

# Raspberry Pi to Ham Radio Push-To-Talk (PTT) Trigger/Isolator Kit

Model: HTX-PTT3-KIT (Rev A)

## Reference Manual

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#### FEATURES

- Easily and reliably connect any Raspberry Pi to your Ham Radio's PTT line, isolated by an opto-coupler
- Terrific for FT8, JT65, FT4, JT9, PSK31, RTTY, SSTV, and more digital modes using WSJT-X or any other digital communications applications.
- LED indicator when PTT active
- RF Filter Capacitor (1nF)
- Ground-Bridge Jumper
- LED-Enable (Disable) Jumper
- Standoff and mounting screw hole
- In-board strain-relief hole
- High-grade 2-layer PCB w/ solder-mask, beveled corner, and silk-screen
- Overall board size: 11.5mm x 21.75mm

#### OPTIONS

- **Ground-Bridge Jumper Pad (JP1):** By default, the Raspberry Pi's GROUND and the Radio's GROUND are electrically isolated from each other on the HTX-PTT3 board. If you want to bridge them together, just apply a solder drop to GND\_BRIDGE (JP1) on the BOTTOM of the board.
- **LED Enable (JP2):** By default, the on-board LED is enabled and lights when PTT is active. If you do not want to see the LED light, just use a razor to gently slice the trace on JP2 on the BOTTOM of the board. You can re-solder it again, if you change your mind later.

#### ASSEMBLY

1. **Install the 12-pin Raspberry Pi Header Socket (J1) on the BOTTOM:** Insert the Raspberry Pi Socket into the BOTTOM of the HTX-PTT3 board. While holding it steady to the board, apply solder to just one corner pin on the TOP first. Then carefully look at the socket and ensure it is perfectly seated on the board, protruding at exactly 90° from the BOTTOM of the board, so it will cause your board to remain horizontal when plugged onto the Raspberry Pi. If it needs adjustment, just heat that single pin and adjust it while it's hot. Then solder the remaining eleven pins.
2. **Solder the Radio PTT Wires (J2):** You may prefer to use a 2-pin 90-degree header for your PTT connection. Alternatively, you may choose to solder them directly to the HTX-PTT3 board. If you chose this option, you might prefer to run the wires up/down through the adjacent board hole as a strain relief, and solder them to whichever side of the board you prefer for your configuration. The connector or wires may be soldered to EITHER SIDE of the board.

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#### CONNECTING TO YOUR RASPBERRY PI TO YOUR RADIO

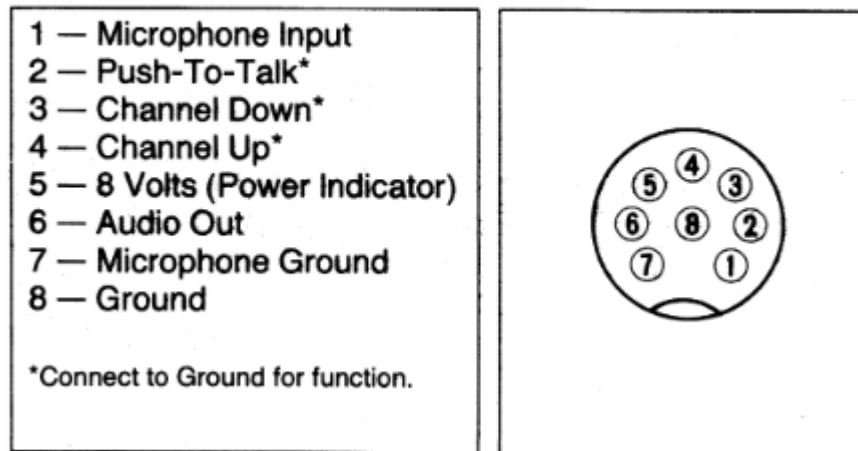
- IF YOU INCORRECTLY INSTALL THE PTT BOARD, IT CAN CAUSE PERMANENT DAMAGE TO YOUR RASPBERRY PI!!!

When installing the HTX-PTT3 board to your Raspberry Pi, properly shut-down and **POWER-OFF** your Raspberry Pi first! Then, install the board onto your Raspberry Pi's GPIO header pins, properly aligning the corner screw hole between the PTT board and your Pi.

Only after you are 100% certain you have installed the board so that only GPIO pins 1 through 12 exactly match the HTX-PTT3 Raspberry Pi Socket (J1), power up your Raspberry Pi.

- Connect the HTX-PTT3's Radio PTT Header (J2) pins to your radio's PTT jack. You may use the 2-pin header with a 2-pin cable, or you may solder your wires directly to the board (use the strain-relief hole). The GND pin MUST go to your radio's Ground and the PTT pin should go to your radio's PTT input. Here's a sample pin-function chart from the Radio Shack Realistic HTX-100 Radio manual:

#### **MICROPHONE JACK PIN FUNCTIONS**



Note: When connecting to the PTT Radio Header/Pads (J2) on the HTX-PTT3 board, be certain to connect the GND and PTT leads as indicated. The GND pad is the one closer to the outside of the board. This is important because forward current from the radio is required to flow through the Optocoupler's internal transistor from collector to emitter. If you accidentally switch these, it should not damage anything, but PTT will not work, even though the LED light will light.

- Connect a *shielded* cable to carry your Transmit Audio from your Raspberry Pi's USB Sounds Card Headphone-Out jack to your radio's Microphone input. Ground from the sound card should also go to your radio's Ground, along with PTT ground from above.

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- Alternatively, you may choose to use a 3-conductor *shielded* cable to run *both* the Transmit Audio and PTT signal together. If you chose to do this, use the outer-jacket of the cable as ground for both the HTX-PTT3 board and the USB sound card to your radio's Ground. Then use one inner-wire for the PTT signal from the board's Radio Header (J2)'s PTT pin to your radio's PTT (Push-To-Talk). Use the other inner-wire for the sound card's Audio-Out signal to your radio's Microphone Input.
- In addition, use a standard 1/8" male-to-male cable to carry the Receive Audio from your radio to your Raspberry Pi's USB Sound Card. Connect it from the Headphone/Phones Jack to your USB sound card's microphone input. Stereo cables often work fine here, too. If you want to try simply monitoring for some digital signals, such as FT8, just connect this up first and see what you can decode on your Raspberry Pi.

#### USING WSJT-X

Following is a basic primer for installing and configuring the WSJT-X application on a Raspberry Pi, using the newest currently-available software as of the creation date of this manual (Raspbian AKA "Raspberry Pi OS" which is Debian 10 AKA "Buster" & Linux Kernel 5.10.17 and WSJT-X 2.3.1). This procedure is subject to change as Debian and WSJT-X make changes/updates.

1. Install the newest Raspbian using the procedure at <https://www.raspberrypi.org/software/>
2. SSH to your Pi
3. Update packages and install some basic utilities:

```
apt update -y; apt upgrade -y
```

```
apt install -y joe raspi-gpio
```

4. Test manually triggering the HTX-PTT3 board's PTT line from Raspberry Pi's GPIO17 (pin 11):

```
raspi-gpio set 17 op pn dl
```

Your HTX-PTT3 should now enable PTT and turn on the LED

```
raspi-gpio set 17 op pn dh
```

Your HTX-PTT3 should now disable PTT and turn off the LED

5. Configure GPIO17 (Pin 11) to NOT be enabled on boot:

```
sudo joe /boot/config.txt
```

Add this line to the end:

```
gpio=17=a3
```

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Exit and save by typing Ctrl-K, Ctrl-X

```
mkdir ham; cd ham
```

```
getconf LONG_BIT
```

If you see "32", enter this line:

```
wget http://www.htx-100.com/resources/clearAMA0RTS.txt -O clearAMA0RTS
```

OR, if you see "64", enter this line:

```
wget http://www.htx-100.com/resources/clearAMA0RTS_64.txt -O clearAMA0RTS
```

```
chmod 755 clearAMA0RTS
```

```
crontab -eu pi
```

(choose Joe Editor, if prompted) Add to bottom:

```
@reboot /home/pi/ham/./clearAMA0RTS
```

Save and Exit by pressing Ctrl-K, Ctrl-X

```
sudo reboot
```

6. Enable Serial Port (required for WSJT-X to work):

```
sudo raspi-config > Interface Options > Serial Port
```

```
> login shell: NO > enable serial port: Yes
```

```
> Ok > Finish > Reboot?: Yes
```

7. Enable VNC for remote operation of Raspberry Pi:

```
sudo raspi-config > Interface Options > VNC > Yes > Ok > Finish > Reboot?: Yes
```

8. On your other/local PC, run VNC Viewer/VNCConnect (by RealVNC): Connect to the local IP of Pi

9. Upon first VNC login:

```
Ok > Next >
```

```
United States, American English, New York, Use English Language, Use US Keyboard > Next
```

```
new password > Next > Desktop fill screen? don't check > next
```

```
network: Next > Update software: (yes) Next > Done
```

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Start > Preferences > Raspberry Pi Configuration > Display

> Set Resolution > 1280x1024 > Ok > Close window > reboot? Yes

10. To Install wsjtx 2.3.1 & configure it: In SSH:

```
cd ham  
  
wget https://physics.princeton.edu/pulsar/k1jt/wsjtx_2.3.1_armhf.deb  
  
dpkg -i wsjtx_2.3.1_armhf.deb  
  
apt-get -f -y install
```

11. Back in VNC: Start > Sound & Video > wsjtx > File > Settings

> Radio: PTT Method: RTS (/dev/ttyAMA0)

Clicking "Test PTT" should now toggle your HTX-100 "TX" mode  
and light the LED on the HTX-PTT3 card.

> Audio: Input: plughw:CARD=Device,Dev=0 Output: plughw:CARD=Device,Dev=0  
(Possible alternative card: alsa\_output.platform-bcm2835\_audio.analog-stereo)

> Frequencies > right-click in the Working Frequencies list, and select Reset > Yes > Ok

Wide Graph: Bins/pixel: 5, start: 100hz, N Avg: 2, Flatten, Cumulative, Spec: 25%.

12. For further instructions using WSJT-X, see <https://physics.princeton.edu/pulsar/k1jt/wsjtx.html>

*NOTE: When booting your rPi, the PTT line will pulse for approx. 500ms between the OS' enabling of AMAO's RTS and our script clearing it. As such, it is recommended to keep your rig off/disconnected during boot.*

#### **LEGAL**

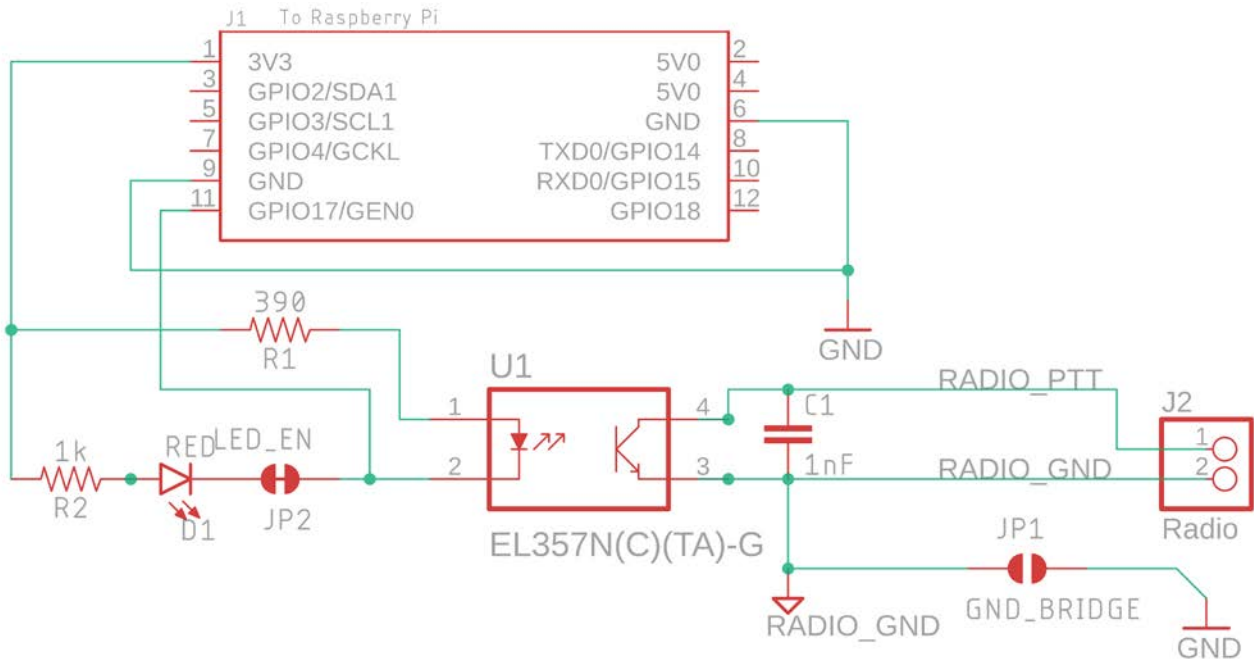
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- Radio shack and HTX-100 are Trademarks of Retail Ecommerce Ventures
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#### SCHEMATIC DIAGRAM



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#### PHOTOS OF COMPLETED HTX-PTT3-KIT INSTALLED ON RASPBERRY PI's & WSJT-X using HTX-PTT3

