













Soldering Workshop

DroidCON Style




Overview

-  Safety, Safety, Safety
-  Basic Tools, Materials
-  Work Area & Tool Setup
-  Procedures
 -  Cleaning, Wetting and Pre-Heating
 -  Solder Flow
 -  Iron Contact
 -  Solder Fillet
 -  Solder Bridges
 -  Vias
-  Workshop Project - A DroidCON Exclusive
-  Have Fun!



Safety, Safety, Safety

 Two words: MOLTEN METAL

 It's seriously HOT!!! (Up to 850°F or 455°C)

 Don't pick up like a Pencil... you will only do this once

 Only touch the plastic handle of the iron

 Keep hair and skin away from the soldering iron

 Lead Solder

 Melting not the issue

 Handling lead is the issue

 Use Lead Free if possible - RoHS

 Solder Fumes

 Flux or Rosin vapor - Not LEAD

 Ventilation and/or fume extractor

 It's addicting, you'll get to love it!



Basic Tools and Materials

 Soldering Pen 20W to 40W


 Small conical or chisel tip

 Holder

 Sponge or Brass Sponge

 Solder

 64/37 (Tin/Lead*) Best

 60/40 Good, but careful about movement while solder is still fluid, it can result in cold joint.

 No Clean Flux or Water Soluble

 Lead Free RoHS

 .31 to .20 diameter

 Flush Cutters better than Diagonal Cutters



Setup Your Work Area & Tools



Flush Cutters



Solder



Solder Wick

Soldering Iron Stand



Sponge Well Wet












Soldering Iron in stand?

Soldering Iron Plugged In?

Soldering Iron Hot?



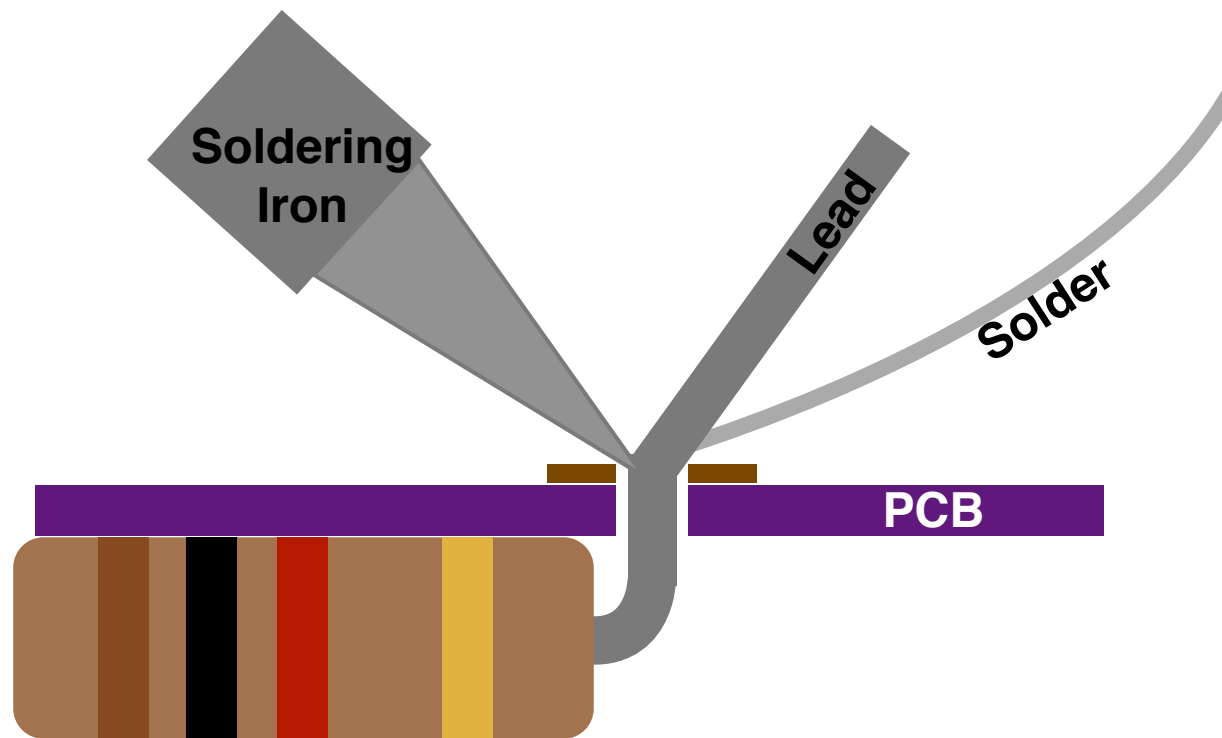
Basic Procedure

-  Make sure the soldering area is clean
 -  No grease, no oxide, no oils
-  Put the items together
-  Wet the area with flux if needed
 -  Flux- Latin *fluxus* for FLOW, cleans, protects copper against oxidation while. If you burn off the Flux = poor solder
-  Clean tip of iron on wet sponge or brass “sponge”
-  Pre-heat the area with soldering iron
-  Apply and feed solder at the joint
-  Remove solder when sufficient solder has been applied
-  Then remove the iron.
-  Get in, get it on, get out...





Yes we are still talking about Soldering!

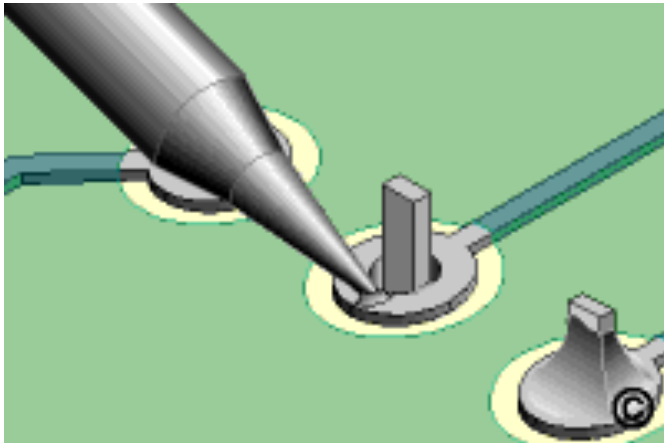


Basic Procedure - cont.

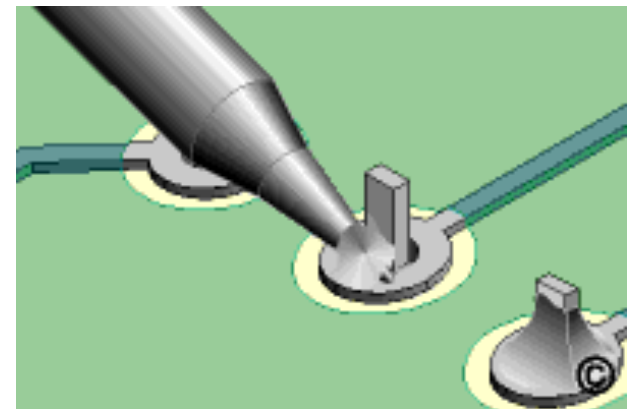


Iron Contact Area

-  Pre-Heating is critical and only takes a half second or so.
-  Iron tip needs good contact with BOTH parts
-  Trace and Component Leads
-  Heat transfer with small solder bridge works well







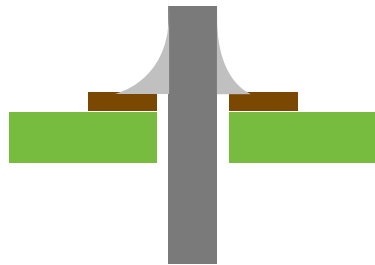
Not enough



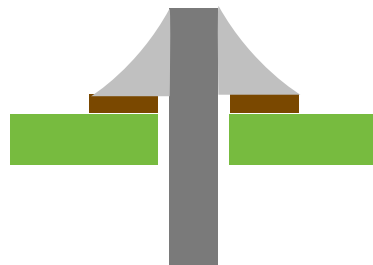
Good

Solder Fillet Flow

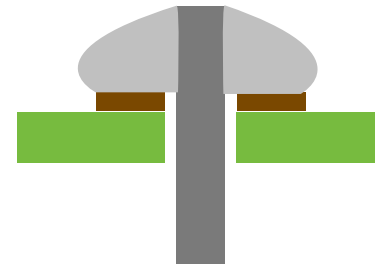
-  Minimum solder will not withstand stress
-  Excessive solder can lead to stressed and cold joints
-  Optimal solder joints looks neat, clean and professional
-  Smoke & fumes are from the Flux/Rosin not lead.



Minimum



Optimal








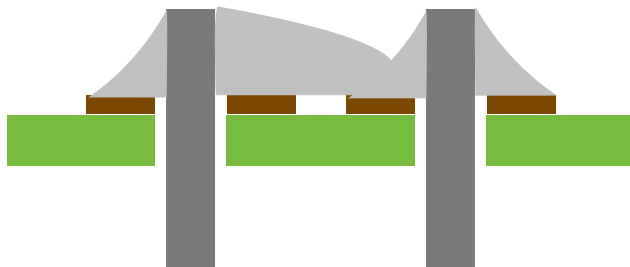
Excessive

 Remember: Flux- Latin *fluxus* for FLOW, cleans, protects copper against oxidation while. If you burn off the Flux = poor solder



Solder Bridge

-  Too much solder
-  Easy to create on densely populated PCBS
-  Can be hard to troubleshoot
-  Watch out for those Vias!
-  Fix with Solder Wick or Solder Sucker












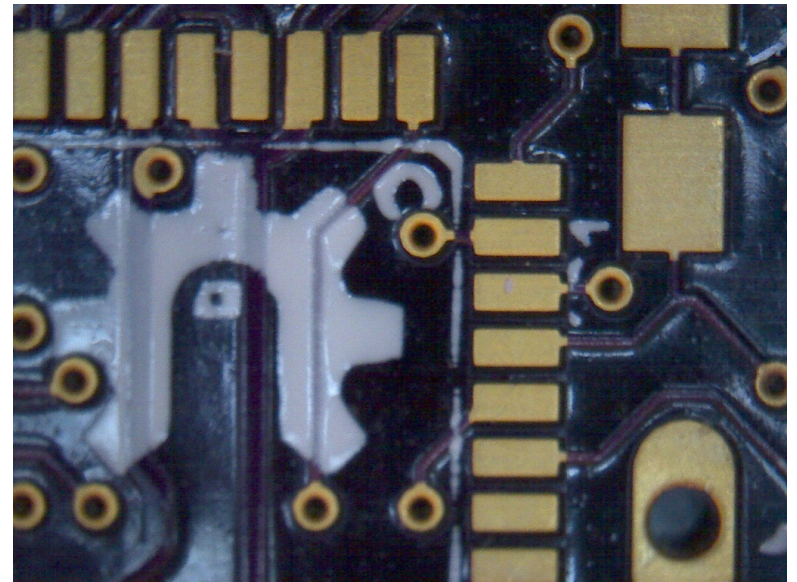
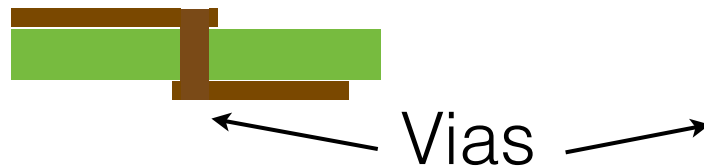
Solder Bridge















Good

Oye Como Vias

-  Pathways for signals to move to other layers of the PCB
-  Barrel - The tube or rivet
-  Pad - Connects the barrel to the trace paths
-  Typically very small “hole” or barrel compared to a pad
-  Sometimes covered by PCB coating
-  Great test points, if not covered
-  Can be rather close tolerances
-  Thermal Vias
-  Avoid creating solder bridges!



Tips and Techniques










-  Use Breadboard to place and hold headers for you
-  Use Solder bridge to get heat into the lead and pad
-  Get it hot enough.
-  Use appropriate temperature
-  Use appropriate soldering pen tip for the job.
-  Keep the tip clean, allows for rapid heat transfer
-  Don't have sponge and brass sponge? Wet paper towel
-  Clean the rosin from the PCB with IPA 90%+
-  Headers - solder 1 pin first, then heat and adjust by others
-  Practice on old boards or bad PCBs... got plenty of them.
-  Workmanship
-  Never use a SOLDER CANNON on PCBs.



Solder Cannons



Workshop Project

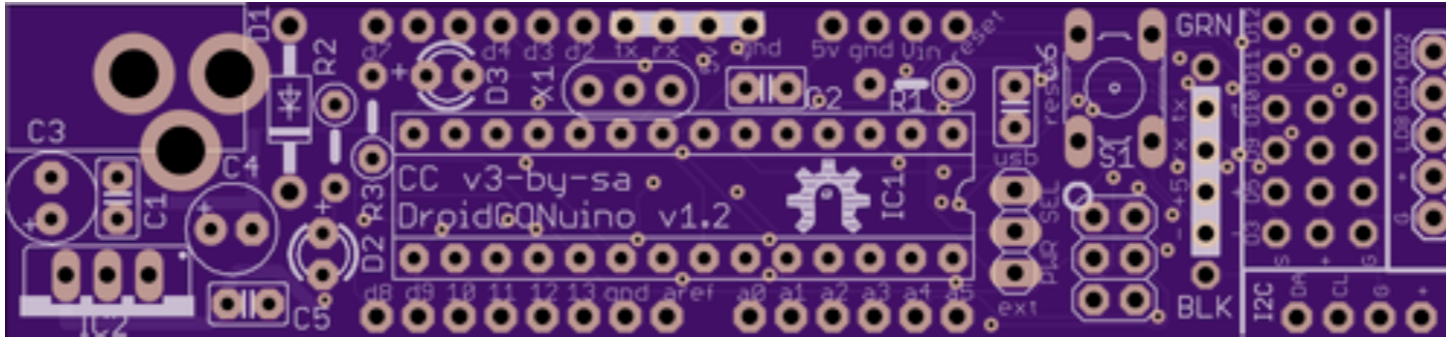
-  DroidCON Exclusive
-  Simple Through-Hole (PTH) Kit
-  Lots of typical solder joints
-  It's a densely populated PCBs
-  Vias close to Pads
-  Avoid creating solder bridges.
-  Takes about 30 to 60 minutes to build
-  Ask questions about soldering!
-  Have Fun!








So what are we going to build?



DroidCONuino

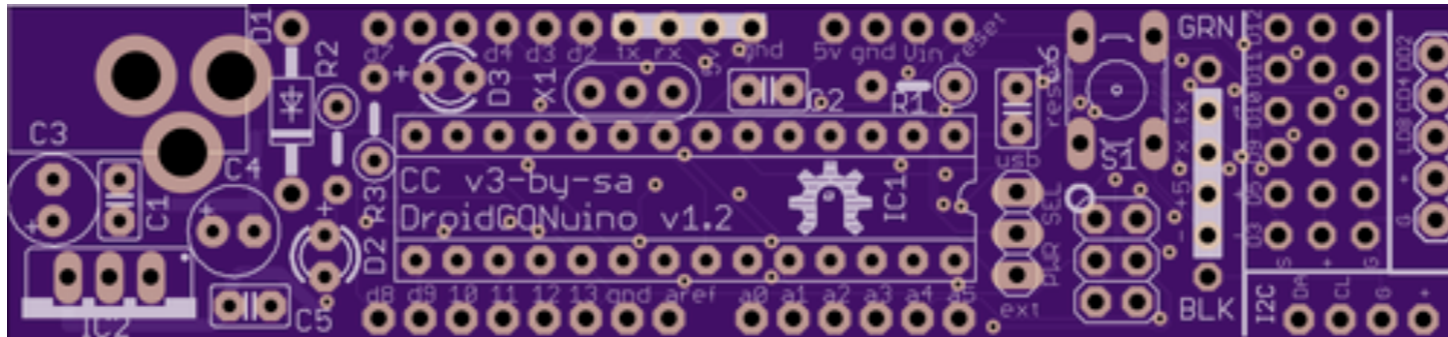


-  Arduino Uno Compatible MicroController w UNO bootloader
-  Atmel 328P 28DIP or SMD
-  6 Servos
-  Teeces 7219/7221 Logics Control
-  1 x i2c Bus
-  1 amp 5v regulator
-  External Power Input (<15 volt)
-  Bread Board Compatible
-  FTDI & ICSP Connections
-  Based on AdaFruit's Boarduino DC design!



Part Inventory & Identification

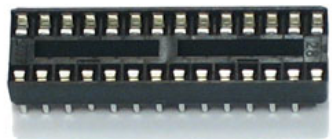
PCB



IC1



SOC



X1



JACK



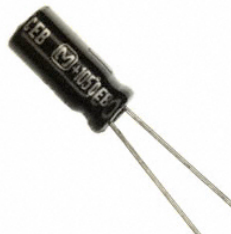
IC2



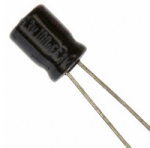
C1, C2
C5, C6



C3



C4



R1



R2, R3



SWITCH

D1



D2



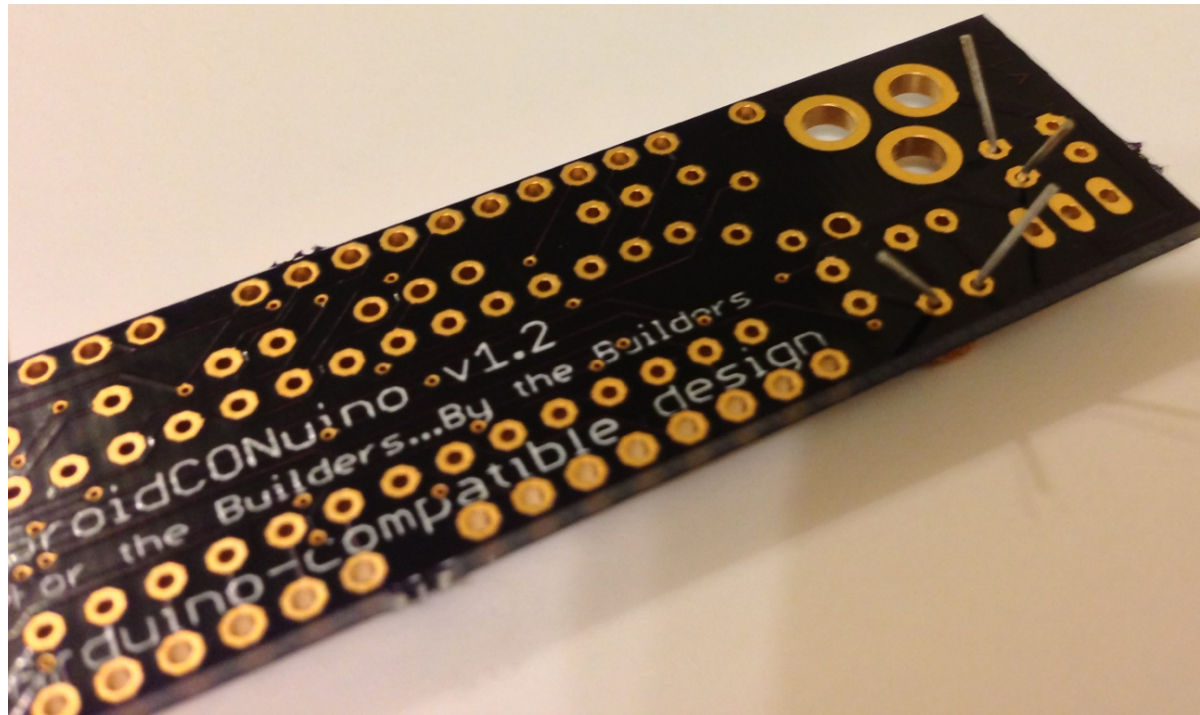
D3



JUMPER



Installing Components



- 👤 Components with long legs, once inserted into the PCB, you should bend the legs out to hold part into the PCB when soldering.
- 👤 Cut long component legs AFTER soldering that component
- 👤 Don't try to do more than one component at a time for now
- 👤 Solder one pad, ensure that part is aligned and flush, then continue
- 👤 Use the BreadBoard to help with the Headers



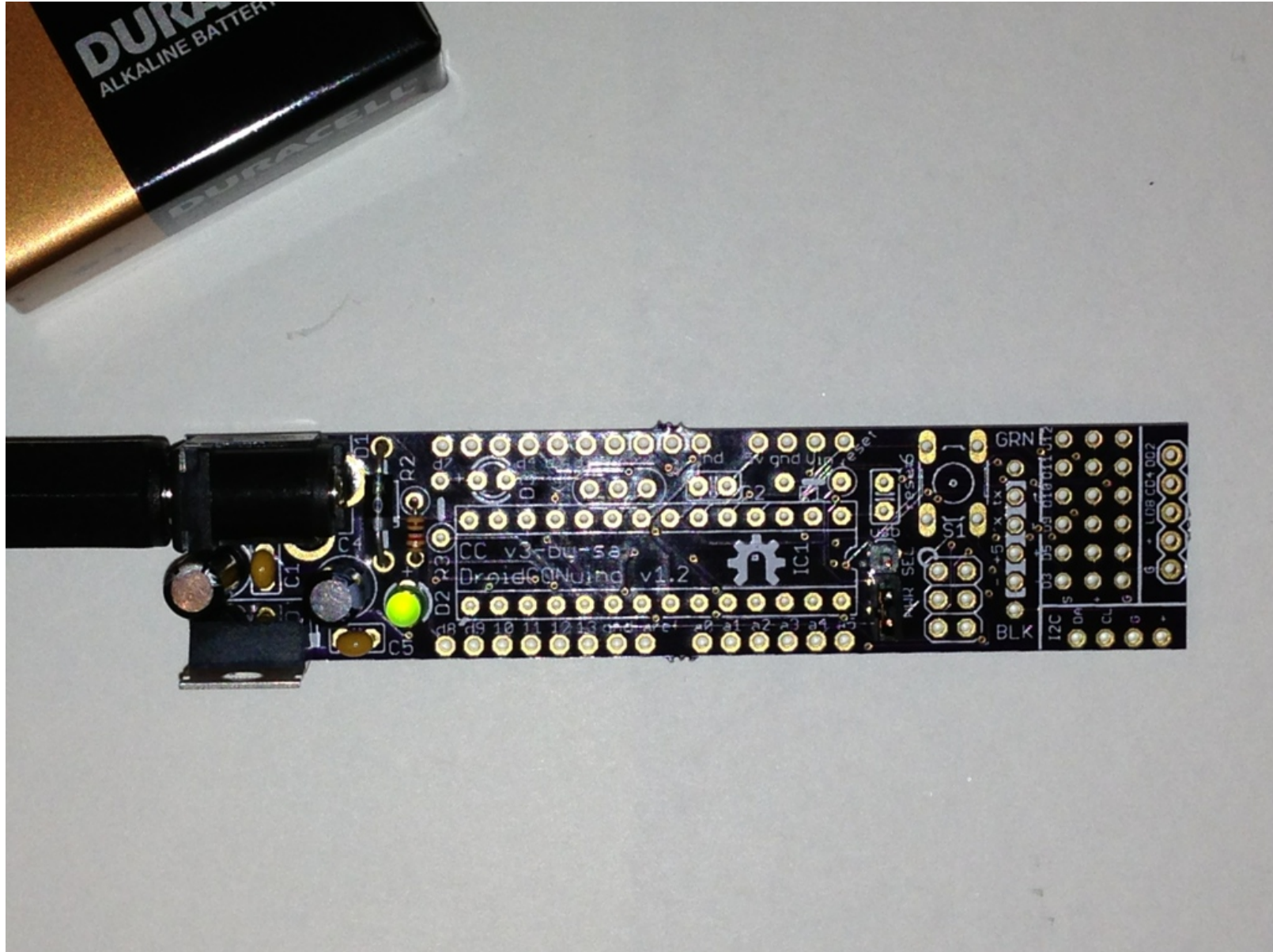
DroidCONuino - Power Supply



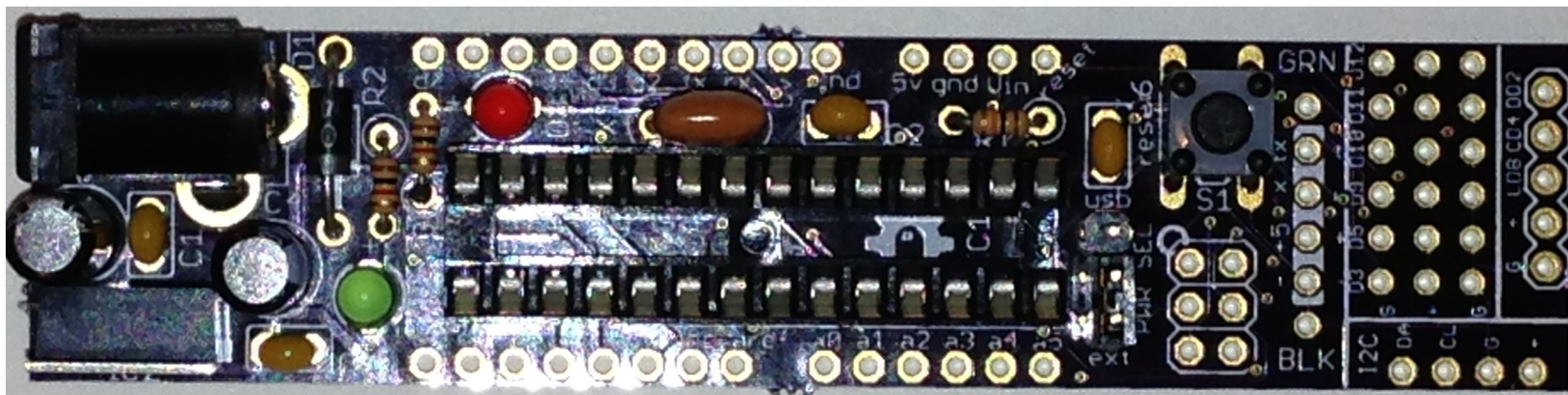
- 👤 Install Capacitors C1 & C5 (.1uf 50V - Little & beige)
- 👤 Install Capacitor C4 (100uf 6.3v - rather short) LONG LEG goes into +
- 👤 Install Capacitor C3 (47uf 25v - Tallest) LONG LEG goes into +
- 👤 Install Diode D1 (1N4001)... notice the polarity Band matches Band
- 👤 Install 7805C 5V Regulator IC2. Match orientation with diagram
- 👤 Install Resistor R2 (1k Ohm Brown-Black-RED-Gold)
- 👤 Install LED D2 (3mm Green) LONG LEG goes into +
- 👤 Install Power JACK - Will fit one way into top of PCB
- 👤 Install 1x3 Header & then place JUMPER on pin marked EXT & center
- 👤 Smoke Test it!!!



Should Look Like This



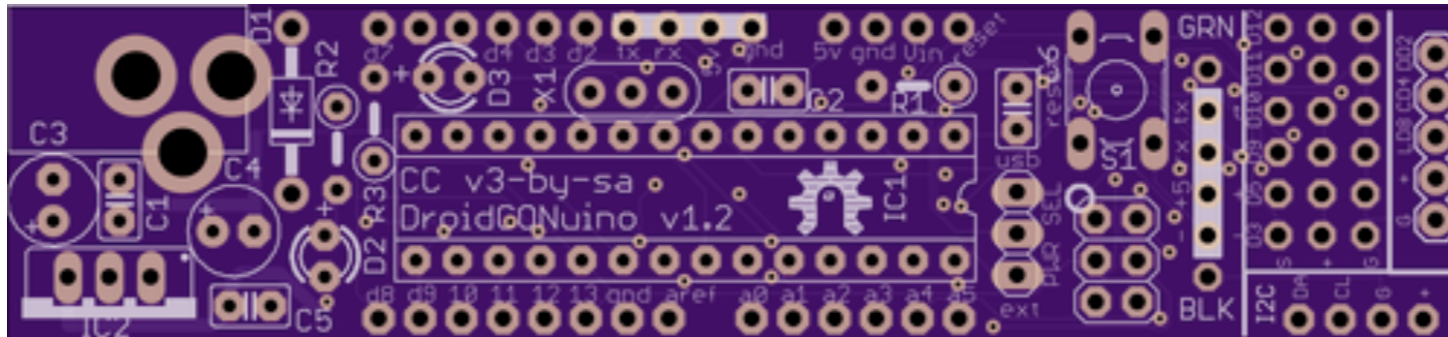
DroidCONuino - MCU Section



- 👤 Install Resistor R3 (1k Ohm Brown-Black-RED-Gold)
- 👤 Install LED D3 (3mm RED). LONG LEG goes into +
- 👤 Install X1 (16 MHz Ceramic Resonator) Notice it has 3 leads and no polarity
- 👤 Install Resistor R1 (10k Ohm Brown-Black-ORANGE-Gold)
- 👤 Install Capacitor C2 & C6 (.1uf 50V - Little & beige)
- 👤 Install SWITCH for Reset into top of PCB. Careful of the pins
- 👤 Install IC1 SOCKET into top of PCB.



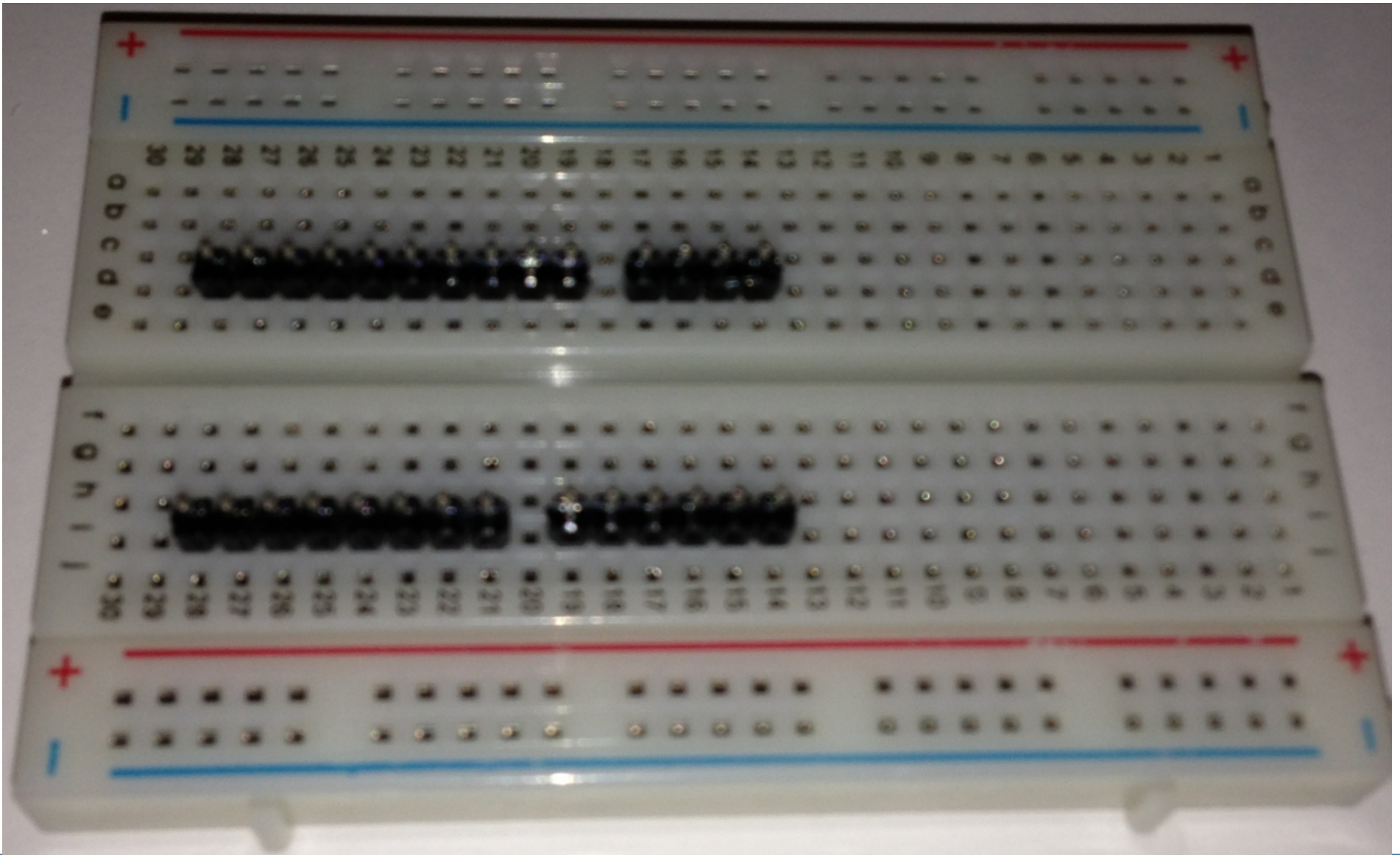
DroidCONuino - Headers



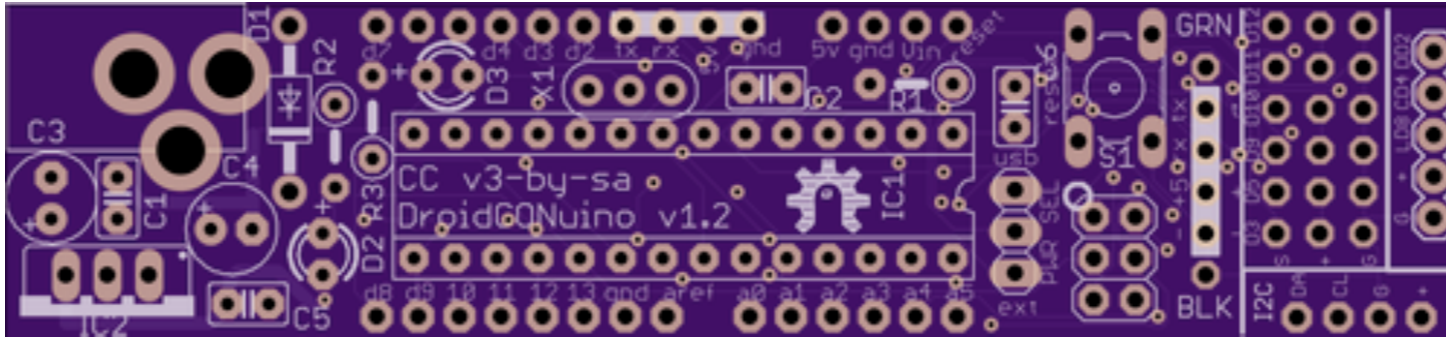
- 👤 Install 2x3 header into ISCP, beside the reset SWITCH
- 👤 Install 1x6 header into the USB/FTDI section into the TOP of PCB
- 👤 Install 3x6 header into SERVO section into the TOP of the PCB
- 👤 Install 1x4 header into the I2C section, TOP of the PCB
- 👤 Install 1x5 header into the LOGICS section, TOP of the PCB
- 👤 (OPTIONAL) If your going to use with a BREADBOARD, install headers onto the BREADBOARD, LONG legs into BREADBOARD.



Header Setup on BreadBoard



DroidCONuino - Atmel 328P



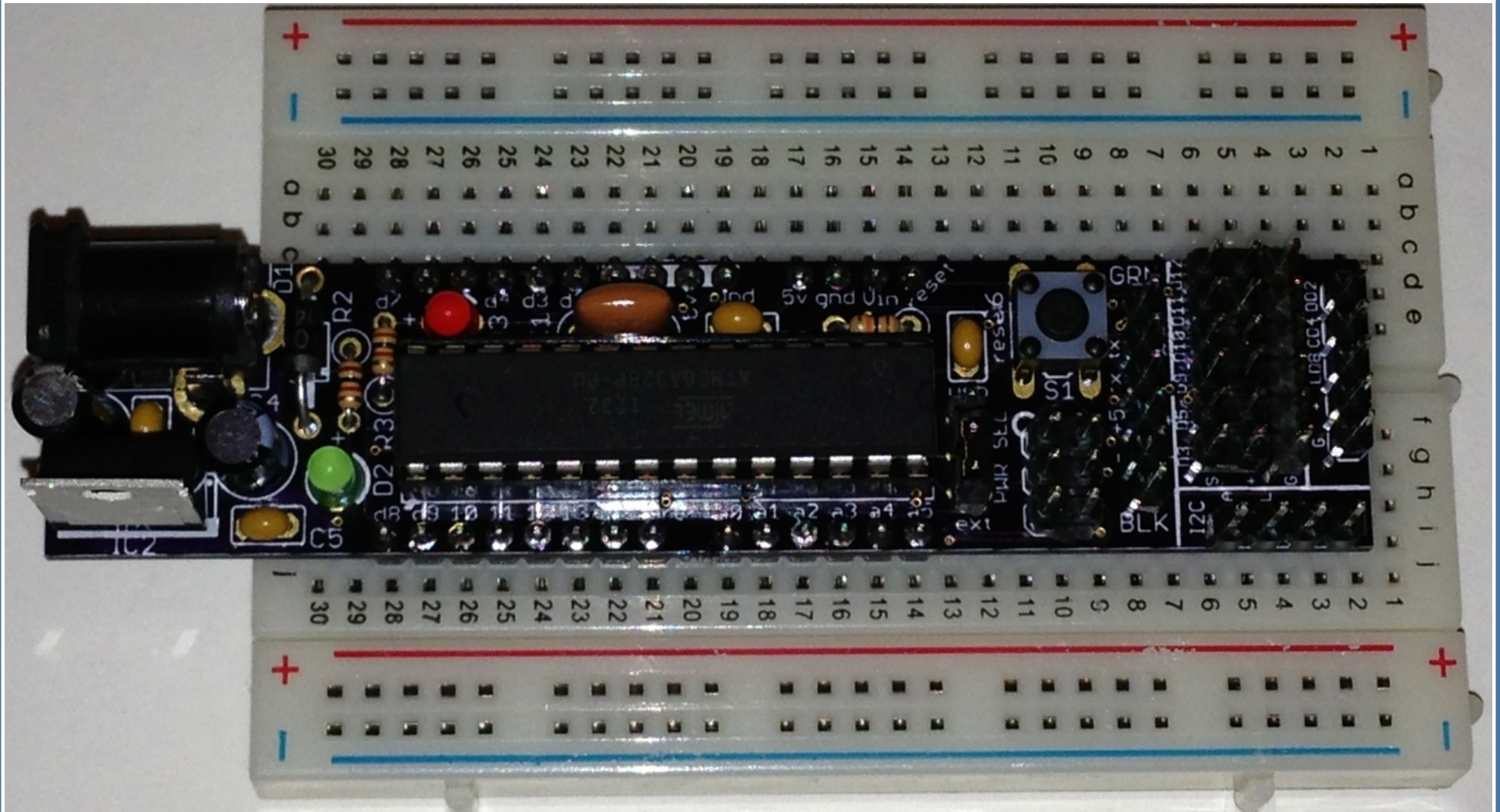
- 👤 STATIC Sensitive... meaning static can kill it.
- 👤 Dump static to a ground if possible... touch the metal faucet in the sink
- 👤 Align 328P with IC1 Socket indentation.
- 👤 Gently set 328P onto socket
- 👤 Verify the pins are aligned with socket receptacles
- 👤 Press 328P into the socket

Indentation →










Pin 1 →



Completed?



Smoke Test

-  Apply 9V DC via Power JACK
-  Green LED should turn on.
-  Press RESET once
-  Red LED D3 should blink on & off.
-  If everything is a good...
-  Let an Instructor test programming it!
-  It will also rotate any SERVOS attached to Servo 1-6
-  Test Maxim 72xx Bus
-  If it does not blink or if you let the Magic Blue Smoke out



Q

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