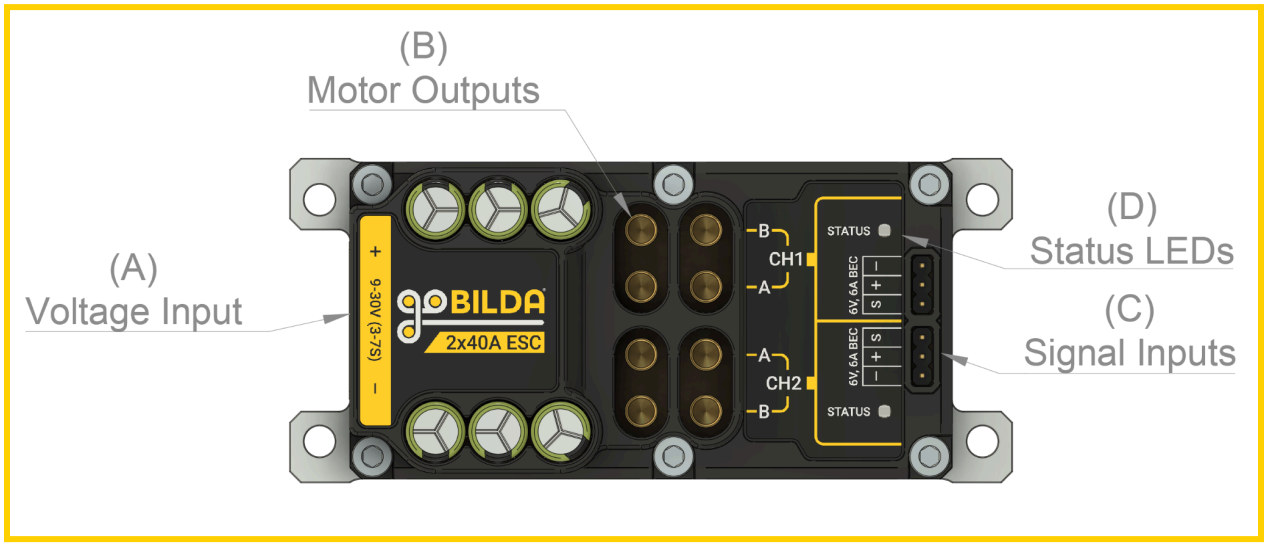
2x40A Motor Controller

SKU: 3105-0201-0040 REV1

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 single **RGB STATUS LED** and 3 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 is recommended to not exceed 40A continuously.

(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 490µs - 2510µs. 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 10 valid pulses (200ms) 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 (1100-1900µs): 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 (490-1100µs and 1900-2510µs): 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 490µs or greater than 2510µs is invalid and will result in the channel output being disabled until the signal re-enters the arm zone.

(D) RGB Status LEDs The status LEDs are used in conjunction with motor beeps to indicate the state of each channel. The table on the next page shows their possible states and how they are displayed.

State	LED Color	LED Behavior	Beeping	Comments
Boot	X	X	Single Beep	
No signal or invalid signal (outside 490 to 2510µs)	Yellow	Continuous Blink	X	
Received signal within arm zone and output is now armed (1400 to 1600µs)	Green	Solid	2 Beeps on armed channel	
Is armed and has a valid input signal (490 to 2510µs)	Green	Solid	X	
Is getting a valid signal (490 to 2510µs) and not within Arm Zone	Yellow	Continuous Blink	X	
Temperature Warning	Yellow	2 Blinks every 4 seconds	X	Lower blinking priority
Temperature Fault	Red	2 Blinks every 4 seconds	X	Highest blink priority, and that channel output is disabled until power cycling
Current Warning	Yellow	3 Blinks every 4 seconds	X	Higher blinking priority

Protection Features: The ESC has 3 main protection features to prevent damage to the controller as described below.

Temperature Protection:
Temperature protection is activated when the board temperature exceeds 100°C. When this protection is active, the max duty cycle of the channel is reduced proportionally to the temperature. For example, if the temperature is 110°C then the max dusty cycle is 50%. If the temperature ever is at or exceeds 120°C the motor controller will disable the output until a hard reboot has occurred.

Current Protection: Current protection is activated when an approximately 50A load or greater is detected. This protection works independently for each channel. A cycle by cycle current chop method is employed to ensure the max current through the motor controller does not exceed 50A. This means that any time the current exceeds 50A the output is turned low immediately and only goes high again on the next cycle. There are approximately 23,000 cycles per second so mechanically this feature is hard to notice however it can be audible to the human ear. This current setting is not adjustable and has a tolerance of -0% and +10%

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 to -30V.

NOTE: The ESC will continue to function while a 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. Extended amounts of time with these protection features active can reduce the overall lifespan of the device. 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, microcontrollers, or additional electronics without requiring a separate battery. It can burst up to 7.5A as temperature and voltage allow. To prevent damage, there are similar temperature, current protections that apply to the 6A BEC. **Note:** The 6A BEC is also used for controller logic. If a protection feature is active that disables the BEC, the motor controller will power off 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.