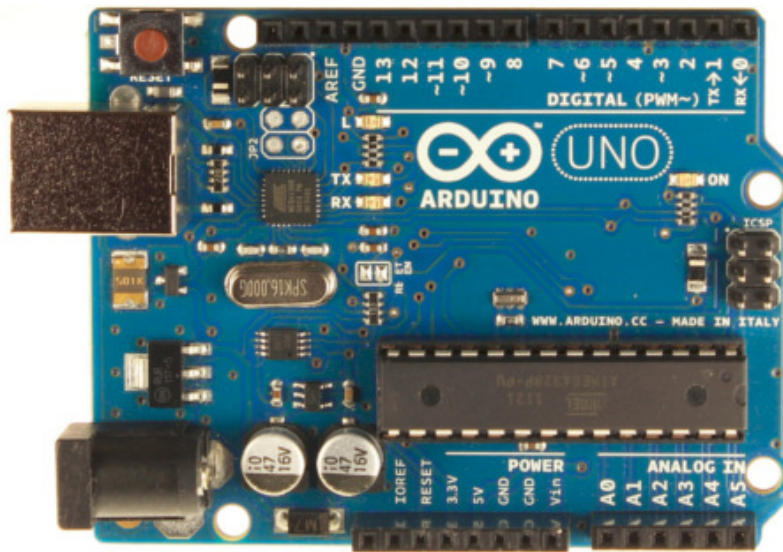


Parts list:

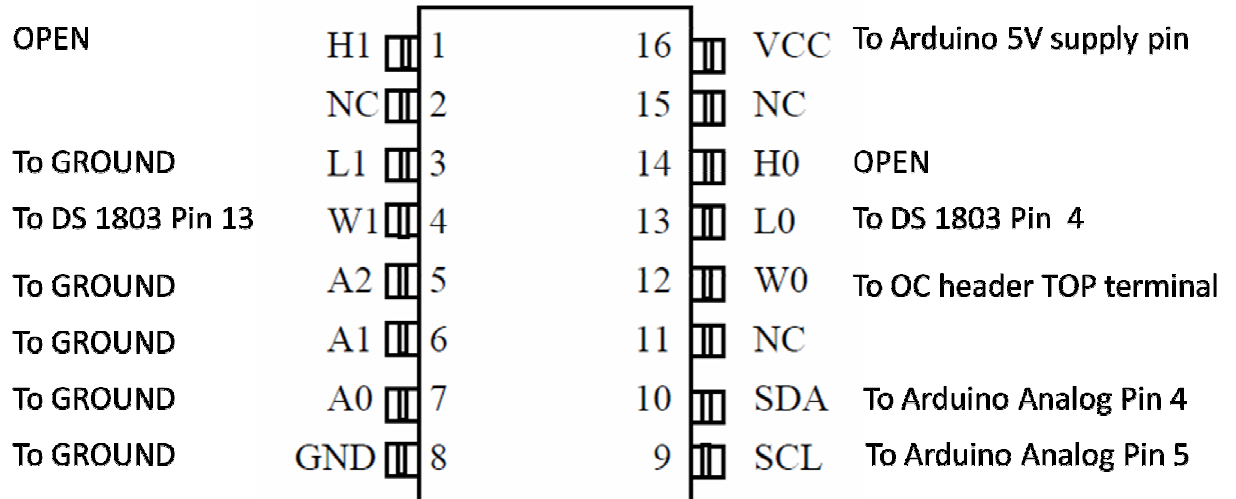
- Arduino UNO
- Arduino Shield
- DS 1803 Digital Potentiometer
- 16 pin Socket
- Solarbotics Solar Cell
- Cable Socket
- Cable Metal Crimp
- Cable Receptacle



Arduino:

- 1) Place the 2 pin (solar panel) cable receptacle onto the Arduino shield as shown in the picture below. Solder the receptacle onto the shield.
 - a. Solder the MINUS pin of the receptacle to Arduino's GROUND pin.
- 2) Place a 2 pin "Open Circuit" (OC) header onto the Arduino shield as shown in the picture below.
 - a. Solder the BOTTOM pin of the OC header to the PLUS terminal of the solar panel receptable.
 - b. Solder the TOP pin of the OC header to Pin 12 of DS1803 (see step 6)
- 3) Solder a piece of wire between A0 (Analog Input pin 0) and the PLUS terminal of the solar panel cable receptacle. (DO NOT SOLDER TO THE BOTTOM PIN OF THE OC HEADER)
- 4) Place the 16 pin socket onto the Arduino shield as shown in the picture below. From the BOTTOM SIDE of the shield, apply solder to each exposed pin. Note location of PIN 1.

- 5) From the **BOTTOM SIDE** of the shield, solder a wire onto Pins 3, 4, 8, 9, 10, 12, and 16 of the 16-pin socket. Each wire should be about 2 inches long.
- 6) Connect each wire to the corresponding location as shown in the diagram below. Connect pins 5, 6, 7, and 8 together with a wire.



- 7) Gently insert the shield onto the Arduino UNO. Make sure all wires remain in between the shield and the UNO.
- 8) Gently insert the DS 1803 into the socket. Double check the chip's orientation!

Solar Panel:

- 1) Make two strips of wires, one black and one red. Each 6 inches long.
- 2) Strip the ends so about 0.5 cm of metal is exposed.
- 3) Use the crimping tool to place the metal crimps onto one end of each of the two wires
- 4) Place some solder onto the metal crimp-wire junction to strengthen the connection.
- 5) Push the wires into the socket until you hear a “click”.
- 6) Solder the other ends of the two wires onto the solar cell. Red to positive. Black to negative (ground).

2 wires (3 inches) for one solar panel
1 ground (1 inch) wire for solar panel receptacle
1 short for wire for solar panel PLUS to OC header BOTTOM

7 wires for DS1803 (1 in.)
1 bare wire for DS1803 (1 in.)

Prep Steps:

- 1) **Insert shield headers into Arduino UNO. Place bare shield PCB on top. Solder all header pins to Shield's PCB.**
- 2) **Remove shield. Place 16 pin socket onto shield and solder the 16 pins onto the back side.**
- 3) **Solder solar panel cable receptacle and OC header onto shield. (from bottom side)**
- 4) **Solder 1 Kohm Resistor between VCC and AREF pin.**
- 5) **Prepare wires.**
- 6) **Solder wires onto two shields.**
- 7) **Make solar cell module.**

TEST PLAN

NOTE: Before performing steps below, make sure you have Arduino IDE and MATLAB installed.

- 1) Plug the Arduino Module into the Computer (through USB). Make sure Microsoft Windows recognize the device and installs the drivers accordingly.
 - a. If Windows does not recognize the module OR shows that the device was not installed properly, try to unplug it and plugging it in again. If still does not work, the Arduino UNO board might be faulty. Take out the attached shield and set the UNO board aside.
- 2) Open "Device and Printers" from the Control Panel. Check that a COM port has been assigned to the Arduino.
 - a. If Windows does not recognize the module, see notes in 1a) above
- 3) Make sure MATLAB is CLOSED.
- 4) Open Arduino IDE. Go to Tools->Serial Port and make sure the correct COM port is selected.
- 5) File->Open to open adiosrv.pde. Upload it to the Arduino (by clicking the "Play" button).
 - a. If Arduino IDE gives error messages regarding uploading, read the message and take appropriate actions. If all else fails, close the IDE and unplug the module from the computer. Start from Step 1) again. If fails again, module might be faulty. Detach the Arduino shield and set the UNO board aside.
- 6) OPEN MATLAB.
- 7) Place the module under the lamp. Make sure the solar cell is facing up.
- 8) Open and run arduino_test.m. If you obtain a plot like below, the hardware is functional.
 - a. If plot is a vertical line (with x-axis at ~ 3 volts), move lamp further and try again.
 - b. If plot is a horizontal line (with y-axis scattered near zero), move lamp closer and try again.
 - c. If neither,
 - i. Check and make sure all wires are soldered securely.
 - ii. Check and make sure no wires are shorting the adjacent pins.
 - iii. Probe the VCC and Ground pin of the digital potentiometer and make sure power supply is present.
 - iv. Probe the SCL and SDA pins of the digital potentiometer with an O-scope. There should be activity here.
 - v. Probe the solar panel output using a volt meter to make sure it has a non-zero voltage, and that the voltage changes with illumination (cover the panel with your finger and see the voltage change).
- 9) Use a Sharpie and label the Arduino module with a NUMBER on the top side of the USB port.