Exploring the Infrared World

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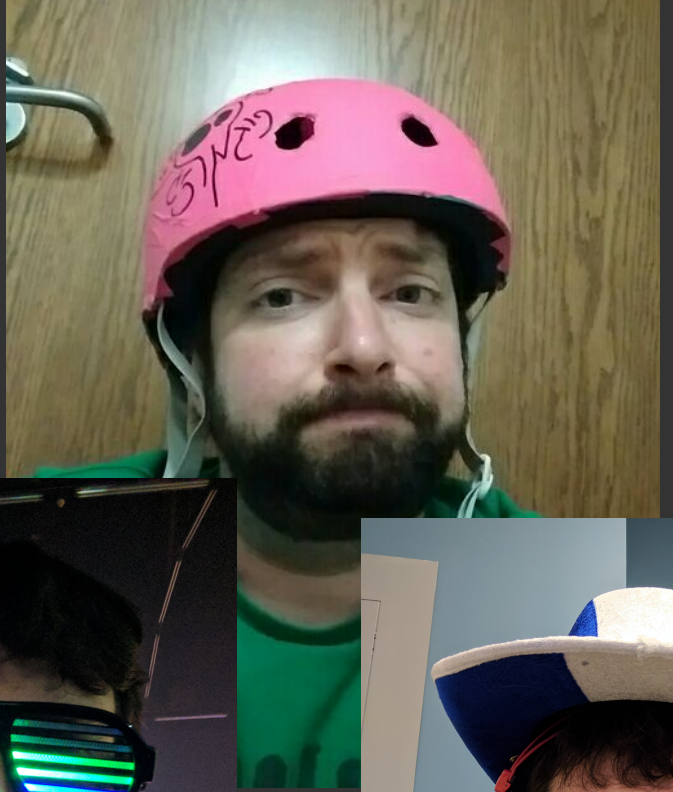
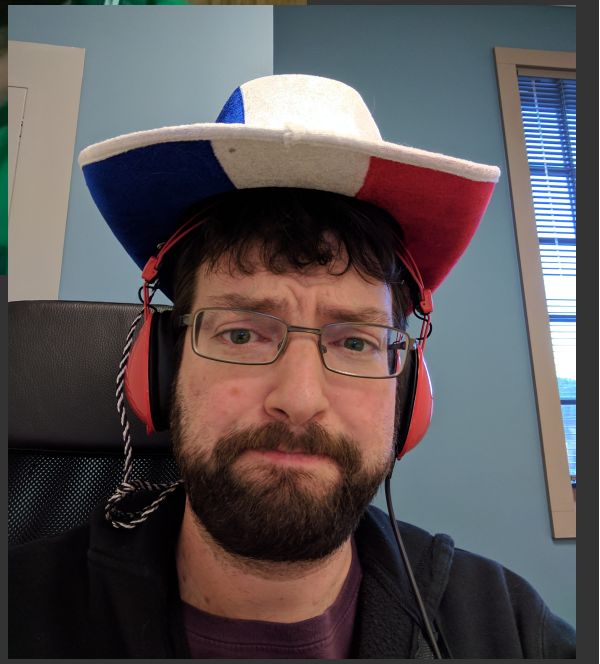
Great Scott Gadgets
@GSGlabs

Dominic Spill

- Open source software developer
  - Ubertooth / GreatFET / HackRF
  - fcc.io
- Extraordinary



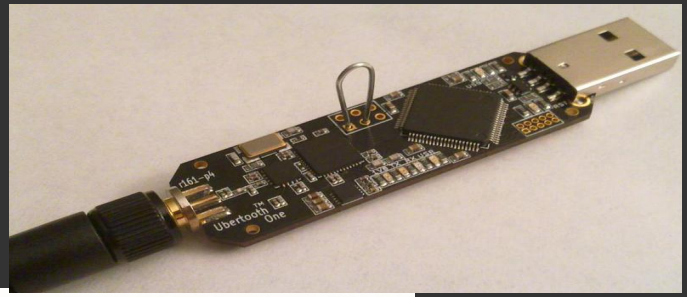


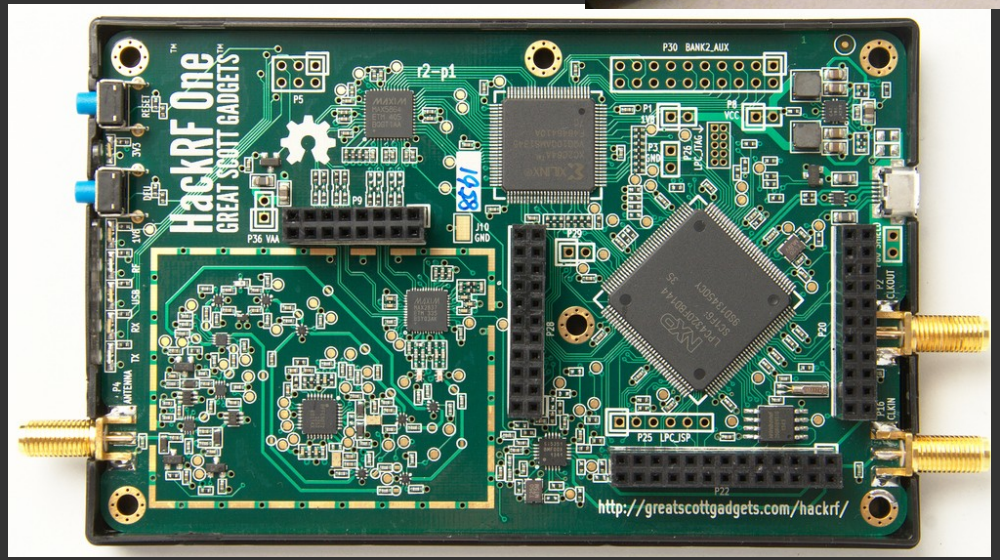
Michael Ossmann

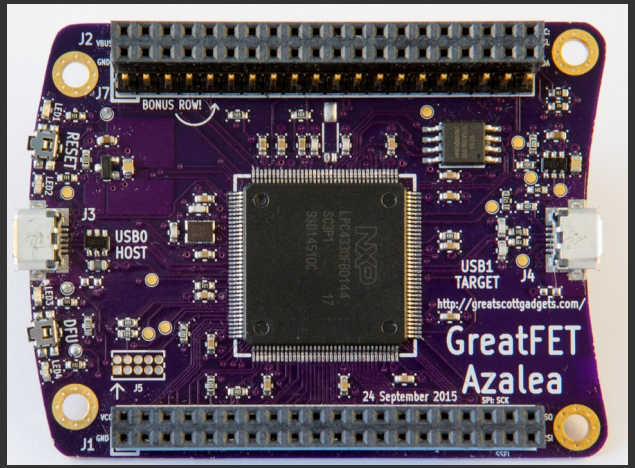
- Open source hardware developer
  - Ubertooth
  - GreatFET
  - HackRF
- Founded GSG
- Ordinary

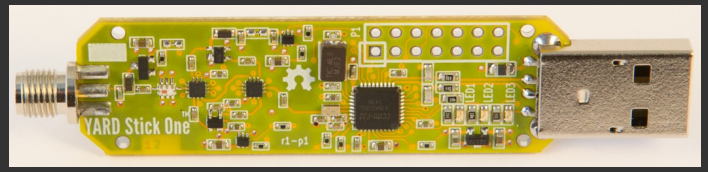
Great Scott Gadgets

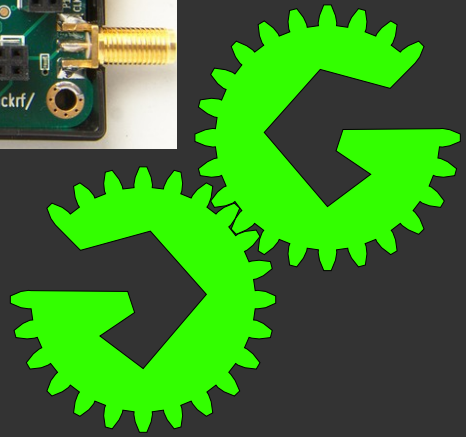
- HackRF One
- Ubertooth
- YARDStick One
- GreatFET







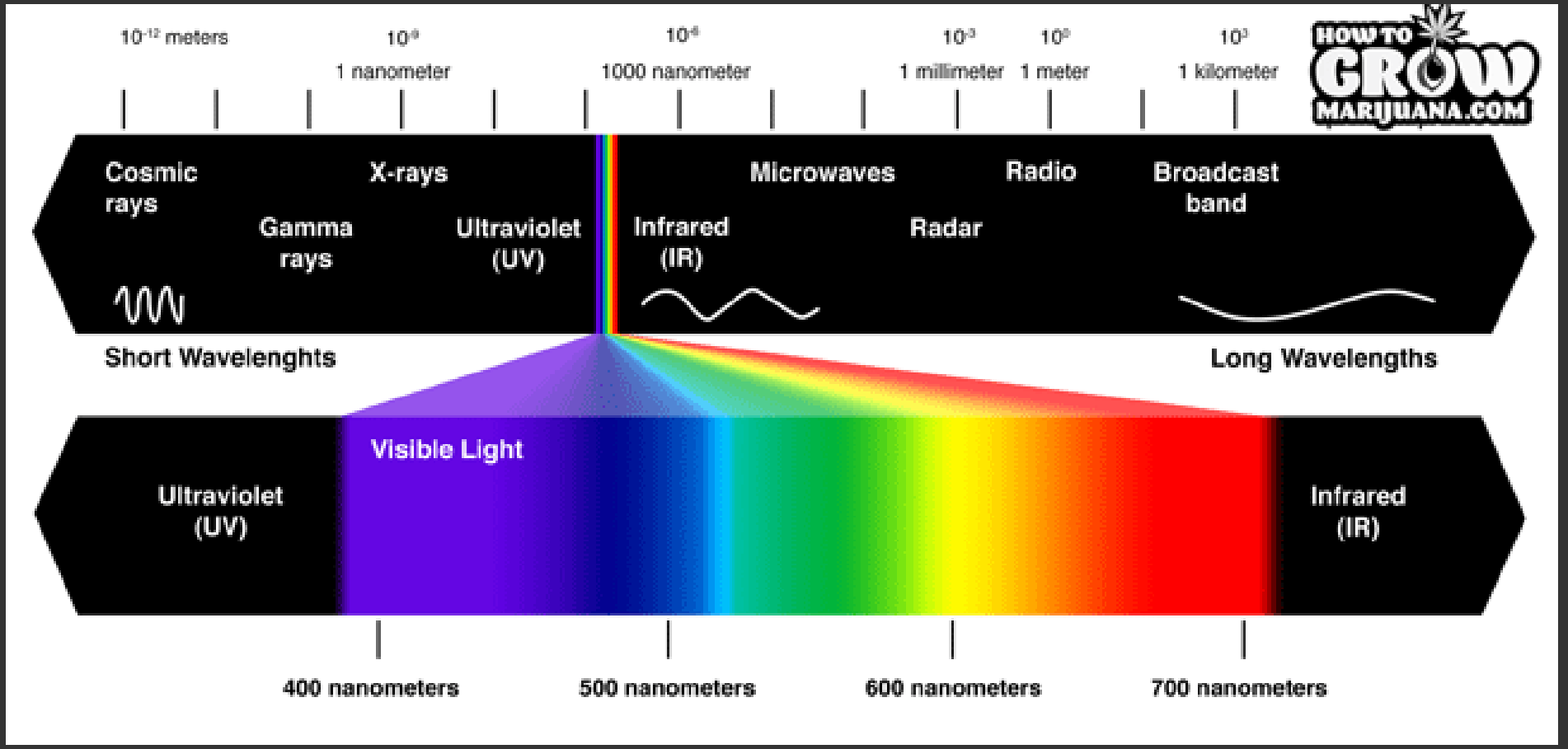




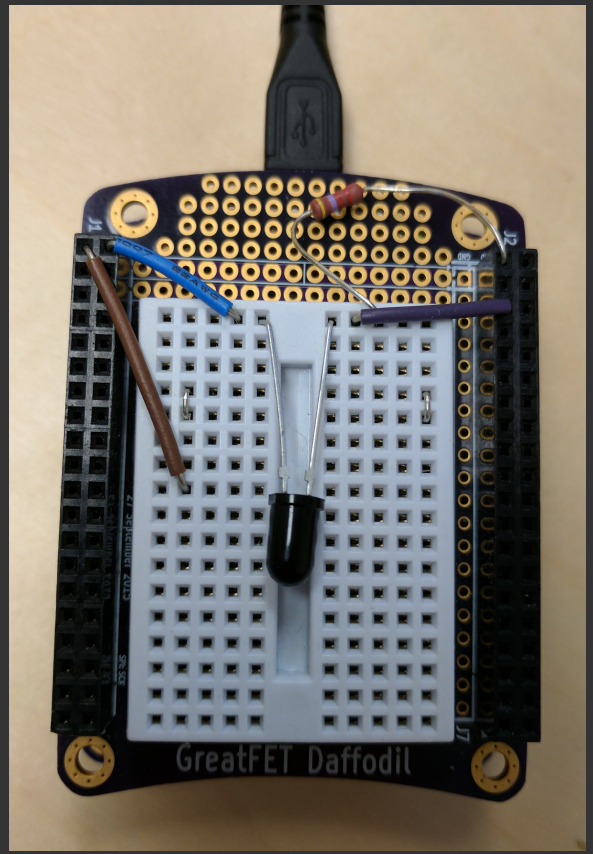
Infrared

- Remote control
  - AV, home automation, lighting
  - Toys
- Communications
  - IRDA
  - Audio
- Sensing
  - PIR
  - LIDAR
- Heat
  - This one’s tricky…

Light

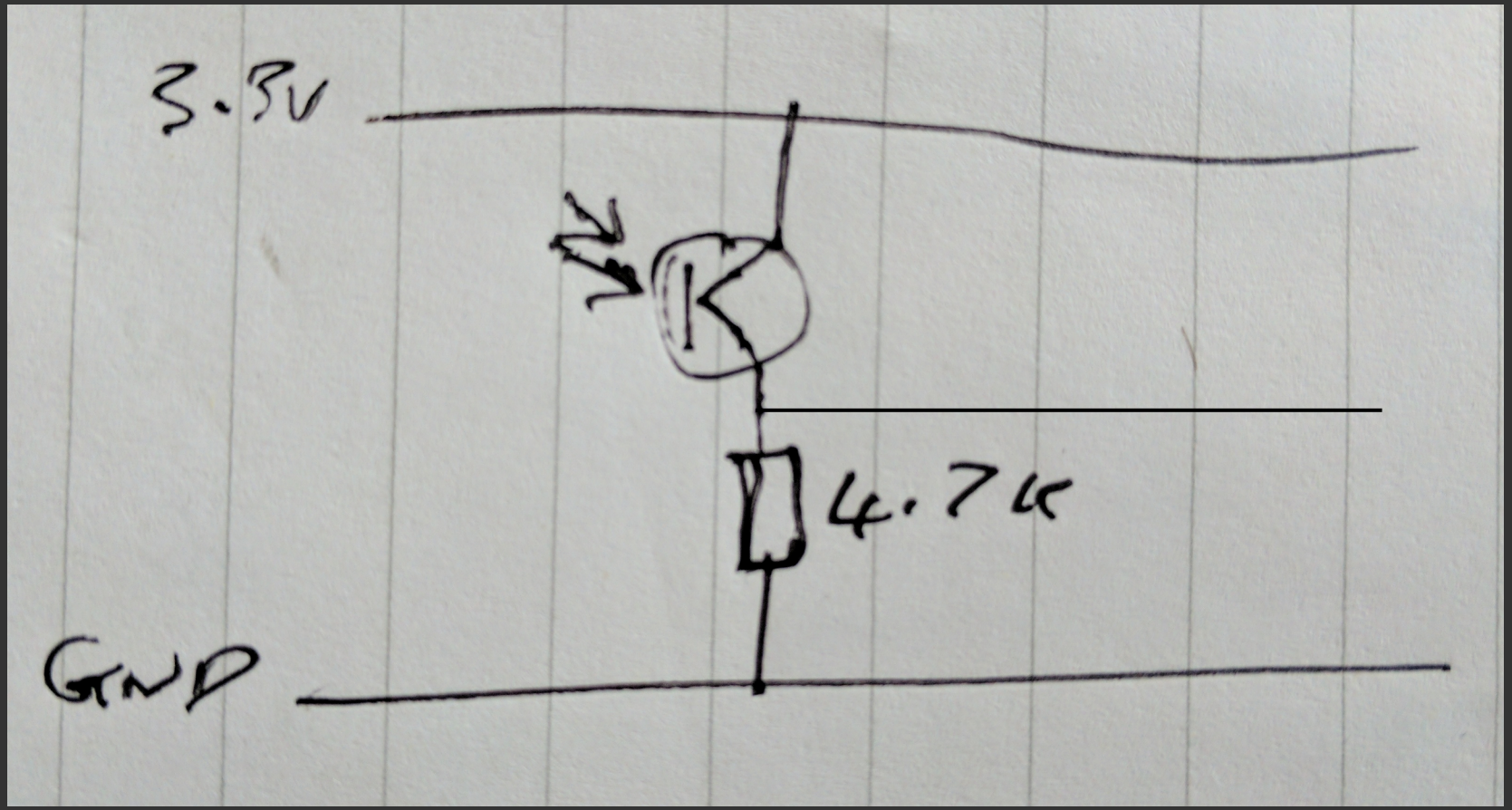

10^{-12} meters
10^{-9}
1 nanometer
10^{-6}
1000 nanometer
10^{-3}
1 millimeter
10^{0}
1 meter
10^{3}
1 kilometer
HOW TO GROW MARIJUANA.COM
Cosmic rays
Gamma rays
X-rays
Ultraviolet (UV)
Infrared (IR)
Microwaves
Radar
Radio
Broadcast band
Short Wavelenghts
Long Wavelengths
Ultraviolet (UV)
Visible Light
Infrared (IR)
400 nanometers
500 nanometers
600 nanometers
700 nanometers

Let’s build some hardware!

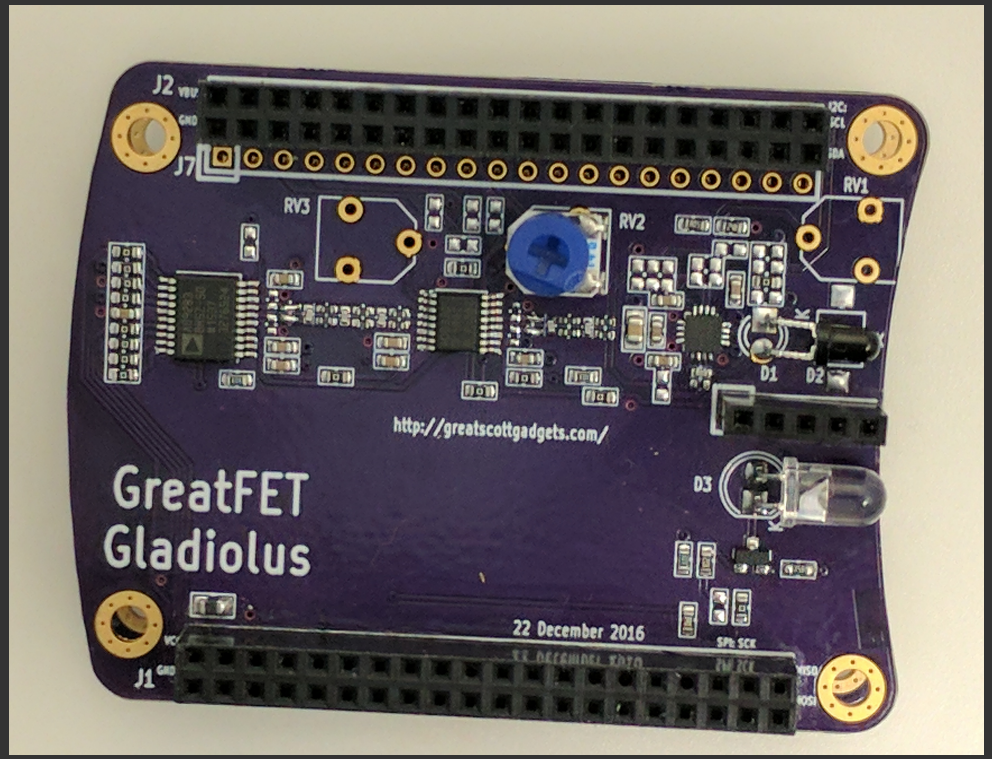


- Simple
  - Really simple
    - I mean so simple that I built it
- Infrared Photo-transistor
- Resistor (4.7kOhm)
- Your favourite microcontroller
  - GreatFET

Circuit Diagram



Better Hardware

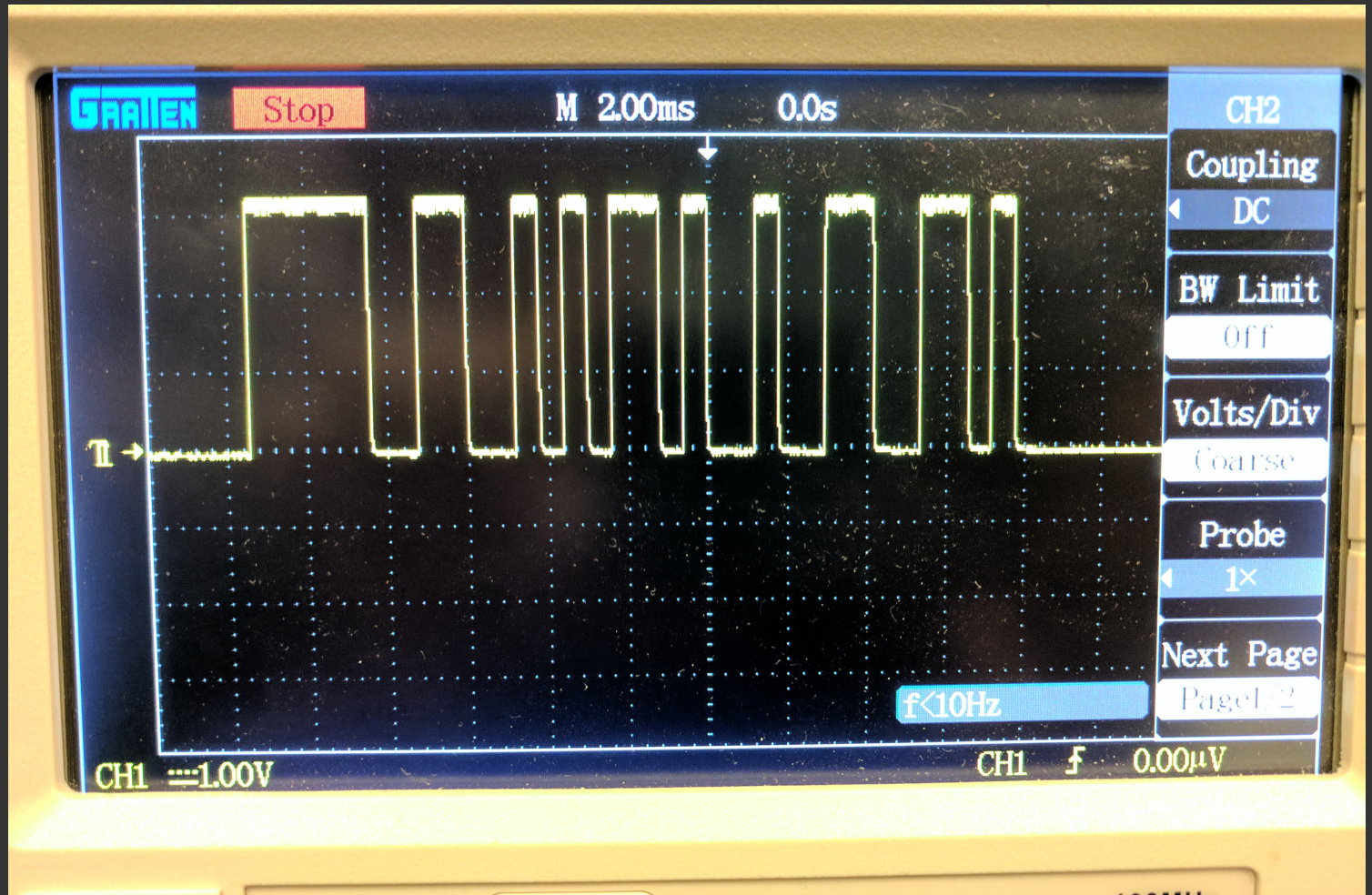


- Gladiolus
  - Mike designed this one
- DC-10MHz
- Variable Gain
- 8 bit samples
  - Up to 40Msps

Demo

GreatFET SDIR Tool
(and a few examples)

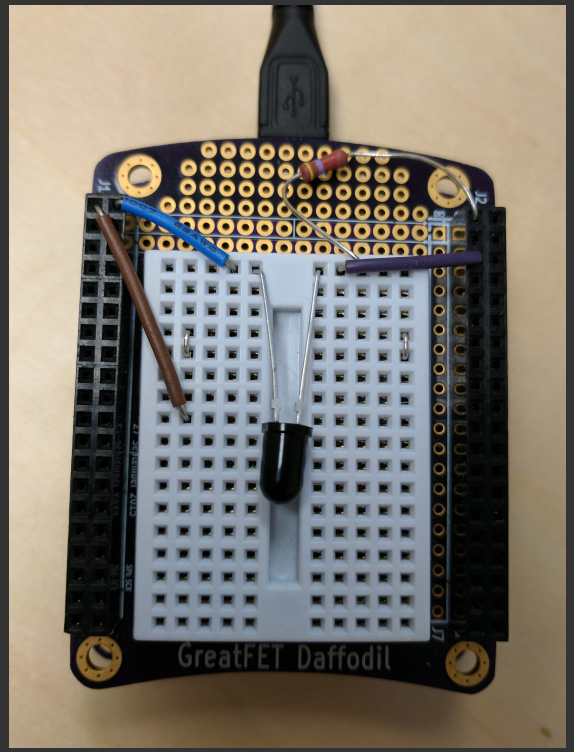
Everything’s 38kHz, right?

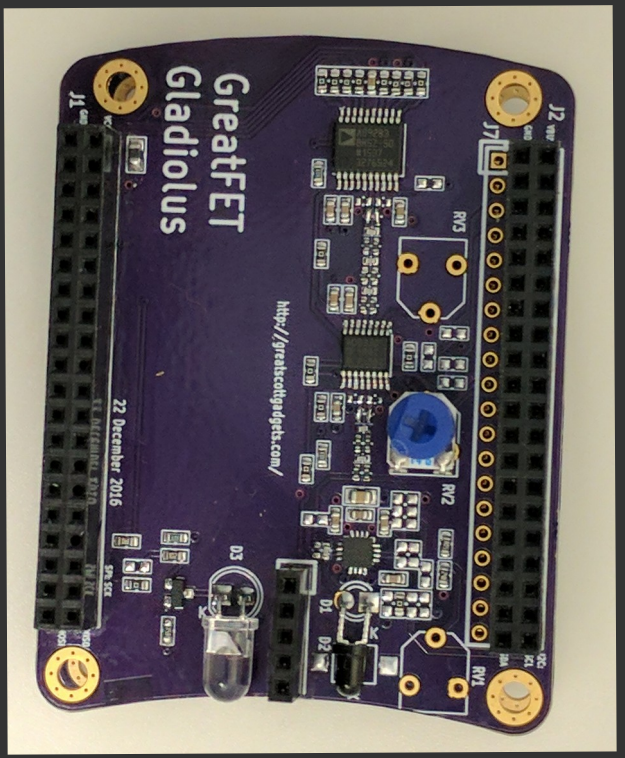


Phones

- Woody (@tb69rr) - “Blinded By The Light”
  - SkyDogCon
  - https://www.youtube.com/watch?v=SyMUTqRQZPA
- Iris hardware
  - Binary (1bit) output
  - Used with Arduino to fingerprint phones

Hardware Comparison





Demo

Phones

Demo

IrDA

Demo

Analog Audio

Opticom™ Infrared System

M195/196, M9192, M292, M9592,
M592 Emitters
M511, M521, M522 Detectors
M262, M562 Phase Selectors
M360, M560 System Chassis
M5168, M5575 Interface Cards

The items described in this manual, originally manufactured by 3M have been discontinued. Ongoing support including any warranty if applicable will be handled by Global Traffic Technologies.

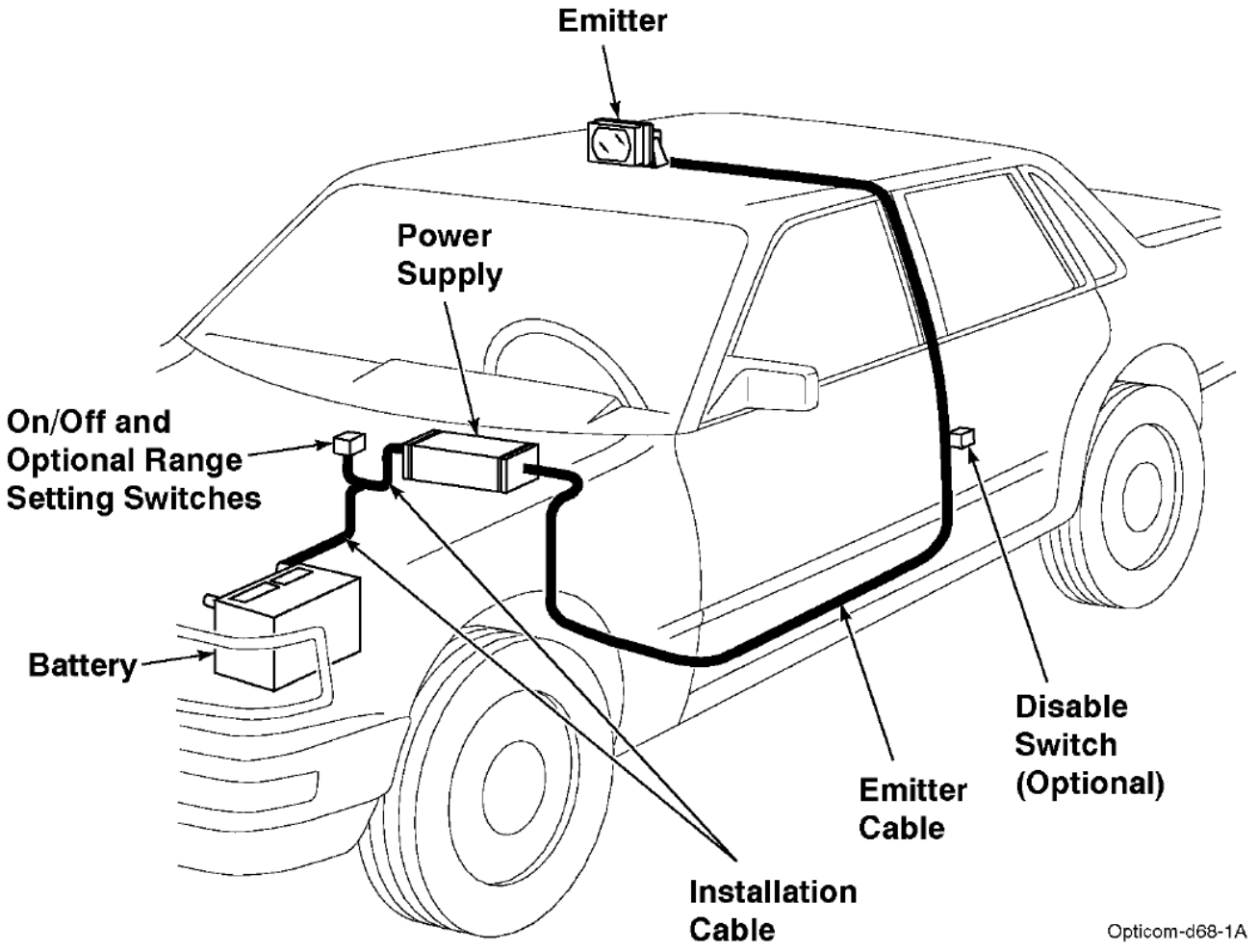


Figure 3-5. Typical M292 Emitter Installation

The timing circuit generates the control signal that determines the emitter flash rate. The two base flash rates are approximately 14 Hz for High priority and 10 Hz for Low priority.

You can select either High or Low priority operation on some emitter models during the installation process, while other models are factory pre-set for High or Low priority operation.

Encoded emitters generate extra pulses between the base Opticom™ Infrared system pulses. The encoding pulses contain the vehicle class and vehicle identification number.

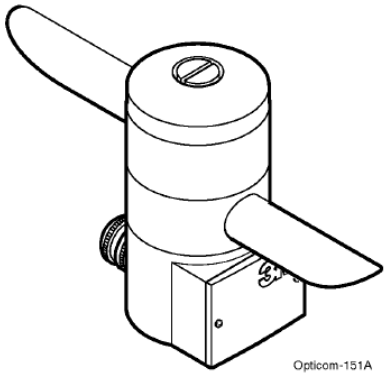


Figure 4-4. M521 Detector

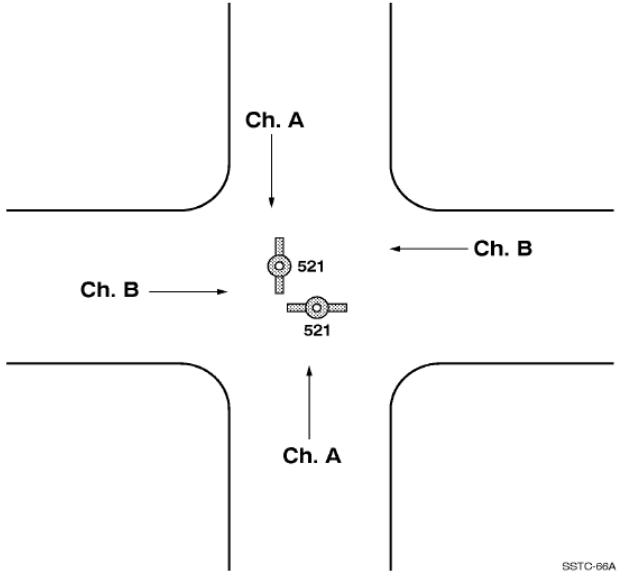


Figure 4-5. 2-Phase, 2-Channel Application Using M521 Detectors

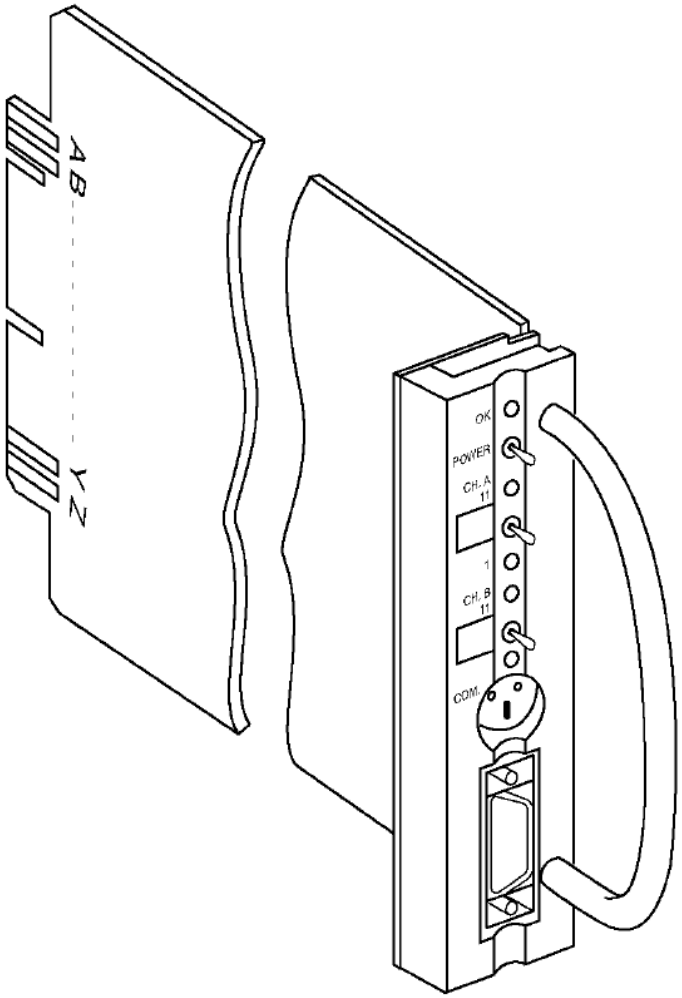


Figure 5-3. M562 Phase Selector

Demo

Traffic signal preemption

Thanks

- Great Scott Gadgets
  - Taylor
  - Elizabeth
- Woody
- Schuyler
- Root Killah
- Unallocated Space
- Matthew Freilich
- Russ

Demo

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