

# ameriDroid USB Ultrasonic Ranging Sensor Kit

## CONNECTING THE USB CABLE TO THE MICROCONTROLLER

A USB to serial cable should be connected to the microcontroller (the small circuit board with the rows of pins sticking out of it). The microcontroller has a row of 4 or 6 pins on one end. If it has 6 pins, concentrate on the 4 center pins and follow the directions below:

Black -	Connect to GND
Red -	Connect to VCC
Green -	Connect to RXI
White -	Connect to TXD

## CONNECTING THE ULTRASONIC SENSORS TO THE MICROCONTROLLER

On each ultrasonic sensor, there are four labeled pins. They are Vcc, Trig, Echo, Gnd. For the first ultrasonic sensor, connect pin 2 on the microcontroller to the "Trig" pin on the ultrasonic sensor. Connect pin 3 on the microcontroller to the "Echo" pin on the sensor. Connect the "Vcc" pin on the sensor to 5V DC (the "VCC" pin on the microcontroller supplies 5V DC), and the "Gnd" pin on the sensor to a ground connection (like one of the "GND" pins on the microcontroller).

If you are connecting up a second ultrasonic sensor, connect "Trig" to pin 4 and "Echo" to pin 5. Continue connecting to the next higher pin numbers for additional sensors, up to pins 12 and 13 if you want to connect six ultrasonic sensors.

## SOFTWARE CONNECTION TO THE MICROCONTROLLER

Use a terminal program like PuTTY or Screen or use your favorite programming or scripting language to connect to the serial port that appears when you connect the ultrasonic sensor. This will vary based on the operating system used to connect to the microcontroller. In Windows, "Device Manager" is the common way to find this out. In Linux, "dmesg" or "lsusb" are common ways to detect which port it is connected to. You may see something called "PL2303", which is the microcontroller connection. If you receive garbage in your terminal when you connect, make sure the serial settings are 9600 baud, 8 bits, none (parity) and 1 stop bit.

**Here are the commands that are accepted by the microcontroller:**

***debug on*** – Enables detailed feedback. This is disabled by default, and will provide some clarification on input errors.

***debug off*** – Disables detailed feedback.

***init x y*** – Initializes an HC-SR04 on the pins specified. X is trigger, Y is echo. Must be digital pins. Device 0 is preset to pins 2 and 3, so those pins do not need to be specified. Invalid pin selections will return an exclamation mark.

***ping*** – Outputs a single read of the previously used HC-SR04. If none have been used yet, it will use device 0. If the command is followed by a single space and a number between 0-100 (exclusive), that number of reads will be made, outputting first the average of those reads, then the number of failed reads (which do not count towards the average), then the minimum and maximum read values separated by spaces. In any case, if a signal times out, -1 will be returned.

***start*** – Constantly pings all connected devices in sequence. Because the devices are used one at a time, the flow of data from this command will be faster if the devices measure short distances. If this command is followed by a single space and a number greater than 0, the board will wait that many milliseconds between reading from the last device and reading from the first device. Output from this command will be each device's reading (with a single space after each), and a return after the last device.

***stop*** – Only effective after 'start'. Stops the 'start' operation.

***mode*** – Outputs the current measuring mode. M for Metric (millimeters), I for Imperial (tenths of an inch), or R for Raw (the pulse length in microseconds returned by the HC-SR04.) Defaults to M.

***timeout*** – Outputs the current timeout for signal reads. Timeout is the longest amount of microseconds that the board will wait before declaring the HC-SR04 to have made a bad read, which is NOT NECESSARILY the same thing as the longest pulse the board will accept from the HC-SR04. When the board measures the pulse from the HC-SR04, it first waits for the HC-SR04 to begin sending a pulse at all. This time counts towards the timeout. When this command is followed by a space and a number, timeout will be set to that number. Defaults to 1 second (1,000,000 microseconds).

***ver*** – Outputs version information and credits.

If any command (or no command) is preceded by a single digit from 0-5 (inclusive) followed by a space, the device which corresponds to that digit will be selected for use with the next 'ping' command.

Each time the board is ready for a command, it will output ">" to the serial. The only exception is after the 'start' command, which will not prompt for input until after 'stop' has been recognized.