

Scanners & Ham Radio

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Before we
get
started...

Some of the topic's are easy to understand

Some of the topic's are very complex and hard to grasp

I am not an expert...just one guy that is fascinated with communications of all kinds. Curious to learn. Love to listen to various types of comms.

This is very much a summary **overview** of what could be a lifelong set of learnings.

My objective is to illustrate yet another way to use radios and have fun doing it!

Agenda

- What does scanning have to do with ham radio?
- What can I hear?
- What kind of equipment does it take?
- What about Software Defined Receivers?
- How do I get started?
- What resources are available?

This is how I started...years ago



What does scanning have to do with Ham Radio?

- Common themes: Frequencies, technologies, radios
- Reinforces the radio theory you learned to get a license.
- Hear, and learn, how professionals communicate.
- Information gained leads to increased situational awareness.
- Most of our HT's use scanning...so it's somewhat familiar.
- The people in the scanner world are friendly and like to learn.
- It's fun!



| What can I hear?

- 500 KHz to 1.75 GHz (+)
- Aircraft (commercial / private)
- Aircraft (military)
- Civil Air Patrol
- Public Safety (PD, Sheriff, Fire, EMS, Federal, Corrections, etc)
- Hospitals
- Schools
- Maritime
- GMRS
- International Space Station
- Media
- Public works
- Racing
- Transportation/Railroad
- General business frequencies
- Satellites (decoding WX satellites)
- And...Amateur Radio!

What kind of equipment does it take?

- A receiver (portable or base/mobile)
 - Analog only (legacy)
 - Analog and Digital (Phase I and Phase II)
 - State of the art scanners are SDR-based and handle simulcasting
 - USB SDR (or similar)
- Antenna (verticals, high gain, discone, yagi's, panel, portable, mobile)
- Proper grounding (if external)
- Coax (I prefer LMR-400 for low loss at 800 mhz +)
- Power supply (to feed multiples)
- Software (programming, some are free)
- Other accessories

Who manufactures the gear?

- The receiver
 - Uniden
 - Whistler
 - Radio Shack/GRE
 - Icom & Yaesu
 - Unication
- Antennas (a lot of the same sources as ham radio, Diamond, etc.)
- Coax (same sources as ham radio)
- Software: BuTel, FreeScan, ProScan, Sentinel
- Other accessories: carrying case, BT speakers, easy read manuals

What about encryption?



- This is a bit of a lightning rod topic.
- Varies widely by state
- In some communities everything is encrypted
- Yet in others it's completely wide open
- Tulsa is a mix...
- Oklahoma Public Service (LE, PD, Sheriff, Fire, EMS, etc) are mostly all on one statewide system – Oklahoma Wireless Interoperability Network...aka OKWIN. Motorola APCO P25 Phase II



Drumright Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
55376	d85	A	Drumright Police	Police Dispatch	Law Dispatch
55408	d87	A	Drumright Fire	Fire Dispatch	Fire Dispatch

Kellyville Talkgroups ▶

Kellyville Police are dispatched by Creek County Sheriff on talkgroup 27408

DEC	HEX	Mode	Alpha Tag	Description	Tag
25008	61b	A	Kellyville PD A	Police Car-to-Car A	Law Tac
25040	61d	A	Kellyville PD B	Police Car-to-Car B	Law Tac
25072	61f	A	Kellyville Fire	Fire Dispatch	Fire Dispatch

Kiefer Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
63440	f7d	A	Kiefer Police	Police Car-to Car	Law Dispatch
63472	f7f	A	Kiefer Fire	Fire Dispatch	Fire Dispatch

Mannford Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
62512	f43	A	Mannford PD	Police Dispatch	Law Dispatch
62608	f49	A	MannfordFire	Fire and EMS Dispatch	Fire Dispatch

Sapulpa Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
33296	821	A	Sapulpa Police A	Police Dispatch A	Law Dispatch
33328	823	A	Sapulpa Police B	Police Secondary B	Law Tac
33360	825	A	Sapulpa Fire A	Fire Dispatch A	Fire Dispatch
33392	827	A	Sapulpa Fire B	Fire Tactical B	Fire-Tac

Delaware County Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
28432	6f1	A	Delaware Co SO	Sheriff Dispatch	Law Dispatch
32272	7e1	A	Grove Police	Grove Police Dispatch	Law Dispatch
16016	3e9	D	Grove Police Tac	Grove Police Tactical	Law Tac
16048	3eb	D	Grove PD Cars	Grove Police Car-to-Car	Law Talk
60432	ec1	A	Grove Fire	Grove Fire Dispatch	Fire Dispatch

Tulsa Fire Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
2241	8c1	D	Tulsa Fire	Dispatch - A	Fire Dispatch
2243	8c3	D	Tulsa Fire B	Non-Emergency - B	Fire Dispatch
2245	8c5	D	Tulsa Fire Dist1	District 1 Tactical - C	Fire-Tac
2247	8c7	D	Tulsa Fire Dist2	District 2 Tactical - D	Fire-Tac
2249	8c9	D	Tulsa Fire Dist3	District 3 Tactical - E	Fire-Tac
2251	8cb	D	Tulsa Fire Dist4	District 4 Tactical - F	Fire-Tac
2253	8cd	D	Tulsa Fire Dist5	District 5 Tactical - G	Fire-Tac
2255	8cf	D	Tulsa FD HazMat	Hazardous Materials - H	Fire-Tac
2257	8d1	D	Tulsa FD Airport	Airport Tactical - I	Fire-Tac
2259	8d3	D	Tulsa FD KnoxBox	Knox Boxes - J	Fire-Talk
2261	8d5	D	Tulsa FD TaskFor	Rescue Task Force - K	Fire-Tac
2263	8d7	D	Tulsa FD Trainin	Training - L	Other
2265	8d9	D	Tulsa Fire Staff	Staff - M	Fire-Talk
2267	8db	D	Tulsa Fire Admin	Administration - N	Fire-Talk
2269	8dd	D	Tulsa Fire Code	Code Enforcement - O	Fire-Talk
2305	901	D	Tulsa FD Train A	Training A	Other
2307	903	D	Tulsa FD Train B	Training B	Other
2309	905	D	Tulsa FD Train C	Training C	Other
2311	907	D	Tulsa FD Train D	Training D	Other
2313	909	D	Tulsa FD Train E	Training E	Other
2315	90b	D	Tulsa FD Train F	Training E	Other
2329	919	D	Tulsa FD Admin A	Administration A	Fire-Talk
2331	91b	D	Tulsa FD Admin B	Administration B	Fire-Talk
2333	91d	D	Tulsa FD Admin C	Administration C	Fire-Talk

Tulsa Police Talkgroups ▶

DEC	HEX	Mode	Alpha Tag	Description	Tag
1953	7a1	D	TPD Gilcrease	Gilcrease Division Dispatch A	Law Dispatch
707	2c3	DE	TPD GilcreaseTlk	Gilcrease Division Talk B	Law Tac
709	2c5	DE	TPD GilcreaseTac	Gilcrease Division Tactical C	Law Tac
1921	781	D	TPD Mingo Valley	Mingo Valley Division Dispatch D	Law Dispatch
713	2c9	DE	TPD MingoValTalk	Mingo Valley Division Talk E	Law Talk
715	2cb	DE	TPD MingoVal Tac	Mingo Valley Division Tactical F	Law Tac
1939	793	D	TPD Riverside	Riverside Division Dispatch G	Law Dispatch
719	2cf	DE	TPD RiversideTlk	Riverside Division Talk H	Law Talk
721	2d1	DE	TPD RiversideTac	Riverside Division Tactical I	Law Tac
723	2d3	DE	TPD Service	Service Side J	Law Tac
725	2d5	DE	TPD Records K	Records K	Law Tac
727	2d7	DE	TPD Records L	Records L	Law Tac
729	2d9	DE	TPD Teletype	Teletype M	Law Tac
731	2db	DE	TPD Investgation	Special Investigations N	Law Tac
765	2fd	DE	TPD Special Ops	Special Operations Team O	Law Tac
699	2bb	DE	TPD Tactical ENC	Tactical Encrypted	Law Tac
733	2dd	DE	TPD Tactical ENC	Tactical Encrypted	Law Tac
735	2df	DE	TPD Tactical ENC	Tactical Encrypted	Law Tac
745	2e9	DE	TPD Tactical ENC	Tactical Encrypted	Law Tac
763	2fb	DE	TPD Tactical ENC	Tactical Encrypted	Law Tac
1969	7b1	D	Tulsa School PD	School Security (Linked to Mototrbo UHF)	Schools
1619	653	D	TulsaPD Explorer	Police Explorers	Law Talk
1697	6a1	D	BA PD Link	Broken Arrow Police Link	Interop

What kind of receivers are out there?

- Portable
 - SDS 100 (D, A)
 - BCD 396XT (D, A)
- Mobile / base
 - SDS 200 (D, A)
 - BCD 536HP / 996P2 (D, A)
 - Whistler TRX 2 (D,A)
 - Uniden BC355N (A)
- Software defined receiver (SDR)
 - RTL-SDR (watch out for counterfeits)
 - Nooelec





Can you use one antenna on multiple radios?

- Yes!
- A multicoupler is highly recommended.
- An active multicoupler is a high-performance device designed to distribute signals to multiple receivers from one antenna.
- Characteristics:
 - No signal degradation due to insertion loss
 - High isolation between ports
- 25 MHz to 1 GHz
- Stridsbergeng.com



Software Defined Receivers

```
object to mirror  
mirror_mod.mirror_object  
operation == "MIRROR_X":  
    mirror_mod.use_x = True  
    mirror_mod.use_y = False  
    mirror_mod.use_z = False  
operation == "MIRROR_Y":  
    mirror_mod.use_x = False  
    mirror_mod.use_y = True  
    mirror_mod.use_z = False  
operation == "MIRROR_Z":  
    mirror_mod.use_x = False  
    mirror_mod.use_y = False  
    mirror_mod.use_z = True
```

```
selection at the end -add  
obj.select= 1  
obj.select=1  
text.scene.objects.  
("Selected" + str(modifier  
mirror_ob.select = 0  
= bpy.context.selected_obj  
data.objects[one.name].select  
print("please select exactly
```

```
-- OPERATOR CLASSES --
```

```
types.Operator):  
    X mirror to the selected  
    object.mirror_mirror_x"  
    mirror X"
```


Software Defined Receivers (SDR)

Software	Hardware
<ul style="list-style-type: none">• SDR Sharp AIRSPY• DSD+• OP25• SDR Uno• SDR Console• HD SDR• Fastlane• UniTrunker• ADSB/FlightAware on a Raspberry Pi• And more...	<ul style="list-style-type: none">• Nooelec• RTL-SDR• HackRF ONE• Airspy HF, Airspy R2, Airspy Mini, Spyverter• SDR Play RSP1A• Adalm-Pluto (can Tx)• And more...



000.146.887.500



Step: 12.5 kHz



Frequency Manager

Radio

☒ NFM ☐ AM ☐ LSB ☐ USB☐ WFM ☐ DSB ☐ CW ☐ RAW☒ Shift 0

Filter Blackman-Harris 4

Bandwidth Order

31,400 1,000

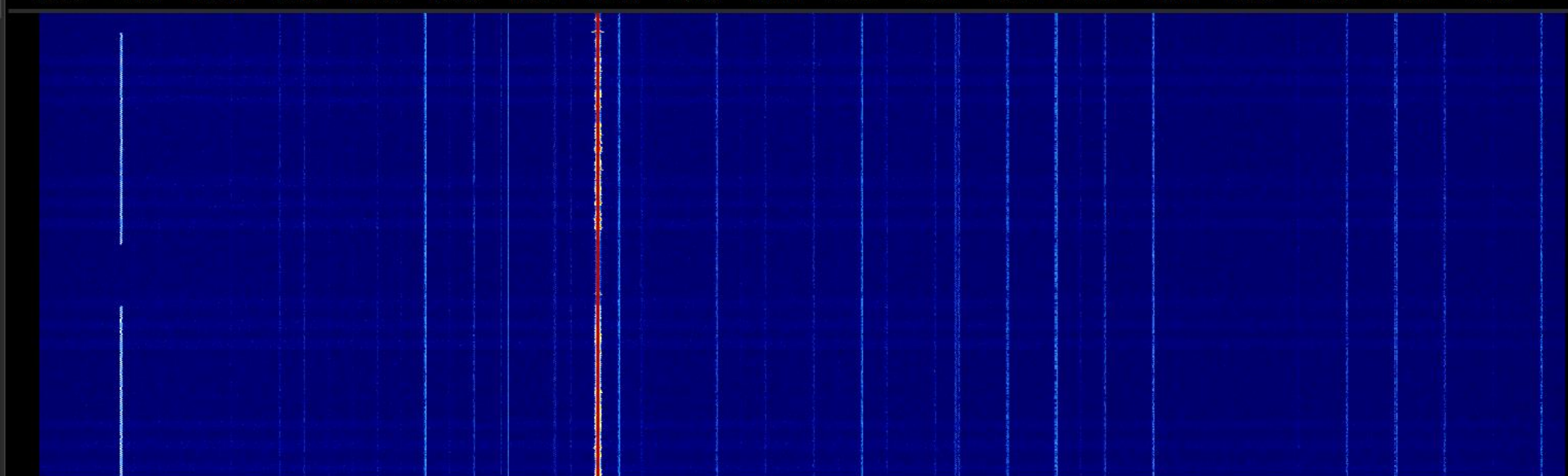
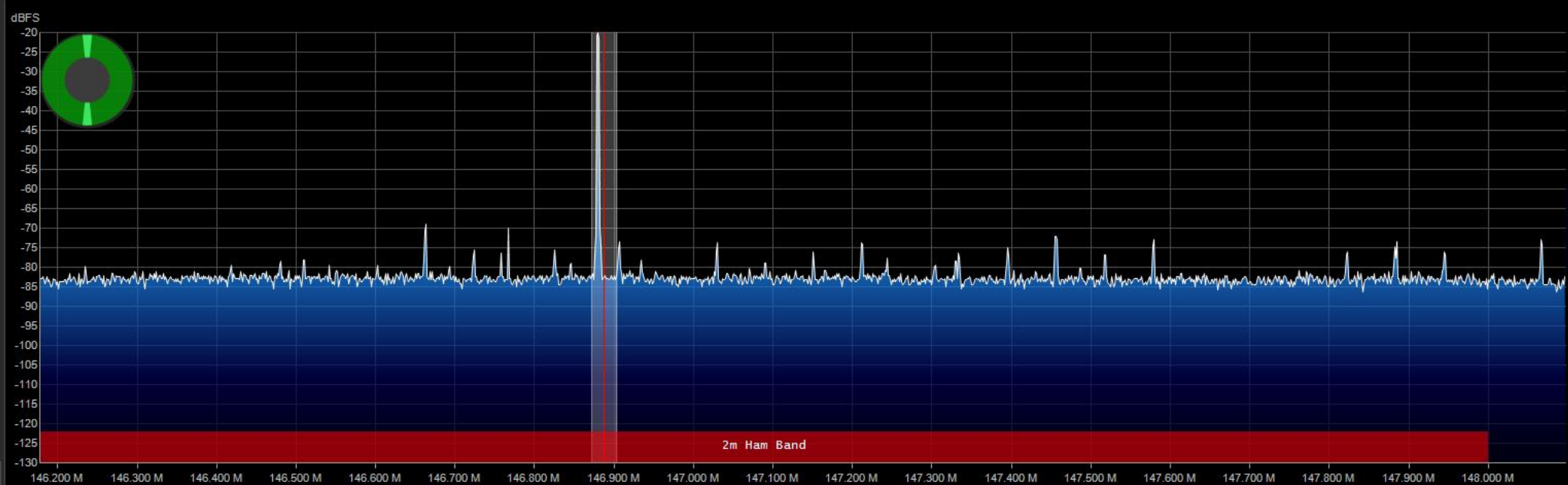
☒ Squelch CW Shift

50 1,000

☒ FM Stereo ☒ Snap to Grid☐ Lock Carrier ☐ Correct IQ☐ Anti-Fading ☐ Invert Spectrum

Source: RTL-SDR USB

RTL-SDR USB



Zoom



Range



≡ □ + ▾ ⚙ 🔊 

000.098.500.000



Step: 100 kHz



Frequency Manager

Radio ▾ 🔍 ×

- ☐ NFM ☐ AM ☐ LSB ☐ USB
☒ WFM ☐ DSB ☐ CW ☐ RAW

☒ Shift

Filter

Bandwidth Order

☐ Squelch CW Shift

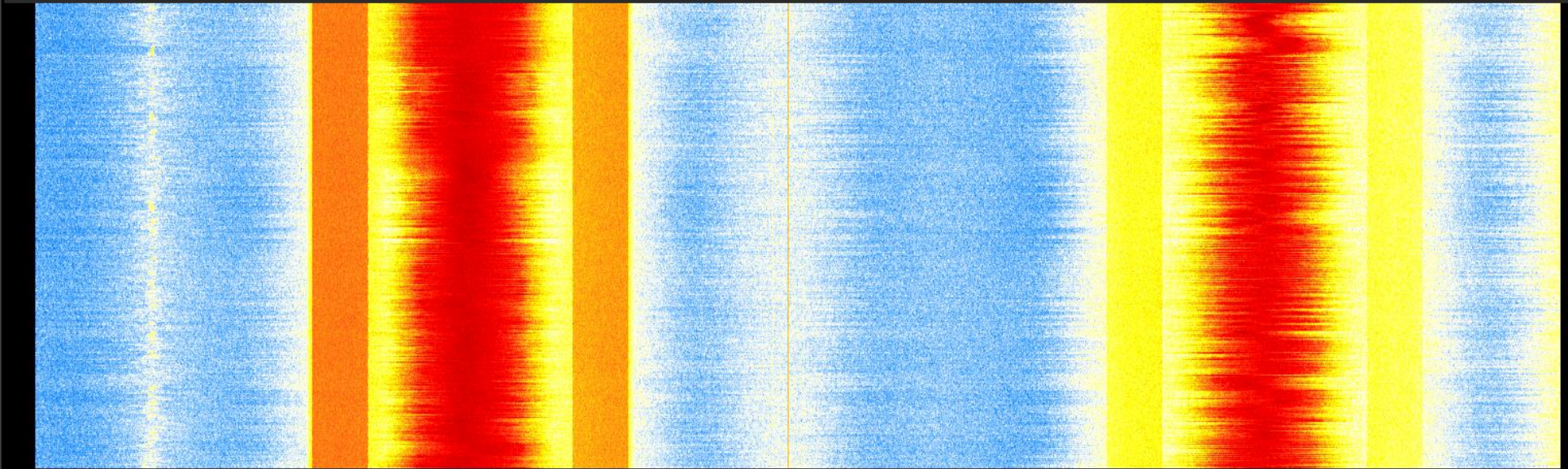
☒ FM Stereo ☒ Snap to Grid

☐ Lock Carrier ☐ Correct IQ

☐ Anti-Fading ☐ Invert Spectrum

Source: RTL-SDR USB ▾ 🔍 ×

dBFS (((A1dean -))) - 48EE - Got



Zoom

Contrast

Range

Offset



Display

Theme: Fluent Dark

View: Both

Window: Blackman-Harris 4

Resolution: 32768

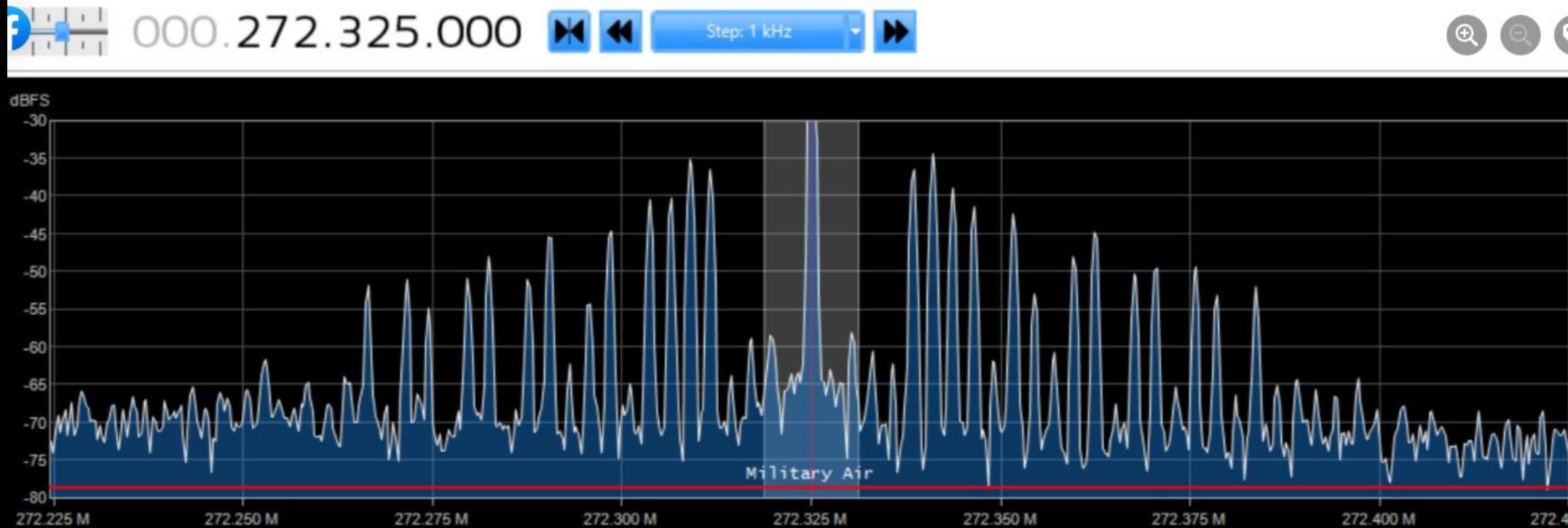
Style: Static Gradient

Marker Color: 255, 255, 255

☐ Time Markers

☐ Mark Peaks

Smoothing



2/15/2022 11:18:33 AM

2/15/2022 11:18:30 AM

2/15/2022 11:18:26 AM

2/15/2022 11:18:23 AM

LOKI82

Hex: ADFEB6 [Share](#)



adsbexchange.com



Image © Tim-Patrick Müller

Reg.: 75-0125

United States

DB flags: military

Type: B742

Boeing E-4B

Type Desc.: L4J

Squawk: 3664

History



SPATIAL

Groundspeed: 551 kt

Baro. Altitude: 29025 ft

Geom. Altitude: 29125 ft

Vert. Rate: 0 ft/min

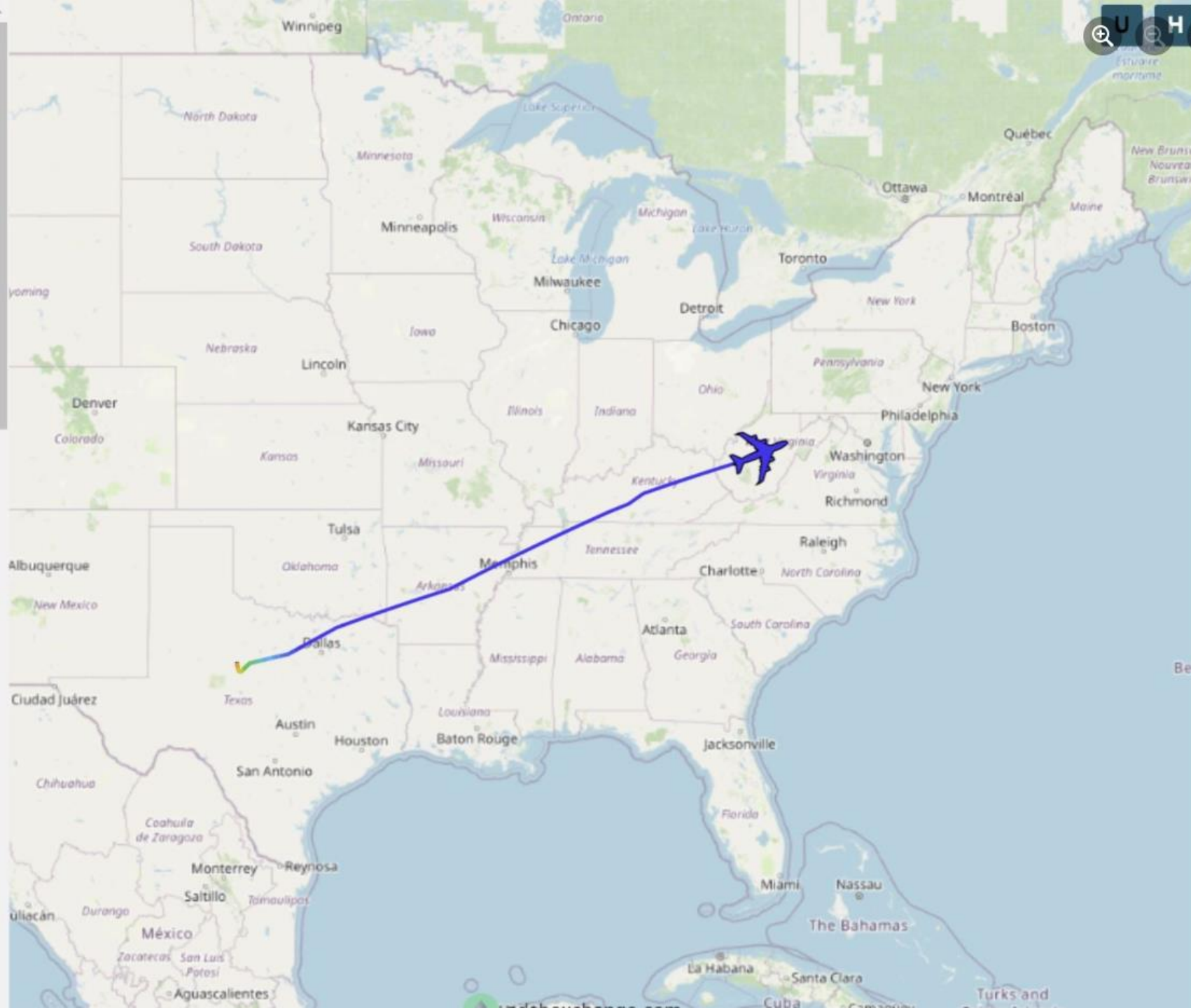
Track: 67.3°

Pos.: 38.597°, -80.925°

Distance: n/a

SIGNAL

Source: ADS-B



How do I get started?

1. Think about what you want to listen/scan.
2. Research thoroughly.
3. Are the frequencies analog, or digital, or both?
4. Are any of the frequencies/talk groups encrypted?
5. Do you want a portable or a base station type radio?
6. Look for the radio that fits your needs. New or used.
7. Program it up and start listening.
8. See #1 above.

What resources are available?

- Radio Reference (www.radioreference.com)
- Mark's Scanners (new.marksscanners.com)
- The Scanner Guys <https://thescannerguyshow.com>
- Stores: Scanner Master, Bearcat Warehouse, HRO, DX Engineering
- Scanner School podcast (www.scannerschool.com) ★★★★★
- Scanner School SDR course (free & paid, scannerschool.teachable.com)
- A ton of FaceBook groups
- A megaton of info on YouTube
- Broadcastify and cell phone apps

Questions?

