Smoke Signals

Newsletter of Fullerton Radio Club

August 2024

Presidents Column

The Summer of POTA.

Two ham radio activities I very much enjoy are operating Parks on the Air (AKA POTA) and talking to my friends on the radio. During the past twelve weeks, I have done plenty of both. My wife KJ6QLY and I have been towing our small travel trailer around the west since early June, camping in (so far) 18 different state and national parks in the US and Canada. In many of these parks, I was able to work in a POTA activation, in between hiking, sightseeing, and other generally touristy activities.

I have had QSOs with POTA "hunters" all over the US, Canada, and a few in Europe. But in just about every activation, I also had QSOs with Fullerton Radio Club Members and friends.

Thanks to the following folks for regularly listening for me:

Dick WB6JDH
Joe K0OV
Bart WB6WUW
Tom KB6A
Alex AC9DX
John K6AHY
Del K7PD

Thanks also to Joe for providing detailed propagation predictions and Bart for providing "Reader's Digest" versions of Samantha Skov's space weather reports.

73,
Bob AD6QF

Upcoming event

Our next "2nd Saturday in the Park" will be September 14 at Hillcrest Park. We will do some newer ham mentoring and may try to make a few contacts during the ARRL VHF Contest. Come join us. Details to follow.

What's Happening On the Outside of Your Coax?

By Joe Moell K0OV

When I got my Novice license at the age of 11, it was the peak of the sunspot cycle. Of the three HF bands that Novices could use, on CW only, 15 meters offered the best opportunities for DX. That band was usually wide open during daylight hours.

My first antenna was a 15-meter folded dipole[1] a few feet above the ridge of the house roof. Both the dipole and the feedline were 300-ohm "twinlead,"[2] which was very inexpensive because it was the line of choice for rooftop TV antennas in my fringe-area hometown. Impedance of this folded dipole was about 300 ohms, but matching it was no problem for the pi-network output in my Heathkit DX-40 transmitter.

Good twinlead has very low loss, but it needs to be routed in the clear, several inches away from buildings, gutters, other wires, etc. Proximity to metal would upset the balance of the electrostatic and electromagnetic fields that extend out from each of the two wires. Twinlead is not suitable for burial, for the same reason.

Fullerton Radio Club
P.O. Box 545, Fullerton, CA 92836

FRC August 2024 Board Meeting Minutes

The monthly FRC Board Meeting was called to order by President Bob Houghton AD6QF at 5:30 PM on Wednesday, August 7, 2024. Additional board Members present included VP Robert Gimbel KG6WTQ, Treasurer Gene Thorpe KB6CMO, Members at Large Walter Clark, Larry McDavid W6FUB. Board members absent: Bart Pulverman WB6WUW.

The July Board Meeting minutes were reviewed and approved without amendment.

Treasurer's Report
- Bank balance: $6237.47 as of August 5.
- New deposits: $20.02 interest, Jesse James membership
- New expenditures: None
- New members: None
- Bob's records show 34 memberships 2024 paid and 1 life member as of 8/5/24.

Old Business
- None

New Business
- Saturday 8/10 "2nd Saturday in the Park" at Hillcrest
- Hands-on new ham training ideas

There being no further discussion the meeting was ended at 5:45 PM.

Submitted by President Bob Houghton

About this time, TV antenna installers were beginning to discover the benefits of coaxial feedlines, especially for the new color TV sets that were coming to market. Although costlier than twinlead and having higher loss, coax had the big advantage of being relatively unaffected by its surroundings. It could be run along gutters, taped to masts, and even buried without causing the "ghosting" that often plagued analog TV in those days. Hams began using coax for feeding their HF and VHF antennas for the same reason.

A 1965 article in Electronics World[3] made this claim about coax: "The electrostatic lines of force appear only between the inner and outer conductors. They do not cancel out but are confined within the cable shield. Since no part of the coaxial cable fields appears outside the cable, it is completely unaware of its surroundings. Coax won't pick up direct TV signals. Coax won't pick up auto or appliance interference."

However, to quote Ira Gershwin, "It ain't necessarily so." Because of the "skin effect," RF flows only on the surface of any conductor. In coaxial transmission lines, the desired currents flow on the outside of the center conductor and the inside of the shield, keeping the fields confined inside. However, different RF currents can flow on the outside of that same shield. Usually we don't want that. As an example, visualize a coax line from your

transmitter to a horizontal dipole antenna. The coax center conductor connects to one side of the dipole and the coax shield to the other side. As RF reaches the antenna, current from the center conductor flows onto one side of the dipole. Depending of the match, the current arriving from the inside of the shield divides. Part goes to the other side of the dipole and part goes back down the outside of the shield. [4] Both currents radiate, so the antenna system launches horizontally polarized RF from the dipole and vertically polarized RF from the outside of the coax shield.

We may not care which parts of this antenna system radiate our signal, as long as we're making contacts. But what if the coax is fastened to a metal mast or runs along other wires? That's why it's good practice to put a balun between coax and antenna to choke RF from the outside of the shield.

RF chokes can be very important for receiving, too. See the photo of my six-element UHF quad, which I use for transmitter hunting on the 440 MHz band. There are 25 ferrite beads that I added over the outside of the coax at the feed point. Without these beads, the combination of the desired signal from the quad and signal pickup on the coax shield caused a 90-degree error in bearings. With the beads, the receiving pattern of the quad is nearly perfect.

UHF Quad

MFJ 1886 Receiving Loop

When WA6OPS and I moved into our ground-floor suite in Morningside of Fullerton, I knew we would have to be content with vertical antennas for the HF bands. I soon discovered that our building is plagued with broadband noise sources that ruin reception from verticals, especially on 75 and 40 meters. So I put up a broadband loop with preamp for receiving (MFJ-1886). These so-called "magnetic" loops are very directional and do an excellent job of rejecting electrical noise, although there is controversy about the underlying theory. That's a subject for another article.

The preamplifier in the base of this loop on my patio is connected to the receiver via 75-ohm coax. I was very disappointed when I first used it because the local noise was just as bad as on my verticals. It covered up all but the strongest signals.

I did a lot of snooping and probing with a portable HF receiver (Icom R-20). I couldn't find

the source of the noise within our apartment, but I noticed that re-radiation of the noise along the 75-ohm coax was very strong. No doubt the coax shield was acting as a longwire antenna, picking up the noise and coupling it into the loop preamp.

A ferrite choke (sometimes called a W2DU balun) on each end of the coax ought to keep the picked-up noise on the shield from getting into the loop preamp and receiver. I built several RF chokes from ferrites that I had on hand, but none provided more than about two S-units reduction in the noise. Then I discovered the High Common Mode Impedance Feedline Choke by DX Engineering.

Its RF impedance is specified as more than 2000 ohms from 200 kHz to 30 MHz. On 160 through 40 meters, the impedance is over 8000 ohms. It is designed for receiving only, which is why it has CATV-type F-series connectors.

The waterfall displays (see below) show that before adding any chokes, the noise floor on 40 meters was -90 dBm (almost S9) and only the strongest signals were receivable. With DX Engineering chokes on each end of the coax from the loop, the RFI is suppressed, atmospheric noise at -120 dBm can be heard, and the band is full of signals.

So pay attention to what's happening on the outside of your coax. It may be just as important as what's going on inside.

Joe Moell K0OV

REFERENCES:

[1] www.qsl.net/w4sat/fdipole.htm
[2] en.wikipedia.org/wiki/Twin-lead
[3] www.rfcafe.com/references/electronics-world/coax-vs-twinlead-electronics-world-july-1965.htm
[4] www.homingin.com/files/QST1983MarchBalunsW2DU.pdf

Promoting PowerPoles

by Larry McDavid W6FUB

I've talked about PowerPole connectors for low-voltage power recently because several members have purchased new ham radios and needed to connect them to power supplies. I believe using PowerPole connectors serves that purpose well.

Of course, there are details...

Our common PowerPole 12 volt dc power connector uses red and black connector shells but has the choice of three contacts rated at different current capacities. The contact choices fitting this common-size shell are rated 15 Amp, 30 Amp and 45 Amp; all three will fit the same plastic shell. Because of the different current ratings, the contacts are designed to accept different gage wires, as shown below:

15 Amp Contact accepts 16-18 AWG wires
30 Amp Contact accepts 14-12 AWG wires
45 Amp Contact accepts 10 AWG wire only

PowerPole contacts are silver-plated copper alloy, soft enough to allow gas-tight crimping onto stranded wire. Sufficient contact-to-contact mating force is provided by a high tensile-strength leaf spring built into each plastic shell; when connectors are mated; these leaf springs provide the necessary long-life contact force. The end of this leaf spring snaps into a groove on the back side of the contact and prevents the contact sliding out the rear of the shell.

Most PowerPole crimping tools have three different jaw sets, each to accept only one rated-current contact. The tools are ratcheting, so once started closing you must complete the full crimp in order for the tool to release the jaws; this ensures the best crimp of the wire.

Note that this crimp is intended for only stranded-conductor wire! Do not try to crimp solid conductor wire.

The PowerPole connector design is hermaphroditic so there is only one "gender" contact. In practice this is very convenient as you don't need to worry about "pin" and "socket" contacts. In the world of connectors, the terms, "male" and "female" refer to connector shells, not contacts.

That leaves the question of contact polarity. That is absolutely essential to get consistent. There is no right and wrong but there is now a very-well established polarity standard that is virtually universally accepted. That is important because you don't want to worry about dc polarity when you mate these connectors.

This polarity contact position and wire color is widely documented but I like to remember a simple mnemonic so I don't have to go find a drawing. I use this and remember its "catchy" rhyme easily:

"Red Right Tang Top" or "RRTT"

Thus, looking at the mating end of a PowerPole connector, the positive (Red) wire is on the right and the negative (Black) wire is on the left. The contact is a single leaf or tang held by the connector shell on the top side of the connector shell.During assembly, you orient the individual

shells so the that contact leaf, or "Tang" is on the Top. Think, "RRTT." The two pictures above show this orientation clearly.

I recently had to apply PowerPole connectors to an Icom power cable. This allows the cable to be connected easily to many kinds of power supplies and battery packs I use. If you use PowerPole connectors on every 12 vdc power connection, all will fit together and you won't be looking for power connector adapters!

You must have a good PowerPole crimper but no other required tools are unique to the connector. Each contact has its own individual connector shell and the individual shells (usually red and black) slide together side-by-side in grooves and are held from sliding apart by a short spring roll pin. Shells, contacts, roll pins and tools are all readily available locally. If you must later remove a contact from a shell, there is a PowerPole tool for that purpose; nothing else works well.

See the attached pictures showing the "RRTT" orientation and my construction of an Icom power cable. Listen for a distinct "click" when inserting contacts fully into the connector shells; sometimes it takes an unexpected "push" to get the contact fully seated in the shell. I used a short piece of 3/4-inch (or, 5/8-inch) diameter heat shrink tubing over the rear of the PowerPole shells and the wires. Some small tie wraps complete the job.

The Icom-supplied power cable uses 12 AWG wire so it is best to use the 30 Amp rated contact. The 45 Amp contact is sized to crimp only on 10 AWG wire; 12 AWG wire is a loose fit in the 45 Amp contact and will not crimp well. See the picture of the completed power cable; the two black blocks are fuse holders supplied with the Icom cable.

Icom cable after PowerPole installation

The final picture shows the PowerPole crimp tool I've had for many years. Be sure to get a crimp tool that has a set of three crimp jaws, one for each of the contacts.

PowerPole crimping tool

There are *many* accessories for PowerPole connectors and power cables. Fused junction boxes, numerous kinds of hand-held connector blocks, panel mount parts, cigarette light outlet adapters name just a few. A principal local supplier of a wide-range of PowerPole parts is PowerWerx in Yorba Linda and on-line at:

https://powerwerx.com/

HRO in Anaheim stocks many of the common PowerPole connectors and parts.

Note that there are many colors of PowerPole connector shells available. The ham community has standardized on red and black for 12 vdc (or, 13.8 vdc) but if you use these connectors for other voltages you should select different colors.

And, there are many larger sizes of PowerPole connectors using different shells and different contacts; there are crimp tools available for all these.

I've talked about PowerPole connectors for low-voltage power recently because several members have purchased new ham radios and needed to connect them to power supplies. I believe using PowerPole connectors serves that purpose well.

Of course, there are details...

Our common PowerPole 12 volt dc power connector uses red and black connector shells

but has the choice of three contacts rated at different current capacities. The contact choices fitting this common-size shell are rated 15 Amp, 30 Amp and 45 Amp; all three will fit the same plastic shell. Because of the different current ratings, the contacts are designed to accept different gage wires, as shown below:

15 Amp Contact accepts 16-18 AWG wires
30 Amp Contact accepts 14-12 AWG wires
45 Amp Contact accepts 10 AWG wire only

PowerPole contacts are silver-plated copper alloy, soft enough to allow gas-tight crimping onto stranded wire. Sufficient contact-to-contact mating force is provided by a high tensile-strength leaf spring built into each plastic shell; when connectors are mated; these leaf springs provide the necessary long-life contact force. The end of this leaf spring snaps into a groove on the back side of the contact and prevents the contact sliding out the rear of the shell.

Most PowerPole crimping tools have three different jaw sets, each to accept only one rated-current contact. The tools are ratcheting, so once started closing you must complete the full crimp in order for the tool to release the jaws; this ensures the best crimp of the wire.

Note that this crimp is intended for only stranded-conductor wire! Do not try to crimp solid conductor wire.

The PowerPole connector design is hermaphroditic so there is only one "gender" contact. In practice this is very convenient as you don't need to worry about "pin" and "socket" contacts. In the world of connectors, the terms, "male" and "female" refer to connector shells, not contacts.

That leaves the question of contact polarity. That is absolutely essential to get consistent. There is no right and wrong but there is now a very-well established polarity standard that is virtually universally accepted. That is important because you don't want to worry about dc polarity when you mate these connectors.

This polarity contact position and wire color is widely documented but I like to remember a simple mnemonic so I don't have to go find a drawing. I use this and remember its "catchy" rhyme easily:

"Red Right Tang Top" or "RRTT"

Thus, looking at the mating end of a PowerPole connector, the positive (Red) wire is on the right and the negative (Black) wire is on the left. The contact is a single leaf or tang held by the connector shell on the top side of the connector shell.During assembly, you orient the individual shells so the that contact leaf, or "Tang" is on the Top. Think, "RRTT." The first two attached pictures show this orientation clearly.

I recently had to apply PowerPole connectors to an Icom power cable. This allows the cable to be connected easily to many kinds of power supplies and battery packs I use. If you use PowerPole connectors on every 12 vdc power connection, all will fit together and you won't be looking for power connector adapters!

You must have a good PowerPole crimper but no other required tools are unique to the connector. Each contact has its own individual connector shell and the individual shells (usually red and black) slide together side-by-side in grooves and are held from sliding apart by a short spring roll pin. Shells, contacts, roll pins and tools are all readily available locally. If you must later remove a contact from a shell, there is a PowerPole tool for that purpose; nothing else works well.

See the attached pictures showing the "RRTT" orientation and my construction of an Icom power cable. Listen for a distinct "click" when inserting contacts fully into the connector shells; sometimes it takes an unexpected "push" to get the contact fully seated in the shell. I used a short piece of 3/4-inch (or, 5/8-inch) diameter heat shrink tubing over the rear of the

PowerPole shells and the wires. Some small tie wraps complete the job.

The Icom-supplied power cable uses 12 AWG wire so it is best to use the 30 Amp rated contact. The 45 Amp contact is sized to crimp only on 10 AWG wire; 12 AWG wire is a loose fit in the 45 Amp contact and will not crimp well. See the picture of the completed power cable; the two black blocks are fuse holders supplied with the Icom cable.

The final picture shows the PowerPole crimp tool I've had for many years. Be sure to get a crimp tool that has a set of three crimp jaws, one for each of the contacts.

There are *many* accessories for PowerPole connectors and power cables. Fused junction boxes, numerous kinds of hand-held connector blocks, panel mount parts, cigarette light outlet adapters name just a few. A principal local supplier of a wide-range of PowerPole parts is PowerWerx in Yorba Linda and on-line at:

https://powerwerx.com/

HRO in Anaheim stocks many of the common PowerPole connectors and parts.

Note that there are many colors of PowerPole connector shells available. The ham community has standardized on red and black for 12 vdc (or, 13.8 vdc) but if you use these connectors for other voltages you should select different colors.

And, there are many larger sizes of PowerPole connectors using different shells and different contacts; there are crimp tools available for all these.

There is some acquired skill needed when assembling PowerPole connectors. It is important to get the wire strand orientation correct for the polarity position before crimping, for example; it is unwise to try to twist a large-gage wire 180 degrees if you get that wrong! Many crimp tools allow you to insert the contact into a cavity that orients the contact tang consistently for wire strand insertion. Expect to need two hands to complete closing the crimp tool. I suggest you practice and use dry runs before you crimp critical parts.

All that said, practice and care will produce a very reliable and easy-to-use power/connector system.

All that said, practice and care will produce a very reliable and easy-to-use power/connector system.

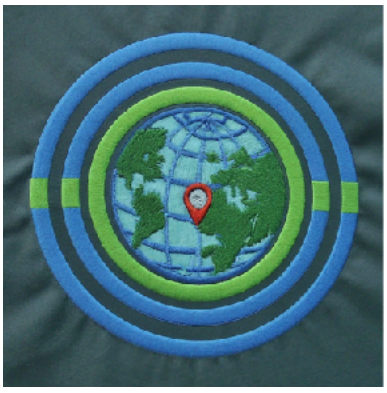
APRS Gets Some Love

It's been 42 years since Bob Bruninga WB4APR started developing an idea that ten years later would come to be known as APRS - the Automatic Packet Reporting System.. For the next thirty years years Bob pretty much solely administered and developed the many features of what was really designed to be a situational awareness and messaging system (not just a pin in a map). When the "benevolent dictator" of APRS became a silent key (silent keyboard?) there was justifiable concern that APRS might also die, or at least change in unpredictable and uncoordinated ways. I have seen more than one YouTube video proclaiming that APRS is dead.

I recently learned that in the two years since Bob's passing there has been much work silently going on to guide the future development of the APRS standard.

A new 501c(3) non-profit organization called APRS Foundation has been formed and will be shepherding future APRS development.

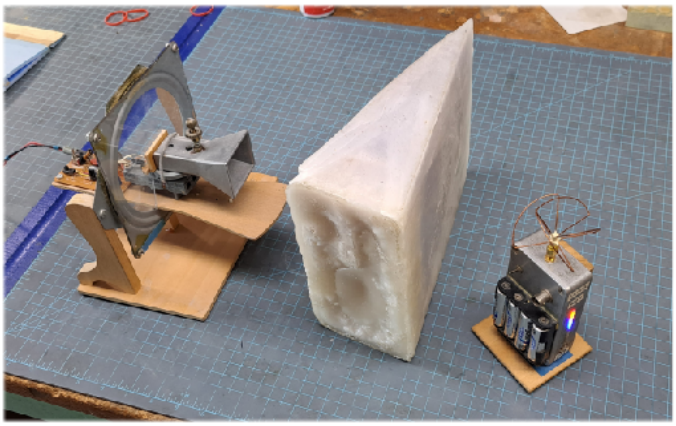
For more information visit aprsfoundation.org



APRS Foundation Logo

TAG Activity Report for August 2024

Walter Clark, your host, demonstrated the theme for the evening "something optical" with a paraffin prism, and a 10 GHz beam of microwave. Notice it is deflected toward the wide end.



Larry McDavid is an active member of the Microscopy Society of Southern California. One of the things he likes to do is restore microscopes and then through that society, make them available for children. The microscope he brought here is a Nikon SMZ-1B. He said there are two optical systems for stereo microscopes; the one he brought uses a Greenough system with two independent optical paths with excellent stereo-image merging. Greenough systems have slightly divergent-angle optical paths, as opposed to parallel-path optics. Both systems allow the eyepieces to spread apart to adjust for the user's individual interpupillary distance.

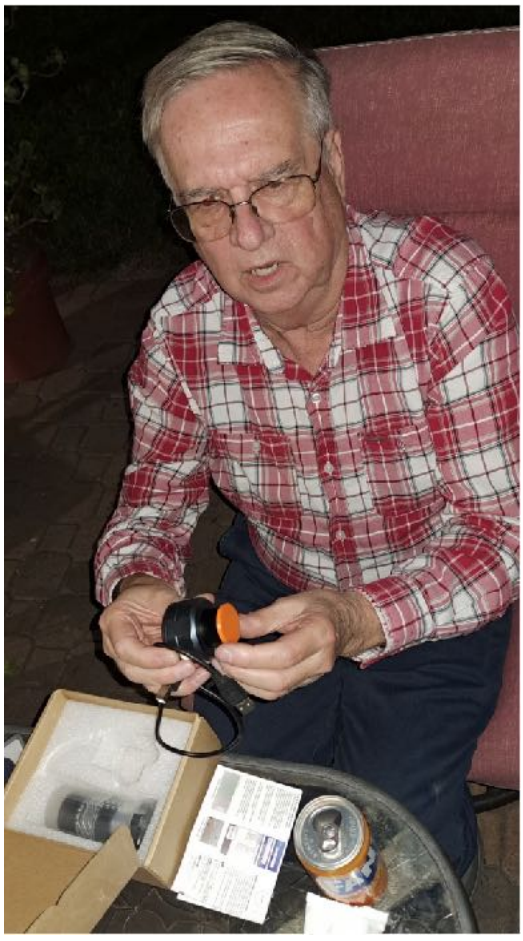
The two large knobs move the entire optical head up and down to adjust focus; the smaller two knobs continuously adjust zoom magnification from 8 to 35X power. This magnification range is just right for working on Surface Mount Technology electronics, and the working distance allows space for a soldering iron. Most modern electronics use SMT chips and a good stereo microscope is really important.

Dick Palmer meant to bring a green laser which is quite strong. But forgot, being distracted by the oatmeal cookies his wife made for us at the meeting. There was discussion on the legal use, and how the green light is actually generated.

Larry McDavid couldn't let a meeting go by without a discussion on crimping technology for permanent connections. As silly as that sounds,

all of us are very interested in this subject. Larry talked about using stranded THHN wire for house wiring; large-gage stranded wire is much

easier to pull through a metal conduit than is common solid-conductor wire. However, a simple screw cannot tighten against stranded wire; the strands just get pushed apart. The solution is to use a “Crimp Ferrule;” the metal ferrule crimps and holds the strands together so a screw-end can tighten against the wire for a good connection. The crimping tool is self-adjusting to accommodate different size crimp ferrules for different gage wires. The crimped ferrule does not form a gas-tight crimp as in common crimped terminals but rather holds the strands together so a simple screw can tighten and form the gas-tight connection. Larry pointed out that electrical codes in Germany, for example, require the use of crimp ferrules for stranded wire. For some reason, crimp ferrules are not well known in the USA but are common through the EC. Larry’s first experience with crimp ferrules was in automation PLC (Programmable Logic Controller) wiring with small-gage wires. The crimp ferrule assortment Larry showed was for 26 to 6 AWG wires; the picture shows Larry applying a crimp ferrule to 10 AWG house protective-ground green wire.



Bill Webb brought a “stacking camera.” It is useful for exceedingly dim scenes that don’t move very much; principally astrophotography. The red cap he’s holding is over a tube which fits the eyepiece holder of a telescope. It is for those new to digital astrophotography, thus the low price. https://www.svbony.com/sv105-planetary-camera/#F9159B That is, the resolution is not as good as most telescopes can reveal but is adequate for playing with “stacking mode.” Instead of exposing film for many seconds, this camera digitally adds brief exposures for an equivalent of a time exposure of many seconds; minutes even. This trick eliminates a source of noise, film doesn’t have; dark noise. What makes it non-trivial is that it aligns the images so you don’t have to guide the scope. In fact

you don’t even need a clock drive. Fer sure that’s something film can’t do.

The first time he played with it, he didn’t think much of the software. He looked at the latest software last week and it looks pretty good.

Bill also brought his small O-Scope. The advantage of smallness is that it doesn’t take up much room on the work bench. This is important if you rarely need it. Another advantage over the restored Tektronix scopes is a video display instead of a phosphor screen. The various knob setting are very easy to see. They show up momentarily on the screen instead of under a knob. Priced at under $100, it has specs normally only seen in much more expensive scopes. This was accomplished by numerous “tricks” in the firmware. For my purposes, microcontroller projects, it is just fine. http://www.zeeweii.com/productinfo/dso3d12.html