

## **Transmitter Control Using Wireless Wi-Fi LAN for *Transceiver* or *RCForb* & *EchoLink Client's* Push-to-Talk** *Wireless LAN PTT Using a Smartphone App*

by Gene Hinkle, K5PA (<https://www.k5pa.com>)

### **Summary**

This tech note describes my project to perform Wi-Fi wireless LAN push-to-talk (PTT) control of your local ham radio transmitter or PTT activation of RCForb Client (also known as RemoteHams) or EchoLink software programs using a serial (COM) port on your computer. The beauty of this design is having the ability to operate the PTT over your local area wireless network (Wi-Fi LAN) using a simple smartphone App. Both Apple iOS and Android O/S are supported by the app. I have found this very useful when operating with the Plantronics Wireless Headsets (<https://www.k5pa.com/cs520hams/index.htm>) that have a very large coverage distance, typically up to 350 feet or more!

This design is easy to build using readily available off-the-shelf (Amazon) circuit boards and very few parts. **As a bonus**, the design files for 3D printing a custom box are available or you can select an enclosure of your choice.

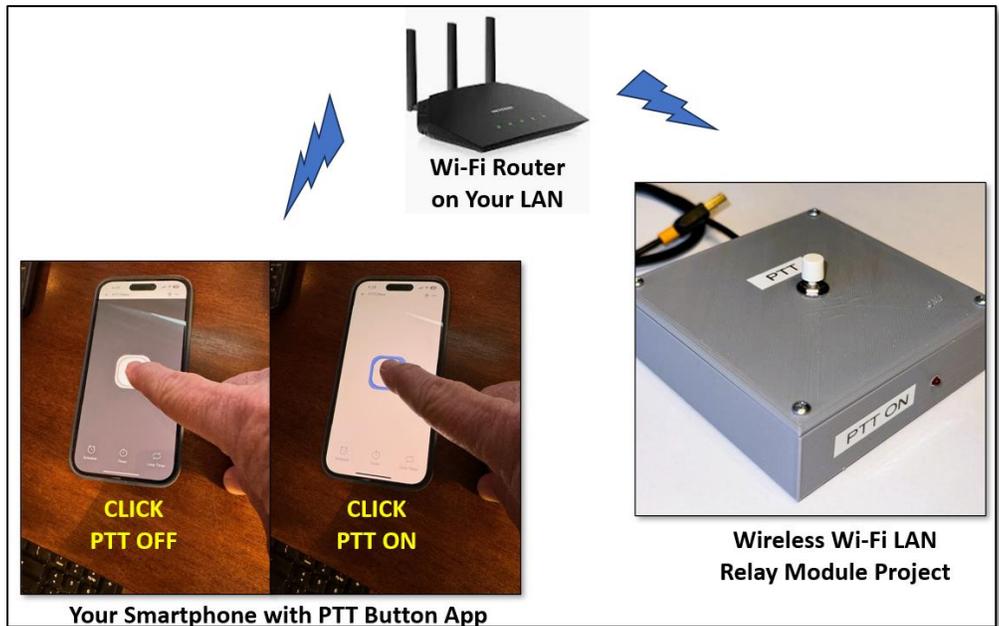
The schematic and parts lists (Bill of Materials) are provided to make the project go smoothly. All new parts cost approximately \$30 USD. If you are interested, read on.

### **Introduction**

Ham operators enjoy using RemoteHams *RCForb Client* applications (<http://download.remotehams.com/>) to connect to remote radio servers world-wide. I use the **v0.9.xxx Public Alpha** releases to provide the functionality shown in this tech note (the current alpha release is ***RCForbClientSetup\_v0.9.319.exe***). However, using the Client's radio GUI button mouse click leaves something to be desired when controlling the push-to-talk soft button. The space bar can also be used if the PTT is first highlighted by the mouse. However, what is missing is a standard PTT interface using a switch closure from a real push-button.

In prior projects, I have used several tiny wireless RF switches or relays that make interfacing a snap. I have found the RF switches had somewhat limited range due to their use of a button cell powered FOB (or clicker as some call it). The better approach for extended range around your home QTH is a Wi-Fi network enabled, wireless push-to-talk switch that uses a smartphone application (app) as shown in Figure 1. Both iOS (Apple) and Android OS apps are available from the wireless relay board vendor. I selected the iOS app for use with my Apple iPhone. The app has a simple button switch displayed on your smartphone and touching it will toggle the

PTT ON or OFF. The smartphone's **display background is illuminated** when the PTT is asserted giving a positive indication of PTT control.



**Figure 1. Smartphone App Showing Background Illuminating with PTT ON**

My design solution provides either a USB interface to your software program (RCForb Client or EchoLink) or a relay contact switch closure to connect to your transmitter. An LED is also illuminated whenever the PTT is asserted. A small pushbutton is located on top of the enclosure for forcing a PTT manually, suitable during testing or for manual control.

Luckily, the RCForb Client software already has a built-in external PTT option using a serial port on your computer! All that is needed is an inexpensive USB to TTL converter that exposes the serial control signals (e.g., CTS, DSR, etc.). The completed assembly is shown in Figure 2 and has been assigned my **P/N 4000-0072**.



*Figure 2. Wi-Fi LAN PTT Assembly, P/N 4000-0072*

The left photo shows the front of the enclosure with a small, red LED to indicate when PTT is asserted either by pressing the PTT button on top or when using the smartphone app over Wi-Fi LAN connection. The right photo shows the USB cable that connects to your computer for powering the circuit boards (5 VDC from the USB connection) and for communicating PTT commands to your RCForb Client or EchoLink programs. The RCA style jack is also shown that provides a relay contact normally open (N.O.) contact to your transmitter. The relay contacts are closed whenever PTT is asserted.

The complete schematic is shown in figure 3. The right-side circuit board connects to your computer serial COM port by connecting a cable from the **Mini-B USB** socket to the computer's USB port. The other side of the circuit board has a two-wire connection for the PTT switch closure to connect the control signal **CTS** to ground (**RTN**). These **CTS** and **RTN** signals are switched with the Wi-Fi LAN circuit board. Once the RCForb Client or EchoLink software has been configured to accept this signal, connecting the **CTS** and **RTN** lines together using the Wi-Fi LAN switch sends the PTT signal to your software. A physical switch can also be used, and a small, red LED is included to indicate the assertion of PTT. This is a very low current (2 mA) red LED.

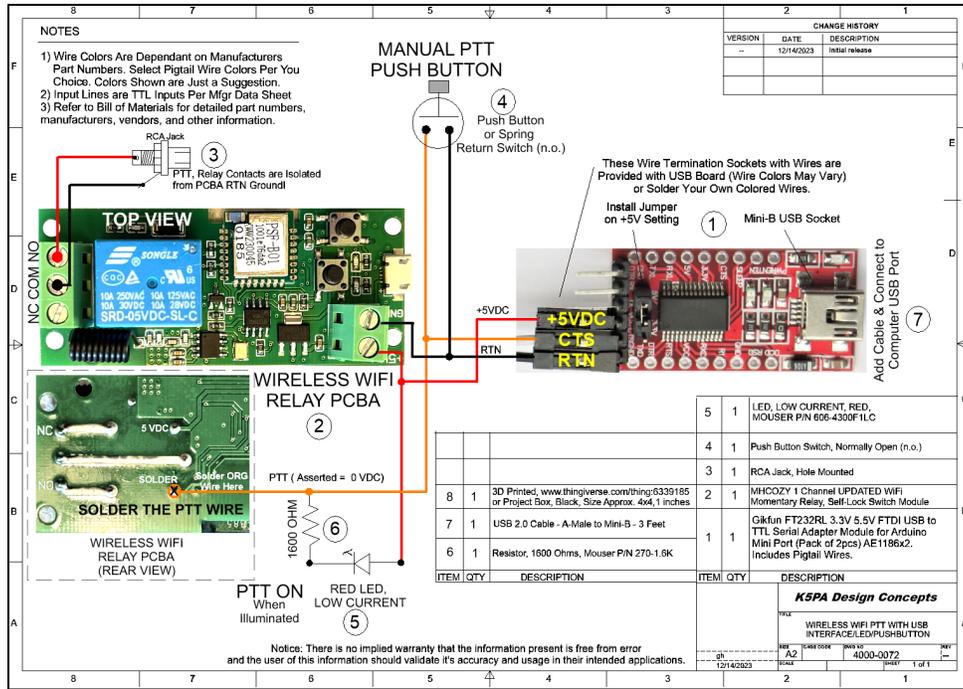


Figure 3. Wireless PTT Schematic, P/N 4000-0072

### RCForb Client Software Setup

The **RCForb Client** software has **External PTT** settings under the **Control Devices** tab at the top of the main GUI, shown in Figure 4. Initially the **External PTT** tab is **OFF**. It cannot be turned **ON** until the **CONFIG COM #** assignment and **PTT Pin CTS** are defined.

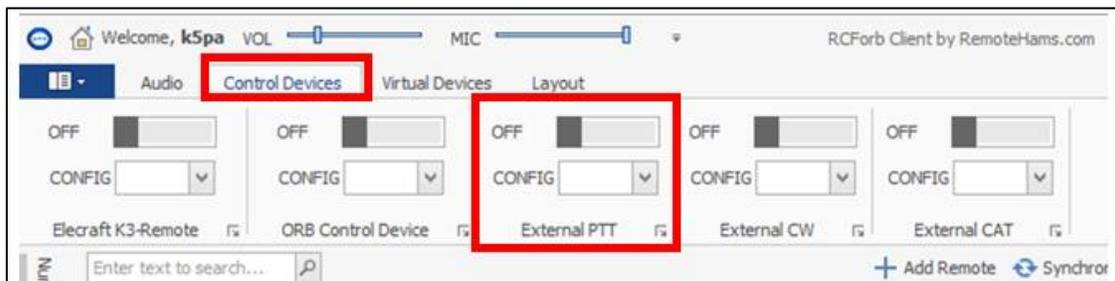
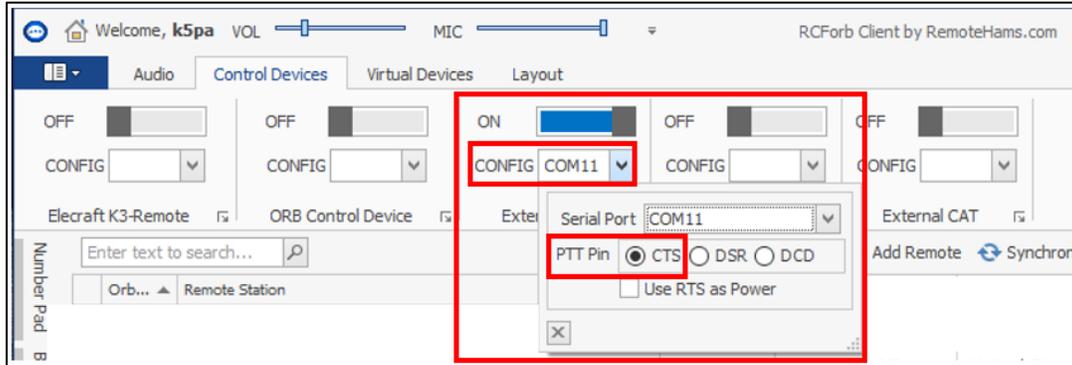


Figure 4. Control Devices Tab, External PTT in OFF State

When the USB to TTL interface is plugged into the computer's USB port, the connection creates a **COM #** port, where **#** is the number assignment. This **COM #** port number will be displayed in the **CONFIG** drop down menu as shown below. Selecting the **COM #** port number and the **CTS** line for the PTT function will allow the Client to use this port for PTT.

<https://www.k5pa.com>

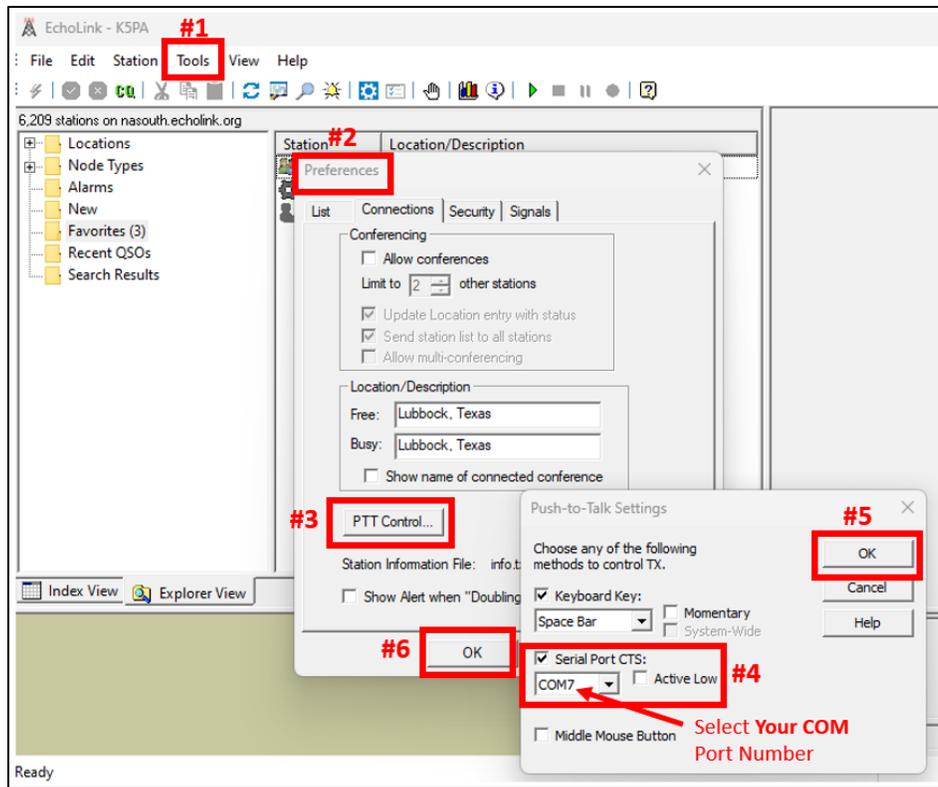
When the **External PTT** settings have been finalized the software slide switch can be changed from **OFF** to **ON** that is already shown **ON** in Figure 5. It is now able to respond to a hardware PTT using the small interface board.



*Figure 5. RCForb Client’s External PTT Selection for COM Port, PTT Pin Assignment CTS*

### **EchoLink Client Software Setup**

The **EchoLink Client** setup is very similar to that of RCForb Client. The numbered red boxes, shown in Figure 6, lists the sequences to open each panel to reach the **Push-to-Talk Settings** menu, **check** mark the **Serial Port CTS**, and select the **COM** port number assigned to the device. It is shown as COM7 in the figure, but it must be selected to match the assigned number whenever you plug in the project to the computer’s USB COM port.



**Caption:** refer to text for detailed instructions

**Figure 6. EchoLink Client's External PTT Selection for COM Port, PTT Pin Assignment CTS**

### Hardware Schematic and Bill of Materials

The schematic diagram is included in the **Appendix** as well as the **Bill of Materials** (BoM). The BoM includes suggestions for part numbers and vendors to purchase any components. Feel free to make substitutions based on the BoM given. Also provided are web links that can be clicked to take your browser to the vendor. Photographs of a completed prototype are also included in the Appendix.

There are two in-line pin header blocks, one for input/output connections and the other for 3.3 or 5 VDC operation on the board. The 5-volt selection must be enabled by adding a small pin joiner across the 5 VDC selection as shown on the schematic diagram. The 3 pins used for the power and CTS signal are connected using a single pin socket to wire connector. Since the 3 pins are adjacent, I simply added a white piece of heat shrink tubing to keep the 3 wires/sockets together while they are slid over the proper pins.

I have designed the circuit to include an extremely low current (2 mA), LED to indicate when the PTT is asserted. This is important if the latching type logic is selected in the wireless switch, so you always know the state of the PTT, on or off. I also included an option to add a physical PTT switch for times when I am at the computer and within reach of the wireless switch box. In that case, I can just press the push button to assert PTT.

I might mention there are several alternative configurations for USB to TTL circuit boards on the market. If you select an alternate circuit board configuration or a different source, beware of using boards that do not have the **genuine FTDI chipset** and driver availability. There are also **counterfeit FTDI chipsets** on the market, so buyers beware. The part number I provided has been used successfully in many applications by the author.

### **3D Printed Enclosure Design Files**

A good friend ham radio operator, John (K4LT), designed the 3D printed boxes, shown in Figure 7, for this project and has published these on **UltiMaker Thingiverse** website and are free to use.

The link to this 3D printed project box is: <https://www.thingiverse.com/thing:6339185>

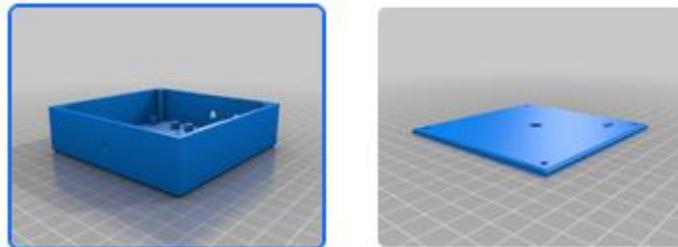


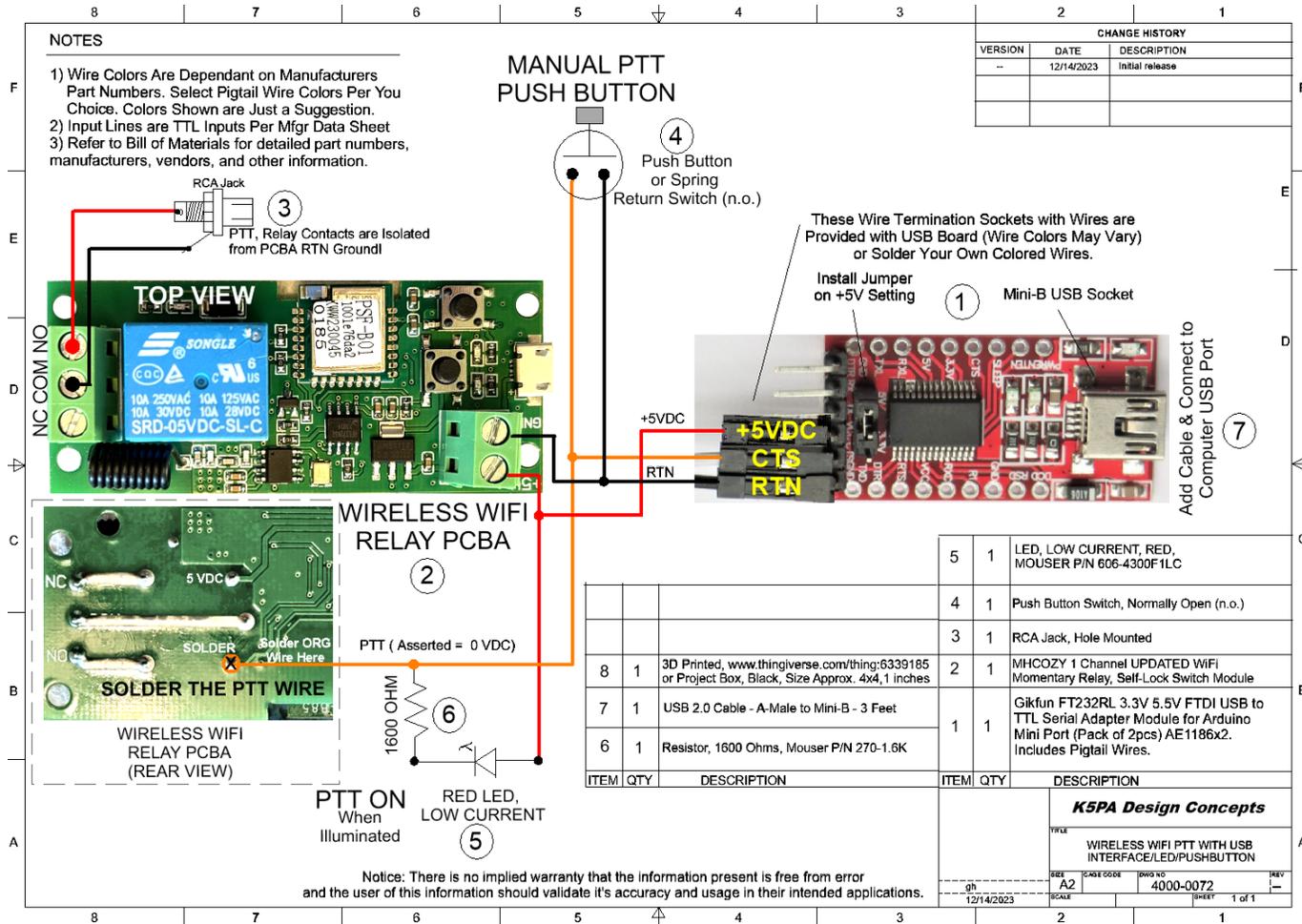
Figure 7. The 3D Printed Box for this Project

During my initial design, I found the Wi-Fi Wireless Relay manufacturer came out with an **UPDATED** version for their product which had a slightly different PCB shape. I was lucky enough to have noticed this during my design and was able to ask John to provide **additional** mounting posts for the **original and UPDATED** boards. Hence, both board types will fit the box based on these 2 board holes and parts placement. Since another board layout could certainly be produced by the manufacturer at any time, it is recommended that the board layout be confirmed if you are going to produce a 3D printed box from the current design files. If necessary, any new board layout of course could be incorporated by the end user modifying the design as needed! That is the beauty of the 3D printing hobby.

# APPENDIX

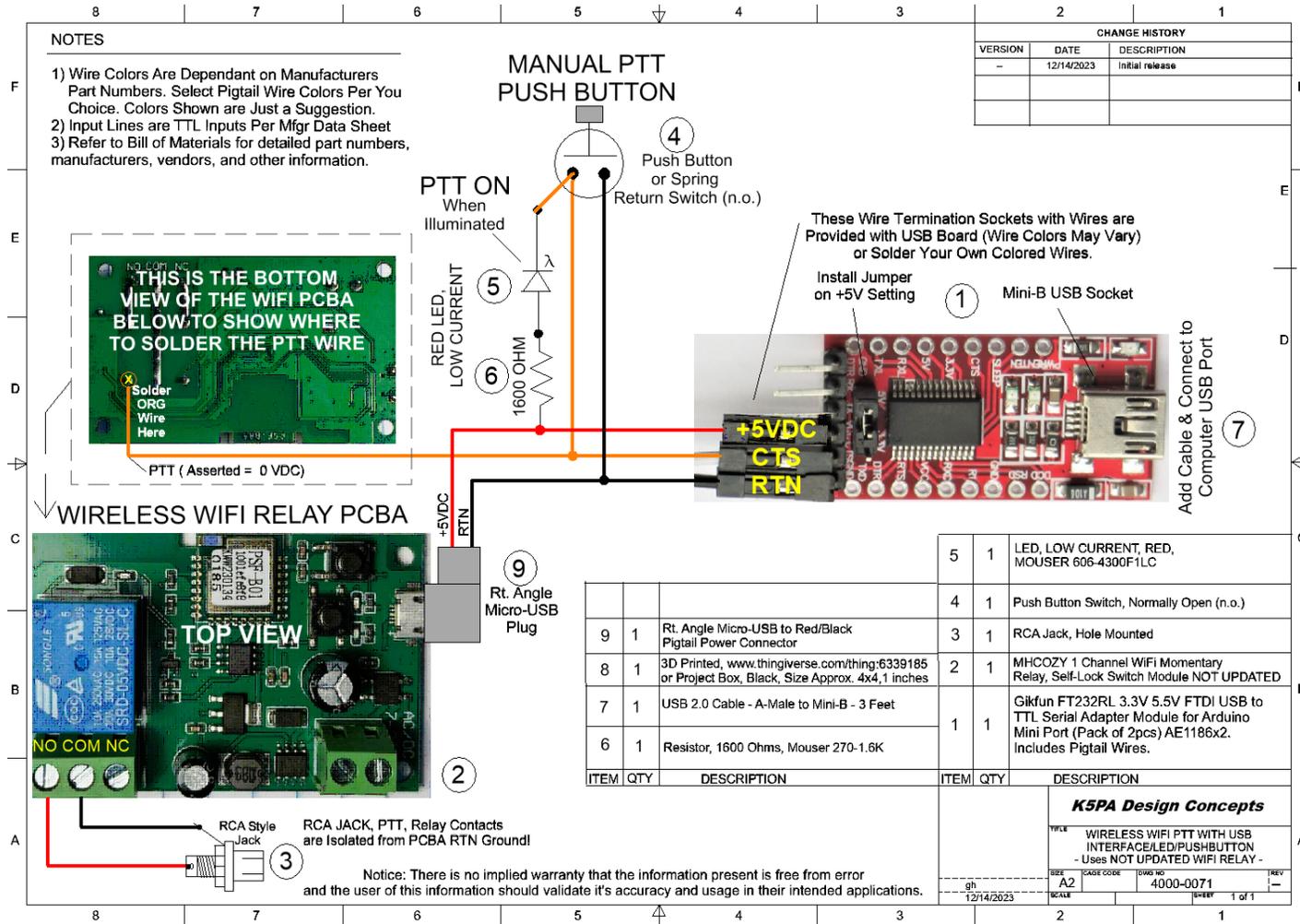
- SCHEMATIC, P/N 4000-0072 (preferred, UPDATED Relay Board)
- Alt. SCHEMATIC, P/N 4000-0071 (older Wi-Fi relay board)
- FINISHED UNIT PHOTOGRAPHS
- BILL OF MATERIALS (WITH CLICKABLE URL VENDOR LINKS)

# Schematic P/N 4000-0072



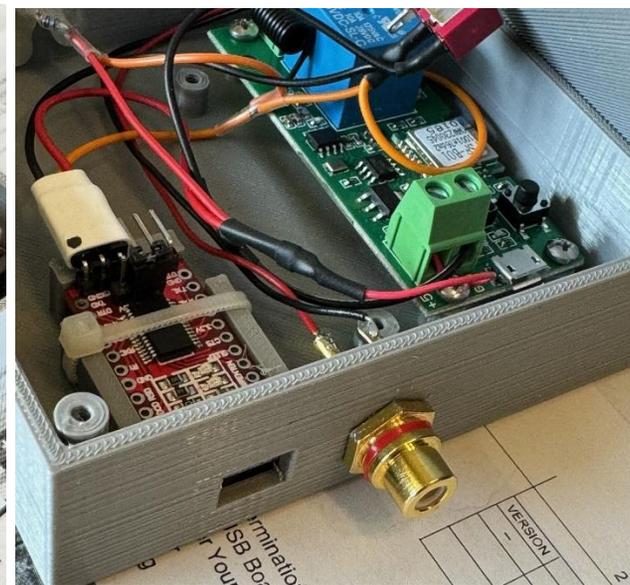
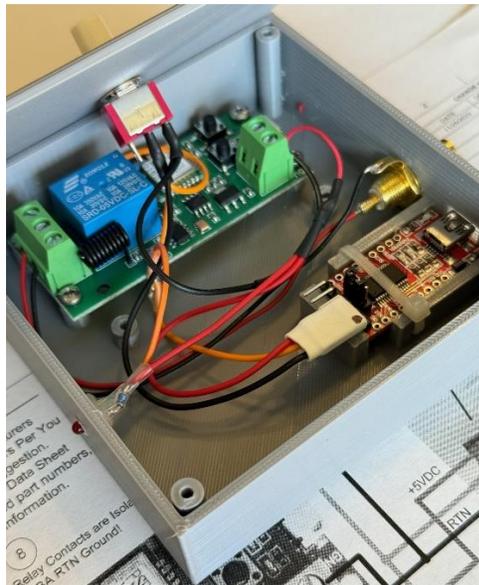
- This schematic # 4000-0072 design uses an UPDATED version of the Wireless Wi-Fi Relay Board available from Amazon. So, select wisely based on the part number and style of the board. The board shown is more rectangular shaped than the older design shown on the next page. I prefer this version and it is the version shown in the photographs and with 3D printed box files. During the 3D box design, both board styles were included by allowing mounting posts for both board styles!

# Alt. Schematic P/N 4000-0071



- This alternate design schematic # 4000-0071 uses a **prior** version of the Wireless Wi-Fi Relay Board that **may or may not** be available from Amazon. So, select wisely based on the part number for the board. The board shown is less rectangular shaped than the older design shown on the prior page. During the 3D box design, both board styles were included by allowing mounting posts for both board styles!

## Finished Unit Views of P/N 4000-0072



## Bill of Materials List of P/N 4000-0072

(See next page for live links)

Date: 12/14/2023							
Bill of Materials Drawing 4000-0072			Transmitter Control Using Wireless Wi-Fi LAN 12-14-2023				
Item	Part No.	Part Description	Mfgr	Part No.	Vendor	URL of Vendor P/N (See Next Page for Live URL Links)	Qty
1	4000-0072	DIGISHUO FT232RL FTDI Mini USB to TTL Serial Converter Adapter Module 3.3V 5.5V FT232R Breakout FT232RL USB to Serial Mini USB to TTL Adapter Board for Arduino (2Pcs Red Module)	DIGISHUO	ASIN: B0BTRTXWX9	Amazon	<a href="#">FT232RL 3.3V 5.5V FTDI Mini USB to TTL</a>	1
2	4000-0072	MHCOZY Updated WiFi Wireless Smart Switch Inching Self-Locking Relay Module,Set Inching Time from 0.5 Second to 1 Hour,be Applied to Access Control,DIY WIFI Garage Door Opener (5V)	MHCOZY	ASIN: B07L69HD6N	Amazon	<a href="#">MHCOZY Updated WiFi Wireless Switch (5V)</a>	1
3	4000-0072	DIYhz 20Pcs Audio Terminal Jack Panel Mount RCA Lotus Head Welding Female Socket Connector (10Pcs Black + 10Pcs Red)	DIYhz	ASIN: B07DH77ZB8	Amazon	<a href="#">RCA Panel Mount Jack</a>	1
4	4000-0072	Gikfun AC 2A 250V/ 5A 120V NO/NC SPST Momentary Push Button Switch DIY Kit for Arduino (Pack of 8pcs) EK1926	Esooho	ASIN: B07F8HSYKK	Amazon	<a href="#">SPDT Panel Switch</a>	1
5	4000-0072	Red Diffused LED, Low Current, 2 mA	VCC	4300F1LC	Mouser	<a href="https://www.mouser.com/">https://www.mouser.com/</a> and enter the part number: <b>606-4300F1LC</b>	1
6	4000-0072	Metal Film Resistor, 1.6K ohms, 1%	Xicon	1.6K-RC	Mouser	Go to <a href="http://www.mouser.com">www.mouser.com</a> and enter the part number: <b>270-1.6K-RC</b>	1
7	4000-0072	AmazonBasics USB 2.0 Cable - A-Male to Mini-B - 3 Feet (0.9 Meters)	Amazon Basics	Model: AFIR	Amazon Basics	<a href="#">USB A-Male to Mini-B</a>	1
8	4000-0072	3D Printed Enclosure, <a href="http://www.thingiverse.com/thing:6339185">www.thingiverse.com/thing:6339185</a> or Project Box, Blac, Size Approx. 4x4x1 inches					1
9	4000-0072	Reserved, Not Used	Printed	Printed	Printed		0

Date: 12/14/2023

## Bill of Materials Drawing 4000-0072

## Transmitter Control Using Wireless Wi-Fi LAN 12-14-2023

Item	Part No.	Part Description	Mfgr	Part No.	Vendor	URL of Vendor P/N (Live URL Links)	Qty
1	4000-0072	DIGISHUO FT232RL FTDI Mini USB to TTL Serial Converter Adapter Module 3.3V 5.5V FT232R Breakout FT232RL USB to Serial Mini USB to TTL Adapter Board for Arduino (2Pcs Red Module)	DIGISHUO	ASIN: B0BTRTXWX9	Amazon	<a href="#">FT232RL 3.3V 5.5V FTDI Mini USB to TTL</a>	1
2	4000-0072	MHCOZY Updated WiFi Wireless Smart Switch Inching Self-Locking Relay Module,Set Inching Time from 0.5 Second to 1 Hour,be Applied to Access Control,DIY WiFi Garage Door Opener (5V)	MHCOZY	ASIN: B07L69HD6N	Amazon	<a href="#">MHCOZY Updated WiFi Wireless Switch (5V)</a>	1
3	4000-0072	DIYhz 20Pcs Audio Terminal Jack Panel Mount RCA Lotus Head Welding Female Socket Connector (10Pcs Black + 10Pcs Red)	DIYhz	ASIN: B07DH77ZB8	Amazon	<a href="#">RCA Panel Mount Jack</a>	1
4	4000-0072	Gikfun AC 2A 250V/ 5A 120V NO/NC SPST Momentary Push Button Switch DIY Kit for Arduino (Pack of 8pcs) EK1926	Esooho	ASIN: B07F8HSYKK	Amazon	<a href="#">SPDT Panel Switch</a>	1
5	4000-0072	Red Diffused LED, Low Current, 2 mA	VCC	4300F1LC	Mouser	<a href="https://www.mouser.com/">https://www.mouser.com/</a> and enter the part number: <b>606-4300F1LC</b>	1
6	4000-0072	Metal Film Resistor, 1.6K ohms, 1%	Xicon	1.6K-RC	Mouser	Go to <a href="http://www.mouser.com">www.mouser.com</a> and enter the part number: <b>270-1.6K-RC</b>	1
7	4000-0072	AmazonBasics USB 2.0 Cable - A-Male to Mini-B - 3 Feet (0.9 Meters)	Amazon Basics	Model: AFIR	Amazon Basics	<a href="#">USB A-Male to Mini-B</a>	1
8	4000-0072	3D Printed Enclosure, <a href="http://www.thingiverse.com/thing:6339185">www.thingiverse.com/thing:6339185</a> or Project Box, Blac, Size Approx. 4x4x1 inches				<a href="https://www.thingiverse.com/thing:6339185">https://www.thingiverse.com/thing:6339185</a>	1
9	4000-0072	Reserved, Not Used	Printed	Printed	Printed		0