IQS624 GUI Setup Guide

User guide to configure the IQS624 in the GUI PC software

Contents

1 Introduction

The purpose of this document is to describe the graphical user interface (GUI) layout of the Azoteq IQS624 GUI PC software for device debug and display purposes. The designer may configure the IC via the GUI software for a specific application, and evaluate the performance in real time. Although configuration examples will be given, this document is not intended to discuss or address all applications, but rather to provide the user with the necessary configuration, debugging, data logging and header file export knowledge of the GUI software to address their unique application. Furthermore, the scope of this document is limited to the configuration of the IQS624 using the appropriate and latest Azoteq IQS624 GUI PC software. For guidelines on the hardware and design, please refer to the application notes. For IC specific information, operation, and memory map details, please refer to the IQS624 datasheet.

2 Getting Started

This section describes the process of initial device set-up prior to application-specific tuning.

2.1 Step 1: GUI Software Installation

Download and install the Azoteq IQS624 GUI PC Software from the Azoteq website located under: *Design -> Software and Tools* page. Extract the downloaded .zip file, follow the installation wizard procedure and afterwards launch the software executable program. The following window should appear after successful installation and upon software execution:

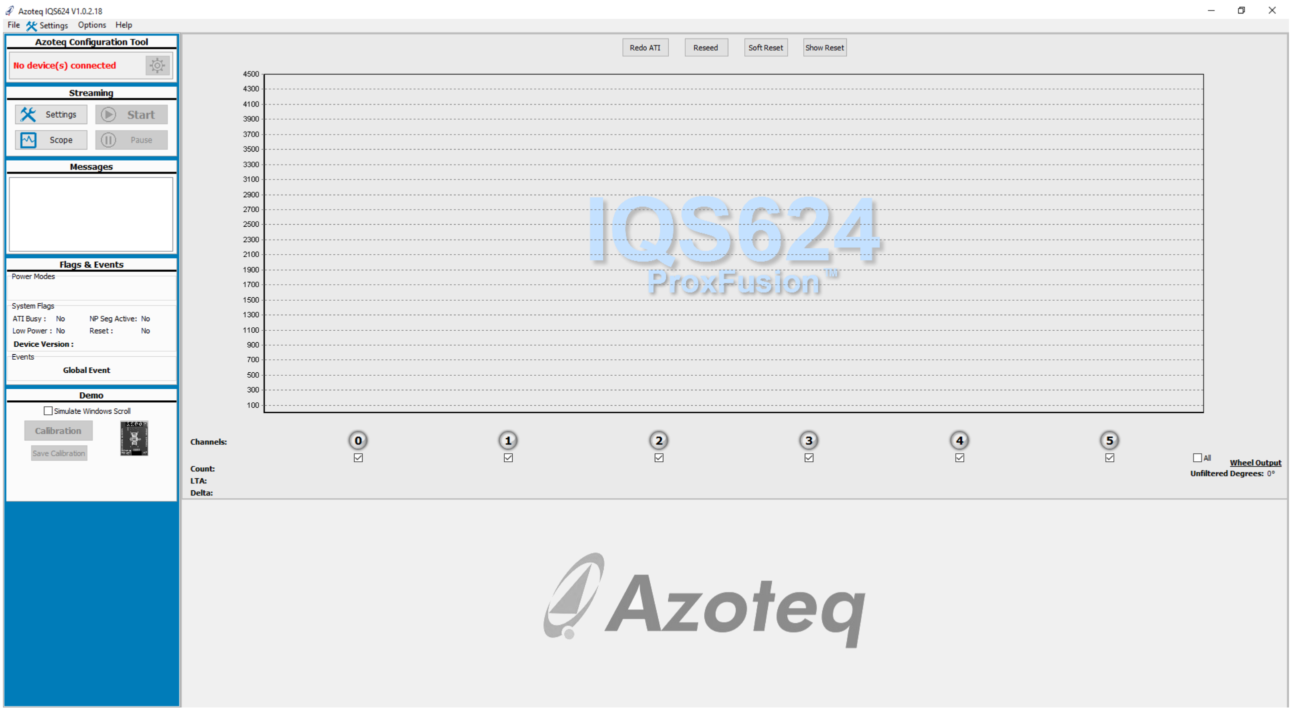

Figure 2.1: Main Window of the Azoteq IQS624 GUI

2.2 Step 2: Hardware Connections

Connect your PC to the Azoteq configuration debug and display tool (CT210A) using a standard USB-micro data cable. The device under test (DUT), being either an IQS624 EV-Kit or an application PCBA with the device and required passives, can be interfaced with a suitable 20-to-10 pin ribbon cable connection (or application-specific connections) as shown in the below picture.

Figure 2.2: Hardware Connection for Streaming and Testing

Connect the application hardware's power supply (VDD), ground (GND), I²C (SDA and SCL) as well as the data ready interrupt signal (RDY) traces to the CT210A USB dongle's pins as shown in the pin-out table and Figure 2.3 below.

Table 2.1: CT210A Pin-out

IQS Pins	CT210A Pins
GND	Pin 1
VDD	Pin 3
SDA	Pin 7
SCL	Pin 9
RDY	Pin 10

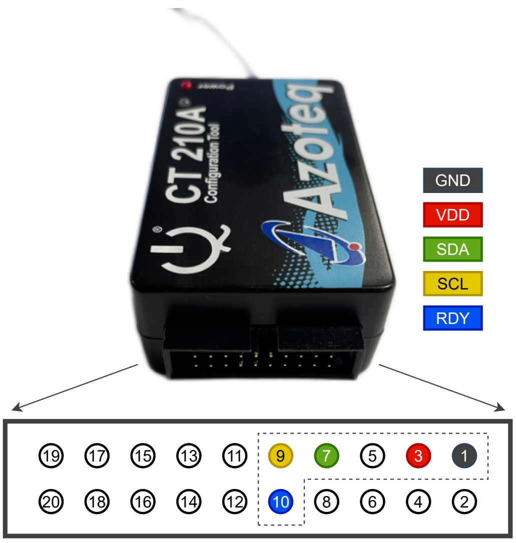

Figure 2.3: CT210A Power, I²C and RDY Connections

2.3 Step 3: PC Connection Verification

After connecting the CT210A device to the computer via a micro-USB data cable, the GUI software will automatically install drivers if needed and verify its connection and firmware by displaying a green 'Azoteq - CT210A' in the configuration tool section, as indicated in the red block:

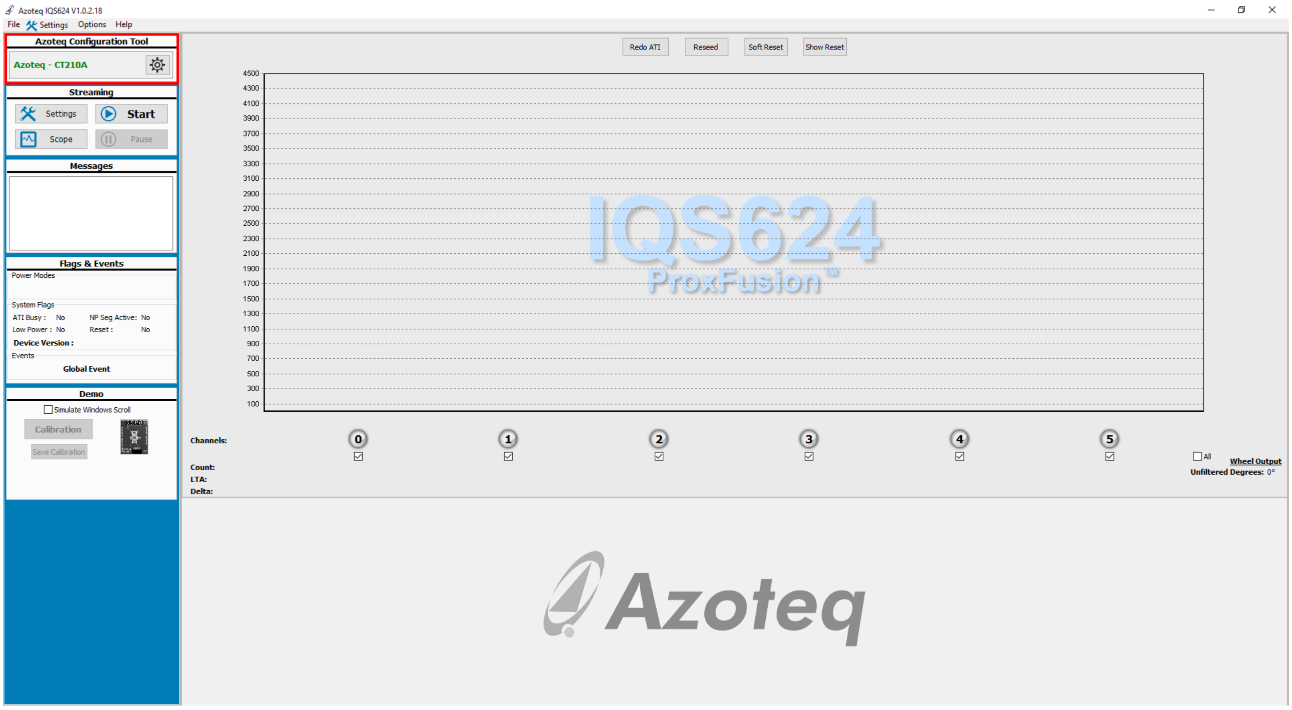

Figure 2.4: CT210A Recognition and Connection

<u>Note:</u> Pressing the 'Gear' will open up the configuration tool setup window. The new window will display the CT210A's serial number and current version. The user will receive a prompt if the connected CT210A device firmware is out of date. The firmware can be updated by pressing the 'Update' button. In the image displayed in Figure 2.5 below, the CT210A connected was already up to date with the latest firmware and did not require an update.

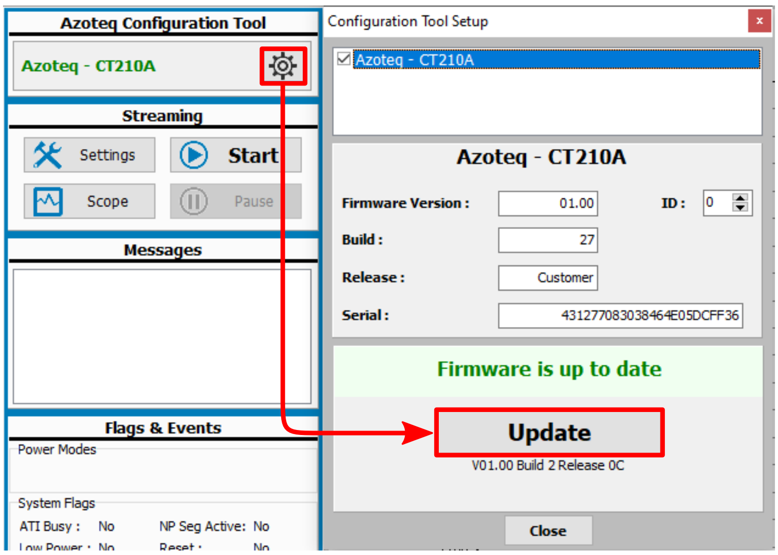

Figure 2.5: CT210A Configuration Tool Setup

2.4 Step 4: Initiate DUT Communication (Streaming)

Click on 'START' to initialize the serial connection to the DUT. Additional information messages will appear as listed and shown below:

- Power status,
- I²C address,
- Device version info,
- Settings and streaming confirmations or errors as applicable.

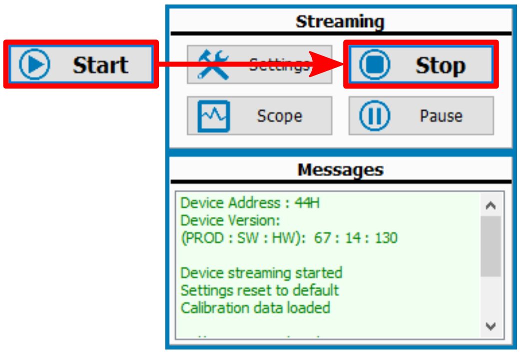

Figure 2.6: Message Dialogue Results From a Successful DUT Connection

If the above messages do not appear, please verify the device connection, the IQS part and version numbers.

The device may now be configured further by either loading pre-configured settings (in a *.ini* - header file format) or selecting the 'SETTINGS' button to open the pop-up window with the settings organised in menu tabs. Refer to section 4 for more detail.

Note - Only a single instance of the GUI software may run at any given moment and therefore, only one device can be streamed at a time. Opening multiple instances of the GUI (or other Azoteq PC software and tools) will lead to program and streaming malfunctions.

2.5 Step 5: Import Device Configuration (Optional)

If the device was previously configured and an associated *.ini*-file was exported from the GUI, the file may now be imported into the GUI using the 'Load Settings' feature. Additional information messages will be provided to confirm that the file has imported correctly:

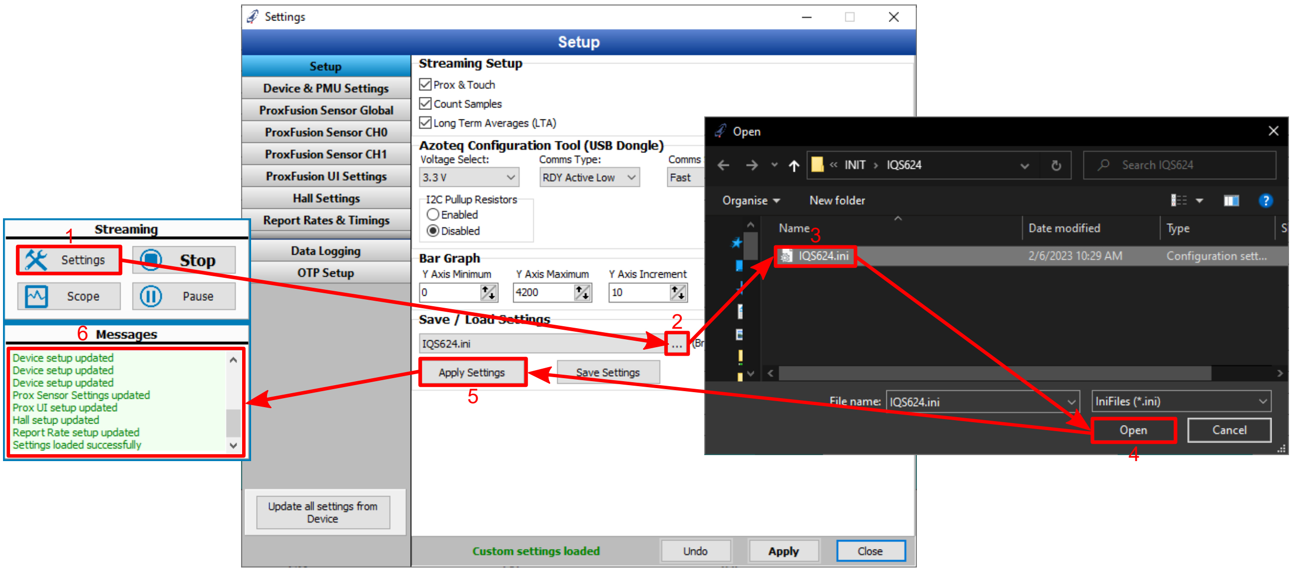

Figure 2.7: Importing a Predefined Configuration

2.6 Step 6: Export Device Configuration (Optional)

After the DUT has been configured, the new settings may be exported for safe-keeping, sharing or re-use at a later stage or on another device. The settings are exported as a *.ini*-header file using the 'Save Settings' button. Take care to save the new settings file with an appropriate descriptive name and file location as intended.

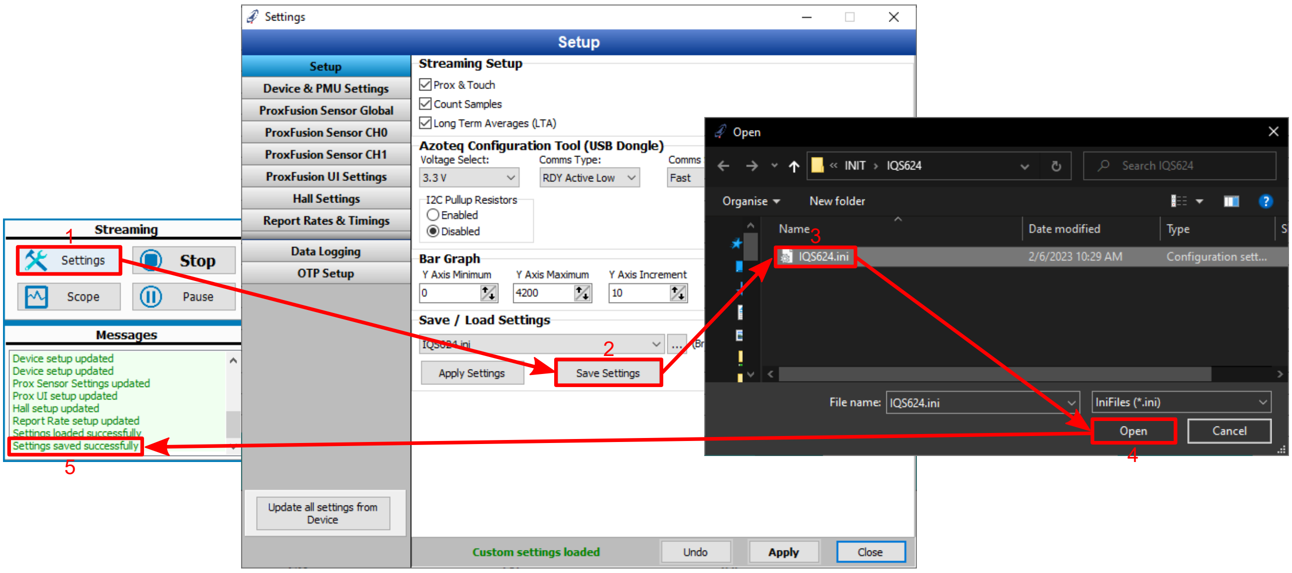

Figure 2.8: Exporting a Defined Configuration

The alternative is to export the settings as a .h header file. This can be done by choosing 'Export H File' in the 'File' menu found in the top left of the GUI, shown in Figure 2.9.

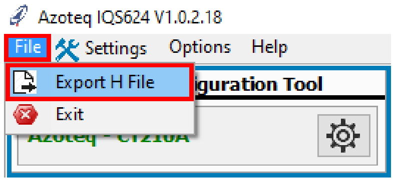

Figure 2.9: Exporting a .h Header File

3 GUI Overview

The IQS624 graphical user interface (GUI) software allows the user to test, configure, and export settings (as *.ini*-files) for the IQS624 IC. Figure 3.1 shows the main window components of the GUI numbered for subsequent descriptions thereof.

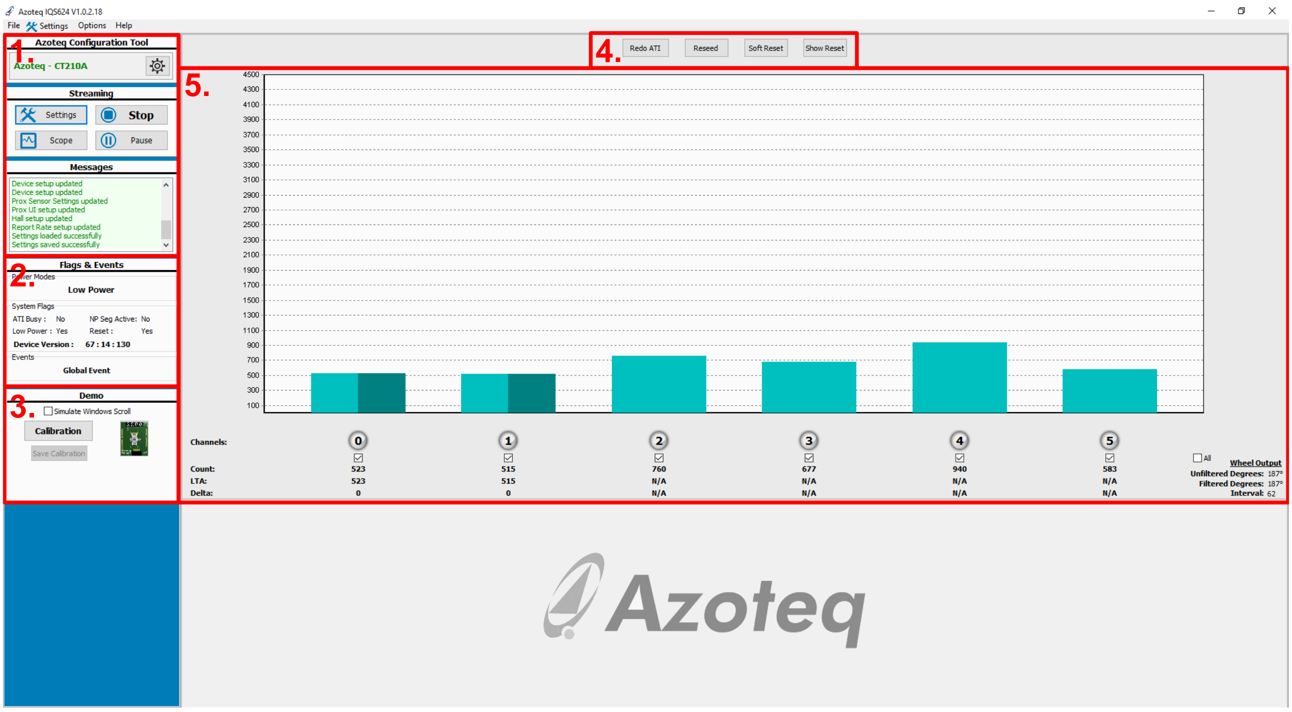

Figure 3.1: Main Window Sections of the Azoteq IQS624 GUI

The description of each numbered item in Figure 3.1 is as follows:

1. **Configuration tool, Streaming, and Messages** – Allows for general configuration tool hardware recognition, control and feedback in the GUI. The green text next to the 'Gear' will show the currently-connected configuration tool. If a valid connection is made, the 'START' button may be used to initiate I^2C communication and start a data 'stream' from the DUT. If the stream was initiated successfully, the button will change to 'STOP' that, when pressed, will terminate I^2C communication. The 'PAUSE' button will temporarily pause the I^2C activity from the configuration tool's side and ignore any DUT RDY signals. The text box will provide general information on the I^2C connection, tasks completed, as well as error messages in case of any unsuccessful attempts or lost communications.

2. **Flags & Events** – Provides a dashboard overview of various events that are triggered. Individual text will change for event occurrences or trigger activation states. The following events are

shown:

- **Power modes:** Shows the current power mode state in which the device is currently operating.
- **System Flags:**
  - **ATI Busy**: Active when ATI routine execution is busy.
  - **NP Seg Active**: Indicates when the IQS624 is busy performing a normal power update.
  - **Low-Power**: Active when in IQS624 is in its low power state.
  - **Reset**: Active at power-on or when a reset has occurred (without acknowledgement through 'SHOW RESET').
  - **Device Version**: Shows the DUT's firmware version.
- **Events**
  - **Global Event**: Active when an event has occurred and should be handled.

3. **Demo** – Provides useful tool to calibrate an off-axis hall wheel and to load settings for the AZP675E03 evaluation kit. The 'CALIBRATION' button will start the calibration process for an off-axis Hall rotation wheel. When pressed, the user will need to rotate the magnet placed above the IQS624 in a single direction. When completed, the DUT will be calibrated and the calibration data can be saved. For more information regarding magnet placement and calibration, please refer to Appendix A and B in the IQS624 datasheet.

4. **System Commands Section** – The 'SHOW RESET' button will issue a reset acknowledgement command to the IC as confirmation of coming from a power-on / reset state (with default device settings populated). The 'SOFT RESET' button will command the DUT to perform a warm re-boot. The 'Redo ATI' button will command the DUT to use its automatic tuning implementation (ATI) algorithm for sensor re-calibration (please refer to the IQS624 datasheet for more information). The 'RESEED' button commands the DUT to seed / set its Long Term Average (LTA) filtered values equal to its current count values. Note: these operations apply globally to all channels or the device as a whole.

5. **Bar View** – This area will display bar graphs of the sensor counts and LTA signals as configured for every channel. The decimal representation of the current values are displayed below each channel. The 'Counts' value represents the filtered signal input from the device's sensors. The 'LTA' is the long term average of the counts and acts as a slow adjusting baseline used as a reference to detect any quick deviation in Counts.

6. **Scope View** – The 'SCOPE' button will open the scope view, which will show the data of each channel as lines plotted over time. The channel's Counts and LTA line plots can be selected or deselected for display to make the scope view less cluttered. The 'SETTINGS' tab is used to adjust the X-Y axis accordingly. For the changes to take affect, the corresponding buttons need to be pressed.

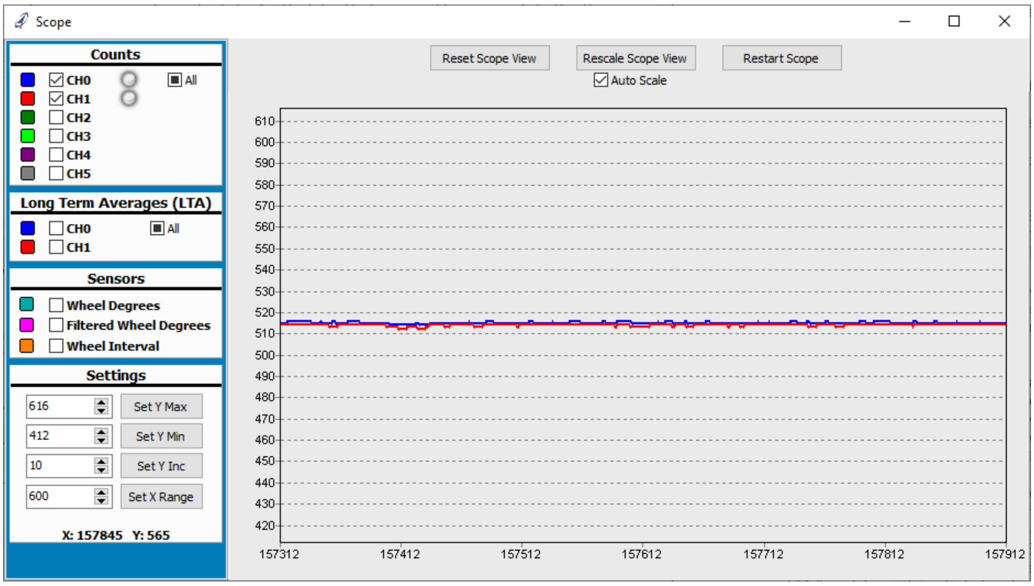

Figure 3.2: Scope view of the IQS624 GUI

4 Application Example

This section will describe the IQS624 settings required to set up and run the IQS624 Evaluation Kit (EV02) hardware. The schematic and electrode layout of the IQS624 EV-Kit is provided in Figure 4.1 and Figure 4.2. It is important to know that magnet placement and wheel calibration will not be discussed in this document as all necessary information can be found in Appendix A and B in the IQS624 datasheet.

After connecting the EV-Kit to the CT210A and pressing the 'START' button, the IQS624 will power on, and the PC GUI should display the default active channels. Channel 0 and 1 are dedicated capacitive sensing channels with channel 2 – 5 representing the Hall-effect channels needed for off-axis rotation calculations as can be seen in Figure 3.1.

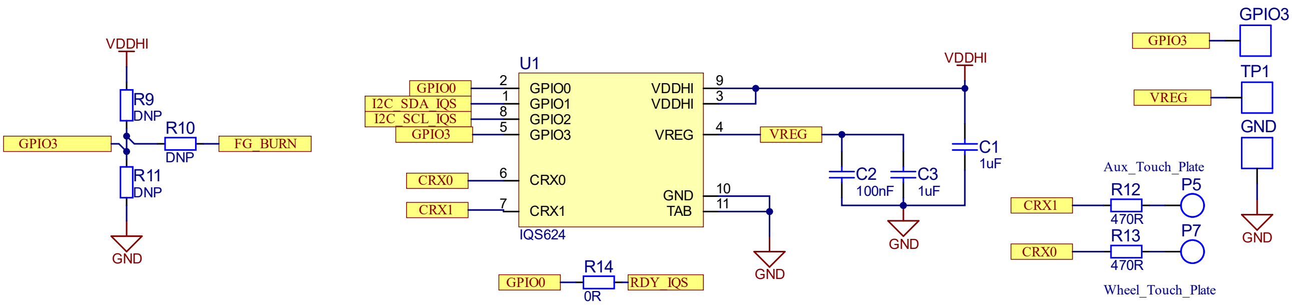

Figure 4.1: IQS624 EV-Kit Schematic Layout With Passives.

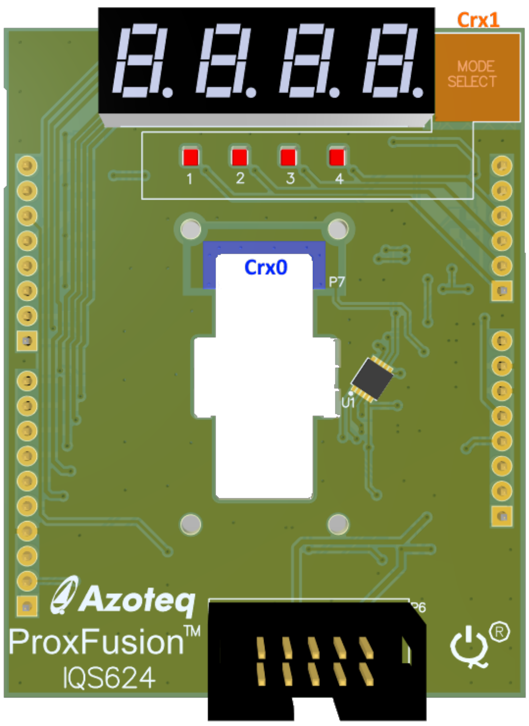

Figure 4.2: IQS624 EV-Kit Hardware and Electrode Connections.

4.1 Device and PMU Settings

The Device and PMU Settings tab shown in Figure 4.3 contains all the communication and power mode options available on the IQS624. The 'Event Mode' section determines how the master wants to interact with the IQS624.

- **Streaming Mode:** After every program cycle the device reports the sensor data.
- **Event Mode:** Interrupt request for communication only upon an event occurrence or state change.

For the rest of the Device and PMU Settings tab, the default settings should be acceptable and should not be changed without contacting Azoteq.

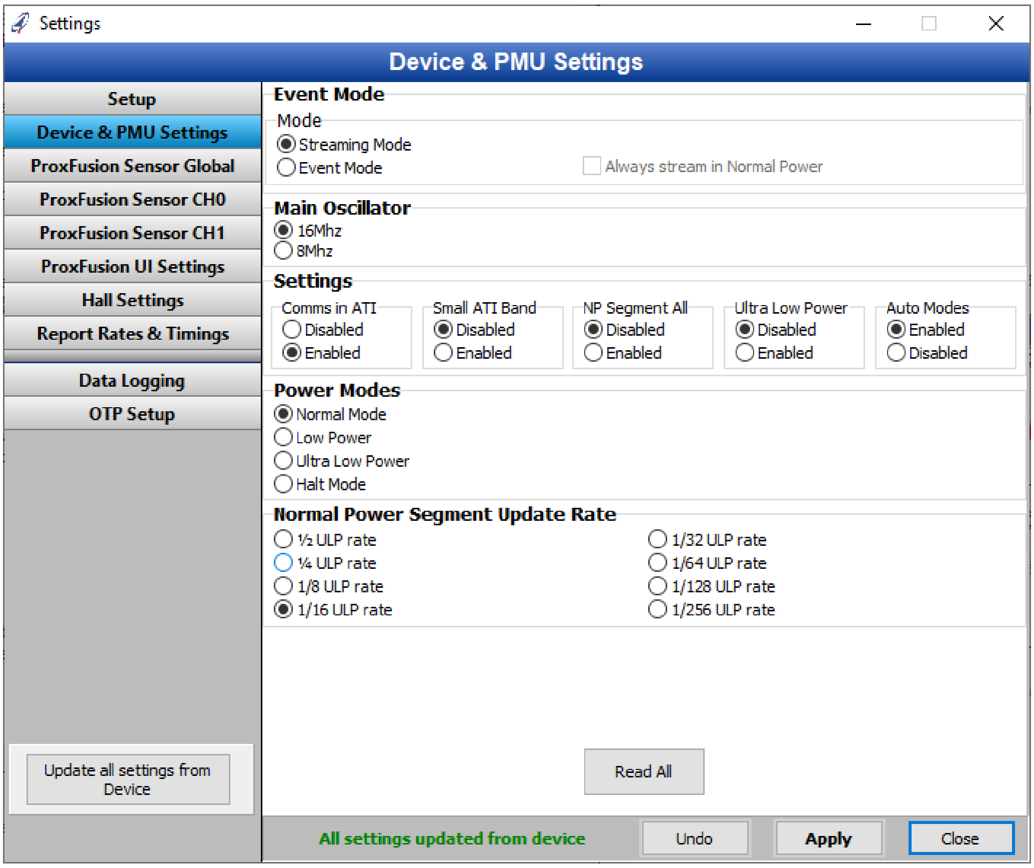

Figure 4.3: Device & PMU Settings

4.2 Report Rates and Timings

Under the Report Rates and Timings tab shown in Figure 4.4 the user can adjust communication timeouts and power mode report rates. These parameters are application specific and should be adjusted to meet power consumption and response time requirements.

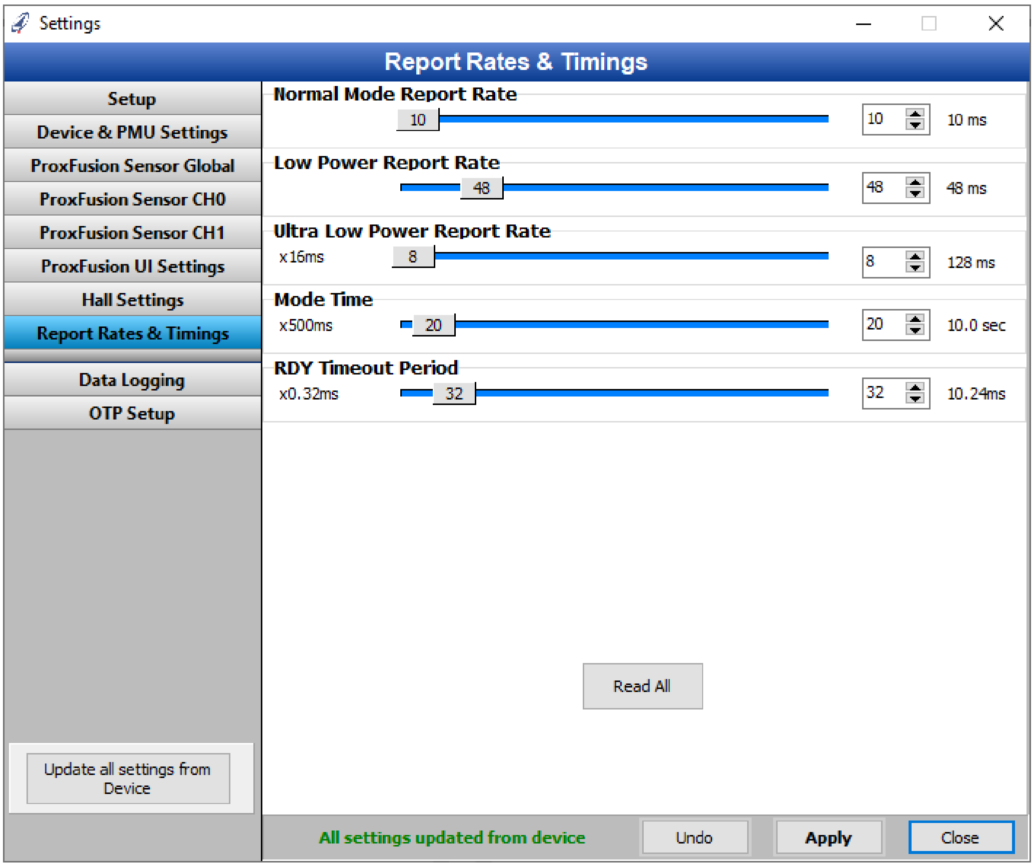

Figure 4.4: Report Rates & Timings

4.3 ProxFusion Sensor Settings

The ProxFusion Sensor Settings for channels 0 and 1 are where the user adjusts the gain and selects the input pin (CRX 0 and 1) for the capacitive sensor. Under 'Advanced' one can select the correct CRX line. Figure 4.2 shows that CRX0 is connected to the touch detection for the wheel on the IQS624 EV-Kit. To use CH0 for this application, 'RX 0' should be selected.

The sensor gain should be chosen so that reliable touch detection is achieved. The gain can be adjusted by changing the 'ATI Base' and 'ATI Target' where,

$$Gain \propto \frac{ATI_{Target}}{ATI_{Base}} \quad (1)$$

For the IQS624 EV-Kit, a base value of 100 and Target value of 512 is chosen. The mode button connected to CRX1 can be set up in the exact same way on Channel 1.

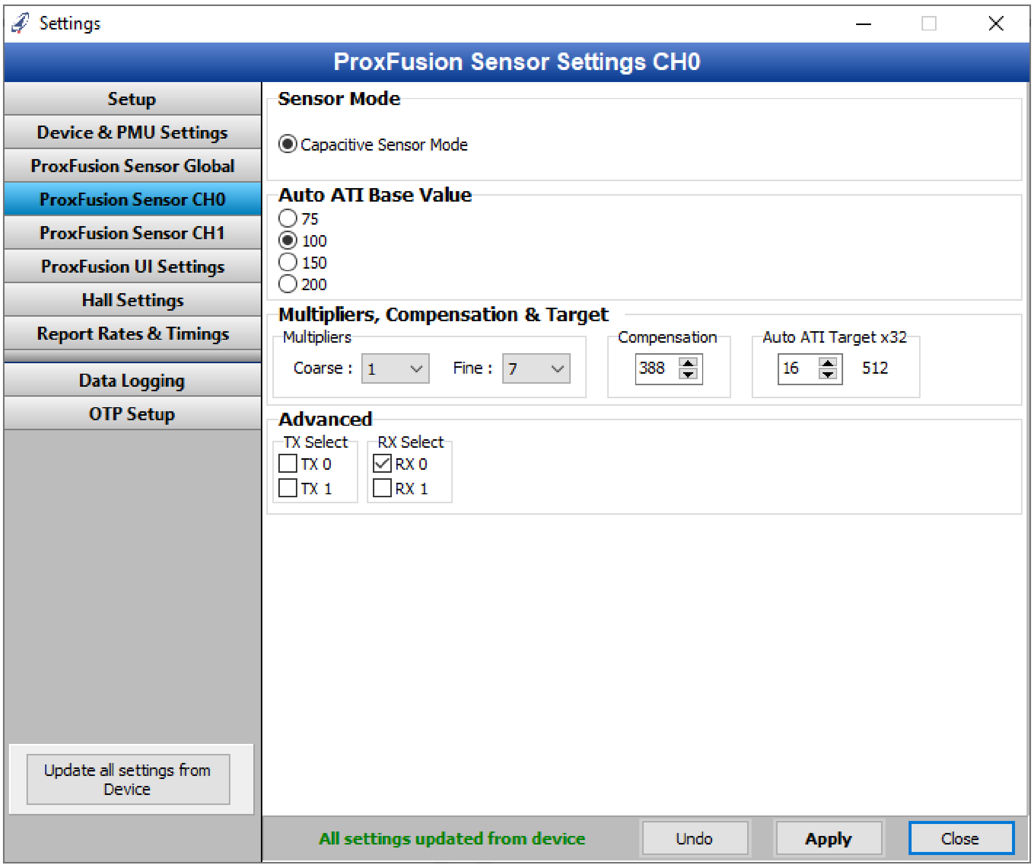

Figure 4.5: ProxFusion Sensor Settings for CH0

4.4 ProxFusion UI Settings

The ProxFusion UI Settings houses the Proximity and Touch Thresholds which will determine at what delta value ($Delta = LTA - Counts$) the capacitive sensing channels should indicate a proximity or touch event.

The threshold values alongside the gain are used to properly set up the capacitive sensors for any desired application. For the EV-Kit, a proximity threshold of 22 Counts is chosen and a touch threshold of 12.50% of the LTA, which is approximately 64 counts.

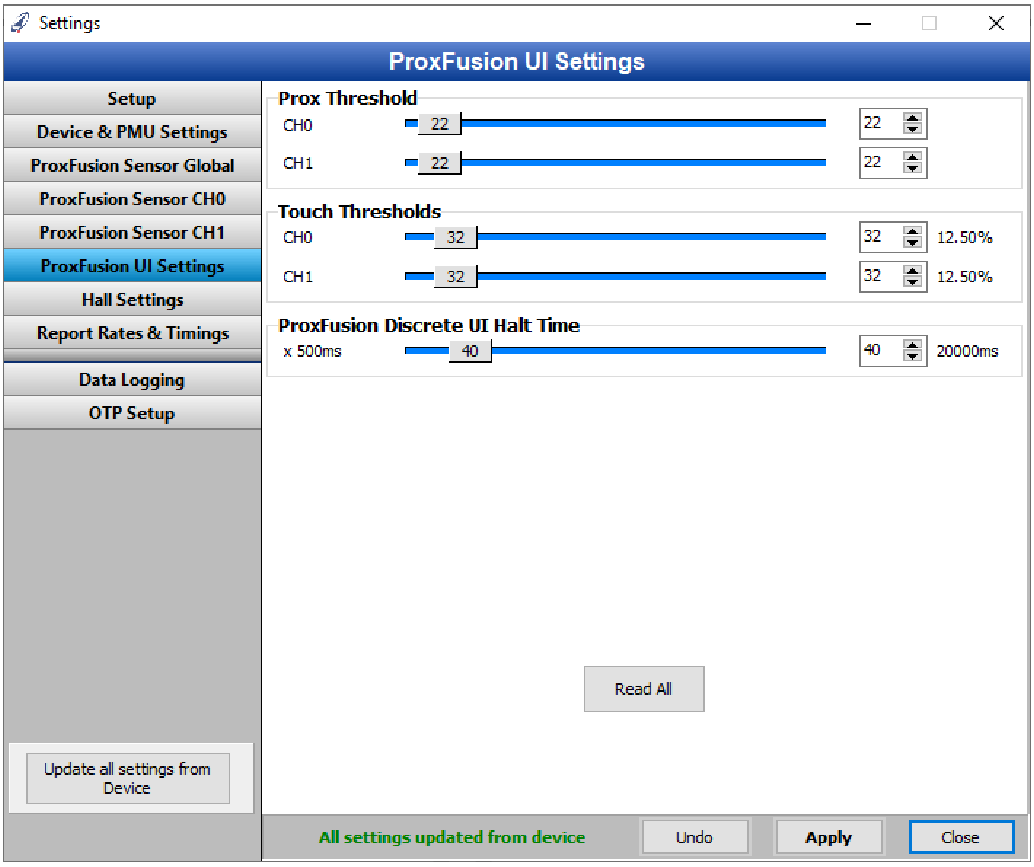

Figure 4.6: ProxFusion UI Settings

5 Conclusion

This document explains the layout, operation, and related settings displays of the IQS624's GUI PC software. This document uses the IQS624 EV-kit hardware as an example and explains how to configure the device using its GUI, and export the resulting settings as a C/C++ header file for use in an application.

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