



Orion Analyzer

Orion Analyzer User Manual

REFERENCES

1. Orion User Manual
2. u-Nav Binary Protocol Specification for SDK Users
3. NMEA 0183 Standard For Interfacing Marine Electronic Devices

ABBREVIATIONS

Acronym	Description
ASCII	American Standard Code for Information Interchange (ASCII) is a character set and a character encoding based on the Roman alphabet as used in modern English. ASCII codes represent text in computers, in other communications equipment, and in control devices that work with text. Most recent character encoding has an ASCII-like base.
Baud	In telecommunications and electronics, baud is a measure of the "signaling rate" which is the number of changes to the transmission media per second in a modulated signal. For example: 250 baud means that 250 signals are transmitted in one second. If each signal carries 4 bits of information then in each second 1000 bits are transmitted. This is abbreviated as 1000 bit/s.
COM	An interface on a computer system with which information is transferred in or out one bit at a time. Throughout most of the history of personal computers, this was accomplished using the RS-232 standard over simple cables connecting the computer to a device such as a terminal, modem or GPS receiver.
DLL	Dynamically Linkable Library. Used in Windows operating systems for shared / common / separated code to be loaded and linked to the main program at the run time.
EGNOS	The European Geostationary Navigation Overlay Service (EGNOS) is a satellite navigation system under development by the European Space Agency , the European Commission and EUROCONTROL .
GPS	Global Positioning System (the US military refers to it as NAVSTAR GPS) is a satellite navigation system used for determining precise location and providing a highly accurate time reference almost anywhere on Earth or in Earth orbit. It uses an intermediate circular orbit (ICO) satellite constellation of at least 24 satellites.
GPS Receiver	Electronic equipment that passively receives GPS signal for processing. A receiver may be hand-held or permanently mounted on a vehicle.
GUI	Graphical User Interface
NMEA	A combined electrical and data specification for communication between marine electronics and also, more generally, GPS receivers. The protocol is a means by which marine instruments and also most GPS receivers can communicate with each other. It has been defined and is controlled by the US based National Marine Electronics Association.
PC	Personal Computer

Plug-In	Plug-in is a computer program that can, or must, interact with another program to provide a certain, usually very specific, function. In Orion Analyzer it means DLL file, where part of Orion Analyzer functionality has been implemented.
PRN	Pseudo Random Noise
RS-232	A standard for serial binary data interconnection between a DTE (Data Terminal Equipment) and a DCE (Data Communication Equipment). It is commonly used in computer serial ports. A similar ITU-T standard is V.24.
SBAS	Satellite Based Augmentation System
UBP	u-Nav Microelectronics Binary Protocol
Atheros Orion Receiver	Standard GPS receiver which produces NMEA and UBP data
WAAS	The Wide Area Augmentation System (WAAS) is an extremely accurate navigation system developed for civil aviation by the Federal Aviation Administration in conjunction with the United States Department of Transportation .
XML	The Extensible Markup Language (XML) is a W3C-recommended general-purpose markup language for creating special-purpose markup languages, capable of describing many different kinds of data. Its primary purpose is to facilitate the sharing of data across different systems, particularly systems connected via the Internet.

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1 Orion Analyzer 3.0 Overview

Orion Analyzer is a Windows® application that is used to connect a GPS receiver via RS-232 connection to a PC for visualizing and analyzing the received data.

Orion Analyzer supports unrestricted amount of GPS receivers simultaneously. GPS receiver can be a third-party manufactured receiver or Atheros GPS receiver (Atheros Orion receiver). Atheros Orion receiver produces NMEA messages [3] and UBP [2] messages. NMEA protocol contains only navigation data, whereas UBP message format features more detailed information useful in analyzing GPS navigation results. Orion Analyzer can be configured for both of these protocols from all receivers.

One of the exciting Orion Analyzer features is that all the received messages can be recorded to log files for later play back operation and analyzing.

As Orion Analyzer environment, the following is recommended:

- Computer with a 600 MHz or faster processor 192 MB of RAM or more
- 50 Mb of available hard-disk space
- 1024x768 or higher-resolution display with minimum 256 colors
- Keyboard and Microsoft Mouse or compatible pointing device

Orion Analyzer can be installed on the following operating systems:

- Microsoft® Windows® 2000 with Service Pack 4
- Microsoft® Windows® XP with Service Pack 2

The program consists of several binary files (one main EXE and several plug-in DLL files for extensible functions). When the program is executed, it checks all plug-in DLL files (later called views) and loads compatible ones. Those plug-in files implement different functions that are used for receiving or analyzing the data in human readable form.

1.1 Features

The main Orion Analyzer features are:

- Unlimited amount of GPS receivers that Orion Analyzer can work on simultaneously
- Lots of different Plug-Ins for visualizing data
- Recording and playing back data operations with different formats
- Managing and controlling GPS and Atheros Orion receivers through NMEA and UBP commands

- Uploading new Orion binary to the Atheros Orion receiver
- Ability to create, load and work with different work settings

1.2 Software and Hardware Environment

Note: Before starting to use Orion Analyzer with the GPS receiver, please read the user manual of the receiver, how to set it up and connect it to the host running the Orion Analyzer application. Orion Analyzer application is compatible with Microsoft Windows® 2000 operation system and Microsoft Windows® XP.

The PC should have two serial ports (or at least one) for interaction with the receiver:

- By default COM port 1 is used for NMEA protocol (baud rate 4800)
- By default COM port 2 is used for UBP protocol (baud rate 115200)

1.3 Installing the Software

Orion User Manual document [1] has the installing instructions for getting the tool into your computer. The Orion binary file can be uploaded to the Atheros Orion receiver as soon as the tool has been set up correctly.

1.4 Uninstalling the Software

Orion User Manual document [1] contains instruction for uninstalling the package.

2 Orion Analyzer Architecture overview

The basic module division consists of the main program (Orion Analyzer executable file) and Plug-In libraries (DLL files). Plug-In libraries are located in Plug-Ins subdirectory. During the start-up time Orion Analyzer searches for Plug-Ins and automatically loads them.

Plug-In library consists of two major entities: the Receiver Plug-In and the Viewer Plug-In (Viewer). They may have several instances and several different types of entities. For example the "Serial Communication Port" Plug-In implements functionality for reading and writing data from the serial port. The data is interpreted according to correct protocol form and ready messages are sent ahead to the Viewer Plug-Ins. Each Viewer Plug-In receives messages and visualizes them.

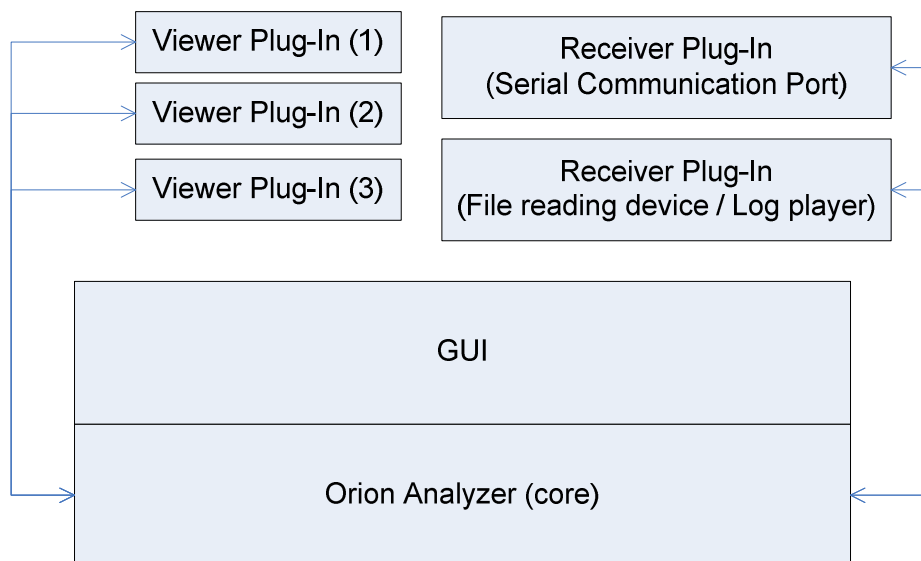


Figure 2-1. Orion Analyzer Architecture Overview

2.1 Protocols

Orion Analyzer supports both NMEA [3] and the Atheros proprietary protocol [2].

UBP message format contains more detailed information about Atheros Orion Receiver and GPS navigation and it is very useful for observing and analyzing the data.

When Atheros Orion Receiver is used as standard GPS receiver and navigation behavior is investigated, Atheros recommends using UBP protocol instead of NMEA protocol. UBP includes everything available with NMEA plus additional proprietary information unique to the Atheros Orion receiver. The examples below focus on UBP, but most of them are applicable to NMEA as well.

2.2 Receiver Plug-In Logic

The new Receiver Plug-In instance is created when the user opens a new connection. There are two different connection types available:

- Serial Communication Port
- File reading device / Log player

Receiver Plug-In supports two types of protocol:

- NMEA protocol
- UBP protocol

Orion Analyzer core creates new output console window (for more details see chapter 4.2) for each instance of the Receiver Plug-In. The receiver sends all received messages to the core of Orion Analyzer at run time. The core forwards the messages to the suitable Viewer Plug-In instances and to the console.

Each instance of Viewer Plug-In receives the messages; some keep the messages as a history queue, some may discard the message immediately after having read its content.

The Receiver Plug-In works until the user disconnects it. All allocated resources including the created connection instance are freed, and the registered Viewer Plug-Ins are notified about the disconnection.

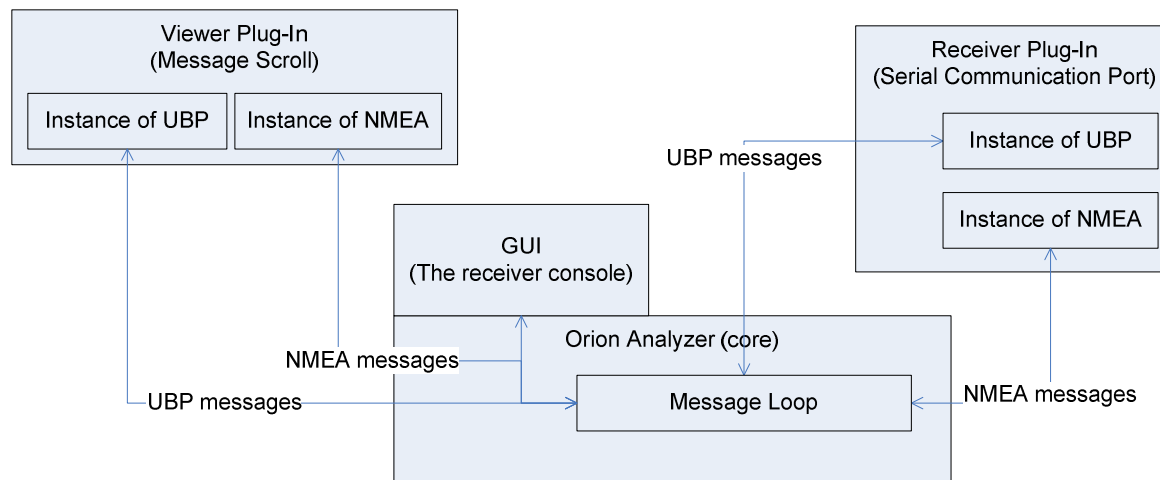


Figure 2-2. Receiver Plug-In Logic

2.3 Viewer Plug-In Logic

The Viewer Plug-In instance is created when the user wants to open a new view to see and analyze the received data.

The Viewer Plug-In understands two different types of messages:

- NMEA messages
- UBP messages

Basically, the Viewer Plug-In instance just waits for incoming messages. When a message appears from the Receiver Plug-In instance, it is forwarded to the Viewer Plug-In instance. The Viewer Plug-In functionality calculates the needed steps and renders the results to the window for user viewing.

The Viewer Plug-In works by receiving messages and drawing data to the screen until the user closes it. On the close all allocated resources are freed and the message receiving connections to the Receiver Plug-In instance are disconnected.

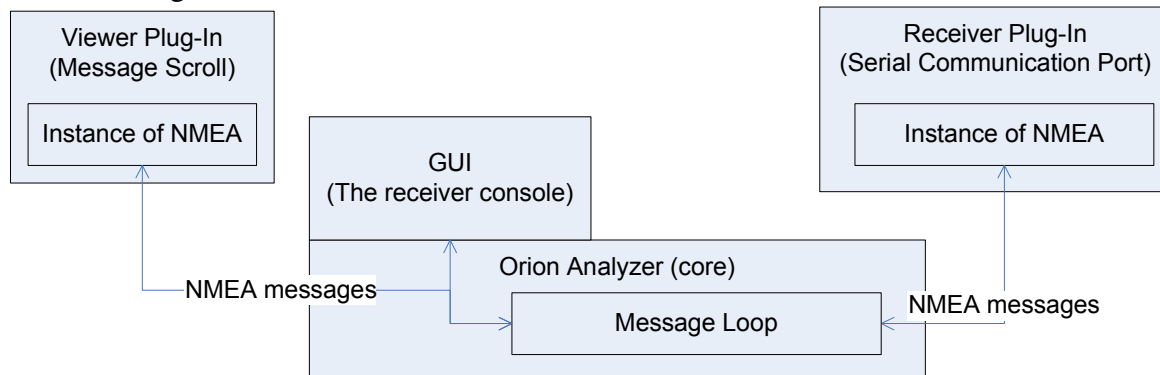


Figure 2-3. Viewer Plug-In Logic / NMEA Protocol

2.4 Data Record Logic

When the Receiver Plug-In instance is established, the user may start to record the received data. In this case several recording instances can be created for one receiver object (e.g. one per each type of recording) and they are attached to the appropriate Receiver Plug-In instance.

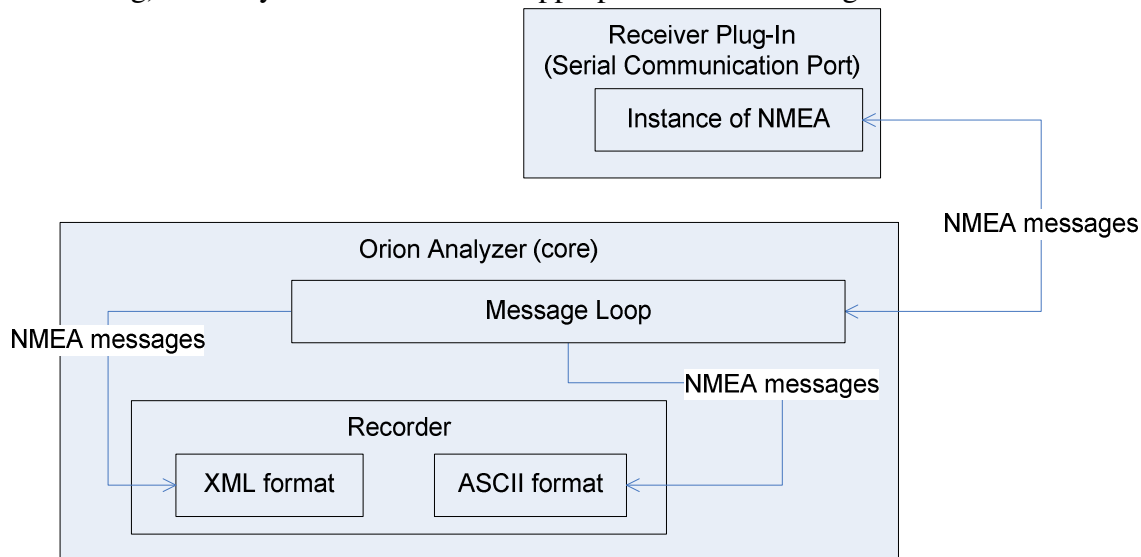


Figure 2-4. Record Operation

For different types of connections, different recording formats are available:

- Receiver Plug-In connection with NMEA protocol supports:

- ASCII recording format – each message is stored as one line in the text file
- XML recording format – each message is saved as XML nodes with formatting
- Receiver Plug-In connection with UBP protocol supports:
 - Binary format - different types of messages are stored in different binary files. The main record file (index) keeps references to other files
 - XML format - each message is saved in text format as XML nodes

2.5 Work Settings Logic

Orion Analyzer supports saving and loading work settings. All Viewer Plug-In instances, window positions and current connections are saved in the file settings. Later on the setting file can be loaded and work environment restored.

Note: Only one exception, the current setting, will not be saved but default work setting will be restored if “File reading device / Log player” is used.

3 Quick Start

To start Orion Analyzer application, double click the Orion Analyzer application shortcut on the desktop.

3.1 First Start

When starting Orion Analyzer for the first time, the main window with default session will be opened.

Next time Orion Analyzer will open the latest working session. The default session opens serial port COM1 for receiving NMEA messages.

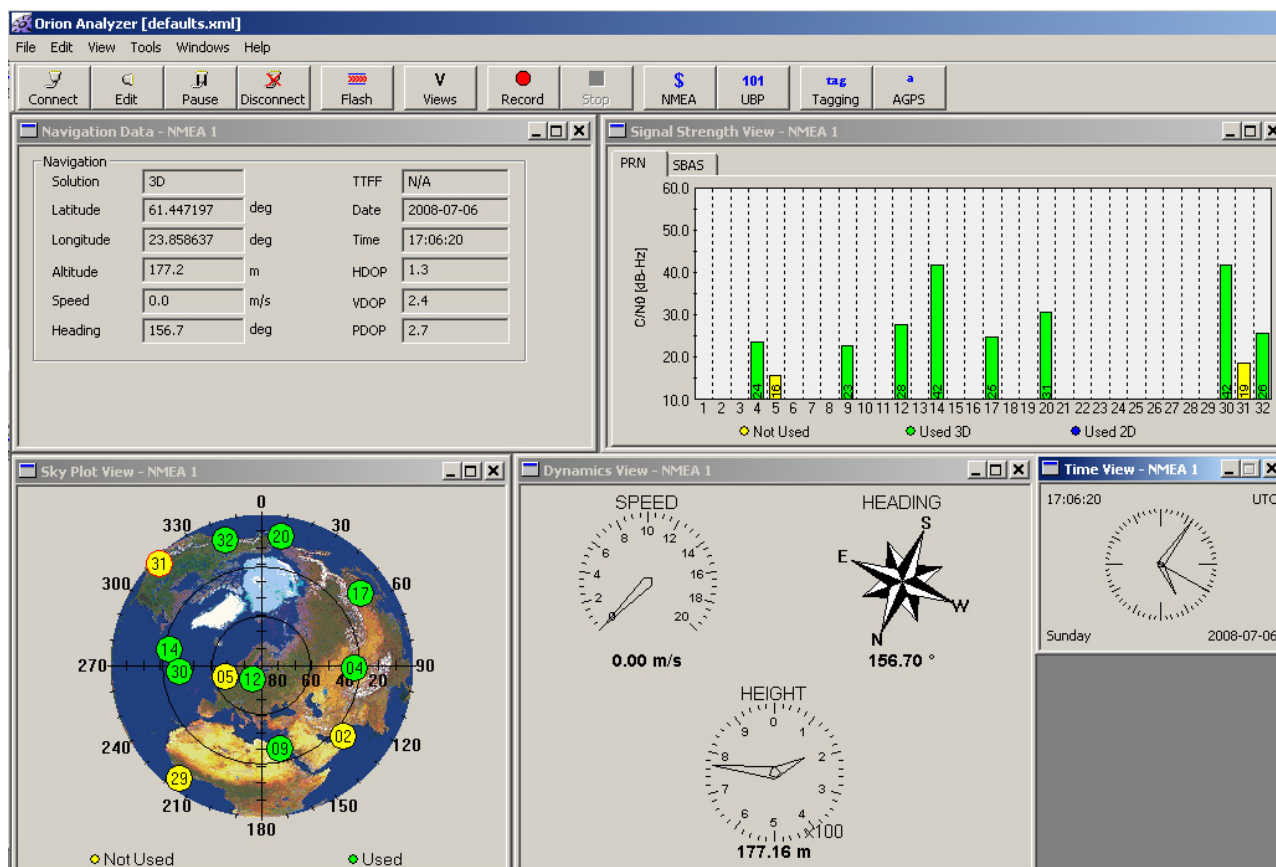



Figure 3-1. Orion Analyzer Default Session

For editing the session, go to File menu and select “Edit Connection” item. “Edit Connection”

dialog can also be opened by pressing CTRL-E, or clicking on the  icon in the tool bar. On the “Edit Connection” also port number or baud rate can be changed.

4 Orion Analyzer Graphical User Interface

4.1 Main Window

The main GUI of Orion Analyzer has been divided in five areas: main menu, toolbar, client area, output console and status bar. Toolbar, output console and status bar can be disabled from the menu (“Menu -> View”) to get more space for the client area views.

The main GUI offers a possibility to print a snapshot of the main window. The print is fitted on paper so that the print uses the whole paper area in one dimension. The user may choose printer and fitting from the print setup (File -> Print). The printed area is the toolbar, the client area, the output

4.2 System Output Console

Other windows are Receiver Plug-In related tab pages. The view shows the basic information of messages independent of the protocol. A new tab page is added for each Receiver Plug-In instance. For example, NMEA connection shows the original NMEA messages.

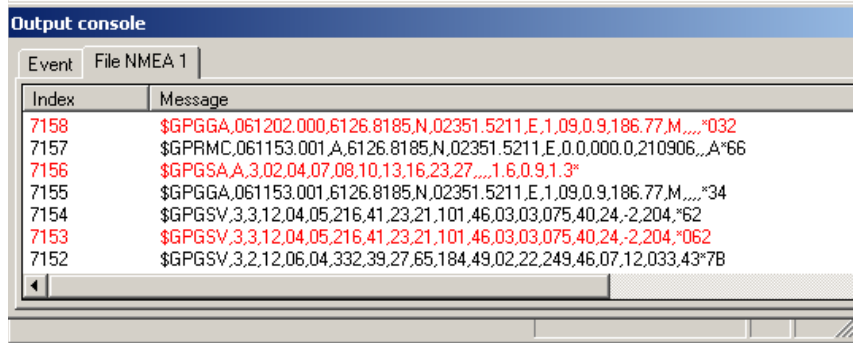



Figure 4-1. System Output Console

Output Console highlights messages with invalid checksum.

4.3 File Menu

4.3.1 New Connection

A “New Connection” dialog can be opened by pressing CTRL-N or clicking the  icon in the tool bar.



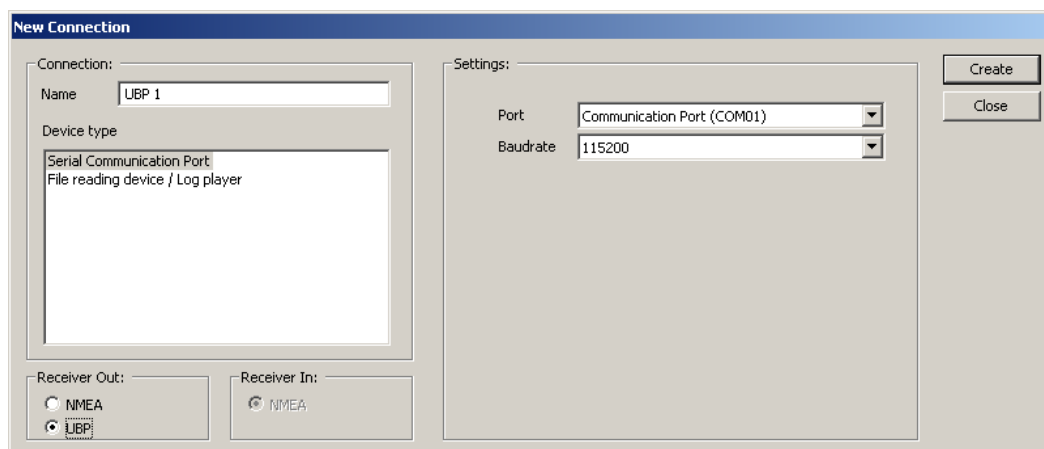


Figure 4-2. New Connection / Serial Communication Port

The basic device type is “Serial Communication Port” that is connected to any serial port in the computer.

Please select the appropriate protocol type, serial port and baud rate - or the default values - and after that click the “Create” button. The new Receiver Plug-In instance will be created.

“File reading device” Plug-In is used for play back mode, and to feed data from the recorded data file to Orion Analyzer. In principle it works in the same way as “Serial Communication Port” Plug-In, but the data is read from a file instead of a real communication connection.

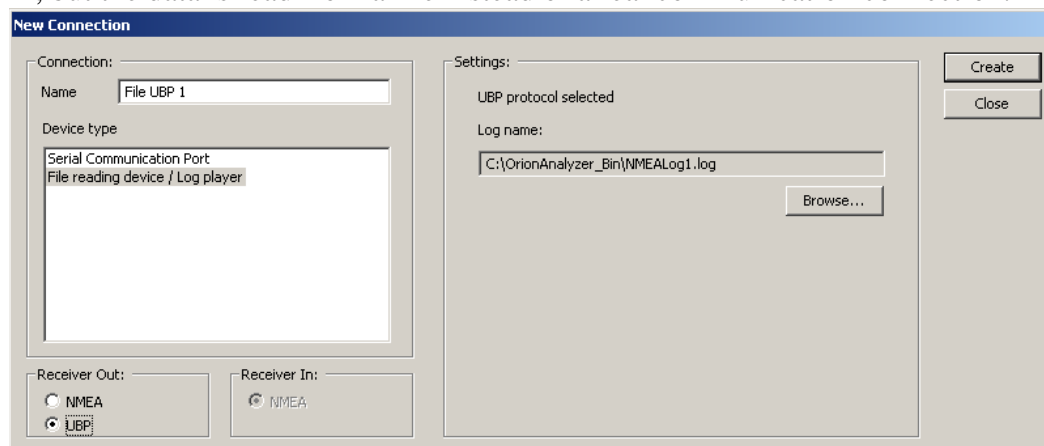


Figure 4-3. New Connection / File Reading Device

“File reading device” Plug-In can only use the log files created by recording operation (see section 4.4.10).

Be sure to set the Protocol radio button (NMEA or UBP) to match the log file. Browse to the subdirectory of the log session and select the Index file (for example:

C:\OrionAnalyzer_Bin\NMEALog1.log).

Note: It is important to select the correct protocol and index file. Incorrect settings may appear to be OK in playback, but no data will be displayed.

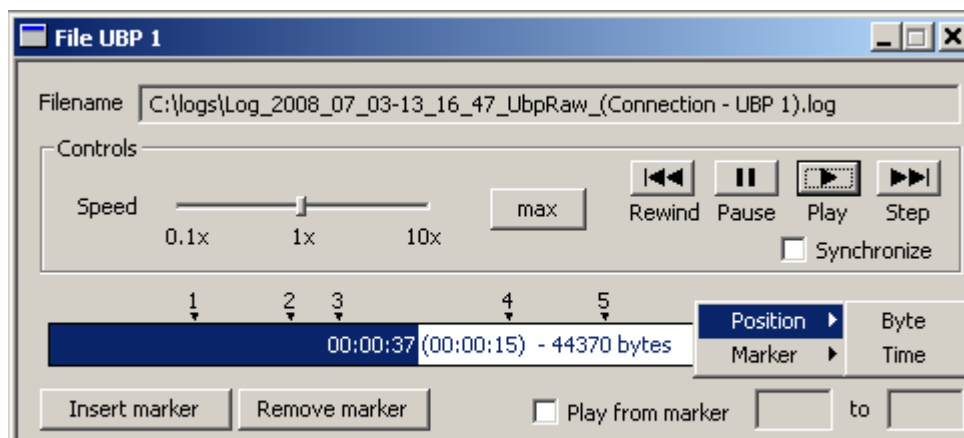


Figure 4-4. Playback

The data can be played from the file in different speeds; by clicking the **max** button, the maximum speed can be reached. **Rewind**, **Pause**, **Play** and **Step** buttons are useful when studying the recorded data in detail.


Markers can be inserted while playing the data. The user may also set position or marker based on byte offset or time of the record. By clicking the right mouse button while the mouse cursor is over the progress bar, the context menu opens with options to set playback **Position** or **Marker**.

With the inserted markers, the data can be played from one marker to another. When running several logs at a time, by ticking the **Synchronize** button, the logs can be rewound, paused and played at the same time within the log. Markers can be deleted by selecting **Remove marker**.

By clicking the left mouse button while the mouse cursor is over the progress bar, the data can be played from any chosen point.

Note: It is important to select the correct protocol for the log file. Incorrect settings may appear to be fine in playback, but no data will be displayed.

4.3.2 Edit Connection

“Edit Connection” dialog can also be opened by pressing CTRL-E or clicking on the  icon in the tool bar.

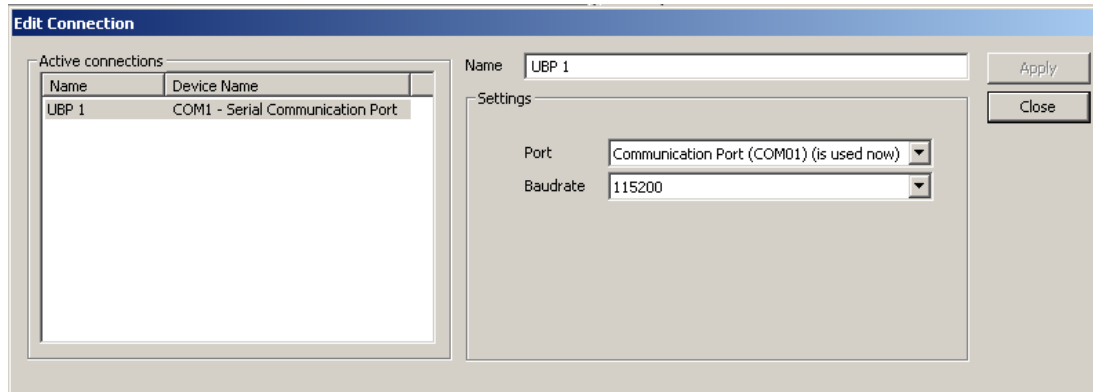



Figure 4-5. Edit Connection


“Edit connection” dialog is used if the port or baud rate needs to be changed during the runtime. For NMEA play back mode also the log file name can be changed.

4.3.3 Pause

“Pause” blocks and resumes the selected connection without disconnecting it. The dialog can be

opened by clicking the  button.

4.3.4 Disconnect

“Disconnect” dialog can also be opened by pressing CTRL-D or clicking on the  icon in the tool bar.

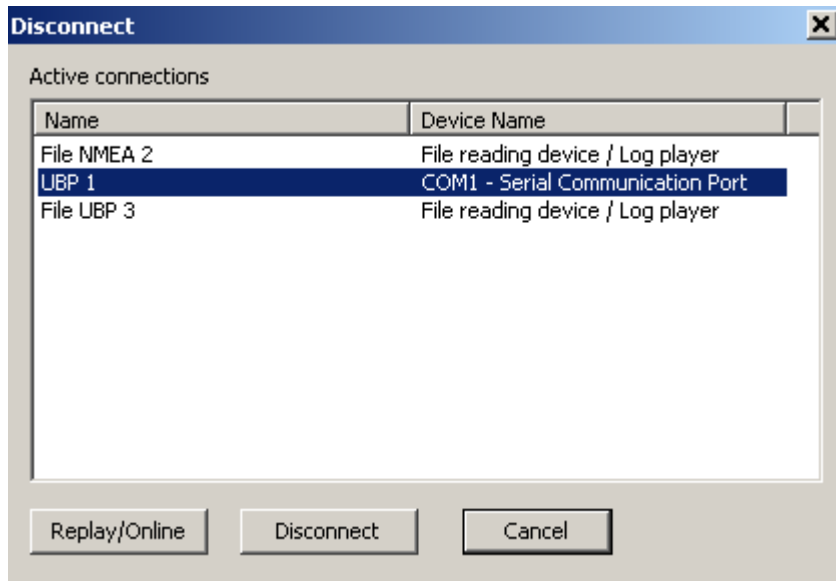


Figure 4-6. Disconnect

“Replay/Online” is used for storing automatic log into disk where it can be replayed for more detailed information. Only a limited amount of messages can be saved. The amount can be checked at “Tools -> Settings -> Automatic Logging -> Maximum amount of messages”. The active connection can be closed by selecting the connection and pressing the “Disconnect” button. This will free up the connected communication port for different kind of use.

4.3.5 Open Settings

“Open Settings” dialog can also be opened by pressing CTRL-O.

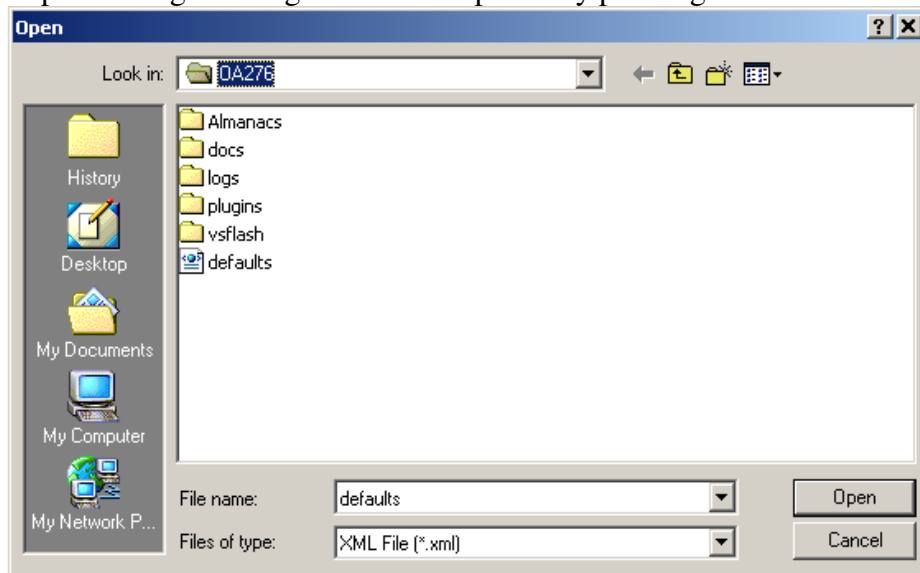


Figure 4-7. Open Settings

Orion Analyzer can work with different predefined work settings and this menu item is used for loading them.

4.3.6 Save Settings

“Save Settings” dialog can also be opened by pressing CTRL-S.

When used for the first time, Orion Analyzer opens the default work settings (which are saved at defaults.xml file). During the work session the user can make modifications such as add additional receiver or open more views. This menu item is used for saving working modifications.

4.3.7 Save Settings As

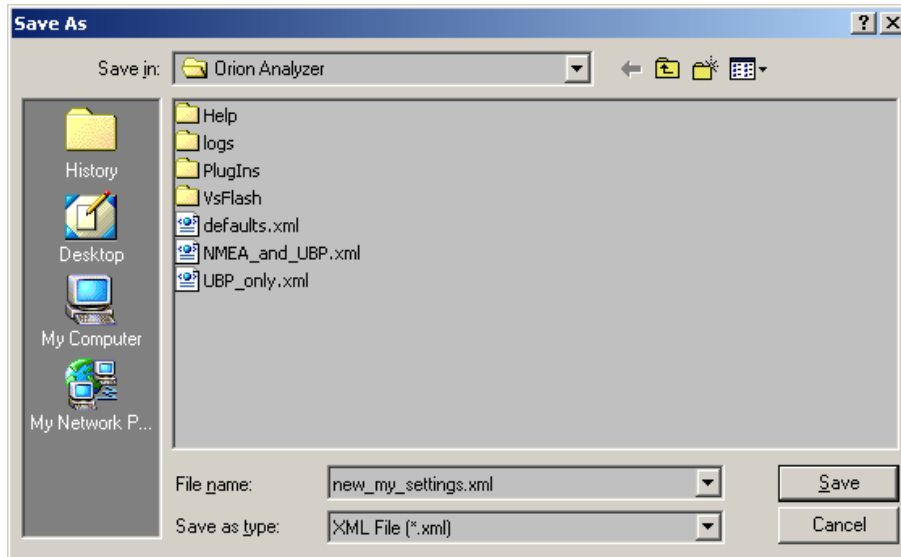


Figure 4-8. Save Settings As

This menu item is used for saving working settings in a new file.

4.4 Tools Menu

4.4.1 Open View

“Open viewer(s)” dialog can also be opened by pressing CTRL-Shift-V or clicking on the icon in the tool bar.



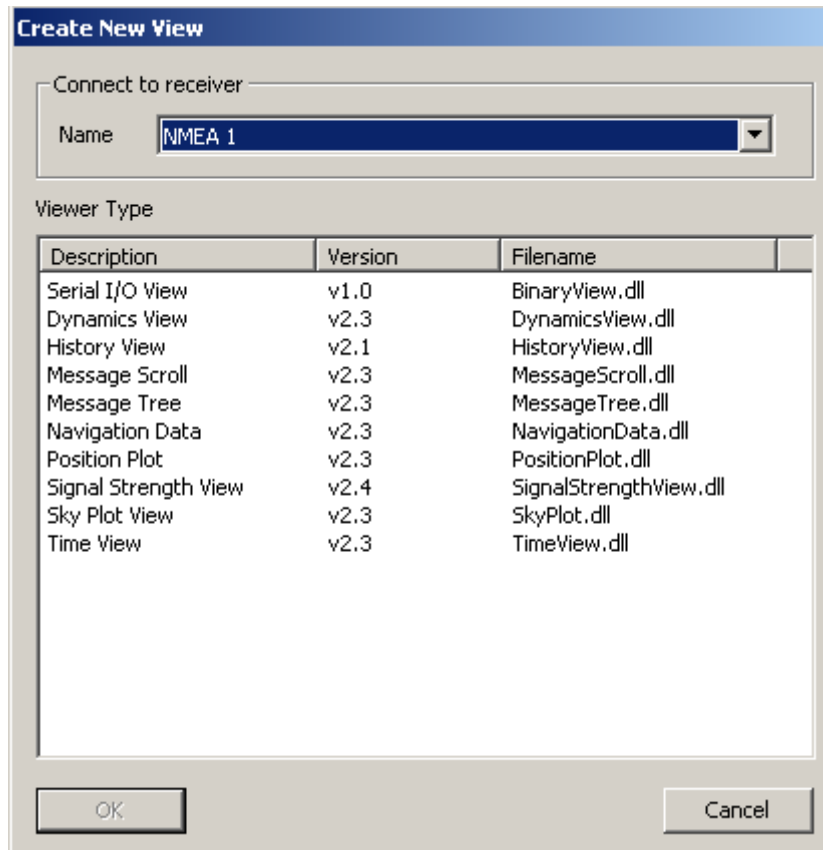


Figure 4-9. Create New View / NMEA

This dialog allows opening additional views by selecting the new view and pressing OK. Different protocols have different amount of available views. The figures above and below show the lists of available views for NMEA and UBP protocols, respectively.

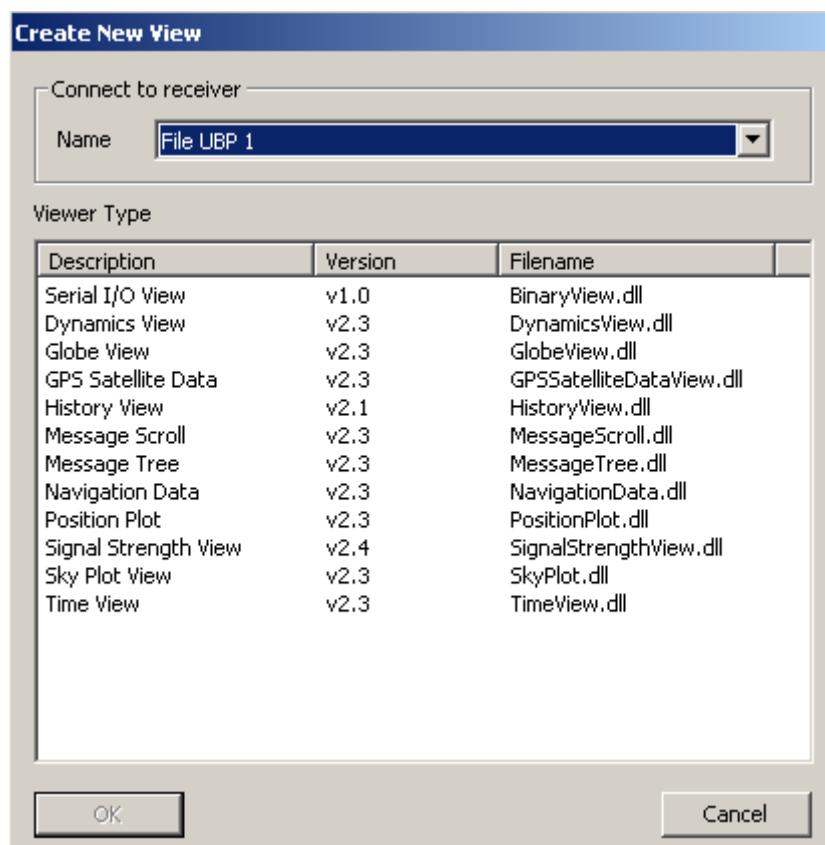


Figure 4-10. Create New View / UBP

4.4.2 Program Firmware

“Program Firmware” dialog can also be opened by pressing CTRL-Shift-F or by clicking on the



Flash icon in the tool bar.

This dialog is used for uploading a new Orion binary to the board. Start by selecting the path and binary file with COF extension. After that choose the appropriate COM port and press “Start Flash” button.

Note: If the selected COM port is already in use in the current session, it will be disconnected automatically before flashing operation and restored back after finishing.

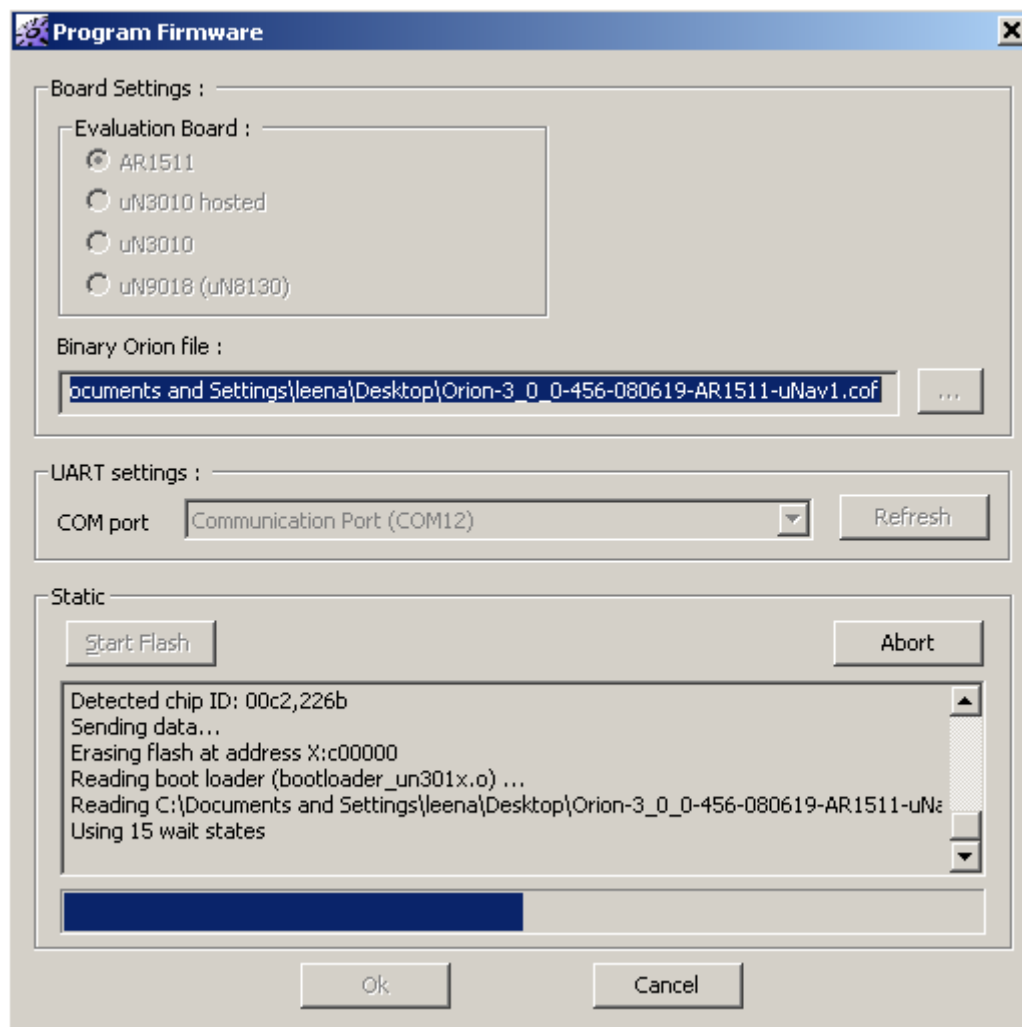


Figure 4-11. Program Firmware

4.4.3 NMEA Command

“NMEA Command” dialog can also be opened by pressing CTRL-Shift-N or by clicking on the



icon in the tool bar.

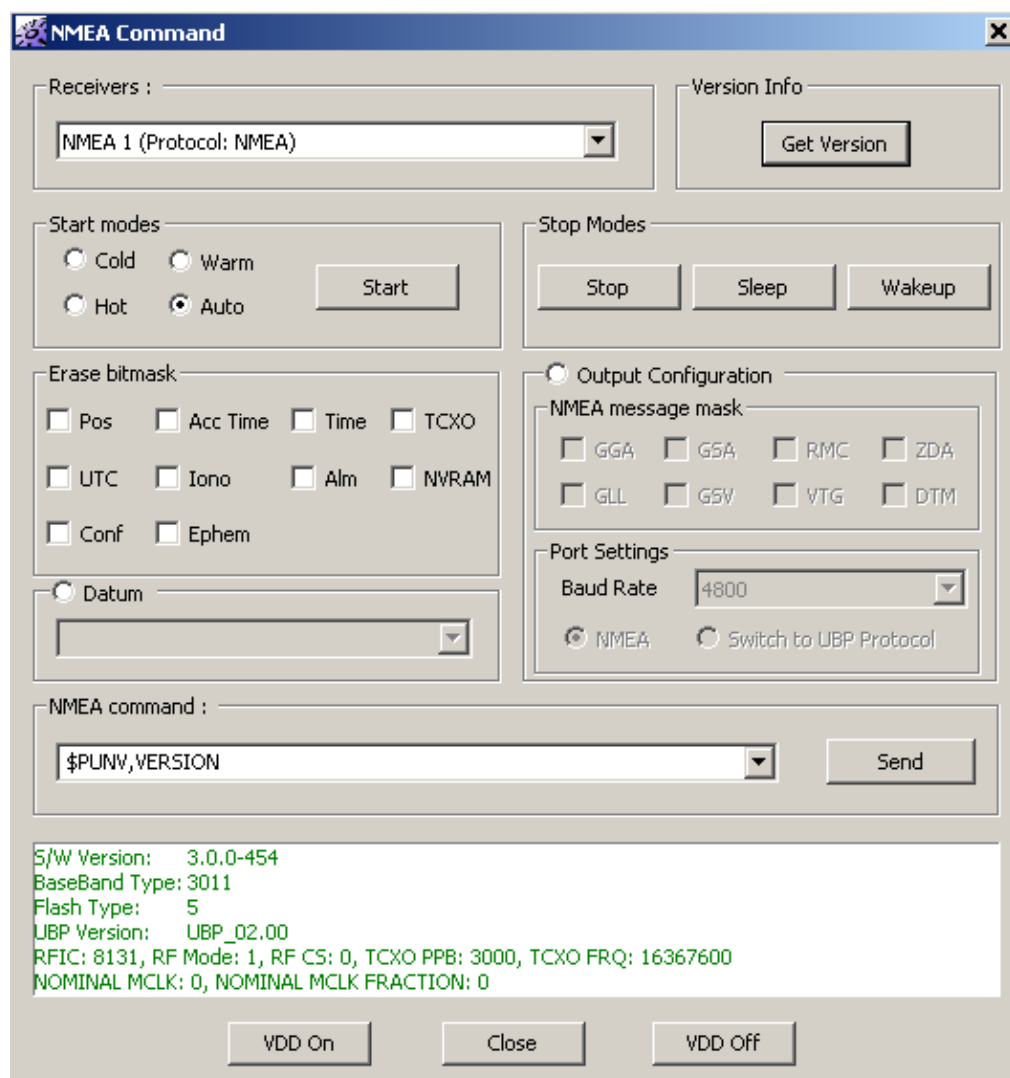


Figure 4-12. NMEA Command

The dialog is used for commanding Orion through NMEA protocol. It allows getting version information into the output console at the bottom of the view, and executing start and stop modes.

Erase bitmask defines the items that are to be erased from receiver memory. Each start mode corresponds to a specific erase mask.

The set of NMEA messages to be output every second can be defined using the NMEA message mask configuration checkboxes.

The user may select the **Datum** to be used in position and altitude output from the drop down menu. Also message types and baud rate may be changed.

In **NMEA Command** the user may enter any command manually.

Switching from the NMEA protocol to the UBP protocol can be done with Port Settings radiobutton.

Note: The NMEA checksum is automatically added to the NMEA commands. Thus, when entering NMEA commands manually, it is not necessary to enter the asterisk and the checksum at the end of the command.

Below are some examples on NMEA messages with individual checksums:

```
$PUNV,START,COLD*59  
$PUNV,START,AUTO*52  
$PUNV,START,WARM*54  
$PUNV,START,HOT*0E
```

Note: It is also possible to send NMEA commands over a UBP protocol connection by selecting a UBP connection from the **Receivers** drop-down menu and entering NMEA commands manually.

VDD On and **VDD Off** buttons only work on a modified AR1511 EVK with boot select switch in REM position.

4.4.4 UBP Command

“UBP Command” dialog can also be opened by pressing CTRL-Shift-U or by clicking on the



icon in the tool bar.

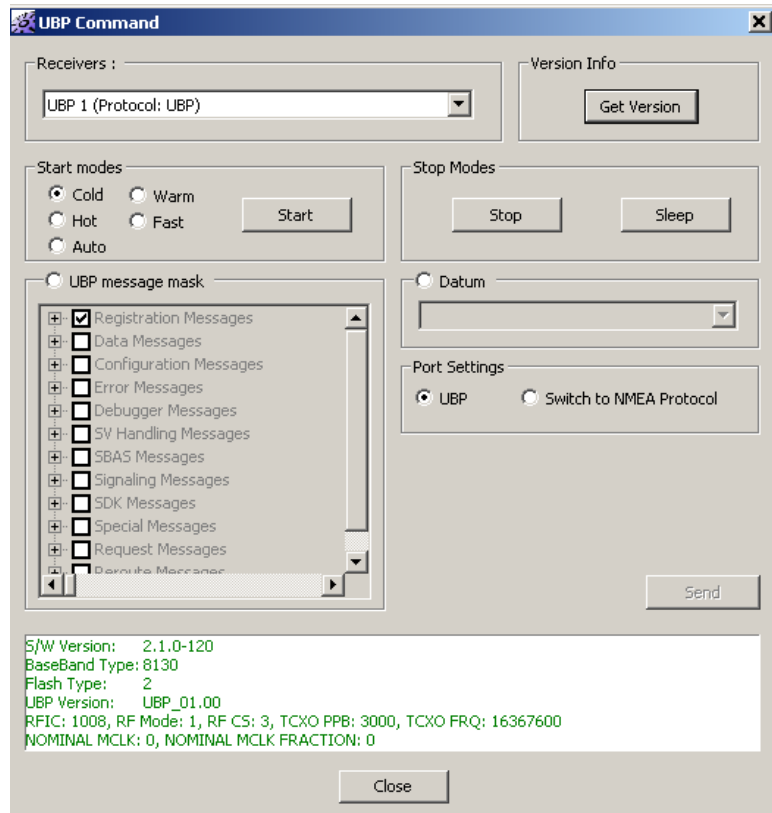


Figure 4-13. UBP Command

This dialog is used to handle the Orion through UBP protocol. It allows getting version information and changing start and stop modes. It also allows changing output type messages.

If the PC has got only one COM port, the dialog allows switching from UBP protocol to the NMEA protocol.

4.4.5 Tagging



Tagging mode is enabled by clicking “Tagging” button or by selecting “Tagging” from the “Tools” menu (Ctrl + Shift + T). In tagging mode the user can insert tags into UBP or NMEA stream being recorded by pressing the configured keys. For more information about key configurations, see chapter **Error! Reference source not found..**

4.4.6 Server AGPS

This function is under development and should not be used.

4.4.7 Converters

This dialog is used for converting UBP and NMEA logs into other formats. After having browsed the appropriate files, press “Convert” to start conversion.

The following six conversions are supported:

- UBP-log to NMEA-Log
- UBP-log to TRACE-Log
- UBP-log to GPX-Log
- NMEA-log to GPX-Log
- NMEA-log to KML
- UNB-log to KML

4.4.8 Settings

The dialog is used to set up the global parameters that will be used during the session.

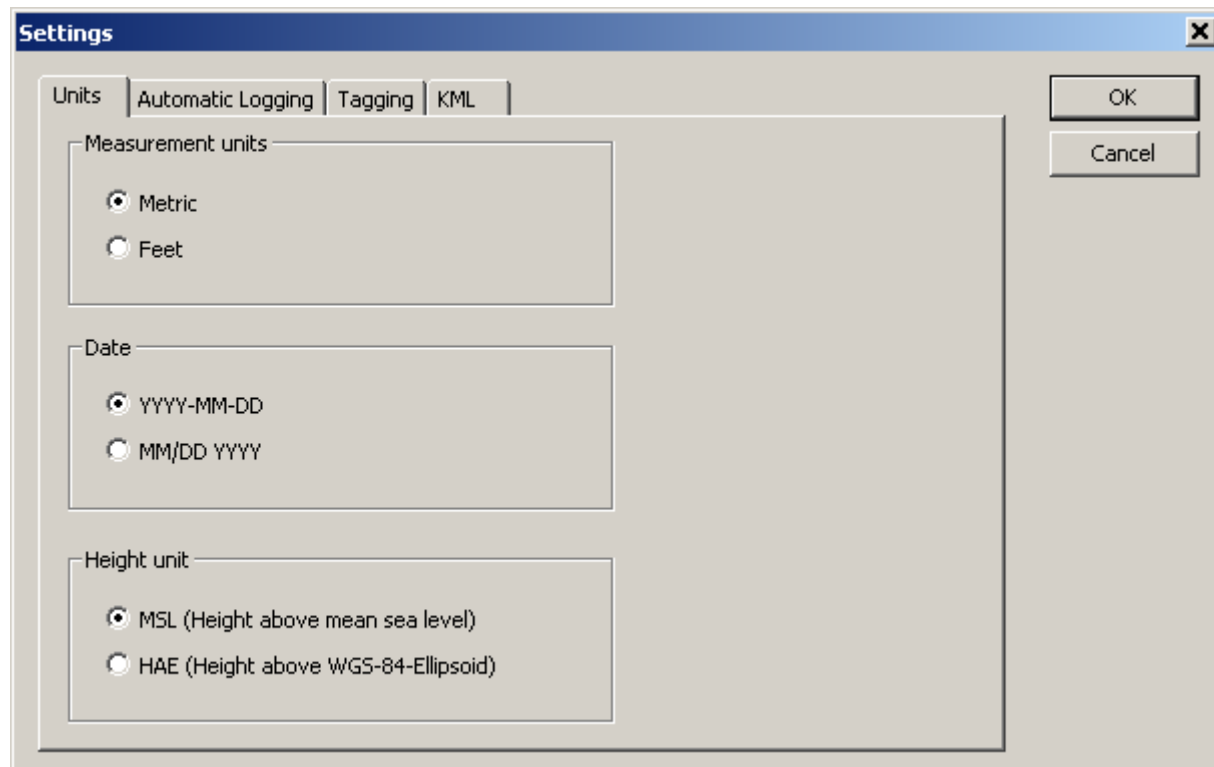


Figure 4-14. Settings: Units

The units and date formats can be controlled with the above dialog.

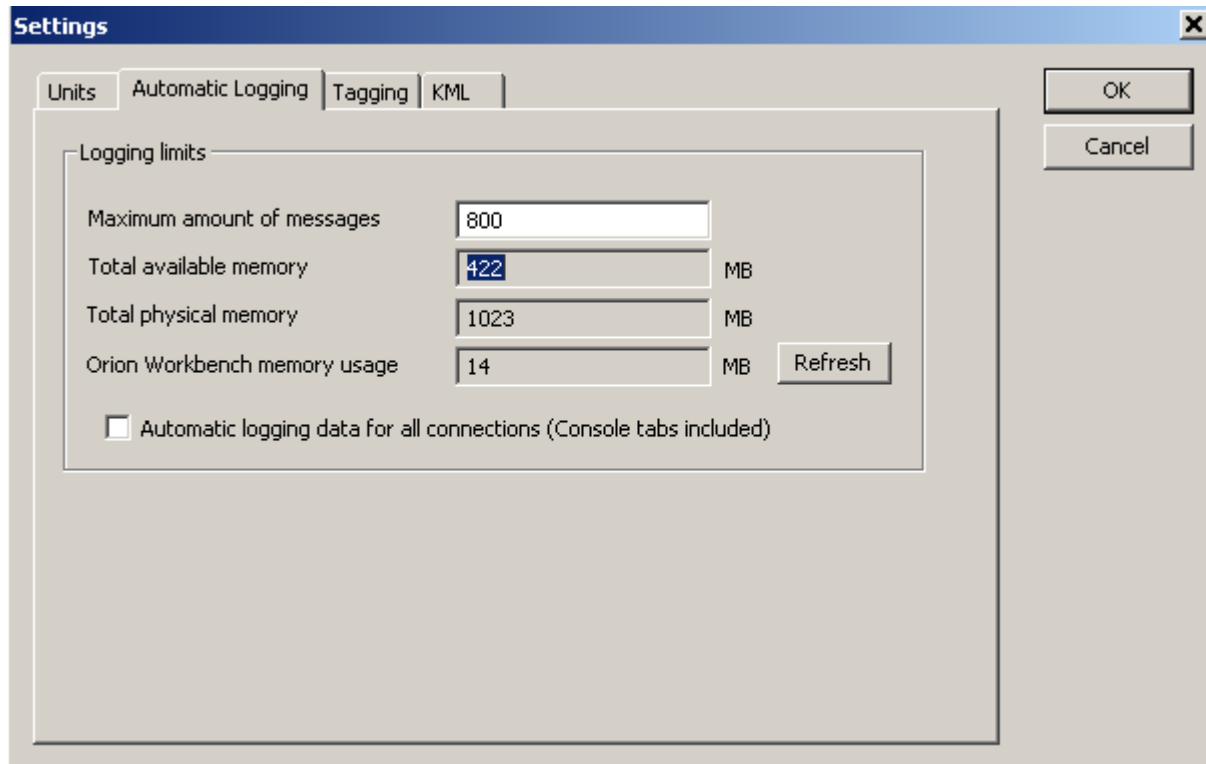


Figure 4-15. Settings: Automatic Logging

The “Automatic Logging” disk usage can be controlled with the dialog above. The given limits are available for all Orion Analyzer views. It is possible for the user to specify the amount of messages shown by replacing the default 800 messages with the desired amount. The rest of the values reflect the memory consumption of the program. “Refresh” button updates these values.

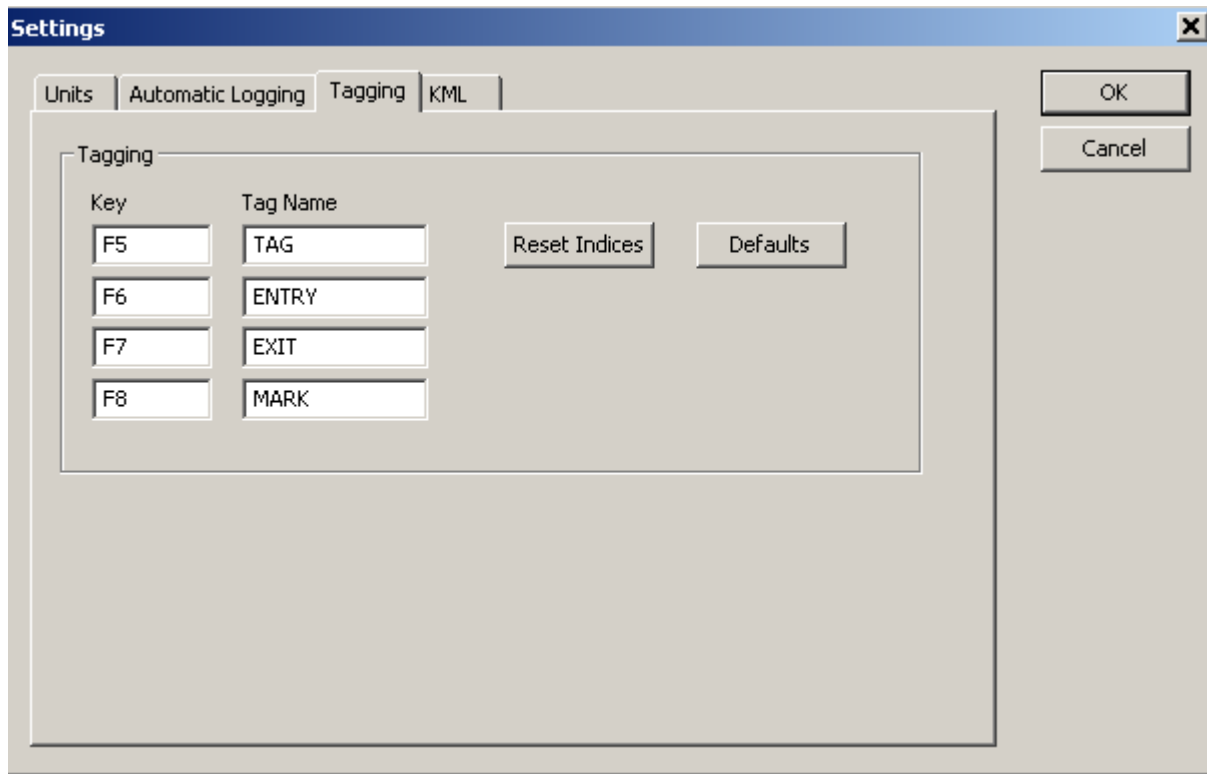


Figure 4-16. Settings: Tagging

The user can configure the key bindings and tag names. The key binding is configured by clicking the key field and pressing the desired key. Function keys (F1- F12), spacebar and alpha-numeric keys can be assigned. Tag name can be up to 10 characters long. The default configuration is restored by clicking the “Defaults” button. Each tag has an index numbering from 0000 to 9999, and it can be reset by pressing the “Reset Indices” button.

4.4.9 Data Files

The dialog allows exporting Ephemeris and/or Almanac data to the XML or TXT formats.

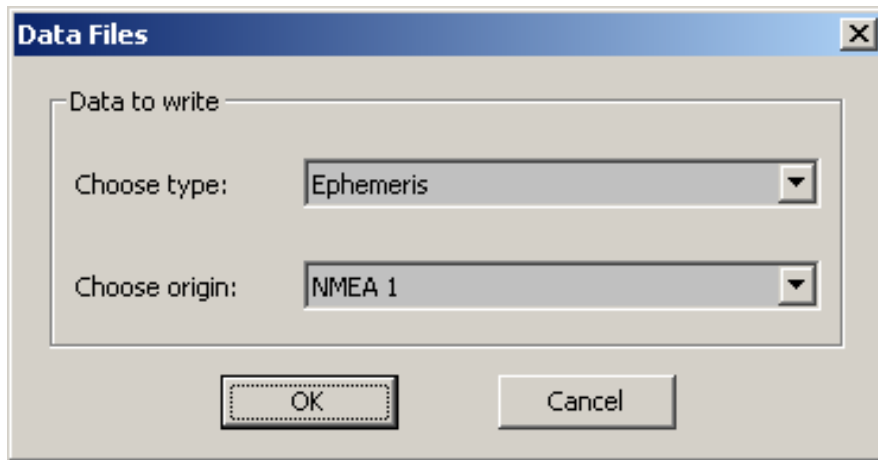



Figure 4-17. Data Files

4.4.10 Record: Start and Stop

The **Record** dialog can also be opened by clicking on the  icon in the tool bar. Once the connection has been established, logging begins by selecting **Record**. The dialog box presented below in **Figure 4-18** prompts for the log file settings. Choose the receiver protocol, set the session path appropriately for your computer directory and select appropriate log type.

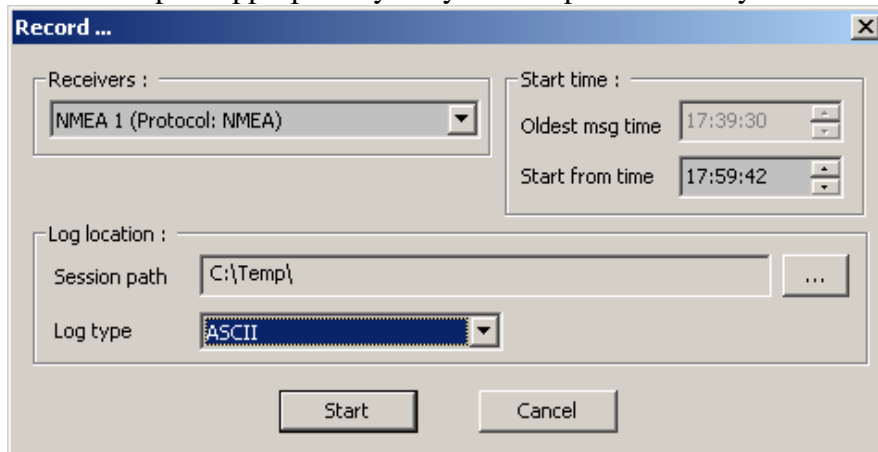



Figure 4-18. Record -> Start

Stop Recording dialog can also be opened by clicking on the  icon in the tool bar.

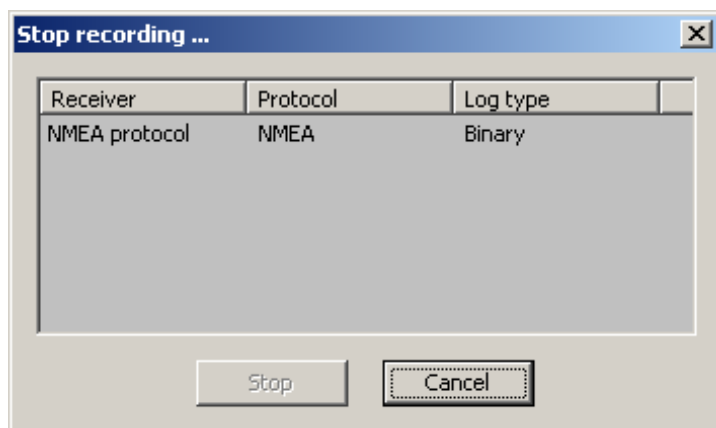


Figure 4-19. Record -> Stop

If recording operation is turned on, this dialog allows stopping the recording. Orion Analyzer automatically stops recording when the connection is closed.

4.4.11 FSH Extractor

FSH Extractor allows downloading the Flash File System (FSH) content from a receiver unit to an output file as raw data. The resulting file will then contain a complete bit image of the FSH content.

The settings for the extraction can be made using the controls in the FSH Extractor View. The default values **Base Address** (c40000 in hexadecimal format) and **Size** (192 kB in decimal format) do not typically need to be changed. Select output file name and location in **FSH output file** and select the **COM Port** in **UART**. The list of available COM Ports can be updated by pressing the **Refresh** button.

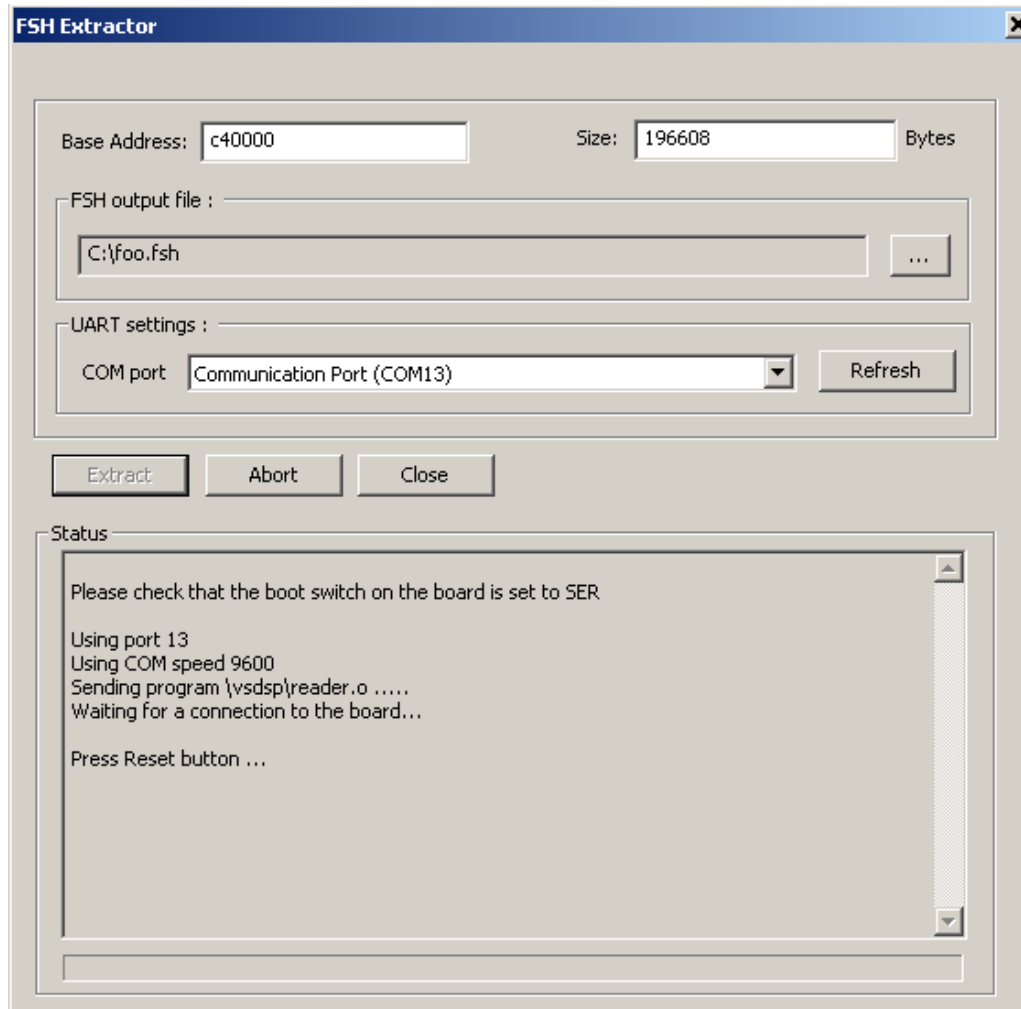


Figure 4-20. FSH Extractor

The boot switch on the EVK device has to be set to **SER** and the **RESET** button pressed. Extracting the FSH content can then be started by pressing the **Extract** button followed by **RESET**. After all data has been received and stored in the target file, the **Close** button should be pressed to close the FSH Extractor. **Abort** button can be used to stop extraction before its completion. **Status** notes in the output console at the bottom of the view show more instructions and details of the extraction.

4.4.12 FSH Editor

With **Flash File System Editor** the extracted FSH file content can be edited, the files opened, closed and saved and downloaded back to the EVK device. The user can add and delete files. The files can be visualized in hexadecimal or Structured format, and changes made as needed.

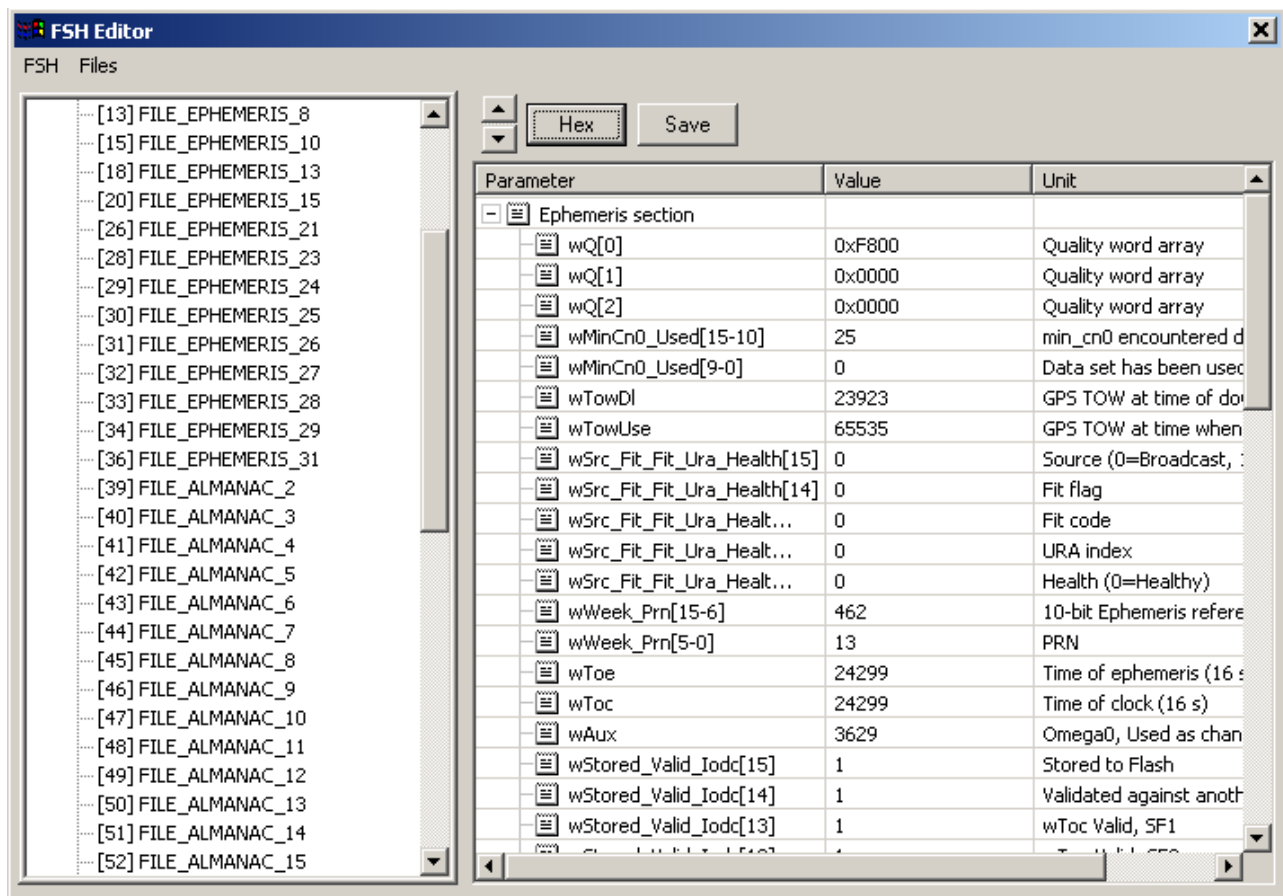


Figure 4-21. FSH Editor

4.4.13 Hex Editor

Hex Editor can be used for editing any file. **Cut**, **copy**, **paste** and **delete** functions can be accessed with right click of the mouse. The changed parts of the file are shown in boldface font.

Both the hexadecimal format on the left and the printable format on the right of the view can be edited. The file with an asterisk after the end of its name in the title bar means that the file has been edited. After the file has been saved the asterisk disappears from the title bar.

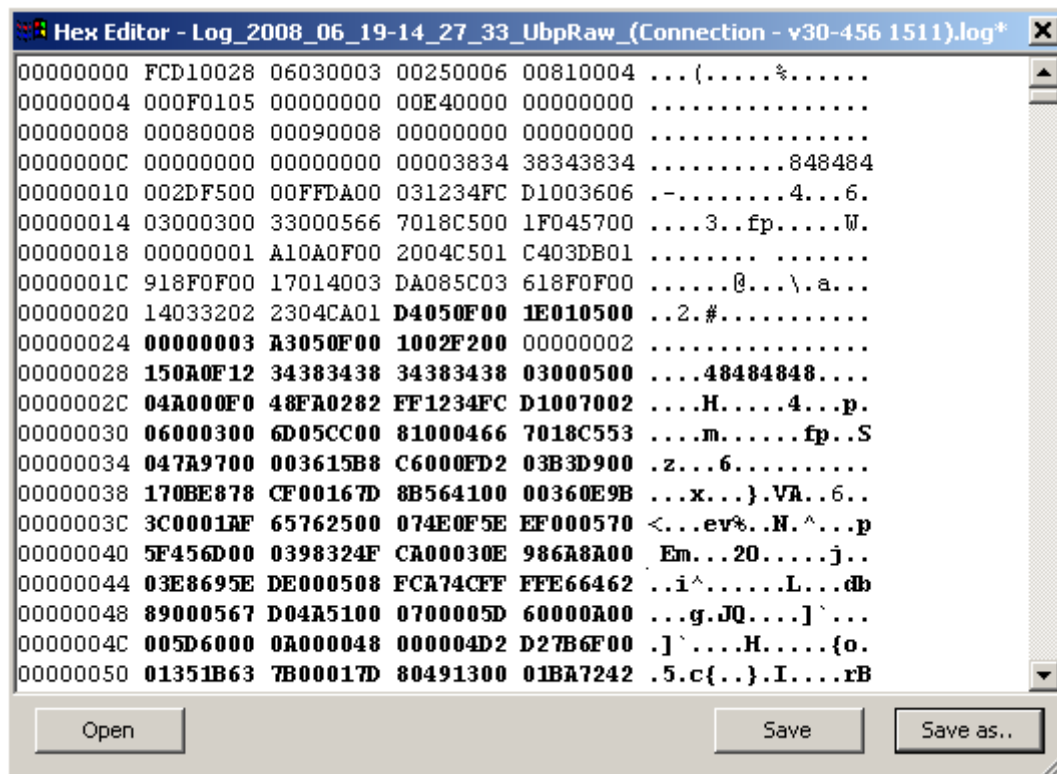


Figure 4-22. Hex Editor

5 VIEWS

In the Client Area, a set of different views can be chosen for observing and visualizing data. Ten of them are available for both NMEA and UBP protocol, and two more for UBP only.

5.1 Serial I/O View

The **Serial I/O View** offers a visualization of the raw data stream coming out of the EVK into the PC. The binary data can be viewed in hexadecimal or ASCII format. The scrolling of the stream can be paused by pressing **Pause**. The binary can be saved in a new file for later investigation by choosing **Save**, selecting file name and location. The scrolling can be resumed with the **Pause** button.

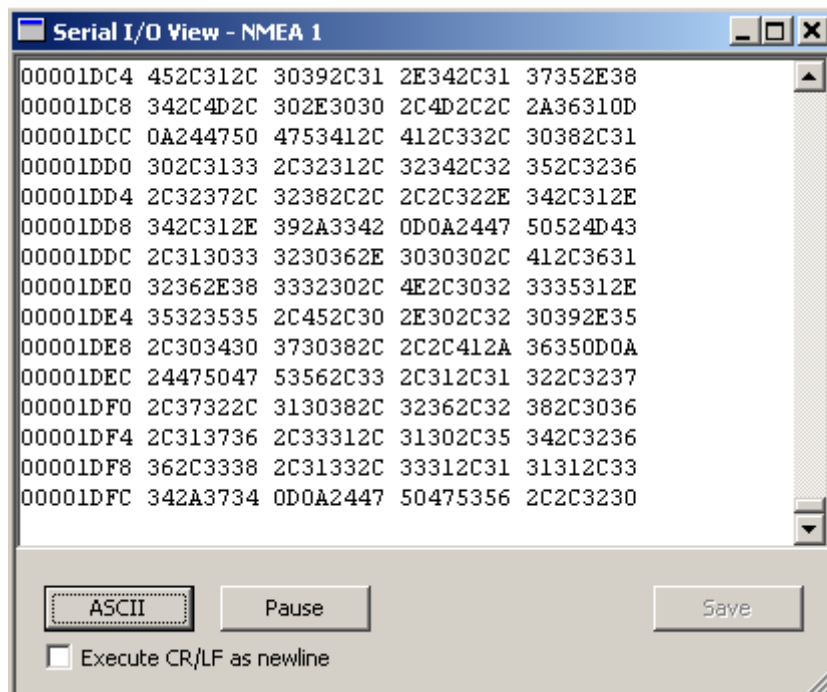


Figure 5-1. Binary View: Hex Format

In NMEA stream viewed in ASCII format, **Execute CR/LF** (Carriage Return / Line Feed) as **newline** can be chosen to make the stream more readable.

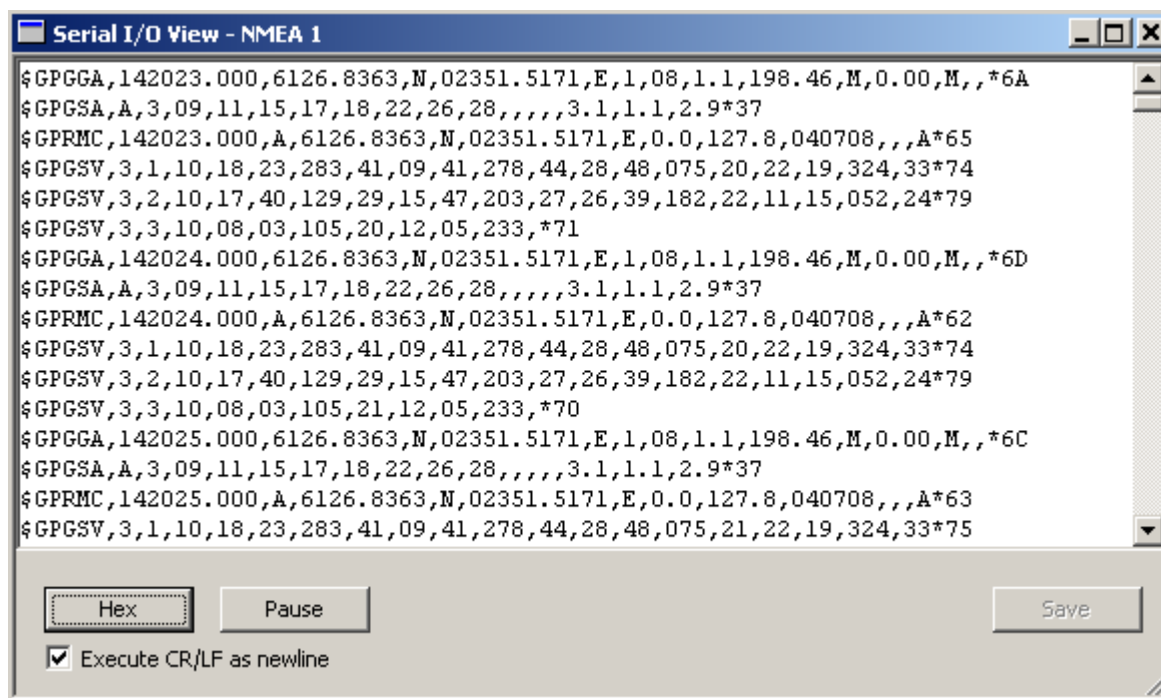


Figure 5-2. Binary View: ASCII Format

5.2 Dynamics View



Figure 5-3. Dynamics View: Graphical Format

The dynamics view combines four different views inside one window. The views are “Speed”, “Vertical speed”, “Compass” and “Height”. The data of these views is shown in both textual and a graphical format. Using context menu (mouse right click), the graphical mode can be switched to

the text mode to make more window space available (“Hide graphics”). It is possible to hide one or more views in order to make important views more visible (“Settings”). These operations are available from the context menu.



Figure 5-4. Dynamic View: Textual Format

The size of the window can be changed, and the graphical figures resized accordingly. There are four adjustment modes: auto, side by side, one upon another and two rows. The adjustment mode and how many views are shown can be set to default in the context menu.

5.3 Globe View

Globe View is available for UBP connection only.

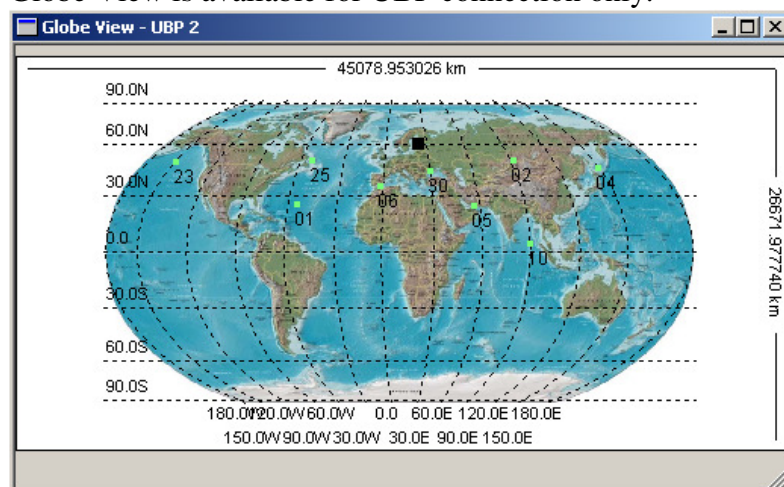


Figure 5-5. Globe View

Globe view shows the positions of all available satellites around the world. The positions are based on position information of UBP messages (satellite info message). Every time a new position of satellite is received, it is updated to the view. It is possible to see all GPS satellite positions on the screen at the same time. In addition, SBAS satellites, WAAS and EGNOS are shown with different color symbols. By the right click of the mouse, the grid lines on the globe can be toggled on or off. Globe view also shows the position of the navigation point on the world map with a black square. A more detailed look on the satellite locations can be taken via the position plot.

5.4 GPS Satellite Data

The GPS Satellite Data view in **Figure 5-6** below is available for UBP connection only.

GPS Satellite Data - UBP 1																							
Satellites			Track									Subframes					Quality						
PRN	Az	Ele	f	C	B	F	T	P	C/No	Carrier	Chip	1	2	3	4	5	H	CP	CC	SP	PR	EL	U
01	68	41							33	35804	715												
04	308	28							46	41059	976												
05	359	09							36	36720	17												
12	347	08							42	36514	737												
13	225	22							32	42085	113												
17	256	19							37	35584	54												
20	136	71							29	37246	266												
23	214	52							30	40821	399												
30	16	14							33	37928	984												
31	68	40							27	37634	212												

Figure 5-6. GPS Satellite Data

The GPS satellite data view is a grid view to show the basic information of available satellites. Only the information available is shown – other fields are empty. In Satellites column PRN stands for pseudo random noise, Az for azimuth and Ele for elevation. In Track, the tracking bits are coded in the following way:

- f - Frequency lock
- C - Code lock
- B - Bit sync
- F - Frame sync
- T - TOW decoded
- P - Parity check
- C/No – Signal strength

The colors in Track, columns from f to T have no specific meaning, just delimiting the subcolumns. In column P the red color means *parity check error*.

In **Subframes**, columns 1 to 5 are the frame numbers, H stands for the satellite health status.

In Subframes, columns 1 to 5 the light blue color means the receiver has already acquired subframe information from the satellite and the dark blue color that the receiver is at the moment acquiring subframe information from the satellite.

The Subframe empty column H means that satellite produces correct, healthy signal. The red color in the column indicates the signal is not healthy. The “bad health” information means that the satellite is “dead” (i.e. not available for navigation purpose).

The Quality column abbreviations stand for the following:

- CP - Code Phase check (channel must be in code sync)
- CC - Cross Correlation check
- SP - Satellite Position calculation has succeeded (or not)
- PR - PRN in Range (1...32)
- EL - Elevation check
- U - Used in navigation
- DD - Doppler Differences
- GD - Gross Doppler test (tests the difference between the estimated and measured dopplers)
- PD - Pseudo range differences
- GP - Gross Pseudo range test
- CN – C/No check

In Quality column the green color indicates good signal quality and yellow not good quality.

5.5 History View

History View has two dialogs for controlling the view and visualizing and analyzing the satellite history.

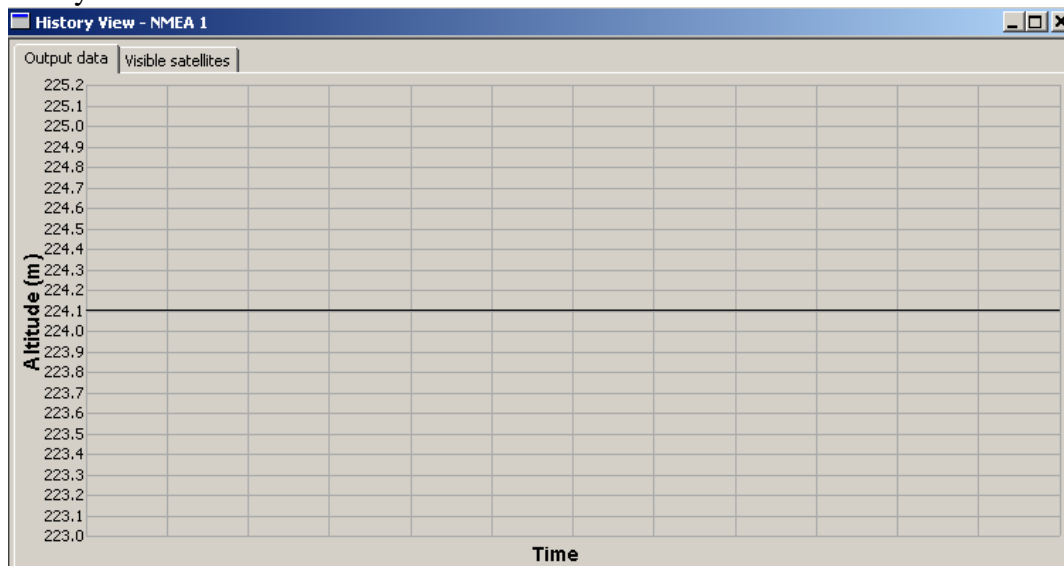


Figure 5-7. History View: Output Data

5.5.1 Output Data

The context menu for the Output Data dialog can be launched by the right click of the mouse. The view can be zoomed in and out, and controlled with the options shown in **Figure 5-8**. In the Settings menu the following options may be selected:

- Dynamics: altitude in meters, heading in degrees and speed in kilometers per hour
- Satellite Counts: PRNs in view, in track and in fix
- Fix Data: fix mode, HDOP, VDOP and PDOP
- Satellite Data: elevation and azimuth in degrees, and signal to noise in dB-Hz

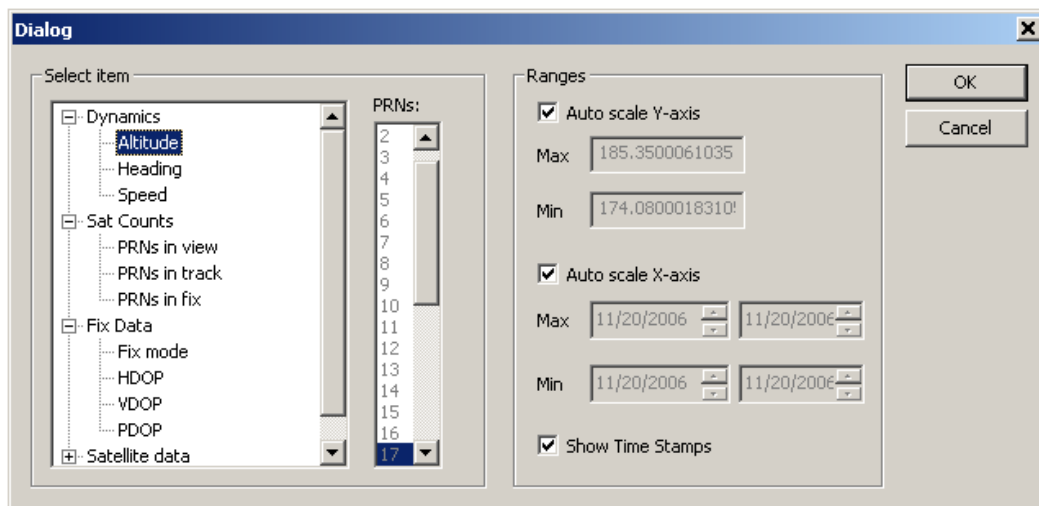


Figure 5-8. History View: Settings

The ranges can be either ticked with Auto scale Y- and/or X-axis, or defined with maximums and minimums, and having the time stamps either shown or hidden.

5.5.2 Visible Satellites

The Visible Satellites dialog shows all the satellites with PRN numbers that are visible at the time, with three different shades of blue color.

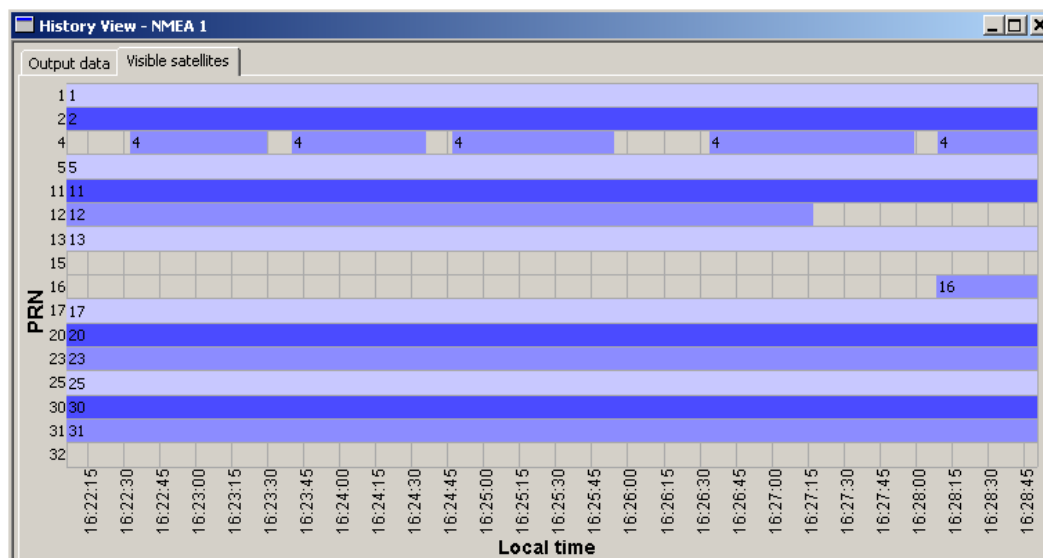


Figure 5-9. History View: Visible Satellites

5.6 Message Scroll

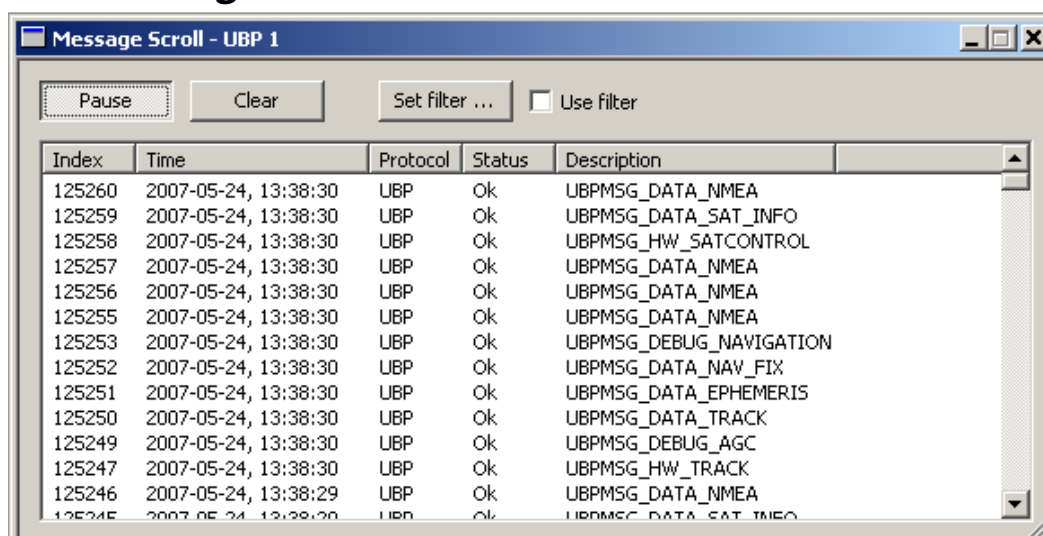
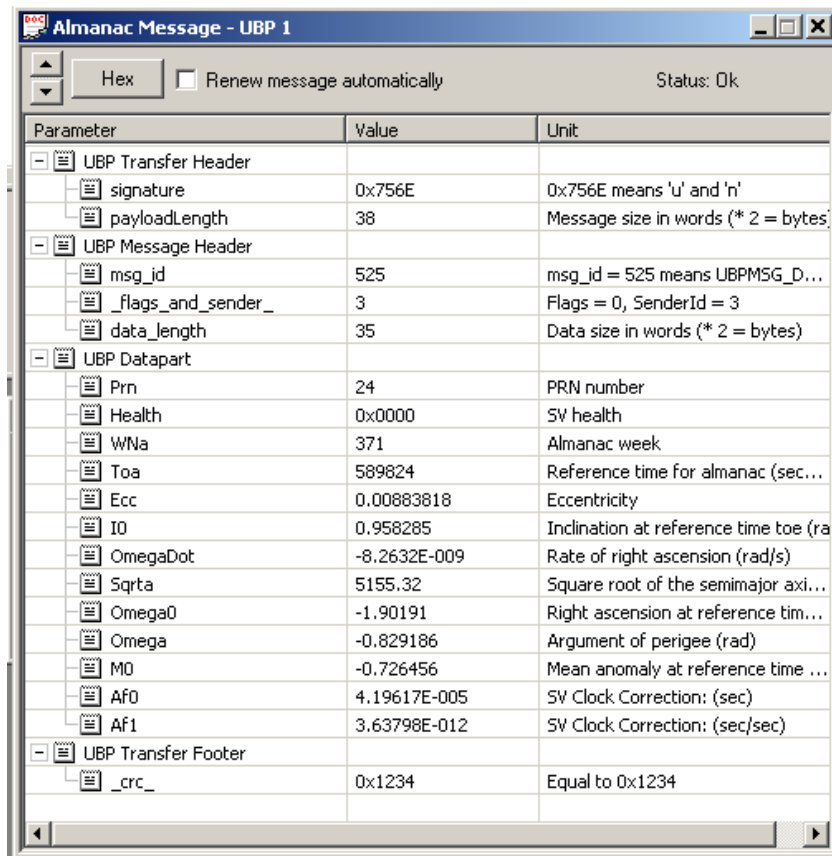


Figure 5-10. Message Scroll

The message scroll view shows all received messages from one receiver. It shows the basic information of the message: receiving time, protocol, status and message name. “Pause” button interrupts updating of the window and “Clear” removes the messages. The user may choose certain type of messages by pressing “Set filter” button. After applying user defined filter only selected messages will be shown.

When the message row is double clicked, the message is opened to the message view for details.

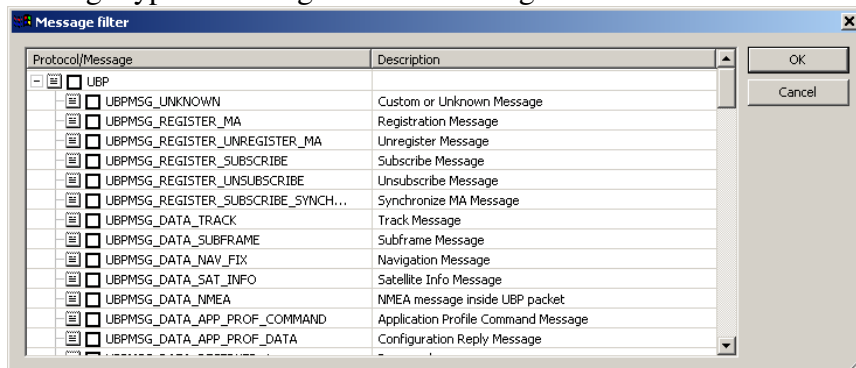


Parameter	Value	Unit
UBP Transfer Header		
signature	0x756E	0x756E means 'u' and 'n'
payloadLength	38	Message size in words (* 2 = bytes)
UBP Message Header		
msg_id	525	msg_id = 525 means UBPMMSG_D...
_flags_and_sender_	3	Flags = 0, SenderId = 3
data_length	35	Data size in words (* 2 = bytes)
UBP Datapart		
Prn	24	PRN number
Health	0x0000	SV health
WNa	371	Almanac week
Toa	589824	Reference time for almanac (sec...
Ecc	0.00883818	Eccentricity
IO	0.958285	Inclination at reference time toe (ra
OmegaDot	-8.2632E-009	Rate of right ascension (rad/s)
Sqrta	5155.32	Square root of the semimajor axi...
Omega0	-1.90191	Right ascension at reference tim...
Omega	-0.829186	Argument of perigee (rad)
M0	-0.726456	Mean anomaly at reference time ...
Af0	4.19617E-005	SV Clock Correction: (sec)
Af1	3.63798E-012	SV Clock Correction: (sec/sec)
UBP Transfer Footer		
crc	0x1234	Equal to 0x1234

Figure 5-11. Message Scroll: details

By ticking “Renew message automatically” the view will be set to update its content automatically. By clicking the arrow up, previous message of the same type is displayed, and the arrow down displays next message.

It is also possible to pause the scroll and configure a filter for the messages. The user can select the message type according to which messages are wanted on the screen; see **Figure 5-12** below.



Protocol/Message	Description
<input type="checkbox"/> UBP	
<input type="checkbox"/> UBPMMSG_UNKNOWN	Custom or Unknown Message
<input type="checkbox"/> UBPMMSG_REGISTER_MA	Registration Message
<input type="checkbox"/> UBPMMSG_REGISTER_UNREGISTER_MA	Unregister Message
<input type="checkbox"/> UBPMMSG_REGISTER_SUBSCRIBE	Subscribe Message
<input type="checkbox"/> UBPMMSG_REGISTER_UNSUBSCRIBE	Unsubscribe Message
<input type="checkbox"/> UBPMMSG_REGISTER_SUBSCRIBE_SYNCH...	Synchronize MA Message
<input type="checkbox"/> UBPMMSG_DATA_TRACK	Track Message
<input type="checkbox"/> UBPMMSG_DATA_SUBFRAME	Subframe Message
<input type="checkbox"/> UBPMMSG_DATA_NAV_FIX	Navigation Message
<input type="checkbox"/> UBPMMSG_DATA_SAT_INFO	Satellite Info Message
<input type="checkbox"/> UBPMMSG_DATA_NMEA	NMEA message inside UBP packet
<input type="checkbox"/> UBPMMSG_DATA_APP_PROF_COMMAND	Application Profile Command Message
<input type="checkbox"/> UBPMMSG_DATA_APP_PROF_DATA	Configuration Reply Message

Figure 5-12. Message Filter

5.7 Message Tree

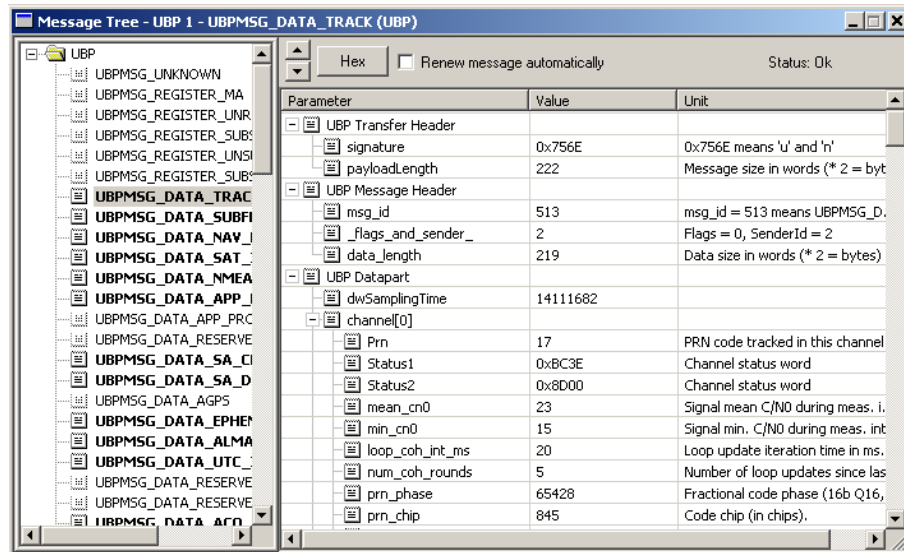


Figure 5-13. Message Tree

The message tree view shows the last instance of any received message type from one receiver. The user can see the tree view of all supported message types from each configured protocol. When a new message arrives, the appropriate message type name will be bolded. When the user clicks with mouse the tree branch, the received message will be opened to the right side of the tree view.

5.8 Navigation Data

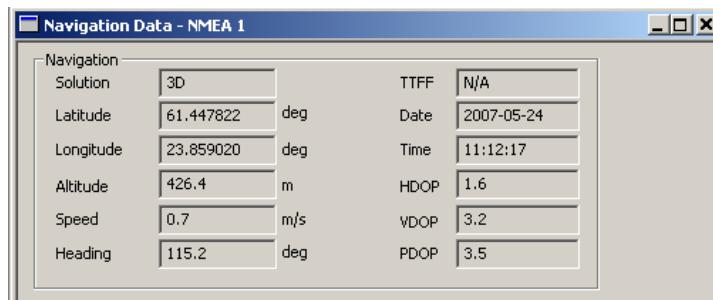


Figure 5-14. Navigation Data: NMEA Protocol

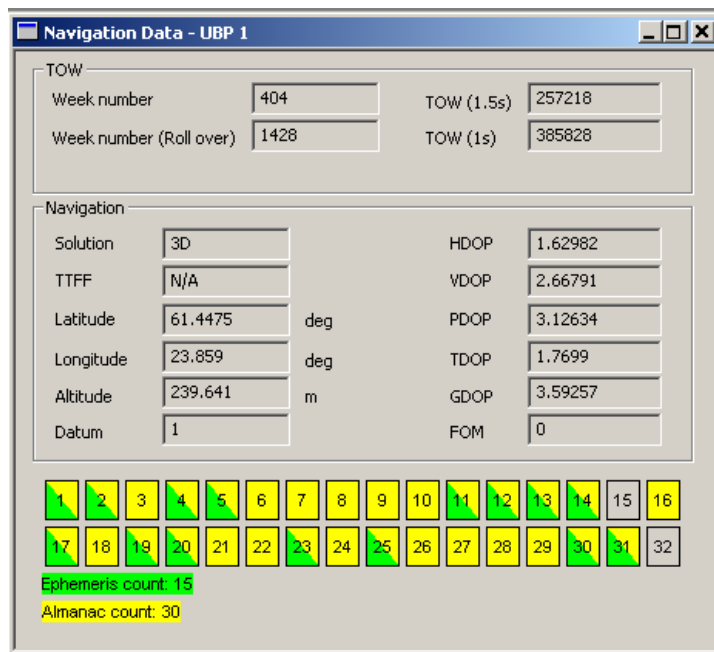


Figure 5-15. Navigation Data: UBP Protocol

The navigation data view is a text-based view that shows navigation related parameters. Different views are used for NMEA and UBP protocols. The parameters are read directly from the data of the received messages. For UBP protocol the view also indicates whether the almanac or ephemeris information of each single satellite is available or received. Yellow color indicates received almanac information, green is used for received ephemeris information. If the satellite is marked with both yellow and green color, then both almanac and ephemeris information is available.

5.9 Position Plot

The position plot view, **Figure 5-16** below, shows the position of the fix on the plot. By default, the view shows grid lines. It is possible to follow up to 8 fix positions at the same time. The view shows the whole world size grid by default. Auto panning and zooming are enabled right from the start. Immediately after the first received fix information, the grid is zoomed and scaled around the fix. The used grid scale is about 5 meters after the auto-zoom.

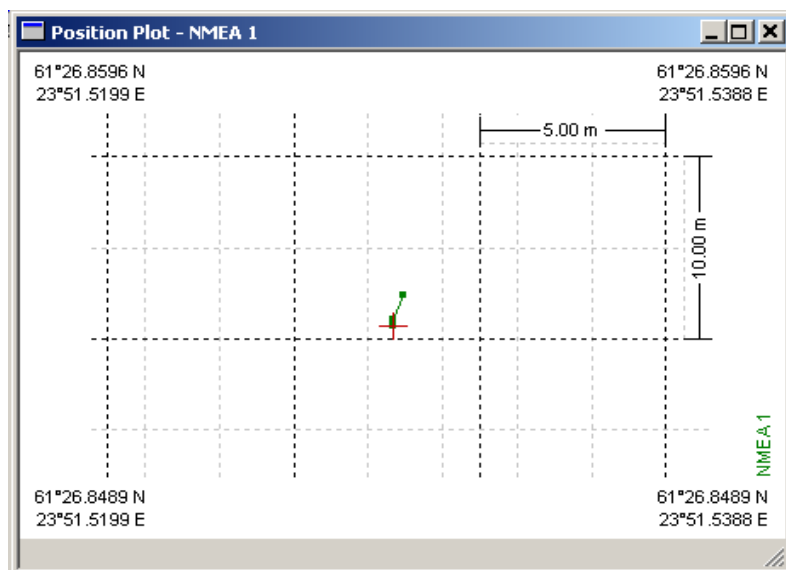


Figure 5-16. Position Plot

5.9.1 Context Menu

The Context menu can be launched by the right click of the mouse. It is used to customize the View.

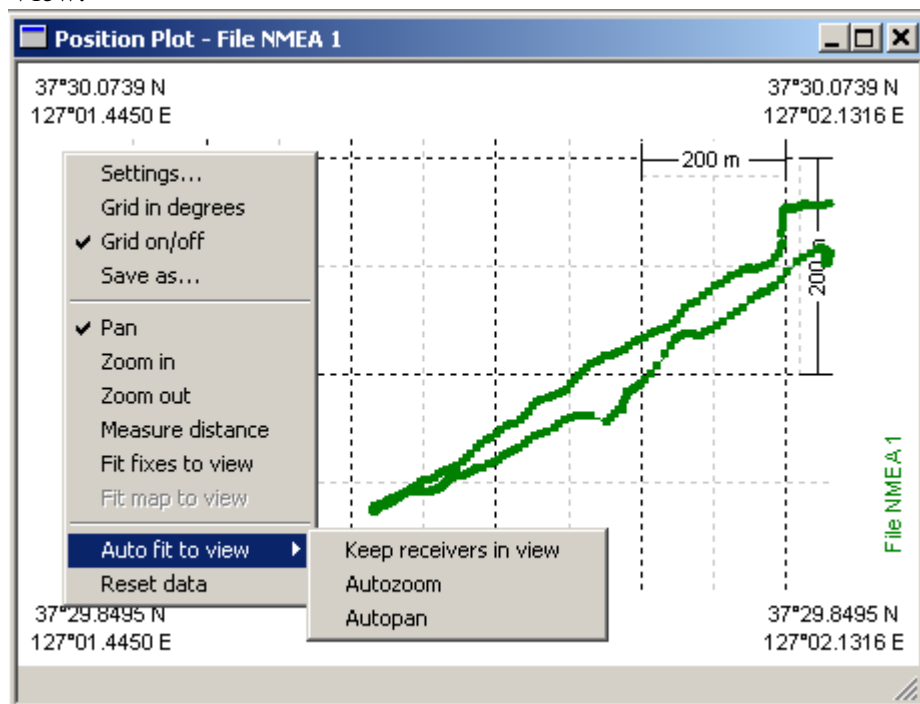


Figure 5-17. Position Plot: Context Menu

Position Plot Context provides the following functions:

Settings -	launches the Settings dialog
Grid in metrics / Grid in degrees-	switches between measuring coordinates in degrees and metrics
Grid on/off -	selects/deselects grid to be drawn
Save as -	saving the position plot for later use
Pan -	allows user to move the entire map (i.e. “central point” move) relative to coordinates by dragging it with the mouse while left button is pressed
Zoom in -	enables user to stretch a rectangular contour while holding left mouse button pressed and, after releasing the button to see the area covered by rectangle enlarged (scale down)
Zoom out -	enables user to go back to less detailed view of the map (scale up)
Measure distance -	allows the measuring of the distance between to points by pressing left button and stretching the line from the starting point. Distance in meters is drawn at the bottom of the View.
Fit fixes to view -	fitting all way points in the rectangle of the Position Plot view
Fit map to view -	this option is not available for Orion Analyzer (this feature is for Orion Workbench only)
Auto fit to view -	automatic rescaling, three options:
<i>Keep receivers in view:</i>	makes the View draw each receiver's route if checked
<i>Autozoom:</i>	switching between automatic view rescaling and manual one. Also enables X and Y spacing Map Settings Dialog.
<i>Autopan:</i>	switching between automatic moving of the “central point” of the view through the map and the manual one (See the Pan mode)
Reset data -	clears the view from already drawn way points (fixes)

5.9.2 Map Settings

The Map Settings dialog below in **Figure 5-18** provides configuration settings for the Position Plot view.

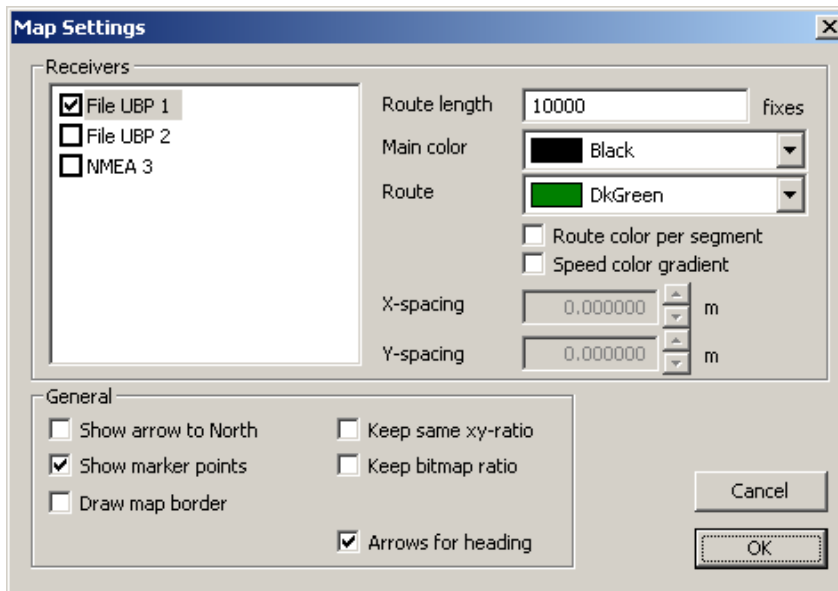


Figure 5-18. Position Plot: Map Settings 1

Receivers

This group of settings refers to receivers i.e. independent sources of GPS-navigation data (UBP and NMEA; see the Connections dialog, chapters 4.3.1 and 4.3.2).

In the top left corner of this dialog there is a Receivers check-list with all available, connected receivers. The user can choose a set of receivers he or she would like to explore with Position Plot by checking the appropriate receiver from the list.

Route length -
Main color -
Route -

the number of fixes (position messages) to be drawn
the color to draw accessory items (reserved for future use)
the color to draw way points (fixes)

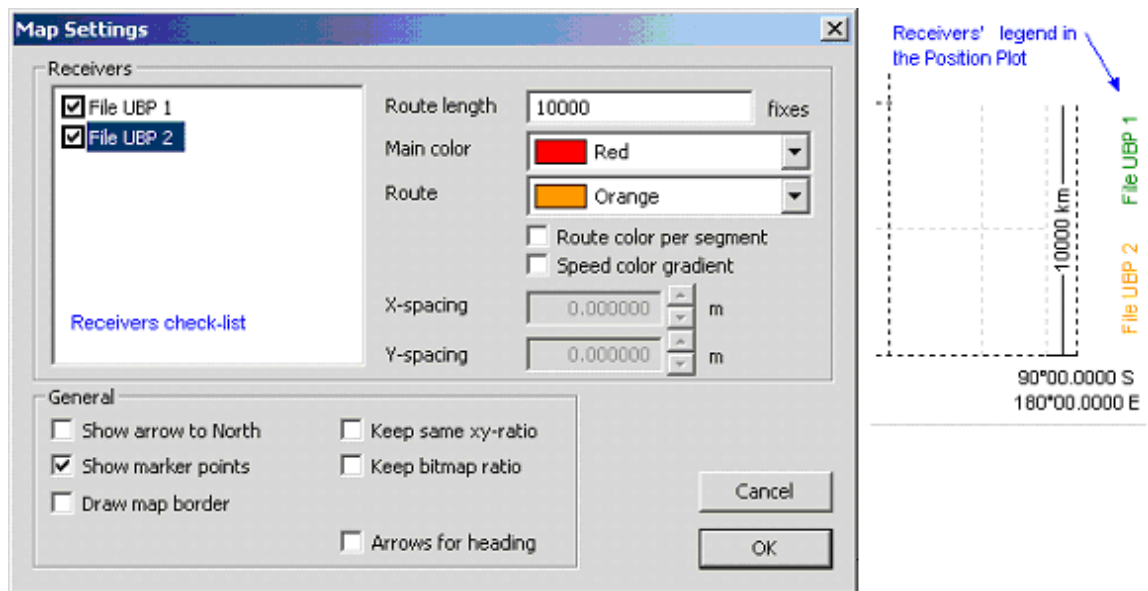


Figure 5-19. Position Plot: Map Settings 2

The routes of two receivers are shown in different colors in the Position Plot below:

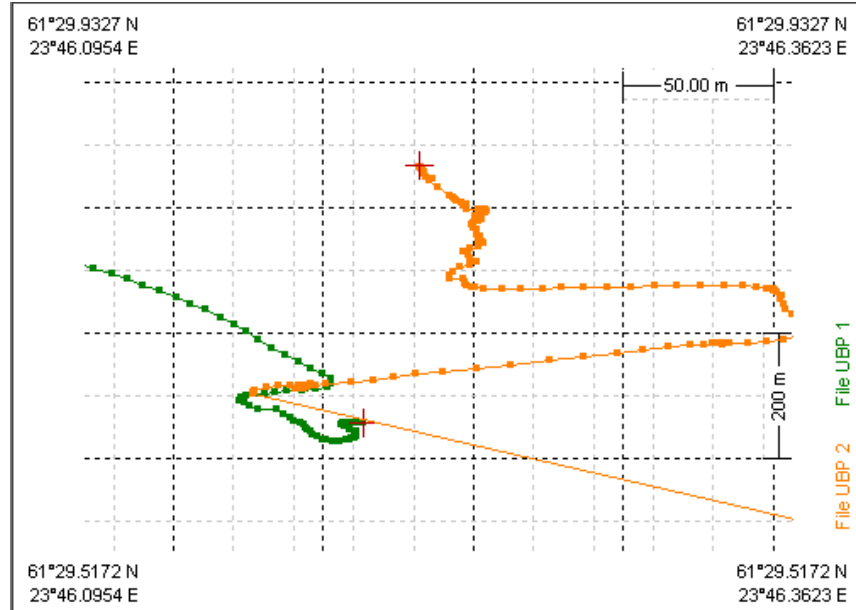


Figure 5-20. Position Plot: Two Receivers' Routes

The route color drawing the way points is shown in green color in the Position Plot below:

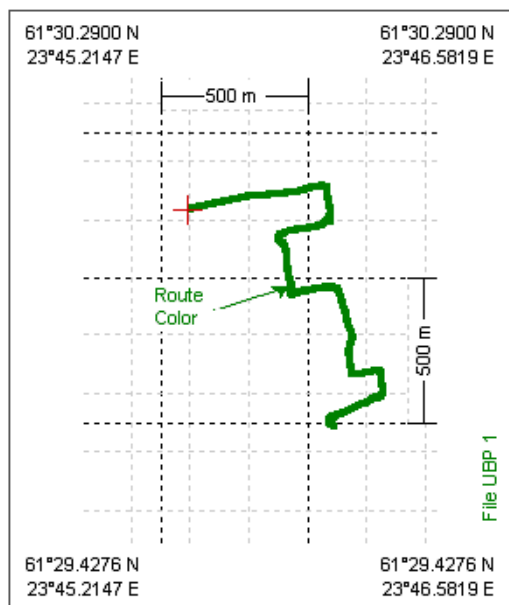


Figure 5-21. Position Plot: Route Color

Route color per segment: checking this box in the Map Settings dialog, together with selecting different route colors, results in different colors for the route segments; see below.

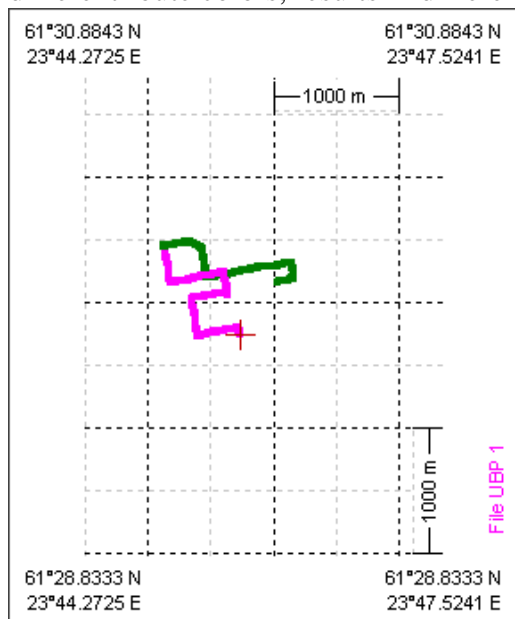


Figure 5-22. Position Plot: Route Color per Segment

Speed color gradient: checking this box enables route coloring according to velocity. The darkness of the color indicates the velocity for each dot: the darker the slower, the lighter the faster.

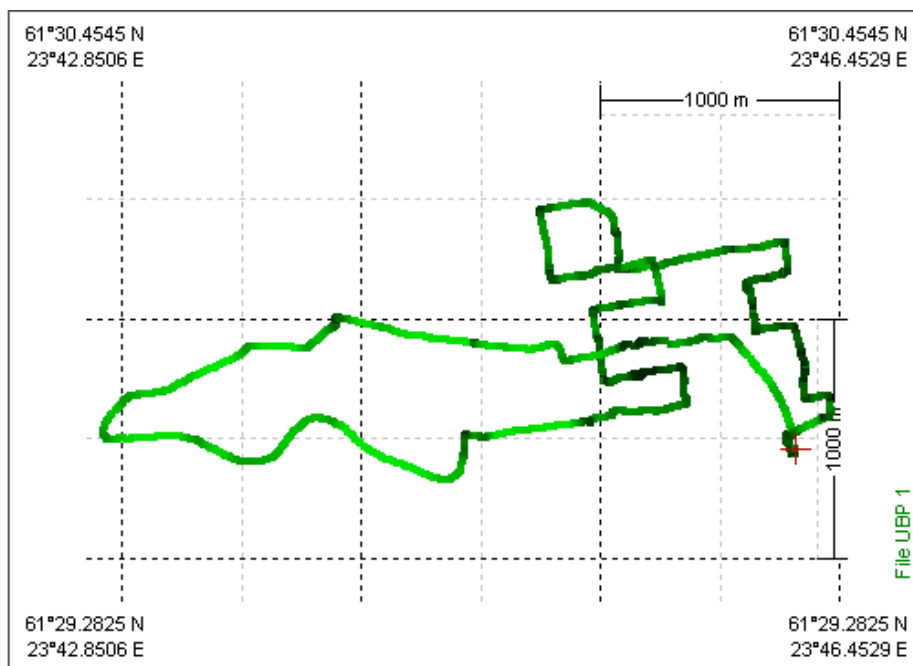


Figure 5-23. Position Plot: Speed Color Gradient

X-Spacing and Y-Spacing: This option is enabled by un-checking Autozoom in the context menu (switching between the automatic view rescaling and the manual one).

X and Y spacing mean latitude and longitude scale in meters. This allows the user to fix the scaling as he or she wants. *Be aware that the option "Keep same x-y ratio" from the General group of this dialog enables the user to select a fixed setting for both x and y coordinates by specifying just X-spacing.*

General

Show arrow to North -



Show marker points -

Draw map border -

Keep same xy-ratio -

Keep bitmap ratio -

Arrows for heading -

This group of settings refers to the entire Position Plot.

by checking this box the user makes the view to show the direction to North:

reserved for future use

draws a border over the entire map

keeps the same latitude / longitude ration while positioning the plot

keeps the bitmap in actual ratio

makes Position Plot draw arrows heading to the direction of the movement reported by GPS

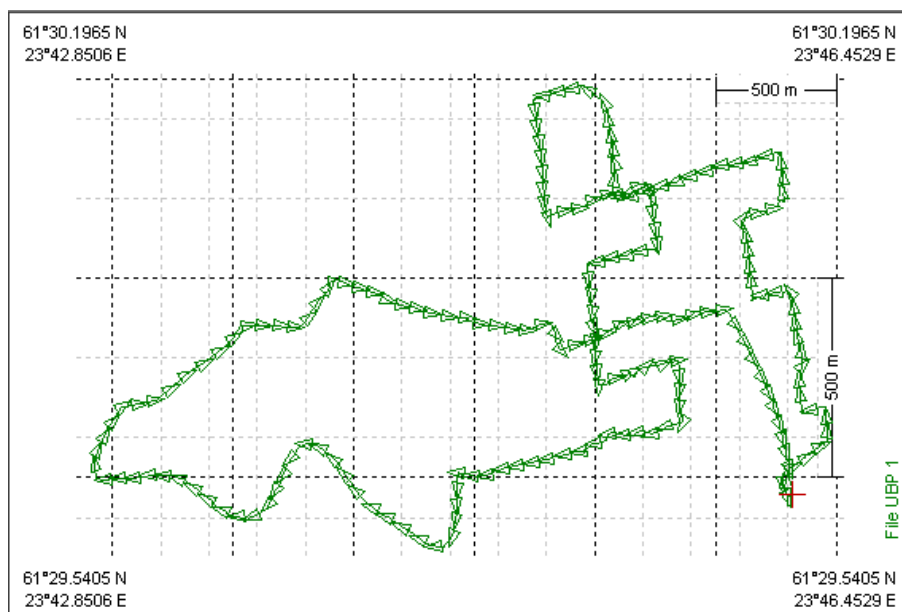


Figure 5-24. Position Plot: Arrows for Heading

5.10 Signal Strength View

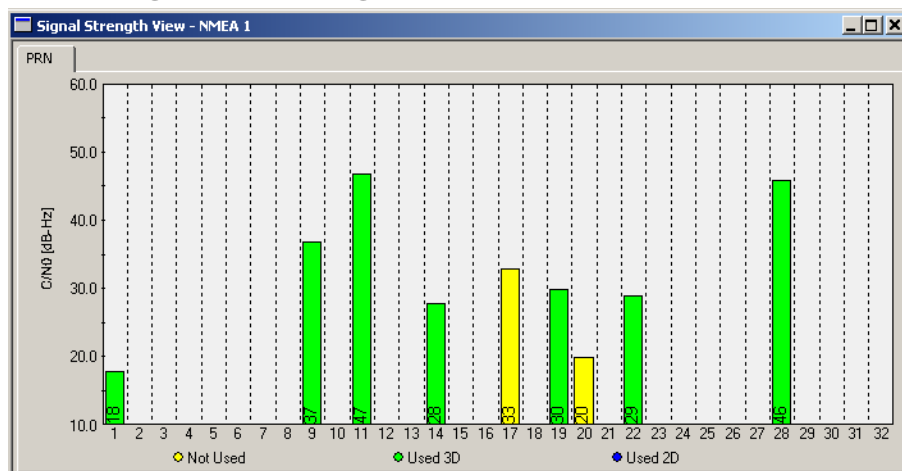


Figure 5-25. Signal Strength View

The signal strength view is a graphical view for the signal strengths (signal/noise) of the satellites. The view can show all GPS satellites at the same time. The column shown may have three different states: “Not Used”, “Used 3D”, and “Used 2D”. The state “Not used” tells that the satellite could have been used for navigation, but was not used (e.g. because of bad angle or weak signal). So the state “Used” tells that the satellite is used, either in 3D or 2D mode.

The context menu can be launched by the right click of the mouse. In the Settings dialog the user can select if all the PRN numbers are shown or not, and also change the minimum and maximum ranges. The navigation can be reset by choosing Reset data.

5.11 Sky Plot View

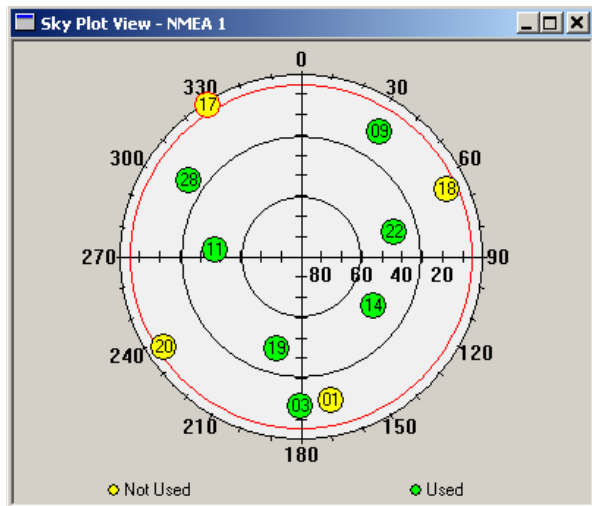


Figure 5-26. Sky Plot View

The sky plot view is a graphical view of available satellites. Each of them is shown immediately when the satellite position information is received. The satellite symbols shown may have two different states: “Not Used” and “Used”. The state “Not Used” tells that the particular satellite could have been used in navigation, but was not (e.g. because of bad angle or weak signal). “Used” means that the satellite was used in the positioning.

Sky plot shows the satellites on the sky from the receiver location. Zero on the outer ring refers to North, the other numbers to the direction (azimuth) measured in degrees. The distance from the center refers to the satellite elevation angle.

5.12 Time View

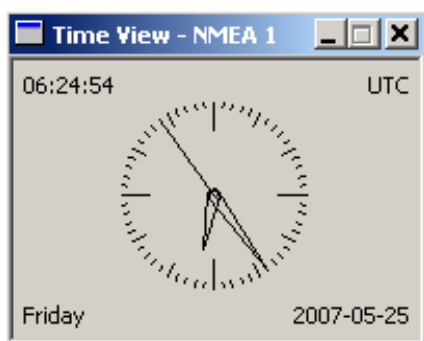


Figure 5-27. Time View

The time view is a very simple graphical view that shows the time of the received position fix. Every time a new position fix information is received, the received time stamp is shown on the view. It is possible to configure local time offset by the right click of the mouse. The time is then shown as shifted by the given offset.