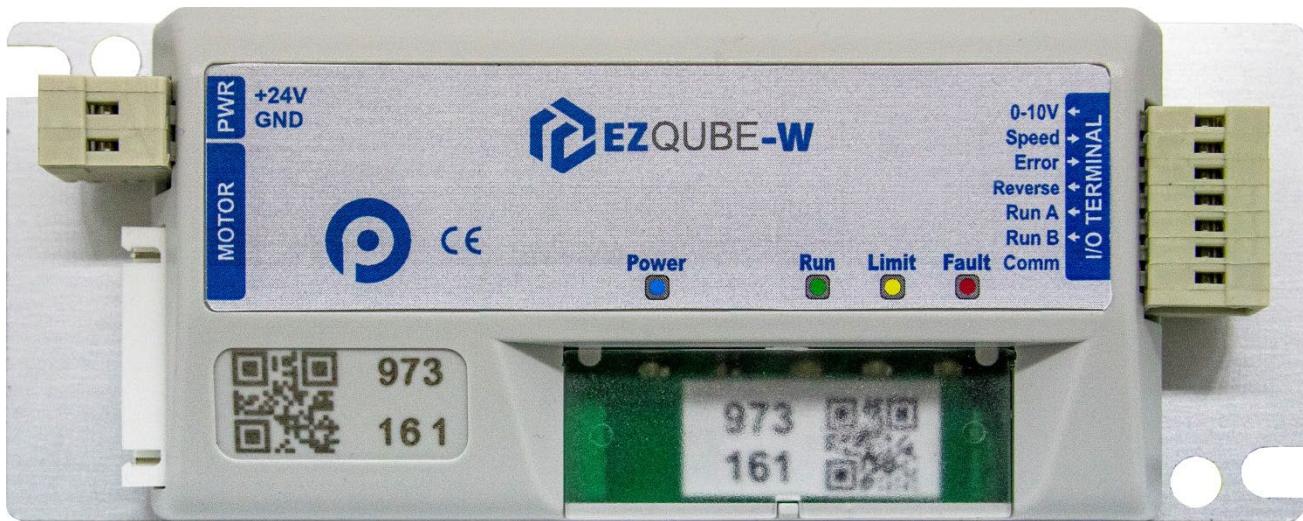


EZQube-W User Manual

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PLCs, Software, Conveyor Controls

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FCC Notes:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.**
- Increase the separation between the equipment and receiver.**
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.**
- Consult the dealer or an experienced radio/TV technician for help.**

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

- 1. This device may not cause interference.**
- 2. This device must accept any interference, including interference that may cause undesired operation of the device.**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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1. EZQube-W Module Features:

- Adjusting basic parameters like speed, acceleration, deceleration etc. via a wireless connection to the module.
- Over-voltage protection with transient voltage suppressor
- Protection from over-voltage produced by over-speeding of MDR
- Thermal and Over-Current Protection for module and MDR
- Reverse polarity protection against incorrect wiring of the power terminals
- Sensing and indication of over voltage from power supply and/or MDR (31 Volts)
- Sensing and indication of under voltage from power supply (18 Volts)
- Adjustable acceleration and deceleration
- External 0-10V analogue voltage variable speed control
- Selectable Free Spin, Servo and Continuous Torque brake control modes
- Automatic error recovery
- Four status LEDs
- Removable power and control signal terminal blocks
- Motor reversing capability while motor is running.
- Error Output signal and LED indication for module and MDR diagnosis
- Speed Output signal
- Over-Current Protection for Error and Speed Outputs
- Selectable default rotation direction
- Hinged clear protective cover for LEDs and QR code sticker
- Options for PNP or NPN control signal wiring accommodation
- Options for Senergy ECO, Senergy BOOST and Senergy BOOST 7A motor rollers

2. EZQube-W Module Components

Figure 1 shows an example EZQube-W module which accommodates the standard Senergy motor roller with 9-pin JST style connector. Figure 2 shows a Senergy motor roller with JST connector.

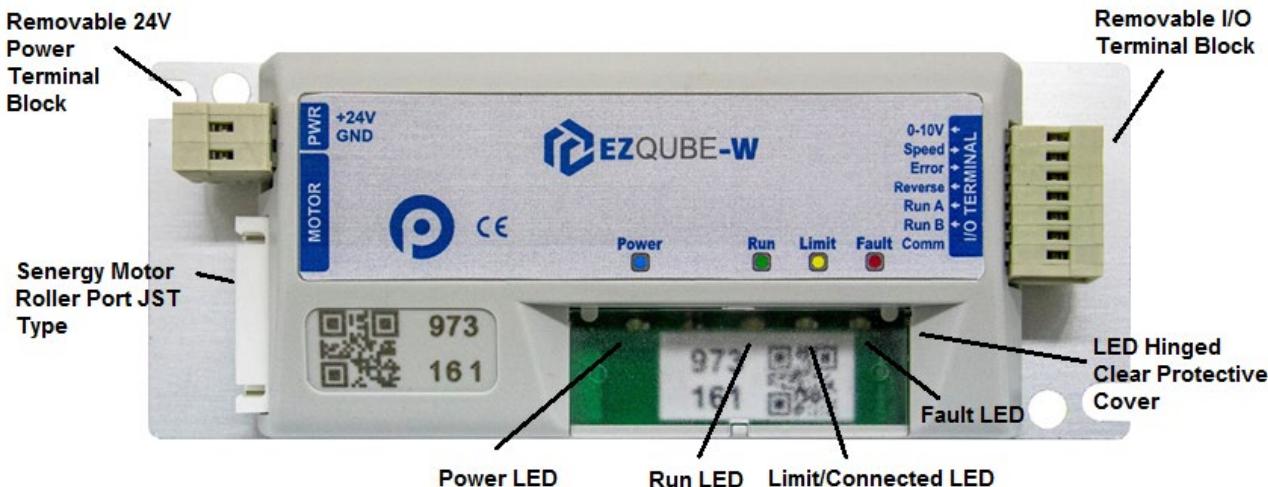


Figure 1 - EZQube-W Module Layout



Figure 2 – Senergy Motor Roller with JST Connector

2.1 Terminal Connections

EZQube-W has three removable terminal connectors designated as PWR, MOTOR and I/O TERMINAL.

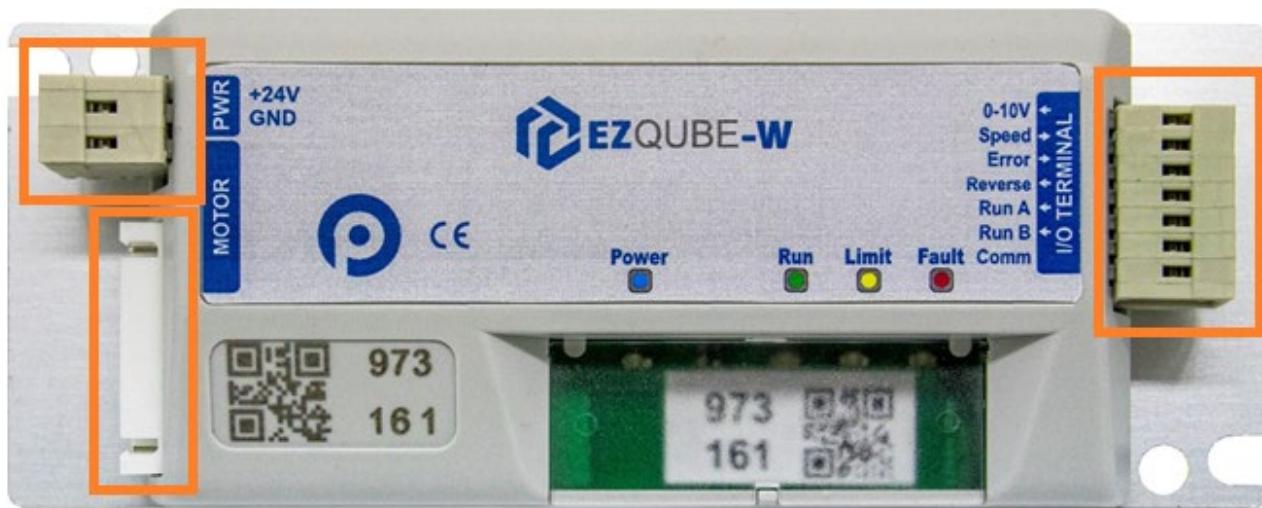
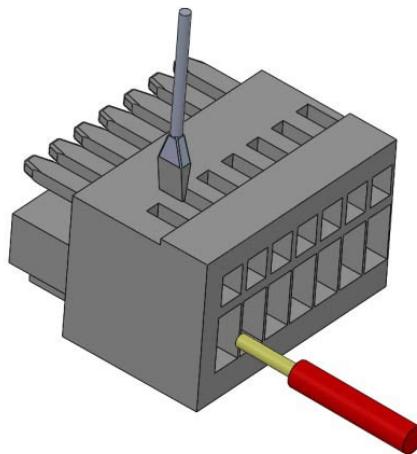


Figure 3 – EZQube-W Connectors

Wire terminals on all removable connectors are “cage-clamp” style requiring a small blade screwdriver to open the clamp to insert the wire.



2.1.1 Removable Power Terminal

This is a removable 2 pin plug-in terminal connector. Wire size range is 24-14 AWG (0.2 mm² to 1.5 mm²). Refer to Figure 1 for +24V and GND terminal designation.

Pin No.	Signal Name	Description
1	+24V	24 Volt DC Power of EZQube-W
2	GND	0V

2.1.2 Removable I/O Terminal Block

This is a removable 7 pin plug-in terminal connector. Wire size range is 24-20 AWG (0.2 mm² to 0.5 mm²). The following chart lists each signal and its usage. Refer to Figure 1 for Removable I/O Terminal Block designations.

Pin No.	Signal Name	Direction	Description
1	0-10V	Input	0-10 Volt analog input for speed control.
2	Speed	Output	Outputs frequency proportional to the speed of the MDR.
3	Error	Output	Provides +24V or 0V output when Error condition is active.
4	Reverse	Input	Accepts +24V or 0V input to run motor in opposite direction that is set in wireless app.
5	Run A	Input	Accepts +24V or 0V input for run at speed control (see section <i>RunA</i>).
6	Run B	Input	Accepts +24V or 0V input for run at speed control (see section <i>RunB, A+B</i>).
7	Common		DC common for optocouplers of Inputs (Run A, Run B, Reverse).

2.1.3 Run A and Run B Inputs

The combination of signals on the Run A and Run B terminals allows you to dynamically set the speed with your run signals to the EZQube Wireless module. The following chart lists the signal states and their respective speed control:

Run A	Run B	Description
ON	OFF	Start motor roller and run at the speed selected for Run A in smartphone app
OFF	ON	Start motor roller and run at the speed selected for Run B in smartphone app
ON	ON	Start motor roller and run at the speed selected for Run A+B in smartphone app
OFF	OFF	Stop motor roller

The Run/Reverse inputs on all EZQube Wireless modules can be wired to accept *either* PNP or NPN source signals. Selection on whether a module is PNP or NPN is made from the smartphone app.

2.1.4 MDR Plug-In Connection

MDR connector is a 9 pin JST brand right angle header with 2.5mm center to center pin spacing.

Pin No.	Signal Name	Description
1	Hall Sensor GND	Ground
2	Hall Sensor Power	5.5VDC
3	Coil U	Motor Winding Coil U
4	Coil V	Motor Winding Coil V
5	Coil W	Motor Winding Coil W
6	Hall U	Hall Effect Sensor Output U
7	Hall V	Hall Effect Sensor Output V
8	Hall W	Hall Effect Sensor Output W
9	-	Not Used

3. Power Supply Requirements

The power supply for any and all EZQube modules must meet the following requirements:

- Supplying 24 Volts DC and a minimum of 5 Amperes per module (for Senergy in BOOST mode, 7 Amperes for Senergy in BOOST 7A mode);
- Certified as NEC Class II device;
- Capable of detecting and properly handling short circuit and overload of its DC power output.

4. Connecting to the EZQube-W Module via the smartphone/tablet app

The EZQube-W module can be configured via the *EZQube* application for Android or iOS. Start by downloading the app from the Google Play Store or Apple App Store, respectively. Search for *EZQube* – this is the name of the configuration tool. After the download and installation is complete, start the application. The home screen should look like this:

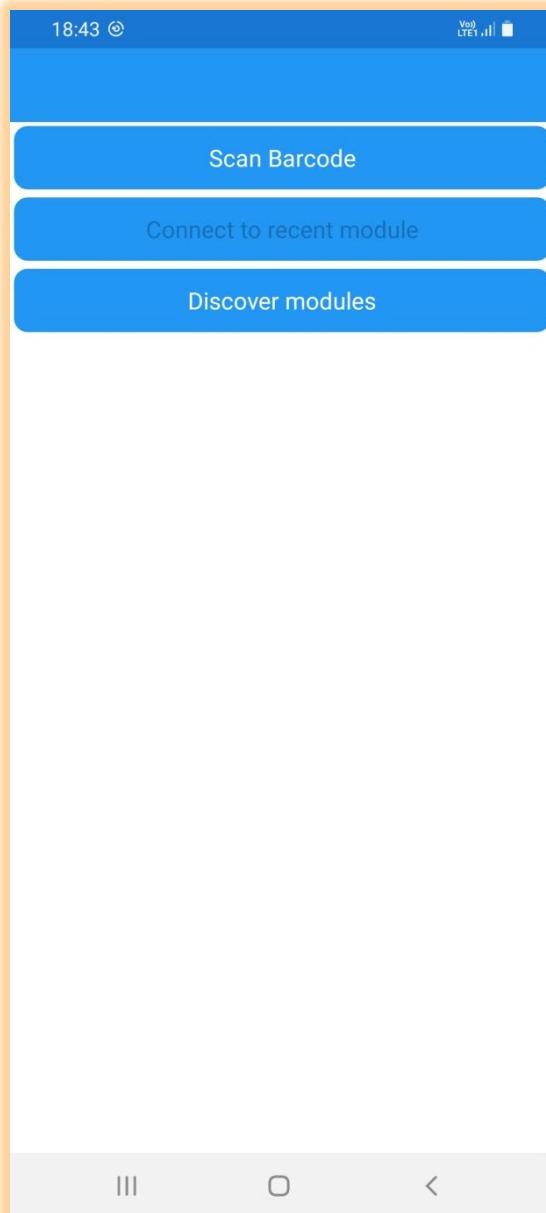


Figure 4 – EZQube Home Screen

Note: All the smartphone app screenshots in this User Guide are from Android OS, but for iOS they are nearly identical. In iOS, the list of tabs is at the bottom of the screen instead of the top.

There are initially two ways to discover and connect to a module – directly, by scanning its QR code, and via the discovery procedure. The *Connect to Recent Module* is initially greyed out – it will become active when you've disconnected from a module and tapping the button will immediately connect you back to it.

1. Connect Directly by Scanning

To connect directly to a module, tap “Scan Barcode” button and point the camera to the QR code that's either on the module case or inside it on the module PCB (Figure 5). **Note:** If you scan the code on the PCB, open the plastic protective cover over it first.

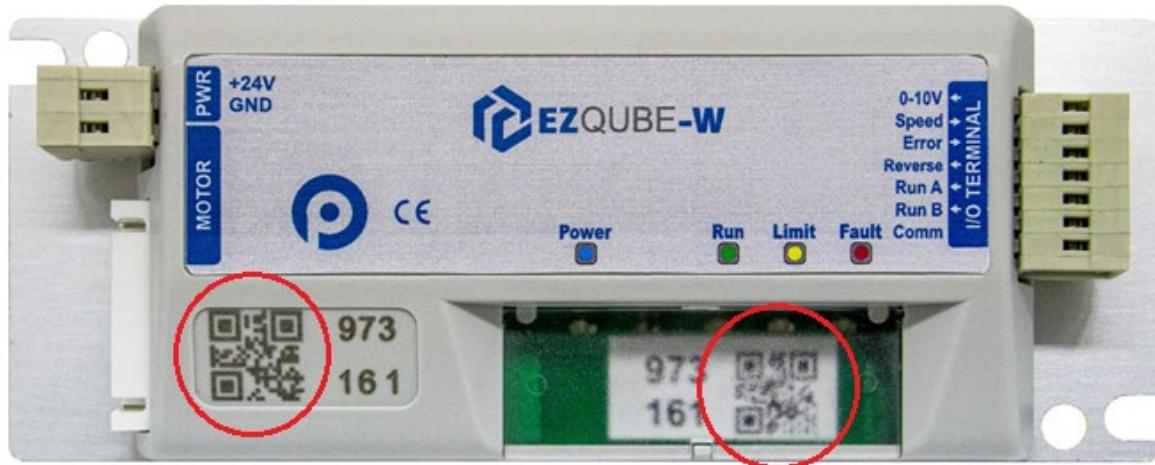


Figure 5 – Location of QR codes

After the phone/tablet scans the code, a pop-up appears with options “Connect”, “Get Password” and “Close”. **Note:** The “Get Password” option is still inactive.

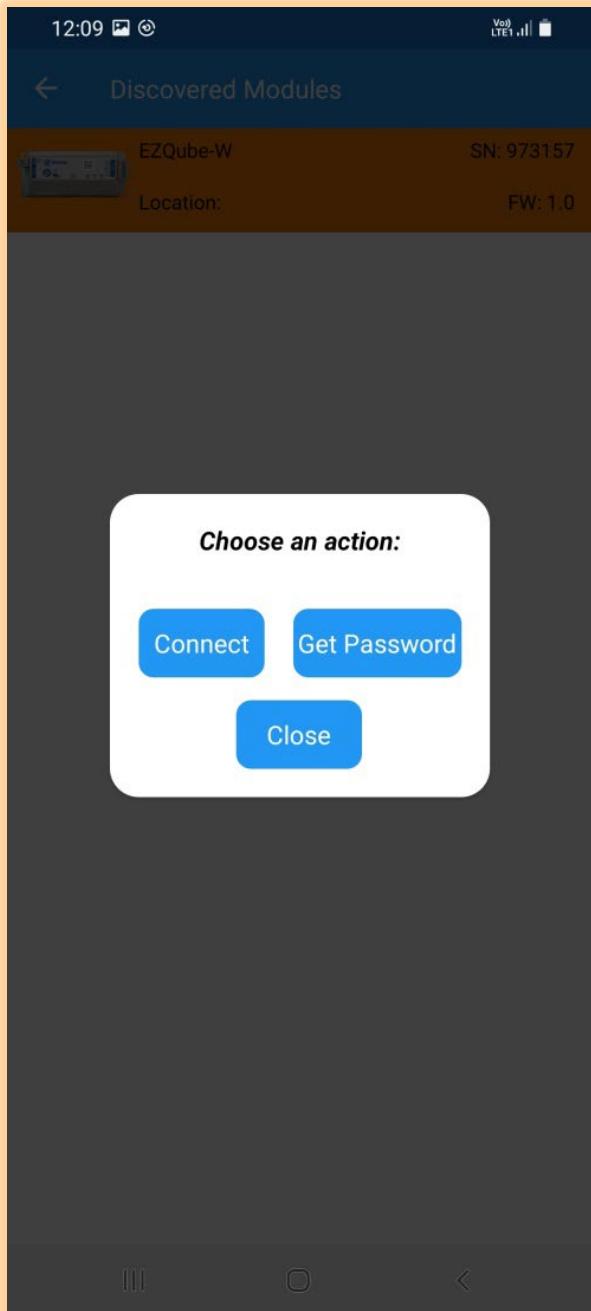


Figure 6 – Choose an action box

Tap “Connect” to connect to the selected module. After successfully connecting, the app configuration screen will appear. **Note:** If the connection attempt is unsuccessful, a box will appear asking whether you would like to retry connecting. Tap on “Yes”.

2. Connect by Discover Procedure

If you first want to see a list of all discovered modules in range, tap on Discover modules. A table appears showing all the available devices.



Figure 7 – Discovered Modules screen

Here you will see a picture of the module, the module name, serial number, Location (if set, see section **General Tab**) and firmware version. Tapping on the module will make the box at Figure 5 to appear and from then on the connect procedure is the same.

After successfully connecting to a module, the configuration screen will appear and the yellow Limit/Connected LED on the module will start flashing:



Figure 8 – Configuration screen (General tab), Android and iOS

4.1 General Tab

On the General tab screen, you can see:

- the module serial number;
- the available tabs with the General tab selected;
- the Location field, which is empty by default. The Location field is a user-defined field that can be used to display information about the specific module, like place of module on the conveyor line, building the module is in, department number etc. It is four characters long and accepts letters, numbers and punctuation marks (characters 32 – 122 from the ASCII table). Once a Location value is added to a module, it stays there permanently. The value itself can be changed at any time. If the entered text string is less than 4 characters, it is padded with zeroes to the left. When a new Location value is entered, the user device disconnects from the EZQube-W and then reconnects.
- the Send Backup button, which is still inactive;
- a picture of the module;
- Password field and “Set” button (still inactive).

4.2 RunA Tab

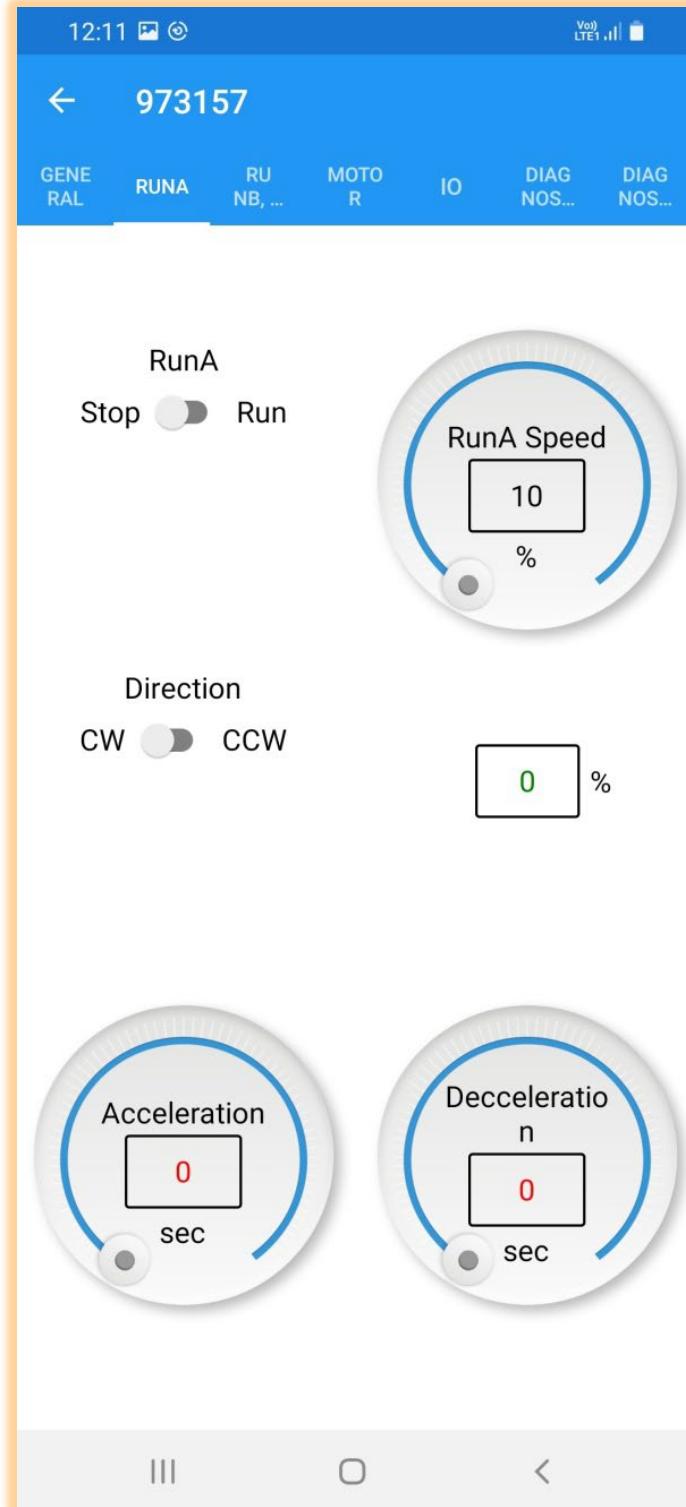


Figure 9 – RunA tab

The RunA tab contains settings for RunA of the motor (Run/Stop switch, direction switch and speed setting dial), a box showing the current measured speed of the motor in

percentage of the maximum possible speed and settings for motor acceleration and deceleration that affect RunA, RunB and RunA+B. **Note:** The measured speed value is only accurate if the Closed Loop box is checked in the “Motor” tab.

Setting the speed, acceleration and deceleration with the corresponding dials can be done either by selecting and dragging the button along the dial or manually entering a value in the box at the center. For the speed setting dial, the number represents the percentage of maximum speed of the motor. For acceleration and deceleration, the value entered is in seconds and it can be in the range of 0.1 – 10.0 seconds, meaning it would take the entered amount of seconds for the motor to start and reach the maximum speed.

4.3 Run B, A+B Tab

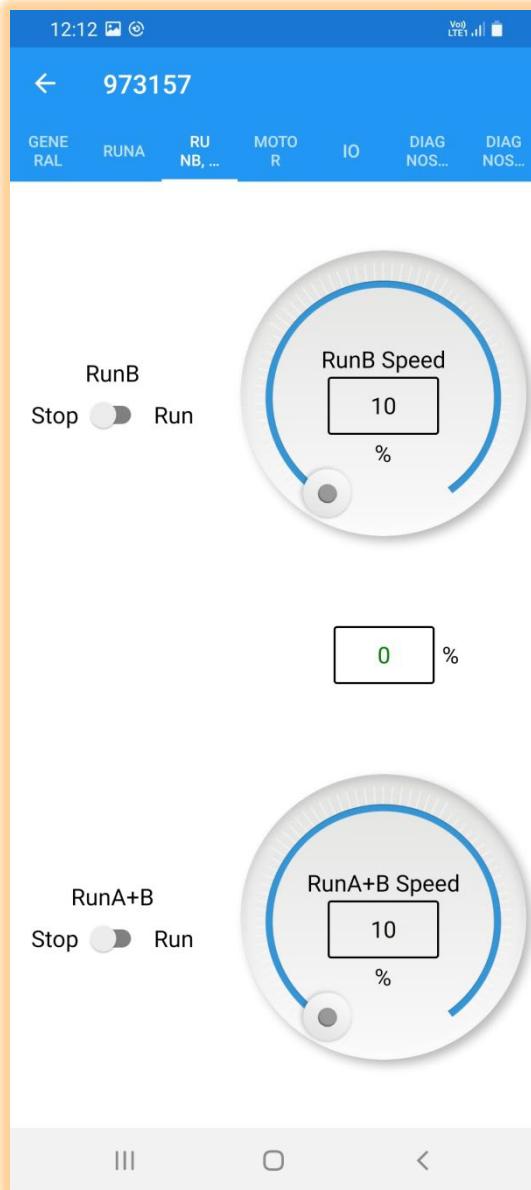


Figure 10 – RunB, A+B tab

Same as the RunA tab, but for RunB and A+B.

4.4 Motor Tab

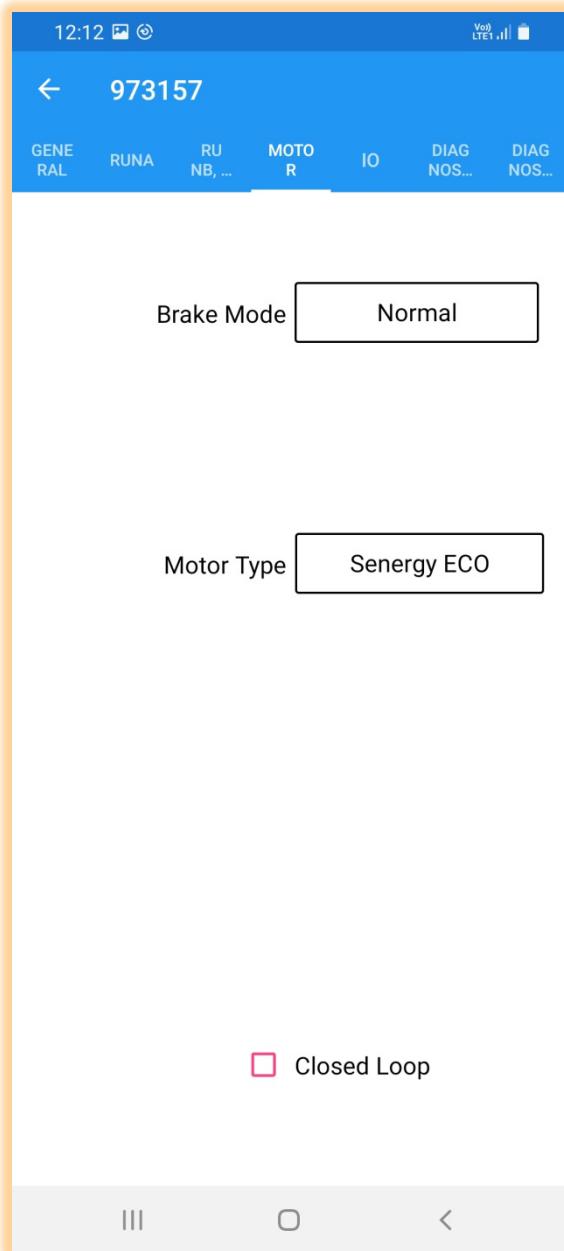


Figure 11 – Motor tab

In the Motor tab, there are 3 settings:

- Brake Mode: selection of the type of brake you want to use with the motor. The options are:

Method	Description
Normal	Each of the 3 Motor power transistor circuits in the EZQube-W are internally shunted to ground after the module has performed its configured deceleration function. The mechanical inertia of the gearbox and the magnetic resistance of the motor rotor provides the holding force. This is the MDR industry standard holding braking method
Free	Each of the 3 Motor power transistor circuits in the EZQube-W are internally opened after the module has performed its configured deceleration function. The mechanical inertia of the gearbox provides the only holding force
Servo Brake	When the EZ-Qube module has finished its configured deceleration function, it remembers the position of the motor rotor and provides active power to the motor coils to maintain that roller position
Continuous Torque	When the EZ-Qube module has finished its configured deceleration function, it remembers the position of the motor rotor and provides active power to the motor coils to maintain that roller position. However, if there is a continuous force applied to the motor that results in the roller moving to another position, the new position becomes the "new" stop position and the motor will not try to return to the original stop position.

- Motor Type tab: selection of the motor mode to use. The options are:

Mode	Description
Senergy ECO	Mode of performance that provides the highest speed for the selected gear reduction option of the PulseRoller Senergy brand motor roller and gear drive units
Senergy BOOST	Mode of performance that provides the highest torque for the selected gear reduction option of the Pulseroller Senergy brand motor roller and gear drive units
Senergy BOOST, 7A	Same as Senergy BOOST, but with a starting current of 7A.

- Closed Loop checkbox – select whether the PI (proportional integral) regulator is used or not. It should be used in order to get a correct speed measurement (displayed in the box in the RunA and RunB tabs).

4.5 IO (Input/Output) Tab

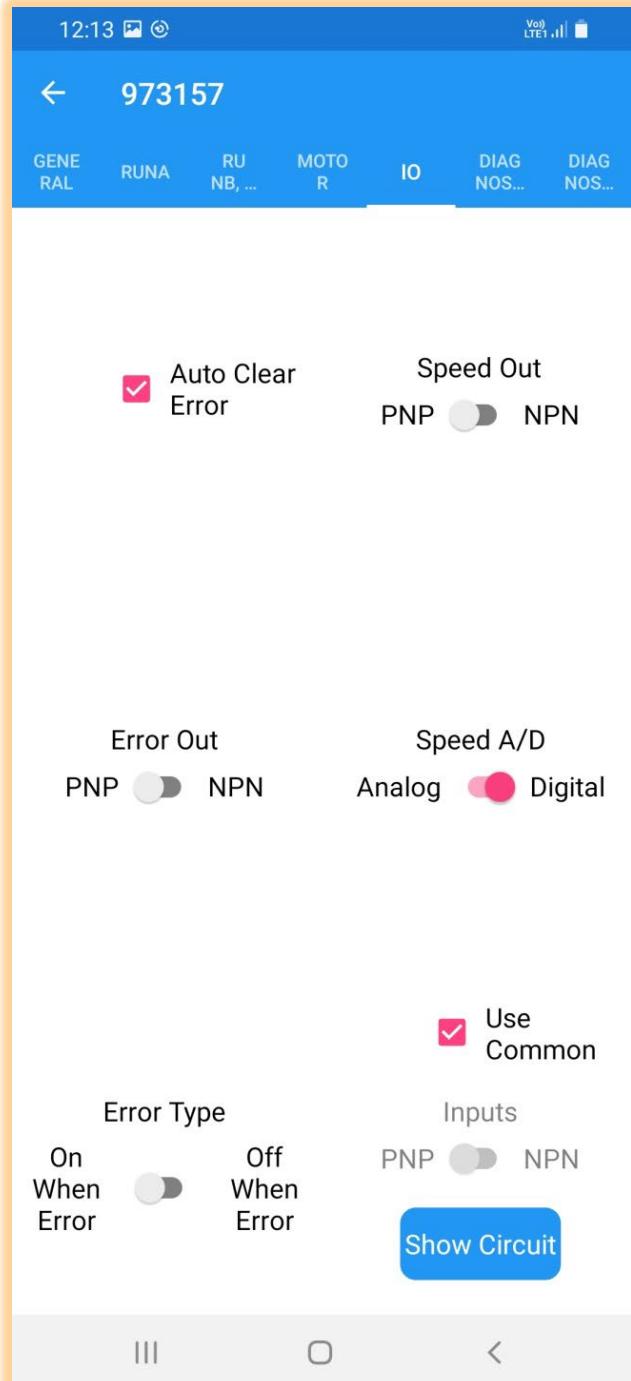


Figure 12 – IO tab

The IO tab contains settings for the module inputs and outputs. They are:

- Auto Clear Error: when an error appears, an error flag is set to High. When the error disappears, the flag can go automatically back to low or be cleared manually by stopping the motor and running it again.
- Speed Out: choose whether the Speed Out signal is for PNP or NPN module wiring. (PNP or NPN mode is selected with the Inputs switch at bottom right.)

For single PNP module wiring:



Figure 13 – SpeedOut PNP module wiring

For single NPN module wiring:



Figure 14 – SpeedOut NPN module wiring

- Error Out - choose whether the Error Out signal is for PNP or NPN module wiring.

For single PNP module wiring:



Figure 15 – ErrorOut PNP module wiring

For single NPN module wiring:



Figure 16 – ErrorOut NPN module wiring

- Speed A/D – choose whether the speed is set by the set speed dials in the previous tabs or via the Analog Speed Control input pin.
- Error Type – choose whether the error flag is set High or Low when an error appears.
- Inputs – choose whether the Reverse, RunA and RunB inputs and ErrorOut and SpeedOut outputs are used with PNP or NPN module wiring. The Use Common option determines whether you want to also use the Common pin with those inputs. Tapping the Show Circuit button shows the module wiring for the current selected option.

Module wiring

For single PNP module wiring with Common connection:



Figure 17 - PNP module wiring with Common connection

For single PNP module wiring without Common connection:



Figure 18 - PNP module wiring without Common connection

For single NPN module wiring with Common connection:



Figure 19 - NPN module wiring with Common connection

For single NPN module wiring without Common connection:



Figure 20 - NPN module wiring without Common connection

4.6 Diagnostic Tab

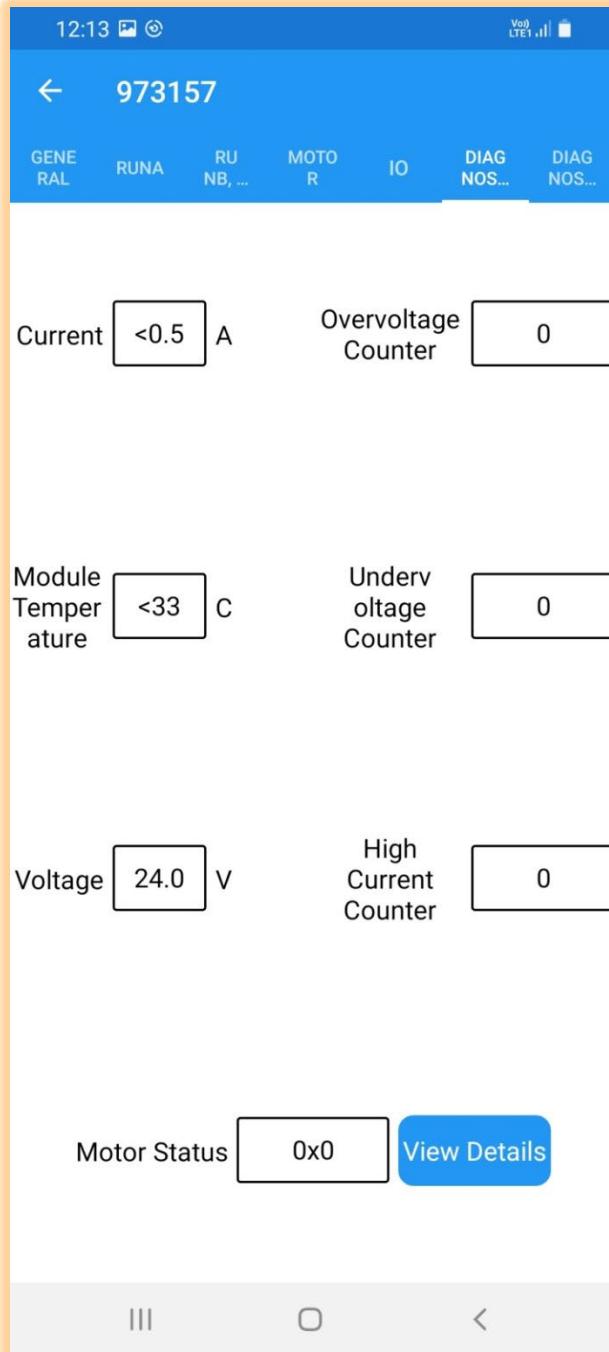


Figure 21 – Diagnostic tab

The Diagnostic tab contains various information about the module.

- Current (not measured if less than 0.5A);
- Module Temperature (not measured if less than 33 degrees C);
- Voltage;
- Overvoltage Counter – how many times since the last boot has the supply voltage exceeded 31V;

- Undervoltage Counter – how many times since the last boot has the supply voltage fallen below 18V;
- High Current Counter – how many times since the last module boot has the supply current exceeded 3,5A.
- Motor Status field – a hexadecimal number representing the current motor status. For details, click the View Details button.

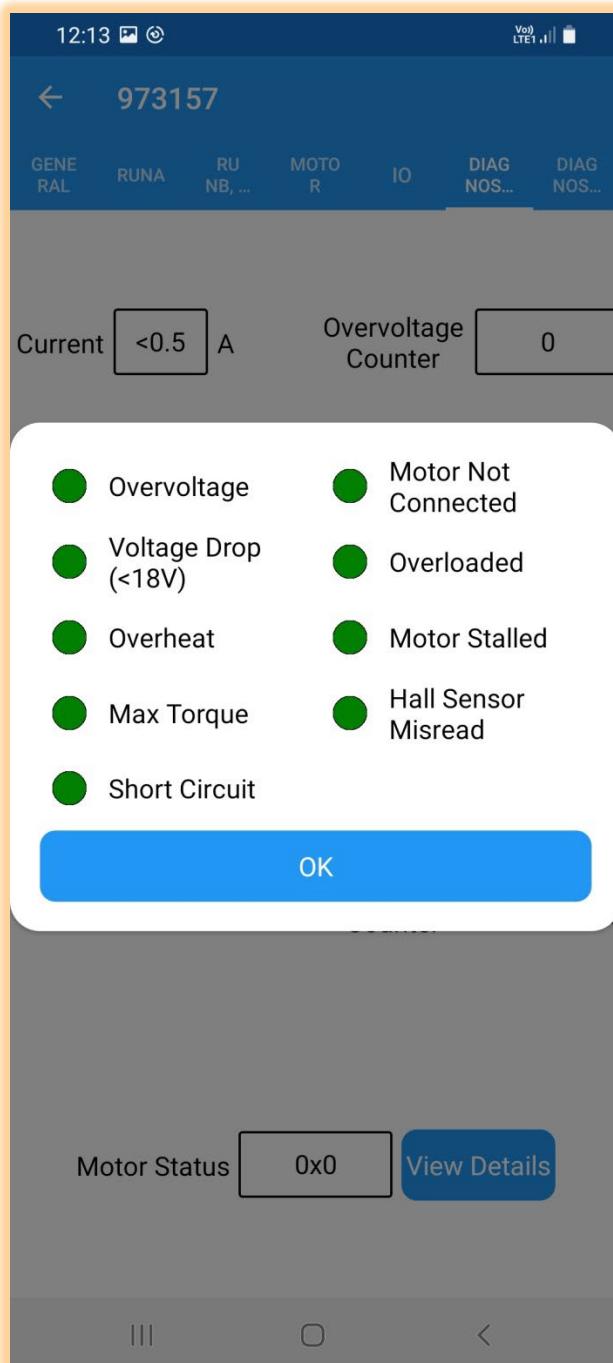


Figure 22 – Motor Status Details screen

This screen contains information for any current motor errors.

4.7 Diagnostic Log Tab

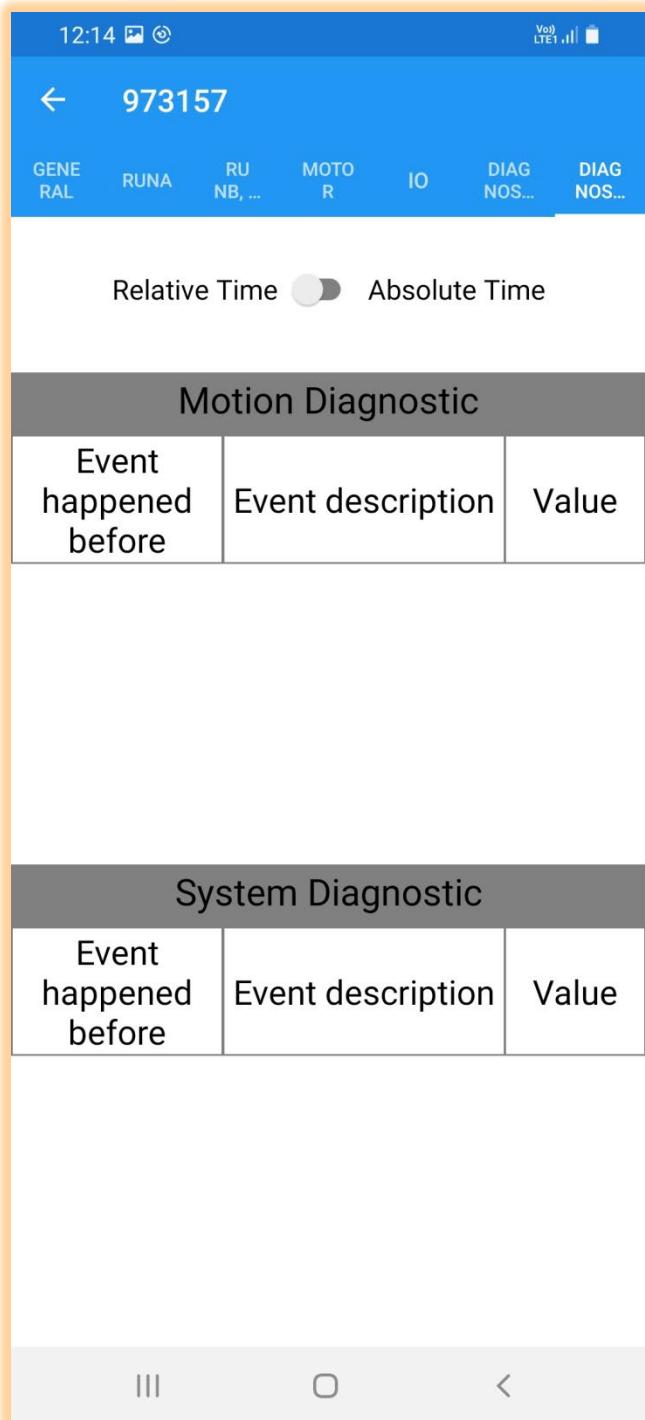


Figure 23 – Diagnostic Log

The Diagnostic Log screen shows a list of the different errors that have occurred since the last module boot. It is divided into two parts – Motion Diagnostic (for motor errors) and System Diagnostic (for system errors). If an error occurs, a message will appear in one of the tables describing the error. After the error condition is over, another message appears announcing the end of the error condition. For example, if the motor cable is unplugged, a message appears under “Motion Diagnostic” reading “Motor fault occurred”. After the cable is plugged back in, another message appears reading “Motor fault over”. Messages are displayed with the newest one appearing on top of the list. **Note:** You have to refresh the screen by swiping down to see the new entries.

There are two options for displaying the time at which an event occurred – Relative Time and Absolute Time. Relative Time shows the time elapsed since the event occurred. Absolute Time shows the date (DD/MM/YYYY) and time (HH:MM:SS) the event occurred.