



2x10A UNO ROBOT CONTROLLER URC10



User's Manual V1.0

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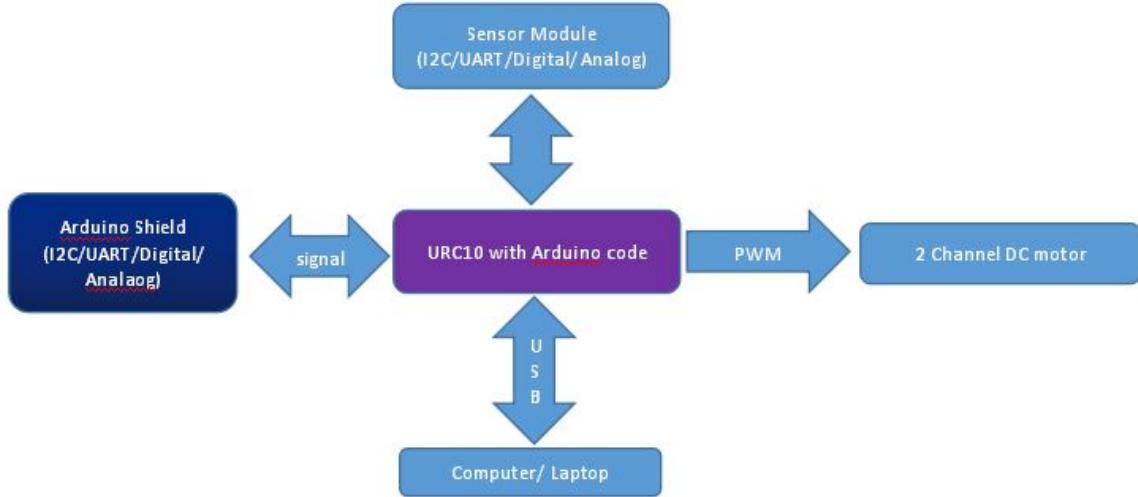
INTRODUCTION AND OVERVIEW

1.0 Introduction of UNO Robot Controller (URC10)

2x10A UNO Robot Controller is designed to drive two high current brushed DC motors up to 10A continuously by using build in [CT-UNO](#) (Arduino UNO compatible) as the controller. This board combines the simplicity of the UNO's Optiboot bootloader (which load program faster), and the R3 shield compatibility of the latest [Arduino UNO R3](#) with two channel motor driver. It offers several enhancements such as support for both locked-antiphase and sign-magnitude PWM signal as well as using full solid state components which result in faster response time and eliminate the wear and tear of the mechanical relay and reduce time for wiring. The board incorporates most of the components of the typical applications. With minimum interface, the board is ready to Plug and Play. Simply add in power, do simple coding and this board is ready to drive brushed motor. This board has been designed with capabilities and features of:

- Specially designed for mobile robot controller with Arduino UNO compatibility.
- Bi-directional control for two brushed DC motor
- Support up to 30A peak(10 second) and 10A(continuous) per channel.
- Current limiting at **30A**.
- Solid state components provide faster response time and eliminate the wear and tear of mechanical relay.
- Fully NMOS H-Bridge for better efficiency and no heat sink is required.
- Speed control PWM frequency up to 20KHz.
- Support both locked-antiphase and sign-magnitude PWM operation.
- Arduino sketch compatible.
- Able to drive brushed motor from 6V to 24V.
- Single power input for both motor and on board controller.
- SMD ATmega328 microcontroller with Optiboot (UNO) Bootloader.
- On board 1A (maximum) 5V voltage regulator.
- On board 500mA (maximum) 3.3V voltage regulator.
- 0-5V digital outputs with 3.3V compatible inputs.
- 14 Digital I/O Pins (6 PWM outputs).(4 pin used for Motor driver)
- 6 Analog Inputs (Can be digital I/O too).
- ISP 6-pin Header.
- 32k Flash Memory.
- 16MHz Clock Speed.
- R3 Shield Compatible.
- TX, RX, Power, pin 13 LEDs are moved to edge.
- LED indicator for I/O pin
- I/O extension
- 2x HC-SR04 connector
- Utilize USB Micro-B socket.
- On board push buttons for fast test and manual operation.
- **No polarity protection!**
- **Dimension:** 75.57cm x 99.7cm

1.1 System Overview

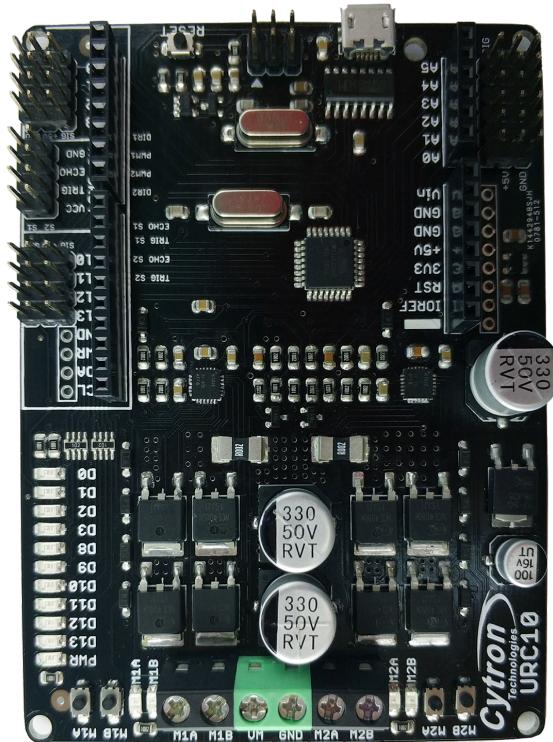


Uno Robot Controller is one of motor driver with built in controller. One of the additional features for URC10 compare to other driver is the I/O extension pin and interface for easiest communication or connect directly to Arduino Shield. .

1.2 General Description

Driving brush motor is common necessity in most robotic project. A brush motor is an electric motor that can drive a full rotation. Brush motor is ideally suit for robot mobility. This motor can operate in forward/reverse with controllable speed motor driver. There are various kinds of brush motor, some example are geared motor, planetary geared motor, and automobile DC motor. This board, Uno Robot Controller is design to drive 7V-24V DC motor with build in programmable microcontroller.

2. PACKING LIST



Please check the parts and components according to the packing list. If there are any parts missing, please contact us at sales@cytron.io immediately.

2x10A UNO Robot Controller comes with:

- 1 x Uno Robot Controller board with every component is soldered properly and tested before board is shipped.
- [User's Manual](#) and sample [Arduino sketch](#) can be downloaded at <https://www.cytron.io/p-urc10>.

3. PRODUCT SPECIFICATION AND LIMITATIONS

Power Input Pins Function Description

Label	Definition	Function
VM	Motor Supply Voltage	VM is for board power sources. VM will supplies power to both motor and controller circuit. User must ensure the voltage and polarity of connection are correct before providing the power so that the controller can function correctly.
GND	System Ground	Common ground for both logic operation and motor power source.

*If power is connect correctly, the PWR LED should light up.

Signal Input Pins Function Description

Label	Definition	Function
DIR 1	Motor Rotating Direction Control Pin	Input for motor 2 to rotate CW (clockwise) or CCW (counterclockwise). This pin is TTL/CMOS logic (5V and 0V). The direction is depends on the Arduino code For example: DIR = 0V CW DIR = 5V CCW
PWM 1	Speed control Pin	Input pin to Control the motor speed.This pin need PWM signal.
PWM 2	Speed control Pin	Input pin to Control the motor speed.This pin need PWM signal.
DIR 2	Motor Rotating Direction Control Pin	Input for motor 2 to rotate CW (clockwise) or CCW (counterclockwise). This pin is TTL/CMOS logic (5V and 0V). The direction is depends on the Arduino code For example: DIR = 0V CW DIR = 5V CCW
TRIG	Sonar Sensor trigger Pin: Sensor 1- D9 Sensor 2- D11	Connection for Sonar sensor connected to Arduino pin number D9 for Sonar 1 and Arduino pin number D11 for Sonar sensor number 2.
ECHO	Sonar Sensor Echo pin: Sensor 1- D8 Sensor 2- D10	Connection for Sonar sensor connected to Arduino pin number D8 for Sonar 1 and Arduino pin number D10 for Sonar sensor number 2.
+5V	5V Output	5V output to power up sensor.
GND	System Ground	Common ground for both logic operation and stepper motor

		power source.
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The truth table for the control logic for motor 1 and motor 2 are as follow:

PWM	DIR	Output A	Output B
Low	X(Don't care)	Low	Low
High	Low	High	Low
High	High	Low	High

Pin No	Pin Name	Description
M1A	Motor 1 Output A	Connect to motor 1 terminal A
M1B	Motor 1 Output B	Connect to motor 1 terminal B
VM	POWER +	Positive Supply (positive terminal of battery)
GND	POWER -	Negative Supply (negative terminal of battery)
M2A	Motor 2 Output A	Connect to motor 2 terminal A
M2B	Motor 2 Output B	Connect to motor 2 terminal B

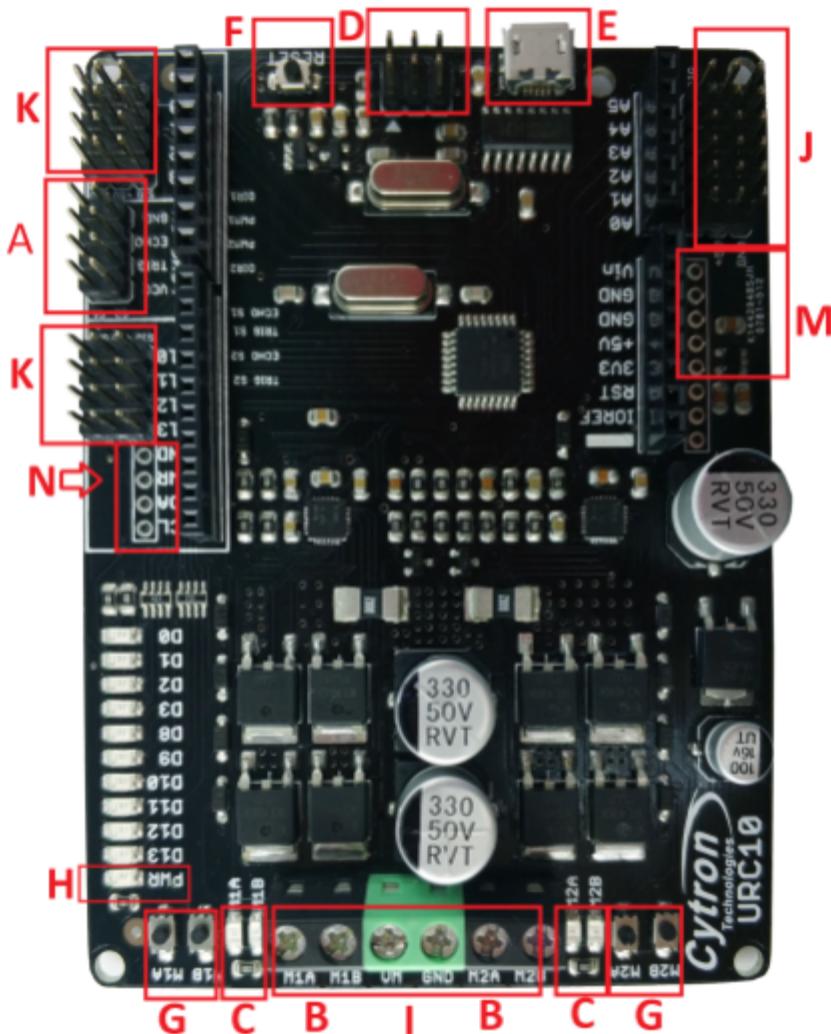
Absolute Maximum Rating

No	Parameter	Max	Typical	Min	Unit
1	Input Voltage (Motor Supply Voltage)	7	-	24	V
2	I _{MAX} (Maximum Continuous Motor Current)*	-	-	10	A
3	I _{PEAK} – (Peak Motor Current) **	-	-	30	A
4	V _{IOH} (Logic Input – High Level)	5	-	1.3	V
5	V _{IOL} (Logic Input – Low Level)	0.7	-	0	V

* For momentary peak current. Driving at this condition may trigger overheat or over-current cut-off.

**Must not exceed 1 second.

4.BOARD LAYOUT



Label	Function	Label	Function
A	Connector for Sonar	H	Small LED as POWER indicator
B	Connector to Motor	I	Voltage input (7V-24V)
C	Small LED as indicator	J	Connector for analog input
D	ICSP connector	K	Connector for Digital IO
E	USB connector for Arduino	L	Connector for LCD
F	Push button to reset	M	Power extension
G	Push button to test	N	Power select

A – A connector to connect to two Sonar(HC-SR04) .

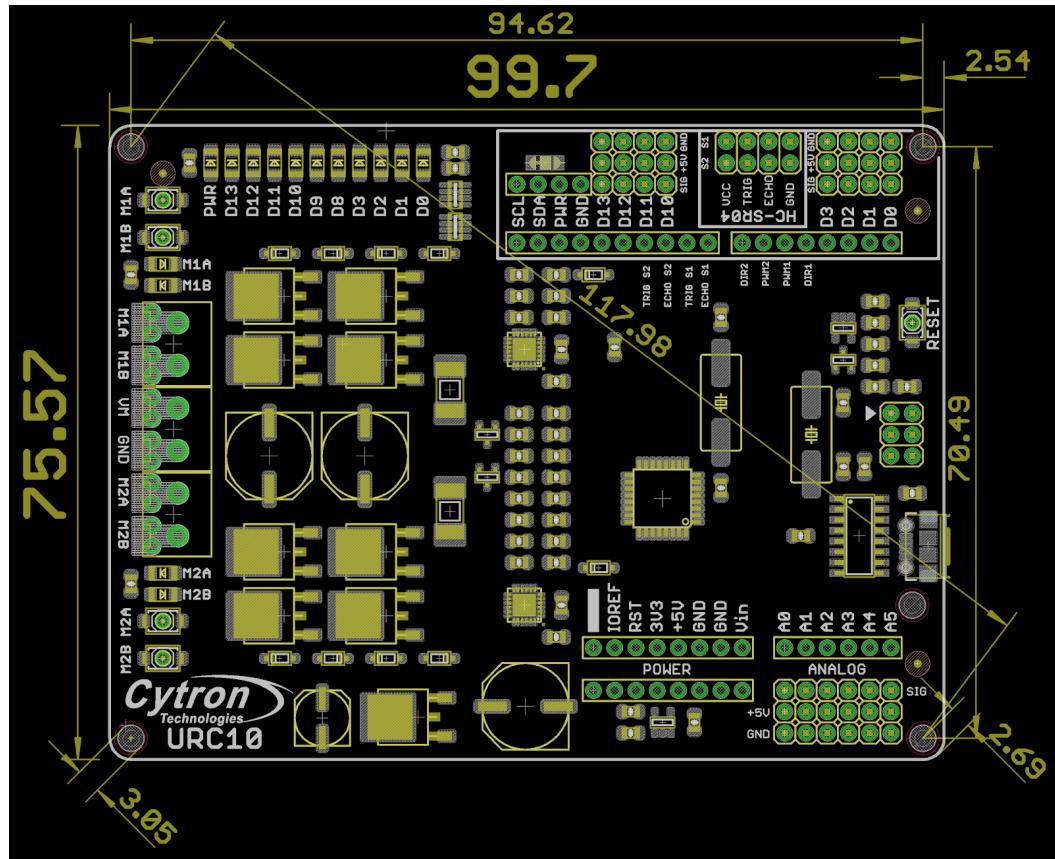
B – A 2 ways connector for user to connect particular DC motor. Please skru the

wire properly by referring to chapter 5, Hardware Installation.

- C** – Red LEDs acting as indicator for motor direction These LEDs will indicate which direction is being powered at a moment
- D** – ICSP connector/ SPI connection
- E** – USB for UART communication between URC10 and PC's Serial Communication Interface (SCI).

- F** – A push button acting as reset button to URC10. If this button is pressed, URC10 will be reset to initial stage. Please DO NOT press this button during operation
- G** – A push button to activate self test on URC10. When it is pressed and held, URC10 will start to drive stepper motor. If power supply is connected and this button is pressed, LEDs at C will illuminate sequentially.
- H** – A small green LED to indicate status of power. If power is connected, this LED will light ON.
- I** – Voltage input for the power source.
- J** – A 6x3 ways connector for analog input complete with Signal, 5V and GND pin.
- K** – A 4x3 ways connector for Digital IO complete with Signal, 5V and GND pin.
- L** – A 4x1 ways connector for user to connect particular **SPI/I2C device**
- M** – A 8x1 ways connector for power extension, normally not used.
- N** – A jumper at back of PCB is to select power **for I2C/SPI device**

4.1 DIMENSION



*All dimension in milimeter.

5. INSTALLATION (HARDWARE)

5.1 Connecting Driver to a DC Motor

URC10 is compatible with 2 types of PWM operation, which are:

1. Sign-Magnitude PWM - For sign-magnitude PWM operation, 2 control signals are used to control the speed and direction of the motor. PWM is feed to the PWM pin to control the speed while DIR pin is used to control the direction.
2. Locked-Antiphase PWM - For locked-antiphase PWM operation, only 1 control signal is needed to control the speed and direction of the motor. PWM pin is connected to logic high while the DIR pin is being feed with the PWM signal. When the PWM signal has 50% duty cycle, the motor stops running. If the PWM has less than 50% duty cycle, the motor will turn CW(or CCW depending on the connection). If the PWM signal has more than 50% duty cycle, motor will turn CCW(or CW depending on the connection)

Sample connection diagram is as follow:

URC10 pin control name	Control Mode	
	Sign magnitude	Locked Anti-Phase
DIR1 (pin 4)	Direction control	Enable driver
PWM1 (pin 5)	Speed Control	Speed & Direction
PWM2 (pin 6)	Speed control	Speed & Direction
DIR2 (pin 7)	Direction control	Enable driver

5.2 Connecting to URC10 using Signal Input Pin(HC-SR04)

Typical application would require a controller to generate pulses and wait for reflected ultrasonic burst. Following figure shows an example of HC-SR04 connected to URC10. The above example shows that the TRIG pin is connected to pin number D9 and Echo pin connected to pin number D8.

Example connection as follow:

6. INSTALLATION DRIVER

This board (URC10) use CH340G USB to UART converter as for sketch uploading bridge. This UART chip require USB driver to be installed on computer.

Please download the respective driver for your computer or laptop:

1. [Windows user](#)
2. [MAC OS driver](#) for OSX Mavericks 10.9, Yosemite 10.10, and El Capitan 10.11
3. [MAC OS driver](#) for OSX Sierra 10.12
4. Linux normally pre-installed with the proper driver

7. GETTING STARTED

You will need URC10 board and USB Micro B cable to start.

This section will show how to get started with URC10 and connect to computer for sketch uploading.

7.1 Using URC10 with Arduino IDE

After installation of URC10 driver, user is ready to use URC10 with computer/laptop.

- A. Connect USB to URC10, another end of USB cable to PC.
- B. Power up URC10. When power is connected, power indicator LED will turn ON.
- C. URC10 board will use power from USB if no external power connected.
- D. Get the latest Arduino IDE from <http://arduino.cc/en/Main/Software>.
- E. When the download finishes, unzip the downloaded file. Make sure to preserve the folder structure. Double-click the folder to open it. There should be a few files and subfolders inside.
- F. Double click on Arduino IDE icon at your desktop.
- G. Try BLINK example: go to FILES>Examples>0.1Basic>Blink
- H. Select board: Tools>Board>Arduino UNO
- I. Select serial port number with biggest number
- J. Upload sketch:

Now, simply click the "Upload" button in the environment. Wait a few seconds - you should see the D0 and D1 leds on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar. A few seconds after the upload finishes, you should see the pin 13 LED on the board start to blink (in orange). If it does, congratulations! You've gotten URC10 up-and-running.

8. WARRANTY

- ❖ Product warranty is valid for 6 months.
- ❖ Warranty only applies to manufacturing defect.
- ❖ Damage caused by miss-use is not covered under warranty.
- ❖ Warranty does not cover freight cost for both ways.

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