



# **FreqEZ:** **A Homebrew Band Decoder**

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# FreqEZ: DIY Band decoder

## ▶ Setting Expectations

- I have antenna problems
- FreqEZ was designed to solve my problems
- You probably have antenna problems, too
- FreqEZ might solve your problems
- If it doesn't – that's not my problem!



*Any questions?*

# FreqEZ: Problem Statement

- ▶ What are K8UT's antenna problems?
  - Too many antennas
  - Some antennas have two bands
    - 80/160, 30/40 dual band dipoles
  - Some bands have two antennas
    - Dipoles and Verticals for 80/160
  - One antenna needs +12 for band switching
  - Six antennas occupy the top of the tower
    - Coax can get expensive
  - **Chasing DX requires instant antenna resolution**

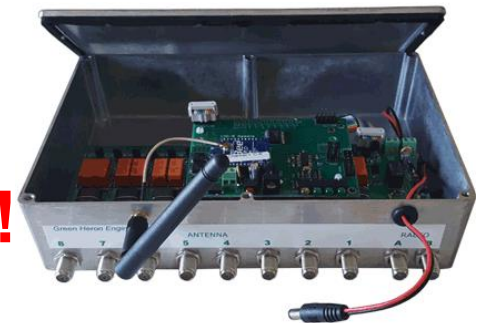
# FreqEZ: Fundamental Pieces

- ▶ Frequency source: Rig or Logging Program
- ▶ **Band Decoder: Interprets / Decides**
- ▶ Antenna Switches: Select Antennas
- ▶ Frequency destination: Selected Antenna



# FreqEZ: Commercial Solutions?

- ▶ Many manufacturers in this space
  - TopTen Devices, Ameritron, Green Heron, microHam...
- ▶ But most are...
  - Complicated
  - Difficult to configure
  - Expensive
- ▶ **And they don't solve my problems!**



# FreqEZ: Launching a DIY Project

- ▶ **Project Goals. FreqEZ must...**
  1. Work with my logging programs
  2. Interface with my existing antenna switches
  3. Also support antenna-related devices
  4. Not require jumpers, solder, bridges or diodes
  5. Be easily re-configurable
  6. Safeguard my rigs and antennas
  
  7. **Solve my antenna problems**

# FreqEZ: Project Goal #1

- ▶ **Work with N1MM+ and DXLab Commander**
  - Both broadcast UDP packets with current radio frequency
  - N1MM+'s UDP packet also includes Configurer's selected antenna number

FreqEZ receives these UDP packets and selects antennas based on Frequency and/or Selected Antenna (plus N1MM+ <alt>F9 support)

*For stations using ...other... logging software, FreqEZ can interface with BCD band outputs available from most rigs*

# FreqEZ: Project Goal #2

## ▶ Interface with Existing Antenna Switches

WX0B Rat Packs

Two SainSmart relay modules provide 16 “dry” SPDT relay contacts, each capable of handling 10 amps at 250 volts. This should satisfy any flavor of remote antenna switches – even switches requiring BCD encoded signaling





# FreqEZ: Project Goal #3

- ▶ **Support Antenna-Related Devices**

Band filters, receive antennas, power distribution

Those 16 SPDT relay contacts do not have to be connected to remote antenna switches. They can automate any other device that performs a band/frequency dependent function



# FreqEZ: Project Goal #4

- ▶ No Jumpers, Solder, Bridges or Diodes

FreqEZ's configuration is contained in one easily edited XML text file

```
<?xml version="1.0" encoding="utf-8"?>
<FEZconfig>
  <StationName>K8UT-PC</StationName>
  <RecvPort>12062</RecvPort>
  <RPiAddress>192.168.1.147</RPiAddress>
  <RPiPort>13066</RPiPort>
  <BandSource>FREQ</BandSource>
</FEZconfig>
<FREQsource>
  <FREQ1>5000000-5400000,1</FREQ1>
  <FREQ2>2800000-3000000,2</FREQ2>
  <FREQ3>2400000-2600000,3</FREQ3>
  <FREQ4>2100000-2200000,4</FREQ4>
  <FREQ5>1800000-1900000,5</FREQ5>
  <FREQ6>1400000-1450000,6</FREQ6>
  <FREQ7>1000000-1015000,8</FREQ7>
  <FREQ8>700000-750000,8</FREQ8>
  <FREQ9>350000-400000,9</FREQ9>
  <FREQ10>180000-200000,9</FREQ10>
</FREQsource>
```

...up to <FREQ50>

# FreqEZ: Project Goal #5

- ▶ Be Easily Re-Configurable



Clicking the configure icon opens the XML file in Notepad. Saving the file automatically adjusts FreqEZ's operation

# FreqEZ: Project Goal #6

- ▶ Safeguard my rig and antennas

Packets from the Windows Console to the Raspberry Pi Controller use guaranteed delivery TCP packets which also contain a checksum and forward error correction. The Controller will not react to a failed checksum. In addition, the Controller constantly polls the rig's PTT line and will not react to Console commands while transmitting

PTT/Tx inhibit  
from radio

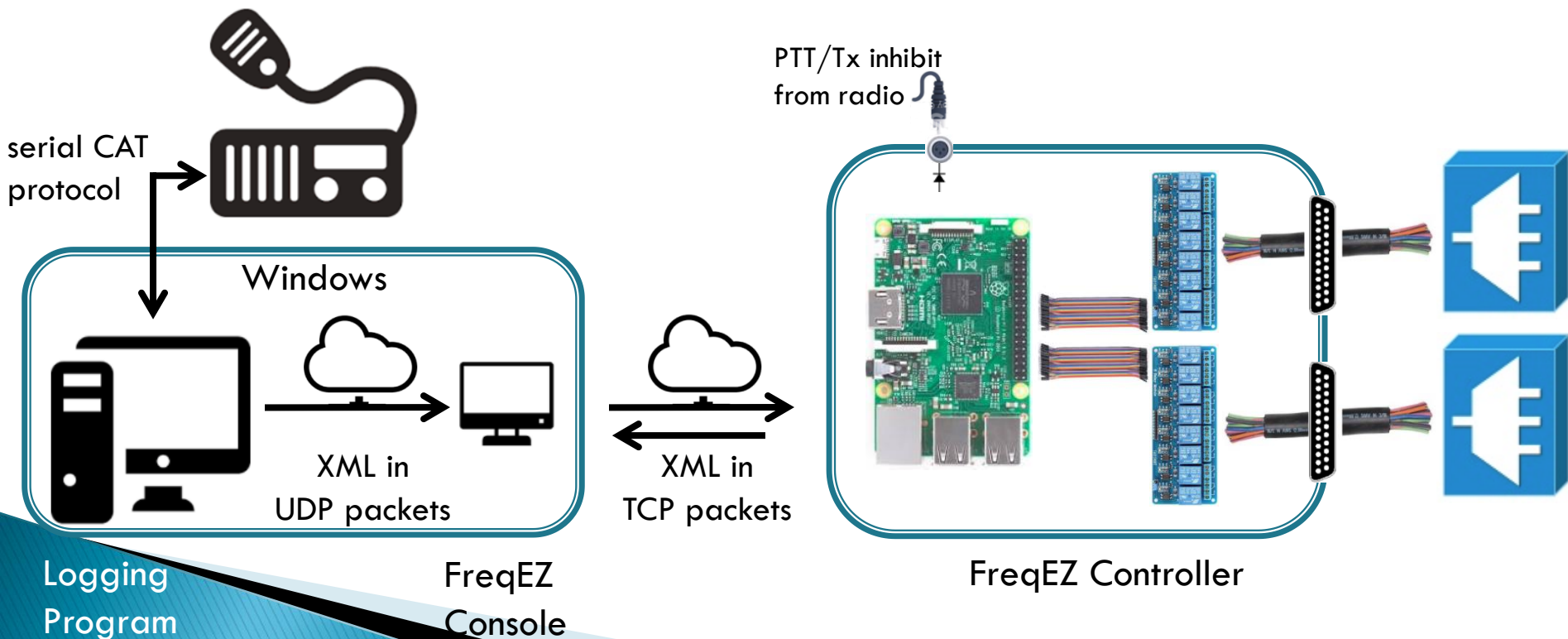


# FreqEZ: Project Goals - Other

- ▶ Be easy to use
- ▶ Consume a minimum of screen space
- ▶ Operate in manual or auto mode
- ▶ Respond instantly to frequency/band changes
- ▶ Connect across local LAN or remote WAN
- ▶ Support multi-station networks
- ▶ Use off-the-shelf components
- ▶ Require no special tools for construction
- ▶ Cost less than commercial products

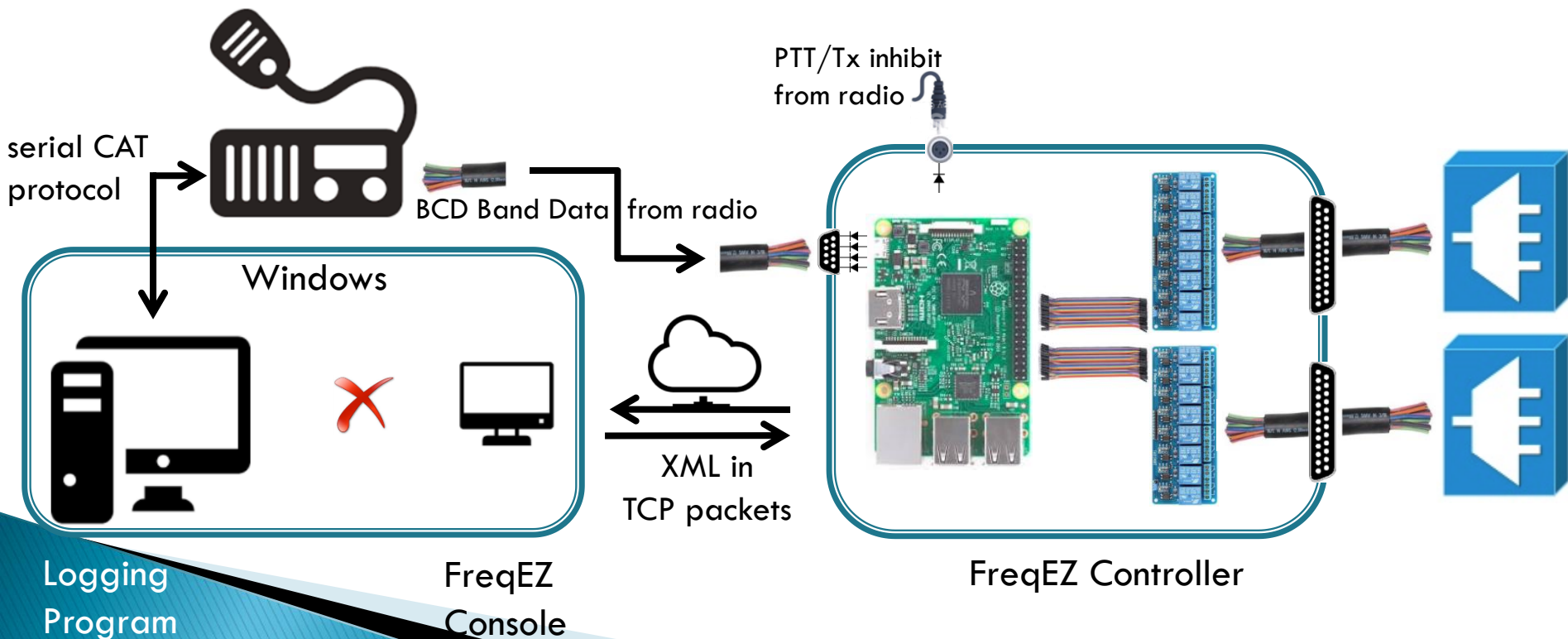
# FreqEZ: Project Architecture #1

- ▶ Logger sends to the Windows FreqEZ Console
- ▶ Console sends antenna choices to the Controller
- ▶ RPi Controller direct-wired to antenna switches



# FreqEZ: Project Architecture #2

- ▶ Radio sends BCD band data to the RPi Controller
- ▶ Controller forwards BCD data to the Console
- ▶ RPi Console sends antenna choice to Controller



# FreqEZ: Summary

- ▶ Obvious questions:

When will FreqEZ be done?

Do you think I could build one of these?

How much is this gonna' cost?

Parts list:

▪ Raspberry Pi 3, microSD card	\$40
▪ 2 x SainSmart modules	\$20
▪ 5 x silicon diodes (4 x BCD, 1 x PTT)	\$ 1
▪ DuPont rainbow jumpers	\$ 5
▪ Large perf board or aluminum plate	\$10
▪ Enclosure (203mm x 144mm x 68mm)	\$20
▪ Connectors (2 x DB25, 1 DB9, rca jack)	\$ 5
▪ FreqEZ Software	\$ 0



# FreqEZ: Live Demonstration

Please be patient. I have a couple of wires to connect...





# **FreqEZ:** **A Homebrew Band Decoder**

**Thank You!**

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