



u-center

GNSS evaluation software for Windows

User guide

Abstract

This document leads you through the efficient use of the u-center evaluation software, the powerful and easy to use tool from u-blox for evaluating, performance analysis and configuration of u-blox GNSS positioning chips and modules.

www.u-blox.com

UBX-13005250 - R30
C1-Public



Document information

Title	u-center		
Subtitle	GNSS evaluation software for Windows		
Document type	User guide		
Document number	UBX-13005250		
Revision and date	R30	24-May-2022	
Document status	Production information		
Disclosure restriction	C1-Public		

This document applies to the following products:

Product name	Type number	Firmware version	PCN reference
u-center			

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1 Preface

1.1 Overview

u-center is u-blox's powerful GNSS evaluation and visualization tool which can be downloaded free-of-charge from our website (www.u-blox.com). This user guide provides a description of the features of this software. It allows end users to assess and test u-blox GNSS positioning chips and modules for navigation and positioning performance.

The purpose of u-center is to enable users to:

- Conduct performance tests on u-blox and other GNSS devices.
- Configure u-blox GNSS positioning chips and modules.
- Update the firmware on GNSS modules.
- Test the added performance provided by u-blox's AssistNow service.

1.2 Using this guide

This guide assumes that the user has basic computer skills and is familiar with the Windows Graphical User Interface (GUI) and GNSS receiver environments.

The following symbols are used to highlight important information:



An index finger points out key information pertaining to integration and performance.



A warning symbol indicates actions that could negatively impact u-center behavior.

1.3 Technical support

If you have questions about installing or using u-center:

- Read this user guide carefully.
- Check our homepage (<https://www.u-blox.com>) to ensure that your GNSS device, firmware and the u-center software are the latest versions.
- Refer to our web based information service.

1.3.1 Worldwide Web

Our website (www.u-blox.com) is a rich pool of information. Product information and technical documents can be accessed 24/7.

1.3.2 By email

If you have technical problems or cannot find the required information in the provided documents, contact the closest technical support office. To ensure that we process your request as soon as possible, use our service pool email addresses rather than personal staff email addresses. Contact details are at the end of the document.

1.3.3 Helpful information when contacting technical support

When contacting technical support, have the following information ready:

- Receiver type (e.g. NEO-M9N), firmware version (e.g. FW SPG 4.04), u-center release (e.g. u-center 21.09).
- Receiver configuration and short description of the application.

- Your complete contact details.

2 Features

u-center evaluation software provides system integrators and end users with a quick and simple way to interface with u-blox GNSS chipsets, modules and boards. It enables easy evaluation, performance testing, development and debugging of GNSS positioning chips and modules. u-center allows easy connection to u-blox products and provides a suite of features to view, log, and analyze performance. The features include:

- Support for u-blox's receivers using u-blox positioning technology. u-center can communicate with these receivers using either the UBX protocol or the NMEA-0183 standard protocol.
- Support for receivers that utilize standard NMEA strings.
- u-center presents all the information collected during the operation of the GNSS device. All aspects of GNSS data (position, velocity, time, satellite tracking, etc.) can be monitored and logged under various test scenarios for the evaluation of a receiver. u-center software allows analysis of the collected data in order to investigate performance issues such as accuracy, road test position and trajectory, satellite tracking, time to first fix, etc. All processed data can be captured in ASCII format and ported into popular spreadsheets for creating additional plots and statistics.
- Camera View: photographic data can be stored in the log file together with the navigation data and later be replayed in the application.
- Export data files to Google Earth and Google Maps.
- Supports (Multiple GNSS) AssistNow Online and AssistNow Offline.
- Data recording and playback function.
- Structural and graphical data visualization in real-time.
- Export functionality to standard PC applications.
- Docking views (real-time cockpit instruments): Satellite constellation, compass, clock, altimeter, speedometer, GNSS and satellite information views.
- Download firmware updates to GNSS positioning modules.
- Support for NTRIP server and NTRIP client functionality.
- Support for MQTT client functionality.
- Google Earth server support.
- SQLITE database support

3 Getting started

3.1 General information about displayed values

- Longitude and latitude are displayed according to the datum selected in the GNSS device (either the default WGS-84 or based on user-defined parameters). This option can be polled and set using the configuration item group `CFG-NAVSPG-USRDAT-*`.
- Time is displayed with reference to UTC.
- Elevation is displayed with reference to either MSL (Height above Mean Sea Level or Orthometric Height) or to HAE (Height Above WGS-84-Ellipsoid). The reference is controlled by the GNSS configuration.

3.2 Connecting an u-blox evaluation kit to the PC

This section assumes that you have purchased an u-blox evaluation kit. Should you try to connect a module or IC receiver directly to the PC, make sure you use appropriate RS-232 level shifters.

The evaluation kit can be connected to the PC by using either an USB or a serial cable. In case of using the USB port, a driver is required (installed by the u-center for Windows installer or downloadable from our homepage). Be sure to install the driver before connecting the evaluation kit to the computer.

3.3 Installing u-center

The installation program guides you through the necessary steps for a successful program installation. During the installation, you can choose the destination folder for the program.



u-center uses dynamic link libraries (DLL). The installation program will automatically install the required DLL's into the u-center program directory. Should you try to copy a u-center installation from one location to another after the installation, make sure you copy the DLL files as well.

After a successful installation, u-center can be started from the Start Menu (All Programs > u-blox > u-center > u-center) and will start up as shown in [Figure 1](#).

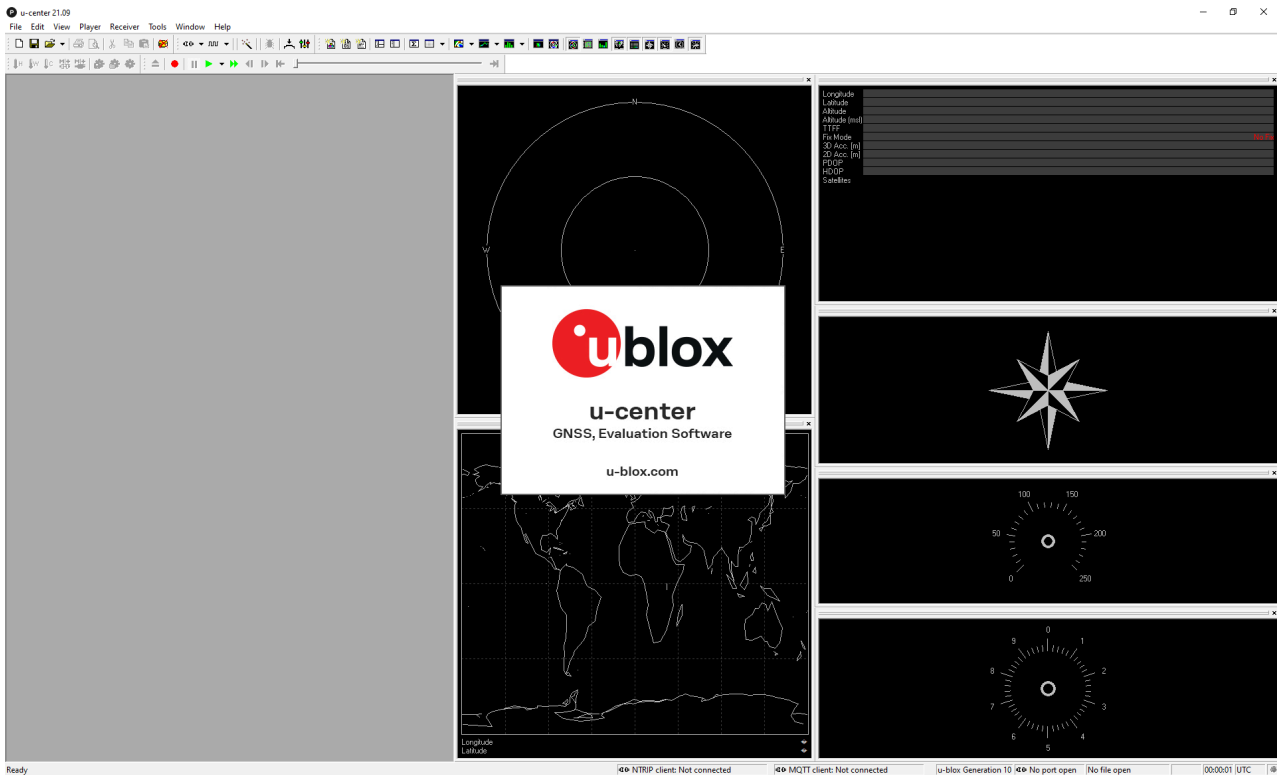


Figure 1: Start display

3.4 Connect to the receiver

3.4.1 Select the port

Locate the communication toolbar (Figure 2) and click on the arrow beside the icon. This will show a list with all available COM ports (Figure 3). Select the corresponding COM port where the receiver is connected. If a link could be established, the icon will turn green and the text in the status bar changes from No port open to COM6 9600 (in this example u-center is connected to COM6). This does not mean that the communication already works but only that the port could be opened.



Figure 2: Communication Toolbar

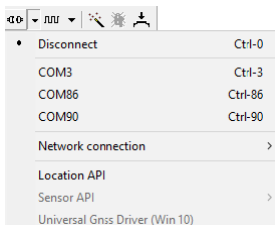



Figure 3: List of available COM ports

3.4.2 Select the baud rate (only for COM ports)

Again in the communication toolbar, click on the arrow beside the icon. This will show a list with all available baud rates (Figure 4). Select the correct baud rate on which the receiver is communicating (typically 9'600 baud). If u-center is able to decode data from the receiver, the status

bar begins to blink in green as shown in the following icon:  . This means that the connection is established successfully and the communication between the receiver and u-center is working.

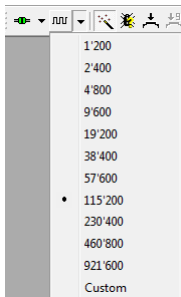


Figure 4: List of available baud rates

Now you are ready to use the receiver.

4 Concept and philosophy

Understanding the basic concept behind u-center is important in order to get the highest benefit out of this powerful evaluation software. [Figure 5](#) depicts the architecture of the software. The program gets a data stream from either a communication port or a log file and splits this stream into protocol messages. From the messages, relevant parameters are extracted and inserted into the current dataset of the database that is used by the display and analysis features of the application.

In the current dataset, statistical values of the parameters are calculated. Average, minimum, maximum and standard deviation are calculated for most parameters. If the available messages do not provide a parameter, u-center tries to calculate the parameter from the ones that are available. For example if velocity-north and velocity-east are available, u-center calculates the speed over ground and course over ground, unless this data is already available in other messages.

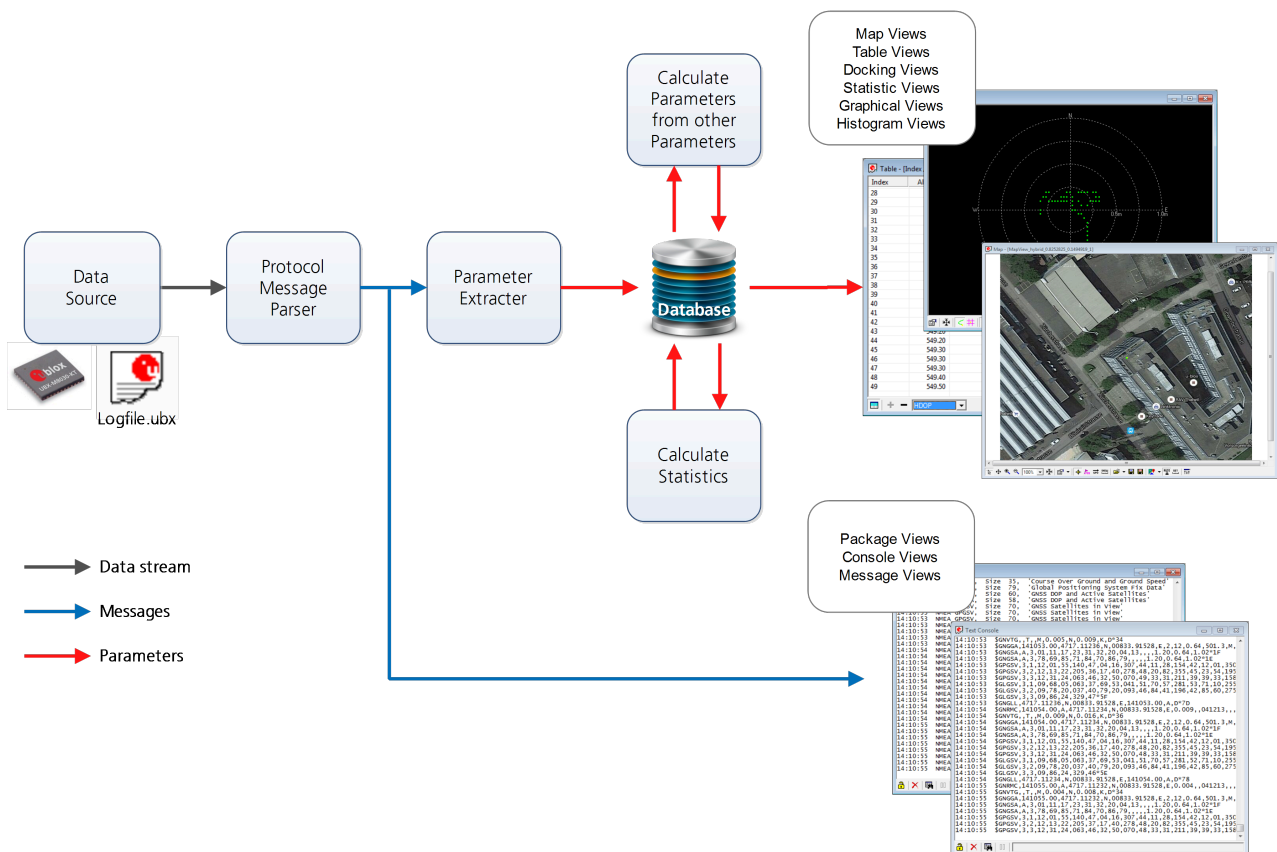


Figure 5: Engine architecture

The u-center database size may be adjusted. If the size is exceeded u-center keeps only the latest data sets and the oldest ones are removed. Refer to [Database limitations](#) for the details.



Very long recordings may decrease performance of u-center.

u-center provides various view classes (described below) for display and presentation. Most views take their data from the database, but some get their data directly from the message without using the database at all. The other views are updated when the database changes.

- **Message Views** display and decode a copy of every known message. These views allow observing a single message in detail and they may also be used to configure the GNSS device. Refer to

[Messages view](#) for details. The configuration view is a subset of the message view and only displays message to configure the receiver.

- **Console Views** display the messages in text form. There is also a wide range of information available which is useful for evaluation and testing. Refer to sections [Packet console](#), [Binary console](#) and [Text console](#) for details.
- **Graphical Views** display parameters from the database in graphical form. Charts (see [Chart view](#)), histograms (see [Histogram view](#)) and a map view (see [Map view](#)) can be created. There are two more views (deviation map and sky view, see [Deviation map](#) and [Sky view](#)) that may be used for statistical performance and antenna pattern analysis.
- **Tabular Views** show the parameters of the database in tabular form. They can be freely configured to allow customized tables. Refer to [Table view](#) and [Statistic view](#) for details.
- **Docking Windows** can be docked to the frame of u-center. An analog watch, compass, world map, altitude and speed meter are available. There are also docking windows showing the current signal power and the constellation of the satellites received by the device as well as a summary of the GNSS status.



Displaying various views and docking windows requires computing power. Minimizing or closing them may significantly reduce CPU usage.

4.1 Color and satellite coding scheme

In the graphical views and some docking windows, colors are used to indicate data quality. [Table 1](#) shows the color codes for graphical views depending on the quality of the navigation solution.








	Color	Meaning
	 Yellow	Current value
	 Orange	Valid 3D navigation fix + Dead Reckoning
	 Green	Valid 3D navigation fix
	 Cyan	Valid 2D navigation fix
	 Magenta	Dead Reckoning fix
	 Blue	Degraded navigation fix
	 Red	No or invalid navigation fix

Table 1: Color-coding scheme for graphical views

[Table 2](#) gives the color-coding scheme for the docking windows and sky view. It indicates the state of each satellite.







	Color	Meaning
	 Green	Satellite used in navigation (with Ephemeris)
	 Olive	Satellite used in navigation (with Ephemeris and PPP)
	 Dark Green	Satellite used in navigation (with aiding data: AssistNow Autonomous, AssistNow Online/Offline)
	 Cyan	Satellite signal available, available for use in navigation
	 Blue	Satellite signal available, not available for use in navigation
	 Red	Satellite signal not available

Table 2: Color-coding scheme for the docking windows and sky view

Table 3 gives the satellite-coding scheme for the docking windows and sky view. It indicates to which GNSS a satellite belongs.

Code	System
Gxx	GPS
Rxx	GLONASS
Bxx	BeiDou
Exx	Galileo
Sxx	SBAS
Qxx	QZSS

Table 3: Satellite-coding scheme for the docking windows and sky view

Figure 6 shows the Status Color configuration. This is available under: Tools > Preferences > Status Colors.

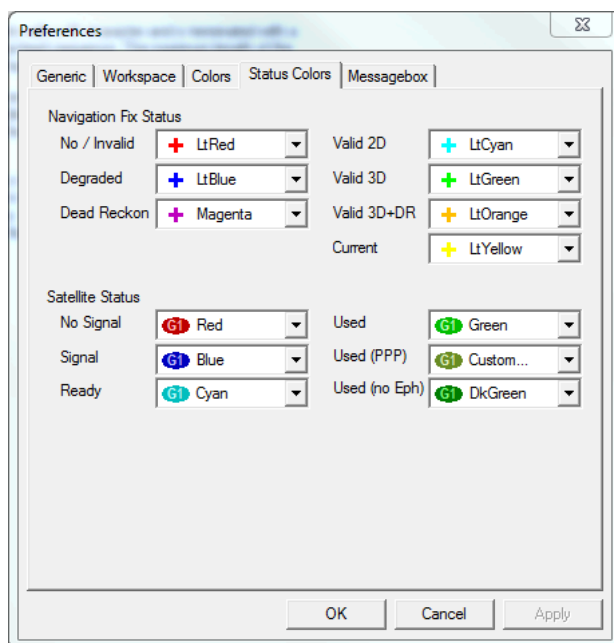


Figure 6: Color-coding configuration

4.2 Operating modes

u-center has different operating modes (see Figure 7). The mode changes when you open or close a log file or when you invoke the player. To be able to use the record mode you have to create a new file, save to a new file or open an existing file. The record and play mode are only available if you have created a new file or when you have opened a writable file.

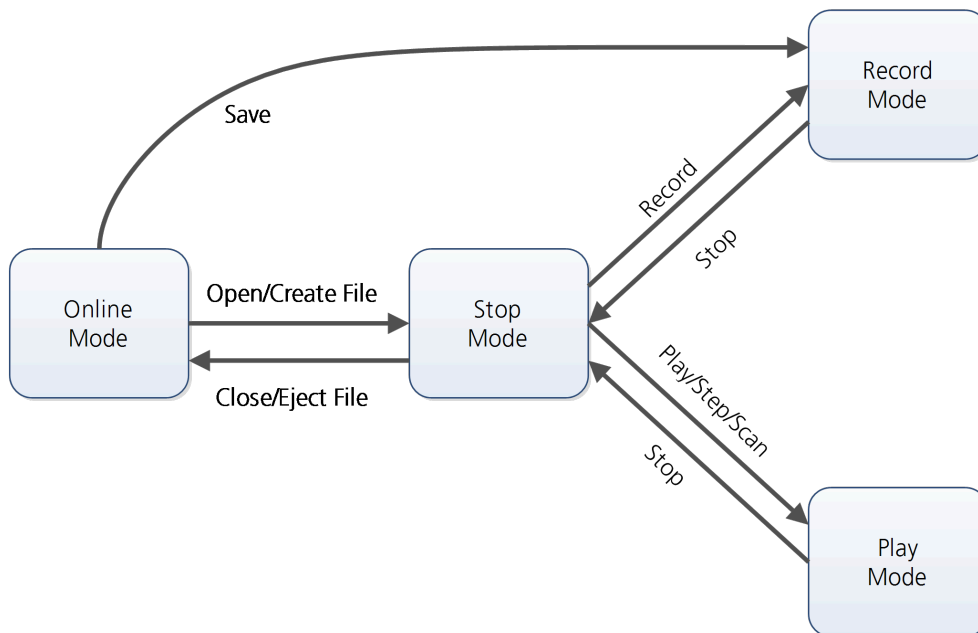


Figure 7: Relation between operating modes

4.2.1 Online mode

In this mode a GNSS device is directly connected to u-center via a COM port. u-center can control and configure the receiver and it will display the data that the receiver is sending periodically.

4.2.2 Stop mode

In this mode no data from a receiver or a log file is forwarded to the database and views. u-center is in this mode when a log file is open but player and recorder are not active.

4.2.3 Record mode

Record Mode is the same mode as the Online Mode, except u-center additionally creates a log file, concatenating all the messages sent by the receiver. You enter this mode by creating a new log file or opening an existing log file without write protection and pressing the record button. An example of using this mode would be to make overnight measurements and evaluate the data at a later time. u-blox customer support may request a log file from you when you are experiencing a problem with one of our receivers and will usually need this to be recorded with debug data enabled (see [Receiver](#)).

4.2.4 Play mode

The Play Mode allows replaying a previously recorded log file step by step, in real-time or at an accelerated rate. You enter this mode by opening a file and pressing the play, step or scan button.

4.2.5 Relations between modes

The operating mode depends on the status of the log file player. Modes are changed by user actions. Each mode has different states that are changed by a user action or by an event (see [Figure 7](#)). In **Online mode** and **Record mode**, u-center displays data from the receiver. In **Play mode** data from a log file is displayed. **Play mode** has different states:

- Play reads and displays messages periodically from the log file. The user interface is derived from that of a CD player. u-center updates the views after each message.
- Step gets one message from the log file and immediately returns to paused Play state.

- Scan reads messages periodically but the display is only updated when paused or by changing the state.

Position can be set in a log file. This behaves differently in **Play mode** and **Stop mode**. In **Stop mode** the position is just set and no data is read and displayed. u-center will start recording or playing from that position when changing the mode. If position is set in **Play mode**, u-center will load the data up to this position from the log file and display the contents.

4.2.6 Database limitations

The number of epochs displayed by views that show history (Table, Chart, Histogram, Sky, Satellite level history etc.) can be limited in order to allow an efficient analysis of large log files and not to consume too much disk space. There is a setting which controls this history database limit, which is available under: Tools > Preferences > General. By default the value for the number of epochs is set to 0, which means the database size is not limited. Any other number higher than 0 will limit the size of this history database. When this limit is set, then the oldest values will be discarded after the database reaches this limit size. Data stored to a log file is not affected by the database limitation.

Also controlled in Tools > Preferences > General is the max number of messages stored. This limit applies to how many messages from a log file can be loaded and are playable. The default value for this is set very high, but can be reduced to save disk space, or increased if a very large log file cannot be fully loaded.

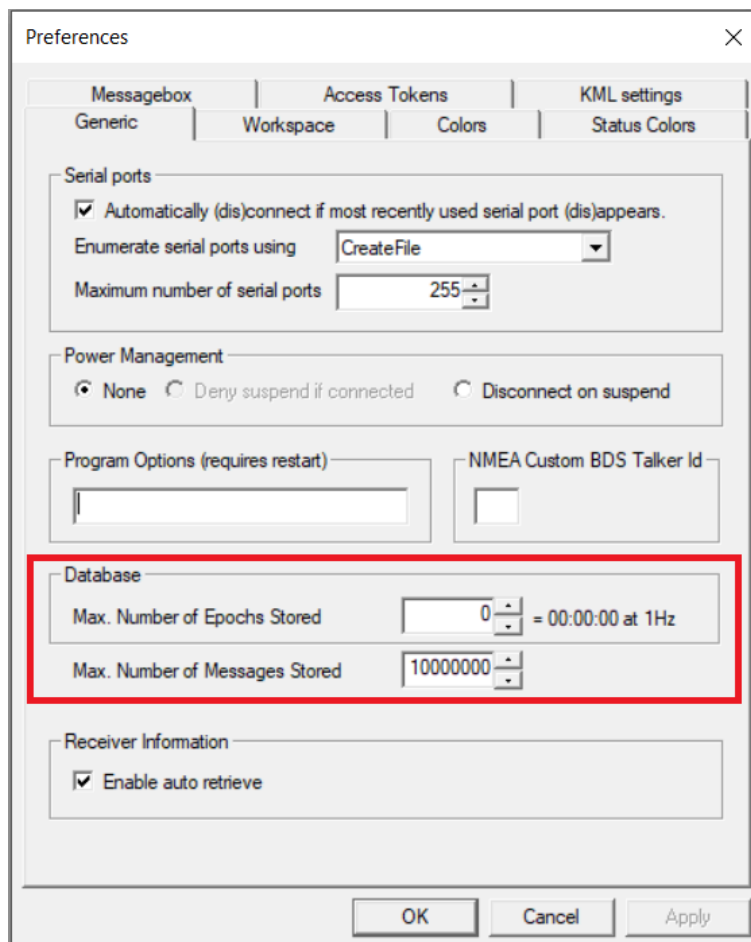


Figure 8: Example of setting maximum number of epochs to keep in database

For long-term observations, it is recommended to record the messages to a log file.

If a high value of epochs is selected, the display of data in real-time cannot be guaranteed, especially when graphical views are open.

4.2.7 Receiver information

u-center will try to retrieve some information about what kind of receiver is connected by sending UBX-MON-VER message on every successful connection. In this way certain functionality can automatically be disabled if it is not supported by the connected receiver. In some cases this might not be the desired behavior as it might hinder some other operation where these extra messages are not desired. There is a setting that controls if receiver information is auto-retrieved or not, and that is available under: Tools > Preferences > General. By default the auto retrieval is enabled.

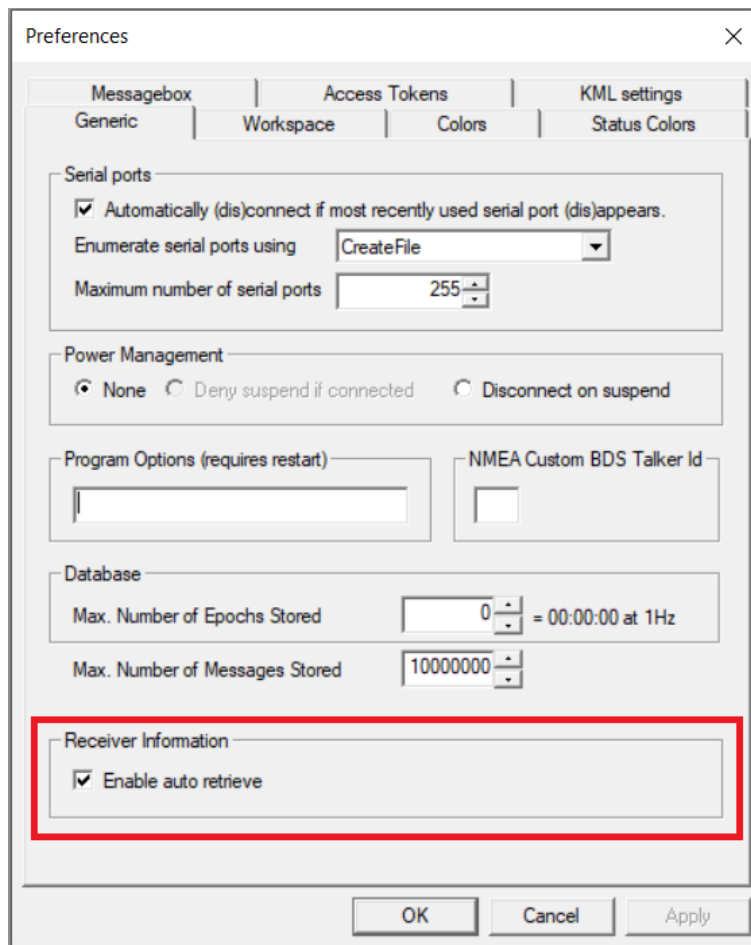


Figure 9: Enabling/disabling automatic receiver information retrieval

5 u-center menus and windows

5.1 Main frame and toolbars

The main frame is the primary display screen of u-center. It displays all tool bars and some of the information provided by the device. In the standard status bar, information about communication, UTC time, connection time, used protocol (NMEA or UBX), used file, etc. is shown.

Button tool tip: A description about each button in the toolbars can be obtained by holding the mouse cursor over the button for a few seconds. A tool tip message will appear near the icon with additional information while a detailed description is displayed in the status display.

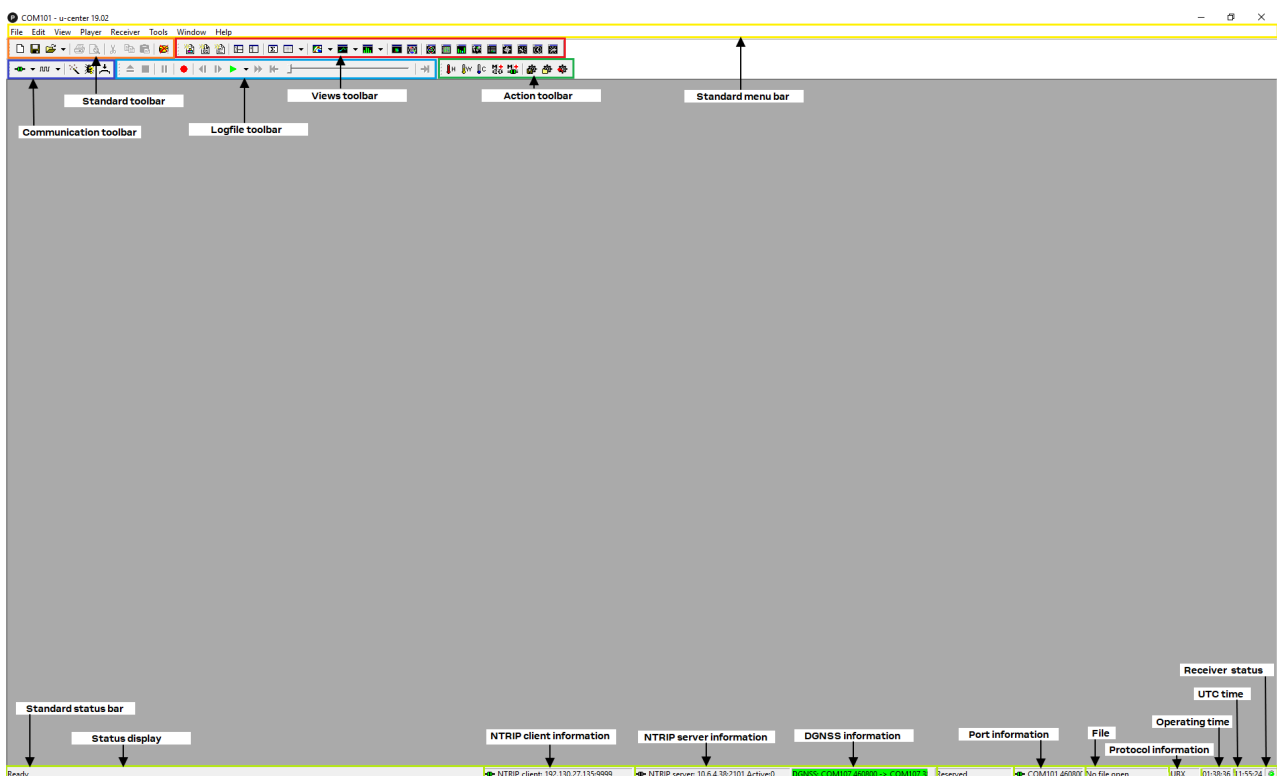


Figure 10: u-center main frame and toolbars

5.1.1 Standard menu bar

All u-center functions can be accessed through the standard menu bar. Commands can also be accessed by shortcuts that are listed in the menus. Some often used operations are also available in the different toolbars.

5.1.1.1 File

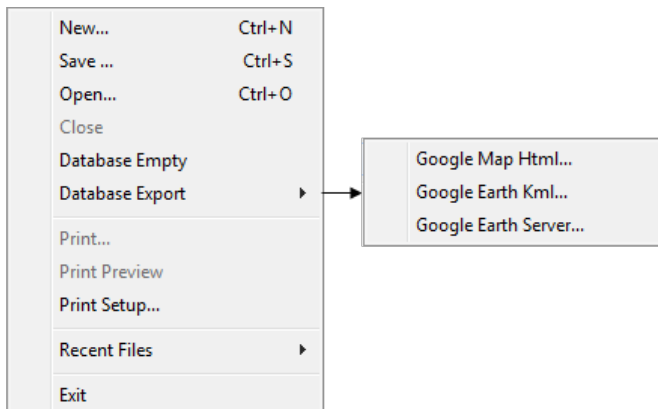


Figure 11: File menu entries

Function	Description	Shortcut / Toolbar icon
New...	Creates a new log file. No data is yet written but only the file is opened. The duration of the logging time is displayed in the status bar field Operating time.	Ctrl+N /
Save...	Creates a new log file, saves the data from the internal database to the log file and starts immediately recording all new data from the receiver. This is useful when an error or an unexpected event occurred and no log file was recorded. The size of the ring buffer (4 MB) is large enough to retain the data for the last hour (approx.).	Ctrl+S /
Open...	Opens a stored log file to be replayed.	Ctrl+O
Close	Closes the active file.	Ctrl+E /
Database Empty	Deletes the internal database and all saved values.	
Database Export	Exports the internal database into HTML or KML data formats for displaying with Google Map or Google Earth.	
Google Map Html...	Exports the internal database into HTML data format for displaying with Google Map.	
Google Earth Kml...	Exports the internal database into KML data format for displaying with Google Earth.	
Google Earth Server...	Starts u-center's Google Earth server which allows continuous and real time tracking to be visualized in Google Earth.	
Print...	Prints the active document.	
Print Preview	Shows a preview of the print output.	
Print Setup...	Shows the setup dialog of the printer.	
Recent Files	Lists all recently used files.	
Exit	Exits u-center.	Ctrl+F4

Table 4: File menu entries

5.1.1.2 Edit

Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Select All	Ctrl+A
Clear All	Ctrl+Del

Figure 12: Edit menu entries




Function	Description	Shortcut / Toolbar icon
Cut	Cut the current selection and put in to the clipboard.	Ctrl+X / Shift +Del / 
Copy	Copy the current selection to the clipboard.	Ctrl+C / Ctrl- Insert / 
Paste	Paste the clipboard content to the current position.	Ctrl+V / Shift +Insert / 
Delete	Delete the current selection.	Del
Select All	Select all in the current view.	Ctrl+A
Clear All	Clear all in the current view.	Ctrl+Del

Table 5: Edit menu entries

5.1.1.3 View

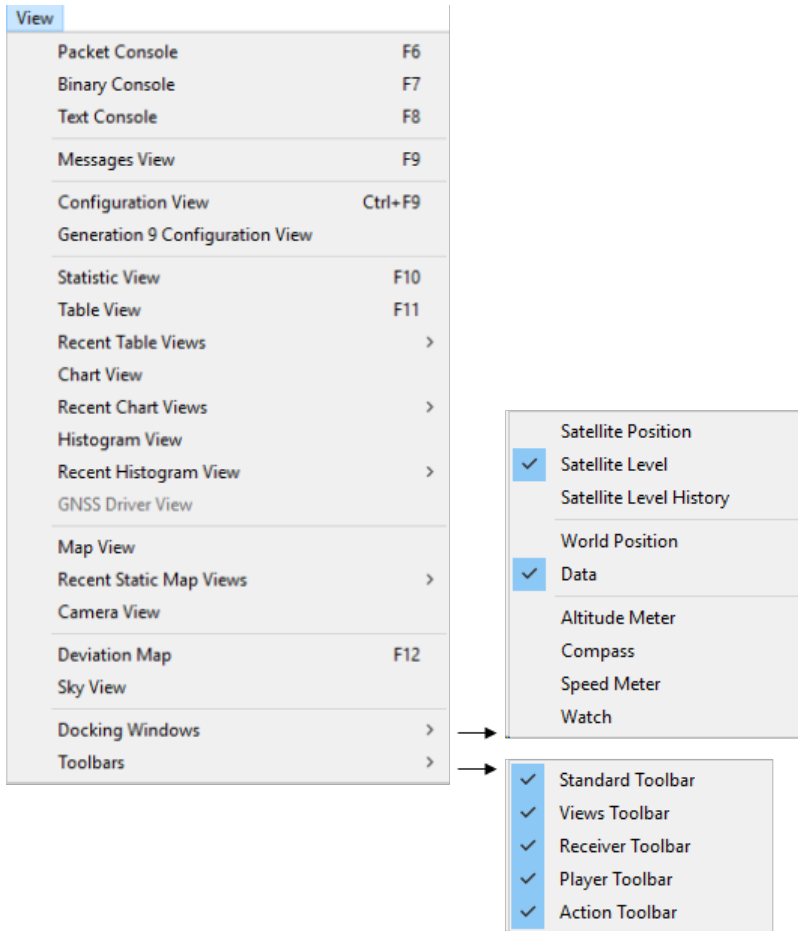


Figure 13: View menu entries

Function	Description	Shortcut / Toolbar icon
Packet Console	Opens the packet console.	F6 /
Binary Console	Opens the binary console.	F7 /
Text Console	Opens the text console.	F8 /
Messages View	Opens the dialog with all supported messages.	F9 /
Configuration View	Opens the dialog with all configuration messages. This is a subset of the Messages View.	Ctrl-F9 /
Generation 9 Configuration View	Opens the dialog for Generation 9 Advance configuration view. All the Generation 9 receivers should be configured with this new dialog.	
Statistic View	Opens the statistic view with all data from the internal database.	F10 /
Table View	Opens the empty table view. All values from the internal database can be displayed individually.	F11 /
Recent Table View	Lists all the table views that have been opened. This information comes from the Windows registry and is also valid after a restart of u-center.	
Map View	Opens a window allowing to display a map.	
Recent Map View	Lists all the maps views that have been opened. This information comes from the Windows registry and is also valid after a restart of u-center.	













Function	Description	Shortcut / Toolbar icon
Chart View	Opens a window with chart functionality. All values from the internal database can be displayed individually.	
Recent Chart View	Lists all the chart views that have been opened. This information comes from the Windows registry and is also valid after a restart of u-center.	
Histogram View	Opens a window with histogram functionality. All values from the internal database can be displayed individually.	
Recent Histogram View	Lists all the histogram views that have been opened. This information comes from the Windows registry and is also valid after a restart of u-center.	
Camera View	Opens a window allowing to connect to a web cam and visualize and save the image.	
Deviation Map	Opens a window with a position deviation map.	F12 / 
Sky View	Opens a window with the sky view. The current position of the satellites and their values from the internal database are shown.	
Docking Windows	Opens a list with all available docking windows that can be shown.	
Satellite Position	Shows or hide the current satellite positions.	
Satellite Level	Shows or hide the current satellite levels.	
Satellite Level History	Shows or hide the history of the satellite levels.	
World Position	Shows or hide the current position on the world map.	
Data	Shows or hide data from the navigation solution (like position, TTFF, accuracy and DOPs).	
Altitude Meter	Shows or hide the altitude meter.	
Compass	Shows or hide the compass.	
Speed Meter	Shows or hide the speed meter.	
Watch	Shows or hide the clock.	
Toolbars	Opens a list with all available toolbars that can be shown.	
Standard Toolbar	Shows or hide the standard toolbar.	
Views Toolbar	Shows or hide the views toolbar.	
Receiver Toolbar	Shows or hide the receiver toolbar.	
Player Toolbar	Shows or hide the player toolbar.	
Action Toolbar	Shows or hide the action toolbar.	

Table 6: View menu entries

5.1.1.4 Player

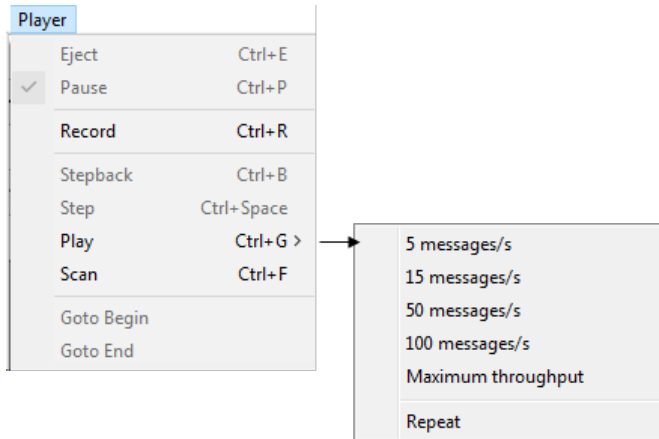


Figure 14: Player menu entries

Function	Description	Shortcut / Toolbar icon
Eject	Closes the active log file.	Ctrl+E /
Pause	Pauses reading or recording from the active log file.	Ctrl+P /
Record	Starts recording to a new or already opened log file. Any data in the internal database will not be written to the file. If you want to save this data into a log file, open the File menu and click Save. To stop recording, press the same button.	Ctrl+R /
Stepback	Single step function. The previous message is read.	Ctrl+B /
Step	Single step function. The next message is read.	Ctrl+Space /
Play	Starts reading from the active log file. The speed of the action can be chosen on the sub-menu.	Ctrl+G /
Scan	Reads the entire log file into the database and updates the display at the end of the scan period.	Ctrl+F /
Goto Begin	Sets the read position to the beginning of the log file.	
Goto End	Sets the read position to the end of the log file.	

Table 7: Player menu entries

5.1.1.5 Receiver

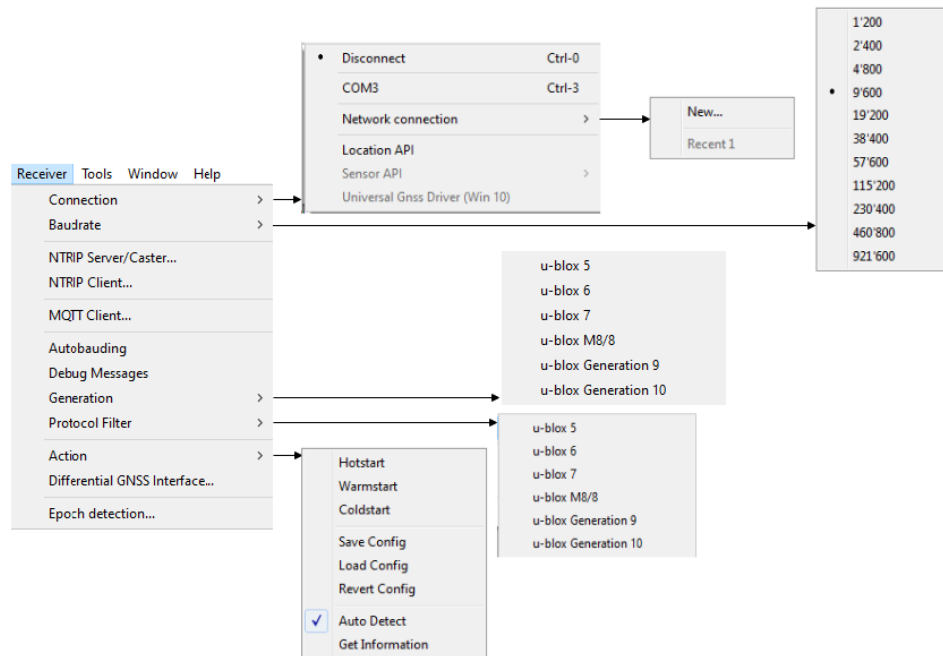


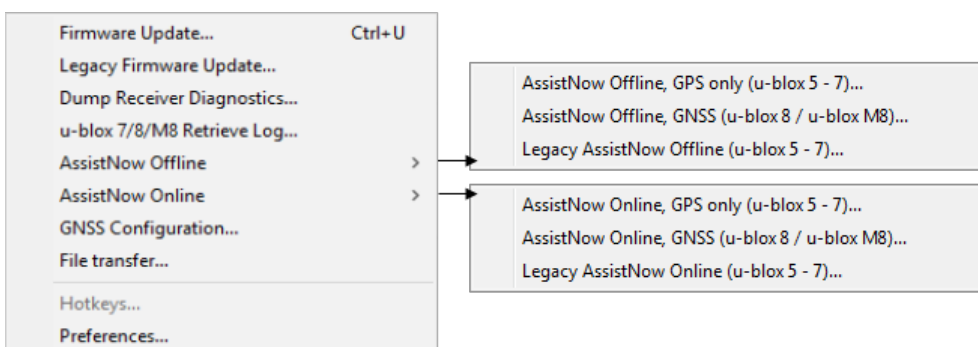
Figure 15: Receiver menu entries

Function	Description	Shortcut / Toolbar icon
Connection	Defines the port u-center connects to. The list is generated automatically using the enumeration method under Tools > Preferences > Generic > Serial ports. The currently used port will be indicated.	
Disconnect	Disconnects from a connected receiver.	
COMx	Connects to COMx with the current baud rate.	Ctrl+[1...9] (if available)
Network connection	Connects to a receiver through network.	
Location API	Connects to the receiver using the Location API available in windows 7 onwards.	
Sensor API	Connects to the receiver using the Sensor API in Windows 7 and Windows 8 (the USB Sensor driver is required in this case) but not in Windows 10.	
Baud rate	Defines the baud rate of the communication. The list is predefined and cannot be changed. The currently set baud rate will be indicated.	
NTRIP Server/Caster	Enables u-center to act as a NTRIP server.	
NTRIP Client	Enables u-center to act as a NTRIP client.	
Autobauding	Enables or disables autobauding for the current communication with the receiver.	
Debug Messages	Enables all debug messages in the receiver. Can be requested from u-blox support.	
Generation	Defines the generation of the attached u-blox GNSS receiver. u-center also tries to detect automatically the correct generation.	

Function	Description	Shortcut / Toolbar icon
Protocol Filter	Sets the message filter against versions of protocol specification.	
Action	Lists all possible actions that can be performed with the u-blox GNSS receiver.	
Hot start	Sends a hot start command to the receiver. No data is deleted in the receiver.	
Warm start	Sends a warm start command to the receiver. Only the ephemeris are deleted from the memory.	
Cold start	Sends a cold start command to the receiver. All information is deleted from the memory.	
Save Config	Saves the current receiver configuration to the memory so that it will be loaded after a restart.	
Load Config	Loads the last saved configuration from the memory.	
Revert Config	Deletes all configurations in the memory and reverts the receiver to the default configuration.	
Auto Detect	Enable/Disables the automatic polling of the UBX-MON-VER message to allow u-center to obtain information about the receiver. On receiving the message, the receiver information contained within the message is extracted, stored and used by u-center for any receiver specific features. Having this feature enabled allows u-center to automatically be aware of the type of receiver attached. Disabling this feature might be useful when the random appearance of UBX-MON-VER messages could interfere with the current users task.	
Get Information	Manually polls the receiver for a UBX-MON-VER message. On receiving the message, the receiver information contained within the message is extracted, stored and used by u-center for any receiver specific features. Typical use would be when the users need auto detection disabled, but would like u-center to be aware of the connected receiver's details.	
Differential DGNSS Interface...	Allows the streaming of RTCM messages to the receiver for high precision applications.	
Epoch detection...	Defines which time information determines the boundary of an epoch detection in u-center (see Change epoch detection method).	

Table 8: Receiver menu entries

5.1.1.6 Tools


Figure 16: Tools menu entries

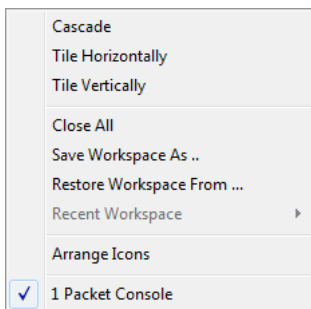
Some of the menu items will only be displayed when the correct receiver generation is connected and identified by u-center. If you cannot select one option, change the receiver generation under Receiver > Generation.

Function	Description	Shortcut / Toolbar icon
Firmware Update u-blox 5 - 8...	Opens the firmware update dialog for u-blox 5 - 8 generation receivers.	Ctrl+U

Function	Description	Shortcut / Toolbar icon
Dump Receiver Diagnostics...	Tool to create the receiver diagnostic. Can be requested by the u-blox support team.	
u-blox 7/8/M8 Retrieve Log...	Opens the dialog to download log information from the receiver. This is supported only since u-blox 7 receivers.	
AssistNow Offline	Opens the AssistNow Offline dialog. Please switch over to AssistNow Offline as the Legacy AssistNow Offline service is marked deprecated.	
AssistNow Online	Opens the AssistNow Online dialog. Please switch over to AssistNow Online as the Legacy AssistNow Online service is marked deprecated.	
GNSS Configuration...	Opens the dialog to save the receiver configuration to a file on the PC or to restore a configuration from a file on the PC.	
File transfer...	Opens the dialog to transfer a file to the receiver.	
Preferences...	Opens the dialog for the u-center preferences.	

Table 9: Tools menu entries

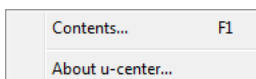
5.1.1.7 Window


Figure 17: Window menu entries

Function	Description	Shortcut / Toolbar icon
Cascade	Arranges all open dialogs cascaded.	
Tile Horizontally	Arranges all open dialogs horizontally.	
Tile Vertically	Arranges all open dialogs vertically.	
Close All	Closes all open dialogs and windows.	
Save Workspace As...	Saves the position of the open dialogs and windows to a file on the computer.	
Restore Workspace From...	Restores the position of the dialogs and windows from a file on the computer.	
Recent Workspace	Lists all recently used workspace files.	
Arrange Icons	Arranges the icons at the bottom of the window.	
List of dialogs and windows	Lists all visible and hidden dialogs and windows in u-center.	

Table 10: Window menu entries

5.1.1.8 Help

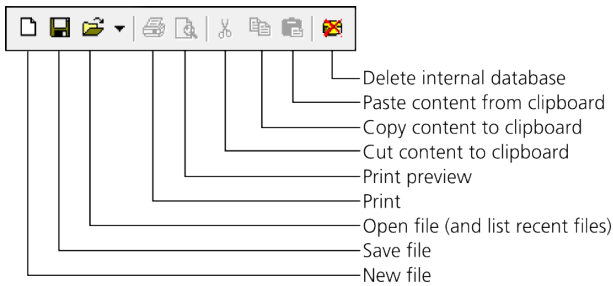

Figure 18: Help menu entries

Function	Description	Shortcut / Toolbar icon
Contents...	Gives a reference to this user guide.	F1
About u-center...	Shows the about dialog with the software version and the used libraries and their versions.	

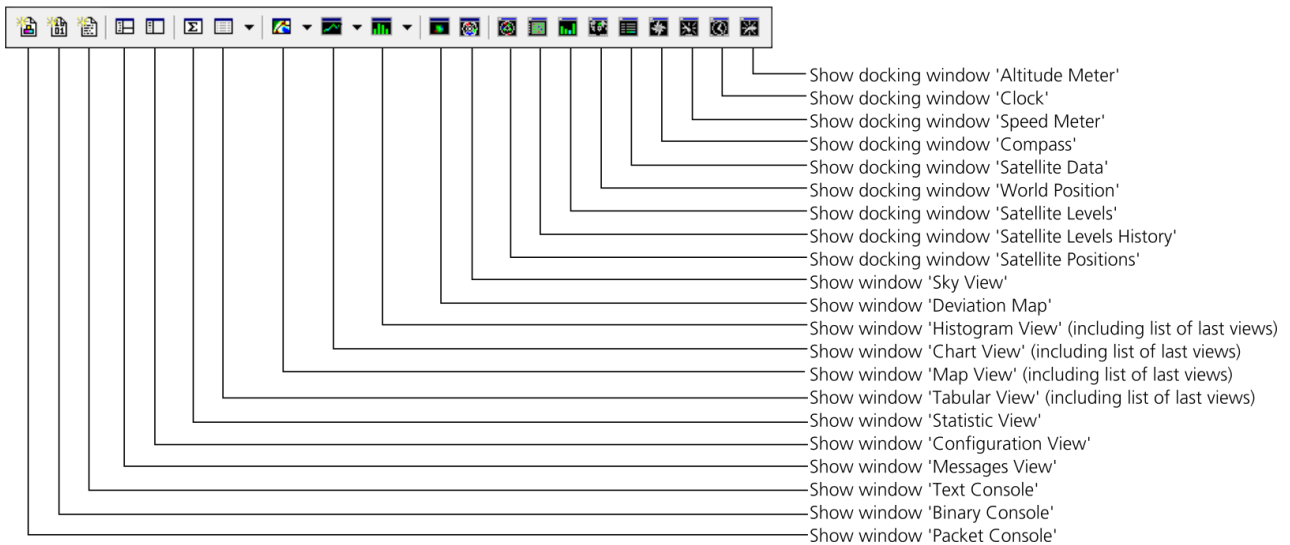
Table 11: Help menu entries

5.1.2 Standard toolbar

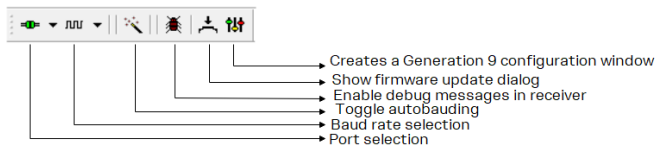
The standard toolbar gives access to standard operations like opening and saving files, print the current view or empty the database.



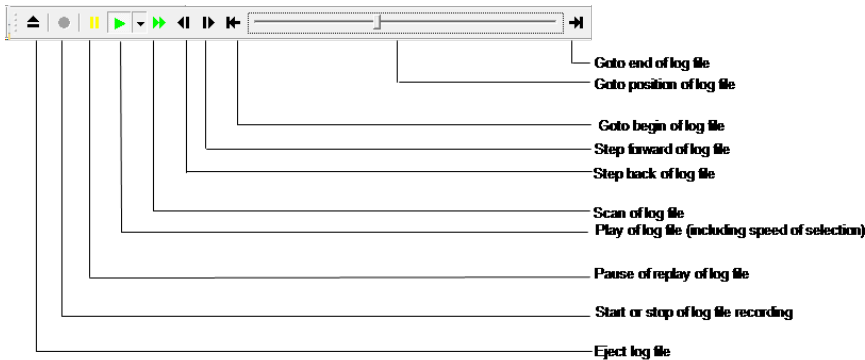
5.1.3 Views toolbar



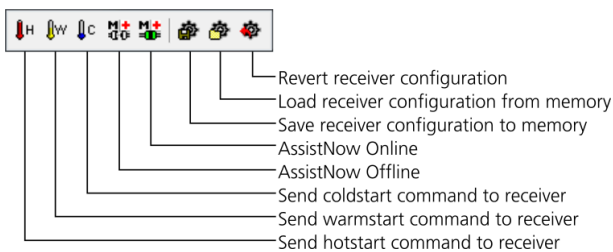
5.1.4 Communication toolbar



5.1.5 Logfile toolbar



5.1.6 Action toolbar



5.1.7 Standard statusbar

The standard status bar is updated automatically and shows the information about the opened file, the connection and the time. The following fields are available:

Status display: Displays the current action or the function of a button if the mouse cursor is over the button.

NTRIP client information: Shows the connection to an NTRIP caster (only when activated through Receiver > NTRIP Client...). Clicking on it will show up to 100 of the last errors between u-center and connected NTRIP caster.


NTRIP server information: Shows the status and number of clients currently connected to u-center's NTRIP caster (only when activated through Receiver > NTRIP Server/Caster...). Clicking on it will show up to 100 of the last errors between u-center's NTRIP caster and connected clients.

DGNSS information: Shows the connection to a DGNSS source (only when activated through Receiver > Differential GNSS Interface...).

Receiver generation: u-center tries to automatically detect the type of device connected and activates the appropriate mode of operation in order to take optimal advantage of the features. The mode can also be manually selected through the menu bar (Receiver > Generation).

Port information: Shows the active COM port and baud rate. Color coding of the icon:

- Disconnected
- Waiting for first data
- Data is being received but errors are detected (mostly because of wrong baud rate settings)
- Last data received was valid but there is no data to collect at this time
- No data is being received but errors have been detected in the past

 Data is being received and collected at the correct baud rate




File: The file opened in the u-center player.

Protocol information: This box indicates the current message set that is being used to communicate with the device.

Operating time: The time elapsed since you started u-center.

UTC time: The current time sent by the device. This field is only updated if a receiver is connected.

Receiver status: Shows the last known status of the receiver. Color coding of the icon:

-  Power status of receiver is unknown
-  Receiver is powered on
-  Receiver is powered off

5.2 Views and windows

5.2.1 Packet console

The packet console lists all incoming and outgoing messages, and provides information about message length and type. The direction of the message is shown in the following way:

- R <- Indicates the message was sent to the receiver
- R -> Indicates the message came from the receiver
- L -> Indicates the message came from the log file

```

Packet Console
14:18:32 L -> NMEA GNGGA, Size 42, 'Global Positioning System Fix Data'
14:18:32 L -> NMEA GNGLL, Size 29, 'Geographic Position - Latitude/Longitude'
14:18:32 L -> UBX ACK-NAK, Size 10, 'Not Acknowledged'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX NAV-PVT, Size 100, 'Navigation PVT Solution'
14:18:32 L -> NMEA GNRMC, Size 47, 'Recommended Minimum Specific GNSS Data'
<<< New Epoch [21] >>>
14:18:32 L -> NMEA GNVTVG, Size 21, 'Course Over Ground and Ground Speed'
14:18:32 L -> NMEA GNGGA, Size 42, 'Global Positioning System Fix Data'
14:18:32 L -> NMEA GNGLL, Size 29, 'Geographic Position - Latitude/Longitude'
14:18:32 L -> UBX ACK-NAK, Size 10, 'Not Acknowledged'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX CFG-DAT, Size 60, 'Datum'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX ACK-ACK, Size 10, 'Acknowledged'
14:18:32 L -> UBX NAV-PVT, Size 100, 'Navigation PVT Solution'
14:18:32 L -> NMEA GNRMC, Size 47, 'Recommended Minimum Specific GNSS Data'
<<< New Epoch [22] >>>
14:18:32 L -> NMEA GNVTVG, Size 21, 'Course Over Ground and Ground Speed'
14:18:32 L -> NMEA GNGGA, Size 42, 'Global Positioning System Fix Data'
14:18:32 L -> NMEA GNGLL, Size 29, 'Geographic Position - Latitude/Longitude'
14:18:32 L -> UBX CFG-DGNSS, Size 12, 'Differential GNSS (RTK) configuration'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX ACK-ACK, Size 10, 'Acknowledged'
14:18:32 L -> UBX ACK-NAK, Size 10, 'Not Acknowledged'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX NAV-PVT, Size 100, 'Navigation PVT Solution'
14:18:32 L -> NMEA GNRMC, Size 47, 'Recommended Minimum Specific GNSS Data'
<<< New Epoch [23] >>>
14:18:32 L -> NMEA GNVTVG, Size 21, 'Course Over Ground and Ground Speed'
14:18:32 L -> NMEA GNGGA, Size 42, 'Global Positioning System Fix Data'
14:18:32 L -> NMEA GNGLL, Size 29, 'Geographic Position - Latitude/Longitude'
14:18:32 L -> UBX ACK-NAK, Size 10, 'Not Acknowledged'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX NAV-PVT, Size 100, 'Navigation PVT Solution'
14:18:32 L -> NMEA GNRMC, Size 47, 'Recommended Minimum Specific GNSS Data'
<<< New Epoch [24] >>>
14:18:32 L -> NMEA GNVTVG, Size 21, 'Course Over Ground and Ground Speed'
14:18:32 L -> NMEA GNGGA, Size 42, 'Global Positioning System Fix Data'
14:18:32 L -> NMEA GNGLL, Size 29, 'Geographic Position - Latitude/Longitude'
14:18:32 L -> UBX CFG, Size 20, 'Config'
14:18:32 L -> UBX CFG, Size 8, 'Config'
14:18:32 L -> UBX ACK-ACK, Size 10, 'Acknowledged'
14:18:32 L -> NMEA GNGSA, Size 47, 'GNSS DOP and Active Satellites'
14:18:32 L -> NMEA GNGSA, Size 47, 'GNSS DOP and Active Satellites'
14:18:32 L -> NMEA GNGSA, Size 47, 'GNSS DOP and Active Satellites'
14:18:32 L -> NMEA GNGSA, Size 47, 'GNSS DOP and Active Satellites'
14:18:32 L -> NMEA GPGSV, Size 62, 'GNSS Satellites in view'
14:18:32 L -> NMEA GPGSV, Size 62, 'GNSS Satellites in view'
14:18:32 L -> NMEA GPGSV, Size 63, 'GNSS Satellites in view'
14:18:32 L -> NMEA GPGSV, Size 33, 'GNSS Satellites in view'
14:18:32 L -> NMEA GLGSV, Size 32, 'GNSS Satellites in view'
14:18:32 L -> NMEA GLGSV, Size 38, 'GNSS Satellites in view'
14:18:32 L -> NMEA GAGSV, Size 20, 'GNSS Satellites in view'
14:18:32 L -> NMEA GAGSV, Size 20, 'GNSS Satellites in view'
14:18:32 L -> NMEA GBGSV, Size 20, 'GNSS Satellites in view'
    
```

Figure 19: Packet console

Refer to [Table 12](#) for an explanation of the icons and text field.

5.2.2 Binary console

The binary console lists all incoming messages in binary and ASCII format.

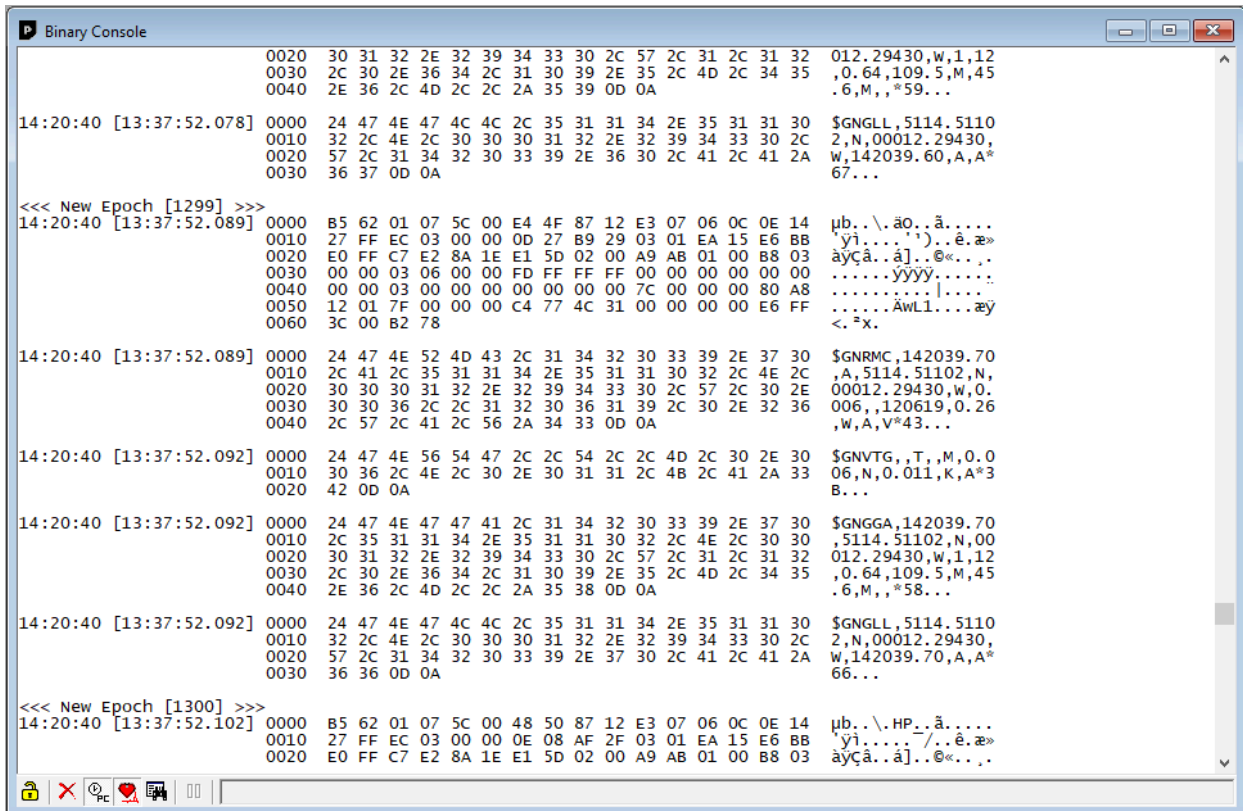


Figure 20: Binary console

Refer to [Table 12](#) for an explanation of the icons and text field.

5.2.3 Text console

The text console displays the content messages in textual form such as UBX-INF or NMEA messages.

NMEA messages are shown with heading \$Gxyyy, where x stands for the satellite system (P = GPS, SBAS, QZSS, L = GLONASS, A = Galileo, B = BeiDou, N = Any combination of GNSS) and yyy for the type of message (e.g. ZDA=Time & Date).

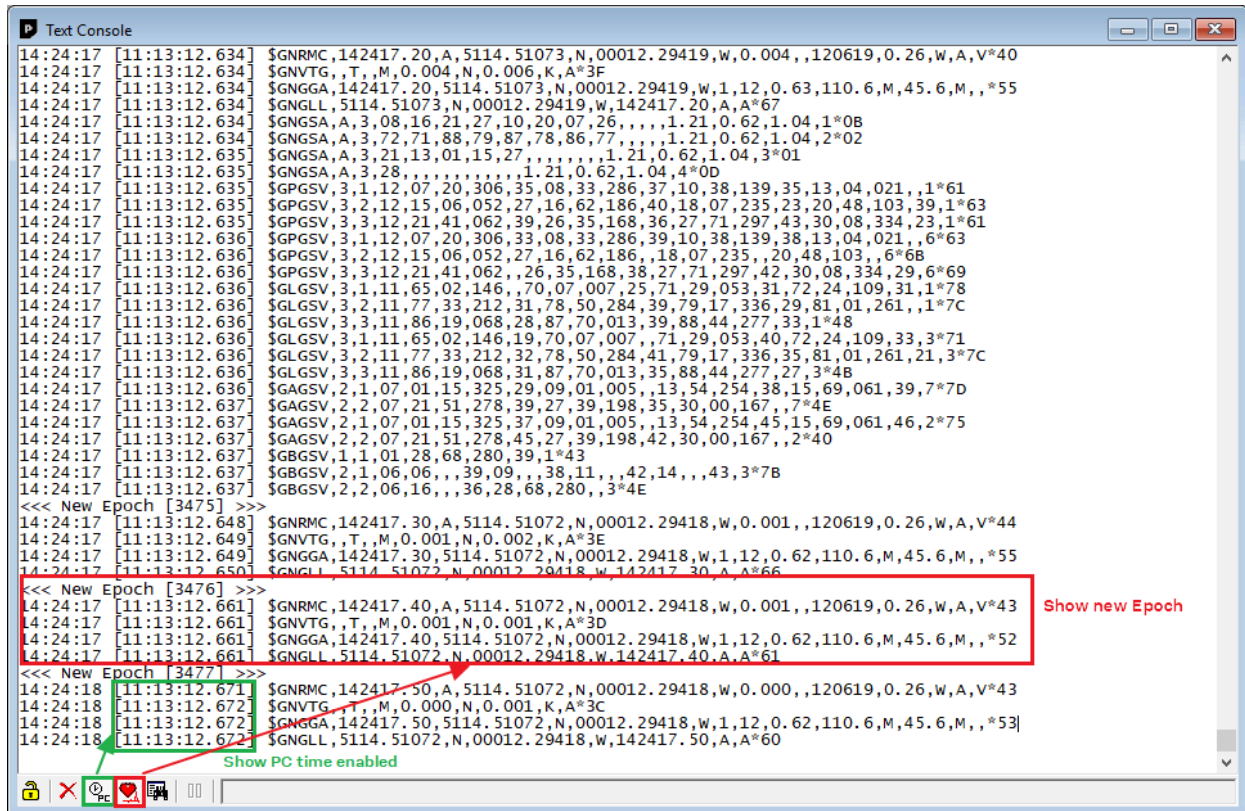


Figure 21: Text console displaying UBX-INF and NMEA messages with "Show PC Time" and "Show/hide epoch markers" enabled

Refer to Table 12 for an explanation of the icons and text field.

5.2.4 Icons and text field of console views

Element	Name	Description
	Lock / Locked	Prevents the console from being updated with new data when locked. Pause key can be used to Lock/Unlock the current console window.
	Clear All	Erases all data in the console.
	Show/Hide PC time	Shows/Hides the PC time in the console.
	Show/Hide epoch markers	Shows/Hides text for every new epoch with enumeration.
	Filter on/off	Filters unwanted data from the data stream. This allows searching for certain expression, e.g. all RMC messages.
	Pause player	Pauses the player when the search expression is found. Only works in playback mode.

Table 12: Description of the buttons and text field of the console views

5.2.5 Regular expression evaluation

Normally, when you search for a sub-string in a string, the match should be exact. So if we search for a sub-string "abc" then the string being searched should contain these exact letters in the same sequence for a match to be found. We can extend this kind of search to a case insensitive search where the sub-string "abc" will find strings like "Abc", "ABC" etc. That is, the case is ignored but the sequence of the letters should be exactly the same. Sometimes, a case insensitive search is also not enough. For example, if we want to search for numeric digit, then we basically end up searching for each digit independently. This is where regular expressions come in to our help. Regular expressions

are text patterns that are used for string matching. Regular expressions are strings that contain a mix of plain text and special characters to indicate what kind of matching to do. Here's a very brief tutorial on using regular expressions.

Suppose, we are looking for a numeric digit then the regular expression we would search for is "[0-9]". The brackets indicate that the character being compared should match any one of the characters enclosed within the bracket. The dash (-) between 0 and 9 indicates that it is a range from 0 to 9. Therefore, this regular expression will match any character between 0 and 9, that is, any digit. If we want to search for a special character literally we must use a backslash before the special character. For example, the single character regular expression "*" matches a single asterisk. In the table below the special characters are briefly described. A regular expression search is case-sensitive.

Character	Description
^	Beginning of the string. The expression "^A" will match an "A" only at the beginning of the string.
[^	The caret (^) immediately following the left bracket ([) has a different meaning. It is used to exclude the remaining characters within brackets from matching the target string. The expression "[^0-9]" indicates that the target character should not be a digit.
\$	The dollar sign (\$) will match the end of the string. The expression "abc\$" will match the sub-string "abc" only if it is at the end of the string.
	The alternation or logic OR character () allows either expression on its side to match the target string. The expression "a b" will match "a" as well as "b".
.	The dot (.) will match any character.
*	The asterisk (*) indicates that the character to the left of the asterisk in the expression should match 0 or more times.
+	The plus (+) is similar to asterisk but there should be at least one match of the character to the left of the + sign in the expression.
?	The question mark (?) matches the character to its left 0 or 1 times.
()	The parenthesis affects the order of pattern evaluation.
[]	Brackets ([and]) enclosing a set of characters indicates that any of the enclosed characters may match the target character.

Table 13: Regular expression syntax

5.2.5.1 Examples

Let's assume that the lines in [Figure 22](#) would appear in the NMEA console without filtering.

```
14:00:03 $GPGGA,140003.242,4717.1126,N,00833.7862,E,1,06,1.3,543.0,M,,,,,0000*09
14:00:03 $GPGLL,4717.1126,N,00833.7862,E,140003.242,A*34
14:00:03 $GPGSA,A,3,06,17,25,22,30,10,,,,,,,,,2.9,1.3,2.6*3A
14:00:03 $GPGSV,2,1,07,06,58,062,44,17,52,161,44,25,45,239,44,22,35,301,44*7F
14:00:03 $GPGSV,2,2,07,30,31,123,44,10,17,059,39,01,05,316,*4E
14:00:03 $GPRMC,140003.242,A,4717.1126,N,00833.7862,E,0.03,80.59,010201,,*36
14:00:03 $GPVTG,80.59,T,,M,0.03,N,0.1,K*56
14:00:04 $GPGGA,140004.242,4717.1126,N,00833.7862,E,1,06,1.3,542.0,M,,,,,0000*0F
14:00:04 $GPGLL,4717.1126,N,00833.7862,E,140004.242,A*33
14:00:04 $GPGSA,A,3,06,17,25,22,30,10,,,,,,,,,2.9,1.3,2.6*3A
14:00:04 $GPGSV,2,1,07,06,58,062,45,17,52,161,44,25,45,239,44,22,35,301,44*7E
14:00:04 $GPGSV,2,2,07,30,31,123,44,10,17,059,39,01,05,316,*4E
14:00:04 $GPRMC,140004.242,A,4717.1126,N,00833.7862,E,0.02,152.96,010201,,*0D
14:00:04 $GPVTG,152.96,T,,M,0.02,N,0.0,K*6B
```

Figure 22: Regular Expression Template

5.2.5.1.1 Example 1

Searching for the RMC with a valid position and all GGA Messages:

```
GP (GGA | RMC, .* , A, ) "
```



```
14:00:03 $GPGGA,140003.242,4717.1126,N,00833.7862,E,1,06,1.3,543.0,M,,,,,0000*09
14:00:03 $GPRMC,140003.242,A,4717.1126,N,00833.7862,E,0.03,80.59,010201,,*36
14:00:04 $GPGGA,140004.242,4717.1126,N,00833.7862,E,1,06,1.3,542.0,M,,,,,0000*0F
14:00:04 $GPRMC,140004.242,A,4717.1126,N,00833.7862,E,0.02,152.96,010201,,*0D
```

Figure 23: Regular Expression Example 1

5.2.5.1.2 Example 2

Searching for all GSV with the message index of "2" or "3":

GSV,.*,[2-3],

```
14:00:03 $GPGSV,2,2,07,30,31,123,44,10,17,059,39,01,05,316,*4E
114:00:04 $GPGSV,2,2,07,30,31,123,44,10,17,059,39,01,05,316,*4E
```

Figure 24: Regular Expression Example 2

5.2.5.1.3 Example 3

Searching for all messages starting with \$GP, which have a "G" in the message identifier but not at the first position:

^\\$GP.+G.*,

```
14:00:03 $GPGGA,140003.242,4717.1126,N,00833.7862,E,1,06,1.3,543.0,M,,,,,0000*09
14:00:03 $GPVTG,80.59,T,,M,0.03,N,0.1,K*56
14:00:04 $GPGGA,140004.242,4717.1126,N,00833.7862,E,1,06,1.3,542.0,M,,,,,0000*0F
14:00:04 $GPVTG,152.96,T,,M,0.02,N,0.0,K*6B
```

Figure 25: Regular Expression Example 3

5.2.5.1.4 Example 4

Searching for all messages having a checksum of which the higher nibble is 3

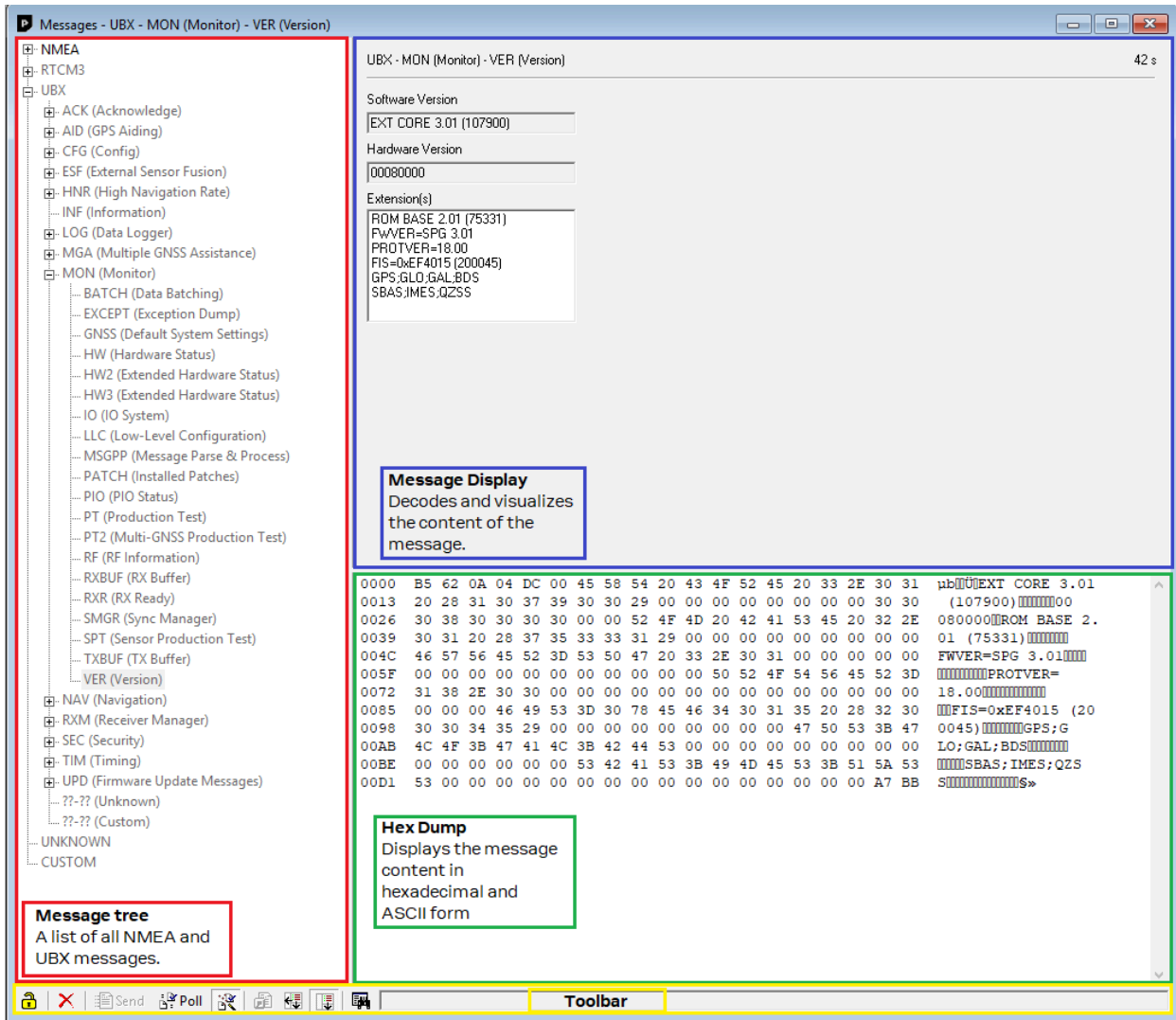
*3.\$

```
14:00:03 $GPGLL,4717.1126,N,00833.7862,E,140003.242,A*34
14:00:03 $GPGSA,A,3,06,17,25,22,30,10,,,,,,,,,2.9,1.3,2.6*3A
14:00:03 $GPRMC,140003.242,A,4717.1126,N,00833.7862,E,0.03,80.59,010201,,*36
14:00:04 $GPGLL,4717.1126,N,00833.7862,E,140004.242,A*33
14:00:04 $GPGSA,A,3,06,17,25,22,30,10,,,,,,,,,2.9,1.3,2.6*3A
```

Figure 26: Regular Expression Example 4

5.2.6 Messages view

The messages view is utilized to communicate with the device. Receiver output messages (e.g. navigation output, status and debug information) are displayed; input messages (e.g. configuration messages) can be sent. There are different sections for NMEA and UBX protocol. See [Figure 27](#) for an overview of the different elements in the messages view.


Figure 27: Messages view

	Lock / Unlocked	Prevents the message view from being updated with new data when locked. Pause key can be used to Lock/Unlock the current view window.
	Clear All	Erases the entire message view.
	Send	Sends the current message to the device.
	Poll	Polls the selected message once.
	Auto poll	Automatically polls a newly selected message once.
	Message Hotkey	Assigns a hotkey to the selected message.

Table 14: Description of the buttons in the messages view toolbar

5.2.6.1 Receiver output messages

Message tree
 Black text indicates that the message was received in the last second.
 Grey text means that the Message was never received or no new data is available.

Parameter	Value	Unit	Description
UTC	125613.00	hhmmss.ssss	Universal time coordinated
Lat	6012.56623	ddmm.mmmmm	Latitude
Northing Indicator	N		N=North, S=South
Lon	02449.65463	dddmm.mmmmm	Longitude
Easting Indicator	E		E=East, W=West
Status	2		0=Invalid, 1=2D/3D, 2=DGNSS, 4=Fixed RTK, 5=Float RTK, 6=Dead Reckoning
SVs Used	12		Number of SVs used for Navigation
HDOP	0.58		Horizontal Dilution of Precision
Alt (MSL)	28.5	m	Altitude (above means sea level)
Unit	M		M=Meters
Geoid Sep.	17.7	m	Geoid Separation = Alt(HAE) - Alt(MSL)
Unit	M		M=Meters
Age of DGNSS Corr		s	Age of Differential Corrections
DGNSS Ref Station	0000		ID of DGNSS Reference Station

```

0000 24 47 4E 47 47 41 2C 31 32 35 36 31 33 2E 30 30 2C 36 30 $GNGGA,125613.00,60
0013 31 32 2E 35 36 36 32 33 2C 4E 2C 30 32 34 34 39 2E 36 35 12.56623,N,02449.65
0026 34 36 33 2C 45 2C 32 2C 31 32 2C 30 2E 35 38 2C 32 38 2E 463,E,2,12,0.58,28.
0039 35 2C 4D 2C 31 37 2E 37 2C 4D 2C 2C 30 30 30 30 2A 37 42 5,M,17.7,M,,0000*7B
004C 0D 0A
    
```

Figure 28: Message display of an output message



Double-clicking on an output message enables or disables the periodic message update if the communication protocol is active. This feature is currently only supported for the UBX protocol.

5.2.7 Generation 9 configuration view

The new u-blox Generation 9 configuration view allows the users to check the current configuration of the receiver and change it if needed. This view can only be used to configure u-blox 9 generation receivers.

By default, the configuration values being edited come from (and can be written back to) an attached receiver. This view consists of two different sub-views, GNSS Configuration and Advanced Configuration.

5.2.7.1 GNSS configuration

This GNSS configuration sub-view enables the users to poll and configure the basic and advanced GNSS system configurations of the attached receiver. This sub-view describes sections below:

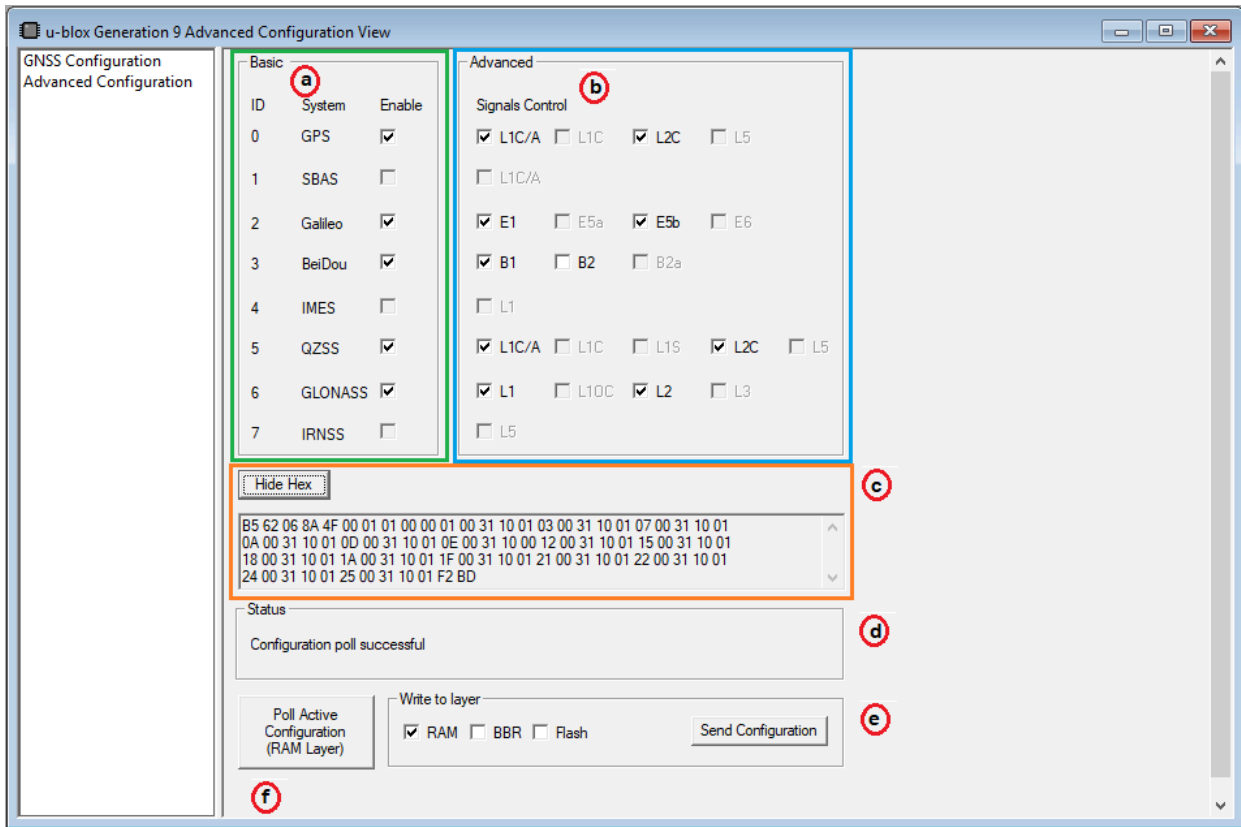


Figure 29: u-blox Generation 9 Advanced Configuration View

Basic	This section shows the GNSS constellation configuration of the receiver by pressing Poll Active Configuration . The receiver's GNSS constellations can also be configured by enabling/disabling the required satellite constellations, and then pressing Send Configuration . See position a .
Advanced	This section shows the GNSS constellation signal information configured in the receiver by pressing Poll Active Configuration . The receiver's GNSS signals can also be configured by enabling/disabling the required signals, and then pressing Send Configuration . See position b .
Show Hex/ Hide Hex	Shows or hides the hex values that make up the messages describing the receiver configuration just sent or received. See position c .
Status	Shows the status of the action taken. See position d .
Write to layer	Once selected the desired layer, Send configuration button sends the GNSS constellation and signal information to the receiver. See position e .
Poll Active Configuration (RAM Layer)	Polls the GNSS constellation and signal configuration from RAM layer of the attached receiver. See position f .

Table 15: Description of the buttons and sections in the GNSS Configuration sub-view

5.2.7.2 Advanced Configuration

In the Advanced Configuration sub-view, all groups of configuration items are displayed in a tree structure. Expanding a group will show the RAM layer values for all readable configuration items in that group. Each item is read individually from the receiver as the group is expanded. Some item values may not be known to the receiver in which case the value will be shown as "-".

If no receiver is attached or if the receiver does not support the new configuration concept then no values will be visible. If the receiver is not responding for some reason then close the group and open it again to retry.

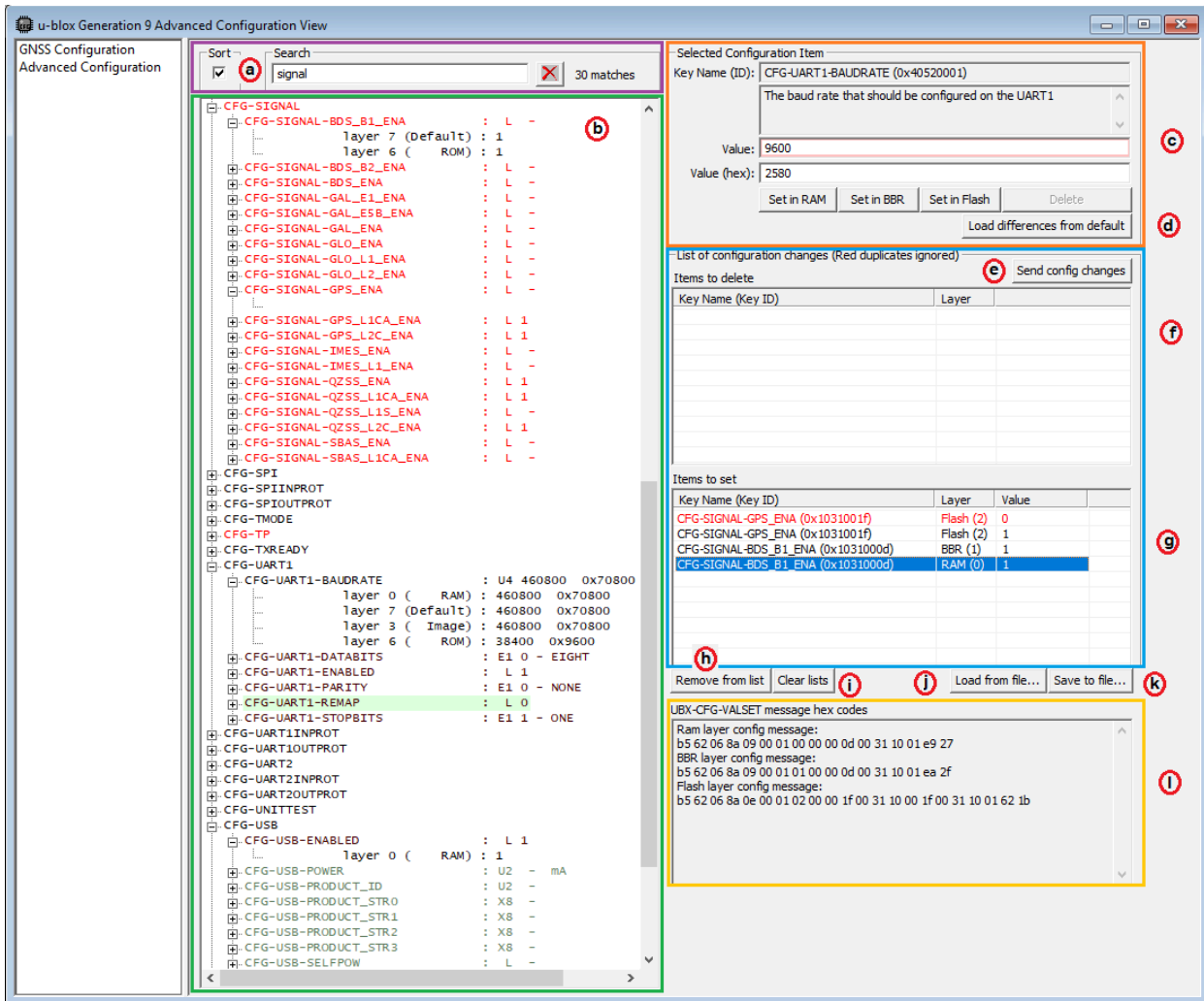


Figure 30: Advanced Configuration view

Users can expand items of interest and u-center will attempt to read values for all the other layers such as BBR, flash, ROM, pin, etc. and display any that it finds. This sub-view contains sections below:

Configuration item search	To search for an item by name, type into the search text box just above the tree. The search is case-insensitive. See position a .
Configuration item tree view	All entries that contain the search text will be highlighted in red. The search will check for a match in group and item names, titles and descriptions. If a group contains an item which matches then the group will be highlighted as well. See position b .
Selected Configuration Item	This section describes the selected item in more detail. The field having the searched item is shown in red. See position c .
Load differences from default	Click on Load receiver differences from default to read the configuration values set in the receiver. This can be used to duplicate the current settings in another receiver. The operation depends on the working mode of the tool. If used in the normal, attached to receiver mode then the "writes" list will be populated with any settings in the FS or BBR layers. See position d .
Send config changes	"Send config changes" will send the current set of settings to the attached receiver. A tick will appear next to the items which were successfully altered in the receiver. If the receiver does not acknowledge the request, a cross appears. If there is no tick or a cross, the receiver does not respond to the request. Items are sent in groups of values to be sent to the same layer. If one value for a layer cannot be written, then all values for that layer will fail to be written and will show a cross. See position e .

Items to delete	If an item that can be deleted from the receiver (if it is in the BBR or Flash layers) is selected from the tree, then a button Delete will appear. If that button is selected then it will be added to the list of deletions shown in the "Items to delete" section on the right of the tree. See position f .
Items to set	If a writable layer item is selected, then press one of the layer buttons to add write operations to a list of item writes. A value can be changed by clicking on it in the top left sub-view area before writing. If two values for the same item are selected in the same layer, then the earlier one will be highlighted in red to show that it will be ignored as a duplicate setting. See position g .
Remove from list	Removes the selected item from one of the lists. See position h .
Clear lists	Removes all the items from all the lists. See position i .
Load from file...	Loads a group of settings from a readable text file. See position j .
Save to file...	To save the current list of settings to a readable text file, click Save to file... and choose a file path. This will produce a file in the ASCII format. See position k .
Message hex codes	Lists the hex values for the UBX-CFG-VALSET message that will be constructed for setting the selected configuration properties. See position l .

Table 16: Description of the buttons and sections in the Advanced Configuration sub-view

5.2.8 Statistic view

Title	Count	Age	Current	Minimum	Maximum	Average	Deviation	Unit	Description
UTC	1	0	13:14:27.000 ...	13:14:27.000 ...	13:14:27.000 ...			time d...	Time UTC
GPS time	1	0	2046:216272....	2046:216272....	2046:216272....			wno:tow	Time GPS
iTOW	1	0	216424.000	216424.000	216424.000			s	GPS iTOW
NAV-HNR iTOW	0							s	NAV-HNR iTOW
TACC	1	0	0.004000	0.004000	0.004000	0.004000		us	Time Accuracy
TimeStartup	1	0	1920.892	1920.892	1920.892	1920.892		s	Time since Startup
TTFF	1	0	32.903	32.903	32.903	32.903		s	Time to first fix
TM0 rising	0					0.000000000			Timemark0 Rising Edge
TM0 falling	0					0.000000000			Timemark0 Falling Edge
TM1 rising	0					0.000000000			Timemark1 Rising Edge
TM1 falling	0					0.000000000			Timemark1 Falling Edge
TM2 rising	0					0.000000000			Timemark2 Rising Edge
TM2 falling	0					0.000000000			Timemark2 Falling Edge
TP Qerr	0					0.000		ns	Timepulse Quantisatio...
TOSIntFreq	0					0		ppb	TOS internal frequenc...
TOSExtFreq	0					0		ppb	TOS external frequenc...
TOSIntFreqUnc	0					0		ppb	TOS internal frequenc...
TOSExtFreqUnc	0					0		ppb	TOS external frequenc...
TOSGNSSTime	0					0		ns	TOS GNSS time offset
TOSGNSSTim...	0					0		ns	TOS GNSS time uncert...
TOSUTCTime	0					0		ns	TOS UTC time offset
TOSUTCTime...	0					0		ns	TOS UTC time uncerta...
TOSDiscSrc	0					0			TOS disciplining source
FCHGIntFreq...	0					0		ppb	FCHG internal frequen...
FCHGIntFreq...	0					0		ppb	FCHG internal frequen...
FCHGExtFreq...	0					0		ppb	FCHG external frequen...
FCHGExtFreq...	0					0		ppb	FCHG external frequen...
SMEASIntFreq...	0					0		ppb	SMEAS Internal freque...
SMEASIntFreq...	0					0		ppb	SMEAS Internal freque...
SMEASGNSSF...	0					0		ppb	SMEAS GNSS frequenc...
SMEASGNSSF...	0					0		ppb	SMEAS GNSS frequenc...
SMEASExt0Fre...	0					0		ppb	SMEAS ext 0 frequenc...
SMEASExt0Fre...	0					0		ppb	SMEAS ext 0 frequenc...
SMEASExt1Fre...	0					0		ppb	SMEAS ext 1 frequenc...
SMEASExt1Fre...	0					0		ppb	SMEAS ext 1 frequenc...
SMEASInt0Pha...	0					0		ns	SMEAS Internal phase...

Figure 31: Statistic view

All available database values (transmitted from the device or calculated by u-center) are displayed. The following statistics are displayed:

- Current value
- Minimum value

- Maximum value
- Average value
- Standard Deviation

The following color scheme for the values is applied:

- Grey color: The value was not set for the current epoch
- Blue color: The value was calculated by the application from other data
- Empty field: No data is available

Choosing "Database Empty" in the file menu or pressing the button clears the statistic view.

The content of the statistic view can easily be exported to other programs using Copy/Paste.

5.2.9 Table view

Index	UTC	Lat	Lon	Alt (HAE)	PACC 3D	VDOP	
Unit	time date	°	°	m	m		Statistical information
Count	142	142	142	141	0	141	
Age	0	0	0	1		1	
Current	13:28:27.000 03/26/2...	60.20943...	24.82757...	45.800		1.0	
Minimum	13:26:06.000 03/26/2...	60.20943...	24.82756...	45.500		1.0	
Maximum	13:28:27.000 03/26/2...	60.20944...	24.82758...	47.700		1.0	
Average		60.20944...	24.82757...	46.650	0.000	1.0	
Deviation		0.00000182	0.00000413	0.556		0.0	
0	13:26:06.000 03/26/2...	60.20944...	24.82758...	46.600		1.0	
1	13:26:07.000 03/26/2...	60.20944...	24.82758...	46.600		1.0	
2	13:26:08.000 03/26/2...	60.20944...	24.82758...	46.500		1.0	
3	13:26:09.000 03/26/2...	60.20944...	24.82758...	46.400		1.0	
4	13:26:10.000 03/26/2...	60.20944...	24.82758...	46.400		1.0	
5	13:26:11.000 03/26/2...	60.20944...	24.82758...	46.400		1.0	
6	13:26:12.000 03/26/2...	60.20944...	24.82758...	46.200		1.0	
7	13:26:13.000 03/26/2...	60.20944...	24.82758...	46.200		1.0	
8	13:26:14.000 03/26/2...	60.20944...	24.82758...	46.300		1.0	
9	13:26:15.000 03/26/2...	60.20944...	24.82758...	46.300		1.0	
10	13:26:16.000 03/26/2...	60.20944...	24.82758...	46.400		1.0	
11	13:26:17.000 03/26/2...	60.20944...	24.82758...	46.400		1.0	
12	13:26:18.000 03/26/2...	60.20944...	24.82758...	46.500		1.0	
13	13:26:19.000 03/26/2...	60.20944...	24.82758...	46.500		1.0	
14	13:26:20.000 03/26/2...	60.20944...	24.82758...	46.500		1.0	
15	13:26:21.000 03/26/2...	60.20944...	24.82758...	46.600		1.0	
16	13:26:22.000 03/26/2...	60.20944...	24.82757...	46.600		1.0	
17	13:26:23.000 03/26/2...	60.20943...	24.82757...	46.600		1.0	
18	13:26:24.000 03/26/2...	60.20943...	24.82757...	46.600		1.0	
19	13:26:25.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
20	13:26:26.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
21	13:26:27.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
22	13:26:28.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
23	13:26:29.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
24	13:26:30.000 03/26/2...	60.20943...	24.82757...	46.500		1.0	
25	13:26:31.000 03/26/2...	60.20943...	24.82757...	46.600		1.0	
26	13:26:32.000 03/26/2...	60.20943...	24.82757...	46.700		1.0	
27	13:26:33.000 03/26/2...	60.20943...	24.82757...	46.800		1.0	

Figure 32: Table view

All values from the database can be displayed in a tabular form (Figure 32). This is very useful when analyzing the log file in detail.

To add a new column, first select the desired value (Figure 33) and click the **+** button. To remove a displayed value, click the **-** button. To see the table header click the button. Statistical information will be shown for 4 seconds.

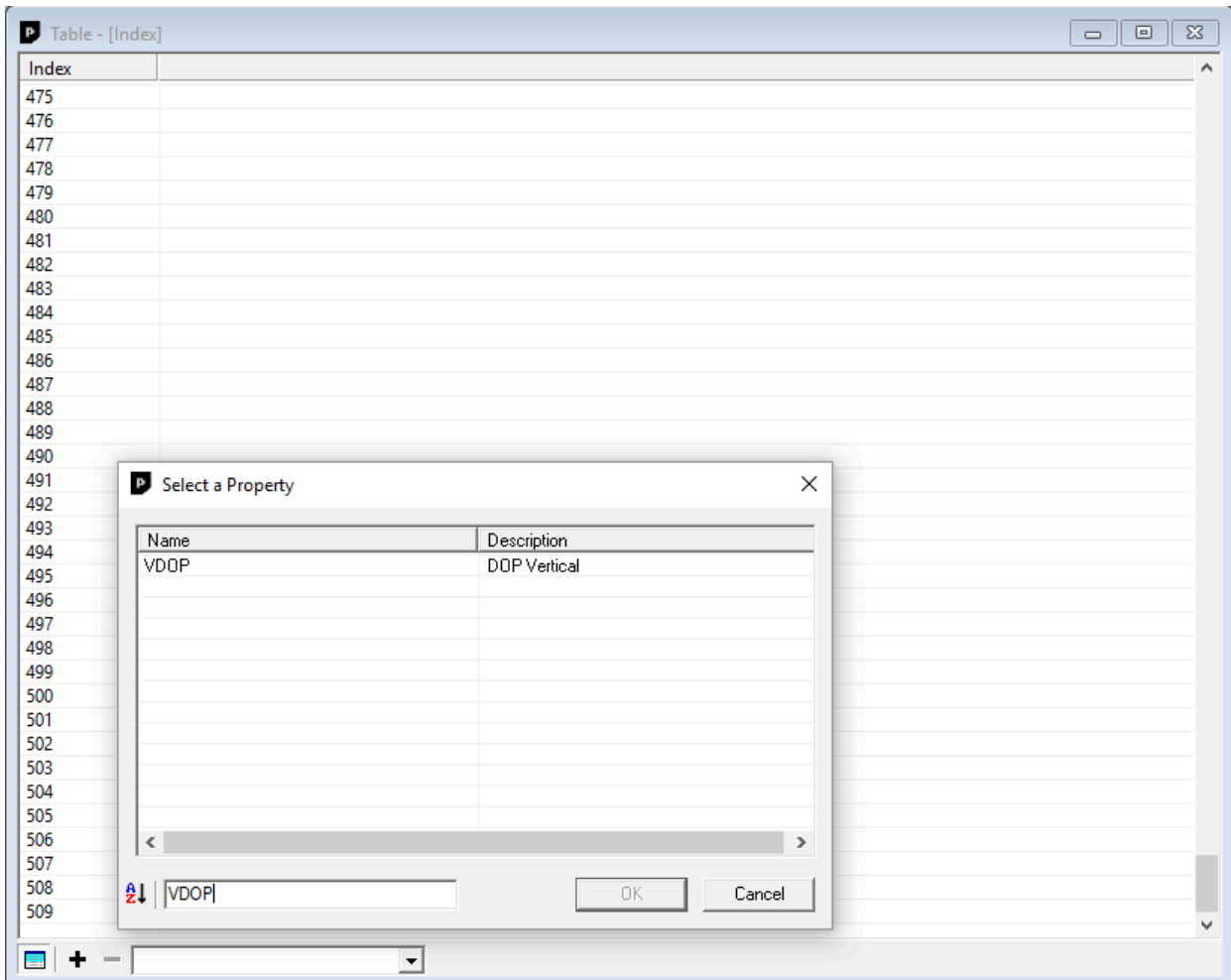


Figure 33: Selecting a new value

- The number of displayed epochs is set to 1800 by default.
- Choosing "Database Empty" in the file menu or pressing the button clears the table view.
- The content of the table view can easily be exported to other programs using Copy/Paste.

5.2.10 Map view

u-center can display positions on pre-calibrated or Google online (dynamic) maps (see Figure 34).

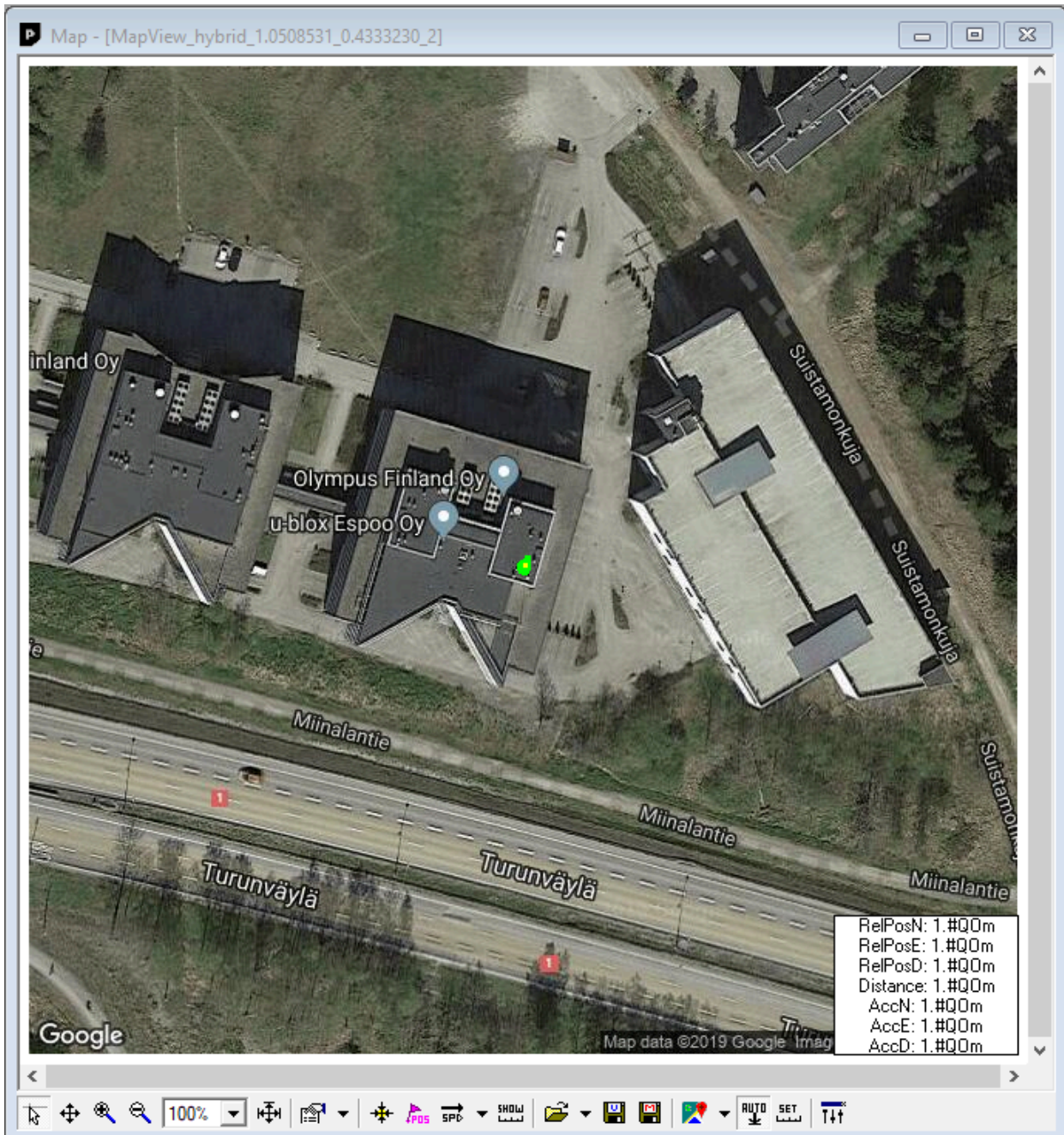


Figure 34: Map view with Google online map

5.2.10.1 Using map view

If you want to use the Google online maps you have to enter an API key in Tools > Preferences > Access Tokens. A missing API key can lead to the output shown in [Figure 35](#).

```

No online map image :-(
Have you checked your Google Maps is valid?
Enter a valid key into u-center here:
  Tools->Preferences, 'Access' tab

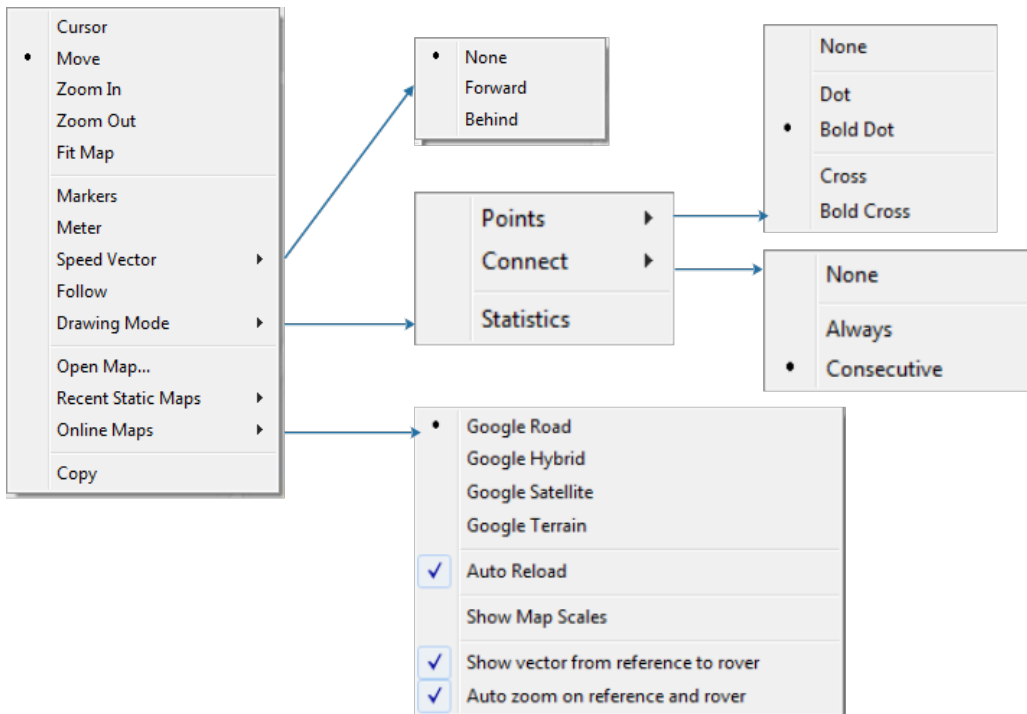
Get a Google Map API key here:
  https://developers.google.com/maps/documentation/static-maps/?hl=en
    
```

Figure 35: Missing online map API key

👉 Please go to <https://developers.google.com/maps/documentation/static-maps/?hl=en> to get a valid Google Static Maps API key.

You can access the view specific commands in two different ways:

- Using the command in the tool bar below the map view.
- Holding the cursor inside the map view and pressing the right mouse button. This will open the following context menu (see [Figure 36](#)).


Figure 36: Map view context menu

Function	Description	Shortcut / Toolbar icon
Cursor	The position of the cursor is shown on the lower left edge of the u-center screen (Longitude, Latitude and Pixel-Position). By holding the left mouse button and moving the cursor over the map you can measure distance from one position to another.	
Move	The map inside the map view window can be moved.	
Zoom In	The map is enlarged by selecting a rectangle.	
Zoom Out	The size of the map is decreased.	
Zoom	Zoom the map to a specified level.	100%

Function	Description	Shortcut / Toolbar icon
Fit Map	The map size is adjusted to fit the Map Window.	
Markers	Add or remove the defined markers (see also section Map calibration)	
Meter	Show or hide the ruler.	
Speedvector	Show or hide the speed vectors, and select where they are drawn from.	
Follow	Centers the map on the current GNSS position.	
Drawing Mode	The size and form of the displayed position can be changed in the menu Points ; the connection line between the points can be selected in the menu Connect . To see statistical values (average, minimum, maximum, standard deviation) directly in the map, select the menu entry Statistic .	
Open Map... / Recent Static Maps	Open a new or one of 8 recently used static maps.	
Online Maps	Use online maps. Select the type in the menu and also if they should be automatically downloaded when the current position moves out of the current map tile (Auto Reload). The menu option Show Map Scales allows you to select a different scale of the tiles. The menu option Show vector from reference to rover will show the vector pointing from reference to rover if such configuration exists. In this case, auto zoom capability exists to track the two by selecting the option Auto zoom on reference and rover .	
Save map (only in toolbar)	Save the current map view to a file (combined with all visible elements or only the map).	
Image settings (only in toolbar)	Brightness, contrast and color saturation of map can be adjusted by moving the glides.	

Table 17: Description of the buttons and context menu entries in map view



Map Views can be copied to the clipboard using the "Print Screen" function.



Choosing "Database Empty" in the file menu or pressing the button clears the statistic view.

5.2.10.2 Map calibration

To create your own map you will need a digitized map or a picture with orthogonal projection in one of the following pixel graphics formats.

png	Portable Network Graphics
bmp	Windows Bitmap
dib	Device Independent Bitmap
gif	Graphics Interchange Format
jpg/jpeg	Jpeg File Interchange Format
pcx	PC Paintbrush
tif	Tag Image File Format

If your map is not in one of the above formats, you can simply convert it in one of the supported formats by a third party program.

To use a map in u-center, three calibration points are needed. For these points you have to know the pixel coordinates and the according WGS84 coordinates in the latitude/longitude format in degrees (longitude: -180.0° to 180.0° , latitude: -90.0° to 90.0°). These points are stored in the map calibration file. The calibration file must be stored at the same location as the bitmap itself. It has the same name but a different extension ($*.mcf$). The format of the calibration file is very simple and can be edited in a simple editor like notepad.

5.2.10.2.1 Example

As an example we will have a look at the virtual map file `world.png` and its calibration file `world.mcf`.

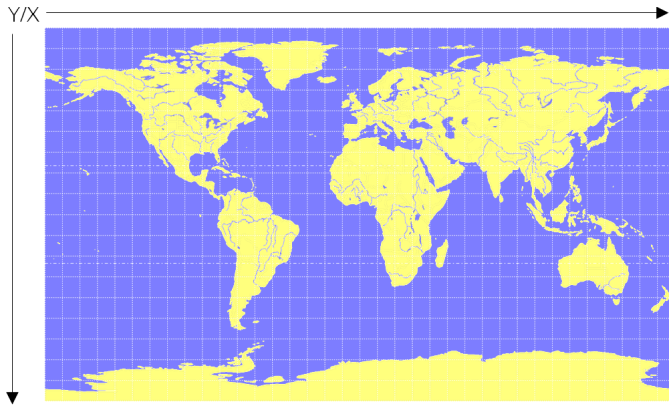


Figure 37: Digital map file: `world.png`

The Map has 1765 pixels (0 to 1764) in the horizontal and 1046 pixels (0 to 1045) in the vertical direction. The origin is the upper left corner. To calibrate this map we will use the following three calibration points (#1 to #3).

Reference Point	#	Pixel		WGS84 Coordinate	
		X	Y	Longitude	Latitude
Upper Left Corner	1	0	0	-180.0	90.0
Lower Right Corner	2	1764	1045	180.0	-90.0
Upper Right Corner	3	1764	0	180.0	90.0

Table 18: Calibration reference points

To determine the exact pixel position you can use Microsoft Paint (`mspaint.exe`) or any other pixel-editing program.

The calibration file is a plain ASCII text file. The file may contain comments. The file consists of two sections, which start with keywords encapsulated in braces.

The `REFERENCE` section, which is mandatory, contains the three points used to calibrate a map. Each reference point is on a single line and has the following syntax: `# = <x>, <y>, <lon>, <lat>` where

- `#` is the index of the reference point
- `<x>` is the horizontal image coordinate
- `<y>` is the vertical image coordinate
- `<lat>` is the latitude in degrees and WGS84
- `<lon>` is the longitude in degrees and WGS84.

The optional `MARKER` section defines additional points on the map. Each point is on a single line with the syntax: `# = i, <x>, <y>[, <text>]` or `# = c, <lat>, <lon>[, <text>]` where

- `#` is the index of the marker point
- `i` indicates that the coordinates relate to the image
- `c` indicates that the coordinates relate to the world

- <x> is the horizontal image coordinate
- <y> is the vertical image coordinate
- <lat> is the latitude in degrees and WGS84
- <lon> is the longitude in degrees and WGS84.
- <text> is a optional string in quotes labeling the marker point.

The points must have a unique index from 1 to <num>. The maximum marker point index <num> is written to the same section on a separate line with the syntax `Count = <num>`.

```

; I N F O
; -----
; File:   world.mcf
; Source: (sample data set)

; R E F E R E N C E
; -----
; 3 Points must be defined to calibrate a Map
; Parameters:
; #       = index of the point (1 to 3)
; x,y     = image coordinates
; lat,lon = world coordinates
; Syntax:
; # = <x>, <y>, <lon>, <lat>

[REFERENCE]
1 = 0, 0, -180.0, 90.0
2 = 1764, 1045, 180.0, -90.0
3 = 1764, 0, 180.0, 90.0

; M A R K E R
; -----
; You can add points (image or world coord) to the map
; Parameters:
; num     = number of markers that follow
; #       = index of the point (1 to num)
; type    = c for world or i image coordinates
; x,y     = image coordinates
; lat,lon = world coordinates
; text    = quoted text decription to the marker (optional)
; Syntax:
; Count = <num>
; #     = <type>, <x|lon>, <y|lat>[, <text>]

[MARKER]
Count = 1
1 = c, 8.56525, 47.28519444, "u-blox ag"
    
```

Figure 38: Map calibration file: world.mcf

5.2.10.2.2 Map calibration tool

u-center includes a built-in calibration tool for providing coordinates to maps and photographs in supported data formats to create u-center maps. To use the tool open the map view window as seen in [Figure 39](#) and then open the file of the map to be calibrated.

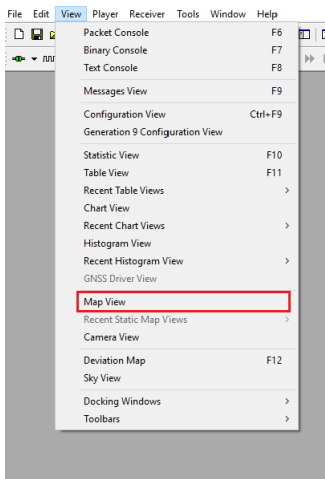


Figure 39: Opening map view window

If the file to be opened has not been calibrated, the message in [Figure 40](#) will appear.

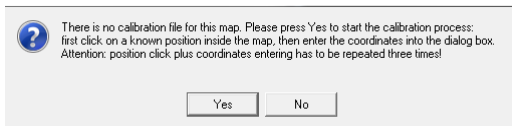


Figure 40: No calibration information found

Select three points on the map and enter the calibration coordinates in the specified format as seen in [Figure 41](#).

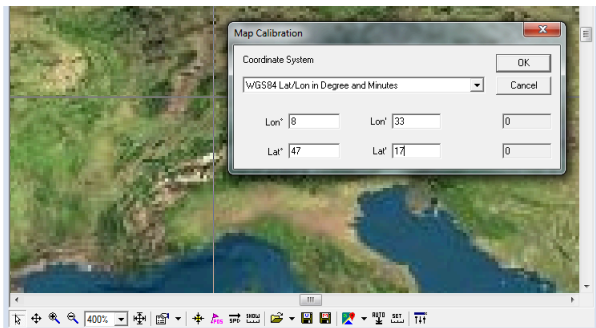


Figure 41: Calibrating a map using calibration tool

Following these steps the map is now calibrated and can be used with u-center.

5.2.11 Chart view

Chart view allows you to conveniently view GNSS data records in graphical form. The data can be scaled in many different ways and formats. It's even possible to print the entire chart. The examples below illustrate two different typical applications.

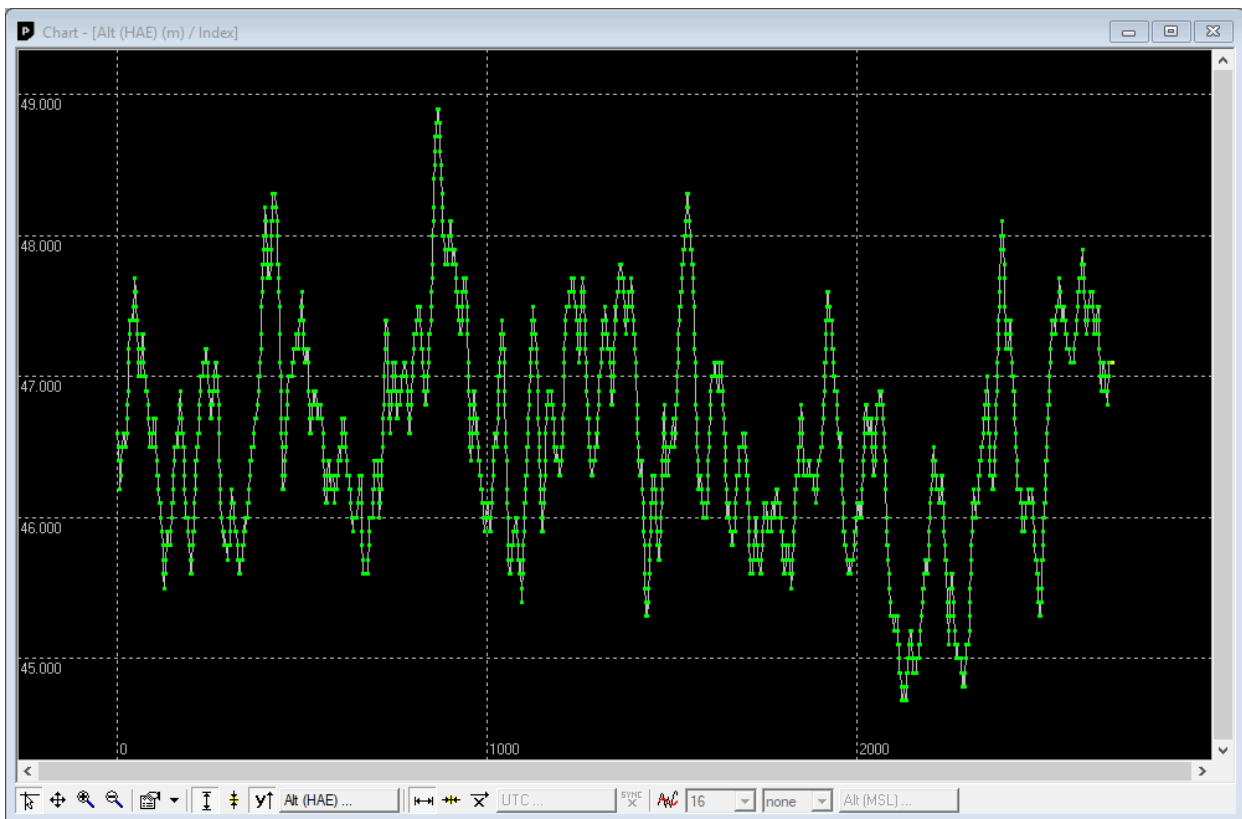


Figure 42: Altitude as a function of Index (X = Index, Y = Alt)

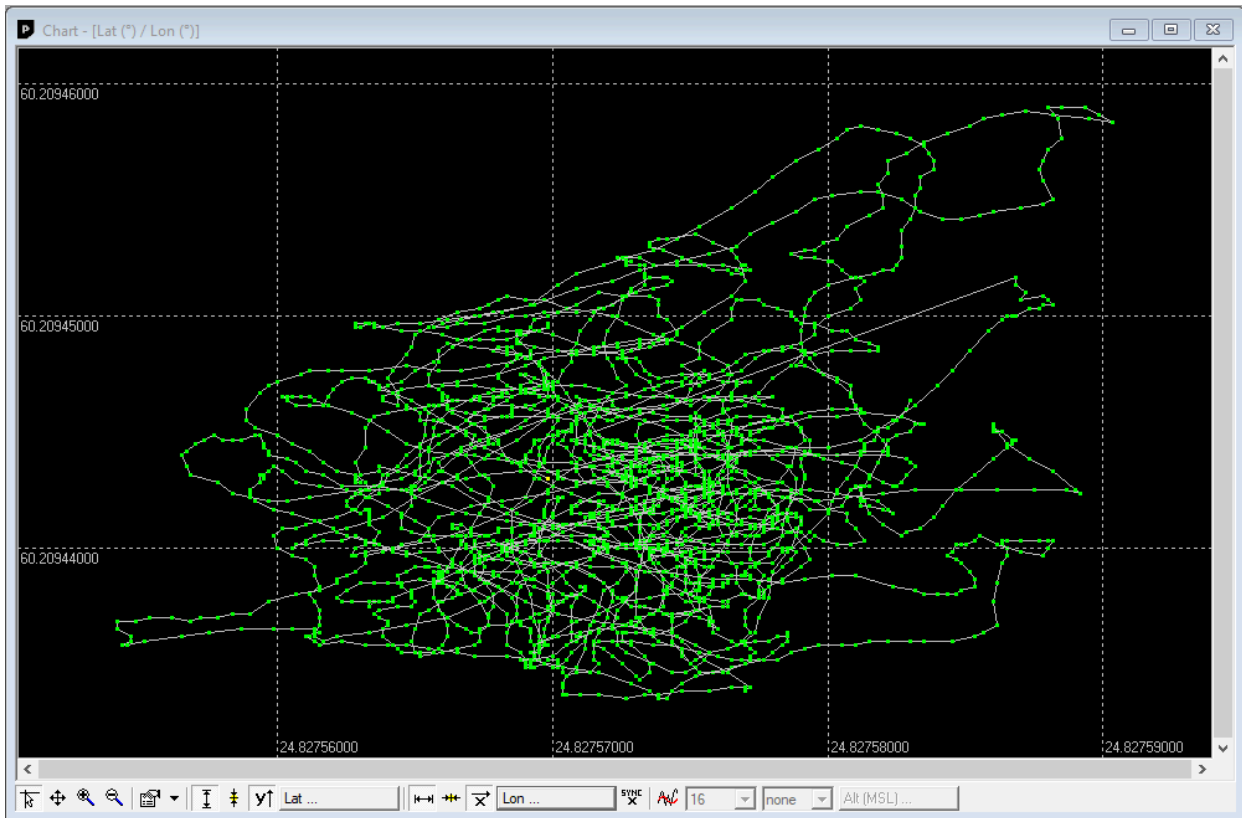


Figure 43: Latitude as a function of longitude (X =Longitude, Y = Latitude)

Function	Description	Shortcut / Toolbar icon
Cursor	The position of the cursor is shown on the lower left edge of the u-center screen (Longitude, Latitude and Pixel-Position). By holding the left mouse button and moving the cursor over the chart you can measure distance from one position to another.	
Move	The chart inside the chart view window can be moved.	
Zoom In	Drawing a rectangle enlarges the chart to the new view. To zoom in the chart double-click on the chart.	
Zoom Out	Drawing a rectangle decreases the chart to the new view. To zoom out the chart double-click on the chart.	
Drawing Mode	The size and form of the displayed values can be changed in the menu points; the connection line between the values can be selected in the menu connect. For viewing the statically values (average, minimum, maximum, standard deviation) directly in the chart select the statistics menu.	
Fit Y range	Fits the Y range.	
Follow Y	Follow the most current Y value (the most current Y-value is always in the middle of the chart).	
Index or Y value	Switch between the index and the Y value.	
Y value	Select the Y value to be displayed.	
Fit X range	Fit the X range.	
Follow X	Follow the most current X value (the most current X value is always in the middle of the chart).	
Index or X value	Switch between the index and the X value.	
X value	Select the X value to be displayed.	

Function	Description	Shortcut / Toolbar icon
Moving average	Adds a moving average. The average is calculated over the number of most recent values, specified with the parameter.	16 none Alt (MSL)

Table 19: Description of the buttons in the chart view toolbar

The number of displayed epochs is set to 1800 by default.

5.2.12 Histogram view

Histogram views allow you to view GNSS data and probability distributions (see [Figure 44](#)) and print the entire histogram if desired. The number of bins (storage containers) can be set by you.

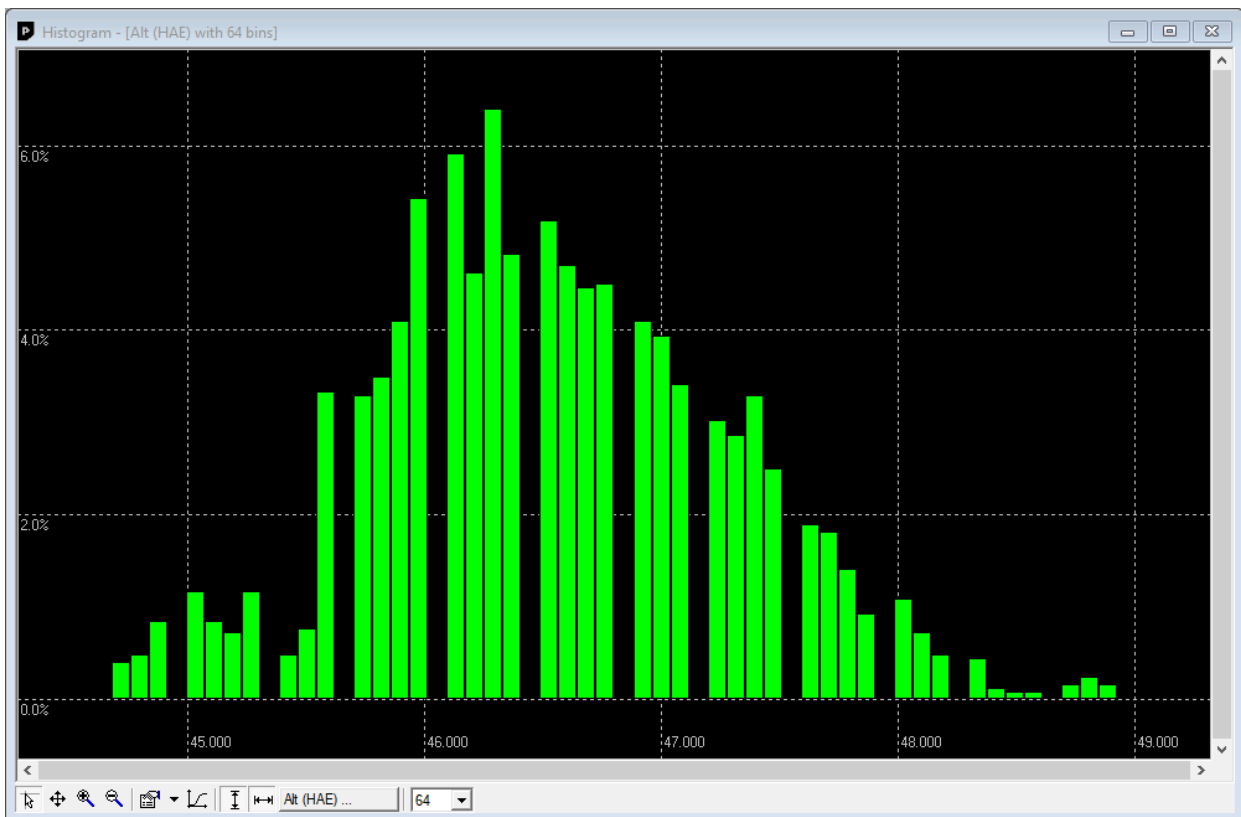


Figure 44: Altitude Histogram View

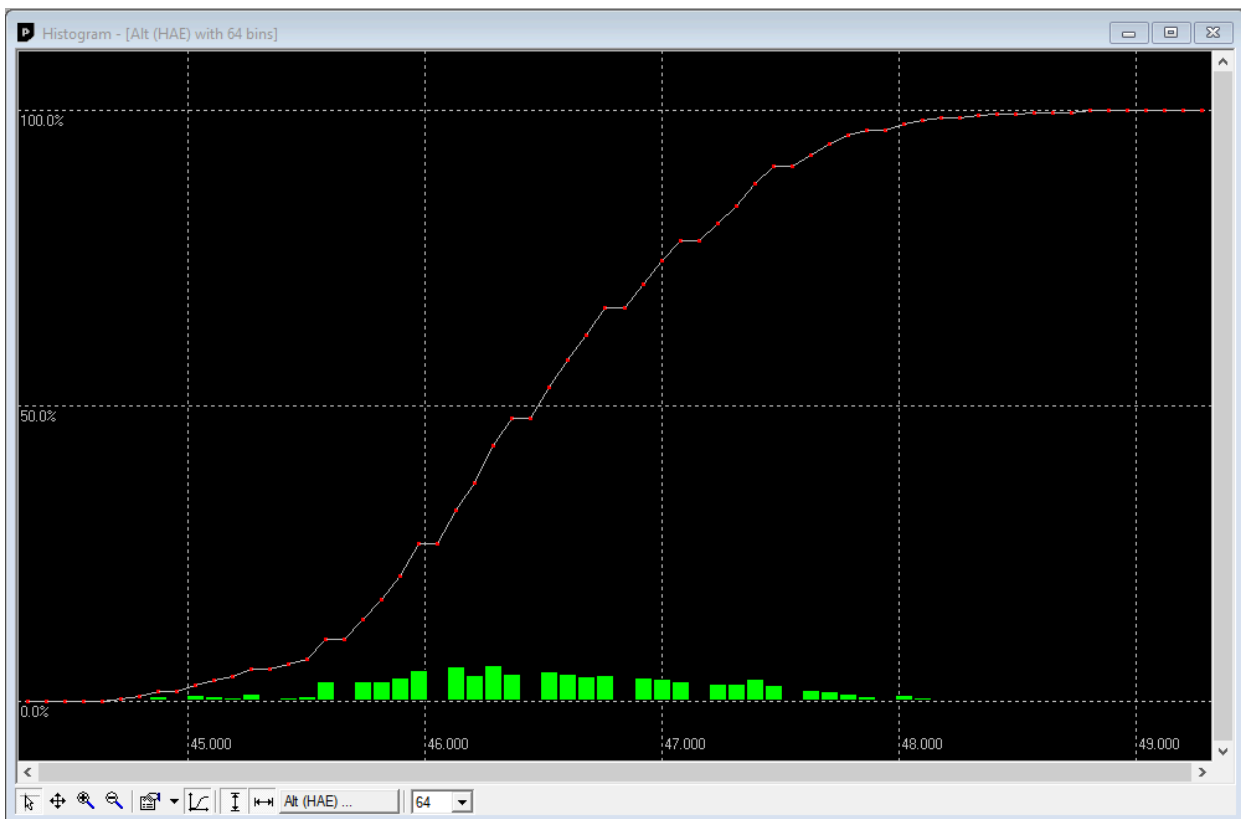


Figure 45: Probability chart

Function	Description	Shortcut / Toolbar icon
Cursor	The position of the cursor is shown on the lower left edge of the u-center screen (Longitude, Latitude and Pixel-Position). By holding the left mouse button and moving the cursor over the histogram you can measure distance from one position to another.	
Move	The histogram inside the histogram view window can be moved.	
Zoom In	Drawing a rectangle enlarges the histogram to the new view. To zoom in the histogram double-click on the histogram.	
Zoom Out	Drawing a rectangle decreases the histogram to the new view. To zoom out the histogram double-click on the histogram.	
Drawing Mode	The size and form of the displayed values can be changed in the menu points; the connection line between the values can be selected in the menu connect. For viewing the statically values (average, minimum, maximum, standard deviation) directly in the histogram select the statistics menu.	
Probability	Fit the Probability range.	
Fit Probability	Fit the Probability range	
Y value	Select the Y value to be displayed.	
Bins	The number of bins.	

Table 20: Description of the buttons in the histogram view toolbar

The number of displayed epochs is set to 1800 by default.

5.2.13 Camera view

The camera view function enables photographs, taken during recording of log files, to be linked to the GNSS data stored in the corresponding log files. This allows a video depiction of the test, with a picture assigned to a specific point of GNSS data.

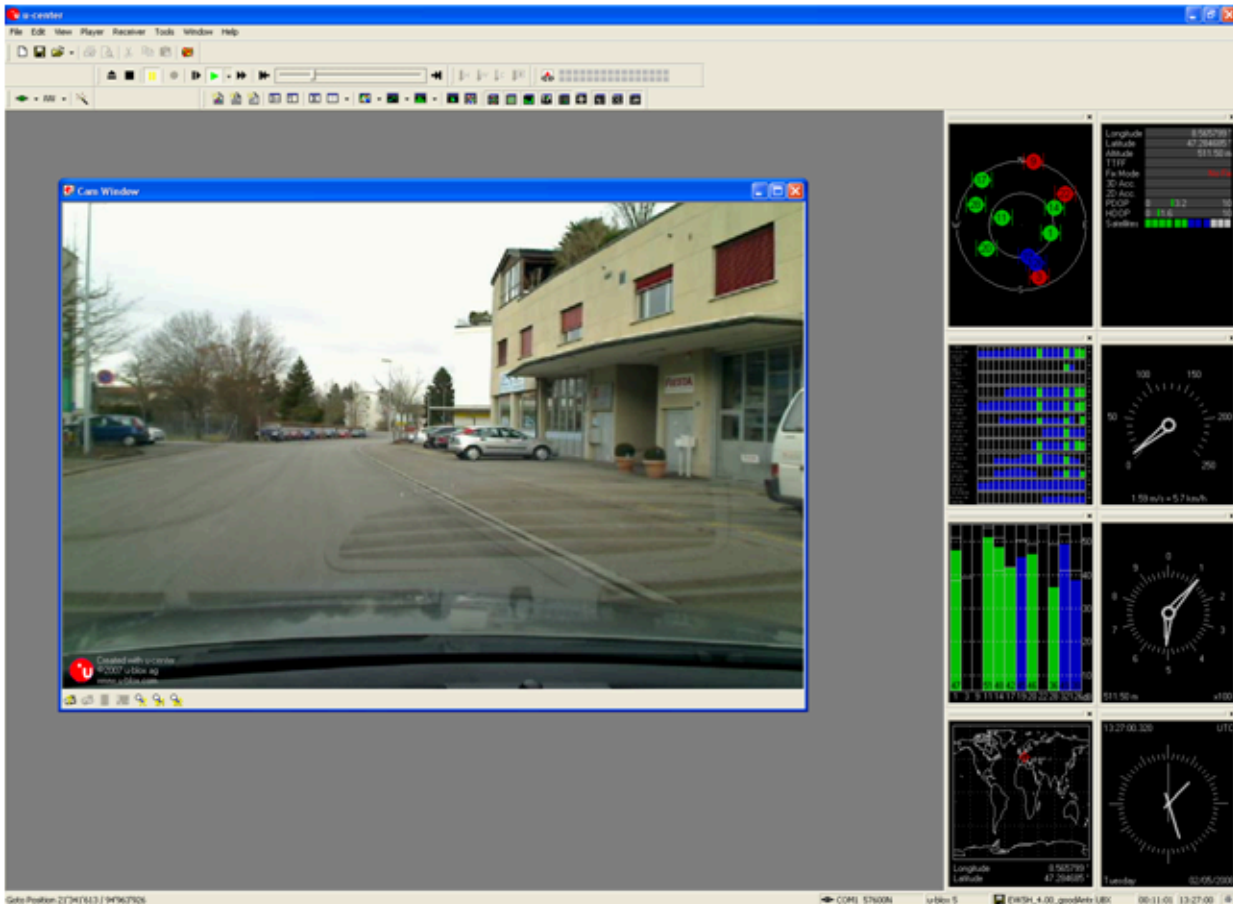


Figure 46: Camera view

Using Camera View can result in very large log files and can slow down u-center when playing such files.

5.2.14 Deviation map

The deviation map displays positions in longitude and latitude relative to a defined reference position.

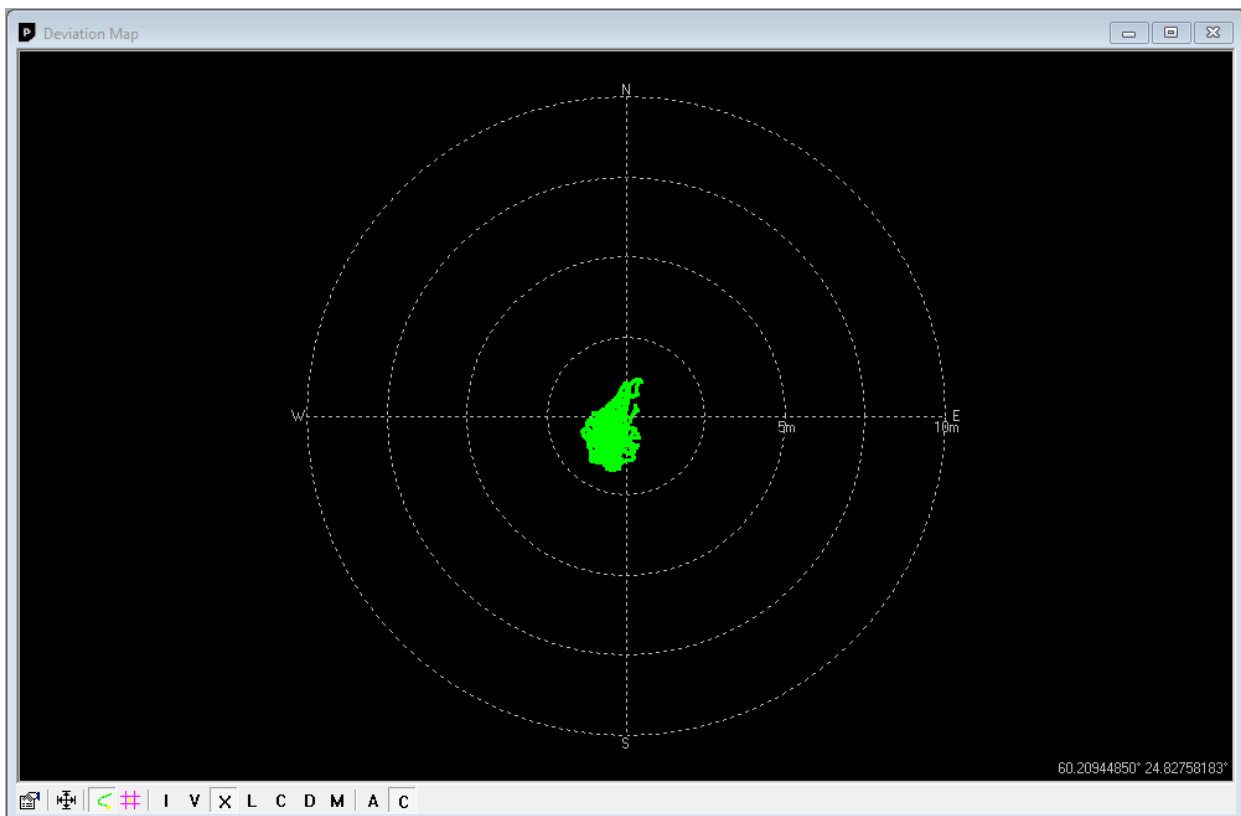


Figure 47: Deviation map

Function	Description	Shortcut / Toolbar icon
Properties	The reference position can be defined as: <ul style="list-style-type: none"> • The average of all previously measured positions • The current position • A fixed, predefined value • The radius of the outer circle can be adjusted with the Max. Deviation parameter. 	
Fit	Automatically adjusts the reference position and the maximum deviation to fit all positions into the deviation map.	
Track	Show track of values from the internal database.	
Statistics	Show statistics of the values from the internal database.	
Maximum deviation shortcut	Shortcut for changing the scale of the deviation map to prefixed values. The icons represent Roman numerals, with "I" corresponding to a 1 m radius of the deviation map, and "V"= 5 m, "X"= 10 m, "L"= 50 m, "C" = 100 m, "D" = 500 m, and "M" = 1000 m.	I V X L C D M
Reference position shortcut	Shortcut for setting the reference position: <ul style="list-style-type: none"> • A = average position • C = current position 	A C

Table 21: Description of the buttons in the deviation map toolbar



The number of displayed epochs is set to 1800 by default.



You can use the mouse scroll wheel to zoom in/out on the deviation map. Holding down the Shift key allows you to zoom in beyond the default 1 m maximum zoom.

5.2.15 Sky view

Sky view is an excellent tool for analyzing the performance of antennas as well as the conditions of the satellite observation environment. The polar plot graphically displays the averaged relative satellite signal strength (see Figure 48), the position of satellites in the sky, identifies satellites by number and indicates which satellites are being used in the receiver calculation. Right-clicking the mouse on sky view allows the copying of C/N0 values in tabular form to another program.

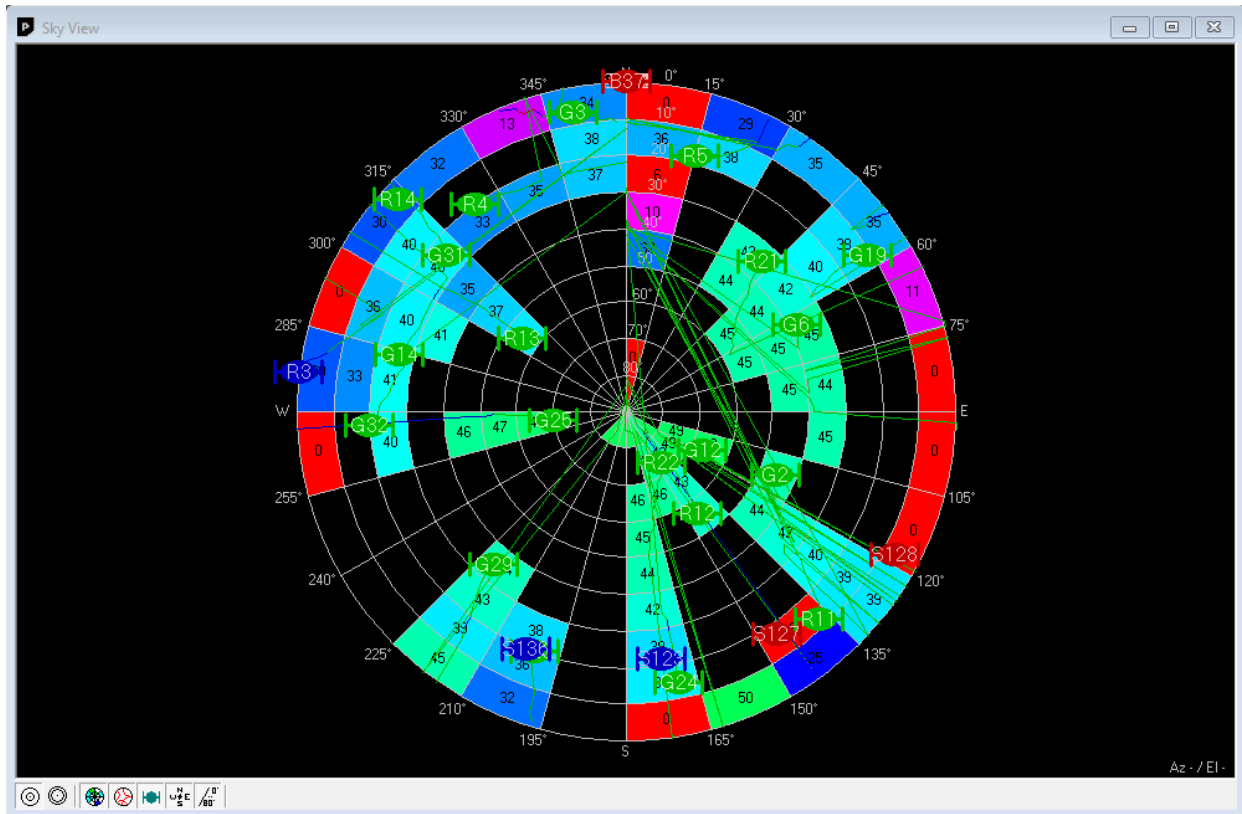


Figure 48: Sky view

Function	Description	Shortcut / Toolbar icon
Linear projection	Displays the sky view with a linear projection.	
Sine projection	Displays the sky view with a sine projection.	
C/N0	Displays or hides the averaged C/N0 values.	
Orbits	Displays or hides the satellite orbits.	
Satellites	Displays or hides the current satellite positions.	
Coordinates	Displays or hides the caption for the azimuth.	
Elevation	Displays or hides the caption for the elevation.	

Table 22: Description of the buttons in the sky view toolbar

6 NTRIP

This section will give an overview of the NTRIP support in u-center. Currently u-center supports both NTRIP client and NTRIP caster/server functionality. Settings for both of them can be found under "Receiver" menu.

Networked Transport of RTCM via Internet Protocol (NTRIP) is an application-level protocol that supports the streaming of Global Navigation Satellite System (GNSS) data over the internet. NTRIP is a generic, stateless protocol based on the Hypertext Transfer Protocol HTTP/1.1. The HTTP objects are extended to GNSS data streams.

6.1 NTRIP client

NTRIP client allows connecting to any NTRIP compliant caster and receiving RTCM correction data for receiver. Currently version 1 of NTRIP standard is implemented.

Perform the following steps to connect to the caster (steps 10 to 14 are only needed when the mount point requires additional NMEA message to be sent by the client):

1. Establish the communication between u-center and the device (see also [Connect to the receiver](#)).
2. Open NTRIP client settings dialog by clicking on Receiver > NTRIP Client...

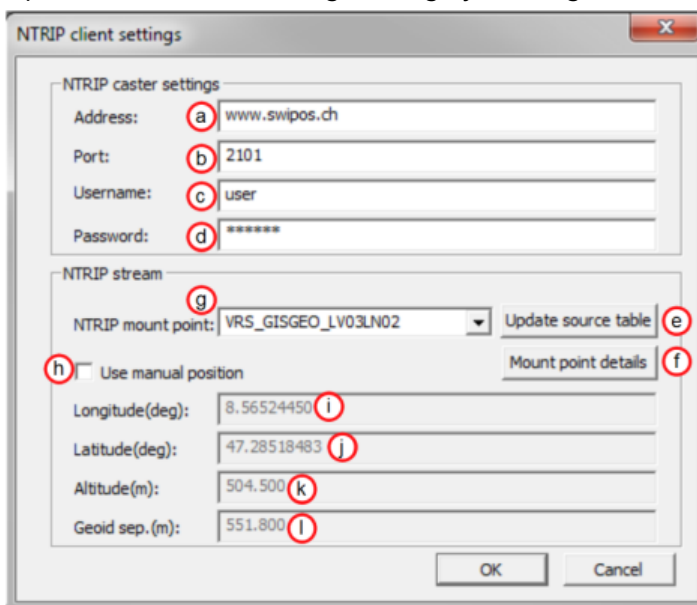


Figure 49: NTRIP client settings dialog

3. Enter the address of the NTRIP caster. See position **a**.
4. Enter the port number of the NTRIP caster. See position **b**.
5. Enter the username which will be sent to the NTRIP caster. If no authentication is required by the caster, then leave this field empty. See position **c**.
6. Enter the password which will be sent to the NTRIP caster. If no authentication is required by the caster, then leave this field empty. See position **d**.
7. Click on **Update source table** to get an up to date list of all available mount points from the caster. See position **e**.
8. To see the detailed attributes of mount points, click on **Mount point details**. This will bring up a new dialog box listing all the mount points available and their attributes. See position **f**.

9. Select one of the mount points listed in the drop down box. See position **g**.
10. Click on **Use manual position** to enter values for position data. If this is not checked, the position data will be retrieved directly from the receiver. See position **h**.
11. Enter the longitude in degrees, in either floating point or integer format. See position **i**.
12. Enter the latitude in degrees, in either floating point or integer format. See position **j**.
13. Enter the altitude in meters in floating point or integer format. See position **k**.
14. Enter the geoid separation in meters in floating point or integer format. See position **l**.
15. Click on **OK** to start receiving correction data.

6.2 NTRIP server/caster

The u-center NTRIP caster is able to accept requests from NTRIP compliant clients and send them RTCM correction data. This is implemented according to NTRIP standard version 1. The server part is not implemented according to the standard but we are currently supporting one mount point, which gets data from direct connection to the receiver.

Perform the following steps to set up the caster:

1. Establish communication between u-center and the device (see also [Connect to the receiver](#)).
2. Open NTRIP server/caster settings dialog by clicking on Receiver > NTRIP Server/Caster... There are two tabs. First tab contains the basic configuration (port only), while the second tab contains the rest of the configuration options.

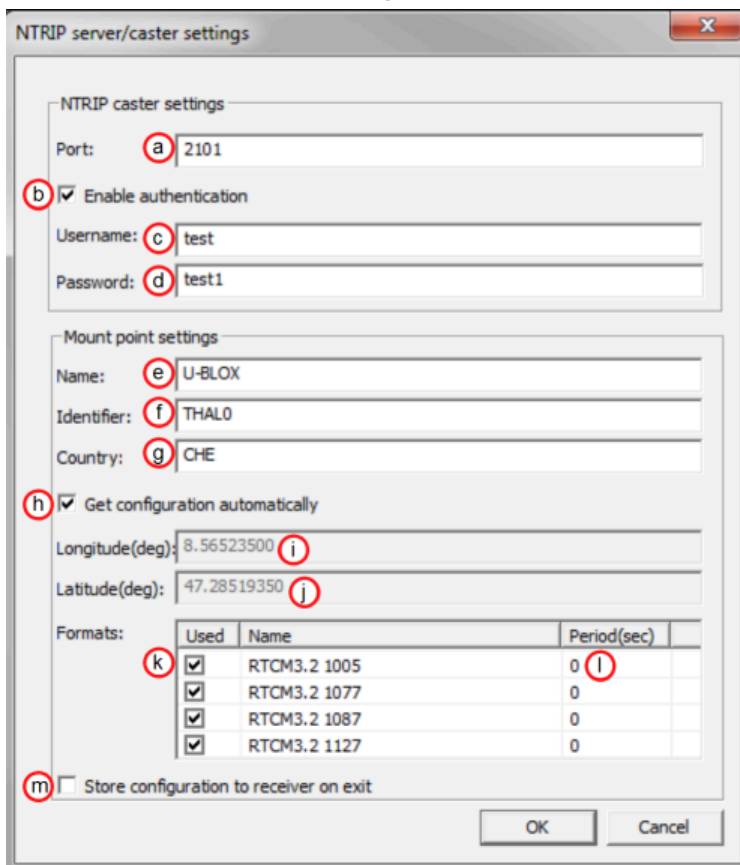


Figure 50: NTRIP server settings dialog, both the Basic and More tabs

3. Enter the port that will be used by the NTRIP caster. See position **a**.

4. Check "Enable authentication" if you want to enable basic authentication on your caster. See position **b**.
5. Enter the username which will have to be provided by the clients (only if you enabled authentication under 4). See position **c**.
6. Enter the password which will have to be provided by the clients (only if you enabled authentication under 4). See position **d**.
7. Enter the name for the mount point. See position **e**.
8. Enter the identifier for the mount point e.g. name of the city next to mount point location. See position **f**.
9. Enter the country code in ISO 3166 for the mount point. See position **g**.
10. Check **Get configuration automatically** to use longitude, latitude and RTCM message configuration of the currently connected receiver that will be sent out on the mount point. In this case, you can go directly to 16. See position **h**.
11. Enter the longitude for the mount point in integer or floating point format. See position **i**.
12. Enter the latitude for the mount point in integer or floating point format. See position **j**.
13. Select the RTCM messages that will be sent by the mount point. See position **k**.
14. For every selected RTCM message enter the period at which messages will be sent to the clients. See position **l**.
15. Check **Store configuration to receiver on exit** to store the configuration of RTCM messages to the receiver (using the UBX-CFG-MSG message). See position **m**.
16. Click **OK** to start NTRIP server/caster.

7 MQTT

MQTT (Message Queuing Telemetry Transport) is a message protocol for restricted networks (low bandwidth) and IoT devices with high latency.

This section gives an overview of the MQTT support in u-center.

7.1 MQTT client

The MQTT client allows connecting to an MQTT data stream and receiving PointPerfect correction data for the receiver.

To connect to the MQTT data stream:

1. Establish the communication between u-center and the device (see also [Connect to the receiver](#)).
2. Open MQTT client settings dialog by clicking Receiver > MQTT Client...

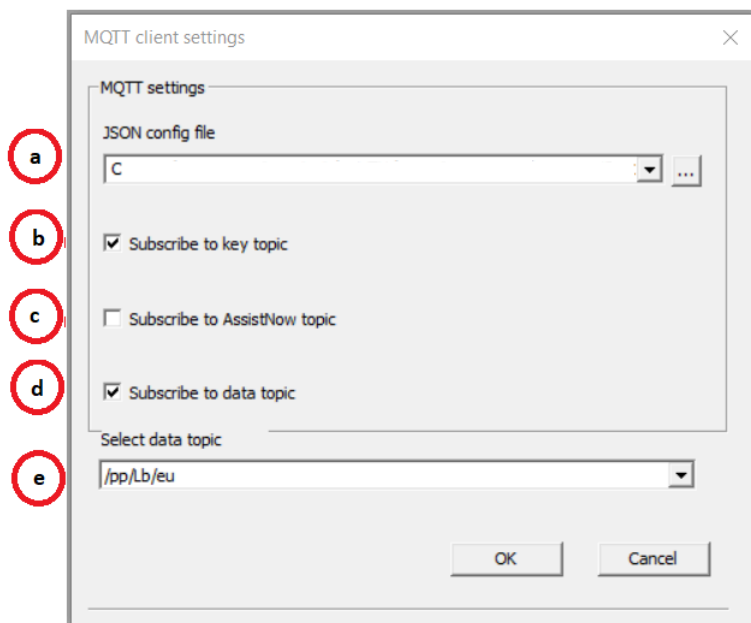


Figure 51: MQTT client settings dialog

3. Upload the u-center configuration file that you need to download from Thingstream. See position **a**. For more information on how to sign in to Thingstream to get the u-center configuration file, visit [PointPerfect getting started](#). Clicking OK without any configuration file will show an error, as shown in [Figure 52](#).

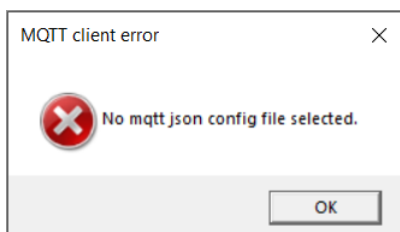


Figure 52: MQTT client error message

4. To subscribe to the key topic, select the "Subscribe to key topic" checkbox. See position **b**.

5. To subscribe to the AssistNow topic, select the "Subscribe to AssistNow topic" checkbox. See position **c**.
6. To subscribe to a data topic, select the "Subscribe to data topic" checkbox. See position **d**.
7. Select the required data topic from the drop-down menu. See position **e**. Clicking OK without any data topic selection will show an error, as shown in [Figure 53](#).

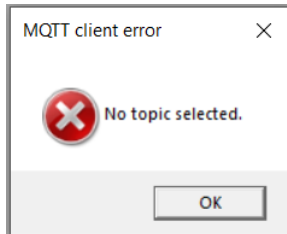


Figure 53: MQTT client error message

8. Once the required checkboxes, u-center configuration file and data topic have been correctly selected, click OK to start receiving the correction data.

8 Google Earth server

This section gives an overview of the Google Earth server support in u-center.

The Google Earth server can continuously send positioning data in a specific format to the Google Earth application. By hosting such a server in u-center we are able to visualize positioning data in real time.

There are only a few settings that can be set via the Google Earth server dialog. This means a lot of functionality and behavior of the Google Earth is still configurable from the application itself and therefore out of control of u-center's direct control.

Perform the following steps to start the Google Earth server:

1. Establish the communication between u-center and the device (see also [Connect to the receiver](#)).
2. Open Google Earth settings dialog by clicking on File > Database Export > Google Earth Server...

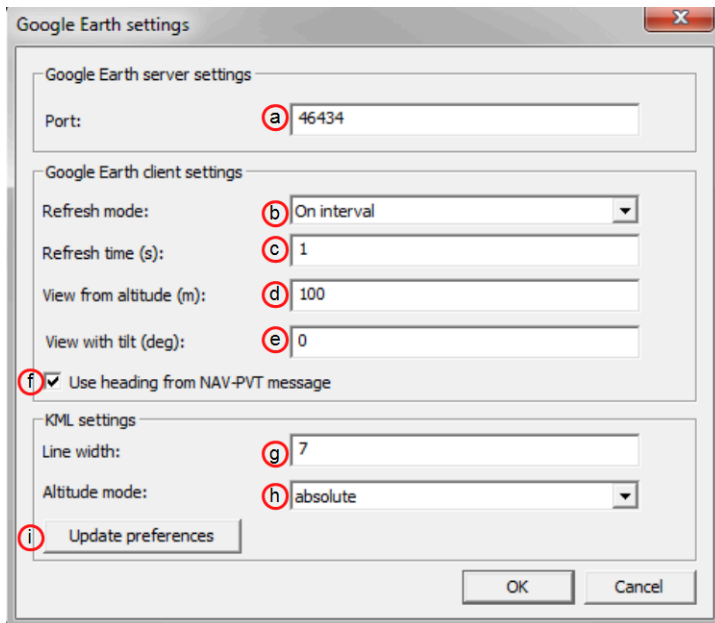


Figure 54: Google Earth settings dialog

3. Enter the port of the server. See position **a**.
4. Select the refresh mode. Supported modes are "On camera stop" where Google Earth will send requests only when previous view has stabilized or "On interval" where requests from Google Earth will be sent in regular intervals. See position **b**.
5. Enter the refresh time. This is the time between two consecutive requests in "On interval" mode or delay after camera stops in "On camera stop" mode. See position **c**.
6. Enter the altitude in meters of the view. See position **d**.
7. Enter the tilt in degrees of the view. A value of 0 indicates that the view is aimed straight down toward the earth and a value of 90 indicates that the view is aimed toward the horizon. See position **e**.
8. Check this field if you want the heading of the camera to follow heading information coming from UBX-NAV-PVT message. See position **f**.
9. Enter the number to set the line width in the view. Higher values mean a thicker tracking line. See position **g**.

10. Select the altitude mode for the view. The "absolute" mode sets the altitude relative to sea level, "relativeToGround" mode sets it relative to the actual ground elevation in a particular location and "clampToGround" ignores the altitude specification. See position **h**.
11. Click on **Update preferences** if you want to permanently store information about Line width and Altitude mode. The same can be achieved through menu "Tools > Preferences > KML settings". See position **i**.
12. Click on **OK** to start the server.

9 Tools

This section will give an overview of the embedded tools of u-center. They can be used for different purpose and should facilitate the usage of u-blox GNSS receivers. The tools can be found under the "Tools" menu but some of the options are only displayed when a receiver is connected to u-center. The firmware update tools also depend on the connected receiver generation.

9.1 Firmware update

This tool allows you to update the firmware of a receiver. For the firmware update to work, the receiver must have a flash memory attached as the new firmware will be stored in this location.

In the earlier versions of u-center, firmware update was implemented as part of the u-center application. Now, the firmware update is implemented as a separate application which u-center launches and passes parameters to, depending on the options selected in the UI.

To update the firmware, perform the following steps:

1. Display the firmware update tool view by clicking on Tools > Firmware Update...

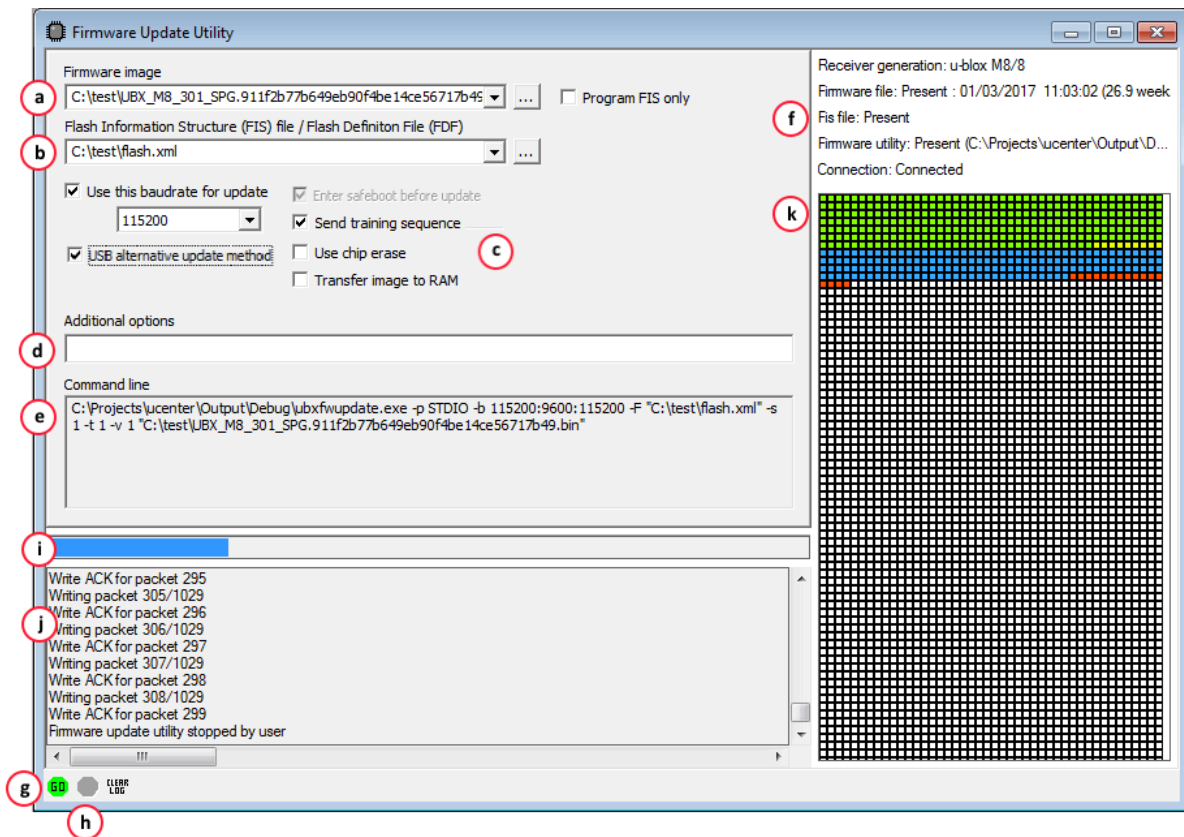


Figure 55: Firmware update view

2. Select the firmware image suitable for the connected receiver. See position **a** on [Figure 55](#).
3. Select the flash information structure file (only needed if using u-blox receiver generation 7 or later), or the flash definition file (only needed before u-blox receiver generation 7). These files should be bundled with u-center. See position **b** on [Figure 55](#).

4. Select the options for your receiver. See position **c** on [Figure 55](#).

Option	Description	Recommended
Use this Baud rate for update	Selects the speed of the communication for updating the firmware on the receiver. Only has an effect when the receiver is connected over a serial port.	115200
Program FIS only	Writes only the flash information structure (FIS) into the external memory and does not update the firmware. This option is used for receivers running from ROM but with an attached SQL memory (for example for logging). Only supported after and including u-blox receiver generation 7.	disabled
Enter Safeboot before update	Sends the command to enter safeboot. In this state, the receiver boots from the internal ring oscillator and does not rely on any external components. GNSS functionality is not started and the receiver does not output any data. Don't use this method when having the receiver connected over USB.	disabled
USB alternative update method	Enables updating the receiver via USB. "Enter Safeboot before update" will be disabled automatically if that option has been chosen.	enabled (using USB only)
Send Training sequence	Sends the training sequence after safeboot was entered. This synchronizes the internal ring oscillator so that a communication can be established.	enabled
Use chip erase	Erases the flash using an single command instead of individual sector erases.	check support
Transfer image to RAM	Transfers the firmware image directly to the receiver's RAM. Not stored to flash.	disabled

5. The additional options field allows more command options to be specified than are presented in the UI. This feature should only be needed if the firmware update utility launched by u-center has additional features which the development of th UI has not caught up with yet. See position **d** on [Figure 55](#).
6. The command line field displays the actual command line and parameters used to launch the firmware update utility from u-center. This can be used to help diagnose any issues that may occur when performing a firmware update. See position **e** on [Figure 55](#).
7. The status fields display information about the connected receiver, the presence of the firmware and FIS files, and if the firmware update utility can be found. See position **f** on [Figure 55](#). If there is a problem with any of these items, the **Go** button, which starts the update process, will be greyed out.
8. Press the **Go** button to start the firmware update process. This button will only be enabled if u-center can see the receiver and can find the specified files. If this button is greyed out, check the status display to see what is wrong. See position **g** on [Figure 55](#).
9. Press the **Stop** button to terminate the firmware update process. This will only be enabled when the update process is running. See position **h** on [Figure 55](#).
10. During firmware update, a progress bar is displayed. See position **i** on [Figure 55](#).
11. A log is also displayed during the update process. See position **j** on [Figure 55](#).
12. A detailed image of the flash erase and writing progress will also be shown. See position **k** on [Figure 55](#).

9.2 Legacy Firmware update u-blox 5 - 8

This is the legacy receiver firmware update tool, which is built into the u-center binary. It can be used to program u-blox 5 to u-blox 8 receivers. Further feature development has been stopped and u-center now uses the stand alone command line firmware update utility as the primary firmware update mechanism. This is documented in the previous section. In the future, this legacy firmware update tool will be removed permanently from u-center.

As with the primary firmware update tool, the receiver has to have a flash memory attached as the firmware has to be stored in this location.

Perform the following steps to update the firmware:

1. Establish the communication between u-center and the device (see also [Connect to the receiver](#)).
2. Open firmware update tool by clicking Tools > Legacy Firmware Update...

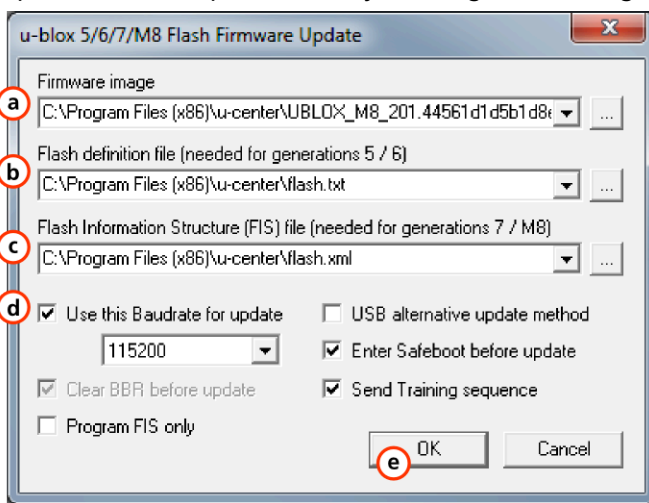


Figure 56: Legacy firmware update window

3. Select the firmware image suitable for the connected receiver. See position **a** on [Figure 56](#).
4. Select the flash definition file (only needed before u-blox receiver generation 7). This file is bundled with u-center. Point to the latest file version. See position **b** on [Figure 56](#).
5. Select the flash information structure file (when using u-blox receiver generation 7 or later). This file is also bundled with u-center. Point to the latest file version. See position **c** on [Figure 56](#).
6. Select the correct options for your receiver. See position **d** on [Figure 56](#).

Option	Description	Recommended
Use this Baud rate for update	Selects the speed of the communication for updating the firmware on the receiver. Only has an effect when the receiver is connected over a serial port.	115200
Clear BBR before update	Deletes the complete battery-backed memory (BBR) so that the receiver will start with the default configuration.	enabled
Program FIS only	Writes only the flash information structure (FIS) into the external memory and does not update the firmware. This option is used for receivers running from ROM but with an attached SQI memory (for example for logging). Only supported after and including u-blox receiver generation 7.	disabled

Option	Description	Recommended
USB alternative update method	Erases the first sector of the flash memory and restarts the receiver. The receiver will then start from ROM and the flash firmware can be updated. Use this method if you want to update the firmware of a receiver connected over USB.	disabled
Enter Safeboot before update	Sends the command to enter safeboot. In this state, the receiver boots from the internal ring oscillator and does not rely on any external components. GNSS functionality is not started and the receiver does not output any data. Don't use this method when having the receiver connected over USB.	enabled
Send Training sequence	Sends the training sequence after safeboot was entered. This synchronizes the internal ring oscillator so that a communication can be established.	enabled

7. Click **OK**.

9.3 Dump receiver diagnostics

This tool is used to dump the receiver diagnostic to a file. Use this tool if requested by the support team.

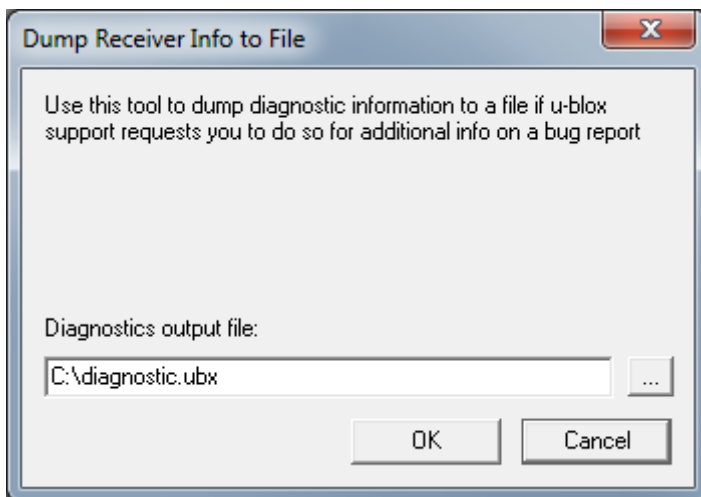


Figure 57: Dump receiver diagnostics tool

9.4 GNSS configuration

u-center is capable of getting the actual configuration of a u-blox GNSS positioning chip or module and storing it to an ASCII text file containing hexadecimal records. Such a file can be edited and stored to a u-blox GNSS device again. In u-center Tools menu, select GNSS Configuration to open the GNSS Configuration dialog box. The following functions are available:

- Specify the name of a new configuration file to store current configuration from the u-blox GNSS device
- Specify the name of an existing configuration file and load this configuration into the u-blox GNSS device
- A flag can be set to force storing the configuration into a battery-backed RAM (BBR) or flash, applicable for u-blox 5 to u-blox 8/M8 only.

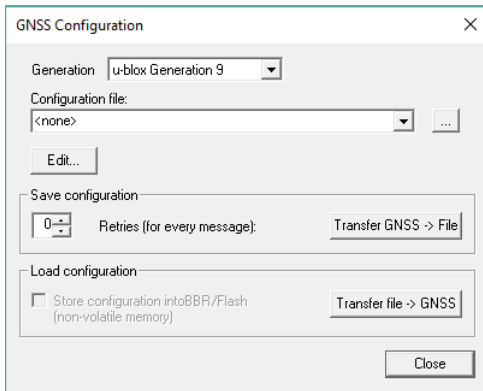


Figure 58: GNSS configuration tool

9.4.1 Read/Write configuration files

1. Connect to the device.
2. Open "Tools > GNSS Configuration".
3. Select the u-blox receiver generation connected from the **Generation** drop down menu.
4. To read an existing configuration file, select the name of the file, then click **Transfer file > GNSS** button. The GNSS Configuration window then closes and the progress window pops up, showing the configuration being sent to the receiver. This progress window closes after successful transfer.
5. To write a new configuration file, click "Transfer GNSS > File". The GNSS Configuration window closes and the progress window pops up, showing the configurations being polled and stored into a local file in ASCII format.



Select **Store configuration into BBR/Flash** checkbox if the parameters need to be stored into the device's non-volatile memory (BBR/Flash). This option is applicable for u-blox 5 to u-blox 8/M8 generation receivers.



Sending a configuration to a u-blox GNSS device may fail due to a baud rate change on the current serial port of the receiver to which the configuration is being sent. If this happens, simply change the u-center baud rate and send the configuration again.

If reading or writing configuration data fails too frequently, try to increase the number of retries u-center should do on a single message if one fails.

The user can abort the transfer by clicking the **Abort** button. It is not possible to close the window unless the transfer is complete or aborted by the user.



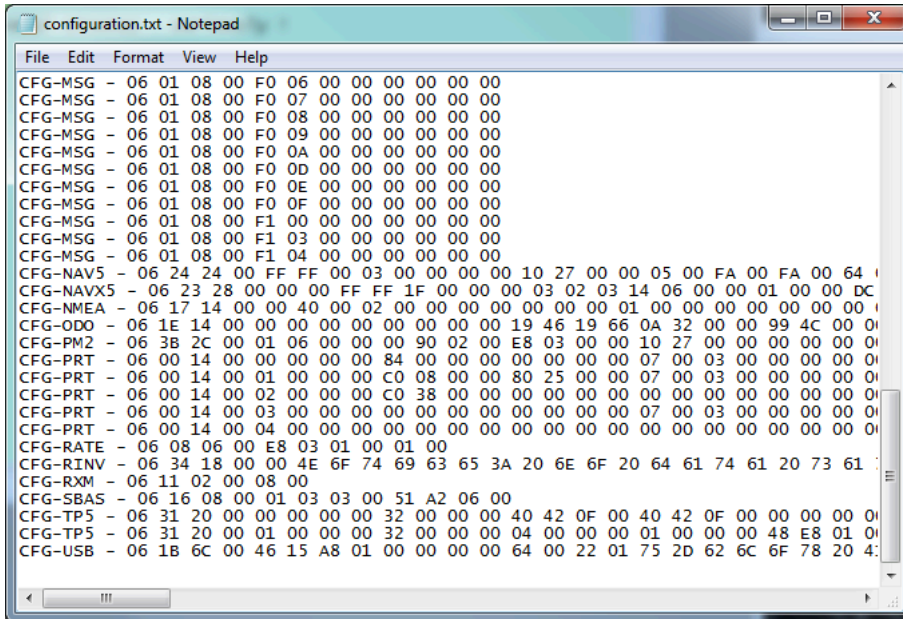
It is not recommended to read/write configuration while the u-blox GNSS device is in sleep mode.

9.4.2 Editing configuration file

When clicking the **Edit** button in the GNSS Configuration dialog, the Notepad editor opens (standard Windows software). Configurations are stored the following way:

- The first line contains the version of the u-blox GNSS receiver where the configuration is from. **Never change this line!**
- For the second and following lines, each line contains the same: `<class ID>-<message ID> - <hexadecimal byte code of the message>`. The byte code consists of class and message IDs (2 bytes), payload length (2 bytes), payload (payload length bytes). The sync characters and the checksum are not included. They will be calculated automatically.

Refer to *u-blox Receiver Description including Protocol Specification* for detailed information and ranges.



```

configuration.txt - Notepad
File Edit Format View Help
CFG-MSG - 06 01 08 00 F0 06 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 07 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 08 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 09 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 0A 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 0D 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 0E 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F0 0F 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F1 00 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F1 03 00 00 00 00 00 00
CFG-MSG - 06 01 08 00 F1 04 00 00 00 00 00 00
CFG-NAV5 - 06 24 24 00 FF FF 00 03 00 00 00 00 10 27 00 00 05 00 FA 00 FA 00 64
CFG-NAVX5 - 06 23 28 00 00 00 FF FF 1F 00 00 00 03 02 03 14 06 00 00 01 00 00 DC
CFG-NMEA - 06 17 14 00 00 40 00 02 00 00 00 00 00 00 01 00 00 00 00 00 00 00
CFG-ODO - 06 1E 14 00 00 00 00 00 00 00 00 00 19 46 19 66 0A 32 00 00 99 4C 00 00
CFG-PM2 - 06 3B 2C 00 01 06 00 00 00 90 02 00 E8 03 00 00 10 27 00 00 00 00 00 00
CFG-PRT - 06 00 14 00 00 00 00 00 84 00 00 00 00 00 00 07 00 03 00 00 00 00 00
CFG-PRT - 06 00 14 00 01 00 00 00 C0 08 00 00 80 25 00 00 07 00 03 00 00 00 00
CFG-PRT - 06 00 14 00 02 00 00 00 C0 38 00 00 00 00 00 00 00 00 00 00 00 00 00
CFG-PRT - 06 00 14 00 03 00 00 00 00 00 00 00 00 00 00 07 00 03 00 00 00 00 00
CFG-PRT - 06 00 14 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
CFG-RATE - 06 08 06 00 E8 03 01 00 01 00
CFG-RINV - 06 34 18 00 00 4E 6F 74 69 63 65 3A 20 6E 6F 20 64 61 74 61 20 73 61
CFG-RXM - 06 11 02 00 08 00
CFG-SBAS - 06 16 08 00 01 03 03 00 51 A2 06 00
CFG-TP5 - 06 31 20 00 00 00 00 00 32 00 00 00 40 42 0F 00 40 42 0F 00 00 00 00 00
CFG-TP5 - 06 31 20 00 01 00 00 00 32 00 00 00 04 00 00 00 01 00 00 00 48 E8 01 00
CFG-USB - 06 1B 6C 00 46 15 A8 01 00 00 00 64 00 22 01 75 2D 62 6C 6F 78 20 40
    
```

Figure 59: Content of GNSS configuration file

9.5 Preferences

The preferences tool can be used to configure a number of u-center parameters.

10 How To

10.1 Change baud rate of receiver

1. Connect to the device.
2. Open View / Messages View (Hotkey: F9).
3. Select UBX-CFG-PRT.
4. Poll the current configuration from the receiver (Poll).
5. Change the setting to the desired baud rate.
6. Send the message to the receiver (Send).

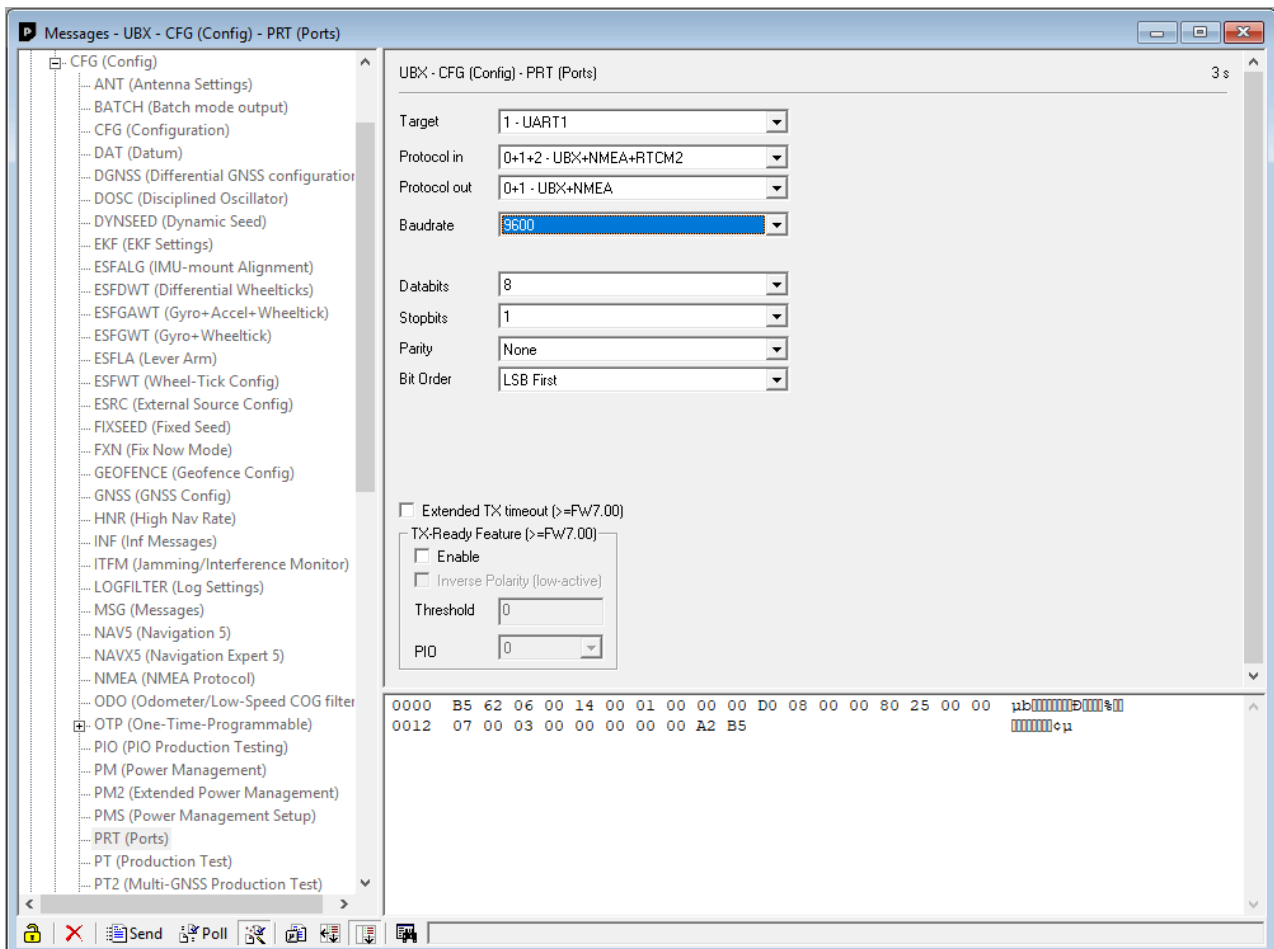


Figure 60: Changing baud rate (using UBX-CFG-PRT)

10.2 Save parameters to receiver non-volatile memory (BBR/Flash)

There are 2 ways to save parameters to the receiver's non-volatile memory (BBR/Flash).

10.2.1 Saving parameters with UBX-CFG-CFG

1. Connect to the device.
2. Open View / Messages View (Hotkey: F9).

3. Select UBX-CFG-CFG.
4. Select “save current configuration” (see [Figure 61](#)).
5. Send the message to the receiver (Send).

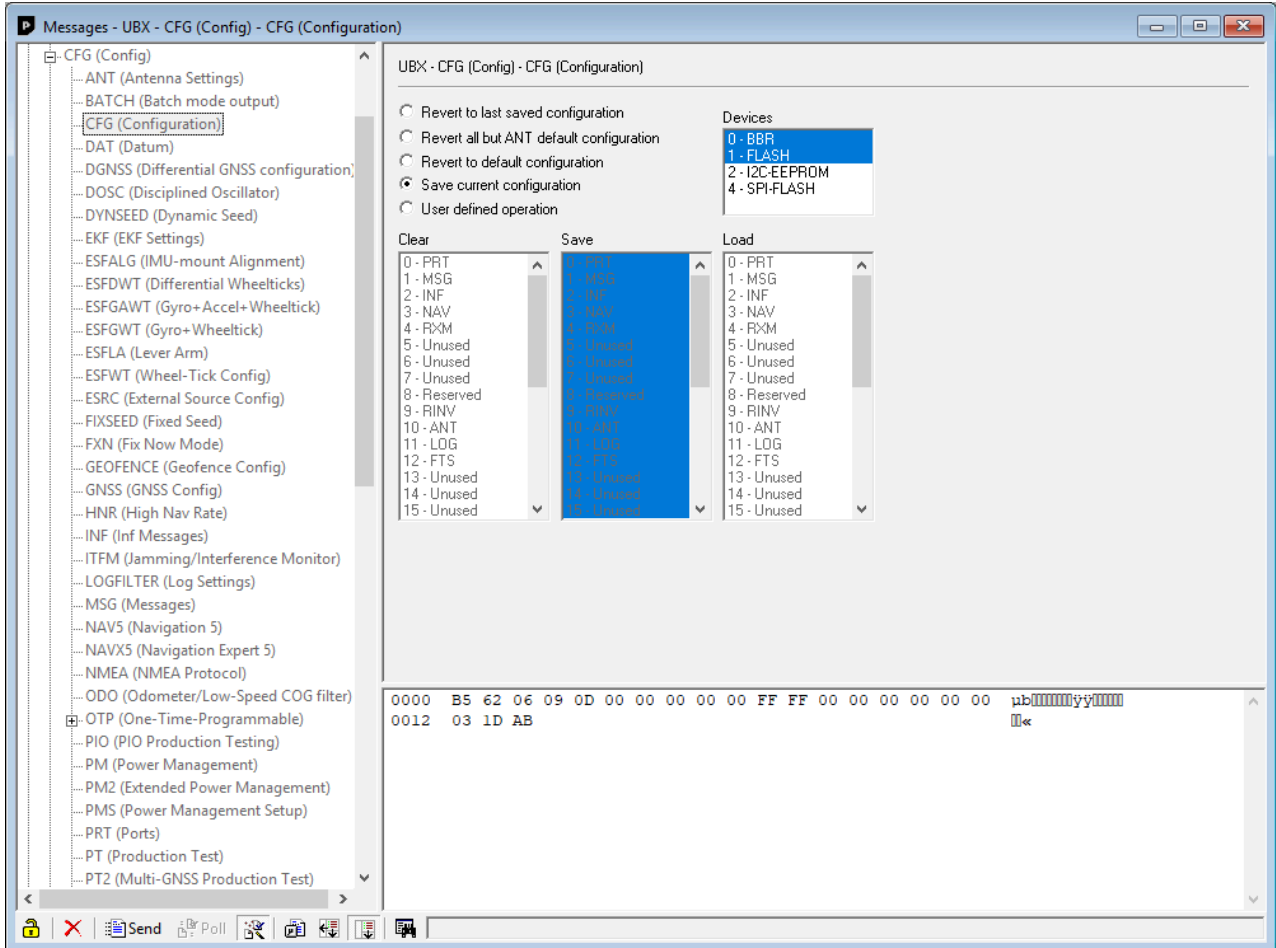


Figure 61: Saving Parameters (using UBX-CFG-CFG)

10.2.2 Saving parameters with GNSS configuration

Refer to chapter [Read/Write configuration files](#)

10.3 Recording/Playing a log file

u-center allows recording and playing log files. Use the player controls, to record or playback a log file. Select the log file to be opened through the file menu tool bar. The series of buttons in the player toolbar can be used to navigate through the log file. The records will be displayed on the navigation display window, in the same way that live GNSS data is displayed when using u-center. Refer to [Player](#) for a description of the menu items.

10.4 Conduct sensitivity tests

u-center is a useful tool for conducting sensitivity tests of GNSS positioning chips and modules and receiver designs. To do so, under open sky conditions record a log file of the receiver to be tested and an Evaluation Kit as reference. Make sure that the log files are recorded under the same conditions.

Using the Statistic View or Table View windows from u-center, compare the C/N0 values of the five strongest satellites. With Table view, export the values to a spreadsheet for analysis.

10.5 Read/Write configuration files

Refer to chapter [Read/Write configuration files](#)

10.6 Set GNSS configuration

1. Connect to the device.
2. Open View / Messages View (Hotkey: F9).
3. Select UBXCFGGNSS.
4. Place or remove the checkmark for the desired GNSS under **Enable**.
5. Send the message to the receiver (Send).

The following figure shows an example that configures the device to receive GPS and GLONASS.

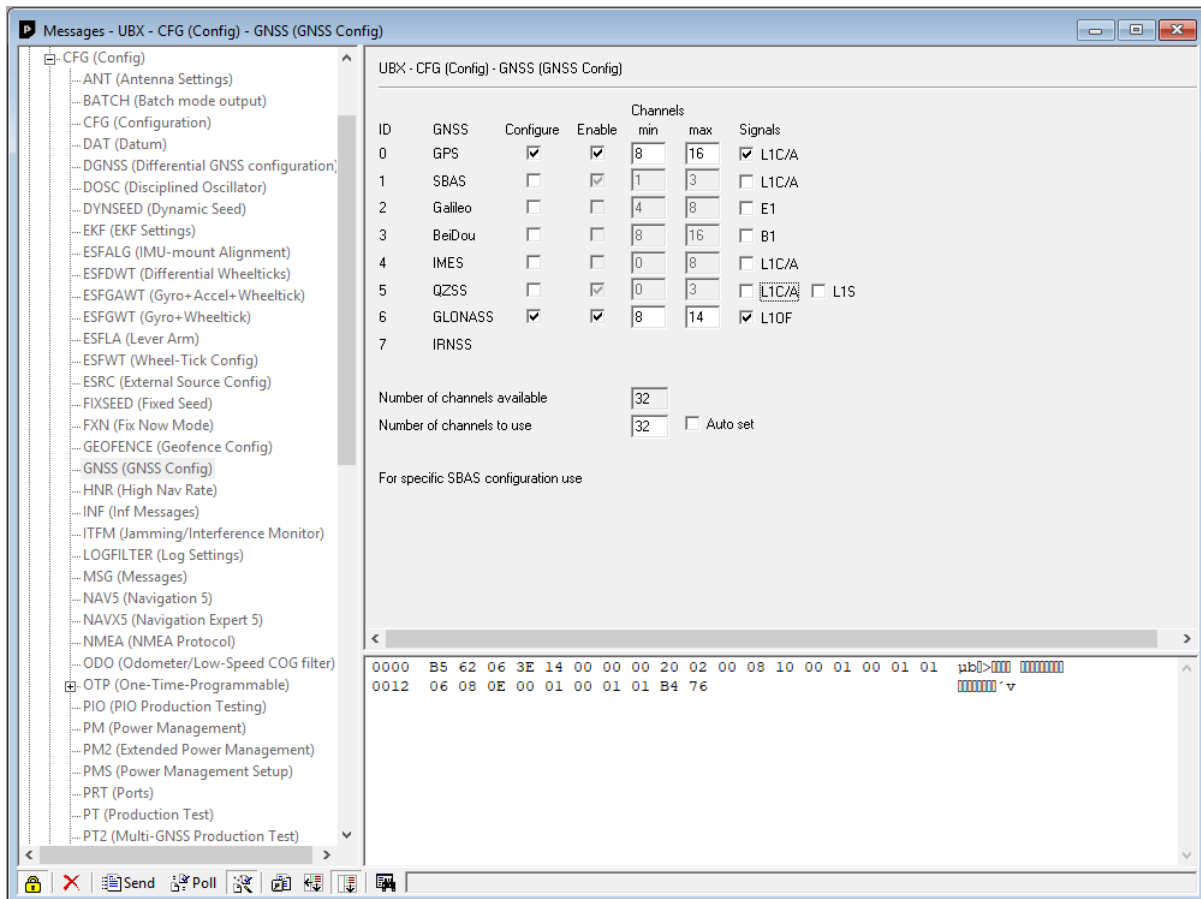


Figure 62: GNSS configuration (using UBXC-FG-GNSS)

10.7 Change epoch detection method

u-center looks for epochs in the incoming messages from the receiver, and uses them as a heartbeat to trigger view updates and calculate the statistics. To detect new epochs, u-center examines various groups of fields in the incoming message stream. It is possible to specify which field groups u-center is interested in for epoch detection. Opening the dialog under "Receiver > Epoch detection..." allows the user to do this.

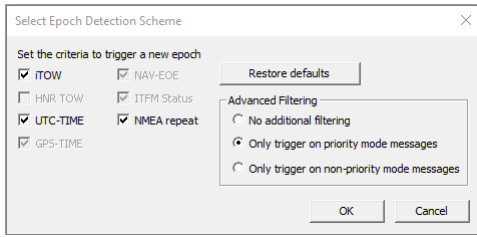


Figure 63: Select epoch detection method

From the "Select Epoch detection Scheme" window, the following options can be configured:

Option	Description	Default
iTOW	Monitor the "iTOW" database element. Trigger an epoch if a difference is seen. Typically UBX-NAV messages cause this trigger.	Yes
HNR TOW	Monitor the "NAV-HNR iTOW" database element. Trigger an epoch if a difference is seen. HNR based messages cause this trigger.	No
UTC-TIME	Monitor the "UTC" database element. Trigger an epoch if a difference is seen. Typically NMEA messages cause this trigger.	Yes
GPS-TIME	Monitor the "GPS time" database element. Trigger an epoch if a difference is seen. Typically PUBX messages cause this trigger.	Yes
NAV-EOE	Monitor for incoming UBX-NAV-EOE messages. Trigger an epoch if one is seen.	Yes
ITFM Status	Monitor the "ITFM Status" database element. Trigger an epoch if a difference is seen. The UBX-RXM-INTF message causes this trigger.	Yes
NMEA repeat	Monitor for NMEA messages. Trigger an epoch if the same NMEA message is seen twice since the last epoch. Excluding GxGRS and GxGSA.	Yes
No additional filtering	No additional filtering performed when looking for epoch triggers.	Yes
Only trigger on priority mode messages	Trigger an epoch on a priority navigation output message.	No
Only trigger on non-priority mode messages	Trigger an epoch on a non priority navigation output message.	No

Table 23: Epoch detection method options

The default configuration can be restored by clicking the **Restore defaults** button.

11 Troubleshooting

NMEA or UBX protocol is not available in the Messages View

u-center uses dynamic link libraries (DLL). The installation program will automatically install the required DLLs into the u-center program directory. Should you try to copy a u-center installation from one location to another, make sure you also copy the DLL files. Verify, the version of u-center matches the DLL version.

u-center does not display all messages

Make sure the baud rate is sufficient. If the bandwidth is insufficient, receivers will skip excessive messages. Some serial port cards/adapters (i.e. USB to RS-232 converter) frequently generate errors. If a communication error occurs while u-center receives a message, the message will be discarded.

Some COM port are not shown in the port list

Only the COM ports that are available on your computer will show up in the COM port drop down list. If a COM port is grayed out, another application in the computer is using it.

PC is very slow when u-center runs

If a high value of epochs is selected, the display in real-time cannot be guaranteed, especially when many graphical views are open. u-center does not update minimized views and console in real-time. Close or minimize as many of the graphical views and consoles as possible and u-center will run faster.

Log file/data are only partly displayed

The number of epochs displayed in u-center can be limited in order to allow an efficient analysis of larger log files. When this limit is set then the oldest values will be discarded after the database reaches this limit size. Data stored to a log file are not affected by the database limitation. Refer to [Database limitations](#) for instructions on how to increase or remove this limit. When planning long-term observations, it's recommended to start recording a log file before analysis begins.

Output messages are not updated in the Messages View

Make sure that the protocol you would like to receive is enabled. If so, double-click on the desired output message. Double-clicking on an output message enables or disables the periodic message update if the respective protocol is active. Alternatively, select the desired input or output message and press the **Poll** button. If you would like to get `UBX-INF-*` messages in the log file, configure the receiver accordingly with the `UBX-CFG-INF` input message.

No log file is recorded

After a new log file is created, logging will not automatically start but only after selecting the **Record** button in the Player Toolbar.

Related documents

- [1] GPS Compendium, Doc No GPS-X-02007
- [2] u-blox 5 Receiver Description including Protocol Specification, Document number: GPS.G5-X-07036
- [3] u-blox 6 Receiver Description including Protocol Specification, Document number: GPS.G6-SW-10018
- [4] u-blox 7 Receiver Description including Protocol Specification V14, Document number: GPS.G7-SW-12001
- [5] u-blox 8 / u-blox M8 Receiver Description Including Protocol Specification (Public version), Document number: UBX-13003221

Revision history

Revision	Date	Name	Status / Comments
-	08-Oct-2008	tgri	Initial release
A	22-Jul-2009	tgri	New CI
A1	17-Feb-2011	tgri	Third party libraries
B	01-Nov-2011	tgri	Google Earth View added
C	03-Jun-2012	khir	Updated for u-center 6.3. GNSS configuration added
R06	09-Dec-2013	mfre	Update for u-center 8.01 and u-blox 7 and M8 generations
R07	01-Oct-2014	jbow	Packet view update describing message direction indicators
R08	23-Feb-2015	yzha	Updated menu pictures and shortcut key list corresponding to latest version
R09	04-Sep-2015	smos	Updated Contact page
R10	12-Dec-2015	mfre	Remove Google Earth support
R11	29-Mar-2016	mfre	Epoch detection, DGNSS interface and receiver status icons description added, legacy aiding marked deprecated, pictures updated
R12	15-Jul-2016	mfre	Map view updated, removed EVK-6PPP how to
R13	01-Oct-2016	rsmr	NTRIP support added
R14	19-Dec-2016	rsmr	Google Earth server added, new RTCM messages added
R15	31-Mar-2017	rsmr	Support for Sqlite database added, improved UI processing, support for moving baseline added
R16	29-Jun-2017	jbow	Limiting the database size, automatic receiver identification
R17	28-Sep-2017	msul	Firmware update view modernized
R18	04-Dec-2017	msul	Addition of the "Transfer image to RAM" checkbox in firmware update window
R19	29-May-2018	msul	Addition of the "Stepback" button in log file toolbar and additional bar to NTRIP server/caster settings screen
R20	28-Sep-2018	msul	Addition of the "USB alternative update method" checkbox in firmware update window
R21	11-Mar-2019	msul	Added Generation 9 Advanced Configuration View
R22	25-Jun-2019	msul	Updated figures 8, 9, 29, 53 and 56. Updated section 8.4.1 Read/Write configuration files accordingly
R23	30-Aug-2019	msul	Updated figures 19, 20, 21 and table 12 for new epoch marker. Updated figure 60 and table 23 for advanced filtering introduction in epoch detection scheme
R24	02-Oct-2019	msul	Updated section 5.2.7.2 Advanced Configuration View
R25	23-Oct-2019	msul	Added a hex field to the Advanced Configuration View
R26	15-Mar-2021	msul	Updated figures 8 and 9
R27	09-Jun-2021	msul	Added new section 7 MQTT
R28	22-Oct-2021	msul	Updated content in section 7 MQTT
R29	01-Mar-2022	msul	Added limitation note in section 7 MQTT
R30	24-May-2022	msul	Improved MQTT section with options to subscribe to key, AssistNow and data topics in section 7

Contact

For further support and contact information, visit us at www.u-blox.com/support.