ADC Control

1. Overview

This document provides a complete configuration tutorial for controlling AESC motor controllers via ADC (Analog Voltage Input) signals. It covers hardware connection, software configuration, parameter debugging, and common issue resolution, helping users quickly achieve control of AESC using a throttle handle and electronic brake.

ADC (Analog-to-Digital Converter) allows control of motor speed or braking force through analog voltage signals (0~3.3V). AESC supports connecting throttle handles and electronic brakes via its ADC interface to achieve precise throttle and brake control.

Important Note: Before configuring ADC control, it is essential to first run the "Setup Motors FOC" wizard in VESC Tool to complete comprehensive detection and identification of motor parameters. This is the foundation for ensuring stable and safe motor operation.

2. Software Preparation

- **Download VESC Tool: https://vesc-project.com/vesc_tool**
- Scan the QR code below for download instructions:

Figure 1: AESC Configuration Tutorial QR Code

- Run the VESC Tool software.

3. Hardware Preparation

3.1.Required Components

- AESC Motor Controller (e.g., AESC V4, AESC V6.7, AESC V4 Pro, AESC V6.7 Pro)
- Brushless DC Motor (e.g., 5065, 6374, 63100)
- Lithium-ion Battery Pack / LiPo Battery Pack / Adjustable DC Power Supply (Voltage: 12V ~ 50.4V)
- PC
- USB Type-C
- Throttle Handle (with analog voltage output)
- Electronic Brake (with analog voltage output or switch signal)

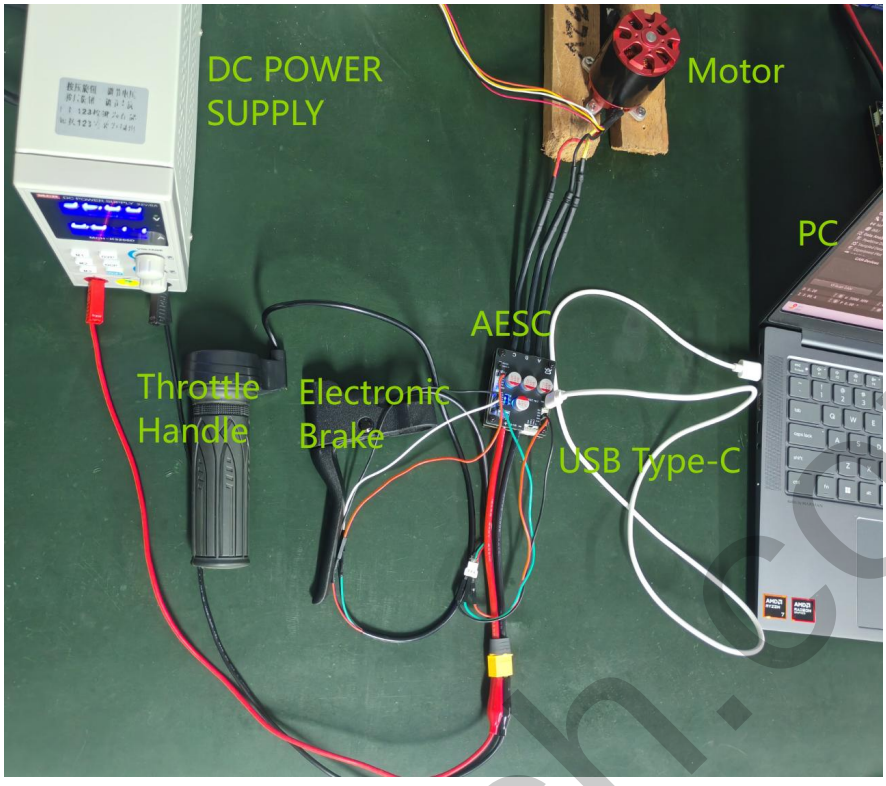

Figure 2: Hardware Connection Diagram

3.2. Hardware Connection

a. Power Off All Devices

• Before performing any connection operations, ensure all components are disconnected from power sources.

b. Connect Motor to AESC

• Connect the motor's three-phase wires (A, B, C) to the AESC's motor output terminals (A/B/C).

Note: The connection order of the motor phases does not affect functionality; incorrect rotation direction can be adjusted in VESC Tool.

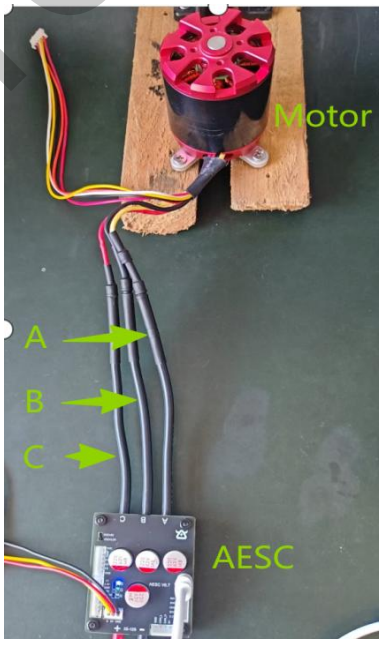

Figure 3: Motor Three-Phase Wires Connected to AESC

c. Connect AESC to Computer

- Connect to Computer: Use a USB Type-C cable to connect the AESC to the computer for configuration or firmware updates.
- After connection, you should see the AESC's power indicator light up normally.

d. Connect Throttle Handle and Electronic Brake to AESC

- Connect the throttle handle signal wire (usually green or white) to the AESC's ADC1 pin.
- Connect the electronic brake signal wire (usually green or white) to the AESC's ADC2 pin.
- Connect the shared GND wire (usually black) from the throttle handle and electronic brake to the AESC's GND pin.
- Connect the shared 3.3V power wire (usually red) from the throttle handle and electronic brake to the AESC's 3.3V pin.

Warning: The throttle handle and electronic brake power wires must only be connected to 3.3V.

e. Check Power Compatibility

Before connecting the power source, ensure your power source (battery) is compatible with your AESC device and motor:

- **Voltage Check:** Confirm that your battery's nominal voltage and fully charged voltage are within the input voltage range specified in the AESC user manual. Exceeding the maximum voltage will cause permanent damage to the controller.
- **Current Check:** Ensure your battery can supply sufficient continuous current to meet the operational demands of the motor and AESC. The battery's current output (in Amps) should be greater than the maximum current you plan to draw.
- **Motor Compatibility:** The power source must be capable of driving your specific motor at the required voltage and current.

f. Connect Power Source to AESC

Warning: Mind the polarity! Connect the positive terminal (+) of the power source to the AESC's positive (+) input, and the negative terminal (-) to the negative (-) input. Reverse connection will permanently damage the controller.

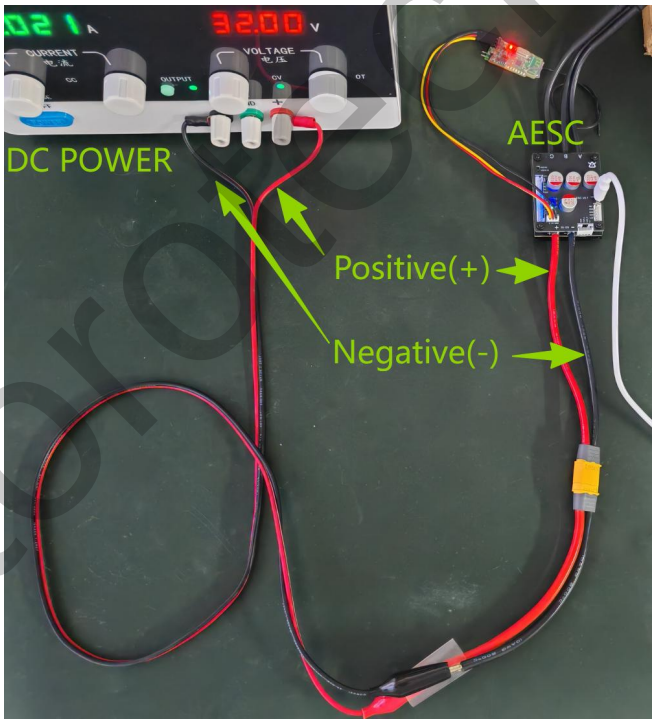

Figure 4: Power Supply Wiring

3.3.Final Connection Check

- **Visually recheck all connections:** Carefully verify the correctness and security of all connections, especially battery polarity.
- **Check wire security:** Ensure all cable connections are firm, with no looseness or potential short-circuit risks.

3.4.Power On

- After confirming all connections are correct, turn on the power supply to energize the AESC.

4. ADC Input Configuration

4.1.Connection

a. Devices found.

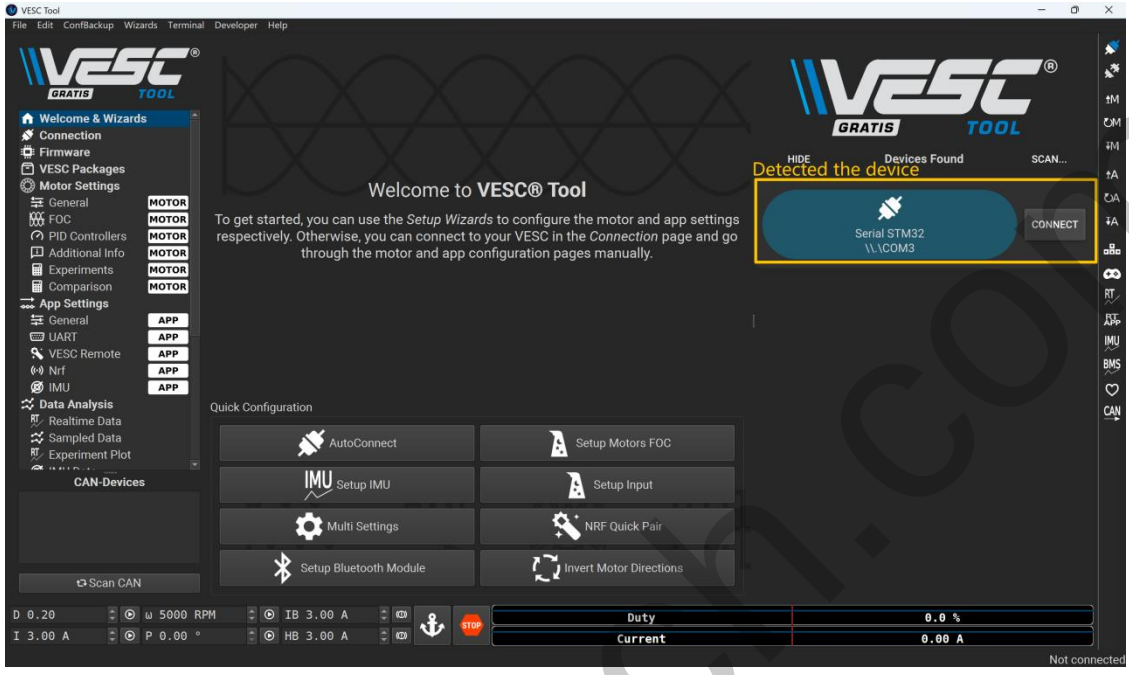

Figure 5: Detected the motor controller

b. Click "AutoConnect". A successful connection is indicated by the status "Connected (serial) to COM*" in the bottom-right corner.

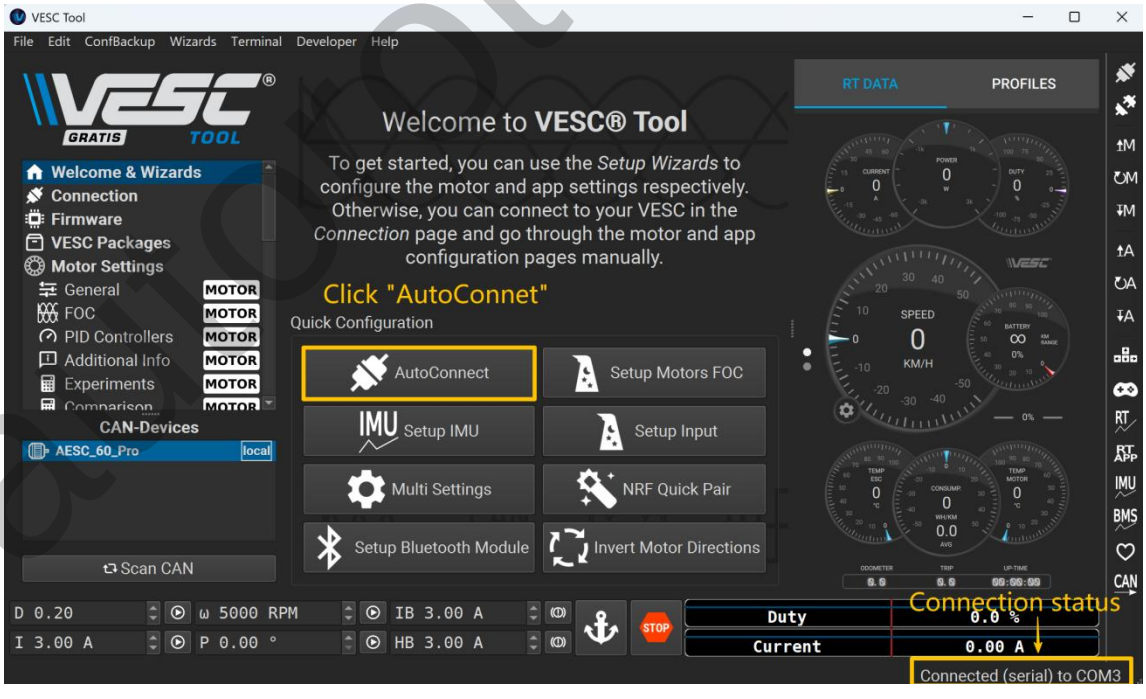

Figure 6: Connection status

4.2.Configure ADC Input

a. Click“Setup Input”.

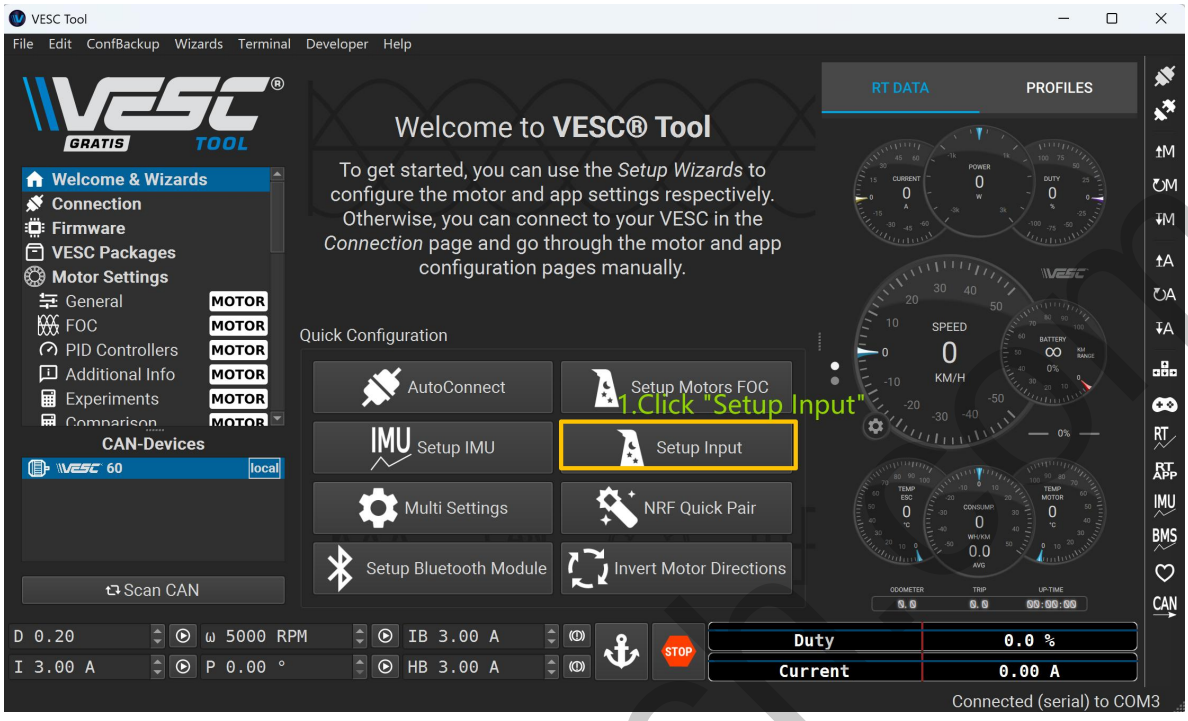

Figure 7: Click“Setup Input”

b. Click“Next”.

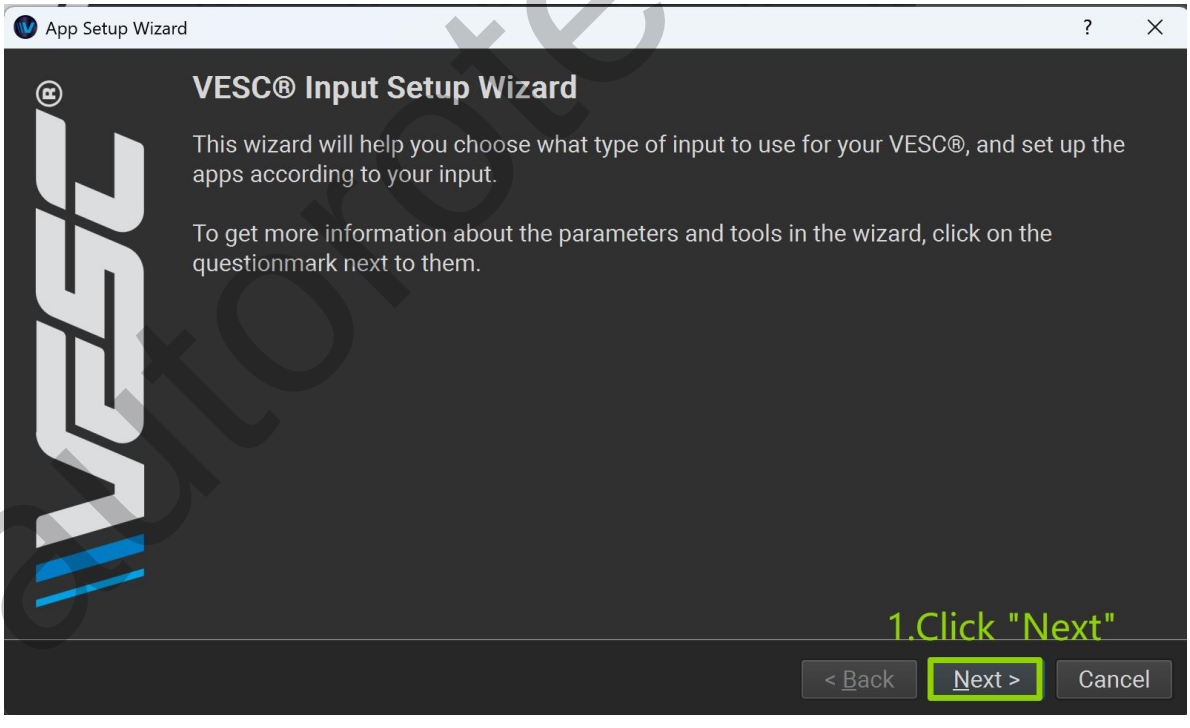

Figure 8: Click“Next”

c. Select "ADC", then click "Next".

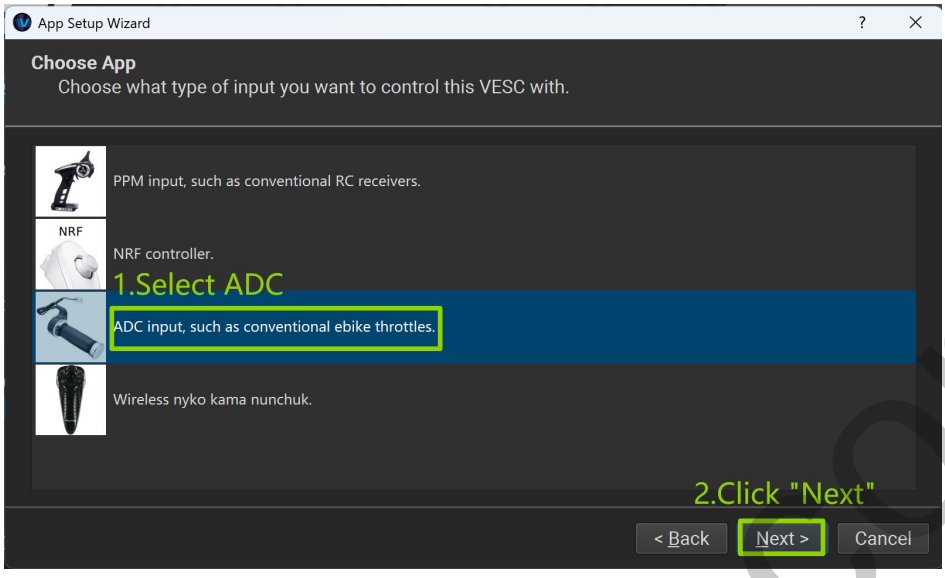

Figure 9: Select ADC Input

d. Two-Channel ADC Input Configuration (Alternatively, only configure ADC1 depending on the control method):

- Slowly rotate the throttle handle to its maximum position. The ADC1 signal progress bar should move to the right and stop after reaching its maximum value.
- Slowly squeeze the electronic brake. The ADC2 signal progress bar should move to the right and stop after reaching its maximum value.

Notes:

1. If the ADC1 signal progress bar does not respond when the throttle is fully rotated, check the connections of the throttle handle's power, GND, and signal wires.
2. If the ADC2 signal progress bar does not respond when the brake is squeezed, check the connections of the electronic brake's power, GND, and signal wires.
3. During initial calibration, it is normal if the progress bar value does not reach or slightly exceeds 100%.
4. If a sensor supporting bidirectional control (e.g., a center-returning potentiometer) is connected to the ADC1 interface and bidirectional speed control is required, check the "Use Centered Control" option in the configuration.

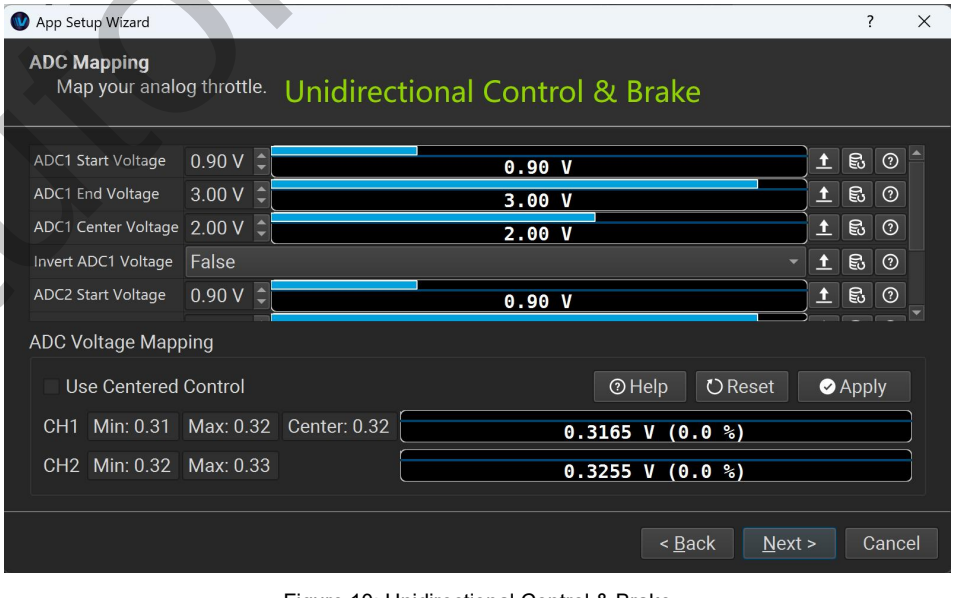

Figure 10: Unidirectional Control & Brake

e. Click "Apply" to save the current configuration.

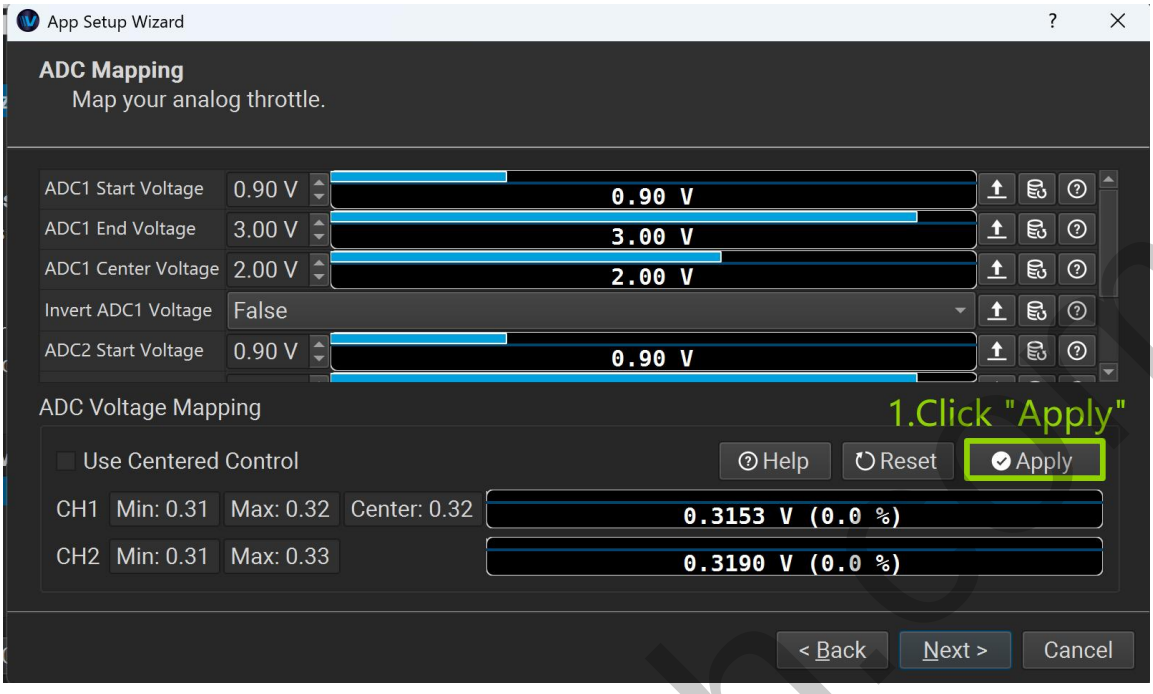

Figure 11: Click “Apply”

f. Verify the settings.

- Slowly rotate the throttle handle to its maximum position; the CH1 signal progress bar should move right and stabilize near 100%.
- Slowly squeeze the electronic brake; the CH2 signal progress bar should move right and stabilize near 100%.

Note: If the signal progress bar value deviates significantly when the control is at its maximum position, you can click "**Reset**" to reset parameters, click "**Apply**" to save, and then reconfigure your controller according to **step d.**

g. Click “Next”.

Figure 12: Click “Next”

h. Select the control type based on your control mode:

• **Current:** Current Control. Motor speed increases linearly with throttle input. The motor smoothly decelerates to a stop when the throttle returns to the minimum position.

• **Current Reverse Center:** Current Control. Bidirectional current control with a center point. Stop when the throttle is centered, forward when pushed forward, reverse when pulled backward.

• **Current Reverse Button:** Current Control. Bidirectional control with direction switched via a button.

• **Current No Reverse Brake Center:** Current Control. Bidirectional current control with a center point. Accelerate when pushed forward, brake when pulled backward.

• **Current No Reverse Brake Button:** Current Control. Accelerate when pushed forward. Emergency brake via a button.

•**Current No Reverse Brake ADC2:** Current Control. Accelerate when the throttle is pushed forward. ADC2 (electronic brake) controls the braking force.

• **Duty Cycle:** Duty Cycle Control. The throttle signal directly controls the power percentage output to the motor. Direct response, no reverse function.

• **Duty Cycle Reverse Center:** Duty Cycle Control. Bidirectional duty cycle control with a center point. Stop when centered, forward when pushed forward, reverse when pulled backward. Linear control, fast response.

• **Duty Cycle Reverse Button:** Duty Cycle Control. Bidirectional control with direction switched via a button.

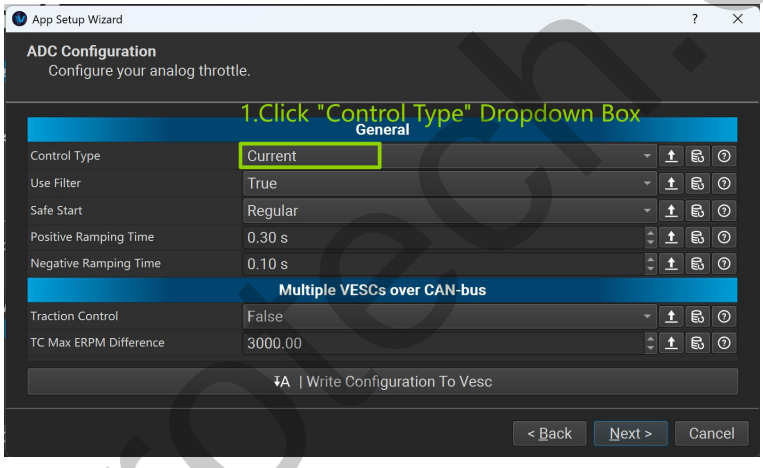

Figure 13: Click "Control Type" Dropdown Box

We choose “Current No Reverse Brake ADC2”.You can configure different types of controls according to your own needs.

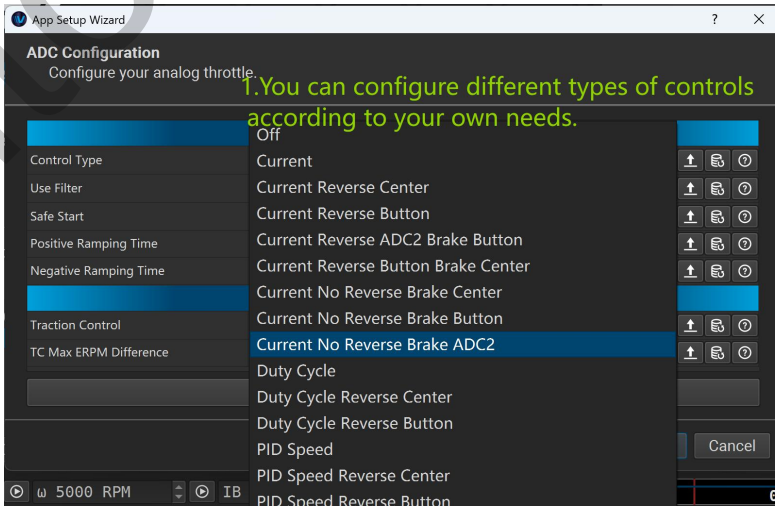

Figure 14: Select Control Type

i. Save the configuration to the controller, then click "Next".

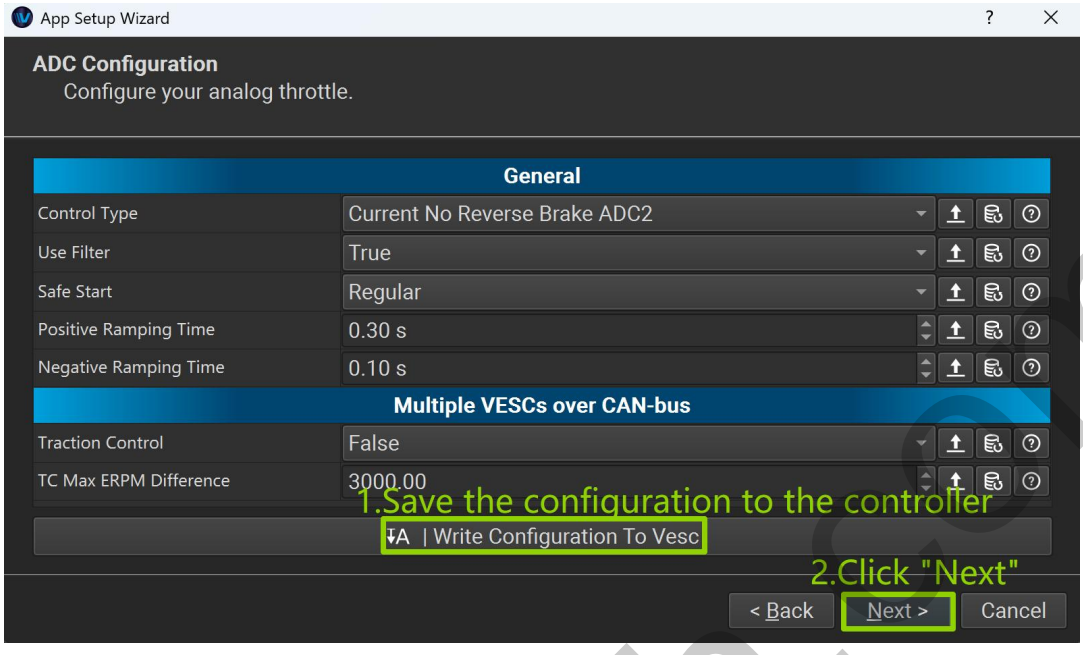

Figure 15: Save Configuration

j. Click "Finish" to complete the configuration.

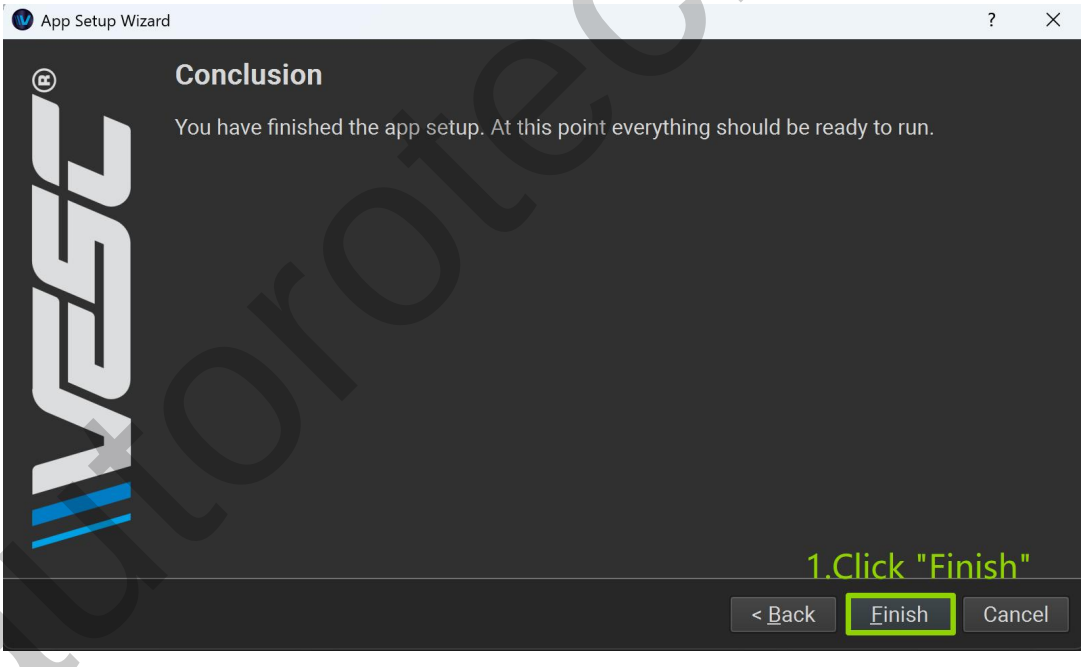

Figure 16: Finish Configuration

k. If you have previously run the FOC wizard to complete motor parameter detection, you can now control motor rotation and stopping via the throttle handle and electronic brake.

Note:

1. Always maintain smooth, gradual control of the throttle and brake during operation. Avoid sudden full-range acceleration or emergency braking to protect the motor, controller, drive system, and ensure personal safety.

5. Troubleshooting

5.1. Throttle No Response, Motor Does Not Rotatee

- **Possible Cause 1:** Throttle handle signal wire not connected correctly or poor contact.
- **Solution:** Check that the connections between the AESC's ADC1 port and the throttle handle's signal wire, power wire (3.3V), and ground wire (GND) are secure and reliable.
- **Possible Cause 2:** Throttle handle power supply abnormal or handle damaged.
- **Solution:** Use a multimeter to measure the voltage between the handle's VCC and GND; it should be 3.3V. If there is no voltage, check the AESC output. If there is voltage but no change during operation, the handle may be damaged.
- **Possible Cause 3:** ADC configuration error or not saved successfully.
- **Solution:** Repeat the configuration process according to this tutorial.
- **Possible Cause 4:** FOC setup wizard not run to complete motor parameter detection.
- **Solution:** Complete motor parameter detection by following the FOC configuration tutorial.

5.2. Electronic Brake Ineffective, Cannot Brake Motor

- **Possible Cause 1:** Brake signal wire connected incorrectly or poor contact.
- **Solution:** Check that the brake signal wire is correctly connected to the AESC's ADC2, and ensure the power (3.3V) and ground connections are normal.
- **Possible Cause 2:** Brake function not enabled or parameter settings incorrect.
- **Solution:** In VESC Tool's "**App Settings**" → "**ADC**" → "**General**" → "**Control Type**", set it to "**Current No Reverse Brake ADC2**" and save the configuration by clicking **“Write app configuration”。**

6. Contact & Support

For technical support,contact : Autoro.service@hotmail.com

Website : https://www.autorotech.com