ELECTRONICS & DEFENSE

STIM318

Evaluation kit
User Manual

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  - USB connectivity to PC
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  - Full IMU configuration capability
  - Detailed IMU diagnostics
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  - Data presentations and save data to file capability
  - Custom scale and zoom functions
  - CRC check
- Logging panel
  - Support for any measurement duration, only limited by hard drive, available memory and processor capacity of PC
  - Various stop criteria for measurements available ('Manually', 'No. of samples' or 'Time elapsed')
- Measurements of up to 4 IMUs simultaneously supported (requires additional cable(s))

STIM318 EVK PCI

STIM318 EVK USB

1.1 General description

The evaluation kit provides measurement and configuration access to STIM318 IMU. Configuration, graphical result presentation and saving data to file functions are supported. The single voltage supply required for the IMU operation is provided from an USB port.

USB-kit – important notice!
The USB kit supports certain distinct bit rates only. The following bit rates have been tested and verified:

Approved bit rates w/USB kit
3 000 000 bps
2 000 000 bps
1 500 000bps
1 411 765 bps
Most settings below 1 300 000 bps

Table 2 Valid bit rates

1.1.1 Wiring diagrams

Figure 1 and Figure 2 shows the wiring diagrams of the PCIe and USB version respectively.

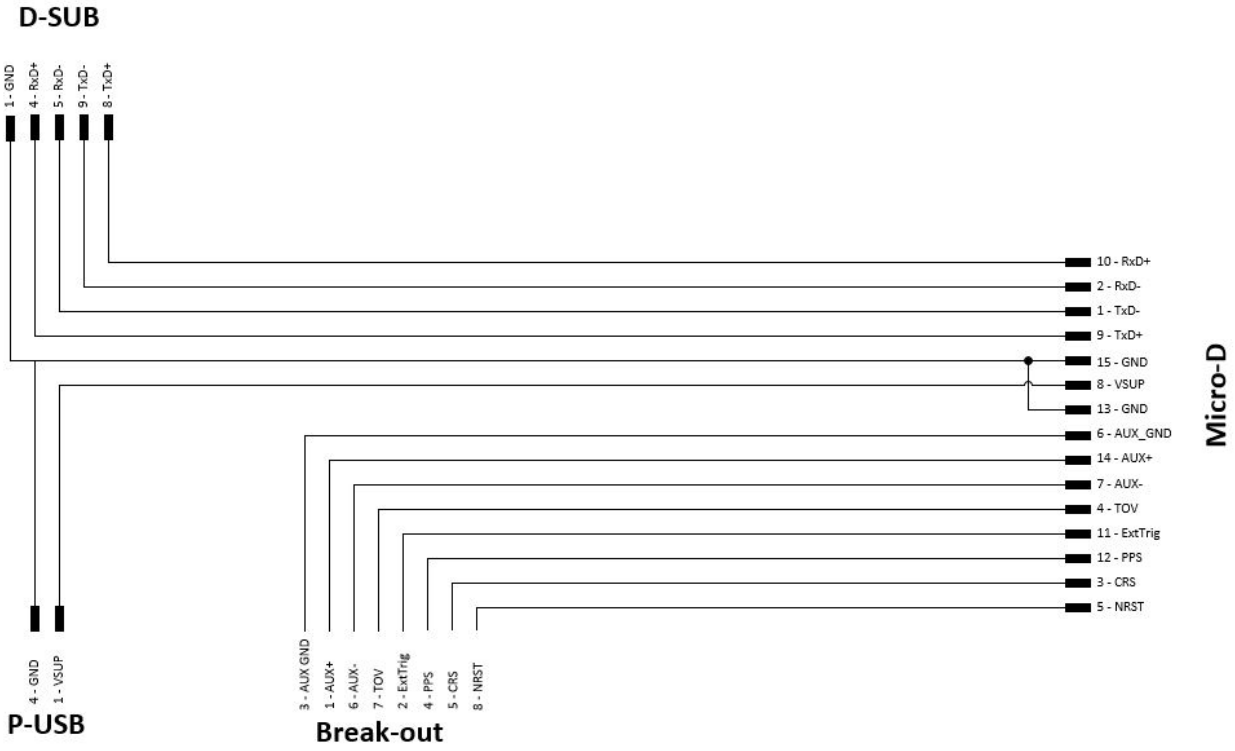

Figure 1 Wiring diagram, PCIe kit

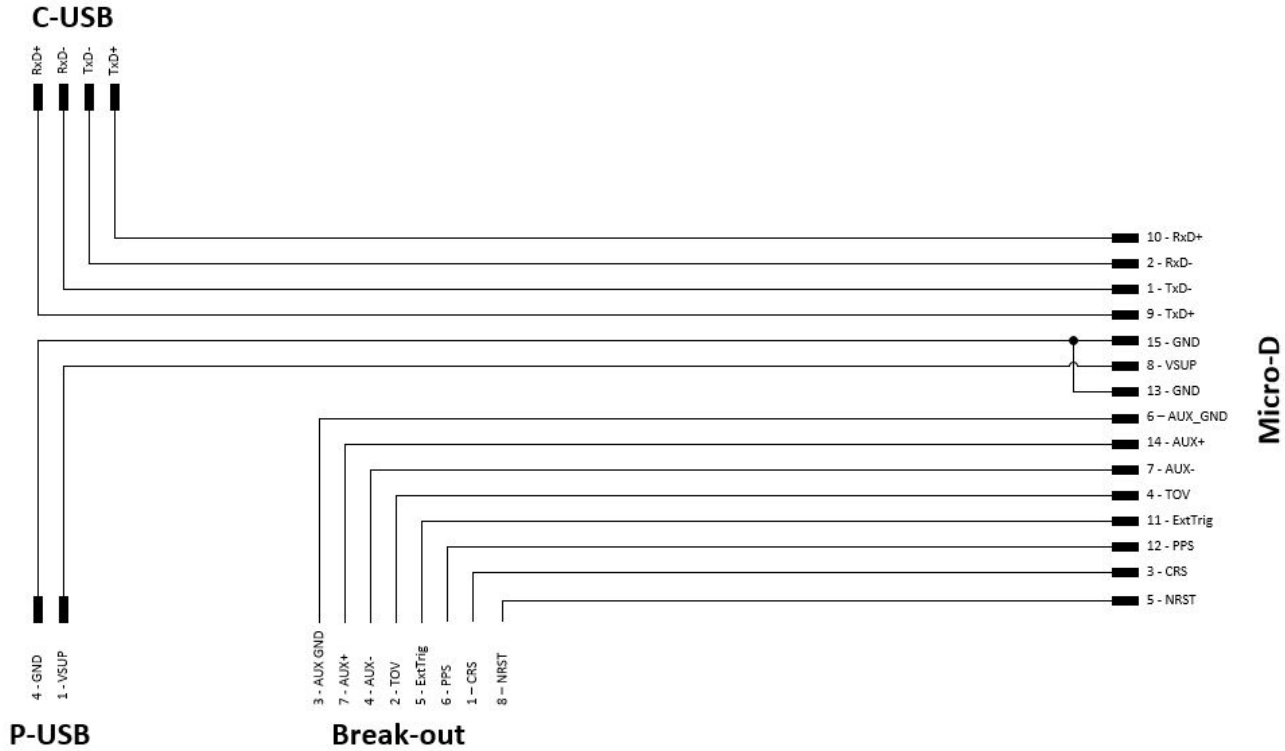

Figure 2: Wiring diagram, USB kit

1.2 Configurable and readable parameters

Configurable parameters in Service Mode:

- Output format (angular rate, incremental angle etc.)
- Bias trim offset parameters
- Datagram format
- Sampling rate
- Bandwidth/ Low pass filter frequency
- RS422 transmission bit rate
- Number of stop bits in datagram
- Parity
- Line/ Datagram termination

Configurable parameters in Bias Trim Offset Mode:

- Gyro bias offset
- Accelerometer bias offset
- Inclinometer bias offset

Readable parameters:

- Part number
- Serial number
- Firmware revision
- Hardware revision
- IMU diagnostics

Detailed diagnostic information includes RAM and flash checks, stack handling checks, status of internal voltage supply references, and various parameter reports for each measurement axis are available in SERVICE mode.

Note: Time of Validity (TOV) and external trigger functionalities of STIM318 are not supported by the EVK PC-software.

2 Kit contents

- PCIe option:
  - PCIe to RS422 interface card
  - IMU communication and power cable
- USB kit:
  - USB to RS422 interface cable with USB power supply connector
- Memory stick with:
  - PC software, STIM318
  - User manual for evaluation kit
- Allen Wrench for fixing connector of communication and power cable to the IMU

Note that the evaluation kit does not include a STIM318 IMU. This must be ordered separately.

3 System requirements

- Windows XP SP2 (or later), Windows Vista, Windows 7 (32/ 64bit), Windows 10
- PCIe kit:
  - 1 free USB port and 1 free PCIe slot
- USB kit:
  - 2 free USB ports
- Quad core processor recommended (when simultaneously logging data from two IMUs)

4 Getting started

Depending on the version of evaluation kit, preparing your system involves the following steps:

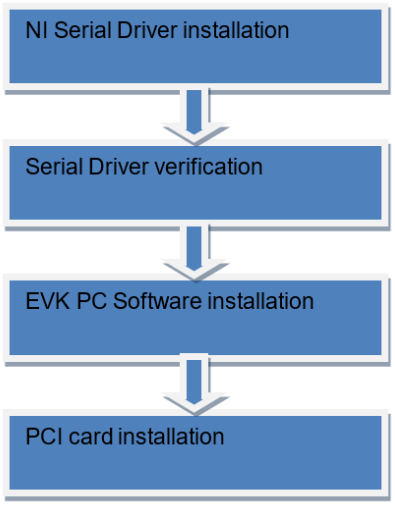

Figure 3: PCIe kit installation

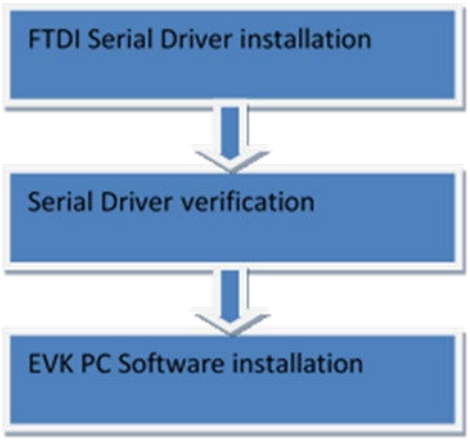

Figure 4: USB kit installation

4.1 PCIe installation

4.1.1 Installation of PCIe to RS422 serial driver

Install the serial driver from the memory stick included in the kit. This procedure is self-explanatory. Follow the on-screen messages without doing any configuration changes.

Figure 5 and Figure 6 show two of the messages that appear during serial driver installation.

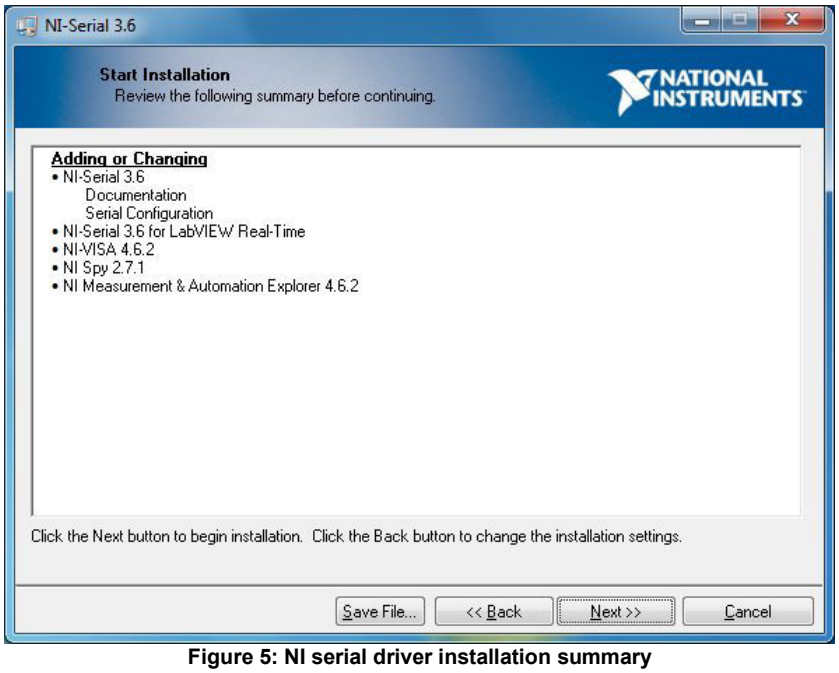

Figure 5: NI serial driver installation summary

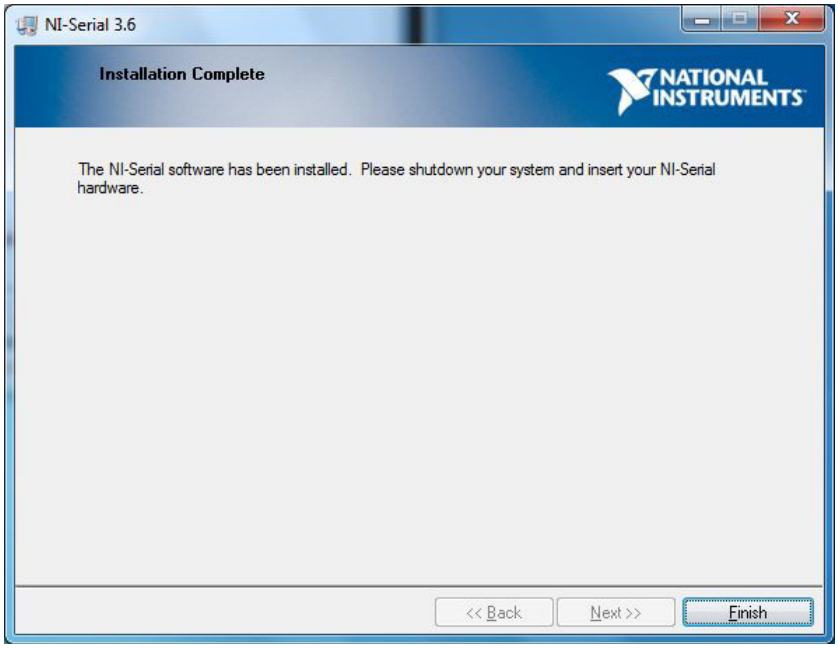

Figure 6: NI serial driver

4.1.2 Installation of PCIe card

Disconnect power from your computer prior to installation.

Following your computer manufacturer's directions, insert the card into a free PCIe slot.

4.1.3 Verification of serial driver set-up

Launch **Device Manager:** *Start -> Control Panel -> Hardware and Sound -> Devices and Printers -> Device Manager*.

Verify that the serial driver installation has completed successfully. An example is shown in Figure 7.

Make a note of the assigned COM port value(s) information. This will be needed later for connecting to the STIM from the PC software.

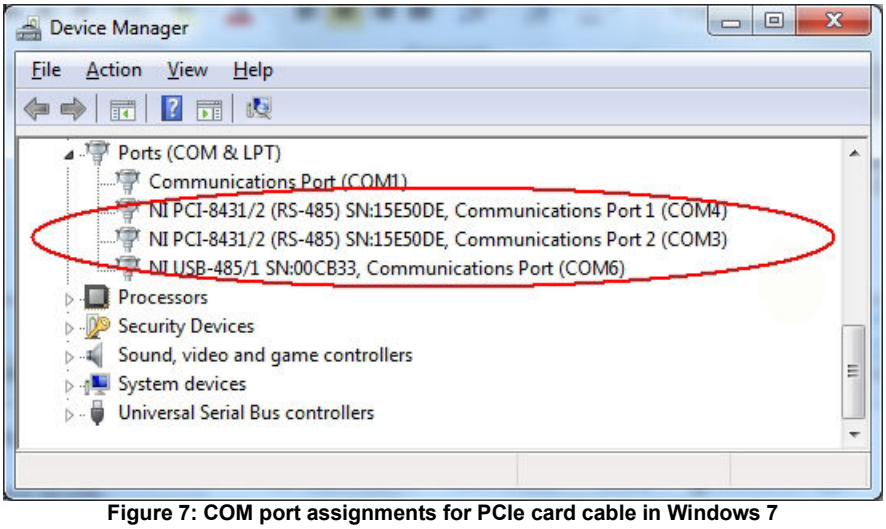

Figure 7: COM port assignments for PCIe card cable in Windows 7

4.2 USB installation

4.2.1 Installation of FTDI serial driver

To install the drivers for the FTDI serial driver under Windows, follow the instructions below:

- Connect the USB-RS422 plug to a spare USB port on your PC.
- If there is an available Internet connection, some Windows versions will silently connect to the Windows Update website and install a suitable driver
- In the event that no automatic installation takes place, please refer to the set-up guide from FTDI: http://www.ftdichip.com/Support/Documents/InstallGuides.htm

4.2.2 Connecting the USB EVK to your PC

Figure 8 shows how to connect the EVK to a PC

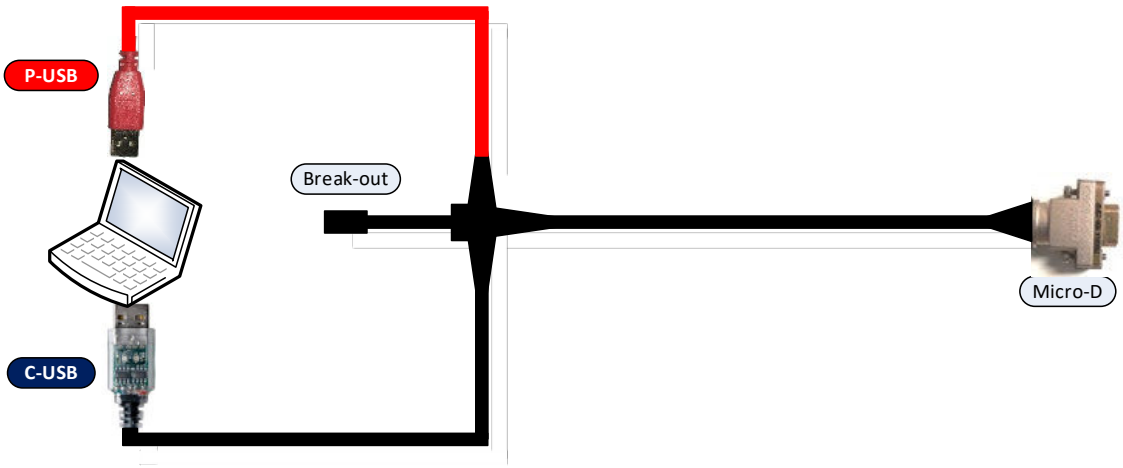

Figure 8: Connecting the EVK to a computer.

4.2.3 Verification and configuration of serial driver

Launch *Device Manager*. See *Control Panel -> Hardware and Sound -> Devices and Printers*.
Verify that the driver installation has completed successfully:

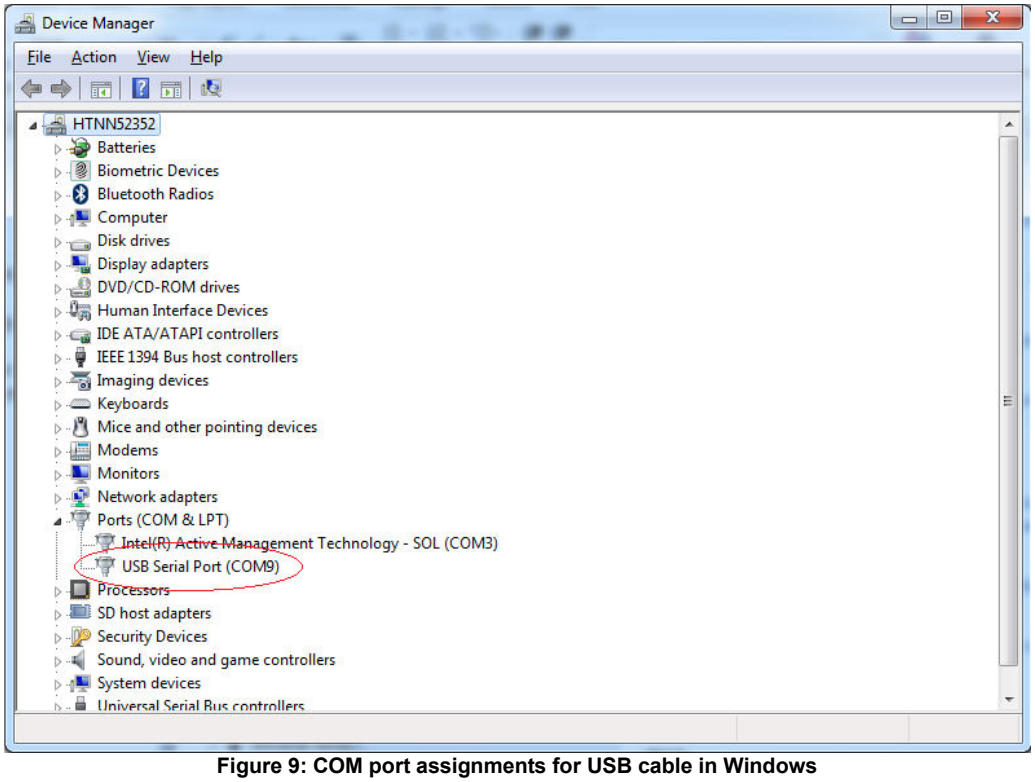

Figure 9: COM port assignments for USB cable in Windows

Make a note of the assigned COM port value(s) information. This will be needed later for connecting to the STIM from the PC software.

Right-click "USB Serial Port (COM<n>)" and select "Properties"

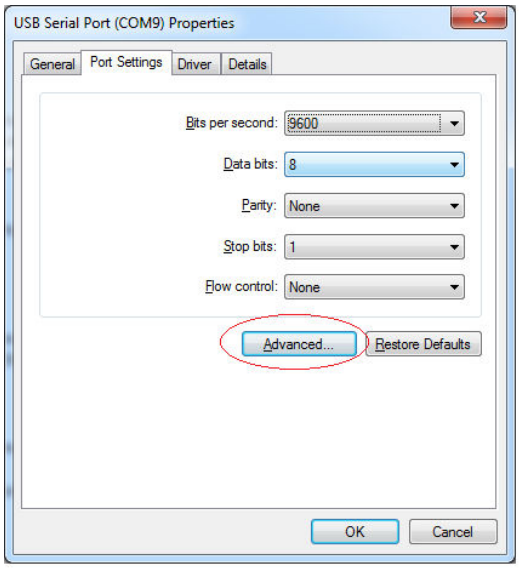

Figure 10: Port setting properties for COM port

Select "Advanced" from the "Port Setting" tab.

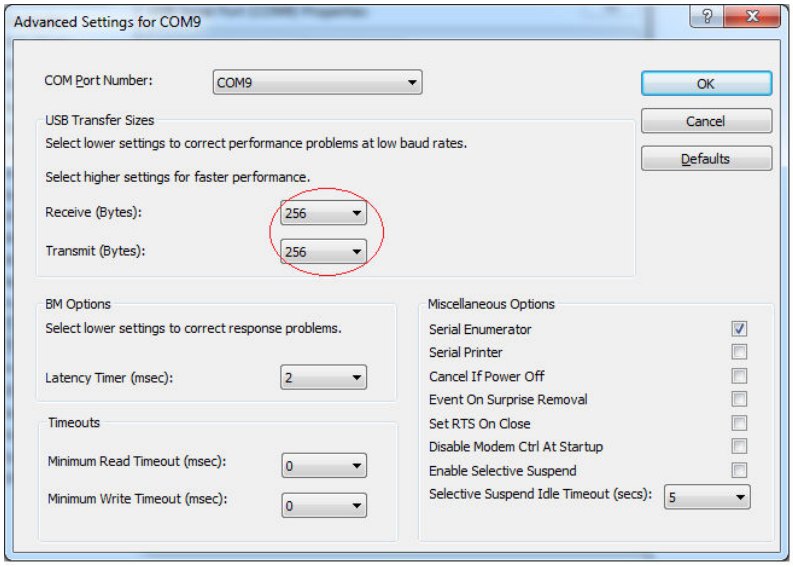

Figure 11: Advanced settings for COM port

Set the "Receive (Bytes)" and Transmit (Bytes) settings to 256.
Press OK twice.

The computer may have to be restarted for the changes to take effect.

4.3 Installation of PC software

Install the PC software by running "setup.exe" found on the included memory stick or downloaded from product support web page. Follow the on-screen instructions to complete the installation. See the following screen shots for guidance. The PC software can also be downloaded from the Product support site. Check this site regularly for updates.

5 Connecting the STIM318 to your PC

Figure 11 (USB) and Figure 12 (PCIe) shows how to connect the EVK to a PC

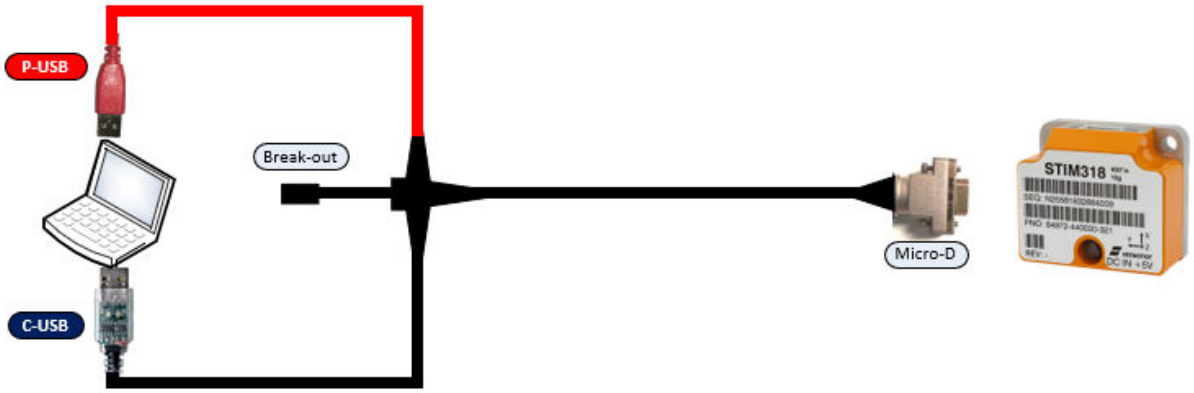

Figure 12: Connecting the STIM318 to the computer via USB.

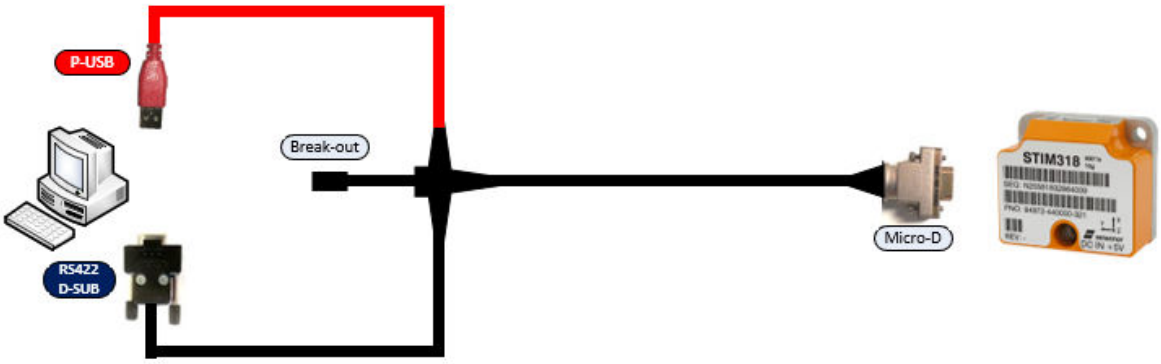

Figure 13: : Connecting the STIM318 to the computer via PCIe

6 Using PC software

1. Navigate to the ‘STIM evaluation tools’ folder from Windows start menu. Click on the shortcut named "STIM318 EVK" to start the PC software. For full functionality, the computer user should have Local Administrator rights.

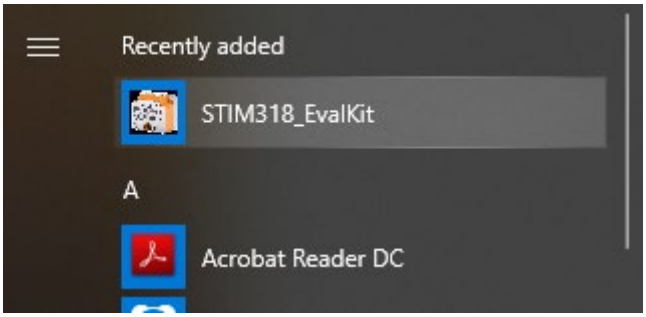

Figure 14: Starting PC software from Windows 10 start menu

2. A pop-up window will ask for a parameter (.INI) file. Select the INI-file (available in the installation folder by default) and press "Load"

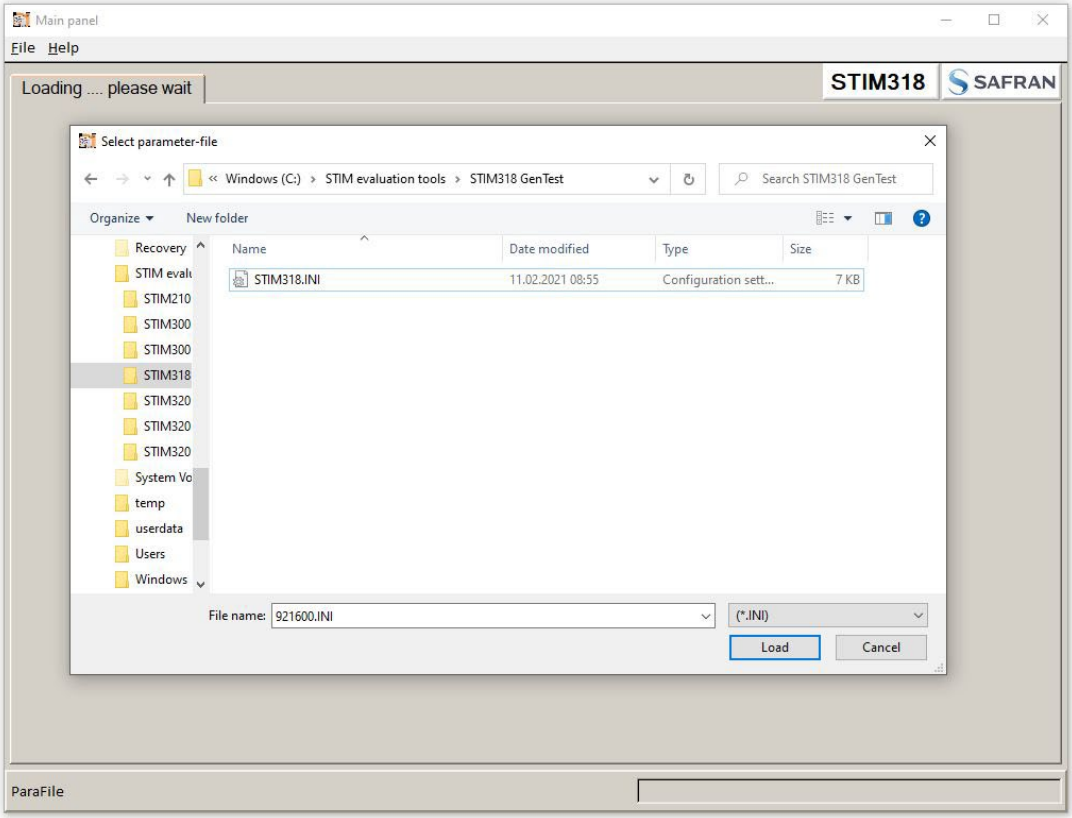

Figure 15: INI-file selection

3. A pop-up box for software registration appears. Fill in the open fields and press "Submit". The default email client opens. Press "Send" in order to complete this step. This step will only have to be completed once.

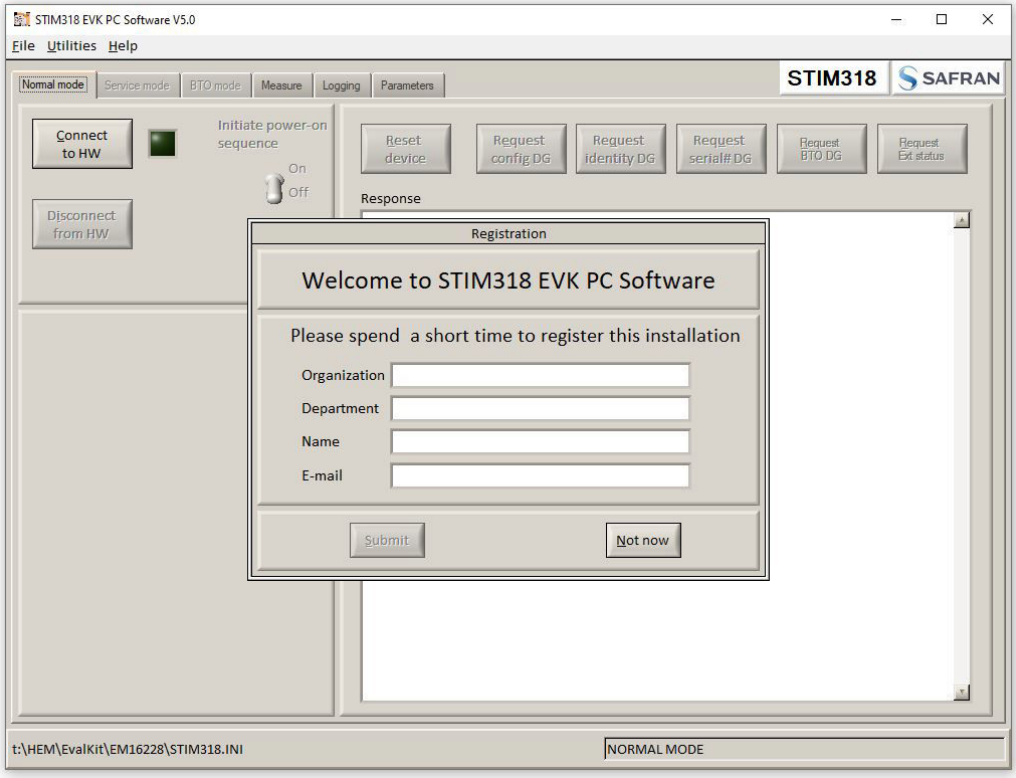

Figure 16: Welcome message and software registration

4. A pop-up window containing the End User License Agreement appears. Click the “Accept” button to accept the agreement and enable the EVK software to have full functionality.

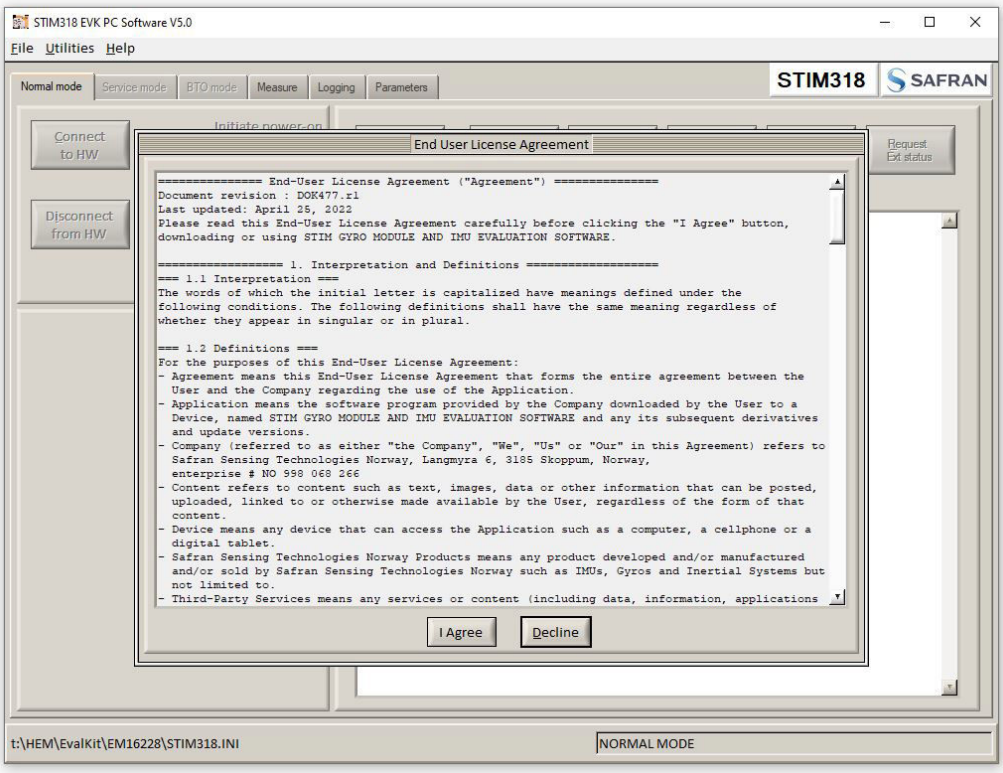

Figure 17: EULA confirmation window

5. The Normal mode panel is shown

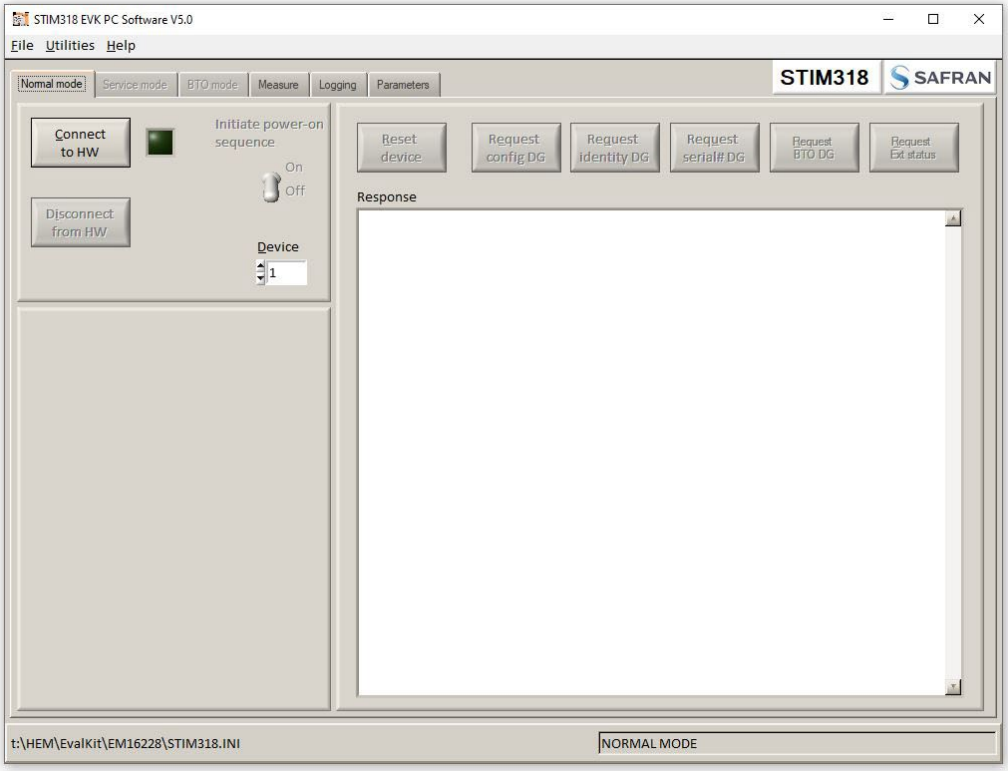

Figure 18: Normal mode panel after selecting INI-file

6. Verify the correct COM port settings in the Parameters view. If needed port # setting needs to be changed, do this by double clicking on the value and enter correct value. The default password to edit is ‘stim’.

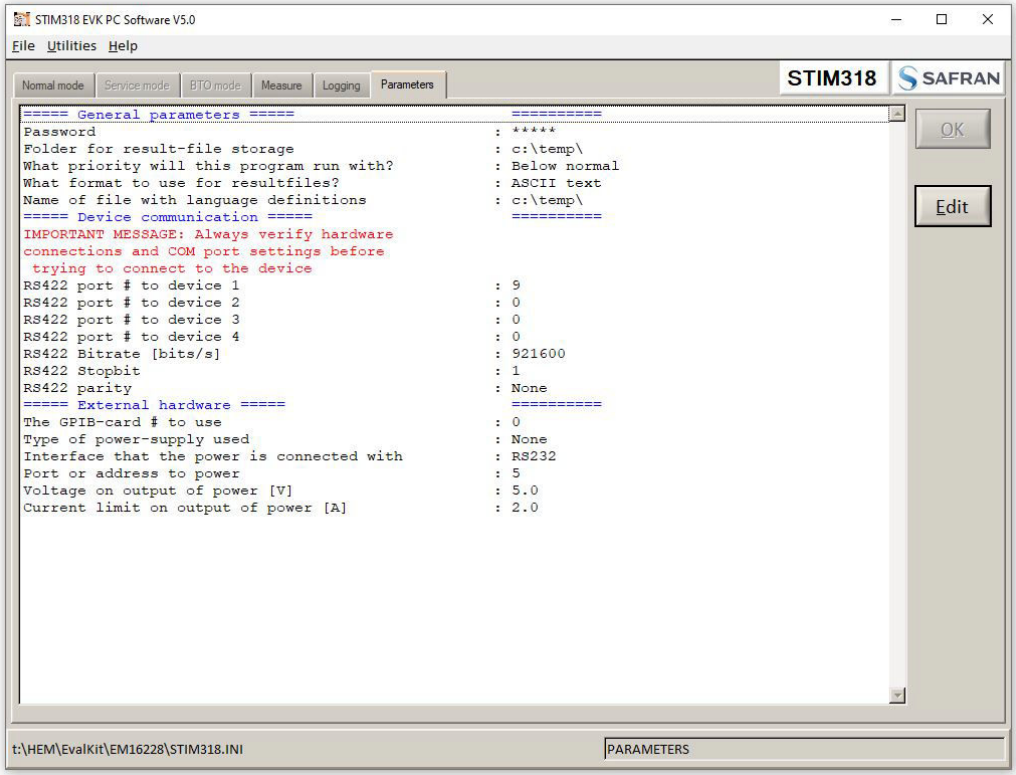

Figure 19: Edit the INI-file in order to verify correct COM port settings

7. Connect the IMU by pressing the ‘Connect to HW’ button in the Normal mode panel. A green LED light indicates that the COM port is active

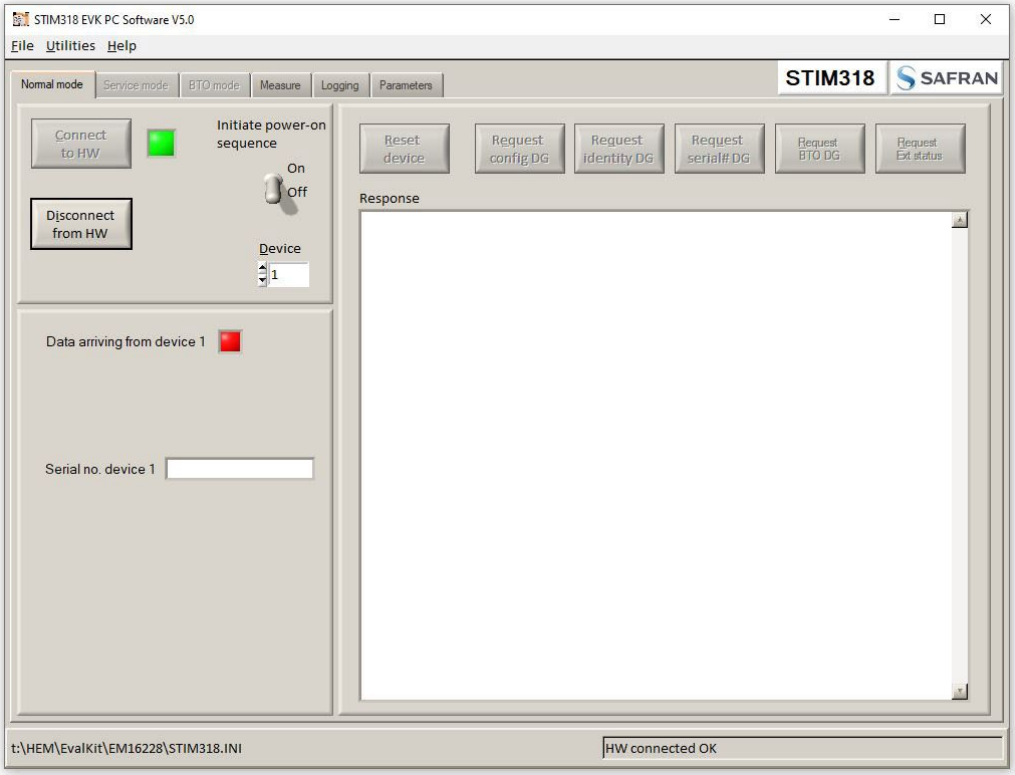

Figure 20: Normal mode panel after first hardware connection

8. Click on the the 'Initiate power-on sequence' control switch so it switches position to 'On'. Do not insert the power supply cable at this point. The pop-up message asking for confirmation of bitrate appears. Press OK.

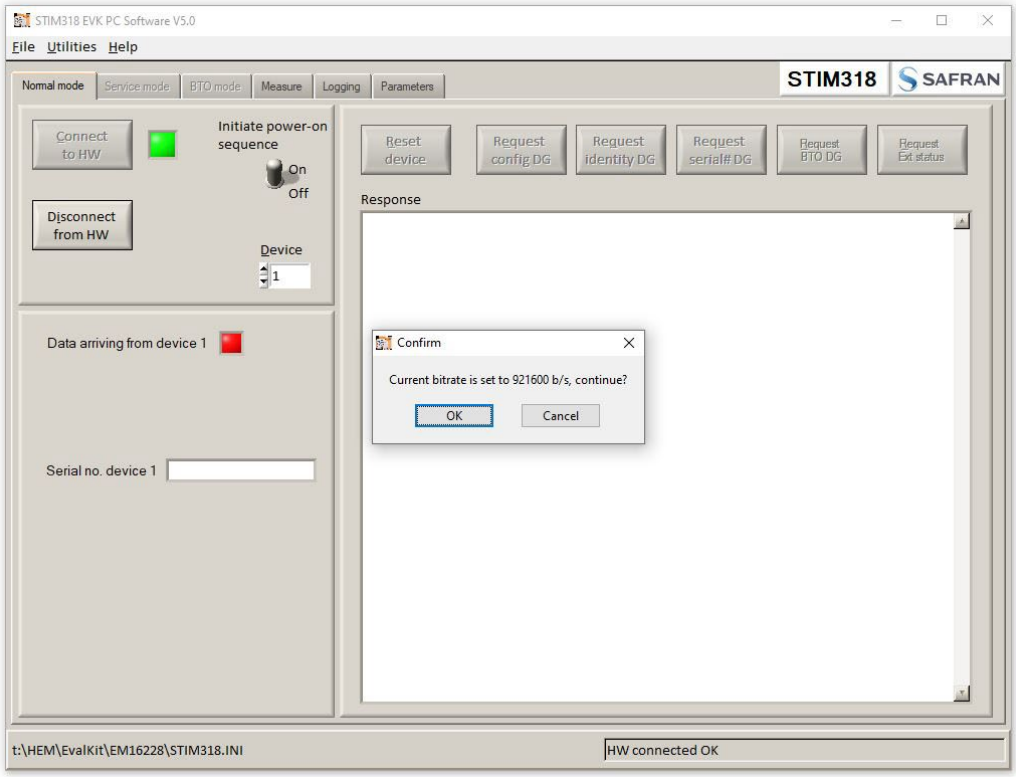

Figure 21: Normal mode panel after switching on voltage

9. A pop-up message telling "Connect power cable to voltage supply and then press OK to continue" appears. First insert the red USB connector into a free USB port of the PC/ laptop and then confirm the supply voltage is applied by pressing 'OK'

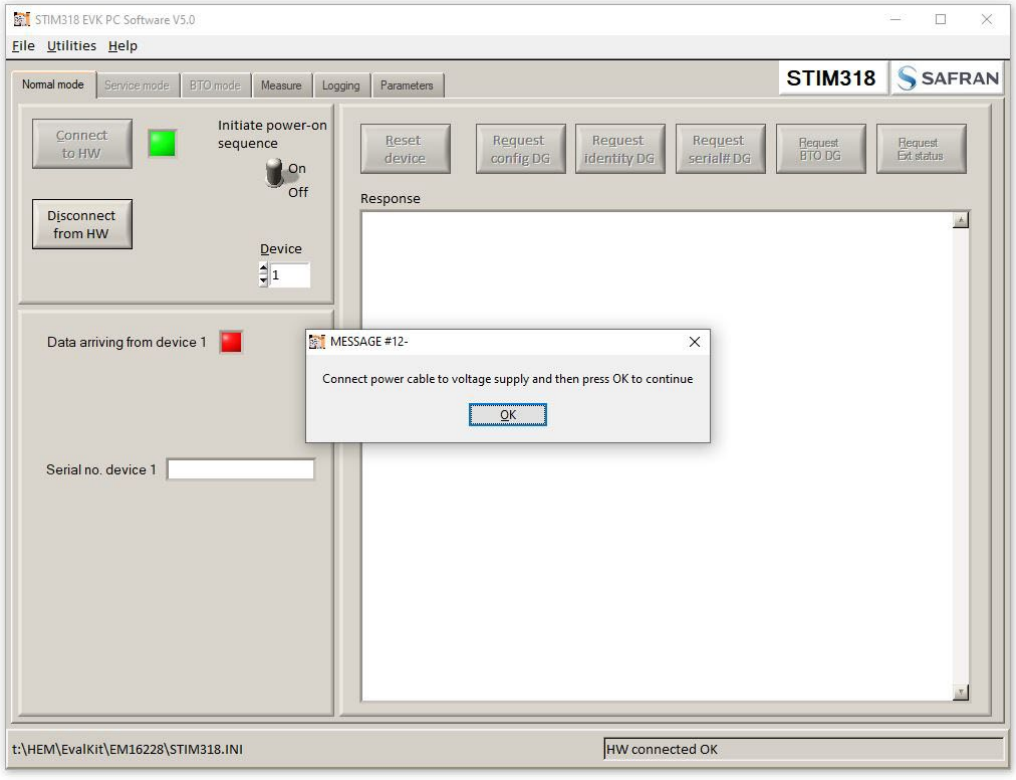

Figure 22: Confirmation of supply voltage

10. A green LED (Data arriving from device n) indicates that data is received from the IMU(s). Verify the communication to module by clicking on the 'Request serial# DG' button. An example of such a result is shown in Figure 24. The system is now ready for use.

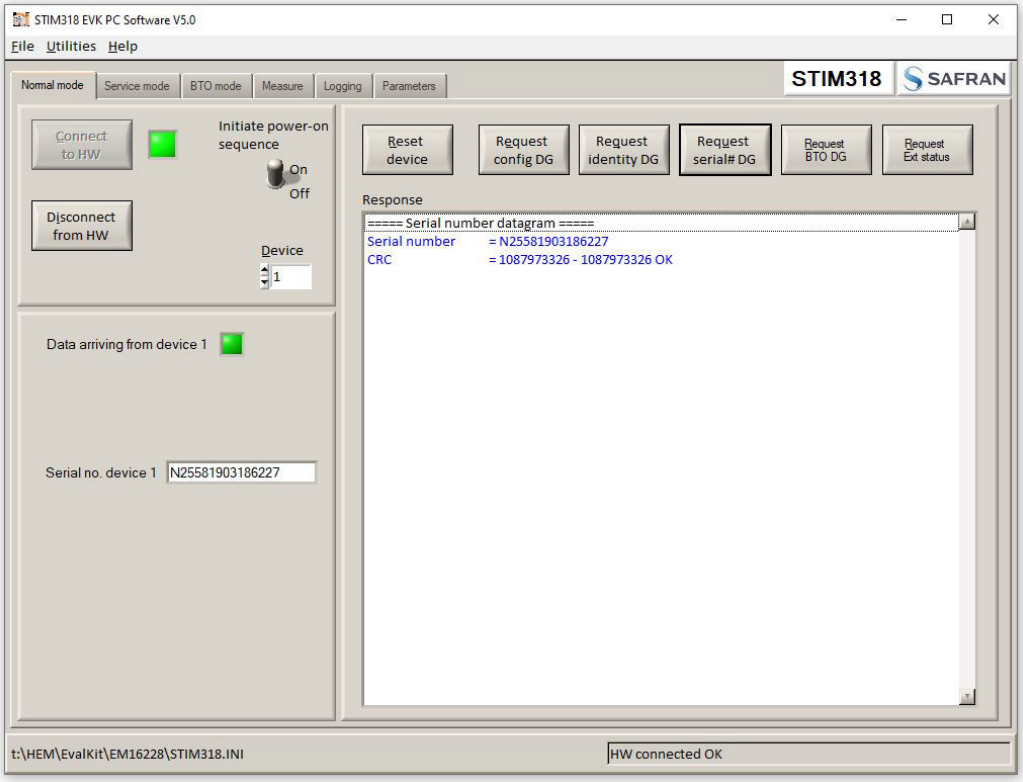

Figure 23: Example of 'Request serial# DG' response

7 Introduction to PC software

7.1 Panels overview

In addition to the Normal mode and Parameters panel, other panels are also available:

7.1.1 Service mode panel

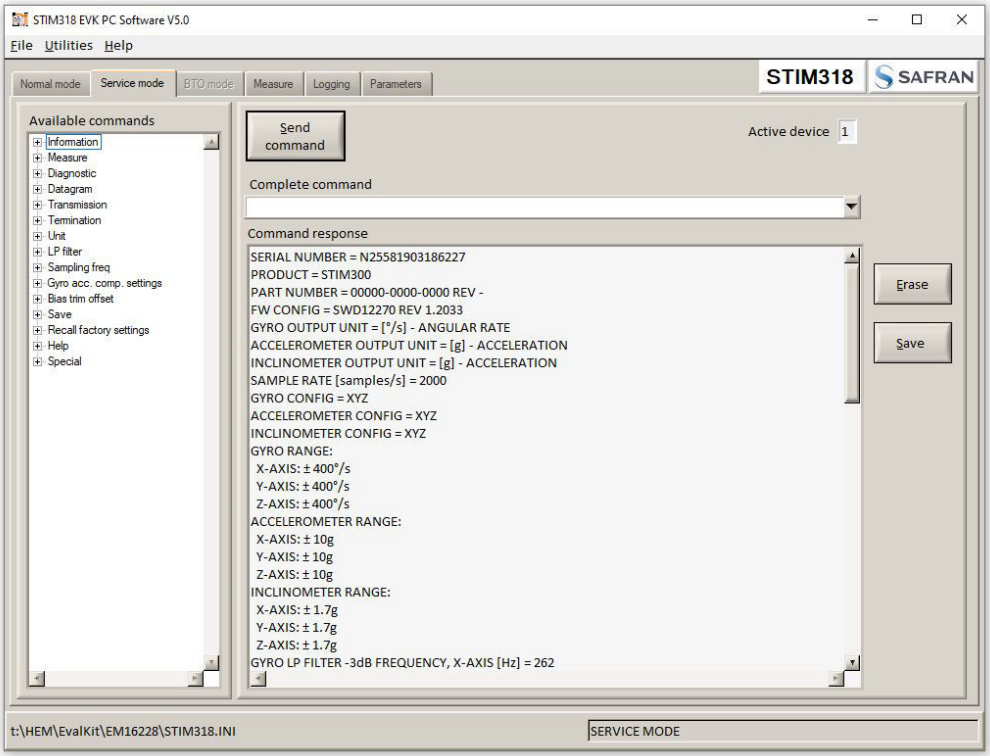

Figure 24: Service mode panel

7.1.2 BTO panel

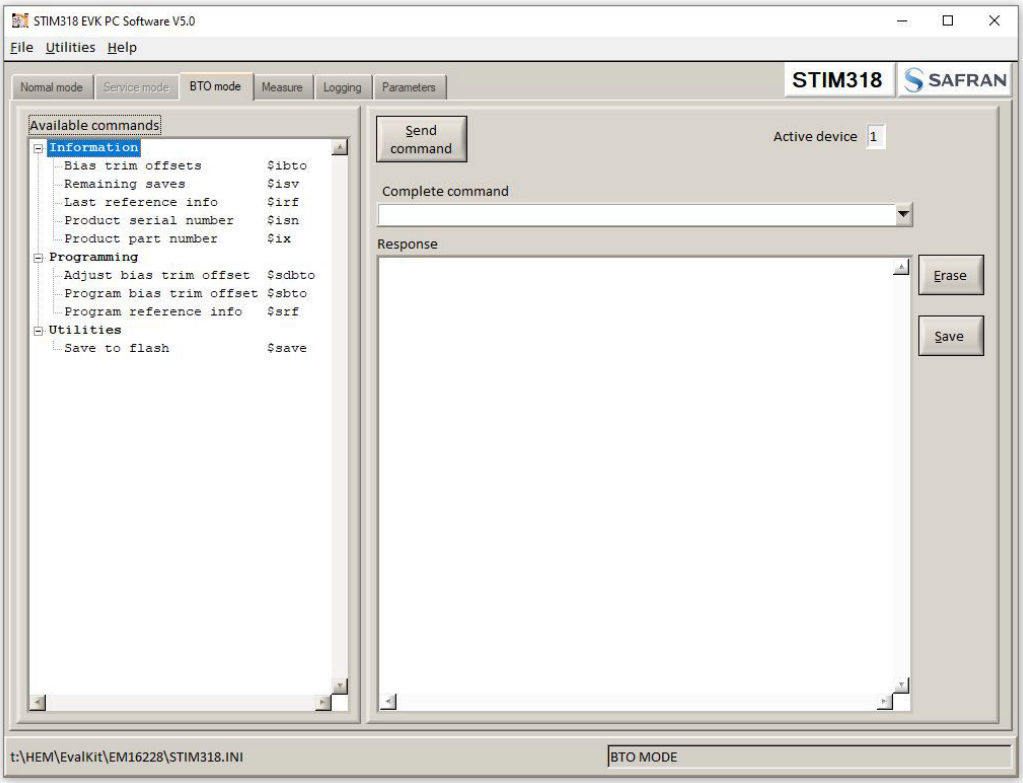

Figure 25: BTO mode panel

7.1.3 Measure panel

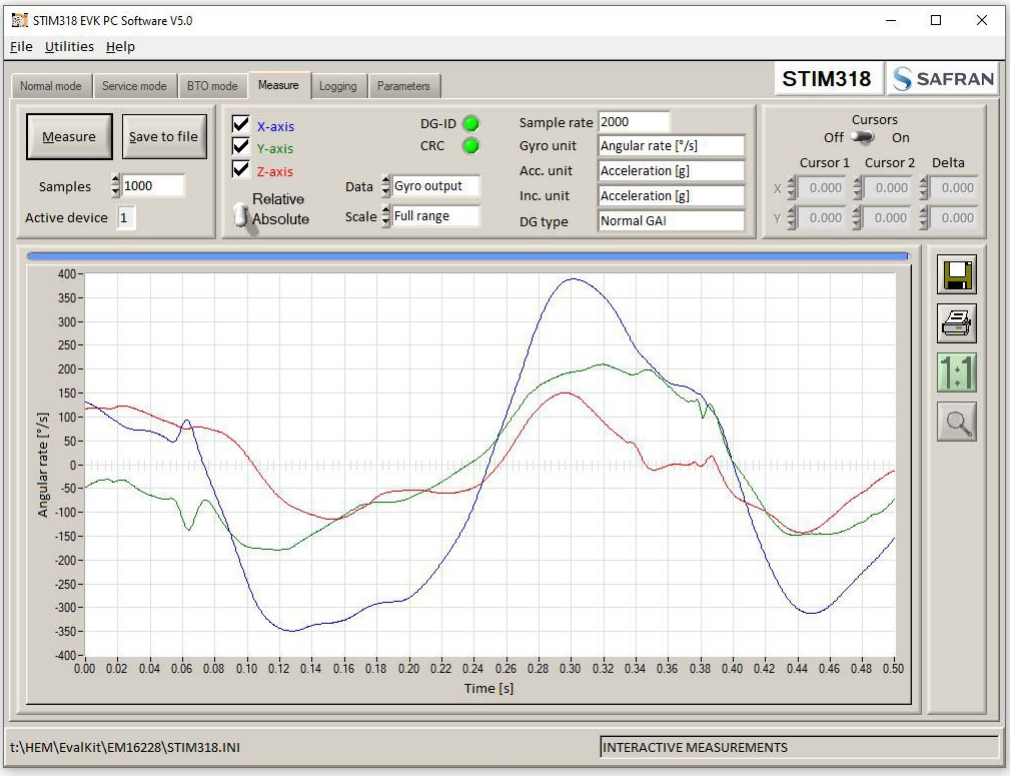

Figure 26: Measure panel

7.1.4 Logging panel

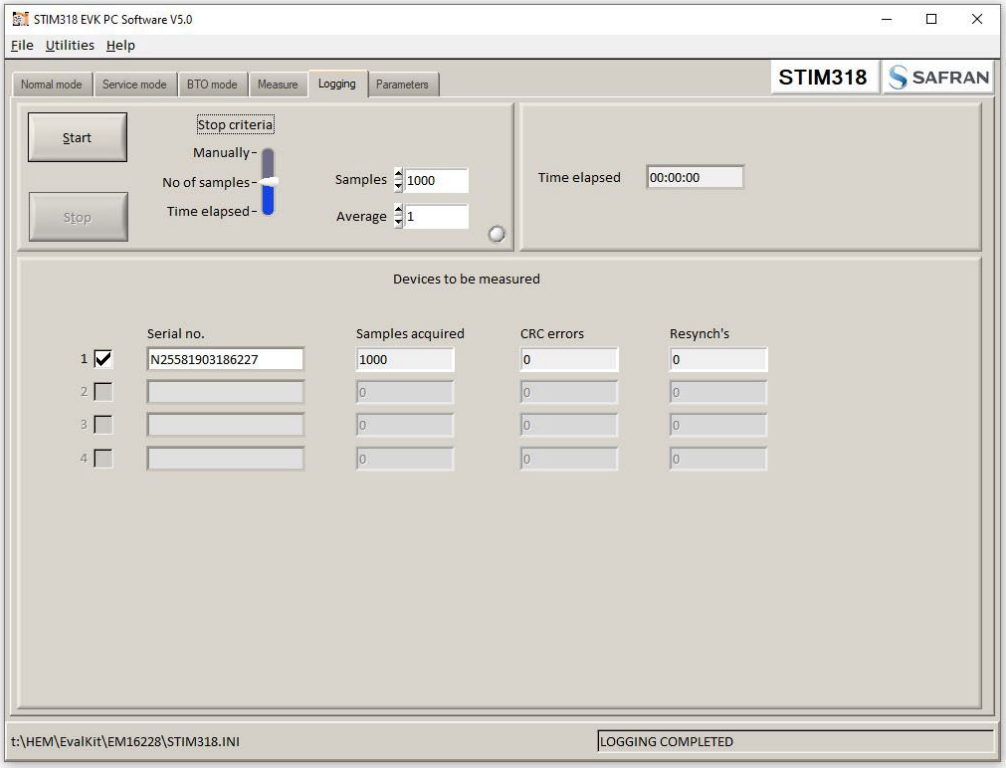

Figure 27: Logging panel (for saving data to file)

7.2 Main panel menu

Menu	Description
'File' → 'New parameter file'	Creates a new INI-file with default settings. Note that the new INI-file must be edited to match the hardware and IMU configuration settings.
'File' → 'Open parameter file'	For loading an existing INI-file
'File' → 'Save parameter file as'	To save current parameter settings with a new file name
'File' → 'Print parameters'	For printing the current 'Parameters' content on the default printer
'File' → 'Edit parameters'	Edit the 'Parameters' content
'File' → 'Exit'	Exit program
'Help' → 'Check for updates'	Opens the Sensonor support site in a web browser. New and updated Drivers, PC software and user manuals can be downloaded
'Help' → 'License agreement'	Displays the End User License Agreement with buttons for Agree or Decline
'Help' → 'About'	Information about the program (Program name, publisher and software revision number)

Table 3: Menu contents

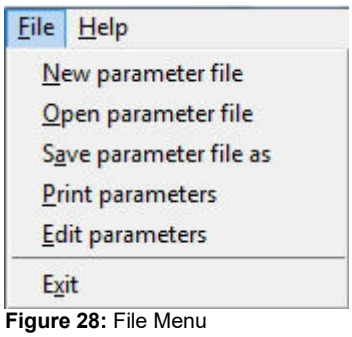

Figure 28: File Menu

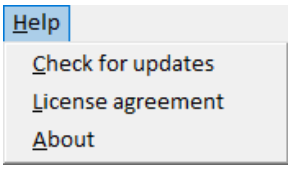

Figure 29: Help menu

7.3 Normal mode panel

Panel content	Functionality and description
Connect to HW	Connects to interface hardware. Opens COM port according to settings specified in active parameter file
LED	Indicator for hardware connection. A GREEN light indicates the COM port is opened
Disconnect from HW	Disconnects from interface hardware. Closes the COM port
Apply voltage switch (On/Off)	Toggles supply voltage if connected to an external power supply. Controls certain functions of the PC software.
Device box	Device number (and corresponding COM port) according to active parameter file. Selects which IMU is activated for datagram requests in Normal mode, Service mode operations and measurements in Measure panel. Does not apply for Logging panel.
Reset device button	Resets the IMU. Sends reset command (‘R’)
Request config DG button	Sends command (‘C’) to receive configuration datagram
Request identity DG button	Sends command (‘N’) to receive part number datagram
Request serial# DG button	Sends command (‘I’) to receive serial number datagram
Request Ext status button	Sends command (‘E’) to receive extended error information datagram
Request BTO DG button	Sends command (‘T’) to receive Bias Trim Offset datagram
Response window	Displays response to special datagram requests ('C', 'N' and ‘I’ datagrams)

Table 4: Normal mode panel descriptions

7.4 Service mode panel

Service mode is used for IMU configuration.

Service mode is entered by clicking on the Service mode tab next to the Normal mode tab after the IMU has been powered up. Service mode usage, functionalities and descriptions are listed in Table 5. Exit from Service mode to Normal mode by selecting one of the other panel tabs (Normal, Logging, Service or Parameter panel tab).

Note: Changes made for the IMU in Service mode are only stored permanently in flash memory when the save command (‘s’) subsequently is sent to the IMU.

Panel content	Functionality and description
Available commands window	Shows a list of available commands. See product datasheet for details
Complete command window	Contains the complete command to be sent. The command is auto-completed by the software during usage of the listings in the Available commands window. Left click inside the Complete command window brings up a list of previously sent commands. Right click enables manual command entry
Send command button	Sends command to the IMU
Active device indicator	Indicates active IMU. Corresponding COM port is specified in the active parameter file
Command response window	Shows the responses to commands from the IMU. See product datasheet for details
Erase button	Clears the content of the command response window
Save button	Saves the content of the command response window to a text file with a date and time tag

Table 5: Service mode panel descriptions

7.5 BTO mode panel

BTO mode is used for configuration of bias trim offset parameters.

BTO mode is entered by clicking on the BTO mode tab after the IMU has been powered up. BTO mode usage, functionalities and descriptions are listed in Table 6. Exit from BTO mode to Normal mode by selecting any available panel tab.

Note: Changes made for the IMU in BTO mode are only stored permanently in flash memory when the settings are saved to flash memory.

Panel content	Functionality and description
Available commands window	Shows a list of available commands. See product datasheet for details
Complete command window	Contains the complete command to be sent. The command is auto-completed by the software during usage of the listings in the Available commands window. Left click inside the Complete command window brings up a list of previously sent commands. Right click enables manual command entry
Send command button	Sends command to the IMU
Command response window	Shows the responses to commands from the IMU. See product datasheet for details
Erase button	Clears the content of the command response window
Save button	Saves the content of the command response window to a text file with a date and time tag

Table 6: BTO mode panel descriptions

7.6 Measure panel

Panel content	Functionality and description
Measure button	Starts a measurement series
Samples box	Defines the number of samples to be collected (max 50 MS)
Save to file button	Saves data from a completed measurement series to a result file. The file path defined in the active parameter file is proposed
X-, Y- and Z-axis check boxes	Selects which axis data to present in the graph area (up to 3 axes can be plotted simultaneously)
Relative and absolute toggle switch	When set to 'Absolute', all results are plotted as received. When set to 'Relative' the curves are translated so that the first measurement is shown in the plot as zero.
Active device indicator	Indicates active IMU. Corresponding COM port is specified in the active parameter file
CRC and DG-ID LEDS	Status on all CRC checks and DG-IDs. GREEN = OK, RED = FAIL
Data box	Selects which datagram content to be shown. Several options are available, depending on the active datagram type. Left click inside box to display available selections. The plot updates immediately if a measurement series has been done.
Scale box	Enables user to change Y-axis scaling (Full range, User defined, or Auto). Left click inside box to display available selections
Sample rate box	Displays the sample rate used in measurement
Unit box	Displays the output unit for all measurements (Angular Rate, Incremental Angle, etc.)
DG type box	Displays the type of datagram received
Save to disk icon	Saves the plot to a .JPG file
Print icon	Prints a picture of the plot to the default printer
1:1 icon	Resets zoom level to 1:1 (if ZOOM is active. See below)
Zoom icon	Enables a custom zoom of the presented results in the strip chart (graph area) according to placement of the cursors
Cursors (On/Off) switch	Enables usage of cursors (default is Off)
Cursor 1	Shows the location of cursor no 1
Cursor 2	Shows the location of cursor no 2
Delta	Shows the delta between the two cursor locations (X and Y values)
Progress bar	A blue continuous line above plot area shows the measurement series progress
Lower bar on panel	Shows the INI-file in use and the active mode (INTERACTIVE MEASUREMENTS)

Table 7: Measure panel description

Saved data:
An example of a result file is shown in Figure 31, for a standard datagram measurement series of IMU # 1. A description of each of the columns of the data log file is found in the table that follows.

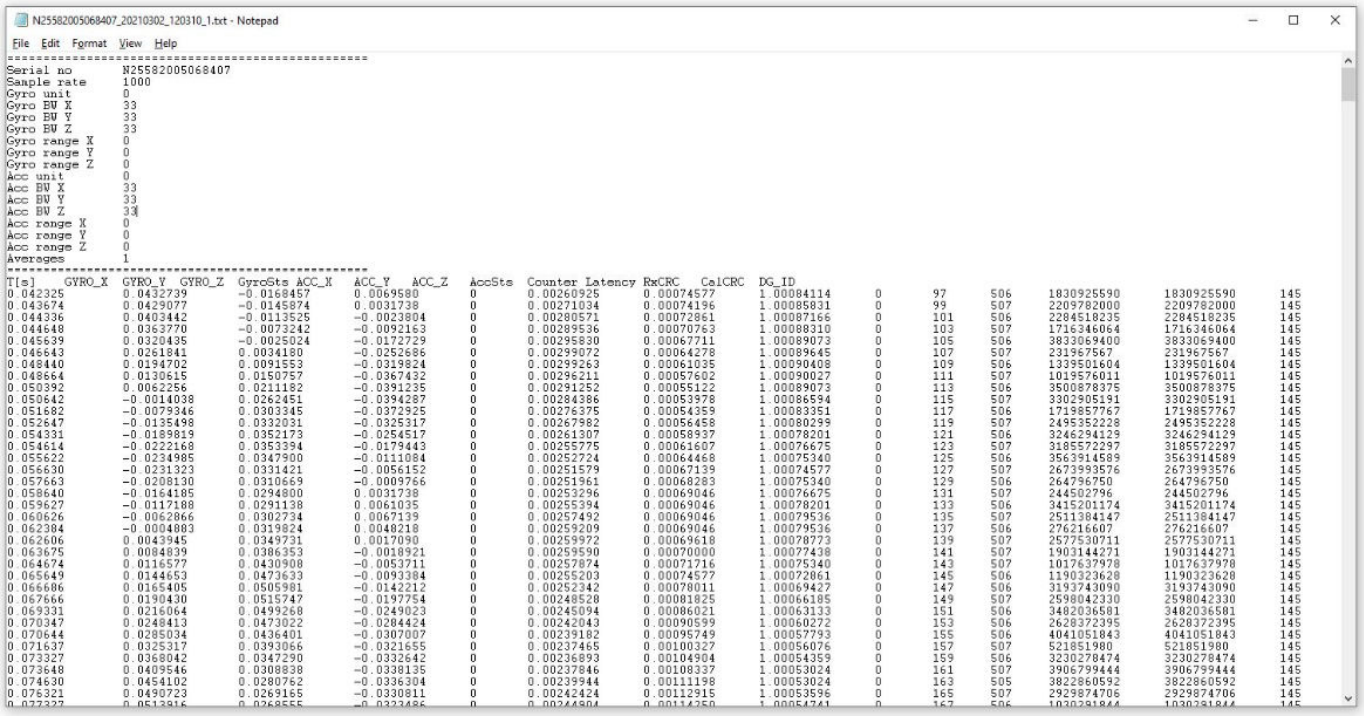

Figure 30: Result file example

DG-type	Col. #	Heading	Comments
Standard	1	Time[s]	Time in seconds (derived from sample rate). First sample is always zero.
	2	GYRO_X	Gyro signal X-axis
	3	GYRO_Y	Gyro signal Y-axis
	4	GYRO_Z	Gyro signal Z-axis
	5	GYRO_STS	Status-byte for gyro
	6	GYRO_TMP_X	Temperature, X-axis gyro
	7	GYRO_TMP_Y	Temperature, Y-axis gyro
	8	GYRO_TMP_Z	Temperature, Z-axis gyro
	9	GYRO_TMP_STS	Gyro temperature status
	10	ACC_X	Accelerometer signal X-axis
	11	ACC_Y	Accelerometer signal Y-axis
	12	ACC_Z	Accelerometer signal Z-axis
	13	ACC_STS	Status-byte for accelerometer
	14	ACC_TMP_X	Temperature, X-axis accelerometer
	15	ACC_TMP_Y	Temperature, Y-axis accelerometer
	16	ACC_TMP_Z	Temperature, Z-axis accelerometer
	17	ACC_TMP_STS	Accelerometer temperature status
	18	INC_X	Inclinometer signal X-axis
	19	INC_Y	Inclinometer signal Y-axis
	20	INC_Z	Inclinometer signal Z-axis
	21	INC_STS	Status-byte for inclinometer
	22	INC_TMP_X	Temperature, X-axis inclinometer
	23	INC_TMP_Y	Temperature, Y-axis inclinometer
	24	INC_TMP_Z	Temperature, Z-axis inclinometer
	25	INC_TMP_STS	Inclinometer temperature status
	26	Counter	Sample counter. See product datasheet for details

DG-type	Col. #	Heading	Comments
	27	Latency	Sample latency. See product datasheet for details
	28	RxCRC	Received CRC
	29	CalCRC	Calculated CRC
	30	DG_ID	Datagram identifier

Table 8: Result file content, datagram including Gyro, Accelerometer, Inclinometer, Temperature

7.7 Logging panel

Panel content	Functionality and description
Start button	Starts data logging
Stop button	Stops data logging
Stop criteria slide	User can select between “Manually”, “No of samples” and “Time elapsed” for stopping a measurement series
Samples box	Used for defining number of samples when logging a finite number of samples
Average	Used for downsampling of data. Average value of selected number of values is logged to file
Time elapsed	Shows the time elapsed since start of test
Samples acquired	Shows number of samples acquired
CRC_errors	Shows number of CRC errors (normally 0, otherwise the user should consider to reject results data in any analysis)
Resynch’s	Increments from 0 to a number if any re-synchronisations are needed in order to re-establish data collections from module

Table 9: Logging panel descriptions

Log to file capability:

- Quad core processor is recommended when measuring on two or more IMUs simultaneously
- The size of the log file is only limited by the available space on the storage media in use
- The path for result file storage is defined in the active parameter file
- The program should be run with administrator rights to ensure the creation and storage of the result file

7.8 Parameters panel

Panel content	Functionality and description
===== General parameters =====	
Password	Current valid password to be able to edit the parameters list. The default password is “stim”
Folder for result-file storage	Path to storage (e.g. “c:\userdata\test\")
What priority will this program run with	Instructs the program priority for the PC operation system
What format to use for result files	ASCII text by default. Can be changed to 8 byte binary (see description in 6.8.1)
Name of file with language definitions	Application can be configured with language other than English
===== Device communication ===== IMPORTANT MESSAGE: Always verify hardware connections and COM port settings before trying to connect to the device	
RS422 port # to device 1	Defining which COM port # to assigned to IMU # 1
RS422 port # to device 2	Defining which COM port # to assigned to IMU # 2
RS422 port # to device 3	Defining which COM port # to assigned to IMU # 3
RS422 port # to device 4	Defining which COM port # to assigned to IMU # 4
RS422 Bitrate [bit/s]	RS422 bit rate selection
RS422 Stopbit	1 or 2. Default is “1”
RS422 parity	None, odd or even. Default is “None”
===== External Hardware =====	
The GPIB-card # to use	Interface for external power supply (optional). If card(s) are in use; the first card will be assigned to #0, second to #1, etc. Default value is “0”
Type of power supply used	External power supply (optional). Default "None" (not in use). Agilent E3631A, E3633A and E3644A are supported
Interface that the power is connected with	Interface type for external power supply (optional). Default "None" (not in use). RS232 (for Agilent E3631A only) and GPIB supported
Port or address to power	GPIB port for external power supply (optional). Default "0" (not in use). Selectable up to 31
Voltage on output of power supply [V]	Voltage output on external power supply (optional). Default value is 5.1 V. Value should be within the supply voltage range of the IMU. See product datasheet for details
Current limit on output of power [A]	Current limitation on external power supply (optional). Default value is 1.0 A

Table 10: Parameters panel descriptions

7.8.1 Binary file description

The binary file’s first 2101 bytes is the header. The header is defined as:

- The first byte is stating the number of ‘columns’ in the file (n columns)
- The next 100 bytes is defining the data-type for each ‘column’ (only the first n values are set). Currently these numbers are all 0x05, meaning 8-byte floating point (double)
- The remaining header bytes are 100 20-byte strings with the header name for each ‘column’ (only the first n values are set)

After the header follows the data measurement result values, stored as 8-byte floating point values (double) in groups of n results.

7.9 Messages from the program

Messages that the program can display are listed in Table 11.

#	Message	Description
1	This application is already running! Stop loading of 2. instance...	The program is already started, a second instance will not be allowed
2	Wrong password entered!	The password entered does not match the required one for this INI-file
3	No response to message was received	Did not receive the expected response to the sent service-mode command
4	There is no measurement data available for storage	To be able to save measurement data, there must be data available
5	Unable to open the selected file	Saving of measurement data failed, unable to open or create the selected file
6	Unable to allocate the required memory	Failed to acquire the requested number of datagrams from the IMU due to error when trying to allocate memory for temporary storage
7	No product identification datagram received	Even after retries the, expected datagram is not received as response to command sent
8	No configuration datagram received	Even after retries the, expected datagram is not received as response to command sent
9	No serial number datagram received	Even after reties the, expected datagram is not received as response to command sent
10	No datagrams received	Failed to acquire the requested number of datagrams from the IMU, no recognizable datagrams received
11	Turn off device supply voltage	Instruction to user when running without controlled power-supply
12	Turn on device supply voltage	Instruction to user when running without controlled power-supply
13	Error encountered when trying to control voltage	Failed to detect the three special datagrams that theSTIM318 sends immediately after power on. This could result from incorrect power up sequence (as specified via dialog boxes during power-on procedure) or from incorrect communication settings (COM port number, parity settings, number of stop bits, bit rate etc.)
14	Unexpected DG-ID received !	When waiting for datagrams, unexpected datagrams are received
15	Unable to read config DG to determine output unit !	Unable to read configuration datagram to determine the output unit
16	Unable to synch with DG-stream !	Failed to acquire the requested number of datagrams from the IMU, unable to get in synch with datagram stream
17	Error encountered when trying to print, check configuration !	Failed to print the graph, check that a printer is configured
18	Unable to create result-folder specified by parameter !	The specified pathname cannot be created, either due to access-rights or errors in the path specification
19	Unable to enter service-mode !	Unable to enter service-mode, does not receive expected response to command.
20	Unable to save parameters to active INI-file !	Error encountered when trying to save parameters onto INI-file
21	Edit-mode of parameters is active, unable to exit !	The edit-mode of parameters are active, unable to exit the program until edit mode is ended
22	You are about to change the RS422 bit rate. If are you using the USB kit hardware, please notice that you will not be able to communicate with the device if you change to something else than supported 460800 b/s! For the PCI card there are no worries - it supports all available bit rates	A warning to the user about limitations for certain RS422 hardware
23	Unable to create/save to selected file, check access rights to folder	Unable to open or create the specified file in the selected folder, try another filename and/or location. The reason may be lacking access rights to the folder, or illegal filename format
24	Unsupported datagram received	When trying to read datagrams into memory a datagram type not supported by the EVK is detected

Table 11: Possible messages given by the program

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