

# DO-IT-YOURSELF B U I L D E R

Build on a Budget

Free Copy

Prototype



## PROJECTS

- DIY 1hp Air Compressor
- Prosumer Home Network
- Android Open Accessory 2.0 - USB HID Consumer Device

## BUSINESS

- Every-Door-Direct-Mail USPS marketing for microbusiness
- Intellectual Property: open source and closed source

## TRENDS

- The Maker Movement
- INNOVATORS and SUCCESS
- Elon Musk

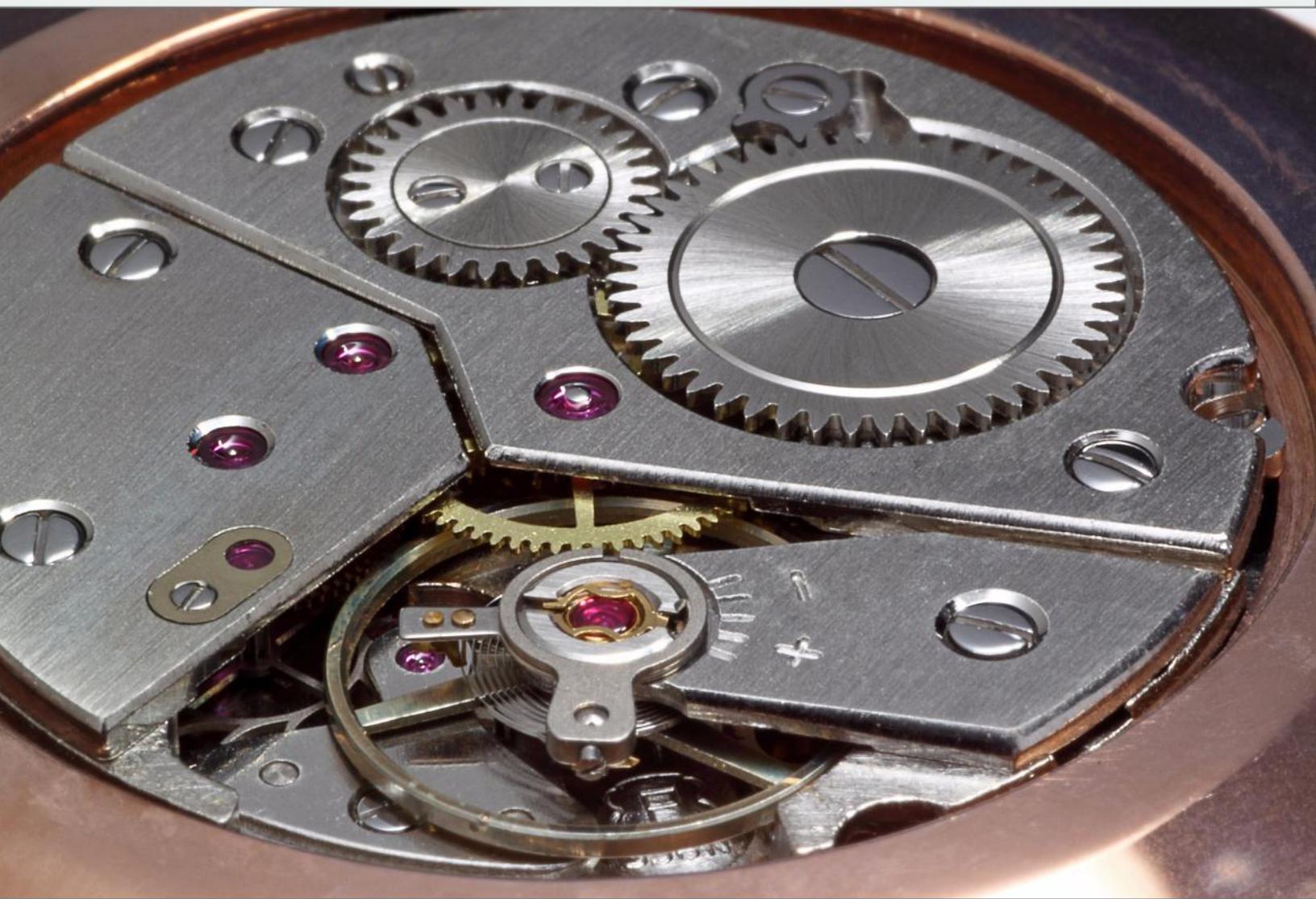
FREE COPY  
ISSN 1234-5679  
9771234 567003

MORE INSIDE...

HIGH PRECISION - HIGH STANDARDS  
= ☺ =

# WATCHMAKER

= SWISS =  
TOP QUALITY WRIST WATCHES



**Authorized dealer for Hamilton watches.**

**Maximus Mechanical Watch Co.**

**3203 SW 34th Ave  
Ocala, FL 34474**

**Phone: 352-772-8880**

**We repair:**

- \* Swiss ETA movements
- \* Seagull Movements
- \* Precision Pinion Technology movements

# DO-IT-YOURSELF B U I L D E R

Build on a Budget

## STAFF:

Publisher: [Mr. Blue](#)

Editor: [Mr. Blue](#)

Photographer: [Mr. Blue](#)

Operations Manager: [Mr. Blue](#)

DO-IT-YOUSELF BUILDER (ISSN 1234-5679)

## CONTACT:

### Mail:

DO-IT-YOURSELF BUILDER  
PO BOX 12345  
Ocala, FL 34474

### Website:

[www.diybuilder.com](http://www.diybuilder.com)

### Phone:

(352)123-4567

**This is a prototype magazine.**

All ads are fictional:  
the business names, addresses, and  
phone numbers do not exist.

Photographs in the ads are licensed  
from shutterstock

Designed with Scibus 1.4.6

# Contents



## Features

### Projects

DIY 1hp Air Compressor	6
------------------------	---

Prosumer Home Network	10
-----------------------	----

Android Open Accessory 2.0 - USB HID Consumer Device	16
--	----

### Business

Every-Door-Direct-Mail	12
------------------------	----

USPS marketing for microbusiness	
----------------------------------	--

Intellectual Property: open source and closed source	20
--	----

## Departments

### Editor's Note

3

### Trends

The Maker Movement	23
--------------------	----

### Innovators and Success

Elon Musk: revolutionary in space, transportation and renewable energy	27
---	----



**MasterAuto  
Full Service Center  
2022 SW 27th Ave  
Ocala, FL 34471**

**Phone:  
352-662-4455**

**We Specialize in:**

- \* **Brake systems**
- \* **Air conditioning**
- \* **Electrical systems**



**We service all makes and models  
from your basic oil change to engine/transmission replacements.**

---

## EDITOR'S LETTER

By **Mr. Blue**



Welcome to the premier issue of “Do-It-Yourself Builder: Build on a Budget”. The goal is to create a periodical on DIY projects to honor the artisan, craftsperson, DIY builder, and innovator in all of us. It is a vehicle to share ideas to learn and accomplish things. Each magazine’s features will cover projects that one can build in their home and microbusiness topics: the departments include modern trends and the “leader’s and success” section.

When I was young I always loved building things. As a child I loved tinkering with legos, modeling with clay, drawing, building model kits and I was curious about many things. However, I never had tools or a strong knowledge base to guide me. The education I received prepared me in the sciences, math, and english to work in a large organization but was lacking in building a final product.

I first started investing in tools out of necessity. I bought my first car while doing a four year stint in the Army. It was a Ford Mustang that seemed to always have something wrong with it. On the Fort Benning military base there was a shop that was filled with tools, a lift, and bays to work on automobiles that soldiers could use to work on their cars. A soldier had to pay a rental fee to use the space and tools. That was the first time I saw something that would be similar to a modern day FabShop, MakerSpace, or TechShop. I had friends who knew about cars who would help me on a project or advise what would be a good first time tool kit. I also bought the typical DIY car manuals: Haynes and Chilton.

The next time I really felt the need to DIY was shortly after I bought my first computer. It was early 1996, Windows 95 was new, and the hardware on the computers of the time needed to be upgraded almost right out of the box. I had bought an AST Research machine that came with a 14.4K modem, a 100-megahertz cpu, and 8mb of memory. I remember whenever I had to call tech support I got an auto-attendant that informed me wait times were about one hour and to have my credit card ready. I bought a magazine that showed how to upgrade computer hardware. At first it was worrisome knowing that once I opened the PC cover my warranty will be null and void, however, it was worth it to upgrade to a faster modem and more memory. It wasn’t long before I changed the motherboard, cpu, and memory in one process. That AST was the last and only personal computer that I bought as a consumer product. Ever since I have always built my own computers. By 2006 I was using the Ubuntu OS instead of Windows XP. Ubuntu is an open source debian based linux distribution that was founded in 2004. To find out more about open source licensing read the article about intellectual property on page 22.

Since 2006 I have been hooked on building projects. When you read my article on the Maker Movement on page 25 you will find that the internet and open collaboration between DIY oriented individuals has created an environment to inspire creation and innovation. I have learned how to build audio equipment: active and passive crossovers, speakers, and amplifiers. I have learned how to do my own auto repairs and home repairs of malfunctioning equipment. The potential is endless in our modern world with access to information and affordable equipment.

Regards,

**Mr. Blue**





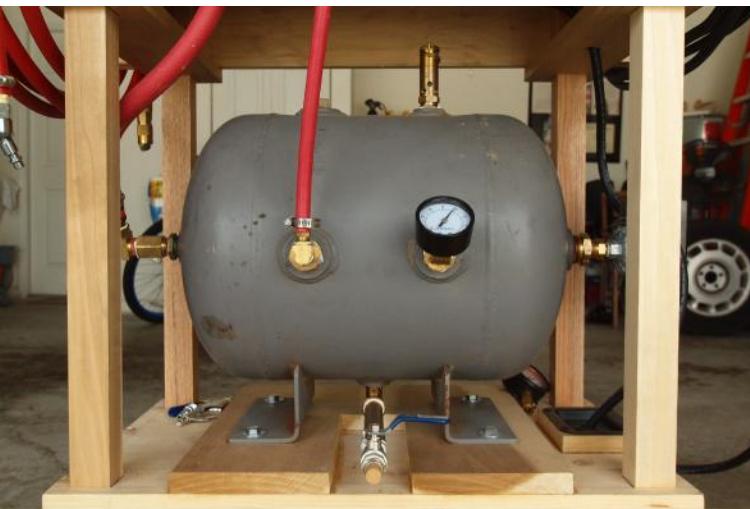
# Healthy Foods Grocery

*100% Farm Fresh*

**7579 SW State Rd 200  
Ocala, FL 34476**

**Phone: 352-955-3301**





## PROJECTS

### DIY Air Compressor

By: Mr. Blue



## PROJECTS

### DIY Air Compressor

By Mr. Blue

**Warning:** It is potentially very dangerous to work with household electricity when you are wiring the electric motor. I am not an electrician, please make sure that you comply with electrical codes in your state. The pulleys, and belt should have a shroud over them to prevent accidental contact.

An air compressor is a very useful tool for many reasons. Inflation of sports equipment, air mattresses, tire inflation and to run a variety of air powered tools. Pneumatic tools include: airbrush guns, pneumatic stapler, nail guns, and more. This air compressor was made for residential use so it was designed with a 1 hp electric motor to run it.

#### What should be considered in a design for an air compressors

Many consumer air compressors have the same components, some air compressors source the same parts and rebrand them with their logos. With the knowledge in this article you can always repair a broken consumer air compressor, if you are not looking into building one from the ground up.

The first thing is to evaluate the primary use, determine limitations, and plan accordingly. I wanted to use this in my garage using existing outlets. I had several 15 amp outlets and one 20 amp outlet, all at 115 VAC. I figured a 15 amp outlet could run a  $\frac{1}{2}$  hp motor and a 20 amp outlet could run a 1 hp motor.

I based the air compressor off of a Brazilian air compressor line, the Schulz Compressores Linha Pro CSV-5,2/100. In the USA the parts are distributed by Schulz of America, Inc, out of Georgia. The electric motor is also from a Brazilian company: WEG S.A.

**Note:** 1 hp is approximately 4cfm at 100 psi

#### The Top Frame

The two main components on the top of the frame are the air pump and the electric motor that drives it.

#### Air Compressor Motor

Schulz Mundial CSV-5,2 Pro; Product Code: 809.1821-0

Flywheel diameter: 7.9 inch; Cylinders: 2

CFM: 5.2 cubic feet per minute; RPM: 1200 @ 1hp

Max Pressure: 125 psi; Belt: 3VX; Lubrication: splash oil

#### Synthetic oil

Brand: Kobalt 16-oz Synthetic Compressor Oil (16-KSCO)

#### Electric Motor

Brand: WEG motors; Model Number: 00136OS1BCDB56

RPM: 3480; Frame: B56 with mounting feet

Voltage: 115VAC, 60 Hz; Rated Current: 12.2 A @115V

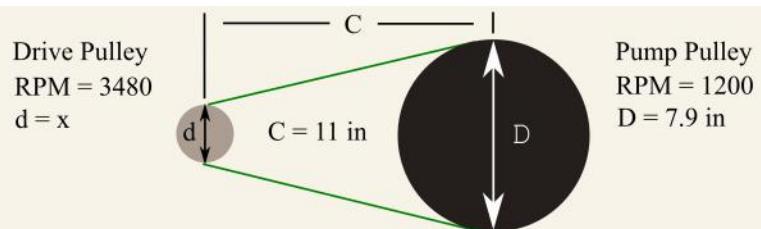
Phase: single-phase

Knowing the specifications of the two components we can find the pulley size to use on the electric motor and the belt size.

#### Calculate Pulley size and the V-belt length:

To calculate the pulley (sheave) size for the motor we need the speed ratio between the air pump and the drive source. Once that size is obtained the V-belt size can be calculated.

There are online calculators that will figure the numbers just by entering the variables but the mathematical formulas are not that hard. Following are the two formulas needed and the values we have already.



$$\text{Pump RPM} \div \text{Driveshaft RPM} = \text{Drive Pulley Dia} \div \text{Pump Pulley Dia}$$

$$1200 \div 3480 = x \div 7.9$$

$$x = 2.72 \text{ in}$$

Looking in the TB Woods catalog the closest sheave size is **2.65 in**

#### Calculate belt size

$$L_p = 2C + 1.57(D+d) + (D-d)^2/4C$$

$$L_p = 2(11) + 1.57(7.9 + 2.65) + (7.9 - 2.65)^2/4(11)$$

$$L_p = \mathbf{39.19 \text{ in}}$$

For the sheave (pulley) I choose the TB Woods Sure-Grip Narrow Ultra-V sheave. It requires a bushing to fit the axle of the WEG motor. I choose the TB Woods Sure-Grip JA size bushing. For V-belt length the two closest sizes were: 3VX375 (37.5 in) and 3VX400 (40.0 in). I choose the 40 in size.

#### Pulley(sheave), bushing, and Belt

##### *Sheave*

Brand: TBWoods; Sure-Grip Narrow Ultra-V sheave

Model: 3V2651; For Use With 3V or 3VX Type V-Belts

OD: 2.65 in; page B1-4 in catalog

##### *Bushing*

Brand: TBWoods; Sure-Grip bushing; Series JA

Mfr number: JA58; Bore Dia. 5/8 in

Page A1-4 in catalog

##### *V-Belt*

Brand: Gates Super HC - Narrow Section V-Belt

Part Number: 3VX400; 40 in length

There are a few other components that round off the top end of my DIY frame. I also have a motor mounting base, an electric unloader valve, on/off switch, brass fittings, air filters, and air hose. The motor mounting base allows moving the motor to be able to install and remove the belt, adjust belt tension, and alignment. The unloader valve is designed to release the air pressure in the hose between the air pump and the check

valve in the air tank. This is important because the electric motor needs a large amount of amps when starting. Air pressure in the hoses exiting the air pump cylinders will put the compressor under load and could prevent starting. Most air compressor switches have a mechanical unloader valve built in, I choose to use an electric solenoid valve. I added a manual on/off switch near the motor as a safety feature since the air pressure switch automatically turns on when the psi in the tank falls below 95 psi. The brass fitting that separates the top frame from the bottom frame is an anchor coupling. The brass fittings exiting the air pump cylinders are 1/4-18 NPT, the oil outlet and inlet are also 1/4 NPT. The air pump inlets for the air filters are 3/8-18 NPT. I used Solberg FS air filters (FS-xx-038). The hose from the cylinders to the anchor coupling is 1/4 in ID, red hose rated for 300 psi. I used loctite pipe thread sealant #565 on the brass threads.

### ***Motor Mounting Base***

Brand: Dayton; Model: 3M276; frame: 56

### ***Solenoid valve***

Brand: ASCO Redhat; Model: 8262H261

Max PSI (air/gas): 275 PSI; Valve config: Normally Open

### ***Air Filters***

Brand: Solberg FS; Part number series FS-xx-038

Paper element = FS-04-038 and FS-06-038

Polyester element = FS-05-038 and FS-07-038

The FS-06-038 and FS-07-038 are taller and wider and have greater air flow. The fitting is the same.

## **The Bottom Frame**

The bottom part of the frame holds the air receiver tank and all the parts connected to it. The larger the air tank the more air volume can be stored. I used a Manchester horizontal air tank rated up to 200 psi. It has seven ports for the inlet/check valve, safety valve, drain port, air pressure gauge, air pressure switch, and outlet air regulator. The frame has four lockable swivel wheels and a removable 12awg power cable with a 5-20p NEMA plug on one side and a Neutrik PowerCON TRUE1 connector on the other.

### ***Air Tank***

Brand: Manchester Tank; Model: 304934

Size and shape: 7 Gallon Universal Horizontal Air Receiver

OD: 12 inches; Length: 17 inches

PSI rating: 200 PSI

Seven NPT fittings: 1/2 inch (two – top and bottom); 3/4 inch (four); 1 inch (one)

### ***Inlet Check Valve***

Brand: CDI control devices; Model: P5050-1EP

Max pressure rating: 450 psi; Body material: brass

Inlet: 1/2 (F)NPT; Outlet: 1/2 (M)NPT; Hex size: 1 inch

### ***Compressed Air Safety Relief Valve***

Brand: Control Devices; Model: SF50-1A150

Preset setting: 150 psi; Body material: brass

Inlet: 1/2 (M)NPT

### ***Drain Port***

Kobalt 3/8 in manual drain valve

### ***Air Gauge***

Kobalt 0 to 160 psi from Lowes

### ***Air Compressor Pressure Switch***

Brand: Furnas Hubbell; Model: 69JG7LY

On: 95 PSI; Cutoff: 125 PSI

### ***Outlet Air Regulator***

Brand: Ingersoll-Rand ARO-Flo; Model: R37121-600

Max inlet PSI: 250 PSI; Adjustment range: 0 to 140 PSI

Series: 1000 series; Max flow: 59 cfm

Pipe Size: 1/4 inch NPT; Gauge: 0-140 PSI flush mount gauge

### ***Frame***

### ***Material***

Project wood from Lowe's

### ***Plates***

Penn-Elconn (1/2" x 5 1/8" black connector dishes) 3pcs

### ***Wheels***

Brand: Everbilt; Model: 4120745EB

Size: 4 in; Type: Polyurethane Caster with Brake

### ***Removable Power Cable and Connector***

**Cable (to frame):** Locking connector; Wire size: 12 AWG

Brand: Neutrik; Model: NAC3FX-W PowerCON TRUE1

Rated current: USA 20 amp; Rated voltage 230 VAC

**Cable (to NEMA 5-20R receptacle):** NEMA 5-20P plug

**Appliance inlet:** Male receptacle; Wire size: 12 AWG

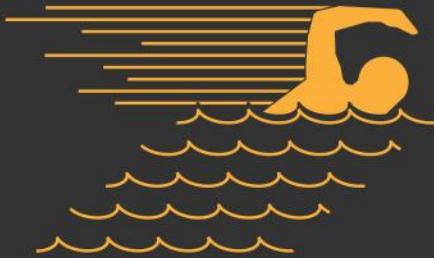
Brand: Neutrik; Model: NAC3MPX PowerCON TRUE1

Rated current: USA 20 amp; Rated voltage 250 VAC

A few other things are necessary to complete the bottom end of the frame. A drain port should be on the bottom of the air receiver tank to allow water to exit the tank. Water will condense on the inside of the tank and accumulate in the bottom. I just use a Kobalt manual 3/8 NPT valve to release air pressure after use which will expel the water inside. I use the same air hose for the connections on the bottom end. I use the red 300 psi rated air hose; 1/2 in ID for the anchor coupler to the inlet check valve, and 1/4 in ID for the outlet to the air pressure regulator. I use 3/8 in red, 300 psi hose from the air regulator to my air tools. I use two 10 foot connections coupled in the middle with a swivel connector. That way I can readily extend the reach by simply attaching an extension hose. I attached quick disconnects on the ends of my hose and on my air tools for easily changing tools. In the pictures you can see two special fittings. One is on the top of the solenoid valve and the other is on the exit of the drain port valve. They are mufflers, made of porous material to allow air to pass. They are not quiet but they keep debris from getting inside.

Overall the air compressor is a great workhorse. So far I have used it to run a pneumatic upholstery staple gun and add air to the tires of my cars. Some tips that I learned the hard way. To prevent leaks use a good quality pipe thread sealant and hose clamps. I purchased brass fittings with thread sealant pre-applied when possible and I used loctite pipe thread sealant #565. I also used stainless steel hose clamps. □

# TRIATHLON



SWIMMING



CYCLING



RUNNING



**Ocala 10th annual triathlon  
October 2017  
Lake Weir**

**Race events will include the following distance events:**

**sprint distance**

**half-iron distance**

**iron distance**

**sign up at  
[www.events.com](http://www.events.com)**



Ubiquiti Edgerouter-Lite as router



UniFi AP AC Lite as Wi-Fi

Edgerouter X as switch

## PROJECTS

### Prosumer Networking Equipment

By Mr. Blue

When the typical home user subscribes for service from an internet service provider they would get an all-in-one device that performs the functions of modem, router, firewall, and wireless access point. This consumer device is economical and sufficient for many needs, however, if a user requires more from their existing home network there is a step up in networking gear that can be considered the “prosumer” level. When discussing performance grades in equipment there is “consumer grade,” “enterprise grade,” and “carrier grade.” Prosumer equipment falls somewhere between consumer and enterprise.

Prosumer equipment can be all-in-one or it can break up the components into separate devices. The benefit of using separate devices is using the right parts for the right job and upscalability of the overall system. Another benefit of using prosumer gear is that they can better handle gigabit speeds if one upgrades to a fiber network instead of using DSL or cable.

Ubiquiti products are reasonably priced and provide an infrastructure for a strong home network for personal use or a microbusiness. For my home system I used three products to integrate with my CenturyLink C1100Z DSL modem: the EdgeRouter-Lite, the EdgeRouter X, and the UniFi AP AC Lite. The EdgeRouter products are considered carrier class routing and part of the EdgeMAX line. The UniFi AP AC Lite is considered enterprise class WiFi and part of the UniFi line.

#### Ubiquiti EdgeRouter Lite as router

The EdgeRouter Lite has carrier-class reliability with enterprise level features. The device uses the EdgeOS proprietary operating system, which has a web based management interface. It is an OS that is based off a fork of the Vyatta OS. The Vyatta OS, now VyOS, is a debian distribution made specifically for networking. Features include: firewall policies, DHCP server, NAT rules, and more. The Lite version has three Gigabit routing ports and a RJ45 serial console port.

The EdgeOS can be configured via the web user interface by connecting to <https://192.168.1.1>, or by using the command line interface (CLI).

Configuring the EdgeOS via CLI can be done in four ways: SSH, Telnet, the web UI, or the RJ45 serial console port. For out of the box use there is a wizard to configure basic settings. The basic settings is the same as the WAN+2LAN2 wizard: one port is the wide area network port for input from the DSL modem and the other two ports can be bridged for local area network ports. Retail price is about \$100.

#### EdgeRouter X as switch

As part of the EdgeMAX line the EdgeRouter X has many of the same benefits of the ERLite-3. It comes in a smaller footprint and half the price of the ERLite-3 at about \$50. The advantage in hardware that the ER-X has over the ERLite-3 is that all five ports of the ER-X can be configured for line-rate, layer 2 switching. The ERLite-3 has two ports that can be bridged to act as a switch, however, this is done in software and degrades performance. The built-in hardware switch in the ER-

X is incredibly fast especially if one is using it with a fiber internet connection. I therefore configured the ER-X as a switch.

#### UniFi AP AC Lite as Wi-Fi

The UniFi line boasts enterprise performance, unlimited scalability, and works with a central management controller. The UniFi line has about seven products that can act as WiFi access points. The first two in the line are meant to connect to an ethernet wall connection. The other five can be mounted on a wall, the ceiling, or another suitable location. The AP AC Lite is the entry level for wall/ceiling mount. Retail price is about \$80, it is for indoor only. Here are some of the specifications:

- \* 2.4 GHz MIMO 2x2 radio
- \* 5 GHz MIMO 2x2 radio
- \* 400 ft range
- \* 24 volt passive PoE power mode
- \* 10/100/1000 ethernet port
- \* WiFi standards: 802.11 a/b/g/n/ac

#### UniFi Controller

Whereas the EdgeMAX products have built-in web servers for configuration the UniFi AP AC Lite is configured by an external controller. There is a free Java based version that can be installed on Windows or Linux. There is a mobile app that can be installed on a mobile device. Ubiquiti also sells a hardware controller for about \$80.

Overall my experience with the Ubiquiti products have been very good. The setup for a small office/home office (SOHO) is very simple and there are many more features for power users. □



# BRICK CITY MARATHON RUN FOR FUN

25  
AUGUST  
2017



40 KM | 26.2 miles

sign up at  
[www.events.com](http://www.events.com)

## BUSINESS

### Marketing your small business with the USPS

By Mr. Blue

A microentrepreneur is always looking for an effective way to market his business. A microbusiness operates with less than 10 people and has very little working capital; often a sole proprietor doing everything by himself. If you are in a similar situation there is a time-tested approach to market your microenterprise. Since 2011 the United States Postal Service has offered a service known as Every Door Direct Mail (EDDM).

Every Door Direct Mail comes in two flavors: business and retail. For this article I will focus on the retail version which is better suited for a microbusiness with a very small advertising budget.

#### EDDM-Retail flats

EDDM-Retail are USPS marketing mail flats that are delivered as saturation mail with a simplified address, no names or specific addresses needed, to every mail box in a postal route. Below is a sample of acceptable label options.

Local Postal Customer	PRSR STD ECRWSS U.S. POSTAGE PAID EDDM RETAIL
Acceptable Every Door Direct Mail Addressing Example	Approved Retail Postage Indicia Example

Standard mail flats are the only type of mail that can be used with EDDM-Retail. The minimum that must be shipped is either 200 pieces, or 50 pounds of mail. The maximum for EDDM-Retail is 5000 pieces of mail per day. You do not need a mail permit or pay any annual fees for the service.

#### EDDM-Retail size dimensions

A customer can mail any postcard, flyer, pamphlet, magazine, folded newspaper, or brochure as long as it meets the following specifications:

\* **Maximum weight:** per piece is 3.3 oz.

\* **Minimum size:** All pieces must be at least 5 inches long, 3-1/2 inches high and 0.007 inch thick. EDDM Retail flats also must have at least one dimension greater than 10-1/2 inches long, 6-1/8 inches high, or 1/4 inch thick.

\* **Maximum size:** 15 inches long, 12 inches high, and 0.75 inch thick.

#### EDDM-Retail price

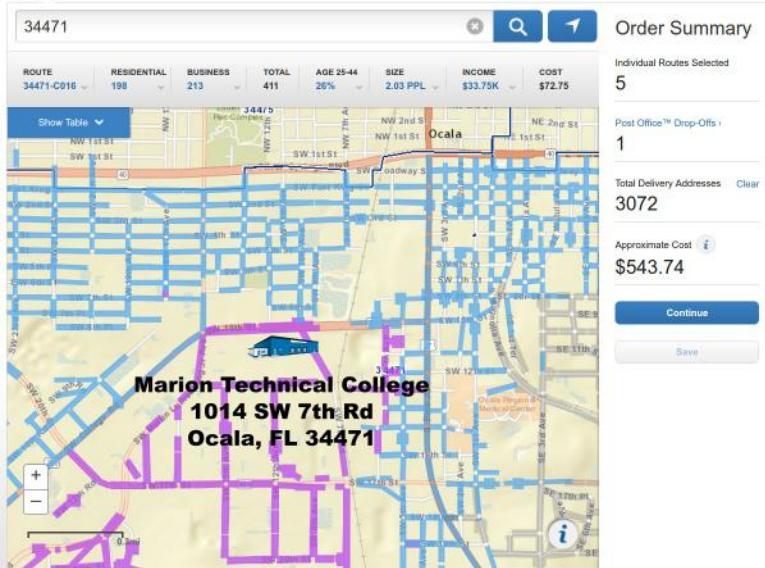
Each piece is approximately \$0.17; simply pay the total amount by cash, check, debit, or credit card at your local post office.

#### Preparation of mailing pieces

If you are the creative type you can design and make your own mailings. If you prefer outside help there are services that specialize in this. At the post office you must bundle the mailings and attach a facing slip.

#### EDDM online tool

The following graphic shows how the EDDM mapping tool works. I want to saturate mailings around the Marion Technical College at 1014 SW 7th Rd, Ocala, FL 34471.



#### Mapping tool:

<https://eddm.usps.com/eddm/customer/routeSearch.action>

In the select routes box I enter 34471. The MTC is located on the intersection of SW 10<sup>th</sup> ST and SW 7<sup>th</sup> RD. I can zoom in to the area I want. The purple area in my graphic is the carrier mailing route for the school. It is 34471-C016, which has 198 residences and 213 businesses and will cost \$72.75 total for the route.

To saturate the entire area north, east and west of the school I would need to use a total of 5 mailing routes: 34471-C016, 34471-R081, 34471-C022, 34471-C004, 34471-C055. Those areas are in blue in the graphic. There is only one USPS local office I need to mail from: Ocala Post Office at 400 SW 1ST AVE, Ocala, FL 34478 (downtown). It would require 3072 pieces of mail and cost \$543.74 or \$0.177 per piece.

#### Conclusion

Those are the basics. It is a quick and reliable way for an entrepreneur to get his presence known. There is a way for a postal customer to opt out of EDDM mailings by going to the Data & Marketing Association ([www.dmachoice.org](http://www.dmachoice.org)).

#### For complete information visit:

<https://www.usps.com/business/every-door-direct-mail.htm>





**Tattoo Customs**  
975 SW 6th Ave #115  
Ocala, FL 34471

[www.tattoocustoms.com](http://www.tattoocustoms.com)

**phone: 352-771-0121**

**STOCK & CUSTOM DESIGN**

**Bicycle**

**ACCESSORIES & SERVICE**

**Reliable Bicycle Repair**  
2523 NE 3rd St  
Ocala, FL 34470

[www.reliablebicycle.com](http://www.reliablebicycle.com)

**phone: 352-881-0121**



**Coming In January 2018 to Brick City**

For more information go to  
[www.thorcustom.com](http://www.thorcustom.com)



**THOR CUSTOM MOTORCYCLES**  
**3949 SW College Rd.**  
**Ocala, FL 34474**

**Phone : 352-498-2213**

# PROJECTS

Android Open Accessory 2.0  
USB HID Consumer Device

By: Mr. Blue



## PROJECTS

### Android Open Accessory 2.0: USB HID consumer device

By Mr Blue

This project is about making a USB consumer device using Android's built in "Android Open Accessory" (AOA) protocol. The goal is to use an Android device to act as a front end to a cloud audio service like Google Play, Amazon Prime music, or Pandora and pass the audio signal to an external amplifier and speakers.

The AOA technology is about six years old by now; for modern audio devices I see it in car audio receivers. Google first released AOA 1.0 in 2011 and later in 2012 Google released AOA 2.0. The 2012 release added bluetooth, audio and human interface design (HID) support. The Google AOA kits are designed to work with Arduino microcontrollers, however, the specification allows a programmer to turn any Linux based PC or microprocessor into a host for the Android open accessory client.

This project has four projects in one: 1) a refurbished Samsung Galaxy IV I9505 international edition flashed with CyanogenMod; 2) a PupDAC USB DAC for audio output; 3) a BeagleBone Black microprocessor as host programmed to put the Android device in accessory mode; 4) a DIY keypad with WASD audioplayer keys for the human interface input.

#### CyanogenMod on the Galaxy S4

The Galaxy S4 was designed to be modular so it is easy to replace broken parts. There are tear-down guides on the internet, such as iFixit. The S4 front panel assembly, made up of the LCD digitizer, frame and front glass, is the only parts that are glued together. All the other components can be sourced and replaced individually. I bought a I9505 S4 on Ebay with a working screen but damaged motherboard. I sourced the motherboard in China and had it delivered to my home. The motherboard had the S4 OEM Samsung version of Android that comes with the TouchWiz UI.

After Assembly I wanted to flash CyanogenMod, which uses the Android Open Source Project (AOSP) software stack for the operating system. The benefit is it is minimalistic without bloatware from a third party UI skin. The downside is that it does not come with Google's Gapps experience apps like the Playstore, Gmail, Maps, etc. The solution is to install OpenGapps after installation of CyanogenMod.

#### PupDAC USB DAC

A USB DAC is simply a usb soundcard. It is a digital to analog converter that will take the digital signal from the Android device and convert it to analog to be handled by the audio input equipment. You can buy a ready to use USB DAC from a distributor like HiFimeDIY or buy a kit from a place like Beezar, which is where I got my PupDAC.

#### DIY keypad

This is a simple device, you just need momentary on/off switches. You can put one together very quickly using a

project breadboard, switches, and jumper wires. In the picture I made one using project files that I uploaded to OSH Park. OSH Park is a great company that will make small batches of custom PCB's. I have also begun a new keypad using Cherry MX switches and a steel plate lasercut by lasergist, located in Greece.

#### BeagleBone Black microprocessor

This will take the place of the Arduino microcontroller that was normally part of the Google AOA kit. I used the C+ computer language to write the code that will place the Android device into open accessory mode, specifically into audio mode with the option to read input from a HID keypad.

The BeagleBone Black is an open hardware computer platform which comes pre-installed with Debian, which is open source and has a free software license.

Install the latest copy of Debian, which would be Debian Jessie 8.7. I start by logging into the BeagleBone Black via minicom on my PC and configure the software to be accessible via a terminal window and ssh.

PulseAudio is the software used that will take the incoming audio from the BBB USB input and send it out through the PupDAC's USB output.

I used the mraa C/C++ library from Intel to read the input GPIO pins to detect if a switch is pressed or not.

#### C+ code explained

My code is uploaded on GitHub, a web based Git repository hosting service. I will break the code down into several sections to explain how it works. There are 6 sections: 1) include libraries and define variables; 2) the USB HID report descriptor; 3) find the Android device descriptor VID and PID; 4) check AOA protocol, put the device in audio and accessory mode, change VID and PID to Google; 5) register HID, send HID report, send HID event; 6) the main program.

#### Include libraries and define variables

Include the library header files for use in the program. Use: stdio.h for standard input/output; libusb-1.0 and libusb.h for usb devices; stdbool.h for boolean type and values; stdint.h for integer types; stddef.h for NULL; unistd.h for usleep (suspend execution in microseconds); and finally mraa.h, which is an Intel library to interface with general-purpose input/output (GPIO) pins.

Here we will define our smartphone/tablet vendor identification (VID) and Google accessory VID and product identification (PID). You would add whatever VID you require for your specific Android device. I have values for the MotoG and the Galaxy S4. I have two definitions that are used when the microprocessor attempts to put the Android device in accessory mode. They are read and write values. Last in the definitions are the codes that Google uses for AOA 2.0.

The first three are all that is needed just to put the Android device into accessory mode and output all audio via the USB port. The VID and PID are changed from the manufacturer's to Google's, which is VID 18d1 and PID 2d02.

## USB HID report descriptor

The keypad was the hardest part of the software code for me to understand. Once I understood it the code is fairly simple. Important reference documents include [Hut1\\_12v2.pdf](#) and [HID1\\_11.pdf](#) that can be found on [usb.org](#).

The HID report descriptor is sent as a 1 byte report that consists of 8 bits. Think of it as a container that holds 8 pockets. Binary is read right to left so bit 0 starts on the right and bit 7 ends on the left.

The HID report Descriptor gets the inputs in the following order:

Input	Command
Play/Pause	0xCD
Track Forward	0xB5
Track Reverse	0xB6
Stop	0xB7
Music	0x83, 0x01
Mute	0xE2
Vol Up	0xE9
Vol Down	0xEA

Binary is read right to left.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	0xEA	0xE9	0xE2	0x83 0x01	0xB7	0xB6	0xB5 0xCD



Each bit is represented by a 1 or a 0 in binary:

1 byte = 0000 0000

The HID event command will be given using Hex.

For the PlayPause/0xcd command I need to send binary 0000 0001 to point to the first bit on the right (read right to left).

Convert the binary to hex and I have:

0000 0001 (binary) = 01 (hex)

The HID event command I would send to Play/Pause is 0x001

Use that formula to get the following conversions

HID Event	Binary	Hex	Command
Play/Pause	0000 0001	01	0x001
Track Forward	0000 0010	02	0x002
Track Reverse	0000 0100	04	0x004
Stop	0000 1000	08	0x008
Music	0001 0000	10	0x010
Mute	0010 0000	20	0x020
Vol Up	0100 0000	40	0x040
Vol Down	1000 0000	80	0x080

## Find the Android device descriptor VID and PID

This next section will use the libusb library to find the VID and PID for every USB device attached. If the info.idVendor matches one of the pre-defined manufacturer VIDs then the program returns true.

## Check AOA protocol, put the device in audio and accessory mode, change VID and PID to Google

This section uses AOA 2.0 definitions.

## The Google AOA 2.0 code definitions:

#define ACCESSORY_GET_PROTOCOL	51
#define ACCESSORY_SET_AUDIO_MODE	58
#define ACCESSORY_START	53
#define ACCESSORY_REGISTER_HID	54
#define ACCESSORY_UNREGISTER_HID	55
#define ACCESSORY_SET_HID_REPORT_DESC	56
#define ACCESSORY_SEND_HID_EVENT	57

First, the BeagleBone Black sends a code 51 to the android device to verify that the Android device supports AOA 2.0. If the Open Accessory version is 2.0 the BBB will automatically put the Android device into audio mode by sending code 58. The BBB will then automatically put the Android device into accessory mode by sending the START code 53. Once the Android device is placed into accessory mode the VID and PID are changed from the stock manufacturer's to Google's (google\_vid=18d1; google\_pid=2d02).

## Register HID, send HID report, send HID event

At this point the Android device will function as an audio device and the user can use the touch screen to control the music player. To use the HID functions in order to use an external keypad with audio device keys the last four AOA definition codes are used.

First, the BeagleBone Black sends a code 54 to the android device to register as a HID device. The BBB then sends code 56 to send the HID report descriptor described previously. Now the BBB is listening for HID inputs, which would be key presses. If true the BBB sends code 57 as a HID event along with the hex command for the specific event. When unpressed the BBB sends hex command 0x00 to release the hid event.

## The main program

This is the main function of the program that calls the other previously described functions when needed and depends are the previously described libraries, definitions, and variables.

The first part uses mraa to set all of the GPIO pins as inputs. The main function then calls upon three functions.

- 1) android\_device\_find\_device: explained in "find the Android device VID and PID."
- 2) android\_device\_set\_accessory\_mode: explained in "check AOA protocol... and register HID..."
- 3) android\_device\_send\_hid\_event(&dev, KEYCODE\_MUSIC): automatically opens the default music app.

The rest of the main function uses mraa to listen for keypad presses and if true sends the HID event and hex command for that switch. Each switch is individually wired to a GPIO pin.

## Conclusion

Getting the entire script to work as it currently is was a great learning experience. It is the first program I completed in C and getting the keypad to work was a challenge. This is not a complete tutorial but a way of peaking interest and focusing on one of the more difficult parts. □



**Hoplite Crossfit  
1010 South Pine Ave  
Ocala, FL 34471**

**Open 24/7**

**Phone: 352-544-8112**

**[www.hoplitecrossfit.com](http://www.hoplitecrossfit.com)**



## What you should know about intellectual property

By **Mr. Blue**

*Disclaimer: I am not an attorney, this article by no means constitutes legal advice. This article merely stimulates ideas based on the legal information of intellectual property. If you need a solution to a legal problem do your research using legal websites, your local legal library or consult an attorney.*

The founding fathers found intellectual property important enough to write the IP clause (Article I, Section 8, Clause 8) into the US Constitution. The IP clause has become the bedrock of all patent and copyright laws in the United States. What are the basics of intellectual property protection and under what circumstances can one use protected works for open collaboration?

### Copyright Basics:

A copyright protects unique, original artistic and literary works both published and unpublished. Works are automatically protected from the moment of creation. The works must be in a fixed, tangible form of expression such as a written work or recorded music.

An employer is the copyright owner of any works created by an employee. An employer is the copyright owner of works created by an independent contractor if the works satisfy the legal requirements as “work made for hire.”

Protection lasts 70 years after the death of the copyright owner for works created after January 1<sup>st</sup> 1978. Protection for “work made for hire” lasts 95 years from publication or 120 years from creation, whichever is shorter. After expiration the work becomes public domain.

Material that cannot be copyrighted includes: facts, titles, names, short phrases, slogans, ideas, and works taken from common sources.

A work created by a United States government employee is considered in the public domain and does not have

any copyright protection.

A copyright owner's exclusive rights may be transferred if done in writing and signed by the owner or their legal agent such as in a legally binding contract.

### Trademark Basics:

A trademark protects brand names and logos on goods; a service mark protects brand names and logos on services.

Protection for a trademark lasts for the duration the product or service is used in commerce and is defended from infringement.

### Patent Basics:

A patent protects an invention. There are three types of patents: utility patents which protect how an article is used and works, design patents which protect how an article looks, and plant patents which protect discoveries or inventions of new plant species.

Protection for a utility patent lasts for 20 years from the date the application was filed. Protection for a design patent lasts for 14 years from the date of the grant prior to May 13, 2015 and 15 years if granted after May 13, 2015.

### Licensing agreements to use copyrighted works:

A person can always purchase a license to use a work. For example, purchasing a licensing agreement to use Microsoft Windows 10 grants the user the right to use the software under the terms of agreement. However, there are also free licensing agreements.

### Open Source Basics:

Open Source is associated with software code. Open Source is a license from an approved organization to use copyrighted works. Popular open source software licenses include: GNU GPL, Mozilla public license 2.0, Apache license 2.0, and the MIT license. There is a very unrestrictive license with no conditions that is meant to release software into the public domain called “unlicense.”

### Open Hardware Basics:

Open hardware licenses protect not the hardware itself but the design files and schematics. Open Hardware licenses

include CERN Open Hardware license, TAPR Open Hardware license. One can always use GPL, MIT, and BSD licenses to protect firmware and CAD drawings.

### Public Copyright Basics:

Creative Commons is a Public Copyright license. Unlike the open source license models, such as GNU GPL, the creative commons licenses will cover more than software. From the creativecommon.org website coverage includes: “other kinds of creative works: websites, scholarship, music, film, photography, literature, courseware, etc.”

There are 7 regularly used licenses, the least restrictive is the Public Domain (CC0). The zero public domain license is meant to waive as many rights as possible to release a work into the public domain.

### How can one use previously published work in a DIY project:

Works that can be used freely without infringing on another’s rights include: those offered under open source licenses, those that are in the public domain (copyright protection is not valid or has lapsed), trademarks and servicemarks that are dead/inactive, and patents that have expired.

As stated earlier a work created by a United States government employee is considered in the “public domain” and does not have any copyright protection. Some states, such as Florida, also have language in their constitution that puts government public records in the “public domain;” the state of Florida is not permitted to claim copyright protection on works that are public records. □

“As we benefit from the inventions of others, we should be glad to share our own... freely and gladly.”

- **Benjamin Franklin**

“There is no patent.

Could you patent the sun?”

- **Jonas Salk, on who owned the patent to the polio vaccine.**



**Scuba Adventures**  
2705 NE 14th St  
Ocala, FL 34470



**Phone:**  
**352-656-2398**  
**Web:**  
[scubaadventures.com](http://scubaadventures.com)

**Training Courses:**

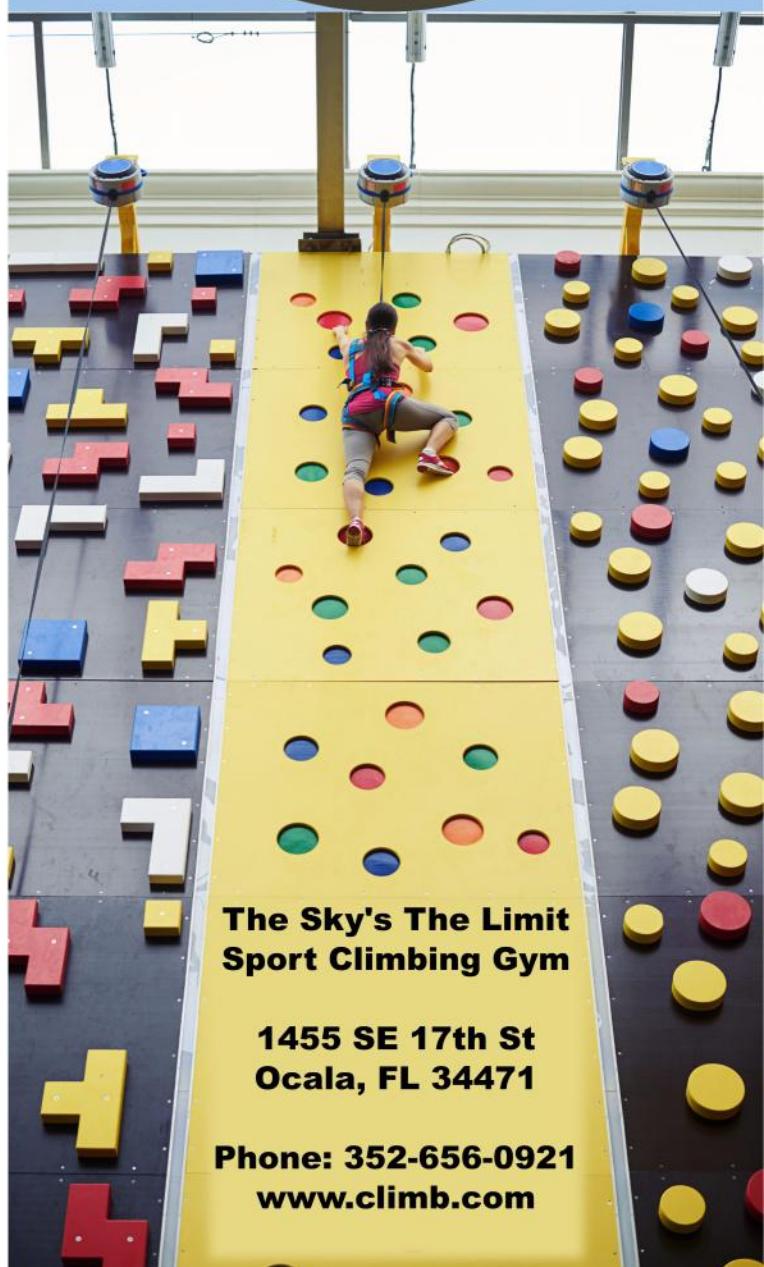
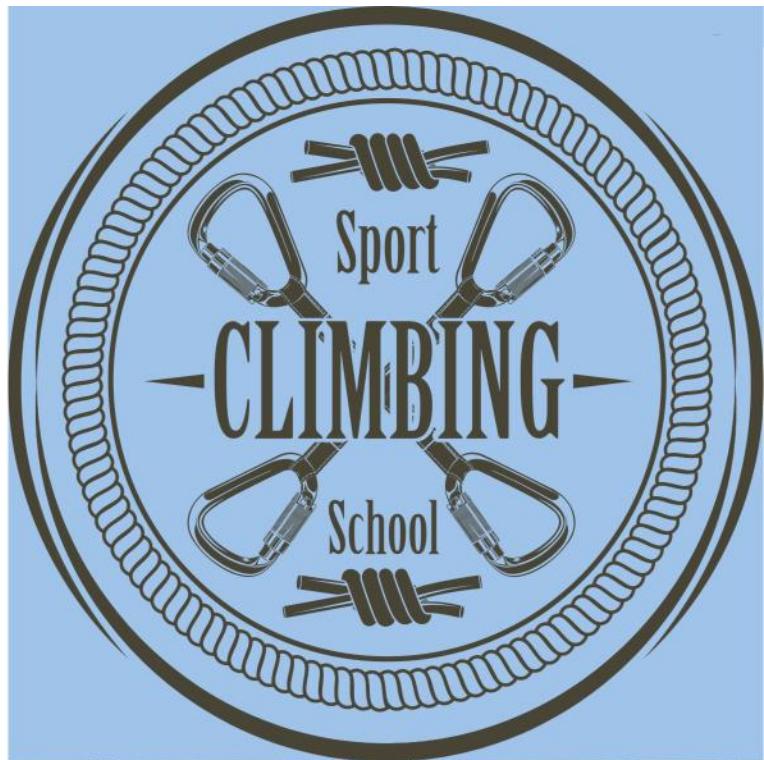
**Padi:**  
open water diver

**NSS-CDS:**  
cavern diver

basic cave diver

apprentive cave  
diver

cave diver



# ROMANO'S Pizza House

CLASSIC RECIPES

1706 NW 10th St  
Ocala, FL 34475



Fresh  
Ingredients

Available  
for  
private parties  
call us

Phone:  
352-662-7789

# MORTIMER's Steak

ESTD 1980

3218 SW College Rd  
Ocala, FL 34474

Phone: 352-228-7732



# Baja Grill



81 N Pine Ave  
Ocala, FL 34475

Phone:  
352-443-7765



BIG. JUICY. TASTY



No 1

# BURGER 33

Best Choice

2450 SW 19th Avenue Rd  
Ocala, FL 34471

Phone: 352-223-8812





▲ Two chairs from the 1960's reupholstered, but still incomplete. The springs were originally zig zag springs. They were changed to 8-way hand tied coil springs, considered the "gold standard" in furniture upholstery. Modern materials were used including: polyester spring twine to tie the coils, dacron deck padding, synthetic polypropylene webbing, synthetic upholstery burlap, and 9 gauge six inch springs (9 for each chair).

The chairs were stripped of original finish as well. They were colored using 3 shades of wood dye (red, brown, and amber). They were finished using shellac flakes dissolved in denatured alcohol.

The exteriors will be completed with Dolce polyurethane made by Spradling. Polyurethane is a synthetic material that mimics the softness of leather.

Tools included a DIY 1hp air compressor and pneumatic staple gun.

## TRENDS

### The Maker Movement: You may be part of it and not even know it

By [Mr. Blue](#)

If you enjoy building things and take great pride in the achievement of designing, planning, and executing a project, you can be a part of the fast growing maker movement. Of course making things is nothing new; people have been doing it for centuries. In the past artisans and crafters who built things were known as tinkerers, hackers, how-toers, inventors or some other name. Some makers build just for a hobby and some turn their endeavors into a business.

There have been other movements in the past such as the "Arts and Crafts Movement" from 1880 to 1920 that rose in opposition to the industrial revolution. There was the "DIY movement" that rose from 1940 to 1970 that was mostly home improvements. There was the "hacker culture" from groups such as the

Homebrew Computer Club that grew from hobbyist home computing of the 1970's. There is the "slow movement" that started in the 1980's with the "slow food movement." The slow food movement started when a McDonald's fast food restaurant was being constructed at the Piazza di Spagna in the heart of Rome. A slow food manifesto was released in 1989 which included the statement: "Fast Life has changed our way of being and threatens our environment." The slow movement has grown to include slow agriculture, slow work, slow hobbies, and slow crafts.

What all of these movements had in common was shared collaboration, free knowledge, hands-on approach, social responsibility, freedom from mass consumerism, creativity and pride in making something self-made. In the past information was shared from study-tours, printed journals, magazines, and newspapers. The mass proliferation of the personal computer, the web browser in the 1990's, and high speed internet access has brought about a new



### ▲ A home built mono 3 way speaker setup to use Google Chromecast Wi-Fi audio as the input.

This speaker was originally built using a microprocessor running Linux to utilize Android Open Accessory protocol 2.0.

AOA 2.0 allows playing USB audio from an Android device (smartphone or tablet). It has since been converted to accept any audio input using a 1/4 inch audio connector.

The 3 drivers; which are the tweeter, mid-bass, and woofer, are quad-amped. The tweeter and mid-bass have their own amplifier: the woofer has dual voice coils and each voice coil gets its own amplifier.

The stereo input is converted to a mono signal using an op-amp summing amplifier. The frequencies for the 3 speakers are filtered with 4<sup>th</sup> order linkwitz-riley active crossovers.

There are 4 power supplies: one 24 vdc psu for the tweeter/mid-bass, one 24 vdc psu for the 2 voice coils in the woofer, one 5 vdc psu for the Google Chromecast Wi-Fi, and one transformer that powers the op-amps in the active crossover circuit.

**“America has always been a nation of tinkerers, inventors, and entrepreneurs... think of Benjamin Franklin, Benjamin Banneker, George Washington Carver, Ida B. Wells, Henry Ford, Grace Hopper, and so many more. In recent years, more and more Americans have gained access to technologies that support making, such as 3D printers, laser cutters, easy-to-use design software, and desktop machine tools, along with freely available information about how to use, modify, and build upon these technologies. Such resources, in combination with growing networks of maker enthusiasts and crowd-funding platforms, are enabling more Americans to design and build almost anything.”**

- The White House | announcing the 2014 Nation of Makers campaign.

movement: the maker movement.

The Maker Movement was started in 2005 when Make:magazine, based in California, was first published by O'Reilly Media. It was a combination of magazine/book that featured DIY technology projects. Also established in 2005 was Etsy, the online marketplace for handmade crafts. In 2006 the first TechShop was opened in Menlo Park, California. A TechShop is an open-access facility that provides workspace and tools to build a project. As a way to get like-minded individuals to meet in a social setting the first Maker Faire was held on April 22-23 2006 in San Mateo County, California.

All of these things put together was the beginning of an infrastructure that would provide a framework for the new way of sharing information, providing raw materials, parts, tools, and equipment for the new wave of builders, inventors, makers, hobbyists, and tinkerers.

The movement got a significant boost when the White House announced support for STEM (science, technology, engineering, and math). In 2009 President Obama had his “Educate to Innovate Campaign”; two of the goals achieved was public-private partnerships totaling over \$250 million and a CEO-led coalition to involve the private sector. In June 2014 President Obama launched the “Nation of Makers” campaign and held the first Maker Faire at the White House. At that time over 150 colleges and universities wrote letters committing to take part in the Maker Movement. One year later, on June 12-18 2015, the first “National Week Of Making” was held at the White House.

In our time the maker ecosystem has

grown exponentially. Even if one does not attend a Maker Faire, or use a Makerspace, Hackerspace, Techshop, or FabLab one can benefit from web published shared information and the online marketplace. There are tutorials on YouTube that show a person how to fix a car, an appliance, or take apart and put together a mechanical watch. A person can buy tools, raw materials, or parts from retailers like McMaster-Carr, Digikey, Mouser, or Zorro. Large and small boutique stores offer tutorials and components for products they specialize in like Parts-Express, Sparkfun, and Adafruit. One can find shared projects published with “instructables”.

Affordable fabrication tools include 3-D printers, CNC machines, laser cutters, and soldering stations.

Large private companies offer support. GE sponsors “GE Garages”, which operates as an open-access fabrication shop. Ford and TechShop collaborated to create a techshop in the Detroit area.

Makerspaces are sponsored in the public sector. NASA created SpaceShop which is a MakerSpace located in the NASA Ames Research Center, California. All across the country public libraries are creating MakerSpaces for public access.

Overall it has never been a more exciting time to DIY and make things. It doesn't have to be STEM related. One can bake their own bread, grow their own food, or make their own repairs when something breaks. The tools are out there if one chooses to do something more challenging. □



**Steve Williams, CPA**

**118 SE Magnolia Ave  
Ocala, FL 34471**

**Phone: 352-444-9021**



**Dental Continuing Education**

**Courses Offered**

**2500 SE 17th St**

**Ocala, FL 34471**

**Phone: 352-544-9901**



**VIP Limousine**

**505 NE 1st Ave  
Ocala, FL 34470**

**Phone: 352-662-1199**



**Precision Builder**

**Carpenter and  
Cabinet Maker**

**3098 SW College Rd  
Ocala, FL 34474**

**Phone: 352-221-5577**



**McGregory's  
Smokeshop**  
**3133 SW College Rd  
Ocala, FL 34474**  
**Phone: 352-443-9012**

**Phoenix Barber Shop**  
**5805 W SilverSprings Blvd**  
**Ocala, FL 34474**

**Phone: 352-233-5411**



**Mondo's  
Fullservice Catering**  
**2012 SW College Rd**  
**Ocala, FL 34471**

**Phone: 352-554-7821**

**Eric Smith  
Welding  
and  
Repairs**

**Phone:  
352-223-4499**



**2677 NW 10th St  
Ocala, FL 34475**



## **Brick City Dental Care**

**2415 SW 27th Ave  
Ocala, FL 34471**

**Phone : 352-621-0033**

## **WOLFGANG'S AUTO**

**Certified Pre-Owned**

**33 NW 12th St  
Ocala, FL 34475**



**Phone: 352-333-8891**



LOS ANGELES, CA - FEB 9: Elon Musk at the Tesla Worldwide Debut of Model X on February 9, 2012 in Hawthorne, Los Angeles, California

#### Some of Elon Musk's accolades:

- 2007:** R&D Magazine's innovator of the year for SpaceX, Tesla, and Solar City.
- 2007:** Inc. Magazine's entrepreneur of the year for SpaceX, Tesla, and Solar City.
- 2009:** Aviation Week's 52nd annual laureate award for space. Developing the Falcon 1, the first privately financed vehicle to place a satellite in orbit.
- 2010:** Automotive Executive of the year award for excellence in leadership and innovation in Tesla.
- 2010:** The FAI – The World Air Sports Federation's Gold Space Medal awarded for contributing greatly to the development of aeronautics.
- 2011:** Wall Street Journal's innovator of the year in technology for automobiles, renewable energy, and space exploration.
- 2012:** Royal Aeronautical Society's Gold Medal for contributions in aerospace. The Falcon 1 and the Space X Dragon, the first private sector recoverable capsule.

#### Honorary doctorates:

Design  
Aerospace engineering  
Engineering and technology

#### INNOVATORS and SUCCESS

##### Elon Musk: revolutionary in space, transportation and renewable energy

By [Mr. Blue](#)

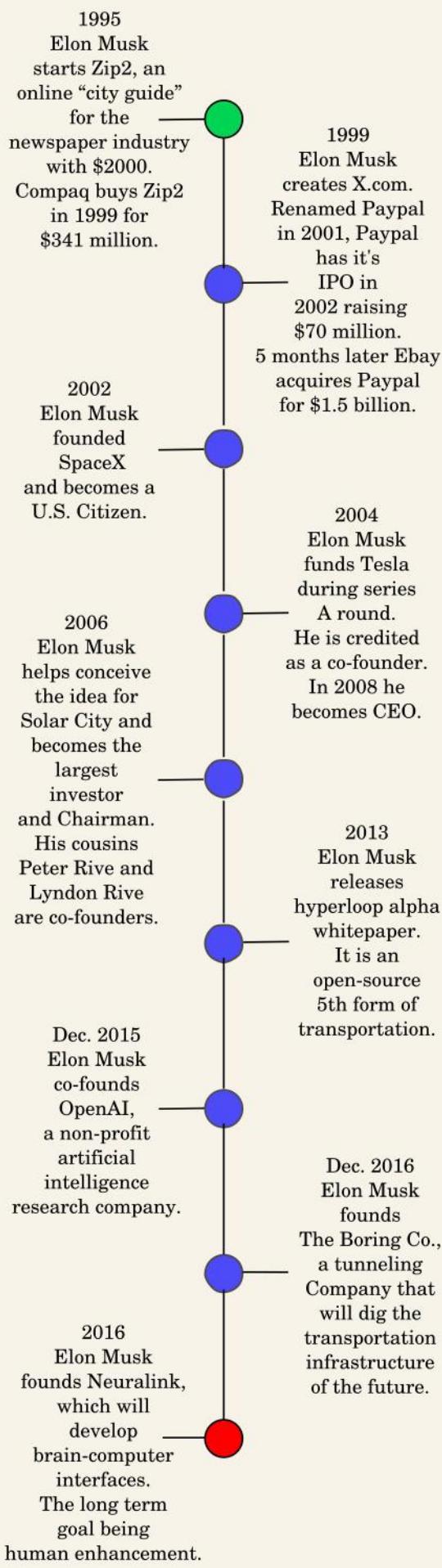
A friend of mine once asked me what is the difference between a discovery, an invention, and an innovation. I replied, "A discovery is finding something that already exists for the first time. An invention is creating something that never existed before with one's ideas and efforts. An innovation is improving on something that already exists making it better." When compiling a short list of modern successful innovators it is hard not to include Elon Musk.

Since 1995 Elon Musk has received numerous accolades for innovation and business. He has been a serial entrepreneur and been credited for innovations in the aerospace industry, renewable energy, automobiles, transportation, and software.

Even before his run in technological innovation Elon Musk was always a problem solver. His personal background is an incredible adventure

in achieving the storied American Dream. He was born in South Africa to an engineer father and a dietician mother who had dual South African – Canadian citizenship. Elon Musk always wanted to immigrate to the U.S.A. where he thought great things were possible. In 1988 South Africa was fighting the South African Border War and all white males were forced to serve a mandatory two year conscription in the South African Defense Force. The SADF enforced oppressive apartheid and fought resistance at the border and in the townships. Rather than be drafted at the age of 18 Elon Musk left South Africa while still 17 to Canada where his mother had relatives.

For two years Elon Musk worked odd jobs and at age 19 enrolled in Queen's University in Kingston, Ontario. In 1990 he transferred to the University of Pennsylvania in the U.S.A. on full scholarship. He received an economics degree from the Wharton School of Business and a degree in physics. He was accepted to Stanford's physics PhD program in 1995 but Elon dropped out after two days to start Zip2 with his brother Kimbal. Their venture capital



financiers helped them obtain their visas. Elon Musk's first two companies, Zip2 and Paypal, provided him with the seed money to pursue his other goals.

Elon Musk's most renowned business ventures are SpaceX, Tesla, and Solar City. Elon credits his physics background for providing him a framework to see opportunities others do not.

With SpaceX, Elon Musk has joined the "Thrillionaires." These are wealthy capitalists, such as Paul Allen (Microsoft/Vulcan aerospace), Jeff Bezos (Amazon/Blue Origin), and Richard Branson (Virgin Atlantic/Virgin Galactic) that have joined the space race in the private market. Out of the above SpaceX has more ambitious plans and has outperformed. Blue Origin and Virgin Galactic focus more on space tourism, while Vulcan Aerospace's goal is to get satellites into orbit launched from a carrier aircraft. SpaceX has the ultimate goal of colonizing Mars.

SpaceX also boasts the following milestones. The Falcon 1 is the first privately developed vehicle to orbit the earth. The Dragon is the first privately developed capsule to be recovered from orbit. In 2015, after settling a lawsuit with SpaceX, the US Air Force certified SpaceX to bid on US national security contracts. On April 2016 SpaceX wins its first US contract to put a GPS satellite into orbit and in May 2017 SpaceX wins the contract for the GPS III satellite. On May 1, 2017 the Falcon 9 launched, put a satellite into orbit, and the first stage rocket successfully landed on land to be reused in a subsequent launch.

SpaceX's closest competitor is United Launch Alliance (ULA), which is company made jointly of Boeing and Lockheed Martin. ULA's disadvantages are it is almost twice as expensive for a launch, and their rockets are outsourced from the Soviet Union. The Soviet Union and the US are not in a good relationship considering Putin's aggressions. The US Congress is trying to control the Federal Budget regarding the

taxpayer burden.

Electric powered cars was always something Elon Musk was interested in. The first Tesla prototype was made of a glider chassis made by Lotus and a drive system provided by AC Propulsion. Elon Musk got involved during the first series A round of funding and was credited as a founder of the car company, being involved from the ground up with the most recent version of the Tesla vehicle. On April 2017 Tesla reached the milestone of briefly surpassing both GM and Ford as the most valuable US car company regarding market capitalization. Tesla had passed Fiat Chrysler long ago.

Tesla is not just revolutionizing cars but the means to power them. In 2015 the Gigafactory 1 began construction to make powerwall and powerpack lithium-ion battery packs. As of Jan 2017 the company is mass producing them. In 2016 Tesla acquired SolarCity for \$2.5 billion. One of Solar City's newest innovations is a solar roof. Instead of traditional solar panels that sit on top of the roof, integrated glass tiles will replace traditional shingles. Integrated with powerwall battery technology it can become a new way to power the home and store energy to recharge an electric vehicle.

As an alternative to California's High Speed Rail project Elon Musk released the open-source hyperloop alpha paper in 2013. He promoted the idea has a fifth form of transportation besides: planes, trains, automobiles, and boats.

Elon Musk's extraordinary vision and leadership has caught the attention of world leaders; he is currently a member of President Trump's economic advisory council, and member of Jared Kushner's White House Office of American Innovation advisors. His personality and drive has not only made his mark in the world of science but also in popular culture; the character of Tony Stark in the Iron Man/Avengers movies has been based off of Elon Musk. □



**Services include :**

- \* Adult Comprehensive Eye Exams
- \* Pediatric Eye Exams and Consultations
- \* Lasik Consultation and Co-Management
- \* Specialty Contact Lens Fittings
- \* Cataract Evaluations/Treatment

**Fairfield Eye Care Center  
810 NE 25th Ave  
Ocala, FL 34470**

**Phone: 352-732-0044**



PRSR STD  
ECRWSS  
U.S. POSTAGE  
PAID  
OCALA, FL 344  
PERMIT NO. XXX

\*\*\*\*\*ECRWSSEDDM\*\*\*\*\*

POSTAL CUSTOMER



"It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat."

- President Theodore Roosevelt  
**THE MAN IN THE ARENA**

Excerpt from the speech "Citizenship In A Republic"  
delivered at the Sorbonne, in Paris, France on 23 April, 1910