EX-100
Single-Ant GNSS/INS

EXLP-100
Single-Ant GNSS/INS

gX-100
Single-Ant GNSS/INS

Navigation Manual

VERSION 1.00

AUGUST 2025

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ABBREVIATIONS

Abbreviation	Description
AHRS	Attitude Heading Reference System
BIN Message	Binary Message
CEP	Circular Error Probability
CSEP	Calculated Separation
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
MSEP	Measured Separation
N/A	Not Available
N/C	Not Connected
PVT	Position, Velocity, Time
RMS	Root Mean Square
TBD	To Be Determined
UKF	Unscented Kalman Filter
VG	Vertical Gyro

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Ver. #	Description	Author/s	Date
1.00	Nav Eval SW Manual (xX100)		August 2025

1. INTRODUCTION

The arazim evaluation Navigation software is based on the SDK provided and is used to evaluate arazim Navigation systems.

Figure 1 shows sample evaluation kits for xX100 devices.

Figure 1. Sample Evaluation Kits for xX100 Devices

2. GETTING STARTED

Table 1 lists the area names and functions in the arazim navigation evaluation software home screen. Figure 2 shows the location of each area referred to in Table 1.

The information displayed in the home screen depends on the selected/detected system.

Table 1. arazim Navigation System Evaluation Software Home Screen

No.	Name	Purpose
1	Main Menu	Menu item navigation
2	Toolbar	Includes icons to control: • Navigation device comm port • Recording • Playback • Single sample viewing
3	Message View	• Graphic view • Numeric view (default)
4	Message Selector	• Changes frame lock and updates "Message Content" depending on selected message. The default is NAVIGATIONs Tilt-2.
5	Message Content	Information on: • Field name • Field value • Eng units • Notes
6	System BIT Flags Information	System built-in test, performed before data frame transmission. The color indicators to the left of each item indicate whether those items are functioning properly and are communicating with the host controller. • Green = Functioning Properly • Red = Error • Black = Default, before beginning communication with the device

No.	Name	Purpose
7	Incoming Messages	Indicates the detected incoming Navigation messages. You can only select messages from Reference 4, that match one of the incoming messages.
8	Message Information	Incoming messages Status-bar, Includes information on: • Message Type selected • Message Rate • Message Error • Total Messages Rate (user and system messages)
9	Status Information	Information on: • Device Comm port Status • GPS Comm port Status • Navigation System Platform name (Reference 10) • DLL Version • Device Status (for example, “Waiting for GPS Lock”)
10	Platform Name	The platform name changes according to which VG/AHRS device is connected.

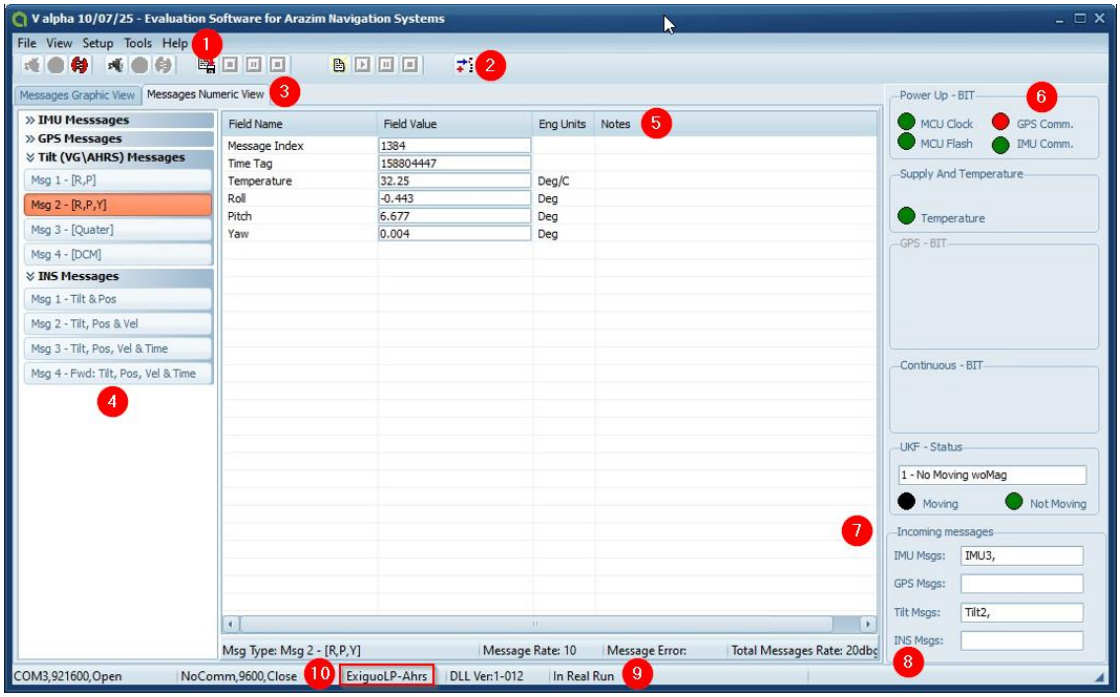


Figure 2. arazim Navigation Evaluation Software Home Screen

3. DATA VIEW

The evaluation software features both a **Messages Numeric View** tab (the default – to view the data fields of one selected message) and a **Messages Graphic View** tab (to view the data fields as numeric and graphic of more than one selected message).

3.1. BIT Indicator Panels

The BIT indicators display the statuses of the built-in tests. The status of tests performed only during system initialization does not change. These BIT indicators should be tested only after system initialization. Other BITs are continuous, and the application should be aware of their status as long as the device is active.

Table 2. BIT Indicator Panel Comparisons

gX100	EXLP100	EX100
		

The BIT indicators may be:

- **Black** to indicate that the test was not performed
- **Green** to indicate that the test succeeded
- **Red** to indicate that the test failed

3.1.1. Power-Up BIT

The BIT indicators in the Power-up BIT (built-in tests) section display the status of the built-in tests, which are only performed during system initialization. The statuses of these BIT indicators remain the same while the device is active.

Each of the BIT tests are discussed below.

- If the **MCU Clock** indicator is green, the system has finished configuring the system-clock and all MCU peripherals have completed the configuration and initialization processes.
- If the **GPS Comm.** indicator is green, the device is communicating with the GPS, based on the checksum result of incoming messages. The indicator is green as long as at least one message has been received properly during the BIT test.
- If the **MCU Flash** indicator is green, the data checksum in user flash memory is correct. However, if the MCU Flash BIT is red, meaning that the checksum is incorrect, the system loads the default configuration.

Note	A red MCU Flash indicator may also mean that no configuration was burned to flash memory. If that is the case, click **Burn to Flash** (in configuration mode) to burn the configuration to flash memory.

- If the **IMU Comm.** indicator is green, the device is communicating with the IMU. During system initialization, the system checks the IMU configuration regarding sampling rate, frame rate, and other factors. This indicator is green only if all the communication checks pass.

3.1.2. Supply and Temperature BIT

The BIT indicators in the Supply and Temperature BIT (built-in tests) section display the statuses of continuous monitoring of power and temperature. These built-in tests are performed while the device is active, and its value/state may change according to the measured conditions.

- The **Vin** indicator is shown and relevant only in the gX100 platform. If the **Vin** indicator is green, the system's voltage-in is within the allowed threshold range.
- If the **Temperature** indicator is green, the system's environment-temperature is within threshold range, configured by the user, using the Configuration form.

3.1.3. Continuous BIT

Continuous BIT is not relevant to EX100, EXLP100, gX100.

3.1.4. UKF Status BIT

The BIT indicators in the UKF Status BIT (built-in tests) section continuously display the statuses of the UKF. These built-in tests are performed while the device is active, and its value/state may change according to the measured conditions.

The UKF status indicates using two BIT flags whether the state detected is static (not Moving) or dynamic (Moving). Any of these statuses is supported by a numeric value that describes the current system state.

Table 3 lists the optional numeric state values.

Table 3. UKF status – Numerical State Value

Value	Value Indication	Description
0	Non-Moving	System has detected static condition (wPOS, wMag, woVel)
1	Non-Moving	System has detected static condition (wPOS, woMag, woVel)
2	Non-Moving	System has detected static condition (woPOS, wMag, woVel)
3	Non-Moving	System has detected static condition (woPOS, woMag, woVel)
4	Moving	System has detected dynamic condition (wPOS, wMag, Vel>Th)
5	Moving	System has detected dynamic condition (wPOS, woMag, wVel)

Value	Value Indication	Description
6	Moving	System has detected dynamic condition (wPOS, wMag, Vel<Th)
7	Moving	System has detected dynamic condition (wPOS, woMag, woVel)
8	Moving	System has detected dynamic condition (woPOS, wMag, woVel)
9	Moving	System has detected dynamic condition (woPOS, woMag, woVel)

3.2. Messages Numeric View

The **Messages Numeric View** tab is the system default view.

1. The left portion of this view shows a list of messages available for a selected Navigation device (Figure 2, Reference 4)
   For example:
   a. IMU Messages
      i. Raw Data (factory use)
      ii. 6DOF – IMU 3xAcc + 3xGyro
      iii. 9ODF – 6DOF + 3xMag (+ Baro)
      iv. Misc. Sensors
   b. Tilt (VG/AHRS) Messages
      i. [R, P] – Tilt information: Roll & Pitch
      ii. [R, P, Y] – Tilt information + Yaw
      iii. [Quater] – Quaternion information
      iv. [DCM] – DCM information
2. The main portion of this view (Figure 2, Reference 5) shows:
   a. **Field Name**: the sensor source name
   b. **Field Value**: the current sample value
   c. **Eng. Units**: the engineering unit for the field value
   d. **Notes**: general remarks about this field
3. The Status Bar of the main portion of this view shows:
   a. **Message Rate**: the number of times a selected message was received per second (Figure 2, Reference 4)
   b. **Message Error**: the number of times an error message was received per second (Figure 2, Reference 5)
   c. **Total Messages Rate**: the total number of user and system messages received per second (Figure 2, Reference 6).

4. Platform Name
   The platform name (Figure 2, Reference 10) can be valid for Exiguo (EX100), ExiguoLP (EXLP100), and gINS (gX100), which all use the VG/AHRS algorithm.
5. The right portion of this view shows a panel with all BIT indicator information (Figure 2, Reference 6). These indicators are arranged in user-friendly groups

3.3. Messages Graphic View

The **Message Graphic View** provides a graphic view of the real-time values of message information. Some views show information from multiple messages (for example, INS + GNSS information).

The four tabs under **Messages Graphic View** are arranged by interest and message type as follows:

- **VG/AHRS** shows Roll, Pitch and Yaw fields both numerically and graphically.
- **IMU** shows IMU raw data fields both numerically and graphically.
- **GPS** Values are irrelevant for this system.
- **INS** Values are irrelevant for this system..

To view **VG/AHRS** messages:

1. Make sure that messages Tilt [R, P] or Tilt [R, P, Y] are enabled in the device configuration.
2. Select **Messages Graphic View**.
3. Select the **VG/AHRS** tab.
   a. Under **Attitude [Deg]**, the numerical values for the roll, pitch, and yaw are displayed in addition to being displayed in the graphs to the right.
   b. Under **Temperature [Deg/C]**, a numerical temperature value is displayed

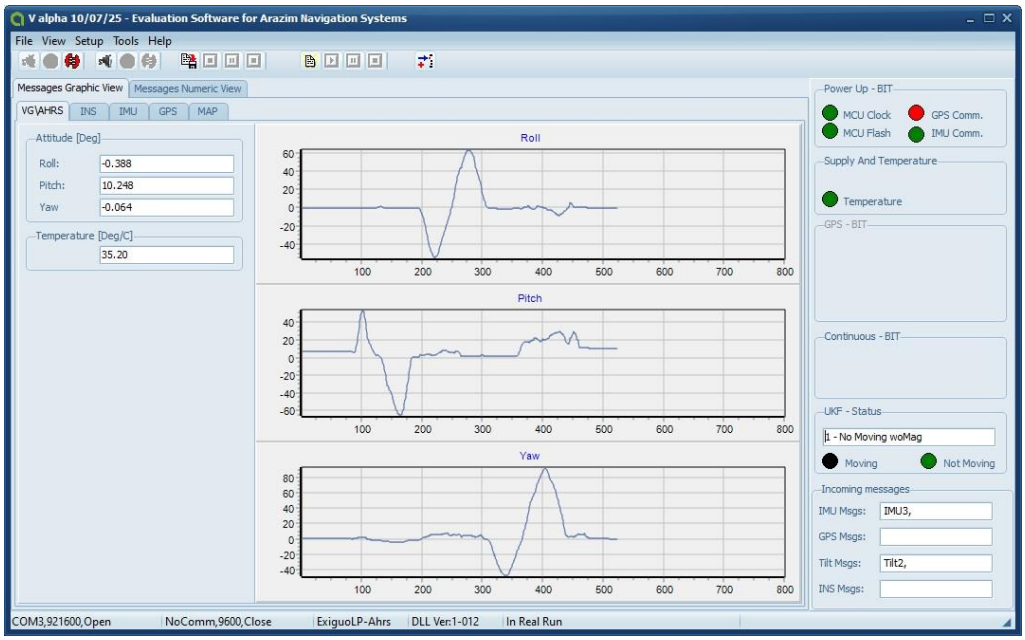


Figure 3. Messages Graphic View – VG/AHRS

To view **IMU** messages:

1. Make sure that IMU_2 or IMU_3 messages are selected in the device configuration.
2. Select **Messages Graphic View**.
3. Select the **IMU** tab.
   a. **Acceleration [g]** shows the numerical values for Acc-X, Acc-Y, and Acc-Z. These values are also displayed in the graph to the right.
   b. **Gyros [Deg/Sec]** shows the numerical values for Gyro-X, Gyro -Y, and Gyro -Z. These values are also displayed in the graph to the right.
   c. **Magnetometers [Raw]** shows the numerical values for Mag-X, Mag -Y, and Mag -Z. These values are also displayed in the graph to the right.
   d. **Other Sensors** shows the numerical values for temperature (Temp [Deg/C.]), Odometer (Odo [Km/H]), and Barometer (Baro [P]). These values are also displayed in the graph to the right.

Figure 4. Messages Graphic View – IMU

3.4. Connect to a Navigation Device

Verify that:

- The Host (PC running Windows 10 or above) is connected to the navigation device via a USB to an RS-232/RS-422 converter.
  The type of converter depends on the device communication channel type.
- The navigation device is connected to an active and adequate energy source (according to the Navigation Platform specifications).

Before working with a navigation device, the evaluation software must be aware of that device either:

- Automatically – The navigation software automatically detects the device (default) or
- Manually – You select the connected device from the menu of available devices.

3.4.1. Automatic Device Detection

1. Go to **Tools>Developer>Enable System Detection** and verify that **Enable System Detection** is checked to automatically detect a navigation device when a communication port is opened.
2. To select communication port, go to **Setup>Device Comm, Port>Select Port…** or click **Select Comm Port for Nav Device** in the toolbar () (Figure 1 and Figure 2, Reference 1).
   In the dialog box:
   a. Select a communication port.
   b. Select a baud rate (default baud rate is 921,600).
3. To open the communication port, go to **Setup>Device Comm. Port>Open Port** or click **Open Nav Device Comm Port** in the toolbar () (Figure 1 and Figure 2, Reference 2).
4. Wait for device to reach “In Real-Time” status.
5. Check the incoming messages (Figure 2, Reference 7).
6. Select a message view (default = **Messages Numeric View**). (Figure 1, Reference 9).
7. Select a message to view (Figure 2, Reference 4).

3.4.2. Manual Device Configuration

1. Go to **Tools>Developer>Enable System Detection** and verify that **Enable System Detection** is unchecked so that a Navigation device is not automatically detected when the communication port is opened.
2. Go to **Tools>Developer>Select System** and select a Navigation device from the list.
3. Verify that the selected Navigation device is in the list.
4. To select the communication port, go to **Setup>Device Comm. Port>Select Port…** or click **Select Comm Port for Nav Device** () in the toolbar (Figure 1 and Figure 2, Reference 1).
   In the dialog box that is displayed:
   a. Select a communication port.
   b. Select a baud rate (default baud rate = 921,600).
5. To open the communication port, go to **Setup>Device Comm. Port>Open Port** or click **Open Nav Device Comm Port** () in the toolbar (Figure 1 and Figure 2, Reference 2).

6. Wait for device to reach “In Real-Time” status.
7. Check the incoming messages (Figure 2, Reference 7).
8. Select a message view (default = **Messages Numeric View**). (Figure 1, Reference 9).
9. Select a message to view (Figure 2 – Reference 4).

3.4.3. Post-Selection and Detection Phases

After the device is turned on and the selected communication port is correctly connected and open, the device goes through the following phases:

1. Bias estimation
   (Do not move the device until after the device sends a notification that bias estimation has finished.)
2. In Real-Run (the device is activated and can begin sending messages)

3.5. Recording and Saving Messages

To record incoming message information:

1. Click  (Select Destination File Name for Recording).
   a. Select or enter a file name.
   b. Save the file as either a *.dat file or a *.bin file.

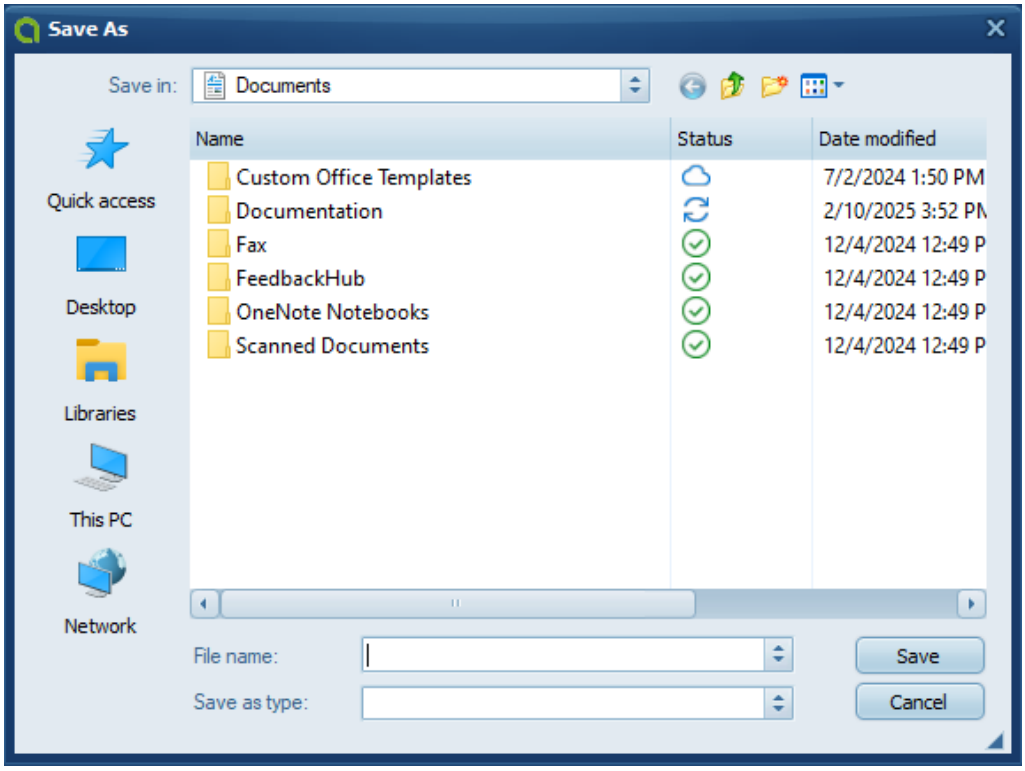


Figure 5. Save File

2. Click **Start Recording** (Figure 1 and Figure 2, Reference 3) to record incoming messages to the file you created.
3. Click **Stop Recording** (Figure 1 and Figure 2, Reference 5) when you have finished recording.

Note	Recording length is unlimited and depends on your needs. Since the file you recorded is in a proprietary format, you must export it to to a comma-delimited file in order to view/use it with other softwares.

To export the recorded file to a comma-delimited file:

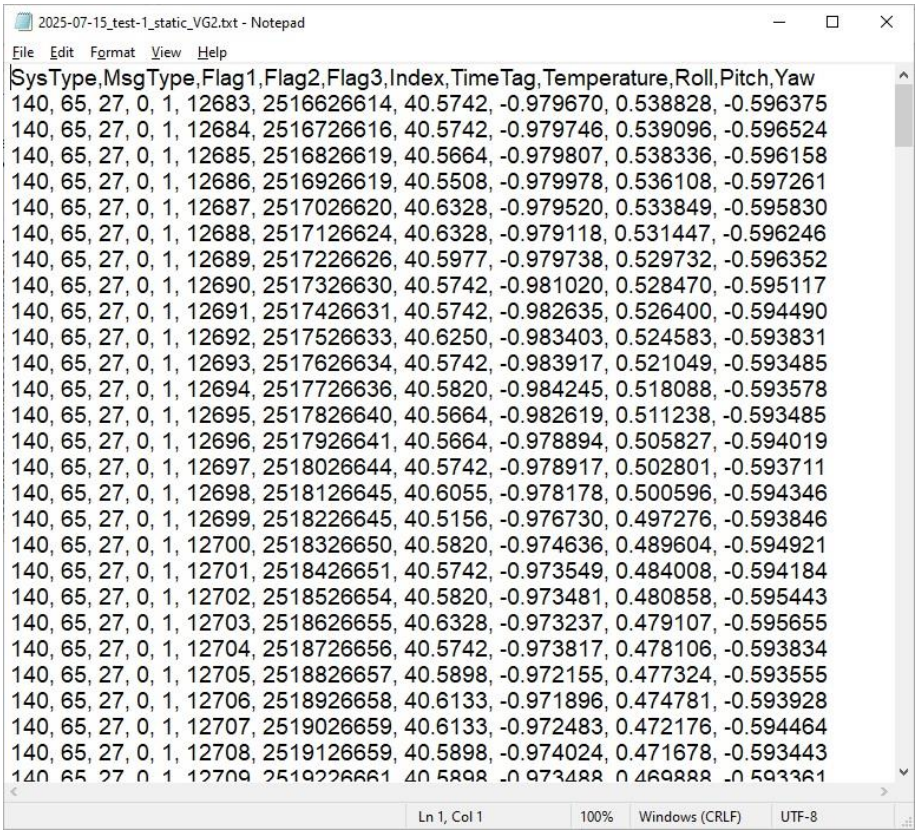
1. In the main menu, go to **File>Export.**
   Open Dialog is displayed.
2. Double click on the file name you created (*.dat or *.bin extension) or select the file and click **Open** to create a text file (*.txt or *.csv extension).
3. If the export succeeds, an “Export Complete” notification is displayed. Figure 6 shows a sample *.txt file.
4. 

Figure 6. Sample *.txt File

4. VIEW CONTROL

Go to the **View** tab in the main menu to control the view as described below.

4.1. Form Style

You can edit the screen display style, based on your preferences.

To edit the screen presentation style:

1. In the main menu, go to **View** and select **Form Style**.
   The **Form Style** dialog is displayed (Figure 7).

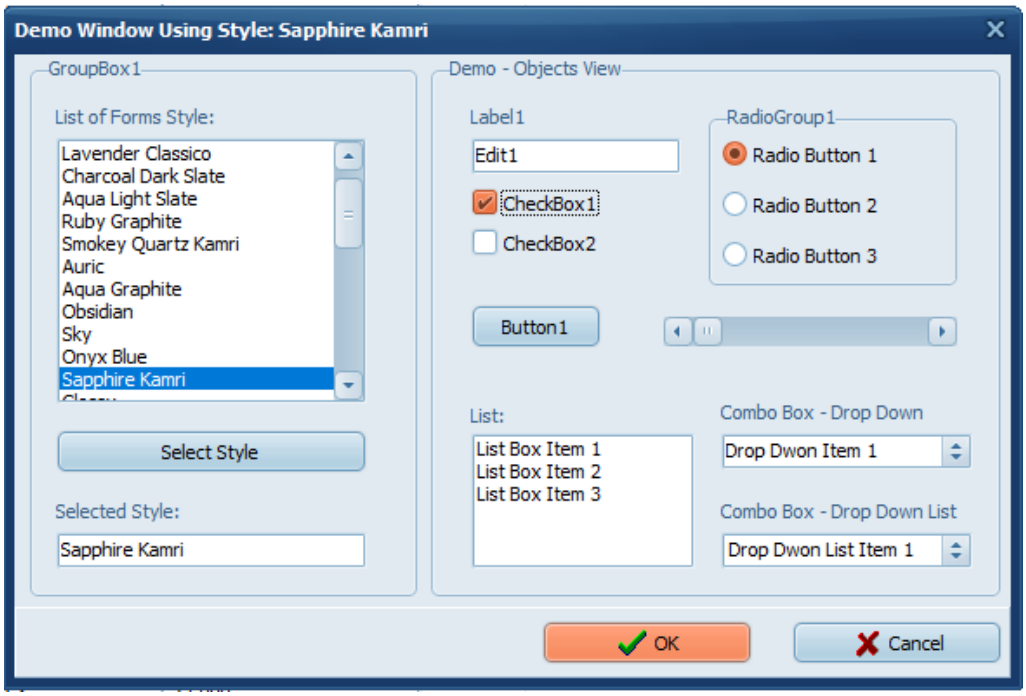


Figure 7. Forms Style

2. Under **GroupBox1>List of Forms Style**, select a style and click **Select Style**.
   The style you selected is displayed in the **Selected Style** field.
3. Under **Demo-Objects View**, you can select the appearance of:
   a. Check boxes
   b. Radio buttons
   c. List items
   d. Combo boxes
4. Click **OK** to save your form style selections.

4.2. Monitor Communication with Device

You can view the communication process between the device and the software.

To view communications:

1. In the main menu, go to **View** and select **Monitor Device Comm**. **Track Process Information** is displayed, where you can view all device communication actions.
2. Click **Clear** to clear all displayed actions.
3. Click **Pause** to pause the display of all actions to focus on specific items.
4. Click **Release** to restart the display of all actions.
5. Click **Close** to close the **Track Process Information** window.

Note	By default, the Monitor is set to be: Stay On Top. The user can disable this view mode by selecting from the Main Menu: Tools->Developer->Monitor View->Normal

4.3. Show/Hide BIT Flags Panel

Use the **Built-in Test (BIT)** panel to detect any failed test. Table 2 shows the BIT panel (displayed by default).

To hide the displayed BIT panel, from the **View** menu un-check the **Show BIT Flags** menu item.

To display the hidden BIT panel, from the **View** menu check the **Show BIT Flags** menu item

4.4. Show 3D Form

To view the Navigation device in three dimensions form:

1. Configure the system to send either “Tilt-1” ([R, P]) or Tilt-2 ([R, P, Y]) messages. (If both message types are configured, the system selects Tilt-2).
2. From the **View** menu, select **Show 3D Form**.
   You can now see the device movement in three dimensions.

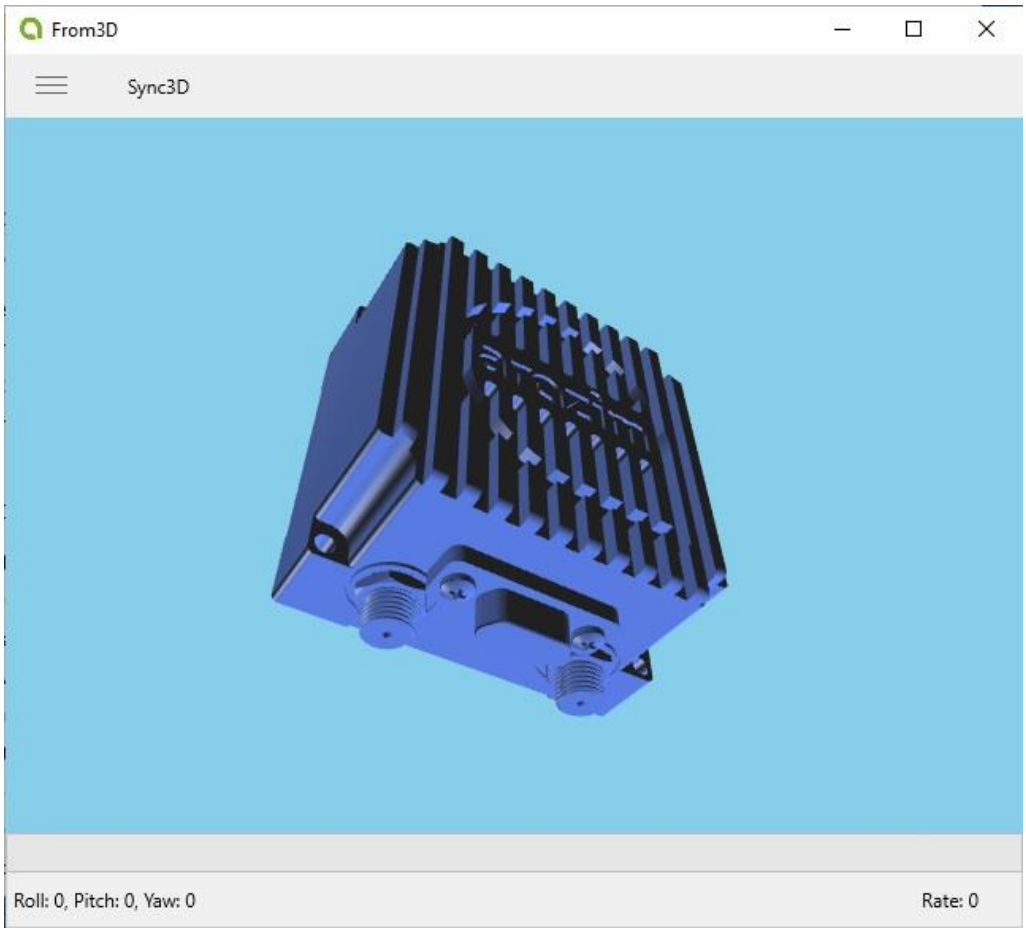
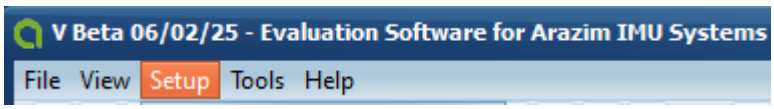


Figure 8. 3D Form

Note	• If you only select the "Tilt-1" message, the 3D view is limited to Roll and Pitch rotation. • The 3D form also supports dynamic simulation (Section 6.1.2).

5. SETUP

Go to the **Setup** tab in the main menu to perform the operations described in the following subparagraphs.



5.1. Device Communication Port

You can select, open, and close the device communication port, using either the communication port buttons, described in Section 2, or via the Setup tab.

To select the port using the **Setup** tab:

1. In the main menu, go to **Setup** and select **Device Comm Port**.
   a. Click **Select Port** to select a communication port.
   b. Click **Open Port** to open the selected communication port.
   c. Click **Close Port** to close the selected communication port.

5.2. GPS Communication Port

You can select, open, and close the GPS communication port, using either the communication port buttons, described in Section 2, or via the Setup tab.

To select the port using the **Setup** tab:

1. In the main menu, go to **Setup** and select **GPS Comm Port**.
   a. Click **Select GPS Port** to select a communication port.
   b. Click **Open GPS Port** to open the selected communication port.
   c. Click **Close GPS Port** to close the selected communication port.

5.3. Device Configuration

You can configure several parameters of the Navigation device and change or update them to suit your needs.

To configure the Navigation device:

1. Verify that the Navigation device is connected and sending messages.
2. In the main menu, go to **Setup** and select **Device Configuration**. **Configuration Form** is displayed.

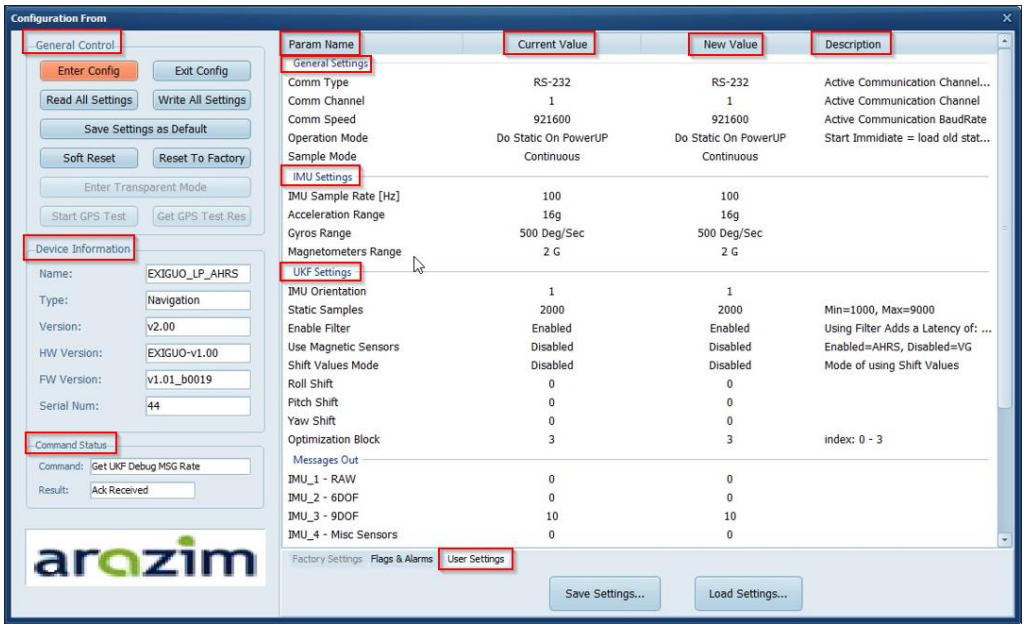


Figure 9. Configuration Form – Navigation Device

5.3.1. Configuration Form

The Configuration Form (Figure 9) includes the following areas:

- The left area contains a panel with control buttons and general information about the connected device. Section 5.3.1 has more information.
- The bottom area contains a panel with the **Save Settings** and **Load Settings** buttons. Section 5.3.2 has more information.
- The configuration parameters area is the main area, located above the bottom area and it contains three tabs to handle settings:
  - Factory Settings – For factory use only
  - Flags & Alarms – To configure temperature thresholds and enable the special “debug-message”.
    (The remaining alarms are for factory use only).
  - User Settings – To determine what settings to use.
    Section 5.3.1.1 has more information.

Before putting the device in **Configuration** mode, make sure the connected device is powered up, correctly detected, and transmitting messages.

To put the device in **Configuration** mode, go to **General Control** and select **Enter Config**.
Once the device is in **Configuration** mode, the Navigation device stops sending messages.

Note	• Device Configuration is available only if a connecton was established with the device. • After each **General Control** panel operation, check the Command Status to verify that the operation succeeded.

After entering Configuration mode, select Read All Settings to read the device's current settings.

5.3.1.1. User Settings

The main section of the form shows the settings registers and values. **User Settings** are displayed as a list of registers, grouped by association. For example, the **Messages Out** group gathers all messages that can be activated.

The register list consists of four columns:

- **Param Name** – the name of the register
- **Current Value** – the current register value
- **New Value** – the last register value that you set
  To write all changes to the device registers, select **Write All Settings**. Verify that all changes were made to all device registers.
- **Description** – Register supply information

The registers and optional parameter values in the list depend on navigation platform that is connected.

5.3.1.2. General Settings Registers

Users may change the following parameter values (unless they are Read-Only values):

- **Comm Type** – This Read-Only parameter displays the hardware selected communication interface (which may be RS-232 or RS-422).
- **Comm Channel** – This Read-Only parameter always displays "1" (saved for multi-port devices).
- **Comm Speed** – This Read/Write parameter displays the communication speed in bauds (default = 921,600).
- **Operation Mode** – This Read/Write parameter displays how the device is initialized at power-up:
  - **Start Immediate** –The system starts right away (using saved bias estimation parameters).
  - **Do Static on Power-up** – The system, first, runs the bias estimation to reduce sensor biases.

- **Sample Mode** – This Read/Write parameter displays how the system sends data samples (default = Continuous).
    - **Continuous** – Data samples are sent according to the defined frame-out rate.
    - **Polling** – Data samples are sent only when the Host device requests them.

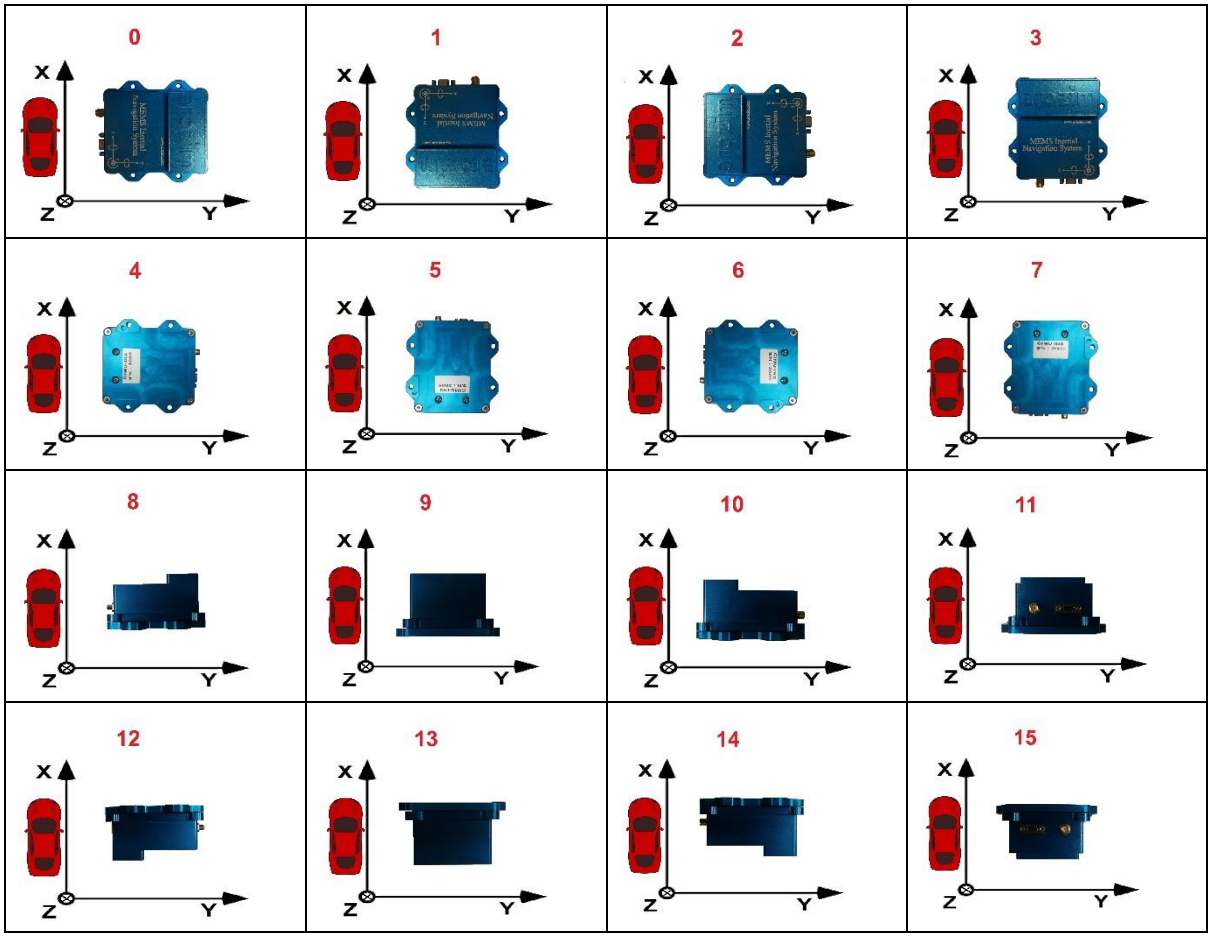
5.3.1.3. Inertial Measurement Unit (IMU) Settings Registers

- **IMU Sample Rate (Hz)** (default = 100Hz) This Read/Write parameter displays the IMU message rate (range = 1 to 1000).
- **Acceleration Range** – This Read-Only parameter displays the current accelerometers full scale in [g] units (hardware dependent).
- **Gyros Range** – This Read-Only parameter displays the current rate-gyros full scale in [Deg/Sec] units (hardware dependent).
- **Magnetometers Range** – This Read-Only parameter displays the current magnetic full scale in [Gauss] units (hardware dependent).

5.3.1.4. Unscented Kalman Filter (UKF) Settings Registers

- **IMU Orientation** – This Read/Write parameter displays how the IMU is oriented with respect to the platform X,Y,Z axes (range = from 1 to 16). Table 4 shows all the available IMU orientations.
  (The default IMU orientation value is 1, which is equivalent to index 0 in Table 4.)

Table 4. Optional Parameter Values for Set Orientation



- **Static Samples** – This is a Read/Write parameter (default = 2000), which displays the number of static samples used to compute the bias estimation at power-up.
  The optional values are from 1000 to 9000
  The computation time can take from 10-90 seconds, assuming an IMU sampling rate of 100Hz.
- **Enable Filter** – This is a Read/Write parameter (default = Disabled). When enabled, the IMU data is filtered with IIR LPF 10hz, which creates a latency of three samples.
- **Use Magnetic Sensors** – This is a Read/Write parameter (default = Disabled).
  It allows the UKF to use magnetic sensors.
- **Latitude** – This is a Read/Write parameter (default = 0).
  It determines the initial latitude in degrees.
  When the system's Operation mode is configured as immediate, the system initializes the UKF latitude with this value.

- **Longitude** – This is a Read/Write parameter (default = 0).
  It determines the initial longitude in degrees.
  When the system's Operation mode is configured as immediate, the system initializes the UKF longitude with this value.
- **Altitude** – This is a Read/Write parameter (default = 0).
  It determines the initial altitude in degrees.
  When the system's Operation mode is configured as immediate, the system initializes the UKF altitude with this value.
- **Shift Values Mode** – This is a Read/Write parameter (default = Disabled).
  It determines whether or not a manual shift of roll, pitch, and yaw values is used to correct the device orientation with respect to the platform X,Y,Z axes…
  If disabled, the mechanism uses the IMU orientation value to make the shift.
  The optional modes are:
  - **Disabled** - use the IMU orientation with respect to platform X,Y,Z
  - **Auto** (not operational)
  - **Manual** – use the Roll, Pitch Yaw shift fields with respect to platform X,Y,Z axes.
- **Roll Shift** – This is a Read/Write parameter (default = 0).
  It determines the roll shift, in degrees, and is only used when the **Shift Values Mode** is **Manual**.
- **Pitch Shift** – This is a Read/Write parameter (default = 0).
  It determines the pitch shift, in degrees, and is only used when the **Shift Values Mode** is **Manual**.
- **Yaw Shift** – This is a Read/Write parameter (default = 0).
  It determines the yaw shift, in degrees, and is only used when the **Shift Values Mode** is **Manual**.
- **Optimization Block** – This is a Read/Write parameter (default for EX100 = 6, default for gX100 = 9). It ranges from 4-9 and assists in achieving more accurate road/track results.
  For example, you can choose a better optimization block when a device is assembled on a platform with a high volume of engine noise.
  Table 5 has more information on which scale factor levels to use.

Table 5. Scale Factor Levels Used by Optimization Block Level

Scale Factor Level	Remarks
0 – 3	Other platforms
4	EX100 and EXLP100 scale factors & IMU's low-level factors.
5	EX100 and EXLP100 scale factors & IMU's medium-level factors.

Scale Factor Level	Remarks
6	EX100 and EXLP100 scale factors & IMU's high-level factors.
7	gX100 scale factors & IMU's low-level factors.
8	gX100 scale factors & IMU's medium-level factors.
9	gX100 scale factors & IMU's high-level factors.
10 - 12	Other platforms

5.3.1.5. Messages Out

Users may configure the system to send several message types, at different frame rates, simultaneously.

All the messages frame out rates (except for the GPS messages), rely on the IMU sampling rate. The messages frame out rates are limited to the IMU sampling rate.
The IMU sampling rate is configurable up to 1KHz.
The maximum INS messages frame out rate is limited to 100Hz.

To increase the frame out rate of these messages, users must configure the IMU sample-rate to a higher value, first.

The frame-rates available for:
- IMU Messages
- Tilt Messages
- INS Messages
are the following:
1Hz, 2Hz, 5Hz, 10Hz, 25Hz, 50Hz, 100Hz, 200Hz, 250Hz, 500Hz, 1KHz

Since GPS messages sent from the GPS unit, are received at a rate of 10Hz, the maximum configured value of GPS messages framerate should be 10Hz. If you configure the GPS messages at a higher frame rate, the information given in the frames will repeat itself.
The frame out rates recommended for the GPS messages are the following:
1Hz, 2Hz, 5Hz, 10Hz

The following is a list of message groups and the messages they contain:

- **IMU Messages** (default = 0) – Information collected directly from IMU sensors (If active, this information is filtered.)
    - IMU_1 – RAW (Factory use)
    - IMU_2 – 6DOF, IMU 3xAcc, + 3xGyro
    - IMU_3 – 9DOF, 6DOF + 3xMag (+Baro)

- IMU_4 – Misc Sensors

- **GPS Messages** – Information collected directly from the GNSS server
  - GPS_1 – GNSS position given in Lat, Lon, Alt Coordinates
  - GPS_2 – GNSS position given in ECEF coordinates
  - GPS_3 – Extra Statistic Information
  - GPS_4 – GNSS Real Time Kinematics (RTK) information
- **Tilt Messages –** Computed results
  - Tilt [R, P] – Tilt information: Roll & Pitch
  - Tilt [R, P, Y] – Tilt information + Yaw
  - Tilt (Quater) - Quaternions
  - Tilt [DCM] – DCM information
- **INS Messages –** Computed results
  - INS [Tilt, Pos] – UKF position and Tilt Information.
  - INS [Tilt, Pos, Vel] – UKF Position, Velocity and Tilt Information.
  - INS [Tilt, Pos, Vel, Time] – UKF Forward Level ARM information.

Note	While it is possible to send multiple messages, be careful when configuring the output rates of those messages. If the message output rate exceeds the COM port bandwidth, the system may become unstable and messages may be lost. The PC software notifies you if the total messages (and their frame rates) exceed the COM port's maximum bandwith. In addition, if the message output rate exceeds sensor output (IMU or GPS), the message output will be repeated.

5.3.1.6. Control Buttons/General Information

This section describes the buttons and fields in the left of the Configuration Form:

- General Control (Figure 10, Reference 1) – These buttons are used to activate transactions with the Navigation device.
- Device information (Figure 10, Reference 2) – These are identification parameters.
- Command Status (Figure 10, Reference 3) – This is the result status of the last transaction activated by the general control buttons.

Figure 10. Settings Control

5.3.1.7. General Control

You can perform the following functions in the **General Control** section:

1. Click **Enter Config** to enter **Configuration** mode – The navigation device stops sending messages and waits for further configuration commands.
2. Click **Exit Config** to exit **Configuration** mode – The navigation device returns to real-time mode and starts sending selected message at the selected rate (unless you are working in polling mode).
3. Click **Read All Settings** to read all configuration values from the device RAM.
4. Click **Write All Settings** to write the settings to the Navigation device RAM.
5. Click **Save Settings as Default** to burn all RAM values to flash memory. It may take a few seconds to receive an ACK.
6. Click **Soft Reset** to reset the system – The reset is effective only after exiting **Configuration** mode.
7. Click **Reset to Factory** to reset the default configuration. This operation does not reset the calibration values.

5.3.1.8. Device Information

The connected **Device Information** is displayed when you are in **Configuration** mode and click **Real All Settings**.

5.3.1.9. Command Status

Command Status displays the last message sent to the system and indicates whether that message was acknowledged (ACK).

5.3.2. Save Settings and Load Settings

You can save the current configured settings for future use and later load saved settings.

To save the settings:

1. Click **Save Settings.**
2. In the **Save As** dialog displayed, go to the **Save in** field and select a location to save the file.
3. Go to the **File name** field and enter the file name and click **Save**.

To load the saved settings:

1. Click **Load Settings**.
2. In the **Open** dialog displayed, go to the **Look in** field and select the saved file location.
3. Select the file from the file list and click **Open**.

5.4. Device Calibration

You can calibrate several parameters of the Navigation device and change or update them as needed.

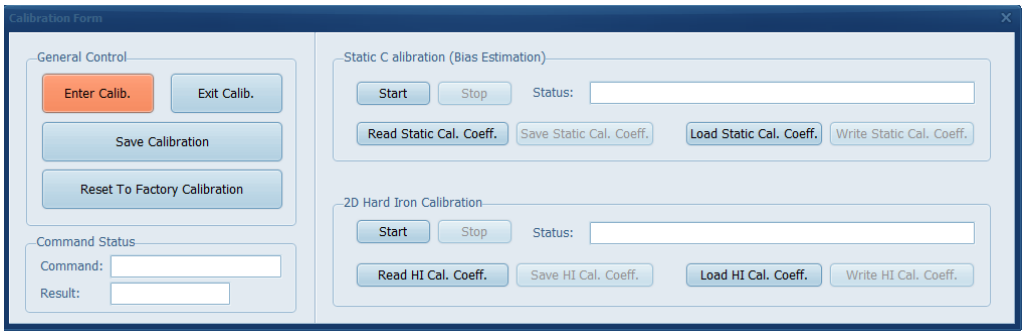


Figure 11. Device Calibration

5.4.1. General Control

You can perform the following functions with the General Control section buttons:

1. Click **Enter Calib** to enter Calibration mode – The Navigation device stops sending messages and waits for further calibration commands.
2. Click **Exit Calib** to exit Calibration mode – The Navigation device returns to real-time mode and starts calibrating for the selected parameters.
3. Click **Save Calibration** to save the calibration values from the device RAM.
4. Click **Reset to Factory Calibration** to erase user calibration information.

5.4.2. Static Calibration (Bias Estimation)

Static calibration is based on a fixed number of configured static samples, which you can configure in the **Configuration Form** under **UKF Settings > Static Samples**.

To start static calibration:

1. Click **Start** to begin the calibration, which stops automatically when it has finished.

   The **Status** field indicates calibration progress.
2. Click **Stop** to stop the calibration before it has finished, for example, if you would like to use a shorter period than the period defined in the configuration form.
3. When the calibration has finished, click **Read Static Cal. Coeff.** to read the calculated calibration coefficients from the device.
4. Click **Save Static Cal. Coeff.** to save the read static calibration information on the Host drive.

5. Click Save Calibration (General Control) to save the new calibration results in the device flash for use in the next power-up if you select Immediate Power-Up.

Otherwise, to load a previously saved static calculation file to a device:

1. Click **Load Static Cal. Coeff.** to load the static calibration from a selected file.
2. Click **Write Static Cal. Coeff.** to write to RAM memory.
3. Click **Save Calibration** under **General Control** to save the new calibration results in the device flash to use in the next power-up if you select Immediate Power-Up.

5.4.3. 2D Hard Iron Calibration

Unlike static calibration, 2D hard iron calibration is not configured, but is calibrated continuously. This calibration procedure involves rotating the platform on which the device is assembled horizontally 720 degrees.

To start 2D hard iron calibration:

1. Click **Start** to begin the calibration, which will continue calibrating until you click **Stop**.

   The **Status** field indicates calibration progress.
2. Click **Stop** when you have finished rotating the platform.
3. Click **Read HI Cal. Coeff.** to read calibration coefficients from the device RAM.
4. Click **Save HI Cal. Coeff.** to save the calibration coefficient on the Host drive.
5. Click **Save Calibration** under **General Control** to save the new calibration results in the device flash, to use in the next power-up, if you selected Immediate Power-Up.

Otherwise, you can load the previous HI coefficients from a selected file as follows:

1. Click **Load HI Cal. Coeff.** to load the calibration coefficients from a selected file.
2. Click **Write HI Cal. Coeff.** to write to RAM memory.
3. Click **Save Calibration** under **General Control** to save the new calibration results in the device flash, to be used in the next power-up, if you do not intend to perform a new HI calibration during the next power-up.

5.4.4. Command Status

The name and results of the last command sent are displayed in **Command Status**. This single transaction status changes rapidly for **Read All Settings** and **Write All Settings**.

5.5. Device Optimization

Optimize the device only with the assistance of an arazim representative.

5.6. GPS Configuration

The Navigation device is equipped with a secondary serial port dedicated to GNSS message outputs. You can configure several GNSS parameters and update them later to meet your needs.

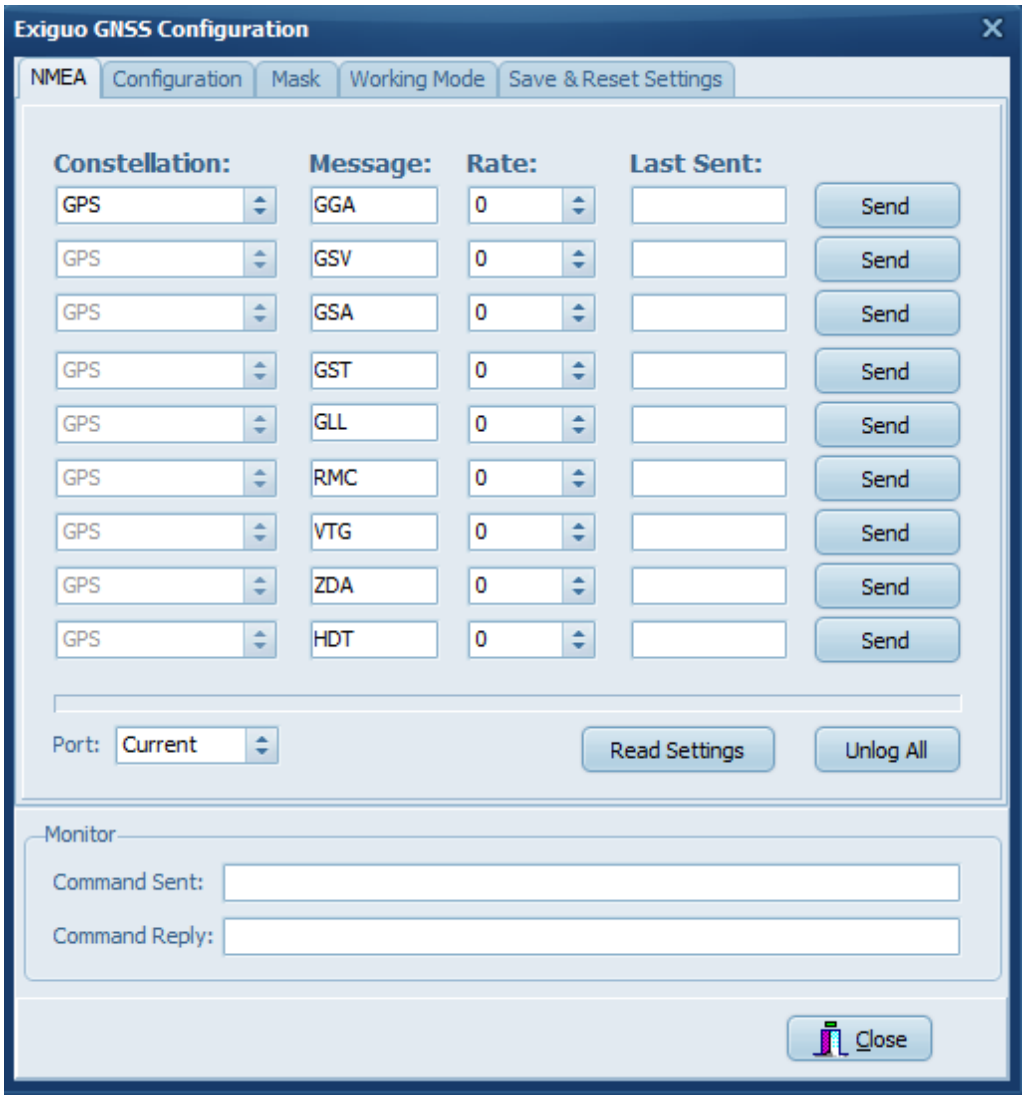


Figure 12. GNSS Configuration

To configure GNSS:

1. Select a port from the **Port** dropdown menu.

NMEA Tab

1. In this TAB we exhibit the messages that the user can configure to emit at a specific rate
2. **Constellation** – Select one of the available constellation values.

Note	If you select any constellation other than GPS, the message sent will be based on that constellation. For example, if you configure the GGA message for GPS and Glonass, two messages will be sent.

3. **Message** – This field is a static value that indicates the message being configured.
4. **Rate** – This field, selected from the dropdown menu, determines the frequency that the system uses to broadcast the current message.
5. **Last Sent** – This field shows the last rate value you sent.
6. Click **Read Settings** to read the GNSS configuration settings from the GPS.
7. Click **Unlog All** to stop all message broadcast on the chosen COM port.
8. Under **Monitor** (Section 4.20), view the sent commands and their respective replies.

Configuration Tab

1. Enter values for each of the fields in the tabs listed below.
2. Click **Read Configuration** before making your selections to read the last configuration set.
3. Set the baud rate for each of the comm ports
4. Click **Send**.
5. View the sent commands and their respective replies under **Monitor**.

Mask

1. Use this TAB to Mask and UnMask specific frequencies, an entire constellation, or just the elevation.
2. View the sent commands and their respective replies under **Monitor**.

Offsets

1. Enter a **Heading angle correction** value (between -180° and +180°). The value reflects how the heading is viewed.
2. Enter a **Pitch angle correction** value (between -90° and +90°). The value reflects how the heading is viewed.
3. Click **Send Command**.
4. View the sent commands and their respective replies under **Monitor**.

Mask Tab

Use this tab to Mask and UnMask specific frequencies, the elevation, or an entire constellation.

1. View the sent commands and their respective replies under **Monitor**.

Working Mode Tab

Use this tab to configure how the end unit (which should always be the rover) works.

1. View the sent commands and their respective replies under **Monitor**.

Save & Reset Settings Tab

1. Under **Save GNSS Current Settings to Flash** section, click **Save Current Settings As Default**.
   This command burns the last configuration (temporarily in RAM) into FLASH memory.
2. Under **Reset Settings**, select an item from the **Reset** dropdown menu (optional memory information blocks), then click **Build Cmnd**.
3. Under **Reset All Settings**, click **Reset All Settings** to reset all memory information blocks.
4. View the sent commands and their respective replies under **Monitor**.
5. When all configurations under all tabs have been set, you can close the Configuration Form.

6. TOOLS

Go to the **Tools** tab in the main menu to perform the following operations:

6.1. Simulation

You can simulate device messages without using the device.

For example, when a programmer wants to develop an application that can receive messages without the Navigation device, the programmer can connect a cross-cable between two serial ports, one that simulates outgoing messages, and the other to develop code to receive messages

6.1.1. Simulation Setup – Ext Frame Player

To set up the arazim Data Packet Recorder and Player with an actual device:

1. Go to **Tools>Simulation**.
2. Select **Ext Frame Player**.

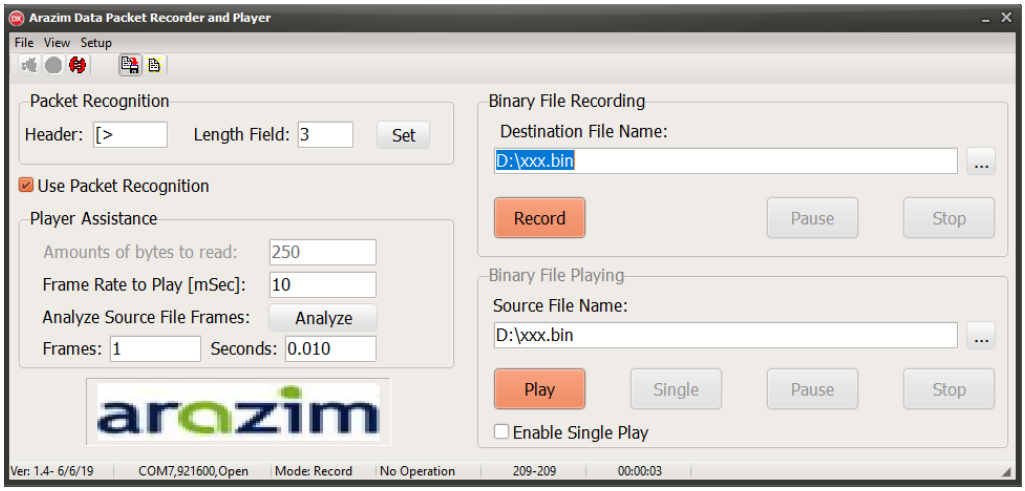


Figure 13. arazim Data Packet Recorder and Player

3. In the three buttons on the left of the Toolbar (Figure 13):
   a. Click **Select Comm Port for Nav Device** .
   b. Click **Open Nav Device Comm Port** .
4. Under **Packet Recognition:**
   a. Verify that the Header is "[>".
   b. Verify that the Length Field is in the "3" byte of the incoming message.
   c. Click **Set**.
5. Check **Use Packet Recognition**.

Recording

1. To enable recording, click **Select Destination File Name for Recording**  .
2. Under **Binary File Recording**, click ... to save a file.
   A **Save As** window is displayed.
3. Select a folder and enter a file name (with either a *.bin or a *.dat suffix).
   The file is displayed under **Destination File Name** in the **Binary File Recording** section.

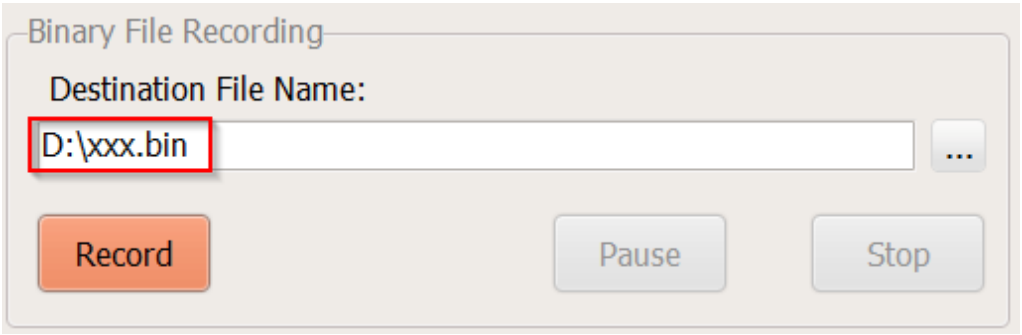
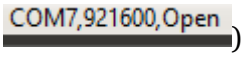


Figure 14. Destination File Name

4. At the bottom of the screen, verify the device to which the communication port is connected, the baud rate, and the status, as shown below (in this example, COM7, 921600, Open):
   

).
5. Click **Record**.
   If you selected a destination file name that already exists, a notification popup informs you that the file already exists and asks if you want to overwrite it.
6. Verify that the mode is **Record** and that the status is **Recording**.
   The number of packets recorded and the recording time elapsed are also displayed, as shown below (where 40 packets were recorded in 4 seconds):
   

7. Press **Pause** to record specific intervals of the recording.
8. Press **Stop** to stop recording.

Playing

1. Click **Enable Binary File Play Options** to play the recording.
2. Under **Binary File Playing**, click ... to select a file to play.
   An **Open** window is displayed.
3. Select a file from the displayed list and click **Open**.
   The file is displayed under **Source File Name** under **Binary File Playing**.
4. Under **Player Assistance**, enter the frame rate for outgoing messages, then press **Analyze** to obtain the number of frames in the file and the playback duration.

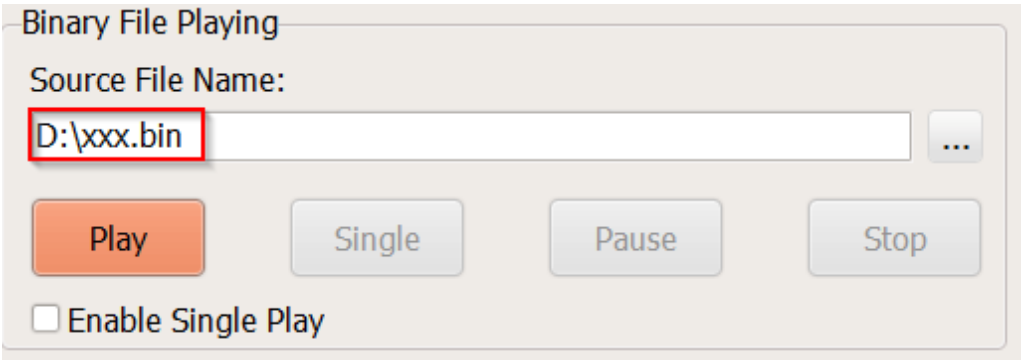


Figure 15. Source File Name

5. Click **Play** for continuous play
   a. Verify that the mode is **Play** and the status is **Playing**.
      The number of packets playing and the playing time elapsed are also displayed, as shown below:

6. Check **Enable Single Play** to send a single packet only when you press **Single**, for example, when you want to check for bugs in the recording of a packet.
7. Hit **Pause** to pause play.
8. Hit **Stop** to stop playback and return the file pointer to the first frame.

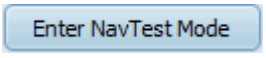
6.1.2. Dynamic Tilt Simulation

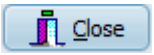
Select the **Dynamic Tilt Simulation** so the software can send "Tilt2" ([R, P, Y]) simulated message.
The messages simulate, one axis after the other, a slow movement, from 90 degrees to -90 degrees.
The simulation stops once all the axes have completed their movement.

Note	To view the simulated tilt-messages as a 3-D graphic image, select **Show 3D Form** from the **View** menu before running the simulation.

6.1.3. NavSim Test

Select **NavSim Test** to run a simulated test on data saved to a specific file.

1. Select **NavSim Test**.
   The **Testing Nav Systems** window is displayed with fields for the simulation source and simulation information.
2. Under Simulation Source, enter a source file path in the **Select source file name** field.
3. Under Simulation Information, enter a number from 1 to 1000 in the **Output Frame Rate** field.
4. Click 

to enter navigation UKF mathematics works properly.
5. Click 

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6.2. Developer

You can use the Developer functions to select a system and simulate system operations without using an actual device.

6.2.1. Enable System Detection

When this menu item is checked, the system is configured to detect the type of connected device automatically, when you click **Open Communication Port**. Section 3.4 contains additional information.

If this menu item is unchecked, you should define the type of connected device manually. Section 6.2.2 contains additional information.

6.2.2. Select System

Use these menu options to select the type of connected device manually.
Section 3.4 contains additional information.

The systems currently available are:

- **ExiguoLP (VG, AHRS, INS, INS2ANT) – use INS for EX100 & EXLP100.**
- **Gins (VG, AHRS, INS, INS2ANT) – use INS for gX100.**
- Others:
    - Exiguo (VG, AHRS, INS, INS2ANT)
    - ArSys (INS2ANT_05)
    - MiniExiguo (INS)

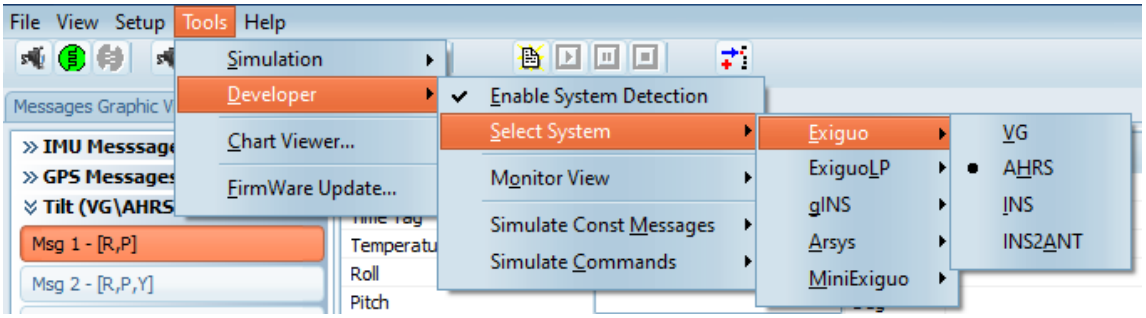

Figure 16. Tools>Developer>Select System Path

6.2.3. Monitor View

Set whether the monitor view is the top-most window.

To set the monitor view:

1. Go to **Tools>Monitor View**.
2. Select one of the following:

- **Normal** – The monitor is not the top-most window.
- **Stay on Top** –The monitor is the top-most window (default).

6.2.4. Simulate Const Messages

To simulate **const** (constant value) messages:

1. Go to **Tools>Simulate Const Messages**.
2. Click on one of the available selections.

Note	Make sure to simulate a const message that matches the selected navigation device and selected message.

6.3. Chart Viewer

To open charts in the arazim Graph View application without leaving the Navigation device Evaluation Software:

1. Go to **Tools>Chart Viewer**.
   The arazim Graph View application opens for use with the arazim Navigation device.
2. Refer to the ***GraphViewer User Guide*** for more information.

6.4. Firmware Update

To update the system firmware:

1. Go to **Tools>Firmware Update**.
   The Firmware Upgrade window is displayed.
2. Verify that all communication ports are closed.
3. In the group of three left-most buttons (Figure 17):
   a. Click **Select Comm Port for Nav Device**  .
   b. Click **Open Nav Device Comm Port**  .
4. Verify that the **Burning flow state** is **Read**.
5. Under **Firmware File**, click to select a file.
   An **Open-File** dialog is displayed.
6. Select a file from the displayed list and click **Open**.
   The file is displayed under **Firmware File**.
7. Check **Enable Power Reset**.
   The device enters a firmware upgrade mode, once it is turned on.
   (The PC software sends an ACK response within 200 mS)
8. Power up the device.
   Under **Firmware Actions**, **Burn Firmware** is enabled.
9. Click **Burn Firmware**.

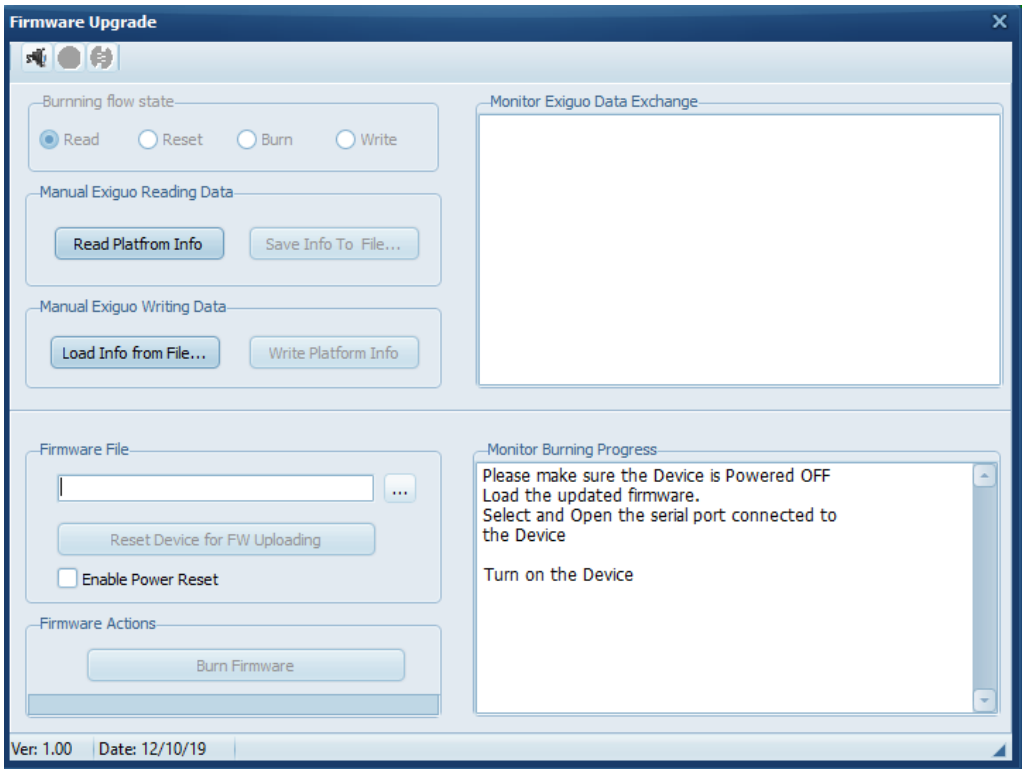

Figure 17. Firmware Update