Algo-Plugin Desktop Development 2.0 User Manual

Algo-Plugin User manual

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Notes	Data and descriptions in this document are subject to change without notice. Product photos and pictures are for illustration purposes only and may differ from the real product appearance

1. About user manual

This manual describes the installation and usage of Algo Plug-in feature of Development Desktop 2.0 UI (DD2.0 UI), a Windows based PC software application developed by Bosch Sensortec.

1.1 Who should read this manual

This information is intended for users who want to understand the Algo Plug-in feature in DD2.0 UI.

1.2 Overview

Bosch fusion library uses Accelerometer, Magnetometer and Gyroscope sensor signals for compensating each other's shortcomings and provides highly accurate, reliable and stable orientation data.

Algo Plug-in is a feature implemented in Development Desktop 2.0 to show the Fusion Library supported virtual sensor's data in the plotter UI

The Algo Plug-in UI has the fusion Library BSXxx integrated. It offers flexibility for choosing the desired mode of operation of the algorithm. It supports ECompass, M4G, IMU, NDOF and NDOF+FMC modes. Each mode has its own virtual sensors.

Supported sensors:

1. 6DoF:
   Shuttle boards : BMC150, BMC056, BMC050, BMI055, BMI058
2. 9DoF:
   Shuttle boards : BMX055
   Form factor boards : BMI055+BMM150, BMC055 + BMG160, BMC150+BMG160, BMC056+BMG160

1.2.1 Accelerometer – Overview

An accelerometer is a device that measures the proper acceleration of the device. The accelerometer measures the components of the earth's gravity. This is not necessarily the same as the coordinate acceleration (change of velocity of the device in space), but is rather the type of acceleration associated with the phenomenon of weight experienced by a test mass that resides in the frame of reference of the accelerometer device. However, an accelerometer in gravitational free fall toward the center of the Earth will measure a value of zero because, even though its speed is increasing, it is in an inertial frame of reference, in which it is weightless. For advanced sensor fusion, the performance of the accelerometer is crucial, since its output contributes to the static accuracy of the 9DoF system

1.2.2 Magnetometer – Overview

A geomagnetic sensor is a device used to measure the strength or direction of the magnetic field, either produced in the laboratory or existing in nature. The Earth's magnetic field (the magnetosphere) varies from place to place for various reasons such as in homogeneity of rocks and the interaction between charged particles from the sun and the magnetosphere. In fusion algorithms geomagnetic sensors are used to drift-compensate gyroscopes.

1.2.3 Gyroscope – Overview

A gyroscope is the device used to measure the angular velocity of the device about the axis of rotation. A Gyroscope is immune versus linear accelerations and distortion affecting accelerometer and magnetometer. So, advanced fusion techniques can be used for magnetic distortion filtering and accurate device orientation while

device experiencing dynamics can be estimated with assistance of the gyroscope. A gyroscope by Bosch Sensortec offers a range of ±2000 °/s and thus enables high dynamic needed for real-time gaming.

1.3 Key features of Algo Plug-in

- Advanced 9DoF sensor fusion algorithms
- Fast in-use background calibration of all sensors and calibration monitor
- Supports 6-axis based applications (IMU)
- Processed library data can be analysed in real time.
- Orientation data can be analysed.
- Supports 6DoF and 9DoF sensors.
- Supports offline feature which reads sensor data from file instead of a sensor.

1.4 DD2.0 Overview

DD2.0 is a PC based software used to read, capture, and display sensor data. To display the sensor data of BMI090L on DD2.0, mount the sensor on the **Bosch Sensortec** application board. This is a universal demonstration environment for **Bosch Sensortec** sensor products.

Bosch Sensortec sensors are mounted on sensor specific shuttle boards. All sensors shuttle boards have an identical footprint and can be plugged into the application board's shuttle board socket. DD2.0 automatically detects the sensor that has been plugged in and starts the corresponding software application.

1.5 Sensor Communication:

DD2.0 software supports both SPI and I^2C to communicate with the sensor.

1.6 Graphical display:

DD2.0 UI displays the sensor data and interrupts in different graphical formats.

1.7 Data logging:

DD2.0 offers data logging of the sensor data.

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2. Getting started

2.1 Start up view

To start the Development Desktop 2.0 software:

- Click **Start > Programs > Development Desktop 2.0.**

Or

- Double click the Development Desktop 2.0 software icon on the desktop.
  If the plugged-in sensor is supported by the Algo Plug-in then the “Algo Plugin” menu item is enabled, else the Algo Plugin menu item will be disabled

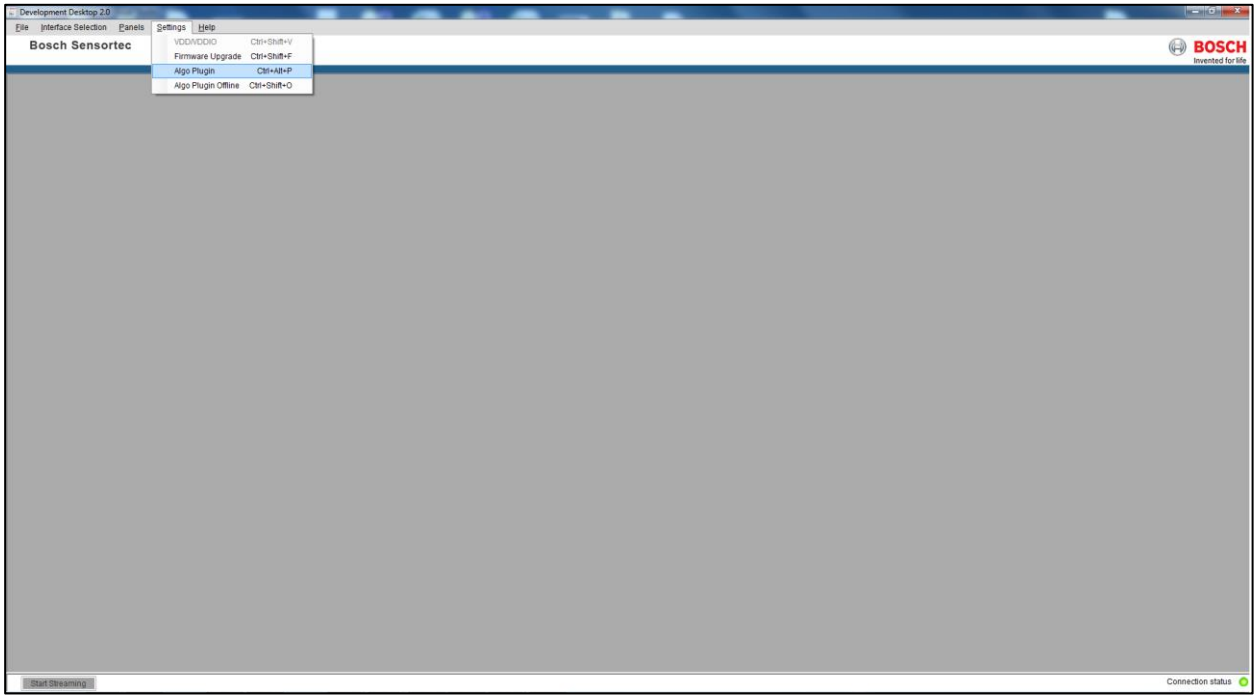


Figure 1 : *Algo Plugin” Settings menu*

- Loading the Algo Plug-in UI need to follow the below procedures
  - In the menu bar click ‘settings’ menu
  - Select AlgoPlug-in menu

  Browse the given Algo Plug-in dll (say AlgoPluginBSX2x.dll for BSX2.x algorithm library and AlgoPluginBSX3x for BSX3.x algorithm library)

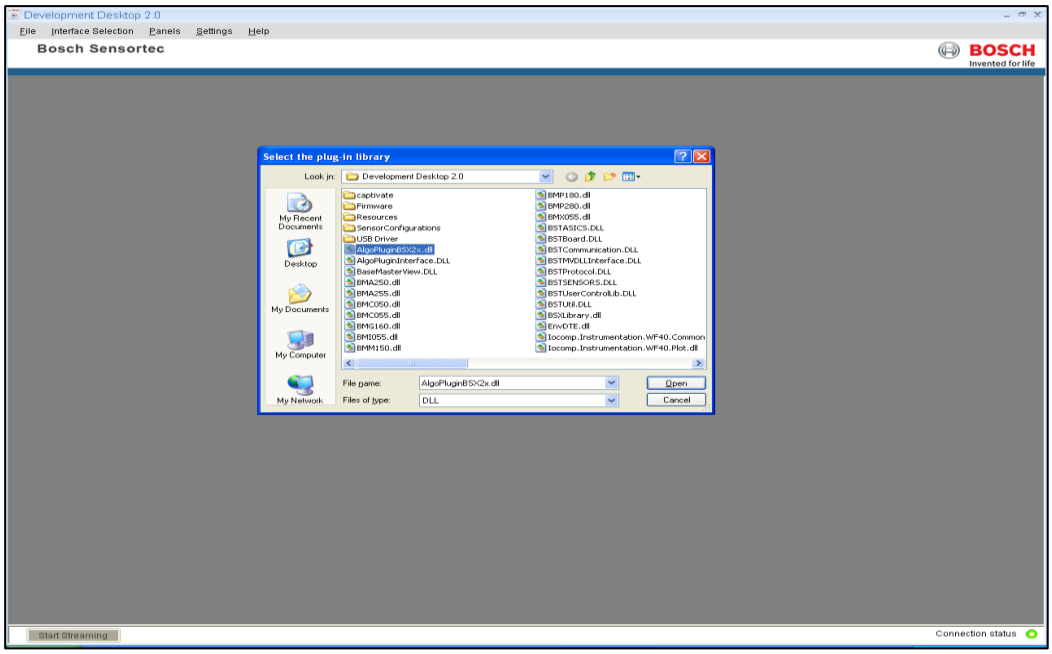


Figure 2 : *Browse the dll*

- Note: The Algo Plug-in dll is not part of the installer; dll is different for both x86 and x64 bit PC's.
- Load the given Algo Plug-in dll.
- The Graphical User Interface (GUI) of the Algo Plug-in component appears like below.

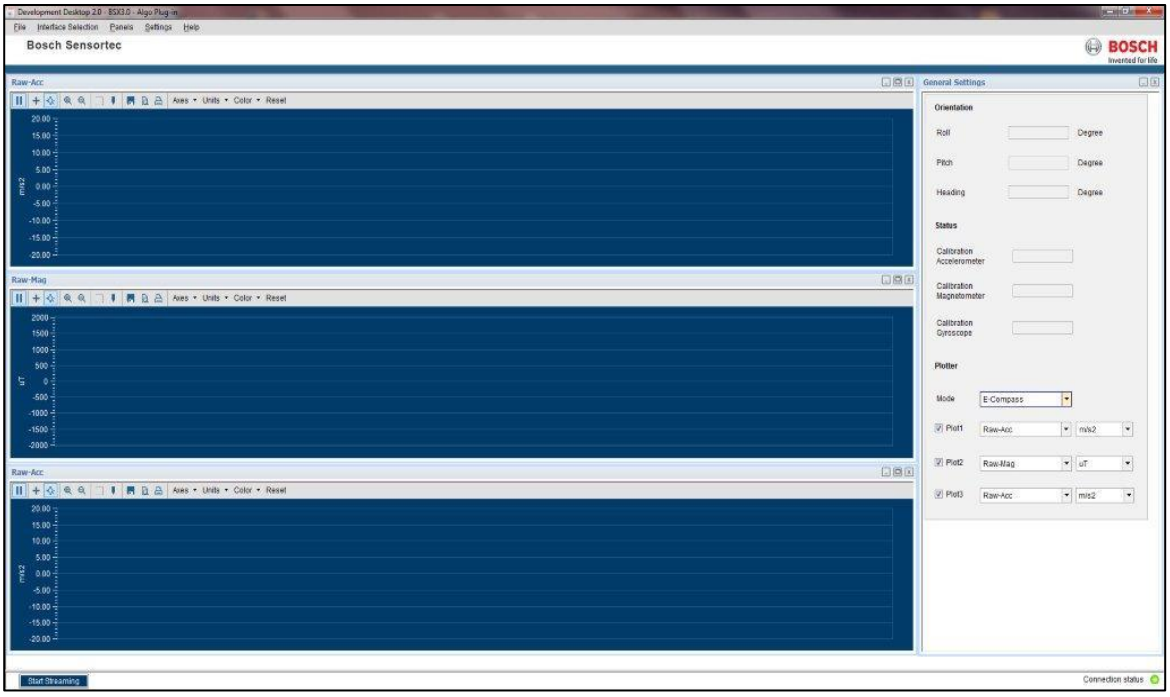


Figure 3 : Algo Plug-in GUI

2.2 Setting up the Board-PC connection

The following pictures show how to connect the board to your PC via USB

1. Use the Installer to install the Development Desktop 2.0 software.
2. Insert the shuttle board to the Application Board/Development Board.

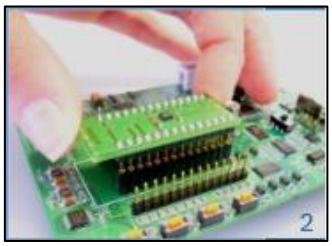


Figure 4 : Insert sensor

3. Connect the board to the PC using the USB cable/UART cable/Bluetooth

Figure 5 : Connect board and PC

4. Power up the board by turning the on/off switch “on”.

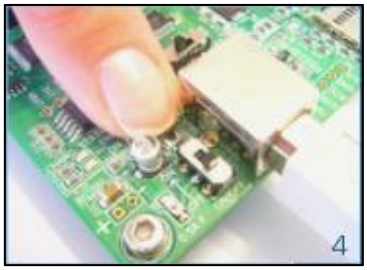


Figure 6 : Connection complete

5. Once the board is turned on, the LED glows and in case of development board the LCD displays the message “**Bosch Sensor Tec Dev. Board HW: x.x SW: x.x**”.

6. Procedure for SID value setting.

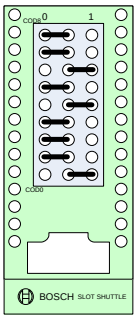
   - Convert the shuttle Id to binary format

   a. For ex: SID value is 0x51.

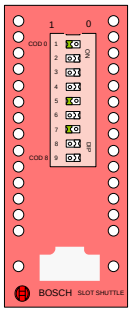
COD 8	COD 7	COD 6	COD 5	COD 4	COD 3	COD 2	COD 1	COD 0
0	0	1	0	1	0	0	0	1
SID Value 0x51								

For Version 1.0 slot shuttle:

- The socket shuttle contains 8 pins on the left, 8 pins in the middle and 8 pins on the right. The left most pins have the value 0 and right most pins have the Value 1.
- For binary value 0, place the jumper such that it connects the left most pin and the middle pin.
- For binary value 1, place the jumper, such that it connects the middle pin and the right most pin. Following picture depicts the top view of the slot shuttles.



Slot shuttle ver1.0



Slot shuttle ver2.0

Figure 7 : Slot Shuttle

For Version2.0 slot shuttle:

- The socket shuttle contains DIP switch to set the SID values.
- If the switch is positioned to OFF, it corresponds to value 1
- If the switch is positioned to ON, it corresponds to value 0.

7. The following picture shows how to connect the form factor board in the socket shuttle

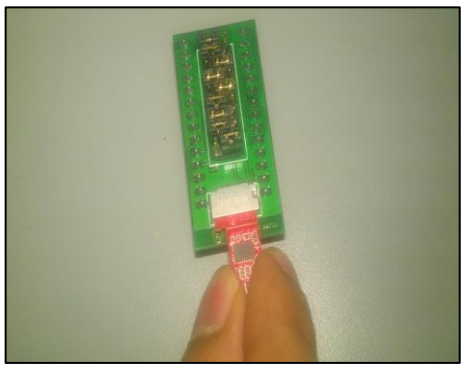


Figure 8 : Connect form factor Board and Socket shuttle

8. The following picture shows how to connect the socket shuttle with form factor in the development board.

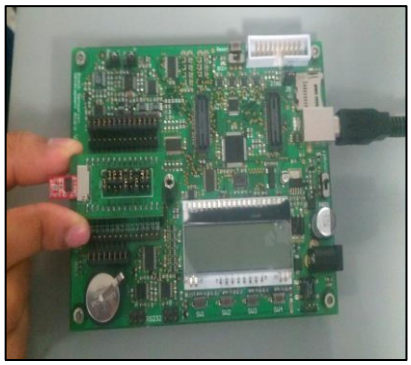


Figure 9 : Connect shuttle and Board

3. Working with Development Desktop 2.0 – Algo Plug-in UI

Algo Plug-in supports below features in Development Desktop 2.0 UI

- Modes
- Virtual Sensors
- Calibration

Data export

3.1 Algo Plug-in Modes

Based on the combination of sensors BSXxx library supports different modes, they are

MODE	SENSORS
Ecompass	Accelerometer+Magnetometer
M4G	Accelerometer+Magnetometer
IMU	Accelerometer+Gyroscope
Normal 9-DoF	Accelerometer+Magnetometer+Gyroscope
FMC 9-DoF	Accelerometer+Magnetometer+Gyroscope

In Development Desktop 2.0 the modes can be selected from general settings panel.

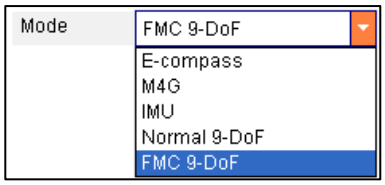


Figure 10 : List of modes

3.1.1 Ecompass

- Ecompass is an Electronic Compass. Measures earth magnetic field.
- Combining of 3-axis magnetometer and 3-axis accelerometer.
- Provides solution for orientation data calculation using accelerometer and magnetometer field data.
- It is used for sensing the Tilt Compensation, Orientation and Heading.
- Ecompass supports following virtual sensors
  - Raw-Acc

- Raw-Mag
- Cor-Acc
- Cor-Mag
- Filter-Acc
- Filter-Mag
- Orientation sensor
- Quaternion

- When Ecompass mode is selected, Ecompass menu item will get enabled. This feature is available only when Algo Plug-in is deployed with BSX3.X library. For more, please refer to the section 5 in this document

3.1.2 M4G

- Gyroscope emulation mention as M4G, that is magnetometer based virtual gyroscope sensor.
- This is a method to compute the angular velocity measurement based on the 3-axis accelerometer and 3-axis magnetometer
- M4G supports following virtual sensors
  - Raw-Acc
  - Raw-Mag
  - Cor-Acc
  - Cor-Mag
  - Cor-Gyro (BSX 3.x library only)
  - Filter-Acc
  - Filter-Mag
  - Orientation
  - Quaternion

3.1.3 IMU

- An Inertial measurement unit mention as IMU
- Combination of accelerometer and gyroscope. It is used to measure the velocity, orientation, gravitational force, pitch, and roll.
- IMU supports following virtual sensors
  - Raw-Acc
  - Raw-Gyro
  - Cor-Acc
  - Cor-Gyro
  - Filter-Acc
  - Filter-Gyro
  - Orientation sensor
  - Quaternion
  - Gravity sensor
  - Linear Acc sensor
  - Rotation vector sensor

3.1.4 FMC 9DoF

- FMC 9 degree of freedom is a combination of accelerometer, magnetometer and Gyroscope.
- FMC 9DoF supports following virtual sensors
  - Raw-Acc
  - Raw-Gyro
  - Raw-Mag
  - Cor-Acc
  - Cor-Gyro

- Cor-Mag
- Filter-Acc
- Filter-Gyro
- Filter-Mag
- Orientation sensor
- Quaternion
- Gravity sensor
- Linear Acc sensor
- Rotation vector sensor

3.1.5 Normal 9DoF

- Normal 9 degrees of freedom is combination of accelerometer, magnetometer and Gyroscope.
- Normal 9DoF supports following virtual sensors
  - Raw-Acc
  - Raw-Gyro
  - Raw-Mag
  - Cor-Acc
  - Cor-Gyro
  - Cor-Mag
  - Filter-Acc
  - Filter-Gyro
  - Filter-Mag
  - Orientation sensor
  - Quaternion
  - Gravity sensor
  - Linear Acc sensor
  - Rotation vector sensor

3.2 Virtual Sensors

- By selecting the mode corresponding virtual sensors for the mode is displayed as below.
- On clicking on the start streaming button, the selected virtual sensor data's get plotted in the plotter.
- In Development Desktop 2.0 virtual sensors can be selected from general settings panel.
- Select the virtual sensor along with the corresponding units for each plotter UI.

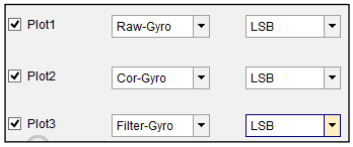


Figure 11 : *Virtual sensor and its corresponding units*

3.2.1 Raw Virtual sensors

- Raw is the unprocessed data from the sensor.
- Supported units
  - Accelerometer: LSB*, m/s2 and g
  - Magnetometer: LSB*, uT
  - Gyroscope: LSB*, °/s, rad/s
  - *Only BSX2.x supports LSB unit.*

- BSXxx library provides below given raw virtual sensors

3.2.2 Corrected Virtual Sensor

- Corrected data is the processed data after removing the sensor errors ex: offset, sensitivity errors etc...
- Supported units
  - Accelerometer: LSB*, m/s2 and g
  - Magnetometer: LSB*, uT
  - Gyroscope: LSB*, °/s, rad/s
  - *Only BSX2.x supports LSB unit*

3.2.3 Filter Virtual Sensor

- Filter: Filtered corrected data is called as Filter-Acc, Filter-Mag, and Filter-Gyro.
- Low Pass IIR filter is used for filtering the corrected data.
- Supported units
  - Accelerometer: LSB*, m/s2 and g
  - Magnetometer: LSB*, uT
  - Gyroscope: LSB*, °/s, rad/s
  - *Only BSX2.x supports LSB unit.*
  - BSXxx library provides below given Filter virtual sensors

3.2.4 Orientation Virtual Sensor

- Orientation of an object describes how it is placed in the 3D space based on positions of Heading, Roll and Pitch
- Heading is the angle between the magnetic north direction and the y-axis, around the z-axis. Heading ranges from 0° to 359° (0=North, 90=East, 180=South, 270=West).

- Roll is defined as the rotation around Y axis (-90 to 90), with increasing values when the x-axis moves toward the z-axis

- Pitch is defined as the rotation around X axis (-180 to 180), with increasing values when the z-axis moves toward the y-axis

- Roll and pitch are calculated with the assistance from accelerometer after dynamic suppression and heading using the magnetic field strength from magnetometer.

- Typically the orientation is given relative to a frame of reference specified by a coordinate system
- At least three independent values as parts of a 3-dimensional vector are needed to describe the orientation
- All the points of the body change their position during a rotation except for those lying on the rotation axis
- This algorithm provides Euler angles(Roll and Pitch) and quaternion to measure the orientation of the device

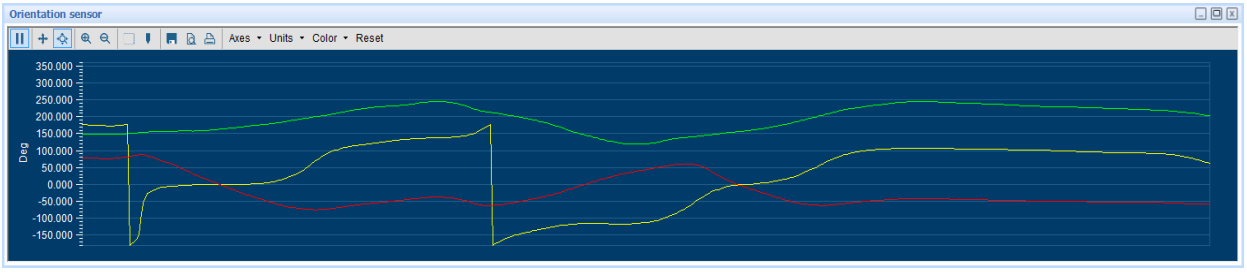


Figure 12 : *Heading, Pitch, Roll*

- In Development Desktop 2.0 Orientation values are shown in general setting panel

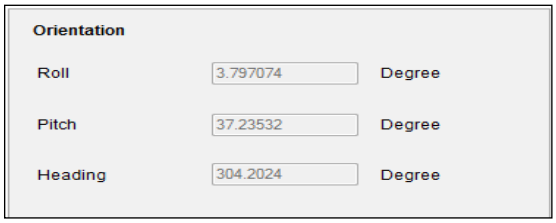


Figure 13 : *Heading, roll, pitch values in general settings*

3.2.5 Quaternion Virtual Sensor

- This is a four element vector can be used to represent the device in 3D space
- The inclination quaternion provides orientation information with respect to accelerometer data around X Y plane
- Full Quaternion provides orientation information along all three axes using both accelerometer and magnetometer data.
- Any rotation in three-dimensions can be represented as an axis vector and an angle of rotation
- 4D vector representing objects orientation in space and avoids the problem of gimbal lock.
- Also known as orientation quaternion's or attitude quaternion's
- $\vec{q} = (w, x, y, z)$
- Supported units: Default, LSB*.

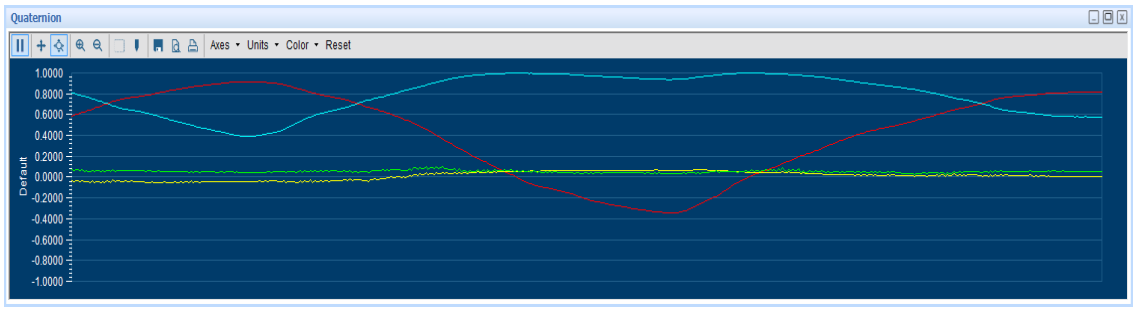


Figure 14 : *W, X, Y, Z*

3.2.6 Gravity Virtual Sensor

- Acceleration sensor gives the sum of all forces applied to the device, while Gravity sensor returns only the influence of gravity.

- A three dimensional vector indicating the direction and magnitude of gravity
- The coordinate system is the same as is used by the acceleration sensor.
- When the device is at rest, the output of the gravity sensor should be identical to that of the accelerometer
- Gravity vector can be used to develop motion base games.
- Supported units: LSB*, m/s2.
- * *Only BSX2.x supports LSB unit*

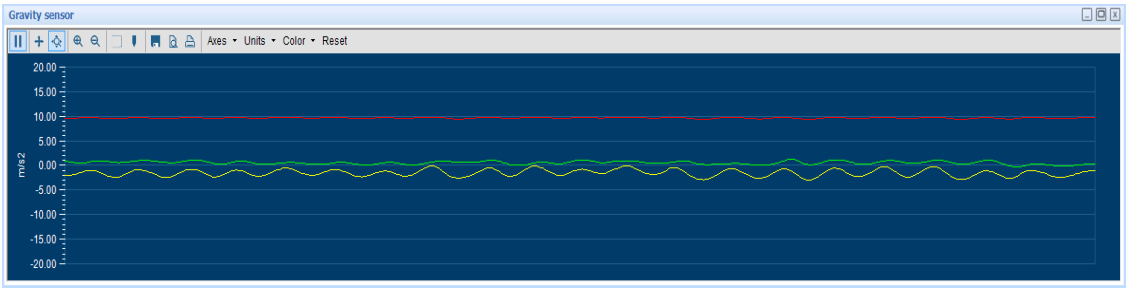


Figure 15 : *Gravity Sensor - X, Y, Z*

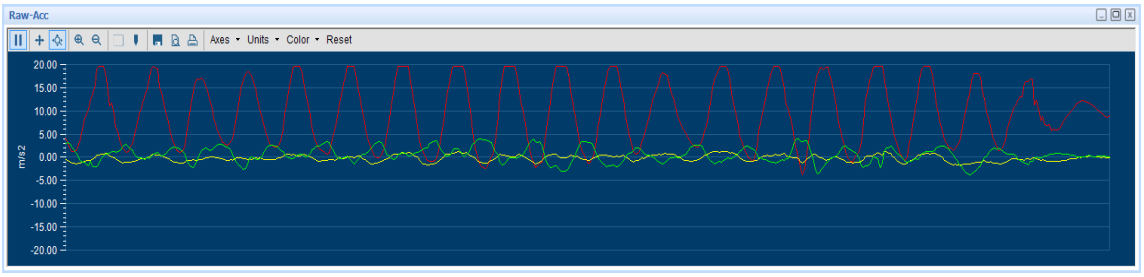


Figure 16 : *Gravity Sensor - X, Y, Z*

3.2.7 Linear Acceleration Virtual Sensor

- A three dimensional vector indicating acceleration along each device axis
- Linear acceleration considered within the mobile phone is free from the gravity. The signal includes only dynamic acceleration and has no static component
- The coordinate system is the same as being used by the acceleration sensor.
- Supported units: LSB*, m/s2
- * *Only BSX2.x supports LSB unit*

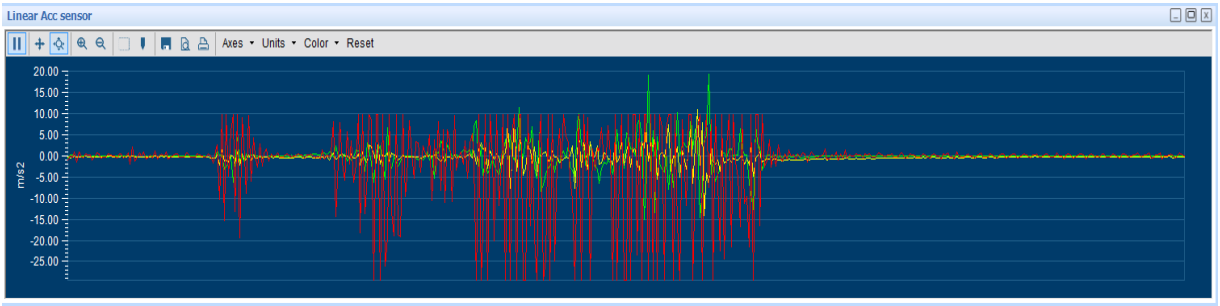


Figure 17 : *Linear Acc Sensor - X, Y, Z*

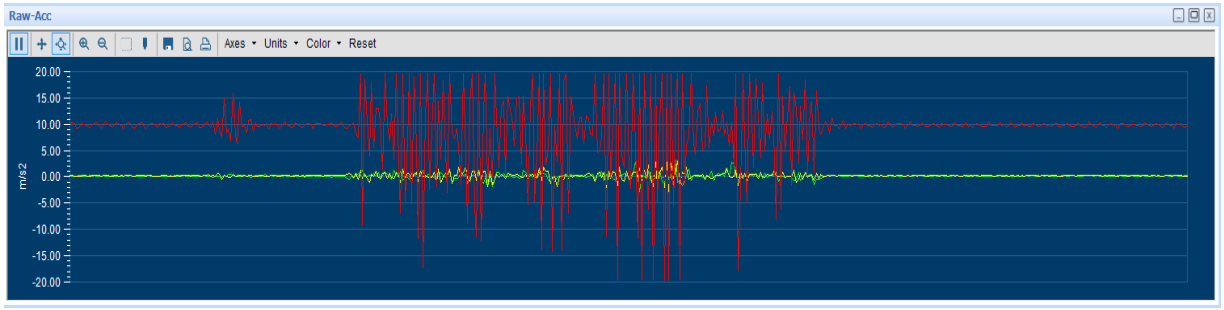


Figure 18 : *Linear Acc Sensor - X, Y, Z*

3.2.8 Raw Virtual Sensors

- The rotation vector represents the orientation of the device as a combination of an angle and an axis, in which the device has rotated through an angle θ around an axis (x, y, or z).
- The direction of the rotation vector is equal to the direction of the axis of rotation.
- Supported units: Default and LSB*
- Only BSX2.x supports LSB unit

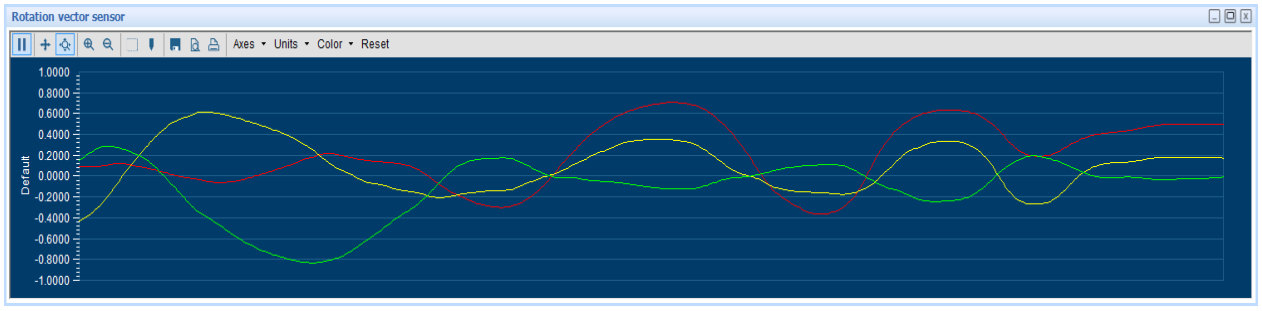


Figure 19 : *X, Y, Z*

3.3 Data Export

- The sensor data can be logged to a file by using the option **Data Export**.
- To launch this view, click on Panels in the main menu and select **Data Export**. Alternately, **Ctrl + D** can be used as a shortcut.
- Follow these steps to carry out the data export
- Launch Data Export from panels and click on select Destination button
- Click the select destination button to select the destination path
- Change the toggle button to append or overwrite. Then click OK. In Append mode, the new data is appended to the selected file. In Overwrite mode, the old data is erased from the selected file and the data from the new measurement is saved to it.
- Check the Enable Data Logging check box.
- Click Start streaming button, output of the sensor data is saved in the desired destination path.
- Please find the data format of Algo Plug-in below text file.

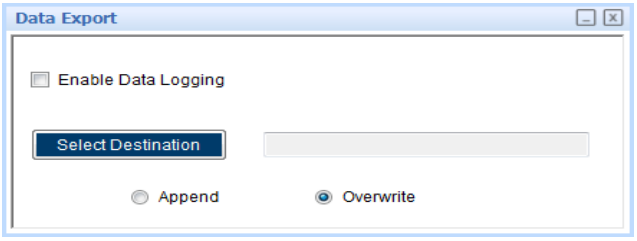


Figure 20 : *Data export panel*

3.4 Calibration Status

- Development Desktop 2.0 shows the calibration status of Accelerometer, Magnetometer and Gyroscope.
- Start moving the board to start the Calibration procedure. While evaluating Classical Calibration i.e. Compass, M4G or NDOF mode, move the board in figure of 8. While evaluating Fast Calibration any three axis motion can be performed.
- Fast Magnetic calibration will start only if gyro is calibrated. It is highly recommended to keep the board stable for 5-10 sec before starting the evaluation in FMC Mode

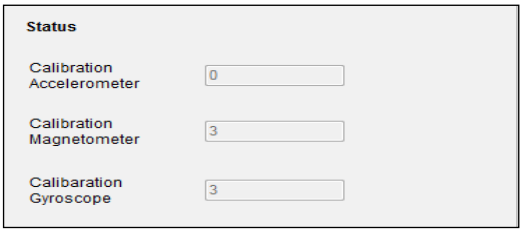


Figure 21 : *Calibration status in general settings*

3.5 Working with Development Desktop – Algo Plug-in offline

3.5.1 Overview

Algo Plug-in offline is a feature in Development Desktop 2.0 which is used to analyze the BSX library data in the plotter UI. Sensor data to the library is given from a file instead of a sensor.

It offers flexibility for choosing the desired mode of operation of the algorithm. Modes and the virtual sensors are same as Algo Plug-in which is described in section 3.

Data source shall be a text file that has the data, logged out from

- Form factor Android phones.
- Algo Plug-in feature of Development Desktop 2.0.
  Shark UI application of BST

3.5.2 Opening the Algo Plug-in Offline UI

To start the Development Desktop 2.0 software:

- Click **Start > Programs > Development Desktop 2.0.**

  or
- Double click the Development Desktop 2.0 software icon on the desktop.

- Algo Plug-in offline UI shall be loaded with / without the shuttle board connected to the application / development board.

- Loading the Algo Plug-in Offline UI need to follow the below procedures
  - In the menu bar click ‘settings’ menu
  - Select “Algo Plugin Offline” menu

  Browse the given Algo Plug-in dll

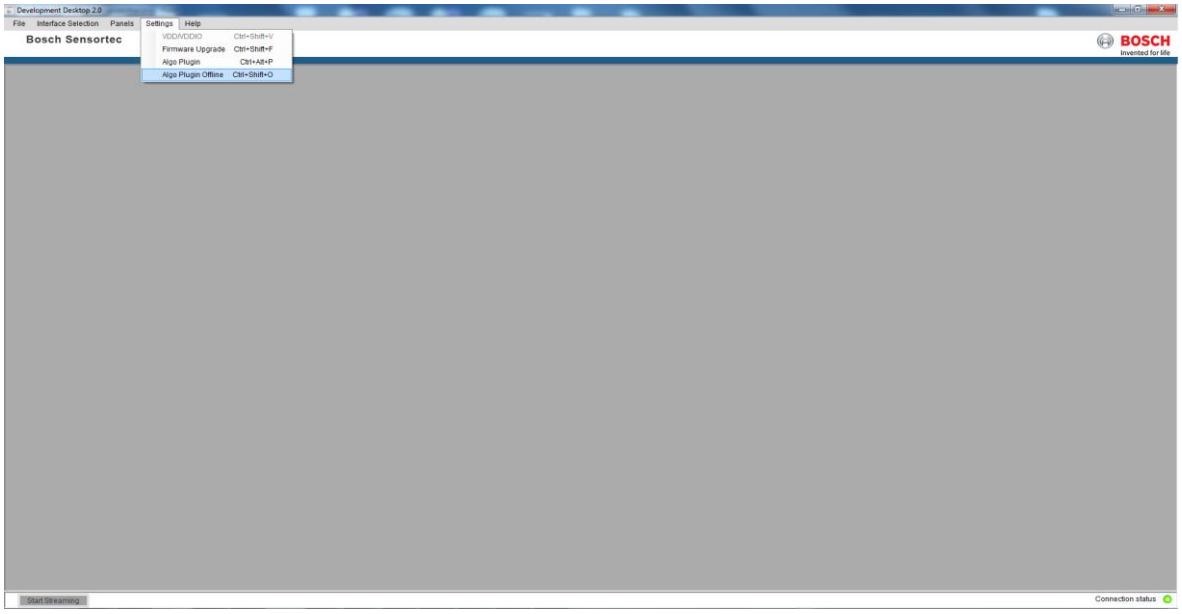


Figure 22 : *Select “Algo Plugin offline” menu item*

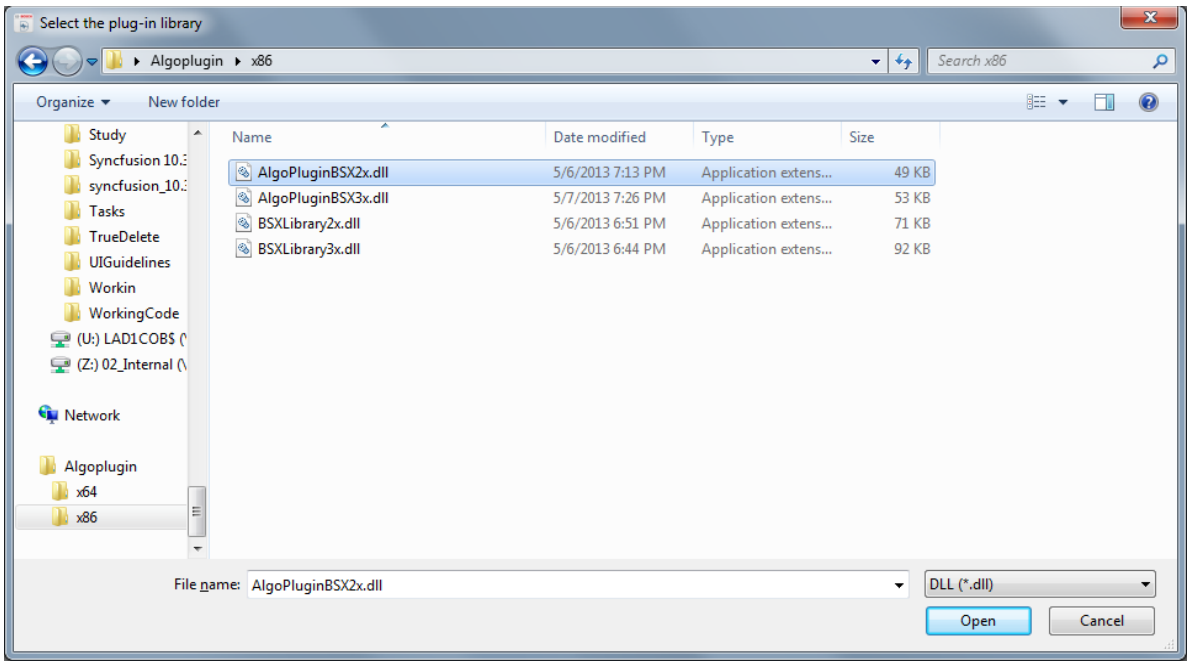


Figure 23 : *Browse and load dll*

Note: The given Algo Plug-in dll is not part of the installer; dll is different for both x86 and x64 bit PC's.

- Load the given Algo Plug-in dll

- After the dll is selected, following settings window appears

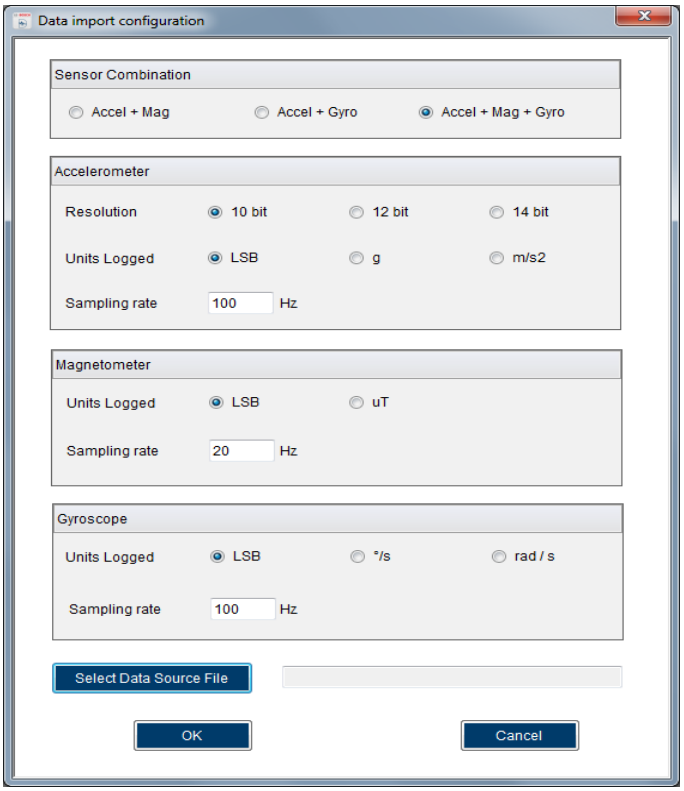


Figure 24 : *Algo Plug-in offline Settings form*

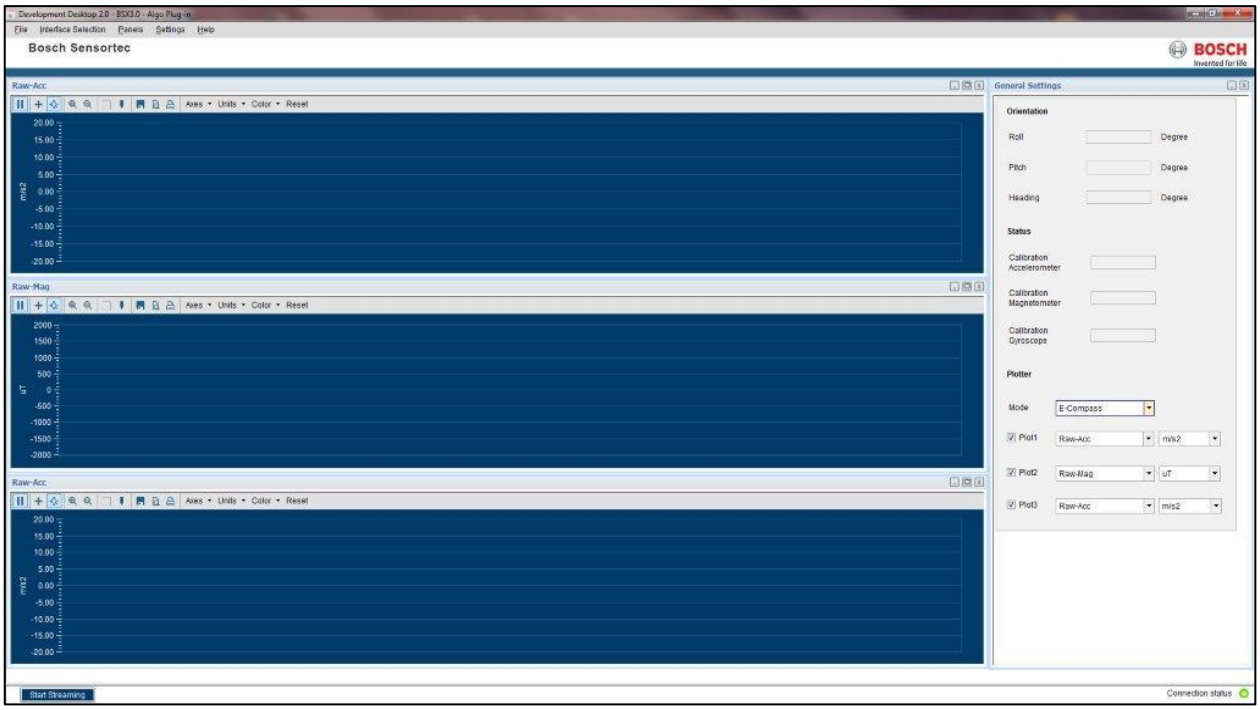


Figure 25 : *Algo Plug-in offline GUI*

3.5.3 Algo Plug-in Settings:

User has to input the settings according to the data source (Refer Fig 31)
Following are the settings:

Sensor Combination:
Denotes the sensor combination in the data source.
E.g.:

- Select Accel + Mag if the data source contains only Accelerometer and Magnetometer data.
  E.g.: If data source is a data log from Shark UI / Algo Plug-in with Mode as Ecompass or M4G
- Select Accel + Gyro if the data source contains only Accelerometer and Gyroscope data.
  E.g.: If data source is a data log from Shark UI / Algo Plug-in with mode as IMU
  or if data source is a data log from android with Accel and Gyro data.
- Select Accel + Mag + Gyro if the data source contains Accelerometer, Magnetometer and Gyroscope data
  E.g.: If data source is a data log from Shark UI / Algo Plug-in with mode as FMC 9DOF / Normal 9DOF
  or if data source is from android data source with Accel, Mag, Gyro data.

Accelerometer – Resolution:
Denotes resolution of accelerometer in data source.
E.g.: 10 bit if the data source is a data log from Algo Plug-in with BMC050 sensor
12 bit if the data source is a data log from Algo Plug-in with BMC055 sensor
Note: 14 bit is not supported in BSX2.x version of library.

Accelerometer – Units Logged:
Denotes the unit logged in data source. It can be LSB or m/s2 or G.

Accelerometer – Sampling Rate:

Denotes the sampling rate of accelerometer in data source.

E.g.: Input 100 Hz if data source is a data log file from Algo Plug-in UI with Mode as Normal 9DOF or FMC 9DOF.
Input 10Hz if data source is a data log file from Algo Plug-in UI with Mode as Ecompass
Input 100Hz if data source is a data log file from Algo Plug-in UI with mode as IMU.

Magnetometer – Units Logged:
Denotes the magnetometer unit logged in data source. It can be uT or LSB.

Magnetometer – Sampling Rate:
Denotes the sampling rate of magnetometer in data source.

E.g.: Input 20Hz if data source is a data log file from Algo Plug-in UI with Mode as Normal 9DOF or FMC 9DOF.
Input 10Hz if data source is a data log file from Algo Plug-in UI with Mode as Ecompass
Input 50Hz if data source is a data log file from Algo Plug-in UI with Mode as M4G.

Gyroscope – Units Logged:
Denotes the gyroscope unit logged in data source. It can be LSB or deg/sec or rad/sec

Gyroscope – Sampling Rate:
Denotes the sampling rate of gyroscope in the data source.

E.g.: Input 100Hz if data source is a data log file from Algo Plug-in UI with Mode as Normal 9DOF or FMC 9DOF.
Input 100Hz if data source is a data log file from Algo Plug-in UI with Mode as IMU.

3.5.4 Closing the Algo Plug-in Offline UI:

- Algo Plug-in data import UI can be closed from the settings menu by clicking on the Algo Plug-in offline menu item.

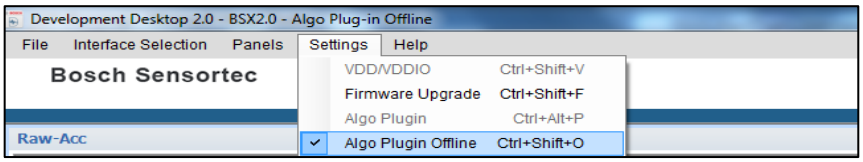


Figure 26 : *Close Algo Plug-in offline from settings menu*

- **Shuttle board connected to the board, when Algo Plug-in data import UI is already loaded :**
  In this case, notification will be given to the user indicating whether to load the view corresponding to the shuttle board or to remain in the current view (i.e. Algo Plug-in Data import)

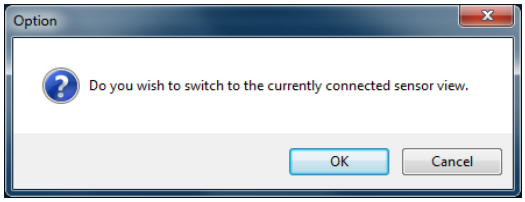


Figure 27 : *Dialog to close the Algo Plug-in*

3.6 Working with Development Desktop – Ecompass UI:

3.6.1 Overview

- Ecompass is an Electronic Compass. It measures the earth magnetic field and shows
- the corresponding magnetic direction . It is a combination of 3-axis magnetometer and 3-axis accelerometer.

- It provides solution for orientation data calculation using accelerometer and magnetometer field data. It is used for sensing the Tilt Compensation, Orientation and Heading

3.6.2 Loading the ECompass UI

To start the Development Desktop 2.0 software:

- Click **Start > Programs > Development Desktop 2.0.**

Or

- Double click the  Development Desktop 2.0 software icon on the desktop.

- ECompass UI shall be loaded with the shuttle board connected to the application / development board.

Loading the ECompass UI need to follow the below procedures.

The Ecompass mode needs to be selected first. After selecting the Ecompass mode, the E-Compass menu item gets enabled in the “Panels” menu.

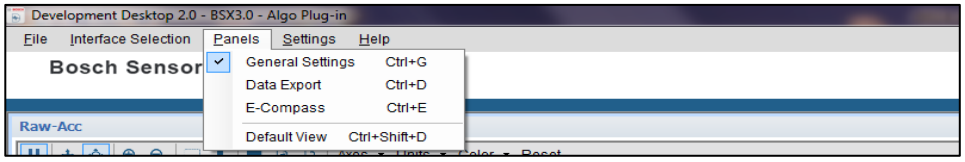


Figure 28 : *E-compass menu item*

- For other modes like M4G, IMU, FMC-NDOF, NDOF, E-Compass menu item would be disabled.

- The E-Compass menu item would be available only when the Algo Plug-in UI is deployed with BSX3.X library.

When the E-Compass menu item is selected, the ECompass UI gets loaded.

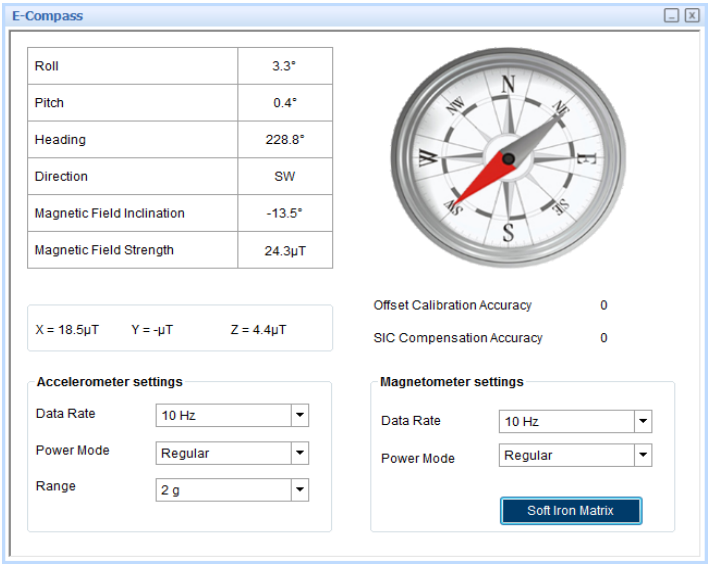


Figure 29 : *E-compass panel*

The E-Compass UI comprises of the following:

- **Dial:**

The dial is used for indicating the magnetic direction based on the earth's magnetic field.

- **Accelerometer settings:**

The Accelerometer settings allows the user to vary the g-range values, the data rate [rate at Which the sensor data is read] and the power mode of accelerometer sensor. The range settings shall be used to select various g-range values of accelerometer. The power mode settings shall be used to vary current consumption of the accelerometer sensor. The data rate settings shall be used to vary the rate at which the data is read from the sensor.

- **Magnetometer settings:**

The Magnetometer settings allows the user to vary the data rate [rate at which the sensor data is read] and the power mode of magnetometer sensor. The power mode settings shall be used to vary current consumption of the accelerometer sensor. The data rate settings shall be used to vary the rate at which the data is read from the sensor.

- **Roll:**

The Roll values indicate the rotation along the X-axis.

- **Pitch:**

The Pitch values indicate the rotation along the Y-axis.

- **Heading:**

The Heading values indicate the rotation along the Z-axis.

- **Direction:**

The direction is nothing but the magnetic direction.

- **Magnetic Field Inclination:**

The Magnetic field inclination indicates the angle, at which an object is inclined towards the magnetic field.

- **Magnetic Field Strength:**

The Magnetic field strength indicates the magnetic field value in terms of Micro Tesla.

- **Other Settings**

The X, Y and Z values indicate the corrected magnetometer values. Offset compensation accuracy values indicate the magnetic calibration values. SIC Calibration accuracy values indicate the soft iron calibration values.

3.6.3 Loading the Soft-Iron Correction UI:

When the Soft Iron Matrix button is clicked, the Soft-Iron Correction UI is loaded.
The Soft iron correction is calibrating the disturbances due to magnetic field in three dimensions.

4. Legal disclaimer

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5. Document history and modifications

Table 1: Revision History

Rev. No	Chapter	Description of modification/changes	Date
1.0		Document creation	24 May 2013
1.1		Adopt to new format	21 August 2020
1.2		Correct the List of Figure Link	.8 June 2021

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