

# WENSS USER MANUAL

WÜRTH ELEKTRONIK NAVIGATION  
AND SATELLITE SOFTWARE

VERSION 1.4.0

OCTOBER 27, 2023

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

## Revision history

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## Abbreviations

Abbreviation	Name	Description
COM port	Communication port	
ACK	Acknowledgement	Message indicating that a request was successful.
BDS	Beidou	Chinese global navigation satellite system
DOP	Dilution Of Precision	
FSE	Field Sales Engineer	
Galileo		European global navigation satellite system
GLONASS	Global navigation satellite system	Russian global navigation satellite system
GNSS	Global navigation satellite system	General term for global navigation satellite system
GPS	Global Positioning System	American global navigation satellite system
GUI	Graphical User Interface	
HDOP	Horizontal Dilution Of Precision	
0xhh [HEX]	Hexadecimal	All numbers beginning with 0x are stated as hexadecimal numbers. All other numbers are decimal.
MID	Message identifier	Used in OSP to specify the message
NACK	No Acknowledgement	Message indicating that a request was not successful
NMEA	National Marine Electronics Association	Specification for communication. Used by GNSS receivers.
OSP	One Socket Protocol	Proprietary protocol for navigation messages.
PDOP	Position Dilution Of Precision	
PRN	Pseudo Random Noise	
RAM	Random-Access Memory	Volatile memory to store data.
RF	Radio frequency	Describes everything relating to the wireless transmission.

SNR	Signal-to-noise ratio	
TTF	Time to first fix	Time between start-up of module and first fix after that
UART	Universal Asynchronous Receiver Transmitter	Allows communicating with the module of a specific interface.
USB	Universal Serial Bus	
UTC	Coordinated Universal Time	Primary time standard
VCP	Virtual Com Port	
VDOP	Vertical Dilution Of Precision	
WENSS	Würth Elektronik Navigation and Satellite Software	

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# 1 Overview

Würth Elektronik Navigation and Satellite Software, WENSS for short, is a simple PC tool to interact with the EV-Boards of the Würth Elektronik eiSos positioning modules using the UART interface. It allows:

- Taking into operation of the EV-board
- Bidirectional communication with the GNSS module
- Evaluation of module capabilities and features
- Getting familiar with module protocols, sentences and commands
- Configuration of the module without knowledge of the protocols
- Parsing of sentences and commands

Experienced users have the opportunity to use WENSS for more advanced configurations. Therefore it allows an easy evaluation of positioning application.

## 1.1 Supported GNSS modules

The following GNSS modules are supported:

- Elara-I
- Elara-II
- Erinome-I
- Erinome-II

## 1.2 System requirements

### 1.2.1 Supported operating systems

The following operating systems are supported:

- Windows 10, 32/64 bit
- Windows 8, 32/64 bit
- Windows 7, 32/64 bit

### 1.2.2 .NET Framework

Version 4.7.2 or later of the Microsoft .NET framework is required to use WENSS. Install this package if you receive a corresponding error message when starting the program.

### 1.2.3 Internet connection

WENSS works mostly offline. An internet connection is only required to follow links present in the software, e.g. links to manuals and product sites. Normal operation can be done without internet connection of any sort.

## 2 Installation

WENSS is provided in the form of a compressed zip file. To use WENSS extract the zip files to a directory of your choice. The new folder will contain the following files:

- WENSS.exe
- Custom\_Commands.xml

No further actions are required for installation. However, the serial-to-USB FTDI converter chip (for example, FT232R) on the evaluation platform or USB dongles requires special drivers to be installed for proper operation. To use USB dongles or evaluation boards of Würth Elektronik eiSos wireless connectivity modules, the Virtual COM Port (VCP) drivers have to be installed by following the "Installation Guides" of FTDI found under:

<https://www.ftdichip.com/Drivers/VCP.htm>



It is recommended to restart the PC after installation of the drivers.



WENSS creates folders and writes log files during operation. Please make sure that the directory has the necessary permission.

### 2.1 Connect the EV-Board

After the FTDI VCP drivers installation the EV-Board can be connected to the PC via USB cable. Please refer to the EV-Board user manual for detailed information.



During the plug-and-play routine of Windows the positioning EV-Board might be detected as a trackball mouse. This leads to the mouse cursor jumping around wildly. This behaviour can be avoided by switching the positioning module on after plug-and-play routine is finished. The routine takes up to 5 seconds after plugging the device in.

## 3 Deinstallation

WENSS can be uninstalled by simply deleting the directories and files that have been created during operation and installation. WENSS operates only in the folder it was extracted to. No changes are made to the registry.

We recommend to save the log files for usage for analysis at a later time.

## 4 Operation

### 4.1 Starting the program

The program can be started by double-clicking the "WENSS.exe" extracted earlier during the installation. Right after start up the navigation view will be shown.

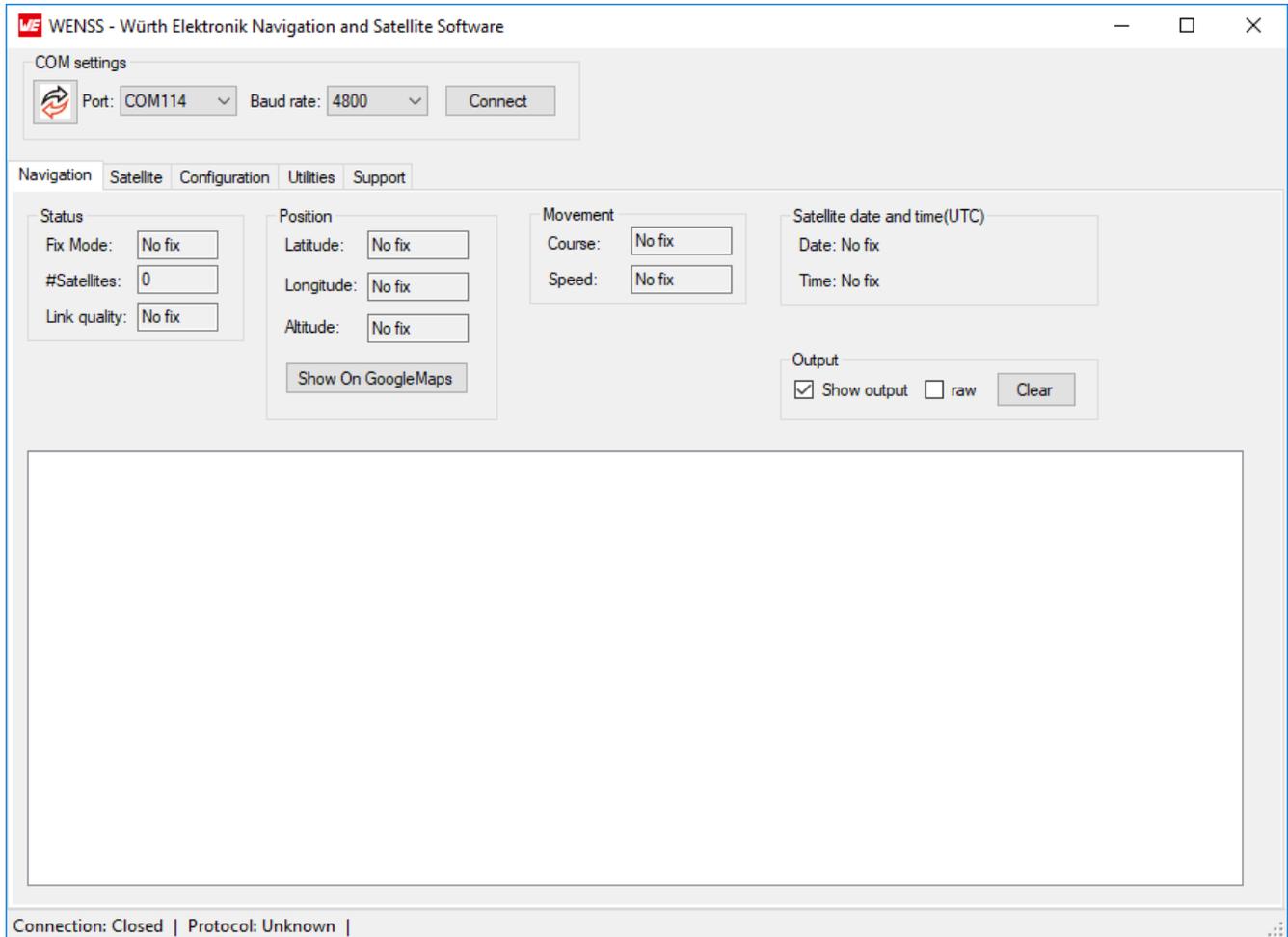


Figure 1: WENSS after start up

## 4.2 Structure of the GUI

The GUI is structured in a way that the collected information and possible configurations are bundled in different views. The main views are organised in tabs and can be selected by clicking its respective name.

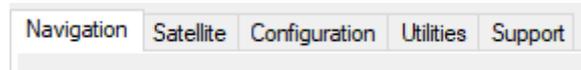


Figure 2: Tabs to select the different views

The available tabs are as follows:

- **Navigation**  
Presents and interprets received messages regarding the navigation and allows faster understanding of the information delivered by the module.  
For more details refer to chapter 4.5
- **Satellite**  
Presents information about the satellites in view and those used for position calculation.  
For more details refer to chapter 4.6
- **Configuration**  
Allows to send commands to the module and to configure its output and behaviour.  
For more details refer to chapter 4.7
- **Utilities**  
Provides checksum calculation and time measurements to further evaluate the module.  
For more details refer to chapter 4.8
- **Support**  
Provides links to the product website, manuals and support.  
For more details refer to chapter 4.9

To make it possible to open and close the connection to the module the "COM settings" are visible from every view. Please refer to chapter 4.3 on how to open the communication to the module. The status bar displays the current com port status and used protocol as further explained in chapter 4.4.

## 4.3 Connect/Disconnect

To open the communication with the module:

1. Refresh com ports by clicking the refresh button to the left.
2. Select the port from the drop-down list.
3. Select the baud rate from the drop-down list.
4. Click the "Connect" button.

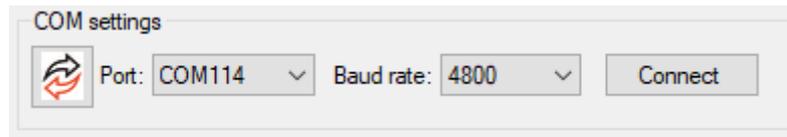


Figure 3: Com settings

If the selected baudrate does not match the configured module baud rate, communication is not possible. The default baud rate of the modules is 4800 Baud. If baud rate setting has been changed in previous module operation, last configured baudrate has to be chosen on the PC-tool.

If connection with the module is successful and the module is in full power state, the message flow is visible in the navigation view, unless all messages have been deactivated. Please refer to chapter 4.5 for details about Navigation view. On first power-up the module starts in hibernate state and can be switched to full power state through the ON/OFF switch or button. Please refer to EV-board manual for detailed information.

After connection, the text of the button will change to "Disconnect". Press this button to close the COM port and stop the communication with the module. If connection with the module is stopped successfully message flow stops in the navigation view. .

## 4.4 Status bar

At the lower edge of the window a status bar shows information about the connection status and the current protocol used by the module. The status bar is visible independently of the selected tab.

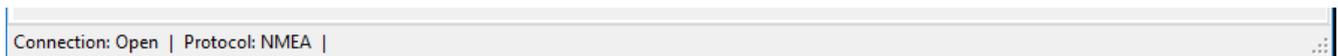


Figure 4: Status bar displaying connection status and used protocol.

Field name	Description	Possible values
Connection	Shows COM port status	<ul style="list-style-type: none"><li>• Closed</li><li>• Open</li></ul>
Protocol	Current protocol of the module	<ul style="list-style-type: none"><li>• Unknown</li><li>• NMEA</li><li>• OSP</li></ul>

Table 1: Description of the status bar

### 4.5 Navigation view

The navigation view prints the received messages relevant for the navigation and shows the collected information like

- fix status
- position
- velocity
- date and time

The parsed messages allow faster understanding of the information delivered by the module. The raw messages can be used to become familiar with the communication protocols used by the GNSS module.

Message flow visible in this tab matches modules current communication setting (communication protocol, update rate, message rate). Refer to module manual for detailed information.

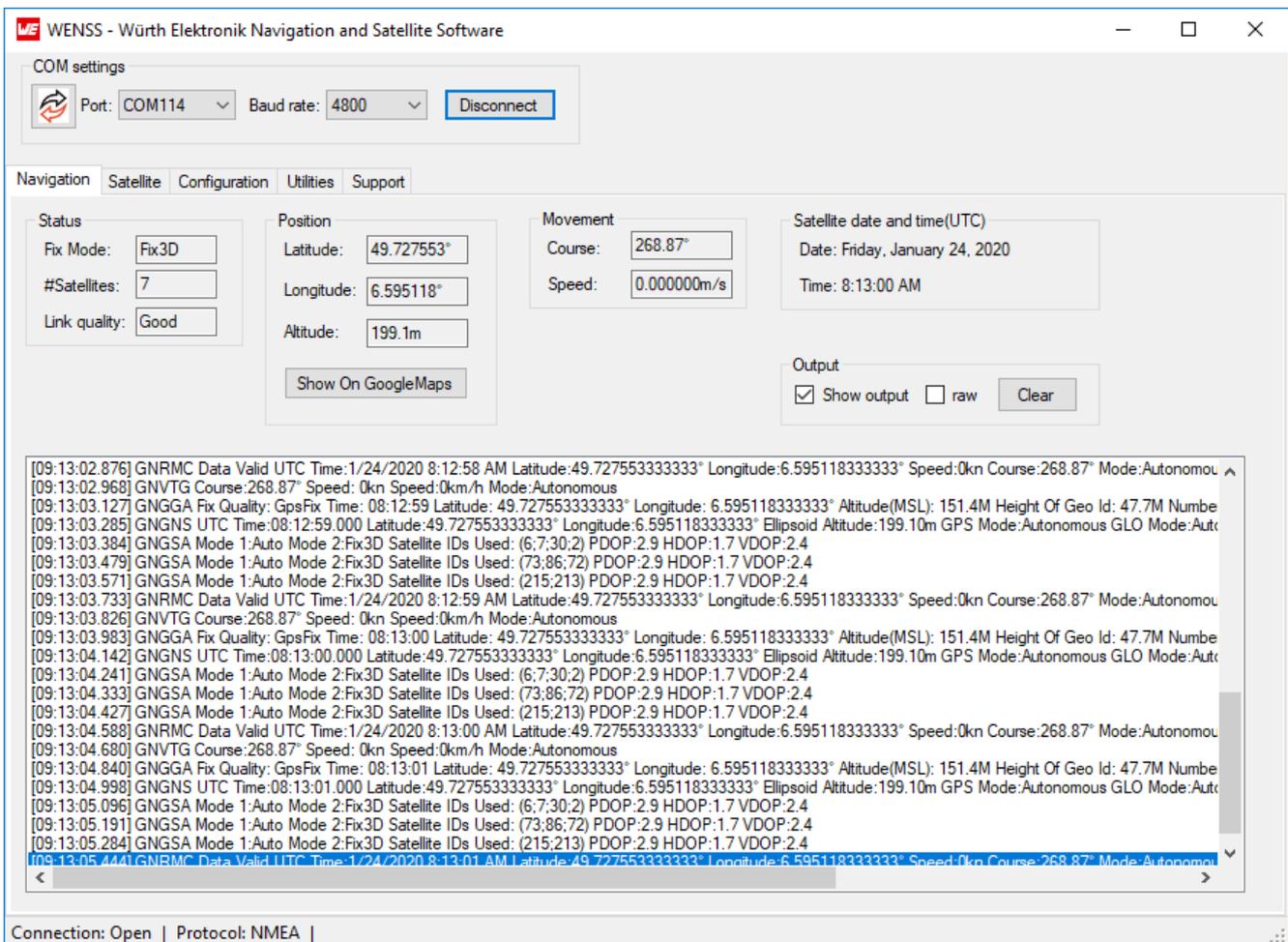


Figure 5: Navigation view when a fix is acquired

**4.5.1 Status**

Status contains general information about the position fix and the quality of the link with the GNSS satellites. Data is extracted from NMEA message GSA or OSP message MID66 and MID67,1. If these messages are deactivated, this part of the GUI will not be updated any-more.

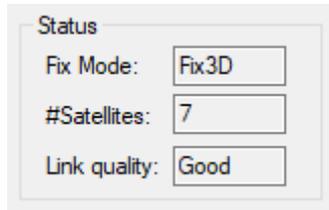


Figure 6: Status group of navigation view

Field name	Description	Possible values
Fix mode	Shows current fix mode	<ul style="list-style-type: none"> <li>• No fix</li> <li>• Fix2D</li> <li>• Fix3D</li> </ul>
#Satellites	Number of satellites used for fix	<ul style="list-style-type: none"> <li>• No fix</li> <li>• number <math>\geq 0</math></li> </ul>
Link quality	Quality of the link with GNSS satellites. Shows dilution of precision (DOP) when hovering over with mouse. Based on the PDOP as stated in brackets to the right.	<ul style="list-style-type: none"> <li>• No fix</li> <li>• Ideal (1)</li> <li>• Excellent (1-2)</li> <li>• Good (2-5)</li> <li>• Moderate (5-10)</li> <li>• Bad (&gt; 10)</li> </ul>

Table 2: Description of the status group

**4.5.2 Position**

Position contains the values describing the position of the receiver. By clicking the button "Show on GoogleMaps" the link is created using the received longitude and latitude and open in the

internet browser. This requires internet connection.

Data is extracted from NMEA messages GGA, GNS, GLL and RMC and OSP messages MID41 and MID67,1. If these messages are deactivated, this part of the GUI will not be updated any-more.



Figure 7: Position group of navigation view

Field name	Description	Possible values
Latitude	Shows current latitude in degree. Negative value southwards, positive value northwards	(-90)° to 90°
Longitude	Shows current longitude in degree. Negative value westwards, positive value eastwards	(-180)° to 180°
Altitude	Shows current altitude in meter based on WGS-84 ellipsoid	

Table 3: Description of position group

**4.5.3 Movement**

In the movement group course and speed are shown. This allows to determine the direction and velocity of the receiver. Data is extracted from NMEA messages VTG and RMC and OSP messages MID41 and MID67,1. If these messages are deactivated, this part of the GUI will not be updated any-more.

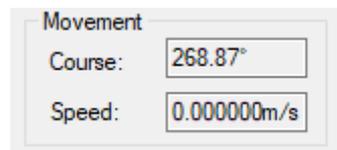


Figure 8: Movement group of navigation view

Field name	Description	Possible values
Course	0° and 360° represent true north	0° to 360°
Speed	Current speed in <i>m/s</i>	

Table 4: Description of the movement group

**4.5.4 Date and time**

In this area the date and UTC-time are shown. The format of the date is "weekday, month day, year" whereas weekday and month are written out. Time is based on a 12 hour system and AM or PM is given. Data is extracted from NMEA messages ZDA and RMC and OSP messages MID41. If these messages are deactivated, this part of the GUI will not be updated any-more.

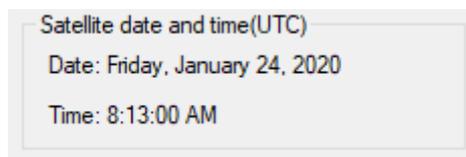


Figure 9: Time and date group of navigation view

**4.5.5 Output**

The output controls allow to change the display of the received messages. By toggeling the "Show output" checkbox, the output of the messages can be enabled or disabled. Disabling the output of the messages can be helpful when analyzing message history. Messages can be shown just as received by the module

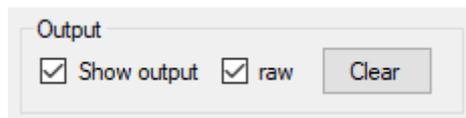


Figure 10: Show messages as received by module

or parsed and interpreted.

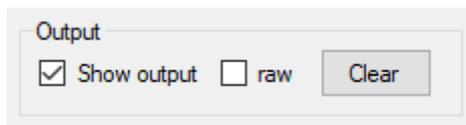


Figure 11: Show messages parsed and interpreted

These control options only change the behaviour of the GUI. The module is not affected by the changes. With the "Clear" button the received messages are cleared in the log field.

### 4.6 Satellite view

The satellite view shows information about the satellites in view and in use. The information is shown both in a table view and in a sky view. Satellites disappear from the table and view once they are not in sight any-more. Data is extracted from NMEA message GSV and OSP message MID67,1. If these messages are deactivated, this part of the GUI will not be updated any-more.

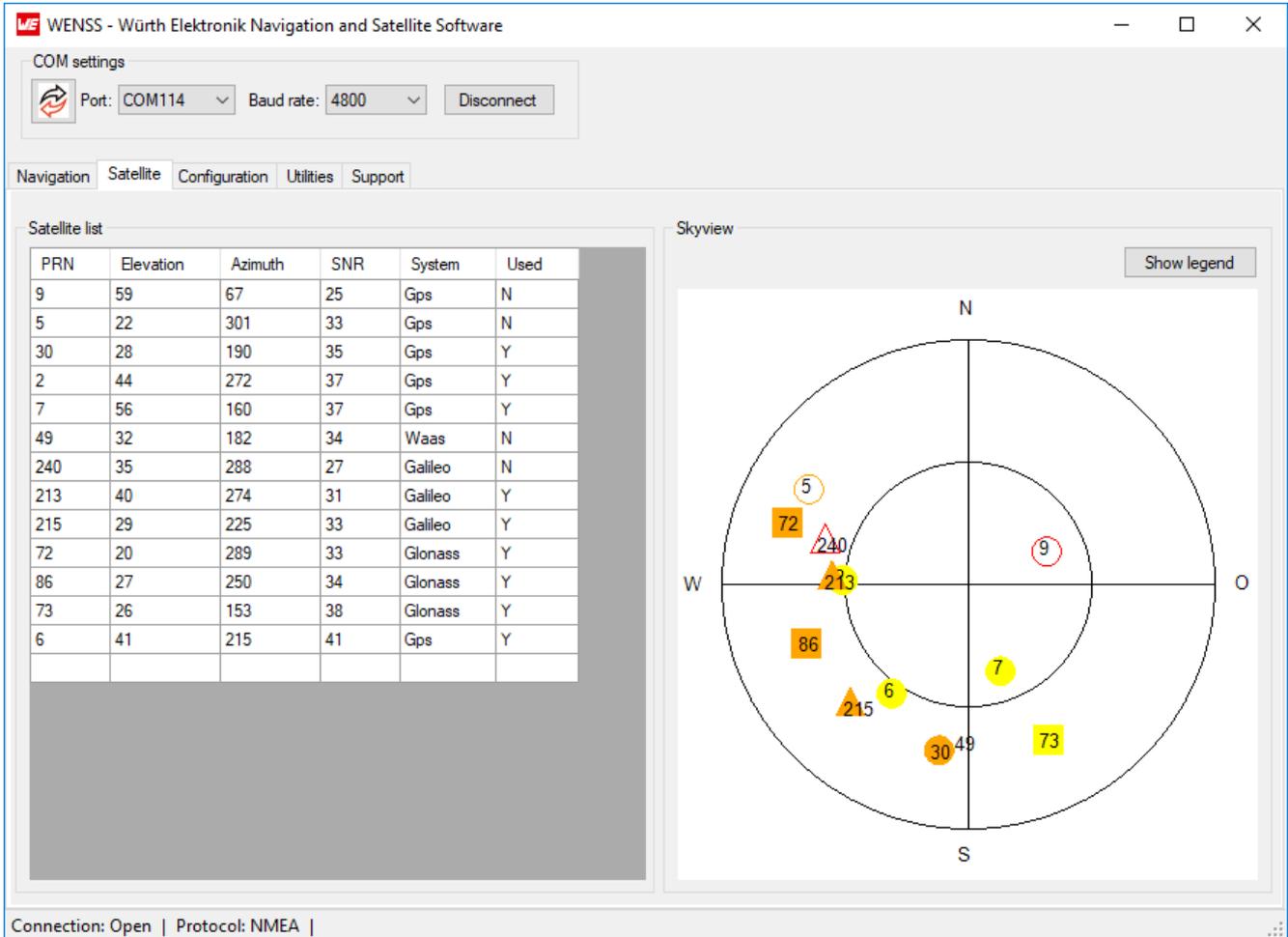


Figure 12: Satellite view when a fix is acquired

**4.6.1 Table**

The table contains the information about the satellites in readable form. The columns can be sorted by clicking on the header row.

Satellite list					
PRN	Elevation	Azimuth	SNR	System	Used
9	59	67	25	Gps	N
5	22	301	33	Gps	N
30	28	190	35	Gps	Y
2	44	272	37	Gps	Y
7	56	160	37	Gps	Y
49	32	182	34	Waas	N
240	35	288	27	Galileo	N
213	40	274	31	Galileo	Y
215	29	225	33	Galileo	Y
72	20	289	33	Glonass	Y
86	27	250	34	Glonass	Y
73	26	153	38	Glonass	Y
6	41	215	41	Gps	Y

Figure 13: Information about satellite in view shown as table

Field name	Description
PRN	Pseudo Random Noise. Unique for every satellite. Is used as ID.
Elevation	The angle above the horizon. An angle of 90° represents the zenith.
Azimuth	The angle between the north vector and the satellites' vector on the horizontal plane.
SNR	Signal-to-noise ratio. Indicator for signal strength. The higher SNR the better the signal.
System	GNSS the satellite belongs to.
Used	Indicates if the satellite is used for the fix. "Y" indicates used for fix.

Table 5: Description of satellite table

**4.6.2 Skyview**

All modules in view are shown on the sky view. The outer line represents the horizon while the centre represents the zenith.

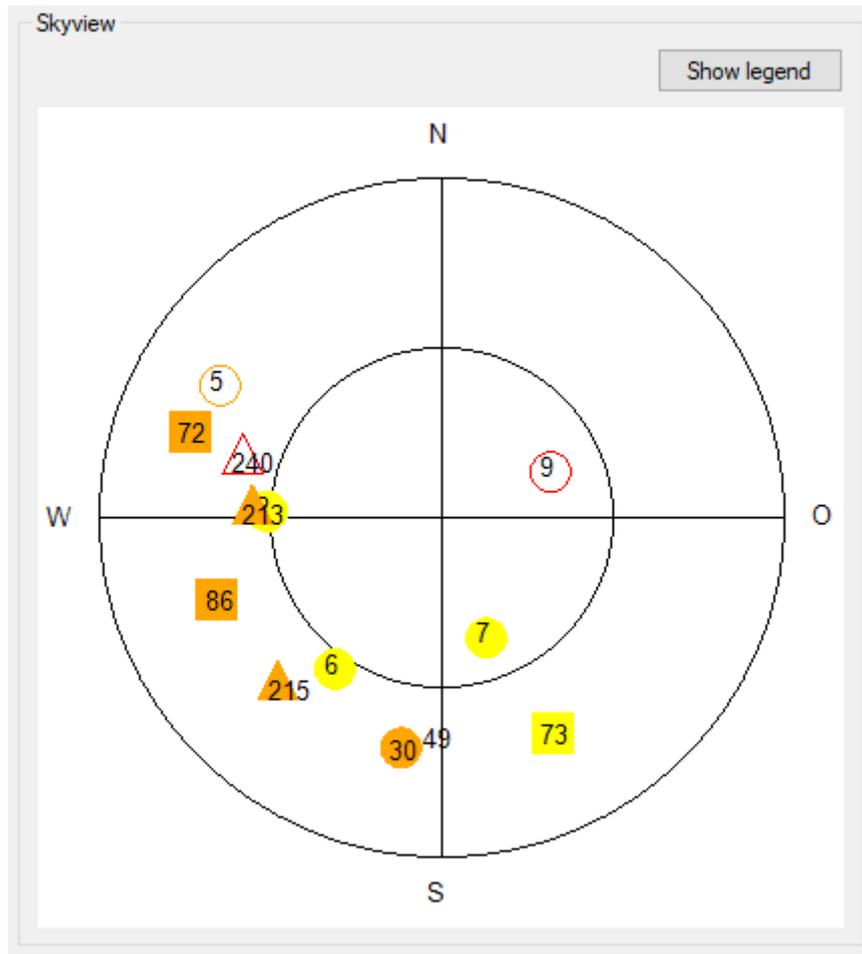


Figure 14: Satellites in view shown as skyview

If a satellite is used for the fix the figure is filled out. Otherwise only the outer lining is drawn. The PRN of the satellite is written within the symbol for identification. The colour indicates the signal strength. The representation for the satellites is as follows:

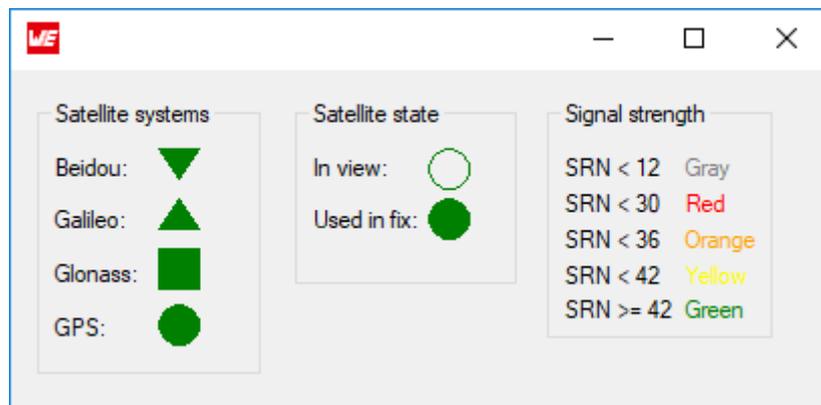


Figure 15: Legend of satellite representation

## 4.7 Configuration view

The configuration view allows to send commands to the module and to configure its output and behaviour. WENSS automatically allows only those actions which are available in the current protocol. In addition the input is only enabled if a connection is open and a valid protocol is detected.

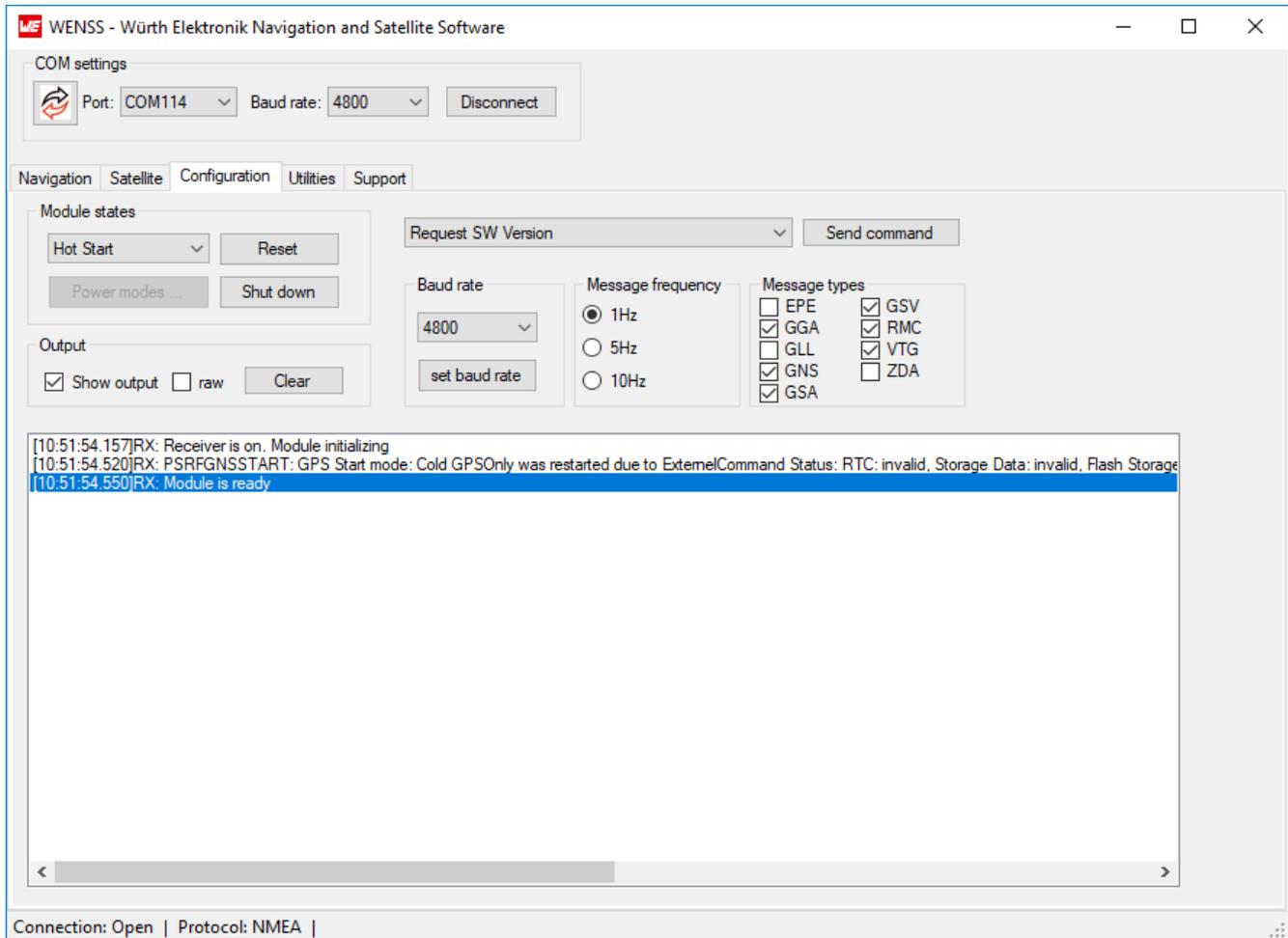


Figure 16: Configuration view to adjust the modul to one’s needs

### 4.7.1 Module states

The module can be set to various states. These include reset, shutdown and predefined power modes.

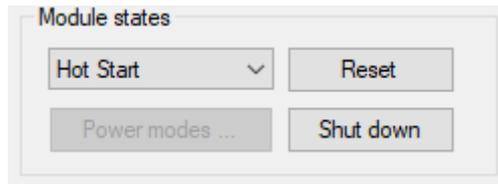


Figure 17: Module states group of configuration view

**4.7.1.1 Reset**

The dropdown allows to select the type of reset to perform. By clicking the button "Reset" the module will be reset accordingly.

Field name	Description
Hot Start	Use initialization data and begin in start mode. RAM is not cleared.
Warm Start	Ephemeris data is cleared. Rest of data remains in RAM.
Cold Start	Position, time and ephemeris are cleared. Rest of data remains in RAM.
Factory Reset	Internal RAM is cleared completely.

Table 6: Description of resets

**4.7.1.2 Shutdown**



This command has no effect for the Elara-I and Elara-II modules.

This command has the same effect as the on/off pin of the hardware. The module will be powered off but data in RAM will be retained. The module can only be powered on with a hardware reset or by ON/OFF pin.

**4.7.1.3 Power modes**



The configuration of power modes is only available when using OSP.

Using the low power modes the module automatically switches between full power and hibernate mode according to the selected parameters. By clicking on the "Reset"-button a new window opens to further configure the power mode. The available power modes are:

- Full power mode
- SmartGNSS
- Push-To-Fix
- Trickle mode

For information about the power modes and the parameters consult the manual of the specific module.

#### 4.7.2 Custom commands

The available commands for the current protocol are shown in a drop down menu and can be selected. The selected command is sent by clicking "Send command". The drop-down list of commands corresponds to the list contained in the XML file supplied with WENSS.



Figure 18: custom commands of configuration view

The NMEA protocol has no acknowledge response, so there is no feedback whether the command was successful or not. OSP on the other hand responds with an ACK or NACK command.

##### 4.7.2.1 Add custom command

The XML file containing custom commands can be opened and edited by the user with an editor of choice. The commands are divided into NMEA and OSP commands. Both contain a "name" and a "data" property whereas "name" is shown in the dropdown menu and "data" is sent to the module. To apply the new XML file WENSS has to be restarted.

```
<NMEACommands>
  <NMEACommand name="Request SW Version" data="$PSRF125*21" />
  ....
  <NMEACommand name="Custom command name" data="Your NMEA command" />
</NMEACommands>
<OSPCommands>
  <OSPCommand name="Request SW Version" data="A0A2000284000084B0B3" />
  ....
  <OSPCommand name="Custom command name" data="Your OSP command" />
</OSPCommands>
```

Code 1: Example of Custom\_Commands.xml

#### 4.7.3 Baud rate

The baud rate of the module can be set by selecting a baud rate from the drop-down list and clicking the "set baud rate"-button.



Figure 19: Baud rate group of configuration view

When using OSP protocol the tool will switch the baud rate of the COM port automatically once the acknowledgement is received. When using NMEA no acknowledgement is sent by the module. The baud rate of the port has to be changed manually by disconnecting and connecting again with the new baud rate as described in chapter 4.3.

#### 4.7.4 Update rate



If update rate or message types are configured in a way that the resulting message rate is higher than the default configuration it is advised to increase the baud rate. Otherwise messages might get lost and request are performed with a delay.

Update rate configuration effects all enabled NMEA and OSP messages. It is advised to increase the baud rate prior to increasing the update rate. The command to change the update rate is sent when the selection of the radio buttons changes. There will be no acknowledgement.

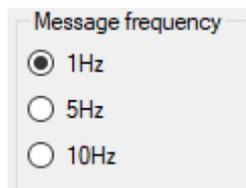


Figure 20: Update rate group of configuration view



Selecting an update rate of 10Hz has no effect on Elara-I and Elara-II.

#### 4.7.5 Message types

The configuration of message types is only available using the NMEA protocol.

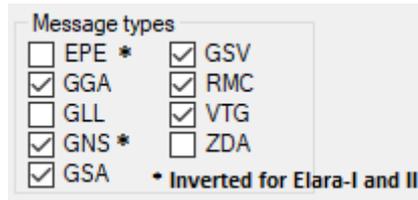


Figure 21: Message types group of configuration view

The standard message types of the NMEA protocol can be enabled and disabled by checking or unchecking the respective box. There will be no acknowledgement.

Message type	Description
EPE	UTC Time and expected position error
GGA	Time, position and fix type data
GLL	Latitude, longitude, UTC time of position fix and status
GNS	Position data
GSA	Time, position and fix type date
GSV	Satellite information and DOP values
RMC	Time, date, position, course and speed data
VTG	Course and speed data
ZDA	PPS timing message

Table 7: Description of message types



When using the Elara family EPE and GNS are inverted as the command is used differently. The software does not make a difference between the different modules yet. To enable or disable EPE please use the checkbox for GNS and vice versa.

### 4.7.6 Output

The output controls allow to change the display of the received messages. By toggeling the "Show output" checkbox, the output of the messages can be enabled or disabled. Disabling the output of the messages can be helpful when analyzing message history.

Messages can be shown just as received by the module

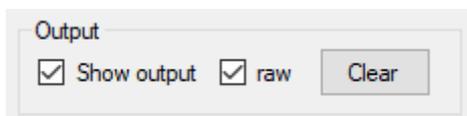


Figure 22: Show messages as received by module

or parsed and interpreted.

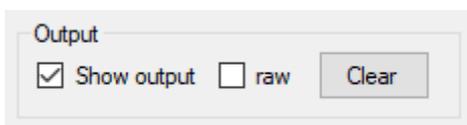


Figure 23: Show messages parsed and interpreted

These control options only change the behaviour of the GUI. The module is not affected by the changes. With the "Clear" button the received messages are cleared in the log field.

## 4.8 Utilities view

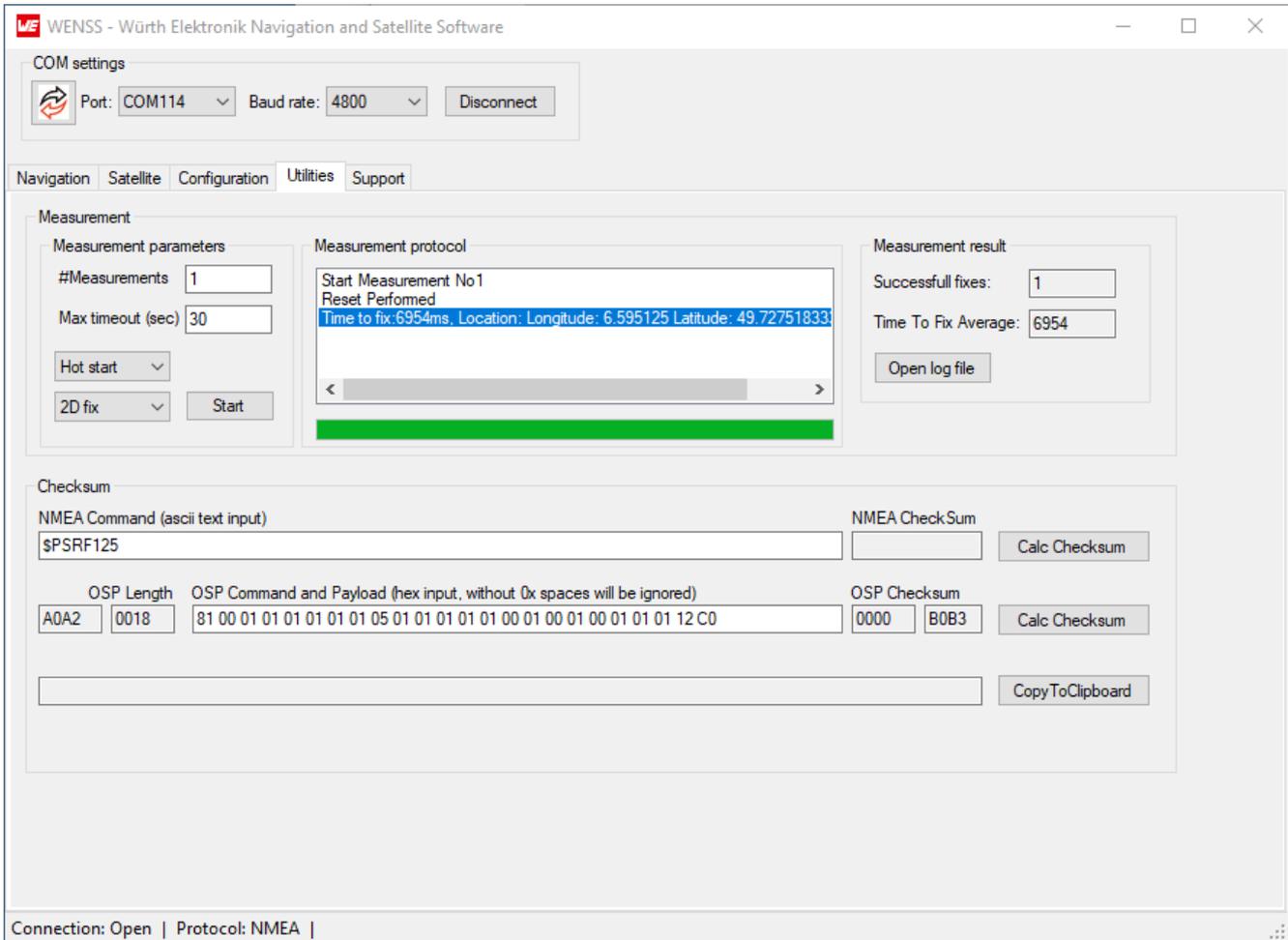


Figure 24: Utility view with various tools

### 4.8.1 Time-to-First-Fix measurement

The Time-To-First-Fix can be measured using WENSS and supports the user in a basic evaluation of receiver acquisition time after cold, warm, or hot start. When starting the measurement a reset command is sent to the module. Once the startup message is received after the reset the time until a fix is acquired is measured and logged. If the reset was not successful the program will proceed with the next measurement. This procedure is automatically repeated until the specified amount of measurements are performed. A protocol shows the current steps, which are additionally logged into a file.

The measurement can be started by clicking the "Start" button. The text of the button will switch to "Abort" while the measurement is running. One can abort the entire measurement by clicking on the "Abort" button.

For best results the following preparations should be done before starting the measurement.

- Choose a higher baudrate of 921600.

- Disable all message types except for GSA and GGA (Tab configuration)

The configurable input for the measurement is as follows:

- Measurement: Number of total measurements.
- Max timeout (sec): Maximum time to wait between reset and fix.
- Drop-Down 1: What kind of reset should be performed.
- Drop-Down 2: Fix to be waited for (2D-Fix or 3D-Fix) to consider the measurement complete.

The output of the measurements is as follows:

- Successfull fixes: Amount of successfull measurements where a fix was acquired.
- Time To Fix Average: Average time of all successfull measurements in milliseconds.
- Measurement protocol: Output information during the measurements.
- Log file containing the timings and location of acquired fix. Use Button "Open log file" to show the log file in an editor.

#### **4.8.2 Checksum calculation**

This part of the tool is meant to support the user in building up NMEA and OSP commands. In particular, the checksum of NMEA or OSP messages can be calculated using WENSS. The input for NMEA messages is the entire command until the checksum separator "\*". For OSP messages only the data part has to be entered. The length will also be adapted when calculating the checksum. By clicking the "Calc Checksum" button next to the input the respective command including the checksum will be output below. The entire command can be copied to the clipboard using the button "CopyToClipboard". To add the built command to the selection window of the configuration view, copy it into the XML file (see section 4.7.2).

### **4.9 Support**

In the last tab contains information about the software and links to further information about the modules like:

- *Product site*
- *Manual of the supported modules*
- *Support*

We appreciate any feedback about our software tool WENSS. Please use to link below to sent an email with your improvement, ideas or general feedback: [WCS@we-online.com](mailto:WCS@we-online.com)

## 4.10 Log file

NMEA and OSP messages are logged according to the current protocol, update rate and message rates. Start and end of the log file correspond to the start and end of the communication with the module (Connect button, see section ...). Log files can be used to analyze message history and evaluate module behaviour. The navigation messages will be logged as received by the module thus not parsed.

The log files can be found in the "logFiles" folder next to the executable of WENSS.

## 5 Software history

### Version 1.0.0.0 "Release"

- First released version of the tool.

### Version 1.1.0.0 "Internal Release"

- Only used internally.

### Version 1.2.0.0 "Release"

- Fix bug where UTC date and time was not shown when using OSP even after fix was acquired.
- Fix bug where COM port was not opened correctly in some cases
- Fixed typo in satellite view

### Version 1.3.0.0 "Release"

- Satellites in view were only shown once a fix was acquired. Satellites in view are now always shown, even without a fix.

### Version 1.4.0.0 "Release"

- Fix links to website
- Bugfix in parsing of message MID2
- Bugfix in parsing of message MID67,1
- Add possibility to switch between MSL and WGS84 altitude

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