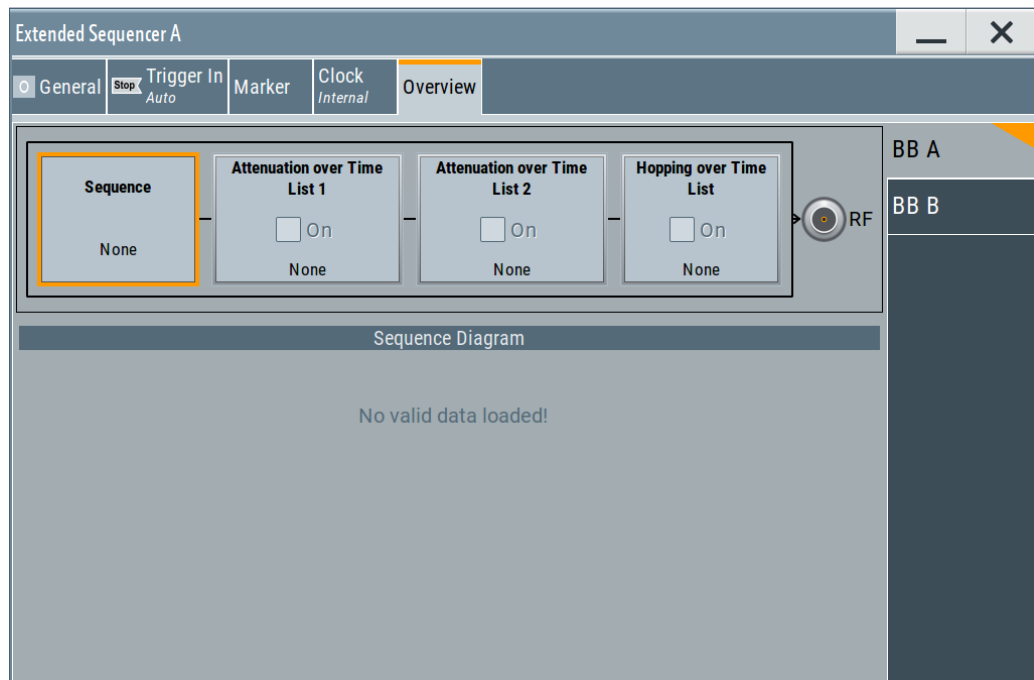
See also chapter "Local and global connectors settings" in the user manual.

3.14 Overview settings

Access:

1. Select "Baseband" > "Misc" > "Extended Sequencer".
2. Select "Overview".

This dialog displays the graphical overview on the signal processing in user mode and visualizes the sequence order. The blocks are interactive. Select a block to access the related settings.



Settings:

Sequence Blocks	87
Sequence Diagram	88

Sequence Blocks

Displays the extended sequencer files used in the user mode. To load the files, see [Chapter 3.1, "General settings"](#), on page 37.

"Sequence" Indicates the waveform segment sequence list file.

"Attenuation over Time (List1/List2)"
Indicates the loaded gain list files.

"Hopping over Time List"
Indicates the loaded frequency hopping list file.

Sequence Diagram

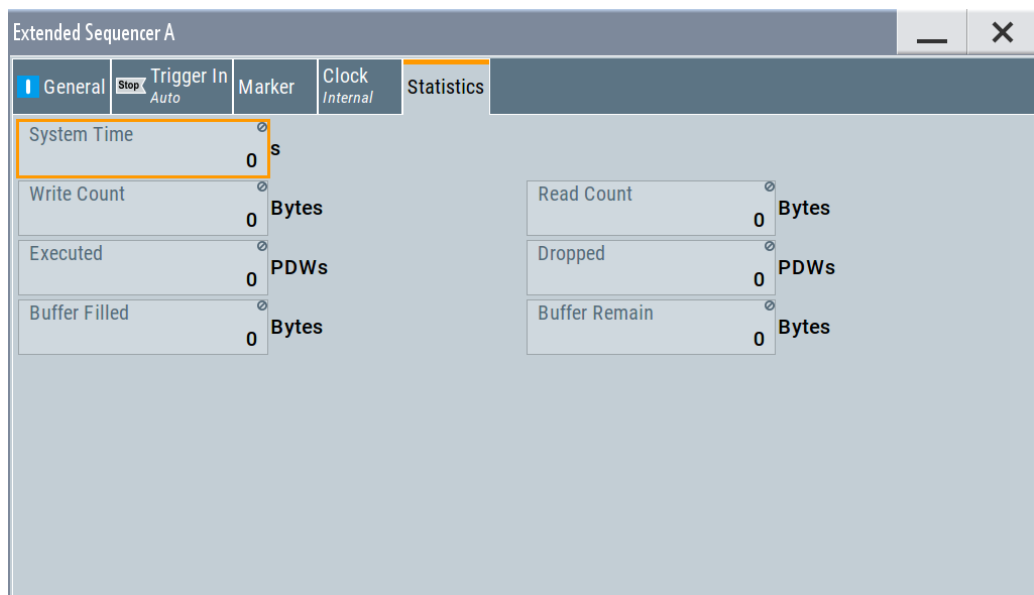
Overview of the internal structure of the sequence list. The diagram visualizes loops, subsequences, repetition and time parameters.

3.15 Statistics display

Access:

1. Select "Baseband" > "Misc" > "Extended Sequencer".
2. Select "Statistics".

This dialog displays the statistics data for the selected mode.



Statistics

Displays the system time, read/write count of the PDW bytes, the number of executed and dropped PDW and the buffer performance in the coder board. The displayed parameters depend on the selected mode.

For details, see the [Interface Control Document](#), sections about PDW timing.

Remote command:

[:SOURce<hw>] :BB:ESEQuencer:PSEQuencer [:SEQuencer<st>] :STReam:STIME|EXEC? on page 112

[:SOURce<hw>] :BB:ESEQuencer:DFINDing [:SEQuencer<st>] :STReam:STIME|EXEC? on page 113

[:SOURce<hw>] :BB:ESEQuencer:RTCI:STReam:STIME|DROP|EXEC|WRDWrite|WRDRead|BUFRemain|BUFFilled? on page 115

[:SOURce<hw>] :BB:ESEQuencer:PLAYback [:SEQuencer<st>] :STReam:STIME|EXEC? on page 119

[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing [:SEQuencer<st>] :STReam:DROP|EXEC|WRDWrite|WRDRead|BUFRemain|BUFFilled? on page 130

3.16 Configuring fast frequency switching mode

Requires:

- 1-channel R&S SMW200A
- Option: R&S SMW-K503/-K504
- R&S SMW configuration supporting list mode
- RF frequency up to 20 GHz

To work with the extended sequencer in fast frequency switching mode via time control descriptor word (TCDW), the following configurations are necessary:

To enable the list mode

1. Select "I/Q Mod > I/Q Settings > I/Q Modulator" > "Internal baseband > Optimization Mode > Fast".
 - a) Switch "State > On".
2. Select "RF > RF Level > Automatic Level Control" > "State > Off (Table)".
3. Switch "RF > On".
4. Select "RF > Sweep / List > List Mode" > "Mode > Extern PDW Index".

- a) In the "List Mode Data" tab, create a frequency list or import a list from an external file.

- To create a list, click "Edit List Mode Data".

	Frequency (Hz)	Power (dBm)	Dwell Time (s)
0	1 000 000 000.000	0.00	0.010 000
1	1 100 000 000.000	0.00	0.020 000
2			

Note: For one frequency value is only one power value supported.

- To import an external list, select the side tab "Im-/Export".

See the R&S SMW200A user manual.

- b) Select "Run Mode > Learned (Frozen RF Settings)".
 c) Click "Learn List Mode Data".
 d) Switch "State > On".

To configure the extended sequencer

1. Select "Baseband A > Misc > Extended Sequencer".
2. In the "General" tab, select "Mode > Real Time Control Interface".
 - a) Switch "State > On".
3. In the "Marker" tab, select "Mode > List Index".
4. In the "Trigger In" In tab, select "Local Connectors".
 - a) Select "T/M/C1" > "Signal > Baseband Marker 1".
 - b) Make sure that the connector "T/M/C1" is connected to the connector "INST TRIG A" on the rear panel of the R&S SMW200A.
5. Stream the TCDW to the R&S SMW200A.
6. Trigger the R&S SMW200A.

To configure a phase coherent test setup with two R&S SMW200A

It is assumed that:

- You connected the two R&S SMW200A as described in ["Phase coherent test setup with two R&S SMW"](#) on page 34.
- List mode is enabled on both R&S SMW200A, as described in ["To enable the list mode"](#) on page 89.
- The extended sequencer is configured on both R&S SMW200A, as described in ["To configure the extended sequencer"](#) on page 90.

Configure multi instrument mode on R&S SMW200A 1:

1. Select "System Configuration" > "Multi Instrument" > "Common Trigger" side tab > "Multi Instrument Trigger > Primary".
2. Switch "State > On".

Configure multi instrument mode on R&S SMW200A 2:

1. Select "System Configuration" > "Multi Instrument" > "Common Trigger" side tab > "Multi Instrument Trigger > Secondary".
2. Switch "State > On".

Configure the LO coupling on R&S SMW200A 1:

1. Select "RF > RF Frequency > LO Coupling".
2. Select "Mode > Internal".
3. Select "Out State > On".

Configure the LO coupling on R&S SMW200A 2:

1. Select "RF > RF Frequency > LO Coupling".
2. Select "Mode > External".

4 Remote-control commands

The following commands are required to generate signals with the option R&S SMW-K501/-K502/-K503/-K504/-K506/-K315 in a remote environment. It is assumed that the R&S SMW is connected to a network for remote control, as described in the R&S SMW user documentation. Basic knowledge of the remote control and the SCPI command syntax is required.



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 SMW user manual.

Common suffixes

The following common suffixes are used in the remote-control commands:

Suffix	Value range	Description
ENTity<ch>	1 to 4	Entity in a multiple entity configuration with separate baseband sources ENTity3 4 require option R&S SMW-K76
SOURce<hw>	[1] to 4	Available baseband signals Only SOURce1 possible, if the keyword ENTity is used
OUTPut<ch>	1 to 3	Available markers
BB<st>	1 to 8	Requires "System Configuration > Mode = Advanced" Available baseband signals
SEQuencer<st>	1 to 6	Option: R&S SMW-K315 Requires "System Configuration > Mode = Extended Sequencer Advanced" Available sequencers
STReam<di>	1 to 2	Option: R&S SMW-K315 Requires "System Configuration > Mode = Extended Sequencer Advanced" Available streams



Using SCPI command aliases for advanced mode with multiple entities

You can address multiple entities configurations by using the SCPI commands starting with the keyword `SOURce` or the alias commands starting with the keyword `ENTity`.

Note that the meaning of the keyword `SOURce<hw>` changes in the second case.

For details, see section "SCPI Command Aliases for Advanced Mode with Multiple Entities" in the R&S SMW user manual.

The commands specific to the extended sequencer are described here:

• Programming examples.....	94
• General commands.....	104
• User mode commands.....	108
• Pulse sequencer mode commands.....	110
• Direction finding commands.....	112
• Real time control interface commands.....	113
• Playback from file commands.....	118
• Advanced extended sequencer commands.....	119
• Network commands.....	123
• Agile sequencing commands.....	127
• QSFP+ network commands.....	130
• Trigger commands.....	133
• Marker commands.....	141
• Clock commands.....	143

4.1 Programming examples

This section provides simple programming examples for the R&S SMW. The purpose of the examples is to present **all** commands for a given task. Real applications usually require only a subset of the commands shown.

The programming examples have been tested with a software tool which provides an environment for the development and execution of remote tests. To keep the examples as simple as possible, only the "clean" SCPI syntax elements are reported. Non-executable command lines (for example comments) start with two // characters.

At the beginning of the most remote control programs, it is recommended that you perform an instrument reset to set the R&S SMW to a defined state. The commands `*RST` and `SYSTem:PRESet` are equivalent for this purpose. `*CLS` also resets the status registers and clears the output buffer.

In the examples, it is assumed that:

- A remote PC is connected to the instrument
- The remote PC and the instrument are switched on
- The connection between them is established
- The security setting "System Config > Setup > Security > SCPI over LAN" is enabled

Example: Storing current configuration

This example shows how to query and load settings files, stored with the save/recall function.

```
// Save the current extended sequencer configuration
SOURcel:BB:ESEQUencer:SETTing:STORe "/var/user/ExtSeq_UserDef_att_hop_contphase"
*RST
SOURcel:BB:ESEQUencer:SETTing:CATalog?
// Response: ExtSeq_UserDef_att_hop_contphase, ExtSeq_UserDef_att_hop
SOURcel:BB:ESEQUencer:SETTing:LOAD "/var/user/ExtSeq_UserDef_att_hop_contphase"
SOURcel:BB:ESEQUencer:SETTing:DELeTe "/var/user/ExtSeq_UserDef_att_hop"
SOURcel:BB:ESEQUencer:SETTing:CATalog?
// Response: ExtSeq_atthop_contphase

// Save the extended sequencer configuration, including the used files
SOURcel:BB:ESEQUencer:ARCHive:STORe "/var/user/ExtSeq_UserMode_Archive.ps_arc"
SOURcel:BB:ESEQUencer:ARCHive:CATalog?
// Response: ExtSeq_UserMode_Archive, ExtSeq_PSMODE_Archive
SOURcel:BB:ESEQUencer:ARCHive:LOAD "/var/user/ExtSeq_UserMode_Archive.ps_arc"
```

Example: User mode configuration

This example shows how to load the files for the extended sequencer and configure the corresponding settings for generating the signal.

```
// Reset the instrument to a predefined state
SOURcel:BB:ESEQUencer:PRESet

// Select the extended sequencer user mode,
// query the available files and select the corresponding data lists:
// a sequence list, attenuation over time lists and a hopping over time list.
SOURcel:BB:ESEQUencer:MODE USER
SOURcel:BB:ESEQUencer:USER:SEQuence:FILE:CATalog?
// Response: Sequence, Seq_list
SOURcel:BB:ESEQUencer:USER:SEQuence:FILE:SElect
"/var/user/Sequence.ps_seq"
SOURcel:BB:ESEQUencer:USER:AOTime:FILE:CATalog?
// Response: AttenuationList1,AttenuationList2
SOURcel:BB:ESEQUencer:USER:AOTime1:FILE:SElect
"/var/user/AttenuationList1.ps_att"
SOURcel:BB:ESEQUencer:USER:AOTime2:FILE:SElect
"/var/user/AttenuationList2"
SOURcel:BB:ESEQUencer:USER:HOTime:FILE:CATalog?
// Response: HoppingList,HoppingListPhase
SOURcel:BB:ESEQUencer:USER:HOTime:FILE:SElect
"/var/user/HoppingListPhase.ps_hop"

// Check the list files for xml format errors
SOURcel:BB:ESEQUencer:ERRor?
//Response: 0
```

```
// Activate the selected data lists and enable signal generation
SOURCE1:BB:ESEQuencer:USER:AOTime1:STATe 1
SOURCE1:BB:ESEQuencer:USER:AOTime2:STATe 1
SOURCE1:BB:ESEQuencer:USER:HOTime:STATe 1
SOURCE1:BB:ESEQuencer:STATe 1
```

Example: Pulse sequencer mode configuration

This example shows how to process an extended segment waveform file created with the R&S Pulse Sequencer software.

```
SOURCE1:BB:ESEQuencer:PRESet
SOURCE1:BB:ESEQuencer:MODE PSEQ
SOURCE1:BB:ESEQuencer:PSEQuencer:FILE:CATalog?
// Response: IQ_Ps,IQ_PulseSeq
SOURCE1:BB:ESEQuencer:PSEQuencer:FILE:SeLect "IQ_PulseSeq"
// Retrieve date and further information on the selected file
SOURCE1:BB:ESEQuencer:PSEQuencer:DATE?
// Response: "08.03.2016 16:10"
SOURCE1:BB:ESEQuencer:PSEQuencer:COMMeNt?
// Response:"2016-03-03/IQTestScenario1"
```

Example: Direction finding mode configuration

This example shows how to process an extended segment waveform file for direction finding.

```
SOURCE1:BB:ESEQuencer:PRESet

SOURCE1:BB:ESEQuencer:MODE DFINDing
SOURCE1:BB:ESEQuencer:DFINDing:FILE:CATalog?
// Response: IQ_Df, IQ_DFIndSeq
SOURCE1:BB:ESEQuencer:DFINDing:FILE:SElect "IQ_DFIndSeq"

// Retrieve date and further information on the selected file
SOURCE1:BB:ESEQuencer:DFINDing:DATE?
SOURCE1:BB:ESEQuencer:DFINDing:COMMeNt?
```


Example: Real time control interface mode configuration

This example shows how to process an extended segment waveform file for real time control interface.

```
// Preset the instrument and select the real time control interface mode
SOURcel:BB:ESEQuencer:PRESet
SOURcel:BB:ESEQuencer:MODE RTCI

// Select variant PDW format
SOURcel:BB:ESEQuencer:RTCI:PDWFormat BASic

// Set the maximum ARB streaming rate
SOURcel:BB:ESEQuencer:RTCI:WLISt:DASR "SR250K"

// Query the list of waveform list (*.inf_mswv) from the default directory
// Select the existing file or create a new one
SOURcel:BB:ESEQuencer:RTCI:WLISt:FILE:CATalog?
SOURcel:BB:ESEQuencer:RTCI:WLISt:FILE "/var/user/extseq.inf_mswv"

// Query the available waveform files (*.wv) in the default directory
// Add waveforms to the waveform list
// (waveforms are added in the order the commands are executed)
SOURcel:BB:ESEQuencer:RTCI:WAVE:FILE:CATalog?
//chirp, pulse, barker
SOURcel:BB:ESEQuencer:RTCI:WLISt:SEGMENT:APPend "/var/user/chirp.wv"
SOURcel:BB:ESEQuencer:RTCI:WLISt:SEGMENT:APPend "/var/user/pulse.wv"
SOURcel:BB:ESEQuencer:RTCI:WLISt:SEGMENT:APPend "/var/user/barker.wv"

// Query the waveforms sequenced in the waveform list
// Remove one of them, save and load the waveform list to the corder board
SOURcel:BB:ESEQuencer:RTCI:WLISt:SEGMENT:CATalog?
// "/var/user/chirp.wv","/var/user/pulse.wv","/var/user/barker.wv"
SOURcel:BB:ESEQuencer:RTCI:WLISt:SEGMENT:DElete "/var/user/pulse"
SOURcel:BB:ESEQuencer:RTCI:WLISt:SAVE

// Activate the real time control interface
SOURcel:BB:ESEQuencer:STATe 1

// If required, you can restart the streaming process
// SOURcel:BB:ESEQuencer:RTCI:STR:REST

// Query the statistic display of the PDW streaming
SOURcel:BB:ESEQuencer:RTCI:STReam:STIME?
SOURcel:BB:ESEQuencer:RTCI:STReam:DROP?
SOURcel:BB:ESEQuencer:RTCI:STReam:EXEC?
SOURcel:BB:ESEQuencer:RTCI:STReam:WRDWrite?
SOURcel:BB:ESEQuencer:RTCI:STReam:WRDRead?
SOURcel:BB:ESEQuencer:RTCI:STReam:BUFRemain?
SOURcel:BB:ESEQuencer:RTCI:STReam:BUFFilled?
```

Example: Playback from file mode configuration

This example shows how to process an externally created extended segment waveform file.

```
// Set the mode
SOURcel:BB:ESEQuencer:MODE PLAYback

// Query available files
SOURcel:BB:ESEQuencer:PLAYback:FILE:CATAlOG?
// Response: IQ

// Select the file
SOURcel:BB:ESEQuencer:PLAYback:FILE:SElect "IQ"

// Retrieve date and further information on the selected file
SOURcel:BB:ESEQuencer:PLAYback:DATE?
// Response: "2023-04-26T12:46:29.013"
SOURcel:BB:ESEQuencer:PLAYback:COMMeNt?
// Response:"New_2023-04-26T123536/Scenario 1"

// Activate playback from file mode
SOURcel:BB:ESEQuencer:STATe 1
```

Example: Agile sequencing mode configuration

This example shows how to configure the agile sequencing mode in operation mode deterministic.

```
// Preset the instrument and select the real time control interface mode
SOURcel:BB:ESEQuencer:PRESet
SOURcel:BB:ESEQuencer:MODE ASEQ

// Select the operation mode
SOURcel:BB:ESEQuencer:ASEQuencing:OMode DET

// Query the list of waveform list (*.inf_mswv) from the default directory
// Select the existing file or create a new one
SOURcel:BB:ESEQuencer:ASEQuencing:WLISt:FILE:CATAlOG?
// "wv,wvlist"
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:FILE "wvlist"

// Query the available waveform files (*.wv) in the default directory
SOURcel:BB:ESEQuencer:ASEQuencing:WAVE:FILE:CATAlOG?
// "wv1,wv2"

// Add waveforms to the waveform list
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:SEGMeNt:APPend "wv1.wv"
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:SEGMeNt:APPend "wv2.wv"

// Save the waveform list
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:SAVE
```

```

// Query the waveforms in the waveform list
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:SEGMent:CATalog?
// "/var/user/wv1.wv", "/var/user/wv2.wv"

// Delete a waveform from the list
SOURcel:BB:ESEQuencer:ASEQuencing:SEQuencer1:WLISt:SEGMent:DELeTe "wv1.wv"

// Configure the desired ARB sample rate
SOURcel:BB:ESEQuencer:ASEQuencing:WLISt:DASR SR300M

// Set the trigger mode and trigger source
SOURcel:BB:ESEQuencer:TRIGGer:SEQuence RETR
SOURcel:BB:ESEQuencer:TRIGGer:SOURce EGT1

// Query the marker mode
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut:MODE?
// READ

// Query the statistic display of the ADW streaming
SOURcel:BB:ESEQuencer:ASEQuencing:STReam:WRDWrite?
SOURcel:BB:ESEQuencer:ASEQuencing:STReam:WRDRead?
SOURcel:BB:ESEQuencer:ASEQuencing:STReam:EXEC?
SOURcel:BB:ESEQuencer:ASEQuencing:STReam:BUFFilled?
SOURcel:BB:ESEQuencer:ASEQuencing:STReam:BUFRemain?

```

Example: Clock, marker and trigger configuration

The following examples present the available commands:

```

// Clock settings
// Select the internal clock
SOURcel:BB:ESEQuencer:CLOCK:SOURce INTernal

// Select and configure external clock
SOURcel:BB:ESEQuencer:CLOCK:SOURce ELCL
SOURcel:BB:ESEQuencer:CLOCK:MODE?
// Response: SAMP

// Marker settings
// Select the standard marker signal
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut1:MODE UNCHanged

// Select the restart marker signal
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut1:MODE START
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut1:DURation 125

// Select the entry marker signal
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut1:MODE ENTRY
SOURcel:BB:ESEQuencer:TRIGGer:OUTPut1:DURation 1

```

```
// Configure marker delay
SOURcel:BB:ESEQuencer:TRIGger:OUTPut1:DELAy 16
// delays the marker signal output

// Configure pre and post marker time
SOURcel:BB:ESEQuencer:MODE RTCI
SOURcel:BB:ESEQuencer:TRIGger:OUTPut1:MODE PDW
SOURcel:BB:ESEQuencer:TRIGger:OUTPut1:PRE 15
SOURcel:BB:ESEQuencer:TRIGger:OUTPut1:POST 10
// The marker signal starts 15 clock cycles before the pulse signal and
// ends 10 clock cycles after pulse signal

// Trigger settings
// Set trigger mode AUTO
SOURcel:BB:ESEQuencer:TRIGger:SEQuence AUTO

SOURcel:BB:ESEQuencer:TRIGger:SOURce INTB
SOURcel:BB:ESEQuencer:TRIGger:OBASeband:INHibit 100
SOURcel:BB:ESEQuencer:TRIGger:OBASeband:DELAy 200

// Trigger source external global trigger
// The external trigger signal must be provided at the connector,
// configured for the External Global Trigger 1 signal
SOURcel:BB:ESEQuencer:TRIGger:SOURce EGT1

SOURcel:BB:ESEQuencer:TRIGger:EXTErnal:SYNChronize:OUTPut 1
SOURcel:BB:ESEQuencer:TRIGger:EXTErnal:INHibit 52
SOURcel:BB:ESEQuencer:TRIGger:EXTErnal:DELAy 12
SOURcel:INPut:USER3:DIRection INP
SOURcel:INPut:USER3:SIGNA l TRIG1

// Trigger mode single, trigger source external local trigger
// The external trigger signal must be provided at the connector,
// configured for the External Local Trigger 1 signal
SOURcel:BB:ESEQuencer:TRIGger:SEQuence SINGLe
SOURcel:BB:ESEQuencer:TRIGger:SOURce ELTR
SOURcel:BB:ESEQuencer:TRIGger:EXTErnal:SYNChronize:OUTPut 1
SOURcel:BB:ESEQuencer:TRIGger:EXTErnal:DELAy 200
SOURcel:INPut:INPut:Tm1:DIRection INP
SOURcel:INPut:INPut:Tm1:SIGNA l TRIG

// execute trigger and query running mode
SOURcel:BB:ESEQuencer:TRIGger:EXEC
SOURcel:BB:ESEQuencer:TRIGger:RMODE?
// Response: RUN
```

```
// specifying delay and inhibit values in time units
SOURCE1:BB:ESEQUENCER:CLOCK 1000000
SOURCE1:BB:ESEQUENCER:TRIGGER:SEQUENCE AAUT
SOURCE1:BB:ESEQUENCER:TRIGGER:SOURCE EGT1
SOURCE1:BB:ESEQUENCER:TRIGGER:DELAY:UNIT SAMP
SOURCE1:BB:ESEQUENCER:TRIGGER:EXTERNAL:DELAY 100
SOURCE1:BB:ESEQUENCER:TRIGGER:EXTERNAL:RDELAY?
// Response: 100

SOURCE1:BB:ESEQUENCER:TRIGGER:DELAY:UNIT TIME
SOURCE1:BB:ESEQUENCER:TRIGGER:EXTERNAL:TDELAY 0.00001
SOURCE1:BB:ESEQUENCER:TRIGGER:EXTERNAL:TDELAY?
// Response: 0.00001

SOURCE1:BB:ESEQUENCER:TRIGGER:DELAY:UNIT SAMP
SOURCE1:BB:ESEQUENCER:TRIGGER:EXTERNAL:DELAY 10
```

Example: Enable signal generation

The following example configures automatic triggering and activates signal generation:

```
SOURCE1:BB:ESEQUENCER:TRIGGER:SEQUENCE AUTO
SOURCE1:BB:ESEQUENCER:TRIGGER:SOURCE INTERNAL
SOURCE1:BB:ESEQUENCER:STAT ON
```

Example: Configuring multiple emitters parallel

```
SCONFIGURATION:APPLY
SCONFIGURATION:MODE ESEQ
SCONFIGURATION:APPLY
SOURCE1:BB:ESEQUENCER:MODE RTCI

SOURCE1:BB:ESEQUENCER:SEQCOUNT?
// 6
SOURCE1:BB:ESEQUENCER:RTCI:SEQUENCER1:WLIST:FILE "/var/user/waveformlist.inf_mswv"
SOURCE1:BB:ESEQUENCER:RTCI:SEQUENCER1:WLIST:DASR SR1M
SOURCE1:BB:ESEQUENCER:RTCI:WLIST:SEGMENT:CATALOG?
// "/var/user/chirp.wv", "/var/user/mod.wv"
SOURCE1:BB:ESEQUENCER:RTCI:SEQUENCER1:WLIST:SEGMENT:APPEND "/var/user/chirp.wv"
SOURCE1:BB:ESEQUENCER:RTCI:SEQUENCER1:WLIST:SEGMENT:APPEND "/var/user/mod.wv"
SOURCE1:BB:ESEQUENCER:RTCI:SEQUENCER1:WLIST:SAVE
SOURCE1:BB:ESEQUENCER:SEQUENCER1:TDELAY 0
SOURCE1:BB:ESEQUENCER:SEQUENCER1:FOFFSET 1000000
SOURCE1:BB:ESEQUENCER:SEQUENCER1:POFFSET 90
SOURCE1:BB:ESEQUENCER:SEQUENCER1:ATTENUATION 3
SOURCE1:BB:ESEQUENCER:STRCOUNT?
// 2
SOURCE1:BB:ESEQUENCER:STREAM1:SEQCOUNT 3
SOURCE1:BB:ESEQUENCER:STREAM2:SEQCOUNT 1
SOURCE1:BB:ESEQUENCER:STREAM1:SEQUENCER1:STATE 1
SOURCE1:BB:ESEQUENCER:STREAM1:SEQUENCER2:STATE 1
```

```
SOURce1:BB:ESEQuencer:STReam1:SEQuencer3:STATe 1
SOURce1:BB:ESEQuencer:STReam2:SEQuencer4:STATe 1
SOURce1:BB:ESEQuencer:STReam2:SEQuencer5:STATe 0
SOURce1:BB:ESEQuencer:STReam2:SEQuencer6:STATe 0
SOURce1:BB:ESEQuencer:STReam1:OUTPut RFA
SOURce1:BB:ESEQuencer:STReam2:OUTPut RFB
```

```
SOURce1:BB:ESEQuencer:STATe 1
```

```
SOURce1:BB:ESEQuencer:TRIGger:SEQuencer1:OUTPut1:MODE PULS
SOURce1:BB:ESEQuencer:TRIGger:SEQuencer1:OUTPut1:DElay 0
```

Example: Synchronizing extended sequencer

The following example configures the synchronizing of extended sequencer to an external trigger signal that runs continuously (e.g. 1 pps signal)

```
// Set mode to RTCI and source to external global trigger
SOURce1:BB:ESEQuencer:MODE RTCI
SOURce1:BB:ESEQuencer:TRIGger:SOURce EGT1
// Set trigger mode to armed auto
SOURce1:BB:ESEQuencer AAUTO
// Disable external trigger
SOURce1:BB:ESEQuencer:TRIGger:EXTErnal:DISable 1
// wait for the 1 pps pulse one second and enable the external trigger
SOURce1:BB:ESEQuencer:TRIGger:EXTErnal:DISable 0
// The R&S SMW starts synchronously with the next 1 pps pulse
```

Example: Configuring fast frequency switching mode

This example shows how to configure fast frequency switching mode in a phase coherent test setup with two R&S SMW.

```
// Configure SMW1 hardware
SOURCE1:BB:IMPAIRMENT:OPTIMIZATION:MODE FAST
SCONFIGURATION:MULTIINSTRUMENT:MODE PRIMARY
SCONFIGURATION:MULTIINSTRUMENT:STATE 1

// Configure SMW2 hardware
SOURCE2:BB:IMPAIRMENT:OPTIMIZATION:MODE FAST
SCONFIGURATION:MULTIINSTRUMENT:MODE SECONDARY
SCONFIGURATION:MULTIINSTRUMENT:STATE 1

// Configure Extended Sequencer of SMW1 and SMW2
// Send the remote command sequence to both SMW1 and SMW2
SOURCE1:BB:ESEQUENCER:TRIGGER:ARM:EXECUTE
SOURCE1:BB:ESEQUENCER:MODE RTCI
SOURCE1:BB:ESEQUENCER:RTCI:PDWFORMAT BASIC
SYSTEM:COMMUNICATE:BB1:NETWORK:PROTOCOL TCP
SOURCE1:BB:ESEQUENCER:TRIGGER:SEQUENCE AAUT
SOURCE1:BB:ESEQUENCER:TRIGGER:OUTPUT1:MODE LINDEX
OUTPUT1:TM1:SIGNAL MARKA1
SOURCE1:BB:ESEQUENCER:STATE 1

// Configure LO coupling of SMW1
SOURCE1:FREQUENCY:MODE CW
SOURCE1:FREQUENCY:LOSCILLATOR:MODE INTERNAL
SOURCE1:FREQUENCY:LOSCILLATOR:OUTPUT:STATE 1

// Configure LO coupling of SMW2
SOURCE2:FREQUENCY:MODE CW
SOURCE2:FREQUENCY:LOSCILLATOR:MODE EXTERNAL

// Configure Automatic Level Control of SMW1 and SMW2
// Send the remote command sequence to both SMW1 and SMW2
SOURCE1:POWER:ALC:STATE OFFTABLE
SOURCE1:POWER:LEVEL:IMMEDIATE:AMPLITUDE 0
OUTPUT1:STATE 1

// Configure list mode for SMW 1 and SMW2
// Prepare a frequency list and load it to SMW1 and SMW2
// Send the remote command sequence to both SMW1 and SMW2
SOURCE1:LIST:SELECT /var/user/freq_list
SOURCE1:LIST:FREQ 2 GHz, 4 GHz, 12 GHz
SOURCE1:LIST:POW 0 dBm, 0 dBm, 0 dBm
SOURCE1:LIST:DWEL:LIST 100 100 100
SOURCE1:LIST:DWELL:MODE GLOBAL
SOURCE1:LIST:DWELL 100
SOURCE1:LIST:MODE INDEX
```

```

SOURce1:LIST:TRIGger:SOURce EXTernal
SOURce1:LIST:LEARn
SOURce1:FREQuency:MODE LIST
Display:Update OFF

// Stream PDW and TCDW to SMW1 and SMW2

```

4.2 General commands

This section contains the commands for the general settings of the baseband power sweep, e.g. preset, or file handling commands for save/recall settings files.

Commands:

[:SOURce<hw>]:BB:ESEQuencer:STATe	104
[:SOURce<hw>]:BB:ESEQuencer:ERRor?	104
[:SOURce<hw>]:BB:ESEQuencer:MODE	105
[:SOURce<hw>]:BB:ESEQuencer:PRAMp:STATe	105
[:SOURce<hw>]:BB:ESEQuencer:PRESet	106
[:SOURce<hw>]:BB:ESEQuencer:ARCHive:CATalog?	106
[:SOURce<hw>]:BB:ESEQuencer:ARCHive:LOAD	106
[:SOURce<hw>]:BB:ESEQuencer:ARCHive:STORE	106
[:SOURce<hw>]:BB:ESEQuencer:SETTING:CATalog?	107
[:SOURce<hw>]:BB:ESEQuencer:SETTING:DELeTe	107
[:SOURce<hw>]:BB:ESEQuencer:SETTING:LOAD	107
[:SOURce<hw>]:BB:ESEQuencer:SETTING:STORE	107

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

Activates signal generation, and deactivates all digital standards, digital modulation modes and other sweeps in the corresponding path.

Parameters:

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

Example: See [Example"Enable signal generation"](#) on page 101.

Manual operation: See ["State"](#) on page 38

[\[:SOURce<hw>\]:BB:ESEQuencer:ERRor?](#)

Queries detected xml format errors.

Return values:

<Error> string

Example: See [Example"User mode configuration"](#) on page 95.

Usage: Query only

```
[ :SOURce<hw>]:BB:ESEQuencer:MODE <Mode>
```

Selects the processing mode for the extended sequencer.

Parameters:

```
<Mode>          USER | PSEQuencer | DFINDing | RTCI | ASEQuencing |
                PLAYback
```

USER
Processes user defined extended sequences.

PSEQuencer
Processes files created with the signal generation software R&S Pulse Sequencer.

DFINDing
Processes files containing sequences with extended direction finding of the antennas. The files are created with the signal generation software R&S Pulse Sequencer.

RTCI
Processes files containing sequences of precalculated waveform.

ASEQuencing
Processes prestored ARB segments.

PLAYback
Processes user written PDW files.

```
*RST:          USER
```

Example: See [Example "User mode configuration"](#) on page 95 and [Example "Pulse sequencer mode configuration"](#) on page 96.

Options: RTCI mode requires R&S SMW-K503
ASEQuencing mode requires R&S SMW-K506

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

```
[ :SOURce<hw>]:BB:ESEQuencer:PRAMP:STATE <RfPowRampState>
```

If activated, a marker signal created internally is used to control the RF pulse modulator. This leads to a better ON/OFF ratio.

Parameters:

```
<RfPowRampState> 1 | ON | 0 | OFF
*RST:             0
```

Example:

```
SOURce1:BB:ESEQuencer:RTCI:WLISt:FILE:CATalog?
SOURce1:BB:ESEQuencer:RTCI:WLISt:FILE "/var/user/extseq.inf_mswv"
SOURce1:BB:ESEQuencer:PRAMP:STATE 1
SOURce1:BB:ESEQuencer:STATE 1
```

Options: R&S SMW-K22

Manual operation: See ["RF Power Ramping with Burst Marker"](#) on page 44

[:SOURce<hw>]:BB:ESEQuencer:PRESet

Sets all the parameters of the extended sequencer to their default values (*RST values specified for the commands).

Not affected is the state set with the command `[:SOURce<hw>]:BB:ESEQuencer:STATe`.

Example: See [Chapter 4.1, "Programming examples"](#), on page 94.

Usage: Event

Manual operation: See ["Set to Default"](#) on page 39

[:SOURce<hw>]:BB:ESEQuencer:ARCHive:CATalog?

Queries the available extended sequencer archive files in the default directory. Listed are files with the file extension *.ps_arc.

Return values:

<Catalog> string
Returns a string of file names separated by commas.

Example: See [Example "Storing current configuration"](#) on page 95.

Usage: Query only

Manual operation: See ["Save/Recall"](#) on page 39

[:SOURce<hw>]:BB:ESEQuencer:ARCHive:LOAD <Filename>

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

Setting parameters:

<Filename> string
File name or complete file path; file extension can be omitted

Example: See [Example "Storing current configuration"](#) on page 95.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 39

[:SOURce<hw>]:BB:ESEQuencer:ARCHive:STORe <Filename>

Stores the current user mode configuration in the selected file, including all used extended sequencer files.

Setting parameters:

<Filename> string
File name or complete file path

Example: See [Example "Storing current configuration"](#) on page 95.

Usage: Setting only
Manual operation: See ["Save/Recall"](#) on page 39

[:SOURCE<hw>]:BB:ESEQUencer:SETTING:CATalog?

Queries the available extended sequencer settings files in the default directory. Listed are files with the file extension *.eseq.

Return values:

<Catalog> string
Returns a string of file names separated by commas.

Example: See [Example"Storing current configuration"](#) on page 95.

Usage: Query only

Manual operation: See ["Save/Recall"](#) on page 39

[:SOURCE<hw>]:BB:ESEQUencer:SETTING:DELeTe <Filename>

Deletes the selected file with extended sequencer configuration settings. Deleted are files with extension *.eseq.

Setting parameters:

<Filename> string

Example: See [Example"Storing current configuration"](#) on page 95.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 39

[:SOURCE<hw>]:BB:ESEQUencer:SETTING:LOAD <Filename>

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

Setting parameters:

<Filename> string
File name or complete file path; file extension can be omitted

Example: See [Example"Storing current configuration"](#) on page 95.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 39

[:SOURCE<hw>]:BB:ESEQUencer:SETTING:STORe <Filename>

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

Setting parameters:

<Filename> string
File name or complete file path

Example: See [Example "Storing current configuration"](#) on page 95.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 39

4.3 User mode commands

Option: see ["User mode options"](#) on page 14.

This section lists the remote-control commands, necessary to configure a signal in user mode.

Commands:

[:SOURce<hw>]:BB:ESEQuencer:USER:SEQuence:FILE:CATalog?	108
[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:SEQuence:FILE[:SElect]	108
[:SOURce<hw>]:BB:ESEQuencer:USER:AOTime:FILE:CATalog?	109
[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:AOTime<ch>:FILE[:SElect]	109
[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:AOTime<ch>:STATe	109
[:SOURce<hw>]:BB:ESEQuencer:USER:HOTime:FILE:CATalog?	109
[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:HOTime:FILE[:SElect]	110
[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:HOTime:STATe	110

[\[:SOURce<hw>\]:BB:ESEQuencer:USER:SEQuence:FILE:CATalog?](#)

Queries the available user defined waveform segment sequence files.

As response, you get a string containing the existing files `*.ps_seq`, separated by commas. To set the default directory, use command `MME:CDIRectory`.

Return values:

<Catalog> string

Example: See [Example "User mode configuration"](#) on page 95.

Usage: Query only

Manual operation: See ["Sequence"](#) on page 41

[\[:SOURce<hw>\]:BB:ESEQuencer:USER\[:BB<st>\]:SEQuence:FILE\[:SElect\]](#) <Filename>

Selects an existing sequence file.

Parameters:

<Filename> string

Example: See [Example "User mode configuration"](#) on page 95.

Manual operation: See ["Sequence"](#) on page 41

[:SOURce<hw>]:BB:ESEQuencer:USER:AOTime:FILE:CATalog?

Queries the available attenuation list files.

As response, you get a string containing the existing gain list files *.ps_att, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Return values:

<Catalog> string

Example: See [Example"User mode configuration"](#) on page 95.

Usage: Query only

Manual operation: See ["Attenuation over Time List x"](#) on page 42

**[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:AOTime<ch>:FILE[:SElect]
<Filename>**

Selects an existing attenuation list file.

Parameters:

<Filename> string

Example: See [Example"User mode configuration"](#) on page 95.

Manual operation: See ["Attenuation over Time List x"](#) on page 42

[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:AOTime<ch>:STATe <State>

Enables the selected attenuation list to be included in the signal generation.

Select an attenuation list file first, see [\[:SOURce<hw>\]:BB:ESEQuencer:USER\[:BB<st>\]:AOTime<ch>:FILE\[:SElect\]](#).

Parameters:

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

Example: See [Example"User mode configuration"](#) on page 95.

Manual operation: See ["Use Attenuation over Time List"](#) on page 42

[:SOURce<hw>]:BB:ESEQuencer:USER:HOTime:FILE:CATalog?

Queries the available hopping list files.

As response, you get a string containing the hopping list files *.ps_hop, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Return values:

<Catalog> string

Example: See [Example "User mode configuration"](#) on page 95.

Usage: Query only

Manual operation: See ["Hopping over Time List"](#) on page 42

**[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:HOTime:FILE[:SElect]
<Filename>**

Selects an existing hopping list file.

Parameters:

<Filename> string

Example: See [Example "User mode configuration"](#) on page 95.

Manual operation: See ["Hopping over Time List"](#) on page 42

[:SOURce<hw>]:BB:ESEQuencer:USER[:BB<st>]:HOTime:STATe <State>

Enables the selected frequency hopping list to be included in the signal generation.

Select a frequency hopping list file first, see [\[:SOURce<hw>\]:BB:ESEQuencer:USER\[:BB<st>\]:HOTime:FILE\[:SElect\]](#).

Parameters:

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

Example: See [Example "User mode configuration"](#) on page 95.

Manual operation: See ["Use Hopping over Time List"](#) on page 42

4.4 Pulse sequencer mode commands

Option: see ["Pulse sequencer mode options"](#) on page 15.

This section lists the remote-control commands, necessary to configure a signal in pulse sequencer mode.

Commands:

[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer:FILE:CATalog?	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:SEQuencer<st>]:COMMeNT?	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:BB<st>]:COMMeNT?	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:SEQuencer<st>]:DATE?	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:BB<st>]:DATE?	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:SEQuencer<st>]:FILE[:SElect]	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:BB<st>]:FILE[:SElect]	111
[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:SEQuencer<st>]:STReam:STIMe EXEC?...	112

[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer:FILE:CATalog?

Queries the available pulse sequencer files.

As response, you get a string containing the existing files *.ps_def, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Return values:

<Catalog> string

Example: See [Example "Pulse sequencer mode configuration"](#) on page 96

Usage: Query only

Manual operation: See ["Definition File"](#) on page 44

[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:SEQUencer<st>]:COMMeNt?**[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:BB<st>]:COMMeNt?**

Queries the information on the loaded pulse sequencer file.

Return values:

<Comment> string

Example: See [Example "Pulse sequencer mode configuration"](#) on page 96

Usage: Query only

Manual operation: See ["Comment"](#) on page 44

[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:SEQUencer<st>]:DATE?**[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:BB<st>]:DATE?**

Queries the timestamp of the selected pulse sequencer file.

Return values:

<Date> string

Example: See [Example "Pulse sequencer mode configuration"](#) on page 96

Usage: Query only

Manual operation: See ["Date"](#) on page 44

**[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:SEQUencer<st>]:FILE[:SELeCt]
<Filename>****[:SOURce<hw>]:BB:ESEQUencer:PSEQUencer[:BB<st>]:FILE[:SELeCt]
<Filename>**

Selects an existing pulse sequencer file.

Parameters:

<Filename> string

Example: See [Example "Pulse sequencer mode configuration"](#) on page 96.

Manual operation: See ["Definition File"](#) on page 44

[[:SOURce<hw>]:BB:ESEQuencer:PSEQuencer[:SEQuencer<st>]:STReam:STIME|EXEC?

Query data from streaming interface registers for system time and executed PDWs.

Return values:

<Value> float

Usage: Query only

Manual operation: See ["Statistics"](#) on page 88

4.5 Direction finding commands

Option: see ["Direction finding mode options"](#) on page 15.

This section lists the remote-control commands, necessary to configure a signal in direction finding mode.

Commands:

[:SOURce<hw>]:BB:ESEQuencer:DFINding:FILE:CATalog?	112
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:SEQuencer<st>]:COMMeNT?	112
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:BB<st>]:COMMeNT?	112
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:SEQuencer<st>]:DATE?	113
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:BB<st>]:DATE?	113
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:SEQuencer<st>]:FILE[:SELeCt]	113
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:BB<st>]:FILE[:SELeCt]	113
[:SOURce<hw>]:BB:ESEQuencer:DFINding[:SEQuencer<st>]:STReam:STIME EXEC?	113

[[:SOURce<hw>]:BB:ESEQuencer:DFINding:FILE:CATalog?

Queries the available pulse sequencer files with direction finding.

As response, you get a string containing the existing files *.ps_df, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Return values:

<Catalog> string

Example: See [Example"Direction finding mode configuration"](#) on page 96.

Usage: Query only

Manual operation: See ["Definition File"](#) on page 46

[[:SOURce<hw>]:BB:ESEQuencer:DFINding[:SEQuencer<st>]:COMMeNT?
[[:SOURce<hw>]:BB:ESEQuencer:DFINding[:BB<st>]:COMMeNT?

Queries the information on the loaded pulse sequencer file.

Return values:

<Comment> string

Example: See [Example"Direction finding mode configuration"](#) on page 96

Usage: Query only

Manual operation: See ["Date, Comment"](#) on page 46

[:SOURce<hw>]:BB:ESEQUencer:DFINDing[:SEQuencer<st>]:DATE?

[:SOURce<hw>]:BB:ESEQUencer:DFINDing[:BB<st>]:DATE?

Queries the timestamp of the selected direction finding file.

Return values:

<Date> string

Example: See [Example"Direction finding mode configuration"](#) on page 96

Usage: Query only

Manual operation: See ["Date, Comment"](#) on page 46

**[:SOURce<hw>]:BB:ESEQUencer:DFINDing[:SEQuencer<st>]:FILE[:SElect]
<Filename>**

[:SOURce<hw>]:BB:ESEQUencer:DFINDing[:BB<st>]:FILE[:SElect] <Filename>

Selects an existing direction finding file.

Parameters:

<Filename> string

Example: See [Example"Direction finding mode configuration"](#) on page 96.

Manual operation: See ["Definition File"](#) on page 46

**[:SOURce<hw>]:BB:ESEQUencer:DFINDing[:SEQuencer<st>]:STReam:
STIME|EXEC?**

Query data from streaming interface registers for system time and executed PDWs.

Return values:

<Value> float

Usage: Query only

Manual operation: See ["Statistics"](#) on page 88

4.6 Real time control interface commands

Option: see ["Real-time control interface options"](#) on page 15.



By default, the waveform files are saved in the default directory of the instrument, that is the `/var/user/` directory or the directory specified with the command `:MMEMory:CDIRectory`. To access the waveform files in this default directory, only the file name is required, without the path and the file extension (`*.wv`).

However, to access waveform files located in a directory different to the default one, the complete file path and file name are required.

Commands:

<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:PDWFormat</code>	114
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:STReam:REStArt</code>	114
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:STReam:REStArt</code>	114
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:STReam:STReSet</code>	115
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:STReam:STReSet</code>	115
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:STReam:</code> <code>STIMe DRoP EXEC WRDWrite WRDRead BUFRemain BUFFilled?</code>	115
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:STReam:</code> <code>STIMe DRoP EXEC WRDWrite WRDRead BUFRemain BUFFilled?</code>	115
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WAVE:FILE:CATalog?</code>	115
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:FILE:CATalog?</code>	116
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:FILE</code>	116
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:FILE</code>	116
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:DASR</code>	116
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:DASR</code>	116
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:SEGMENT:CATalog?</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:SEGMENT:CATalog?</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:SEGMENT:APPend</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:SEGMENT:APPend</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:SEGMENT:DELeTe</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:SEGMENT:DELeTe</code>	117
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:WLISt:SAVE</code>	118
<code>[:SOURce<hw>]:BB:ESEQuencer:RTCl:WLISt:SAVE</code>	118

`[:SOURce<hw>]:BB:ESEQuencer:RTCl:PDWFormat <Format>`

Selects the PDW format.

Parameters:

`<Format>` BASic | EXPert
 *RST: BASic

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["PDW Format"](#) on page 48

`[:SOURce<hw>]:BB:ESEQuencer:RTCl[:SEQuencer<st>]:STReam:REStArt`
`[:SOURce<hw>]:BB:ESEQuencer:RTCl:STReam:REStArt`

Restarts the streaming interface.

Example: SOURce1:BB:ESEQuencer:RTCI:STR:REST
 // Restart streaming interface

Usage: Event

**[[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:STReam:STReset
[:SOURce<hw>]:BB:ESEQuencer:RTCI:STReam:STReset**

Reset system time in streaming interface, buffer is also empty in the coder board.

Note: Do not use this command if streams are added in the "I/Q Stream Mapper", for example if stream A and stream B are both routed to RF A.

Example: SCONfiguration:APPLY
 SCONfiguration:OUTPut:MAPPING:RF1:MODE **Single**
 SCONfiguration:OUTPut:MAPPING:RF1:STReam1:STATE 1
 SCONfiguration:OUTPut:MAPPING:RF1:STReam2:STATE 0
 SCONfiguration:OUTPut:MAPPING:RF2:STReam1:STATE 0
 SCONfiguration:OUTPut:MAPPING:RF2:STReam2:STATE 1
 OUTPut1:STATE 1
 SOURce1:BB:ESEQuencer:MODE RTCI
 SOURce1:BB:ESEQuencer:STATE 1

 SOURce1:BB:ESEQuencer:RTCI:STReam:STReset

Usage: Event

**[[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:STReam:
STIME|DROP|EXEC|WRDWrite|WRDRead|BUFRemain|BUFFilled?
[:SOURce<hw>]:BB:ESEQuencer:RTCI:STReam:
STIME|DROP|EXEC|WRDWrite|WRDRead|BUFRemain|BUFFilled?**

Query data from streaming interface registers for system time, write count, read count, executed PDWs, dropped PDWs, buffer filled and buffer remain information.

Return values:

<Value> float

Example: see [Example "Real time control interface mode configuration"](#)
 on page 97.

Usage: Query only

Manual operation: See "[Statistics](#)" on page 88

[[:SOURce<hw>]:BB:ESEQuencer:RTCI:WAVE:FILE:CATalog?

Reads out the files extension * .wv in the default directory.

Return values:

<Catalog> string

Returns the available waveform files separated by commas

- Example:** see [Example"Real time control interface mode configuration"](#) on page 97.
- Usage:** Query only
- Manual operation:** See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:RTCI:WLIST:FILE:CATalog?

Reads out the files extension *.inf_mswv from the default directory.

Return values:

<Catalog> string
Returns the available waveform list separated by commas

Example: see [Example"Real time control interface mode configuration"](#) on page 97.

Usage: Query only

Manual operation: See ["Waveform List"](#) on page 48

**[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:WLIST:FILE <File>
[:SOURce<hw>]:BB:ESEQuencer:RTCI:WLIST:FILE <File>**

Selects a waveform list from the default directory. If a waveform list with the specified name does not yet exist, it is created. The file extension *.inf_mswv may be omitted.

Parameters:

<File> string

Example: see [Example"Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Waveform List"](#) on page 48

**[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:WLIST:DASR
<StreamingRate>**

[:SOURce<hw>]:BB:ESEQuencer:RTCI:WLIST:DASR <StreamingRate>

The desired ARB Streaming rate directly influences the Minimum common clock rate all waveforms are resampled to. The higher the desired rate, the higher the common sample rate, in order to optimize the ARB PDW Streaming rate. At the same time, the required Memory will also increase.

Parameters:

<StreamingRate> SR250K | SR750K | SR500K | SR1M
SR250K: streaming rate = 250 kPDW/s
SR500K: streaming rate = 500 kPDW/s
SR750K: streaming rate = 750 kPDW/s
SR1M: streaming rate = 1 MPDW/s
*RST: SR1M

Example: see [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Desired ARB Streaming Rate"](#) on page 75

[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:WLISt:SEGMent:CATalog?

[:SOURce<hw>]:BB:ESEQUencer:RTCI:WLISt:SEGMent:CATalog?

Queries the waveform sequence of the currently selected waveform list.

Return values:

<Catalog> string
Returns the waveform files separated by commas.

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Usage: Query only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:WLISt:SEGMent:APPend <Waveform>

[:SOURce<hw>]:BB:ESEQUencer:RTCI:WLISt:SEGMent:APPend <Waveform>

Appends the specified waveform to the selected waveform list.

Setting parameters:

<Waveform> string

Example: see [Example "Real time control interface mode configuration"](#) on page 97.

Usage: Setting only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:WLISt:SEGMent:DELeTe <Filename>

[:SOURce<hw>]:BB:ESEQUencer:RTCI:WLISt:SEGMent:DELeTe <Filename>

Deletes the selected waveform file.

Setting parameters:

<Filename> string

Example: see [Example "Real time control interface mode configuration"](#) on page 97.

Usage: Setting only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

```
[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:WLISt:SAVE
[:SOURce<hw>]:BB:ESEQuencer:RTCI:WLISt:SAVE
```

Save and load the waveform list to the coder board, the file extension `*.inf_mswv` is automatically assigned.

Example: see [Example"Real time control interface mode configuration"](#) on page 97.

Usage: Event

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

4.7 Playback from file commands

Option: see ["Playback from file mode options"](#) on page 15.

```
[:SOURce<hw>]:BB:ESEQuencer:PLAYback:FILE:CATalog?..... 118
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:FILE[:SElect]..... 118
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:FILE[:SElect]..... 118
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:DATE?..... 119
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:DATE?..... 119
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:COMMENT?..... 119
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:COMMENT?..... 119
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:STReam:STIMe|EXEC?..... 119
```

```
[:SOURce<hw>]:BB:ESEQuencer:PLAYback:FILE:CATalog?
```

Queries the available user written PDW files.

As response, you get a string containing the existing files `*.ps_def`, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Example: See [Example"Playback from file mode configuration"](#) on page 98

Usage: Query only

Manual operation: See ["Definition File"](#) on page 68

```
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:FILE[:SElect]
<Filename>
```

```
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:FILE[:SElect] <Filename>
```

Accesses the standard "File Select" function of the instrument to load a user written PDW file. The provided navigation possibilities in the dialog are self-explanatory.

Parameters:

<Filename> string

Example: See [Example"Playback from file mode configuration"](#) on page 98

Manual operation: See ["Definition File"](#) on page 68

[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:DATE?
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:DATE?

Displays information on the date of the loaded file.

Return values:

<Date> string

Example: See [Example"Playback from file mode configuration"](#) on page 98

Usage: Query only

Manual operation: See ["Date"](#) on page 69

[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:COMMeNt?
[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:BB<st>]:COMMeNt?

Displays comment information of the loaded file.

Return values:

<Comment> string

Example: See [Example"Playback from file mode configuration"](#) on page 98

Usage: Query only

Manual operation: See ["Comment"](#) on page 69

[:SOURce<hw>]:BB:ESEQuencer:PLAYback[:SEQuencer<st>]:STReam:STIME|EXEC?

Queries data from streaming interface registers for system time and executed PDWs.

Return values:

<Value> float

Usage: Query only

Manual operation: See ["Statistics"](#) on page 88

4.8 Advanced extended sequencer commands

Option: see ["Pulse-on-pulse simulation options"](#) on page 16.

[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:STATE	120
[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:TDELay	120
[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:POFFset	120
[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:FOFFset	121
[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:ATTenuation	121

[:SOURce<hw>]:BB:ESEQuencer:STRCount.....	121
[:SOURce<hw>]:BB:ESEQuencer:SEQCount?.....	121
[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:SEQCount.....	122
[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:SEQuencer<st>:STATe.....	122
[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:OUTPut.....	122

`[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:STATe <State>`

Enables the sequencer.

Parameters:

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

Example: See [Example"Configuring multiple emitters parallel"](#) on page 101.

Manual operation: See ["S1 to S6"](#) on page 58
 See ["State"](#) on page 59

`[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:TDELaY <TriggerDelay>`

Delays the trigger event for the selected sequencer.

Parameters:

`<TriggerDelay>` float
 Range: 0 to 688
 Increment: 250E-12
 *RST: 0

Example: See [Example"Configuring multiple emitters parallel"](#) on page 101.

Manual operation: See ["Trigger Delay"](#) on page 61

`[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:POFFset <PhaseOffset>`

Sets a phase offset for the selected sequencer.

Parameters:

`<PhaseOffset>` float
 Range: 0 to 359.99
 Increment: 0.01
 *RST: 0

Example: See [Example"Configuring multiple emitters parallel"](#) on page 101.

Manual operation: See ["Phase Offset"](#) on page 61

[[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:FOFFset <FreqOffset>

Sets a frequency offset for the selected sequencer.

Parameters:

<FreqOffset> float
 Range: -250E6 to 250E6
 Increment: 0.01
 *RST: 0

Example: See [Example"Configuring multiple emitters parallel"](#)
 on page 101.

Manual operation: See ["Frequency Offset"](#) on page 61

[[:SOURce<hw>]:BB:ESEQuencer:SEQuencer<st>:ATTenuation <Attenuation>

Adds an additional attenuation for the selected sequencer.

Parameters:

<Attenuation> float
 Range: 0 to 50
 Increment: 0.001
 *RST: 0

Example: See [Example"Configuring multiple emitters parallel"](#)
 on page 101.

Manual operation: See ["Attenuation"](#) on page 61

[[:SOURce<hw>]:BB:ESEQuencer:STRCount <NumbOfStreams>

Queries the number of streams.

Parameters:

<NumbOfStreams> integer
 Range: 2 to 2
 *RST: 2

Example: See [Example"Configuring multiple emitters parallel"](#)
 on page 101.

Manual operation: See ["Stream A/B"](#) on page 62

[[:SOURce<hw>]:BB:ESEQuencer:SEQCount?

Queries the number of sequencers.

Return values:

<NumOfSequencer> integer

Number of available sequencers depends on the installed options.

Range: 1 to 6

*RST: 1

Example:See [Example"Configuring multiple emitters parallel"](#) on page 101.**Usage:**

Query only

[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:SEQCount <MaxNumOfSeq>

Sets how many sequencers can be mapped to the stream at most.

Parameters:

<MaxNumOfSeq> integer

Range: 1 to 3

*RST: 1

Example:See [Example"Configuring multiple emitters parallel"](#) on page 101.**Manual operation:** See ["Maximum Number of Sequencers"](#) on page 62**[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:SEQuencer<st>:STATe
<SequencerState>**

Assigns a sequencer to the selected streams.

Parameters:

<SequencerState> 1 | ON | 0 | OFF

*RST: 0

Example:See [Example"Configuring multiple emitters parallel"](#) on page 101.**Manual operation:** See ["Sequencers Assigned to Stream A/B"](#) on page 63**[:SOURce<hw>]:BB:ESEQuencer:STReam<di>:OUTPut <Output>**

Selects the RF output the stream is routed to.

Parameters:

<Output> NONE | RFA | RFB

NONE

Disable the stream output.

*RST: NONE

Example:See [Example"Configuring multiple emitters parallel"](#) on page 101.

Manual operation: See "Output" on page 63

4.9 Network commands

Example: Retrieving information on network-related settings

```

SYSTem:COMMUnicate:BB1:NETWork:STATus?
// 1
SYSTem:COMMUnicate:BB1:NETWork:SOCKet:STATe?
// 1
SYSTem:PROTection1:STATe 0,123456

SYSTem:COMMUnicate:BB1:NETWork:IPADdress:MODE STAT
SYSTem:COMMUnicate:BB1:NETWork:IPADdress "10.113.0.104"
SYSTem:COMMUnicate:BB1:NETWork:IPADdress:DNS "10.0.2.166"
SYSTem:COMMUnicate:BB1:NETWork:COMMon:HOSTName?
// "instrument-ADV-DATA-CTRL1"
SYSTem:COMMUnicate:BB1:NETWork:IPADdress:SUBNet:MASK "255.255.252.0"
SYSTem:COMMUnicate:BB1:NETWork:MACAddress "08 00 27 a3 a1 70"
SYSTem:COMMUnicate:BB1:NETWork:PROTOcol TCP
SYSTem:COMMUnicate:BB1:NETWork:PORT "49152"

SYSTem:PROTection1:STATe 1

//Retrieving the default gateway in address mode "Auto (DHCP)"
SYSTem:COMMUnicate:BB1:NETWork:IPADdress:MODE AUTO
SYSTem:COMMUnicate:BB1:NETWork:IPADdress:GATeway?
//127.0.0.1

```

Commands:

[SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:STATus?.....	124
:SYSTem:COMMUnicate:BB<hw>:NETWork:STATus?.....	124
[SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:SOCKet:STATe?.....	124
:SYSTem:COMMUnicate:BB<hw>:NETWork:SOCKet:STATe?.....	124
[SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:IPADdress?.....	124
:SYSTem:COMMUnicate:BB<hw>:NETWork:IPADdress.....	124
:SYSTem:COMMUnicate:BB<hw>:NETWork:IPADdress:MODE.....	124
:SYSTem:COMMUnicate:BB<hw>:NETWork[:IPADdress]:GATeway.....	125
:SYSTem:COMMUnicate:BB<hw>:NETWork:MACAddress.....	125
:SYSTem:COMMUnicate:BB<hw>:NETWork:PORT.....	125
:SYSTem:COMMUnicate:BB<hw>:NETWork:PROTOcol.....	125
:SYSTem:COMMUnicate:BB<hw>:NETWork:REStart.....	126
[SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:HOSTName?.....	126
:SYSTem:COMMUnicate:BB<hw>:NETWork[:COMMon]:HOSTName.....	126
:SYSTem:COMMUnicate:BB<hw>:NETWork[:IPADdress]:SUBNet:MASK.....	126

```
[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:NETWork:STATus?  
:SYSTem:COMMunicate:BB<hw>:NETWork:STATus?
```

Queries the network configuration state.

Return values:

<State> 1 | ON | 0 | OFF

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Usage: Query only

Manual operation: See ["Network Status"](#) on page 50

```
[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:NETWork:SOCKet:  
  STATe?  
:SYSTem:COMMunicate:BB<hw>:NETWork:SOCKet:STATe?
```

Queries whether the socket is open and thus if the connection between the external PDW simulator and the instrument is established.

Return values:

<SocketState> 1 | ON | 0 | OFF

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Usage: Query only

Manual operation: See ["Socket State"](#) on page 50

```
[:SOURce<hw>]:BB:ESEQUencer:RTCI[:SEQUencer<st>]:NETWork:IPADdress?  
:SYSTem:COMMunicate:BB<hw>:NETWork:IPADdress <IpAddress>
```

Sets the IP address.

Parameters:

<IpAddress> string
Range: 0.0.0.0. to ff.ff.ff.ff

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["IP Address"](#) on page 51

```
:SYSTem:COMMunicate:BB<hw>:NETWork:IPADdress:MODE <Mode>
```

Selects manual or automatic setting of the IP address.

Parameters:

<Mode> AUTO | STATic
*RST: n.a. (factory preset: AUTO)

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Address Mode"](#) on page 51

:SYSTem:COMMunicate:BB<hw>:NETWork[:IPADdress]:GATeway <Gateway>

Sets the IP address of the default gateway.

Parameters:

<Gateway> string
Range: 0.0.0.0 to ff.ff.ff

Example: See [Example "Retrieving information on network-related settings"](#) on page 123.

Manual operation: See ["Default Gateway"](#) on page 52

:SYSTem:COMMunicate:BB<hw>:NETWork:MACaddress <MacAddress>

Queries the MAC address of the network adapter.

This is a password-protected function. Unlock the protection level 1 to access it, see `:SYSTem:PROTect<ch>[:STATe]` in the R&S SMW user manual.

Parameters:

<MacAddress> string

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["MAC Address"](#) on page 52

:SYSTem:COMMunicate:BB<hw>:NETWork:PORT <Port>

Sets the port address use for network traffic.

Parameters:

<Port> integer
Range: 0 to 65536
*RST: n.a. (factory preset: 49152)

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["TCP Port/UDP Port"](#) on page 52

:SYSTem:COMMunicate:BB<hw>:NETWork:PROTocol <Protocol>

Selects the communication protocol for the network traffic.

Parameters:

<Protocol> UDP | TCP
 *RST: n.a. (factory preset: TCP)

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Protocol"](#) on page 52

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

Restarts the network.

Example: :SYSTem:COMMunicate:BB1:NETWork:REStart
 Terminates the network connection and sets it up again.

Usage: Event

Manual operation: See ["Restart Network"](#) on page 50

[:SOURce<hw>]:BB:ESEQuencer:RTCI[:SEQuencer<st>]:NETWork:HOSTname? :SYSTem:COMMunicate:BB<hw>:NETWork[:COMMOn]:HOSTname <Hostname>

Sets an individual hostname for the R&S SMW.

Note: We recommend that you do not change the hostname to avoid problems with the network connection. If you change the hostname, be sure to use a unique name.

This is a password-protected function. Unlock the protection level 1 to access it, see :SYSTem:PROTect<ch>[:STATe].

Parameters:

<Hostname> string

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Hostname"](#) on page 50

:SYSTem:COMMunicate:BB<hw>:NETWork[:IPADdress]:SUBNet:MASK <Mask>

Sets the subnet mask.

Parameters:

<Mask> string

Example: See [Example "Real time control interface mode configuration"](#) on page 97.

Manual operation: See ["Subnet Mask"](#) on page 51

4.10 Agile sequencing commands

Option: see "[Agile sequencing mode options](#)" on page 15.

Commands:

<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:OMODE</code>	127
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WAVE:FILE:CATalog?</code>	127
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WLISt:FILE:CATalog?</code>	128
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLISt:FILE</code>	128
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WLISt:DASR</code>	128
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLISt:SEGMent:CATalog?</code>	129
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLISt:SEGMent:APPend</code>	129
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLISt:SEGMent:DELeTe</code>	129
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLISt:SAVE</code>	129
<code>[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:STReam:DROP EXEC WRDWrite WRDRead BUFRemain BUFFilled?</code>	130

`[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:OMODE <OperationMode>`

Selects the operation mode.

Parameters:

<OperationMode> INSTant | DETerministic

INSTant

The generator plays back prestored ARB segments according to the ADW with low latency.

DETerministic

The generator plays back prestored ARB segments according to the ADW after a "ready" signal is acknowledged and the next ARB segment is triggered.

*RST: INSTant

Example: See [Example "Agile sequencing mode configuration"](#) on page 98.

Manual operation: See "[Operation Mode](#)" on page 71

`[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WAVE:FILE:CATalog?`

Reads out the files extension * .wv in the default directory.

Return values:

<Catalog> string

Returns the available waveform files separated by commas.

Example: See [Example "Agile sequencing mode configuration"](#) on page 98.

Usage: Query only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WLIST:FILE:CATalog?

Reads out the files extension `*.inf_mswv` from the default directory.

Return values:

<Catalog> string
Returns the available waveform list separated by commas

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Usage: Query only

Manual operation: See ["Waveform List"](#) on page 48

**[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLIST:FILE
<File>**

Selects a waveform list from the default directory. If a waveform list with the specified name does not yet exist, it is created. The file extension `*.inf_mswv` may be omitted.

Parameters:

<File> string

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Manual operation: See ["Waveform List"](#) on page 48

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing:WLIST:DASR <SampleRate>

The desired ARB sample rate directly influences the minimum common clock rate all waveforms are resampled to. The higher the desired rate, the higher the common sample rate, in order to optimize the ADW sample rate. At the same time, the required memory will also increase.

Parameters:

<SampleRate> SR37M5 | SR75M | SR300M | SR2G4
SR37M5: sample rate = 37.5 MHz
SR75M: sample rate = 75 MHz
SR300M: sample rate = 300 MHz
SR2G4: sample rate = 2.4 GHz
*RST: SR2G4

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Manual operation: See ["Desired ARB Sample Rate"](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLIST:SEGMent:CATalog?

Queries the waveform sequence of the currently selected waveform list.

Return values:

<Catalog> string
Returns the waveform files separated by commas.

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Usage: Query only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLIST:SEGMent:APPend <Waveform>

Appends the specified waveform to the selected waveform list.

Setting parameters:

<Waveform> string

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Usage: Setting only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLIST:SEGMent:DELeTe <Filename>

Deletes the selected waveform file.

Setting parameters:

<Filename> string

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Usage: Setting only

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:WLIST:SAVE

Save and load the waveform list to the coder board, the file extension *.inf_mswv is automatically assigned.

Example: See [Example"Agile sequencing mode configuration"](#) on page 98.

Usage: Event

Manual operation: See ["Waveform List, Append/Delete/Up/Down/Save&Load."](#) on page 75

**[:SOURce<hw>]:BB:ESEQuencer:ASEQuencing[:SEQuencer<st>]:STReam:
DROP|EXEC|WRDWrite|WRDRead|BUFRemain|BUFFilled?**

Query data from streaming interface registers for write count, read count, executed ADWs, buffer filled and buffer remain information.

Return values:

<Value> float

Example: See [Example "Agile sequencing mode configuration"](#) on page 98.

Usage: Query only

Manual operation: See ["Statistics"](#) on page 88

4.11 QSFP+ network commands

Example: Configuring the QSFP+ network

```
// *****
// Configuring QSFP+ 1 network parameters at the connector HS DIG I/Q1.
// *****
// Set the IP address.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:IPAddress "127.0.0.1"
// Set the subnet mask.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:IPAddress:SUBNet:MASK 255.255.255.0
// Set the UDP Port.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:PORT 49152

// Query the QSFP+ network settings.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:STATus?
// Response: "1"
// The R&S SMW is connected.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:APPLication?
// Response: "ExtSeq (10GbE)" for extended sequencer, 10 GbE Ethernet mode.
// Response: "ARB Upload (10GbE)" for ARB Ethernet upload, 10 GbE Ethernet mode.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:HOSTname?
// Returns the hostname consisting of the R&S SMW short name, the
// serial number and the connector HS-DIG-IQx.
SYSTEM:COMMunicate:BB1:QSFP:NETWork:IPAddress:MODE?
// Response: "STATic"
SYSTEM:COMMunicate:BB1:QSFP:NETWork:MACAddress?
SYSTEM:COMMunicate:BB1:QSFP:NETWork:PROToCol?
// Response: "UDP"

// *****
// Configuring QSFP+ 2 network parameters at the connector HS DIG I/Q2.
```

```
// *****
// Configure analogous as for the QSFP+ 1 network using the suffix BB<hw> = BB2.
```

Commands:

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:STATus?	131
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:APPLication?	131
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:COMMON]:HOSTname?	131
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPADdress:MODE	132
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPADdress	132
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:IPADdress]:SUBNet:MASK	132
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:MACAdress?	133
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PROToCol	133
:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PORT	133

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:STATus?

Queries the network configuration state.

Return values:

<NetworkStatus> 1 | ON | 0 | OFF
*RST: n.a. (no preset. default: 0)

Example: See [Example"Configuring the QSFP+ network"](#) on page 130.

Usage: Query only

Manual operation: See ["Network Status"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:APPLication?

Queries a running application.

Return values:

<RunningApp> string
Returns the name of the running application.

ExtSeq (10GbE)

Extended sequencer, 10 GbE Ethernet mode

Example: See [Example"Configuring the QSFP+ network"](#) on page 130.

Usage: Query only

Options: ARB Upload (10GbE)|ARB Upload (40GbE) require R&S SMW-K507.
ExtSeq (10GbE) requires R&S SMW-K506.

Manual operation: See ["Running Application"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:COMMON]:HOSTname?

Queries an individual hostname for the R&S SMW.

Note: We recommend that you do not change the hostname to avoid problems with the network connection. If you change the hostname, be sure to use a unique name.

This is a password-protected function. Unlock the protection level 1 to access it, see `:SYSTem:PROTeCt<ch>[:STATe]`.

Return values:

<Hostname> string

Example: See [Example "Configuring the QSFP+ network"](#) on page 130.

Usage: Query only

Manual operation: See ["Hostname"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPADdress:MODE
 <IpAddressMode>

Displays the mode of the IP address.

Parameters:

<IpAddressMode> STATic
 *RST: n.a. (factory preset: STATic)

Example: See [Example "Configuring the QSFP+ network"](#) on page 130.

Manual operation: See ["Address Mode"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:IPADdress <IpAddress>

Sets the IP address.

Parameters:

<IpAddress> String
 Range: 0.0.0.0 to ff.ff.ff.ff

Example: See [Example "Configuring the QSFP+ network"](#) on page 130.

Manual operation: See ["IP Address"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork[:IPADdress]:SUBNet:MASK
 <SubnetMask>

Sets the subnet mask.

Parameters:

<SubnetMask> String

Example: See [Example "Configuring the QSFP+ network"](#) on page 130.

Manual operation: See ["Subnet Mask"](#) on page 73

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:MACAddress?

Queries the MAC address of the network adapter.

This is a password-protected function. Unlock the protection level 1 to access it, see `:SYSTem:PROTect<ch>[:STATe]` in the R&S SMW user manual.

Return values:

<MacAddress> string

Example: See [Example"Configuring the QSFP+ network"](#) on page 130.

Usage: Query only

Manual operation: See ["MAC Address"](#) on page 74

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PROTocol <Protocol>

Displays the communication protocol for the network traffic.

Parameters:

<Protocol> UDP
*RST: n.a. (factory preset: UDP)

Example: See [Example"Configuring the QSFP+ network"](#) on page 130.

Manual operation: See ["Protocol"](#) on page 74

:SYSTem:COMMunicate:BB<hw>:QSFP:NETWork:PORT <PortNumber>

Sets the port address used for network traffic.

Parameters:

<PortNumber> integer
Range: 0 to 65536
*RST: n.a. (factory preset: 49152)

Example: See [Example"Configuring the QSFP+ network"](#) on page 130.

Manual operation: See ["UDP Port"](#) on page 74

4.12 Trigger commands

This section lists the remote-control commands, necessary to configure the trigger.

Commands:

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:ARM:EXECute	134
[:SOURce<hw>]:BB:ESEQuencer:TRIGger:DELay:UNIT	134
[:SOURce<hw>]:BB:ESEQuencer:TRIGger:EXECute	134
[:SOURce<hw>]:BB:ESEQuencer:TRIGger:EXTernal:SYNChronize:OUTPut	135
[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:DELay	135

<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:INHibit</code>	135
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:RDElay?</code>	135
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:TDElay</code>	136
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:RMODE?</code>	136
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:SOURce</code>	136
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXternal]:DElay</code>	137
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXternal]:DISable</code>	137
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXternal]:INHibit</code>	138
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXternal]:RDElay?</code>	138
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXternal]:TDElay</code>	138
<code>[:SOURce<hw>]:BB:ESEQuencer[:TRIGger]:SEQUence</code>	139
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME:DATE</code>	139
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME:TIME</code>	140
<code>[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME[:STATE]</code>	140

`[:SOURce<hw>]:BB:ESEQuencer:TRIGger:ARM:EXECute`

Stops signal generation; a subsequent trigger event restarts signal generation.

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Usage: Event

Manual operation: See ["Arm"](#) on page 79

`[:SOURce<hw>]:BB:ESEQuencer:TRIGger:DElay:UNIT <DelayUnit>`

Determines the units the trigger delay is expressed in.

Parameters:

<DelayUnit> SAMPLE | TIME
*RST: SAMPLE

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99

Manual operation: See ["\(External\) Delay Unit"](#) on page 81

`[:SOURce<hw>]:BB:ESEQuencer:TRIGger:EXECute`

Executes a trigger.

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Usage: Event

Manual operation: See ["Execute Trigger"](#) on page 79

**[[:SOURce<hw>]:BB:ESEQuencer:TRIGger:EXTernal:SYNChronize:OUTPut
<Output>**

Enables signal output synchronous to the trigger event.

Parameters:

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

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Sync. Output to External Trigger/Sync. Output to Trigger"](#) on page 80

[[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:DELay <Delay>

Determines the delay of the trigger event to the trigger signal of another trigger source, e.g. the internal baseband trigger signal of the other path ([BB:ESEQ:TRIG:SOUR INTA](#) or [INTB](#)), or an external .

Parameters:

<Delay> float
Range: 0 to 2147483647
Increment: 0.01
*RST: 0

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["\(Specified\) External Delay/\(Specified\) Trigger Delay"](#) on page 81

[[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:INHibit <Inhibit>

For triggering via the other path, specifies the number of samples by which a restart is to be inhibited following a trigger event.

Parameters:

<Inhibit> integer
Range: 0 to 67108863
*RST: 0

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["External / Trigger Inhibit"](#) on page 81

[[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:RDELay?

Queries the time a trigger event from the other path is delayed.

Return values:

<OtherResTimeDel> float
 Range: 0 to 688
 Increment: 250E-12
 *RST: 0

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99

Usage: Query only

Manual operation: See ["Actual Trigger Delay/Actual External Delay"](#) on page 82

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:OBASeband:TDELay
 <OtherTimeDelay>

Specifies the trigger delay for triggering by the signal from the other path.

Parameters:

<OtherTimeDelay> float
 Range: 0 to 688
 Increment: 250E-12
 *RST: 0
 Default unit: s

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99

Manual operation: See ["\(Specified\) External Delay/\(Specified\) Trigger Delay"](#) on page 81

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:RMODE?

Queries the signal generation status.

Return values:

<RunningMode> STOP | RUN
 *RST: STOP

Example: See [Example"Clock, marker and trigger configuration"](#) on page 99.

Usage: Query only

Manual operation: See ["Running/Stopped"](#) on page 78

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:SOURce <Source>

Selects the trigger signal source and determines the way the triggering is executed. Provided are:

- Internal triggering by a command (INTernal)
- External trigger signal via one of the local or global connectors

- EGT1 | EGT2: External global trigger
- EGC1 | EGC2: External global clock
- ELTRigger: External local trigger
- ELCLock: External local clock
- Internal triggering by a signal from the other basebands (INTA | INTB)
- In primary-secondary instrument mode, the external baseband synchronization signal (BBSY)
- OBASeband | BEXternal | EXternal: Setting only
Provided only for backward compatibility with other Rohde & Schwarz signal generators.
The R&S SMW accepts these values and maps them automatically as follows:
EXternal = EGT1, BEXternal = EGT2, OBASeband = INTA or INTB
(depending on the current baseband)

Parameters:

<Source> INTB | INTernal | OBASeband | EGT1 | EGT2 | EGC1 | EGC2 | ELTRigger | INTA | ELCLock | BEXternal | EXternal | BBSY
*RST: INTernal

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Options: ELTRigger|ELCLock require R&S SMW-B10
BBSY require R&S SMW-B9

Manual operation: See ["Trigger Source"](#) on page 79

[:SOURce<hw>] :BB:ESEQUencer:TRIGger[:EXTernal]:DELay <Delay>

Sets the trigger delay.

Parameters:

<Delay> float
Range: 0 to 2147483647
Increment: 0.01
*RST: 0

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["\(Specified\) External Delay/\(Specified\) Trigger Delay"](#) on page 81

[:SOURce<hw>] :BB:ESEQUencer:TRIGger[:EXTernal]:DISable <DisableState>

Sets the disable state for external trigger in PDW mode.

Parameters:

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

Example: See [Example "Synchronizing extended sequencer"](#) on page 102.

Options: R&S SMW-K503

Manual operation: See ["Disable External Trigger"](#) on page 82

[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXTernal]:INHibit <Inhibit>

Specifies the duration by which a restart is inhibited.

Parameters:

<Inhibit> integer
 Range: 0 to 67108863
 *RST: 0

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["External / Trigger Inhibit"](#) on page 81

[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXTernal]:RDElay?

Queries the time (in seconds) an external trigger event is delayed for.

Return values:

<ResTimeDelay> float
 Range: 0 to 688
 Increment: 250E-12
 *RST: 0

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99

Usage: Query only

Manual operation: See ["Actual Trigger Delay/Actual External Delay"](#) on page 82

[:SOURce<hw>]:BB:ESEQuencer:TRIGger[:EXTernal]:TDElay <ExtTimeDelay>

Specifies the trigger delay for external triggering. The value affects all external trigger signals.

Parameters:

<ExtTimeDelay> float
 Range: 0 to 688
 Increment: 250E-12
 *RST: 0
 Default unit: s

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99

Manual operation: See ["\(Specified\) External Delay/\(Specified\) Trigger Delay"](#) on page 81

[:SOURce<hw>]:BB:ESEQuencer[: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
 For [:SOURce<hw>] :BB:ESEQuencer:MODE
 USER | PSEQuencer | DFINDing:
 AUTO | RETRigger | AAUTo | ARETrigger | SINGle
 For [:SOURce<hw>] :BB:ESEQuencer:MODE RTCI:
 AUTO | AAUTo
 *RST: AUTO

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Trigger Mode"](#) on page 78

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME:DATE <Year>, <Month>, <Day>

Sets the date for a time-based trigger signal. For trigger modes single or armed auto, you can activate triggering at this date via the following command:

SOURce<hw>:BB:<DigStd>:TRIGger:TIME:STATe

<DigStd> is the mnemonic for the digital standard, for example, ARB. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<Year> integer
 Range: 1980 to 9999

<Month> integer
 Range: 1 to 12

<Day> integer
 Range: 1 to 31

Example: See example "Configure a time-based trigger signal" in the sub-chapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See ["Trigger Time"](#) on page 79

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME:TIME <Hour>, <Minute>, <Second>

Sets the time for a time-based trigger signal. For trigger modes single or armed auto, you can activate triggering at this time via the following command:

SOURce<hw>:BB:<DigStd>:TRIGger:TIME:STATe

<DigStd> is the mnemonic for the digital standard, for example, ARB. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<Hour>	integer	
	Range:	0 to 23
<Minute>	integer	
	Range:	0 to 59
<Second>	integer	
	Range:	0 to 59

Example: See example "Configure a time-based trigger signal" in the sub-chapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See ["Trigger Time"](#) on page 79

[:SOURce<hw>]:BB:ESEQuencer:TRIGger:TIME[:STATe] <State>

Activates time-based triggering with a fixed time reference. If activated, the R&S SMW triggers signal generation when its operating system time matches a specified time.

Specify the trigger date and trigger time with the following commands:

SOURce<hw>:BB:<DigStd>:TRIGger:TIME:DATE

SOURce<hw>:BB:<DigStd>:TRIGger:TIME:TIME

<DigStd> is the mnemonic for the digital standard, for example, ARB. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<State>	1 ON 0 OFF
	*RST: 0

Example: See example "Configure a time-based trigger signal" in the sub-chapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See ["Time Based Trigger"](#) on page 79

4.13 Marker commands

This section lists the remote-control commands, necessary to configure the markers.

Commands:

<code>[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:MODE</code>	141
<code>[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:DELay</code>	142
<code>[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:DURation</code>	142
<code>[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:POST</code>	143
<code>[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:PRE</code>	143

`[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:MODE`
`<Mode>`

Defines the signal for the selected marker output.

Parameters:

`<Mode>` UNCHanged | START | ENTRy | PULSe | PDW | READy | ADW | LINDex

UNCHanged

Provides the marker signal defined in the waveform.

ENTRy

Generates a marker signal when enabled in the loaded list file.

The `[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:DURation` on page 142 determines how long the marker signal is high.

START

Generates a marker signal at each sequence start.

The `[:SOURce<hw>] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:DURation` on page 142 defines the length of the marker signal.

PULSe

Creates a marker signal with the same width as the pulse width.

PDW

Option:R&S SMW-K502: uses the marker signals as defined in the R&S Pulse Sequencer.

Option:R&S SMW-K503: creates marker signals according to the marker bit field inside the PDW header.

READy

Option:R&S SMW-K506: creates marker signals according to the marker bit field inside the ADW header for acknowledgment.

Required:

`[:SOURce<hw>] :BB:ESEQuencer:MODE ASEQuencing`
`[:SOURce<hw>] :BB:ESEQuencer:ASEQuencing:OMODE DETerministic`

This parameter is set per default.

ADW

Option: R&S SMW-K506: creates marker signals according to the marker bit field inside the ADW header.

Required:

```
[ :SOURce<hw> ] :BB:ESEQuencer:MODE ASEQuencing
[ :SOURce<hw> ] :BB:ESEQuencer:ASEQuencing:OMODE
INSTant
```

LINDex

Option: R&S SMW-K503/-K504

Requires [:SOURce<hw>] :BB:ESEQuencer:MODE RTCI,
[:SOURce<hw>] :LIST:MODE INDEx,
[:SOURce<hw>] :LIST:TRIGger:SOURce EXTErnal and
[:SOURce<hw>] :LIST:RMODE LEARned.

Creates a marker signal according to the list index in the pulse descriptor word.

*RST: UNCHanged

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Marker Mode"](#) on page 83

```
[ :SOURce<hw> ] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]: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 (R&S SMWK501/-K502/-K503/-K504/-K506)/6
(R&S SMW-K315) to 16777215
Increment: 1E-3
*RST: 0
```

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Marker x Delay"](#) on page 84

```
[ :SOURce<hw> ] :BB:ESEQuencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:
DURation <Duration>
```

Sets the duration of the restart marker signal, or the signal defined in the sequence list.

Parameters:

```
<Duration> integer
Range: 1 to 65536
*RST: 1
```

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Marker Mode"](#) on page 83

[:SOURce<hw>]:BB:ESEQUencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:POST
 <PostTime>

[:SOURce<hw>]:BB:ESEQUencer:TRIGger[:SEQuencer<st>]:OUTPut<ch>:PRE
 <PreTime>

Sets pre-marker time.

Parameters:

<PreTime> integer
 Range: 0 to 24000
 *RST: 0

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Manual operation: See ["Pre Time/Post Time"](#) on page 85

4.14 Clock commands

This section lists the remote-control commands, necessary to configure the clock.

Commands:

[\[:SOURce<hw>\]:BB:ESEQUencer:CLOCK:MODE.....](#) 143
[\[:SOURce<hw>\]:BB:ESEQUencer:CLOCK:SOURce.....](#) 143

[:SOURce<hw>]:BB:ESEQUencer:CLOCK:MODE <Mode>

Sets the type of externally supplied clock.

Parameters:

<Mode> SAMPLE | MSAMple | SAMPlE
 *RST: SAMPlE

Example: See [Example "Clock, marker and trigger configuration"](#) on page 99.

Options: R&S SMW-B10

Manual operation: See ["Clock Mode"](#) on page 86

[:SOURce<hw>]:BB:ESEQUencer:CLOCK:SOURce <Source>

Selects the clock source:

- `INTernal`: Internal clock reference

- `ELCLock`: External local clock
- `EXTernal = ELCLock`: Setting only
Provided for backward compatibility with other Rohde & Schwarz signal generators

Parameters:

<Source> `INTernal|ELCLock|EXTernal`
*RST: `INTernal`

Example: See [Example "Clock, marker and trigger configuration"](#)
on page 99.

Options: `ELCLock` requires R&S SMW-B10

Manual operation: See ["Clock Source"](#) on page 86

List of commands

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:SYSTem:COMMunicate:BB<hw>:NETWork:IPADdress:MODE.....	124
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:SYSTem:COMMunicate:BB<hw>:NETWork:PORT.....	125
:SYSTem:COMMunicate:BB<hw>:NETWork:PROTocol.....	125
:SYSTem:COMMunicate:BB<hw>:NETWork:REStart.....	126
:SYSTem:COMMunicate:BB<hw>:NETWork:SOCKet:STATe?.....	124
:SYSTem:COMMunicate:BB<hw>:NETWork:STATus?.....	124
:SYSTem:COMMunicate:BB<hw>:NETWork[:COMMOn]:HOSTName.....	126
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