Raspberry Pi Weather Station

Internet Based Weather Station for $55
(not including a monitor)

Features

- Code is based upon the PiClock Project (Python)
  - https://github.com/n0bel/PiClock/blob/master/Documentation/Overview.md
  - Displays intraday and 5 day forecast, updates every 30 Min
    - Uses Weather Underground API
      - http://www.wunderground.com/weather/api/
    - Requires a license key (free for low usage)
  - Display radar updated every 10 Min
    - Uses Google maps for radar (free)
   - Needs lat/long for fetching map

Features

- Supports up to (4) DS18B20 Temperature sensors
- Supports IR remote
- Supports WS2818 based RGB LEDs (attached to the back of the monitor for 'atmosphere')
- Supports streaming NOAA weather radio
- Simple to configure
  - Update your weather underground API key in ApiKeys.py
  - Update your lat/long in Config.py (multiple places
    - I use airport lat/long, so could just leave it alone
- User can create their own backgrounds/icons to get a different look
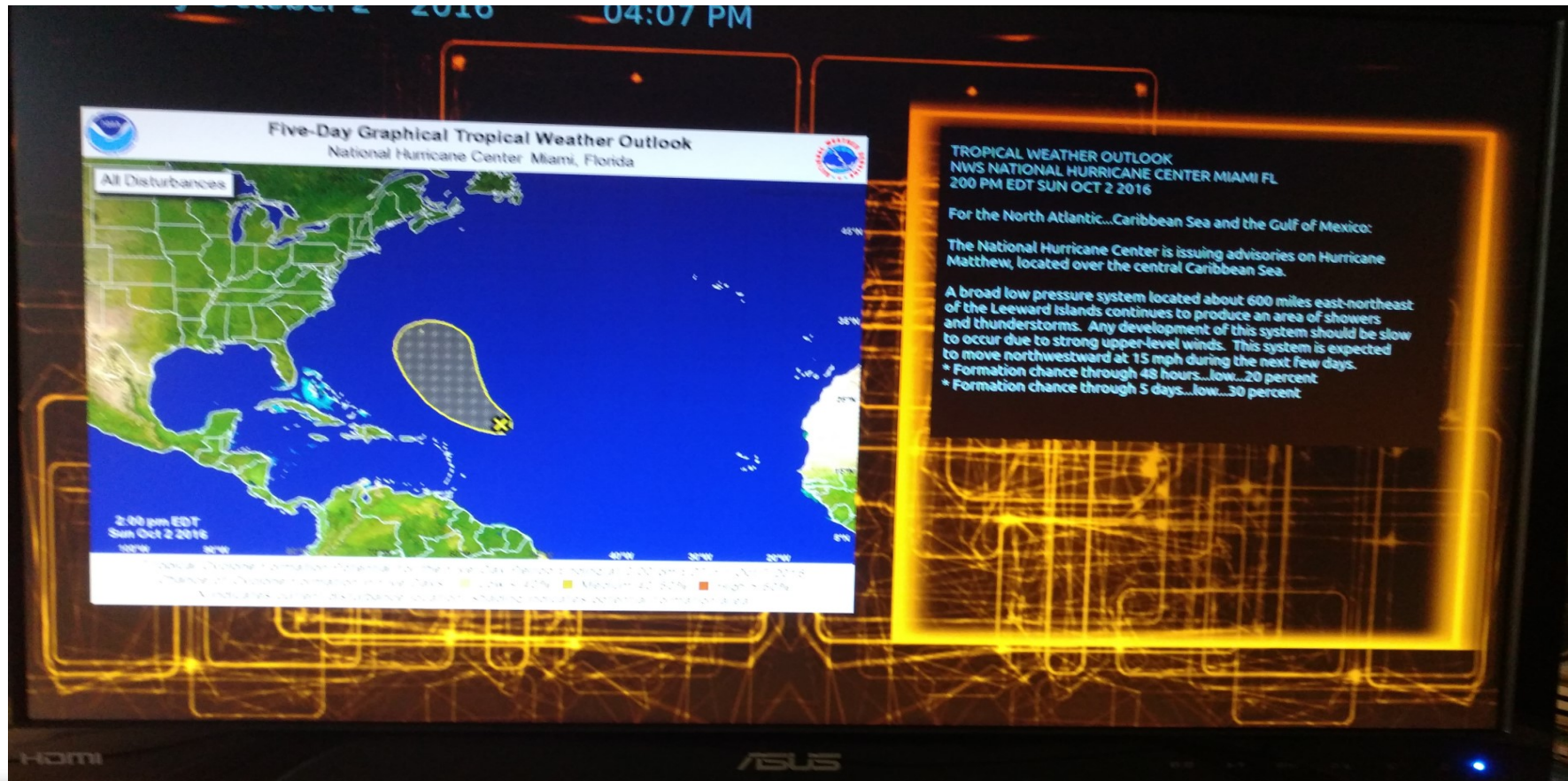
Main Screen

2nd Page
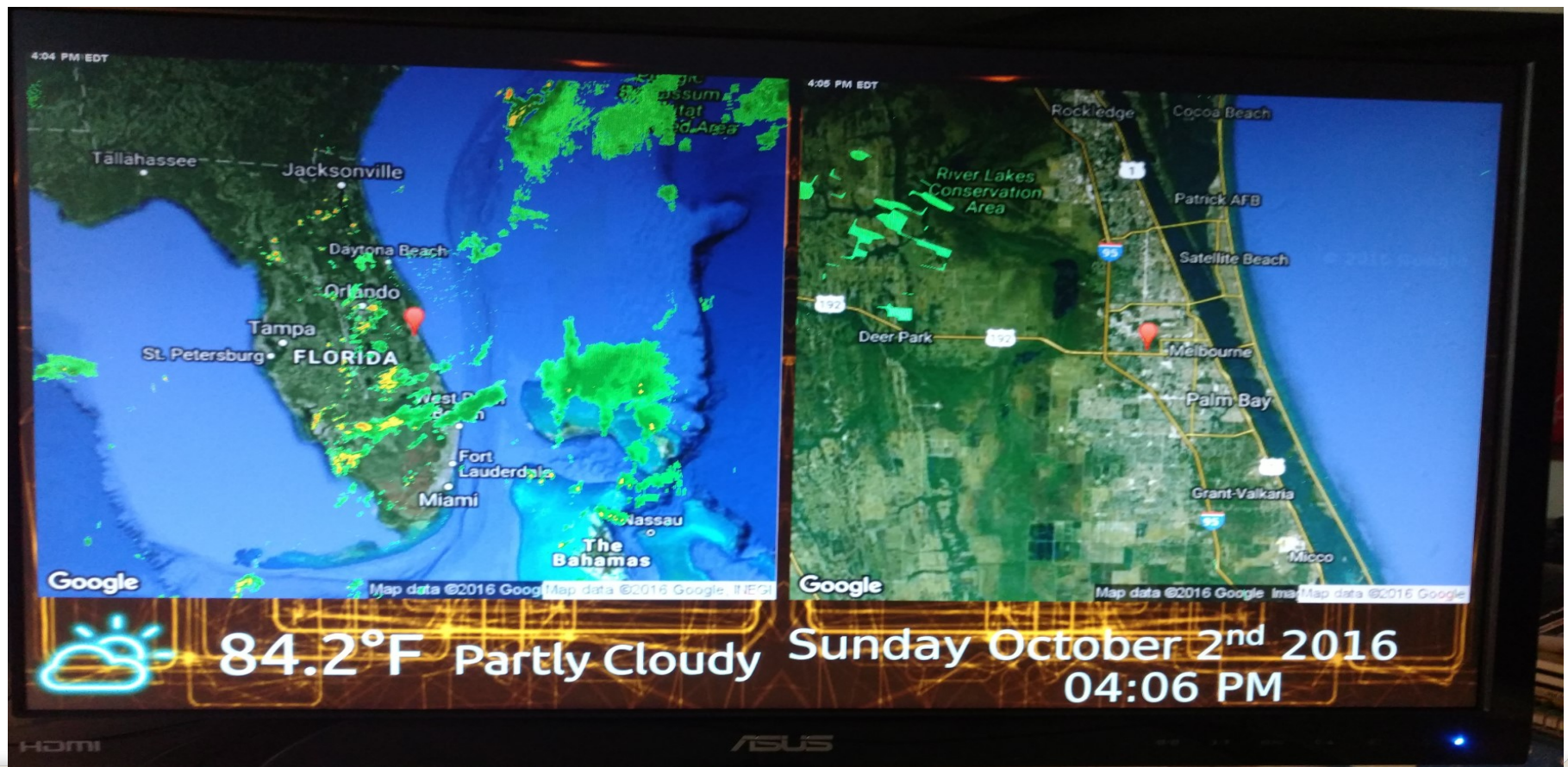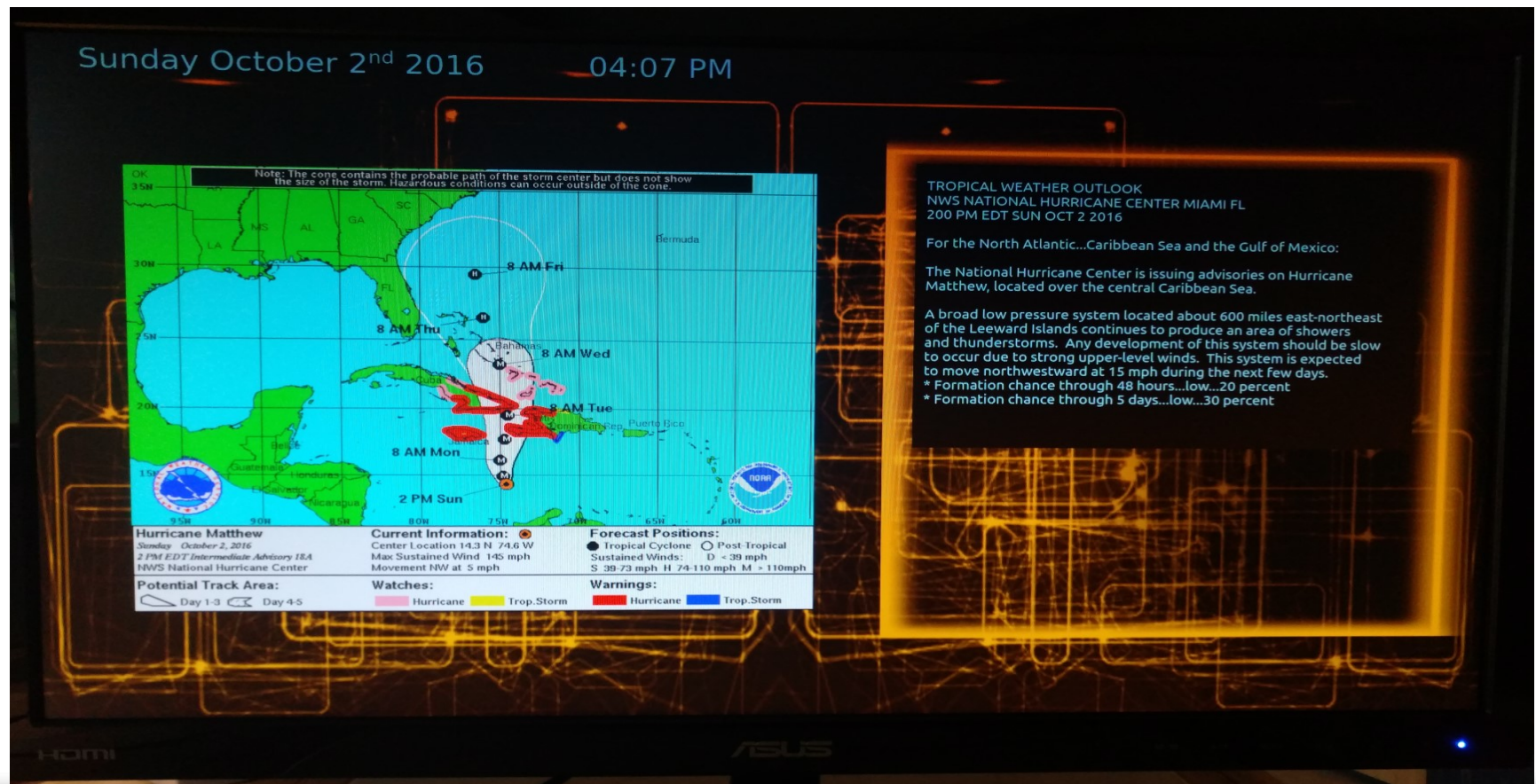
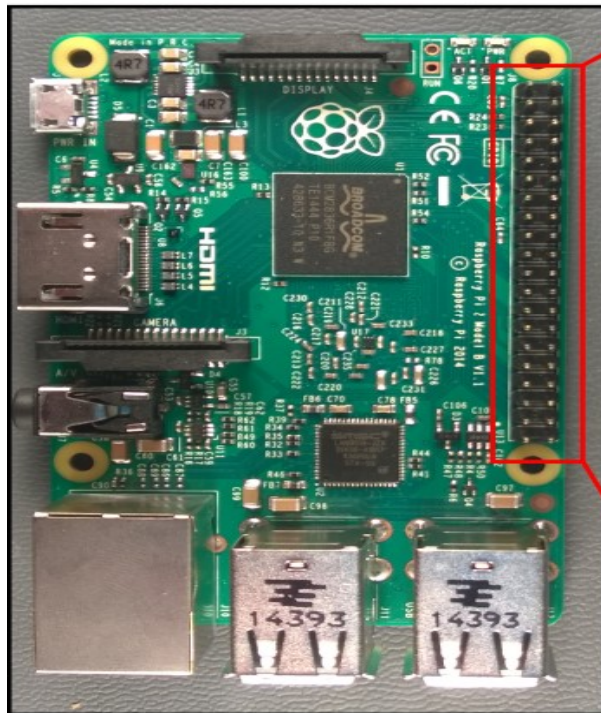# Hurricane Tracking

Individual Hurricane Tracking

Raspberry Pi 3($35)

- A 1.2GHz 64-bit quad-core ARMv8 CPU
  - 802.11n Wireless LAN , Bluetooth 4.1 & Ethernet
  - 1GB RAM, 4 USB ports
  - 40 GPIO pins (including SPI , I2C & serial, 3.3V levels)
  - HDMI port
  - Combined 3.5mm audio jack and composite video
  - Camera interface (CSI) & Display interface (DSI)
  - Micro SD card slot
  - VideoCore IV 3D graphics core
- Runs Raspbian & Ubuntu Linux
  - Could also run XBMC & Windows 10 (reduced features)
  - Running Ubuntu for this application since the distro has a firewall

RASPI -2/3

Naturally There has to be changes
(and some soldering required)

- Internal Temperature & Humidity
  - Uses DHT-22 sensor
    - Sensor uses 1-wire communications, so timing important
      - Adafruit has support code
        - Code not trivial for a non-dedicated processor
- Added Hurricane tracking
  - Gets info from NOAA NHRC site
    - URLS are in Config.py, easy to update
  - Show general tropical storm map to show what's developing
  - Shows path map for each tropical storm
  - Shows tropical summary text
  - Updates every 4 hrs
- Updated to Python 3
- Added support for 4 button RF remote
  - Go between pages
  - Turn NOAA radio on/off

Support Scripts

- Turns on the screensaver @ midnight and turns off the screensaver @ 8:00am
  - The Raspberry PI kernel does not support putting the monitor in power savings mode (yet)
  - Runs automatically as Cron job
- Temperature Server started on boot
  - Started in rc.local
- Autologin
  - Starts up PiClock on login
  - Starts only 1 copy, so remote logins don't muck things up

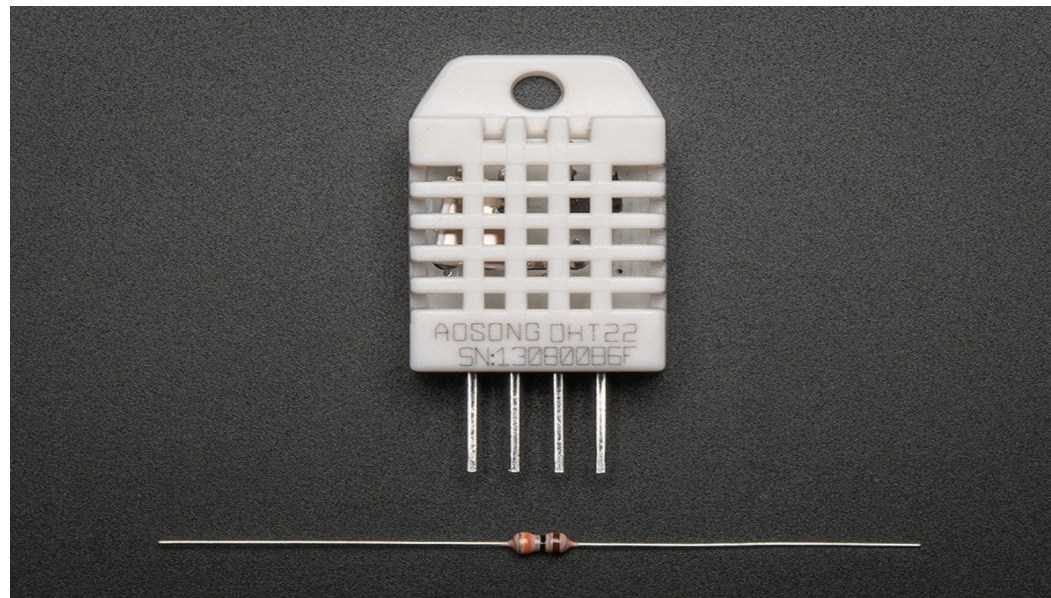# Simple RF T4 Receiver - 315MHz Momentary Type ($4.95 Adafruit)
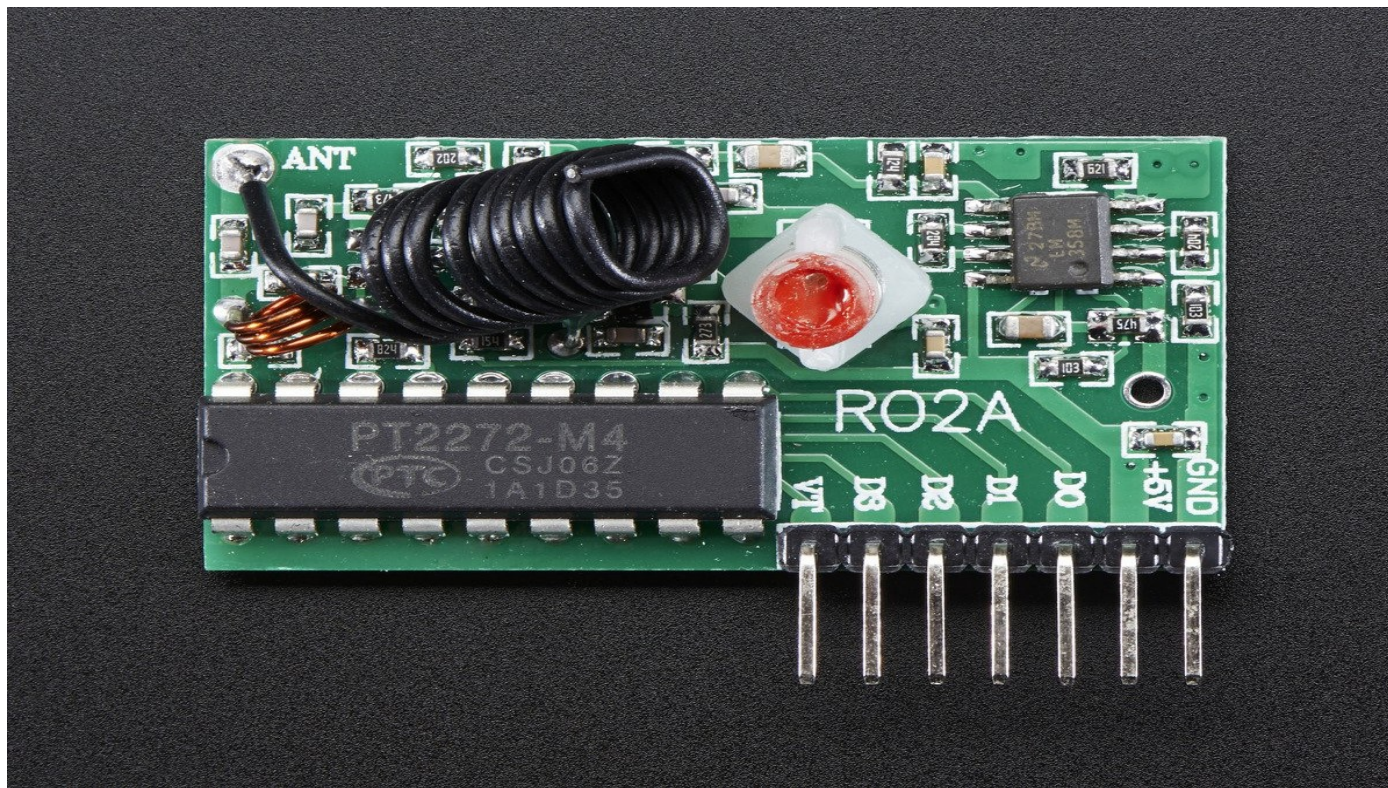
Keyfob 4-Button RF Remote Control 315MHz Receiver ($6.95 Adafruit)
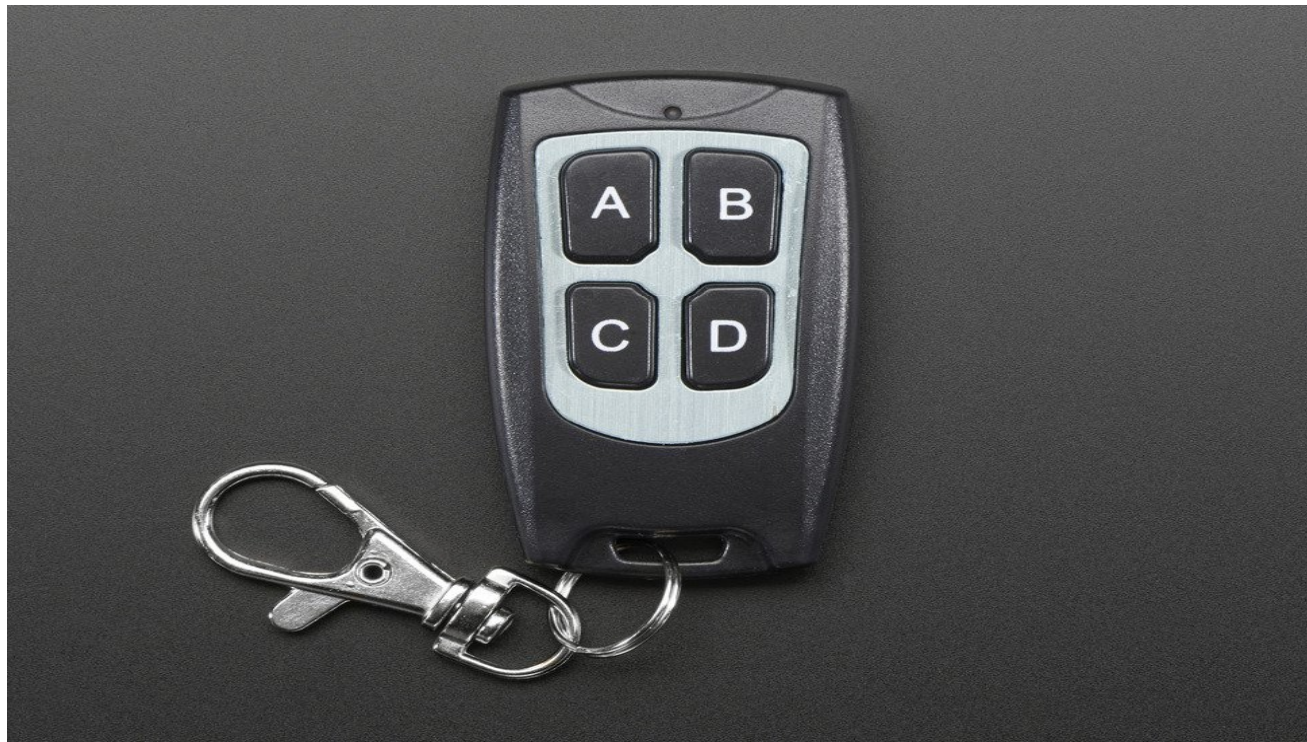
315MHz Receiver

- 4 Digital outputs
  - (5V levels, needs level shifter to interface to RASPI 3.3V GPIO)
- Momentary button response
  - Also comes is Toggle or latched outputs
- Based on the PT2272 chipset

DHT-22 Temperature Humidity Sensor

DHT-22 Temperature Humidity Sensor

- Available Amazon, Adafruit & etc for $9.95
- Based on AM2303
  - Power: 3.3-6V DC
- 1-wire signal (requires pull-up resistor)
  - An SMD 805 resistor fits nicely between pins 1 & 2
- 0-100% humidity($\pm$2%), -40 to 125 $^\text{o}$C($\pm$0.2$^\text{o}$C)
- Average sensing period: 2S
- Raspberry Pi source code available from Adafruit
  - http://learn.adafruit.com/dht-humidity-sensing-on-raspberry-pi-with-gdocs-logging/overview

315MHz Remote Level Shifter
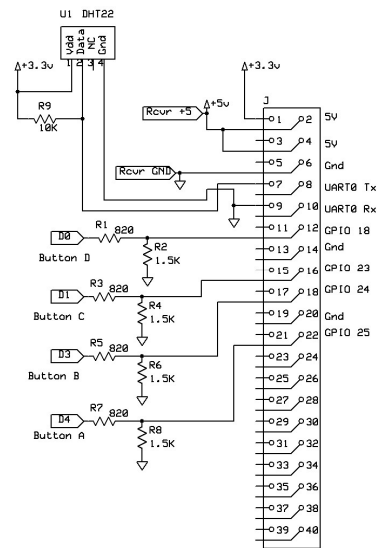
Future Features

- ~~Update code to Python 3~~
- Add high/low tide information
    - NOAA has made it ridiculously difficult to fetch the daily tide info
- Possibly add outside wireless sensors
- Rain gauge, wind speed & temp/humidity
- Requires a receiver board (adafruit) and some data decoding

Acurite 5 in1 weather sensor
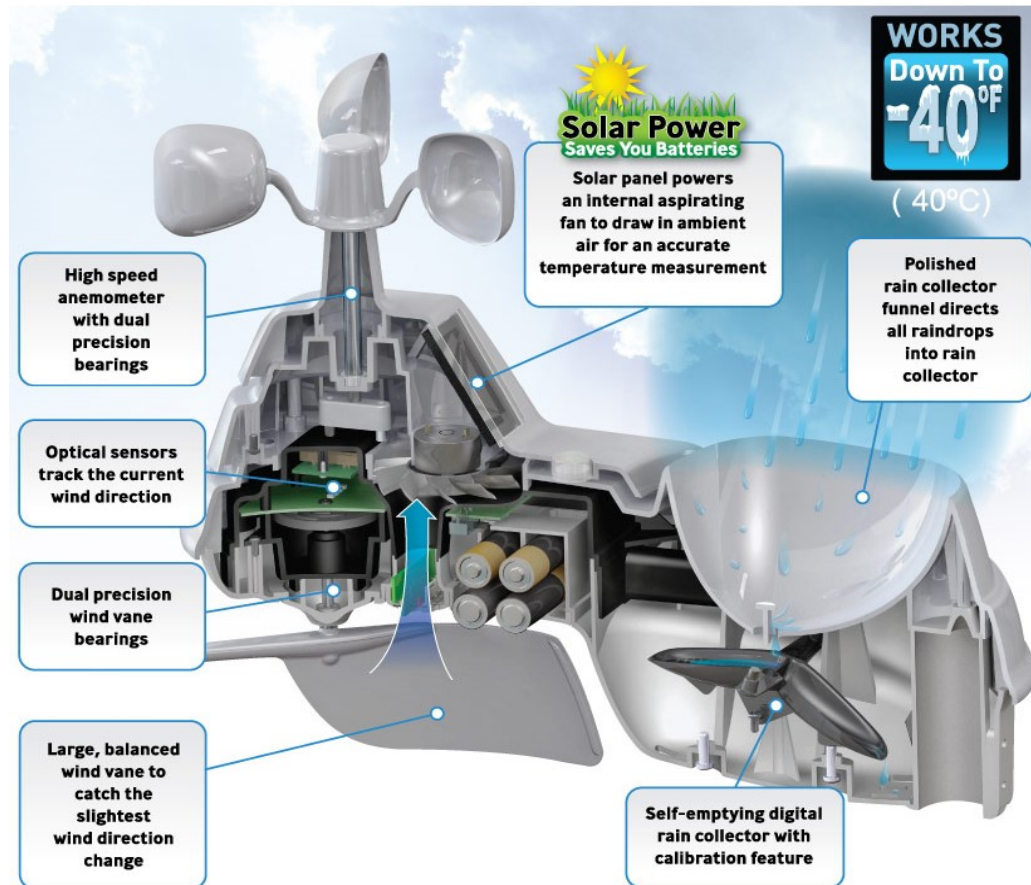
Miscellaneous

- PiClock works the best on a 16x9 monitor
    - Cheaper monitors can be had at places like Amazon warehouse, Monoprice &etc
    - Best to use a monitor with an HDMI input (most 1080p monitors have them, lesser resolutions usually have DVI)
        - PI has HDMI output
- Other packages you will need to the PI
    - apt-get install python-qt4
    - apt-get install libboost-python1.49.0
    - apt-get install unclutter (turns the mouse cursor after a while)
    - apt-get install mpg123 (for the NOAA radio stream)

Miscellaneous

- General Pi &Pi Clock instructions can be found here
  - https://hackaday.io/project/6184/instructions
- For this implementation
  - Don't need to bother with the DS18B20 stuff
  - Don't need to bother with the IR remove stuff (lirc)
  - Don't need to bother with the NeoPixel LED stuff
    - Won't work on Ubuntu anyway unless you find the source code and re-build it. It's supposed to work with the Raspian distro
- My implementation is available upon request

Miscellaneous

•Pi Clock works on PC, but since there is no GPIO, you don't get the internal temp sensor, remote or NeoPixel
   •Python for the PC can be obtain from
   https://www.python.org/download/releases/2.7/
•Visual Studio Code
   •A nice code editor/debugger (free) from Microsoft
   •Plugs for python, arduino, pearl, C/C++, JSON, PHP, & more
   •https://code.visualstudio.com/
   •Help tutorials available at the site