

EPIC FMS

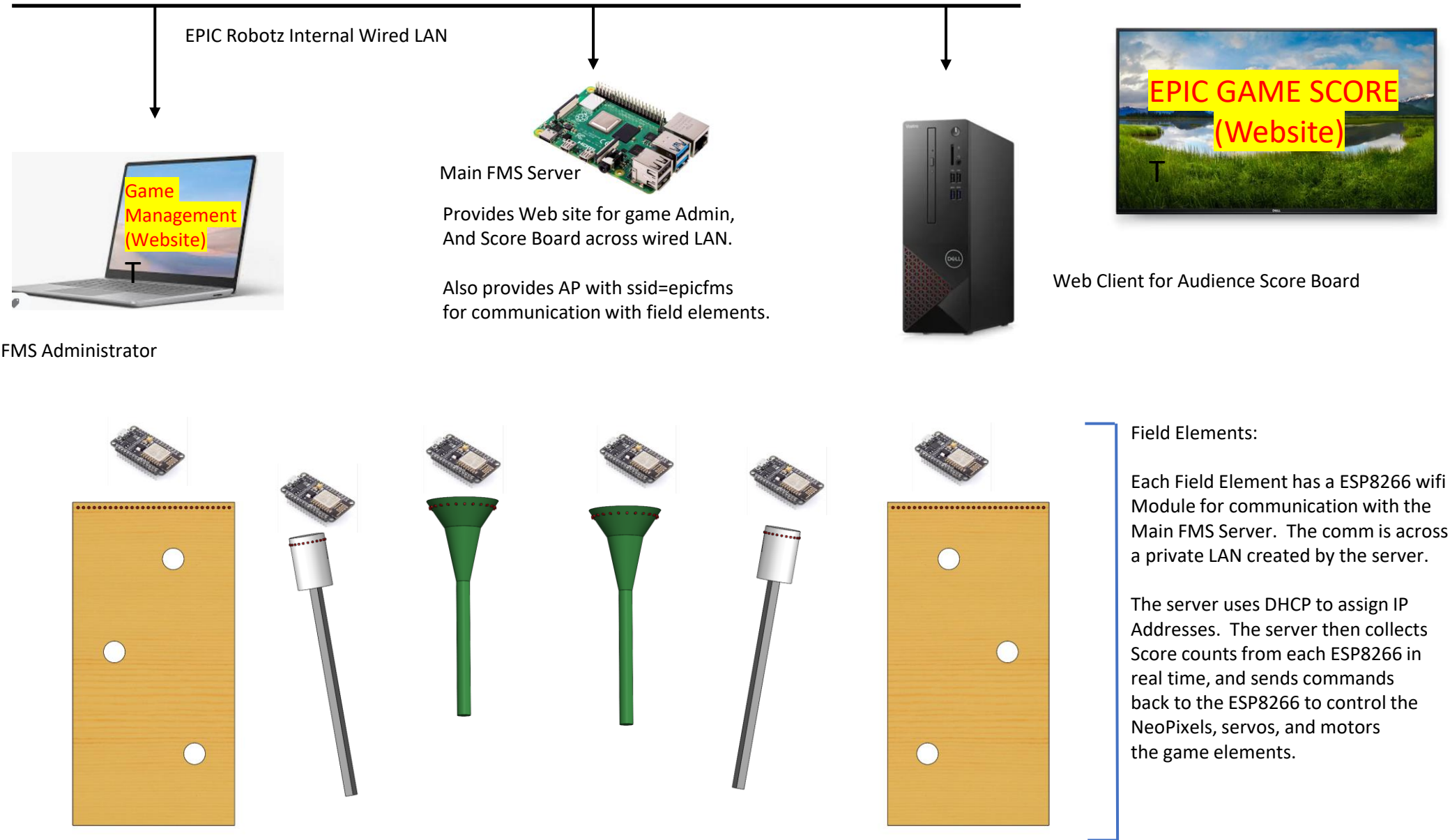
A Field Management System (FMS) for the Fall Game

Epic Robotz

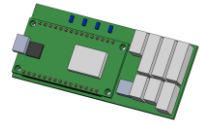
Fall 2021

This stack contains useful info about various parts of EpicFMS.

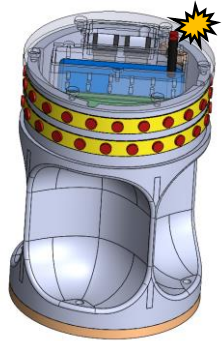
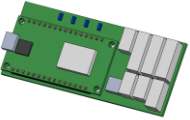
EPIC Robotz FMS System for the Fall 2021 Intramural Game



Overview of Electronics for Field Elements

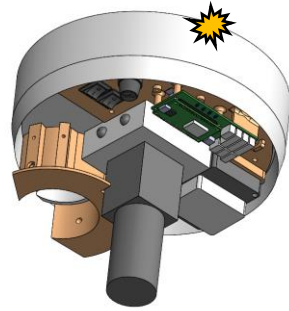


Two versions (V1, V2) of a PCB were manufactured to support EpicFMS. The schematics for these PCBs are named "Moving Target Unit, V4" and "Moving Target Unit, V5", respectively. These feature an ESP8266 for WiFi.




Moving Target Unit

These units use V2 of the PCB, And are wired according to "Moving Target Wiring Schematic" Power to this unit is an internal 2S Lipo battery.



Basket Target Unit

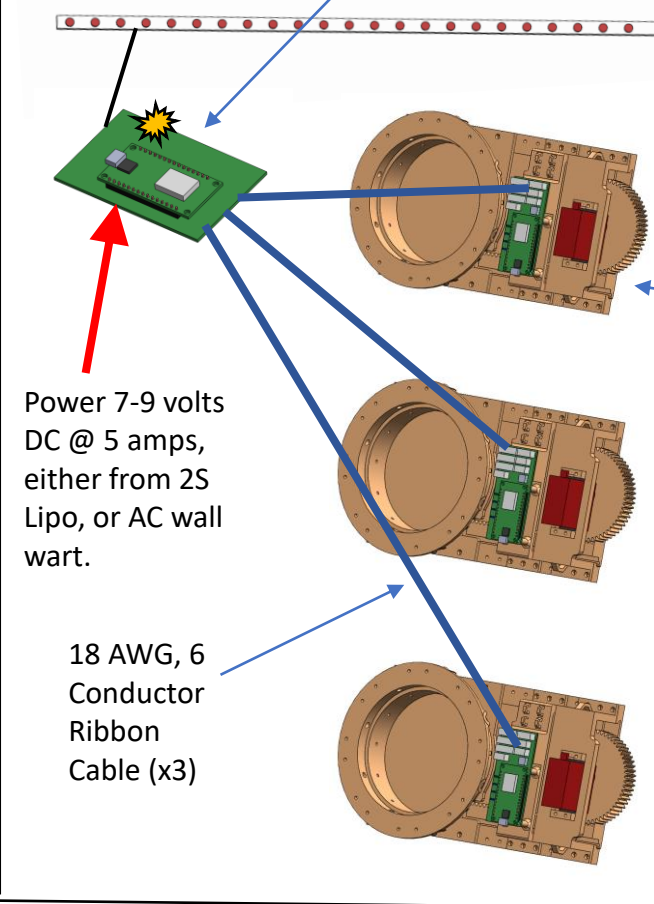
These units use V1 of the PCB, And are wired according to "Basket Wiring Schematic" Power to this unit is 12 volts DC @ 10 amps, either from a 3S Lipo Battery, or an AC Wall Wart.

 = WiFi Enabled Device

Target Board Conductor Unit

This is a hand soldered circuit board. See "Target Board Conductor Schematic"

Target Board



The Target Boards features 3 targets that can open and close on command from the EpicFMS server. In addition, there is a strip of NEO LEDs at the stop, also controlled by the server.

Sliding Target Unit

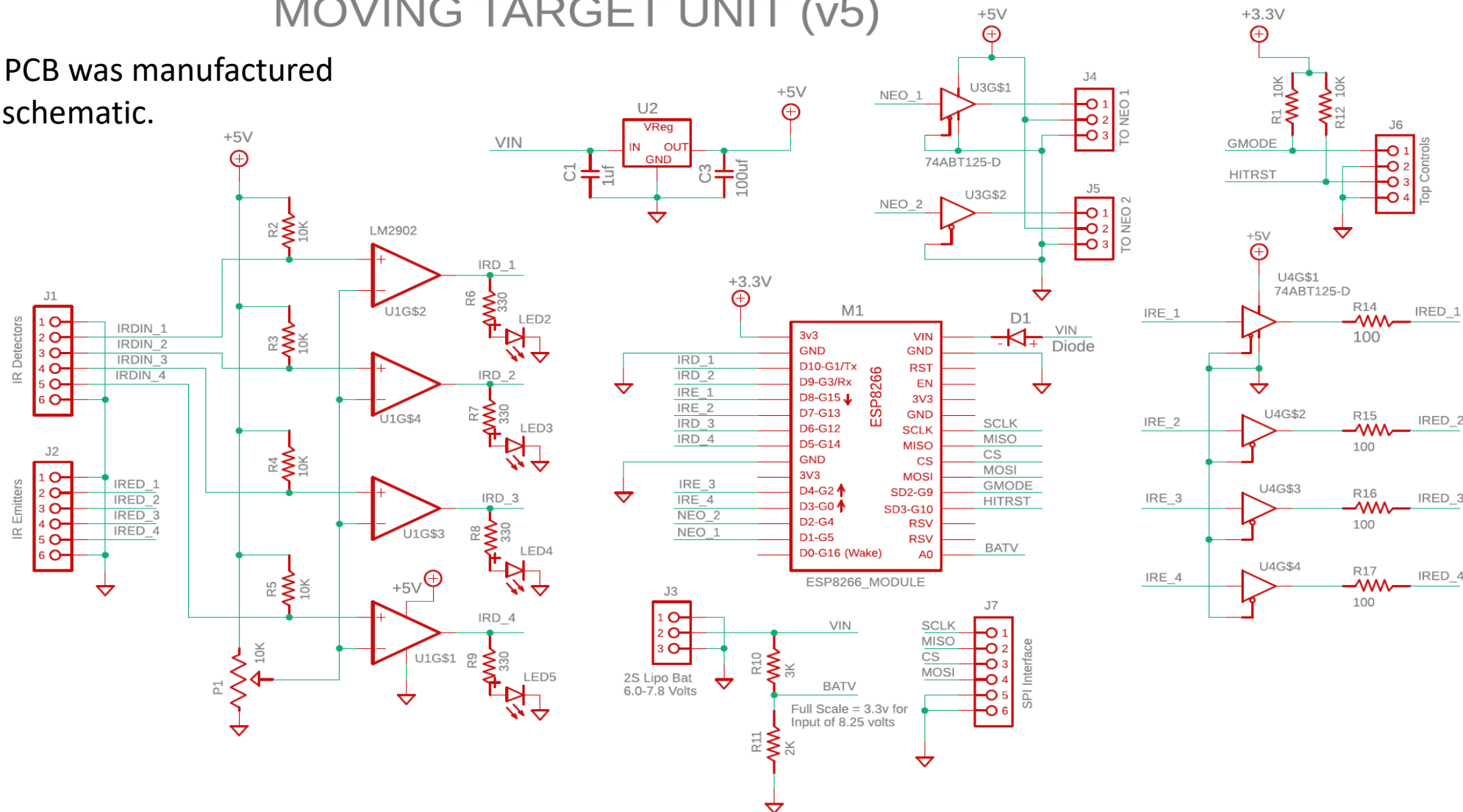
Each of these uses a V2 PCB, and is wired according to the "Sliding Target Wiring Schematic" These slider units do not use their WiFi capability, but instead communicate with the Target Board Conductor via SPI over a ribbon cable. The ribbon cable also supplies power to these units.

MOVING TARGET UNIT, V4

PCB Schematic, V2

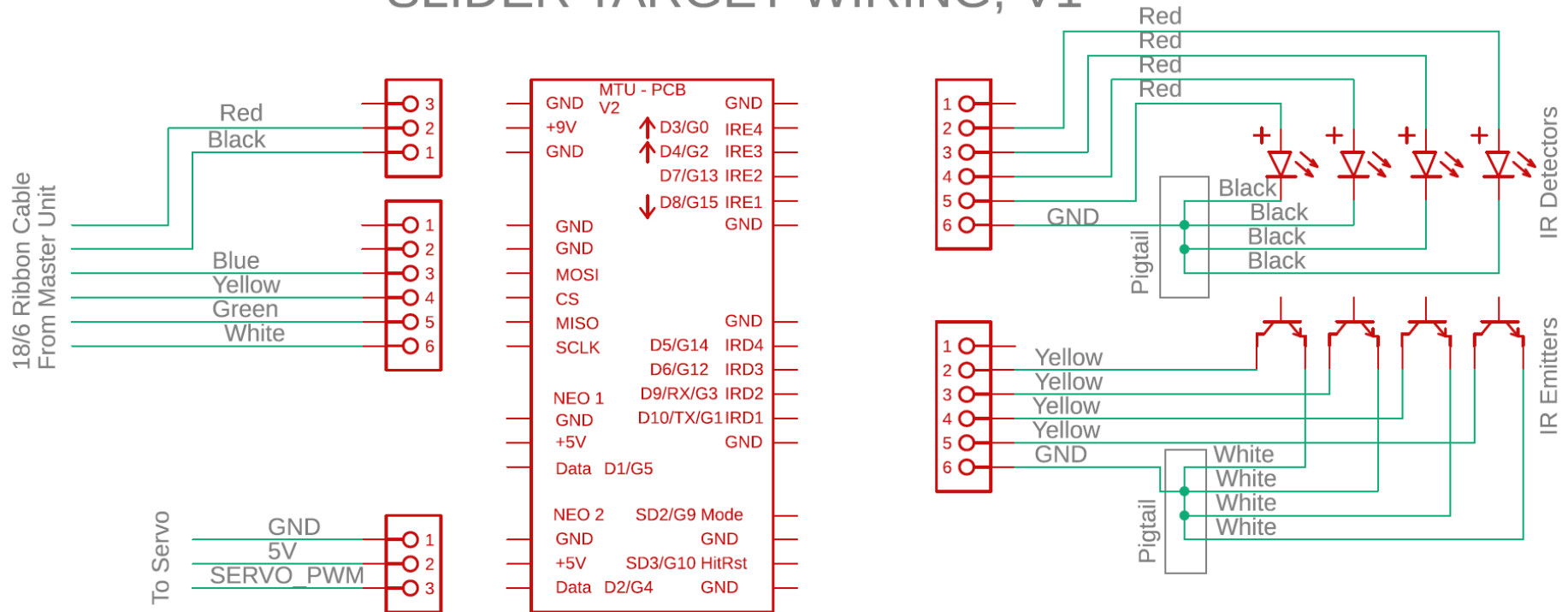
MOVING TARGET UNIT (v5)

V2 of the PCB was manufactured from this schematic.



Sliding Target Wiring Schematic

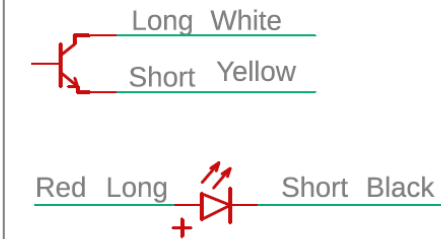
SLIDER TARGET WIRING, V1



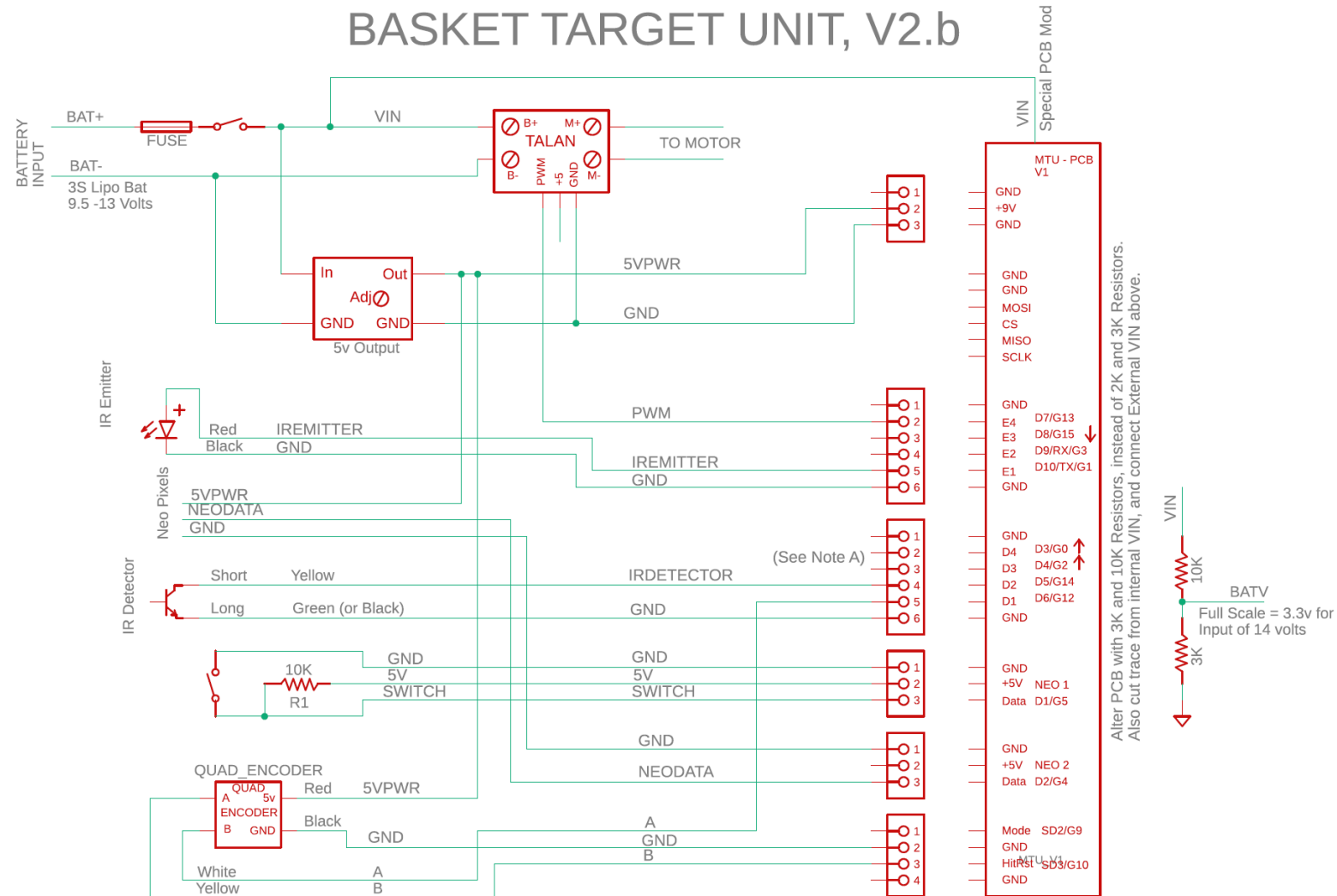
Notes:

1. Rect Blocks are JST connectors, HX series
2. IR Emitter/Detectors are 5mm 940nm from Amazon
3. Wire sizes are 24 AWG, stranded.

Detector / Emitter Wiring, 4 each



Basket Target Wiring Schematic



Note A: for proper boot up D3 and D4 at the ESP8266 module must be held high. This can be accomplished by leaving them UNCONNECTED even though they are fed by an OpAmp on the PCB. This allows a V1 Version of the PCB to be used for the basket target -- although for other targets, V1 cannot be used.

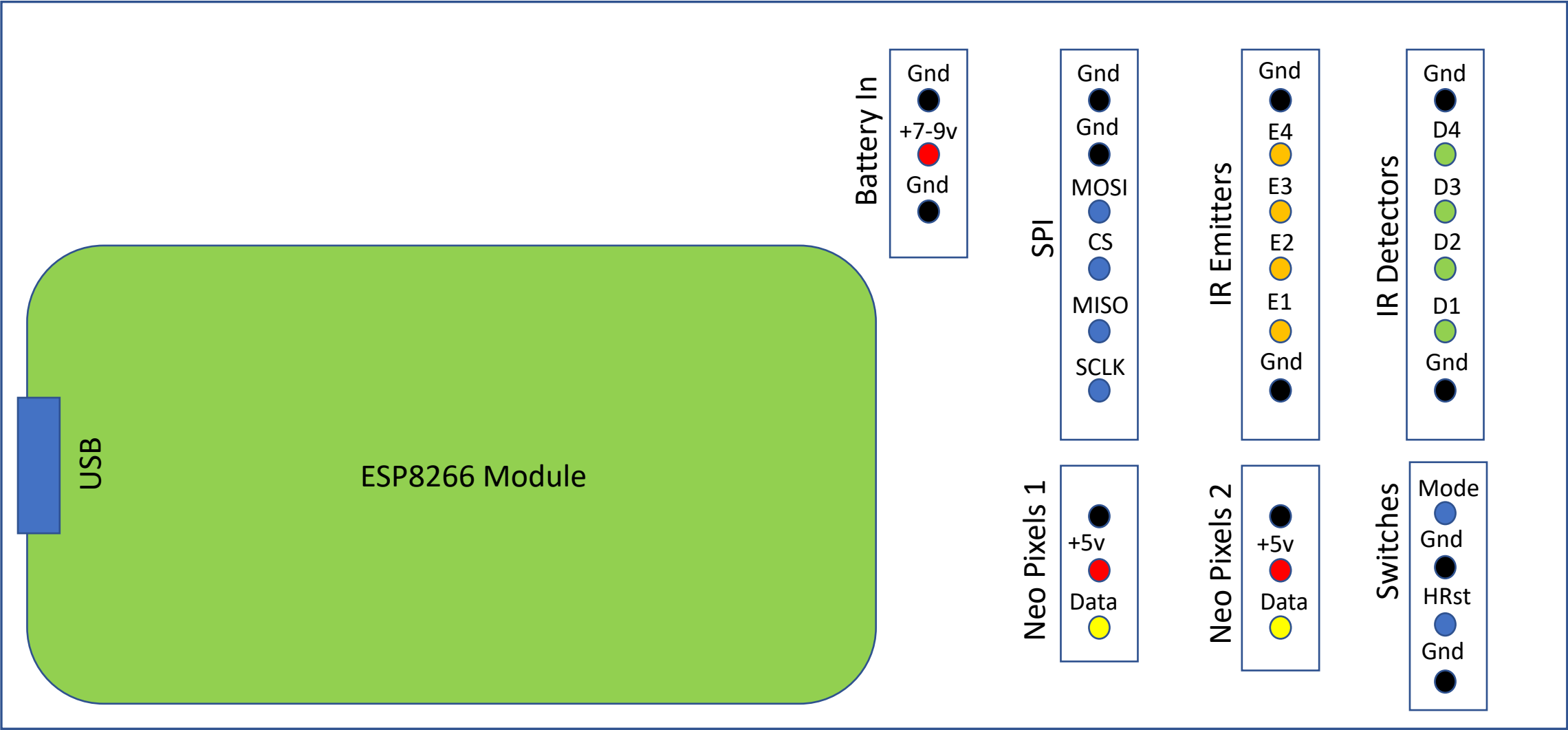
Target Board Conductor Unit, Schematic

Coming Soon, I Hope.

Moving Target Wiring Schematic

Coming Soon, I Hope.

MOVEING TARGET CIRCUIT BOARD CONNECTORS



Wiring IR Emitter/Detectors

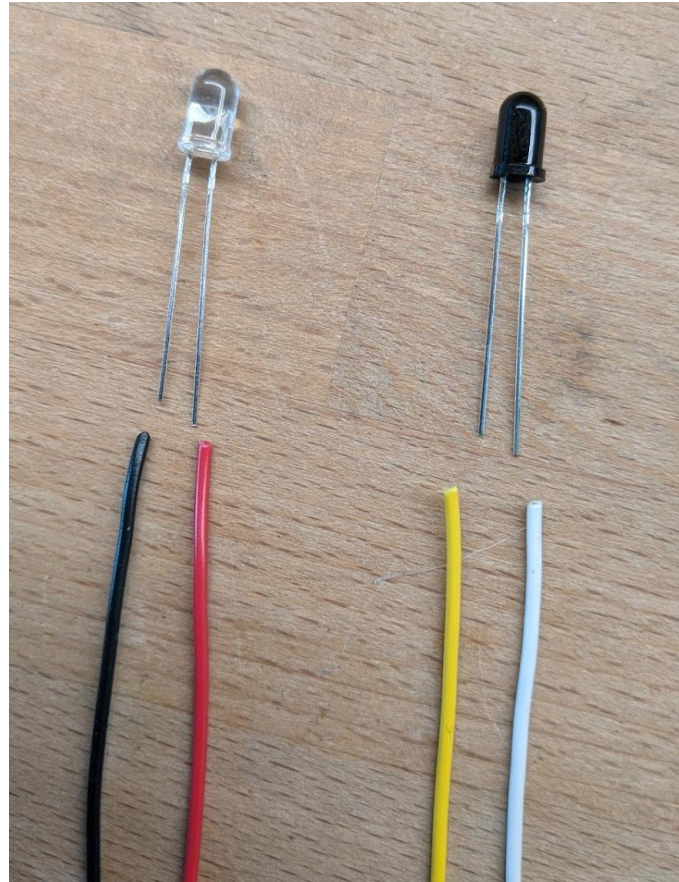
The CLEAR LED is the Emitter.

Our circuit sends about 17ma of current through this device.

The RED wire carries positive voltage and must be connected to the LONG lead.

The BLACK wire should be connected to the SHORT lead.

Use 24-26 AWG stranded wire.



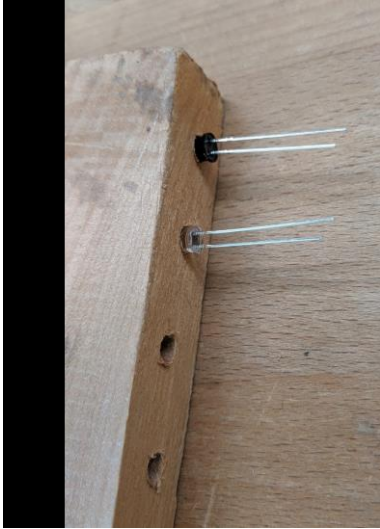
The Dark Component is the Detector.

When it detects IR light, it allows current to flow between it's leads, but in only one direction: from the short lead to the long lead.

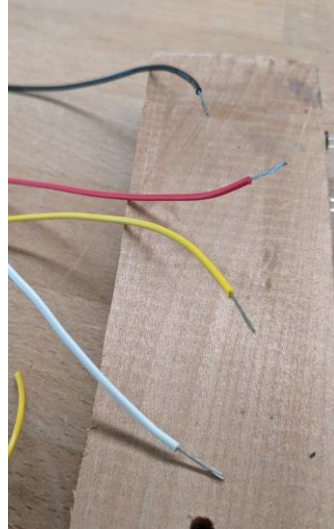
The YELLOW wire is the positive side and Must be connected to the SHORT lead.

The WHITE wire is the negative side and Must be connected to the LONG lead.

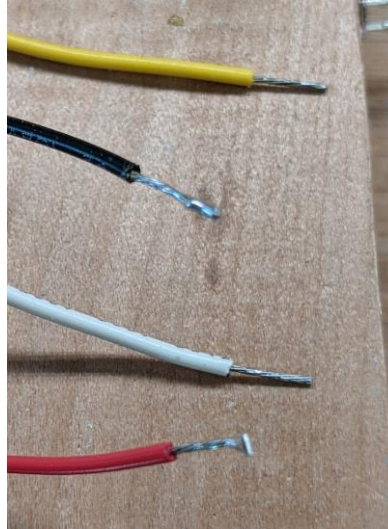
Steps to Solder Wires to the IR Components



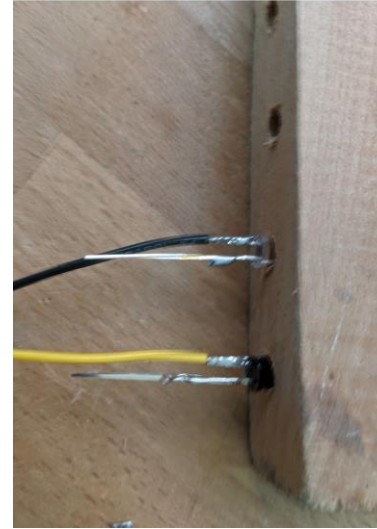
Start with the components in the soldering jig with the long leads nearer the top of the jig.



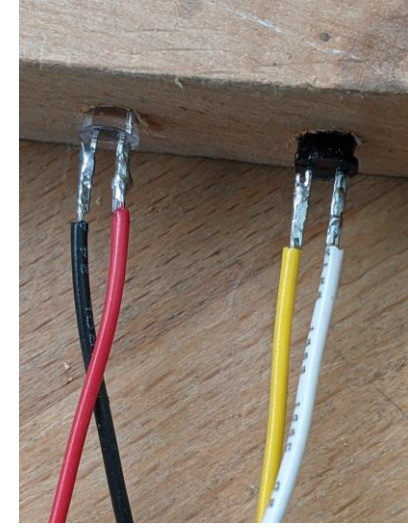
Strip about 0.5 inch of insulation from each wire.



Tin all wires and leads. Then trim the wires so that there is about 3/8 inch of conductor showing.



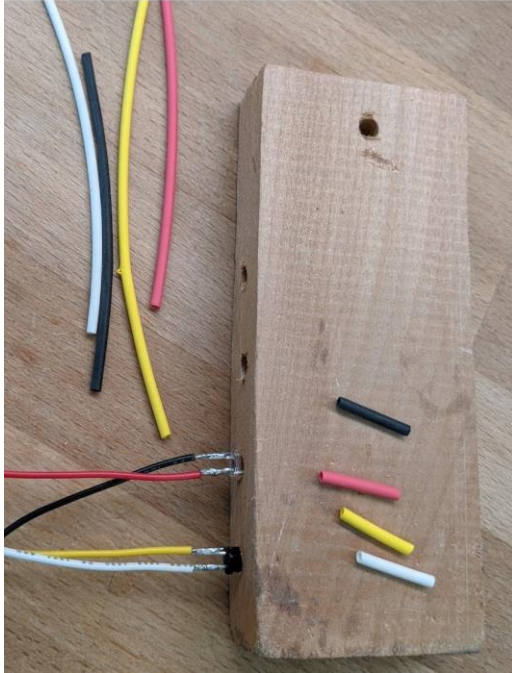
Cut the short leads to about 3/8 inch. And then use the **parallel solder technique** to solder the wires.



Do the same for the long leads.

Parallel solder technique: After tinning both wire and lead, bring the wire along side of the lead (i.e., parallel to it), and then heat both with the soldering iron at the same time. Allow the solder to flow between the lead and the wire while holding the wire very steady. Remove the soldering iron while keeping the wire absolutely still until the solder cools.

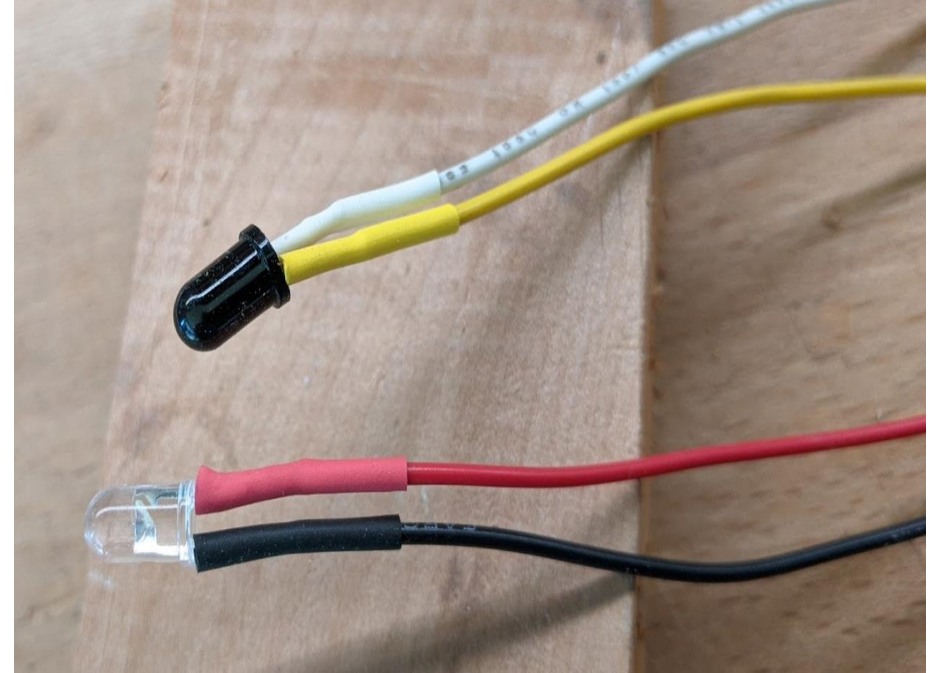
Steps to Finish the Soldered IR Components



Cut about 5/8" of heat shrink tubing for each wire. Try to use the same color. Use 1/16 " diameter tubing (measured before heat applied).

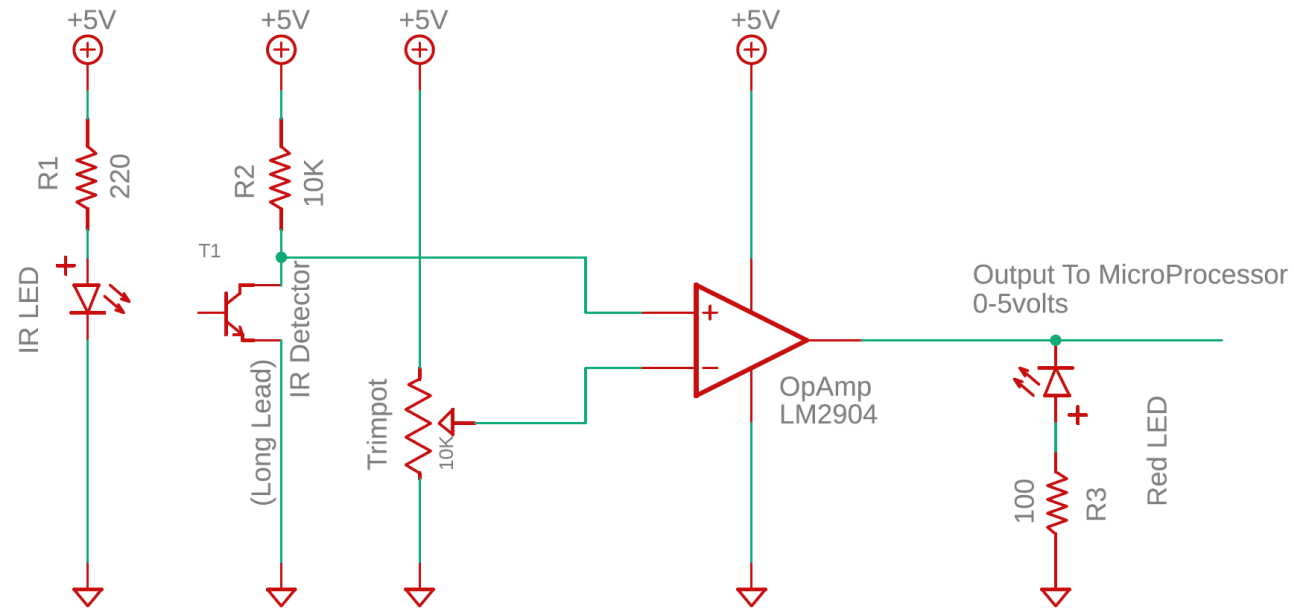


Slide the heat shrink tubing on each wire all the way to the component. Apply heat with a heat gun. Don't use a match!



All Done!

IR Emitter / Detector Test Circuit



Notes:

1. The IR Emitter, as shown with a 220 ohm resistor draws about 17 mA.
2. The voltage at the + terminal on the OpAmp runs between 0.12 volts when the beam is detected, and 3.5 volts when the beam is broken.
3. The OpAmp is wired as a simple comparator. It outputs a hard 0 volts if the beam is detected, and about 3.5 volts if the beam is broken.
4. The Red LED after the OpAmp is included to indicate when the beam is broken.

IR Emitter / Detector Wiring

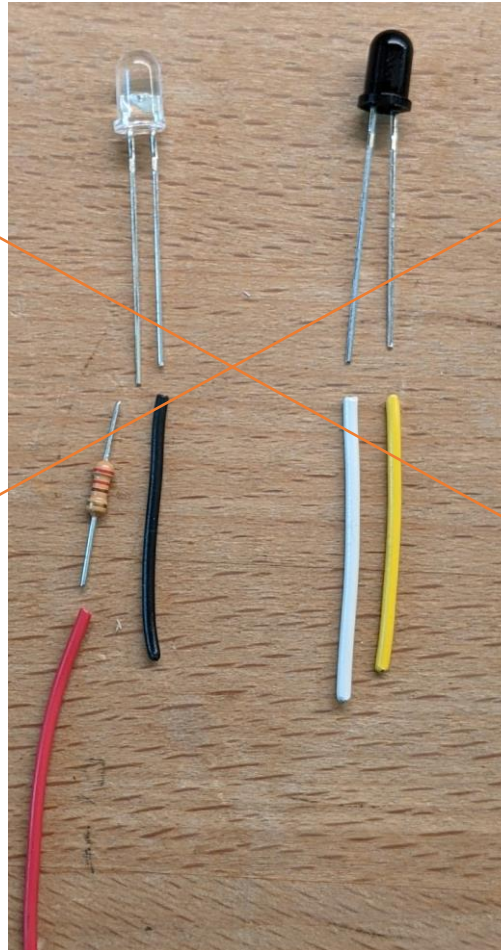
OBSOLETE!! Design Changed.

The Clear LED is the Emitter.

Connect a Red wire to a 220 ohm resistor and then to the long lead. On the short lead, connect a black wire.

Use 24-26 AWG stranded wire.

When powered with 5 volts, Each emitter will draw about 14 mA.



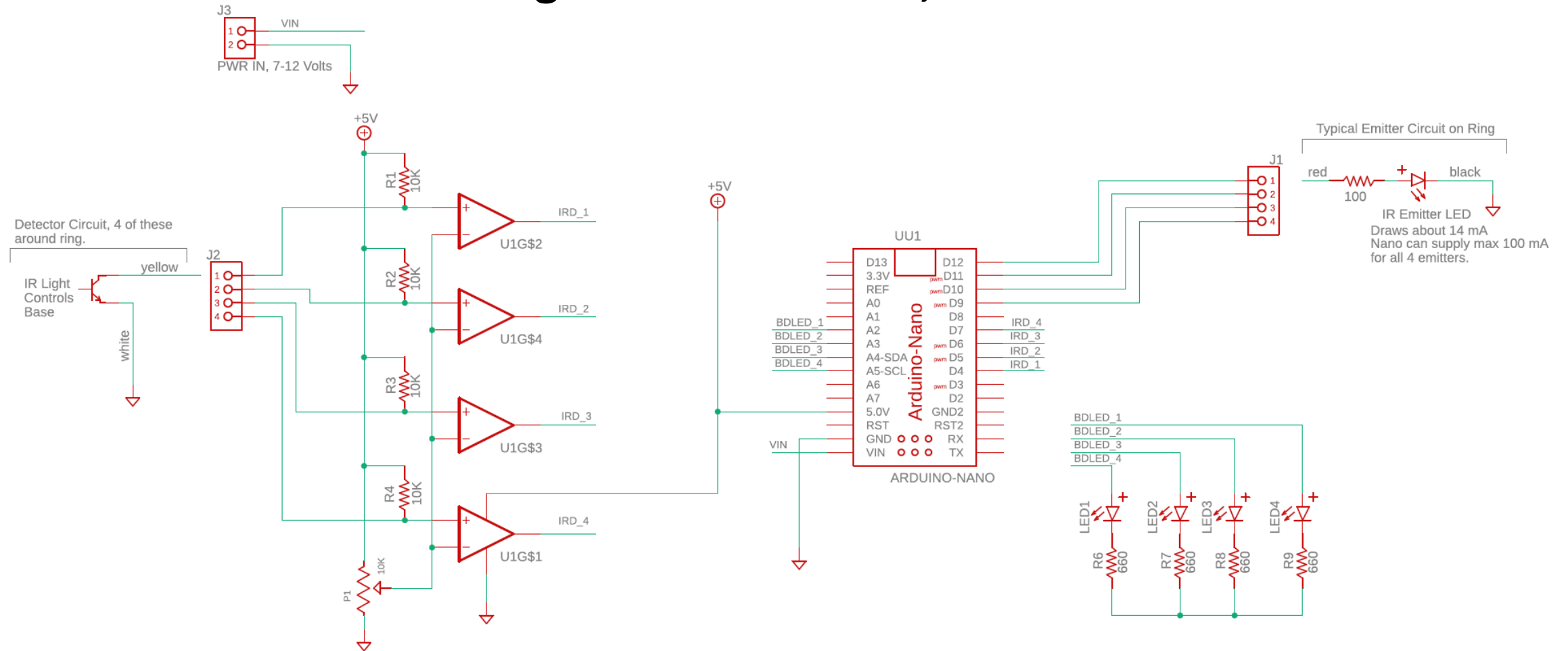
The Dark Blue Component is the Detector.

Connect a white wire to the long lead. Connect a yellow wire to the short lead.

Use 24-26 AWG stranded wire.

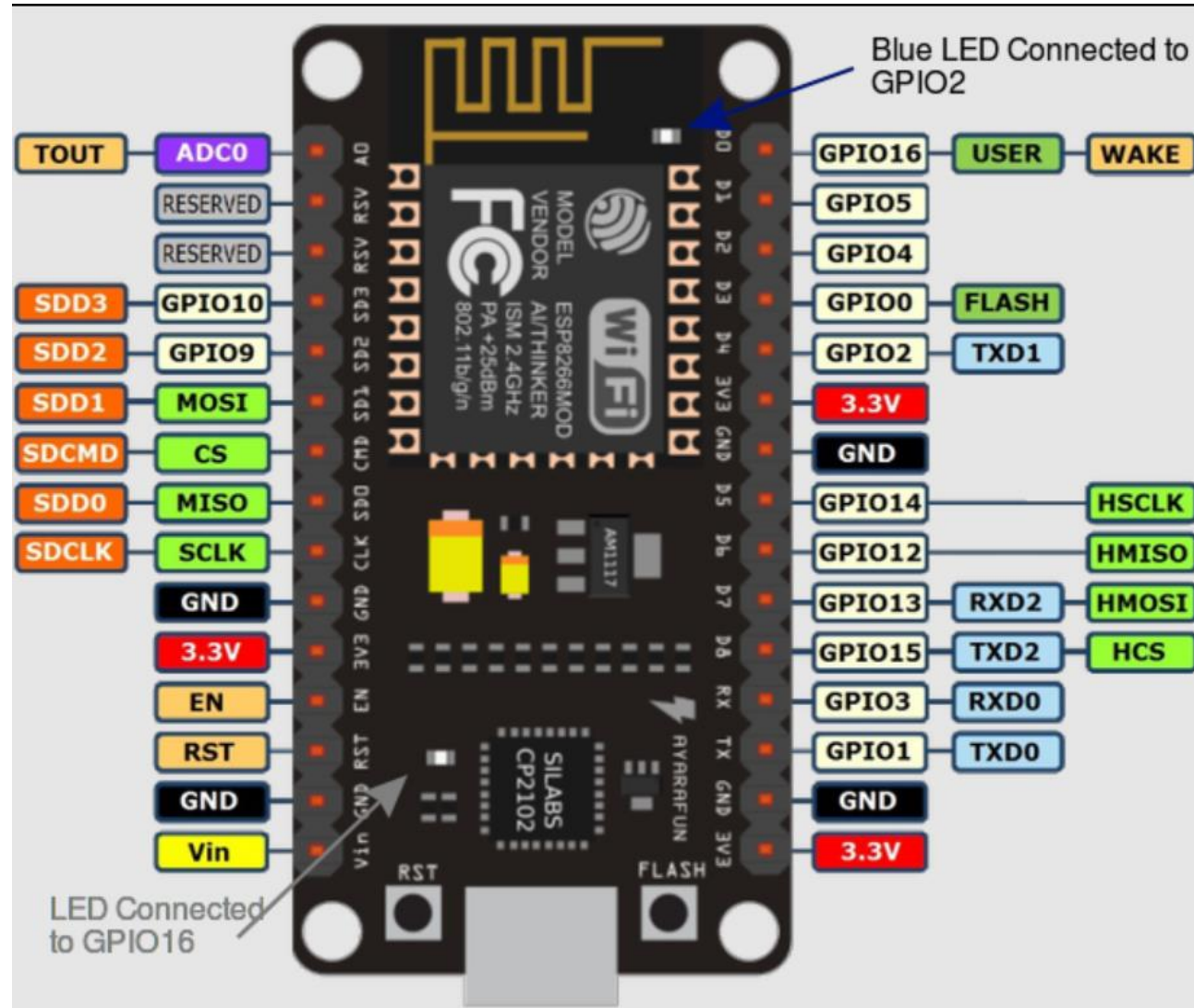
In the circuit, the white lead will be connected to ground. When the detector is "on", current will flow from the yellow wire through the detector to ground.

Ring Detection Circuit, Version 1

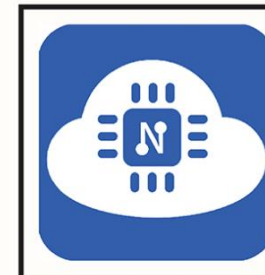
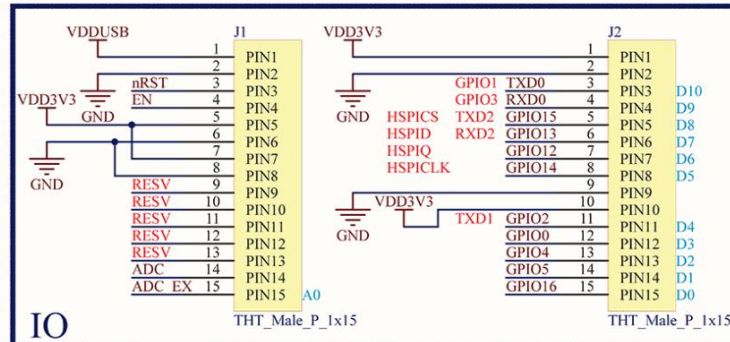
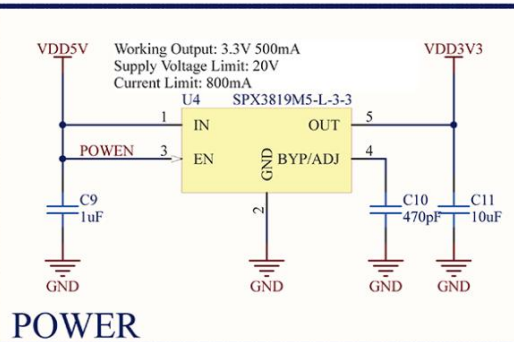
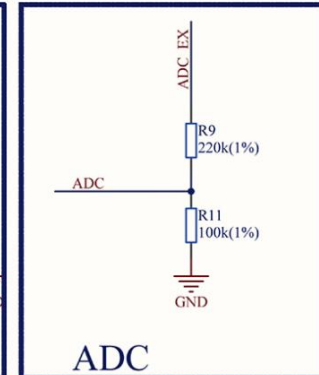
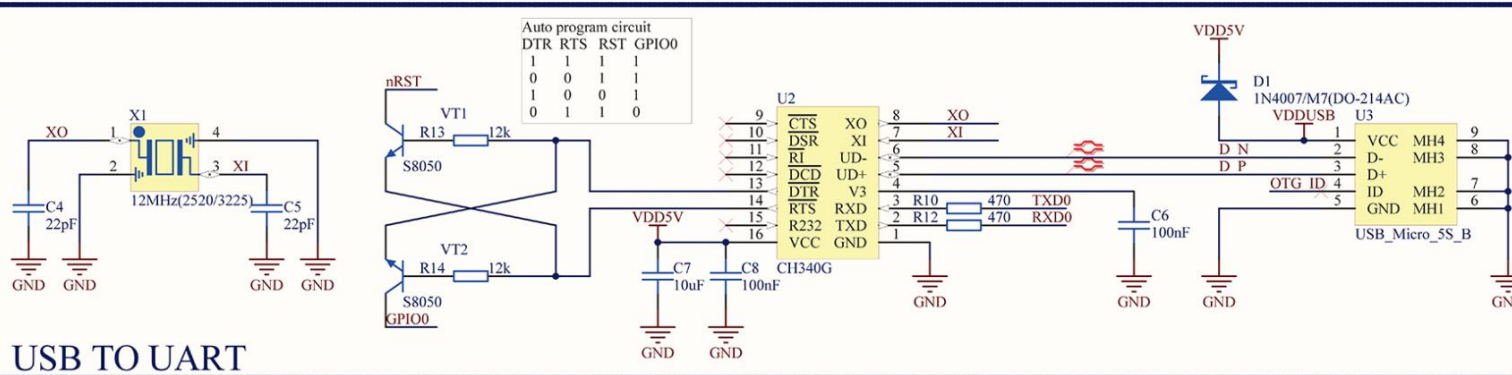
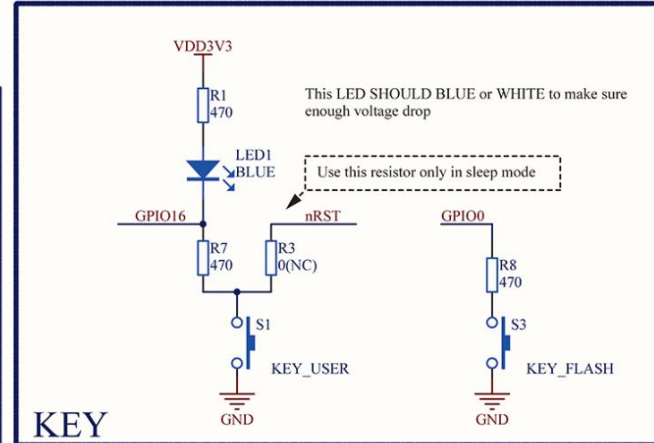
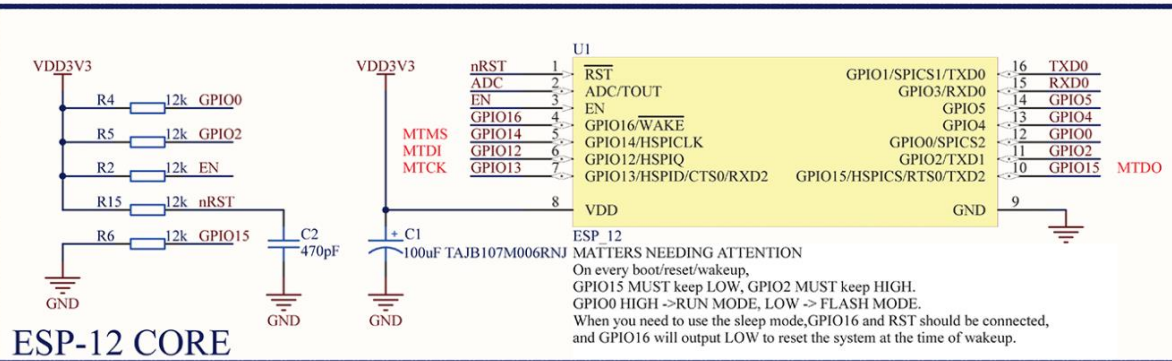


This circuit was used in early development to test IR detection. It is not part of the final system.

Pinout for nodeMCU



NODE MCU ESP12



VER	DATE
0.9	20/11/2014
ORGANIZATION	
NODE MCU TEAM	
WEBSITE	
WWW.NODEMCU.COM	

INFO About Arduino NANO – Pin Mappings

NANO PINOUT

