ACCUDRIVE

Data Sheet

ACD-V04B120A

High-Performance Sensorless BLDC Motor Controller

FEATURES

- Sensorless BLDC Motor Controller/Driver
- 20V - 58V Supply Voltage Range (6 - 14S)
- 80A Rated Current
- 120A Peak Current (6 sec)
- PWM / CANBUS / Dshot Interfaces
- FOC / Six-Step Square Wave Drive Method
- Voltage, Current Protections
- 80mm x 40mm x 22mm
- User-Adjustable Throttle Calibration

APPLICATIONS

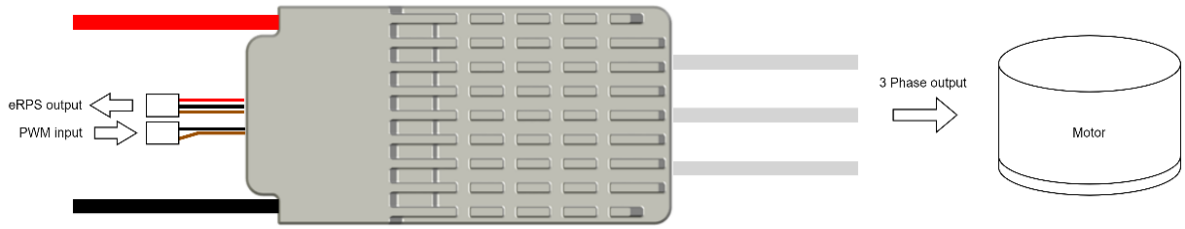
- **UAVs and Drones**
- **Industrial Automation**

GENERAL DESCRIPTION

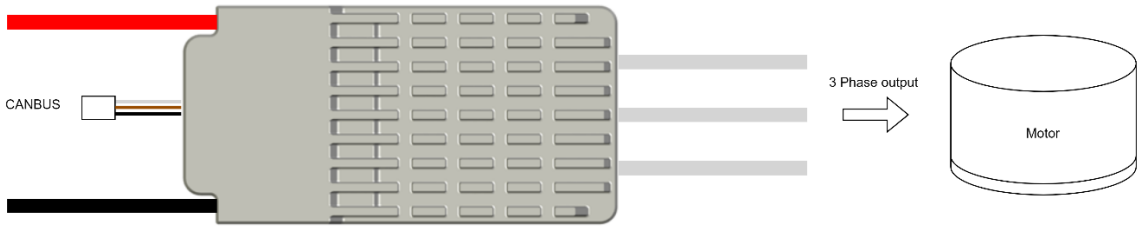
The **ACD-V04B120A** is a high-performance, sensorless BLDC motor controller designed for demanding UAV applications. It supports both Field-Oriented Control (FOC) for superior efficiency and Six-Step Square Wave Drive for simplified control, offering a flexible control strategy adaptable to different performance requirements. With robust protection mechanisms and advanced communication interfaces, it ensures reliable and customizable motor control under various operating conditions.

SIMPLIFIED APPLICATION DIAGRAM

PWM / Dshot Version



CAN Version



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REVISION HISTORY

03/13/2025 - Rev. 1.1: Adjusted buzzer notifications and throttle signal rules.

04/15/2025 - Rev. 1.2: Specification adjustment.

07/01/2025 - Rev. 1.3: Wiring specifications and calibration procedure updated.

SPECIFICATIONS

Hardware Specifications

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Input Voltage			20		58	V
Continuous Current (good heat dissipation)					80	A
Burst Current (good heat dissipation)		6 sec			120	A
Operating Temperature			-20		60	℃

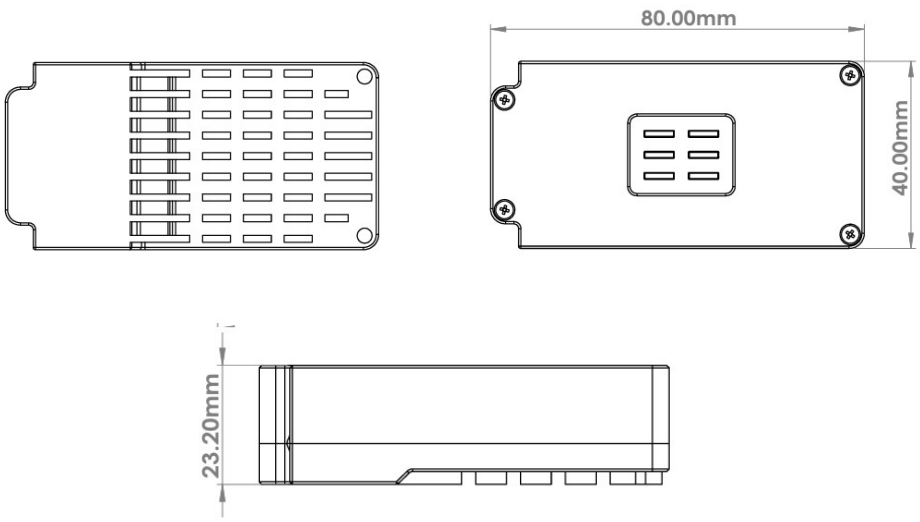
Communication Interfaces

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
PWM Voltage	Input	3.0	3.3	5.0	V
PWM Frequency	Input	50		400	Hz
Speed out	eRPS			3k	Hz
CANBUS	TBD				

Protection Mechanisms

Type	Description
Disconnection	Activates if PWM input signal is lost for more than 1 sec.
Overcurrent	Limits current within rated range to prevent circuit damage.
Overvoltage	Stops motor if input voltage exceeds normal range.
Stall	Automatically shuts down output to prevent damage.

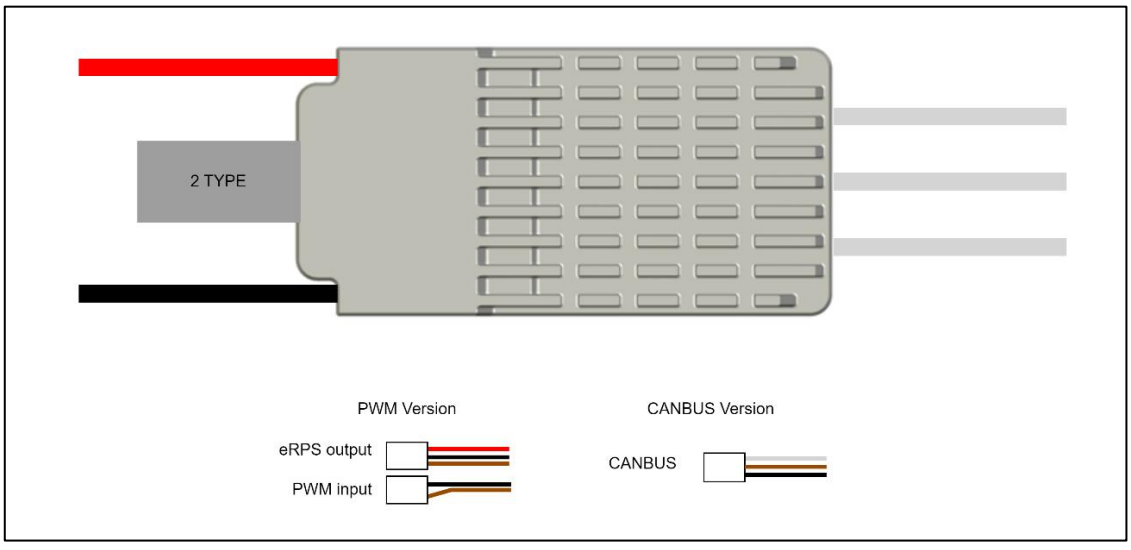
OUTLINE DIMENSIONS



The external dimensions of the **ACD-V04B120A** are illustrated in the following drawings. Typical dimensions are provided below for reference purposes.

PARAMETER	NAME	UNIT	REMARKS
Typical Length (L)	80.00	mm	
Typical Width (W)	40.00	mm	
Typical Height (H)	23.20	mm	Includes heat sink
Weight	82.0	g	Approximate value

PIN CONFIGURATIONS



Connector Types and Mating Connectors

Connector	Type
Power Supply	TBD
Motor Output	TBD
eRPS Output	3 Pin / 2.54mm Dupont Female Connector
PWM input	3 Pin / 2.54mm Dupont Female Connector
CANBUS	3 Pin / 2.54mm Dupont Female Connector

All **TBD** parameters or specifications are subject to customization and will be defined according to customer requirements. The power and motor wire order and specifications will follow the documentation as provided. However, the signal wire colors may vary depending on the delivery batch, and a corresponding color reference sheet will be included accordingly.

Power-Supply

WIRE	NAME	DESCRIPTION	TYPE
RED	B+	Main Supply Input / 12 AWG	IN
BLACK	GND	Common-Supply GND / 12 AWG	

Motor output

WIRE	NAME	DESCRIPTION	TYPE
1	A	Motor Connection / 14AWG	OUT
2	B	Motor Connection / 14AWG	OUT
3	C	Motor Connection / 14AWG	OUT

eRPS Output Connector

PIN	NAME	DESCRIPTION	TYPE
RED	Vcc	+5V	
BLACK	GND		
BROWN	Signal		OUT

PWM / Dshot input Connector

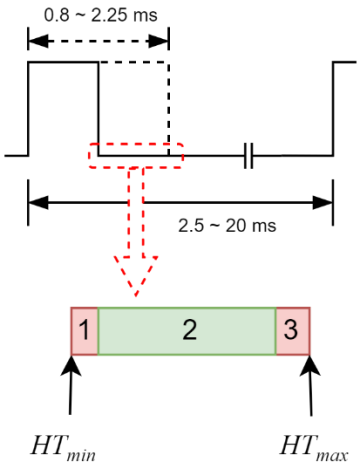
PIN	NAME	DESCRIPTION	TYPE
BLACK	GND		
-	-	-	-
BROWN	+Signal		IN

CANBUS Connector

PIN	NAME	DESCRIPTION	TYPE
WHITE	CAN-H		
BROWN	CAN-L		
BLACK	GND		

CONTROL COMMANDS (PWM Input)

The allowable pulse width for the input command is 0.8 – 2.25 ms, and the signal period ranges from 2.5 - 20 ms.



$$\boldsymbol{H_{Range}} = HT_{max} - HT_{min}$$

$$Block\ 1 = (\boldsymbol{H_{Range}} * 0.05) - HT_{min}$$

$$Block\ 2 = (\boldsymbol{H_{Range}} * 0.9) - (\boldsymbol{H_{Range}} * 0.05)$$

$$Block\ 3 = H_{max} - (\boldsymbol{H_{Range}} * 0.9)$$

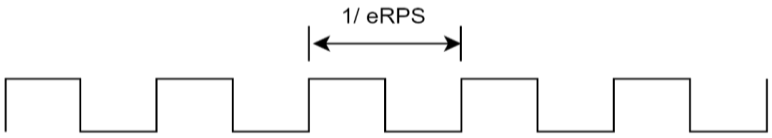
The PWM input controls motor startup and speed regulation:

Block	Command	Description
1	Stop	Motor stops rotating
2	Throttle Control	
3	Maximum Throttle	Highest speed
others	Stop	Motor stops rotating

The actual duty cycle will be scaled proportionally between the calibrated throttle limits, reserving a 5% buffer at the lower end and a 10% buffer at the upper end.

SPEED MONITORING (Speed Output)

The speed is monitored by *eRPS. A high voltage signal is generated when the motor starts, and the signal frequency will vary according to the motor speed after startup.

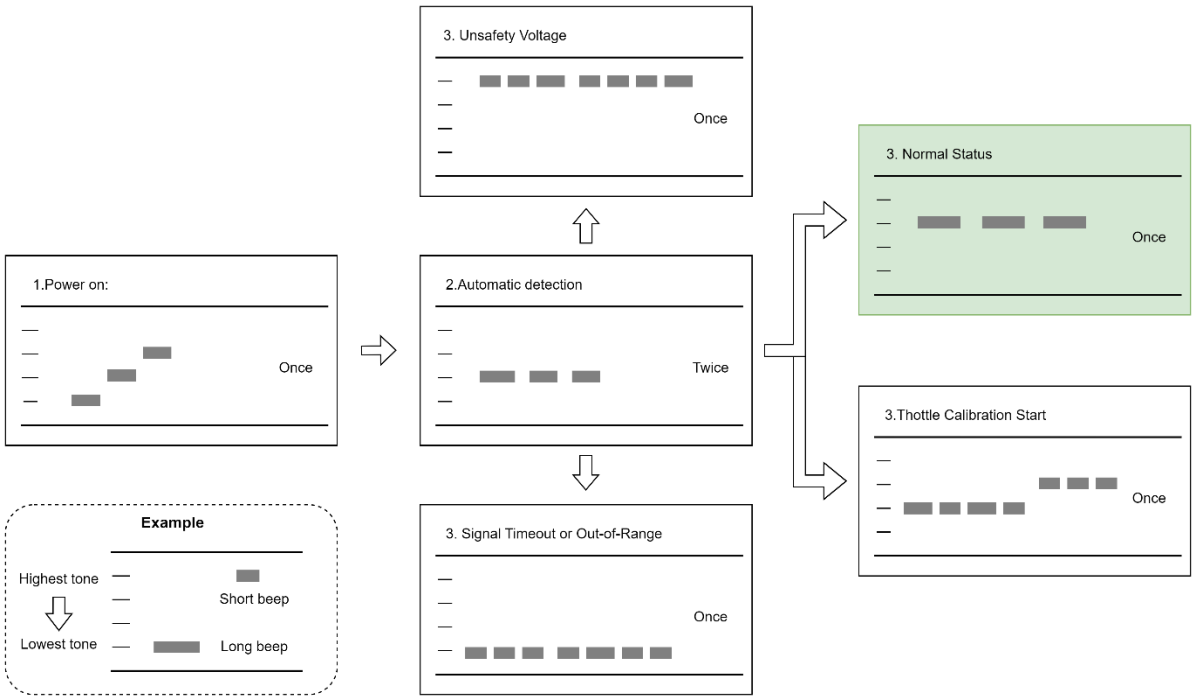


Speed Formula: $$RPM = \frac{eRPS * 60}{pole-pairs}$$

*eRPS : Electrical Revolutions Per Second

STARTUP SELF-CHECK

During power-up, the controller performs self-diagnostic tests and provides audio signals to indicate system status :



Description

This diagram illustrates the beeping patterns of an **ACD-V04B120A** during power-up and operation. By recognizing different beep sequences, users can determine the current ESC status, including power initialization, automatic detection, undervoltage warning, normal operation, throttle signal loss, and throttle calibration mode.

Flow Description:

1. Power-On Sequence

When the **ACD-V04B120A** is powered on, it emits a series of ascending beeps, indicating a successful startup and transition into system detection mode.

2. System Detection

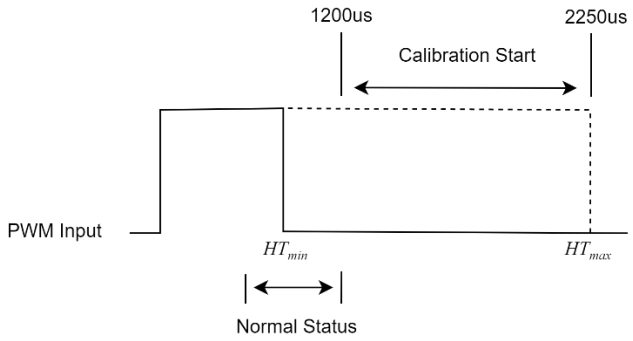
- **Automatic Detection:**
  If the voltage is within the normal range, the **ACD-V04B120A** proceeds with automatic detection to verify motor and receiver connections.

3. Operating Status

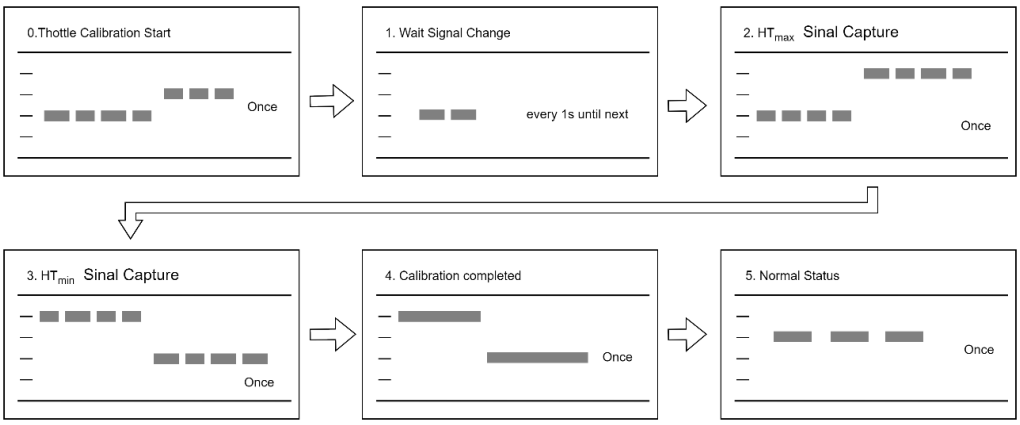
- **Unsafety Voltage:**
  If the input voltage is **below or above** the safe threshold, the ACD-V04B120A emits continuous beeping sounds as a warning and will not enter normal operation mode.
- **Normal Operation:**
  After all system checks pass, the **ACD-V04B120A** emits a specific beep sequence to indicate that it is ready for normal operation and motor control.
- **Signal Timeout or Out-of-Range:**
  If the **ACD-V04B120A** detects that the throttle signal from the receiver is lost or if the signal period exceeds 20ms, it will generate a continuous buzzer alarm to alert the user to check the remote control signal or connection status.
- **Throttle Calibration Mode:**
  If the **ACD-V04B120A** enters throttle calibration mode, it will emit a specific beep pattern to guide the user through the calibration process.

THROTTLE CALIBRATION PROCEDURE

To ensure optimal performance of the **ACD-V04B120A** motor controller, please follow the steps below for throttle range calibration.



The diagram illustrates the method for entering **calibration mode**. After power-on, the controller enters the **Automatic Detection** state, where it monitors the input signal. If the detected throttle signal remains within the **" Calibration Start"** region in the diagram for at least **2 seconds**, the system will enter calibration mode.



1. Wait Signal Change

After entering the calibration mode, the system waits for the user to change the throttle signal. The controller monitors the input at 1-second intervals until a valid signal transition is detected.

- **User Action Required:** Gradually increase the throttle signal to the desired maximum value ($\boldsymbol{HT_{max}}$).
- **Fail-Safe Mechanism:** If no change is detected within a certain timeout period, the calibration process may be aborted.

2. HT_{max} Signal Capture

The system detects and records the maximum throttle position. This value (HT_max) will be used as the upper limit of the throttle range.

- **User Action Required:** Ensure the throttle is set at the intended maximum position before this step.
- **System Behavior:** Once HT_{max} is recorded, the system proceeds to the next step.

3. HT_{min} Signal Capture

After capturing HT_{max}, the system prompts the user to return the throttle to its minimum position (HT_{min}). This ensures the full range of throttle movement is calibrated.

- **User Action Required:** Move the throttle back to its lowest position.
- **System Behavior:** The **ACD-V04B120A** captures the lowest throttle value and confirms the valid range.

4. Calibration Completed

The system confirms that both HT_{max} and HT_{min} have been successfully recorded. The calibration data is stored in the controller's memory.

- **System Output:** A confirmation beep sequence is played to notify the user.
- **Next Step:** The system automatically transitions to normal operation.

5. Normal Status

After a successful calibration, the **ACD-V04B120A** enters Normal Status, and the throttle control now operates within the newly calibrated range. The system is now ready for standard operation.

- **System Behavior:** The **ACD-V04B120A** will recognize throttle signals within the calibrated range and respond accordingly.
- **User Action:** A power cycle (reconnecting power) is required after calibration. Once powered on again, no additional action is needed; the system is now operational.

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