STXiMotion

ZED SERVO DRIVES

Motor Controller software

for ZED Servo Drive

User Manual

ORIGINAL DOCUMENT
Manual Revision 2.0
Software Version 1.3.38a

Revision History

Manual Rev.	Date	Notes
Rev.2.0	19 Dec. 2023	Product name changed from servSD to ZED. servIM removed from manual.
Rev.1.0	22 Dec.2022	Initial release. Software version 1.3.38a.

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CANopen Vendor-ID

Vendor-ID **0513** has been registered to STXI Motion Ltd.
(specified in object 1018h sub-index 01).

Contents

1 Getting Started

1.1 About Motor Controller software

Motor Controller software is a graphical user interface (GUI) supplied with the servo drive to enable configuration and calibration of the servo drive. It also allows you to set certain parameters for the drive and the application in which it is used.

1.2 About this manual

This documentation describes the screens, menus, and functions in the Motor Controller software.

This documentation is intended for persons who are qualified to install, commission, integrate, and maintain the product described herein.

1.3 Safety

Before you install or operate the product, review the instructions in this manual. Pay particular attention to all safety instructions and warnings.

Be sure to apply all safety precautions while developing and integrating the system.

Failure to follow the safety instructions may result in personal injury or equipment damage.

1.4 Guidelines for drive operation

- Add a safety power switch for use if a loss of communication between the drive and the PC occurs.
- Make sure the motor is properly secured to the system or workbench to prevent unwanted movement during calibrations and accelerations.
- Tighten all drive and motors screws according to specifications.
- Make sure the load is secured to the motor shaft or gear.
- Make sure cables are arranged so that they will not become tangled or damaged, and secure them to the system or workbench.
- Do not move the drive, motor, or cables during operation.
- Make sure the drive environmental conditions comply with specifications to ensure drive performance.
- Make sure the system is rigid and has no excessive backlash.
- Stopping the motor and deceleration with a heavy load can increase voltage on the power supply rail, resulting in drive or PSU failure. Be sure to absorb this kinetic energy.

1.5 Computer requirements

The installation requires Windows 10, 64-bit or higher.

To view recorded data, you will need Microsoft Office Excel, or similar spreadsheet software that supports CSV files.

1.6 Motor Controller software installation

Open the installation folder **Motor Controller**.

Activate the software: **Motor Controller.exe**

The Motor Controller software will open automatically.

2 Motor Controller software overview

2.1 Motor Controller software window

The Motor Controller software window has several panes for various functions:

- Communication
- Settings
- Motion
- Status
- Graph

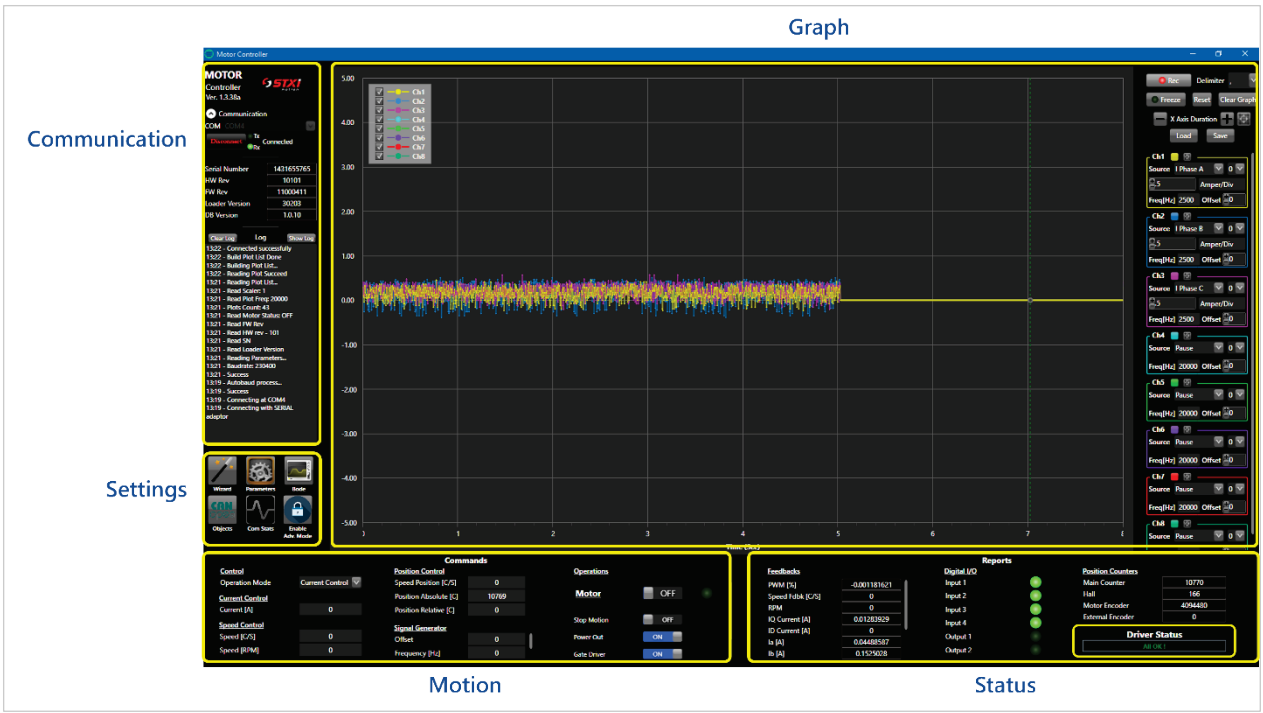

Figure 1. Motor Controller software window panes

2.2 Using Motor Controller software

Send commands and values

To send a command or parameter value to the drive, click in any dark gray field. The field color changes to red, indicating you can type in a value.

After you enter a value, select **Enter** to send the value to the motor controller.

Select **Esc** to cancel operation, and restore the previous value.

Read values

The data displayed in the Motor Controller software is refreshed continuously and automatically by means of the command Get, which is sent in the background to the drive.

3 Communication

The Communication pane enables you to establish and monitor connectivity between the drive and the Motor Controller software. It also displays manufacturer information about the drive.

Note To ensure values are instantly displayed and updated, it is recommended that you use a refresh rate value that does not exceed 100 ms. (By default it is set to 10 ms).

To modify the refresh rate:

1. From the Settings pane, select **Com Stats**.
2. Open the **Advanced UI Settings** tab.
3. Set the **Enable Refresh** rate to a recommended value.
4. Make sure the Enable Refresh option is selected.

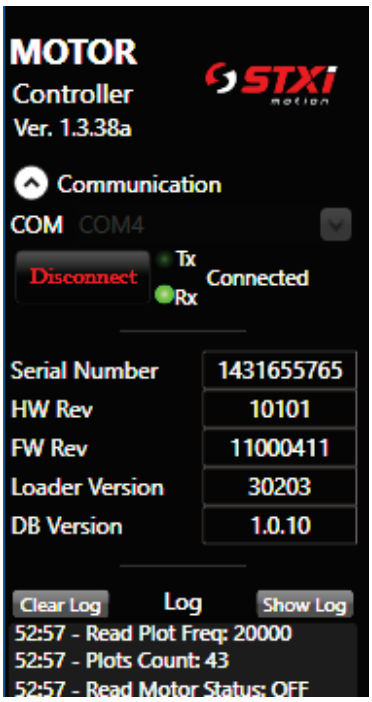

Figure 2. Communication pane

- **Ver**. The version number of the GUI.
- **Communication**.

  Note: text is red when not communicating; white when communicating.

  Use the arrow next to Communication to expand and collapse this portion of the pane.

  - **COM port**. If a port is detected when the Motor Controller software is activated, the port will be selected by default. If more than one COM port is available, select the correct one from the list.
  - **Connect/Disconnect**. When selected, the defined COM port establishes/disconnects communication with the drive.

- **Connection status**. **Tx** and **Rx** LED icons indicate received and transmitted data between the PC and the drive.

- **Drive information**. The serial number, hardware number, and firmware number of the drive are detected at startup, and displayed here.
- **Log**. Displays the processes running in the Motor Controller software.
  - **Show Log**. Opens the log in a floating pane.
  - **Clear Log**. Select to erase the log data.

  The log timestamp shows only minutes and seconds; for example:

  34:07 - Failed
  34:06 - Autobaud process...
  34:06 - Success
  34:06 - Connecting at COM5

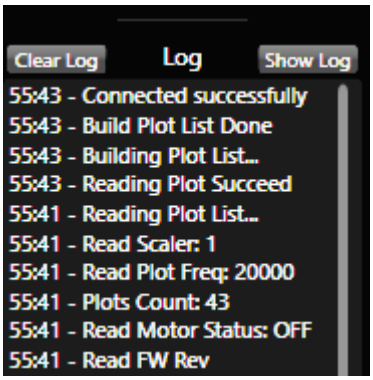

Figure 3. Log example

4 Settings

The Settings pane has several buttons that open various screens:

- Wizard
- Drive Parameters
- Bode
- CAN objects
- Communication statistics
- Advanced mode

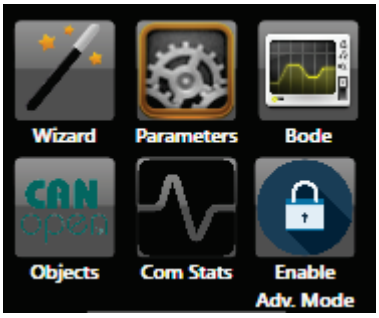

Figure 4. Settings pane

These six screens are floating and can be opened concurrently.

4.1 Wizard

The Wizard screen provides a quick method for setting up the drive and motor. It configures and calibrates the basic parameters for a motor without a load.

It is recommended that you use the Wizard to calibrate you system.

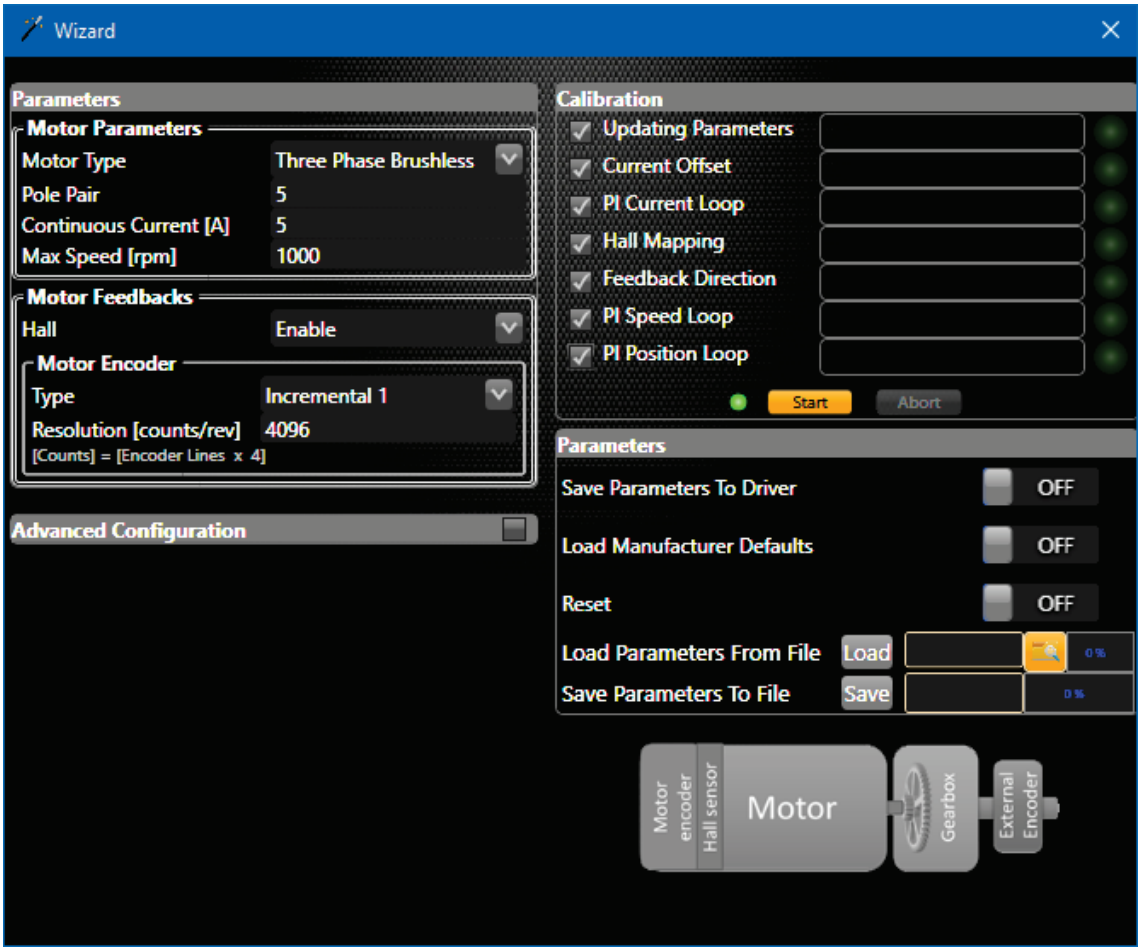

Figure 5. Wizard screen

Before starting the Calibration, set the correct parameter values for the motor and motor encoder.

Refer to the motor/encoder datasheet/s for the appropriate values.

1. Set the Motor parameters.

Note To ensure the Wizard will perform the calibration successfully:

- Set **Continuous Current** to 5 A.
- Set **Max Speed** to a value that does not exceed 1000 rpm.

2. Set the Motor Feedback parameters.

   Resolution setting. For example, if the motor encoder has 1024 pulses per revolution, then 4096 (1024×4) must be entered in the Resolution field.

   Reset. Click this option to automatically load the manufacturer's default settings.

3. Click **Start** to begin the Calibration.

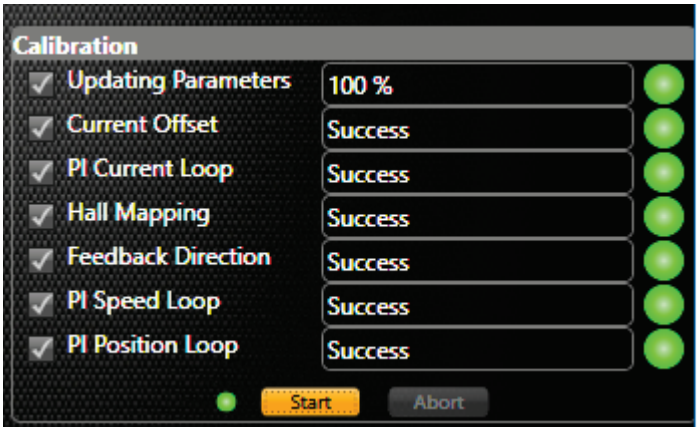

Figure 6. Calibration successful

4. When the calibration is completed, click **Save Parameters to Drive**.
5. Power cycle the drive.

Note If the Wizard is not successful, go to **Parameters** > Calibration tab, and manually execute Calibration one step at a time.

4.2 Parameters

The Drive Parameters screen has a number of tabs for working with various types of parameters.

Enter parameter definitions and values according to the motor and feedback used in your system.

Control tab

The Control tab is used to monitor and define control, motor, motor limit, and current limit parameters.

The following figure is an example of the Control tab with settings for an STXI Motion brushless motor with Hall sensors and an incremental encoder as feedback.

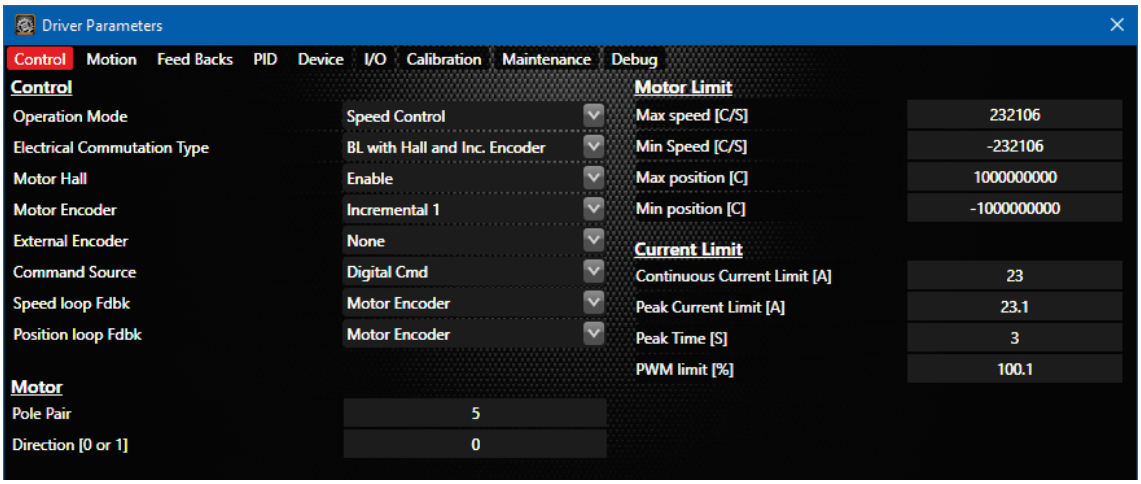

Figure 7. Control parameters

Motion tab

The Motion tab is used to monitor and define speed profile and position profile parameters.

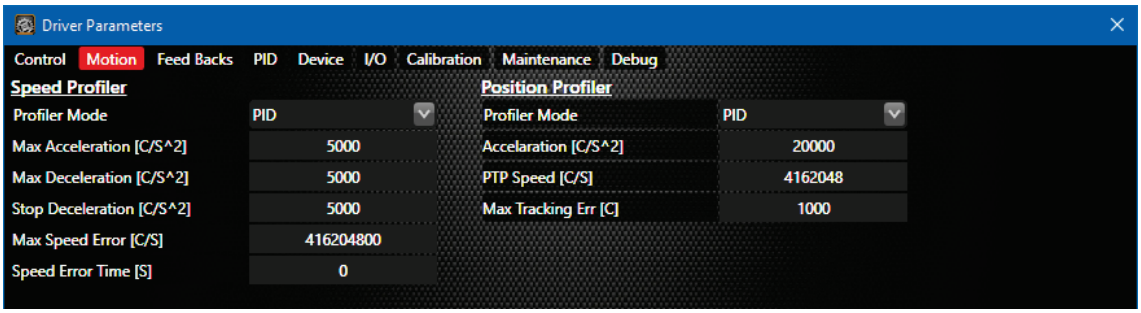

Figure 8. Motion parameters

Feedback tab

The Feedback tab is used to monitor and define parameters for feedback devices.

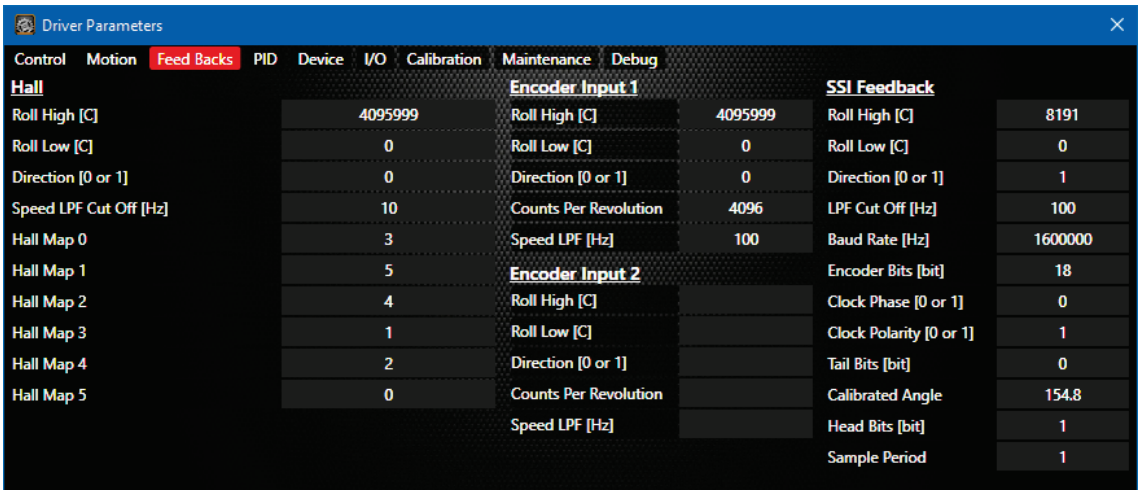

Figure 9. Feedback parameters

PID tab

The PID tab is used to monitor and define Kp (proportional), Ki (integral) and Kd (derivative) parameters for speed, current, and position.

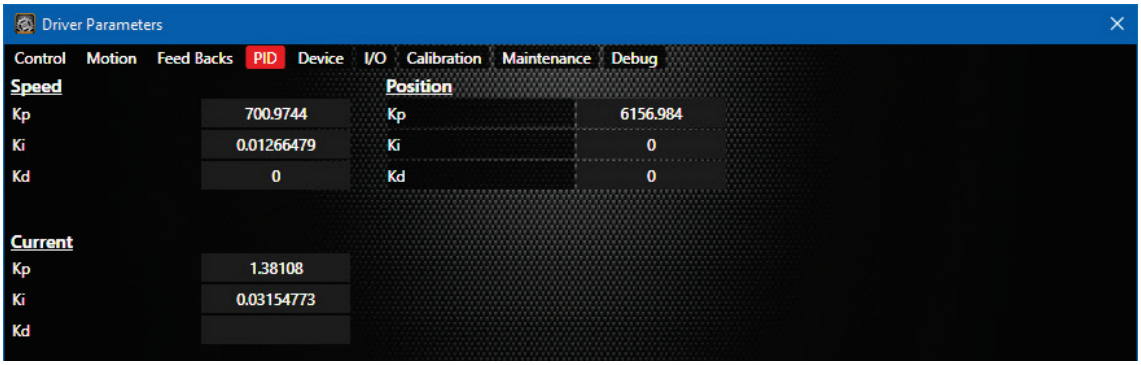

Figure 10. PID parameters

Device tab

The Device tab is used to view device information and to monitor and define parameters for serial and CAN communication.

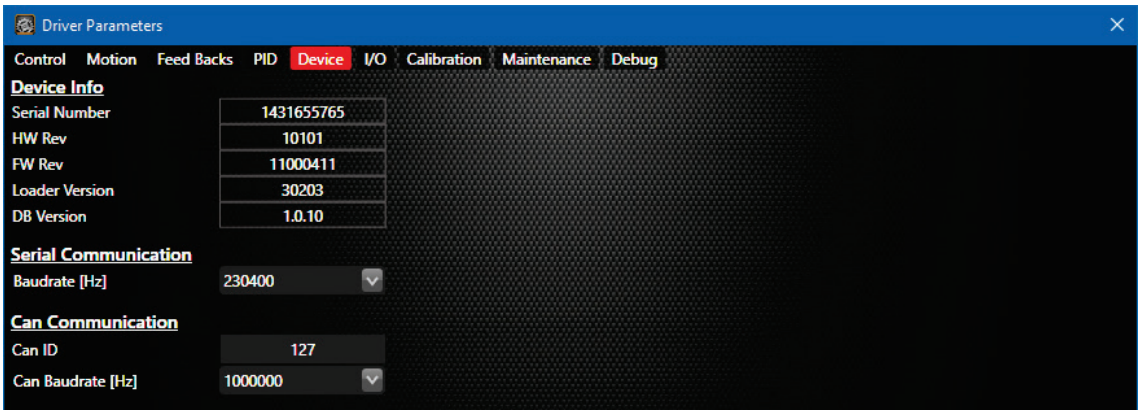

Figure 11. Device parameters

I/O tab

The I/O tab is used to monitor and define parameters for analog inputs and digital outputs.

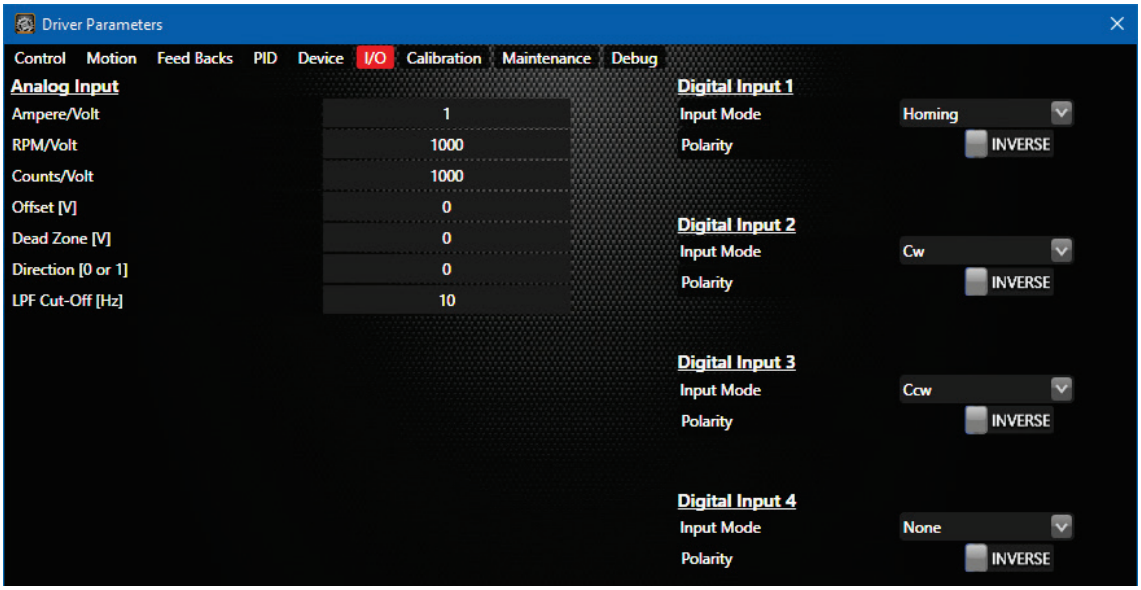

Figure 12. I/O parmeters

Calibration tab

The Calibration tab enables you to calibrate the motor manually, one step at a time.

Use the Calibration tab if the Wizard calibration is not successful.

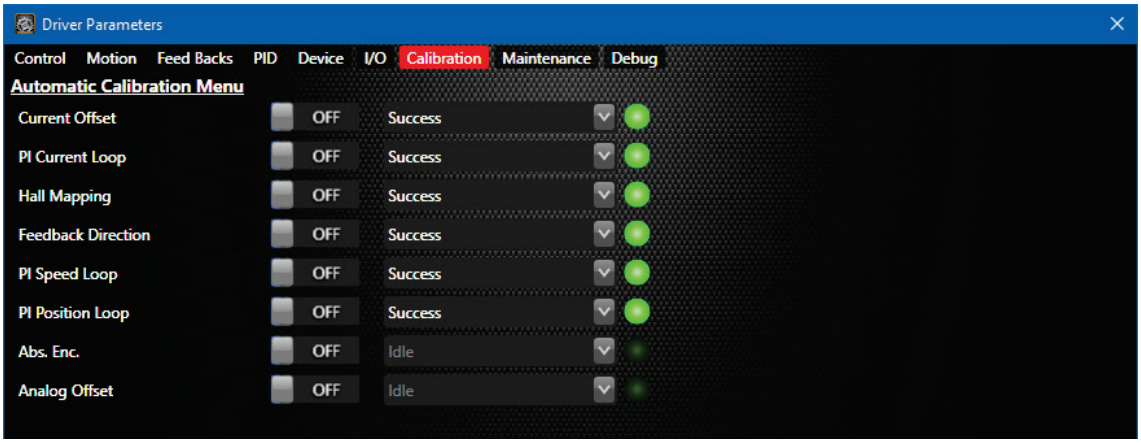

Figure 13.

Example: Manual calibration of an STXI Motion brushless motor with Hall sensors and an incremental encoder:

1. Run the first four calibration steps.
2. After adding a gear to the system, run the first six calibration steps.

Note Do not run **Abs Enc** and **Analog Offset** calibrations – they are not currently applicable to STXI Motion systems.

3. When the calibration is completed, go to Maintenance tab, and click **Save Parameters to Drive**.

   You can also use the option to save the parameters to a file, which can then be reloaded whenever necessary.

Maintenance tab

The Maintenance tab provides tools for loading and saving parameters to/from the drive and to/from software files.

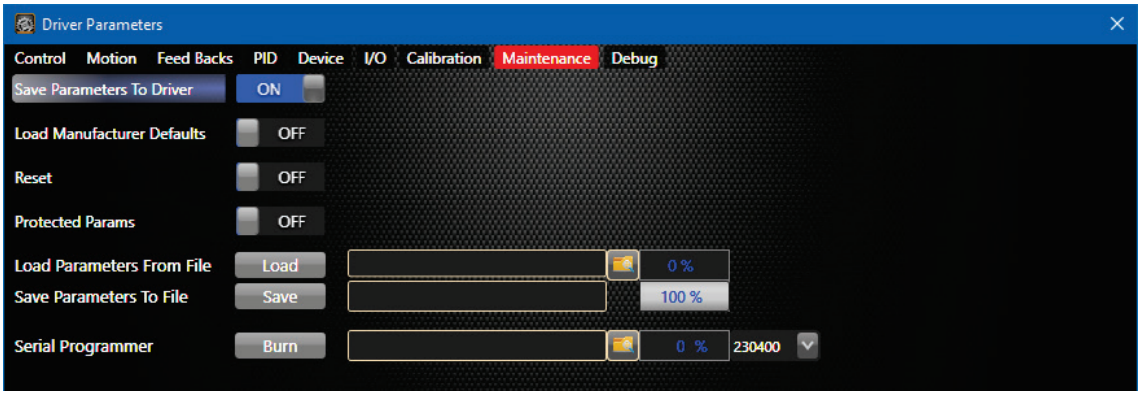

Figure 14. Maintenance tab

- **Save Parameters to Drive**. After modifying parameter values in the Motor Controller software, save the parameters to the drive (flash memory). The values will remain in effect after a disconnect or a reset occurs.
- **Load Manufacturer Defaults**. Restores the manufacture default parameter values of the drive.
- **Reset**. Clears all data from the drive.
- **Protected Params**. For advanced users only. Do not use.
- **Load Parameters from File**. Use this option to load parameters from a file to the drive. Use the browse button to select the file to be loaded, then select **Load**.
- **Save Parameters to File**. Use this option to save the parameters and values currently in the drive to a text file. Use the browse button to select the save location, then select **Save**.
- **Serial Programmer.** Use this option to upload the latest firmware file. Use the browse button to select the file to be installed, then select **Burn**.

  The log will display “Erase start”, then “Program start”. When the process ends, “Success” is displayed.

You will find the correct values in the datasheets for your motor and encoders.

Debug tab

The Debug tab has functions for debugging.

The following figure is an example of debugging the motor brake control function (serial command ID56).

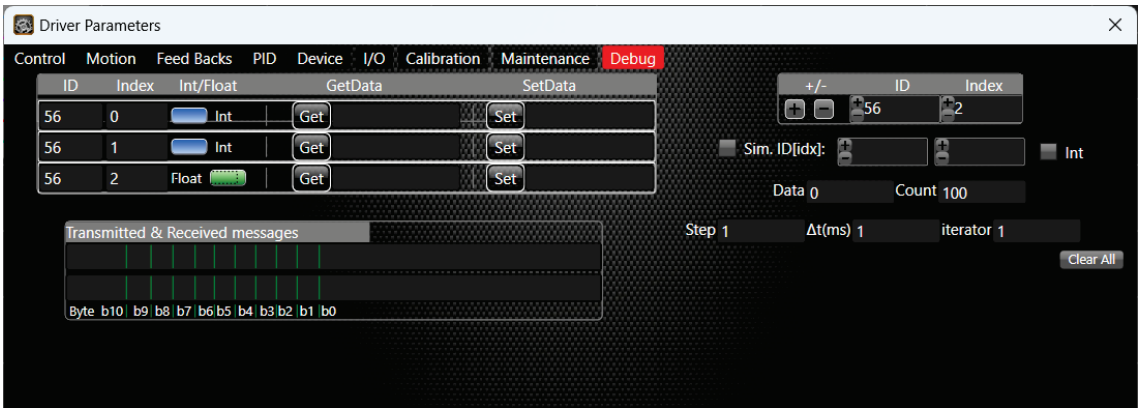

Figure 15. Debug tab

4.3 Bode

The Bode screen generates Bode charts based on the frequency response of the mechanical system, to help you optimize the control loop.

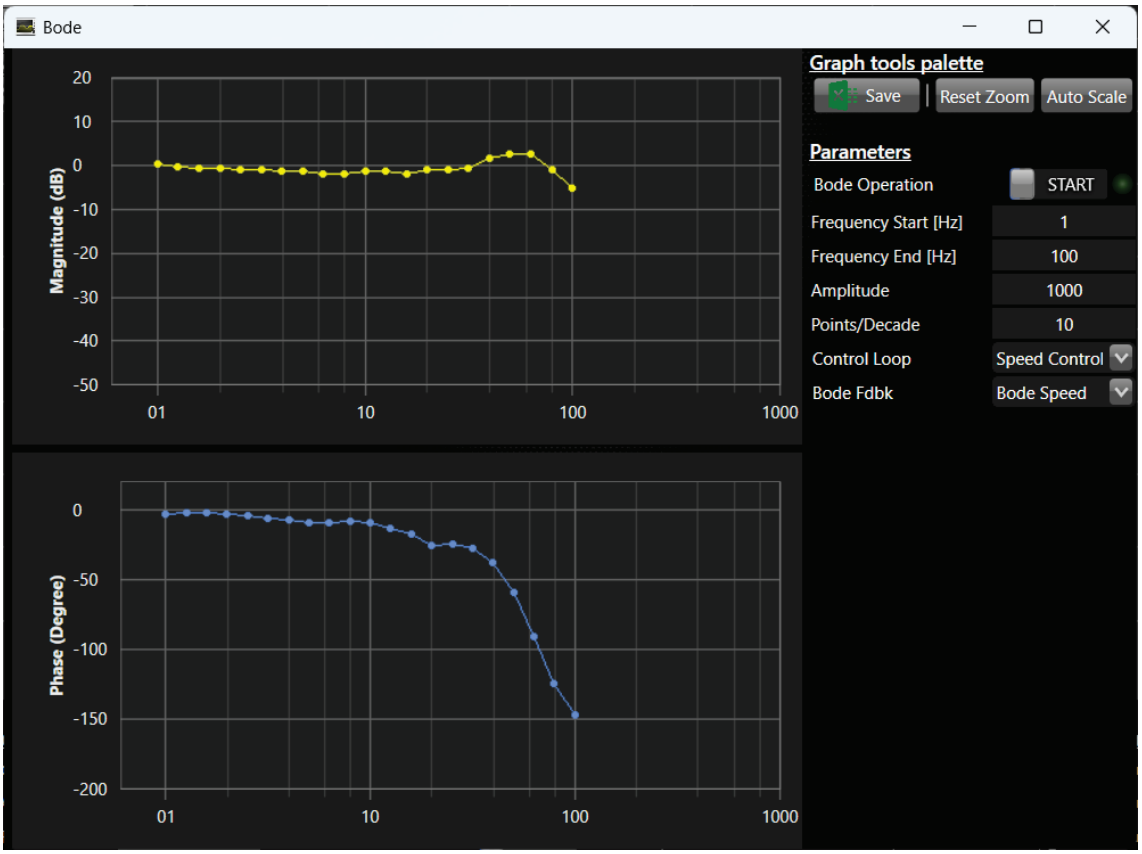

Figure 16. Bode screen

4.4 CAN Objects

The CAN Objects screen allows you to monitor and modify the values of CAN objects in the drive.

Motor Controller software provides access only to the objects required for configuration according to CiA 301.

PDO mapping defines which objects are transmitted and received. Most master devices set PDO mapping at startup. If your system master does not perform this function, you can define the mapping using Motor Controller software's RPDO Mapping and TPDO Mapping tabs.

RPDO Communication tab

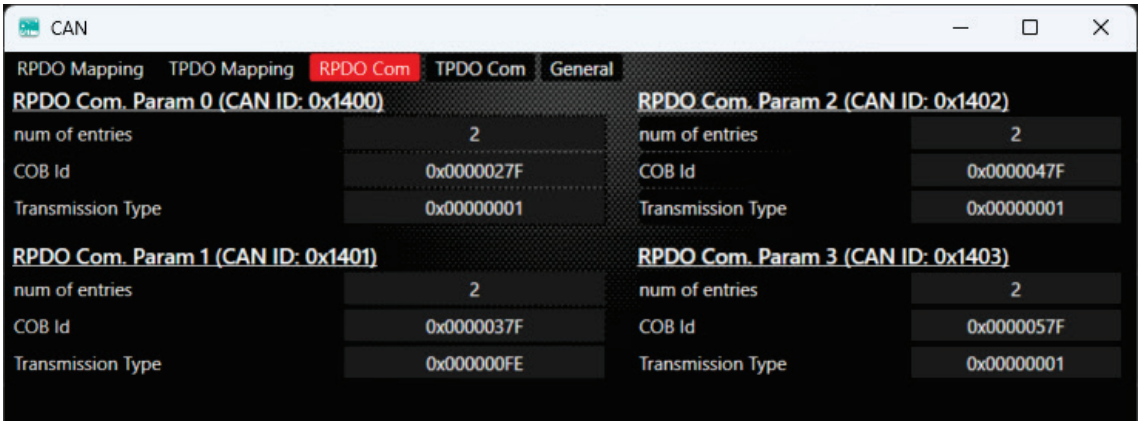

Figure 17. RPDO Communication tab

This tab defines the parameters of the four PDOs that the drive can receive.

- Object 0x1400 - Receive PDO Communication Parameter 1
- Object 0x1401 - Receive PDO Communication Parameter 2
- Object 0x1402 - Receive PDO Communication Parameter 3
- Object 0x1403 - Receive PDO Communication Parameter 4

For each RPDO, the following is defined:

- Sub-index 0: The number of PDO parameters implemented.
- Sub-index 1: The COB-ID. If bit 31 is set, the PDO is disabled.
- Sub-index 2: The transmission type.

RPDO Mapping tab

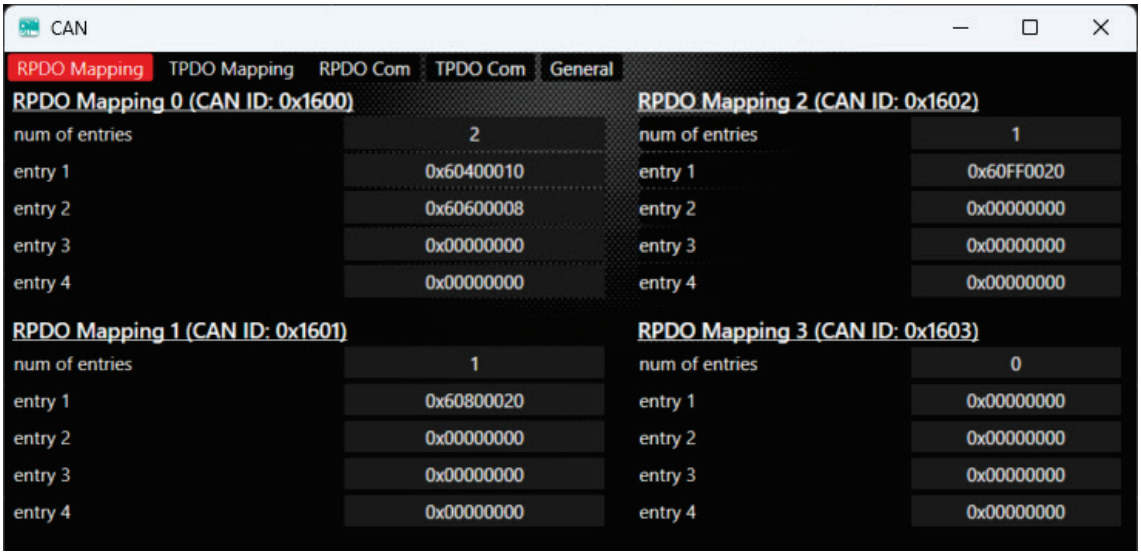

Figure 18. RPDO Mapping tab

This tab contains the mapping of the four PDOs that the drive can receive.

- Object 0x1600 – Receive PDO Mapping Parameter 1
- Object 0x1601 – Receive PDO Mapping Parameter 2
- Object 0x1602 – Receive PDO Mapping Parameter 3
- Object 0x1603 – Receive PDO Mapping Parameter 4

For each RPDO, the following is defined:

- Sub-index 0: The number of valid entries in the mapping record. The number of entries is also the number of the application variables that are received with the corresponding PDO.
- Sub-indices 1 to 4: Contain information about the mapped application variables. These entries describe the PDO contents by their index, sub-index and length.

TPDO Communication tab

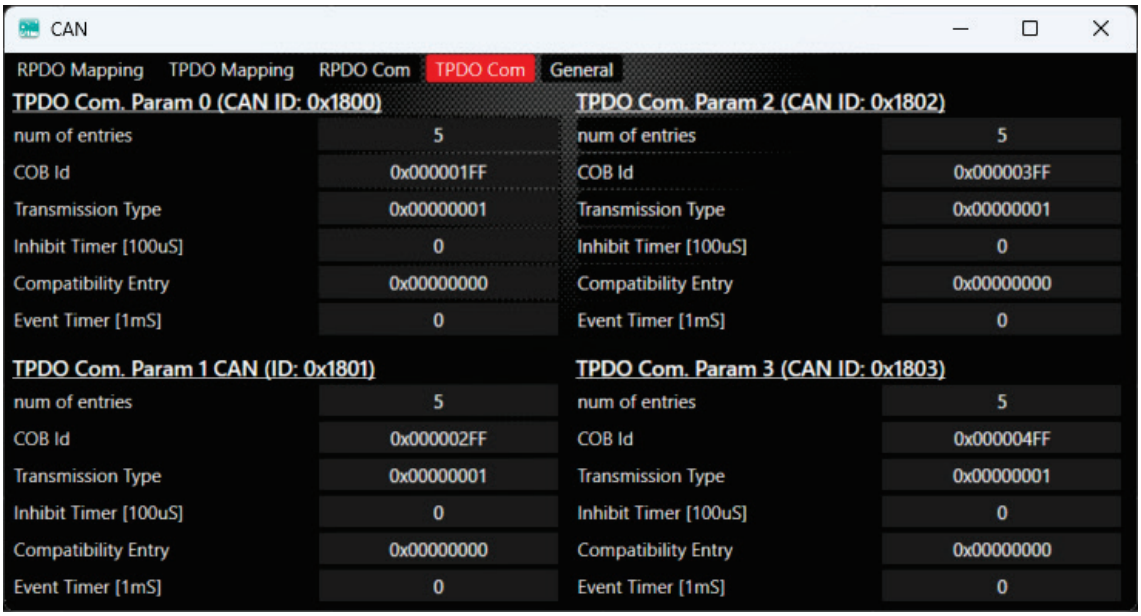

Figure 19. TPDO Communication tab

This tab defines the parameters of the four PDOs that the drive can transmit.

- Object 0x1800 – Transmit PDO Communication Parameter 1
- Object 0x1801 – Transmit PDO Communication Parameter 2
- Object 0x1802 – Transmit PDO Communication Parameter 3
- Object 0x1803 – Transmit PDO Communication Parameter 4

For each TPDO, the following is defined:

- Sub-index 0: The number of PDO parameters implemented.
- Sub-index 1: The COB-ID. If bit 31 is set, the PDO is disabled.
- Sub-index 2: The transmission type.
- Sub-index 3: The inhibit time.

- Sub-index 4: Not in use.
- Sub-index 5: The event time.

TPDO Mapping tab

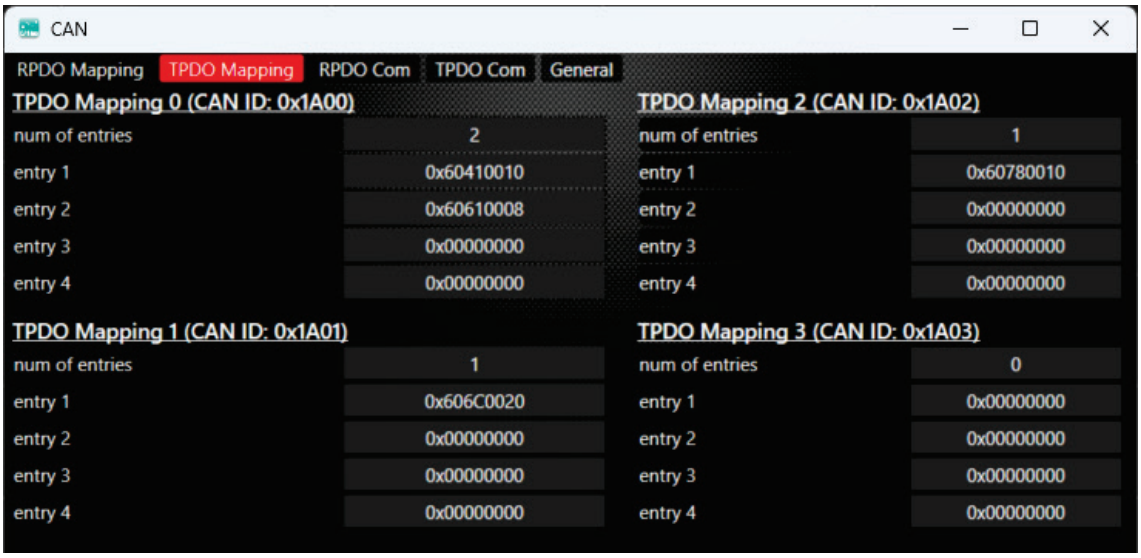

Figure 20. TPDO Mapping tab

This tab contains the mapping of the four PDOs that the drive can transmit.

- Object 0x1A00 - Transmit PDO Mapping Parameter 1
- Object 0x1A01 - Transmit PDO Mapping Parameter 2
- Object 0x1A02 - Transmit PDO Mapping Parameter 3
- Object 0x1A03 - Transmit PDO Mapping Parameter 4

For each RPDO, the following is defined:

- Sub-index 0: The number of valid entries in the mapping record. The number of entries is also the number of the application variables that are received with the corresponding PDO.
- Sub-indices 1 to 4: Contain information about the mapped application variables. These entries describe the PDO contents by their index, sub-index and length.

General tab

The General tab contains several additional CAN objects.

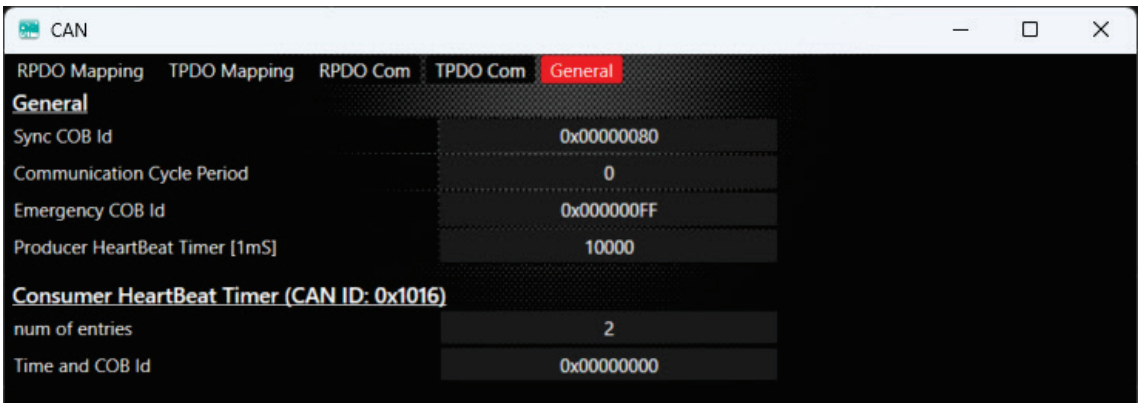

Figure 21. General tab

- Object 0x1005. **COD-ID Sync**. Indicates the configured the COB-ID of the synchronization object (SYNC). It also defines whether the CANopen device generates the SYNC.
- Object 0x1006. **Communication Cycle Period**. Provides the communication cycle period. This period defines the SYNC interval.
- Object 0x1014. **COB-ID EMCY**. Indicates the configured COB-ID for the EMCY write service.
- Object 0x1017h. **Producer Heartbeat Time**. Indicates the configured cycle time of the heartbeat. The heartbeat cycle time must be a multiple of 1 millisecond. It is 0 if not used.
- Object 0x1016h. **Heartbeat Consumer Time**. The consumer heartbeat time provides the expected heartbeat cycle times. It must be higher than the corresponding producer heartbeat time configured on the CANopen device producing this heartbeat. Monitoring starts after the reception of the first heartbeat. If the consumer heartbeat time is 0, the corresponding entry is not used.

4.5 COM Stats

The COM Stats screen has three tabs for advanced settings and functions.

Communication Statistics

This tab is used to view the serial communication configuration, and to monitor serial communication activity.

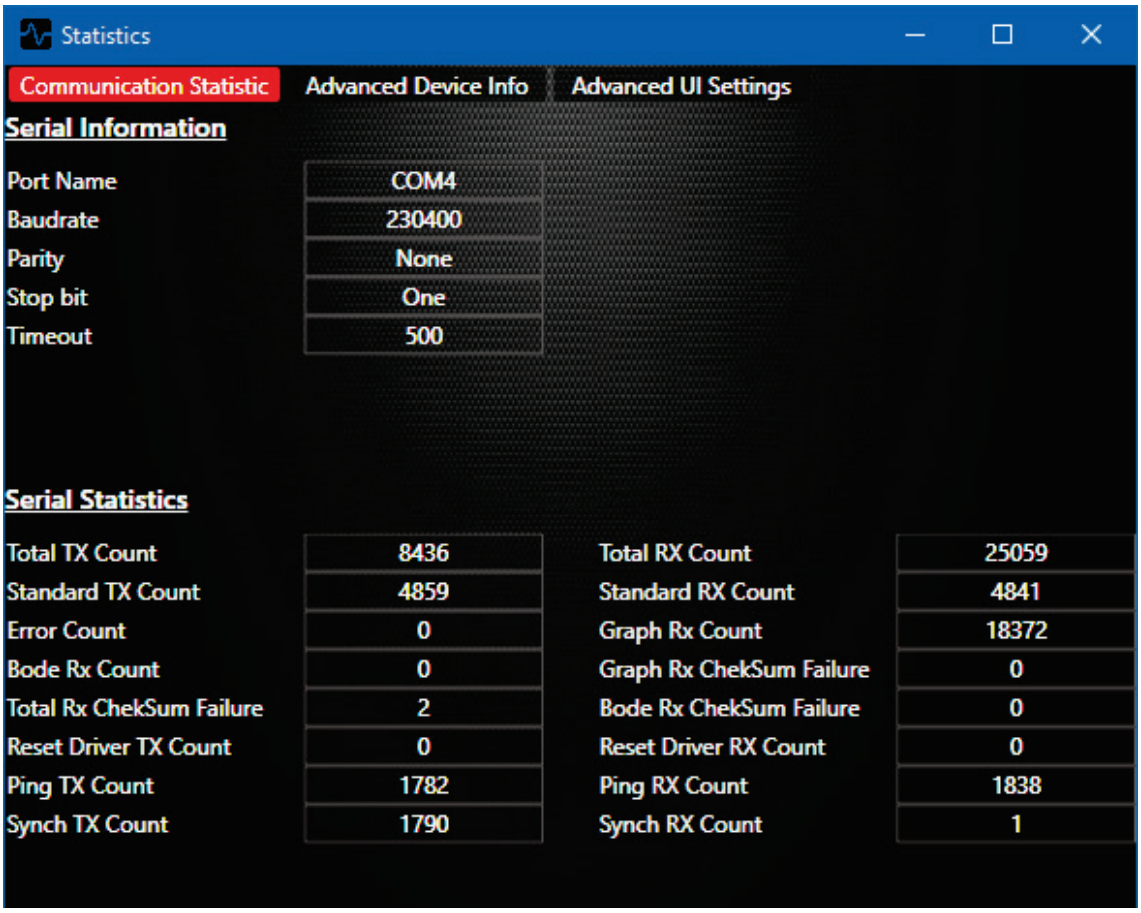

Figure 22. Communication Statistics tab

Advanced Device Info

This tab is used to view the firmware checksum and the part number of the drive.

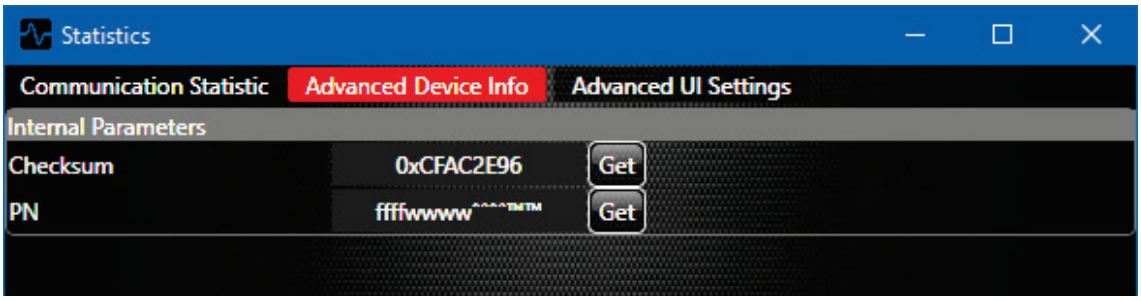

Figure 23. Advanced Device Info tab

Advanced UI Settings

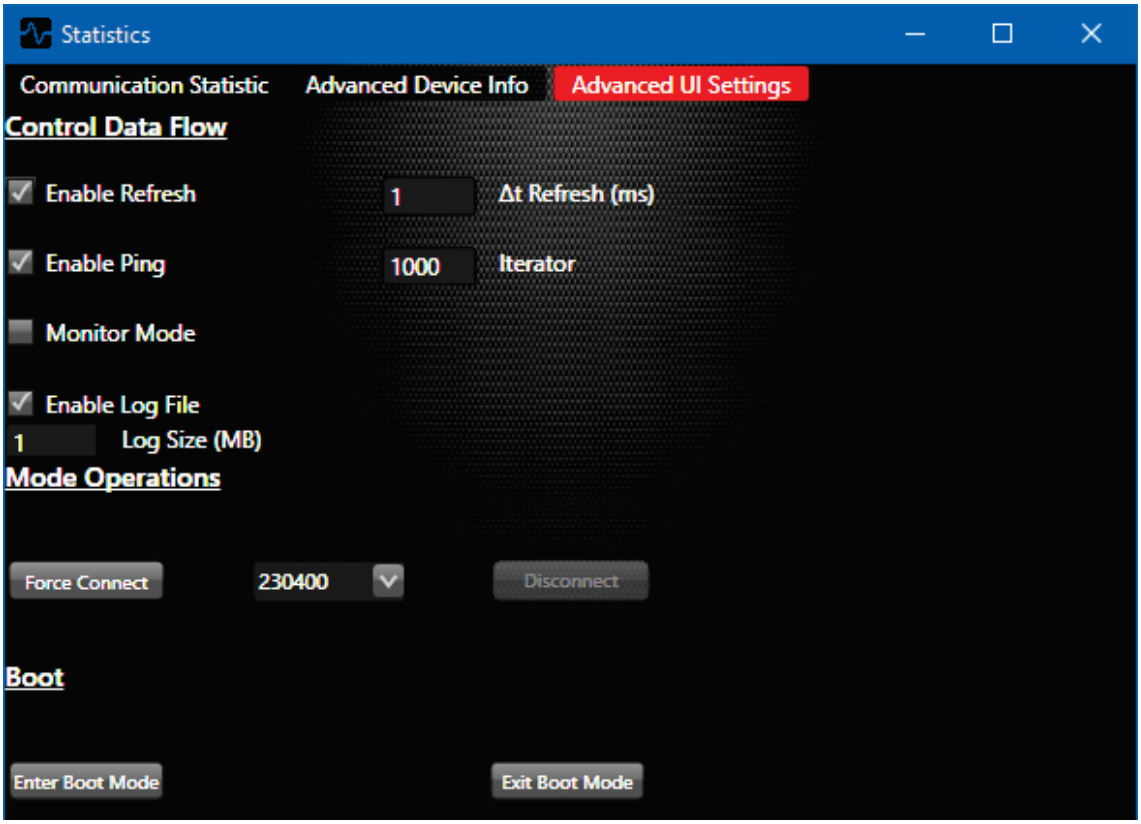

Figure 24. Advanced UI tab

The Control Data Flow section in this tab is used to view and define data communication settings.

You can enable and disable these options.

- **Enable Refresh**. It is recommended to use a refresh rate value less than 100 ms. (By default it is set to 10 ms).
- **Enable Ping**. When enabled, sets the plot request interval. When disabled, plots cannot be generated.
- **Monitor Mode**. *Not in use*
- **Enable Log File**. When enabled, all software communication traffic is continuously recorded and saved to a file. It is recommended that you use this option only when needed for debugging and/or support.

Note | **Mode Operations** and **Boot** functions in this tab are not intended for user manipulation unless instructed by Technical Support.

5 Commands

The Commands pane enables you to send operation and motion commands to the drive.

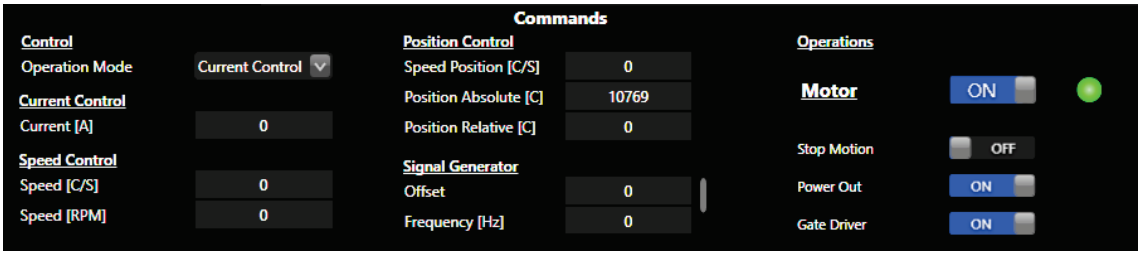

Figure 25. Commands pane

Control

- **Operation Mode**. Defines the operation control mode: current, speed, or position.

Current Control

- **Current**. Defines the current (IQ) command, in amperes. When set, this command automatically switches the operation mode to Current Control.

Speed Control

- **Speed (c/s)**. Defines the speed of movement, in counts/second.
- **Speed (rpm)**. Defines the speed of movement, in rpm.

Position Control

- **Speed position (counts/second)**. Sets the speed for the position control loop.
- **Position absolute (counts).** Sets an absolute target position for the movement. Defined in encoder counts.
- **Position relative (counts)**. Sets the target position for the movement, relative to current position. Defined in encoder counts.

Signal Generator

Creates a SigGen command on the currently used operation control mode.

- **Offset**. The vertical displacement of a waveform from its zero or ground level, measured in volts.
- **Frequency**. The number of times a signal repeats in one second, measured in Hertz (cycles per second).
- **Type**. The shape of the waveform.
  - GenDisabled – Signal generator not in use.
  - RampUpDown
  - SquareWave
  - SinWave

Operations

- **Motor.** Enables and disables motor operation.

  A green LED icon indicates the motor is in the ON state.

The following operations are automatically executed by the drive according to the user configuration and the commands issued.

- **Stop Motion.** Stops motion/motor movements.
- **Power Out**. Controls the motor brake.

  Power Out ON. Brake is released.
  Power Out OFF. Brake is engaged.
- **Gate Driver**. Activates the PWM to the motor.

6 Status (Reports)

This section of the Motor Controller software window displays realtime data that indicates the state of motor feedback, position counters, and digital inputs.

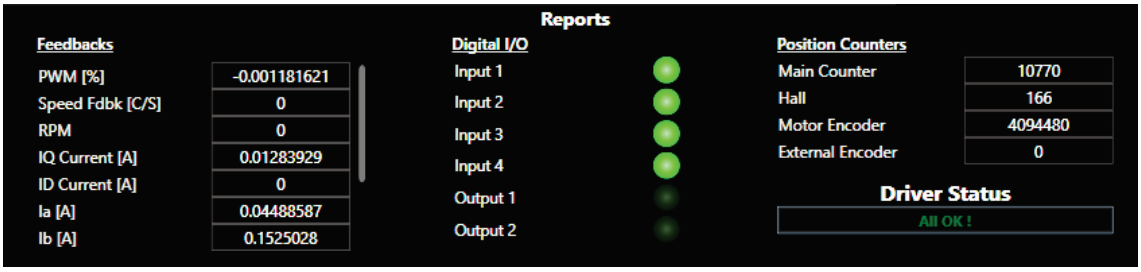

Figure 26. Reports

Feedback

Displays the values of feedback from the motor and various drive components.

Digital I/O

Displays the state of the inputs in the drive.

Position Counters

Displays the values of the encoders and the Hall sensors, in accordance with the Roll High and Roll Low settings.

Drive Status

This section of the Motor Controller software window indicates the state of the **drive**.

- **Driver Status**. Displays warnings and errors from the drive. If no drive warnings or errors are active, displays **All OK!**

7 Graph

The main area of the Motor Controller software screen allows you to monitor signals and motor feedback.

You can plot up to eight analog signals (channels) simultaneously.

The pane on the right side of the Motor Controller software screen lets you select and define the signals to be sampled.

7.1 Channels

A channel has three modes.

- **Disconnected.** When the drive is not communicating (not connected) with the GUI, the channel controls are disabled.

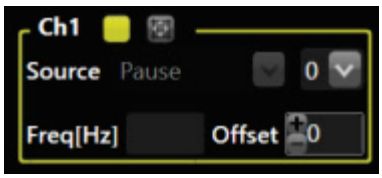

Figure 27. Channel Disconnected

- **Pause**. When the drive is communicating with the GUI, channel controls are enabled. **Pause** mode is the default setting for all channels. In this mode the drive does not send any plot data to the GUI. As soon as you select any source type, the channel switches to **Active** mode.

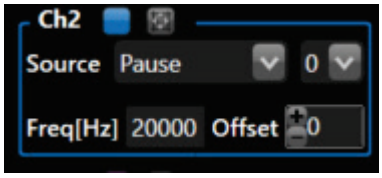

Figure 28. Channel Paused

- **Active**. In Active mode, the drive continually sends plot data, according to the setting shown the **Frequency** field.

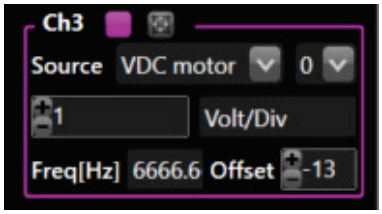

Figure 29. Channel Active

7.2 Channel settings

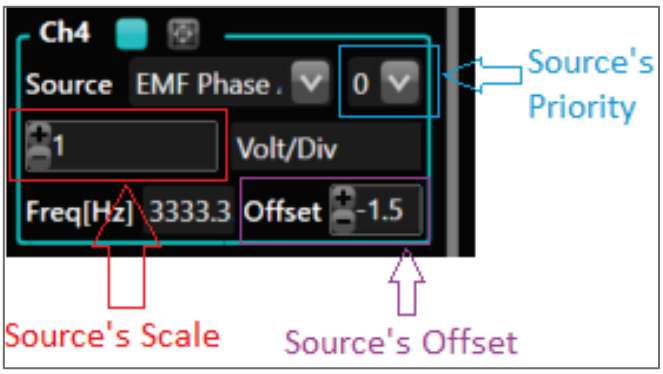

Figure 30.

The Motor Controller software provides eight channels for monitoring and recording various values of the system. Each channel has a set of properties that you can define:

- **Color.** Use the colored square next to the channel number to select the color of the channel plot on the graph.
- **Fit to size.** Automatically adjusts the Y-value on the plot to fit within the vertical area of the graph. This function is useful when a signal plot exceeds the boundaries of the graph on the screen.
- **Source (signal).** From the list, select the type of drive data to be sampled on the channel; for example, motor VDC or motor speed.
- **Priority.** From the list, select the source's priority for sampling: **0** is the highest priority level and **9** is the lowest.
  A higher priority results in a greater number of sampled points per second.
- **Source Scale**. The value in this field scales the signal plot on the Y-axis.
  The units (Amper/Div, Volt/Div) are set automatically by the drive according to the selected Source.
- **Frequency**. Read only. This value is calculated from the CPU base frequency and the signal sampling priority value.
- **Offset**: Defines a value that shifts the Y-axis in the signal plots.
  This option is useful for separating overlapping traces, and improving the readability of the chart.

Hover the mouse over over a channel plot to view the X and Y values of the signal at that specific point.

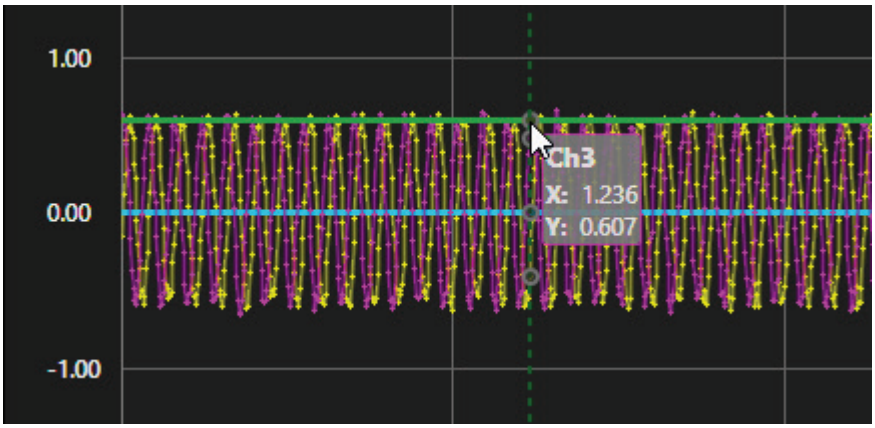

Figure 31.

Channel settings example

Given that the drive sends data to the Y-axis plot, the data point will be drawn at:

$\frac{Y}{Scale} + Offset.$

If, for example:

Power supply from the drive (Vin) = 13.5V

Scale = 2

Offset = -7

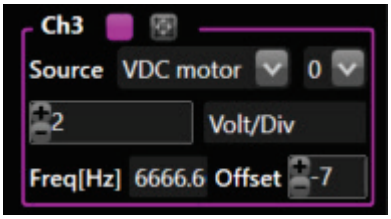

Figure 32.

That is:

$\frac{13.5}{2} - 7 = -\frac{1}{4}$

Hovering over the plot on the graph, the tooltip shows the actual value sent by the drive, while plot line is positioned on the graph at $-\frac{1}{4}$.

Figure 33.

7.3 Plot controls

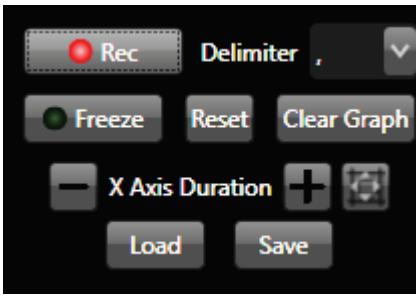

Figure 34.

- **Rec**. Use the **Record** button to start and stop a recording of the signals from all active channels.

  A red icon blinks during the record operation.

  The recorded data is automatically saved in a CSV file. The file name indicates the date and time of the recording.

  The file is automatically saved in the path:
  C:\Users<*UserName*>**\Documents\MotorController\Charts**
- **Delimiter**. Use this option to define whether a comma (,) or a semicolon (;) separates the sampled data when the recording is saved in the CSV file.
- **Freeze**. Use the **Freeze** button to pause and resume the recording and graph display of all active channels.

  A red icon blinks while freeze is in effect.

  During freeze, you can use the mouse wheel to increase and decrease the resolution of the intervals on the Y-axis

  During freeze, you can click on the graph (with left mouse button), and drag to select and magnify an area on the graph.
- **Reset**.

  Sets the Y axis limits at [-5, 5].
- **Clear Graph**. Clears all plot data from the graph.
- **X-Axis Duration**. Zoom in (-). Zoom out (+). Use + and - to increase and decrease the resolution of the intervals on the Time axis.
- **(Y) Auto Scale**. Automatically adjusts the Y-value of every plot from every channel to fit within the vertical area of the graph.
- **Save**. Saves the currently displayed settings of all channels.
- **Load**. Loads the last saved settings of all channels.

Motor Controller software

User Manual