

# BMI2xy

## Desktop Development 2.1 User Manual



### BMI2xy User Manual

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# 1. About user manual

This manual describes the installation and usage of the Development Desktop 2.1 User Interface (DD2.1 UI); a Windows based PC software application and related embedded firmware/software developed by **Bosch Sensortec** for demonstration and evaluation of sensors.

## 1.1 Who should read this manual

This information intended to users who wish to use DD2.1 UI to demonstrate use of the BMI2xy.

## 1.2 DD2.1 UI Overview

DD2.1 UI is a PC based software used to read, capture, and display sensor data. To display the sensor data of BMI2xy on DD2.1 UI, 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. DD2.1 UI automatically detects the sensor that has been plugged in and starts the corresponding software application.

## 1.3 Sensor Communication:

DD2.1 UI software supports both SPI and I<sup>2</sup>C to communicate with the sensor.

## 1.4 Graphical display:

DD2.1 UI displays the sensor data and interrupts in different graphical formats.

## 1.5 Data logging:

DD2.1 UI offers data logging of the sensor data.

## 2. About the BMI2xy

The technical specifications of the BMI2xy sensor are as seen below:

Table 1 : The technical specifications of the BMI2xy sensor

Parameter	Technical Data
Digital Resolution	Accelerometer (A): 16-bit or 0.06 mg/LSB Gyroscope (G): 16-bit or 0.004 dps/LSB
Programmable measurement range & sensitivity	(A): $\pm 2$ g: 16384 LSB/g to (A): $\pm 16$ g: 2048 LSB/g (G): $\pm 125$ dps: 262.1 LSB/dps to (G): $\pm 2000$ dps: 16.4 LSB/dps
Zero-g/Zero-rate offset	(A): $\pm 20$ mg (G): $\pm 0.5$ dps
Sensitivity Error	(A): $\pm 0.4\%$ (G): $\pm 0.4\%$ (with CRT)
Temperature range	-40 ... +85 °C
Temperature behavior (TCO; TCS)	(A): $\pm 0.25$ mg/K; $\pm 0.004$ %/K (G): $\pm 0.02$ dps/K; $\pm 0.02$ %/K
Noise density	(A): 160 $\mu\text{g}/\sqrt{\text{Hz}}$ (G): 0.008 dps/ $\sqrt{\text{Hz}}$
Offset vs PCB strain	A): $\pm 0.01$ mg/ $\mu\epsilon$ (G): $\pm 1.5$ mdps/ $\mu\epsilon$
Filter BW (programmable)	(A): 5 Hz ... 684 Hz (G): 11 Hz ... 751 Hz
Output Data Rate (ODR)	(A): 12.5 Hz ... 1.6 kHz (G): 25 Hz ... 6.4 kHz
Digital inputs/outputs	2x SPI; 2x I2C; AUX I/F; OIS I/F 2x digital interrupts
Supply voltage	1.7 ... 3.6 VDD 1.2 ... 3.6 VDDIO
Current consumption	685 $\mu\text{A}$ at full ODR (aliasing-free)
Package size	2.5 x 3.0 x 0.8 mm <sup>3</sup> 14 pin LGA

### 3 Getting Started

The below sections highlight the procedure to set up connections between BMI2xy, DD2.1 UI and the PC.

#### 3.1 Setting Up the board-PC connection

The procedure to connect sensor to PC via USB is as below:

- Install DD2.1 UI.
- Insert the shuttle board and application board.

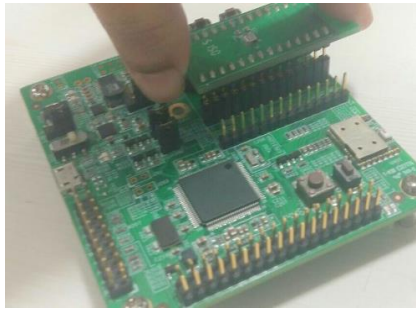


Figure 1 : Insert sensor for APP2.0



Figure 2 : Insert sensor for APP3.0

- Connect the board and PC using a USB cable/Bluetooth.

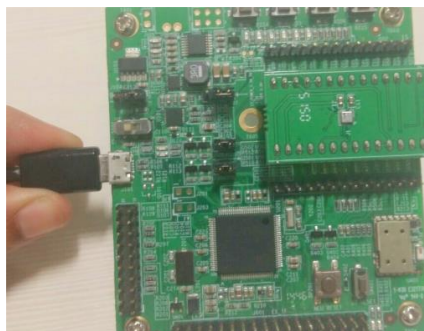


Figure 3 : Connect board and PC for APP2.0

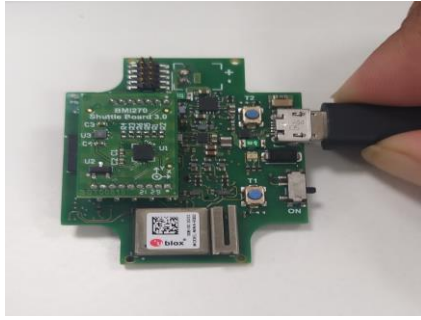


Figure 4 : Connect board and PC for APP3.0

- Turn the on/off switch **ON**. The LED glows.

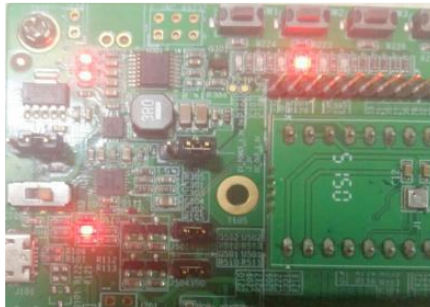


Figure 5 : Connection complete for APP2.0



Figure 6 : Connection complete for APP3.0

## 3.2 Start-up View

To start the DD2.1 UI software:

- Click Start -> Programs -> Development Desktop 2.1.  
Or
- Double click the DD2.1 UI software icon on the desktop.

The Graphical User Interface (GUI) of the software is as seen below:



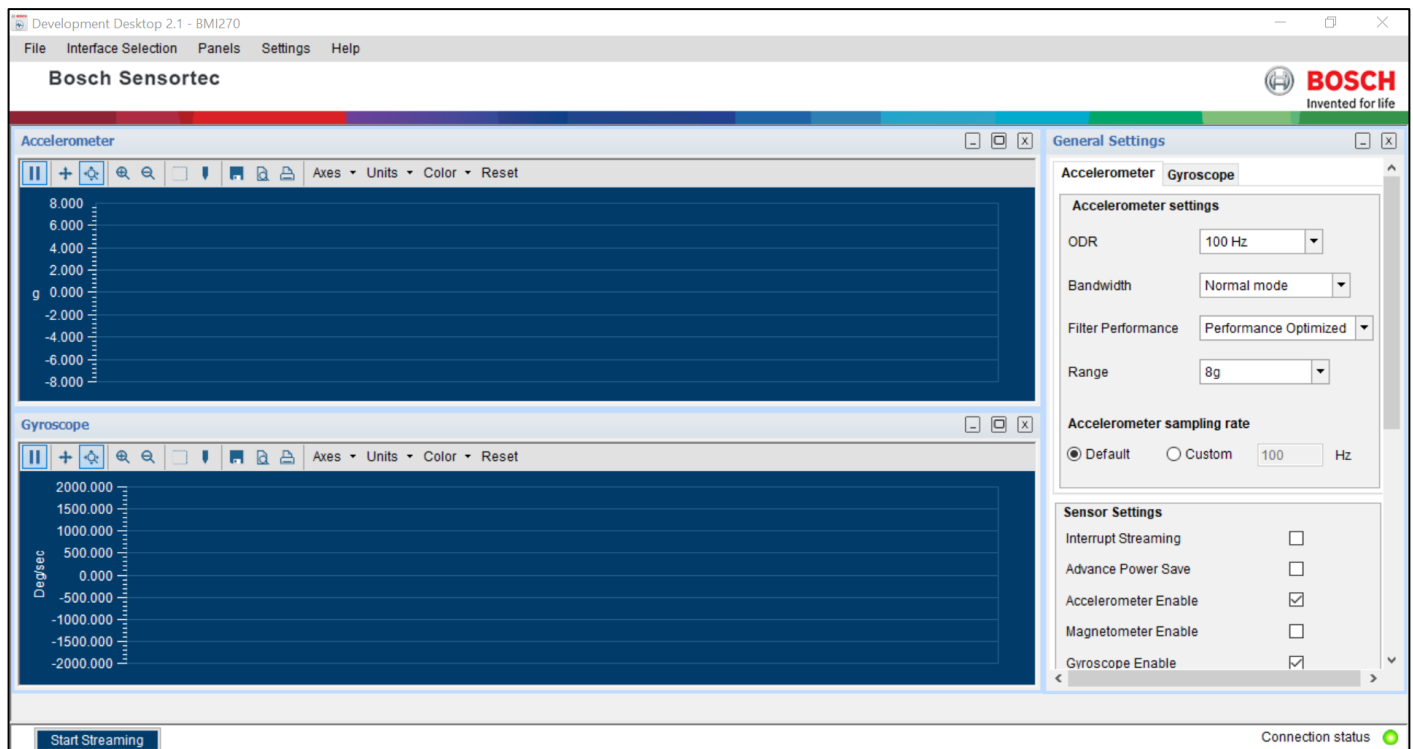


Figure 7 : DD2.1 Startup View

- When the PC and board are connected, the Communication Status glows green as shown below:

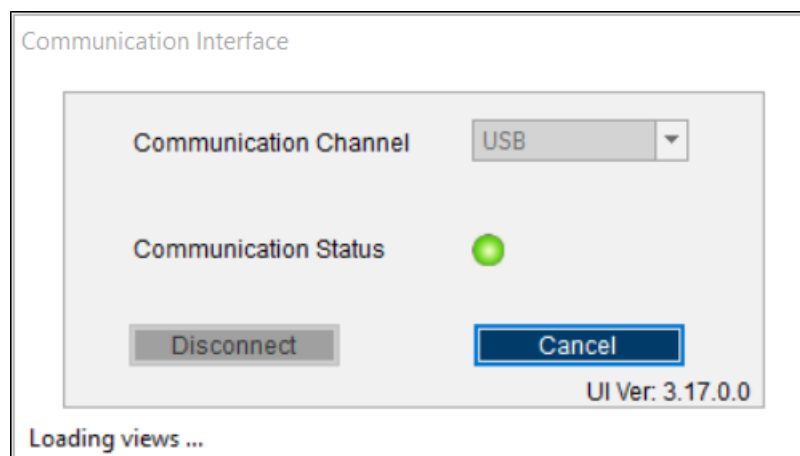
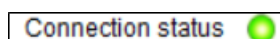


Figure 8 : Communication Status

- The communication status is also indicated at the bottom right of the GUI at all times:



- Other menu options include:

1. File
2. Interface Selection
3. Panels
4. Settings

## 5. Help

These menu options are explained in detail in the following sections.

### 3.3 Upgrading Firmware

#### 3.3.1 For App 2.0 Board:

To upgrade the firmware of DD2.1 UI to match the current version, follow the steps below:

- Click **Menu -> Settings-> Firmware Upgrade**. The following window appears:

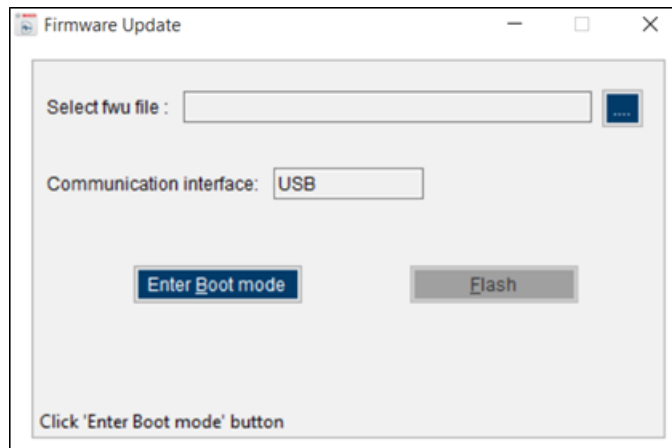


Figure 9 : Firmware upgrade window

- Click Enter Boot mode.

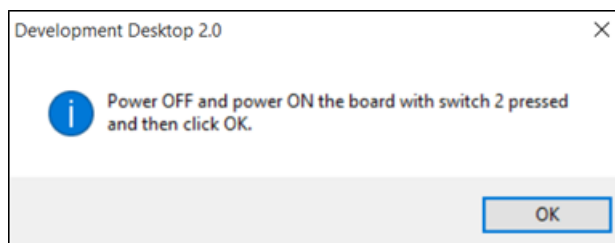


Figure 10 : Application Boot Loader

- Switch off board, and press **Switch 2**. In Application board, all four LEDs will glow simultaneously.
- Click **OK**.
- All four LEDs will glow simultaneously.
- Press **OK**.

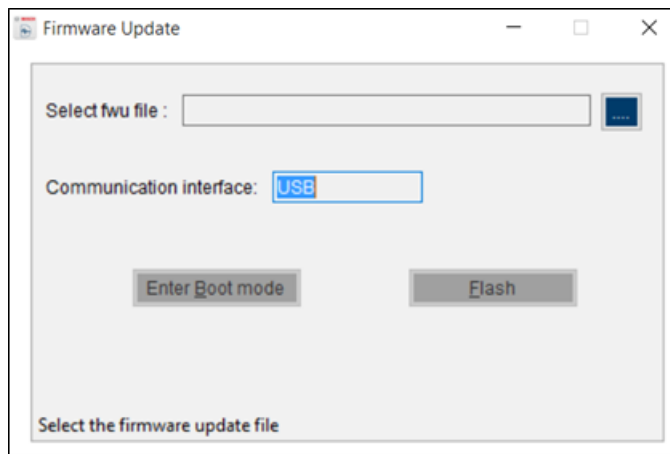


Figure 11 : Boot mode Detected

- Select the default firmware update file (\*.fwu2) from the DD2.1 UI installation directory in the folder **Firmware**.
- Click **Flash**.

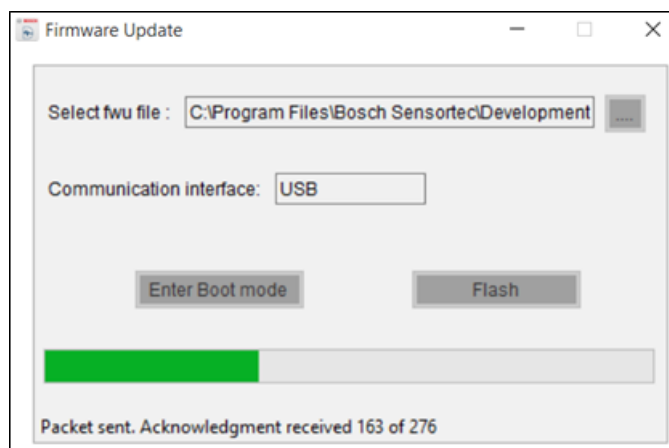


Figure 12 : Firmware upgrade completion

- Once firmware upgrade is complete, restart the application board, and DD2.1 UI.

### 3.2.2. For App 3.0 Board:

To upgrade the firmware of DD2.1 UI to match the current version, follow the steps below:

1. Click **Menu -> Settings-> Firmware Upgrade**. The following window appears:

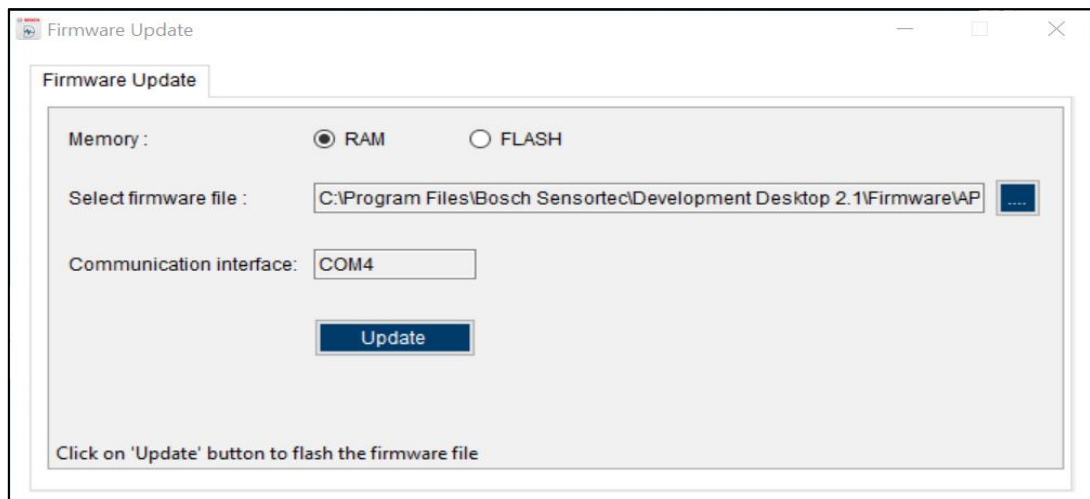


Figure 13 : Firmware upgrade window

Default firmware file (\*.bin) will be automatically chosen from the DD2.1 UI installation directory in the folder **Firmware\App3.0**.

2. Choose RAM or FLASH option to flash the latest recommended firmware file.
3. The file path will get automatically chosen/selected in the select firmware file path textbox. User can also select the firmware as required.
4. Click on **Flash**.
5. DD2.1 recommended firmware is COINES\_bridge firmware for App3.0 shuttle board. If the user chose to flash DD firmware, a popup message will be shown. User can still choose the DD firmware and proceed.

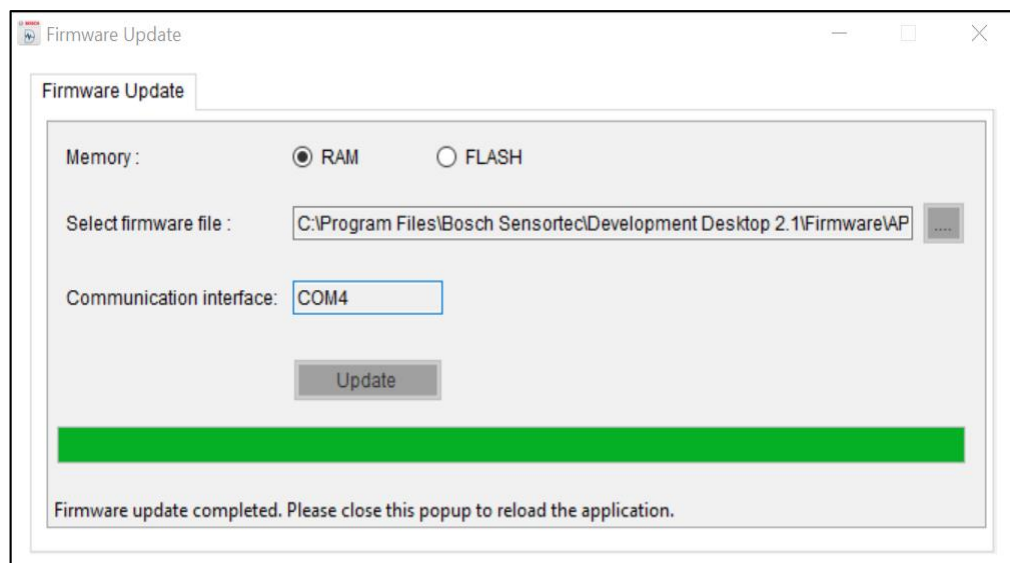


Figure 14 : Firmware upgrade completion

6. Once firmware update is completed, please close the popup and DD 2.1 application will get automatically reloaded.

## 4 Working with DD2.1 UI

The functions of BMI2xy in DD2.1 UI are discussed in the below sections.

### 4.1 Sensor Data Monitoring

DD2.1 UI offers sensor data monitoring for both accelerometer and gyroscope in BMI2xy.

#### 4.1.1 Accelerometer

- To view accelerometer data, go to **Menu -> Panels -> Accelerometer**, or click **Ctrl+A**.
- When an interrupt occurs, the changes in accelerometer data can be seen in the interrupt plotter.

#### 4.1.2 Gyroscope

- To view the gyroscope data, **Menu -> Panels -> Gyroscope**, or click **Ctrl + Alt + G**.
- These panels plot the real time sensor signals from the sensor. The sensor data can be analysed by using graph features like Play/Pause, view history, graph speed, Zoom In/Out, Zoom particular area in the graph, save and print current instance.

### 4.2 General Settings

The General Settings panel is present in the right side of the DD2.1 UI screen. The various general settings available in BMI2xy as discussed in the below sections:

#### 4.2.1 Accelerometer Settings

- The accelerometer settings panel is as seen below:

Figure 15 : Accelerometer settings

- ODR: To choose the Output Data Rate (ODR), select the relevant values from the drop-down list which are:
  1. 12.5 Hz
  2. 25 Hz
  3. 50 Hz
  4. 100 Hz
  5. 200 Hz
  6. 400 Hz
  7. 800 Hz
  8. 1600 Hz
- Bandwidth: To set a bandwidth, the user must select any one of the following options from the bandwidth drop-down list
  1. OSR4 Mode
  2. OSR2 Mode
  3. Normal mode
  4. CIC Mode

**Note: Across all bandwidths, the ODR value options remain the same.**

- Filter Performance: For optimized performance, the different filter performance options available are:
  1. Power Optimized (power consumed). The different bandwidths available in this filter are:
    1. No Averaging
    2. Average 2samples
    3. Average 4samples
    4. Average 8samples
    5. Average 16samples
    6. Average 32samples
    7. Average 64samples
    8. Average 124samples

**Note: Only ODR that supports the power optimized bandwidth are displayed.**

2. Performance Optimized (output accuracy). The different bandwidths available in this filter are:
  1. OSR4 mode
  2. OSR2 mode
  3. Normal mode
  4. CIC mode

**Note: The bandwidth names are as per the DD2.1 UI.**

- Range: To set a range, the user must select any one of the following options from the range drop-down list
  1. 2g
  2. 4g
  3. 8g
  4. 16g

**Note: Across all bandwidths, the range value options remain the same.**

- The two sampling rates offered by DD2.1 UI for BMI2xy are:

Default: A pre- defined sampling rate value supported by the sensor. A pre-defined sampling rate value.

Custom: User-defined sampling rate value. Custom sampling rate can only be a value between 12.5 Hz and 2000 Hz.

- Select relevant value by clicking the radio button next to the option name.

**Note: When the DD2.1 UI is launched, sampling rate will be Default. When you wish to input a custom sampling rate, please enter the value next to the corresponding option.**

#### 4.2.2 Magnetometer Settings

- The magnetometer settings panel is as seen below:

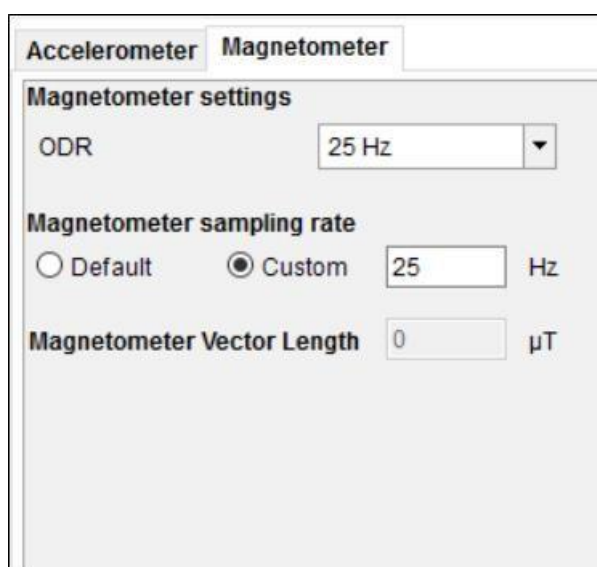


Figure 16 : Magnetometer settings

- ODR: To choose the Output Data Rate (ODR), select the relevant values from the drop-down list. The possible ODR values are:
  1. 1.56 Hz
  2. 3.12 Hz
  3. 6.25 Hz
  4. 12.5 Hz
  5. 25 Hz
  6. 50 Hz
  7. 100 Hz
  8. 200 Hz
- The two sampling rates offered by DD2.1 UI for the BMI2xy sensors are:
 

Default: A pre- defined sampling rate value supported by the sensor.

Custom: User-defined sampling rate value. Custom sampling rate can only be a value between 0.78 Hz and 800 Hz.
- Select relevant value by clicking the radio button next to the options.

**Note:** When the DD2.1 UI is launched, sampling rate will at Default. When you wish to input a custom sampling rate, please enter the value next to the corresponding option.

### 4.2.3 Gyroscope Settings

- The gyroscope settings panel is as seen below:

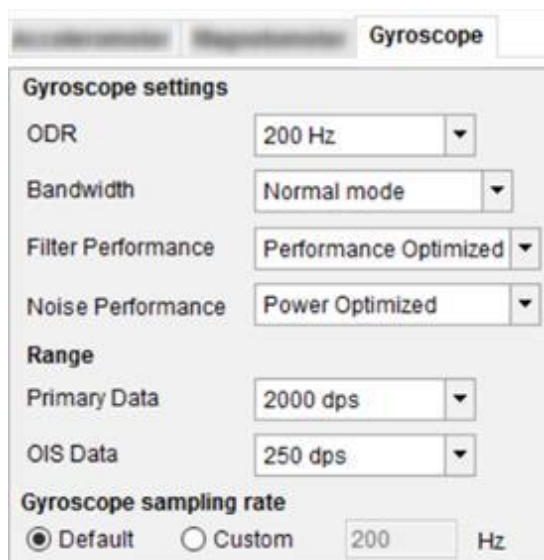


Figure 17 : Gyroscope settings

- ODR: To choose the Output Data Rate (ODR), select the relevant values from the drop-down list. The possible ODR values are:
  1. 12.5 Hz
  2. 25 Hz
  3. 50 Hz
  4. 100 Hz
  5. 200 Hz
  6. 400 Hz
  7. 800 Hz
  8. 1600 Hz
  9. 3200 Hz
- Bandwidth: The different Bandwidth options are:
  1. OSR4 Mode
  2. OSR2 Mode
  3. Normal mode

**Note:** Across all bandwidths, the ODR value options remain the same.

- Filter Performance: For optimized performance, the different filter performance options available are:
  1. Power Optimized (power consumed). The different bandwidths available in this filter are:
    1. OSR4 mode
    2. OSR2 mode
    3. Normal mode
  2. Performance Optimized (output accuracy). The different bandwidths available in this filter are:
    1. OSR4 mode
    2. OSR2 mode
    3. Normal mode

**Note:** The bandwidth names are as per the DD2.1 UI.



- Noise Performance: For optimized performance, the different noise performance options available are:
- 1. Power Optimized (power consumed). The different bandwidths available in this filter are:
  1. OSR4 mode
  2. OSR2 mode
  3. Normal mode
- 2. Performance Optimized (output accuracy). The different bandwidths available in this filter are:
  1. OSR4 mode
  2. OSR2 mode
  3. Normal mode

**Note: The bandwidth names are as per the DD2.1 UI.**

- Range: Range can be defined for both primary and OIS data in BMI2xy sensors. To choose the g-range, select the relevant value from the drop-down list. In all power modes, the g-range values available are:
  1. Primary Data
    1. 2000 dps
    2. 1000 dps
    3. 500 dps
    4. 250 dps
    5. 125 dps
  2. OIS Data
    1. 250 dps
    2. 2000 dps

**Note: Across all bandwidths, the range value options remain the same.**

- The two sampling rates offered by DD2.1 UI for BMI2xy are:
  1. Default: A pre- defined sampling rate value supported by the sensor. A pre-defined sampling rate value.
  2. Custom: User-defined sampling rate value. Custom sampling rate can only be a value between 25 Hz and 3200 Hz.
- Select relevant value by clicking the radio button next to the option name.

**Note: when the DD2.1 UI is launched, sampling rate will at Default. When you wish to input a custom sampling rate, please enter the value next to the corresponding option.**

#### 4.2.4 Sensor Settings

The sensor settings panel is as seen below:

Sensor Settings	
Interrupt Streaming	<input type="checkbox"/>
Advance Power Save	<input type="checkbox"/>
Accelerometer Enable	<input checked="" type="checkbox"/>
Magnetometer Enable	<input type="checkbox"/>
Gyroscope Enable	<input type="checkbox"/>
Temperature Enable	<input type="checkbox"/>

Figure 18 : Sensor settings

- Interrupt Streaming: In Interrupt, data is streamed as and when data is ready. Select relevant value by clicking the radio button next to the options.
- Advance Power Save: To save power (power optimization), check the box next to **Advance Power Save**.
- Accelerometer Enable: To enable accelerometer sensor, check the box next to **Accelerometer Enable** in the **General Settings** panel.

- **Magnetometer Enable:** To enable magnetometer sensor, check the box next to **Magnetometer Enable** in the **General Settings** panel.
- **Gyroscope Enable:** To enable Gyroscope sensor, check the box next to **Gyroscope Enable** in the **General Settings** panel.
- **Temperature Enable:** To enable Temperature sensor, check the box next to **Temperature Enable** in the **General Settings** panel.

#### 4.2.5 Temperature

While data streaming in the plotter, the real time temperature is updated in the given box as shown below:

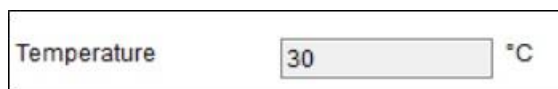


Figure 19 : Temperature

- To select **Primary Interface Data**, select the checkbox next to the option.
- To select **OIS Data**, select the checkbox next to the option.
- The temperature value is updated when:
  1. **Settings -> Temperature**, checkbox is checked.
  2. **Settings -> Gyroscope**, checkbox is checked.

**Note: If Gyroscope checkbox is checked, temperature is measured even if Temperature checkbox is not checked.**

#### 4.2.6 Reset

- To reset all values to its default state, click

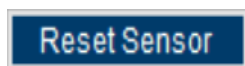


Figure 20 : Reset sensor

- When reset, the following values are reset to their default value as seen below:
  1. Accelerometer
    1. ODR – 100 Hz
    2. Bandwidth – Normal mode
    3. Filter Performance – Performance Optimized
    4. Range – 4g
    5. Accelerometer sampling rate – Default
  2. Gyroscope
    1. ODR – 200 Hz
    2. Bandwidth – Normal mode
    3. Filter Performance – Performance Optimized
    4. Noise Performance – Power Optimized
    5. Range:
      - Primary Data – 2000 dps
      - OIS data – 250 dps
  6. Gyroscope sampling rate – Default

#### 4.2.7 PO Reset

To reset sensor values to default state, click



Figure 21 : PO reset

#### 4.3 Interface Selection

Interface Selection has two menu options as seen:

##### 4.3.1 Board Communication

- To check communication between board and DD2.1 UI, go to **Menu -> Interface Selection -> Board Communication**, or click **Ctrl+Shift+B**.
- If the board and application are connected, **Communication Status** will be green as seen:

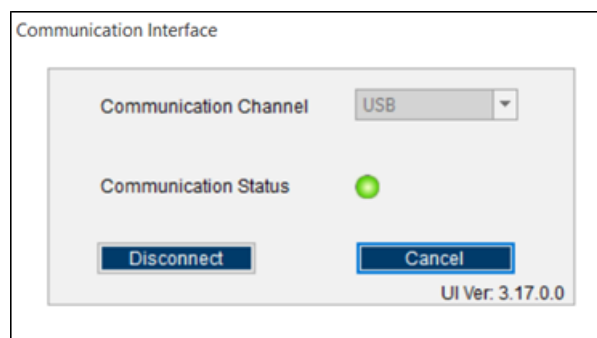


Figure 22 : communication status green

- Click **Disconnect** to break the communication.
- Click **Cancel** to exit the window.
- If the board and application are not connected, the **Communication Status** will be red as seen:

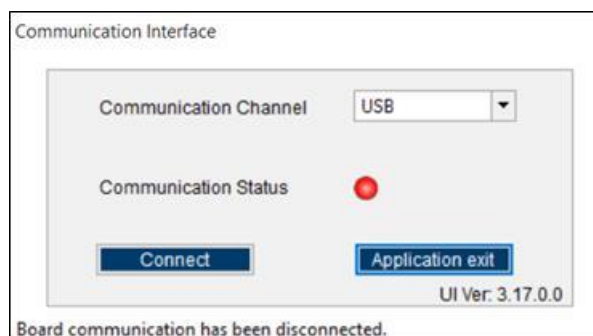


Figure 23 : Communication status

- Click **Connect** to establish connection.
- Click **Application exit** to close DD2.1 UI.

### 4.3.2 Sensor Interface

- To select between the two available interfaces (SPI and I<sup>2</sup>C), go to **Menu -> Interface Selection -> Sensor Interface**, or click **Ctrl+Shift+I**.

- The following window appears:

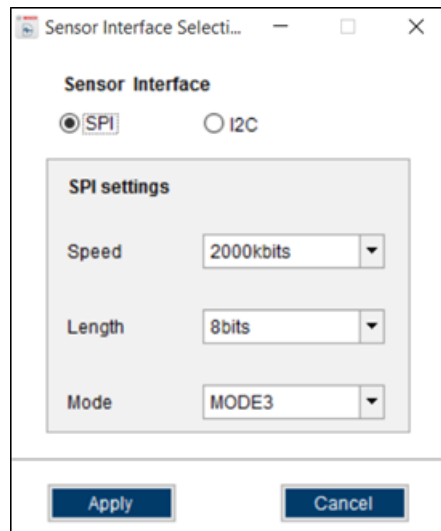


Figure 24 : SPI interface setting

**Note: By default, the sensor interface is in SPI.**

- Select the relevant SPI Address. SPI speed and SPI Mode.
- Click Apply.
- To select I<sup>2</sup>C, click the appropriate radio button. The following window appears:

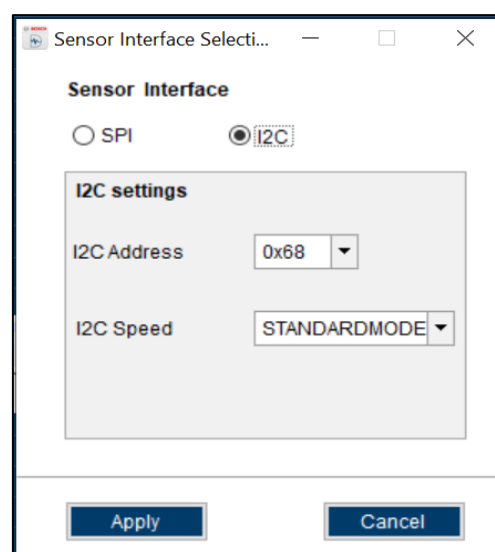


Figure 25 : I2C interface settings

- Select the relevant **I<sup>2</sup>C Address** and **I<sup>2</sup>C speed**.

- Click **Apply**.

**Note: Sensor Interface Selection in the UI is disabled when the sensor is streaming data.**

## 4.4 Panels

To choose the panels for which you wish to view data, go to **Menu -> Panels**.

The different panels available for BMI2xy are:

### 4.4.1 Configuration

To view the **Configuration** settings panel, go to **Menu -> Panels -> Configuration** or click **Ctrl + C**. The following window appears:

Section	Parameter	Value	Range
step_counter_output	byte_0	00	(0x0 - 0xFF)
	byte_1	00	(0x0 - 0xFF)
	byte_2	00	(0x0 - 0xFF)
	byte_3	00	(0x0 - 0xFF)
activity_output	activity_output	0	(0x0 - 0x3)
	orientation_output	0	(0x0 - 0x3)
orientation_output	portrait_landscape	0	(0x0 - 0x3)
	faceup_down	0	(0x0 - 0x1)
gyro_usergain_status	sat_x	0	(0x0 - 0x1)
	sat_y	0	(0x0 - 0x1)
	sat_z	0	(0x0 - 0x1)
gyro_cross_sense	correction_factor_zx	7D	(0x0 - 0x7F)
	nvm_vfrm_error_output	0	(0x0 - 0x1)
nvm_vfrm_error_output	nvm_load_error	0	(0x0 - 0x1)
	nvm_prog_error	0	(0x0 - 0x1)
	nvm_erase_error	0	(0x0 - 0x1)
	nvm_exceed_error	0	(0x0 - 0x1)
	nvm_privl_error	0	(0x0 - 0x1)
	vfrm_lock_error	0	(0x0 - 0x1)
	vfrm_write_error	0	(0x0 - 0x1)
	vfrm_fatal_error	0	(0x0 - 0x1)
general_settings	identification1	0108	
	identification2	0401	
	map_x_axis	0	
	map_x_axis_sign	0	
	map_y_axis	1	
	map_y_axis_sign	0	
	map_z_axis	2	
map_z_axis_sign	0		
gyro_self_off	0		

Figure 26 : Configuration settings

Refer to [Interrupt View](#) for more information on mapping the interrupts.

- Once the interrupt is mapped, simulate the interrupt that has to be triggered.
- Once the interrupt is generated, the following will happen:
  1. The corresponding LED (to the interrupt) will glow green.
  2. The interrupt will be plotted in the DD2.1 UI plotter.
    - Using the above procedure, some of the interrupts in BMI2xy which can be enabled and verified using DD2.1 UI are as seen below:
      1. Any motion
      2. No motion
      3. Orientation
      4. High g
      5. Low g
      6. Flat
      7. Sig motion
      8. Step counter/detector
      9. Activity
      10. Tap(Single\_Tap)

#### 4.2.2 Accelerometer

- To view the real-time accelerometer data in the plotter, go to **Menu -> Panels -> Accelerometer**, or click **Ctrl+A**.
- Refer to [Accelerometer](#) for more information on accelerometer settings.

#### 4.4.3 Gyroscope

- To view the real-time gyroscope data in the plotter, go to **Menu -> Panels -> Gyroscope**, or click **Ctrl+Alt+G**.
- Refer to [Gyroscope](#) for more information on gyroscope settings.

#### 4.4.4 Magnetometer

- To view the real-time magnetometer data in the plotter, go to **Menu -> Panels -> Magnetometer**, or click **Alt+M**.
- Refer to [Magnetometer](#) for more information on magnetometer settings.

#### 4.4.5 Interrupts

- To view the Interrupts panel, go to **Menu -> Panels -> Interrupts**, or click **Ctrl+I**.
- When an interrupt occurs, the corresponding interrupt will glow green in the Interrupts panel as seen in the below figure:

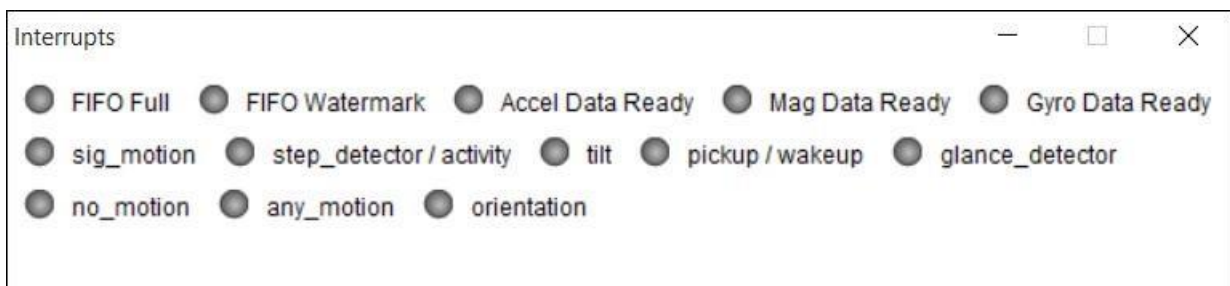


Figure 27 : Interrupts

- Refer to [Interrupt View](#) for more information on interrupt mapping.

#### 4.4.6 Memory Map

- To view **Memory Map** options, go to **Menu -> Panels -> Memory Map**. A drop-down appears as seen below:

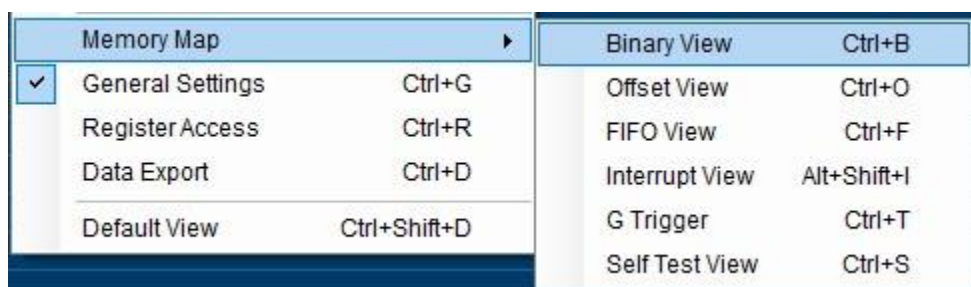


Figure 28 : Memory map

The different options within **Memory Map** are described in the below sections:

### Binary View

- To view the data in binary format, go to **Menu -> Panels -> Memory Map -> Binary View**, or click **Ctrl+B**.
- The following panel appears:

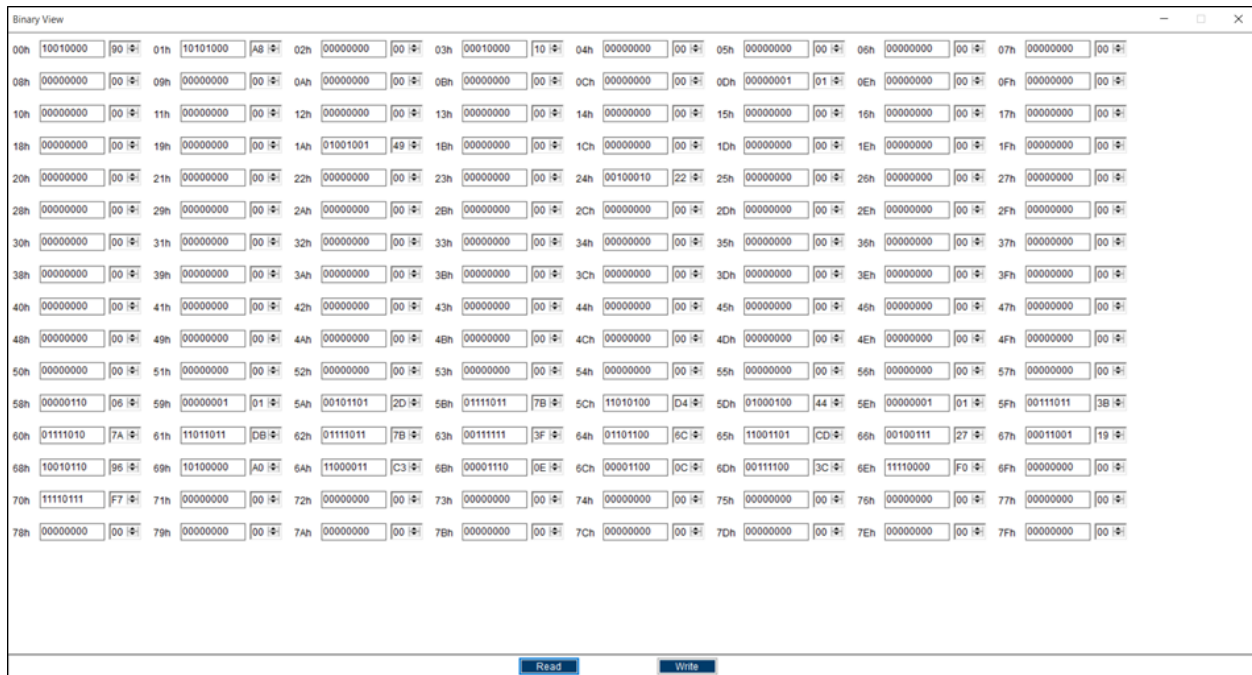


Figure 29 : Binary view

- **Binary View** is used to read or write values into multiple registers in one view. To implement this, follow the below steps:
  1. Enter the value in the box alongside the register name.
  2. As per requirement, click **Read/Write**.

## Offset View

- To set offset values for BMI2xy, go to **Menu -> Panels -> Memory Map -> Offset View**, or click **Ctrl+O**.
- The following window appears:

Figure 30 : Offset view

- **Offset view** is used to allow the user to provide user defined offset values in which the sensor data is compensated.

**Note: In BMI2xy, Offset can be enabled for both Accelerometer and Gyroscope.**

- To implement offset for Accelerometer, follow the below steps:
  1. Check the checkbox next to **Accelerometer Enable**.
  2. Set the **Offset** for X, Y, and Z axes.
    1. It can be set to a value between -128 and 127.
    2. **Offset** will be set to 0 by default.
  3. As per requirement, click **Read** or **Write**.
- To implement offset for Gyroscope, follow the below steps:
  1. Check the checkbox next to **Gyroscope Enable**.
  2. Set the **Offset** for X, Y, and Z axes.
    1. It can be set to a value between -512 and 511.
    2. **Offset** will be set to 0 by default.
  3. As per requirement, click **Read** or **Write**.



## FIFO View

- To launch the FIFO view settings panel, go to **Menu -> Panels -> Memory Map -> FIFO View**, or click **Ctrl+F**.
- The following window appears:

The screenshot shows the 'FIFO View' window with the following sections:

- FIFO Configuration:**
  - FIFO Accel Enable ☐
  - FIFO Mag Enable ☐
  - FIFO Gyro Enable ☐
  - FIFO Stop on Full ☐
  - FIFO Time Enable ☒
  - FIFO Frame Header Enable ☒
- FIFO Interrupts:**
  - FIFO Tag Int1 ☐
  - FIFO Tag Int2 ☐
  - FIFO Watermark ☐ Int1 ☐ Int2
  - FIFO Full ☐ Int1 ☐ Int2
- FIFO Settings:**
  - Watermark / Retain Level: 512
  - Frame Counter: 0
- Gyro Downsampling Configuration:**
  - FIFO Downsampling: 0
  - FIFO Filter Data: 1 = Filtered
- Accel Downsampling Configuration:**
  - FIFO Downsampling: 0
  - FIFO Filter Data: 1 = Filtered
- FIFO Data Log:**
  - ☐ FIFO data log
  - Select Destination: [Empty field]
  - ☐ Append ☒ Overwrite
- FIFO Data:** A table with columns: Frame, Header, Time, LSB, MSB, MSB. The table is currently empty.

Buttons at the bottom: Read, Write, FIFO Read, Start FIFO Streaming, FIFO Flush.

Figure 31 : FIFO view

- To enable data streaming with **FIFO view**, follow the steps below:
  1. As per requirement, enable the accelerometer, magnetometer, gyrometer, or all.
  2. Map the enabled interrupt to **Int1**, **Int2**, or both.
  3. In **FIFO Watermark**, set a non-zero watermark value.
  4. Click **Write** to write the values into the sensor.
  5. Click **FIFO Read**.
- The sensor values are displayed in the **FIFO Data** data grid.
- Click **Start FIFO Streaming** to stream FIFO data in the accelerometer panel.
- Click **FIFO Data Log** to store data plotted/read during FIFO streaming/reading.

## Interrupt View

- To map the interrupts in Interrupt View, go to Menu -> Panels -> Memory Map -> Interrupt View, or click Alt+Shift+I.
- Enable Int1, or Int 2, or both. To accomplish this:
  1. Set **Trigger** to 1. The **Trigger** settings will change from **Level** to Edge.
  2. Set Output Enable to 1. The Output Enable value will change from Output Disabled to Output Enabled.
  3. Select the parameters for which the interrupt has been configured.
  4. Refer to [Configuration](#) for more information on enabling the interrupts.
  5. Click **Write** to write the new values into the sensor.
    - To view the interrupts in the plotter, click **Start Streaming**.
    - The following window appears:

The screenshot shows the 'Interrupt View' window. It contains two panels for 'In Out Control - Interrupt 1' and 'In Out Control - Interrupt 2'. Each panel has four settings: Level (0), Behaviour (0), Output Enable (0), and Input Enable (0), all with dropdown arrows. Below these is an 'INT Mapping' table with columns for various sensor events and checkboxes for Int1 and Int2. At the bottom, there is a 'Latch settings' section with 'Latch Interrupt' set to 0 and 'Non latched'. Two buttons, 'Read' and 'Write', are at the bottom right.

INT Mapping		Data ready	sig_motion	step_detector	activity	wrist_wear_wake	wrist_gesture	no_motion	any_motion	Unused BIT_7
Int1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Int2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 32 : Interrupt view

## G Trigger

- G Trigger comprises of two features.
  1. **CRT (Component ReTrim):**
    1. component retrim feature is to retrim the gyroscope's sensitivity.
    2. During this process, the gyroscope is not useable for generating rate data.
  2. **GBIST (Gyroscope Built In Self-Test) :**
    1. The gyroscope built-in self-test can be used to determine whether, the relative deviation in quadrature measured after soldering, is within a specific range.

- The below table shows which BMI2xy variants have these features, in DD2.1 UI.

Table 2 : CRT feature in BMI2xy variants

BMI2xy RAM variants	CRT feature in DD2.1 UI	GBIST feature in DD2.1 UI
BMI220	Not Applicable	Applicable
BMI260	Applicable	Applicable
BMI260 Qualcomm mobile platform	Applicable	Applicable
BMI261	Applicable	Applicable
BMI270 Wearables and Gestures	Applicable	Applicable
BMI270 Context and Activity	Applicable	Applicable

- To view the G Trigger UI, go to Menu -> Panels -> Memory Map -> G Trigger or click **Ctrl + T**.

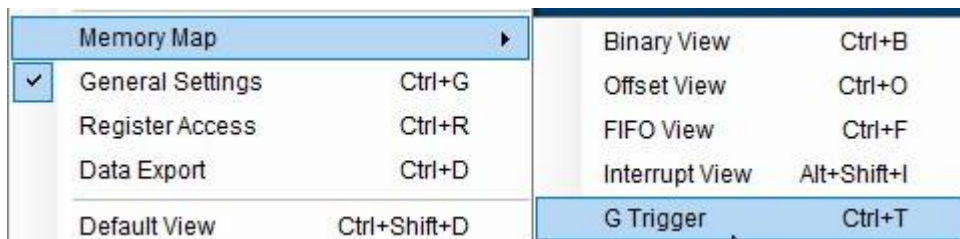


Figure 33 : G trigger

- CRT

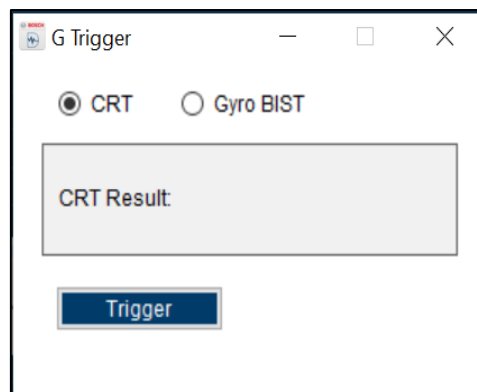


Figure 34 : CRT

- G BIST

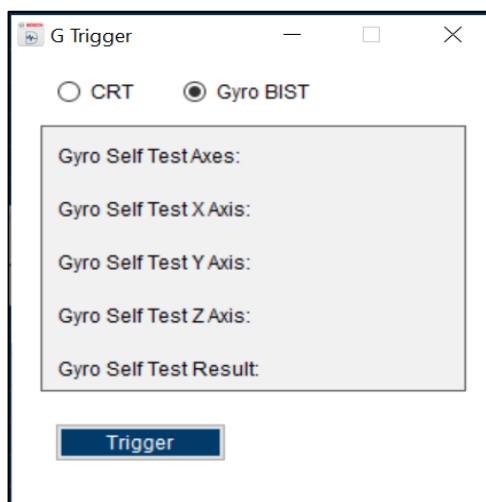


Figure 35 : G BIST

### Self-Test View

To conduct self-test of the three axes in **Accelerometer**, go to **Menu -> Panels -> Memory Map -> Self-Test View**, or click **Ctrl+S**. The following window appears:



Figure 36 : Accelerometer selftest

- Click Self-Test.
- The results of the self-test are displayed in the same window as seen below:



Figure 37 : Selftest success

#### 4.4.7 General Settings

- To view the General Settings panel, go to **Menu -> Panels -> General Settings**, or click **Ctrl+G**.
- Refer [General Settings](#) for more information.

#### 4.4.8 Register Access

- To go to Register Access, go to **Menu -> Panels -> Register Access**, or click **Ctrl+R**.
- The following window appears:



Figure 38 : Register access

**Register Access** is used to read or write values into a register. To implement this, follow the below steps:

1. Enter the hexadecimal register address in **Address [h]**.
2. Enter the hexadecimal data you wish to read/ write in **Data [h]**.
3. Select the data bits into which data has to be written, or read from.
4. As per requirement, click **Read/Write**.

#### 4.4.9 Data Export

- To save the output values plotted by DD2.1 UI, go to **Menu -> Panels -> Data Export**, or click **Ctrl+D**.
- By default, the data values are logged into a text (.txt) file in the destination folder of DD2.1 UI.

- The steps to follow data logging are as seen:

1. Go to **Menu -> Panels-> Data Export**, or click **Ctrl + D**. The following window is displayed.

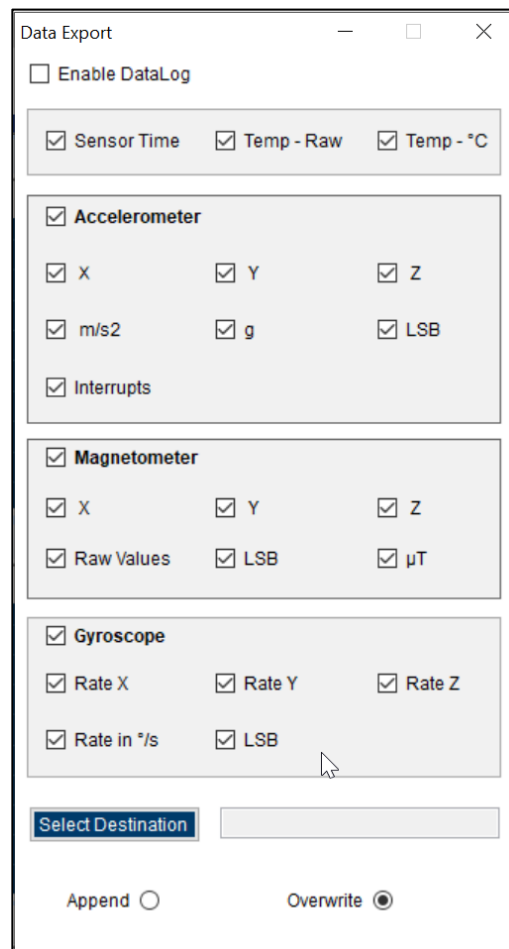


Figure 39 : Data export

2. Check the checkbox **Enable Data Log**.
3. Click **Select Destination** and select required destination folder.

**Note: The data log will be stored in the destination folder selected by you.**

4. To log new data into the selected file, click **Append**.  
Or  
To erase old data from the selected file and log new data in its place, click **Overwrite**.
5. Click **Start streaming** button to plot the sensor data in the plotter.
6. Click Stop streaming to end the plotting of the sensor data.

- The output of the sensor data is saved in the desired destination path.

#### 4.4.10 Default View

- To view the Default View, go to Menu -> Panels -> Default View, or click Ctrl+Shift+D.
- The DD2.1 will revert to its default GUI view.
- The panels available in this view are:

##### 1. Accelerometer Panel

2. Interrupts Panel
3. General Settings Panel

**Note: The Magnetometer and Gyroscope panels will only be visible if Magnetometer Enable and Gyroscope Enable has been checked in the General Settings panel.**

#### 4.4.11 RAM update using Menu

- To view this menu, go to Menu -> Panels -> RAM Update, or press Alt + R.
- This menu item helps the user to choose the RAM files of the corresponding Smart sensor variant and update the chosen RAM file in the sensor.
- This menu item is not visible by default. This menu shall be made visible, Through "DevelopmentDesktop2.1.exe.config" file available in the DD2.1 UI installed path.

#### 4.4.12 Device Initialization

- The RAM images that are supported for BMI2xy variants are shown in this panel. This is available as a child panel inside the "**General settings**" panel.
- The following variants of BMI2xy support more than one RAM image and they are shown in DD2.1

##### 1. BMI220

###### Default

1. Any motion, No motion, step counter interrupt features are available.
2. Size of FIFO is 2Kb.
3. DMR page is used and hence the feature interrupts are available. □
4. Firmware Id is available.



Figure 40 : BMI220

##### 2. BMI270

###### 1.Wearable Gestures recognition

- Size of FIFO is 2Kb.
- Any motion, No motion, significant motion, step counter and wrist gesture interrupt features are available.
- DMR page is used and hence the feature interrupts are available.
- Firmware Id is available

###### 2.Context and Activity recognition

- Size of FIFO is 2Kb.
- Step counter, activity recognition interrupt features are available.
- DMR page is used and hence the feature interrupts are available.
- Firmware Id is available.



Figure 41 : BMI270

### 3. BMI260

#### 1.Default:

- Size of FIFO is 2Kb.
- Step counter, significant motion, Flat, Low-g, High-g, Orientation, Any-motion, No-motion, tap detection interrupt features are available.

#### 2.Qualcomm mobile platform:

- Step counter and Activity, Any-motion interrupt features are available
- Size of FIFO is 2Kb.

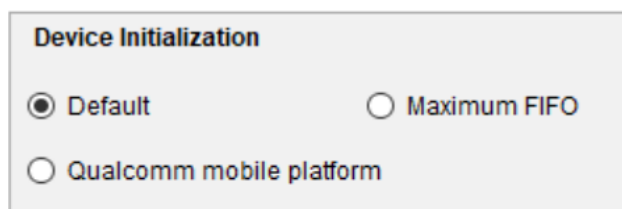


Figure 42 : BMI260

## 5 General Troubleshooting

Follow below guidelines while working with DD2.1 UI:

- Ensure that the shuttle board (with a valid sensor) is seated properly in the application board.
- Ensure that the PC-board connection is properly established.
- When switching on/ off DD2.1 UI, close and restart DD2.1 UI.
- Ensure that at least one channel is selected.

Follow these steps to check the USB connection:

1. Click **My Computer -> Manage -> Computer Management**.
2. Go to **System Tools -> Device Manager**.
3. Click on BST board and check for the USB connection.

Sometimes, data transfer between PC and application board does not work despite the USB device being properly enumerated in the Device Manager.

This could be because the application board is older or that the USB PID and VID has been used with that computer before. In this case, Windows is unable to install the required drivers automatically.

Follow these steps to check the USB connection:

1. Right-click on the USB-device corresponding to your application board (if you are not sure which device corresponds to your application Board, unplug all other USB devices like keyboard and mouse temporarily).



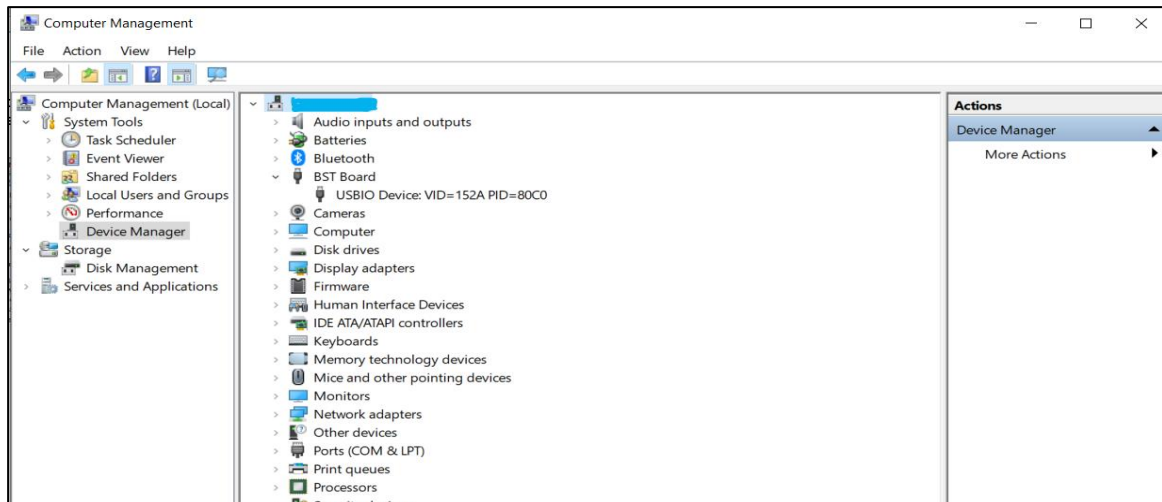


Figure 43 : Selecting USB device corresponding to application board

2. Click **Action -> Scan for hardware changes**. The new USB driver installed automatically. Thereafter, the device communication will function properly.

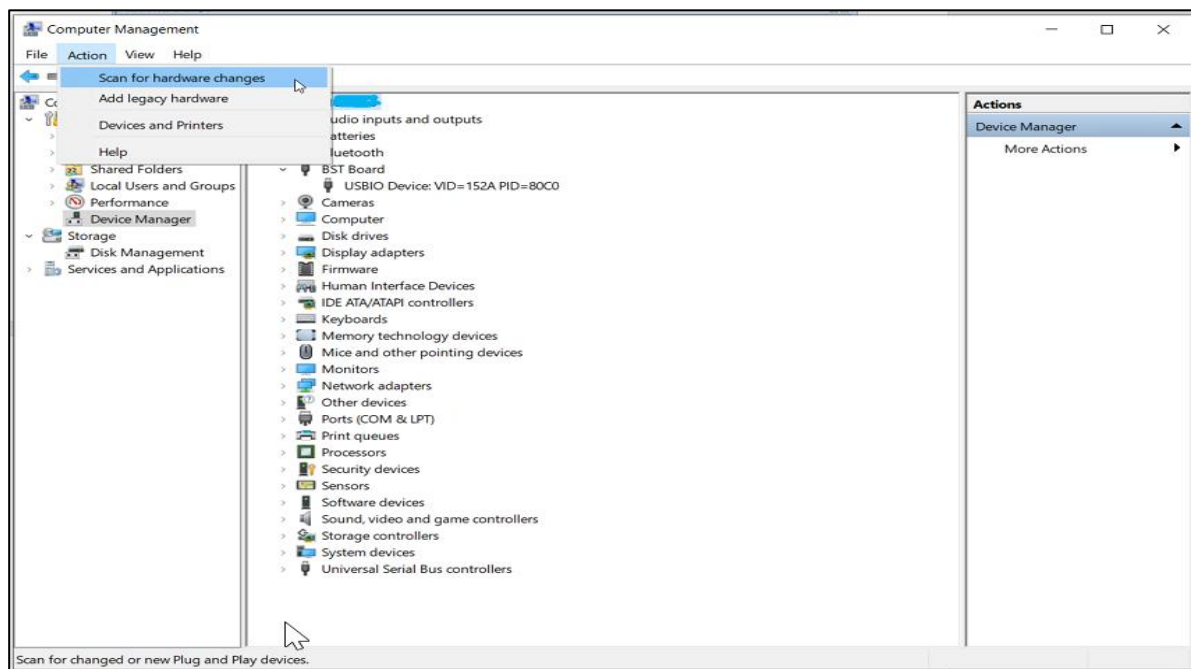


Figure 44 : USB driver installation

The following table lists some of the possible faults that you might encounter and the troubleshooting method.

Table 3 : Troubleshooting Fixing

Condition	Possible cause	Solution
If <b>Communication Status</b> remains grey, red after checking the <b>Start Button</b> .	Application Board is turned off.	<b>Power on</b> the application Board and restart the DD2.1 application. If the board is powered by rechargeable battery, ensure that the battery is charged.
Unable to locate the data logged file.	Destination path not properly defined.	Locate the file in the setup path of Development Desktop.
Error message <b>Please connect application Board</b> is displayed.	Application Board is not connected properly.	Ensure that the PC is connected with the application Board properly. If the board is powered by rechargeable battery, ensure that the battery is charged.
Error message <b>Please connect Shuttle Board</b> is displayed.	Shuttle Board is not fixed properly.	Ensure that the Shuttle Board is correctly fixed in the Development Board.
Error message <b>Please select a path or file for logging</b> is displayed.	Destination path for saving the logged data is not defined.	Select the <b>Data Export</b> option in the file menu and specify the destination path.
Error message <b>Please select File from File Menu → Data Export option to proceed</b> is displayed.	Destination path not selected.	In the file menu, select the <b>Data Export</b> option and select the destination path.
Error message <b>Please Connect Valid Sensor</b> is displayed.	Wrong sensor fixed on the application Board.	Ensure that correct sensor is fixed on the application Board.
Graph for x, y, z channel not plotted.	Channel x, y, z not checked.	Ensure that x, y, z channels are checked.

## 6 Legal disclaimer

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## 7 Document history and modification

Rev. No	Chapter	Description of modification/changes	Date
1.0		Initial release	January 2019
1.1		Adopt to new format	August 2020
1.2		Updated DD application version	April 2023

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