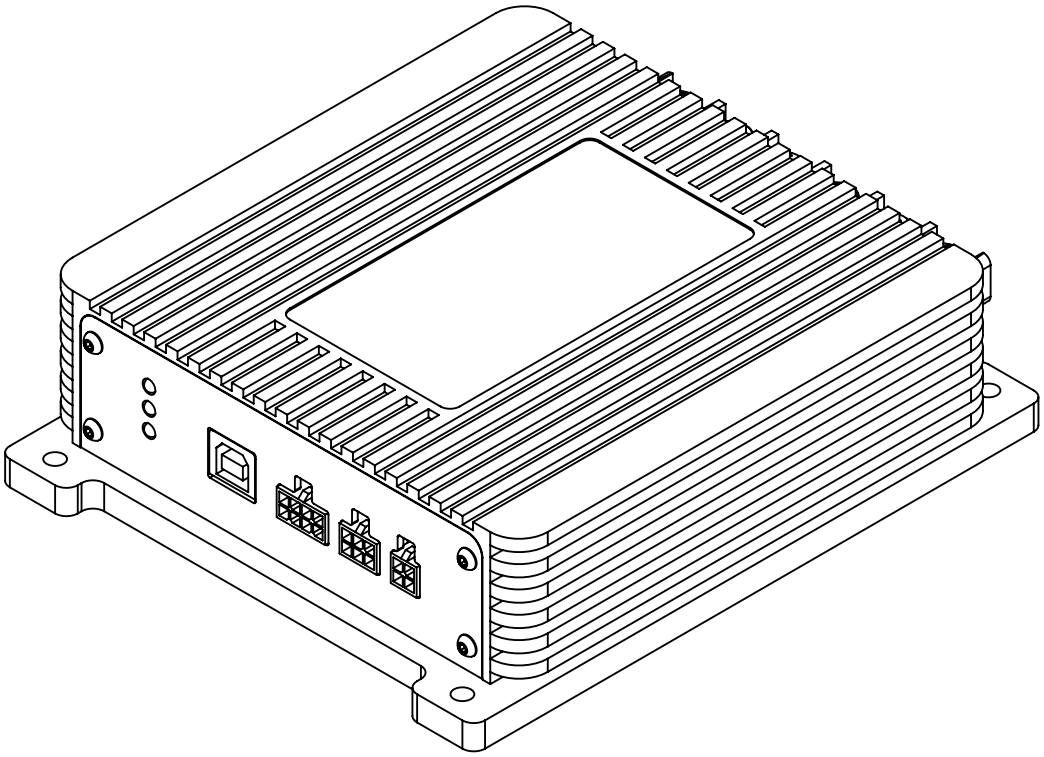
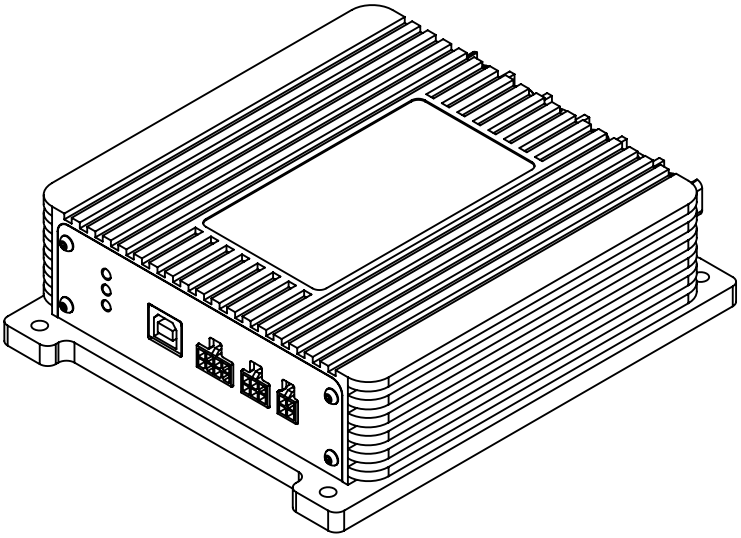
BASICMICRO
MOTION CONTROL



RoboClaw 2x200A, 60VDC Dual Channel
RoboClaw 2x300A, 60VDC Dual Channel
Brushed DC Motor Controllers

Data Sheet Version 3.1

Feature Overview:



- 200 / 300 Amps Continuous Per Channel
- Dual Quadrature Decoding
- 9.8 million PPS Decoding
- Multimode Interface
- TTL Serial
- USB Port
- Analog Interface
- R/C Input Control
- Limit, Home and E-Stops
- Up to 60VDC Operation
- 3.3v Compliant Control Outputs
- 5v Tolerant Control Inputs
- Programmable Current Limiting
- Programmable Voltage Clamping
- Closed and Open Loop Operation
- Auto Tuning PID Feature
- Mixed Control Modes
- Data Logging
- Diagnostic LEDs
- Field Firmware Updates
- Regulated 5VDC, 1A User Available Output
- Over Voltage and Under Voltage Protection
- 2 General Purpose 40V, 3Amp User Controlled Outputs
- Easy Tuning, Monitor and Setup with PC utility

Device Overview

The RoboClaw is an intelligent, high performance motor controller designed to control dual brushed DC motors. It can be controlled from USB, RC radio, PWM, TTL serial, analog and microcontrollers such as an Arduino or Raspberry Pi.

RoboClaw automatically supports 3.3V or 5V logic levels, travel limit switches, home switches, emergency stop switches, power supplies, braking systems and contactors. A built-in switching mode BEC supplies 5VDC at up to 3 Amps for powering user devices. In addition power supplies can be utilized by enabling the built in voltage clamping control feature.

A wide variety of feedback sensors are supported. This includes quadrature encoders, potentiometers and absolute encoders which can be easily configured using the available auto tune function. With sensors, two brushed DC motors can be controlled in closed loop mode allowing precise control over position and speed. With the ability to use potentiometers, servo systems can be created and controlled from any of RoboClaw's interface modes.

For greater control, built-in commands are available for controlling acceleration, deceleration, distance, speed, current sense, voltage limits and more. In addition, RC and analog modes can be configured by user defined settings to control acceleration and deceleration rates.

RoboClaw incorporates multiple protection features including temperature, current, over voltage and under voltage limits. The protection features are self monitoring and protect RoboClaw from damage in any operating condition. User definable settings such as maximum current limit, maximum and minimum battery voltages are provided for more refined control.

RoboClaw's regenerative capabilities will charge a supply battery during slow down or breaking. It's advance circuitry can change direction during full throttle without damage! RoboClaw also incorporates a LiPo cutoff mode to prevent battery damage.

Multimode Interface

RoboClaw's I/O are voltage protected and can handle up to 5VDC. The I/O only output a high of 3.3V. This allows RoboClaw to be interfaced to 5V or 3V logic easily with no translation circuits required. RoboClaw can be connected directly to a Raspberry Pi or Arduino. All of RoboClaw's inputs are internally pulled-up to prevent false triggers. Inputs can also be configured using the Motion Studio application.

Introduction

User Regulated Power Output

RoboClaw provides regulated power (BEC) for user devices. A high efficiency switching regulator supplies 5VDC at up to 1 Amp. This voltage can be used to power external sensors, encoders, MCUs and other electronics. The regulated user power is automatically current limited and thermally protected.

Main Battery

The peak operating input voltage is 60VDC. Do not exceed the model's maximum rated input voltage. Damage can occur if the maximum voltage is exceeded. Always account for the fully-charged voltage of your battery pack, not just the nominal rating.

RoboClaw is a regenerative motor controller. During braking or back-driving, regeneration can increase the supply voltage above the rated limit. This must be managed with proper system design.
Do not disconnect the battery's negative lead if any other ground-referenced connection is present, such as a USB cable.

Logic Battery

RoboClaw accepts a logic battery. The logic battery is also known as a backup battery. The user regulated power output (BEC) is by default powered from the main battery, unless a logic battery is detected. The logic battery source is coupled to the main battery through an on board automatic switch. If the main battery voltage drops below the logic battery input level, the logic circuit and user regulated power output will be drawn from the logic battery.

Cooling

RoboClaw will generate heat. The maximum current ratings can only be achieved and maintained with adequate heat dissipation. The motor controller should be mounted so that sufficient airflow is provided. Which will dissipate the heat away from the motor controller during operation. Some models of RoboClaw include a built-in automatic cooling fan controller, which can be used to help maintain continuous currents under extreme conditions.

Emergency Stop

The motor controller should be wired using an external contactor, relay or high amperage mechanical switch to control the main power input. A second power source should be used to power the logic section in situations where the main power will be under heavy load. Voltage drops can occur from constant full load or high speed direction changes. Voltage drop can cause logic brown outs if only a main battery is used without a logic battery.

USB

A dual ferrite-core USB cable is required. The USB port is intended for configuration and debugging. USB communication is not designed for electrically noisy environments, and the connection may drop during motor operation. If the USB link disconnects, it may not automatically recover. The USB cable may need to be unplugged and reconnected to restore communication. For operation in electrically noisy environments, TTL serial should be the preferred control method.

Software

RoboClaw can be easily configured using the Motion Studio software tool. The Windows based application enables users to quickly configure RoboClaw. The software can be used during run time to monitor and control several operational parameters. Motion studio is available from the Basicmicro.com website. It can also be found in the Downloads section of the Basicmicro website or listed under the Download tabs on the production page.

Firmware Updates

Firmware updates are released periodically to add features or fix issues. Before using RoboClaw for the first time, update to the latest firmware. Install Motion Studio and the USB driver; Motion Studio will check for available updates. RoboClaw must be externally powered during the update process, as it does not power from the USB cable.

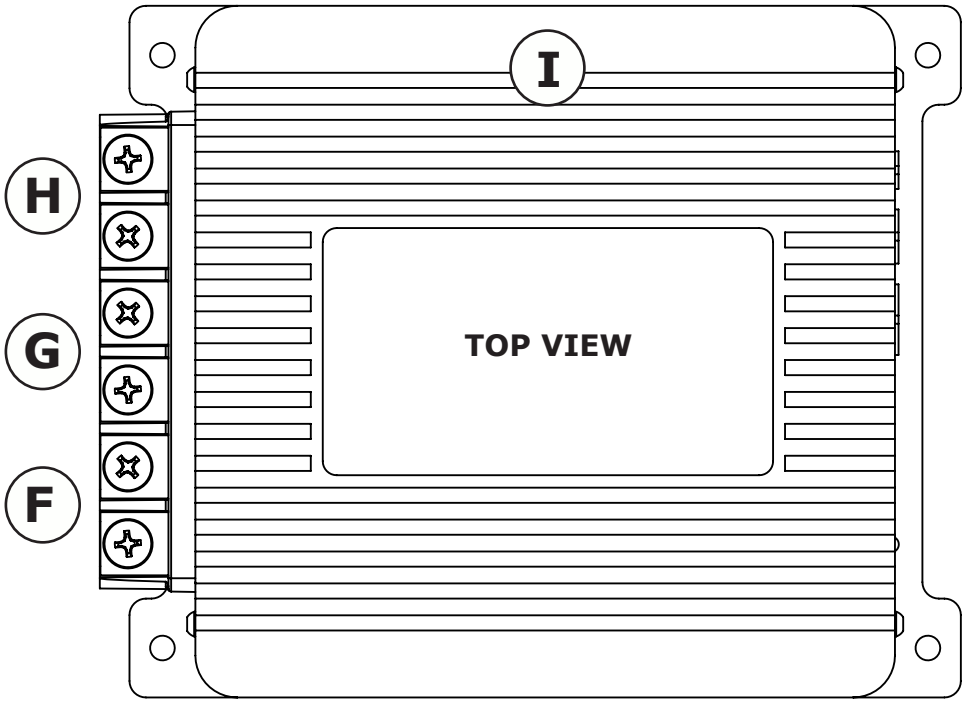
User Manual

This data sheet only covers model specific information and basic wiring. To properly setup and use RoboClaw refer to the RoboClaw User Manual available for download from http://www.basicmicro.com.

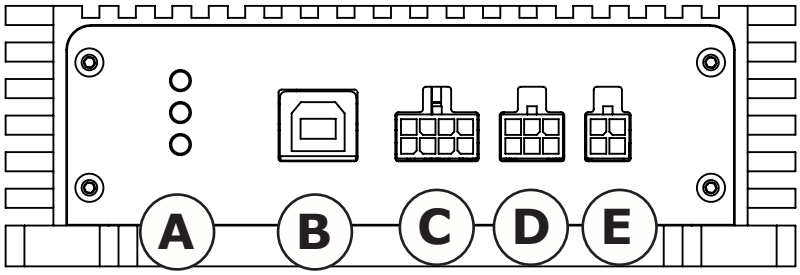
Software Libraries

Software libraries are available for controlling the RoboClaw with external harware such as a micrcontroller.
Libraries are available for Arduino (C++) , Raspberry Pi (Python) and C#. The libraries and example code can be downloaded at: https://www.basicmicro.com and https://resources.basicmicro.com/

Hardware Overview



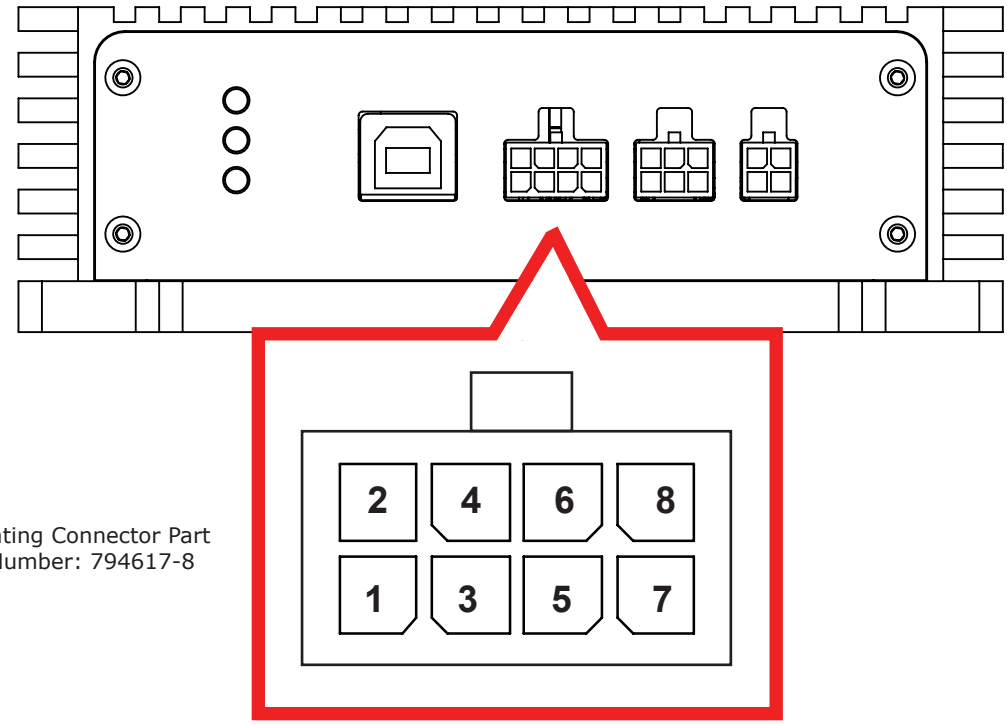
FRONT VIEW



ID	Function	DESCRIPTION
A	Status LEDs	Provides RoboClaw status information.
B	USB Port	Communicate with RoboClaw via USB.
C	Control Inputs	S1,S2,S3,S4 and S5 control inputs.
D	Encoder Inputs	Dual encoder input and power pins.
E	Digital Output	High current output pins. Control contactors or relays.
F	Motor Channel 1	Motor driver output screw terminals for channel 1.
G	Main Battery	Main battery screw terminal input.
H	Motor Channel 2	Motor driver output screw terminals for channel 2.
I	Heat Sink	Aircraft grade aluminum heat sinking case.

Control Interface (CTRL)

RoboClaw 2x200A and 2x300A use Molex-style female connectors. The following tables list the pins and their available functions. All pins are 5V tolerant and output 3.3V for compatibility with processors such as Raspberry Pi and Arduino. R/C pulse, analog and TTL signals can be generated from any microcontroller, and the R/C pulse inputs can also be driven by a standard R/C receiver. Some options are user-configurable depending on the control method selected. To configure RoboClaw, install Motion Studio and connect to the USB port.



Mating Connector Part Number: 794617-8

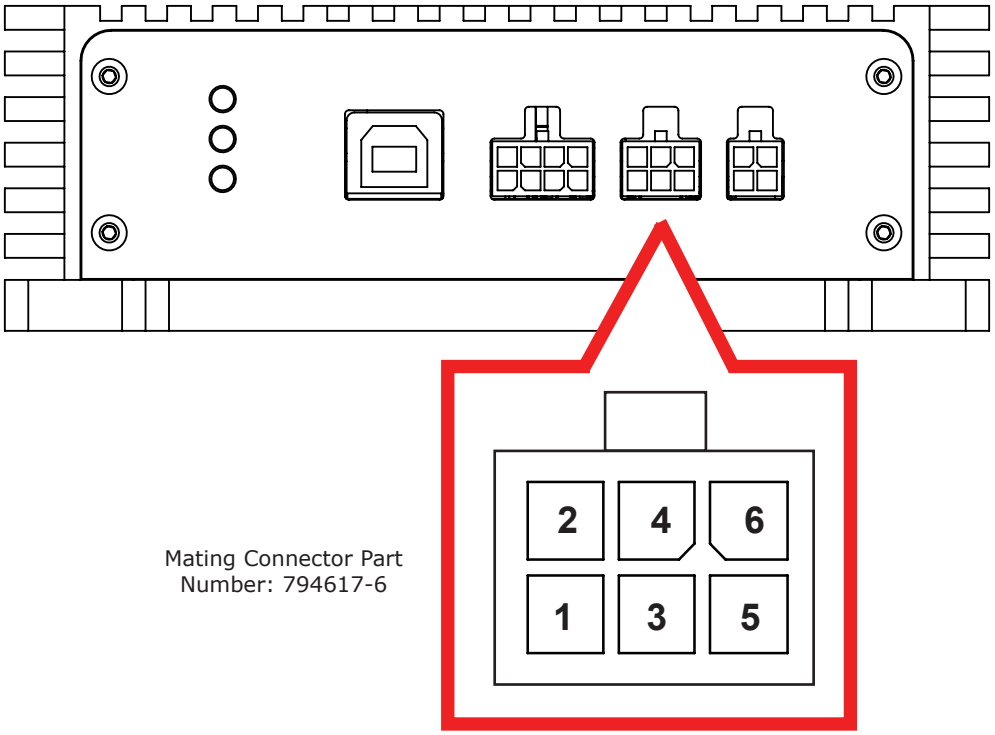
Pin	NAME	UART TTL	ANALOG	R/C PULSE	FLIP SWITCH	E-STOP	HOME	V-CLAMP
1	LB+							
2	S4					X(3)	Motor 1 (2)	X(1)
3	5V+							
4	S3				X(5)	X(3)		X(1)
5	GND							
6	S2	TX	X(4)	X(4)				
7	S5					X(3)	Motor 2 (2)	X(1)
8	S1	RX	X(4)	X(4)				

Notes:

1. Control external voltage clamp circuit. Redirect the regenerative function of RoboClaw.
2. Input can be used for home switch and automatic homing on power up.
3. Optional E-Stop input configuration. Pin state changes error will clear or board reset required.
4. Supports mixed control or individual control of motor channel.
5. Supports TTL or R/C signals

Encoders (ENC)

RoboClaw supports dual quadrature encoders with up to 9.8 million pulses per second. In addition, a wide range of sensor inputs including potentiometers and absolute encoders are supported. The encoder pins are not exclusive to supporting encoders and have several functions available. The encoder inputs were isolated on a separate connector for wiring convenience.



Mating Connector Part Number: 794617-6

Pin	NAME	ENCODER	ABSOLUTE
1	+5V		
2	GND		
3	ENC1A	Channel 1A(1)	Channel 1(1,2)
4	ENC2A	Channel 2A(1)	Channel 2(1,2)
5	ENC1B	Channel 1B(1)	
6	ENC2B	Channel 2B(1)	

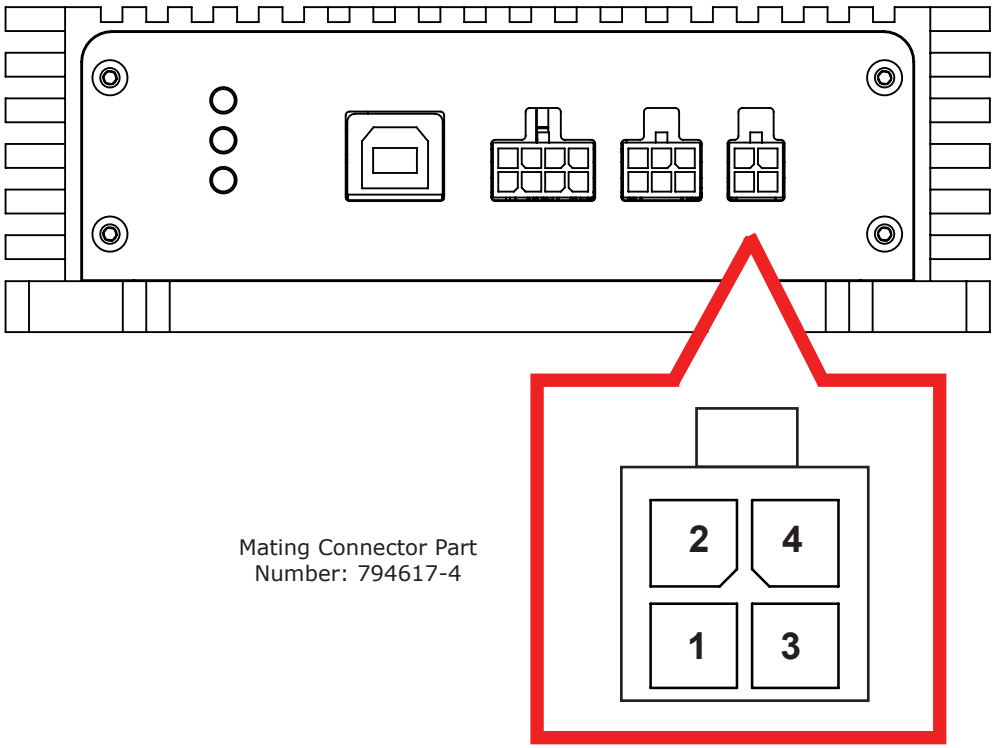
Notes:

1. Pins are 5V tolerant.
2. Absolute encoder pins are 0V to 2V analog reading range.

Digital Driver (DRV)

RoboClaw includes two general purpose 40V at 3Amp output I/O for controlling brakes, contactors and inductive devices. The DRV pins in combination with a simple circuit can be used to regulate the regenerative function of RoboClaw allowing use of DC power supplies. The DRV pin functions are defined using Motion Studio. They can also be setup using packet serial commands. See RoboClaw User Manual for examples.

When using CTRL1 or CTRL2 to drive inductive loads such as relays or solenoids, an external flyback diode across the load is required to prevent voltage spikes



Mating Connector Part Number: 794617-4

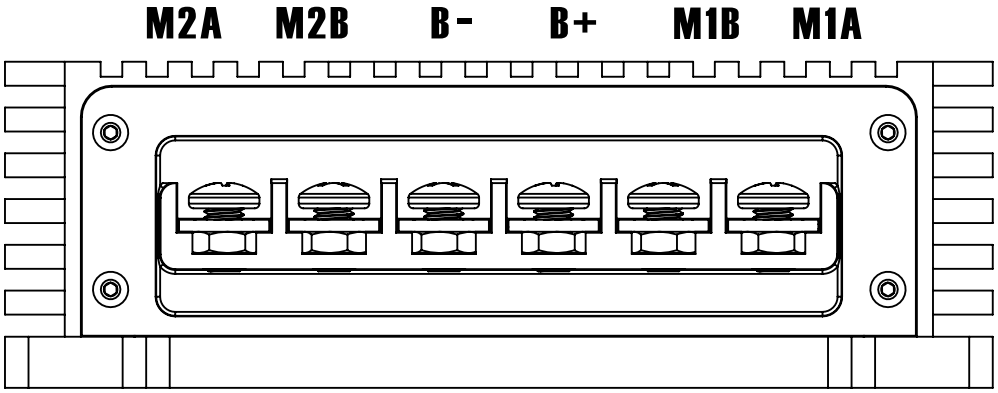
Pin	NAME	V-CLAMP	BRAKE	USER I/O
1	+5V			
2	CTRL1	X(1)	X(1)	X(1)
3	+5V			
4	CTRL2	X(1)	X(1)	X(1)

Notes:

1. CTRL pins can sink 3 Amps at up to 40V.

Motor and Battery Terminals

RoboClaw uses a customer screw terminal for the battery and motor connections. Each terminal is secured with an M5 screw and nut. Several compatible ring terminals exist, such as Digi-Key part A112030-ND, and many other suitable ring terminals or cable terminations may be used depending on wire size and installation requirements.



Pin	NAME	DESCRIPTION
M2A	Motor Channel 2A	Motor chanel output 2 side A
M2B	Motor Channel 2B	Motor chanel output 2 side B
B-	Main Battery Negative	Main battery input terminal. Negative from battery.
B+	Main Battery Positive	Main battery input terminal. Positive from battery.
M1B	Motor Channel 1B	Motor chanel output 1 side B
M1A	Motor Channel 1A	Motor chanel output 1 side A

Logic Battery (LB IN)

The logic circuit of RoboClaw can be powered from a secondary battery wired to LB IN. A logic battery will prevent brownouts when the main battery is low or under heavy load. The positive (+) terminal is located at the board edge and ground (-) is the inside pin closest to the heatsink.

Encoder Power (+ / -)

The pins labeled + and - are the source power pins for encoders. The positive (+) is located at the board edge and supplies +5VDC. The ground (-) pin is near the heatsink. On RoboClaws with screw terminals, power for the encoders can be supplied by the 5VDC and GND on the main screw terminal.

Encoder Inputs (1A / 1B / 2A / 2B)

The encoders inputs are labeled EN1 and EN2. EN1 is for encoder 1 and EN2 is for encoder 2 which also correspond to motor channel 1 and motor channel 2. Quadrature encoder inputs are typically labeled 1A, 1B, 2A and 2B. Channel A of both EN1 and EN2 are located at the board edge on the pin header. Channel B pins are located near the heatsink on the pin header. Quadrature encoders are directional. When connecting encoders make sure the leading channel for the direction of rotation is connected to A. If one encoder is backwards to the other you will have one internal counter counting up and the other counting down. Use Motion Studio to determine the encoders direction relative to the motors rotation. Encoder channels A and B can be swapped in software using Motion Studio to avoid re-wiring the encoder or motor.

Control Inputs (S1 / S2 / S3 / S4 /S5)

S1, S2, S3, S4 and S5 provide user I/O, +5V and GND through the onboard Molex-style connector. S1 and S2 are used for serial, analog and RC control inputs. S3 can be used as a flip switch input in RC or Analog modes. In Serial mode, S3, S4 and S5 can function as emergency stop inputs or as voltage clamp control outputs. When configured as E-Stop inputs, they are active when pulled low. All I/O lines include internal pull-ups to prevent accidental triggers when left floating. S4 and S5 may also be configured as home or limit switch inputs.

DOUT

The DOUT pins are designed to control inductive loads. They can be toggled on or off through user commands. DOUT sinks current to ground, which means the external device is powered from the battery or logic supply on its high side, and DOUT completes the circuit on the low side. This allows direct control of devices such as relay coils, solenoids, brake modules or contactors.

Because inductive loads produce a voltage spike when switched off, an external flyback diode must be installed across the coil or device being driven. If the inductive device draws more than the rated current of the DOUT output, an external transistor or driver circuit should be used.

Operational Requirements

Main Power

The main power connections are labeled "+" and "–". The "+" marks the positive input and the "–" marks the negative input. Do not reverse the main battery or it will damage the motor controller. Keep the main battery leads as short as possible. Do not disconnect the negative terminal if any other ground-referenced connections are present, such as a USB cable.

Do not reverse main battery wires or damage will occur.

Emergency Stop

The motor controller should be wired with an external contactor, relay or high-amperage mechanical switch on the main power input. This allows the system to remove power quickly in the event of a malfunction or runaway condition. The device used must be rated for the full battery voltage and current.

Safe Disconnect

Only the positive lead should be disconnected. Do not disconnect the negative lead if any other ground-referenced connections, such as USB or signal grounds, are still attached. Disconnecting only the positive lead ensures a safe power-down without creating unwanted return paths through other equipment.

Do not disconnect the battery negative wire if other ground sources are connected, such as USB cable. Damage will occur.

Contactors

When using a contactor a flyback diode should be installed across the contactor coil to suppress the voltage spike produced when the coil is switched off. In addition, a power diode rated for approximately 2 to 10 amps should be placed across contactor. This allows regenerative current to return to the battery even when the switch is open and prevents the supply voltage from rising to unsafe levels.

Backup Power

A second power source or logic battery (LB-IN) should be used to power the logic section in systems where the main battery will be under heavy load. Voltage drops can occur during continuous full-load operation or rapid direction changes. If the logic section is powered only from the main battery, these drops can cause logic brownouts.

Motor Screw Terminals

The motor screw terminals are marked with M1A / M1B for channel 1 and M2A / M2B for channel 2. For a typical differential drive robot, the wiring of one motor, should be reversed from the other. The motor and battery wires should be as short as possible.

Wire Length

Wire guage and length are important when designing a robot or motor control system. As wire length increases, so does inductance, which can create harmful voltage spikes. The wires between the controller, battery, and motors should be kept as short as possible and use the largest practical wire gauge.

Power Supplies

RoboClaw is a regenerative motor controller. When a motor brakes, slows or coasts, it generates energy. When using a power supply, the regenerative energy has nowhere to go. If it is not managed, the voltage can rise and damage the motor controller, the power supply or both. Regenerative energy can be handled in several ways. The two most common are adding a battery in parallel with the power supply, or clamping the excess energy and converting it to heat using a high-watt resistor. See VClamp at Basicmicro.com

Regenerative energy can result in damage to the motor controller if left unmanaged.

Current Reporting

External instruments such as digital multimeters and programmable power supplies typically measure and display RMS or time-averaged current over much longer integration periods (seconds). As a result, their displayed values may differ from the controller's reported current.

The motor controller measures phase current by taking samples during the PWM "on" interval. Each reading is averaged over roughly 50 milliseconds and represents the instantaneous current during that sample period. Minimal filtering is applied to maintain a fast response in the control loop.

Users may apply additional software filtering or averaging to sequential motor current readings, or rely on external instrumentation designed for long integration periods.

Motor Current vs Battery Current

Motor current will not be equal to battery current. When operating below 100% duty, the motor only receives a fraction of the battery voltage during each PWM cycle. To produce the same torque at a lower effective voltage, the motor draws a higher current. The battery supplies only the average current, while the motor sees short, higher current pulses. For example:

- 25% duty: Motor ~6V, about 4× battery current
- 50% duty: Motor ~12V, about 2× battery current
- 75% duty: Motor ~18V, about 1.3× battery current

ESD Sensitivity

RoboClaw utilizes a high-performance processor that can be susceptible to electrostatic discharge. The I/O and control signals are protected, but static can still be introduced into unprotected areas, such as the motor terminals, when wiring or handling the controller. Avoid handling the PCB unnecessarily and ensure any static charge is discharged before working with RoboClaw.

Static Sensitive Device. Handle with care!

Environmental Conditions

RoboClaw motor controllers are not rated for direct exposure to moisture, condensation, corrosive agents, or extreme ambient temperatures. It is the end user's responsibility to evaluate the expected operating conditions and provide appropriate protection such as enclosures, ventilation, or environmental controls when required. Proper mitigation will help ensure reliable long-term operation.

Multi Mode Interface

Control Modes

RoboClaw has 4 main functional control modes explained below. Each mode has several configuration options. The modes can be configured using Motion Studio or the built-in buttons. Refer to the RoboClaw User Manual for installation and setup instructions.

RC

Using RC mode RoboClaw can be controlled from any hobby RC radio system. RC input mode also allows low powered microcontrollers such as a Basic Stamp to control RoboClaw. Servo pulse inputs are used to control the direction and speed. Very similar to how a regular servo is controlled. Encoders are supported in RC mode, refer to the RoboClaw user manual for setup instructions.

Analog

Analog mode uses an analog signal from 0V to 2V to control the speed and direction of each motor. RoboClaw can be controlled using a potentiometer or filtered PWM from a microcontroller. Analog mode is ideal for interfacing RoboClaw with joystick positioning systems or other non microcontroller interfacing hardware. Encoders are supported in Analog mode, refer to the RoboClaw user manual for setup instructions.

Simple Serial

In simple serial mode RoboClaw expects TTL level RS-232 serial data to control direction and speed of each motor. Simple serial is typically used to control RoboClaw from a microcontroller or PC. If using a PC, a MAX232 or an equivalent level converter circuit must be used since RoboClaw only works with TTL level inputs. Simple serial includes a slave select mode which allows multiple RoboClaws to be controlled from a signal RS-232 port (PC or microcontroller). Simple serial is a one way format, RoboClaw can only receive data. Encoders are not supported in Simple Serial mode.

Packet Serial

In packet serial mode RoboClaw expects TTL level RS-232 serial data to control direction and speed of each motor. Packet serial is typically used to control RoboClaw from a microcontroller or PC. If using a PC a MAX232 or an equivalent level converter circuit must be used since RoboClaw only works with TTL level input. In packet serial mode each RoboClaw is assigned a unique address. There are 8 addresses available. This means up to 8 RoboClaws can be on the same serial port. Encoders are supported in Packet Serial mode, refer to the RoboClaw user manual for setup instructions.

USB Control

USB can be used in any mode. When RoboClaw is in packet serial mode and another device, such as an Arduino, is connected commands from the USB and Arduino will be executed and can potentially override one another. However if RoboClaw is not in packet serial mode, motor movement commands will be overridden by Analog or RC pulse input. USB packet serial commands can then only be used to read status information and set configuration settings.

Motor Controller Wiring

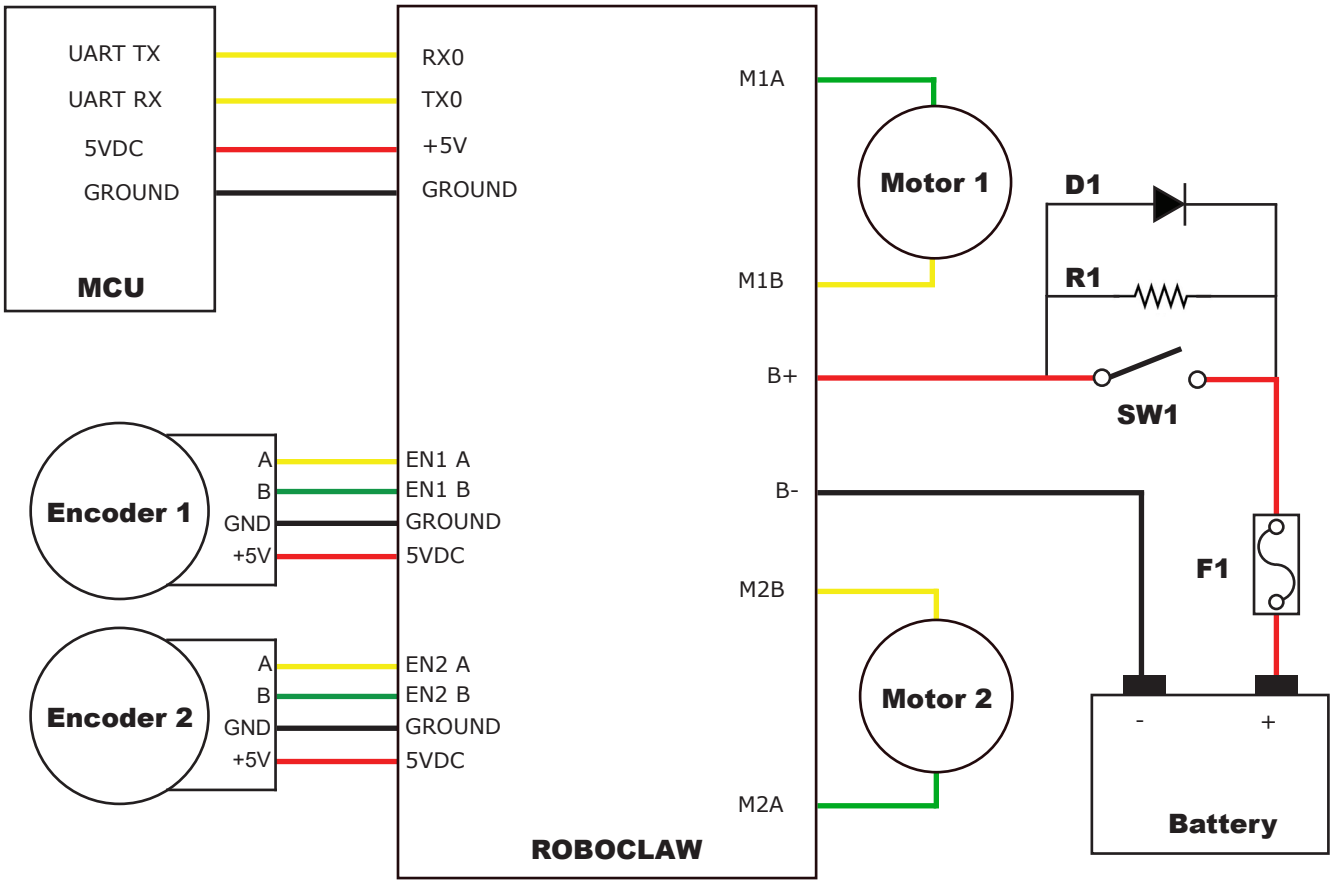
Wiring Safety

In all systems with movement, safety is a concern. This concern is amplified when dealing with higher voltages. The wiring diagram below illustrates a properly wired system. An external main power cut off is required (SW1). The external cut off can consist of a high amperage mechanical switch or a contactor.

When the RoboClaw is switched off or a fuse is blown, a high current diode (D1) is required to create a return path to the battery for potential regenerative voltages. In addition a pre-charge resistor (R1) is required to reduce the high inrush currents to charge the on board capacitors. A pre-charge resistor (R1) should be around 1K, 1/2Watt for a 60VDC motor controller which will give a pre-charge time of about 15 seconds. A lower resistances can be used with lower voltages to decrease the pre-charge time.

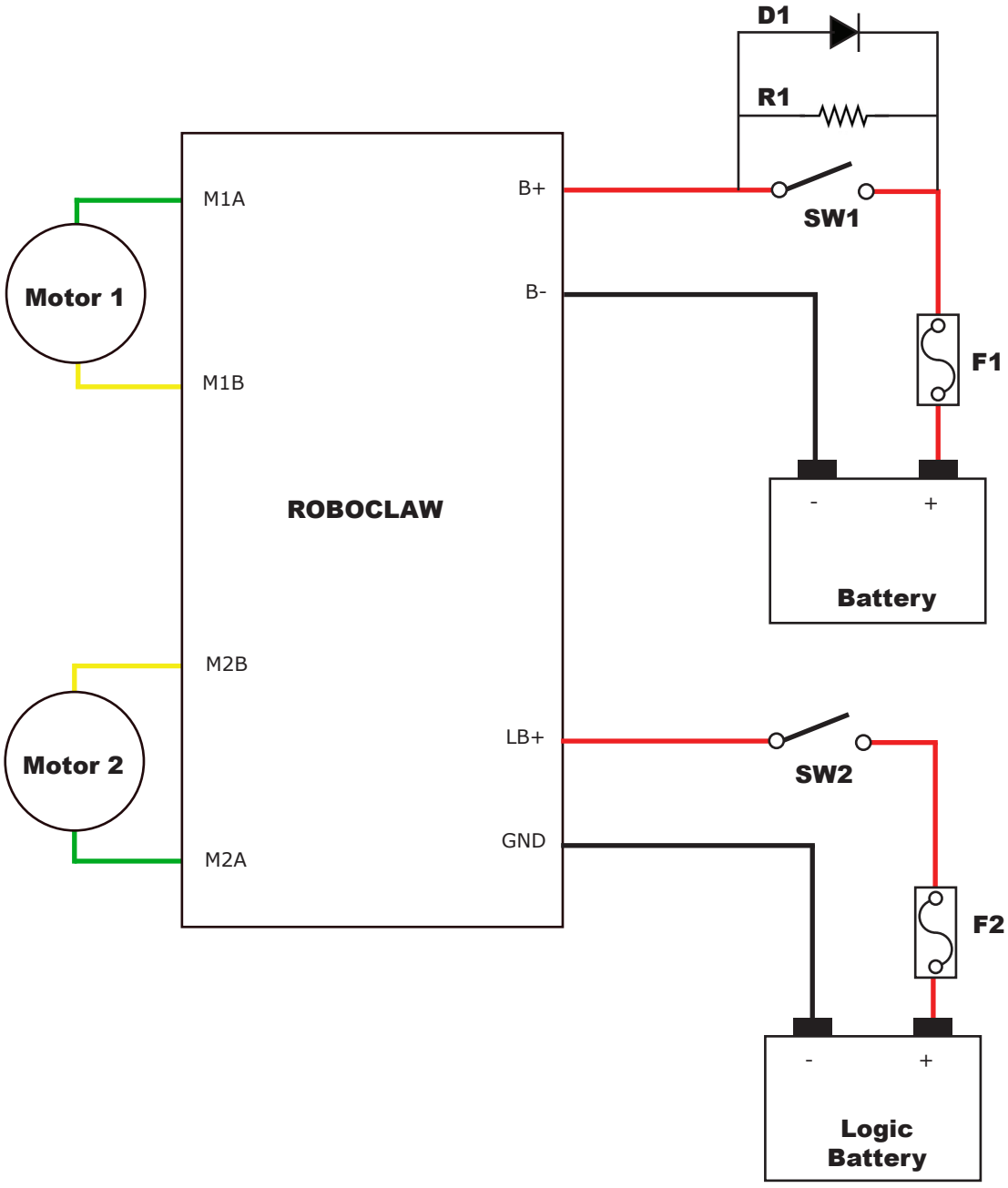
Closed Loop Mode

A wide range of sensors are supported for closed loop operation. RoboClaw supports dual quadrature encoders (up to 9.8 million PPS), absolute encoders, potentiometers and hall effect sensors. The wiring diagram below is an example of closed loop mode using quadrature encoders. Quadrature encoders are directional. RoboClaw's internal counters will increment for clockwise rotation (CW) and decrement for counter clockwise rotation (CCW). When wiring encoders A and B channels it is important they are wired to match the direction of the motor. If the encoder is wired in reverse it can cause a run away condition. All motor and encoder combinations will need to be tuned (see RoboClaw user manual).



Logic Battery

An optional logic battery is supported. Under heavy loads the main power can suffer voltage drops, causing potential logic brown outs which may result in uncontrolled behavior. A separate power source for the motor controllers logic circuit, will remedy potential problems from main power voltage drops. The logic battery maximum input voltage is 34VDC with a minimum input voltage of 6VDC. The 5V regulated user output is supplied by the logic battery if supplied. The mAh of the logic battery should be determined based on the load of attached devices powered by the regulated 5V user output.



Configuring RoboClaw

RoboClaw Setup

The RoboClaw features several control modes such as packet serial, simple serial, RC and analog. Documentation for wiring and software configuration can be found in the User Manual as well as RoboClaw Application Notes.

The User Manual can be found here: https://www.basicmicro.com/downloads
Application Notes can be found on our website: https://resources.basicmicro.com/

Motion Studio is required to setup RoboClaw. Motion Studio is a free application that can be downloaded from Basicmicro.com.

RC Control Setup

This quick guide will outline setting up a RoboClaw for RC control.

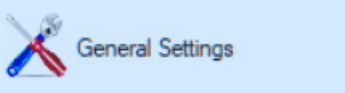
1. Download and install Motion Studio.

2. Wire the RoboClaw, power supply, motor and RC hardware as shown in the RC wiring diagram in this datasheet.

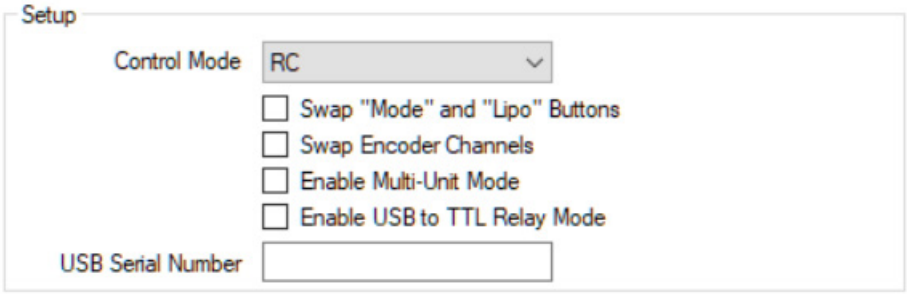
3. Ensure the RoboClaw is wired using the safety precautions illustrated in this datasheet.

2. Connect a micro USB cable between the RoboClaw and a computer with Motion Studio installed. The USB connection does not power the RoboClaw, a power supply must be connected. Open Motion Studio and on the top left under “Attached Devices” select and click the motor controller controller shown.

3. Next, click on General Setting on the left-hand side of the application.



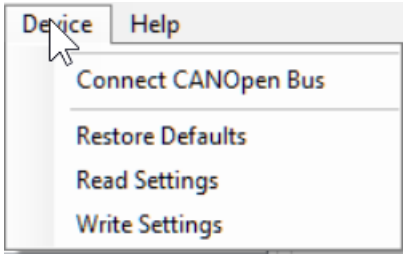
4. In the panel labeled Setup, click on the Control Mode drop down and select RC.



5. Next, RC options can be set in the panel labeled RC/Analog Options.

- Mixing - This setting is for use with a differential drive configuration in which only two motors are used for forwards/backwards movement as well as left/right steering. Tank robots are a classic example of where is setting is applicable.
- Exponential - The exponential setting affects the sensitive of the controls, whether that be with a radio transmitter or microcontroller. When exponential is enabled the controls are less sensitive at the beginning of their range and more sensitive at the outside of their range.
- MCU - This setting allows a microcontroller to send RC-like servo pulses in place of using a typical RC receiver. RoboClaw does not need a constant pulse train in this mode. The RoboClaw will use the value of the last pulse received and execute that until a new pulse is sent. RoboClaw does not auto-calibrate the pulses sent to it in this mode.
- RC Flip / Mode - This setting allows for an input on S3 to flip the control direction of a motor attached to the RoboClaw. When the checkbox is selected an RC receiver output is the control signal that flips the control scheme of the motor.
- Enable Encoder 1 in RC/Analog Mode - This setting allows you to enable an encoder on channel one. The RoboClaw uses encoders for closed-loop control of position and velocity. This means that when a speed or position is set the RoboClaw will do the work of maintaining that value. For example, with encoders, a robot climbing a hill would be able to maintain a constant speed despite the change in load on the motors. Prior tuning of the encoders, is necessary, to use them properly.
- Enable Encoder 2 in RC/Analog Mode - This setting allows you to enable an encoder on channel two. The RoboClaw uses encoders for closed-loop control of position and velocity. This means that when a speed or position is set the RoboClaw will do the work of maintaining that value. For example, with encoders, a robot climbing a hill would be able to maintain a constant speed despite the change in load on the motors. Prior tuning of the encoders, is necessary, to use them properly.

5. To complete the setup click on the "Device" menu and select "Write Settings". This will update and save the settings to the attached RoboClaw.



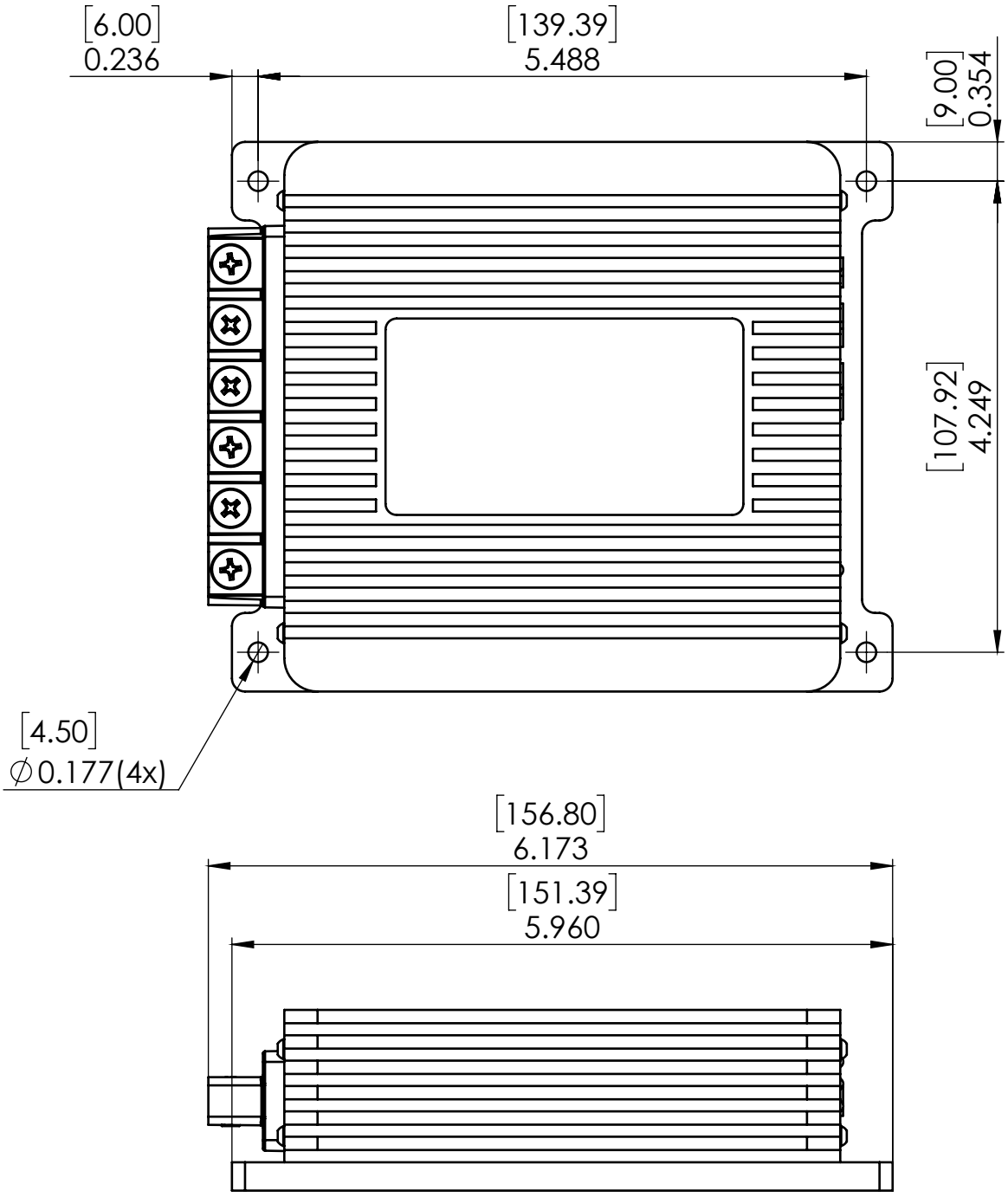
6. Disconnect the RoboClaw from Motion Studio by clicking "Disconnect Selected Unit" in the upper left-hand side of the application. The USB connection can then be removed from the attached controller.

7. The robot or other system can now be operated remotely with a RC transmitter.

Mechanical Specifications

Characteristic	Model	Min	Typ	Max	Rating
Weight	2X200A / 2X300A		58 (1,630)		Oz (g)

Dimensions



Electrical Specifications

Characteristic	Model	Min	Typ	Max	Rating
Main Battery	2X200A	10		60	VDC
	2X300A	10		60	VDC
Logic Battery	All	6	12	14	VDC
Maximum External Current Draw (BEC)	All			3	A
	2X200A		200(2)	200(1,2)	A
	2X300A		300(2)	300(1,2)	
	2X200A		1		mOhm
	2X300A		1		mOhm
Logic Circuit Current Draw	All		50mA		mA
Input Impedance	All		100		Ω
Input	All	0		5	VDC
Input Low	All	-0.3		0.8	VDC
Input High	All	2		5	VDC
CTRL1 / CTRL2	All			40	VDC
CTRL1 / CTRL2	All			3	A
I/O Output Voltage	All	0		3.3	VDC
Digital and Analog Input Voltage	All			5	VDC
Analog Useful Range	All	0		2	VDC
Analog Resolution	All		1.44		mV
Pulse Width	All	1		2	mS
Encoder Counters	All		32		Bits
Encoder Frequency	All			19.66	Mhz
RS232 Baud Rate (Note 3)	All			460,800	Bits/s
RS232 Time Out (Note 3)	All	10			ms
Temperature Range	All	-40	40	90	°C
Temperature Protection Range	All	75		90	°C
Humidity Range	All			100 (4)	%

Notes:

1. Peak current is automatically reduced to the typical current limit as temperature approaches 85°C.
2. Current is limited by maximum temperature. Starting at 75°C, the current limit is reduced on a slope with a maximum temperature of 90°C, which will reduce the current to 0 amps. Current ratings are based on ambient temperature of 25°C.
3. RS232 format is 8Bit, No Parity and 1 Stop bit.
4. Non condensing humidity will damage the motor controller.

Warranty

Basicmicro warranties its products against defects in material and workmanship for a period of 1 year. If a defect is discovered, Basicmicro will, at our sole discretion, repair, replace, or refund the purchase price of the product in question. Contact us at sales@basicmicro.com. No returns will be accepted without the proper authorization.

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