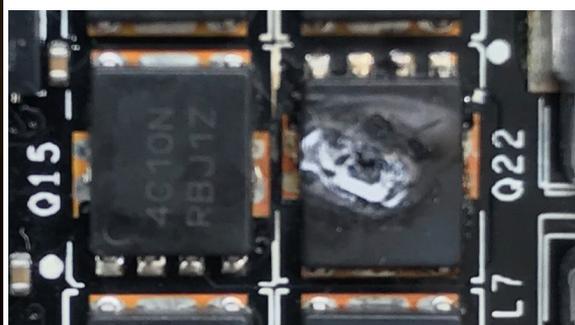


# Microvolt

Monthly newsletter of the Utah Amateur Radio Club

March 2026



## Equipment Repair



As many are fond of saying, *If it ain't broke, don't fix it.* Ok, but what if *it is* broken? Should you attempt to repair it yourself, or should you call a friend or a specialist? The fact is, many amateurs would rather fall out of a tree than tackle a repair job on their own. They seem to lack repair skill confidence, fearing they might make the problem worse, or that their meddling will void the warranty, or that their potential repair failure will make them appear less-than-intelligent to others. Let's dive deeper into the need to repair, should our equipment require it.

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## Cover – Repair and troubleshooting

If our amateur radio equipment ever fails, many of us fear the worst, and immediately imagine a drain on our bank accounts or give up hope of ever seeing the gear work again. [This month's editorial](#) examines the mentality that many of us have embraced as a result of our tendency to dispose of things rather than fix them. But are there things we can fix on our own without requiring years of technical training? It turns out that some “repairs” might be easier than they first appear. By no means comprehensive, here are some tips that might help you troubleshoot a few of your own issues:

### Transceiver stops working

- Coax might be loose or disconnected
- VOX might be enabled

### Equipment fails to power on

- Power cord might be disconnected or loose
- House circuit might have a tripped breaker
- Power supply might be turned off
- Equipment might have a dead battery
- Your equipment might have a blown fuse

### Unable to hear anything on HF

- RF gain might be too low
- Squelch might be too high or AF too low
- Your rig might be in the wrong mode
- An external headphone might be plugged in
- VOX might be enabled

### The radio shuts off when I press the PTT

- Power supply is too small for the job
- Try again with the power turned down

### None of the controls seem to work

- Lock feature might be set
- Frequency might be set outside amateur bands

### Less than expected power while transmitting

- SWR is too high
- Coax might have a short
- Antenna might be loose or disconnected

### Can't hear each other on the repeater

- Radio might have a Receive Tone set
- You two might be too close to each other

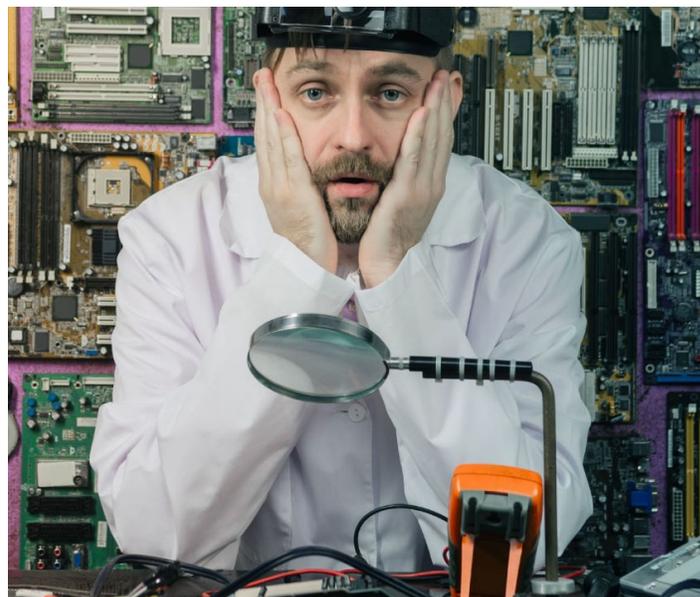
### Beep at the end of your transmission

- Radio might have the WIRES feature turned on
- HT might have its Roger Beep enabled



### Loud hum heard by others on your signal

- Your HT might be sitting in its charging cradle
- Try coiling your coax a few turns to create a [choke](#)
- Your antenna might be too close to your radio



### Sound from your HF rig is staticky or rough

- Try unplugging the external speaker
- A thunderstorm might be nearby
- Turn off the Pre-Amplifier and the Notch Filter
- Rig might be in the wrong mode (AM vs. SSB)

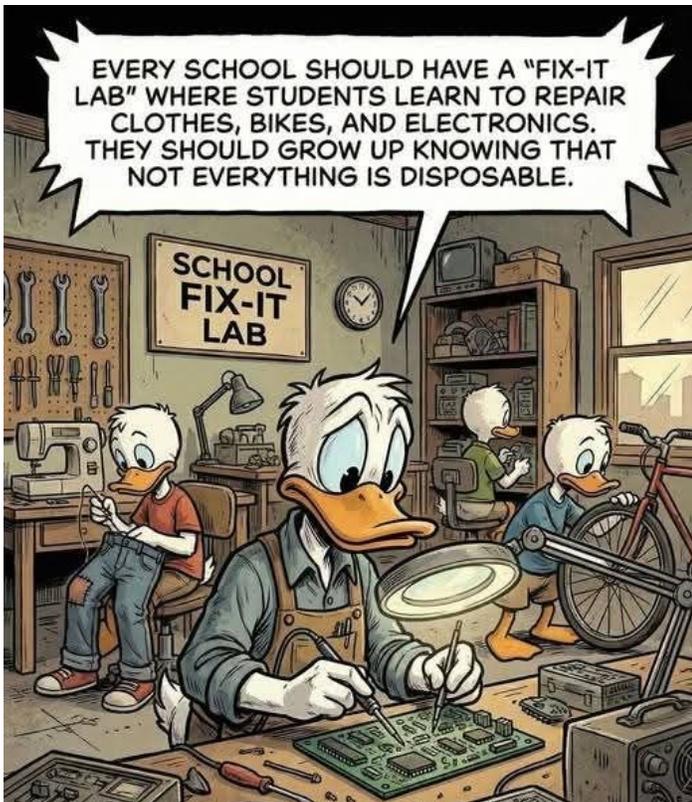
### On HF, I can hear them, but they can't hear me

- They might be working split operation
- Your antenna might not be ideal for transmitting
- The other station might be in your skip zone

As you can see, the “damage” can appear big, but the “repair” might actually be small. Often, instead of sending your equipment out to get repaired, the “fix” might be something you can simply handle yourself, like a good, old-fashioned **factory reset**.

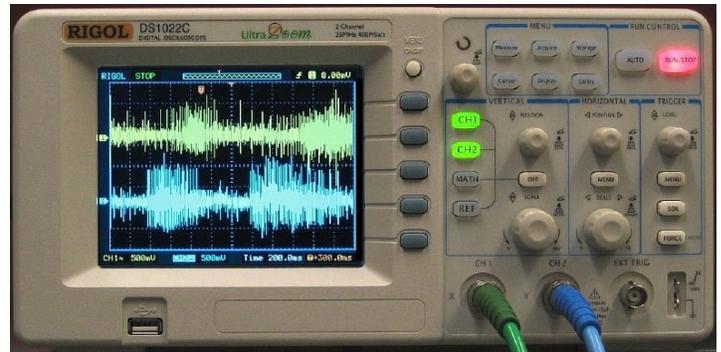
*Microvolt editorial staff*

## Editorial – Repair, replace, consequences



difficult to troubleshoot. The solution in those cases is typically to replace the problem chip.

This repair approach is not unique to amateur radio, but is typical of repairs made to appliances, homes, and vehicles. For example, if an auto mechanic discovers that an electric window assembly has a broken wire inside, instead of fixing the 62¢ wire, he chooses to replace the entire \$450 assembly, which requires less skill and a little less of his time, and therefore labor. The immediate cost to the vehicle owner is that of the assembly, but the societal cost is the investment in the “replacement” mentality.



When something suddenly stops working, it’s easy for many of us to throw up our hands and replace the piece of gear. Sometimes, however, a little troubleshooting on your part can go a long way, and maybe save you a little cash on Amazon. If your transceiver stops working, is it really damaged, or did you simply forget to connect your coax? Maybe you accidentally bumped and pressed the VOX button by mistake. This month’s [cover story](#) discusses some things that you might be able to repair on your own without a lot of skill or knowledge.

Anything to add? Email [editor@utaharc.org](mailto:editor@utaharc.org)

The alternatives to getting your stuff fixed are either living with it in the damaged state or tossing it. If the damage is cosmetic (scratch, dent, bend), we can often continue operating in spite of the blemish. But when the problem affects actual operation, we need to decide whether to fix the device or junk it. In today’s disposable world, it’s become too easy to simply discard a highly advanced piece of ham gear, especially if its replacement costs very little.

In spite of our knowledge and experience, many of us simply don’t have the right equipment to help us diagnose problems. This issue explores a variety of [test instruments](#) that might help you troubleshoot a problem with an electronic circuit or other radio feature. Still, the more involved and technical the problem, the more costly the instrumentation you need to locate the trouble, and the more technical skill and education is required to even know how to use them.

Some hams are very skilled at using an oscilloscope, for example, but to understand what they’re seeing and what they *should expect to see* in a particular powered circuit might require some extensive training. Furthermore, today’s electronics are not the discrete components of yesteryear, but are often advanced consolidations of numerous micro-electronics built into integrated circuits that are inexpensive yet

## Letters to the editor

Dear Editor:

I was given a couple hundred feet of RG-59. Could I use that for dipole elements cut to length if I only use the shield part of it?

Carlos in Taylorsville

Dear Carlos:

Yes, you can make an effective dipole from RG-59 coax. But there are caveats about that kind of antenna you might want to be aware of. First, do not bare the shield, but leave it intact under the sheath (see *ARRL Antenna Book* section 23.5). Second, do not connect the center conductor to the shield anywhere, or the signal can partially cancel.

Dear Editor:

I've heard that ham radios used to have crystals in them, and you needed to keep a set in order to set their frequencies. Why did they use crystals to change frequencies, and why are they no longer needed?

Barry in South Jordan

Dear Barry:

Radio pioneers first used discrete crystals to set their operating frequencies to prevent the drift that plagued [LC and other oscillators](#). But that required the operator to tediously swap crystals for each operating different band or frequency range. Today, modern transceivers still use the [crystal oscillator](#) as their reference frequency, but use digital logic to multiply and divide ("synthesize") the base frequency into the ones required. And BTW, you've given us an idea for a club meeting presentation!

Dear Editor:

I've learned that if I don't want to program my HT (handheld transceiver) manually, I can do so using any of three different programs, CHIRP, RT Systems, or the one that comes with the radio. But which is best? I've been warned not to use the software that comes with the radio, yet wouldn't the manufacturer know how best to program their HTs?

Doug in Layton



Dear Doug:

You would think that CPS (customer programming software) made specifically for a transceiver by its maker would be the best choice, but in the world of some Chinese-made HTs, that might not be the case. Even though many have improved over the years, some were laden with malware, many were not well-tested, and some brought up menus that were not displayed in English by default. These and other less-than-favorable experiences have steered many of us away from their own software. As you mentioned, the alternatives are few, but might also be more favorable. On one hand, [CHIRP](#) not only supports many different HT makes and models, but it's also free-of-charge. On the other hand, paid commercial software like that from [RT Systems](#) (\$49 for both the software and the radio-specific cable) is guaranteed to work, but only with one particular model. At one point CHIRP had bricked some Yaesu HT models, and that problem has long since been fixed, yet the taste that left in some people's mouths has lingered.

Dear Editor:

Will you be going to Field Day? I'd like to meet you and pick your brain.

Sandra in Hill AFB

Dear Sandra:

I'd love to meet you at Field Day too, and you're free to pick my brain, what's left of it.

Send your questions to [editor@utaharc.org](mailto:editor@utaharc.org)

## Club news

Many of us have become concerned that HOAs are legally able to hinder or prevent the installation of amateur radio antennas, in spite of PRB-1. This has become more of an issue lately since more and more hams are moving into them, often with little choice of their own. For the February 2026 meeting, Jeri Brummett WJ3RI educated us about the Utah HOA Initiative and how we can help Utah enact an amateur radio exemption from HOA over-reach.



Jeri said we need to get a critical mass of people behind this initiative. She said we should 1) get to know our legislators, 2) encounter them in a civil way, and 3) introduce yourself to them. She also provided resources (available in the presentation) on



how to contact them.



You can see the replay of the February 2026 club meeting [on YouTube](#) thanks to James Bennett KK7AVS. *BTW, you can view past many club meeting presentations on [our YouTube channel](#).*

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## UARC 2026 Spring Potluck

You and your family are invited to a potluck dinner 6:30 pm Thursday 12 March 2026 at the [Salt Lake County Facilities Management Cafeteria](#), 2001 S State St, room S1-100. Our last potluck drew quite a crowd, and we're looking to do it again, but this time with even more of you! Details are posted [on our website](#). A signup sheet has been [posted here](#). We're looking for main course, side dish, dessert, drink, or salad for ten people.

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## 2026 Utah VHF Society Swap Meet

The 2026 [Utah VHF Society Swap Meet](#) will be held Saturday 28 March 2026 at the [Western Sports Park](#) (formerly the Legacy Events Center), 25 N Sports Park Way (1100 W) in Farmington. Your Utah VHF Society membership gets you into the swap meet, or you can sign up or renew on the spot.

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## 2026 Summer Field Day

Believe it or not, Field Day is fast approaching! Once again, we plan to descend on our usual place near Payson Lakes and get on the air from noon Saturday 27 June through noon Sunday 28 June 2026, and invite you to join us. Details on how to get to our site are on [the club website](#).

## For your information

### 2026 Digital Communications Conference

Sat 28 February 2026 at the SLCC Conference Center (9750 S 300 W), Sandy. Please see the poster in this issue on page 15.

### Field Day 2026

The annual 2026 Field Day will take place from noon Saturday 27 June through noon Sunday 28 June 2026 at a yet-to-be disclosed location! We've traditionally held our summer Field Days at Payson Lakes, but this year we're planning to possibly bring our Field Day a little closer to home. Stay tuned!

### UARC 2026 Steak Fry

Not only for Field Day, but the re-location of our annual Steak Fry is also being discussed. Currently scheduled for Saturday 18 July, the club is considering something a bit closer to town. Again, stay tuned!

### License courses

#### *Salt Lake:*

**Technician** : Tuesdays

**General** : Tuesdays 7:00 pm to 9:00 pm  
147.160+ MHz (127.3 Hz tone)

#### *Provo:*

**Technician** : Saturday, 8:00 am to 1:00 pm  
21 Mar, 18 Apr, 16 May

Visit [HamStudy.org/sessions](https://HamStudy.org/sessions) to register (free)

**Provo Fire Station #2**, 2737 N Canyon Rd  
Email [nv7vham@gmail.com](mailto:nv7vham@gmail.com) for info

#### *Orem:*

**Extra** : 5 Tuesdays, 6:00 to 9:30 pm  
Jul 14, Jul 21, Jul 28, Aug 04, Aug 11

Visit [psclass.orem.org](https://psclass.orem.org) to register (\$10)

**Orem City EOC**, 56 N State St, 2nd Floor  
[HamStudy.org](https://HamStudy.org) account required

Email [nojiratz@hotmail.com](mailto:nojiratz@hotmail.com) for info

#### *Eagle Mountain:*

**Technician** : 5 Thursdays, 7 to 9 pm  
Feb 12, Feb 19, Feb 26, Mar 12, Mar 19

Email [ki6oss6365@gmail.com](mailto:ki6oss6365@gmail.com) to register (free)

**Eagle Mountain City Hall**, 1650 Stagecoach Run



### Exam sessions

#### *Salt Lake County:*

- Email Garth Wiscombe W7PS [w7ps@arrl.net](mailto:w7ps@arrl.net)  
Jan 26, Feb 24, Mar 30

#### *Utah County:*

- Sat 21 Mar 10:00 am : **Eagle Mtn** : [signup](#)
- Wed 15 Apr 7:00 pm : **Provo** : [signup](#)
- Sat 18 Apr 2:30 pm : **Provo** : [signup](#)

### Club repeaters

**Farnsworth Peak** : 146.620– MHz (no tone)

**Scott Hill** : 146.620– MHz (no tone)

**Lake Mountain** : 146.760– MHz (no tone)

### SDRs and beacons

Northern Utah WebSDR : [sdrutah.org](https://sdrutah.org)

KK7AVS SDR : [k7xrd.club](https://k7xrd.club)

N7RIX SDR : [sdr.n7rix.com](https://sdr.n7rix.com)

K7JL beacon 28.2493 MHz

### HF remote and club transceiver stations

If you'd like to learn how to get started using the remote stations, visit the [HF Remotes link](#) on [the club website](#):

<https://user.xmission.com/~uarc/HFRemote.html>

### How you can help!

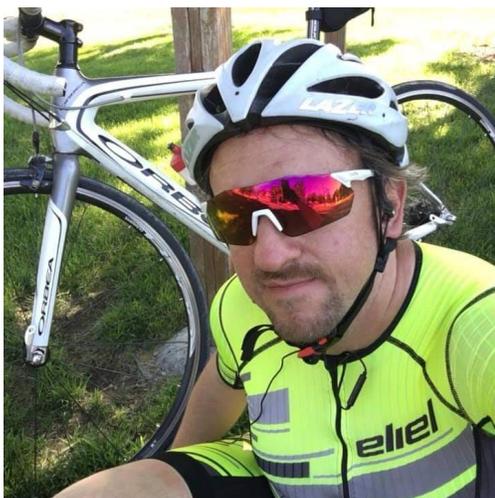
Email [uarc@xmission.com](mailto:uarc@xmission.com) to reach the club leadership. Email [editor@utaharc.org](mailto:editor@utaharc.org) to add content.

## Spotlight – Daland Speirs KC7LNR

Many of us know the late Ron Speirs K7RLS, who had served for years on the UARC Board until he became SK (silent key) a little over a year ago. But very few of us know Ron's son Daland Speirs KC7LNR, whom Ron introduced to amateur radio while Daland was in his teens. The fact is, dad Ron never got his amateur radio license until after his son Daland did.

During high school, Daland got introduced to amateur astronomy, and in that group a friend helped Daland get his ham radio license by helping him pass the code test in 1995. Later that same year Daland received his Technician license barely before high school graduation. Daland said his best graduation gift was his father Ron obtaining his own amateur radio license just a couple of months later.

The following year Daland helped Ron during their first Field Day out at Payson Lakes, hauling and setting up equipment for the event with the late Cindy Peters KB7OUT, the Microvolt editor at the time. Daland recalls the excitement in staying up all night making voice contacts. Since that day, he's attended many Field Days and swap meets.



In 1997 Eugene McWherter N7OVT attempted to help Daland pass the General license, but the code requirement was just a little too much for him. Fast forward ten years, and in 2007 Daland passed the General license exam once the code requirement was dropped. The next year Daland helped construct a new structure for the Scott Hill repeater.

Daland eventually became involved with EmComm (emergency communication), and even joined his local Emergency Response Team. His team even got involved with message handling during the Utah Tornado of August 1999 in downtown Salt Lake City. In 2002 Daland helped his dad with a special event during the Olympics. He even helped Ron and the late Morris Farmer AD7SR teach some ham radio classes. Afterwards, Daland took a break from amateur radio to focus on his other interests.

Turns out that Daland loves trains, so much that he worked at the Heber Valley Railroad for five years as a conductor. Later found him working at UTA fixing track cars and ordering their components, something he's been doing to this day, so far for 19 years. He's also a long-time member of NMRA (National Model Railroad Association), Northern Utah Division, and has given many presentations to their club on various aspects of model railroad design and building.

Daland's hobbies also include amateur astronomy, motorcycle riding, skiing, and snowboarding. During a recent motorcycle event, Daland met Jeri Brummett WJ3RI, who was excited to learn that Daland was once a ham. Jeri talked Daland into returning to ham radio, and even asked him whether he would like to serve on the UARC leadership. Daland agreed, and he's now one of the two UARC Program Chairs.

Welcome back to amateur radio, Daland!

– 73, Linda Reeder N7HVF



## Tech Corner – Instrumentation

We human beings seem to have this need to measure things, from the temperature of the room to the distance to Grandma's house. For some reason, we want to know our heart rate, the height of trees, or how long it takes for paint to dry. There might come a time when you'll want to measure something in connection with your radio, antenna, or other gear. **Instrumentation** is a word that means *device or software used to measure, test, and/or monitor something*.

In the world of amateur radio, we have a lot of scientific measuring devices available to us, but fortunately, only a small subset is truly useful to any practical extent. I mean, if people tell you that your signal isn't getting out like it used to, you'd probably like to know what changed, and how to test that. Let's explore the devices you as a licensed operator might care to use, and list a few others. The intention is to distinguish between the basic equipment you might need and that of a fully-equipped diagnostic facility. To that end, I've grouped this discussion into three categories, by instrumentation you **must have**, those that are **nice to have**, and **others**.

### Must-have measurement instruments

I've been asked many times what testing or measuring devices **must** be in our possession as a radio amateur, and my answer is often, **none**. If you **are** a person who feels the need to measure or monitor something anyway, then I recommend this list:



- **S-meter**

An **S-meter** (signal strength meter) is built into most transceivers, to display the relative strength of the signal being received at the tuned frequency. So, an additional discrete measuring device is typically not needed, but I mention it here for completeness, because it's a meter that an operator should have, if any.

In the HT (handheld transceiver) example to the left, the S-meter is displayed as the dashed line across the bottom of the display. In this case, it appears the HT is displaying about an S8 signal strength. Also, below is an example of an S-meter that might appear on an HF (high frequency) transceiver, as a needle over a set of values. In this example, the S-meter values are displayed across the top, so it appears that the S-meter is measuring a received signal strength of about +27, which means "about 27 dB over S9" or  $2 \times 2 = 512$  times the strength of a calibrated S9 signal.



- **Power meter / "watt" meter**

A **power meter** displays the amount of RF (radio frequency) power (in watts) that's being transferred somewhere, like from your radio to your coax, or from your tuner to your antenna. More often than not, such a power meter is built right in to your transceiver, so a separate piece of equipment to display measured power is not usually necessary. Still, it's essential to know how much RF power your rig is attempting to deliver to the antenna, especially on a fixed station.

On many, if not most, HTs (handheld transceivers) and mobile units, the power meter displays a series of

## Instrumentation, cont'd

bars on a graph, similar to the S-meter mentioned above. Typically, this bar graph only presents a relative quantity, such as discrete "Po" or "PO" units. Obtaining a more accurate RF power reading will likely require a separate, external power meter.



*Bird 43 wattmeter*

An **RF power meter** displays the output of your transceiver somewhere along your transmission line (coax). Discussed later, a **field-strength meter** measures the RF power that your transceiver sends out through your antenna. Yet another type of power meter measures the amount of **DC power** that your transceiver and other equipment draws from your power supply. And there are other types of power meters, so referring to a "power meter" can be ambiguous.

Other types of watt meters include peak-reading, average-reading, and directional. I won't go into detail about those here, but there's one make that I would like to mention: the Bird wattmeter, because many have asked my opinion about it. It's a very accurate and directional (can display how much power is being transferred in each direction) meter, and the Model 43 is considered the professional industry standard, and therefore very expensive (\$700 to \$1100 new). For most amateur needs, the Bird wattmeter is very much overkill, IMO.

### • SWR meter

An **SWR meter** is an instrument that displays the **standing wave ratio** of your antenna system. That is, it compares the amount of power being delivered to a load ("forward power" or "incident power"), with the amount of power being reflected by the load ("reflected power"), due to an impedance mismatch, in which case the **impedance** of the load does not perfectly equal that of the source. Because an SWR meter can measure the forward power, an additional power meter is not truly necessary at the same point.



An SWR meter requires power from the transceiver to work, and so must be inserted in the feed line between your transceiver and your antenna. Then, it'll display the SWR value as you transmit on your radio. Many transceivers, especially HF rigs, have SWR meters built into their displays, and will show the values while you're transmitting if you've selected SWR as the displayed meter.

Today's SWR meters tend to come in any of three flavors of readout displays: digital, gauge, and cross-needle. A digital Bird 43 wattmeter readout displays numerals for forward power, reflected power, and the SWR. A "gauge" meter displays the SWR by a needle across the dial, like the S-meter in an HF transceiver. A cross-needle display shows the forward power by one needle and the reflected power by the other needle, and you can read the SWR where the two intersect.

The SWR meter is good for a "sanity-check"; that is, provides a quick and easy way to visualize your antenna system SWR *at one particular frequency*. To get the "bigger picture" requires an instrument that can display the SWR for an entire band, for example. That's the job of an antenna analyzer.



*Cross-needle SWR meter*

## Instrumentation, cont'd



- **Antenna analyzer**

An *antenna analyzer*, such as the RigExpert AA-170 to the left, measures a number of things about your *antenna system*, which includes your coax, tuner / matching, and antenna, without the need of any applied signal from your transceiver. Among the important quantities measured is the *SWR bandwidth*, which is the range of frequencies for which the detected SWR is 2.0:1 or lower.

If you're the type of person who plans to make more than two or three antennas, then I highly recommend an antenna analyzer be part of your arsenal. On one hand, they can be expensive; on the other hand, if you're a regular antenna builder, you can justify the cost, especially for their convenience if you need to take many measurements while tuning your antenna.

One instrument that has taken the antenna analysis world by storm is the *NanoVNA*. It's a miniature but true VNA (vector network analyzer), and its ability to perform antenna analysis, coupled with its very low price tag, has made it nearly indispensable to the amateur crafter. It does have [somewhat of a learning curve](#), but I believe its low price and high functionality outweigh the time and effort you invest.

- **Multi-meter**

Once in a while you might want to measure your battery or solar panel voltage, your wall socket (house current) voltage, the resistance in your connections, or whether your coax has a short in it. If you do, a *multi-meter* might be what you need. But if you only need to measure voltage, why not just get a voltmeter? Because today, the technology makes it easy to combine several measurement functions into a single instrument, so meters that measure properties like voltage, current, and resistance tend to be packaged together.

As mentioned, a multi-meter is so-called because it can perform several functions, most typically that of a *voltmeter* (measures voltage), *ohmmeter* (measures resistance), and *ammeter* (measures current), then display their measured quantities. Most modern DMMs can also measure the validity of a diode, which allows current flow in one direction. More sophisticated multi-meters can measure and display other interesting properties, such as power, continuity, temperature, humidity, wind speed, and more.

It honestly doesn't matter whether your multi-meter is modern (*DMM : digital multi-meter*), analog (*VOM : volt-ohm meter*), or something more ancient (*VTVM : vacuum tube voltmeter*), as long as it works reasonably well for your needs. A DMM is my choice of multi-meter, but its biggest drawback is its inability to display more than one value per interval, like every second. This hides values that might occur between those interval samples, such as voltage transients while measuring your power supply output.

### **Nice-to-have measurement instruments**

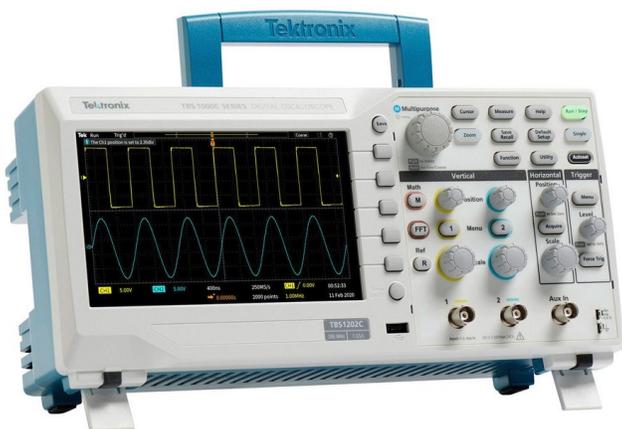
Some useful instrumentation might not be as essential to your needs as those in the previous section. That could be due to their usage frequency, their utility, or being out-of-reach due to their price. Here are some measuring tools that might come in handy (assuming you know how to use them), but can probably wait until you really need them or can afford them, if you don't borrow them from another person:



## Instrumentation, cont'd

### • Oscilloscope

An *oscilloscope* (often abbreviated as an *o-scope*) is a laboratory instrument that can display a signal waveform (shape of a periodic wave), even a complex one. The advantage of viewing a signal waveform is that it provides a snapshot of the signal during one period, allowing you to see an entire cycle of its voltage transition as a function of time. This way, you can be sure that the waveform is correct (square wave, sinusoidal, modulated carrier, etc.) and not a distorted (clipped, over-damped, etc.) version of it, allowing you to quickly test, verify, isolate, and debug a circuit if the signal is not as expected.



The proper operation of an o-scope requires more than a casual knowledge of electronics by the operator, who is often an electronics technician. An o-scope is a must-have device for a person who spends quite a lot of time developing, building, and testing electronics, but not as necessary to a person who simply dabbles in basic antenna-building.

### • Field strength meter

A few years ago, the FCC published updated guidelines on RF exposure, and gave us more than a year to comply with them. Most of the guidelines could be

met by making a few station assumptions, but if you really wanted to be certain about the RF radiation you're exposing your family and neighbors to, you would need to perform some actual testing. This requires the use of a *field strength meter*, which can display the relative RF electric field strength of a transmitted signal for a specific frequency at a specific height and distance from an antenna.

One helpful thing that can be learned from a field strength meter is the radiation pattern of an antenna, if that's important to you. And that could be important if you suspect your antenna pattern takeoff angle might be pointed too high to reach distant stations, or if your radiation pattern is a little more directional than you'd like it.

A field strength meter is nothing more than a simple receiver that's sensitive to the electric field at a particular frequency, regardless of mode. Professional field strength meters have been used to measure and verify the signal strength of broadcast radio and television stations as it's received over large distances, such as counties or small states. For amateur purposes, because most field strength meters are mode-agnostic, it's best to test your field strengths by using a transmitted carrier, such as with AM, CW, or FM.



*Field-strength meter*



### • Spectrum analyzer

Another useful tool is the *spectrum analyzer*. While an oscilloscope measures and displays voltages over a period of time, a spectrum analyzer uses an FFT (Fast Fourier Transform) to convert the signal from the time domain to the frequency domain. This converted display allows you to visualize the behavior of a signal across a wide range, or spectrum, of frequencies.

A spectrum analyzer is useful for exposing problems such as harmonics (multiples of a signal frequency) and spurious (imitation) emissions that your radio might be transmitting

## Instrumentation, cont'd

in a band outside the amateur or other bands of interest. It can also be used for identifying noise and other interference sources because the spectrum analyzer displays a graph of signal strength per frequency, and interfering signals will appear as spikes or relatively strong signals at the culprit frequencies.



*The tinySA*

Similar to the NanoVNA, the *tinySA* is a miniature, hand-held version of a fully equipped spectrum analyzer, that's proving to be a viable, useful, and inexpensive alternative to the standard instrument. Its frequency coverage isn't as large, and it

has fewer features than the standard spectrum analyzer, but if you need to examine amateur signals by a frequency spread, the *tinySA* might be in your future.

- **VNA**

One instrument that many RF engineers consider indispensable is the **VNA** (vector network analyzer). Think of your transceiver, your feed line (coax), tuner, and antenna as part of a network of components, some active and some passive don't require external power to make them work). Erratic voltages and currents, like you might measure with an oscilloscope, can be difficult to display at high frequencies, so a VNA can accurately display the power and phase of a signal as it travels through the network.



Measuring the signal power and phase in one direction provides part of the network picture, but the signal also needs to be evaluated in the opposite direction for properties such as reflection. So, instead of disconnecting and then reconnecting your network in the opposite direction, the VNA provides two ports to facilitate this. For this reason, a VNA is also known as a **two-port analyzer**.

High-frequency electrical networks can become very complex without much effort. The VNA helps simplify the complexity by use of what's known as S-parameters (scattering parameters). These values help detail how high-frequency energy propagates through an electrical network. They offer comprehensive insight into the linear behavior of RF and microwave components, and provide the very bases for filter, transmission line, and amplifier design.

Although you're not likely an RF engineer, you might still find a VNA useful in antenna modeling, feed line analysis, phasing, and for measuring a number of important properties, such as impedance, return loss, insertion loss, and SWR. *Phasing* is important if you want to construct an array of antennas to improve its overall gain. It can also be used in troubleshooting such problems as EMI, jitter, ground bounce, and crosstalk.

- **Power monitor**

Unlike a power meter, mentioned above, a **power monitor** measures and displays the voltage, current, and sometimes other properties of your power line, whether that's DC (direct current) into your radio or single-phase AC (alternating current) into your power supply and amplifier. Many power monitors have the ability to interrupt the power under an adverse condition, such as



*DC power monitor*

## Instrumentation, cont'd

over-current or a brown-out. If you live in an area of frequent brown-outs or poor power conditioning, a power monitor such as a UPS (uninterruptible power source) might help you.

One type of power monitor not only displays voltage and current, but also power consumption by your equipment. An immediately useful application of a DC power monitor is at your solar charge controller, where the monitor can give you some idea of its conversion efficiency.



### Other measurement instruments and thoughts

I'm not going to discuss every piece of instrumentation available to us, but depending on your needs, they could include a service monitor, frequency counter, thermometer, logic analyzer, battery tester, an LCR (inductance-capacitance) meter, and so much more.

### Instrumentation calibration

Your test instrument is only as good as its calibration. Maintaining good calibration on your equipment can provide accurate results, but there are a few trade-offs to think about.

1. One of the first considerations to calibration is the cost of performing the calibration. If you can calibrate it yourself, then you've saved on hiring a professional and the cost of shipping the device to the calibration lab. But if the calibration procedure is so difficult that you need to a) take a week to learn it and b) purchase special calibration equipment to get it done, you might need to ask yourself whether the calibration is all that necessary, and if it is, then whether you should eat the cost of having the lab do it after all.
2. The finer your accuracy demand, the more often and "closer to spec" you'll need to calibrate your test instrument. If your power ("watt") meter displays between 60 watts and 70 watts during a test transmission, when your mobile radio is set for the full 65 watts, it's probably not in need of calibration. Even though it's a little off, it probably reads "good enough" for what you need.
3. Some instruments, such as the pixel-displayed S-meter on your fancy HF transceiver, might be quite difficult (meaning impractical) to calibrate, and is not likely worth the cost and effort to send in the unit to get it done. If you find that one of your test devices (such as an SWR meter) seems *way* off, and yet it's nearly impossible to calibrate it (because it's built into a software application, for example), the problem might be with something else (like your antenna).
4. The factory calibration performed for many modern devices likely never need re-calibration unless they've been damaged in some way. Most high-quality DMMs, for example, arrive fully calibrated, and so probably never need to be re-calibrated.
5. The calibrations mentioned above are "factory" calibrations; that is, each is performed typically by a professional, to ensure an instrument's accuracy. The last calibration is a "peruse" calibration; that is, a minor calibration performed by you, before using the device that day. For example, an oscilloscope requires an expensive and detailed professional calibration by a trained expert, while a NanoVNA requires you to run through its brief calibration procedure before using it, to compensate for variations in temperature, vibrations, and humidity.

### Summary

Any testing or measuring device or software can be considered instrumentation. Most instrumentation can be considered non-essential to your particular needs, but even the essential ones are likely few, if any. Calibration is often an after-thought that many (amateurs and professionals alike) overlook, yet can be important, but its cost versus benefit must be taken into account.

Noji Ratzlaff KNØJI

## Strays – Taking it to the shop

It's an unfortunate fact of our physical world, but our gear gets old, parts give up their lives, and stuff wears out. Even new equipment is subject to damage by accidental dropping, water intrusion, and abuse. When your favorite rig needs repair, and you don't want to perform the job yourself, and you don't trust your handy ham friend to do it, you simply want to take it to the repair shop, leave it for a few days, and have a true expert technician take care of it, maybe even return it with a warranty.

So, do repair facilities still exist, where you can simply drop off your precious cargo and get it fixed, like you can for your car? Turns out they do, but as you might guess, that convenience come at a price. But if no price is too large to fix your dearest amplifier, then you're in luck. Here are a few places whose trusty repair shops can revive your ham radio gear (listed in no particular order):

### Affordable Radio Repair

Mike Anderson NØBXE  
Florence, Colorado  
mike@affordableradiorepair.com

### HamRepair.com

San Antonio, Texas  
214-476-5107  
info@hamrepair.com

### Amateur Radio Service

Paul Hansen W6XA  
Tucker, Georgia  
864-222-3539  
pwhansen@bellsouth.net

### Technical Specialists

Lee Sutherland W9DKC  
Spring Hill, Florida  
813-784-5536  
lee@hamradiorepairfix.com

### Clairmont Skyland Radio Repair

Bill Waller KC4OVY  
Toccoa, Georgia  
678-971-1130  
clairmontskylandnorth@gmail.com



### Manufacturers

If you're more inclined to ship your rig back to its roots, many manufacturers repair each of their own models, depending on the year it was made:

#### Yaesu USA

Cypress, California  
714-827-7600  
customerservice@yaesu-us.com

#### Kenwood FTH Repair

Walnut, California  
626-333-2435  
support@fthgroupinc.com

#### Icom Repair Center

Kirkland, Washington  
425-454-8155

#### REMtronix Authorized Alinco Repair

Manteca, California  
209-800-1945  
alinco-support@remtronix.com

#### BTech Radio Repair

Arlington, South Dakota  
support@baofengtech.com

### Finally

We used to have two repair shops right here in Utah, but sadly they've had to hang up their scope probes and retire to greener pastures. Know any others? Please share!



# Utah DCC

Utah Digital Communications Conference  
Advancing Amateur Radio through Traditional and Digital Innovations

Keynote Address:

## The Truth Behind EMPs and CMEs

### Conference Topics

- ✓ ARES Emergency Preparedness and Communications
- ✓ Field Radio (POTA/SOTA)
- ✓ Mesh Communications (Meshtastic/AREDN)
- ✓ Additional Topics on Getting Started with CW, NanoVNA, Satellite Tracking and More



**Conference Admission:**  
Adult \$17  
Under 18 Free



SLCC Conference Center – Sandy, Utah  
**February 28, 2026 | 9 AM – 5 PM**



**Registration and Conference Details**  
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**We encourage you to submit** original pictures (highest resolution), articles, software and hardware descriptions, appropriate humor, and responses to editorials. Email the content, pictures attached, to the editor at [editor@utaharc.org](mailto:editor@utaharc.org) by the 20th just prior to the target month.

The **Utah Amateur Radio Club** was organized under its present name in 1927, although its beginnings may date back as early as 1909. In 1928, it became affiliated with the **American Radio Relay League** (club #1602) and is a 501(c)(3) non-profit organization. It holds a club station license with the call sign W7SP, a memorial to Leonard "Zim" Zimmerman, amateur radio pioneer in the Salt Lake City area.

**The club meets each month** except July and August. The meetings are usually held on the second Thursday of the month at 7:30 PM in the University of Utah's **Warnock Engineering Building**, room 2230.

**Club membership** is open to anybody interested in amateur radio; a current license is not required. Dues are \$20 per year. Send dues to club secretary James Bennett, 4960 W 5400 S, Kearns, Utah 84118. Send address changes to [kk7avs@gmail.com](mailto:kk7avs@gmail.com)

**Tax-deductible monetary contributions** are gladly accepted. Send directly to club treasurer Shawn Evans, 1338 S Foothill Dr, #265, Salt Lake City, Utah 84108-2321. For in-kind contributions, please contact [uarc@xmission.com](mailto:uarc@xmission.com) to make arrangements.

**UARC maintains** the 146.620– and 146.760– repeaters, which are administered by the **UARC Repeater Committee**. Direct comments and questions to any committee member. The 146.760– repeater is on IRLP node 3352.

Call the **UARC Ham Hotline** at **801-583-3002** for amateur radio information, including club, testing, meeting, and membership information. Leave a message, and we'll make an effort to return your call.

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**For-late breaking news** listen to the UARC Information Net, Sundays at 8:30 pm on 146.620– or visit the [announcement page](#).

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