

BHy2CLI

User Guide

BHy2CLI User Guide

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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.

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Abbreviations

<i>BHy</i>	<i>BHy Smart Sensor Hub [BHIxyz]</i>
<i>CLI</i>	<i>Command Line Interface</i>
<i>GPIO</i>	<i>General Purpose Input Output</i>
<i>ODR</i>	<i>Output Data Rate</i>
<i>PC</i>	<i>Personal Computer</i>
<i>RAM</i>	<i>Random Access Memory</i>
<i>SoC</i>	<i>System on Chip</i>
<i>WRD</i>	<i>Wearable Reference Design</i>

1 Overview

The BHy2CLI command-line interface tool is an application based on the Bosch BHy SensorAPI and COINES SDK (Communication with Inertial and Environmental Sensors) application board framework. It can be used to quickly test and evaluate the BHIxyz shuttle board with the application board.

The core functionalities of the BHy2CLI include:

- Programming the BHy customer shuttles
- Accessing registers
- Accessing System/Driver Specific Parameters
- Data Acquisition
- Sensor Configuration
- Accessing System/Application Status Information
- Application Configuration
- Data Injection
- Diagnostics



Figure 1: Overview

This user guide introduces the BHy2CLI commands with examples to demonstrate the use of these commands to operate the BHy Smart Sensor.

1.1 Compatibility

Table 1 describes the compatibility of BHy2CLI with other dependencies.

Item	BHy2CLI	FW	BSX4	BHy SensorAPI	COINES SDK	Supported Boards	Supported Sensors
Version	1.0.0	1.1.18 1.0.0.4	IR84.3	2.2.0 1.0.0	2.12	APP30 APP31 Nicla Sense	BHIxyz

Table 1: BHy2CLI Compatibility Matrix

Note: BHy2CLI is not tested with Nicla Sense board

2 Setup

Before using the BHy2CLI, it is necessary to understand the system design and set up the embedded environment accordingly.

Note: This Application Note is referenced with COINES SDKv2.12 and BHy SensorAPIv2.2.0, and BHI385v1.0.0.

2.1 COINES SDK Environment

As mentioned earlier, BHy2CLI is based on the COINES SDK Framework. As such, the COINES SDK environment must be set up prior to using the BHy2CLI application, since COINES installation also installs USB drivers which is necessary for MCU testing of BHy2CLI.

1. Install COINES SDK at [COINES SDK | Bosch Sensortec \(bosch-sensortec.com\)](https://www.bosch-sensortec.com/coines-sdk)
2. For further instructions, refer to Chapter 4, “Installation” in the [COINES SDK User Manual](#).
3. Install USB drivers to execute BHy2CLI application

2.2 Application board setup



Figure 2: HW Setup

The BHy2CLI can be used with an Application Board or the Nicla Sense boards to evaluate the BHy Sensor Hubs (BHIxyz).

The Application Board refers to the Bosch Sensortec [Application Board 3.0 | Bosch Sensortec \(bosch-sensortec.com\)](#) and [Application Board 3.1 | Bosch Sensortec \(bosch-sensortec.com\)](#).

The Nicla Sense board is a compact (wearable form-factor), low-power, and robust development board that enables users to develop smart sensing applications and is suitable for rapid prototyping and deployment. Refer to [Arduino Nicla Sense ME | Bosch Sensortec \(bosch-sensortec.com\)](#) for further details.

Note: BHy2CLI is not tested with the Nicla Sense board.

Table 2 shows the BHy2CLI application can be run in two operation modes.

Mode	Description
MCU	The application runs on the Application Board and interacts directly with the Sensor Hub.
PC	The application runs on a PC and interacts with the Sensor Hub via a base application running on the Application Board.

Table 2: Modes of Operation

Note: The following instructions for the board setup are referenced for the application board.

Below is the release package of BHy2CLI, which is received with BHy2CLI v0.6.0, when unzipped, holds BHI3-firmware (BHIxyz firmware), docs (BHy2CLI User Guide, Change log and Compatibility), firmware (COINES firmware – bootloader, coines_bridge and MTP firmware), MCU (BHy2CLI binaries and MTP tools), PC (BHy2CLI executables) and tools (app_switch and usb-dfu – required to transfer firmware files to External FLASH)

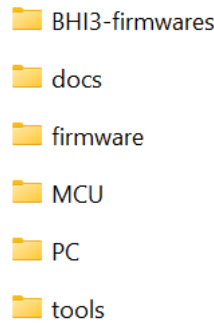


Figure 3: BHy2CLI release package

2.2.1 Running BHy2CLI in MCU mode

In MCU mode, the BHy2CLI application runs in the application board and communicates directly with the BHy Sensor Hub.



Figure 4: MCU Mode

Execute BHyCLI in MCU Mode:

1. From release package (Refer Figure 3 above), open the folder for the Application board connected (**<board>**: app30 or app31)
2. For **app30**,
 - a. In `<release>/firmware/app30`,
 - i. Flash, `coins_bridge/ update_coins_bridge_flash_fw.bat`
 - ii. Flash, `bootloader_update/ update_bootloader.bat`
 - iii. Flash, `mtp_fw_update/ update_mtp_fw.bat`
 - b. In `<release>/MCU/app30`,
 - i. Execute `app30_format_flash.bat` (Formats FLASH)
 - ii. Reset board.
 - iii. Execute `app30_bhi360_mcu_mode.bat` (Uploads BHI360 firmwares to External FLASH)
3. For **app31**,
 - a. In `<release>/firmware/app31`,
 - i. Flash, `coins_bridge/ update_coins_bridge_flash_fw.bat`
 - ii. Flash, `bootloader_update/ update_bootloader.bat`
 - iii. Flash, `mtp_fw_update/ update_mtp_fw.bat`
 - b. In `<release>/MCU/app31`,
 - i. Execute `app31_format_flash.bat` (Formats FLASH)
 - ii. Reset board.
 - iii. Execute `app31_bhi360_mcu_mode.bat` (Uploads BHI360 firmwares to External FLASH)
4. Reset board.
5. BHyCLI application is ready to communicate (Refer Table below for Platform/Application reference)

Note: When executing **<board>_format_flash.bat**, there is a prompt message to confirm if format can be performed. Entering 'y' performs format of External FLASH.

Note: By default, the SPI Interface of BHy2CLI is present. To change to the I2C interface, update to `i2c_bhy2cli.bin` in `<board>_bhxyz_mcu_mode.bat`

- The following host applications can be used to communicate with the BHy2CLI application.
- For communication over serial interface –

Platform	Terminal Application
Windows	<i>PuTTY, HTerm etc. Check COMX port in Device Manager</i>
Linux	<i>cat command. eg: cat /dev/ttyACM0</i>
Mac	<i>screen command, eg: screen /dev/tty.usbmodem9F31</i>

Table 3: Terminal Applications for various OS Environments

- For communication over BLE you can use the Serial over BLE tool at: <https://wiki.makerdiary.com/web-device-cli/>

Platform	Terminal Application
Windows	<i>Tested with PuTTY, HTerm etc. by checking COMX port in Device Manager</i>
Linux	<i>not provided need to be self-tested</i>
Mac	<i>not provided need to be self-tested</i>

Table 4: Tested Terminal Applications for various OS Environments

2.2.2 Running BHy2CLI in PC mode

In PC mode, the BHy2CLI application runs on a PC and communicates to the BHy Sensor Hub through a base application running on the application board.

The base application is a middleware between the PC application (BHy2CLI) and the BHy Sensor Hub Firmware (referenced in section 2.3).



Figure 5: PC Mode

Execute BHyCLI in PC Mode:

1. To prepare the application board (**<board>**: app30 or app31) for first use, connect the Application Board to a PC, and load the base firmware to the evaluation board.
 - a. Execute, (Refer Figure 3 above for release package folder structure)
`<release>/firmware/<board>/coins_bridge/update_coins_bridge_flash_fw.bat`
2. Reset Board.
3. Move to `<release>/PC/bin` folder to run BHyCLI application in PC mode.
 - a. Executable present in x86/x64 folder based on 32-bit/64-bit compiler used.
 - b. I2C and SPI Executables are present for BHyCLI.
 - c. Refer Table below for Platform/Usage reference.

Note: As the base application is being loaded onto the external Flash of the application board, this step needs to be done only once during the first-time setup.

The BHy2CLI in PC mode is run as a terminal command, and this depends on the local operating system.

Platform	Usage
Windows	<code>spi_bhy2cli.exe [<options>] [<option arguments>]</code>

	OR spi_bhy2cli.exe [port] [COMx] [<options>] [<option arguments>]
Linux	./spi_bhy2cli [<options>] [<option arguments>]
MAC	./spi_bhy2cli [<options>] [<option arguments>]

Table 5: PC Mode execution across various OS Environments

Note: When running an application in PC mode, each prompt triggers a re-initialization of the application. As such, when multiple BHy2CLI commands need to be executed in sequence, run all the commands in a single command prompt execution, to avoid re-initializing the BHy2CLI each time, e.g.:

`spi_bhy2cli.exe [<cmd_1> <cmd_1_arguments>] [<cmd_2> <cmd_2_arguments>].. [<cmd_n> <cmd_n_arguments>]`

Note: When changing from `spi_bhy2cli.exe` to `i2c_bhy2cli.exe` or `i2c_bhy2cli.exe` to `spi_bhy2cli.exe`, it is required to restart the device.

2.3 Sensor Hub Setup

The BHy, as programmable Smart Sensor Hubs, contain an embedded microcontroller that must be loaded with an appropriate firmware image to use their Smart Sensor features.

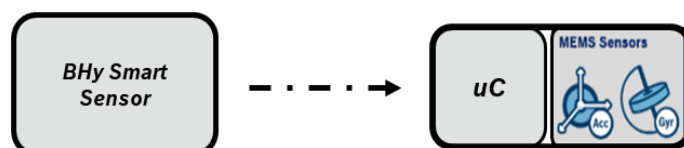


Figure 6: Smart Sensor Architecture

To load the firmware onto the BHy microcontroller, first select the relevant firmware and use the boot commands of BHy2CLI to load the firmware and boot the device. The BHy generic firmware is in the '**BHI3-firmwares**' folder of the **Release package**.

Note: User can either use the provided example firmware located in the 'BHI3-firmwares' folder, or they can create a firmware of their own and use it. Details regarding creating a custom firmware can be found in the [BHy FW SDK User Guide](#)

See [Boot Commands](#) for more details.

3 BHy2CLI Commands

3.1 Overview

The commands supported by the BHy2CLI can be classified as follows:

- Info
- Boot
- Register Read/Write
- Parameter Read/Write
- Data Acquisition
- Log Generation
- Use Case Specific
- System Parameters
- BSX Algorithm Parameters
- Virtual Sensor Information Parameters
- Virtual Sensor Configuration Parameters
- BSEC Parameters

- Physical Sensor Configuration
- Activity Recognition Parameters
- Data Injection
- Diagnostics
- Utility Commands

The following table lists the commands available in BHy2CLI [v1.0.0].

Feature Class	Command	Description
Info	-h OR help	List the available commands along with their usage
	version	Prints the HW, SW and FW version
	-i OR info	Show device information
	-p OR physeninfo	Display Physical Sensor Information of a physical sensor
	schema	Display the schema of the available sensors
	chipid	Get Chip ID of the sensor
Boot	-n OR reset	Reset sensor hub
	ram	Upload firmware to RAM
	-g OR boot	Boot from the specified medium -ram
	-b OR ramb	Reset, upload specified firmware to RAM and boot from RAM
Register Read/Write	-r OR rd	Read from register
	-w OR wr	Write to register
Parameter Read/Write	-s OR rdp	Read parameter
	-t OR wrp	Write parameter
Data Acquisition	-c OR actse	Activate/Deactivate the sensor in ascii streaming mode
	hexse	Activate/Deactivate the sensor in hex streaming mode
	logse	Activate/Deactivate the sensor in logging mode
	dactse	Deactivate all the active sensors
	-a OR addse	Register the expected payload of a new custom virtual sensor
	lsactse	List the active sensors and their respective acquisition modes
Log Generation	attlog	Attach (and create if required) a log file (write-only), where data can be logged to
	detlog	Detach the log file
	logandstream	Log and stream data for sensor
Multi Tap	mtapen	Enable the Multi Tap
	mtapinfo	Get the Multi Tap Info
	mtapsetcnfg	Set the Multi Tap Configurations
	mtapgetcnfg	Get the Multi Tap Configurations
System Parameters	syssetphyseninfo	Set system param physical sensor information
	sysgetphysenlist	Get list of physical sensors
	sysgetvirsenlist	Get list of virtual sensors
	sysgettimestamps	Get system timestamps
	sysgetfwversion	Get system firmware version
	sysgetfifoctrl	Get FIFO control
	syssetwkffctrl	Set watermark for wake-up FIFO control
	syssetnwkkffctrl	Set watermark for Non wake-up FIFO control
	sysgetmectrl	Get meta event control
	syssetmectrl	Set meta event control
BSX Algorithm Parameters	setbsxparam	Set bsx algorithm calibration states
	getbsxparam	Get bsx algorithm calibration states
	getbsxver	Get the BSX version
	kstatus	Get Klio status

Klio	ksetstate	Set state of Klio
	kgetstate	Get state of Klio
	kreset	Reset all Klio state
	kldpatt	Load Klio pattern for recognition
	kenpatt	Enable Klio pattern
	kdispatt	Disable Klio pattern
	kdisapatt	Disable Klio adaptive pattern
	kswpatt	Switch Klio pattern between left/right hand
	kautldpatt	Auto-load Klio patterns
	kgetparam	Get Klio parameters
	ksetparam	Set Klio parameters
	kgetpattparam	Get Klio pattern parameters
	ksetpattparam	Set Klio pattern parameters
	ksimscore	Get Klio Similarity score
	kmsimscore	Get Multiple Klio Similarity score
Virtual Sensor Information Parameters	virtseinfo	Get virtual sensor information
Virtual Sensor Configuration Parameters	setvirtsenconf	Set virtual sensor configuration
	getvirtsenconf	Get virtual sensor configuration
BSEC Parameters	bsecsetalstate	Set the BSEC Algorithm State
	bsecgetalstate	Get the BSEC Algorithm State
	bsecsettempoff	Set the BSEC Temperature Offset
	bsecgettempoff	Get the BSEC Temperature Offset
	bsecsetsamrate	Set the BSEC Sample Rate
	bsecgetsamrate	Get the BSEC Sample Rate
Physical Sensor Control	accsetfoc	Set the Accelerometer Fast Offset Calibration
	accgetfoc	Get the Accelerometer Fast Offset Calibration
	accsetpwm	Set the Accelerometer Power Mode
	accgetpwm	Get the Accelerometer Power Mode
	accsetar	Set the Accelerometer Axis Remap
	accgetar	Get the Accelerometer Axis Remap
	acctrignvm	Trigger NVM for Accelerometer
	accgetnvm	Get the Accelerometer NVM Status
	gyrosetfoc	Set the Gyroscope Fast Offset Calibration
	gyrogetfoc	Get the Gyroscope Fast Offset Calibration
	gyrosetois	Set the Gyroscope OIS state
	gyrogetois	Get the Gyroscope OIS status
	gyrosetfs	Set the Gyroscope Fast Startup
	gyrogetfs	Get the Gyroscope Fast Startup status
	gyrosetcrt	Start Gyroscope CRT
	gyrogetcrt	Get the Gyroscope CRT status
	gyrosetpwm	Set the Gyroscope Power Mode
	gyrogetpwm	Get the Gyroscope Power Mode
	gyrosettat	Set the Gyroscope Timer Auto Trim state
	gyrogettat	Get the Gyroscope Timer Auto Trim status
	gyrotrignvm	Trigger NVM for Gyroscope
	gyrogetnvm	Get the Gyroscope NVM Status

	magsetpwm	Set the Magnetometer Power Mode
	maggetpwm	Get the Magnetometer Power Mode
	wwwsetcnfg	Set the Wrist Wear Wakeup Configuration
	wwwgetcnfg	Get the Wrist Wear Wakeup Configuration
	amsetcnfg	Set the Any Motion Configuration
	amgetcnfg	Get the Any Motion Configuration
	nmsetcnfg	Set the No Motion Configuration
	nmgetcnfg	Get the No Motion Configuration
	wgdsetcnfg	Set the Wrist Gesture Detector Configuration
	wgdgetcnfg	Get the Wrist Gesture Detector Configuration
	baro1setcnfg	Set the Barometer Pressure Type 1 Configuration
	baro1getcnfg	Get the Barometer Pressure Type 1 Configuration
	baro2setcnfg	Set the Barometer Pressure Type 2 Configuration
	baro2getcnfg	Get the Barometer Pressure Type 2 Configuration
	scsetcnfg	Set the Step Counter Configuration
	scgetcnfg	Get the Step Counter Configuration
Activity Recognition Parameters	phyrangeconf	Set the range of physical sensor
	foc	Enable the fast offset compensation for the sensor
	sethearactvcnfg	Set the Hearable Activity Configuration
	gethearactvcnfg	Get the Hearable Activity Configuration
Head Orientation	setwearactvcnfg	Set the Wearable Activity Configuration
	getwearactvcnfg	Get the Wearable Activity Configuration
	hmctrig	Trigger Head Misalignment Calibration
	hmcsetcnfg	Set the Head Misalignment Configuration
	hmcgetcnfg	Get the Head Misalignment Configuration
	hmcsetdefcnfg	Set the Default Head Misalignment Configuration
	hmcver	Get Head Misalignment Calibrator Version
	hmcsetcalcorrq	Set the Head Misalignment Quaternion Calibration Correction
	hmcgetcalcorrq	Get the Head Misalignment Quaternion Calibration Correction
	hmcsetmode	Set the Head Misalignment Mode and Vector X value
	hmcgetmode	Get the Head Misalignment Mode and Vector X value
	hosetheadcorrq	Set Initial Heading Correction, only for IMU Head Orientation Quaternion
	hogetheadcorrq	Get Initial Heading Correction, only for IMU Head Orientation Quaternion
	hover	Get IMU/NDOF Head Orientation Version
	hosetheadcorre	Set Initial Heading Correction, only for IMU Head Orientation Euler
	hogetheadcorre	Get Initial Heading Correction, only for IMU Head Orientation Euler
Data Injection	dmode	Set the Data Injection mode
	dinject	Compute virtual sensor output from raw IMU data
Diagnostics	-m OR postm	Get Post Mortem Data and log to a file
Utility	-v OR verb	Set the verbose level.
	echo	Enable/Disable echo
	heart	Enable/Disable Heartbeat Message
	mklog	Create a log file
	rm	Remove a log file
	ls	List the files in the external Flash
	wrfile	Write to a log file
	rdfile	Read from a log file
	slabel	Set a string label in the log file
	cls	Clear Screen

Table 6: BHy2CLI Commands

This chapter explains the usage of the commands with the help of examples to guide users on how to operate the BHy.

Note: The outputs provided for reference are generated in **MCU** mode over **BLE** communication.

3.2 Info Commands

The Info commands are commands oriented towards giving System and Application specific information.

Feature Class	Command	Description
Info	-h OR help	List the available commands along with their usage
	version	Prints the HW, SW and FW version
	-i OR info	Show device information
	-p OR physeninfo	Display Physical Sensor Information of a physical sensor
	schema	Display the schema of the available sensors
	chipid	Get Chip ID of the sensor

Table 7: Overview of Info Commands

Get Info -	
Action	Usage
Get BHy2CLI Application Info	help
Get BHy2CLI Application Version Details	version
Get System Info	info
Get Physical Sensor Information of a physical sensor	physeninfo <phy_sensor_id>, eg: physeninfo 1
Get schema of the available sensors	schema
Get Chip ID of the sensor	chipid

Table 8: Info Commands Usage

3.2.1 Help

```

help
Usage:
bhy2cli [<port>] [<port_name>] [<options>]
<port>: optional input parameter, trigger keyword
<port_name>: optional input parameter, use it when want to support running multiple applications in parallel
Options:
-h OR help
  = Print this usage message
version
  = Prints the version
-v OR verb <verbose level>
  = Set the verbose level. 0 Error, 1 Warning, 2 Infos
-b OR ramb <firmware path>
  = Reset, upload specified firmware to RAM and boot from RAM
  [equivalent to using "reset ram <firmware> boot r" successively]
-n OR reset
  = Reset sensor hub
-a OR addse <sensor id>:<sensor name>:<total output payload in bytes>:
  <output_format_0>:<output_format_1>
  = Register the expected payload of a new custom virtual sensor
  -Valid output formats: u8: Unsigned 8 Bit, u16: Unsigned 16 Bit, u32:
    Unsigned 32 Bit, s8: Signed 8 Bit, s16: Signed 16 Bit, s32: Signed 32 Bit,
    f: Float, c: Char
  -e.g.: addse 160:"Lean Orientation":2:c:c
  -Note that the corresponding virtual sensor has to be enabled in the same function
    call (trailing actse option), since the registration of the sensor is temporary.
-g OR boot <medium>
  = Boot from the specified <medium>: "r" for RAM
-c OR actse <sensor id>:<frequency>[:<latency>][:<downsampling>]
  = Activate sensor <sensor id> at specified sample rate <frequency>,
  -latency <latency>, duration time <time>, sample counts <count>
  -At least <frequency> is a must input parameter
  -<latency> is optional
  -<downsampling> is optional, in case downsampling = 0, it means there is no stream data is output
  -One or more sensors can be active by passing multiple actse options
  -id: sensor id
  -frequency(Hz): sensor ODR
  -latency(ms): sensor data outputs with a latency
  -downsampling(Hz): sensor downsampling value, it should be smaller than frequency to take effect
  -Eg:
  -actse 3:50::10
schema
  = Show schema information:
  ID: Name: Event size: Parsing format: Axis names: Scaling
hexse <sensor id>:<frequency>[:<latency>]
  = Stream sensor <sensor id> at specified sample rate <frequency>, in hex format

```

Figure 7: 'help' Output

3.2.2 Version

```

version
HW info:: Board: 5, HW ID: 11, Shuttle ID: 179, SW ID: 10
SW Version: 0.6.0
Build date: May 20 2025

```

Figure 8: 'version' Output

3.2.3 Info

```
info
Product ID      : 89
Kernel version  : 2380
User version    : 9792
ROM version     : 5166
Power state     : sleeping
Host interface  : SPI
Feature status  : 0x4a
Boot Status : 0x38: No flash installed. Host interface ready. Firmware verification done.
Virtual sensor list.
Sensor ID | Sensor Name | ID | Ver | Min rate | Max rate |
-----+-----+---+---+-----+-----+
1 | Accelerometer passthrough | 205 | 1 | 1.5625 | 400.0000 |
3 | Accelerometer uncalibrated | 203 | 1 | 1.5625 | 400.0000 |
4 | Accelerometer corrected | 241 | 1 | 1.5625 | 400.0000 |
5 | Accelerometer offset | 209 | 1 | 1.0000 | 1.0000 |
6 | Accelerometer corrected wake up | 192 | 1 | 1.5625 | 400.0000 |
7 | Accelerometer uncalibrated wake up | 204 | 1 | 1.5625 | 400.0000 |
10 | Gyroscope passthrough | 207 | 1 | 1.5625 | 400.0000 |
12 | Gyroscope uncalibrated | 244 | 1 | 1.5625 | 400.0000 |
13 | Gyroscope corrected | 243 | 1 | 1.5625 | 400.0000 |
```

Figure 9: 'info' Output

3.2.4 Physical Sensor Information

```
physeninfo 1
Field Name      hex      | Value (dec)
-----+-----+-----+
Physical Sensor ID  01      | 1
Driver ID          1A      | 26
Driver Version      01      | 1
Current Consumption 01      | 0.100mA
Dynamic Range       0008    | 8
Flags              22      | IRQ status      : Disabled
                   | Master interface: SPI0
                   | Power mode      : Power Down
Slave Address       19      | 25
GPIO Assignment     02      | 2
Current Rate        00000000 | 0.000Hz
Number of axes      03      | 3
Orientation Matrix  0100010001 | +1 +0 +0 |
                   | +0 +1 +0 |
                   | +0 +0 +1 |
Reserved           00      | 0
```

Figure 10: 'physeninfo' Output

3.2.5 Schema Information

```

schema
Schema List.
ID: Name: Event size: Parse format: Axis names: Scaling
1: Accelerometer passthrough: 6: s16,s16,s16: x,y,z: 0.000244
3: Accelerometer uncalibrated: 6: s16,s16,s16: x,y,z: 0.000244
4: Accelerometer corrected: 6: s16,s16,s16: x,y,z: 0.000244
5: Accelerometer offset: 6: s16,s16,s16: x,y,z: 0.000244
6: Accelerometer corrected wake up: 6: s16,s16,s16: x,y,z: 0.000244
7: Accelerometer uncalibrated wake up: 6: s16,s16,s16: x,y,z: 0.000244
10: Gyroscope passthrough: 6: s16,s16,s16: x,y,z: 0.061035
12: Gyroscope uncalibrated: 6: s16,s16,s16: x,y,z: 0.061035
13: Gyroscope corrected: 6: s16,s16,s16: x,y,z: 0.061035
14: Gyroscope offset: 6: s16,s16,s16: x,y,z: 0.061035
15: Gyroscope wake up: 6: s16,s16,s16: x,y,z: 0.061035
16: Gyroscope uncalibrated wake up: 6: s16,s16,s16: x,y,z: 0.061035
19: Magnetometer passthrough: 6: s16,s16,s16: x,y,z: 0.076294
21: Magnetometer uncalibrated: 6: s16,s16,s16: x,y,z: 0.076294
22: Magnetometer corrected: 6: s16,s16,s16: x,y,z: 0.076294
23: Magnetometer offset: 6: s16,s16,s16: x,y,z: 0.076294

```

Figure 11: 'schema' Output

3.2.6 Chip ID

```

chipid
CHIP ID : 0x7a

```

Figure 12: 'chipid' Output

3.3 Boot Commands

The boot commands are used to load and boot the firmware of the BHy sensor hubs. The firmware can be loaded by the application board into the Fuser2 RAM and then booted.

Feature Class	Command	Description
Boot	-n OR reset	Reset sensor hub
	-u OR ram	Upload firmware to RAM
	-g OR boot	Boot from the specified medium -ram
	-b OR ramb	Reset, upload specified firmware to RAM and boot from RAM

Table 9: Overview of Boot Commands

To upload firmware to the sensor hub -		
Action	Location	Usage
Reset the Sensor Hub		reset
Upload firmware	to RAM	ram <ram_firmware_path>, eg: ram Bosch_Shuttle3_BHlxyz.fw
Boot Sensor Hub	from RAM	boot r
Alternatively, uploading the firmware and booting can be done using a single command	from RAM	ramb <ram_firmware_path>, eg: ramb Bosch_Shuttle3_BHlxyz.fw

Table 10: Boot Commands Usage

Note: For **MCU** mode, the application board addresses the firmware path from the external Flash of the application board. The firmware is pre-loaded to the external Flash of the application board. For **PC mode**, the location of the firmware is passed as path.

```

reset
Reset successful

ram Bosch_Shuttle3_BHI380_BME680.fw
Uploading 155916 bytes of firmware to RAM
Uploading firmware to RAM successful

boot r
Waiting for firmware verification to complete
Boot Status : 0x38: No flash installed. Host interface ready. Firmware verification done.
[D][META EVENT WAKE UP]; T: 0.534265625; Firmware initialized. Firmware version 5991
[D][META EVENT]; T: 0.534265625; Firmware initialized. Firmware version 5991
Booting from RAM successful

```

Figure 13: RAM Boot using 'ram' and 'boot'

```

ramb Bosch_Shuttle3_BHI380_BME680.fw
Reset successful
Uploading 155916 bytes of firmware to RAM
Uploading firmware to RAM successful
Waiting for firmware verification to complete
Boot Status : 0x38: No flash installed. Host interface ready. Firmware verification done.
[D][META EVENT WAKE UP]; T: 0.534250000; Firmware initialized. Firmware version 5991
[D][META EVENT]; T: 0.534250000; Firmware initialized. Firmware version 5991
Booting from RAM successful

boot r
Waiting for firmware verification to complete
Boot Status : 0x38: No flash installed. Host interface ready. Firmware verification done.
Booting from RAM successful

```

Figure 14: RAM Boot using 'ramb'

Note: Fuser Core in the BHy Sensor Hub acts as the intermediary between the Host Application and the Physical Sensor on the BHy Sensor Hub. The interaction of the Fuser Core is defined by the firmware (BHy Firmware Image), running in it. As such, it is important to make sure that a firmware is loaded onto the Fuser Core. If not, use the above commands to load the firmware.

3.4 Register Read/Write Commands

The Read/Write commands allow the user to read/write the BHy. This feature can also be extended to read/write various system and application specific parameters.

Feature Class	Command	Description
Register Read/Write	-r OR rd	Read from register
	-w OR wr	Write to register

Table 11: Register Read/Write Commands Overview

To explore the functionality of the register read/write commands -	
Action	Usage
Read from a particular register up to <i>n</i> bytes	rd <reg_addr>:<len>, eg: rd 0x07:4
Write from a particular register onwards	wr <reg_addr>=<val1>,<val2>..., eg: wr 0x07=0x0a,0x0b,0x0c,0x0d
Validate the write operation by reading back the written registers	rd 0x07:4

Table 12: Register Read/Write Commands Usage

```
rd 0x07:4
Register address: Data
-----
0x07      : 00
0x08      : 00
0x09      : 00
0x0a      : 00
Read complete

wr 0x07=0x0a,0x0b,0x0c,0x0d
Writing address successful

rd 0x07:4
Register address: Data
-----
0x07      : 0a
0x08      : 0b
0x09      : 0c
0x0a      : 0d
Read complete
```

Figure 15: Read and Write from register

3.5 Parameter Read/Write Commands

The parameter interface is used to allow the configuration and query the state of the system and the sensors. The parameters differ from the normal registers because the length of data transfer is pre-determined and access to a particular set of parameters is dependent on the loaded firmware. **[For more details, refer section 13.3 in [BHIxyz Datasheet](#)].**

Feature Class	Command	Description
Parameter	-s OR rdp	Read parameter
Read/Write	-t OR wrp	Write parameter

Table 13: Parameter Read/Write Commands Overview

To explore the functionality of the parameter read/write commands -	
Action	Usage
Read a parameter	rdp <param_id>, eg: rdp 0x103
Write to a parameter	wrp <param_id >=<val1>,<val2>.., eg: wrp 0x103=0x05,0x06
Validate the write operation by reading back the written parameter	rdp 0x103

Table 14: Parameter Read/Write Commands Usage

```

rdp 0x103
Byte hex      dec | Data
-----
0x000000      0 | 00 00 00 00 00 48 00 00
0x000008      8 | 00 00 00 00 00 48 00 00
0x000010     16 | 80 01 00 00
Reading parameter 0x0103 successful

wrp 0x103=0x05,0x06
Writing parameter successful

rdp 0x103
Byte hex      dec | Data
-----
0x000000      0 | 05 06 00 00 00 48 00 00
0x000008      8 | 00 00 00 00 00 48 00 00
0x000010     16 | 80 01 00 00
Reading parameter 0x0103 successful

```

Figure 16: Read and Write from parameter

3.6 Data Acquisition Commands

Data acquisition commands allow the user to configure the ODR, latency of specific virtual sensors as well as to control output data quantity and activation duration. The tool provides provision for streaming and logging the data.

Feature Class	Command	Description
Data Acquisition	-c OR actse	Activate/Deactivate the sensor in ascii streaming mode
	hexse	Activate/Deactivate the sensor in hex streaming mode
	logse	Activate/Deactivate the sensor in logging mode
	dactse	Deactivate all the active sensors
	-a OR addse	Register the expected payload of a new custom virtual sensor
	lsactse	List the active sensors and their respective acquisition modes

Table 15: Data Acquisition Commands Overview

Sensor Acquisition -			
Action	Configuration	Mode	Usage
Reset the Sensor Hub			reset
Upload firmware	to RAM		ramb <ram_firmware>, eg: ram Bosch_Shuttle3_BHxyz.fw
Enable the sensor acquisition	single sensor	ascii streaming	actse <id>:<odr>, eg: actse 4:100
		hex streaming	hexse <id>:<odr>, eg: hexse 4:100
		logging	logse <id>:<odr>, eg: logse 4:100
	multiple sensors	ascii streaming	actse <id1>:<odr> actse <id2>:<odr>, eg: actse 4:100 actse 13:50
		hex streaming	hexse <id1>:<odr> hexse <id2>:<odr>, eg: hexse 4:100 hexse 13:50
		logging	logse <id1>:<odr> logse <id2>:<odr>, eg: logse 4:100 logse 13:50

	latency	ascii streaming	actse <id>:<odr>:<latency>, eg: actse 4:100:1000
		hex streaming	hexse <id>:<odr>:<latency>, eg: hexse 4:100:1000
		logging	logse <id>:<odr>:<latency>, eg: logse 4:100:1000
List all the active sensors	generic	all modes	lsactse
Disable the sensor acquisition	single sensor	ascii streaming	actse <id>:0, eg: actse 4:0
		hex streaming	hexse <id>:0, eg: hexse 4:0
		logging	logse <id>:0, eg: logse 4:0
	multiple sensors	ascii streaming	actse <id1>:0 actse <id2>:0, eg: actse 4:0 actse 13:0
		hex streaming	hexse <id1>:0 hexse <id2>:0, eg: hexse 4:0 hexse 13:0
		logging	logse <id1>:0 logse <id2>:0, eg: logse 4:0 logse 13:0
	single Shot	all modes	dactse
Define parsing format for a new/custom sensor	generic	all modes	addse<id>:"name":<payload (in bytes)>:<paring_format> eg: addse 161:"Altitude":4:s32

Table 16: Data Acquisition Commands Usage

Note: The usage of the 'logse' command requires some pre-requisites, which are discussed in [Log Generation Commands](#).

3.6.1 Activate sensor

3.6.1.1 Activate one virtual sensor

```
actse 4:100

[D][META EVENT]; T: 1320.715406250; Power mode changed for sensor id 4
[D][META EVENT]; T: 1320.715406250; Sample rate changed for sensor id 4
[D][META EVENT]; T: 1320.715062500; Flush complete for sensor id 4
[D]SID: 4; T: 1320.774625000; x: -0.094971, y: 0.891357, z: -0.475586; acc: 0
[D][META EVENT]; T: 1320.774625000; Accuracy for sensor id 4 changed to 1
[D]SID: 4; T: 1320.784640625; x: -0.095947, y: 0.897949, z: -0.480469; acc: 1
[D]SID: 4; T: 1320.794671875; x: -0.096680, y: 0.895508, z: -0.479980; acc: 1
[D]SID: 4; T: 1320.804687500; x: -0.095703, y: 0.897949, z: -0.478027; acc: 1
[D]SID: 4; T: 1320.814703125; x: -0.096191, y: 0.897949, z: -0.480957; acc: 1
[D]SID: 4; T: 1320.824718750; x: -0.094971, y: 0.897705, z: -0.476807; acc: 1
[D]SID: 4; T: 1320.834734375; x: -0.095703, y: 0.898682, z: -0.479736; acc: 1
[D]SID: 4; T: 1320.844750000; x: -0.096680, y: 0.895752, z: -0.479004; acc: 1
[D]SID: 4; T: 1320.854765625; x: -0.094727, y: 0.896729, z: -0.477783; acc: 1
[D]SID: 4; T: 1320.864796875; x: -0.095703, y: 0.899902, z: -0.478516; acc: 1
[D]SID: 4; T: 1320.874812500; x: -0.097656, y: 0.900635, z: -0.480713; acc: 1
```

Figure 17: Activate one virtual sensor

3.6.1.2 Activate one sensor with downsampling

```
actse 3:50::10
Sensor ID: 3, sample rate: 50.000000 Hz, latency: 0 ms

[D][META EVENT]; T: 356.202609375; Flush complete for sensor id 3
[D][META EVENT]; T: 356.203046875; Power mode changed for sensor id 3
[D][META EVENT]; T: 356.203046875; Sample rate changed for sensor id 3
[D]SID: 3; T: 356.357531250; x: 0.203125, y: 0.547363, z: -0.803711; acc: 1
[D]SID: 3; T: 356.457140625; x: 0.202881, y: 0.546143, z: -0.803711; acc: 1
[D]SID: 3; T: 356.556734375; x: 0.204102, y: 0.546143, z: -0.803223; acc: 1
[D]SID: 3; T: 356.656343750; x: 0.204346, y: 0.546143, z: -0.803223; acc: 1
[D]SID: 3; T: 356.755937500; x: 0.204102, y: 0.546631, z: -0.803711; acc: 1
[D]SID: 3; T: 356.855546875; x: 0.203857, y: 0.545898, z: -0.803467; acc: 1
[D]SID: 3; T: 356.955140625; x: 0.203857, y: 0.545898, z: -0.803711; acc: 1
[D]SID: 3; T: 357.054750000; x: 0.202881, y: 0.547607, z: -0.804199; acc: 1
```

Figure 18: Activate sensor with downsampling

3.6.1.3 Activate multiple sensors

```
actse 4:25 actse 13:25

[D][META EVENT]; T: 10.640328125; Power mode changed for sensor id 4
[D][META EVENT]; T: 10.640328125; Sample rate changed for sensor id 4
[D][META EVENT]; T: 10.639859375; Flush complete for sensor id 4
[D][META EVENT]; T: 10.658671875; Power mode changed for sensor id 13
[D][META EVENT]; T: 10.658671875; Sample rate changed for sensor id 13
[D][META EVENT]; T: 10.657890625; Flush complete for sensor id 13
[D]SID: 4; T: 10.840546875; x: -0.087402, y: 0.917480, z: 0.518066; acc: 0
[D][META EVENT]; T: 10.840546875; Accuracy for sensor id 4 changed to 0
[D]SID: 13; T: 10.840546875; x: 0.305176, y: 0.061035, z: -0.183105; acc: 0
[D][META EVENT]; T: 10.840546875; Accuracy for sensor id 13 changed to 0
[D]SID: 4; T: 10.880734375; x: -0.088379, y: 0.926025, z: 0.523438; acc: 0
[D]SID: 13; T: 10.880734375; x: 0.915527, y: 0.000000, z: -0.244141; acc: 0
[D]SID: 4; T: 10.920937500; x: -0.087891, y: 0.924072, z: 0.522217; acc: 0
[D]SID: 13; T: 10.920937500; x: 2.868652, y: 0.427246, z: -0.305176; acc: 0
```

Figure 19: Activate multiple sensors

3.6.1.4 Activate sensor in HEX mode

```
hexse 1:10

[D][META EVENT]; T: 1083.120734375; Flush complete for sensor id 1
[D][META EVENT]; T: 1083.121265625; Power mode changed for sensor id 1
[D][META EVENT]; T: 1083.121265625; Sample rate changed for sensor id 1
[H]010000043b1ae50d3e5002c8008710
[H]010000043b1fa853085602cc00ae10
[H]010000043b246bd5db5502cb00a510
[H]010000043b292f1ba55702c900a510
[H]010000043b2df29e785302ca00a710
[H]010000043b32b6214b5602c800a510
[H]010000043b3779e1275502ca00a610
[H]010000043c00a299fa5502c600a410
[H]010000043c056659d65402c900a210
[H]010000043c0a29dca95402cc00a510
[H]010000043c0eed9c855802cb00a410
[H]010000043c13b15c615302c900a510
```

Figure 20: Activate sensor in HEX streaming mode

3.6.1.5 Activate virtual sensor with latency

```
actse 4:200:1000

[D][META EVENT]; T: 294.314843750; Power mode changed for sensor id 4
[D][META EVENT]; T: 294.314843750; Sample rate changed for sensor id 4
[D][META EVENT]; T: 294.314437500; Flush complete for sensor id 4
[D]SID: 4; T: 294.350781250; x: -0.050781, y: 0.796387, z: 0.623535; acc: 1
[D][META EVENT]; T: 294.350781250; Accuracy for sensor id 4 changed to 1
[D]SID: 4; T: 294.355796875; x: -0.051025, y: 0.801514, z: 0.628174; acc: 1
[D]SID: 4; T: 294.360796875; x: -0.052246, y: 0.801025, z: 0.627441; acc: 1
[D]SID: 4; T: 294.365812500; x: -0.053223, y: 0.802490, z: 0.626953; acc: 1
[D]SID: 4; T: 294.370812500; x: -0.053223, y: 0.802490, z: 0.626953; acc: 1
```

Figure 21: Activate sensor with latency

The parameter “latency” can control the activated virtual sensor to output sensor data with a delay. The default unit of this parameter is milliseconds. The parameter is optional, and the default is 0ms if not specified.

3.6.2 List Active sensors

```
actse 50:1

[D][META EVENT]; T: 12.897625000; Power mode changed for sensor id 50
[D][META EVENT]; T: 12.897625000; Sample rate changed for sensor id 50
[D][META EVENT]; T: 12.897203125; Flush complete for sensor id 50

logse 52:1

[D][META EVENT]; T: 18.051250000; Power mode changed for sensor id 52
[D][META EVENT]; T: 18.051250000; Sample rate changed for sensor id 52
[D][META EVENT]; T: 18.050453125; Flush complete for sensor id 52

lsactse
Active Sensors -
SID : 50      ODR : 1.00      R : 1      Acquisition : Streaming
SID : 52      ODR : 1.00      R : 1      Acquisition : Logging
No File attached for Logging
```

Figure 22: List the active sensors

3.6.3 Deactivate virtual sensor

```
actse 50:1

[D][META EVENT]; T: 980.431968750; Flush complete for sensor id 50
[D]SID: 50; T: 982.658843750;
[D]SID: 50; T: 983.106703125;
[D]SID: 50; T: 983.574937500;
[D]SID: 50; T: 984.470421875;
[D]SID: 50; T: 985.203000000;

actse 50:0

[D][META EVENT]; T: 993.326859375; Flush complete for sensor id 50
```

Figure 23: Deactivate sensor using actse

```
lsactse
Active Sensors -
SID : 50      ODR : 1.00      R : 1      Acquisition : Streaming
SID : 52      ODR : 1.00      R : 1      Acquisition : Logging
No File attached for Logging

dactse
Deactivated all the Sensors
[D][META EVENT]; T: 207.311296875; Power mode changed for sensor id 50
[D][META EVENT]; T: 207.311296875; Sample rate changed for sensor id 50
[D][META EVENT]; T: 207.315750000; Power mode changed for sensor id 52
[D][META EVENT]; T: 207.315750000; Sample rate changed for sensor id 52

lsactse
No Active Sensors
No File attached for Logging
```

Figure 24: Deactivate sensor using dactse

3.6.4 Custom/New Virtual Sensor

For a new virtual sensor or for any virtual sensor that is not supported in the BHy2CLI application, it is still possible to use the virtual sensor in BHy2CLI by using the 'addse' command.

Feature Class	Command	Description
Custom/New Virtual Sensor Support	addse	Extend support for a new/custom virtual sensor, which is not yet supported in the BHy2CLI application

Table 17: Custom/New Virtual Sensor support Extension

Adding support for Custom/New Virtual Sensor -	
Action	Usage
Reset the sensor hub	reset
Load the custom firmware with support for custom/new virtual sensor	ramb <custom_firmware> or <flb <custom_firmware>
Check if support available for custom/virtual by reading the list of virtual sensors	info
Extend the support for the Custom/New virtual sensor in BHy	addse <sensor_id>:"<sensor_name>":<parse_size>:<parse_format> eg: addse161:"Test_Sensor ":4:s32
Enable the custom/new virtual sensor	actse <custom_sensor_id>, eg: actse 161:50

Table 18: Adding support for Custom/New Virtual Sensor

```
addse 161:"test_sensor":4:s32
Adding custom driver payload successful

actse 161:10

[D][META EVENT]; T: 1595.970046875; Flush complete for sensor id 161
[D][META EVENT]; T: 1595.971312500; Power mode changed for sensor id 161
[D][META EVENT]; T: 1595.971312500; Sample rate changed for sensor id 161
[D]161; 1596.051500000; 57050
[D]161; 1596.131437500; 57022
[D]161; 1596.211375000; 57036
[D]161; 1596.291312500; 57029
[D]161; 1596.371250000; 57022
[D]161; 1596.451187500; 57043
[D]161; 1596.531125000; 57036
```

Figure 25: Custom/New Virtual Sensor Detected

```

info
Product ID      : 89
Kernel version  : 5991
User version    : 5991
ROM version     : 5166
Power state     : sleeping
Host interface  : SPI
Feature status  : 0x4a
Boot Status : 0x31: Flash detected. Host interface ready. Firmware verification done.
Virtual sensor list.
Sensor ID | Sensor Name | ID | Ver | Min rate | Max rate |
-----|-----|-----|-----|-----|-----|
1 | Accelerometer passthrough | 205 | 1 | 1.5625 | 400.0000 |
3 | Accelerometer uncalibrated | 203 | 1 | 1.5625 | 400.0000 |
4 | Accelerometer corrected | 241 | 1 | 1.5625 | 400.0000 |
5 | Accelerometer offset | 209 | 1 | 1.0000 | 1.0000 |
6 | Accelerometer corrected wake up | 192 | 1 | 1.5625 | 400.0000 |
7 | Accelerometer uncalibrated wake up | 204 | 1 | 1.5625 | 400.0000 |
10 | Gyroscope passthrough | 207 | 1 | 1.5625 | 400.0000 |
12 | Gyroscope uncalibrated | 244 | 1 | 1.5625 | 400.0000 |
13 | Gyroscope corrected | 243 | 1 | 1.5625 | 400.0000 |
14 | Gyroscope offset | 208 | 1 | 1.0000 | 1.0000 |
15 | Gyroscope wake up | 194 | 1 | 1.5625 | 400.0000 |
16 | Gyroscope uncalibrated wake up | 195 | 1 | 1.5625 | 400.0000 |
161 | Undefined custom sensor | 123 | 4 | 1.5625 | 12.5000 |

```

Figure 26: Custom/New virtual Sensor Acquisition

3.7 Log Generation Commands

The log generation commands are used in conjunction with the 'logse' command to acquire the data in logging mode and store the log in the external Flash.

Feature Class	Command	Description
Log Generation	attlog	Attach (and create if required) a log file (write-only), where data can be logged to
	detlog	Detach the log file
	logandstream	Log and stream data for sensor

Table 19: Log Generation Commands Overview

Sensor in Logging mode -	
Action	Usage
Attach a log file for the logging	attlog <file_name.file_extension>, eg: attlog abc.bin
Enable the sensor acquisition in logging mode	logse <id>:<odr>, eg: logse 4:100
Disable the sensor acquisition	logse <id>:0, eg: logse 4:0
Detach log file from logging	detlog <file_name.file_extension>, eg: detlog abc.bin
Log and stream data for sensor with downsampling	logandstream <sensor id>:<frequency>[:<latency>][:<downsampling>] <filename> <start> or logandstream <stop> eg: logandstream 3:50::10 4:100::20 log.bin start logandstream stop

Table 20: Log Generation Commands Usage

```

attlog abc.bin
File abc.bin was created

logse 4:100

[D][META EVENT]; T: 363.048609375; Flush complete for sensor id 4
[D][META EVENT]; T: 363.049187500; Power mode changed for sensor id 4
[D][META EVENT]; T: 363.049187500; Sample rate changed for sensor id 4
[D][META EVENT]; T: 363.111359375; Accuracy for sensor id 4 changed to 0
[D][META EVENT]; T: 364.246390625; Accuracy for sensor id 4 changed to 1

lsactse
Active Sensors -
SID : 4      ODR : 100.00    R : 8      Acquisition : Logging
Attached Log File : abc.bin

logse 4:0

[D][META EVENT]; T: 393.928468750; Power mode changed for sensor id 4
[D][META EVENT]; T: 393.928468750; Sample rate changed for sensor id 4
[D][META EVENT]; T: 393.928093750; Flush complete for sensor id 4

detlog abc.bin
File abc.bin was detached for logging

lsactse
No Active Sensors
No File attached for Logging

```

Figure 27: Log Generation Output

```

logandstream 4:50::10 log.bin start
Executing log and stream together
Creating log.bin
File log.bin was created
[D]Streaming sensor ID 4 with sample rate is 10.000000Hz
Sensor ID: 4, sample rate: 50.000000 Hz, latency: 0 ms
[D][META EVENT]; T: 36.844421875; Flush complete for sensor id 4
[D][META EVENT]; T: 36.844875000; Power mode changed for sensor id 4
[D][META EVENT]; T: 36.844875000; Sample rate changed for sensor id 4
[D][META EVENT]; T: 36.951203125; Accuracy for sensor id 4 changed to 0
[D]SID: 4; T: 36.951203125; x: 0.007568, y: -0.146729, z: 1.004150; acc: 0
[D]SID: 4; T: 37.050781250; x: 0.009277, y: -0.147217, z: 1.000732; acc: 0
[D]SID: 4; T: 37.150343750; x: 0.010742, y: -0.146484, z: 1.002197; acc: 0
[D]SID: 4; T: 37.249906250; x: 0.011230, y: -0.146240, z: 1.001465; acc: 0
[D]SID: 4; T: 37.349468750; x: 0.011719, y: -0.146729, z: 1.002197; acc: 0

```

Figure 28: 'logandstream' Command Output

3.8 Use Case Specific Commands

The use case specific commands allow the user to read/write and configure the various controls and parameters for various use case applications such as Multi-tap, etc.

Note: Before executing various Use Case Specific commands, ensure that firmware for the respective Use Case Applications is flashed onto the BHy Sensor Hub.

3.8.1 Multi Tap

The Multi-Tap sensor detects single, double and triple taps. The following commands configure and enable/disable the various aspects of the Multi-Tap sensor.

Feature Class	Command	Description
Multi Tap	mtapen	Enable the Multi Tap
	mtapinfo	Get the Multi Tap Info
	mtapsetcnfg	Set the Multi Tap Configurations
	mtapgetcnfg	Get the Multi Tap Configurations,

Table 21: Multi-Tap Commands Overview

Multi-Tap commands usage -	
Command	Usage
mtapen	<code>mtapen <tap_setting></code> , eg: <code>mtapen 2</code>
mtapinfo	<code>mtapinfo</code>
mtapsetcnfg	<code>mtapsetcnfg <single_tap_config> <double_tap_config> <triple_tap_config></code> eg: <code>mtapsetcnfg 0x0080 0x4022 0x6862</code> Note: The single/double/triple tap configurations passed as arguments to this command are in combined format. Refer above table for specifics. Refer datasheet for bit mapping
mtapgetcnfg	<code>mtapgetcnfg</code>

Table 22: Multi-Tap Commands Usage

Please refer to **Multi-Tap Application Note** for more details on the Multi-Tap application.

```
mtapinfo
Multi Tap Info : TRIPLE_DOUBLE_SINGLE_TAP

mtapen 2
Multi Tap Parameter set to DOUBLE_TAP

mtapinfo
Multi Tap Info : DOUBLE_TAP

mtapgetcnfg
Single Tap CNFG : 0x0076
-<axis_sel> : 2
-<wait_for_timeout> : 1
-<max_pks_for_tap> : 6
-<mode> : 1
Double Tap CNFG : 0x402d
-<tap_peak_thrs> : 45
-<max_ges_dur> : 16
Triple Tap CNFG : 0x6864
-<max_dur_bw_pks> : 4
-<tap_shock_settl_dur> : 6
-<min_quite_dur_bw_taps> : 8
-<quite_time_after_ges> : 6

mtapsetcnfg 0x0072 0x4022 0x6862
Multi Tap Detector Parameter set successfully

mtapgetcnfg
Single Tap CNFG : 0x0072
-<axis_sel> : 2
-<wait_for_timeout> : 0
-<max_pks_for_tap> : 6
-<mode> : 1
Double Tap CNFG : 0x4022
-<tap_peak_thrs> : 34
-<max_ges_dur> : 16
Triple Tap CNFG : 0x6862
-<max_dur_bw_pks> : 2
-<tap_shock_settl_dur> : 6
-<min_quite_dur_bw_taps> : 8
-<quite_time_after_ges> : 6
```

Figure 29: Multi-Tap Commands Output

3.8.2 Head Orientation

The head orientation tracking software processes the raw sensor input to estimate head orientation information with respect to the Earth reference system. It combines functional modules and a set of calibration routines to correct the original sensor input, IMU and NDOF fusion algorithms, misalignment estimation between the head and device coordinate system and the rotation transformation between different reference systems.

Feature Class	Command	Description
Head Orientation	hmctrig	Trigger Head Misalignment Calibration
	hmcsetcnfg	Set the Head Misalignment Configuration
	hmcgetcnfg	Get the Head Misalignment Configuration
	hmcsetdefcnfg	Set the Default Head Misalignment Configuration

	hmcver	Get Head Misalignment Calibrator Version
	hmcsetcalcorrq	Set the Head Misalignment Quaternion Calibration Correction
	hmcgetcalcorrq	Get the Head Misalignment Quaternion Calibration Correction
	hmcsetmode	Set the Head Misalignment Mode and Vector X value
	hmcgetmode	Get the Head Misalignment Mode and Vector X value
	hosetheadcorrq	Set Initial Heading Correction, only for IMU Head Orientation Quaternion
	hogetheadcorrq	Get Initial Heading Correction, only for IMU Head Orientation Quaternion
	hover	Get IMU/NDOF Head Orientation Version
	hosetheadcorre	Set Initial Heading Correction, only for IMU Head Orientation Euler
	hogetheadcorre	Get Initial Heading Correction, only for IMU Head Orientation Euler

Table 23: Head Orientation Commands Overview

Head Orientation commands usage -	
Command	Usage
hmcver	hmcver
hover	hover
hmcsetcnfg	hmcsetcnfg <sp_max_dur> <sp_min_dur> <dp_max_samples> <acc_diff_th> eg: hmcsetcnfg 0x06 0x02 0x32 0x00002042
hmcgetcnfg	hmcgetcnfg
hmcsetdefcnfg	hmcsetdefcnfg
hmcsetdefcnfg	hmcsetdefcnfg
hmctrig	hmctrig
hmcsetcalcorrq	hmcsetcalcorrq <quat_x> <quat_y> <quat_z> <quat_w> eg: hmcsetcalcorrq 1.000 1.000 1.000 1.000
hmcgetcalcorrq	hmcgetcalcorrq
hmcsetmode	hmcsetmode <mode> <x[0]> <x[1]> <x[2]> eg. hmcsetmode 1 0.0 0.0 1.0 Note: The value of Vector X can be changed only in semi mode (<mode> = 1).
hmcgetmode	hmcgetmode
hosetheadcorrq	hosetheadcorrq <enable/disable> eg: hosetheadcorrq 1
hogetheadcorrq	hogetheadcorrq
hosetheadcorre	hosetheadcorre <enable/disable> eg: hosetheadcorre 1
hogetheadcorre	hogetheadcorre

Table 24: Head Orientation Commands Usage

Please refer to **Head Orientation Application Note** for more details on the Head Orientation application.

3.8.3 Cyclic Klio

Klio or Self-Learning AI sensor learns new cyclic gestures and provides responsive recognition of previously learn cyclic gestures together with an instant repetition count. The cyclic gesture needs to be the same in between the repetitions and the BHy needs to come to the original position to close one cycle.

The below commands configure and enable/disable the various aspects of the Klio sensor.

Feature Class	Command	Description
Klio	kstatus	Get Klio status
	ksetstate	Set state of Klio
	kgetstate	Get state of Klio
	kreset	Reset all Klio state

	kldpatt	Load Klio pattern for recognition
	kenpatt	Enable Klio pattern
	kdispatt	Disable Klio pattern
	kdisapatt	Disable Klio adaptive pattern
	kswpatt	Switch Klio pattern between left/right hand
	kautldpatt	Auto-load Klio patterns
	kgetparam	Get Klio parameters
	ksetparam	Set Klio parameters
	kgetpattparam	Get Klio pattern parameters
	ksetpattparam	Set Klio pattern parameters
	ksimscore	Get Klio Similarity score
	kmsimscore	Get Multiple Klio Similarity score

Table 25 Klio commands overview

Klio commands usage -	
Command	Usage
kstatus	kstatus
ksetstate	ksetstate <le> <lr> <re> <rr> eg: ksetstate 1 0 0 0
kgetstate	kgetstate
kreset	kreset
kldpatt	Kldpatt <index> <pattern>, Eg: kldpatt 0 5242310603a238e7400ad7233c1a8fc640b4e682403db728c1c4826dc0b80b2bc033d2ea3fb2ed ddc059feabbf17bf7140555fb23df5aad8bd3482983e8d70c440821e43c03cf5ef402fd901c087548 3bf16819f3f670446402235e2bf011537c0706bc83de56b64bf16bcf83dea7863bedd3e674021af39 c020daa4be163f1cbf9f6ace3da79faebf096663c0cd3566c0b0a29ebfd3b3bf3fc8246e3e
kenpatt	kenpatt <patterns> eg: kenpatt 0
kdispatt	kdispatt <patterns> eg: kdispatt 0
kdisapatt	kdisapatt <patterns> eg: kdisapatt 0
kswpatt	kswpatt <patterns> eg: kswpatt 0
kautldpatt	kautldpatt <enable> <index> eg: kautldpatt 1 0
kgetparam	kgetparam <param> eg: kgetparam 2
ksetparam	ksetparam <param> <value> eg: ksetparam 2 0.5532353542636231
kgetpattparam	kgetpattparam <pattern> <param> eg: kgetpattparam 2 0

<i>ksetpattparam</i>	<i>ksetpattparam <pattern> <param> <value></i> eg: <i>ksetpattparam 2 0 0.9</i>
<i>ksimscore</i>	<i>ksimscore <pattern1> <pattern2></i> eg: <i>ksimscore</i> 5242310603a238e7400ad7233c5513a4c259107a4263f91742151cab1eacc5cc2015766423dd34d4210529fc23510264242f6bdc1882f2ec2d4404942acbb8741c1b4b7424e4c41bf8d84974182e48142e984a042ce05b7426a706cc1779e8c425e156a4136bf5642dc7b51421e0335c13fbc2d42c253c4c18ab43942c1942b42071298427829ccc196aa8042d3a345418c9d78c2a6836b40ca1b9342 5242310603a238e7400ad7233c5513a4c259107a4263f91742151cab1eacc5cc2015766423dd34d4210529fc23510264242f6bdc1882f2ec2d4404942acbb8741c1b4b7424e4c41bf8d84974182e48142e984a042ce05b7426a706cc1779e8c425e156a4136bf5642dc7b51421e0335c13fbc2d42c253c4c18ab43942c1942b42071298427829ccc196aa8042d3a345418c9d78c2a6836b40ca1b9342
<i>kmsimscore</i>	<i>kmsimscore <base index> <comparison indices></i> eg: <i>kmsimscore 0 2,4,5</i>

Table 26 Kilo commands Usage

3.9 System Parameters Commands

The following commands allow the host to set or get system parameters.

Feature Class	Command	Description
System Parameters	syssetphyseninfo	Set system param physical sensor information
	sysgetphysenlist	Get list of physical sensors
	sysgetvirsenlist	Get list of virtual sensors
	sysgettimestamps	Get system timestamps
	sysgetfwversion	Get system firmware version
	sysgetfifoctrl	Get FIFO control
	syssetwkffctrl	Set watermark for wake-up FIFO control
	syssetnwkkffctrl	Set watermark for Non wake-up FIFO control
	sysgetmectrl	Get meta event control
	syssetmectrl	Set meta event control

Table 27: System Parameters Commands Overview

System Parameters commands usage -	
Command	Usage
<i>syssetphyseninfo</i>	<i>syssetphyseninfo <sensor_id> <orientation_matrix></i> eg. <i>syssetphyseninfo 1 0,-1,0,1,0,0,0,1</i>
<i>sysgetphysenlist</i>	<i>sysgetphysenlist</i>
<i>sysgetvirsenlist</i>	<i>sysgetvirsenlist</i>
<i>sysgettimestamps</i>	<i>sysgettimestamps</i>
<i>sysgetfwversion</i>	<i>sysgetfwversion</i>
<i>sysgetfifoctrl</i>	<i>sysgetfifoctrl</i>
<i>syssetwkffctrl</i>	<i>syssetwkffctrl <watermark value></i> eg. <i>syssetwkffctrl 500</i>
<i>syssetnwkkffctrl</i>	<i>syssetnwkkffctrl <watermark value></i> eg. <i>syssetnwkkffctrl 500</i>
<i>sysgetmectrl</i>	<i>sysgetmectrl <address></i> eg. <i>sysgetmectrl 0x101</i>
<i>syssetmectrl</i>	<i>syssetmectrl <address> <group idx> <value></i>

eg. syssetmectl 0x101 1 1

Table 28: System Parameters Commands Usage

```
sysgetvirsenlist
Virtual sensor list.
Sensor ID | Sensor Name |
-----+-----+
1 | Accelerometer passthrough
3 | Accelerometer uncalibrated
4 | Accelerometer corrected
5 | Accelerometer offset
6 | Accelerometer corrected wake up
7 | Accelerometer uncalibrated wake up
10 | Gyroscope passthrough
12 | Gyroscope uncalibrated
13 | Gyroscope corrected
14 | Gyroscope offset
15 | Gyroscope wake up
16 | Gyroscope uncalibrated wake up
28 | Gravity vector
29 | Gravity vector wake up
31 | Linear acceleration
32 | Linear acceleration wake up
37 | Game rotation vector
38 | Game rotation vector wake up
43 | Orientation
44 | Orientation wake up
136 | Low Power Step counter
137 | Low Power Step detector
143 | Low Power Any motion wake up
153 | Multi Tap Detector
154 | Activity recognition for Wearables
156 | Low Power Wrist Gesture wake up
158 | Low Power Wrist Wear wake up
159 | Low Power No Motion wake up

sysgettimestamps
Host interrupt timestamp: 383.323375000
Current timestamp: 457.535703125
Timestamp event: 0.000000000

sysgetfwversion
Custom version number: 0
EM Hash: 1755aba11aa9
BST Hash: ac49f211
User Hash: ac49f211

sysgetfifoctrl
Wakeup FIFO Watermark = 0
Wakeup FIFO size = 17920
Non Wakeup FIFO Watermark = 0
Non Wakeup FIFO size = 18432
```

```

syssetwkffctrl 500
FIFO wake-up watermark SET Success

syssetnwffctrl 500
FIFO non wake-up watermark SET Success

syssetmectl 0x101 1 1
System meta event control SET Success

sysgetmectl 0x101

Meta event infomation:
0 1 1 0 1 0 0 0
0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0
0 0 0 0 0 1 0 1
0 1 0 1 0 0 1 0
0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0

syssetphyseninfo 1 0,-1,0,1,0,0,0,1
Set the orientation matrix for the Physical Sensors successfully
sysgetphysenlist

Physical sensor list.
Sensor ID | Sensor Name
-----|-----
1 | Accelerometer
3 | Gyroscope
20 | Undefined sensor ID
32 | Step Counter
33 | Step Detector
35 | Any Motion
52 | Activity Recognition
55 | No Motion
56 | Wrist Gesture Detector
57 | Wrist Wear Wakeup

```

Figure 30: System Parameters Commands Output

3.10 BSX Algorithm Parameters Commands

The following commands allow the host to set or get BSX Algorithm parameters.

Feature Class	Command	Description
BSX Algorithm Parameters	<i>setbsxparam</i>	Set bsx algorithm calibration states
	<i>getbsxparam</i>	Get bsx algorithm calibration states
	<i>getbsxver</i>	Get the BSX version

Table 29: BSX Algorithm Parameters Commands Overview

BSX Algorithm commands usage -	
Command	Usage
setbsxparam	setbsxparam <parameter_id> or <parameter_id> <file_name> eg. setbsxparam 0x201
getbsxparam	getbsxparam <parameter_id> or <parameter_id> <file_name> eg. getbsxparam 0x201
getbsxver	getbsxver

Table 30: BSX Algorithm Parameters Commands Usage

```
getbsxparam 0x201

Get Calibration profile of BSX parameter id: 0x0201
Block number: 0
Completion flag: 0, Transfer not complete
Block length: 64
Struct length: 72
-----
Block data
Byte Hex      Dec | Data
-----
0x000000      0 | 03 54 00 04 00 30 00 40
0x000008      8 | 04 00 6f 00 00 00 3e 00
0x000010     16 | 00 00 0b 00 10 00 00 01
0x000018     24 | 00 00 00 00 00 00 00 00
0x000020     32 | 00 00 0b 00 08 00 00 04
0x000028     40 | 00 00 06 00 10 00 00 01
0x000030     48 | 00 00 00 00 00 00 00 00
0x000038     56 | 00 00 06 00 08 00 00 02

Block number: 1
Completion flag: 1, Transfer complete
Block length: 8
Struct length: 72
-----
Block data
Byte Hex      Dec | Data
-----
0x000000      0 | 00 87 00 00 20 00 67 00

getbsxparam 0x201 acc.bin

Get Calibration profile of BSX parameter id: 0x0201

Calibration profile for BSX parameter id 0x0201 is saved to the file acc.bin
```

```
setbsxparam 0x201

Setting Calibration profile of BSX parameter id 0x0201 is completed
```

```
setbsxparam 0x201 acc.bin

Calibration profile for BSX parameter id 0x0201 is read from the file acc.bin and calibrated
```

```
getbsxver
BSX version: 4.0.84.3
```

Figure 31: BSX Algorithm Parameters Commands Output

3.11 Virtual Sensor Information Parameters Commands

The following command allows the host to get virtual sensor information parameters.

Feature Class	Command	Description
Virtual Sensor Information Parameters	virtseinfo	Get virtual sensor information

Table 31: Virtual Sensor Information Parameters Command Overview

Virtual Sensor Information Parameters commands usage -	
Command	Usage
virtseinfo	virtseinfo <sensor_id>

Table 32: Virtual Sensor Information Parameters Command Usage

```
virtseinfo 1
Virtual Sensor Information:
  Sensor ID: 1
  Driver ID: 205
  Driver version: 1
  Power: 1
  Max range: 16
  Resolution: 16
  Max rate: 400.000000
  FIFO reserved: 0
  FIFO max: 2633
  Event size: 7
  Min rate: 1.562500
```

Figure 32: Virtual Sensor Information Command Output

3.12 Virtual Sensor Configuration Parameters Commands

The following commands allow the host to set or get Virtual Sensor Configuration Parameters.

Feature Class	Command	Description
Virtual Sensor Configuration Parameters	setvirtsenconf	Set virtual sensor configuration
	getvirtsenconf	Get virtual sensor configuration

Table 33: Virtual Sensor Configuration Parameters Commands Overview

Virtual Sensor Configuration Parameters commands usage -	
Command	Usage
setvirtsenconf	setvirtsenconf <sensor_id> <sample_rate> <latency> eg. setvirtsenconf 3 10 0

<code>getvirtsenconf</code>	<code>getvirtsenconf <sensor_id></code>
-----------------------------	---

Table 34: Virtual Sensor Configuration Parameters Commands Usage

```

setvirtsenconf 3 10 0
Virtual sensor configuration set successfully
[D][META EVENT]; T: 296.813750000; Power mode changed for sensor id 3
[D][META EVENT]; T: 296.813750000; Sample rate changed for sensor id 3
getvirtsenconf 3
Virtual sensor configuration get successfully
Custom sensor ID=3, sensitivity=0, rate=12.50Hz,latency=0, range=8

```

Figure 33: Virtual Sensor Configuration Parameters Commands

3.13 Physical Sensor Configuration Commands

The following commands allow the host to set or get sensor control information of the physical sensors.

Feature Class	Command	Description
Physical Sensor Control	<code>accsetfoc</code>	Set the Accelerometer Fast Offset Calibration
	<code>accgetfoc</code>	Get the Accelerometer Fast Offset Calibration
	<code>accsetpwm</code>	Set the Accelerometer Power Mode
	<code>accgetpwm</code>	Get the Accelerometer Power Mode
	<code>accsetar</code>	Set the Accelerometer Axis Remap
	<code>accgetar</code>	Get the Accelerometer Axis Remap
	<code>acctrignvm</code>	Accelerometer Trigger NVM
	<code>accgetnvm</code>	Get the Accelerometer NVM Status
	<code>gyrosetfoc</code>	Set the Gyroscope Fast Offset Calibration
	<code>gyrogetfoc</code>	Get the Gyroscope Fast Offset Calibration
	<code>gyrosetois</code>	Set the Gyroscope OIS state
	<code>gyrogetois</code>	Get the Gyroscope OIS status
	<code>gyrosetfs</code>	Set the Gyroscope Fast Startup
	<code>gyrogetfs</code>	Get the Gyroscope Fast Startup status
	<code>gyrosetcrt</code>	Start Gyroscope CRT
	<code>gyrogetcrt</code>	Get the Gyroscope CRT status
	<code>gyrosetpwm</code>	Set the Gyroscope Power Mode
	<code>gyrogetpwm</code>	Get the Gyroscope Power Mode
	<code>gyrosettat</code>	Set the Gyroscope Timer Auto Trim state
	<code>gyrogettata</code>	Get the Gyroscope Timer Auto Trim status
	<code>gyrotrignvm</code>	Gyroscope Trigger NVM
	<code>gyrogetnvm</code>	Get the Gyroscope NVM Status
	<code>magsetpwm</code>	Set the Magnetometer Power Mode
	<code>maggetpwm</code>	Get the Magnetometer Power Mode
	<code>wwwsetcnfg</code>	Set the Wrist Wear Wakeup Configuration
	<code>wwwgetcnfg</code>	Get the Wrist Wear Wakeup Configuration,
	<code>amsetcnfg</code>	Set the Any Motion
	<code>amgetcnfg</code>	Get the Any Motion Configuration
	<code>nmsetcnfg</code>	Set the No Motion Configuration
	<code>nmgetcnfg</code>	Get the No Motion Configuration
	<code>wgdsetcnfg</code>	Set the Wrist Gesture Detector Configuration
	<code>wgdgetcnfg</code>	Get the Wrist Gesture Detector Configuration
	<code>baro1setcnfg</code>	Set the Barometer Pressure Type 1 Configuration
	<code>baro1getcnfg</code>	Get the Barometer Pressure Type 1 Configuration
	<code>baro2setcnfg</code>	Set the Barometer Pressure Type 2 Configuration
	<code>baro2getcnfg</code>	Get the Barometer Pressure Type 2 Configuration
	<code>scsetcnfg</code>	Set the Step Counter Configuration

	scgetcnfg	Get the Step Counter Configuration
	phyrangeconf	Set the range of physical sensor
	foc	Enable the fast offset compensation for the sensor

Table 35: Physical Sensor Control Parameter Commands Overview

3.13.1 Accelerometer

The following commands allow the user to configure the accelerometer sensor.

Feature Class	Command	Description
Accelerometer Sensor Control	accsetfoc	Set the Accelerometer Fast Offset Calibration
	accgetfoc	Get the Accelerometer Fast Offset Calibration
	accsetpwm	Set the Accelerometer Power Mode
	accgetpwm	Get the Accelerometer Power Mode
	accsetar	Set the Accelerometer Axis Remap
	accgetar	Get the Accelerometer Axis Remap
	acctrignvm	Trigger NVM for Accelerometer
	accgetnvm	Get the Accelerometer NVM Status

Table 36: Accelerometer Control Parameter Commands Overview

Parameter	Description
Fast Offset Calibration	FOC is a one-shot process that compensates errors of the sensor by setting the compensation registers to the negated offset error
Power Mode	The power mode of the accelerometer can be configured to operate in other power modes in order to facilitate use case appropriate performance. The accelerometer sensor has 2 power modes – 0 - Normal Mode, The default state of the sensor 2 - Low Power, Low power mode on the account of trade-of of power consumption versus sensor noise. Low power mode may introduce aliasing artifacts
Axis remapping for internal imu features	The axis remapping function is only works for the features in BHIxyz, and it would not influence the IMU outputs (accel data and gyro data). It can change the sign for each axis and switch between each axis.
Triggering a NVM writing	Once NVM writing process is triggered, the value in backup registers value(offset/crt) will be written into NVM area.

Table 37: Accelerometer Control Parameters

Accelerometer Parameter commands usage -	
Command	Usage
accsetfoc	accsetfoc <x_offset> <y_offset> <z_offset>, eg: accsetfoc 0x0016 0x00f8 0x07f
accgetfoc	accgetfoc
accsetpwm	accsetpwm <power_mode>, eg: accsetpwm 2
accgetpwm	accgetpwm
accsetar	accsetar <x> <x_sign> <y> <y_sign> <z> <z_sign> eg: accsetar 1 1 1 1 1 1
accgetar	accgetar
acctrignvm	acctrignvm
accgetnvm	accgetnvm

Table 38: Accelerometer Control Parameter Commands Usage


```

accsetfoc 0x0072 0x0064 0x007F
Set the Accelerometer Fast Offset Calibration
    -<x_offset> : 114
    -<y_offset> : 100
    -<z_offset> : 127
accgetfoc
Accelerometer Fast Offset Calibration :
    -<x_offset> : 114
    -<y_offset> : 100
    -<z_offset> : 127
accsetpwm 0
Set the Accelerometer Power Mode to NORMAL
accgetpwm
Accelerometer Power Mode : NORMAL
accsetar 1 1 1 1 1 1
Set the Accelerometer axis remapping
    -<x> : 1
    -<x_sign> : 1
    -<y> : 1
    -<y_sign> : 1
    -<z> : 1
    -<z_sign> : 1
accgetar
Accelerometer axis remapping :
    -<x> : 1
    -<x_sign> : 1
    -<y> : 1
    -<y_sign> : 1
    -<z> : 1
    -<z_sign> : 1
acctrignvm
Trigger a NVM writing for accelerometer
accgetnvm
NVM writing status for accelerometer: Done

```

Figure 34: Accelerometer Control Parameter Commands Output

3.13.2 Gyroscope

The following commands allow the user to configure the gyroscope sensor.

Feature Class	Command	Description
Gyroscope Sensor Control	gyrosetfoc	Set the Gyroscope Fast Offset Calibration
	gyrogetfoc	Get the Gyroscope Fast Offset Calibration
	gyrosetois	Set the Gyroscope OIS state
	gyrogetois	Get the Gyroscope OIS status
	gyrosetfs	Set the Gyroscope Fast Startup
	gyrogetfs	Get the Gyroscope Fast Startup status
	gyrosetcrt	Start Gyroscope CRT
	gyrogetcrt	Get the Gyroscope CRT status
	gyrosetpwm	Set the Gyroscope Power Mode
	gyrogetpwm	Get the Gyroscope Power Mode
	gyrosettat	Set the Gyroscope Timer Auto Trim state
	gyrogettat	Get the Gyroscope Timer Auto Trim status
	gyrotrignvm	Trigger NVM for Gyroscope
	gyrogetnvm	Get the Gyroscope NVM Status

Table 39: Gyroscope Control Parameter Commands Overview

Parameter	Description
Fast Offset Calibration	FOC is a one-shot process that compensates errors of the sensor by setting compensation registers to the negated offset error
Optical Image Stabilization	Optical Image Stabilization mode of the gyroscope sensor
Fast Startup Mode	Fast Startup Mode, when enabled, powers down the measurement part of the Sensor frontend, while keeping the drive and digital parts operational. This allows a faster transition into normal mode while keeping power consumption significantly lower than in normal mode.
Component Re-Trim	Trigger and read back the status of the Component Re-Trimming of the gyroscope sensor.
Power Mode	The power mode of the gyroscope can be configured to operate in other power modes in order to facilitate use case appropriate performance. The gyroscope sensor has 3 power modes – 0 - Normal Mode, The default state of the sensor 1 - Performance Mode 2 - Low Power, Low power mode on the account of trade-of of power consumption versus sensor noise. Low power mode may introduce aliasing artifacts
Timer Auto Trim	Timer Auto Trim allows to sync the Fuser2 timer oscillator PLL. When enabled, the frequency of the timer oscillator is referenced by gyroscope sample rate, benefitting from the high stability of the gyroscope MEMS oscillator. This feature is only applicable when gyroscope is enabled.
Triggering a NVM writing	Once NVM writing process is triggered, the value in backup registers value(offset/crt) will be written into NVM area.

Table 40: Gyroscope Control Parameters

Gyroscope Parameter commands usage -	
Command	Usage
gyrosetfoc	gyrosetfoc <x_offset> <y_offset> <z_offset>, eg: gyrosetfoc 0x0016 0x00f8 0x0080
gyrogetfoc	gyrogetfoc
gyrosetois	gyrosetois <enable/disable>, eg: gyrosetois 1
gyrogetois	gyrogetois
gyrosetfs	gyrosetfs <enable/disable>, eg: gyrosetfs 1
gyrogetfs	gyrogetfs
gyrosetcrt	gyrosetcrt
gyrogetcrt	gyrogetcrt
gyrosetpwm	gyrosetpwm <power_mode>, eg: gyrosetpwm 2
gyrogetpwm	gyrogetpwm
gyrosettata	gyrosettata <enable/disable>, eg: gyrosettata 1
gyrogettat	gyrogettat
gyrotrignvm	gyrotrignvm
gyrogetnvm	gyrogetnvm

Table 41: Gyroscope Control Parameter Commands Usage

```

gyrosetfoc 0x0016 0x00f8 0x0080
Set the Gyroscope Fast Offset Calibration
  -<x_offset> : 22
  -<y_offset> : 248
  -<z_offset> : 128
gyrogetfoc
Gyroscope Fast Offset Calibration :
  -<x_offset> : 22
  -<y_offset> : 248
  -<z_offset> : 128
gyrosetois 1
Gyroscope OIS Enabled
gyrogetois
Gyroscope OIS Status : Enabled
gyrosetfs 1
Gyroscope Fast Startup Enabled
gyrogetfs
Gyroscope Fast Startup Status : Enabled
gyrosetcrt
Start Gyroscope Component ReTrim (CRT)
gyrogetcrt
Gyroscope CRT Status : Successful
gyrosetpwm 2
Set the Gyroscope Power Mode to LOW POWER
gyrogetpwm
Gyroscope Power Mode : LOW POWER
gyrosettat 1
Gyroscope Timer Auto Trim Started
gyrogettat
Gyroscope Timer Auto Trim Status : Started
gyrotrignvm
Trigger a NVM writing for gyroscope
gyrogetnvm
NVM writing status for gyroscope: Done

```

Figure 35: Gyroscope Control Parameter Commands Output

3.13.3 Magnetometer

The following commands allow the user to configure the Magnetometer sensor.

Feature Class	Command	Description
Magnetometer Sensor Control	magsetpwm	Set the Magnetometer Power Mode
	maggetpwm	Get the Magnetometer Power Mode

Table 42: Magnetometer Control Parameter Commands Overview

Parameter	Description
Power Mode	<p>The power mode of the magnetometer can be configured to operate in other power modes in order to facilitate use case appropriate performance. The magnetometer sensor has 2 power modes –</p> <ul style="list-style-type: none"> 0 - Normal Mode, The default state of the sensor 2 - Low Power, Low power mode on the account of trade-of of power consumption versus sensor noise. Low power mode may introduce aliasing artifacts

Table 43: Magnetometer Control Parameters

Magnetometer Parameter commands usage -	
Command	Usage

<code>magsetpwm</code>	<code>magsetpwm <power_mode></code> eg: <code>magsetpwm 0</code>
<code>maggetpwm</code>	<code>maggetpwm</code>

Table 44: Magnetometer Control Parameter Commands Usage

```
magsetpwm 0
Set the Magnetometer Power Mode to NORMAL
maggetpwm
Magnetometer Power Mode : NORMAL
```

Figure 36: Magnetometer Control Parameter Commands Output

3.13.4 Wrist Wear Wakeup

The following commands allow the user to configure the Wrist Wear Wakeup sensor.

Feature Class	Command	Description
Wrist Wear Wakeup Sensor Control	<code>wwwsetcnfg</code>	Set the Wrist Wear Wakeup Configuration
	<code>wwwgetcnfg</code>	Get the Wrist Wear Wakeup Configuration,

Table 45: Wrist Wear Wakeup Control Parameter Commands Overview

Wrist Wear Wakeup Parameter commands usage -	
Command	Usage
<code>wwwsetcnfg</code>	<code>wwwsetcnfg <maf> <manf> <alr> <all> <apd> <apu> <mdm> <mdq></code> , eg: <code>wwwsetcnfg 1700 1600 120 100 150 225 5 7</code>
<code>wwwgetcnfg</code>	<code>wwwgetcnfg</code>

Table 46: Wrist Wear Wakeup Control Parameter Commands Usage

```
wwwgetcnfg
min_angle_focus : 1774
min_angle_nonfocus : 1522
angle_landscape_right : 128
angle_landscape_left : 128
angle_portrait_down : 22
angle_portrait_up : 241
min_dur_moved : 2
min_dur_quite : 2

wwwsetcnfg 1700 1600 120 100 150 225 5 7
min_angle_focus : 1700
min_angle_nonfocus : 1600
angle_landscape_right : 120
angle_landscape_left : 100
angle_portrait_down : 150
angle_portrait_up : 225
min_dur_moved : 5
min_dur_quite : 7

wwwgetcnfg
min_angle_focus : 1700
min_angle_nonfocus : 1600
angle_landscape_right : 120
angle_landscape_left : 100
angle_portrait_down : 150
angle_portrait_up : 225
min_dur_moved : 5
min_dur_quite : 7
```

Figure 37: Wrist Wear Wakeup Control Parameter Commands Output

3.13.5 AnyMotion/NoMotion

The following commands allow the user to configure the AnyMotion/NoMotion sensor.

Feature Class	Command	Description
---------------	---------	-------------

AnyMotion/NoMotion Sensor Control	amsetcnfg	Set the Any Motion Configuration
	amgetcnfg	Get the Any Motion Configuration
	nmsetcnfg	Set the No Motion Configuration
	nmgetcnfg	Get the No Motion Configuration

Table 47: AnyMotion/NoMotion Control Parameter Commands Overview

The AnyMotion and NoMotion sensors share same set of parameters. These include:

Configuration	Description
duration	Defines the number of consecutive data points for which the threshold condition must be respected, for interrupt assertion. It is expressed in 50Hz samples (20ms). Range is 0-163sec
axis selection	Minimum threshold for flick peak on z-axis. Scaling: 0.4883, Range: 0x1F4 to 0x5DC
threshold	Slope threshold value for any-motion/no-motion detection. Range is 0 to 1g.

Table 48: AnyMotion/NoMotion Control Parameters

AnyMotion/NoMotion Parameter commands usage -	
Command	Usage
amsetcnfg	amsetcnfg <duration> <axis> <threshold> eg: amsetcnfg 5 7 170
amgetcnfg	amgetcnfg
nmsetcnfg	nmsetcnfg <duration> <axis> <threshold> eg: nmsetcnfg 1 7 144
nmgetcnfg	nmgetcnfg

Table 49: AnyMotion/NoMotion Control Parameters Usage

```

amgetcnfg
Any Motion Configuration:
  -duration : 16
  -axis_sel : 4
  -threshold : 44

amsetcnfg 5 7 170
Set the Any Motion Configuration
  -duration : 5
  -axis_sel : 7
  -threshold : 170

amgetcnfg
Any Motion Configuration:
  -duration : 5
  -axis_sel : 7
  -threshold : 170

nmgetcnfg
No Motion Configuration:
  -duration : 1
  -axis_sel : 2
  -threshold : 120

nmsetcnfg 1 7 144
Set the No Motion Configuration
  -duration : 1
  -axis_sel : 7
  -threshold : 144

```

Figure 38: AnyMotion/NoMotion Control Parameter Commands Output

3.13.6 Wrist Gesture Detector

The following commands allow the user to configure the Wrist Gesture Detector sensor.

Feature Class	Command	Description
---------------	---------	-------------

Wrist Gesture Detector Sensor Control	wgdsetcnfg	Set the Wrist Gesture Detector Configuration
	wgdgetcnfg	Get the Wrist Gesture Detector Configuration

Table 50: Wrist Gesture Detector Control Parameter Commands Overview

Wrist Gesture Detector Parameter commands usage -	
Command	Usage
wgdsetcnfg	wgdsetcnfg <mfp_y_th> <mfp_z_th> <gx_pos> <gx_neg> <gy_neg> <gz_neg> <fpdc> <lmfc> <mdjp> <dp0>, eg: wgdsetcnfg 0x400 0x200 0x600 0xf000 0xa000 0x900 0x4000 0x6000 0xb 1
wgdgetcnfg	wgdgetcnfg

Table 51: Wrist Gesture Detector Control Parameter Commands Usage

```

wgdgetcnfg
min_flick_peak_y_threshold : 0x0640
min_flick_peak_z_threshold : 0x02bc
gravity_bounds_x_pos : 0x0784
gravity_bounds_x_neg : 0xfc00
gravity_bounds_y_neg : 0xfc3f
gravity_bounds_z_neg : 0xf912
flick_peak_decay_coeff : 0x7851
lp_mean_filter_coeff : 0x7d71
max_duration_jiggle_peaks : 0x0010
device_position : 0x00

wgdsetcnfg 0x400 0x200 0x600 0xf000 0xa000 0x900 0x4000 0x6000 0xb 1
Wrist Gesture Detector Parameter set successfully

wgdgetcnfg
min_flick_peak_y_threshold : 0x0400
min_flick_peak_z_threshold : 0x0200
gravity_bounds_x_pos : 0x0600
gravity_bounds_x_neg : 0xf000
gravity_bounds_y_neg : 0xa000
gravity_bounds_z_neg : 0x0900
flick_peak_decay_coeff : 0x4000
lp_mean_filter_coeff : 0x6000
max_duration_jiggle_peaks : 0x000b
device_position : 0x01

```

Figure 39: Wrist Gesture Detector Control Parameter Commands Output

3.13.7 Barometer Pressure Type 1/Type 2

The following commands allow the user to configure the Barometer Pressure type 1/type 2 sensor.

Feature Class	Command	Description
Barometer Pressure Sensor Control	baro1setcnfg	Set the Barometer Pressure Type 1 Configuration
	baro1getcnfg	Get the Barometer Pressure Type 1 Configuration
	baro2setcnfg	Set the Barometer Pressure Type 2 Configuration
	baro2getcnfg	Get the Barometer Pressure Type 2 Configuration

Table 52: Barometer Pressure Control Parameter Commands Overview

Barometer Pressure Parameter commands usage -	
Command	Usage
baro1setcnfg	baro1setcnfg <osr_p> <osr_t> <iir_filter> eg: baro1setcnfg 1 1 1
baro1getcnfg	baro1getcnfg
baro2setcnfg	baro2setcnfg <osr_p> <osr_t> <iir_filter_p> <iir_filter_t> <dsp_config> eg: baro2setcnfg 1 1 1 1 1
baro2getcnfg	baro2getcnfg

Table 53: Barometer Pressure Control Parameter Commands Usage

```

baro1setcnfg 1 1 1
Set the Barometer pressure type 1 Configuration
    -osr_p : 1
    -osr_t : 1
    -iir_filter : 1
baro1getcnfg
Barometer pressure type 1 Configuration:
    -osr_p : 1
    -osr_t : 1
    -iir_filter : 1
baro2setcnfg 1 1 1 1 1
Set the Barometer pressure type 2 Configuration
    -osr_p : 1
    -osr_t : 1
    -iir_filter_p : 1
    -iir_filter_t : 1
    -dsp_config : 1
baro2getcnfg
Barometer pressure type 2 Configuration:
    -osr_p : 1
    -osr_t : 1
    -iir_filter_p : 1
    -iir_filter_t : 1
    -dsp config : 1

```

Figure 40: Barometer Pressure Control Parameter Commands Output

3.13.8 Step Counter

The following commands allow the user to configure the Step Counter sensor.

Feature Class	Command	Description
Step Counter Sensor Control	scsetcnfg	Set the Step Counter Configuration
	scgetcnfg	Get the Step Counter Configuration

Table 54: Step Counter Control Parameter Commands Overview

[illegible]

Table 55: Step Counter Control Parameter Commands Usage


```

scgetcnfg
Step Counter Configuration:
  -env_min_dist_up: 1
  -env_coef_up: 1
  -env_min_dist_down: 1
  -env_coef_down: 1
  -step_buffer_size: 1
  -mean_val_decay: 1
  -mean_step_dur: 1
  -filter_coeff_b2: 1
  -filter_coeff_b1: 1
  -filter_coeff_b0: 1
  -filter_coeff_a2: 1
  -filter_coeff_a1: 1
  -filter_cascade_enabled: 1
  -peak_duration_min_walking: 1
  -peak_duration_min_running: 1
  -step_duration_max: 1
  -step_duration_window: 1
  -half_step_enabled: 1
  -activity_detection_factor: 1
  -activity_detection_thres: 1
  -step_counter_increment: 1
  -step_duration_pp_enabled: 1
  -step_dur_thres: 1
  -en_mcr_pp: 1
  -mcr_thres: 1
  -sc_26: 1
  -sc_27: 1

```

Figure 41: Step Counter Control Parameter Commands Output

3.13.9 Physical Range

The following commands allow the user to set the physical range of each sensor.

Feature Class	Command	Description
Physical Range Configuration	phyrangeconf	Set the range of physical sensor

Table 56: Physical Range Configuration Commands Overview

Physical Range Configuration commands usage -	
Command	Usage
phyrangeconf	phyrangeconf <sensor_id> <range_value> eg: phyrangeconf 1 0x10

Table 57: Physical Range Configuration Commands Usage

```

phyrangeconf 1 0x10
Setting the range of sensor successfully

```

Figure 42: Physical Range Configuration Commands Output

3.13.10 Fast Offset Compensation

The following commands allow the user to enable the fast offset compensation for the sensor.

Feature Class	Command	Description
---------------	---------	-------------

Fast Offset Compensation	foc	Enable the fast offset compensation for the sensor
---------------------------------	------------	--

Table 58: Fast Offset Compensation Commands Overview

Fast Offset Compensation commands usage -	
Command	Usage
foc	foc <sensor id ('1' for accelerometer, '3' for gyroscope)> eg: foc 1

Table 59: Fast Offset Compensation Commands Usage

```
foc 1
Keep the sensor stable for accel foc
FOC Success
```

Figure 43: Fast Offset Compensation Commands Output

3.14 Activity Recognition Parameters Commands

The following commands allow the host to set or get Activity Recognition parameters.

Feature Class	Command	Description
Activity Recognition Parameters	sethearactvcnfg	Set the Hearable Activity Configuration
	gethearactvcnfg	Get the Hearable Activity Configuration
	setwearactvcnfg	Set the Wearable Activity Configuration
	getwearactvcnfg	Get the Wearable Activity Configuration

Table 60: Activity Recognition Parameters Commands Overview

Activity Recognition Parameters commands usage -	
Command	Usage
sethearactvcnfg	sethearactvcnfg <ss> <ppe> <mingt> <maxgt> <obs> <msmc> eg. sethearactvcnfg 1 1 1 1 1 1
gethearactvcnfg	gethearactvcnfg
setwearactvcnfg	setwearactvcnfg <ppe> <mingt> <maxgt> <obs> <msmc> eg. setwearactvcnfg 1 1 1 1 1
getwearactvcnfg	getwearactvcnfg

Table 61: Activity Recognition Parameters Commands Usage

```
sethearactvcnfg 1 1 1 1 1 1
Set hearable activity configuration
- seg_size: 1
- post_process_en: 1
- min_gdi_thre: 1
- max_gdi_thre: 1
- out_buff_size: 1
- min_seg_moder_cfg: 1
gethearactvcnfg
Hearable activity configuration:
- seg_size: 1
- post_process_en: 1
- min_gdi_thre: 1
- max_gdi_thre: 1
- out_buff_size: 1
- min_seg_moder_cfg: 1
setwearactvcnfg 1 1 1 1 1
Set wearable activity configuration
- post_process_en: 1
- min_gdi_thre: 1
- max_gdi_thre: 1
- out_buff_size: 1
- min_seg_moder_cfg: 1
getwearactvcnfg
Wearable activity configuration:
- post_process_en: 1
- min_gdi_thre: 1
- max_gdi_thre: 1
- out_buff_size: 1
- min_seg_moder_cfg: 1
```

Figure 44: Activity Recognition Parameters Commands Output

3.15 Data Injection Commands

The following commands allow the host to set or inject data.

Feature Class	Command	Description
Data Injection	dmode	Set the Data Injection mode
	dinject	Compute virtual sensor output from raw IMU data

Table 62: Data Injection Commands Overview

Data Injection commands usage -	
Command	Usage
dmode	dmode <mode> eg. dmode s
dinject	dinject <input_file.txt> eg. dinject field_log.txt

Table 63: Data Injection Commands Usage

```

Sensor ID: 129, sample rate: 4.000000 Hz, latency: 0 ms

Opened Log File baro_chg.bin.csv_Injection.txt

File Size : 29624
[D][META EVENT]; T: 0.347015625; Flush complete for sensor id 129
[D][META EVENT]; T: 0.347875000; Power mode changed for sensor id 129
[D][META EVENT]; T: 0.347875000; Sample rate changed for sensor id 129
[D]SID: 129; T: 0.250000000; 90297.000000
[D]SID: 129; T: 0.500000000; 90299.000000
[D]SID: 129; T: 0.750000000; 90300.000000
[D]SID: 129; T: 1.000000000; 90299.000000
[D]SID: 129; T: 1.250000000; 90299.000000
[D]SID: 129; T: 1.500000000; 90299.000000
[D]SID: 129; T: 1.750000000; 90299.000000
[D]SID: 129; T: 2.000000000; 90301.000000
[D]SID: 129; T: 2.250000000; 90300.000000
[D]SID: 129; T: 2.500000000; 90300.000000
[D]SID: 129; T: 2.750000000; 90299.000000
[D]SID: 129; T: 3.000000000; 90299.000000
[D]SID: 129; T: 3.250000000; 90295.000000
[D]SID: 129; T: 3.500000000; 90298.000000
[D]SID: 129; T: 3.750000000; 90296.000000
[D]SID: 129; T: 4.000000000; 90297.000000
[D]SID: 129; T: 4.250000000; 90298.000000
[D]SID: 129; T: 4.500000000; 90298.000000
[D]SID: 129; T: 4.750000000; 90299.000000
[D]SID: 129; T: 5.000000000; 90298.000000
[D]SID: 129; T: 5.250000000; 90297.000000
[D]SID: 129; T: 5.500000000; 90299.000000
[D]SID: 129; T: 5.750000000; 90299.000000
[D]SID: 129; T: 6.000000000; 90301.000000
[D]SID: 129; T: 6.250000000; 90300.000000
[D]SID: 129; T: 6.500000000; 90301.000000
[D]SID: 129; T: 6.750000000; 90299.000000
[D]SID: 129; T: 7.000000000; 90300.000000
[D]SID: 129; T: 7.250000000; 90301.000000
[D]SID: 129; T: 7.500000000; 90299.000000
[D]SID: 129; T: 7.750000000; 90301.000000
[D]SID: 129; T: 8.000000000; 90301.000000
[D]SID: 129; T: 8.250000000; 90301.000000
[D]SID: 129; T: 8.500000000; 90300.000000
[D]SID: 129; T: 8.750000000; 90298.000000
[D]SID: 129; T: 9.000000000; 90298.000000
[D]SID: 129; T: 9.250000000; 90296.000000
[D]SID: 129; T: 9.500000000; 90297.000000
[D]SID: 129; T: 9.750000000; 90299.000000
[D]SID: 129; T: 10.000000000; 90298.000000
[D]SID: 129; T: 10.250000000; 90299.000000
[D]SID: 129; T: 10.500000000; 90298.000000
[D]SID: 129; T: 10.750000000; 90298.000000
[D]SID: 129; T: 11.000000000; 90298.000000
[D]SID: 129; T: 11.250000000; 90297.000000
[D]SID: 129; T: 11.500000000; 90298.000000
[D]SID: 129; T: 11.750000000; 90299.000000
[D]SID: 129; T: 12.000000000; 90298.000000
[D]SID: 129; T: 12.250000000; 90298.000000
[D]SID: 129; T: 12.500000000; 90299.000000
[D]SID: 129; T: 12.750000000; 90299.000000

```

Figure 45: Data Injection Commands Output

3.16 Diagnostics Commands

The following commands allow the host to get diagnostics information.

Feature Class	Command	Description
Diagnostics	-m OR postm	Get Post Mortem Data and log to a file

Table 64: Diagnostics Command Overview

Diagnostics commands usage -

Command	Usage
<i>postm</i>	<i>postm <pm_log_filename.bin></i> <i>eg. postm pm_log_filename.bin</i>

Table 65: Diagnostics Command Usage

```

Error Reg Value : 44
POST MORTEM STATUS :
valid           : 0x00000001
flags          : 0x00000007

CONTEXT :
reg_1          : 0x00000000
reg_2          : 0x00000000
reg_3          : 0x00a15238
reg_4          : 0x00000024
reg_5          : 0x00a04b90
reg_6          : 0x00f0000c
reg_7          : 0x00000000
reg_8          : 0x00200000
reg_9          : 0x0000003f
reg_10         : 0x10101010
reg_11         : 0x00002300
reg_12         : 0x00a15638
reg_13         : 0x00000000
reg_14         : 0x00a042b4
reg_15         : 0x00a04e04
reg_16         : 0x00000001
reg_17         : 0x00a111c0
reg_18         : 0x00000001
reg_19         : 0x00000008
reg_20         : 0x00a042c0
reg_21         : 0x21212121
reg_22         : 0x22222222
reg_23         : 0x23232323
reg_24         : 0x24242424
reg_25         : 0x25252525
reg_26         : 0x00a05c1c
gp [reg_27]    : 0x00a1117c
fp [reg_28]    : 0x00a11158
sp [reg_29]    : 0x8000481e
ilink [reg_30] : 0x30303030
reg_31         : 0x0011ad74
blink [reg_32] : 0x001029f2

SYSTEM STATUS :
eret          : 0x0010e562
erbt         : 0x0010e4bc
erst         : 0x8000461e
ecr          : 0x00020000
efa          : 0x0010e562
ica         : 0x00000000
mpu_ecr       : 0x00000000

DIAGNOSTIC :
diagnostic    : 0x00000002
debug state   : 0x000000b1
debug val     : 0x00000000
error val     : 0x00000000
interrupt     : 0x00000000
err report    : 0x00000044

STACK INFO :
stack start   : 0x00a05c20
stack size    : 0x00001000

```

Figure 46: Diagnostics Command Output

3.17 Utility Commands

The utility commands are application specific commands and allow the users to control and manage the various application specific configurations to have an enhanced user interaction.

Feature Class	Utility	Command	Description
Utility	Debug	-v OR verb	Set the verbose level.
	Status	echo	Enable/Disable echo
		heart	Enable/disable Heartbeat Message
	File	mklog	Create a log file
		rm	Remove a log file
		ls	List the files in the external Flash
		wrfile	Write to a log file
		rdfile	Read from a log file
		slabel	Set a string label in the log file
	UI	cls	Clear Screen

Table 66: Utility Commands Overview

Note: Except the 'verb' command, all other utility commands are exclusive to MCU mode.

3.17.1 Debug Utility

The verbose command '-v' or 'verb' sets the verbose level. The verbose level refers to the level of response that the user expects from the application regarding its state of execution. The verbose level is classified in the following table.

verbose	scope
0	Give only error notifications.
1	Give notifications regarding errors as well as warnings.
2	Give notifications regarding the complete state of the system in terms of errors, warnings, and information about the current state of execution.

Table 67: Verbose Levels

Debug Utility -	
Command	Usage
verb	verb <verbose_level>, eg: verb 1

Table 68: Debug Utility Command Usage

```

version
HW info:: Board: 5, HW ID: 11, Shuttle ID: 179, SW ID: 10
SW Version: 0.6.0
Build date: May 20 2025

verb 2
[I]Executing verb 2
Setting verbose to 2

version
[I]Executing version
HW info:: Board: 5, HW ID: 11, Shuttle ID: 179, SW ID: 10
SW Version: 0.6.0
Build date: May 20 2025

```

Figure 47: Debug Utility Commands Output

By default, the verbose level is set to 0 to limit the number of notifications to need-to-know. The verbose level can be configured accordingly based on debugging and application requirements.

3.17.2 Status Utility

The echo command echoes back the input given to the application. The echo command can be used to enable/disable the echo feature.

The 'heart' command is used to indicate the system notifications to the user by blinking the LED every time a notification is sent. The heart command can be used to enable/disable the heartbeat feature.

Status Utility -	
Command	Usage
echo	echo <state>, eg: echo on
heart	heart <state>, eg: heart off

Table 69: Status Utility Commands Usage

```

echo off
Setting echo to off

Setting echo to on

heart on
Setting Heartbeat message to on

[H]34807
[H]34857
[H]37307
[H]37357
[H]39807
[H]39857

[H]42307
[H]42357
heart off
Setting Heartbeat message to off

```

Figure 48: Status Utility Commands Output

3.17.3 File Utility

The File utility commands allow the user to handle the various File and Log operations such as create/delete file, read/write file, add annotations etc. The file utility commands are different from the logging commands described in **Log Generation Commands**, in the sense that the log commands are more oriented towards logging the sensor data, whereas the File utility commands are more oriented towards facilitating the user with file management of the external Flash on the application board.

The following table describes those commands:

File Utility -	
Action	Commands
Generate the log file	mklog <file_name.file_extension>, eg: mklog abc.txt
List the files in the external Flash of the application board	ls
Write to the log file	wrfile <file_name.file_extension> <length_in_bytes>, eg: wrfile abc.txt 150 Note 1: In an event, a file is not present with the passed filename, a new file with same filename is generated. Note 2: There is a input timeout duration of 10s. After executing the 'wrfile' command, if no input is provided within the 10s, the application will assert the 'wrfile' callback and return 'Write Timed Out' error. Note 3: If the same command executed second time. The new input data will be appended to the previous content of the file. Note 4: While uploading the data from a PC using any application, ensure that <size_of_file> is passed as the input to length argument, and not the <size_of_file_on_disk>
Read the log file	rdfile <file_name.file_extension>, eg: rdfile abc.txt
Delete the File	rm <file_name.file_extension>, eg: rm abc.txt
Annotate the log file	slabel <label string>, eg: slabel Activity_N Note: slabel command can be used in association with Log generation commands, when acquiring the data in logging mode to annotate the events.

Table 70: File Utility Commands Usage

3.17.3.1 File Handling

```
ls
                                README.TXT | 731 B

mklog ab.txt
File ab.txt was created

ls
                                README.TXT | 731 B
                                ab.txt    |  0 B

wfile abc.txt 10

Waiting for 10 bytes of data
File Transferred : 100.00%
Write Completed

rdfile abc.txt
Read Initiated
abcdef0123
Read Completed

rm ab.txt
File ab.txt was removed

ls
                                README.TXT | 731 B
                                abc.txt   | 10 B
```

Figure 49: File Utility Commands Output

3.17.3.2 Annotation

Annotation is very useful from a data collection perspective. It is used to annotate the various events covered during the scope of data collection.

File Annotation	
Action	Usage
Attach a log file for the logging	attlog <file_name.file_extension>, eg: attlog abc.bin
Enable the sensor acquisition in logging mode	logse <id>:<odr>, eg: logse 4:100
Annotate the log file	slabel <label string>, eg: slabel Activity_N
Disable the sensor acquisition	logse <id>:0, eg: logse 4:0
Detach log file from logging	detlog <file_name.file_extension>, eg: detlog abc.bin

Table 71: File Annotation using ‘slabel’

3.17.4 UI Utility

The ‘cls’ is a UI command and used to clear the screen of the UI.

Debug Utility	
Command	Usage
cls	cls

Table 72: ‘cls’ Command Usage

4 BHy2CLI Limitations

4.1 HW Limitations

- There is a limitation on the file name length when transferring files to APP30 External Flash in MTP mode. It allows a maximum of 39 characters for file names.

4.2 Platform Limitations

- Copying of the log files using Windows Explorer can lead to data corruption.
- For Head Orientation sensors, the ODR change is not reflected for subsequent sensor activation with different ODRs.
- Sometimes, firmware files with large file name lengths can't be copied to external Flash. To address this, shorten the file name.
- Due to filesystem constraints, it does not support the simultaneous writing of multiple files to the external memory of application boards.
- In MCU mode, a file will be appended instead of removed and/or created as a new one for all commands (except 'rm' and 'getbsxparam') with handling file.
- HEX streaming only supports ODR with a frequency not bigger than 400Hz.
- Due to algorithm, sometimes, BSX magnetometer parameters are not restored properly when the sensors are enabled with logse/actse command

5 Legal Disclaimer

5.1 Engineering Samples

Engineering Samples are marked with an asterisk (*) Or (e). Samples may vary from the valid technical specifications of the product series contained in the user guide. They are therefore not intended or fit for resale to third parties or for use in end products. Their sole purpose is internal client testing. The testing of an engineering sample may in no way replace the testing of a product series. Bosch Sensortec assumes no liability for the use of engineering samples. The Purchaser shall indemnify Bosch Sensortec from all claims arising from the use of engineering samples.

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6 Document history and modifications

Rev. No	Chapter	Description of modification/changes	Date
1.0		First Draft	Nov 2023
1.1		Addressed the Review Comments	Jan 2024
2.0		Added new commands for Parameters, Info Added new chapter for limitations	Nov 2024
2.1		Updated compatibility Corrected some typos in commands	Apr 2025
2.2		Updated compatibility Changed name from BHyCLI to BHy2CLI Corrected some typos in commands Removed commands related to Flash Updated limitation related to BSX magnetometer	May 2025
2.3		Update image, descriptions for some commands Remove descriptions related to strbuf command	June 2025
2.4		Added cyclic kilo commands	August 2025

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