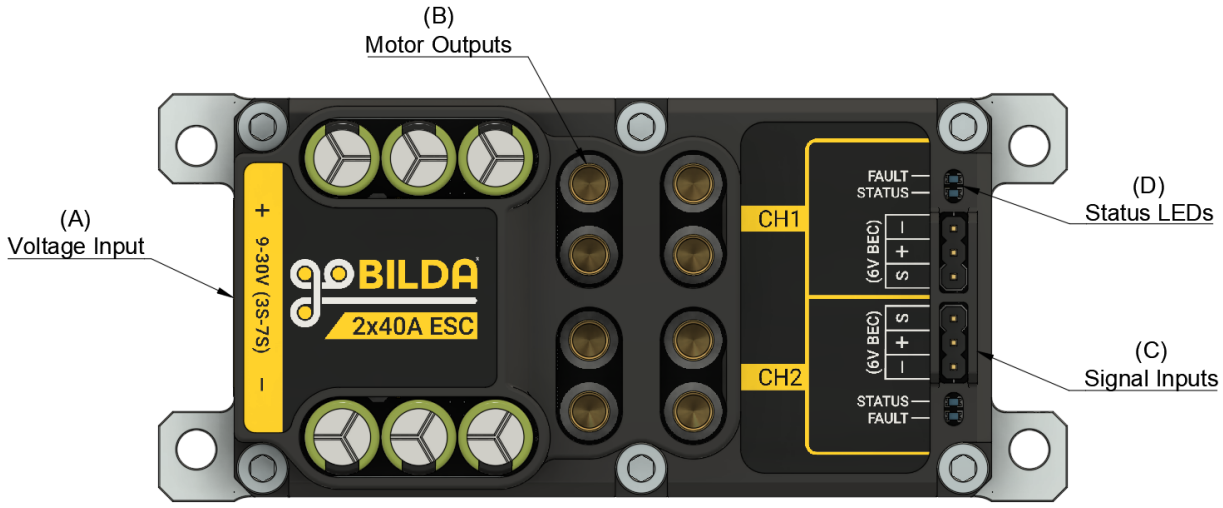
2x40A Motor Controller

SKU: 3105-0201-0040 V1.0

The 2x40A Motor Controller is a two channel bi-directional **E**lectronic **S**peed **C**ontroller (ESC). It has a voltage input of 9 to 30V and is rated for 40A continuous output current on each channel. Each of these motor channels has two pairs of 3.5mm bullets, making it easy to connect two motors on a single channel. Its two signal inputs, one for each motor channel, read the RC PWM signal from any receiver. Its 6.2V, 6A **B**attery **E**limination **C**ircuit (BEC) is accessible on both TJC8 signal input ports. Each channel has a **STATUS** LED, a **FAULT** LED and 4 protection features.



(A) Voltage Input: The ESC requires a DC input voltage between 9 and 30V. Choose a voltage that is appropriate for the motors you plan to use with the controller. The power input port is an XT90 connector that supplies power to both channels. This power input is reverse-polarity protected up to -30V.

(B) Motor Outputs: Each channel has four 3.5mm bullet connectors to easily plug in up to two motors to each channel. If two motors are plugged into one channel, they will operate in unison with one another. The bullet connectors protrude through slots of the top case. Make sure both wires of a given motor are plugged into bullets within a single slot. Your motor is likely to have a positive (+) wire and a negative (-) wire. Don't worry about which bullet connector they go to, as a DC motor is bidirectional, and will run regardless of how you plug it in. Regardless of the number of motors you connect to a single channel, **it's imperative that the total current does not exceed 40A.**

(C) Signal Inputs: Each channel has its own signal input to control speed and direction. This signal must come from a hobby servo controller such as a transmitter and receiver, or a device that can generate such a signal. The signal required is a 50hz digital pulse that has a high (3.3-5V) time of between 500µs - 2500µs. 1500µs is the center where no power is applied to the output. A signal greater than 1500µs will move the motor in one direction, and a signal less than

1500µs will move the motor in the opposite direction. The range can be broken down as shown below:

Dead Zone (1490-1510µs): The dead zone prevents a motor from moving while the PWM input is near the middle of the range (1500µs). When the input is within this region, there is no power applied to the channel output.

Arm Zone (1400-1600µs): The PWM input signal must be within the arm zone for 1 second to enable the channel output (or “arm” the channel). This prevents the motors from starting up and moving quickly when a PWM signal is first applied.

Variable Power Zone (1050-1950µs): When the channel is armed and the PWM input signal moves farther from 1500µs in either direction, the power zone of the output increases until maximum power zone is reached at 1050µs and 1950µs.

Maximum Power Zone (500-1050µs and 1950-2500µs): When the channel is armed and the input signal is within one of these ranges, the maximum power zone is applied to the channel output. Any signal less than 500µs or greater than 2500µs is invalid and will result in the channel output being disabled until the signal re-enters the arm zone.

(D) Status LEDs The status LEDs are used in conjunction with motor beeps to indicate the state of each channel. A pair of LEDs consisting of a STATUS LED (blue) and FAULT LED (red) corresponds to each channel. The table on the next page shows their possible states and how they are displayed.

State	STATUS LED (Blue)	FAULT LED (Red)	Beeping	Comments
Startup	Flashes quickly	Flashes quickly	Beeps 2 times	When ESC is first powered on
No signal or invalid signal (outside 500 to 2500µs)	OFF	ON		
Received signal within arm zone and output is now armed (1400 to 1600µs)	ON	OFF	Beeps 4 times	Within 4 seconds of power being applied to the ESC
Is armed and has a valid input signal (500 to 2500µs)	ON	OFF		
Is getting a valid signal (500 to 2500µs) but is not armed and not within Arm Zone	Blinks Slowly	OFF	Beeps slowly with status blink	
Temperature Protection	Continues to indicate status	Blinks 2 times while protection is active		Lowest blinking priority
Soft Current Protection	Continues to indicate status	Blinks 3 times while protection is active		2nd highest blinking priority
Hard Current Protection	OFF	Blinks 4 times continuously		Both outputs are unarmed. Highest blinking priority

Protection Features: The ESC has 4 protection features to prevent damage to the controller as described below.

Temperature Protection:
Temperature protection is activated when the board temperature exceeds 110°C. When this protection is active, the duty cycle of the channel corresponding to the high temperature is reduced until the temperature returns to an acceptable level.

Soft Current Protection: Soft current protection is activated when a 50A load or greater is detected. This protection works independently for each channel. When this protection is active, the corresponding output duty cycle is reduced until the current returns to an acceptable level. This protection uses a control algorithm to estimate the best duty cycle to deliver 50A to the motors. This feature is not intended to be relied on for regular operation. If a soft limit is regularly activated, the lifespan and performance of the controller may be reduced. This feature will not instantaneously adjust the output or protect against huge current bursts.

Hard Current Protection: Hard current protection is activated when a current spike of 250A or greater is detected on either channel. When this protective feature is activated, both channel outputs are disabled and disarmed. The controller must be restarted before it can be used again. This feature is intended to detect short-circuit events and prevent damage when the controller is improperly wired or an excessive load is applied. If a hard current event is detected, please inspect your load and wiring before proceeding.

Reverse Voltage Protection: The input voltage port (XT90) is keyed to prevent reverse voltage wiring. However, if the port experiences a reverse voltage event, the controller is protected up to -30V.

NOTE: The ESC will continue to function while a soft current or temperature protection feature is active. However, it is not recommended to continue in either of these states for an extended period of time. The 'Status LEDs' section explains how to determine when these protective states are active.

6A BEC: The onboard **B**attery **E**limination **C**ircuit (BEC) is a switching buck regulator that steps down the input voltage to 6.2V, which is accessed by the row pins used for signal input. It can provide 6A of continuous current to run servos and additional electronics off of your receiver or servo controller without requiring a separate battery. It can burst up to 7.5A as temperature and voltage allow. To prevent damage, there are temperature, soft-current, and hard-current protections that apply to the 6A BEC.
Note: The 6A BEC is also used for controller logic. If a protection feature is active, the motor channels will disarm until the fault is cleared.

Mounting: Mounting the ESC to channel or other heat-dissipating components is recommended. When running at peak power for long periods of time, the controller may get very warm. Attaching it to a heat-dissipating object will prevent over-temperature faults and extend the life of the controller. An example of heat-reducing mounting is shown here with a length of 1120 Series U-Channel.