Satellite Navigation Digital Standard for R&S®WinIQSIM2™ User Manual

1179008002
Version 06

ROHDE&SCHWARZ
Make ideas real

This document describes the software options for GPS, Galileo, GLONASS, COMPASS/BeiDou, NavIC/IRNSS satellite navigation systems.
It describes following software options:

- R&S®SMW-K244/-K266/-K294/-K297/-K298/-K407/-K423/-K432
  1413.4880.xx, 1413.7015.xx, 1413.7067.xx, 1414.6287.xx, 1414.3171.xx, 1413.7115.xx, 1413.3410.xx, 1414.6629.xx
- R&S®SMBVB-K244/-K266/-K294/-K297/-K298/-K407/-K423/-K432
  1423.8195.xx, 1423.8320.xx, 1423.8395.xx, 1423.8695.xx, 1423.8408.xx, 1423.8489.xx, 1423.9110.xx, 1423.8837.xx
- R&S®SMM-K244/-K266/-K294/-K297/-K298/-K407/-K423/-K432
  1441.1699.xx, 1441.1560.xx, 1441.1482.xx, 1441.1199.xx, 1441.1476.xx, 1441.1460.xx, 1441.0928.xx, 1441.1176.xx
- R&S®SMCVB-K244/-K266/-K294/-K297/-K298/-K407/-K423/-K432
  1434.4215.xx, 1434.4450.xx, 1434.4596.xx, 1434.5734.xx, 1434.4615.xx, 1434.4638.xx, 1434.5911.xx, 1434.5740.xx
- R&S®SGT-K244/-K266/-K294/-K297/-K298/-K407/-K423/-K432
  1419.6104.xx, 1419.7000.xx, 1419.7400.xx, 1426.3388.xx, 1419.5766.xx, 1419.7452.xx, 1426.3407.xx, 1426.3394.xx
- R&S®CMP-KW220
  1212.2460.02
- R&S®CMW-KW620/-KW621/-KW622/-KW623
  1203.6008.02, 1207.8305.02, 1207.8357.02, 1208.8280.02
- R&S®CMA-KW620/-KW621/-KW622
  1209.6222.02, 1209.6245.02, 1208.8280.02

This manual version corresponds to software version 5.20.107.xx and later of R&S®WinIQSIM2™.

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The following abbreviations are used throughout this manual: R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2, R&S®SMW200A is abbreviated as R&S SMW, R&S®SMM100A is abbreviated as R&S SMM, R&S®SMBV100B is abbreviated as R&S SMBVB, R&S®SMCV100B is abbreviated as R&S SMCVB, R&S®SGT100A is abbreviated as R&S SGT, R&S®CMA180 is abbreviated as R&S CMA, R&S®CMP180 is abbreviated as R&S CMP, R&S®CMW500, R&S®CMW290, R&S®CMW270 and R&S®CMW100 are abbreviated as R&S CMW; the license types 02/03/07/11/13/16/12 are abbreviated as xx.

Contents

1 Welcome to the GNSS options

The R&S WinIQSIM2-K244/-K266/-K294/K297/-K298/-K407/-K432 are firmware applications that add functionality to generate signals in accordance with the GPS, Galileo, GLONASS, NavIC and COMPASS/BeiDou navigation systems.

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 described in the R&S WinIQSIM2 user manual. The latest version is available at:

http://www.rohde-schwarz.com/product/WinIQSIM2.html

You can generate signals via play-back of waveform files at the signal generator. To create the waveform file using R&S WinIQSIM2, you do not need a specific option.

To play back the waveform file at the signal generator, you have two options:

- Install the R&S WinIQSIM2 option of the digital standard, e.g. R&S Snn-K255 for playing LTE waveforms
- If supported, install the real-time option of the digital standard, e.g. R&S Snn-K55 for playing LTE waveforms

1.1 Key features

Key features

The GNSS key features are:

- Support of single global navigation satellite systems (GNSS) and signals (Table 1-1)
- Configuring the state of a particular signal component individually
- Waveform generation for tracking tests

Table 1-1: Supported single GNSS, frequency bands and signals

GNSS/RNSS	L1 band	L2 band	L5 band
GPS	C/A, L1C	C/A, L2C	L5
Galileo	E1 OS	E6	E5a, E5b
GLONASS	C/A, CDMA L1	C/A, CDMA L2	CDMA L3

GNSS/RNSS	L1 band	L2 band	L5 band
BeiDou	B1I, B1C	B3I	B2I, B2a, B2b
NavIC	-	-	SPS

For detailed information, see Chapter 2.2, "GNSS overview", on page 10.

Differences between GNSS simulator and R&S WinIQSIM2

The GNSS implementation in the R&S WinIQSIM2 allows you to generate waveform files. You can load the waveform files to Rohde & Schwarz current and discontinued instruments listed in the table below:

Current instruments	Discontinued instruments
R&S SMW, R&S SMBVB, R&S SMM, R&S SMCVB, R&S SGT, R&S CMW, R&S CMA	R&S AFQ, R&S AMU, R&S BTC, R&S SFU, R&S SMBV, R&S SMJ, R&S SMU

You can simulate **one** GPS, Galileo, GLONASS, BeiDou or NavIC satellite and one signal, for example, R&S SMW-K244 for GPS L1 C/A signal or GPS L2 C/A signal. See also Chapter 2.1, "Required options", on page 9.

As a major difference to the real-time solution of the GNSS simulator, the satellite signal generated with the R&S WinIQSIM2 is limited to a certain time period. It depends on the ARB capacity of the signal generator and the user-configurable sample rate of the satellite signal.

1.2 Accessing the GNSS dialog

To open the dialog with GNSS settings

► In the block diagram of the R&S WinIQSIM2, select "Baseband > GNSS".

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".

1.3 What's new

This manual version corresponds to software version 5.20.107.xx and later of R&S®WinIQSIM2™.

Compared to the previous version, it provides the new features listed below:

- BeiDou B2b_I I-component of the B2b open service signal in L5 band, see Table 2-6 and "Signals" on page 26.

- Apply data of one constellation source file to all active GNSS systems, see "Use Constellation Source File for all active GNSS system" on page 65.
- RINEX file format and download information updated, see Chapter A, "RINEX files", on page 176.
- Editorial changes

1.4 Documentation overview

This section provides an overview of the R&S WinIQSIM2 user documentation. You find it on the product page at:

www.rohde-schwarz.com/manual/winiqsim2

Online help

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

User manual

There are separate manuals for the base unit and the software options:

- Base software user manual
  Contains the description of all software modes and functions including operating R&S WinIQSIM2. It also provides a complete description of the remote control commands with programming examples, interfaces and error messages.
  The contents of the base software are available for download and as help in R&S WinIQSIM2. The help offers quick, context-sensitive access to the complete information for the base unit and the software options.
- Software option manual
  Contains the description of the specific functions of software options. Basic information on operating R&S WinIQSIM2 is not included.
  The contents of the software options are available as help in R&S WinIQSIM2. The contents of R&S WinIQSIM2 GNSS software options is also available for download. For download version of the other software options, see the corresponding R&S SMW options user manuals.

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

Basic safety instructions

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

Data sheet and brochure

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

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

Release notes and open source acknowledgment (OSA)

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

The open source acknowledgment document provides verbatim license texts of the used open source software. See the product page of the base unit, e.g. at:

www.rohde-schwarz.com/software/winiqsim2

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/winiqsim2.

1.5 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 marker signals and filter settings, if appropriate.
- General instrument configuration, such as configuring networks and remote operation
- Using the common status registers

For a description of such tasks, see the R&S WinIQSIM2 user manual.

1.6 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 GNSS options

Global navigation satellite system (GNSS) employs the radio signals of several navigation standards, like GPS, Galileo, GLONASS and BeiDou and NavIC. For several years, GPS used to be the only standard available for civilian navigation through its C/A civilian code.

Nowadays, the GNSS signals and systems are undergoing fast development, some systems are getting modernized and some are new. In the foreseeable future, several more GNSS satellites utilizing more signals and new frequencies are available.

The GNSS implementation in the R&S WinIQSIM2 enables you to generate composite signals of GNSS satellites, depending on the installed options. Signal generation is performed in real time and thus not limited to a certain time period.

The following chapters provide background information on required options, basic terms and principles in the context of GNSS signal generation. For detailed information on the GNSS standards, see the corresponding specifications.

2.1 Required options

You can generate signals via play-back of waveform files at the signal generator. To create the waveform file using R&S WinIQSIM2, you do not need a specific option.

To play back the waveform file at the signal generator, you have two options:

- Install the R&S WinIQSIM2 option of the digital standard, e.g. R&S Snn-K255 for playing LTE waveforms
- If supported, install the real-time option of the digital standard, e.g. R&S Snn-K55 for playing LTE waveforms

For options required to play back GNSS waveforms on a vector signal generator, see Table 2-1. The abbreviation for the option prefix "R&S Snn" includes the vector signal generators R&S SMW, R&S SMM, R&S SMBVB, R&S SMCVB and R&S SGT.

Table 2-1: GNSS single-satellite options

Option	Designation	Remark
R&S Snn-K44/K244	GPS	C/A signals in L1 and L2 bands
R&S Snn-K66/K266	Galileo	E1 OS, E6, E5a and E5b signals in L1, L2 and L5 bands
R&S Snn-K94/K294	GLONASS	C/A signal in L1 and L2 bands
R&S Snn-K97/K297	NavIC	SPS signal in L5 band
R&S Snn-K98/K298	Modernized GPS	L1C, L2C and L5 signals in L1, L2 and L5 bands
R&S Snn-K107/K407	BeiDou	B1I and B2I signals in L1 and L5 bands Q-component AS signals are not supported, see also Table 2-6.

Option	Designation	Remark
R&S Snn-K123/K423	Modernized GLONASS	CDMA L1, CDMA L2 and CDMA L3 signals in L1, L2 and L5 bands
R&S Snn-K132/K432	Modernized BeiDou	B1C, B3I, B2a and B2b signals in L1, L2 and L5 bands Q-component AS signals including B2b_Q are not supported, see also Table 2-6.

For more information, see data sheet.

2.2 GNSS overview

This section provides an overview on the GNSS including the following:

- Power spectral density, frequency bands and center frequencies f_{center}
- Characteristics of the satellite constellation
- Signal plan for each GNSS

The number of deployed satellites increases constantly. For the current deployment status, see the official information of the GNSS providers.

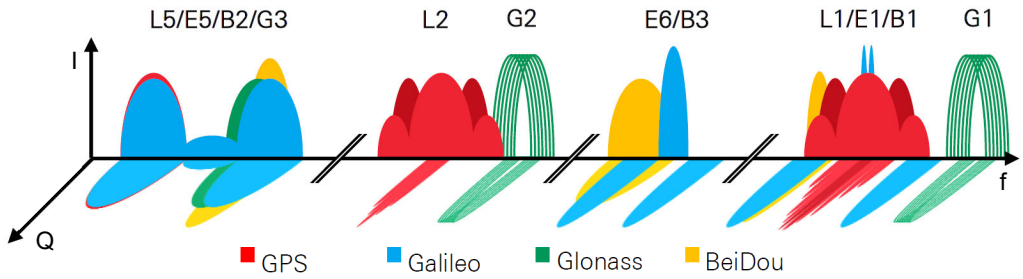


Figure 2-1: Power spectral density and center frequencies of most important GNSS signals

Red = GPS L1, L2 and L5 signals, details in GPS signal plan
Blue = Galileo E1, E5 and E6 signals, details in Galileo signal plan
Green = GLONASS G1(L1), G2(L2) and G3(L5) signals, details in GLONASS FDMA signal plan
Yellow = BeiDou B1, B2 and B3 signals, details in BeiDou signal plan

GPS

The Global Positioning System (GPS) consists of several satellites circling the earth in low orbits. The satellites transmit permanently information that can be used by the receivers to calculate their current position (ephemeris) and about the orbits of all satellites (almanac). The 3D position of a receiver on the earth can be determined by carrying out delay measurements of at least four signals emitted by different satellites.

Being transmitted on a single carrier frequency, the signals of the individual satellites can be distinguished by correlation (gold) codes. These ranging codes are used as spreading codes for the navigation message which is transmitted at a rate of 50 bauds. The C/A codes provide standard positioning service (SPS). The P codes provide precise positioning service (PPS).

Table 2-2: GPS signal plan

Signal	C/A	L1C	L2C	L5
Freq. band	L1	L1	L2	L5
f_{center}, MHz	1575.42	1575.42	1227.6	1176.45
Modulation	BPSK(1)	TMBOC (6,1,1/11)	BPSK(1)	QPSK(10)

Galileo

Galileo is the European global navigation satellite system that provides global positioning service under civilian control. It is planed to be inter-operable with GPS and GLONASS and other global satellite navigation systems.

The fully deployed Galileo system consists of operational and spare satellites. Three independent CDMA signals, named E5, E6 and E1, are permanently transmitted by all Galileo satellites. The E5 signal is further subdivided into two signals denoted E5a and E5b (see Figure 2-1). The Galileo system provides open service (OS), public regulated service (PRS) to authorized, commercial service (CS) and search and rescue (SAR) service.

Table 2-3: Galileo signal plan

Signal	E1 OS	E5a	E5b	E6
Freq. band	E1 L1 (GPS)	E5 L5 (GPS)	E5 L5 (GPS)	E6 L2 (GPS)
f_{center}, MHz	1575.42	1176.45	1207.14	1278.75
Modulation	CBOC (6,1,1/11)	AltBOC (15,10)	AltBOC (15,10)	BPSK(5)

[1)] The Galileo signals E1 PRS-Noise and E6 PRS-Noise are for experimental use only. These signals contain arbitrary noise. Use them for spectral interferer testing. For example, to generate a E1 OS signal and an interfering E1 PRS-Noise signal on the same center frequency. Theses noise signals are not useful position fix calculation and do not comply with any ICD specification.

GLONASS

GLONASS is the Russian global navigation satellite system that uses 24 modernized GLONASS satellites touring the globe.

Together with GPS, more GNSS satellites are provided, which improves the availability and therefore the navigation performance in high-urban areas.

Table 2-4: GLONASS FDMA signal plan

Signal	C/A	C/A	P[1)]	P[1)]
Freq. band	L1 (G1)	L2 (G2)	L1 (G1)	L2 (G2)
f_{center}, MHz	1602 ± k*0.5625[2)]	1246 ± k*0.5625[2)]	1602 ± k*0.5625[2)]	1246 ± k*0.5625[2)]
Modulation	BPSK(0.5)	BPSK(0.5)	BPSK(5)	BPSK(5)

[1] L1 and L2 P code signals are not supported in the GNSS firmware.

[2] k is the frequency number (FDMA) with -7 ≤ k ≤ 13.

Table 2-5: GLONASS CDMA signal plan

Signal	CDMA L1[1]	CDMA L2[1]	CDMA L3
Freq. band	L1	L2	L5
f_{center}, MHz	1600.995	1248.06	1202.025
Modulation	TDM	TDM	QPSK

[1] The modernized GLONASS signals CDMA L1 and CDMA L2 are for experimental use only. Any compliance with GLONASS ICD CDMA open service navigation signal in L1 frequency band or GLONASS ICD CDMA open service navigation signal in L2 frequency band is not guaranteed.

BeiDou

The fully deployed BeiDou navigation satellite system (BDS) is a Chinese satellite navigation system. This navigation system is also referred as BeiDou-2.

The BDS is a global satellite navigation system with a constellation of satellites (COMPASS satellites) to cover the globe. The constellation includes geostationary orbit satellites (GEO) and non-geostationary satellites. The non-geostationary satellites comprise medium earth orbit satellites (MEO) and inclined geosynchronous orbit (IGSO).

The BDS uses frequencies allocated in the B1, B2 and B3 bands. The in phase components (I-components) of the signals provide open service (OS), the quadrature phase components (Q-components) of the signals provide authorized service (AS). For an overview of supported OS signals, see Table 2-6. Q-component AS signals B1Q, B2Q, including B2b_Q, and B3Q are not supported in the GNSS firmware.

Table 2-6: BeiDou signal plan

Signal	B1C	B1I	B2a	B2b[1]	B2I	B3I
Freq. band	B1 L1 (GPS)	B1 L1 (GPS)	B2 L5 (GPS)	B2 L5 (GPS)	B2 L5 (GPS)	B3 L2 (GPS)
f_{center}, MHz	1575.42	1561.098	1176.45	1207.14	1207.14	1268.52
Modulation	BOC(1,1) QMBOC(6, 1, 4/33)	BPSK(2)	BPSK(10) BPSK(10)	BPSK(10)	BPSK(2)	BPSK(10)

[1] BeiDou B2b_I I-component of the B2b open service signal for space vehicles PRN 6 to PRN 58.

NavIC

NavIC (Navigation Indian Constellation) is the Indian navigation satellite system, formerly denoted IRNSS (Indian Regional Navigational Satellite System).

NavIC is a regional satellite navigation system with a constellation of satellites to cover an area of 1500 km surrounding India (2016). The constellation includes geostationary orbit (GEO) satellites and inclined geosynchronous orbit (IGSO) satellites.

The NavIC system uses frequencies allocated in the L5 and S bands providing special positioning service (SPS) and precision service (PS).

Table 2-7: NavIC signal plan

Signal	SPS	PS[1)]
Freq. band	L5	S
f_{center}, MHz	1176.45	2491.75
Modulation	BPSK(1)	N/A

[1)] NavIC PS signal is not supported in the GNSS firmware.

2.3 Single-satellite GNSS signal

This section gives an overview of the basic offline options GPS (R&S Snn-K244 and R&S Snn-K298), Galileo (R&S Snn-K266), GLONASS (R&S Snn-K294), BeiDou (R&S Snn-K407 and R&S Snn-K432) and NavIC (R&S Snn-K297).

R&S WinIQSIM2 calculates a single satellite GNSS signal, where static satellites with constant Doppler shifts are provided for simple receiver tests, like receiver sensitivity, acquisition, tracking and production tests. Selection and configuration of any localization data, such as receiver location for instance, is not enabled.

A generic workflow is described in Chapter 5, "Generating and playing GNSS waveforms", on page 68.

2.4 GNSS components overview

The GNSS system consists of three main components: the space segment, the ground segment and the user segment.

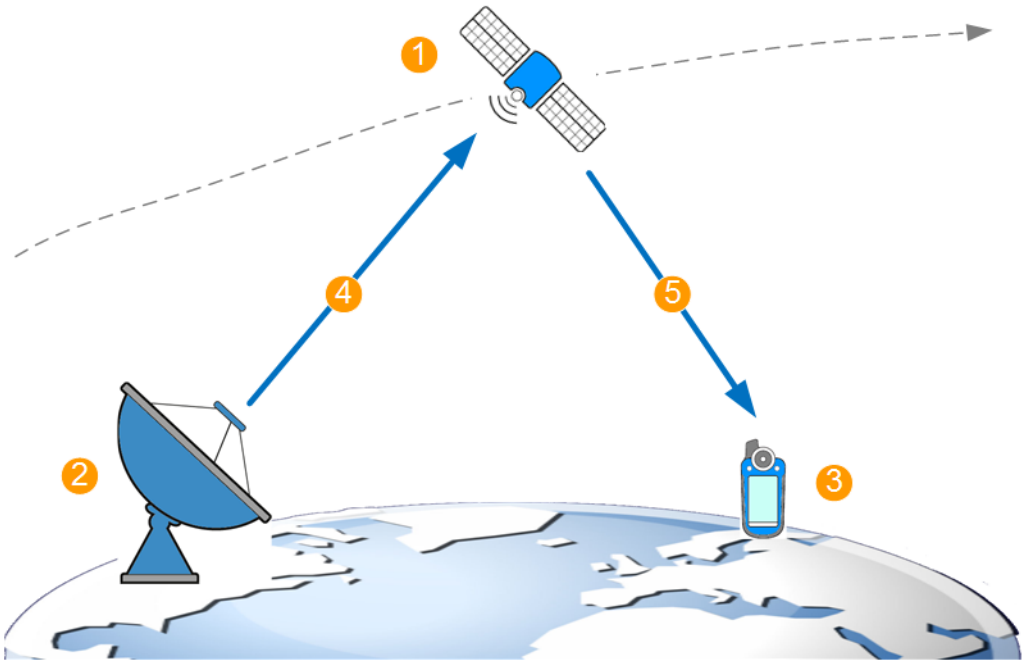


Figure 2-2: GNSS system components (simplified)

1 = Space segment or satellites
2 = Ground segment or ground stations
3 = User segment or receivers
4 = Ephemeris (broadcasted satellites orbit and clock)
5 = Broadcasted navigation message

Space segment

The space segment consists of the **satellites** that orbit the earth on their individual orbits. Satellites broadcast signals at specific frequency in the L band and spread by predefined codes. For the GPS satellites using L1 frequency band, for instance, the predefined codes are the coarse/acquisition (C/A) or the precision (P) codes.

The transmitted signal carries the **navigation message**, on which each satellite broadcasts its major characteristics, its clock offsets and precise orbit description, where the latter is called **ephemeris**. The navigation message contains also satellites status information, ionospheric and time-related parameters, UTC information and orbit data with reduced accuracy for all other satellites, commonly referred as **almanac**.

Ground segment

The ground segment is a network of **ground stations** whose primary goal is to measure constantly the satellites' location, altitude and velocity, and the satellites signals. The ground stations also estimate the influence of the ionosphere. They calculate the **precise orbit (and orbit perturbation)** parameters and **clock drifts** parameters of each satellite. This corrected highly accurate information is regularly broadcasted back to the satellites so that their navigation messages can be updated.

User segment

Finally, the **receiver** decodes the navigation message (ephemeris and almanac) broadcasted by the GNSS satellites, obtains information regarding the satellites orbit, clock, health etc. and calculates the satellites coordinates. The receiver also measures the signal propagation time (i.e. the pseudorange) of at least four satellites and estimates its own position.

3 GNSS configuration and settings

Access:

► Select "Baseband > Satellite Navigation > GNSS"

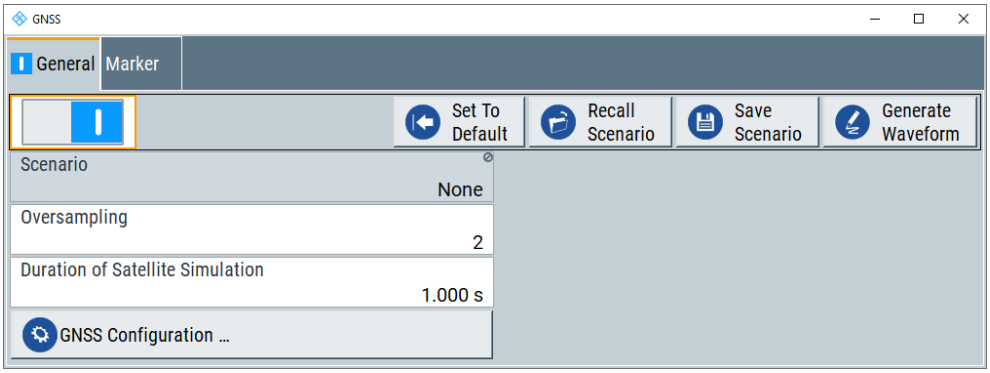
The R&S WinIQSIM2 generates a single GNSS signal that is suitable for testing the receiver capabilities to track the signal and to estimate its position based.

The receiver tests focus on testing if the receiver is capable to acquire and decode the GNSS signal; navigation and thus position estimation is not necessary. For such tests or for receivers' sensitivity tests in zero Doppler conditions or under varying signal dynamics conditions, the R&S WinIQSIM2 provides the tracking mode.

3.1 General settings

Access:

► Select "Baseband" > "Satellite Navigation" > "GNSS".



This dialog provides standard general settings.
The remote commands required to define these settings are described in Chapter 6.1, "General commands", on page 72.

Settings:

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

Remote command:
[:SOURce<hw>]:BB:GNSS:STATe on page 73

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

Parameter	Value
"State"	Not affected by "Set to default"
"Scenario"	"None"
"Oversampling"	"2"
"Duration of Satellite Simulation"	"1.000 s"
"GNSS System"	"GPS"
"Band"	"L1"
"Signal"	"C/A"

Remote command:
[:SOURce<hw>]:BB:GNSS:PRESet on page 73

Save/Recall Scenario
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.

To ensure repeatable test situation, the save/recall file contains all settings and includes all files used in the simulation, like for example waypoints files or vehicle description files.

When a save/recall file is loaded, the instrument checks the installed options and the used system configuration. If there is a mismatch, the file is loaded, settings adapted as far as possible and a warning message is displayed to indicate this situation.

Remote command:
[:SOURce<hw>]:BB:GNSS:SETTing:CATalog? on page 75
[:SOURce<hw>]:BB:GNSS:SETTing:STORe on page 75
[:SOURce<hw>]:BB:GNSS:SETTing:LOAD on page 75
[:SOURce<hw>]:BB:GNSS:SETTing:DELete on page 76

Scenario
Displays a loaded scenario, if selected.

"None" No scenario selected (default setting), see "Set to Default" on page 17.

Directory and filename
Directory and filename, when you load a scenario, see "Save/Recall Scenario" on page 17.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SCENario?` on page 73

Generate Waveform
With enabled signal generation, triggers the instrument to save the current settings of an arbitrary waveform signal in a waveform file with predefined extension `*.wv`. You can define the filename and the directory, in that you want to save the file.

Using the ARB modulation source, you can play back waveform files and/or process the file to generate multi-carrier or multi-segment signals.

See also:
- Chapter 5.1, "To generate a single satellite GNSS waveform", on page 68
- Chapter 5.2, "To play a GNSS waveform with Rohde & Schwarz signal generator", on page 69

Remote command:
`[:SOURce<hw>]:BB:GNSS:WAVeform:CREate` on page 76

Oversampling
Determines the upsampling factor.

A higher upsampling factor improves the filtering but increases the waveform size proportionally and hence limits the maximum Duration Of Satellite Simulation.

The sampling rate is increased/decreased automatically, depending on the modulation, i.e. the GNSS system and signal.

Remote command:
`[:SOURce<hw>]:BB:GNSS:OSAMpling` on page 74

Duration Of Satellite Simulation
Determines the duration of the satellite simulation.

The resulting duration of the simulation is calculated as follows:

$$Duration\ of\ Simulation = \frac{Duration\ of\ Satellite\ Simulation}{1 + \frac{Doppler\ Shift}{F_{Carrier}}}$$

$F_{Carrier}$ is the frequency selected with the parameter L# Band.

The maximum duration of satellite simulation depends on the Oversampling and the ARB memory size of the connected instrument.

Remote command:
`[:SOURce<hw>]:BB:GNSS:DURation` on page 74

GNSS Configuration
Accesses the "GNSS Configuration" dialog for defining active navigation system, used RF bands and signals. Also, the dialog provides further settings to configure satellites.

See:
- Chapter 3.3.1, "Systems and signals settings", on page 24
- Chapter 3.2.1, "Time configuration settings", on page 20
- Chapter 3.3.2, "Satellites settings", on page 28

3.2 Simulation time

The default system time in this simulation is given in the UTC (Universal Time Coordinates) time base. The simulation start time is thus defined as date and time and is set to 2014-02-19 at 06:00:00 am.

Simulation start time

You can change the simulation start time as you can change the time basis at any time. The time is then automatically recalculated and displayed in the selected time format.

The satellite constellation can comprise SVs from different navigation systems. You can observe the current simulation time converted into the time basis of each of the enabled GNSS systems at a glance.

If the satellite constellation comprises SVs from different navigation standards, the time conversion between the time bases in these navigation standards has to be defined. With other words, the time conversion settings are necessary for switching from one timebase to another.

Time conversion parameters and leap second

Time conversion parameters are zero and first order system clock drift parameters and the current leap second.

The leap second describes the difference between the GPS, Galileo, GLONASS, BeiDou or NavIC system time and UTC system time. Correct the time difference by specifying the leap second transition date, the leap second before transition and the leap second after transition.

How to: Example"Configuring leap second transition" on page 22

Simulating time conversion errors

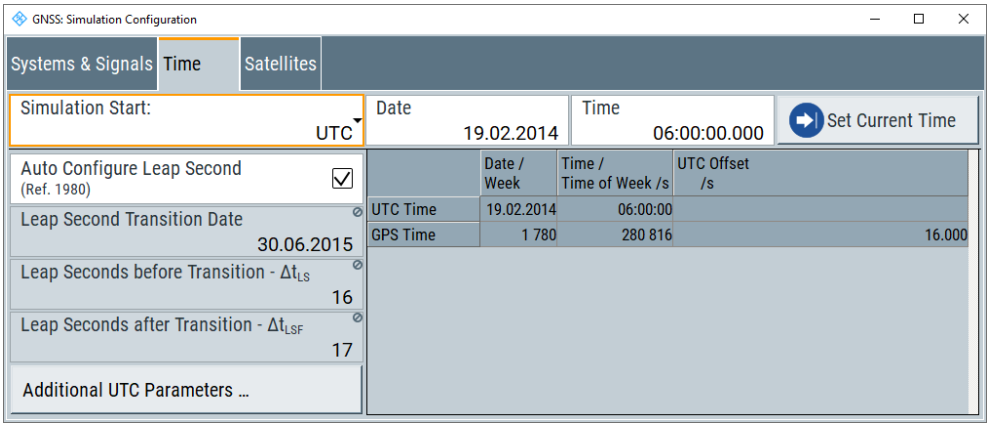
Per default, the time conversion between the time basis excludes conversion errors and drifts between the time basis of the GNSS systems. We recommend that you use the default configuration, without system time offset or time drift.

If you aim to simulate deliberate errors and change the time conversion settings, see:
- "Additional UTC Parameters" on page 23
- Chapter 3.5.5, "Time conversion errors settings", on page 53

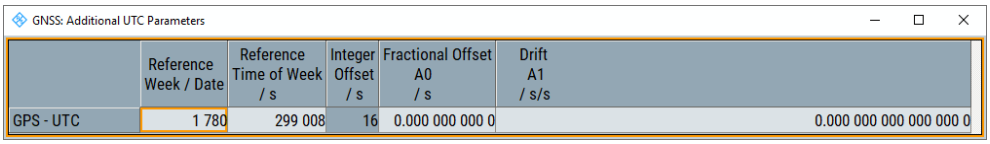
3.2.1 Time configuration settings

Access:

1. Select "GNSS > Simulation Configuration > Time".



2. Select "Additional UTC Parameters".



These dialogs contain the settings required to configure the time conversion from a navigation standard, for example GPS to UTC. The conversion settings are necessary for switching from one timebase to another.

Settings

Simulation Start
Sets the simulation start date and time in the selected format.

"Format" Per default, the UTC format used. If different format is selected, the time is automatically recalculated.

Note: Use the Additional UTC Parameters dialog to configure the parameters, necessary for time conversion between the proprietary time of the navigation standard and the UTC.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:TBASis` on page 84

"Date [yyyy-mm-dd], Time [hh:mm:ss.xxx]"
Enters the date for the simulation in format YYYY-MM-DD (ISO 8601). The date corresponds to the Gregorian calendar and the exact simulation start time in UTC time format.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:DATE` on page 84
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:TIME` on page 85

"Week Number, Time of Week (TOW)"
The satellite clocks in the GPS and Galileo navigation systems are not synchronized to the UTC. They use a proprietary time, the GPS and the Galileo system time. The format used for these systems is week number (WN) and time of week (TOW), that is the simulation start time within this week.
TOW is expressed in number of seconds and covers an entire week. The value is reset to zero at the end of each week.

The weeks are numbered starting from a reference time point (WN_REF=0), that depends on the navigation standard:

- GPS reference point: January 6, 1980 (1980-01-06, 00:00:00 UTC)
- GALILEO reference point: August 22, 1999 (1999-08-22)
- BeiDou reference point: January 01, 2006 (2006-01-01)
- NavIC reference point: August 22, 1999 (1999-08-22)

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:WNUMber` on page 85
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:TOWeek` on page 85

Set Current Time
Applies date and time settings of the operating system to the simulation start time.

Access the operating system time settings via "System Config > Setup > Maintenance > Date / Time".

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:SCTime` on page 84

Leap Second Configuration
Configure leap second transitions for time corrections between UTC system time and the individual GNSS time.

Example: Configuring leap second transition

The examples below comprise leap second transitions before/after the set transition date. Also, the functionality allows you to configure no leap second transition at an arbitrary transition date.

- Leap second transition in the future:
  Set simulation start "Date > 2014-02-19", "Leap Second Transition Date > 2015-06-30", "Leap Second before Transition - Δt_{LS} > 16", "Leap Second after Transition - Δt_{LSF} > 17".
- Leap second transition in the past, no other transition event announced:
  Set simulation start "Date > 2019-12-10", "Leap Second Transition Date > 2016-12-31", "Leap Second before Transition - Δt_{LS} > 17", "Leap Second after Transition - Δt_{LSF} > 18".
- No leap second transition at an arbitrary transition date:
  Set simulation start "Date > 2019-12-10", "Leap Second Transition Date > yyyy-mm-dd", "Leap Second before Transition - Δt_{LS} > 17", "Leap Second after Transition - Δt_{LSF} > 17".

Auto Configure Leap Second (Ref. 1980) ← Leap Second Configuration
Sets the leap second value according to the simulation time.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:AUTO` on page 86

Leap Second Transition Date ← Leap Second Configuration
Editing the parameter requires "Auto Configure Leap Second (Ref. 1980) > Off".

Defines the date of the next UTC time correction in format YYYY-MM-DD (ISO 8601). You can transit leap seconds by adding or subtracting one second to the leap second value before transition.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:DATE` on page 86

Leap Second before Transition - Δt_{LS} ← Leap Second Configuration
Editing the parameter requires "Auto Configure Leap Second (Ref. 1980) > Off".

Specifies the leap second value Δt_{LS} before the leap second transition.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:SEConds:BEFore`
on page 86

Leap Second after Transition - Δt_{LSF} ← Leap Second Configuration
Editing the parameter requires "Auto Configure Leap Second (Ref. 1980) > Off".

Specifies the leap second value Δt_{LSF} after the leap second transition.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:SEConds:AFTer`
on page 86

Date / Week, Time / Time of Week /s, UTC Offset /s
Displays overview information on the parameters used for the time conversion between the different navigation standards.

The basis for the time conversion is the UTC. The parameters of each of the navigation standards are set as an offset to the UTC.

For in-depth configuration, use the "Additional UTC Parameters" on page 23 dialog.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:DATE?` on page 87
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:TIME?` on page 87
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:OFFSet?` on page 88
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:WNUMber?` on page 88
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:TOWeek?` on page 88
`[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:OFFSet?` on page 88
(etc. for the other GNSS systems)

Additional UTC Parameters
Sets the time conversion parameters required for switching from one timebase to another, for example GPS to UTC. The time conversion is performed according to the following equation:

$t_{UTC} = (t_E - delta\_t_{UTC})$ *modulo 86400*, where:
- $delta\_t_{UTC} = delta\_t_{LS}+A_0+A_1 (t_E-T_{ot}+604800(WN-WN_{ot}))$
- $t_E = t_{GPS}$ or $t_{Galileo}$

Reference Week/Date, Reference Time of Week ← Additional UTC Parameters
Sets the reference data and time per navigation standard.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:WNOT` on page 89
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:TOT` on page 90
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:TOT:UNSCaled` on page 90
(etc. for the other GNSS systems)

UTC-UTC(SU) ← Additional UTC Parameters
For GLONASS satellites, indicates the UTC-UTC (SU) time conversion reference date.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:DATE?` on page 89

Integer Offset ← Additional UTC Parameters
Indicates the integer offset.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:IOFFset?` on page 90
(etc. for the other GNSS systems)

Fractional Offset A0, Drift A1 ← Additional UTC Parameters
Sets the time parameters constant term of polynomial, A_0 and 1st order term of polynomial, A_1.

Remote command:
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AZERo on page 91
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AZERo:UNSCaled on page 91
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AONE on page 92
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AONE:UNSCaled on page 92
(etc. for the other GNSS systems)

3.3 Satellite constellation

Single-satellite GNSS signal

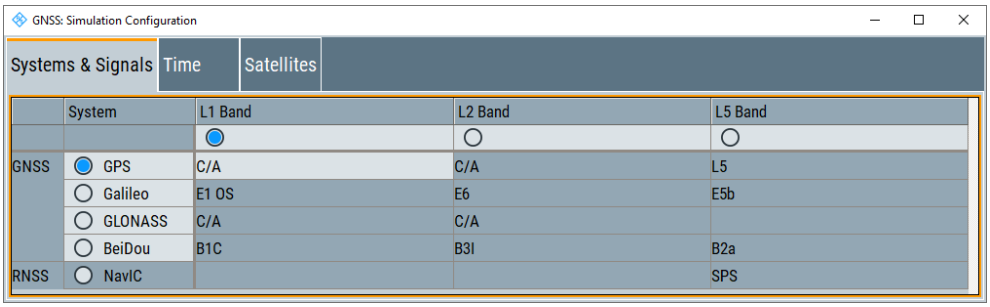
R&S WinIQSIM2 calculates a single satellite GNSS signal, where static satellites with constant Doppler shifts are provided for simple receiver tests, like receiver sensitivity, acquisition, tracking and production tests. Selection and configuration of any localization data, such as receiver location for instance, is not enabled.

A generic workflow is described in Chapter 5, "Generating and playing GNSS waveforms", on page 68.

3.3.1 Systems and signals settings

Access:

1. Select "GNSS" > "Simulation Configuration" > "Systems & Signals".
2. In the dialog, activate frequency bands, systems and their signals.
   Systems mean global navigation satellite systems (GNSS) and regional navigation satellite systems (RNSS).



The figure displays the configuration for a single-satellite signal, i.e. one active GNSS, band and signal.

Settings:

System
Defines the navigation systems that are part of the system configuration, see Chapter 3.3.2, "Satellites settings", on page 28.

The available global, regional and satellite-based navigation and augmentation systems depend on the installed options.

Note: At least one system is always enabled. Switching off a single enabled GNSS is not possible, a warning message is displayed to indicate the situation.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SYSTem:GPS[:STATe]` on page 79
(etc. for the other GNSS systems)

L# Band
Defines the used frequency band "L1/2/5 Band". The satellite signals are modulated on the carrier frequencies as defined for the corresponding frequency band and system.

Table 3-1: Carrier frequencies

System	RF band (signals)	Carrier freq. (MHz)	Required option
GPS	L1 (C/A, L1C) L2 (C/A, L2C) L5 (L5)	1575.42 1227.6 1176.45	R&S Snn-K244 R&S Snn-K298 R&S Snn-K298
Galileo	L1 (E1) L2 (E6) L5 (E5a) L5 (E5b)	1575.42 1278.75 1176.45 1207.14	R&S Snn-K266 R&S Snn-K266 R&S Snn-K266 R&S Snn-K266
GLONASS	L1 (C/A) L1 (CDMA L1) L2 (C/A) L2 (CDMA L2) L5 (CDMA L3)	1602 1600.995 1246 1248.06 1202.025	R&S Snn-K294 R&S Snn-K423 R&S Snn-K294 R&S Snn-K423 R&S Snn-K423
BeiDou	L1 (B1I) L1 (B1C) L2 (B3I) L5 (B2I) L5 (B2a) L5 (B2b)	1561.098 1575.42 1268.52 1207.14 1176.45 1207.14	R&S Snn-K407 R&S Snn-K432 R&S Snn-K432 R&S Snn-K407 R&S Snn-K432 R&S Snn-K432
NavIC	L5 (SPS)	1176.45	R&S Snn-K297

Note: You can only activate one frequency band/signal, which implies that one frequency band/signal is always active. You can change frequency bands/signals via radio buttons.

Remote command:
[:SOURce<hw>]:BB:GNSS:L1Band[:STATe] on page 79
[:SOURce<hw>]:BB:GNSS:L2Band[:STATe] on page 79
[:SOURce<hw>]:BB:GNSS:L5Band[:STATe] on page 79

Signals
Enables the signals per system.

The enabled signals are activated automatically for each SV belonging to the GNSS system. To redefine the signals used by a particular satellite (SV), select "Simulation Configuration > Satellites > GNSS System > SV ID# > SV Config > Signal" > Signal State.

Note: At least one signal is always enabled for active frequency bands and GNSS systems. If switching off the only enabled signal, a warning message is displayed to indicate the situation.

"None" All signals of a GNSS system are disabled assuming, that the GNSS system itself is disabled. All parameters of the GNSS system are disabled, too.
"Signals = None" implies System > "State = Off".

"C/A, L1C, E1 OS, CDMA L1, B1I, B1C, L2C, E6, CDMA L2, B3I, L5, E5a, E5b, CDMA L3, B2I, B2a, B2b, SPS"

Table 3-2: Overview of the supported signals

Band	System	Signal	Minimum required option
L1	GPS	C/A L1C	R&S Snn-K244 R&S Snn-K298
	Galileo	E1 OS	R&S Snn-K266
	GLONASS	C/A CDMA L1[1)]	R&S Snn-K294 R&S Snn-K423
	BeiDou	B1I B1C	R&S Snn-K407 R&S Snn-K432
L2	GPS	C/A L2C	R&S Snn-K244 R&S Snn-K298
	Galileo	E6	R&S Snn-K266
	GLONASS	C/A CDMA L2[1)]	R&S Snn-K294 R&S Snn-K423
	BeiDou	B3I	R&S Snn-K432
L5	GPS	L5	R&S Snn-K298
	Galileo	E5a, E5b	R&S Snn-K266
	GLONASS	CDMA L3	R&S Snn-K423
	BeiDou	B2I B2a B2b[2)]	R&S Snn-K407 R&S Snn-K432 R&S Snn-K432
	NavIC	SPS	R&S Snn-K297

[1)] The modernized GLONASS signals CDMA L1 and CDMA L2 are for experimental use only. Any compliance with GLONASS ICD CDMA open service navigation signal in L1 frequency band or GLONASS ICD CDMA open service navigation signal in L2 frequency band is not guaranteed. See also Table 2-5.

[2)] BeiDou B2b_I I-component of the B2b OS signal for space vehicles PRN 6 to PRN 58. Q-component AS signals including B2b_Q are not supported, see also Table 2-6.

Remote command:

`[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L1Band:CA[:STATe]`

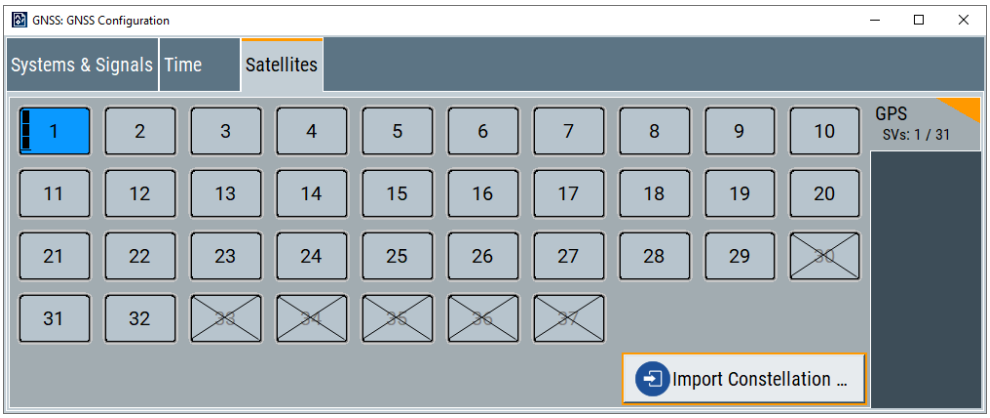
on page 81

(etc. for the other GNSS systems)

3.3.2 Satellites settings

Access:

1. Activate the GNSS system for that you want to configure satellites settings.
   See "System" on page 25.
2. Select "GNSS" > "Simulation Configuration" > "Satellites".



The tab provides settings to select and configure the space vehicle (SV) in the satellite constellation that is a single satellite.
To configure individual SV settings, see Chapter 3.4, "Space vehicle configuration", on page 30.

Understanding satellite constellation characteristics

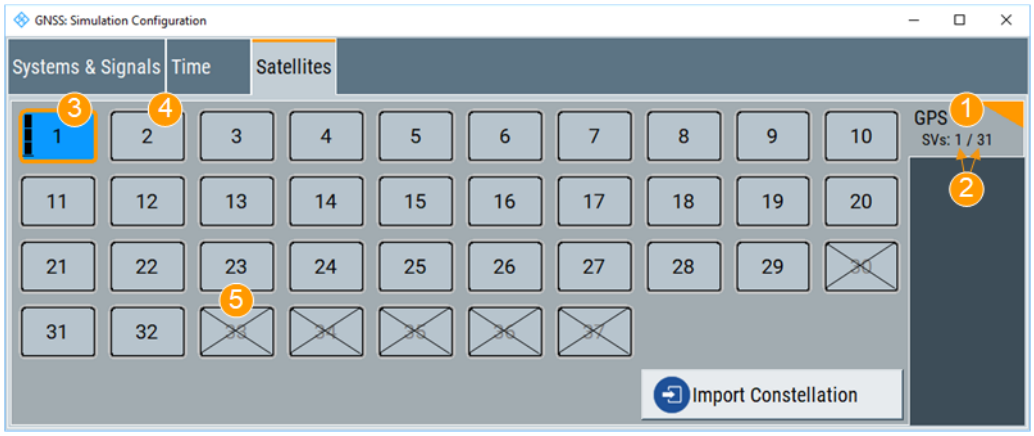


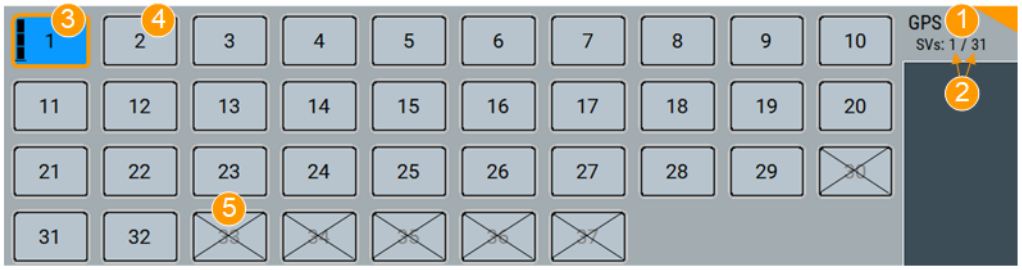
Figure 3-1: Satellite constellation for one GNSS system

1 = Activated GNSS system
2 = Number of active and available SVs of the GNSS system
3 = Visible and active SV, full power level
4 = Not visible and inactive SV
5 = Excluded from the constellation (Present in Constellation = "Off")

An active and visible satellite is indicated with blue color.

Settings:

Satellite's Constellation, SV ID
Indicates the SV IDs included in the current constellation.

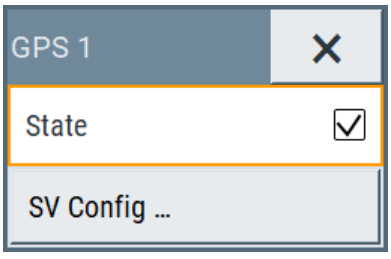


1 = Enabled GNSS system
2 = Number of active and available SVs of the GNSS system
3 = Visible and active SV, full power level
4 = Not visible and inactive SV
5 = Excluded from the constellation (Present in Constellation = "Off")

The information is color-coded. Icons provide further information:

- Blue: active SV ID
- Gray: Inactive SV ID
- Cross out: SV ID is excluded from the constellation, for example if "SV ID > SV Config" > Present in Constellation > "Off"
- Power bar: Reduced height indicates that the signal of the SV ID is transmitted with less power than the value indicated as "Configurable Nav. Message".
  The height of the power bar reflects enabled "Power Offset", "Power Path-Loss" and "Power Offset" of the echoes.

The blocks are interactive. Select an SV ID to access further settings for changing its state, enabling power offset of configuring the orbit simulation and navigation message parameters.



Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID:GPS:LIST:ALL?` on page 97
`[:SOURce<hw>]:BB:GNSS:SVID:GPS:LIST[:VALid]?` on page 97
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:HEALthy` on page 98
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:VISibility:STATe?` on page 99
(etc. for the other GNSS systems)

State (SV ID) ← Satellite's Constellation, SV ID
Changes the SV ID state on-the-fly.

Per default, only visible satellites can be included in the constellation. SV ID for that Present in Constellation > "Off" cannot be activated.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:STATe` on page 106
(etc. for the other GNSS systems)

SV Config ← Satellite's Constellation, SV ID
Access a dialog with further settings for configuring the orbit simulation and navigation message parameters.

See:
- Chapter 3.4, "Space vehicle configuration", on page 30
- Chapter 3.5, "Perturbations and errors simulation", on page 37

Import Constellation
Opens the "Import Constellation" dialog that is a standard "File Select" dialog.

You can select, for example, almanac or RINEX files. See also:
- "File formats" on page 62.
- Chapter 3.6.1, "Import constellation settings", on page 64.

3.4 Space vehicle configuration

Satellite constellation recalculation
If you change settings of the space vehicle configuration, e.g., simulated orbit or simulated clock settings, the satellite constellation is recalculated accordingly. Recalculation interrupts the simulation of the satellite constellation as long as the recalculation process takes.

During longer calculation times, the R&S WinIQSIM2 shows a "Busy" state.

In this section, configure individual settings and modulation control settings for signals and navigation message of a single-satellite system.

Access:

1. Select "GNSS > Simulation Configuration > Satellites".
2. Select "SV# > SV Config".

   The "SV Configuration" dialog of the selected satellite opens.

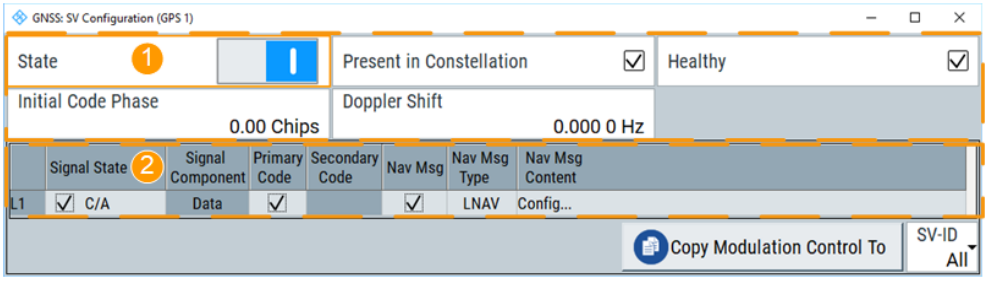


Figure 3-2: SV configuration settings

1 = Individual satellite settings
2 = Modulation control settings

Settings:

3.4.1 Individual satellite settings

Comprises the settings of the selected satellite.

Settings

State (SV ID)
Changes the SV ID state on-the-fly.

Per default, only visible satellites can be included in the constellation. SV ID for that Present in Constellation > "Off" cannot be activated.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:STATe` on page 106
(etc. for the other GNSS systems)

Present in Constellation
If disabled, the SV ID is excluded from the currents constellation. The SV ID is automatically deactivated ("SV ID > State = Off").

In the "Satellites" dialog, SV IDs that are excluded from the constellation are displayed in gray color and are crossed out.

To reactivate such satellite, set "Present in Constellation > On" and activate it ("State > On")

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:PRESent on page 107
(etc. for the other GNSS systems)

Healthy
Defines if the SV ID is healthy or not. A warning symbol indicates an unhealthy satellite.

The healthy state reflects the value of the corresponding healthy flag in the navigation message. The healthy flag and the healthy state are interdependent; changing one of them changes the other.

See:
- GPS > Additional Data > "SV Health" and "L1/L2/L5 Health"
- GLONASS > Additional Data > "SV Health"
- Galileo > Additional Data > "$E1B_{DVS}$/$E5b_{DVS}$/$E1B_{HS}$/$E5b_{HS}$"
- BeiDou > Additional Data > "SV Health"

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:HEALthy on page 98
(etc. for the other GNSS systems)

Initial Code Phase
Sets the initial code phase. In R&S WinIQSIM2, the actual simulated resolution for initial code phase depends on the sample rate.

To increase the sample rate, use the Oversampling function.

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:ICPHase on page 108
(etc. for the other GNSS systems)

Doppler Shift
Sets the Doppler shift for a constant signal profile of the simulated signal of the satellite. The simulation of Doppler shifted signals can be used to check the receiver characteristics under more realistic conditions than with zero Doppler.

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:DSHift on page 108
(etc. for the other GNSS systems)

Frequency Number
For GLONASS satellites, indicates the frequency number of the subcarrier used to modulate the GLONASS satellite.

If "Nav Msg Type = NAV", the frequency number is retrieved from the imported configuration file.

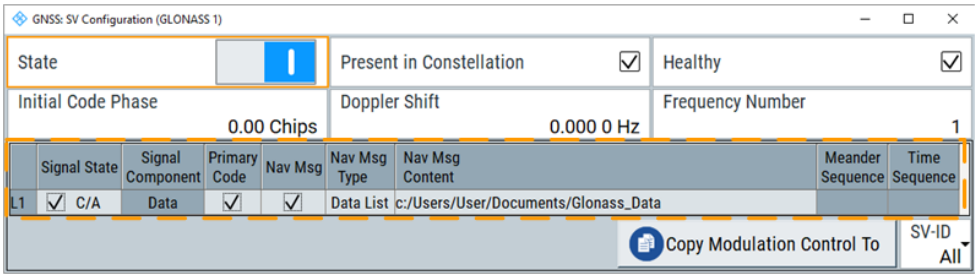
The value is configurable, if arbitrary data is used, e.g. "Nav Msg Content > Config" and "Nav Msg Type > All 0".

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:FNUMber on page 107

3.4.2 Modulation control settings

Access:

1. Select "GNSS > Simulation Configuration > Signals&Systems".
2. Enable the GNSS system for that you want to control the signal modulation, for example:
   "System > GLONASS > On"
3. Select "GNSS > Simulation Configuration > Satellites".
4. Select "GLONASS > SV# > SV Config".
5. To generate a signal with list mode data, sent on the GLONASS frequency, select:
   a) "Primary Code > Off"
   b) "Nav Msg > On"
   c) "Nav Msg Type > Data List"
   d) Load list mode data, e.g. from the file `Glonass_Data.dm_iqd`:
   "Nav Msg Content > /var/user/Glonass_Data"
   e) "Meander Sequence > Off"
   f) "Time Sequence > Off"
6. To apply the modulation control settings of the current satellite to other SV ID, select for example "SV-ID = All" and "Copy Modulation Control To"



Available modulation control settings depend on the GNSS system and selected RF band.
The remote commands required to define these settings are described in Chapter 6.5, "Signals per satellite", on page 101.

Settings:

SV signal configuration table
Table with one or more rows, one row per enabled signal ("Simulation Configuration > Systems&Signals" > Signals).

Signal State ← SV signal configuration table
Activates the selected signal.

The available signals depend on GNSS system and the configuration in the Systems&Signals dialog.

At least one signal has to be activated per satellite. Activate another signal to deactivate a particular signal, if it is the only one active at that moment.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA[:STATe]` on page 108
(etc. for the other GNSS systems)

Signal Component ← SV signal configuration table
Indicates the signal content (data only or data and pilot).

The information is retrieved automatically from the selected simulation data source file. Signal components depend on the signal, the frequency band and the GNSS system.

Remote command:
n.a.

Primary Code ← SV signal configuration table
Enables the primary code to spread the data and pilot components.

If your interference tests require the generation of a continuous wave signal send on the same frequency as a specific SV, set "Primary Code > Off" and "Nav Msg Control > Off".

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:PCODe[:STATe]` on page 111
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:PILot:PCODe[:STATe]` on page 111
(etc. for the other GNSS systems)

Secondary Code ← SV signal configuration table
Enables the secondary code in the pilot and data channel of GPS, Galileo or BeiDou.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:L1C:PILot:SCODe[:STATe]` on page 112
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:SCODe[:STATe]` on page 112

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:PILot:SCODe[:STATe] on page 112
(etc. for the other GNSS systems)

Nav Msg ← SV signal configuration table
Defines whether the navigation message parameters can be changed or not.

"On" Enables configuration of the navigation message parameters ("Nav Msg Type = xNav") or configuration of user-defined data ("Nav Msg Type ≠ xNav").

"Off" Navigation message is disabled.

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage[:STATe] on page 109
(etc. for the other GNSS systems)

Nav Msg Type ← SV signal configuration table
Sets the data source used for the generation of the navigation message.

"LNAV/CNAV/FNAV/INAV/D1NAV/D2NAV/NAV"
The navigation message parameters are "real" since they are retrieved from the loaded simulation data source file, see Import Constellation.
"D1NAV" denotes navigation messages belonging to BeiDou medium-altitude earth orbit (MEO) satellites (SV ID 6 to SV ID 35).
"D2NAV" denotes navigation messages belonging to BeiDou geostationary (GEO) satellites and inclined geostationary (IGSO) satellites (SV ID 1 to SV ID 5).
Note: Galileo E6 signals carry no real navigation data. The signals are simulated using data sources "PRBSxx/Data List/Pattern/Zero NAV".
To change the automatically filled in values, select Nav Msg Content > Config.

"PRBSxx/Data List/Pattern"

Selects a configurable data source.
The data symbols from the data source are transmitted in the navigation message. The signal is sufficient for simple functional tests and sensitivity tests.

The following standard data sources are available:

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

  See also section "Custom Digital Modulation > Data Source" in the R&S WinIQSIM2 user manual.

"Zero NAV" Sets the broadcasted orbit and clock correction parameters in the navigation message to zero. Frame structure, timing and channel coding of the navigation message are retained.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:TYPE` on page 114
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:DSELect` on page 115
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:PATTern` on page 116
(etc. for the other GNSS systems)

Nav Msg Content ← SV signal configuration table
Opens the "Navigation Message" dialog, where you can observe the navigation message parameter and if enabled, change them.

See Chapter 3.5, "Perturbations and errors simulation", on page 37.

Meander Sequence ← SV signal configuration table
Enables meandering of GLONASS satellite navigation signals, i.e. doubling the data rate.

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:MEANdering[:STATe] on page 116
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:MEANdering[:STATe] on page 116

Time Sequence ← SV signal configuration table
Enables the time signal component of GLONASS satellite navigation signals.

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:TSEQuence[:STATe] on page 117
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:TSEQuence[:STATe] on page 117

Copy Modulation Control Settings to,SV-ID
Applies the power settings of the current satellite to the selected or to all SV-IDs of the same GNSS system.

The following settings are considered:
- Signal State
- Primary Code
- Secondary Code
- Nav Msg
- Nav Msg Type
- Meander Sequence
- Time Sequence

Remote command:
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:MCONtrol:COPY:SVID on page 117
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:MCONtrol:COPY:EXECute on page 118
(etc. for the other GNSS systems)

3.5 Perturbations and errors simulation

Real receivers experience also perturbations such as noise, interfering signals, atmospheric effects and ionospheric errors. Other signal errors are caused by satellite orbit and clock errors. The errors remain non-corrected despite the corrections in the broadcasted navigation message.

To simulate even more challenging conditions, you can add deliberate signal errors by manipulating the navigation messages of the satellites. Perturbations of the signal and signal errors of any kind have a direct impact on the receiver's positioning accuracy.

The following sections illustrate error sources and settings necessary to simulate errors.

3.5.1 About error sources

You can observe the effect of the following common error sources on the receiver's positioning accuracy:

- Atmospheric (ionospheric and tropospheric) errors

  See:

  – Chapter 3.5.1.1, "About the atmospheric effects", on page 38.
- Difference between the atmospheric condition at the ground station and the receiver, simulated as difference in the simulated ionospheric model and the broadcasted ionospheric parameters in the navigation message
  See "About simulating errors" on page 41
- Additive noise and CW interferer
- Satellite orbit and orbit perturbation errors (ephemeris errors)

  See:

  – Chapter 3.5.1.2, "About orbit and orbit perturbation parameters and errors", on page 39.
  – Chapter 3.5.3, "Orbit and orbit perturbation errors settings", on page 44.
- Satellite clock and time conversion errors, like system time drifts due to difference in the time conversion sets

  See:

  – Chapter 3.5.1.3, "About clock and time conversion parameters and errors", on page 40.
  – Chapter 3.5.5, "Time conversion errors settings", on page 53.

3.5.1.1 About the atmospheric effects

When traveling thought the atmosphere, the satellite signal experiences changes in speed and direction. While the increased travel time due to signal refraction is insignificant, the variation in the signal propagation speed causes pseudorange measurement errors.

Tropospheric effects

The troposphere is the lower atmosphere layer that comprises rain, snow, clouds, etc. and affects the GNSS signals' propagation. GNSS signals experience a variable path delay, caused mainly by the dry atmosphere. The magnitude of this delay depends on the pressure, humidity, temperature and the location of the receiver and the satellite.

Ionospheric effects

The magnitude of ionospheric effects depends geographical location of the receiver, the hour of day and the solar activity.

Ionospheric effects are frequency-dependent and can be counteracted by frequency measurements. For single frequency receivers, the navigation message contains a set of parameters that describes an ionospheric prediction model with the goal to remove the ionospheric effect.

Tropospheric and ionospheric models

The simulation of atmospheric effects based on tropospheric and ionospheric models is not performed by R&S WinIQSIM2. Use a GNSS simulator for this purpose, e.g. the R&S SMW200A. However, R&S WinIQSIM2 offers configuration of ionospheric parameters within the navigation message.

Ionospheric model vs. ionospheric parameters in the navigation message

The ionospheric model defines the satellite to receiver channel, whereas the ionospheric navigation parameters define what the satellites are transmitting (broadcasting) as ionospheric correction parameters.

See also Chapter 3.5.2, "Ionospheric errors settings", on page 41.

3.5.1.2 About orbit and orbit perturbation parameters and errors

The different GNSS systems use specific approach to describe the satellite's orbit and orbit perturbations.

In GPS, Galileo, BeiDou and QZSS systems, the orbit description is based on the first approximation of 16 Keplerian parameters. The navigation message of a GPS satellite thus carries the reference time of ephemeris t_{0e}, six orbit elements and three rate parameters describing the linear time-dependent changes [1].

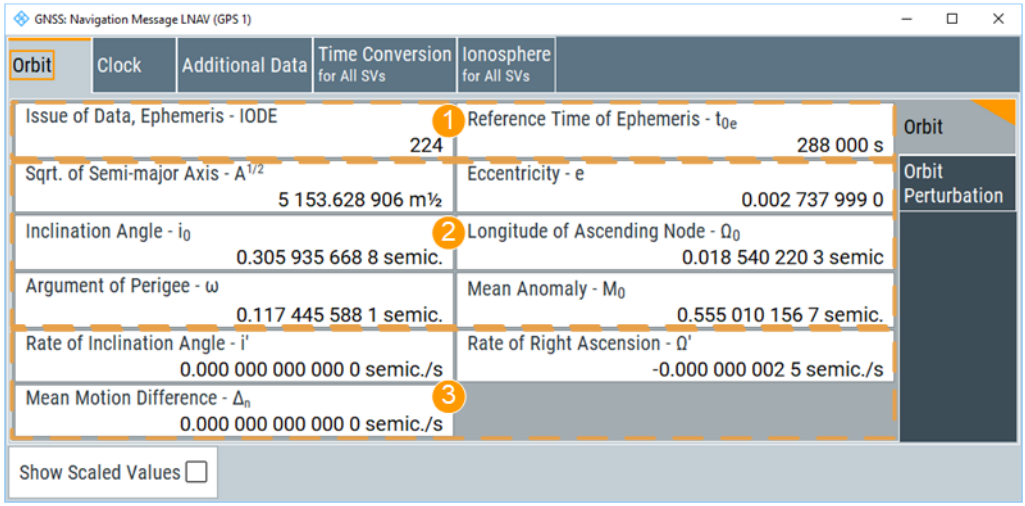


Figure 3-3: Satellite orbit (GPS): Understanding the displayed information

1 = Issue of data, IODE and reference time, t_{0e}
2 = Orbit elements
3 = Rate parameters

In GPS, Galileo, BeiDou and QZSS, the perturbations are seen as variations of the orbital elements. In the navigation message, they are described by three pairs of sinusoidal (cosine and sine) corrections C_C and C_S. Each pair describes the difference in latitude C_U, orbital radius C_r and inclination C_i.

GLONASS satellites broadcast their PZ coordinates and velocity at reference epoch time t_b as well as the moon and sun acceleration components [1].

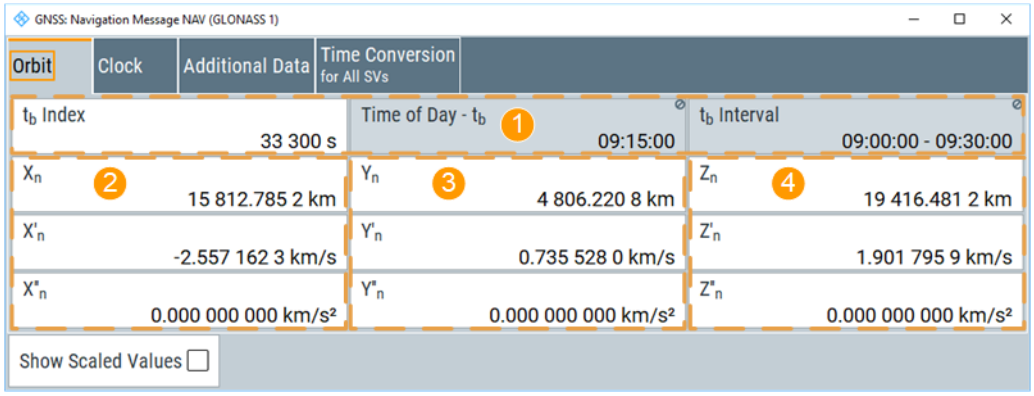


Figure 3-4: Satellite orbit (GLONASS): Understanding the displayed information

1 = Reference epoch, t_b; orbit parameters are given at t_b
2 = Coordinates in PZ-90
3 = Velocity component
4 = Moon and sun acceleration

3.5.1.3 About clock and time conversion parameters and errors

Clock and time conversion errors

Satellites and receivers can suffer from timing errors. Although satellites are equipped with atomic clocks, there is always a clock offset due to:

- Clock drift between the different SVs.
- Misalignment in the time bases of the different GNSS systems.

The clock in the receiver is usually less precise and is hence a prone to an additional drift.

To counteract the drifts in the satellites and GNSS systems time, the navigation message contains satellite clock offset and time conversion parameters, see "Satellite clock parameters" on page 40.

The receiver clock synchronization errors are estimated and compensated during the positioning measurements, because the receiver clock offset is a constant value present in the measurements of all satellites.

Satellite clock parameters

Satellite clock offset $\Delta Clock_{SV}$ is described by a second order polynomial given as follows:

$\Delta Clock_{SV} = a_{f0} + a_{f1}(t - t_{0c}) + a_{f2}(t - t_{0c})^2$, where:

- t_{0c} is the reference time of clock
- a_{f0}, a_{f1} and a_{f2} are three coefficients that are broadcasted in the navigation message.

Polynomial coefficients

In GPS, Galileo, BeiDou and QZSS, polynomial coefficients are:

- a_{f0}: SV clock offset
- a_{f1}: SV clock drift
- a_{f2}: SV clock drift rate

GLONASS considers the first order version of the polynomial (i.e. $a_{f2} = 0$) and transmits only two clock parameters:

- T_n: SV clock offset, where:
  $a_{f0} = -T_n$
- Γ_n: SV relative frequency offset
  $a_{f1} = \Gamma_n$

3.5.1.4 Simulating errors

Per default, the broadcasted navigation message parameters per SV are set automatically to match the simulated orbit, clock and pseudorange parameters. For example, the clock parameters in the navigation message of GPS SV ID #1 resemble the simulated clock values for this satellite.

About simulating errors

Errors are deviations between the simulated and broadcasted navigation message parameters. Changing the default navigation message values leads to deviation between the simulated and the broadcasted navigation information and thus deliberated errors. To simulate clock errors, change for example, the parameter a_{f0} in the broadcasted navigation message of SV#1 but maintain the a_{f0} value of the simulated clock.

You can also simulate unusual stations, like, for example, the wrongly broadcasted clock bias between UTC and GPS system clocks. Such situations are simulated by configuring different time conversion sets for the UTC-GPS conversion parameters in the broadcasted navigation message and in the simulated UTC time parameters.

3.5.2 Ionospheric errors settings

Access:

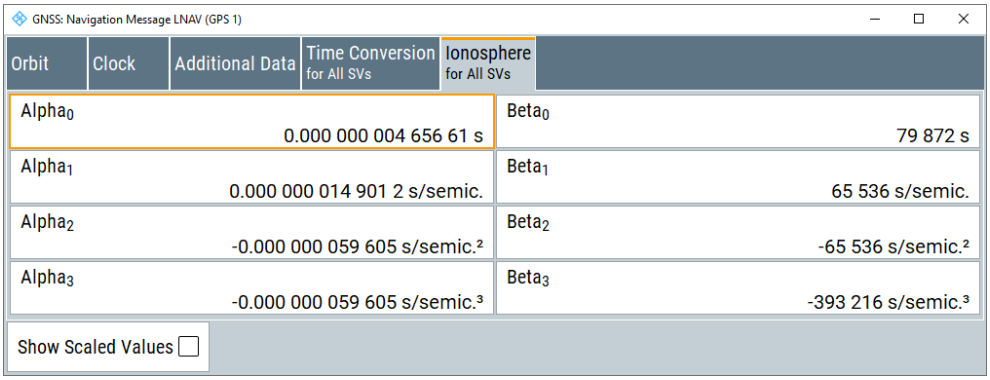
1. Select "GNSS > Simulation Configuration > Satellites".

In the "Satellites" dialog, the single satellite constellation of the GNSS system is displayed.

2. To configure the ionospheric navigation parameters that define what the satellites are transmitting as **ionospheric correction parameters**, set the ionospheric parameters on the navigation message of the particular GNSS system:

   a) Select "SV# > SV Config > Signals Configuration".
   Ionospheric parameters are common for all SV of one GNSS system. To change them, apply the same configuration to all SVs.
   b) Select "SV# > SV Config" > **"Copy Modulation Control to SVI-ID = All"**.
   c) Select **"Nav Msg Content > Config > Ionosphere"**.

   Per default, the navigation message parameters are set to values corresponding to the values retrieved from the single constellation data source.



   Changing these values leads to deviation between the simulated and the broadcasted navigation message and thus deliberated errors.

   Available navigation message parameters depend on the GNSS system and selected navigation message type.
   - The ionospheric model for GLONASS is not yet specified; its satellites transmit no data on the atmosphere.
   - GPS, Galileo and BeiDou assume specific ionospheric models. These systems transmit different atmospheric navigation parameters.

Settings

GPS > Ionosphere
Comprises the parameters of the GPS satellites.

Table 3-3: LNAV and CNAV

Parameter	Remote command:
"$Alpha_0$" to "$Alpha_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:ALPHa<ch0> on page 171
"$Beta_0$" to "$Beta_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:BETA<ch0> on page 172

Galileo > Ionosphere

Comprises the parameters of the Galileo satellites.

Table 3-4: INAV and FNAV

Parameter	Remote command:
"a_{i0}" to "a_{i2}"	[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:INAV:IONospheric:AI<ch0> on page 171
"SF_1" to "SF_5"	[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:INAV:IONospheric:SF<ch> on page 172

BeiDou > Ionosphere

Comprises the parameters of the BeiDou satellites.

Table 3-5: DNAV and CNAV

Parameter	Remote command:
"$Alpha_0$ - $Alpha_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:ALPHa<ch0> on page 171
"$Beta_0$ - $Beta_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:BETA<ch0> on page 172

NavIC > Ionosphere

Comprises the parameters of the NavIC satellites.

Parameter	Remote command:
"$Alpha_0$" to "$Alpha_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:ALPHa<ch0> on page 171
"$Beta_0$" to "$Beta_3$"	[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:BETA<ch0> on page 172

Show Scaled Values

Switches between scaled and unscaled values representation.

Navigation message values are recalculated automatically.

Remote command:
[:SOURce<hw>]:BB:GNSS:SSValues on page 135

3.5.3 Orbit and orbit perturbation errors settings

Access:

1. Select "Simulation Configuration > Satellites".
2. Select the GNSS system for that you want simulate system errors, for example GPS.
3. Select "SV# > SV Config > Signals Configuration".
4. Select real navigation data as data source.
   For example, for a GPS SV ID, select **"Nav Msg Type > LNAV"**.
5. Select **"Nav Msg Content > Config > Orbit"**.

   Per default, the navigation message parameters are set to values corresponding to the values retrieved from the constellation data source.

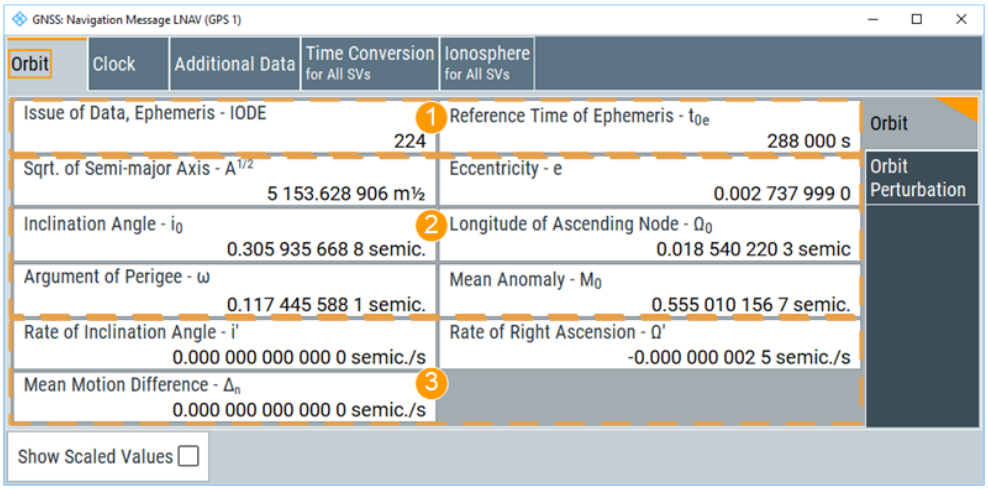


Figure 3-5: Satellite orbit: Understanding the displayed information

1 = Issue of data, IODE and reference time, t_{0e}
2 = Orbit elements
3 = Rate parameters

Changing these values leads to deviation between the simulated and the broadcasted navigation message and thus deliberated errors. The generated signal can be used for testing the receiver's ability to cope with errors.
Available navigation message parameters depend GNSS system and selected navigation message type, see Chapter 3.5.1.2, "About orbit and orbit perturbation parameters and errors", on page 39.

Settings

GPS > Orbit

Comprises the orbit parameters of the GPS satellites.

Table 3-6: LNAV and CNAV

Parameter	Remote command:
"Reference Time of Ephemeris - t_{0e}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:TOE` on page 136
"Square Root of Semi-Major Axis - $A^{1/2}$"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SQRA` on page 137
"Eccentricity - e"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ECCentricity` on page 138
"Inclination Angle - i_0"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IZERo` on page 138
"Longitude of Ascending Node - Ω_0"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OZERo` on page 139
"Argument of Perigee - ω"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OMEGa` on page 140
"Mean Anomaly - M_0"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:MZERo` on page 140
"Rate of Inclination Angle - i'"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IDOT` on page 141
"Rate of Right Ascension - Ω'"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ODOT` on page 142

Table 3-7: LNAV

Parameter	Remote command:
"Issue of Data, Ephemeris - IODE"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IODE` on page 135
"Mean Motion Difference - Δ_n"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:NDELta` on page 143

Table 3-8: CNAV

Parameter	Remote command:
"Rate of Right Ascension Diff. - ΔΩ'"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DODot` on page 142
"Mean Motion Difference - Δ_{n0}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NDELta` on page 143

Parameter	Remote command:
"Rate of Mean Motion Diff. - Δ_{n0}'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DNDot on page 143
"Change Rate in Semi-major Axis - A'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADOT on page 143
"Semi-Major Axis Difference - ΔA"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADELta on page 144

GPS > Orbit Perturbation

Comprises the parameters of the GPS satellites.

Table 3-9: LNAV and CNAV

Parameter	Remote command:
"Cosine Difference of Latitude - C_{uc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUC on page 146
"Sine Difference of Latitude - C_{us}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUS on page 147
"Cosine Difference of Orbital Radius - C_{rc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRC on page 148
"Sine Difference of Orbital Radius - C_{rs}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRS on page 149
"Cosine Difference of Inclination - C_{ic}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIC on page 149
"Sine Difference of Inclination - C_{is}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIS on page 150

Galileo > Orbit

Comprises the parameters of the Galileo satellites.

Table 3-10: INAV and FNAV

Parameter	Remote command:
"IODnav"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IODNav on page 135
"Reference Time of Ephemeris - t_{0e}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:TOE on page 136
"Square Root of Semi-Major Axis - $A^{1/2}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SQRA on page 136
"Eccentricity - e"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ECCentricity on page 137
"Inclination Angle - i_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IZERo on page 138
"Longitude of Ascending Node - Ω_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OZERo on page 139
"Argument of Perigee - ω"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OMEGa on page 139

Parameter	Remote command:
"Mean Anomaly - M_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:MZERo on page 140
"Rate of Inclination Angle - i'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IDOT on page 141
"Rate of Right Ascension - Ω'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ODOT on page 141
"Mean Motion Difference - Δ_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:NDELta on page 142

Galileo > Orbit Perturbation

Comprises the parameters of the Galileo satellites.

Table 3-11: INAV and FNAV

Parameter	Remote command:
"Cosine Difference of Latitude - C_{uc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUC on page 146
"Sine Difference of Latitude - C_{us}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUS on page 147
"Cosine Difference of Orbital Radius - C_{rc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRC on page 147
"Sine Difference of Orbital Radius - C_{rs}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRS on page 148
"Cosine Difference of Inclination - C_{ic}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIC on page 149
"Sine Difference of Inclination - C_{is}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIS on page 150

GLONASS > Orbit

Comprises the parameters of the GLONASS satellites.

See also Chapter 3.5.1.2, "About orbit and orbit perturbation parameters and errors", on page 39.

Parameter	Remote command:
"t_b Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINDex on page 144
"Time of Day - t_b / t_b Interval"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TOE? on page 144 [:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINTerval? on page 144
"X_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XN on page 145
"Y_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YN on page 145

Parameter	Remote command:
"Z_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZN on page 145
"X'_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDN on page 145
"Y'_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDN on page 145
"Z'_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDN on page 145
"X''_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDDN on page 146
"Y''_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDDN on page 146
"Z''_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDDN on page 145

BeiDou > Orbit

Comprises the parameters of the BeiDou satellites.

Table 3-12: DNAV and CNAV

Parameter	Remote command:
"AODE"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IODE on page 135
"Reference Time of Ephemeris - t_{0e}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:TOE on page 136
"Square Root of Semi-Major Axis - $A^{1/2}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:SQRA on page 137
"Eccentricity - e"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ECCentricity on page 137
"Inclination Angle - i_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IZERo on page 138
"Longitude of Ascending Node - Ω_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OZERo on page 139
"Argument of Perigee - ω"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OMEGa on page 140
"Mean Anomaly - M_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:MZERo on page 140
"Rate of Inclination Angle - i'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IDOT on page 141
"Rate of Right Ascension - Ω'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ODOT on page 142
"Mean Motion Difference - Δ_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:NDELta on page 143

BeiDou > Orbit Perturbation

Comprises the parameters of the BeiDou satellites.

Table 3-13: DNAV and CNAV

Parameter	Remote command:
"Cosine Difference of Latitude - C_{uc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUC on page 146
"Sine Difference of Latitude - C_{us}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUS on page 147
"Cosine Difference of Orbital Radius - C_{rc}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRC on page 148
"Sine Difference of Orbital Radius - C_{rs}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRS on page 148
"Cosine Difference of Inclination - C_{ic}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIC on page 149
"Sine Difference of Inclination - C_{is}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIS on page 150

NavIC > Orbit

Comprises the orbit parameters of the NavIC satellites.

Parameter	Remote command:
"Issue of Data, Ephemeris & Clock - IODEC"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IODE on page 135
"Reference Time of Ephemeris - t_{0e}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:TOE on page 136
"Square Root of Semi-Major Axis - $A^{1/2}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:SQRA on page 136
"Eccentricity - e"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ECCentricity on page 137
"Inclination Angle - i_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IZERo on page 138
"Longitude of Ascending Node - Ω_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OZERo on page 138
"Argument of Perigee - ω"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OMEGa on page 139
"Mean Anomaly - M_0"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:MZERo on page 140
"Rate of Inclination Angle - i'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IDOT on page 141
"Rate of Right Ascension - Ω'"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ODOT on page 141
"Mean Motion Difference - Δ_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:NDELta:UNSCaled on page 142

NavIC > Orbit Perturbation
Comprises the parameters of the NavIC satellites.

Parameter	Remote command:
"Cosine Difference of Latitude - C_{uc}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUC` on page 146
"Sine Difference of Latitude - C_{us}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUS` on page 147
"Cosine Difference of Orbital Radius - C_{rc}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRC` on page 147
"Sine Difference of Orbital Radius - C_{rs}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRS` on page 148
"Cosine Difference of Inclination - C_{ic}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIC` on page 149
"Sine Difference of Inclination - C_{is}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIS` on page 149

Show Scaled Values
Switches between scaled and unscaled values representation.

Navigation message values are recalculated automatically.

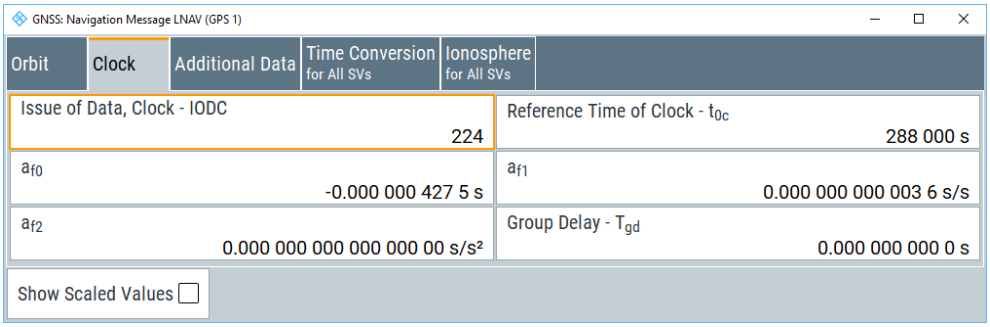
Remote command:
`[:SOURce<hw>]:BB:GNSS:SSValues` on page 135

3.5.4 Clock errors settings

Access:

1. Select "Simulation Configuration > Satellites > GNSS system > SV# > SV Config > Signals Configuration".
2. Select **"Nav Msg Content > Config > Clock"**.

   Per default, the navigation message parameters are set to values corresponding to the values retrieved from the constellation data source.



Changing these values leads to deviation between the simulated and the broadcasted navigation message and thus deliberated errors. The generated signal can be used for testing the receiver's ability to cope with errors.
Available navigation message parameters depend GNSS system and selected navigation message type, see Chapter 3.5.1.3, "About clock and time conversion parameters and errors", on page 40.

Settings

GPS > Clock

Comprises the parameters of the GPS satellites.

Table 3-14: LNAV and CNAV

Parameter	Remote command:
"Reference Time of Clock - t_{0c}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TOC` on page 151
"a_{f0}" to "a_{f2}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:AF<s2us0>` on page 152
"Group Delay - T_{gd}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TGD` on page 152

Table 3-15: LNAV

Parameter	Remote command:
"Issue of Data, Clock - IODC"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IODC` on page 150

Table 3-16: CNAV

Parameter	Remote command:
"$ISC_{L1C/A}$"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L1CA` on page 153
"ISC_{L2C}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L2C` on page 153
"ISC_{L5I5}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5I` on page 153
"ISC_{L5Q5}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5Q` on page 152

Galileo > Clock

Comprises the clock parameters of the Galileo satellites.

Table 3-17: INAV and FNAV

Parameter	Remote command:
"Time of Clock - t_{0c} (E1-E5A)"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:TOC` on page 151
"a_{f0} (E1-E5A)" to "a_{f2} (E1-E5A)"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:AF<s2us0>` on page 151
"Broadcast Group Delay - BGD (E1-E5A)"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDA` on page 153

Table 3-18: INAV

Parameter	Remote command:
"Broadcast Group Delay - BGD (E1-E5B)"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDB` on page 153

GLONASS > Clock

Comprises the parameters of the GLONASS satellites.

Parameter	Remote command:
"Time of Day - t_b"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TOE?` on page 144
"t_b Interval"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINTerval?` on page 144
"τ_n ($-a_{f0}$)"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:TAUN` on page 153
"γ_n (a_{f1})"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:GAMN` on page 154
"$\Delta\tau_n$ (T_{gd})"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:DTAU` on page 154

BeiDou > Clock

Comprises the parameters of the BeiDou satellites.

Table 3-19: DNAV and CNAV

Parameter	Remote command:
"ReferenceTime of Clock - t_{0c}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TOC` on page 151
"a_{f0}" to "a_{f2}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:AF<s2us0>` on page 151

Table 3-20: DNAV

Parameter	Remote command:
"AODC"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IODC` on page 150
"Group Delay B1| - T_{GD1}", "Group Delay B2| - T_{GD2}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TGD<s2us>` on page 152

Table 3-21: CNAV

Parameter	Remote command:
"Group Delay - T_{gd}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:TGD` on page 152

NavIC > Clock
Comprises the parameters of the NavIC satellites.

Parameter	Remote command:
"Reference Time of Clock - t_{0c}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TOC` on page 150
"a_{f0}" to "a_{f2}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:AF<s2us0>` on page 151
"Group Delay - T_{gd}"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TGD` on page 152

Show Scaled Values
Switches between scaled and unscaled values representation.

Navigation message values are recalculated automatically.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SSValues` on page 135

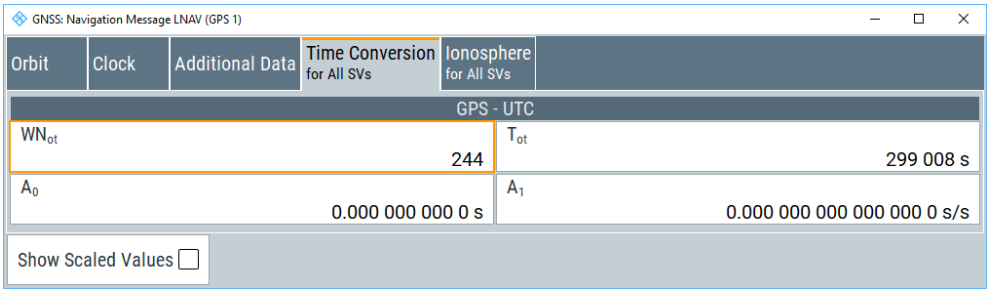
3.5.5 Time conversion errors settings

Access:

1. Select "Simulation Configuration > Satellites > GNSS system > SV# > SV Config > Signals Configuration".
2. Select **"Nav Msg Content > Config > Time Conversion"**.

   Time conversion parameters are read-only and common for all SV of one GNSS system.
3. To change the time conversion parameters of all GPS SVs for example, select "SV# > SV Config" > **"Copy Modulation Control to SV-ID = All"**.

   Per default, the navigation message parameters are set to values corresponding to the values retrieved from the constellation data source.



Changing these values leads to deviation between the simulated and the broadcasted navigation message and thus deliberated errors.
Available navigation message parameters depend GNSS system and selected navigation message type.

Settings

GPS > Time Conversion

Comprises the parameters of the GPS satellites.

Table 3-22: GPS - UTC (LNAV and CNAV)

Parameter	Remote command:
"W_{Not}"	`[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:WNOT` on page 162
"T_{ot}"	`[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:TOT` on page 163
"A_0"	`[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AZERo` on page 165
"A_1"	`[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AONE` on page 164

Table 3-23: GPS - UTC (CNAV)

Parameter	Remote command:
"A_2"	`[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:ATWO` on page 163

Table 3-24: GPS - Galileo (CNAV)

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:WNOT on page 167
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:TOT on page 168
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AZERo on page 168
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AONE on page 169
"A_2"	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:ATWO on page 169

Table 3-25: GPS - GLONASS (CNAV)

Parameter	Remote command:
W_{Not}	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:WNOT on page 169
T_{ot}	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:TOT on page 169
A_0	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AZERo on page 170
A_1	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AONE on page 170
A_2	[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:ATWO on page 170

Galileo > Time Conversion

Comprises the parameters of the Galileo satellites.

Table 3-26: Galileo - UTC (INAV and FNAV)

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:WNOT on page 162
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:TOT on page 163
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AZERo on page 165
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AONE on page 164

Table 3-27: Galileo - GPS (INAV and FNAV)

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:WNOT on page 165
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:TOT on page 166
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AZERo on page 166
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AONE on page 167

GLONASS > Time Conversion

Comprises the parameters of the GLONASS satellites.

Parameter	Remote command:
"τ_c ($-A_0$)"	[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AZERo on page 165
"γ_n (A_1)"	[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AONE on page 164
"τ_{GPS} (A_0)"	[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:GPS:AZERo on page 166

BeiDou > Time Conversion

Comprises the parameters of the BeiDou satellites.

Table 3-28: BeiDou - UTC (DNAV and CNAV)

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:WNOT on page 162
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:TOT on page 163
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AZERo on page 165
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AONE on page 164

Table 3-29: BeiDou - GPS (DNAV and CNAV)

Parameter	Remote command:
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AZERo on page 166
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AONE on page 167

Table 3-30: BeiDou - Galileo (DNAV and CNAV)

Parameter	Remote command:
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AZERo on page 168
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AONE on page 168

Table 3-31: BeiDou - GLONASS (DNAV and CNAV)

Parameter	Remote command:
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AZERo on page 170
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AONE on page 170

NavIC > Time Conversion

Comprises the parameters of the NavIC satellites.

Table 3-32: NavIC - UTC

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:WNOT on page 162
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:TOT on page 163
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AZERo on page 164
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AONE on page 164
"A_2"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:ATWO on page 163

Table 3-33: NavIC - GPS

Parameter	Remote command:
"W_{Not}"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:WNOT on page 165
"T_{ot}"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:TOT on page 165
"A_0"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AZERo on page 166
"A_1"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AONE on page 167
"A_2"	[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:ATWO on page 167

Show Scaled Values
Switches between scaled and unscaled values representation.

Navigation message values are recalculated automatically.

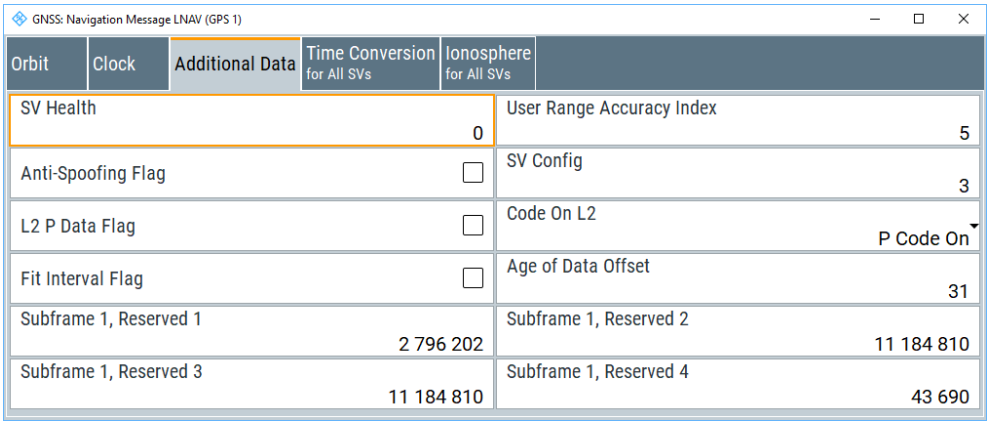
Remote command:
`[:SOURce<hw>]:BB:GNSS:SSValues` on page 135

3.5.6 System errors settings

Access:

1. Select "Simulation Configuration > Satellites > GNSS system > SV# > SV Config > Signals Configuration".
2. Select real navigation data as data source.
   For example, for a GPS SV ID, select **"Nav Msg Type > LNAV"**.
3. Select **"Nav Msg Content > Config"**
4. Select **"Nav Msg Content > Config > Additional Data"**.

   Per default, the navigation message parameters are set to values corresponding to the values retrieved from the constellation data source.



   Available navigation message parameters depend GNSS system and selected navigation message type.

5. To simulate errors, change the values.
   For example, set "User Range Accuracy Index (URA) = 12".

   With this URA index, the selected SV is set to unvisible.

   Changing any navigation message value leads to deviation between the simulated and the broadcasted navigation message and thus to a deliberated error.
   The generated signal can be used for testing the receiver's ability to cope with errors.

Settings

GPS > Additional Data

Comprises the parameters of the GPS satellites.

Table 3-34: LNAV

Parameter	Remote command:
"SV Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:HEALth` on page 156
"User Range Accuracy Index"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:URA` on page 157
"Anti-Spoofing Flag"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ASFLag` on page 157
"SV Config"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SVConfig` on page 157
"Code On L2"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CLTMode` on page 157
"L2 P Data Flag"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:LTPData` on page 157
"Fit Interval Flag"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:FIFLag` on page 158
"Age of Data Offset"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:AODO?` on page 158
"Subframe 1, Reserved 1 (23 bits, Word 4") "Subframe 1, Reserved 2 (24 bits, Word 5") "Subframe 1, Reserved 3 (24 bits, Word 6") "Subframe 1, Reserved 4 (16 bits, Word 7")	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SF1Reserved<s2us>?` on page 158

Table 3-35: CNAV

Parameter	Remote command:
"Alert Flag"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ALERt` on page 154
"L1 Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L1Health` on page 154
"L2 Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L2Health` on page 154
"L5 Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L5Health` on page 154

Parameter	Remote command:
"ED Accuracy Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:URA on page 157
"NED Accuracy Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED0 on page 155
"NED Accuracy Change Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED1 on page 155
"NED Accuracy Change Rate Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED2 on page 155
"Data Predict Week Number -WN_{op}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:WNOP on page 155
"Data Predict Time of Week - t_{op}"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:TOP on page 155
"Integrity Status Flag"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ISFLag on page 155
"L2C Phasing"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L2CPhasing on page 155

Galileo > Additional Data

Comprises the parameters of the Galileo satellites.

Table 3-36: INAV

Parameter	Remote command:
"Signal in Space Accuracy Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SISA on page 158
"Data Validity Status - $E1B_{DVS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BDVS on page 158
"Data Validity Status - $E5b_{DVS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E5BDVS on page 159
"Signal Health Status - $E1B_{HS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BHS on page 159
"Signal Health Status - $E5b_{HS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E5BHS on page 159
"SAR configuration"	
"Mode"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:MODE on page 159
"RLM Data 1" to "RLM Data 4/8" (requires "Mode > Short/Long RLM)"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:RLM<s2us> on page 160
"Spare Data" (requires "Mode > Spare)"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:SPARe on page 160

Table 3-37: FNAV

Parameter	Remote command:
"Signal in Space Accuracy Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:SISA on page 158
"Data Validity Status - $E5a_{DVS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:E5ADVS on page 160
"Signal Health Status - $E5a_{HS}$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:E5AHS on page 161

GLONASS > Additional Data

Comprises the parameters of the GLONASS satellites.

Parameter	Remote command:
"SV Health - $B_n(l_n)$"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:HEALth on page 156
"User Range Accuracy - F_T"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:URA on page 156
"Satellite Ephemeris Type - M"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:SEType on page 161
"CDMA Field M"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:CFM on page 161
"Satellite Operation mode - P"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:P on page 161
"Age of Ephemeris Page - P1"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:AOEP on page 162
"t_b Alignment - P2"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TALignment on page 162
"E_n"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:EN on page 162

BeiDou > Additional Data

Comprises the parameters of the BeiDou satellites.

Table 3-38: DNAV

Parameter	Remote command:
"SV Health"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:HEALth on page 156
"User Range Accuracy Index"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:URA on page 156

Table 3-39: CNAV

Parameter	Remote command:
"Alert Flag"	[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ALERt on page 154

NavIC > Additional Data
Comprises the parameters of the NavIC satellites.

Parameter	Remote command:
"L5 Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:L5Health` on page 156
"S Health"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:SHEalth` on page 156
"User Range Accuracy"	`[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:URA` on page 156

Show Scaled Values
Switches between scaled and unscaled values representation.

Navigation message values are recalculated automatically.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SSValues` on page 135

3.6 Loading constellation and navigation message data

The default satellite's constellation and the navigation message are extracted from official navigation source files and emulates the GNSS navigation system at 9 February 2016 at 06:00:00 am.

Internal algorithms use the predefined navigation source information and predict the satellite's constellation and the navigation messages at any given moment of time. For most test cases, the prediction is sufficient.

Applications

Load constellation data and navigation data for any of the GNSS systems separately. Use loaded data to simulate a realistic GNSS signal or to reproduce a historical satellite constellation.

Loading user-defined constellation is useful, if the HDOP and PDOP values exceed your specific limits. To observe current values, select "GNSS" > "Simulation Monitor" > "Sky View".

File formats

Supported are constellation and navigation message files in the following formats:

- GPS: YUMA, SEM, TXT or RINEX files
  See:
  - "YUMA, SEM and XML file download" on page 63
  - "RINEX file download" on page 63
- Galileo: XML
  See "YUMA, SEM and XML file download" on page 63
- GLONASS: AGL, YUMA and XML

See "YUMA, SEM and XML file download" on page 63

- BeiDou: ALC
  See "YUMA, SEM and XML file download" on page 63

YUMA, SEM and XML file download

You can download YUMA, SEM and XML files via the Internet. Transfer them to the R&S WinIQSIM2 and load them if necessary.

Use, for example, the following sources:

- US Coast Guard Navigation Center GPS Homepage
  https://www.navcen.uscg.gov/archives
  Provides YUMA (`xxx.alm`) and SEM (`xxx.al3` files, where xxx denotes the day of a year
- https://www.celestrak.com/GPS/almanac/
  Provides `almanac.sem/yuma.weekXXXX.YYYYYY.txt` files, where `xxxx` denotes the GPS week and `yyyyyy` the time of almanac (TOA)
- European GNSS Service Center (GSC) Galileo almanac file repository
  https://www.gsc-europa.eu/product-almanacs
  Provides XML (`zzzz-yy-xx.xml`) files, where `zzzz`, `yy` and `xx` denote year, month and day.
- ftp://ftp.glonass-iac.ru/MCC/ALMANAC/
  GLONASS files `xxx.agl`
- Test and Assessment Research Center (TARC) of China Satellite Navigation Office (CSNO) BeiDou almanac file server
  ftp://59.252.100.32/almanac/
  Provides ALC files `tarc0xxx0.zzalc`, where `xxx` denotes the file number and `zz` the year. For example, `*.19alc` files contain almanac data from the year 2019. The file number is approximately the day of the year, but can deviate. The ALC file format is similar to the YUMA file format.

For detailed information on the content and frame structure of navigation data, refer to the specifications.

RINEX file download

RINEX files are standard formats generated by control stations (CS) and many commercial receivers. RINEX navigation files usually comprise the ephemeris sets for several satellites with different TOE and TOC. One RINEX file is enough to describe satellite orbits for a period longer than two hours and sometimes up to one day.

Use, for example, the following sources:

- https://cddis.nasa.gov/archive/gnss/data/daily/
- ftp://ftp.glonass-iac.ru/MCC/BRDC

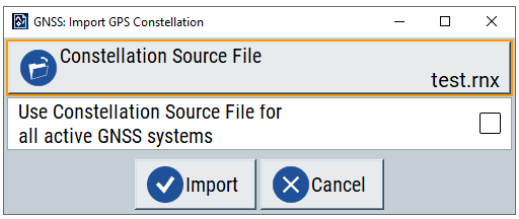
Provided are `*.rnx` or `*.<xx>n`, where `<xx>` denotes the year in two-digit format.
See also Chapter A, "RINEX files", on page 176.

- Import constellation settings.....64

3.6.1 Import constellation settings

Access:

1. Select "GNSS" > "Simulation Configuration" > "Satellites".
2. In the side tab, select the GNSS system, for that you want to import a satellite constellation.
3. Select "Import Constellation".
4. Select "Constellation Source File", to load a constellation source file.
   For GPS, for example, load a RINEX file with file extension `*.rnx`.



   The filename of the last imported file is displayed on the button accessing the standard "File Select" dialog.
5. Optionally, use a different data source for the navigation message.
6. Optionally, apply the specifications in the source file for all active GNSS systems.
7. Select "Import".

   Triggers extracting the data, the satellite constellation and the navigation changes as specified in the file.

Settings:

Constellation Source File
Selects the file from that the satellites constellation and navigation data are extracted.

Simulation data (i.e. the almanac part of the navigation message) and the navigation data per SV ID (i.e. ephemeris) can be extracted from the same or from different files. Supported are almanacs and RINEX files, in any of the standard formats for these files.

For an overview of supported file types, see Table 6-1.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:FILE:CONStellation` on page 99
(etc. for the other GNSS systems)

Use Different Source File for Navigation Message
Loads a dedicated file as source for the navigation data.

Per default, navigation data is extracted from the same file that is used as source for the simulation (satellite constellation).

Remote command:
`[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:UDSource` on page 99
(etc. for the other GNSS systems)

Navigation Message Source File
Selects the file from that the navigation data is extracted.

Use this function, if navigation data differs from the constellation file. For overview of the supported file types, see Table 6-1.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:FILE:NMESsage` on page 100
(etc. for the other GNSS systems)

Use Constellation Source File for all active GNSS system
Requires RINEX files version 3.x or later, see Table A-1.

Applies extracted data from the constellation source to all active GNSS.

Use this function when importing comprehensive constellation source files covering data for several GNSS. If you have a defined constellation of an active GNSS and the file has no constellation data for this GNSS, the constellation of this GNSS is deactivated.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:FILE:NMESsage` on page 100
(etc. for the other GNSS systems)

Import, Cancel
Triggers the import or discards the selected files.

Remote command:
`[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:EXECute` on page 100
(etc. for the other GNSS systems)

4 Signal generation control

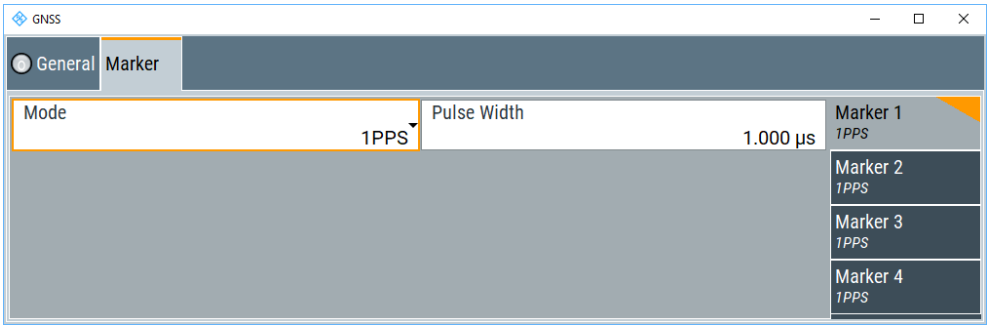
This section lists settings provided for defining the signal generation start and for generating signals necessary for synchronization with other instruments.

Settings:

4.1 Marker settings

Access:

1. Select "GNSS > Marker".



The tab provides settings necessary to select and configure the marker output signal for a single marker, like the marker mode or marker delay settings. By default, the settings for "Marker 1" are displayed. The set "Marker Mode" is also displayed for each marker on the "Marker x" side tabs.

2. To configure another marker, select e.g. the "Marker 2" side tab.

   Maximum four markers can be mapped in the GNSS firmware.

Settings

Marker x Mode
Marker configuration for up to 4 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.

"Restart" A marker signal is generated at each restart of the waveform.
Use the mode to trigger and monitor restarts of the signal generation, i.e. replays of the waveform.

"1PPS/10PPS/1PP2S"

A marker signal is generated at:

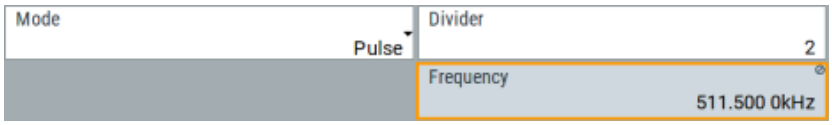
- The start of every second
- 10 times per second or once every 100 ms
- Once every two seconds

Set the "Pulse Width" in the corresponding field.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:WIDTh` on page 175

"Pulse"

Regular marker signal.
To define the pulse frequency, set the divider. The pulse frequency is derived by dividing the chip rate by the divider; the resulting "Frequency" value is displayed.



Remote command:
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:DIVider` on page 175
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:FREQuency?` on page 175

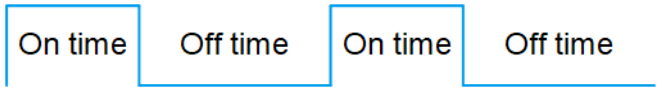
"Pattern"

Marker signal that is defined by a bit pattern. The pattern has a maximum length of 64 bits.

Remote command:
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PATTern` on page 174

"On/Off Ratio"

Regular marker signal that is defined as on-time and off-time; a period lasts one on and off cycle.



Remote command:
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:ONTime` on page 174
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:OFFTime` on page 174

Remote command:
`[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:MODE` on page 174

5 Generating and playing GNSS waveforms

This section provides some examples of typical workflow by working with one of the basic offline options.

The generated single satellite static GNSS signal is suitable for basic tests.

5.1 To generate a single satellite GNSS waveform

To generate a GNSS satellite signal (GPS, Galileo, GLONASS or BeiDou) with R&S WinIQSIM2 and save it as a waveform follow the following general steps:

1. Select "Baseband > GNSS > Set To Default" to call the default settings.
2. Access "GNSS > Simulation Configuration > System & Signals" to select the GNSS system, RF band and signal.
   a) Select the GNSS system, e.g. "GPS".
   b) Select the RF band, e.g. "L1 Band".
   c) Select the signal. With the settings above only "C/A" can be selected.

   Note: Only one GNSS system, frequency band and signal can be selected at a time.
3. In the satellite constellation ("GNSS > Simulation Configuration > Satellites"), select the space vehicle (SV), that you want to simulate.

   By default, the first GPS satellite "SV1" is selected.
4. Optionally, configure individual and modulation control settings of the space vehicle.
   a) Set "Initial Code Phase".
   b) For constant signal dynamics, set the "Doppler Shift".
   c) Select the navigation data type.
   d) For real navigation message types, e.g. "LNAV" for GPS, configure parameters for Perturbations and errors simulation.
5. Set general parameters.
   a) Adjust the "Oversampling" parameter to increase/decrease the sample rate.
   b) Adjust the "Duration of Satellites Simulation".
6. Select "GNSS > Simulation Configuration > Time" to adjust the simulation date and the simulation time (GNSS mean time).
7. Set "State > On" to enable the GNSS satellite signal generation.
8. Select the "Generate Waveform File" to save the GNSS satellite signal to a waveform file.

5.2 To play a GNSS waveform with Rohde & Schwarz signal generator

1. Generate a waveform file.
2. Connect the R&S WinIQSIM2 to the signal generator, on that you want to play the waveform.
3. Transfer the waveform file.
   For detailed description, see to the R&S WinIQSIM2 user manual.
4. On the instrument, select "Baseband > ARB" to load the waveform.
5. Find out, what frequency value you set on the instrument:
   a) In the dialog "Baseband > ARB > General", click the "Waveform Info" button.
   b) In the waveform "Info" dialog (Waveform Info dialog), look for "Comment" line.
   c) Set the RF "Frequency" as requested in the "Comment" line.

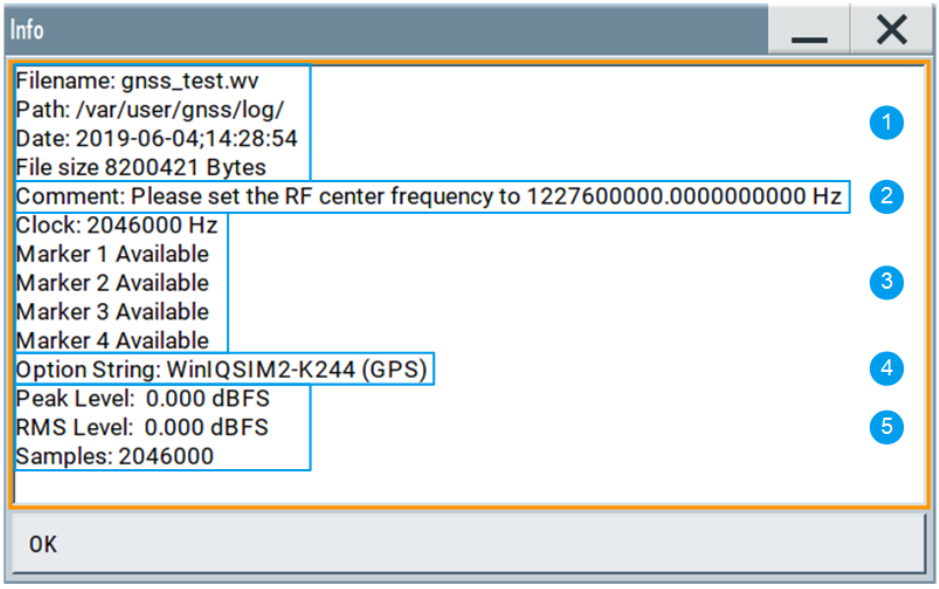


Figure 5-1: Waveform Info dialog

1 = General waveform file properties
2 = RF frequency to set on the instrument
3 = Signal generation and signal control parameters
4 = Required option to play the waveform
5 = General waveform signal properties

6. Select the "FREQ" key to set the frequency in the header of the instrument to the resulting frequency of the generated waveform.
7. Set the "ARB State > On" to enable signal processing.

   The signal generator processes the GNSS signal generated by the R&S WinIQSIM2.

6 Remote-control commands

The following commands are required for signal generation with the satellite navigation options in a remote environment. We assume that the R&S WinIQSIM2 has already been set up for remote operation in a network as described in the R&S WinIQSIM2 documentation. A knowledge about the remote control operation and the SCPI command syntax is assumed.

Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the R&S WinIQSIM2 user manual.

The `:SOURce1:BB:GPS|GALileo|GLONass|BEIDou|NAVic` subsystem contains commands for configuring the GNSS standards.

Common suffixes

The following common suffixes are used in remote commands:

Suffix	Value range	Description
`SOURce<hw>`	[1]	Available baseband signals
`OUTPut<ch>`	1 .. 4	Available markers
`SVID<ch>`	1 to 37 for GPS 1 to 36 for Galileo 1 to 24 for GLONASS 1 to 35 for BeiDou 1 to 14 for NavIC 193 to 195 for QZSS	Distinguishes between satellite SV IDs
`ECHO<s2us0>`	1 to 9	Echoes in the multipath configuration

Required options

SCPI command contains	Required option

`SYSTem:GPS`
`TIME:STARt:GPS`
`TIME:CONVersion:GPS`
`SVID<ch>:GPS`
`SVID:GPS`
`SV:SELection:GPS`
`SV:IMPOrt:GPS`
	R&S Snn-K244
	R&S Snn-K298

`L2C` `L5S`	R&S Snn-K298

SCPI command contains	Required option
SYSTem:GALileo TIME:STARt:GALileo TIME:CONVersion:GALileo SVID<ch>:GALileo SVID:GALileo SV:SELection:GALileo SV:IMPort:GALileo E1OS E5A E5B	R&S Snn-K266
SYSTem:GLONnas TIME:STARt:GLONnas TIME:CONVersion:GLONnas SVID<ch>:GLONnas SVID:GLONnas SV:SELection:GLONnas SV:IMPOrt:GLONnas	R&S Snn-K294
SYSTem:BEIDou TIME:STARt:BEIDou TIME:CONVersion:BEIDou SVID<ch>:BEIDou SVID:BEIDou SV:SELection:BEIDou SV:IMPOrt:BEIDou	R&S Snn-K407 R&S Snn-K432
SYSTem:NAVic TIME:STARt:NAVic TIME:CONVersion:NAVic SVID<ch>:NAVic SVID:NAVic SV:SELection:NAVic SV:IMPOrt:NAVic	R&S Snn-K497

Programming examples

This description provides simple programming examples. The purpose of the examples is to present **all** commands for a given task. In real applications, one would rather reduce the examples to an appropriate subset of commands.

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

At the beginning of the most remote control program, an instrument preset/reset is recommended to set the instrument to a definite state. The commands `*RST` and

SYSTem:PRESet are equivalent for this purpose. *CLS also resets the status registers and clears the output buffer.

The following commands specific to the GNSS options are described here:

6.1 General commands

Example: Save/Recall files with user settings

Query and load settings files, saved with the save/recall function.

```
MMEM:CDIR '/var/user/settings'
SOURce1:BB:GNSS:SETTing:CATalog?
// Response: gnss_settings,settings
SOURce1:BB:GNSS:SETTing:STORe '/var/user/settings/gnss'
SOURce1:BB:GNSS:SETTing:LOAD '/var/user/settings/gnss_settings'
SOURce1:BB:GNSS:SETTing:DELete '/var/user/settings/settings'
// Deletes the file settings.gnss
SOURce1:BB:GNSS:SETTing:CATalog?
// Response: gnss_settings,gnss
```

Example: Selecting a predefined test scenario

Enable a predefined scenario.

```
// ********************************************************************************
// Select and enable the predefined test scenario 3GPP FDD Signaling Test Scenario 2.
// ********************************************************************************
SOURce1:BB:GNSS:PRESet
// Lists all predefined scenarios in a comma-separated list.
SOURce1:BB:GNSS:SETTing:CATalog:PREDefined?
// Response: "Assisted GNSS+EUTRA/LTE+3GPP TS 37.571-2:  S7  Signaling ST1; ..."
SOURce1:BB:GNSS:SETTing:LOAD:PREDefined "3GPP TS 37.571-2:  S7  Signaling ST2"
SOURce1:BB:GNSS:SCENario?
// Response: "3GPP TS 37.571-2:  S7  Signaling ST2"
// Query simulation information.
SOURce1:BB:GNSS:SIMulation:INFO?
// Response: "L1 / GLONASS only"

SOURce1:BB:GNSS:STATe ON
```

Commands:

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

Sets the parameters of the digital standard to their default values (`*RST` values specified for the commands).

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

Example: See Example"Selecting a predefined test scenario" on page 72.

Usage: Event

Manual operation: See "Set to Default" on page 17

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

Enables/disables the GNSS signal simulation.

Parameters:

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

Example: See Example"Selecting a predefined test scenario" on page 72.

Manual operation: See "State" on page 17

[:SOURce<hw>]:BB:GNSS:SCENario?

Queries the current scenario.

Return values:

<Scenario> string

NONE
Indicates the preset configuration or a user-defined configuration.

Scenario name
Returns the scenario name.

Filename
Returns the filename of a saved, user-defined scenario. The scenario file has the extension `*.gnss`.

Example: See Example"Selecting a predefined test scenario" on page 72.

Usage: Query only

Manual operation: See "Scenario" on page 18

[:SOURce<hw>]:BB:GNSS:SIMulation:INFO?

Queries information on the current enabled RF bands, signals and GNSS standards.

Return values:
<SimConfigInfo> string

Example: See Example"Selecting a predefined test scenario" on page 72.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:OSAMpling <OSampling>

Sets the upsampling factor.

A higher upsampling factor improves the filtering but increases the waveform size proportionally. This leads to limitation for the maximum "Duration Of Satellite Simulation".

Parameters:
<OSampling> integer

Range: 2 to 32
*RST: 2

Example: `SOURce1:BB:GNSS:OSAMpling 2`
Sets an upsampling factor of 2.

Manual operation: See "Oversampling" on page 18

[:SOURce<hw>]:BB:GNSS:DURation <Duration>

Sets the duration of the satellite simulation.

The resulting duration of the simulation is calculated as follow:

$$Duration\ of\ Simulation = \frac{Duration\ of\ Satellite\ Simulation}{1 + \frac{Doppler\ Shift}{F_{Carrier}}}$$

where $F_{Carrier}$ is the frequency selected with the parameter RF Band.

The maximum duration of satellite simulation depends on the Oversampling factor and the ARB memory size of the connected instrument.

Parameters:

<Duration> float

Range: 20E-3 to 64
Increment: 1E-3
*RST: 1

Example: `SOUR:BB:GPS:DUR 20`
Sets 20 s duration of the satellite simulation.

Manual operation: See "Duration Of Satellite Simulation" on page 18

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

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

Example: See Example"Save/Recall files with user settings" on page 72.

Usage: Query only

Manual operation: See "Save/Recall Scenario" on page 17

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

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

Setting parameters:

<Filename> "<filename>"

Filename or complete file path

Example: See Example"Save/Recall files with user settings" on page 72.

Usage: Setting only

Manual operation: See "Save/Recall Scenario" on page 17

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

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

Setting parameters:

<Filename> "<filename>"

Filename or complete file path; file extension can be omitted
Query the existing files with the command `[:SOURce<hw>]:BB:GNSS:SETTing:CATalog?`.

Example: See Example"Save/Recall files with user settings" on page 72.

Usage: Setting only

Manual operation: See "Save/Recall Scenario" on page 17

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

Deletes the selected file from the default or the specified directory.

Setting parameters:

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

Example: See Example"Save/Recall files with user settings" on page 72.

Usage: Setting only

Manual operation: See "Save/Recall Scenario" on page 17

[:SOURce<hw>]:BB:GNSS:SETTing:CATalog:PREDefined?

Queries the files with predefined settings.

Example: See Example"Selecting a predefined test scenario" on page 72.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SETTing:LOAD:PREDefined <Scenario>

Loads the selected scenario file.

Setting parameters:

<Scenario> "<ScenarioName>"
Name of a predefined scenario, as queried with the command `[:SOURce<hw>]:BB:GNSS:SETTing:CATalog:PREDefined?`.

Example: See Example"Selecting a predefined test scenario" on page 72.

Usage: Setting only

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

Saves the current settings as an ARB signal in a waveform file (`*.wv`).

Setting parameters:

<Filename> string
Filename or complete file path; file extension is assigned automatically

Example:

```
MMEM:CDIR D:\gnss
SOURce1:BB:GNSS:STATe 1
SOURce1:BB:GNSS:WAVeform:CREate "gnss_test"
```

Usage: Setting only

Manual operation: See "Generate Waveform" on page 18

6.2 System and signal commands

Example: Enabling GNSS systems and signals

The example illustrates how to enable RF bands, GNSS systems and signals.

```
********************************************************************************
// Query information on active RF bands, central RF frequency and GNSS systems.
********************************************************************************
SOURce1:BB:GNSS:SIMulation:INFO?
// Response: "L1,L2,L5 / GPS,Galileo"
SOURce1:BB:GNSS:CFRequency?
// Response in Hz: 1389225000

********************************************************************************
// Enable an RF band. Only one RF band can be enabled at a time.
********************************************************************************
SOURce1:BB:GNSS:L1Band:STATe 1
SOURce1:BB:GNSS:L2Band:STATe? 0
SOURce1:BB:GNSS:L5Band:STATe? 0

********************************************************************************
// Enable a GNSS system. Only one GNSS can be enabled at a time.
********************************************************************************
SOURce1:BB:GNSS:SYSTem:GPS:STATe 1
SOURce1:BB:GNSS:SYSTem:GALileo:STATe 1
SOURce1:BB:GNSS:SYSTem:GPS:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:NAVic:STATe?
// Response: 0

********************************************************************************
// Enable signals within a GNSS and RF band and query other signal states.
********************************************************************************
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L1Band:CA:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L1Band:L1C:STATe 1
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L2Band:CA:STATe 1
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L2Band:L2C:STATe 1
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L5Band:L5S:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GALileo:SIGNal:L1Band:E1OS:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GALileo:SIGNal:L2Band:E6S:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GALileo:SIGNal:L5Band:E5A:STATe?
// Response: 0
```

```
SOURce1:BB:GNSS:SYSTem:GALileo:SIGNal:L5Band:E5B:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:SIGNal:L1Band:CA:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:SIGNal:L1Band:L1CDma:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:SIGNal:L2Band:CA:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:SIGNal:L2Band:L2CDma:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:GLONass:SIGNal:L5Band:L3CDma:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L1Band:B1I:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L1Band:B1C:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L2Band:B3I:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2I:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2A:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2B:STATe?
// Response: 0
SOURce1:BB:GNSS:SYSTem:NAVic:SIGNal:L5Band:SPS:STATe?
// Response: 0


********************************************************************************
// Query information about active RF bands and GNSS systems.
********************************************************************************
SOURce1:BB:GNSS:SIMulation:INFO?
// Response: "L2 / GPS only"
```

Commands:

[:SOURce<hw>]:BB:GNSS:CFRequency?

Queries the central RF frequency. The response is a mean value depending on enabled RF bands and GNSS systems.

Return values:

<CentralRfFreq> integer

Range: 1E9 to 2E9
*RST: 1E9
Default unit: Hz

Example: See Chapter 6.2, "System and signal commands", on page 77.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:L5Band[:STATe] <L5BandState>
[:SOURce<hw>]:BB:GNSS:L2Band[:STATe] <L2BandState>
[:SOURce<hw>]:BB:GNSS:L1Band[:STATe] <L1BandState>

Activates the RF band.

Parameters:

<L1BandState> 1 | ON | 0 | OFF

*RST: 0

Manual operation: See "L# Band" on page 25

[:SOURce<hw>]:BB:GNSS:SYSTem:NAVic[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SYSTem:GALileo[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SYSTem:GPS[:STATe] <State>

Defines if satellites from the selected GNSS system are included in the simulated satellites constellation.

Parameters:

<State> 1 | ON | 0 | OFF

Disabling a GNSS system deactivates all SVID and signals from this system.

*RST: 0

Example: See Example"Enabling GNSS systems and signals" on page 77.

Manual operation: See "System" on page 25

[:SOURce<hw>]:BB:GNSS:SYSTem:NAVic:SIGNal:L5Band:SPS[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2I[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2A[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L5Band:B2B[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L2Band:B3I[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L1Band:B1I[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:BEIDou:SIGNal:L1Band:B1C[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass:SIGNal:L1Band:CA[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass:SIGNal:L1Band:L1CDma[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass:SIGNal:L2Band:CA[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass:SIGNal:L2Band:L2CDma[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GLONass:SIGNal:L5Band:L3CDma[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GALileo:SIGNal:L2Band:E6S[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GALileo:SIGNal:L5Band:E5B[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GALileo:SIGNal:L5Band:E5A[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GALileo:SIGNal:L1Band:E1OS[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L5Band:L5S[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L2Band:L2C[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L2Band:CA[:STATe]
<SignalState>

[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L1Band:L1C[:STATe]
<SignalState>
[:SOURce<hw>]:BB:GNSS:SYSTem:GPS:SIGNal:L1Band:CA[:STATe]
<SignalState>

Enables the corresponding signal from the GNSS system in the corresponding RF band.

Parameters:

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

Example: See Example"Enabling GNSS systems and signals" on page 77.

Manual operation: See "Signals" on page 26

6.3 Time conversion configuration

Example: Configuring the time conversion and leap seconds settings

The example illustrate how to define simulation start and how to configure time settings.

```
SOURce1:BB:GNSS:SYSTem:GPS:STATe 1
********************************************************************************
// Set simulation start date and time in UTC format.
********************************************************************************
SOURce1:BB:GNSS:TIME:STARt:TBASis UTC
SOURce1:BB:GNSS:TIME:STARt:DATE 2016,2,19
SOURce1:BB:GNSS:TIME:STARt:TIME 7,0,0
// Query the simulation start in GPS format.
SOURce1:BB:GNSS:TIME:STARt:TBASis GPS
SOURce1:BB:GNSS:TIME:STARt:WNUMber?
// Response: 1884
SOURce1:BB:GNSS:TIME:STARt:TOWeek?
// Response: 457216.3154372
// Set the simulation start to the current operating system time.
SOURce1:BB:GNSS:TIME:STARt:SCTime
SOURce1:BB:GNSS:TIME:STARt:DATE?
// Response: 2020,7,28
SOURce1:BB:GNSS:TIME:STARt:TIME?
// Response: 11,35,0
********************************************************************************
// Query week number and time of week for the active GNSS system.
********************************************************************************
SOURce1:BB:GNSS:TIME:STARt:GPS:WNUMber?
// Response: 1884
SOURce1:BB:GNSS:TIME:STARt:GPS:TOWeek?
// 457216.3154372
```

```
********************************************************************************
// Activate automatic leap second calculation.
********************************************************************************
SOURce1:BB:GNSS:TIME:CONVersion:LEAP:AUTO 1
SOURce1:BB:GNSS:TIME:CONVersion:LEAP:DATE?
// Response: 2015,6,30
SOURce1:BB:GNSS:TIME:CONVersion:LEAP:BEFore?
// Response in seconds: 16
SOURce1:BB:GNSS:TIME:CONVersion:LEAP:AFTer?
// Response in seconds: 17
********************************************************************************
// Set time conversion parameters for automatic time conversion.
********************************************************************************
SOURce1:BB:GNSS:TIME:CONVersion:GPS:UTC:WNOT 244
SOURce1:BB:GNSS:TIME:CONVersion:GPS:UTC:TOT:UNSCaled 475200
SOURce1:BB:GNSS:TIME:CONVersion:GPS:UTC:AONE:UNSCaled 0
SOURce1:BB:GNSS:TIME:CONVersion:GPS:UTC:AZERo:UNSCaled 0
SOURce1:BB:GNSS:TIME:CONVersion:GPS:UTC:IOFFset?
// Response: 16
SOURce1:BB:GNSS:TIME:CONVersion:UTCSu:UTC:DATE?
// Response: 2014,2,19
SOURce1:BB:GNSS:TIME:CONVersion:GLONass:UTC:AZERo:UNSCaled 0
SOURce1:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AZERo:UNSCaled 0
SOURce1:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AONE:UNSCaled 0
// etc. for each GNSS system
```

Commands:

[:SOURce<hw>]:BB:GNSS:TIME:STARt:DATE <Year>, <Month>, <Day>

If the time base is UTC, defines the date for the simulation in `DD.MM.YYYY` format of the Gregorian calendar.

Parameters:

<Year> integer
Range: 1980 to 9999

<Month> integer
Range: 1 to 12

<Day> integer
Range: 1 to 31

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Simulation Start" on page 20

[:SOURce<hw>]:BB:GNSS:TIME:STARt:SCTime

Applies date and time settings of the operating system to the simulation start time.

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Event

Manual operation: See "Set Current Time" on page 21

[:SOURce<hw>]:BB:GNSS:TIME:STARt:TBASis <SystemTime>

Determines the time basis used to enter the simulation start time.

Parameters:

<SystemTime> UTC | GPS | GST | GLO | BDT | NAV
*RST: UTC

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Simulation Start" on page 20

[:SOURce<hw>]:BB:GNSS:TIME:STARt:TIME <Hour>, <Minute>, <Second>

If the time base is UTC, sets the simulation start time in UTC time format.

Parameters:

<Hour> integer

Range: 0 to 23

<Minute> integer

Range: 0 to 59

<Second> float

Range: 0 to 59.999
Increment: 0.001

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Simulation Start" on page 20

[:SOURce<hw>]:BB:GNSS:TIME:STARt:TOWeek <TOW>

If time base is GPS or GST, sets the simulation start time within week set with the command `[:SOURce<hw>]:BB:GNSS:TIME:STARt:WNUMber`.

Parameters:

<TOW> float

Number of seconds since the beginning of the week

Range: 0 to 604799.999
Increment: 0.001
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Simulation Start" on page 20

[:SOURce<hw>]:BB:GNSS:TIME:STARt:WNUMber <Week>

If time base is GPS or GST, sets the week number (WN).

Parameters:

<Week> integer

The weeks are numbered starting from a reference time point (WN_REF=0), that depends on the navigation standard.

Range: 0 to 9999*53
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Simulation Start" on page 20

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:AUTO <AutoConfigure>

Enables the simulation of the leap second transition.

Parameters:

<AutoConfigure> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Auto Configure Leap Second (Ref. 1980)" on page 22

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:SEConds:AFTer <LeapSeconds>

Specifies the leap second value after the leap second transition.

Parameters:

<LeapSeconds> integer

Range: 0 to 50
*RST: 17

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Leap Second after Transition - Δt_{LSF}" on page 22

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:SEConds:BEFore <LeapSecends>

Specifies the leap second value before the leap second transition.

Parameters:

<LeapSecends> integer

Range: 0 to 50
*RST: 16

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Leap Second before Transition - Δt_{LS}" on page 22

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:LEAP:DATE <Year>, <Month>, <Day>

Defines the date of the next UTC time correction.

Parameters:

<Year> integer
Range: 1980 to 9999

<Month> integer
Range: 1 to 12

<Day> integer
Range: 1 to 31

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Leap Second Transition Date" on page 22

[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:DATE?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GLONass:DATE?

Queries the date at the simulation start time of the selected navigation standard.

Return values:

<Year> integer
Range: 1980 to 9999

<Month> integer
Range: 1 to 12

<Day> integer
Range: 1 to 31

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:TIME?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GLONass:TIME?

Queries the simulation start time of the selected navigation standard.

Return values:

<Hour> integer
Range: 0 to 23

<Minute> integer
Range: 0 to 59

<Second> float
Range: 0 to 59.999
Increment: 0.001

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:TIME:STARt:NAVic:WNUMber?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:BEIDou:WNUMber?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GALileo:WNUMber?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:WNUMber?

Queries the week number at the simulation start of the selected navigation standard.

Return values:
<SystemWeekNumb> integer

Range: 0 to 10000
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

Manual operation: See "Date / Week, Time / Time of Week /s, UTC Offset /s" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:STARt:NAVic:TOWeek?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:BEIDou:TOWeek?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GALileo:TOWeek?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:TOWeek?

Queries the time of week at the simulation start of the selected navigation standard.

Return values:
<TOW> float

Range: 0 to 604799.999
Increment: 0.001
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

Manual operation: See "Date / Week, Time / Time of Week /s, UTC Offset /s" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:STARt:UTC:OFFSet?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:NAVic:OFFSet?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:BEIDou:OFFSet?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GALileo:OFFSet?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GLONass:OFFSet?
[:SOURce<hw>]:BB:GNSS:TIME:STARt:GPS:OFFSet?

Queries the time offset between the time in the navigation standard and UTC.

Return values:
<UtcOffset> float
Range: -1E6 to 1E6
Increment: 0.001
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

Manual operation: See "Date / Week, Time / Time of Week /s, UTC Offset /s" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:WNOT <Wnot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:WNOT <Wnot>

Sets the UTC data reference week number, WN_t.

Parameters:
<Wnot> integer
Range: 0 to 255
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Reference Week/Date, Reference Time of Week" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:DATE?

Enters the date for the UTC-UTC(SU) data in DMS format.

Return values:
<Year> integer
Range: 1996 to 9999
<Month> integer
Range: 1 to 12
<Day> integer
Range: 1 to 31

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

Manual operation: See "UTC-UTC(SU)" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:TOT <Tot>

Sets the UTC data reference time of week, t_{ot}.

Parameters:

<Tot> integer

Range: 0 to 255
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Reference Week/Date, Reference Time of Week" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:IOFFset?
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:IOFFset?
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:IOFFset?
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:IOFFset?
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:IOFFset?
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:IOFFset?

Queries the integer offset.

Return values:

<IntegerOffset> integer

Range: 0 to 604800
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Usage: Query only

Manual operation: See "Integer Offset" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:AZERo: UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AZERo <AZero>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AZERo <AZero>

Sets the constant term of polynomial, A_0.

Parameters:

<AZero> integer

Range: -2147483648 to 2147483647
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Fractional Offset A0, Drift A1" on page 23

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:NAVic:UTC:AONE <AOne>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:BEIDou:UTC:AONE <AOne>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GALileo:UTC:AONE <AOne>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTC:AONE <AOne>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GLONass:UTCSu:AONE <AOne>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:UTCSu:UTC:AONE <AOne>

[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:TIME:CONVersion:GPS:UTC:AONE <AOne>

Sets the first order term of polynomial, A_1.

Parameters:

<AOne> integer

Range: -8388608 to 8388607
*RST: 0

Example: See Example"Configuring the time conversion and leap seconds settings" on page 81.

Manual operation: See "Fractional Offset A0, Drift A1" on page 23

6.4 Satellites constellation

Example: Configuring the satellite's constellation

```
SOURce1:BB:GNSS:PRESet

SOURce1:BB:GNSS:SYSTem:GPS:STATe 1
SOURce1:BB:GNSS:SYSTem:GALileo:STATe 1

SOURce1:BB:GNSS:SV:SELection:MODE ELEV
SOURce1:BB:GNSS:SV:SELection:EOBScuration:REFerence LHOR
SOURce1:BB:GNSS:SV:SELection:EOBScuration:ANGLe 5
// query the number of satellites available
SOURce1:BB:GNSS:SV:SELection:GPS:AVAilable?
// 37
SOURce1:BB:GNSS:SV:SELection:GALileo:AVAilable?
// 29
SOURce1:BB:GNSS:SV:SELection:GPS:MIN 1
SOURce1:BB:GNSS:SV:SELection:GPS:MAX 24
SOURce1:BB:GNSS:SV:SELection:GALileo:MIN 1
SOURce1:BB:GNSS:SV:SELection:GALileo:MAX 15
// query the number of active statellites in the constellation
SOURce1:BB:GNSS:SV:SELection:GPS:ACTive?
// 10
SOURce1:BB:GNSS:SV:SELection:GALileo:ACTive?
// 8

// Query all SV IDs per GNSS system, i.e. SVs included in and excluded
// from the satellite constellation.
SOURce1:BB:GNSS:SVID:GPS:LIST:ALL?
// 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,
// 28,29,30,31,32,33,34,35,36,37
// Query valid SV IDs per GNSS system, i.e. SVs included in the
// satellite constellation.
SOURce1:BB:GNSS:SVID:GPS:LIST:VALid?
```

```
// 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,
// 28,29,30,31
// Query, if an SV ID is healhy or not.
SOURce1:BB:GNSS:SVID1:GPS:HEALthy?
// 1
SOURce1:BB:GNSS:SVID30:GPS:HEALthy?
// 0
// Query, if an SV ID is visible or not.
SOURce1:BB:GNSS:SVID1:GPS:VISibility:STATe?
// 1
SOURce1:BB:GNSS:SVID30:GPS:VISibility:STATe?
// 0

SOURce1:BB:GNSS:SVID1:GPS:STATe 1
SOURce1:BB:GNSS:SVID1:GPS:POWer:OFFSet -10
```

Example: Importing a satellite constellation

```
SOURce1:BB:GNSS:SYSTem:GPS:STATe 1
SOURce1:BB:GNSS:SYSTem:GALileo:STATe 1

// Import a GPS satellite constellation source file.
SOURce1:BB:GNSS:SV:IMPort:GPS:FILE:CONStellation
"/var/user/19_02_2014_gps.txt"
SOURce1:BB:GNSS:SV:IMPort:GPS:EXECute

// Import separate constellation source and navigation message file.
SOURce1:BB:GNSS:SV:IMPort:GPS:FILE:CONStellation
"/var/user/19_02_2014_gps.txt"
SOURce1:BB:GNSS:SV:IMPort:GPS:UDSource 1
SOURce1:BB:GNSS:SV:IMPort:GPS:FILE:NMESsage
"/var/user/19_02_2014_gps.14n"
// Apply data from the constellation source file to all active GNSS systems.
SOURce1:BB:GNSS:SV:IMPort:GPS:UALL 0
SOURce1:BB:GNSS:SV:IMPort:GPS:EXECute
```

Commands:

[:SOURce<hw>]:BB:GNSS:SV:SELection:MODE <SelectionMode>

Selects a criterium to define the initial satellite constellation.

Parameters:

<SelectionMode> MANual | ELEVation | VISibility | DOP | ADOP

MANual
Manual selection to add active space vehicles of the satellite constellation and remove inactive space vehicles from the satellite constellation. You can also activate invisible space vehicles.

ELEVation
Automatic selection of space vehicles according to their highest elevation angle.

VISibility
Automatic selection of space vehicles according to their longest visibility time.

DOP
Automatic selection with good dilution of precision (DOP) values at simulation start.

ADOP
Adaptive DOP mode providing automatic selection with good DOP values at simulation start and during runtime.

*RST: VISibility

Example: See Example"Configuring the satellite's constellation" on page 92.

[:SOURce<hw>]:BB:GNSS:SV:SELection:EOBScuration:REFerence <Type>

Selects how the behavior of earth obscuration is defined.

Parameters:

<Type> ETANgent | LHORizon

*RST: ETANgent

Example: See Example"Configuring the satellite's constellation" on page 92.

[:SOURce<hw>]:BB:GNSS:SV:SELection:EOBScuration:ANGLe <ElevMaskAngle>

Sets the satellite's elevation mask angle. The angle is applied relative to the selected horizon.

Parameters:

<ElevMaskAngle> float

Range: -10 to 90
Increment: 0.1
*RST: 5

Example: See Example"Configuring the satellite's constellation" on page 92.

[:SOURce<hw>]:BB:GNSS:SV:SELection:NAVic:MIN <MinimumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:NAVic:MAX <MaximumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:BEIDou:MIN <MinimumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:BEIDou:MAX <MaximumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GLONass:MIN <MinimumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GLONass:MAX <MaximumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GALileo:MIN <MinimumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GALileo:MAX <MaximumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GPS:MIN <MinimumSVs>
[:SOURce<hw>]:BB:GNSS:SV:SELection:GPS:MAX <MaximumSVs>

Sets the minimum and maximum number of satellites per GNSS system that can be included in the satellite constellation.

Parameters:

<MaximumSVs> integer

Range: 0 to 24
*RST: 24

Example: See Example"Configuring the satellite's constellation" on page 92.

[:SOURce<hw>]:BB:GNSS:SV:SELection:NAVic:ACTive?
[:SOURce<hw>]:BB:GNSS:SV:SELection:BEIDou:ACTive?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GLONass:ACTive?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GALileo:ACTive?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GPS:ACTive?

Queries the number of active satellites per GNSS system that are currently part of the satellite's constellation.

Return values:

<ActiveSVs> integer

Range: 0 to 24
*RST: 0

Example: See Example"Configuring the satellite's constellation" on page 92.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SV:SELection:NAVic:AVAilable?
[:SOURce<hw>]:BB:GNSS:SV:SELection:BEIDou:AVAilable?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GLONass:AVAilable?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GALileo:AVAilable?
[:SOURce<hw>]:BB:GNSS:SV:SELection:GPS:AVAilable?

Queries the number of available satellites per GNSS system.

Return values:
<AvailableSVs> integer

Range: 0 to 40
*RST: 0

Example: See Example"Configuring the satellite's constellation" on page 92.

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SVID:NAVic:LIST:ALL?
[:SOURce<hw>]:BB:GNSS:SVID:BEIDou:LIST:ALL?
[:SOURce<hw>]:BB:GNSS:SVID:GLONass:LIST:ALL?
[:SOURce<hw>]:BB:GNSS:SVID:GALileo:LIST:ALL?
[:SOURce<hw>]:BB:GNSS:SVID:GPS:LIST:ALL?

Queries the SV IDs of all satellites of the GNSS system.

The query lists SV IDs of the satellites included in and excluded from the satellite constellation (Figure 3-1).

Example: See Example"Configuring the satellite's constellation" on page 92.

Usage: Query only

Manual operation: See "Satellite's Constellation, SV ID" on page 29

[:SOURce<hw>]:BB:GNSS:SVID:NAVic:LIST[:VALid]?
[:SOURce<hw>]:BB:GNSS:SVID:BEIDou:LIST[:VALid]?
[:SOURce<hw>]:BB:GNSS:SVID:GLONass:LIST[:VALid]?
[:SOURce<hw>]:BB:GNSS:SVID:GALileo:LIST[:VALid]?
[:SOURce<hw>]:BB:GNSS:SVID:GPS:LIST[:VALid]?

Queries the SV IDs of all valid satellites for the GNSS system.

The query lists SV IDs of the satellites included in the satellite constellation.

Example: See Example"Configuring the satellite's constellation" on page 92.

Usage: Query only

Manual operation: See "Satellite's Constellation, SV ID" on page 29

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:HEALthy <HealthyState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:HEALthy <HealthyState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:HEALthy <HealthyState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:HEALthy <HealthyState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:HEALthy <HealthyState>

Indicates if the selected SV ID is healthy or not.

Parameters:

<HealthyState> 1 | ON | 0 | OFF

1 = healthy satellite
The healthy state reflects the value of the corresponding healthy flag in the navigation message:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:HEALth` on page 156
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L1Health` on page 154
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L2Health` on page 154
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L5Health` on page 154
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BDVS` on page 158
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BHS` on page 159
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E5BHS` on page 159
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:HEALth` on page 156
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:HEALth` on page 156
The values are interdependent; changing one of them changes the other.

*RST: 1

Example: See Example"Configuring the satellite's constellation" on page 92.

Example:

```
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:HEALth 0
SOURce1:BB:GNSS:SVID1:GPS:HEALthy?
// 1
SOURce1:BB:GNSS:SVID1:GPS:HEALthy 0
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:HEALth?
// 63
```

Manual operation: See "Satellite's Constellation, SV ID" on page 29
See "Healthy" on page 32

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:VISibility:STATe?
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:VISibility:STATe?

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:VISibility:STATe?
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:VISibility:STATe?
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:VISibility:STATe?

Queries if the selected SV ID is visible in the satellite constellation.

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

Example: See Example"Configuring the satellite's constellation" on page 92.

Usage: Query only

Manual operation: See "Satellite's Constellation, SV ID" on page 29

[:SOURce<hw>]:BB:GNSS:SV:IMPort:NAVic:FILE:CONStellation <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:BEIDou:FILE:CONStellation <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GLONass:FILE:CONStellation <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GALileo:FILE:CONStellation <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:FILE:CONStellation <Filename>

Selects the file from that the satellites constellation and navigation data are extracted.

Table 6-1: Supported file extensions for satellites constellation and navigation data

GNSS	File extension
GPS	*.rnx, *.txt, *.alm, *.al3, *.<xx>n,
Galileo	*.rnx, *.txt, *.alm, *.al3, *.<xx>n, *.<xx>l, *.xml
GLONASS	*.rnx, *.alg, *.<xx>n
BeiDou	*.rnx, *.txt, *.<xx>n, *.<xx>c
NavIC	*.rnx, *.<xx>i

Parameters:
<Filename> string
Filename, including file path and file extension.

Example: See Example"Importing a satellite constellation" on page 93.

Manual operation: See "Constellation Source File" on page 64

[:SOURce<hw>]:BB:GNSS:SV:IMPort:NAVic:UDSource <UseDiffSrcState>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:BEIDou:UDSource <UseDiffSrcState>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GLONass:UDSource <UseDiffSrcState>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GALileo:UDSource <UseDiffSrcState>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:UDSource <UseDiffSrcState>

Enables loading the dedicated files as source for the navigation data.

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

Example: See Example"Importing a satellite constellation" on page 93.

Manual operation: See "Use Different Source File for Navigation Message" on page 65

[:SOURce<hw>]:BB:GNSS:SV:IMPort:NAVic:FILE:NMESsage <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:BEIDou:FILE:NMESsage <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GLONass:FILE:NMESsage <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GALileo:FILE:NMESsage <Filename>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:FILE:NMESsage <Filename>

Selects the file from that the navigation data is extracted.

For an overview of the supported file types, see Table 6-1.

Parameters:
<Filename> string
Filename, incl. file path and file extension.

Example: See Example"Importing a satellite constellation" on page 93.

Manual operation: See "Navigation Message Source File" on page 65
See "Use Constellation Source File for all active GNSS system" on page 65

[:SOURce<hw>]:BB:GNSS:SV:IMPort:BEIDou:UALL <UseToAllSystems>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GALileo:UALL <UseToAllSystems>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GLONass:UALL <UseToAllSystems>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:UALL <UseToAllSystems>
[:SOURce<hw>]:BB:GNSS:SV:IMPort:NAVic:UALL <UseToAllSystems>
Parameters:
<UseToAllSystems> 1 | ON | 0 | OFF
*RST: 0

[:SOURce<hw>]:BB:GNSS:SV:IMPort:NAVic:EXECute
[:SOURce<hw>]:BB:GNSS:SV:IMPort:BEIDou:EXECute
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GLONass:EXECute
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GALileo:EXECute
[:SOURce<hw>]:BB:GNSS:SV:IMPort:GPS:EXECute

Triggers the import of constellation and navigation data from the selected files.

Example: See Example"Importing a satellite constellation" on page 93.

Usage: Event

Manual operation: See "Import, Cancel" on page 65

6.5 Signals per satellite

Example: Configuring the SV modulation control settings

```
SOURce1:BB:GNSS:PRESet
// Activate C/A code in L2 band.
SOURce1:BB:GNSS:L2Band:STATe 1
SOURce1:BB:GNSS:SYSTem:GPS:SIGNal:L2Band:CA:STATe 1
// Activate GPS SVID#11
SOURce1:BB:GNSS:SVID11:GPS:STATe 1
SOURce1:BB:GNSS:SVID11:GPS:PRESent 1

// Set Doppler shift [Hz] and initital code phase.
SOURce1:BB:GNSS:SVID1:GPS:DSHift 1146.05
SOURce1:BB:GNSS:SVID1:GPS:ICPHase 20459.99

// Set modulation control settings.
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:PCODe:STATe 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:NMESsage:STATe 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:NMESsage:TYPE RND
SOURce1:BB:GNSS:SVID1:GPS:MCONtrol:COPY:SVID 5
SOURce1:BB:GNSS:SVID1:GPS:MCONtrol:COPY:EXECute

// Use a data pattern as navigation message data source.
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:NMESsage:TYPE PATT
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:NMESsage:PATTern #H6,4
// Alternatively use list mode data as navigation message data source.
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:CA:DATA:NMESsage:TYPE DLIS
// Select the file gps_dl.dm_iqd.

// It is required, that the file is stored in the directory below.
SOURce1:BB:GNSS:SVID1:GPS:SIGN:L1Band:CA:DATA:NMES:DSEL "C:\Users\gps_dl.dm_iqd"
```

Commands:

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:STATe <SvState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:STATe <SvState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:STATe <SvState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:STATe <SvState>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:STATe <SvState>

Activates the SV ID.

Parameters:

<SvState> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "State (SV ID)" on page 30

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:PRESent <PresentInConst>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:PRESent <PresentInConst>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:PRESent <PresentInConst>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:PRESent <PresentInConst>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:PRESent <PresentInConst>

Includes the SV ID in the currents constellation.

Parameters:

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

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Present in Constellation" on page 31

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:FNUMber <FreqNum>

Queries the frequency number of the subcarrier.

Parameters:

<FreqNum> integer
Range: -7 to 13
*RST: 0

Example:
```
SOURce1:BB:GNSS:SVID15:GLONass:FNUMber?
```

Manual operation: See "Frequency Number" on page 32

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A[:STATe]
<State>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS[:STATe]
<State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA[:STATe] <State>

Activates the selected signal.

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

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Signal State" on page 34

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:DSHift <DopplerShift>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:DSHift <DopplerShift>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:DSHift <DopplerShift>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:DSHift <DopplerShift>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:DSHift <DopplerShift>

Sets the Doppler shift of the simulated signal of the selected satellite.

Parameters:
<DopplerShift> float
Range: -100E3 to 100E3
Increment: 1E-4
*RST: 0

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Doppler Shift" on page 32

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:ICPHase <InitCodePhase>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:ICPHase <InitCodePhase>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:ICPHase <InitCodePhase>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:ICPHase <InitCodePhase>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:ICPHase <InitCodePhase>

Require arbitrary navigation data source.

Sets the initial code phase in chips.

Parameters:

<InitCodePhase> float

Range: 0 to 20459.99
Increment: 0.01
*RST: 0

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Initial Code Phase" on page 32

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:L1C:DATA:NMESsage[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage[:STATe] <State>

In tracking mode, enables configuration of the navigation message parameters.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Nav Msg" on page 35

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:PILot:PCODe[:STATe] <State>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:L1C:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:L1C:DATA:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:PILot:PCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:PCODe[:STATe] <State>

Activates spreading by using the primary code.

Parameters:

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

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Primary Code" on page 34

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:PILot:SCODe[:STATe] <State>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:PILot:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:SCODe[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:L1C:PILot:SCODe[:STATe] <State>

Activates the secondary code in the data/pilot channel.

Parameters:

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

Example:

```
SOURce1:BB:GNSS:SYSTem:GPS:STATe 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:L1C 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L5Band:L5S 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L1Band:L1C:PILot:SCODE 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L5Band:L5S:PILot:SCODE 1
SOURce1:BB:GNSS:SVID1:GPS:SIGNal:L5Band:L5S:DATA:SCODE 1
```

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Secondary Code" on page 34

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:NMESsage:CONTrol <NavMsgControl>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:NMESsage:CONTrol <NavMsgControl>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:CONTrol <NavMsgControl>

Defines whether the navigation message parameters can be changed or not.

Parameters:

<NavMsgControl> OFF | EDIT | AUTO | OFF | ON

OFF
Disables sending the navigation message.

ON
Enables configuration of the navigation message.

*RST: AUTO

Example: See Example"Configuring the SV modulation control settings" on page 101.

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:NMESsage:TYPE <Data>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:NMESsage:TYPE <Data>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:TYPE <Data>

Sets the data source used for the generation of the navigation message.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | RNData | ZNData

ZERO|ONE|PATTern|PN9|PN11|PN15|PN16|PN20|PN21|PN23|DLISt
Arbitrary data source.
Define the pattern and load an existing data list file with the commands:
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:PATTern`
`[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:DSELect`

RNData
Summary indication for real navigation data.
Current navigation message type depends on the GNSS system and the RF band, e.g. for GPS in L1 RNData means LNAV.

ZNData
Zero navigation data
Sets the orbit and clock correction parameters in the broadcasted navigation message to zero.

*RST: RNData

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Nav Msg Type" on page 35

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:NMESsage:DSELect <DSelect>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:DSELect <DSelect>

Selects an existing data list file from the default directory or from the specific directory.

Parameters:

<DSelect> string

Filename incl. file extension or complete file path

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Nav Msg Type" on page 35

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:SIGNal:L5Band:SPS:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2I:DATA:NMESsage:PATTern <Pattern>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2A:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L5Band:B2B:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L2Band:B3I:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1I:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:SIGNal:L1Band:B1C:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5B:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L5Band:E5A:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L2Band:E6S:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L5Band:L5S:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:CA:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L2Band:L2C:DATA:NMESsage:PATTern <Pattern>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:SIGNal:L1Band:CA:DATA:NMESsage:PATTern <Pattern>

Sets a bit pattern as data source.

Parameters:
<Pattern> 64 bits

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Nav Msg Type" on page 35

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:MEANdering[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:MEANdering[:STATe] <State>

Enables meandering, i.e. doubling the data rate of a GLONASS satellite navigation signal.

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

Example: See `[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:TSEQuence[:STATe]` on page 117.

Manual operation: See "Meander Sequence" on page 36

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L2Band:CA:DATA:TSEQuence[:STATe] <State>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:SIGNal:L1Band:CA:DATA:TSEQuence[:STATe] <State>

Enables the time signal component of GLONASS signals.

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

Example:
```
:SOURce1:BB:GNSS:SYSTem:GLONass:STATe 1
:SOURce1:BB:GNSS:SVID2:GLONass:SIGNal:L1Band:CA:DATA:MEANdering:STATe 1
:SOURce1:BB:GNSS:SVID2:GLONass:SIGNal:L1Band:CA:DATA:TSEQuence:STATe 1
```

Manual operation: See "Time Sequence" on page 37

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:MCONtrol:COPY:SVID <Svid>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:MCONtrol:COPY:SVID <Svid>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:MCONtrol:COPY:SVID <Svid>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:MCONtrol:COPY:SVID <Svid>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:MCONtrol:COPY:SVID <Svid>

Sets the SV ID to that the configuration form the current satellite (`SVID<ch>`) is applied.

Both SV IDs belong to the same GNSS system.

Parameters:

<Svid> 1 | 2 | 3 | 5 | 4 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 19 | 18 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | ALL

*RST: 1

Example: See Example"Configuring the SV modulation control settings" on page 101.

Manual operation: See "Copy Modulation Control Settings to,SV-ID" on page 37

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:MCONtrol:COPY:EXECute
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:MCONtrol:COPY:EXECute
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:MCONtrol:COPY:EXECute
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:MCONtrol:COPY:EXECute
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:MCONtrol:COPY:EXECute

Applies the configuration of the current satellite (`SVID<ch>:<GNSS system>`) to the satellite defined with the command `[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:MCONtrol:COPY:SVID`.

Both SV IDs belong to the same GNSS system.

Example: See Example"Configuring the SV modulation control settings" on page 101.

Usage: Event

Manual operation: See "Copy Modulation Control Settings to,SV-ID" on page 37

6.6 Navigation message commands

Example: Setting scaled or unscaled navigation message parameters

```
// Unscaled values imply, that commands with mnemonic "UNSCaled" are used.
SOURce1:BB:GNSS:SSValues 0
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:TOE:UNSCaled 28800

// Scaled values imply, that commands without mnemonic "UNSCaled" are used.
SOURce1:BB:GNSS:SSValues 1
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:TOE  1800
```

Example: Configuring Galileo Search-and-Rescue (SAR) data

The example illustrates how to configure Galileo SAR data.

```
// ******************************************************************************
// Enable Galileo system and nav. message configuration of, e.g., space vehicle 6.
// ******************************************************************************
SOURce1:BB:GNSS:SYSTem:GALileo:STATe 1
SOURce1:BB:GNSS:SVID6:GALileo:SIGNal:L1Band:E1OS:DATA:NMESsage:CONTrol EDIT
// ******************************************************************************
Configure long return link message (RLM) data.
// ******************************************************************************
// Set for long RLM data SAR mode.
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:MODE LRLM
// Set data bits of RLM parts 1 to 8.
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM1 0
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM2 1
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM3 2
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM4 3
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM5 4
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM6 5
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM7 6
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:RLM8 1048575
// ******************************************************************************
// Configure spare data.
// ******************************************************************************
// Set for spare data SAR mode.
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:MODE SPARe
// Set the 21 bits of spare SAR data.
SOURce1:BB:GNSS:SVID6:GAL:NMES:INAV:EPH:SAR:SPARe 699050
```

Commands:

6.6.1 Orbit, clock, system, time conversion and ionospheric errors

[:SOURce<hw>]:BB:GNSS:SSValues <ShowScaledValue>

Defines if the navigation message parameters are set as scaled or unscaled values and thus which subset of remote-control commands is used.

Parameters:

<ShowScaledValue> 1 | ON | 0 | OFF

0
Used are unscaled values
The `SOURce<hw>:BB:GNSS:...:UNSCaled` commands apply.

1
Used are scaled values
Commands without the mnemonic `UNSCaled` apply.

*RST: 0

Example:

```
SOURce1:BB:GNSS:SSValues 0
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:TOE:UNSCaled
// 28800
SOURce1:BB:GNSS:SSValues 1
SOURce1:BB:GNSS:SVID1:GPS:NMESsage:LNAV:EPHemeris:TOE?
// 1800
```

Manual operation: See "Show Scaled Values" on page 43

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:IODNav <IODnav>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IODNav <IODnav>

Sets the IODnav parameter.

Parameters:

<IODnav> integer

Range: 0 to 1023
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IODE <IODde>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IODE <IODe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IODE <IODe>

Sets the issue of data, emphemeris.

Parameters:

<IODe> integer

Range: 0 to 255
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:TOE <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:TOE:UNSCaled <Toe>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:TOE <Toe>

Sets the reference time of ephemeris.

Parameters:

<Toe> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:SQRA:UNSCaled <SqrtA>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:SQRA <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SQRA:UNSCaled <SqrtA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SQRA <SqrtA>

Sets the square root of semi-major axis.

Parameters:

<SqrtA> integer

Range: 0 to 4294967295
*RST: depends on installed options

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ECCentricity <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:ECCentricity <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ECCentricity <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ECCentricity <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ECCentricity <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ECCentricity <Eccentricity>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ECCentricity:UNSCaled <Eccentricity>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ECCentricity <Eccentricity>

Sets the eccentricity.

Parameters:
<Eccentricity> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:IZERo <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IZERo:UNSCaled <I0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IZERo <I0>

Sets the inclination angle.

Parameters:
<I0> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OZERo <Omega0>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:OZERo <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OZERo <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:OZERo <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OZERo <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:OZERo <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OZERo:UNSCaled <Omega0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OZERo <Omega0>

Sets the longitude of ascending node.

Parameters:

<Omega0> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OMEGa:UNSCaled <Omega>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:OMEGa <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OMEGa:UNSCaled <Omega>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:OMEGa <Omega>

Sets the argument of perigee.

Parameters:
<Omega> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:MZERo <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:MZERo:UNSCaled <M0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:MZERo <M0>

Sets the mean anomaly.

Parameters:
<M0> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:IDOT <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IDOT:UNSCaled <Idot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IDOT <Idot>

Sets the rate of inclination angle.

Parameters:

<Idot> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ODOT:UNSCaled <OmegaDot>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ODOT <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ODOT:UNSCaled <OmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ODOT <OmegaDot>

Sets the rate of right ascension.

Parameters:
<OmegaDot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DODot:UNSCaled <DeltaOmegaDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DODot <DeltaOmegaDot>

Sets the Rate of right ascension difference.

Parameters:
<DeltaOmegaDot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:NDELta:UNSCaled <DeltaN>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NDELta <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:NDELta:UNSCaled <DeltaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:NDELta <DeltaN>

Sets the mean motion difference delta.

Parameters:
<DeltaN> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:DNDot:UNSCaled <DeltaNDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:DNDot <DeltaNDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DNDot:UNSCaled <DeltaNDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:DNDot <DeltaNDot>

Sets the rate of mean motion difference delta.

Parameters:
<DeltaNDot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ADOT:UNSCaled <ADot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ADOT <ADot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADOT:UNSCaled <ADot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADOT <ADot>

Sets the change rate in semi-major axis.

Parameters:
<ADot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ADELta:UNSCaled <DeltaA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ADELta <DeltaA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADELta:UNSCaled <DeltaA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ADELta <DeltaA>

Sets the semi-major axis difference.

Parameters:

<DeltaA> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINTerval?

Queries the T_b-interval.

Return values:

<TbInterval> string

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TOE?

Queries the reference epoch time t_b.

Return values:

<Hour> integer
Range: 0 to 23

<Minute> integer
Range: 0 to 59

<Second> float
Range: 0 to 59
Increment: 1

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINDex:UNSCaled <TbIndex>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TINDex <TbIndex>

Sets the t_b Index parameter.

Parameters:
<TbIndex> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZN:UNSCaled <Zn>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZN <Zn>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YN:UNSCaled <Yn>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YN <Yn>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XN:UNSCaled <Xn>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XN <Xn>

Sets the X_n, Y_n and Z_n coordinates in PZ-90.

Parameters:
<Xn> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDN:UNSCaled <ZnDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDN <ZnDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDN:UNSCaled <YnDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDN <YnDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDN:UNSCaled <XnDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDN <XnDot>

Sets the velocity components X'_n, Y'_n and Z'_n.

Parameters:
<XnDot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDDN:UNSCaled <ZnDotDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:ZDDN <ZnDotDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDDN:UNSCaled <YnDotDot>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:YDDN <YnDotDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDDN:UNSCaled <XnDotDot>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:XDDN <XnDotDot>

Sets the moon and sun acceleration parameters X''_n, Y''_n and Z''_n.

Parameters:
<XnDotDot> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CUC <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUC:UNSCaled <Cuc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUC <Cuc>

Sets the cosine difference of latitude.

Parameters:
<Cuc> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CUS <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUS:UNSCaled <Cus>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CUS <Cus>

Sets the sine difference of latitude.

Parameters:

<Cus> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CRC:UNSCaled <Crc>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CRC <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRC:UNSCaled <Crc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRC <Crc>

Sets the cosine difference of orbital radius.

Parameters:

<Crc> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CRS <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CRS <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CRS <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CRS <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CRS <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CRS <Crs>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRS:UNSCaled <Crs>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CRS <Crs>

Sets the sine difference of orbital radius.

Parameters:
<Crs> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CIC <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIC:UNSCaled <Cic>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIC <Cic>

Sets the sine difference of orbital radius.

Parameters:
<Cic> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:CIS <Cis>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:CIS <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:CIS <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:CIS <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:CIS <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:CIS <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIS:UNSCaled <Cis>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CIS <Cis>

Sets the sine difference of inclination.

Parameters:

<Cis> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:IODC <Iodc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:IODC <Iodc>

Sets the issue of data, clock (IODC).

Parameters:

<Iodc> integer

Range: 0 to 1023
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:TOC:UNSCaled <Toc>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:TOC <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TOC:UNSCaled <Toc>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TOC <Toc>

Sets the reference time of clock.

Parameters:

<Toc> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:AF<s2us0> <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:AF<s2us0> <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:AF<s2us0> <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:AF<s2us0> <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:AF<s2us0> <Af>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:AF<s2us0> <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:AF<s2us0>:UNSCaled <Af>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:AF<s2us0> <Af>

Sets the parameter AF 0 to 2.

Suffix:
AF<s2us0> 0 to 2 (GPS, Galileo, BeiDou)

Parameters:
<Af> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TGD:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:CCORrection:TGD <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:TGD:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:CCORrection:TGD <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TGD<s2us>:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:CCORrection:TGD<s2us> <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:TGD:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORrection:TGD <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TGD:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:CCORrection:TGD <Tgd>

Sets the group delay.

Parameters:
<Tgd> integer
Range: -128 to 127
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5Q:UNSCaled <IscL5Q5>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5Q <IscL5Q5>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5I:UNSCaled <IscL5I5>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L5I <IscL5I5>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L2C:UNSCaled <IscL2C>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L2C <IscL2C>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L1CA:UNSCaled <IscL1CA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:CCORection:ISC:L1CA <IscL1CA>

Sets the inter-signal corrections (ISC) parameters of the GPS/QZSS CNAV message.

Parameters:

<IscL1CA> integer

Range: -4096 to 4095
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:BGDA:UNSCaled <Bgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:CCORrection:BGDA <Bgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDB:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDB <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDA:UNSCaled <Bgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:CCORrection:BGDA <Bgd>

Sets the broadcast group delay.

Parameters:

<Bgd> integer

Range: -512 to 511
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:TAUN:UNScaled <Tau>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:TAUN <Tau>

Sets the parameter T_n (~ $-a_{f0}$)

Parameters:

<Tau> integer

*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:GAMN:UNSCaled <GammaN>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:GAMN <GammaN>

Sets the parameter Γ_n (~a_{f1}).

Parameters:
<GammaN> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:DTAU:UNSCaled <Tgd>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:DTAU <Tgd>

Sets the DELTA T_n (~T_{gd}).

Parameters:
<Tgd> integer
Range: -128 to 127
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:CNAV:EPHemeris:ALERt <AlertFlag>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ALERt <AlertFlag>

Sets the alert flag.

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

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L5Health <L5Health>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L2Health <L2Health>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L1Health <L1Health>

Sets the L1, L2 or L5 health flag in the GPS/QZSS CNAV message.

Parameters:
<L1Health> integer
Range: 0 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED0
<NED0>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED1
<NED1>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:NED2
<NED0>

Sets the NED accuracy index (`NED0`), accuracy change indexs (`NED1`) and accuracy change rate index (`NED2`).

Parameters:

<NED0> integer
Range: 0 to 7
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:WNOP
<WNOP>

Sets the data predict week number.

Parameters:

<WNOP> integer
Range: 0 to 8191
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:TOP:UNSCaled <Top>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:TOP
<Top>

Sets the data predict time of week.

Parameters:

<Top> integer
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:ISFLag
<IsFlag>

Sets the integrity status flag.

Parameters:

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

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:L2CPhasing <L2CPhasing>

Sets the L2C phasing.

Parameters:
<L2CPhasing> 1 | ON | 0 | OFF
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:L5Health <L5Health>

Sets the L5 health flag in the NavIC NAV message.

Parameters:
<L5Health> integer
Range: 0 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:SHEalth <SHealth>

Sets the S health flag in the NavIC NAV message.

Parameters:
<SHealth> integer
Range: 0 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:HEALth <SvHealt>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:HEALth <SvHealt>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:HEALth <SvHealt>

Sets the SV health.

See also `[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:HEALthy` on page 98.

Parameters:
<SvHealt> integer
Range: 0 to 63
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:NAVic:NMESsage:NAV:EPHemeris:URA <URA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:URA <URA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:BEIDou:NMESsage:DNAV:EPHemeris:URA <URA>

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:CNAV:EPHemeris:URA <URA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:URA <URA>

Sets the user range accuracy index.

Parameters:
<URA> integer
Range: 0 to 15
*RST: 5

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:ASFLag <AntiSpoofFlag>

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

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:SVConfig <AsFlag>

Sets the SV config.

Parameters:
<AsFlag> integer
Range: 0 to 7
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:CLTMode <CodeOnL2Mode>

Sets the code on L2.

Parameters:
<CodeOnL2Mode> REServed | PCODe | CACode
*RST: PCODe

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:LTPData <L2P>

Sets the L2 P data flag.

Parameters:
<L2P> 1 | ON | 0 | OFF
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:FIFLag
<FitInterval>

Sets the fit interval flag.

Parameters:

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

[:SOURce<hw>]:BB:GNSS:SVID<ch>:QZSS:NMESsage:NAV:EPHemeris:AODO?
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:AODO?

Queries the age of data offset, that is fixed to 31.

Return values:

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

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GPS:NMESsage:LNAV:EPHemeris:
SF1Reserved<s2us>?

Sets the subframe 1 (reserved 1 to 4).

Return values:

<Subfr1Reserved> integer
Range: 0 to 67108864
*RST: 0

Usage: Query only

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:EPHemeris:SISA
<URA>
[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SISA
<URA>

Sets the signal in space accuracy index.

Parameters:

<URA> integer
Range: 0 to 255
*RST: 5

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BDVS
<DvsE1b>

Sets the data validity status - $E1B_{DVS}$.

Parameters:
<DvsE1b> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E1BHS <HsE1b>

Sets the signal health status - $E1B_{HS}$ parameter.

Parameters:
<HsE1b> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E5BDVS <DvsE5b>

Sets the data validity status - $E5b_{DVS}$ parameter.

Parameters:
<DvsE5b> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:E5BHS <HsE5b>

Sets the signal health status - $E5b_{HS}$ parameter.

Parameters:
<HsE5b> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:MODE <SarMode>

Sets the Search-and-Rescue Service (SAR) mode for SAR message generation. SAR messages are specified by the 22-bit SAR field in the I/NAV navigation message.

For more information, refer to specification Galileo OS SIS ICD.

Parameters:
<SarMode> SPARe | SRLM | LRLM

SPARe
Generates spare SAR data.
The start bit is set to one. SAR receivers interpret the following 21 spare bits as SAR non-relevant data.

SRLM/LRLM
Generates SAR data for nominal mode operation in the Galileo E1-B component. For the SAR message format, you can select between short return link message (SRLM) and long return link message (LRLM).
For the real navigation message, the Short/Long RLM Identifier, in the SAR data field is set accordingly (0 = Short RLM, 1 = Long RLM).

*RST: SPARe

Example: See Example"Configuring Galileo Search-and-Rescue (SAR) data" on page 119.

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:RLM<s2us> <SarRlmData>

Sets the 20-bit Search-and-Rescue Service (SAR) return link message (RLM) data for nominal mode operation.

For more information, refer to specification Galileo OS SIS ICD.

Parameters:
<SarRlmData> integer

Range: 0 to 1048575
*RST: 0

Example: See Example"Configuring Galileo Search-and-Rescue (SAR) data" on page 119.

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:INAV:EPHemeris:SAR:SPARe <SpareData>

Sets the 21-bit Search-and-Rescue Service (SAR) spare data.

For more information, refer to specification Galileo OS SIS ICD.

Parameters:
<SpareData> integer

Range: 0 to 2097151
*RST: 0

Example: See Example"Configuring Galileo Search-and-Rescue (SAR) data" on page 119.

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:E5ADVS <DvsE5a>

Sets the data validity status - $E5a_{DVS}$.

Parameters:
<DvsE5a> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GALileo:NMESsage:FNAV:E5AHS <HsE5a>

Sets the signal health status - $E5a_{HS}$ parameter.

Parameters:
<HsE5a> integer
Range: -1 to 1
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:SEType <SatType>

Sets the satellite ephemeris type - M parameter.

Parameters:
<SatType> GLO | GLOM | GLOK
GLO
GLONASS
GLOM
GLONASS - M
GLOK
GLONASS - K
*RST: GLOM

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:CFM <FieldM>

Sets CDMA field M parameter.

Parameters:
<FieldM> integer
Range: 1 to 7
*RST: 1

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:P <P>

Sets the satellite operation mode - P parameter.

Parameters:
<P> integer
Range: 0 to 3
*RST: 0

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:AOEP <AgeOfEphemeris>

Sets the age of ephemeris page - P1 parameter.

Parameters:

<AgeOfEphemeris> A30M | A45M | A60M
*RST: A30M

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:EPHemeris:TALignment <TbAlignment>

Sets the t_b alignment - P2.

Parameters:

<TbAlignment> EVEN | ODD
*RST: EVEN

[:SOURce<hw>]:BB:GNSS:SVID<ch>:GLONass:NMESsage:NAV:CCORrection:EN <En>

Sets the E_n parameter.

Parameters:

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

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:WNOT <WNot>

Sets the parameter W_{Not}.

Parameters:

<WNot> integer
Range: 0 to 529947
*RST: 0

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:TOT <Tot>

Sets the parameter T_{ot}.

Parameters:

<Tot> integer
Range: 0 to 65535

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:ATWO:UNSCaled <A2>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:ATWO <A2>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:ATWO:UNSCaled <A2>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:ATWO <A2>

Sets the A_2 parameter.

Parameters:

<A2> integer
Range: -64 to 63

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AONE <A1>

Sets the parameter A_1.

Parameters:

<A1> integer
Range: -4096 to 4095

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>

[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:UTC:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:LNAV:TIME:CONVersion:UTC:AZERo <A0>

Sets the parameter A_0.

Parameters:

<A0> integer
Range: -32768 to 32767

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:WNOT <WNot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:WNOT <WNot>

Sets the W_{Not} parameter.

Parameters:

<WNot> integer
Range: 0 to 529947
*RST: 0

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:TOT:UNSCaled <Tot>

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:TOT <Tot>

Sets the T_{ot} parameter.

Parameters:

<Tot> integer
Range: 0 to 65535

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GLONass:NMESsage:NAV:TIME:CONVersion:GPS:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AZERo <A0>

Sets the A_0 parameter.

Parameters:

<A0> integer
Range: -32768 to 32767

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:FNAV:TIME:CONVersion:GPS:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GALileo:NMESsage:INAV:TIME:CONVersion:GPS:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GPS:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GPS:AONE <A1>

Sets the A_1 parameter.

Parameters:
<A1> integer
Range: -4096 to 4095

[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:ATWO:UNSCaled <A2>
[:SOURce<hw>]:BB:GNSS:SV:NAVic:NMESsage:NAV:TIME:CONVersion:GPS:ATWO <A2>

Sets the A_2 parameter.

Parameters:
<A2> integer
Range: -64 to 63

[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:WNOT <WNot>

Sets the W_{not} parameter.

Parameters:
<WNot> integer
Range: 0 to 529947
*RST: 0

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:TOT <Tot>

Sets the T_{ot} parameter.

Parameters:

<Tot> integer
Range: 0 to 65535

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AZERo <A0>

Sets the A_0 parameter.

Parameters:

<A0> integer
Range: -32768 to 32767

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GALileo:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GALileo:AONE <A1>

[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:AONE <A1>

Sets the A_1 parameter.

Parameters:
<A1> integer
Range: -4096 to 4095

[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:ATWO:UNSCaled <A2>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GALileo:ATWO <A2>

Sets the A_2 parameter.

Parameters:
<A2> integer
Range: -64 to 63

[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:WNOT <WNot>

Sets the W_{Not} parameter.

Parameters:
<WNot> integer
Range: 0 to 529947
*RST: 0

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:TOT <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:TOT:UNSCaled <Tot>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:TOT <Tot>

Sets the T_{ot} parameter.

Parameters:
<Tot> integer
Range: 0 to 65535

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AZERo <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AZERo:UNSCaled <A0>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AZERo <A0>

Parameters:

<A0> integer

Range: -32768 to 32767

[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:CNAV:TIME:CONVersion:GLONass:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:BEIDou:NMESsage:DNAV:TIME:CONVersion:GLONass:AONE <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AONE:UNSCaled <A1>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:AONE <A1>

Sets the A_1 parameter.

Parameters:

<A1> integer

Range: -4096 to 4095

[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:ATWO:UNSCaled <A2>
[:SOURce<hw>]:BB:GNSS:SV:GPS:NMESsage:CNAV:TIME:CONVersion:GLONass:ATWO <A2>

Sets the A_2 parameter.

Parameters:

<A2> integer

Range: -64 to 63

[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:ALPHa<ch0>:UNSCaled <AlphaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:ALPHa<ch0> <Alpha>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:CNAV:IONospheric:ALPHa<ch0>:UNSCaled <AlphaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:CNAV:IONospheric:ALPHa<ch0> <Alpha>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:ALPHa<ch0>:UNSCaled <AlphaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:ALPHa<ch0> <Alpha>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:CNAV:IONospheric:ALPHa<ch0>:UNSCaled <AlphaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:CNAV:IONospheric:ALPHa<ch0> <Alpha>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:ALPHa<ch0>:UNSCaled <AlphaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:ALPHa<ch0> <Alpha>

Sets the parameters alpha_0 to alpha_3 of the satellite's navigation message.

Suffix:
<ch0> 0 to 3

Parameters:
<Alpha> integer
Range: -128 to 127
*RST: 0

[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:FNAV:IONospheric:AI<ch0>:UNSCaled <AiUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:FNAV:IONospheric:AI<ch0> <A_i>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:INAV:IONospheric:AI<ch0>:UNSCaled <AiUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:INAV:IONospheric:AI<ch0> <A_i>

Sets the parameters effective ionization level 1st to 3rd order of the satellite's navigation message.

Parameters:
<A_i> integer
Range: a_i0 (0 to 2047), a_i1 (-1024 to 1023), a_i2 (-8192 to 8191)
*RST: 0

[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:BETA<ch0>:UNSCaled <BetaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:NAVic:NMESsage:NAV:IONospheric:BETA<ch0> <Beta>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:CNAV:IONospheric:BETA<ch0>:UNSCaled <BetaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:CNAV:IONospheric:BETA<ch0> <Beta>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:BETA<ch0>:UNSCaled <BetaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:BEIDou:NMESsage:DNAV:IONospheric:BETA<ch0> <Beta>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:CNAV:IONospheric:BETA<ch0>:UNSCaled <BetaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:CNAV:IONospheric:BETA<ch0> <Beta>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:BETA<ch0>:UNSCaled <BetaUnscaled>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GPS:NMESsage:LNAV:IONospheric:BETA<ch0> <Beta>

Sets the parameters beta_0 to beta_3 of the satellite's navigation message.

Suffix:
<ch0> 0 to 3

Parameters:
<Beta> integer
Range: -128 to 127
*RST: 0

[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:FNAV:IONospheric:SF<ch> <SF>
[:SOURce<hw>]:BB:GNSS:ATMospheric:GALileo:NMESsage:INAV:IONospheric:SF<ch> <SF>

Sets the parameters ionospheric disturbance flag for region 1 to 5 of the satellite's navigation message.

Suffix:
<ch> 1 to 5

Parameters:
<SF> integer
Range: 0 to 1
*RST: 0

6.7 Marker commands

Example: Configure and enable marker signals

```
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE REST
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE PPS
SOURce1:BB:GNSS:TRIGger:OUTPut1:PULSe:WIDTh 0.000002
SOURce1:BB:GNSS:TRIGger:OUTPut1:PULSe:WIDTh 0.000003
SOURce1:BB:GNSS:TRIGger:OUTPut1:PULSe:WIDTh 0.000004
SOURce1:BB:GNSS:TRIGger:OUTPut1:PULSe:WIDTh 0.000005
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE PATT
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE RAT
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE PULS
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE PP2S
SOURce1:BB:GNSS:TRIGger:OUTPut1:MODE REST
SOURce1:BB:DM:TRIGger:OUTPut1:MODE PULS
SOURce1:BB:DM:TRIGger:OUTPut1:MODE PATT
SOURce1:BB:DM:TRIGger:OUTPut1:MODE RAT


SOURce1:BB:GNSS:TRIGger:OUTPut2:MODE PATT
SOURce1:BB:GNSS:TRIGger:OUTPut2:MODE RAT
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001001
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001002
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001003
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001004
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001005
SOURce1:BB:GNSS:TRIGger:OUTPut2:ONTime 0.000001006
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001001
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001002
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001003
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001004
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001005
SOURce1:BB:GNSS:TRIGger:OUTPut2:OFFTime 0.000001006


SOURce1:BB:GNSS:TRIGger:OUTPut3:MODE REST
SOURce1:BB:GNSS:TRIGger:OUTPut3:MODE PPS
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001004
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001005
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001006
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001007
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001008
SOURce1:BB:GNSS:TRIGger:OUTPut3:PULSe:WIDTh 0.000001009

SOURce1:BB:GNSS:TRIGger:OUTPut4:MODE PPS
SOURce1:BB:GNSS:TRIGger:OUTPut4:PULSe:WIDTh 0.000002
SOURce1:BB:GNSS:TRIGger:OUTPut4:PULSe:WIDTh 0.000003
SOURce1:BB:GNSS:TRIGger:OUTPut4:PULSe:WIDTh 0.000004
```

```
SOURce1:BB:GNSS:TRIGger:OUTPut4:MODE PATT
SOURce1:BB:GNSS:TRIGger:OUTPut4:MODE RAT
SOURce1:BB:GNSS:TRIGger:OUTPut4:MODE REST
```

Commands

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode> PPS|PP2S|PULSe|PATTern|RATio|RESTart|PPS10

*RST: PPS

Example: See Example"Configure and enable marker signals" on page 173.

Manual operation: See "Marker x Mode" on page 66

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:ONTime <OnTime>
[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:OFFTime <OffTime>

Sets the number of chips during which the marker output is on or off.

Parameters:

<OffTime> float

Range: 0.000000011 to 0.1822215935
Increment: 1E-9
*RST: 1E-6

Example: See Example"Configure and enable marker signals" on page 173.

Manual operation: See "Marker x Mode" on page 66

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PATTern <Pattern>

Defines the bit pattern used to generate the marker signal.

Parameters:

<Pattern> 64 bits

Example: See Example"Configure and enable marker signals" on page 173.

Manual operation: See "Marker x Mode" on page 66

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:DIVider <Divider>

Sets the divider for pulse marker mode (`PULSe`).

Parameters:

<Divider> integer

Range: 2 to 1024
*RST: 2

Example: See Example"Configure and enable marker signals" on page 173.

Manual operation: See "Marker x Mode" on page 66

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:FREQuency?

Queries the pulse frequency of the pulsed marker signal. The pulse frequency is derived by dividing the symbol rate by the divider.

Return values:

<Frequency> float

Example: See Example"Configure and enable marker signals" on page 173.

Usage: Query only

Manual operation: See "Marker x Mode" on page 66

[:SOURce<hw>]:BB:GNSS:TRIGger:OUTPut<ch>:PULSe:WIDTh <Width>

Sets the pulse width for 1PPS, 1PP2S and PPS10 marker mode. The maximum pulse width depends on the marker mode.

Marker mode	1PPS	1PP2S	PPS10
Max. pulse width	1 s	2 s	0.1 s

Parameters:

<Width> float

Range: 1E-9 to depends on the marker mode
Increment: 1E-9
*RST: 1E-6

Example: See Example"Configure and enable marker signals" on page 173.

Manual operation: See "Marker x Mode" on page 66

Annex

A RINEX files

The RINEX file format consists of three ASCII file types: observation data file, navigation message file and meteorological data file. The navigation RINEX files provide the ephemeris information of all visible satellites at a control station or a commercial receiver.

Each file type consists of a header section and a data section. The header section contains global information for the entire file and is placed at the beginning of the file. The format of the data records of the RINEX navigation message files can contain navigation messages of more than one satellite system (GPS, GLONASS, Galileo, etc.).

Navigation files

The GNSS firmware of the R&S WinIQSIM2 can import and generate RINEX navigation files. For supported file formats and extensions per GNSS system, see Table A-1.

Table A-1: File format and file extension per GNSS

Format	GPS	Galileo	BeiDou	GLONASS	QZSS	NavIC
RINEX 2.x	`*.<xx>n`	-	-	`*.<xx>g`	-	-
RINEX 3.x	`*.rnx`	`*.rnx`	`*.rnx`	`*.rnx`	`*.rnx`	`*.rnx`

Where `<xx>` indicates for the year of the recording. For example, the extensions `.12n` indicates a GPS ephemeris file, recorded in 2012.

Specification and download sources

Find latest information on the RINEX file format and download sources for RINEX navigation files, for example, on the following websites:

- RINEX file format specifications all versions:
  https://files.igs.org/pub/data/format
- RINEX file format specification version 3.04:
  https://files.igs.org/pub/data/format/rinex304.pdf
- RINEX navigation files (registration required):
  https://cddis.nasa.gov/archive/gnss/data/daily/

Glossary: List of publications and reference information

Symbols

[1]: http://www.navipedia.net

1GP86: Rohde & Schwarz Application Note 1GP86 "GPS, Glonass, Galileo, BeiDou Receiver Testing Using a GNSS Signal Simulator"

1GP101: Rohde & Schwarz Application Note 1GP101 "Simulating Automatic Obscuration and Multipath for Realistic GNSS Receiver Testing"

1GP102: Rohde & Schwarz Application Note 1GP102 "Hardware in the Loop (HIL) Testing with a GNSS Simulator"

D

Di Giovanni and Radicella, 1990: Di Giovanni, G. and Radicella, S. M., 1990. An analytical model of the electron density pro_le in the ionosphere. Advances in Space Research

G

Galileo OS SIS ICD: European Commission: "European GNSS (Galileo) Open Service - Signal In Space Interface Control Document" https://ec.europa.eu/docsroom/documents/11001/attachments/1/translations/en/renditions/native

J

JAXA: The Japan Aerospace Exploration Agency

R

RTCA MOPS DO-229: "Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment", 13 Dec 2006

S

STANAG: NATO Standard Agreement STANAG 4294 Issue 1

T

TS 34.108: 3GPP TS 34.108 "Common test environments for User Equipment (UE); Conformance testing"

TS 34.171: 3GPP TS 34.171 "Terminal conformance specification; Assisted Global Positioning System (A-GPS); Frequency Division Duplex (FDD)"

TS 37.571-1: 3GPP TS 37.571-1 "User Equipment (UE) conformance specification for UE positioning; Part 1: Conformance test specification "

TS 37.571-2: 3GPP TS 37.571-2 "User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance"

TS 51.010-1: 3GPP TS 51.010-1 "Mobile Station (MS) conformance specification; Part 1: Conformance specification"

List of commands

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