



NAVIKA-300 Evaluation kit Datasheet

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1. Product Overview:

Navika-300 Eval is evaluation platform for high performance GPS –SBAS Receiver module NAVIKA-300. The Built-in USB interface provides both power supply and high speed data transfer and also eliminates the need for external power supply. Compact and Plug & Play nature of NAVIKA-300 Eval makes it ideal to use in laboratories, vehicles and many other remote places.



Figure -1: Navika-300 Evaluation kit

1.1 Evaluation kits Variants

1. NAVIKA-300 Eval for Position evaluation
2. NAVIKA-300T Eval for Timing evaluation

1.2 Accessories

1. Evaluation Unit
2. USB Cable – Type A to Type B standard cable of 0.5m length
3. Active GPS Antenna – 28dB gain antenna with 3m/5m cable length
4. CD – NAVIKA_UI , Drivers and Documentation

2. Device Description :



Figure-2: NAVIKA-300 Evaluation kit

2.1 USB

A USB 2.0 Compatible port is provided at Rear panel for data communication and power supply.

2.2 Antenna Connector (ANT)

An SMA female connector is provided at Front panel of evaluation kit for connecting Active antenna.

2.3 1PPS Connector (1PPS)

An SMA female connector is provided at front panel of evaluation kit to derive 1PPS time pulse.

2.4 LED's (PWR & FIX)

Two LED's are provided in the front panel of evaluation kit for power supply and position fix indication.

3. Product Specification

3.1 General Specification

Receiver	32 Channel L1-C/A code GPS-SBAS
SBAS Support	WAAS,EGNOS,GAGAN
Tracking Sensitivity	-163 dBm
Cold start TTFF	35 sec
Warm start TTFF	30 sec
Hot start TTFF	2-3 sec
NOTE: Active antenna kept under open sky with HDOP<2 and C/N0>40 dB-Hz	

3.2 Timing Specification

1PPS	± 10 ns, 1σ without errors
Pulse width	386 μ s (adjustable between 386 μ s to 500 ms in steps of 386 μ s)
Pulse edge	Rising (Configurable)
Pulse delay	0 ns (adjustable between -999 ns to +999ns)

3.3 Accuracy Specification

Position Accuracy (without SBAS)	<2.5m RMS
Position Accuracy (With SBAS)	<2.0m RMS
Velocity	0.1 m/s (90% without S/A)
NOTE: Active antenna kept under open sky with HDOP<2 and C/N0>40 dB-Hz	

4. NAVIKA User interface (NAVIKA_UI)

Navika_UI is a PC based user interface for GPS receivers. It is a powerful tool for evaluating the performance characteristics of the Navika GPS receivers. Besides, it allows the user to monitor the receiver and use it as a navigational aid.

4.1 System Requirements

Processor	Intel Dual core or higher
Operating System	Windows XP or higher
Memory	512 MB RAM
Disk	At least 50 MB free working space
Serial Port	COM1 to 99
Ethernet Port	At least one port that accepts 8P8C connector

4.2 Navika_UI Functions

Navika_UI supports different functions, which can be used for evaluation, testing or demonstration of various GPS receivers.

The main features are

- a. Real-time plot of the user's position on a navigation run
- b. Display of the various receiver dependent parameters
- c. Display of the satellite visibility information at the user's current position
- d. Sky plot of satellites
- e. Real time display of NMEA messages
- f. Speed and heading display
- g. Displays receiver connectivity status
- h. Record NMEA and GNSS data to specified files

4.3 Screen Layout

When you click on Navika_UI icon, the default screen that appears is shown in Fig.4.3.1. The user may select the mode in which he desires to use Navika_UI from the pop down menu items on the *Mode* item in the menu bar.

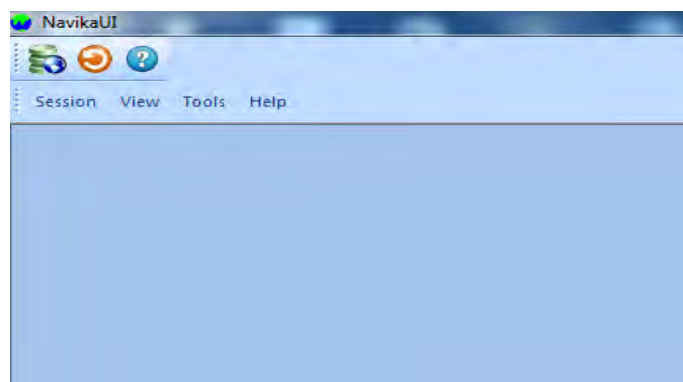


Fig. 4.3.1 NavikaUI Startup screen

On clicking *Real Time Mode*, a property sheet appears. The user can set the communication port parameters, configure message extraction settings and enable data logging.

Under *Communication* (Fig.4.3.2), the user can configure the baud rate, select the communication port from where the messages shall be available, set the number of data bits and choose the type of parity and the number of stop bits. It is possible to connect to the receiver either over serial port (USB with serial port driver is also supported).

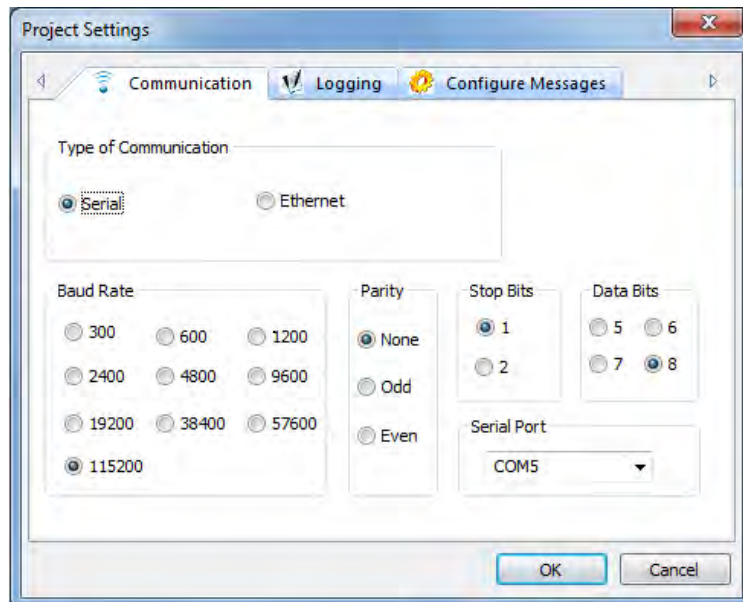


Fig.4.3.2 Communication Settings

In order to log the NMEA messages, the user can select the *Logging* tab (Fig 4.3.3). The path for the log file is specified in this configuration window.



Fig.4.3.3 Message Log Settings

When the Real Time mode is entered, the screen shown in Fig 4.3.4 is displayed.

NavikaUI provides a host of features and screens to view and monitor the performance of the GNSS receiver. These are explained below

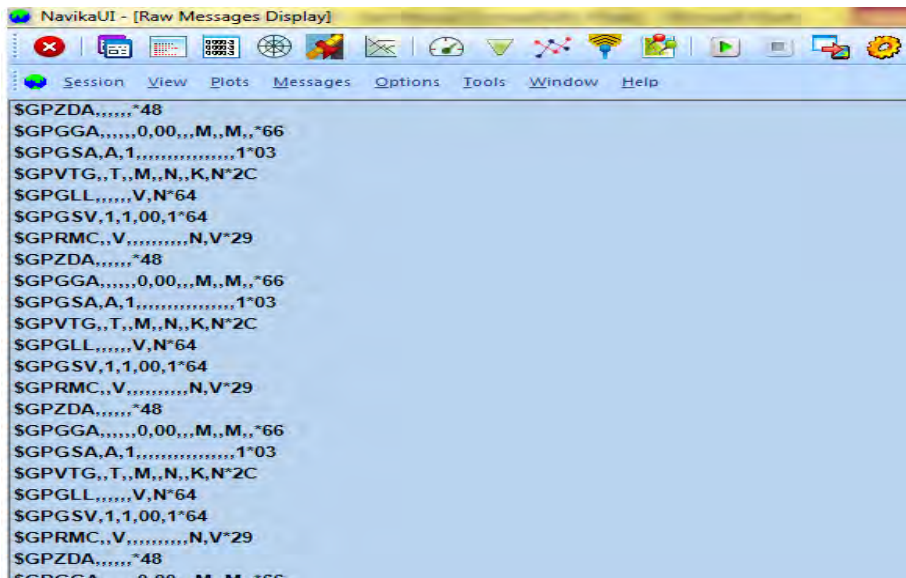


Fig: 4.3.4 NavikaUI Default Real-time Screen

Menu Bar

The Menu bar is present at the top of the NavikaUI screen. It contains drop down options as well as numerous icons to quickly open the required screen. The drop down menu options are explained in the following pages.

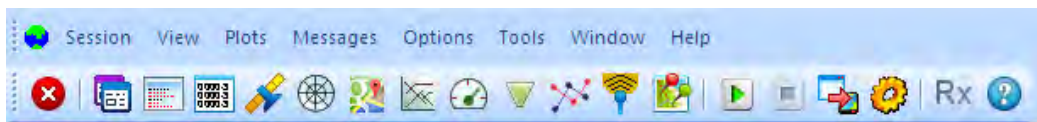


Fig: 4.3.5 NavikaUI Default Real-time Screen

Session

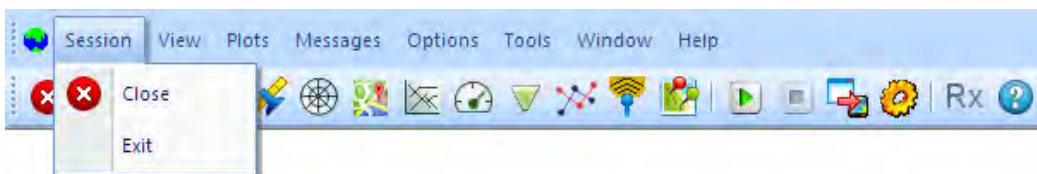


Fig:4.3.6 NavikaUI Session options

The *Session* drop down menu allows the user to close the current session or exit the application.

View

The View drop down menu provides the user with option to open several views of the current GNSS session. The same is shown in Fig 4.3.7 and explained below.

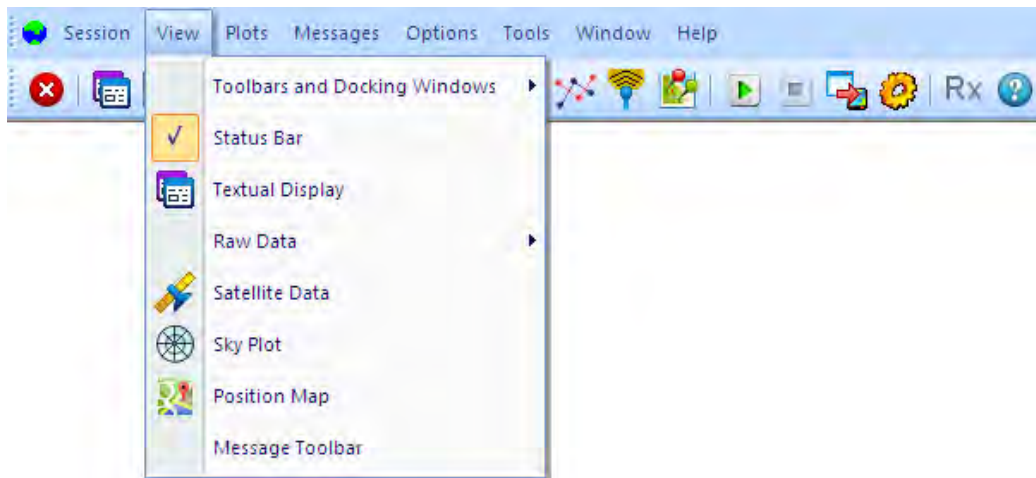


Fig: 4.3.7 NavikaUI View options

Toolbars and Docking Windows

This feature allows the user to manage the toolbar effectively. This feature is currently disabled.

Status bar

This feature allows the user to enable or disable the status bar at the bottom of the UI window.

Textual Display

This feature enables a dock-able pane which appears on the right side of the UI window. This pane has two views – *Vital Info* and *Secondary Info*, selectable through tabs provided at the bottom of the pane. The Vital Info pane provides primary information such as Position, Velocity, Time, DOP, Receiver Status, Fix Count and Satellite Availability.

The Secondary Info pane provides additional information such as

- Magnetic Data,
- DGPS information,
- Quality Indicator,
- Geo Separation,
- Mode Indicator and Signal Id.

Both panes are shown below in Fig 4.3.8

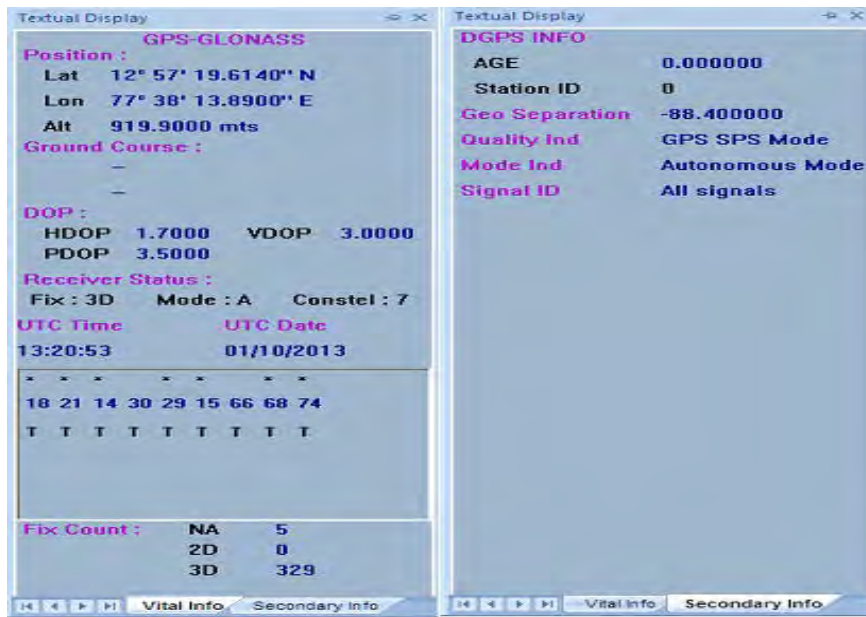


Fig: 4.3.8 NavikaUI Textual Display Panes

Raw Data

The NMEA data that is received by the UI from the GNSS Receiver can be displayed in real time in two formats – ASCII and Raw Hex. The *Raw Data* feature provides the user with the option of selecting either of the two views. The ASCII view is already captured in Fig 4.3.4. The Hex view is shown in Fig 4.3.9

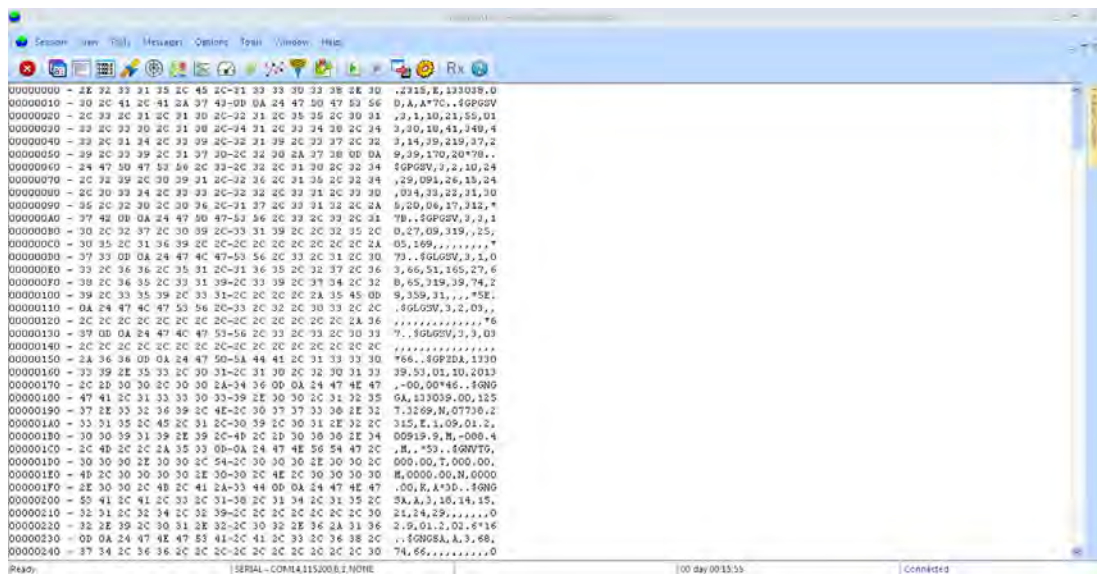


Fig: 4.3.9 NavikaUI Hex Data Display screen

Message Toolbar

The Message Toolbar provides a pull-down list of different commands that can be sent to the Navika GNSS Receiver.

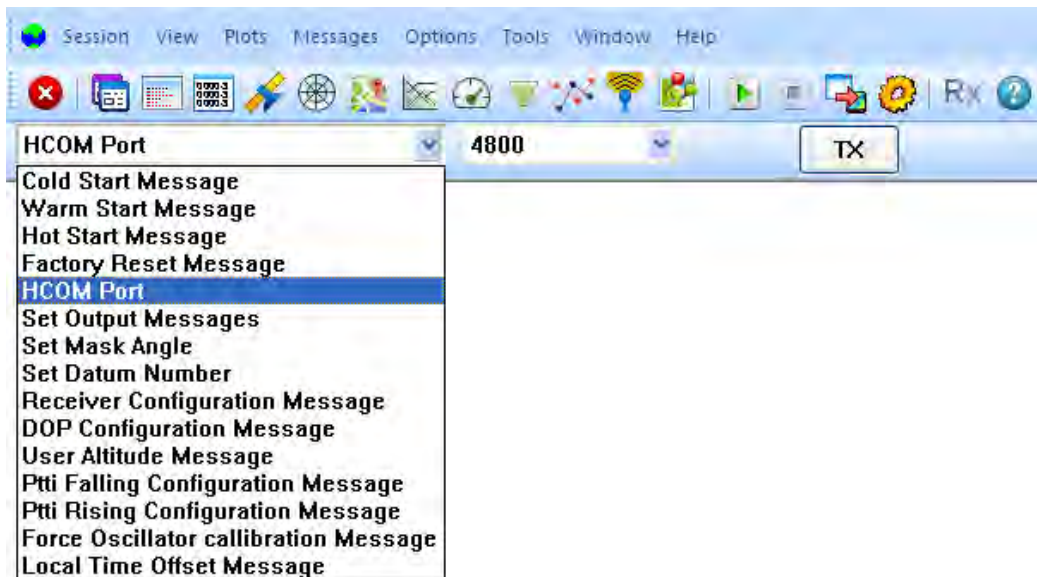


Fig: 4.3.12 NavikaUI Command List

Plots

The *Plots* menu item provides a pull-down list of the various plots that can be viewed on the UI.

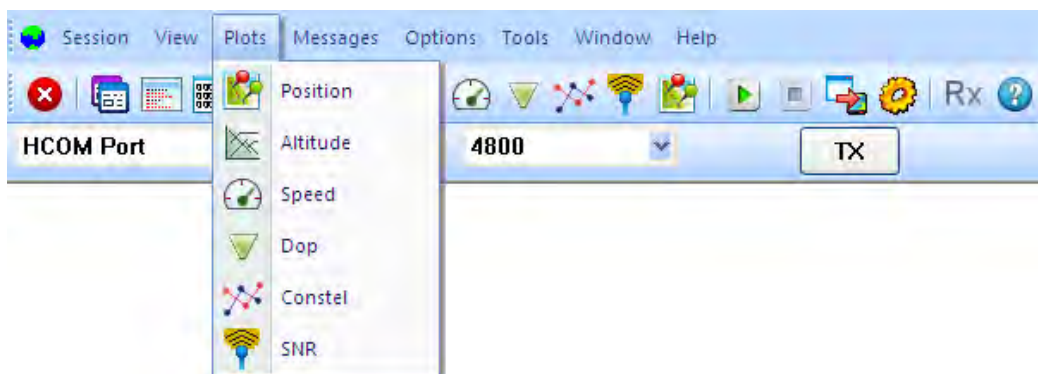


Fig: 4.3.13 NavikaUI Plots

Position

The *Position* trace plot is a graphical view of the instantaneous position co-ordinate in a grid of horizontal (latitude) and vertical (longitude) lines. Different colors are used to differentiate between the individual position co-ordinates generated from GPS, GLONASS or Combined modes. The Position plot is shown in Fig 4.3.14.

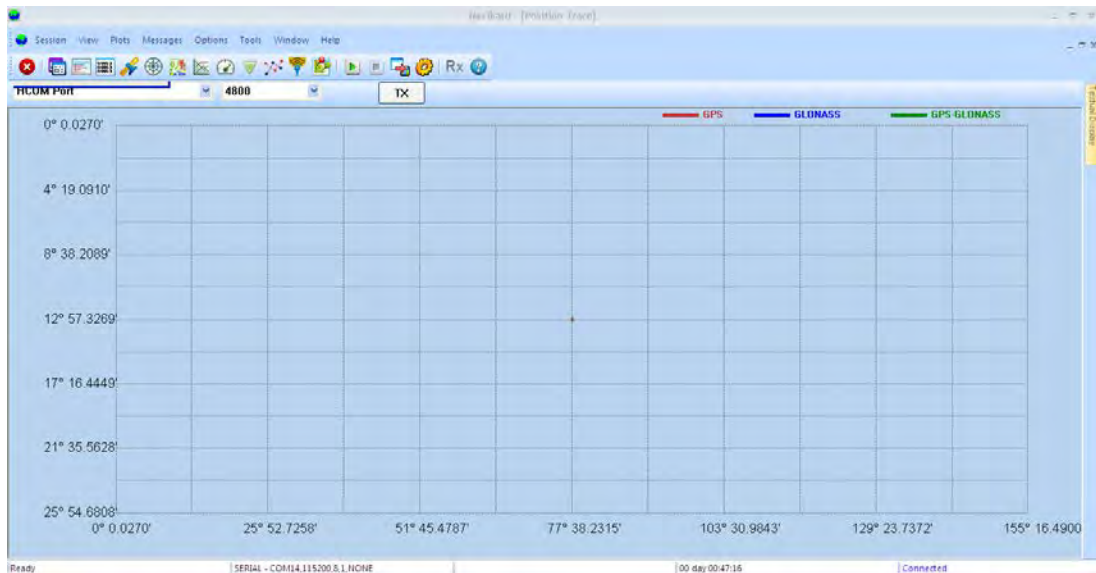


Fig: 4.3.14 NavikaUI Position Trace Plot screen

Altitude

The *Altitude* trace plot is a graphical view of the altitude over time. Different colors are used to differentiate between the individual altitudes generated from GPS, GLONASS or Combined modes. The Altitude plot is shown in Fig 4.3.15.

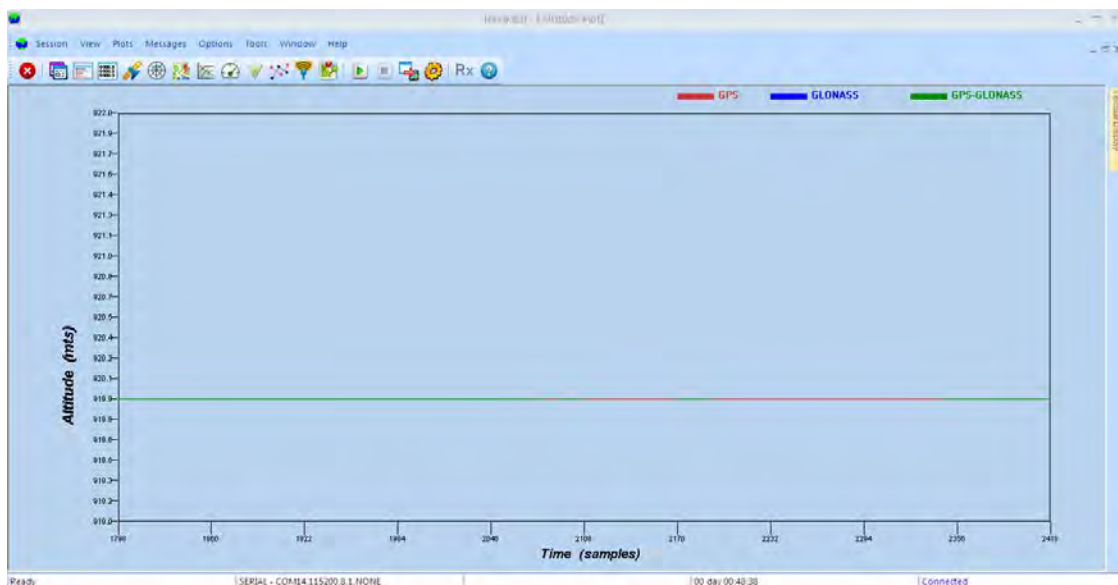


Fig: 4.3.15 NavikaUI Altitude Trace screen

Speed

The *Speed* trace plot is a graphical view of the speed over time. Different colors are used to differentiate between the individual speeds generated from GPS, GLONASS or Combined modes. The Speed plot is shown in Fig 4.3.16.

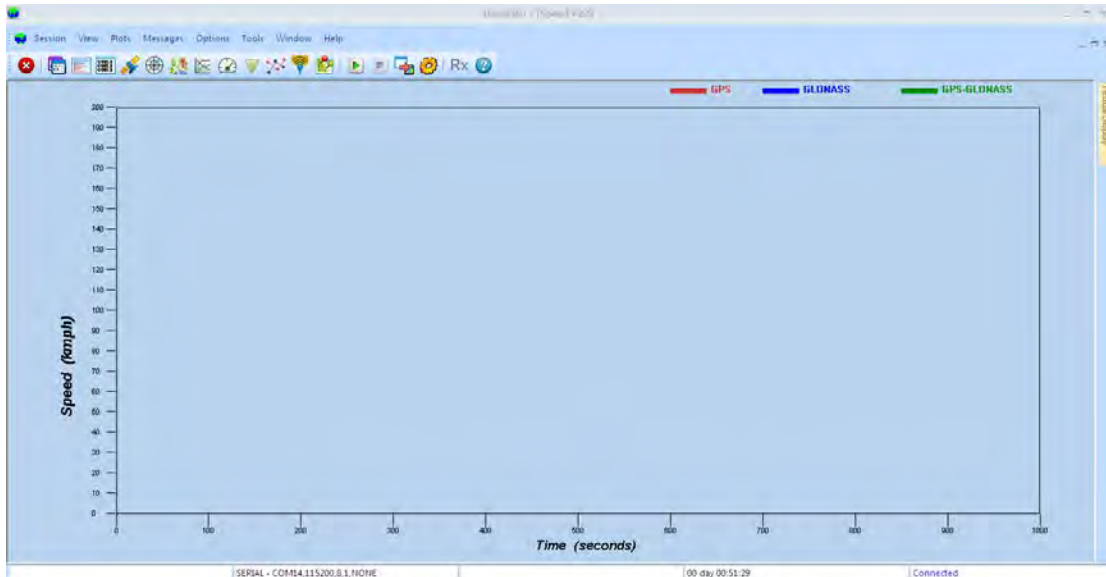


Fig: 4.3.16 NavikaUI Speed Trace screen

DOP

The *DOP* plot is a graphical view of the DOP over time. Different colors are used to differentiate between Horizontal, Vertical and Position DOP values. The DOP plot is shown in Fig 4.3.17.

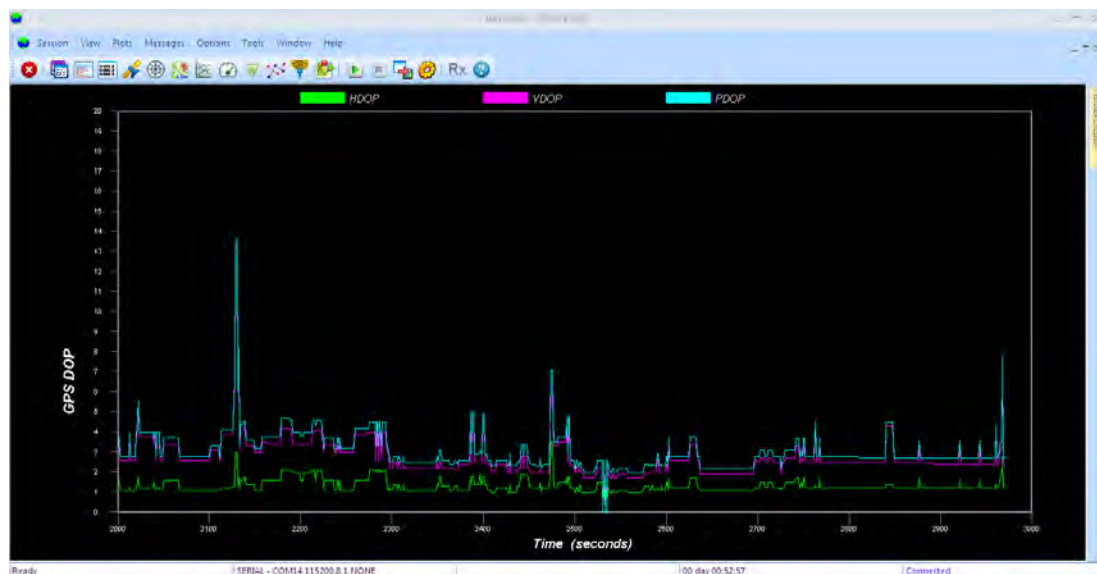


Fig: 4.3.17 NavikaUI DOP plot

SNR

The *SNR* plot is a graphical view of the Carrier to Noise ratio over time. Different colors are used to differentiate between Good, Fair and Poor signal strengths. The SNR plot is shown in Fig 4.3.18.



Fig: 4.3.18 NavikaUI SNR screen

Messages

The *Messages* option supports two features – one to enable data logging and another to transmit commands to the GNSS receiver. This is shown in Fig 4.3.19.

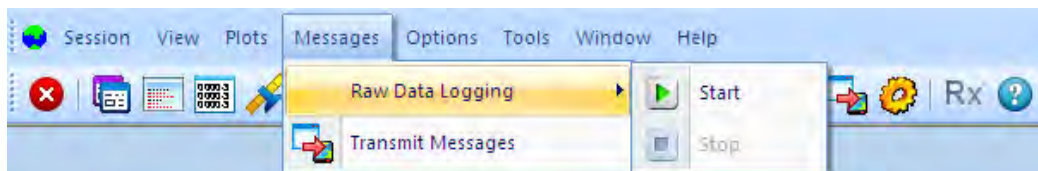


Fig: 4.3.19 NavikaUI Messages Options

Raw Data Logging

This menu item supports data log feature. Under *Raw Data Logging*, two buttons are provided to Start and Stop the data log received by the NavikaUI over either Serial or Ethernet port. Two files are generated – 'Rawdata.log' and 'Error.log'. All data that is received by the UI is stored in the 'Rawdata.log' while the erroneous data (those with missing comma, checksum mismatch etc.) are recorded into 'Error.log'.

Transmit Messages

Using this menu item, the user can transmit any valid command to the GNSS receiver over either Serial or Ethernet port. Invoking this feature opens up a command window s shown in Fig 4.3.20.

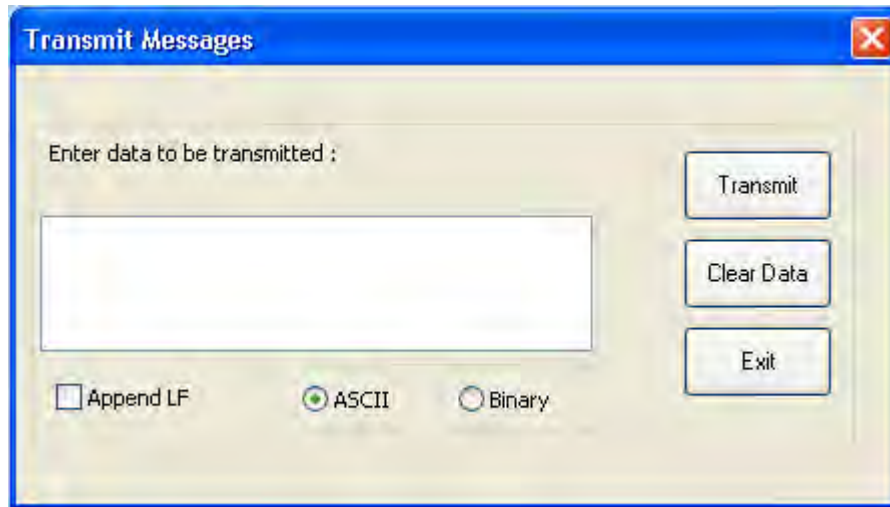


Fig: 4.3.20 NavikaUI Command Transmit window

The user can type the command in the text box provided under ‘Enter data to be transmitted’, append linefeed (if required) by checking the Append LF select button and select the data format between ASCII or Binary. The Transmit button will send the command to the receiver. Clear Data button will clear any command present in the text box.

Options

Under the *Options* menu item shown in Fig. 4.3.21, NavikaUI provides the user with options to set the units for Altitude and Speed as well as display the time in either UTC or Local standards. It also provides the user with the option to select the NMEA message from which to extract the key information like speed, location and date.

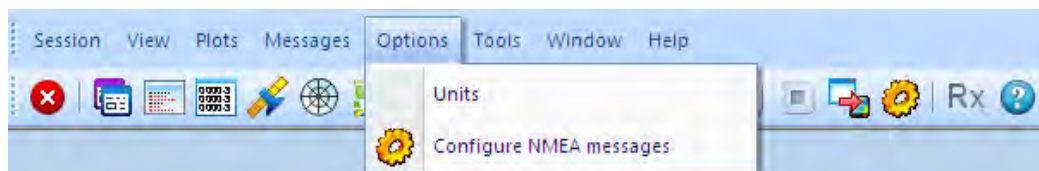


Fig: 4.3.21 NavikaUI Options

Units

The different parameters that can be set are Speed, Altitude and Time. Speed can be displayed either in Km/hr or Miles/hr. Altitude can also be displayed either in Meters or Feet. Time can display local time or the global UTC standard time. The *Unit Setting* is shown in Fig 4.3.22.



Fig: 4.3.22 NavikaUI Unit Setting window

Configure NMEA Messages

As seen in Fig. the UI provides option to select the NMEA message from which to extract the relevant information.



Fig: 4.3.23 NavikaUI NMEA Message Configuration window

Tools

Under the *Tools* menu item, NavikaUI provides some basic conversion utilities for ready reference. The same is shown in Fig 4.3.24.

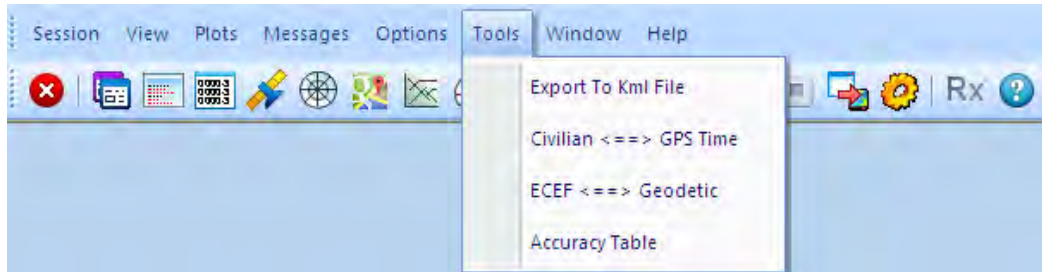


Fig: 4.3.24 NavikaUI Tools

Export To Kml File

This utility allows the user to generate a KML file of the real time data to be fed to Google Earth.

Civilian to GPS Time

This utility enables conversion between civilian time and GPS time as shown in Fig 4.3.25.



Fig: 4.3.25 NavikaUI Time Conversion Toolbox

ECEF to Geodetic

This utility enables conversion between ECEF and Geodetic co-ordinate systems. It also allows the user to select one among 50 datums.

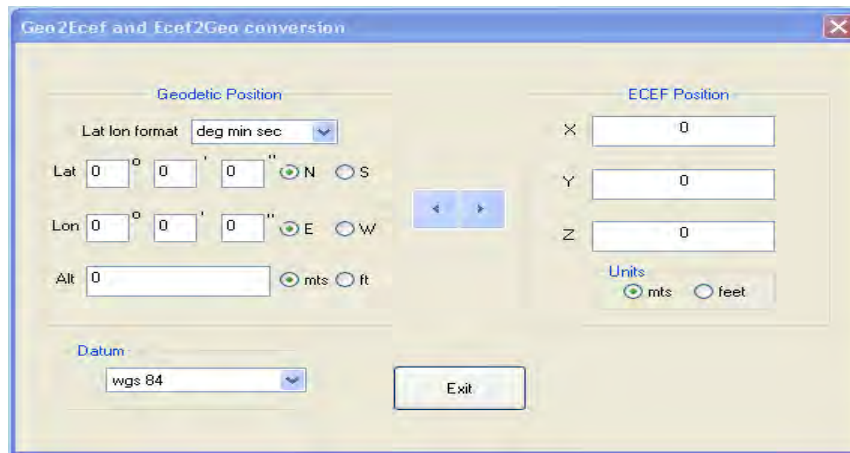


Fig: 4.3.26 NavikaUI Co-ordinate Conversion Toolbox

Accuracy

This utility allows the user to convert between different units of accuracy commonly found in GPS receiver datasheets. This allows apple to apple comparison between different receivers.

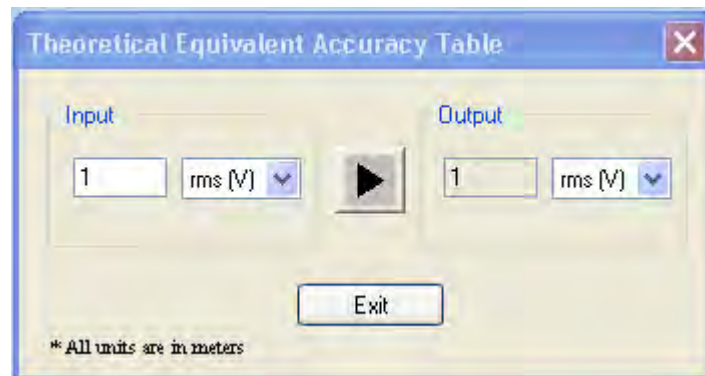


Fig: 4.3.27 NavikaUI Accuracy Conversion Toolbox

Accelerators

NavikaUI also supports keyboard combinations to quickly invoke a feature. The supported key combinations and the corresponding functionality is tabulated below.

Accelerator (short cut keys)	Function
Ctrl + T	Initiates Transmit messages feature
Ctrl + M	Initiates Message Toolbar feature

Shortcut Icons

All the features described in the above sections can be invoked by corresponding shortcut icons. These are provided below the menu bar and taking the mouse cursor on each icon highlights and indicates the purpose of the icon.



Fig: 4.3.28 NavikaUI Icons

5. Standard NMEA Message formats

NMEA 0183 interface protocol defines the communication interface and the data format for the navigation equipment. This chapter provides an overview of the NMEA messages supported

Message	Description
GGA	GPS Fix Data
GLL	Geographic Position
GSA	GPS DOP and active satellites
GSV	GPS Satellites in view
RMC	Recommended Minimum specific GPS/Transit data
VTG	Track made good and ground speed
ZDA	Time and date

GPZDA message

ZDA message contains UTC time, day, month, year and the local time zone.

```
$GPZDA , hhhmss . s , dd , mm , yyyy , aa , bb *CS<CR><LF>
```

Field	Details
hhmmss.s	UTC time hh -> 2 digits of hour. mm -> 2 digits of minutes ss.s -> 2 decimal digits and one fractional digit of second
dd	2 digits of day
mm	2 digits of month
yyyy	4 digits of year
aa	Zonal Time offset in hours with respect to GMT. If the time offset is negative a "-" sign is padded before the hours field. This field is not updated.
bb	Zonal Time offset in minutes with respect to GMT. Sign is same as that of the hour field. This field is not updated.
*	Check sum delimiter
CS	Check sum

GPGGA message

The GGA message includes time, position fix and other position related information of GPS unit.

```
$GPGGA , hhmss . s , llll . llll , a , yyyyy . yyyy , b , q , nn , hh .h ,aaaa . a , M , sss .s , M , aa , aaaa *CS<CR><LF>
```

Field	Details
hhmss.s	UTC time of position fix hh -> 2 digits of hour. mm -> 2 digits of minutes ss.s -> 2 decimal digits and one fractional digit of second
llll.llll	Latitude in <degree degree minutes minutes . minutes minutes minutes minutes > format
a	N for North, S for South
yyyyy.yyyy	Longitude in < degree degree degree minutes minutes minutes minutes minutes > format
b	E for East, W for west
q	Quality indicator 0 -> No GPS, 1-> GPS, 2->DGPS
nn	Number of satellites in use
hh.h	HDOP
aaaa.a	Altitude in meters, if altitude is negative "-" is padded before aaaa.a
M	Units of altitude M -> meters.
sss.s	Geoidal separation in meters. If negative, "-" is padded before sss.s
M	Units of geoidal separation in meters
aa	Age of DGPS data. Field valid only when the quality indicator is 2 (DGPS)
aaaa	Station ID: 0-9999. Valid only in DGPS fix mode.
*	Check sum delimiter
CS	Check sum

GPGLL message

This message includes latitude, longitude, time of position fix and the status information

```
$GPGLL , llll . llll , a , yyyyy . yyyy , b , hhmss . s , c *CS<CR><LF>
```

Field	Details
llll.llll	Latitude in <degree degree minutes minutes. minutes minutes minutes minutes> format
a	N for North, S for South
yyyyy.yyyy	longitude in < degree degree degree minutes minutes . minutes minutes minutes minutes > format
b	E for East, W for west
hhmmss.s	UTC time of position fix. hh -> 2 digits of hour. mm -> 2 digits of minutes ss.s -> 2 decimal digits and one fractional digit of second
c	A -> position is available. V -> position is not available
*	Check sum delimiter
CS	Check sum

GPRMC message

This message includes time, date, position and speed information from the GPS unit

\$GPRMC , hhmmss . s , A , llll . llll , a , yyyyy . yyyy , b , ssss . ss , hhh . hh , ddmmyy , mm . m , d *CS<CR><LF>

Field	Details
hhmmss.s	UTC time of position fix hh -> 2 digits of hour. mm -> 2 digits of minutes ss.s -> 2 decimal digits and one fractional digit of second
A	A -> position is available. V ->position is not available.
llll.llll	Latitude in <degree degree minutes minutes. Minutes minutes minutes minutes > format
a	N for North, S for South
yyyyy.yyyy	Longitude in < degree degree degree minutes minutes . minutes minutes minutes minutes> format
b	E for East, W for west
ssss.ss	Speed over ground in Knots
hhh.hh	Heading in degree with respect to true north
ddmmyy	<day day month month year year>

mm.m	Magnetic variation in degree This field is not valid
d	Direction of magnetic variation, This field is not valid
*	Check sum delimiter
CS	Check sum

GPGSA message

This message indicates the satellite used for navigation, DOP values of the position fix

```
$GPGSA , a , m , s1 , s2 , s3 , s4 , s5 , s6 , s7 , s8 , s9 , s10 , s11 , s12 , pp . p , hh . h , vv . v
*CS<CR><LF>
```

Field	Details
a	Mode could be manual or automatic A ->Automatic mode. In this mode the unit automatically switches between 2D and 3D mode Depending on the PDOP and satellite masks. M ->Manual mode. In this mode the unit is forced to operate in either 2D or 3D mode.
m	Mode 1 -> Fix not available, 2 -> 2D position fix, 3-> 3D position fix.
sl....s12	PRN number of the satellites used for position fix. If less than 12 satellites are used, null in unused fields
pp.p	PDOP
hh.h	HDOP
vv.v	VDOP
*	Check sum delimiter
CS	Check sum

GPGSV message

This message sends the information of all the visible satellites. The C/No is updated for all tracking satellites.

```
$GPGSV , t , n , xx , aa , ee , zzz , cc , aa , ee , zzz , cc , aa , ee , zzz , cc , aa , ee , zzz , cc
*CS<CR><LF>
```

Field	Details
t	Total number of messages which is 3 always
n	Message number (1 to 3)
xx	Total number of satellites in view
aa	Satellite PRN number
ee	Elevation angle in degree. 00 to 90
zzz	Azimuth in degree with respect to true north. 000 to 359
cc	SNR of tracking satellites in dB. Null if not tracking
*	Check sum delimiter
CS	Check sum

GPVTG message

This message indicates the heading and speed relative to ground

\$GPVTG , ddd . dd , T , ddd . dd , M , ssss . ss , N , ssss . ss , K *CS<CR><LF>

Field	Details
ddd.dd	Track degree 0-360
T	True North
ddd.dd	Magnetic track. This field is not valid
M	Magnetic
ssss.ss	Speed in Knots
N	Knots
ssss.ss	Speed in Km/hr
K	Km/hr
*	Check sum delimiter
CS	Check sum

6. Ordering Information

Ordering Part Number	Description
NAVIKA-300 Eval	Evaluation kit for position evaluation
NAVIKA-300T Eval	Evaluation kit for 1PPS Evaluation