

# "THE REPEATER"

December 15th 2025 Vol 8



**Winter Field Day 2026**

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# "THE REPEATER"

## WINTER FIELD DAY



### EVENTS and DATES

**Winter Field Day 2026**  
**Jan 24th - 25th**

Test yourself and your skills as you brave the elements to setup outside for a weekend of contacts and learning!



**Upcoming Contest**  
**DEC 26<sup>th</sup> D-Star QSO Party**  
**DEC 20<sup>th</sup> RAC Contest**  
**JAN 24<sup>th</sup> Winter Field Day**

**WORLD RADIO LEAGUE**  
**Best Logging App on iPhone, Android, and Web App**



By Kris Golden K9CAN



Every Year in January Amateur radio operators throughout the world put there best foot forward, braving the cold and extreme conditions to make contacts and test their radio skills. The hope is that operators will brave the elements, but not everyone is up to this task, and that ok. WFD can also happen inside your home, next to a fire and a bowl of warm soup.

### WHAT IS WFD ALL ABOUT??

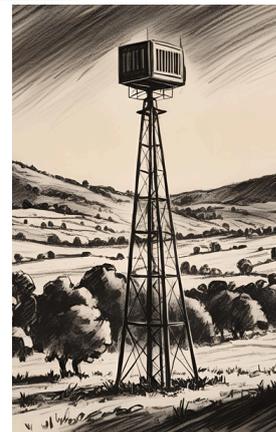
Winter Field Day is a thrilling annual event for amateur radio operators, held during the final full weekend of January. It challenges hams to set up portable stations in outdoor or off-grid locations and make contacts with operators across the globe. You can take part on your own, bring along a few friends, or get your entire club involved. The event is run by the Winter Field Day Association, which emphasizes the importance of practicing emergency communications under harsh winter conditions. Cold weather, snow, ice, and unpredictable elements create unique obstacles—making it the perfect environment for honing real-world operating skills. Winter Field Day is designed to help operators strengthen their disaster-readiness skills and sharpen their ability to function effectively in challenging environments. Participants can operate on HF, VHF, or UHF frequencies and are welcome to use voice, CW, or digital modes. To promote a wide variety of on-air activity, the event encourages

goals such as running on non-commercial power, deploying multiple antenna setups, making satellite contacts, and much more. Click here to learn more about the background and mission of Winter Field Day.

### PRACTICE MAKES GREATNESS, PREPARDNESS EQUALS SUCCESS

Now is a great time to get ready, gather your supplies, organize your thoughts and assemble your team. Maybe your working it alone, thats ok too. But you will want to be prepared. Setup your station, make a list of each component and look for weak points, and prepare for the unexpected. Bring a backup radio, batteries, and other items crucial to success. Visit the WINTER FIELD DAY 2026 website here for more details. Ill see you in the field and on the air! **Click on this link - <https://winterfieldday.org/>**

# WA7ABU 145.290 Repeater Net Schedule



## Monday

Technical Discussion Net: 1000-1100, TBD  
Lunch Bunch: 1200-1230, Kirk K1RKS  
Technical Discussion Net: 1900-2000, TBD  
Learning Linux : 20:30 N0TIF Mike

## Tuesday

Technical Discussion Net: 1000-1100, Scott KF7GGN  
Lunch Bunch: 1200-1230, Darrel W7DDE  
\*\*Project Net: 1900-2000, Brett KG7GDB  
\*\*Homesteading Net : 19:00-20:00 KK7NZG Phil & K9CAN Kris

## Wednesday

Technical Discussion Net: 1000-1100, Brett KG7GDB  
Lunch Bunch: 1200-1230, Russell KE7QXR  
Slow Scan TV Net: 1900-2000, Dan WA7ABU (picture swapping using SSTV mode).

## Thursday

\*\* The Tuesday Net at 19:00 alternates every week its topic as seen to the right and Above

Technical Discussion Net: 1000-1100, Gary K7VBY  
Lunch Bunch: 1200-1230, Tim K17KPF  
Mesh Network Discussion Net: 1900-2000, Brett KG7GDB

## Friday

Technical Discussion Net: 1000-1100, Joe KC7ZZX / Daniel K7CGO  
Lunch Bunch: 1200-1230, Rita KM7BEA  
Space Net/Above Ground Net: 1900-2000, Kris K9CAN

## Saturday

Ham Shopping Club Swap Net: 1900-2000, Dan WA7ABU

## Sunday

LDS Emergency Net, Lebanon: 1800-1830, Rotating Net Control

# S.A.R.G REPEATERS

- 145.290 MHz FM ~ 930 feet -AllStar & Echolink 54326 - Silverton Hills
- 145.190 w/100 Hz tone - WA7ABU Repeater Site ~4000' near Gates
- 444.950 MHz Yaesu Fusion , Wires-X, & FM w/ 100 Hz tone - Newburg
- 444.600 MHz Yaesu Fusion & FM w/ 100 Hz tone - McCully Mtn, Lyons (no I-5 or Portland coverage) (Active & Under Development)
- 147.060 MHz FM -1720 Feet - Mc Cully Mtn, Lyons (Active & Under Development)

## Other Repeaters in our area worth mentioning

- 441.100 FM w/100Hz tone - Yaesu Fusion c4FM -480 feet - Shaw K7GIB
- 440.725 MHz FM no tone - Yaesu Fusion FM -700 Feet- Salem KB7PPM
- 440.225 MHz FM 100Hz Tone - Junction City - 350ft K9CAN

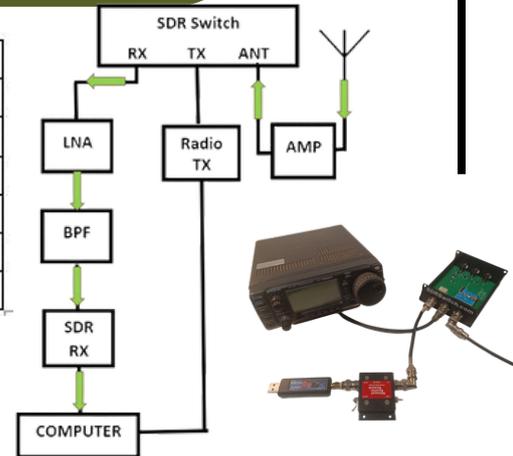
## DID YOU KNOW?

We all have that older radio we're attached to—the one we'd never part with, no matter what new gear comes along. But those modern rigs with their fancy waterfalls and built-in spectrum analyzers can definitely spark a little envy. What if I told you that you can probably add a waterfall display to your older radio setup, too? Read below for a solution!

# 0-450MHz 100W SDR Switch By N2EME



0-450 MHz SDR Switch			
Frequency	VSWR	Insertion Loss	Isolation
3.5 MHz	1.01:1	-0.035 dB	-71.091 dB
14 MHz	1.01:1	-0.006 dB	-60.893 dB
50 MHz	1.03:1	-0.040 dB	-50.708 dB
144 MHz	1.09:1	-0.150 dB	-42.388 dB
450 MHz	1.16:1	-0.166 dB	-45.397 dB



SDRSwitch.com products are engineered to deliver the lowest possible Insertion Loss and VSWR of any SDR switch available today. These two specifications are the most critical when

determining which SDR switch best fits your station setup. SDRSwitch.com units are the only SDR switches created by Weak-Signal VHF/EME operators, specifically built to operate on HF, 50 MHz, 70 MHz, 144 MHz, 450 MHz, and higher without introducing harmful signal loss to already faint signals.

The SDR Switch allows you to enjoy the full performance of a high-quality SDR receiver for your receive path, while continuing to use your existing 100W HF, 50 MHz, 70 MHz, 144 MHz, 450 MHz, and above transceiver for transmit. Instead of limiting your SDR to the role of a simple panadapter, the switch integrates it as your primary station receiver.

When you use this switch, your SDR becomes your exclusive RX path and does not share the receiver of your transceiver. Those who want true dual-receive operation—hearing signals simultaneously on both the SDR and the transceiver’s built-in receiver—can do so by adding a power divider/splitter, which is supported by the 4-BNC RXin/RXout SDR Switch.

## Why rely solely on your SDR for receive?

Every decibel matters when chasing weak DX. Insertion Loss is the single most important metric to consider when selecting an SDR switch. Any loss in front of your SDR or preamp raises the Noise Figure of your entire receiving chain. Running two receivers at once—your SDR and the receiver in your transceiver—automatically introduces a minimum 3 dB loss, along with a 3 dB increase in Noise Figure for both receivers. Some competing SDR switches have Insertion Loss numbers reaching 19.6 dB, which severely impacts weak-signal performance.

For operators who still prefer dual-receive capability, we recommend looking at the 4 BNC SDRSwitch.com RXin/RXout models, available in 0–70 MHz and 0–450 MHz versions.



# 0-450MHz 100W SDR Switch By N2EME....continued



## My Review of the N2EME 0-450 MHz SDR Switch – My New Favorite Station Upgrade

After using the N2EME 0-450 MHz SDR Switch in my shack for several months, I can honestly say it's one of the best weak-signal tools I've added to my station. I bought it specifically because of its reputation for extremely low insertion loss, but I didn't fully appreciate what that meant until I integrated it into my receive chain. Now, I wouldn't run my SDR setup without it.

Right away, the difference was noticeable. This switch is designed by operators who truly understand weak-signal work—VHF, UHF, EME, meteor scatter, HF DX, you name it. As soon as I put the N2EME switch in line, my noise floor stayed low, my preamps behaved exactly as expected, and signals that used to sit just above the noise suddenly popped out with definition. It does exactly what a premium SDR switch should do: get out of the way and let the receiver do its job.

## Why Low Insertion Loss Matters – and Why This Switch Excels

One of the biggest reasons I love this switch is the extremely low insertion loss. Before using it, I had other switches that introduced noticeable loss, especially above 50 MHz. Even half a decibel can make a difference when you're chasing weak signals, and in some cases those older switches were stealing more than that.

The N2EME model, on the other hand, keeps insertion loss so low it's practically invisible, even into the UHF range. That matters because insertion loss directly affects how much of your antenna's signal actually reaches your SDR.

Here's how to think about it:

- Every component you put between the antenna and receiver causes some signal loss.
- Insertion loss is measured in dB, and the difference between 0.2 dB and 1 dB is huge on weak signals.
- A loss of 3 dB means half your signal power is gone.
- A loss of 0.5 dB might not sound like much, but it's enough to reduce the performance of a high-end SDR or preamp.

And it's not just lost signal strength—adding loss in front of your receiver increases the Noise Figure of your entire receive chain. That means a weaker overall signal-to-noise ratio, which is the real killer when working weak signals.

**This is exactly why the N2EME switch stands out:**

It adds almost no loss at all—so your SDR sees the cleanest, strongest possible signal straight from the antenna.



## 0-450MHz 100W SDR Switch By N2EME....continued



### Real-World Example: Using the SDR Switch to add a waterfall/Spectrum Analyzer to an older radio

One of my favorite radios in the shack is my Yaesu FT-1000MP—a fantastic rig, but one that lacks a modern waterfall or spectrum display. I think it's fair to say many of us have gotten a bit spoiled by today's radios and all their feature-rich enhancements. With the SDR Switch, however, I can pair my computer with just about any SDR receiver and instantly bring the FT-1000MP up to the level of even the most advanced and expensive radios available today.

If you're considering this kind of upgrade, I strongly recommend doing your homework on both the SDR receiver and the SDR Switch you plan to use. One of the biggest advantages of this particular N2EME SDR Switch is its exceptionally low insertion loss—something that sets it apart from many other switches on the market. It's equally important to match the switch with the best SDR you can comfortably afford, because like the switch, each SDR has its own components, performance characteristics, and limitations.

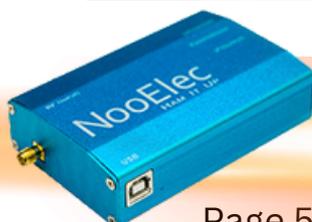
Take the time to research what you really need and want before buying. N2EME offers several SDR Switch models, each engineered for different setups and operating goals, so you can choose the one that fits your station perfectly.

### Final Thoughts

The N2EME 0–450 MHz SDR Switch has absolutely earned a permanent place in my station. It's rugged, intelligently designed, and purpose-built by operators who know exactly what matters in weak-signal environments. And most importantly, the low insertion loss makes a real-world difference in any serious receiving chain.

If you're using an SDR for your main RX—or you want the absolute cleanest receive path possible—this switch is worth every penny. I've used it, I love it, and I wouldn't trade it for anything else in my setup.

### Compatible SDR Devices

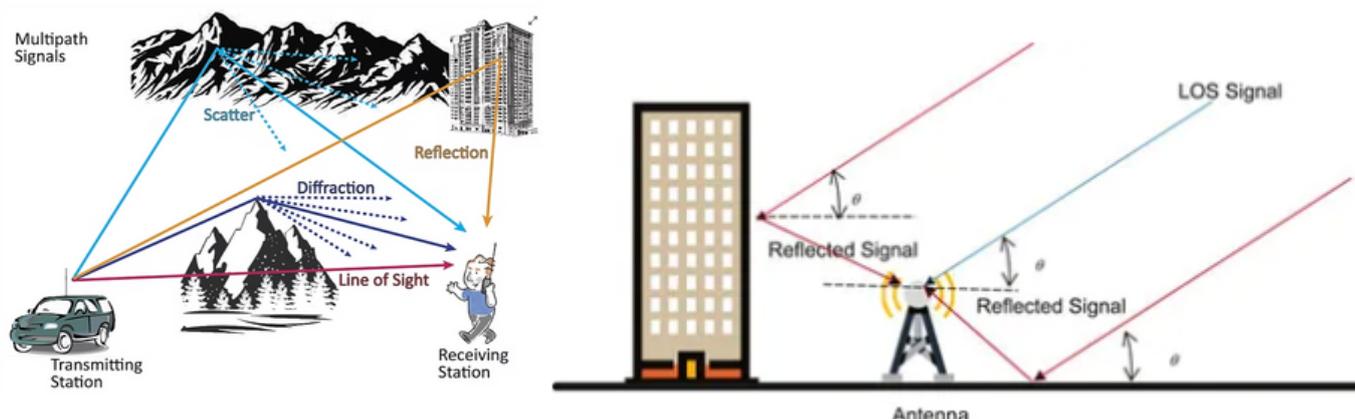


# Elmer's Insider

## Multipath in RF and Amateur Radio: Understanding, Identifying, and Fixing a Hidden Signal Killer

Multipath is one of the most persistent and misunderstood challenges in radio communication, affecting everything from simple FM voice operation to sophisticated digital systems used on VHF, UHF, microwave, and satellite bands. To the amateur radio operator, multipath often appears as fading, fluttering, distorted audio, or unpredictable digital behavior. The underlying cause, however, is remarkably consistent: the radio signal is taking more than one route from transmitter to receiver, and those routes interfere with one another. Understanding multipath is critical for anyone involved in field operations, repeater management, digital communications, AREDN microwave networking, and portable setups like POTA or EMCOMM. While multipath is an unavoidable physical phenomenon, it is far from unmanageable. With knowledge and smart operating practices, an amateur can dramatically reduce its effects and restore clean, reliable communication.

Multipath occurs when a transmitted signal reaches the receiver not only by the intended path but also by reflections, refractions, and diffractions from surrounding objects. At VHF and UHF, the wavelengths are short enough to reflect strongly off buildings, vehicles, water, rock faces, towers, and even dense atmospheric layers. As a result, the receiver may hear one strong direct signal and several weaker, delayed copies of the same signal. Each copy arrives with slightly different timing, amplitude, and phase. When these signals combine, they either reinforce or cancel each other in rapidly fluctuating patterns. The result is the characteristic "picket fencing" heard on FM when driving past reflective surfaces or the sudden bursts of digital distortion on modes like DMR, Yaesu System Fusion, and D-STAR. Even robust analog FM systems can suffer dramatically, especially in urban and mountainous environments where reflections are abundant.



# Elmer's Insider

## Multipath in RF and Amateur Radio: Understanding, Identifying, and Fixing a Hidden Signal Killer....continued

The mechanism is simple but powerful. If two copies of a signal arrive slightly out of phase, they partially cancel; if perfectly out of phase, they can cancel almost completely. Conversely, when they arrive in-phase or close to it, they reinforce one another and produce a momentarily stronger signal. This explains why a mobile operator can move only a few feet and go from perfect copy to serious fading. At UHF, especially 70 cm, a car moving at 30 mph can pass through dozens of constructive and destructive interference zones every second because the wavelength is so short. HF operators are not immune either—ionospheric multipath can create distortion on skywave signals, causing selective fading and even echo-like effects on long-path propagation. Digital HF modes like FT8 and JS8Call can show signs of multipath when the waterfall displays two slightly offset or smeared traces of the same station.

Recognizing multipath begins with understanding its symptoms. On FM, the hallmark is rapid flutter or that “machine gun” picket fencing as the receiver switches between stronger and weaker arrivals. On digital voice, the operator often hears garbled or robotic audio, brief dropouts, or complete decode loss even at strong S-meter levels. Analog SSB may experience phase distortion, hollow audio, or deep fades in otherwise stable signals. Microwave links, such as AREDN mesh nodes or 5 GHz backhaul links, may experience sudden throughput drops, increased latency, or high bit error rates as reflections interfere with the main line-of-sight beam. SDR waterfalls make multipath even easier to see: a strong signal appears, and ghosted or faint delayed versions show up offset in time or frequency. These characteristics help operators diagnose the issue correctly and avoid mistakenly blaming radios, coax, power levels, or repeater issues.

Fortunately, while multipath cannot be eliminated, it can be mitigated through smart station design and operating techniques. One of the simplest remedies is repositioning the antenna. Moving an antenna even a foot or two can dramatically change the interaction of direct and reflected waves at the receiving location. Raising the antenna can reduce reflections from ground-level surfaces such as vehicles or buildings. This is especially valuable for portable POTA setups, where shifting a mast or tripod a few feet can turn a marginal signal into a solid contact. For fixed stations, improving height above rooflines, trees, and nearby metallic objects often reduces multipath by giving the antenna a clearer and more consistent angle of arrival.

# Elmer's Insider

## Multipath in RF and Amateur Radio: Understanding, Identifying, and Fixing a Hidden Signal Killer...continued

Directional antennas offer another powerful tool. Yagi, Moxon, log-periodic, 2M Quad and parabolic antennas naturally reject signals arriving from off-axis angles, reducing the impact of reflected paths. Even a modest 3-element Yagi on 2 meters can dramatically reduce urban multipath when pointed at a repeater. Conversely, omnidirectional antennas with very broad beam patterns—such as 5/8-wave verticals—may pick up reflections from all directions. In some environments, switching to a simple 1/4-wave vertical reduces multipath because of its cleaner radiation and reception pattern, producing fewer surprises on the road.

Polarization also plays a surprising role. Reflected signals often undergo polarization changes, especially when bouncing off metal, glass, water, or asphalt. A signal transmitted vertically may arrive at the receiver partially or fully rotated, degrading reception. By switching polarizations—choosing horizontal, vertical, or circular—operators can often improve clarity instantly. Satellite operators routinely use circular polarization to avoid the unpredictable rotation caused by ionospheric and reflection-induced polarization shifts. Weak-signal VHF and UHF operators often experiment with horizontal polarization to reduce urban reflections and achieve more stable signals.

Proper grounding and bonding help address multipath caused by the operator's own equipment. Feedline radiation, common-mode currents, and poor ground planes can create self-generated reflections. Adding ferrite chokes to coax, bonding railings or vehicle body panels, improving ground plane continuity on mobile antennas, and eliminating nearby metallic interference sources all reduce self-induced multipath. On vehicles, bonding the hood, trunk, doors, and exhaust can greatly stabilize mobile reception, especially on 70 cm, where wavelengths are extremely sensitive to vehicle body irregularities. Many operators are astonished at how much their signal steadies after simply improving vehicle grounding.

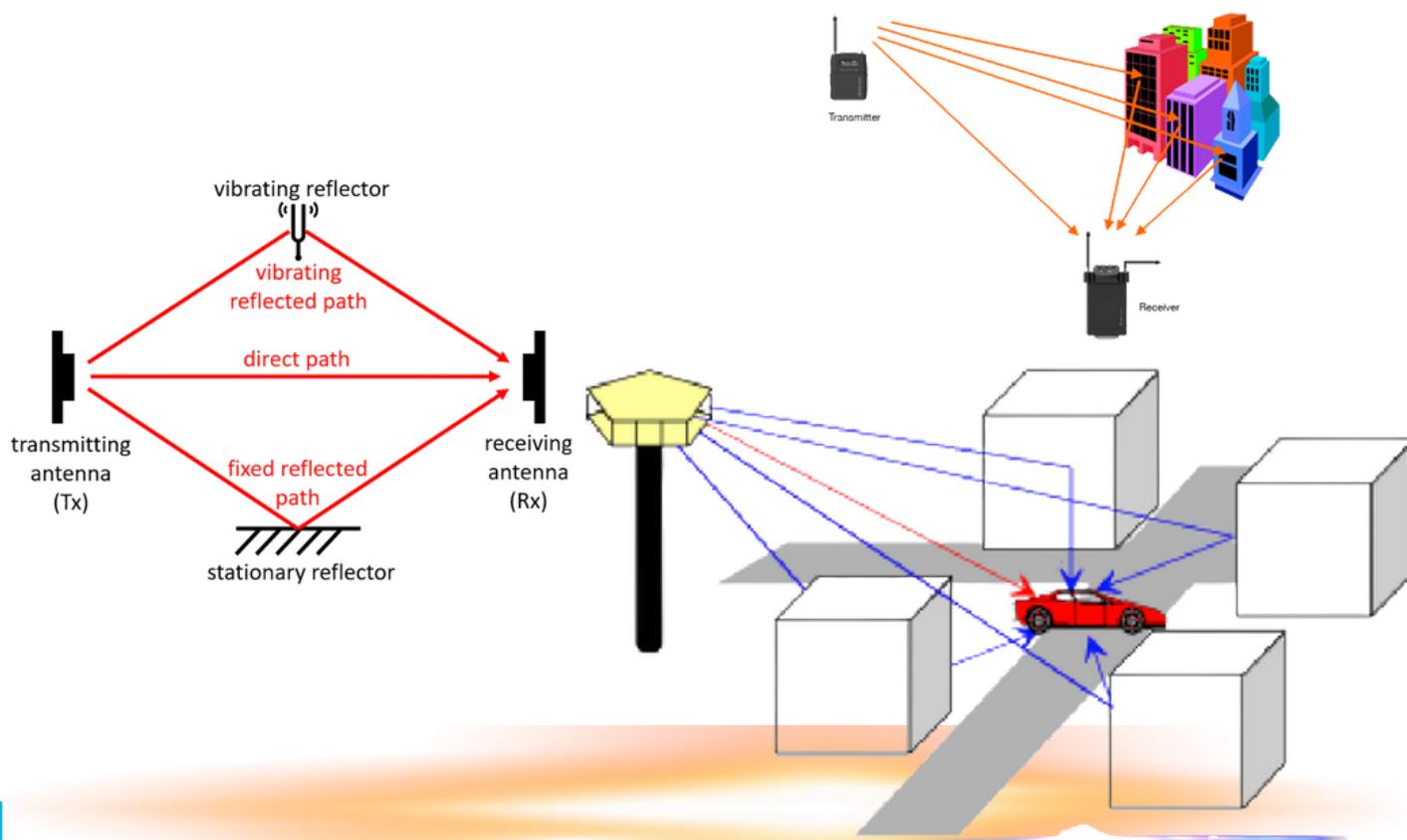
In high-demand applications like microwave networking or long-haul backbone links, diversity reception offers one of the most advanced and effective solutions. Diversity systems use two antennas separated by several wavelengths, two polarizations, or two frequency channels. The receiver selects whichever signal path provides the best instantaneous quality. Diversity is common in commercial cellular towers, Wi-Fi access points, and professional microwave systems but is increasingly used by amateurs working with AREDN and other mesh networks. While more complex, diversity systems can virtually eliminate multipath fading and greatly increase link reliability, especially in urban or reflective environments.

# Elmer's Insider

## Multipath in RF and Amateur Radio: Understanding, Identifying, and Fixing a Hidden Signal Killer...continued

Operating practices also make a difference. If multipath is suspected, shifting to another band often helps. For example, 70 cm is more reflective than 2 meters, and 6 meters is notorious for urban multipath due to long wavelength interactions with terrain. Choosing frequencies and modes suited to the environment—such as moving from DMR to analog FM or from vertical to horizontal polarization—can restore reliable communication. In the field, stepping a few feet in any direction or rotating the handheld 90 degrees can break a multipath null instantly. Mobile users can improve performance by choosing antenna locations that minimize reflections off the vehicle body, such as a center-of-roof mount instead of trunk lip or fender mounts.

In the end, multipath is not an enemy but a natural outcome of radio interacting with the physical world. Every hill, building, tree, and vehicle tells a story about how RF behaves. By recognizing the signs of multipath and applying effective mitigation techniques, amateur radio operators can transform weak or unstable contacts into strong, dependable communication. Whether working through a distant mountaintop repeater, operating AREDN mesh links, setting up POTA activations, or experimenting with digital voice and weak-signal modes, understanding multipath is one of the most valuable technical skills an amateur can develop. With the right knowledge, tools, and techniques, the operator becomes not just a radio user but a master of the environment in which radio waves live and travel.



# From Old to New – The Meeting of Technologies !

By Mark Holt, W7EAZ

## A Repeater Conversation Sparks a Memory

During a recent tech-net on a local repeater near Salem, Oregon, I heard a discussion about building a speech-to-Morse transcriber. It's an intriguing concept – the idea of converting spoken words directly into CW tones. From a practical standpoint, though, it struck me as a little backward. The speech processing required would be far more complex than simply keying a rig or decoding CW.

That conversation reminded me of an early experiment of my own – a project that connected two worlds now separated by decades of technological progress.



## Early Digital Experimentation: Morse Code by Machine (1981)

If you visit my [QRZ page](#), you'll find, after my piano and junior high school radio club entries, an interface I hacked together in 1981 to send and receive machine-generated Morse Code over the air – at up to 50 words per minute.

My brother, who lived in northern Utah at the time, had the identical interface. We tore along as fast as our fingers could type on our keyboards. It was an amazing project for its day, because a few newly available ICs made it possible to generate incredibly accurate Morse timing along with a simple but effective phase-locked-loop (PLL) tone decoder.

To handle real-time decoding, I wrote the deciphering program entirely in Z-80 assembly language. My Radio Shack CPU ran at a blazing 2.1 MHz – just above the 160-meter band – and, yes, it radiated plenty of RFI! The final code occupied about 2,400 bytes and reliably copied 50 WPM under good conditions. It even adapted automatically to slower speeds, locking onto new timing within a character or two.

### TIMELINE

- 1970s: RTTY & early experiments → Voyager 1 & 2 launch
- 1980s: AMTOR, early Packet → Voyager reduces data rates, switches to X-band
- 1990s: PSK31, APRS, early soundcard modes → Voyager at ~160 bps telemetry
- 2000s: WSJT, PACTOR-II/III, Winlink → Voyager <20 bps
- 2010s: WSPR, JT9, FT8, JS8Call → Voyager enters interstellar space
- 2020s: VARA/VarAC, hybrid networks → Voyager still transmitting X-band telemetry



TRS-80 Model III used for Morse decoding, 1981.

# From Old to New – The Meeting of Technologies !....continued

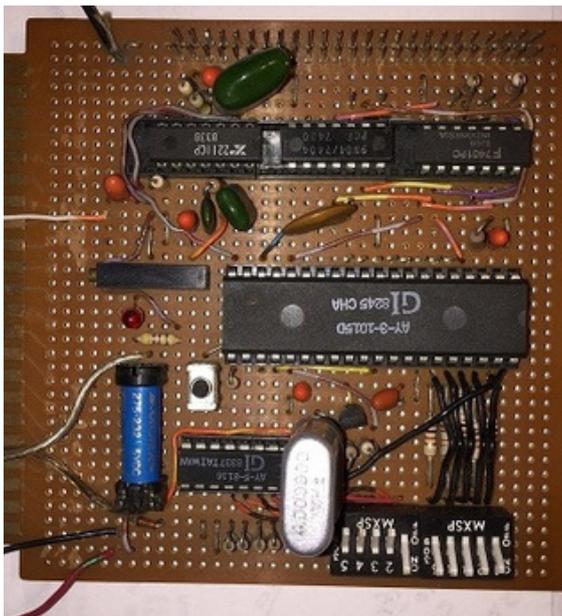
## Lessons Learned: The Realities of Early Digital CW

It performed surprisingly well, but I quickly learned some hard truths about machine decoding CW on HF:

- Noise sensitivity: A single static crash could obliterate one or two characters. There was no forward error correction – not even a simple CRC (Cyclic Redundancy Check).
- QSB fading: Without diversity reception, QSB (fading due to propagation changes) could easily wipe out copy.
- AGC delay: The AGC (Automatic Gain Control) in my old Heathkit HW-101 reacted too slowly to track rapid signal strength variations. I eventually disabled it and used the RF gain manually to hold levels steady.
- Propagation limits: The Utah-to-Washington path wasn't always reliable, and weak signals sometimes fell below the lock threshold of the PLL tone decoder.

Still, the bandwidth of that PLL decoder was forgiving enough that tuning wasn't critical. A simple LED told you when you were within its capture range. Sending CW by computer produced perfectly timed elements because the interface card keyed the transmitter directly through the key jack relay.

Figure 2: Interface board for TRS-80 Mod III Morse decoder. Directly keyed transmitter via relay.



## Discovering Synchronous Modes: Why RTTY Made Sense

Those experiments taught me why RTTY (Radio Teletype) used two closely spaced tones. That dual-tone system provided a constant carrier level for the receiver, partially overcoming AGC issues, and transmitted synchronously – with clear start and stop bits for each character. CW, by contrast, is asynchronous; the human brain fills in the timing gaps that a machine cannot. I eventually adapted the interface board for RTTY, adding a simple clock circuit to establish start/stop timing. It worked beautifully.

Interface board for TRS-80 Mod III Morse decoder. Directly keyed transmitter via relay.

# From Old to New – The Meeting of Technologies !....continued

## **Recognition and the NRI Connection**

The project drew interest from NRI (National Radio Institute), which was still active in-home study electronics courses in the late 1970s and early 1980s. They were fascinated that I had married a computer to a radio – a concept they had not embraced yet.

In 1983, I was honored as their Microcomputer Course Graduate of the Year. My advisor's jaw dropped when he saw his TRS-80 Model III decoding Morse Code as fast as I could send with my electronic keyer. NRI hadn't imagined computers talking to radios, but that moment showed how fast the hobby was evolving.

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## **From Homebrew to Appliance: The Arrival of the PK-232**

By the late 1980s, other manufacturers were entering the digital communications scene. AEA (Advanced Electronic Applications) released the PK-232, a "do-it-all" multimode TNC. I chose to build the Heathkit version (HK-232) to understand its workings firsthand. Both units supported a variety of digital modes – a true milestone in amateur radio communications.

I still have these vintage "dinosaurs," and they remain a reminder of how quickly digital innovation moved from the workbench to the commercial market.

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## **Modes That Shaped Modern Digital Communication**

RTTY (Radio Teletype) – One of the earliest digital modes, sending text over radio using frequency shift keying (FSK) and Baudot code. Later enhancements included ASCII encoding and parity error checking. RTTY contests on HF still celebrate this classic mode. However, on a computer and not on a 90lb 'mil'.

AMTOR (AMateur Teleprinting Over Radio) – Popular from the early 1980s through the 1990s, AMTOR introduced error detection and correction. Using a handshake system for nearly 100% accurate copy, it excelled on noisy HF bands.

PACKET RADIO – Introduced by TAPR (Tucson Amateur Packet Radio), packet took over the 2-meter airwaves almost overnight. Keyboard-to-keyboard chats, digipeaters, and Packet BBS (Bulletin Board Systems) created a digital ecosystem that actually sprang to life about the time the internet was in its infancy. My brother and I linked repeaters across long distances, exchanging messages as long as paths didn't time out.

PACTOR – Introduced around 1991, PACTOR-I (Packet Teletype Over Radio) brought Forward Error Correction (FEC) and adaptive speed negotiation. Developed by SCS (Special Communications Systems) in Germany, the protocol evolved through PACTOR-II, III, and now PACTOR-IV, capable of 5,800 bps under ideal conditions within a 2.4 kHz HF channel. In 2024, PACTOR-IV was officially authorized for U.S. amateur use due to its value in emergency communications.

# From Old to New – The Meeting of Technologies !....continued

CW (Morse Code) – The HK-232 was also my first exposure to a commercially manufactured CW decoding system. Its analog filters and tone detection were exceptional for the time (around 1990). Today, my Kenwood TS-890 includes an internal CW decoder that nearly matches the PK-232's performance – proof that digital precision has come full circle.



## **From the Shack to the Stars**

CW, after all, is a digital mode – just a binary one with elegant simplicity. Over the past half-century, amateur radio has advanced from manually copied CW to adaptive, high-efficiency digital modes capable of pulling coherent data from signals as weak as a few zeptowatts ( $10^{-20}$  W) – roughly the power received from the Voyager spacecraft at the edge of interstellar space. The story of amateur digital communications mirrors the story of Voyager itself: evolving from analog to digital, from noise and uncertainty to precision and resilience. It's been a remarkable meeting of technologies – from old to new – and we're still just getting started.



## Author Bio

Mark Holt, W7EAZ, is an Extra class operator and lifelong experimenter. He enjoys exploring digital modes, QRP, magnetic loops, and ISS communications from his home station.



# 84 foot Antenna...

## What in the World Was I Thinking !

By Kris Golden

**JUST MAKING THINGS UP OVER HERE ! Or am I ??**

K9CAN

Let's start with a few facts . I'm still very new to this hobby—only a year in—and antenna fundamentals feel as unfamiliar to me as a foreign language. So how do we learn something so complex? Is there a "best" way that gives the highest return? That's a tough question because everyone learns differently. As for me, I learn by doing—by diving in, trying things, and yes, making plenty of mistakes. In fact, the more mistakes the better. Each one becomes an opportunity to dig deeper, allowing me to understand the subject in ways that traditional studying doesn't always reveal. itself When I research what went wrong, I inevitably uncover other pieces of the puzzle that broaden my understanding. This 84-foot antenna project has been no exception; it's had its share of hiccups and hurdles. But that's the beauty of it. You start to realize there's no single definitive guide to antenna building—there's only experimentation, exploration, and the willingness to keep learning. Lets take a journey into the crowded corners of my mind where learning and innovation converge, often times making a bit of a mess.

### First things first, lets put the coax before the antenna! HIHI !

Before choosing an antenna I believe its best to first ask a few questions. This is not an exhaustive list but these are my top 10

- 1.What bands do you want to work ?
- 2.How much room do you have to work with in your yard, and are there horizontal/vertical restrictions?
- 3.What is the budget, and include new coax if possible ?
- 4.How do you intend to operate with the antenna? SSB,CW,DX, portable, digital, repeater, FM?
- 5.Is the antenna for receive, transmit, or both?
- 6.Does it need to be taken down or can it be left in place?
- 7.Are there mounting needs or restrictions?
- 8.Do you want this antenna to be directional or omnidirectional?
9. Are there HOA or other environmental restrictions?
10. How much RF power will be used?

**This is a great start, the more you can ask yourself, the more you can ask others.....on the radio!!**

### My Personal Experience

My first HF antenna was a Chameleon Antenna CHA EMCOMM III Portable and it measured 73 feet, it had a 25 foot counterpoise, and a 5:1 transformer. This was a great antenna but I wanted something different I just was not sure what that different was.. I was reminded months ago, as I begun my journey into amateur radio, and I quote m"You can have a \$10,000 radio and a \$10 antenna, at the end of the day you have a \$10 setup". Your antenna is both the frontline and the battlefield for the battle of RF superiority. Some may argue, most will agree, that the antenna is hands down the most important part of any station. So lets walk you through my setup, and you can judge for yourself.



# 84 foot Antenna...

## What in the World Was I Thinking !

By Kris Golden  
K9CAN

**JUST MAKING THINGS UP OVER HERE ! Or am I ??**

When looking to purchase a tuner for my antenna setup I came across an ICom AH-4 antenna coupler. First lets discuss the difference between a tuner and a coupler. Think of them like two cousins in the same family: Both adjust impedance so your radio sees a safe 50-ohm load...but they work in different places and different ways.

### **Antenna Tuner vs Antenna Coupler**

An antenna tuner is a device placed in the radio shack that matches the radio to whatever impedance the feed line and antenna present, but it does not actually tune the antenna itself. It simply makes the transmitter think it's seeing a matched 50-ohm load so it can deliver power safely and efficiently. An antenna coupler, on the other hand, is usually installed at the antenna feed point and matches the antenna to the feed line by adjusting inductance and capacitance right where the impedance mismatch occurs. While both devices reduce SWR as seen by the radio, a tuner only protects the rig and optimizes the transmitter side, whereas a coupler delivers more efficient power transfer because it corrects the mismatch at the antenna itself. In short: a tuner fixes the problem for the radio, a coupler fixes the problem at the antenna, giving better real-world performance and less feed-line loss.

I took a chance and picked it up used, I paid around \$240.00 and it was in great shape. After speaking with Brett KG7GDB I decided to follow his suggestion and started looking into modifying the AH-4 for a more user friendly setup. As it comes stock, it would be placed in a single spot outside at the feedline as close to the radio as possible. The modifications that was suggested seemed a bit daunting in the beginning but possible to achieve with some luck and skill. After reading through the modification instructions, I realized I was relying a bit more on luck than skill when it came to meeting the requirements—but I decided to go for it anyway. HIHI.

I ordered the additional components and while waiting for them to be delivered I disassembled the AH-4 to become acquainted with the device from the inside. Please remember that I had no experience with this coupler much less any couplers so as I said, I was relying on a bit of luck. I proceeded confidently knowing there were many of these devices out in the wild in case I needed to replace it. I also knew if I needed too I could ask Brett KG7GDB or Derek VE5SD to Help me out. Off I went pulling one screw out at a time until the clamshell like device gave way to the prize inside!

# 84 foot Antenna...

## What in the World Was I Thinking !

By Kris Golden  
K9CAN

JUST MAKING THINGS UP OVER HERE ! Or am I ??

### The Put Together

Parts I was waiting on included a Type-N coaxial connector and a waterproof aviation-style connector set. These will make sense shortly. I also ordered a longer run of shielded 4-wire control cable for the connection between the coupler and the radio. Once everything arrived—and once I worked up the courage to begin—I started the project. To my surprise, it was extremely straightforward.



The hardest part was installing the Type-N connector, chosen for its legendary weather resistance and rock-solid RF connection. After that, replacing the control-cable assembly was simple.

The goal of these modifications wasn't based on necessity; it was convenience. By making the AH-4 modular and easily disconnected, it can now be quickly removed, repositioned, or packed for portable use—perfect for POTA, Field Day, or any deployment away from home.

# 84 foot Antenna...

## What in the World Was I Thinking !

By Kris Golden  
K9CAN

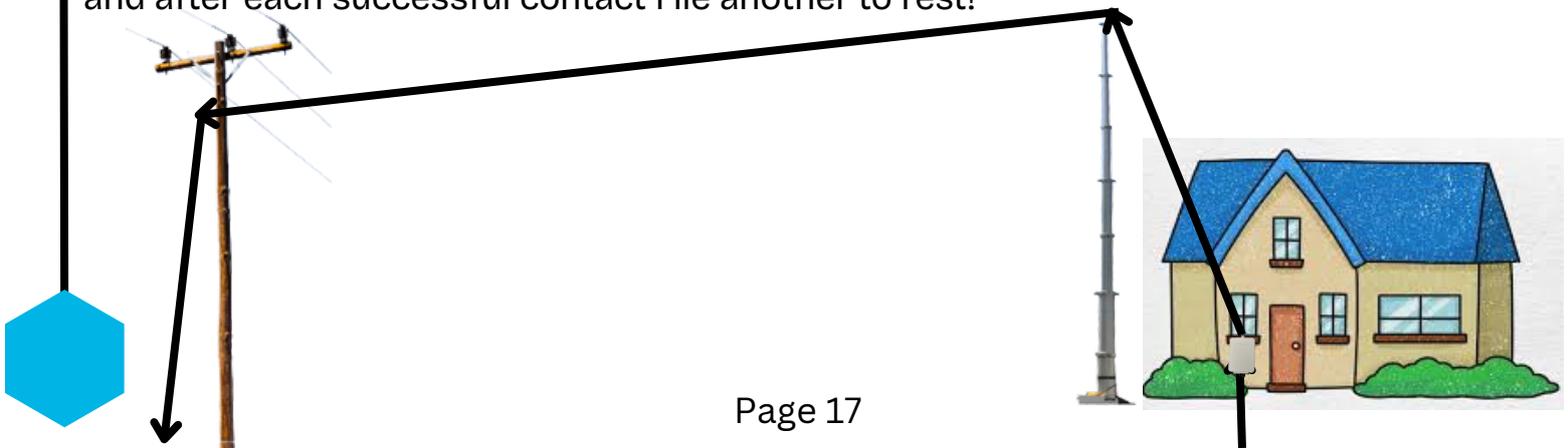
**JUST MAKING THINGS UP OVER HERE ! Or am I ??**

When I finally reassembled the unit, I was genuinely proud. It worked beautifully, and all that remained was to hook it up to the antenna and radio. The AH-4's reputation for handling high-impedance long-wire antennas is well-earned. Documentation shows it can match antenna feed-point impedances between  $\approx 10 \Omega$  and  $3200 \Omega$ , all while trying to deliver a perfect 50-ohm load back to the radio.

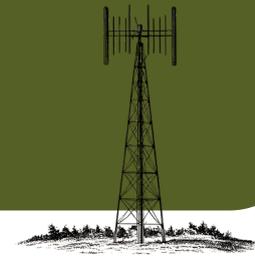
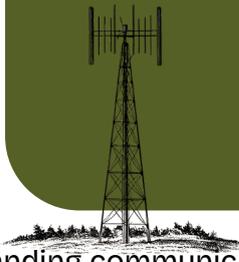
With the coupler ready, the next question was obvious: What length of wire should I use? My highest priority was being able to operate on 80 meters since several local nets meet regularly on that band. I asked ChatGPT for some recommended lengths and it returned a handful of usable options—29, 35.5, 41, 53, 58, and 71 feet—but it also suggested that the best all-around, full-range performance would come from something between 84 and 102 feet. So, 84 feet it would be.

I picked up a 100-foot length of clear-coated 12-gauge Flexweave stranded copper wire and cut it to the 84-foot mark. With the AH-4, the wire connects directly to the coupler—no balun, no unun—so I crimped a ring terminal onto one end of the wire and fastened it to the top stud of the coupler. From there, I ran the wire upward about 20 feet at roughly an 80-degree angle, securing it to a telescoping mast. After reaching the mast, the wire continued horizontally for about 45 feet toward a power pole. With nowhere else practical to terminate it, I allowed the remaining 18 feet to hang gently down the pole. In the end, the antenna formed a kind of inverted “U” shape, but it worked perfectly for the space I had available.

End result... I now have an antenna system that works like magic, and I couldn't be happier with it. Some folks have questioned my decision to use a coupler or to go with an 84-foot wire, but here's what I've learned: if it works well and you are satisfied with the performance, then what others say holds little weight. My setup has seen many opinions and after each successful contact I lie another to rest!



# Half Duplex, Full Duplex, and How Hams Achieve True Duplex Operation



Understanding communication modes in modern amateur radio

If you've spent any time in amateur radio—whether on HF, VHF/UHF, or satellites—you've probably heard the terms half duplex and full duplex tossed around. These two concepts describe fundamental ways we communicate over the airwaves, yet many hams aren't fully aware of how they actually work or how full duplex can be achieved in the shack.

This article breaks them down in plain language, explores how they apply to ham radio, and highlights the gear and setups needed to operate in true full-duplex mode.

## What Is Half Duplex?

In simple terms, half duplex means that a radio can transmit OR receive—but not both at the same time.

This is the mode 99% of amateur radio equipment uses, especially on:

- HF (SSB, CW, AM, digital)
- FM repeaters
- Simplex VHF/UHF
- Digital voice (D-Star, Fusion, DMR)
- Most mobile and handheld rigs

With half duplex:

- You press PTT to talk
- You release PTT to listen
- It's the classic “over... now you talk” way we're used to communicating.

Even when we run split operation on HF (transmit on one frequency, receive on another), it's still half duplex—we can only do one at a time.

## What Is Full Duplex?

Full duplex means a radio can transmit AND receive simultaneously on two different frequencies.

Think of it like a telephone conversation:

- You can talk and hear the other person at the same time
- No waiting, no “over,” no taking turns
- Both directions are live

# Duplex Modes and Uses...Continued

In amateur radio, true full duplex requires:

- A transmitter
- A receiver
- Isolation between the two
- Hardware that can survive transmitting while a sensitive receiver is active

This is far more complex than it sounds, which is why most radios do not offer full duplex.

## Why Most Ham Radios Are Not Full Duplex

**There are several technical reasons:**

### 1. Receiver Overload

If a radio transmits 5, 10, or 50 watts while its receiver is active on another frequency, the strong RF energy can:

- Overwhelm the receiver
- Desensitize the front end
- Damage the RF input stages
- Cause major intermod issues

**HF rigs especially are not designed to listen while the PA is blasting hundreds of watts!!**

### 2. Shared Signal Path

Most radios share:

- Oscillators
- Mixing stages
- Filtering
- RF switching
- This makes simultaneous TX/RX impossible.

### 3. Additional Filtering and Duplexers Required

To do full duplex cleanly, you need:

- Band-specific filtering
- Notch filters
- Low-loss duplexers or diplexers
- These add cost, complexity, and heat.

**This is why only specialized radios—often satellite rigs—offer real duplex capability.**

# Duplex Modes and Uses...Continued

## Where Full Duplex Is Used in Ham Radio

### 1. Satellite Communications

This is the most common use today.

FM and linear satellites require:

- TX on the uplink
- RX on the downlink

And both happen at the same time.

You need to hear yourself coming through the satellite so you can:

- Verify you're making the bird
- Adjust for Doppler shift
- Stay centered in the transponder
- Avoid doubling with other operators

**Without full duplex, you're effectively transmitting blind.**

### 2. Amateur Radio Repeaters

Repeaters are inherently full duplex devices:

- They receive on one frequency
- And transmit on another simultaneously

But the average user accessing the repeater is still half duplex.

### 3. Full Duplex Contesting Setups

Some advanced contest stations run separate:

- Transmitting antennas
- Receiving antennas
- Receivers independent of their main rig

This allows them to listen on band segments while transmitting elsewhere.

It's complex, but considered "full duplex" in functional terms.



## How Hams Achieve Full Duplex Operation

There are three practical ways a ham can do full duplex today:

Method 1: Use a True Full Duplex Radio

These are radios designed with separate TX and RX paths.

Full Duplex Capable Radios

Handhelds

- Icom ID-51A
- Icom ID-52
- Yaesu FT-530 (classic)
- Older Kenwood satellite HTs



# Duplex Modes and Uses...Continued

## Mobiles/Base

- Icom IC-9700 (best modern duplex satellite rig)
- Kenwood TS-2000
- Yaesu FT-847
- Icom IC-910 / IC-910H



These rigs can transmit on VHF or UHF while receiving on the opposite band, perfectly suited for satellites.

## Method 2: Use Two Radios (Independent TX and RX)

Many satellite operators use:

- A VHF/UHF mobile or HT for transmit
- An SDR as the receive radio
- 

Benefits:

- Clean full duplex
- Amazing receive quality with modern SDRs
- Easier to follow Doppler shift
- Flexible antenna options



This setup is extremely popular because SDRs give you a visible waterfall of the satellite downlink.

## Method 3: SDR-Based Full Duplex

Software Defined Radios such as:

- FlexRadio
- ANAN/Apache Labs
- Icom IC-9700
- Full-duplex capable SDR transceivers



...allow simultaneous digital TX/RX processing.

These require:

- Careful gain staging
- External filtering
- Often external PA's
- Good station grounding and isolation

# Duplex Modes and Uses...Continued

## Understanding “Pseudo Full Duplex”

Some radios marketed as “dual receive” are mistaken for full duplex.

**Dual receive ≠ full duplex.**

Dual-receive radios:

- Can monitor two bands
- Can switch quickly between them
- Can show dual VFO displays
- But cannot TX on one while simultaneously receiving on the other.

Examples:

- Yaesu FTM-510
- Yaesu FT-5D
- Kenwood TH-D75
- Icom ID-5100



These are half-duplex radios with dual receive capability.

## Why Full Duplex Matters

For satellites

- Essential
- Accurate Doppler correction
- Prevents interference
- Lets you hear your own signal in real time



For emergency or event communications

-Teams can monitor a command channel while transmitting on another.

For repeater testing / building

-Necessary for diagnosing desense, filtering, and intermod

For high-level contesting

-Advanced receive antennas let contesters monitor band openings while still transmitting.

### ★ Summary

Mode	Description	Most Ham Radios	Where It's Used
Half Duplex	TX or RX (not both)	HF, VHF, most mobiles & HTs	Normal voice, HF, digital
Dual Receive	Two receivers, but still half duplex	Many VHF/UHF mobiles & HTs	Monitoring, APRS
Full Duplex	TX & RX simultaneously	Specialized rigs	Satellites, repeaters, SDR rigs

## Some The Ham That Has Everything, Shopping Can Be Difficult, Heres Some Ideas!



[BUY RTL\\_SDR DONGLE HERE > CLICK ME!!](#)  
**\$38.95**

The RTL-SDR makes a fantastic holiday gift for any amateur radio operator because it opens up a whole new world of radio exploration at an incredibly affordable price. This tiny USB software-defined receiver lets hams monitor everything from HF (with an upconverter or HF-capable model) to VHF, UHF, ADS-B aircraft beacons, weather satellites, local repeaters, digital trunking systems, and even their own transmitted signals. It's perfect for experimenting, learning, and expanding the shack without taking up space or breaking the budget. Whether the operator is brand-new or a seasoned Elmer, an RTL-SDR brings endless fun, discovery, and hands-on tinkering—making it one of the most versatile, exciting, and thoughtful gifts you can give a radio enthusiast during the holiday season.

[Soundcore by Anker Q20i Hybrid Active Noise Cancelling Headphones,](#) **\$39.99**

The Soundcore by Anker Q20i Hybrid Active Noise Cancelling Headphones deliver exceptional value, offering features typically found in pricier models—like hybrid ANC, solid battery life, and customizable sound through the Soundcore app—at a budget-friendly price. Their noise cancelling handles low-frequency noise well, making them great for commuting or travel, and the comfortable over-ear design with memory-foam cups allows for long listening sessions. Sound quality is strong for the cost, with a bass-forward profile that many users enjoy, though it may not satisfy critical listeners. Build materials feel more budget than premium, and ANC doesn't perform at the level of high-end brands, but at this price point, the Q20i still stands out as a versatile, reliable, and highly enjoyable pair of headphones—an excellent choice for everyday listening and an impressive gift option for anyone wanting quality ANC without breaking the bank.



[Signal Staff™ Collapsible OSJ](#) **\$65.00**

The Signal Staff Collapsible OSJ is a well-built, highly portable 2m/70cm antenna that delivers excellent performance for field work, home use, or emergency setups. Made from sturdy aluminum and collapsing down for easy transport, it sets up quickly and consistently reaches distant repeaters with impressive clarity—far outperforming typical handheld antennas. While the threaded assembly takes a little practice and requires a stable mount, the overall durability, compactness, and strong on-air results make it a fantastic addition to any go-bag or portable ham-radio kit.

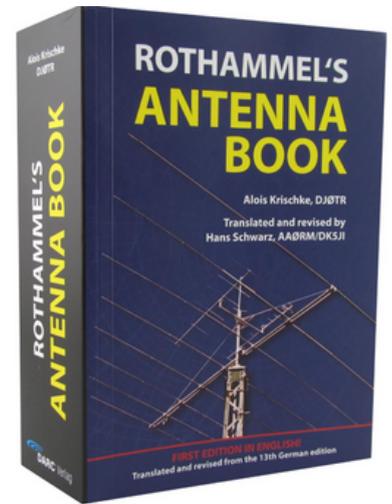


## [LEXIVON Butane Soldering Iron Multi-Purpose Kit | Cordless Self-Igniting](#) **\$49.97**

This cordless, self-igniting butane soldering iron kit delivers professional-grade flexibility in a portable form factor. It features an adjustable flame tip that can reach soldering temperatures, and comes with multiple interchangeable tips for tasks ranging from detailed electronics work to heat-shrink or general repairs. With no cord required and a rugged carry case, it's an ideal tool for mobile operations, field work, or tight-space DIY projects where standard wired soldering irons would be inconvenient.

## [Rothammel's Antenna Book](#) **\$92.99**

Whether you are getting this book as a gift for a loved one, friend, or yourself, you cannot go wrong with this choice. By far my favorite antenna book of all times. In my opinion there is no other book that explains the number of antenna designs out there, imagine 1504 pages of antenna building information..



## [Kenwood TS-990S Transceiver](#) **\$8999.95**



Looking for a gift that says "I LOVE YOU and you deserve the BEST" well this is it. Your loved one will put the dishes up, fold the clothes and take the dog out without you ever needing to ask. Simply the BEST!

## [FNIRSI 2C53T 50MHz Dual Oscilloscope, Signal Generator & Multimeter](#)

**\$106.24**

The FNIRSI 2C53T is a surprisingly capable handheld 3-in-1 tool—combining a 50 MHz dual-channel oscilloscope, a reliable true-RMS multimeter, and a basic signal generator—making it an excellent budget-friendly option for field work and hobby electronics. Its 250 MS/s sampling rate and clear display offer solid performance for quick diagnostics, while the compact design and rechargeable battery make it highly portable. Although the signal generator is limited and the screen is small for detailed bench work, the overall versatility and value make it a great addition to any mobile toolkit or amateur radio go-bag.





# HOLIDAY GIFT GUIDE



## [LAB599 TX500MP](#) **\$1339.95**

The LAB599 TX-500MP is a rugged, ultra-portable QRP/low-power HF transceiver that delivers surprisingly clean audio, excellent filtering, and rock-solid field performance in a compact, adventure-ready package. HF Handy Talkies are a rare breed, this is a jewel.

## [LDG AT-100PRO-II](#) **\$269.99**

100 Watt 1.8 - 54 MHz Automatic Antenna Tuner with Antenna Selection & Bypass Indicators. The LDG AT-100ProII is the next step in the evolution of the automatic tuner. This desktop tuner covers all frequencies from 1.8 - 54 MHz, and will automatically match your antenna in no time. This is my favorite external tuner.



## [LDG RU-9:1 Unun](#) **\$29.95**



The RU-9:1 Unun is built to provide a simple, reliable interface between vertical or end-fed antennas and the LDG family of automatic antenna tuners. Rated at 200 watts PEP, it can also operate completely stand-alone, making it suitable for resonant verticals without requiring an LDG tuner. Versatile enough for a variety of antenna projects needing a 9:1 or 4:1 Unun, it covers 1.8-30 MHz, is easy to weatherproof, and comes in a compact 5" x 2.5" x 1.25" enclosure weighing just 6 ounces.

## [12 Volt Power Inc Bag Set](#) **\$99.99**

The 12 Volt Power, Inc. Assorted Powerpole and Crimp Tool Kits deliver a complete, ready-to-use solution for anyone working with Powerpole connectors. Each kit includes the 15-45CRIMP Powerpole Crimping Tool and a 155-piece assorted connector set, all neatly organized in a rugged tactical nylon bag. Built for durability and versatility, the bag features MOLLE loops, multiple zippered compartments, and an ID pocket, giving you plenty of room for tools, connectors, cables, radios, and more. With this all-in-one kit, you'll have everything you need to begin crimping Powerpole connectors right out of the bag.

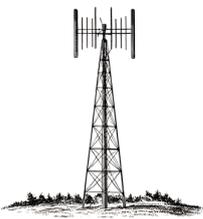


## [STOCKING STUFFERS](#)

[Click on Link Below](#)

- [Modcon Supply COAX-SEAL](#)
- [DC Power Connectors WP30-10PK](#)
- [Coaxial Cable Grippers DXE-CGH-8U](#)
- [Precision Shear Side Cutters](#)
- [Heat Shrink Sleeves HS-ASST-1](#)
- [Pocket Pad Notebooks](#)
- [Wire Assortment Kits](#)
- [Premium Vinyl Electrical Tape](#)
- [Stop Shop Magnetic Hardware Trays](#)

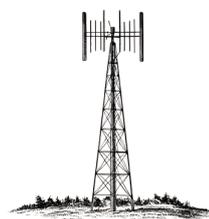




# CONTEST SCHEDULE

DECEMBER 15th-JANUARY 11th

**VISIT CALENDAR HERE**



## December 15 - 21

+ 4 States QRP Group Second Sunday Sprint	0100Z-0300Z, Dec 15
+ NAQCC CW Sprint	0130Z-0330Z, Dec 17
+ VHF-UHF FT8 Activity Contest	1700Z-2100Z, Dec 17
+ Walk for the Bacon QRP Contest	0000Z-0100Z, Dec 18 and 0200Z-0300Z, Dec 19
+ NTC QSO Party	1900Z-2000Z, Dec 18
+ AGB-Party Contest	1600Z-1700Z, Dec 19
+ Feld Hell Sprint	0000Z-2359Z, Dec 20
+ OK DX RTTY Contest	0000Z-2400Z, Dec 20
+ RAC Winter Contest	0000Z-2359Z, Dec 20
+ Croatian DX Contest	1400Z, Dec 20 to 1400Z, Dec 21
+ ARRL Rookie Roundup, CW	1800Z-2359Z, Dec 21
+ Run for the Bacon QRP Contest	2300Z, Dec 21 to 0100Z, Dec 22

## December 22 - 28

+ SKCC Sprint	0000Z-0200Z, Dec 24
+ DARC Christmas Contest	0830Z-1059Z, Dec 26
+ Stew Perry Topband Challenge	1500Z, Dec 27 to 1500Z, Dec 28
+ Original QRP Contest	1500Z, Dec 27 to 1500Z, Dec 28
+ RAEM Contest	0000Z-1159Z, Dec 28

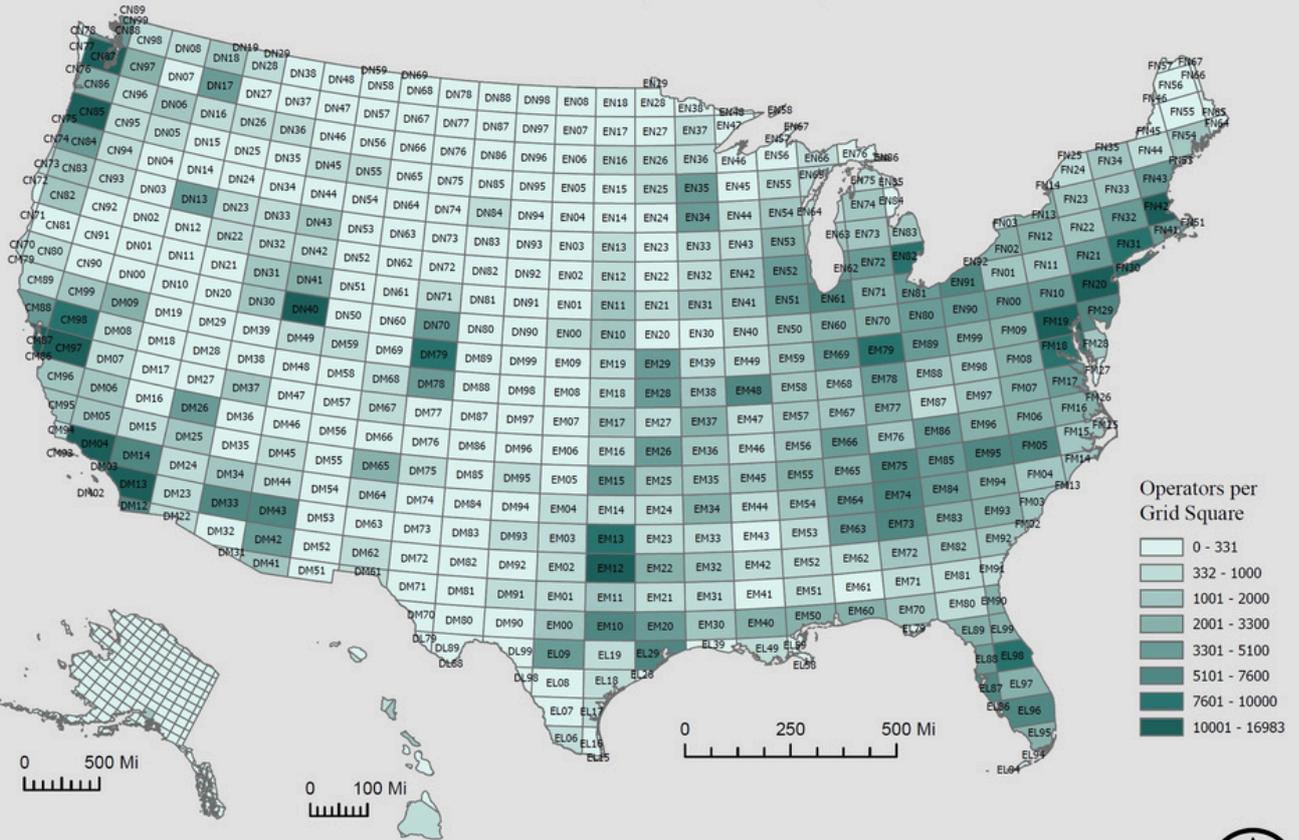
## December 29 - January 4

+ YOTA Contest	1000Z-2159Z, Dec 29
+ QCX Challenge	1300Z-1400Z, Dec 29
+ QCX Challenge	1900Z-2000Z, Dec 29
+ QCX Challenge	0300Z-0400Z, Dec 30
+ Bogor Old and New Contest	0900Z-2359Z, Dec 31
+ AGB New Year Snowball Contest	0000Z-0100Z, Jan 1
+ Walk for the Bacon QRP Contest	0000Z-0100Z, Jan 1 and 0200Z-0300Z, Jan 2
+ SARTG New Year RTTY Contest	0800Z-1100Z, Jan 1
+ AGCW Happy New Year Contest	0900Z-1200Z, Jan 1
+ AGCW VHF/UHF Contest	1400Z-1700Z, Jan 1 (144) and 1700Z-1800Z, Jan 1 (432)
+ IRTS 80m Counties Contest	1700Z-1800Z, Jan 1
+ NRAU 10m Activity Contest	1800Z-1900Z, Jan 1 (CW) and 1900Z-2000Z, Jan 1 (SSB) and 2000Z-2100Z, Jan 1 (FM) and 2100Z-2200Z, Jan 1 (Dig)
+ SKCC Sprint Europe	2000Z-2200Z, Jan 1
+ PODXS 070 Club PSKFest	0000Z-2400Z, Jan 3
+ Marconi Club ARI Loano QSO Party Day	0700Z-2100Z, Jan 3
+ WW PMC Contest	1200Z, Jan 3 to 1200Z, Jan 4
+ RSGB AFS Contest, CW	1300Z-1700Z, Jan 3
+ ARRL RTTY Roundup	1800Z, Jan 3 to 2400Z, Jan 4
+ ARRL Kids Day	1800Z-2359Z, Jan 3
+ EUCW 160m Contest	2000Z-2300Z, Jan 3 and 0400Z-0700Z, Jan 4
+ FOC Old School Classic 1960s QSO Party	1200Z, Jan 4 to 1200Z, Jan 5

## January 5 - 11

+ ARS Spartan Sprint	0100Z-0300Z, Jan 6
+ VHF-UHF FT8 Activity Contest	1700Z-2100Z, Jan 7
+ UKEICC 80m Contest	2000Z-2100Z, Jan 7
+ YB DX Contest	0000Z-2359Z, Jan 10
+ Old New Year Contest	0500Z-0859Z, Jan 10
+ SKCC Weekend Sprintathon	1200Z, Jan 10 to 2400Z, Jan 11
+ UBA PSK63 Prefix Contest	1200Z, Jan 10 to 1200Z, Jan 11
+ North American QSO Party, CW	1800Z, Jan 10 to 0559Z, Jan 11
+ NRAU-Baltic Contest, SSB	0630Z-0830Z, Jan 11
+ NRAU-Baltic Contest, CW	0900Z-1100Z, Jan 11
+ DARC 10-Meter Contest	0900Z-1059Z, Jan 11
+ RSGB AFS Contest, Data	1300Z-1700Z, Jan 11

# U.S. Grid Square Map

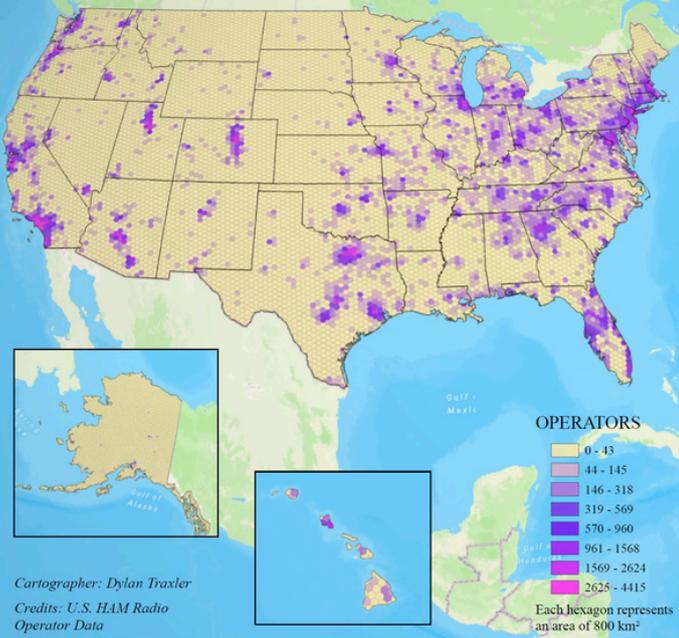


Cartographer: Dylan Traxler

Credits: U.S. Grid System Data & U.S. HAM Radio Operator Data



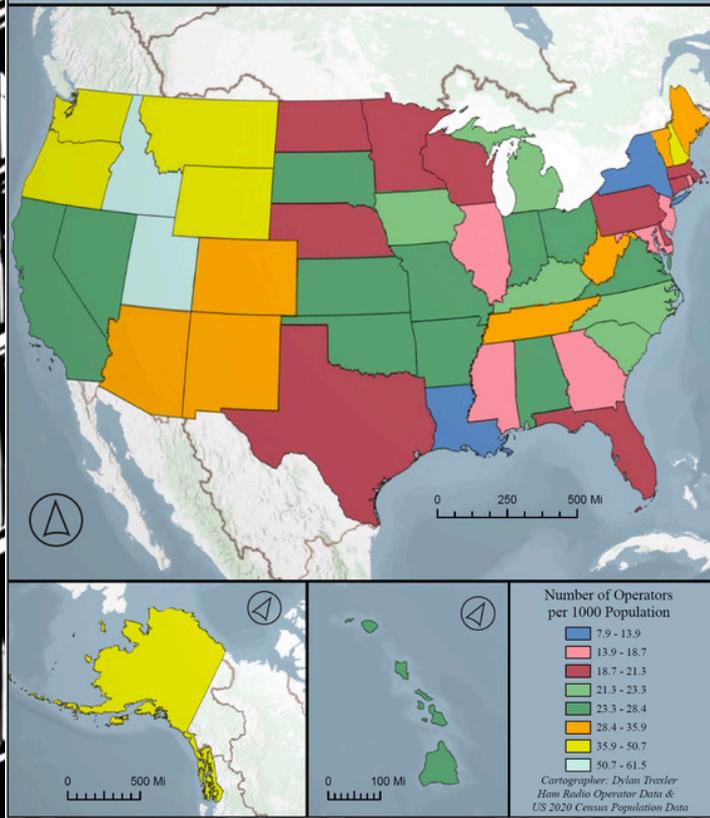
# HAM RADIO OPERATORS



Cartographer: Dylan Traxler  
Credits: U.S. HAM Radio Operator Data

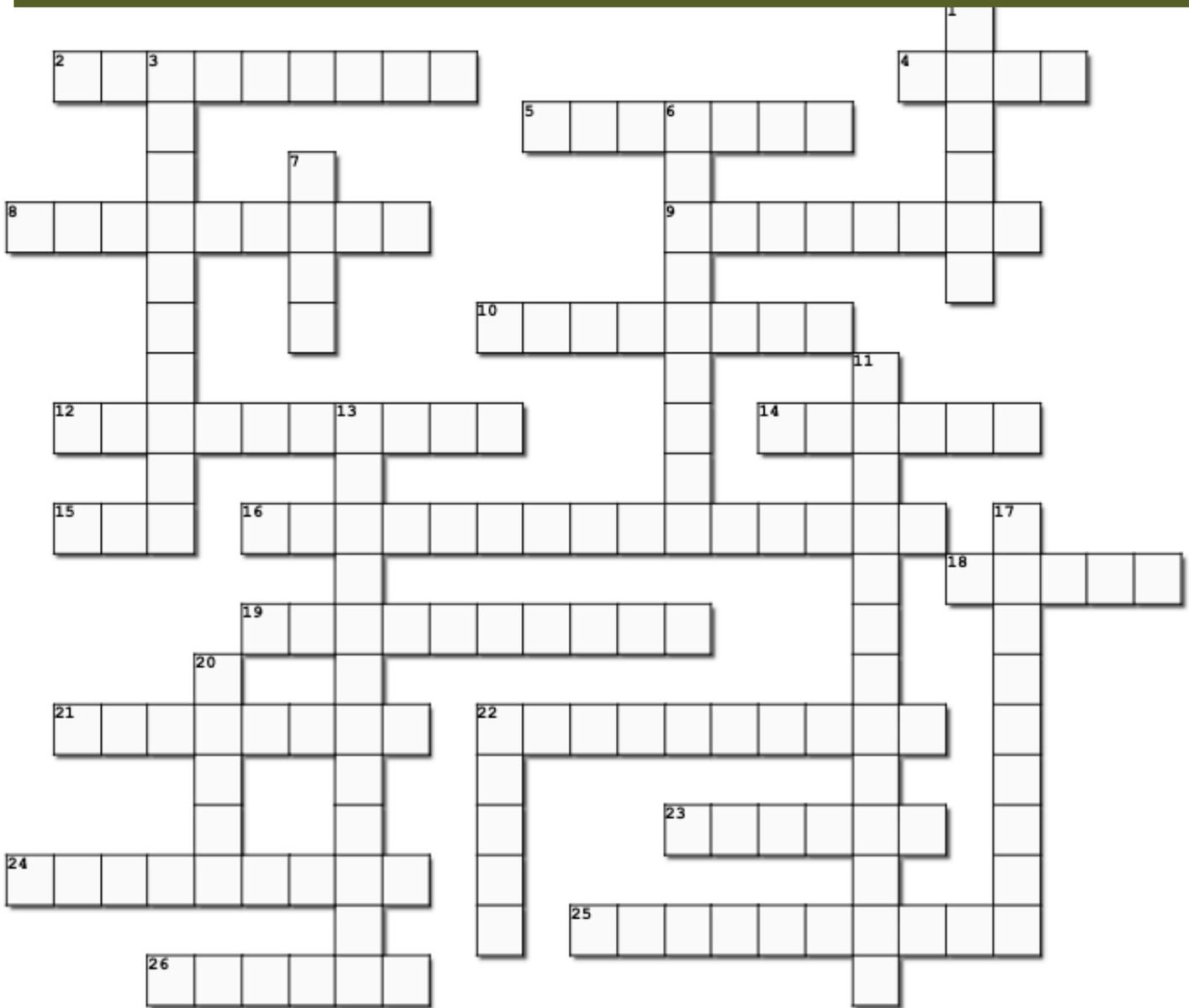
Each hexagon represents an area of 800 km²

# HAM Radio Operators / US State Total Population



Cartographer: Dylan Traxler  
Ham Radio Operator Data & US 2020 Census Population Data

# ELECTRICAL CIRCUIT BOARD

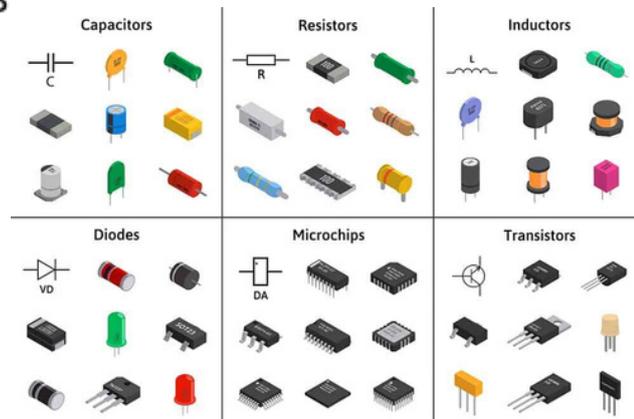


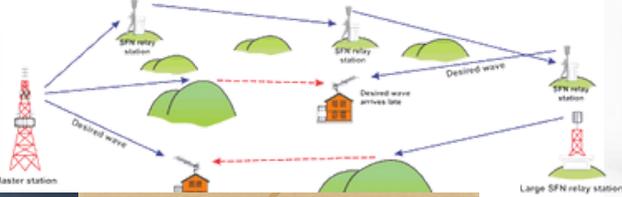
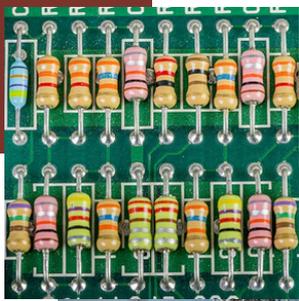
## Across

2. Visual representation of an electrical circuit
4. device that protects circuits by breaking when overloaded
5. The path through which electricity flows
8. Component that converts AC to DC
9. Type of circuit that allows multiple paths for current
10. creates magnetic field when current passes through
12. prototype board used for temporary circuits
14. reference point in an electrical circuit
15. Commonly used software for designing circuit layouts
16. small computer on a single integrated circuit
18. electrically operated switch
19. The protective coating on circuit boards
21. limits current flow in a circuit
22. semiconductor used for switching or amplification
23. metal alloy used to join components on a PCB
24. joins sections of a circuit or attaches cables
25. tool used to measure voltage, current, and resistance
26. Material often used to create circuit connections

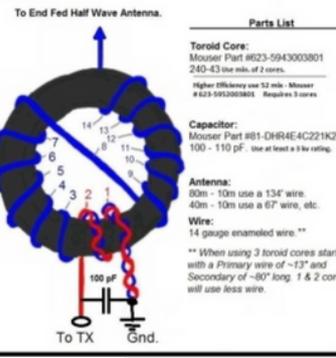
## Down

1. small connector used to open or close circuit paths
3. protective layer to prevent overheating
6. stores electrical energy in an electric field
7. small plated holes that connect PCB layers
11. variable resistor used to adjust voltage
13. tool that displays electrical waveforms
17. device that maintains constant voltage
20. allows current to flow in only one direction
22. copper pathway that connects components on a PCB





**49:1 Transformer**  
 Primary 2 Turns.  
 Secondary 14 turns (Total turns)



900 MHz	Channel	4	5	6	7
	Ctr Freq	907	912	917	922
	Status	Shared with US unlicensed			

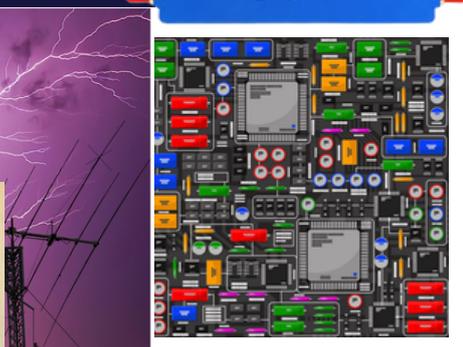
You are responsible for using frequencies, channels, bandwidths, and power levels that comply with your country's amateur radio license requirements.

2.4 GHz	Channel	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8*
	Ctr Freq	2.387	2.392	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437	2.442	2.447
	Status	non-US only		Unshared		Cannot Use	Shared with US unlicensed							

\* Only 5 MHz channel width is available on channel 8

3.4 GHz	Channel	76	77	78	79	80	81	82	83	84	85	86	87	88	89
	Ctr Freq	3.380	3.385	3.390	3.395	3.400	3.405	3.410	3.415	3.420	3.425	3.430	3.435	3.440	3.445
	Status	US Amateur operations remain on a secondary basis but are subject to removal at any time by FCC notice*													

\* per FCC 20-138 IV-E-69



**CONTRIBUTORS**

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 KRIS GOLDEN-K9CAN



**"529" Hall of the Greats**  
 Richard Thomas WOEDF  
 Bruce Carrier W7CCM