

Call For Nominations

Nominations for next year's CVARC Board of Directors will be accepted at this month's club meeting. All board positions are open for nominees. So if you are interested in one of the board positions, you can be nominated by simply volunteering to fill that position. The list of nominees will be published in the November Newsletter with election of the new board occurring at the November meeting.

Being a board member is not a difficult job. In fact we have a good time at our board meetings socializing and planning future club activities. Board meetings generally occur on the third Thursday of each month (the Thursday following each club meeting). However, the schedule for the board meetings is set by the board members and can be changed to whatever day is convenient. There are no special requirements or experience needed to become a board member. If you are a new amateur radio operator, becoming a board member is not only fun, it provides one of the best ways to meet other hams and learn about the many aspects of our hobby. If you are an old timer, your wisdom and experience on the board will be of tremendous help in guiding the CVARC activities. So I encourage each of you to seriously consider becoming a CVARC board member. If you know of someone who would like to become more involved in CVARC activities, encourage them to become a board member.

We need new people to serve on the CVARC Board of Directors each year. New people bring new ideas and different points of view that are critically needed to keep CVARC operating as an effective organization that supports our community and all of amateur radio.

Mark Your Calendar For December 4th

By Paula Larson, KG6FUM

The annual CVARC Holiday Party will be held on Saturday December 4th at Rory Eikland's home. So mark your calendar for that date.

CVARC Meeting October 14th

Gary Hirth, the owner of the Thousand Oaks Batteries Plus store, will be the speaker at our October 14th CVARC Club Meeting. Our CVARC club meeting will begin at 7:30 PM at the Elks Lodge on Conejo School Rd., with a social session from 7 to 7:30 PM. Hope to see you there.

FCC License Examinations - Next Exam On October 10th

By Jeff Reinhardt, AA6JR

CVARC hosts FCC License Examinations at 8:30 AM on the second Sunday of even numbered months at the Ventura East County Sheriff Station on Olsen Rd. (near the Reagan Library). CVARC conducts exams for all license classes. Exam candidates must bring a form of government issued photo I.D., the original AND a photocopy of any existing license or Certificate of Exam Element Completion, a Social Security (or government issued Taxpayer I.D.) number, and \$12 ARRL VE Exam fee (cash is preferred). No advance reservation is necessary, walk-ins are welcome. Advance notice is needed for special circumstances, such as reading the exam to sight-impaired candidates. If you have any questions, contact CVARC VE Coordinator Jeff Reinhardt at 818-706-3853.

Copper Pipe J-Pole Antennas

By Rory Eikland, KG6HCU and Ken Larson, KJ6RZ

Rory and I have had excellent experience building and using J-Pole antennas constructed from 1/2 inch ridged copper pipe, so we decided that we would share our experiences. A copper pipe J-Pole antenna is a single band antenna that is much like a half wave dipole in that it is relatively easy to build, and when you are done you achieve the satisfaction of having built a very good antenna that works as well as expensive commercial antennas. That is exciting.

My own experience with J-Poles did not start out so well. Thinking that copper pipe would be hard to work with, I built some J-Pole antennas using TV twin lead. TV twin lead J-Poles are commonly known as "roll up" portable antennas since you can roll one up and put it in your luggage when you are on travel. A roll up J-Pole provides a reasonable antenna that you can hang up in your hotel room. While a TV twin lead J-Pole is great for this purpose, I was not very impressed with the antenna for a more permanent installation. I did not have any problem with the physical aspect of the antenna. I simply slipped the twin lead J-Pole inside a piece of PVC pipe and made a very nice looking antenna for 2 meters. I also made 220 MHz and 440 MHz antennas following this approach. The problem that I had was that I was never able to tune them for a low SWR. The best that I was able to do was about 1.75 : 1. In hind sight, I think that the problem may have been that I did not experiment enough with the coax tap positions.

My RV forced me to reconsider J-Pole antennas. My RV has a rubber roof so VHF and UHF magnetic mount antennas will not work on it. To overcome this problem I built three 1/4 wave vertical ground plane antennas, complete with radials, and mounted them on the RV roof. The antennas covered 2 meters, 220, and 440 MHz. The ground plane antennas worked ok, except that the radials bounced on the RV roof as I drove down the road. From inside the RV it sounded like I was in a perpetual rain storm, even on nice sunny days. On top of that, the radials began to break off one by one after a few trips across country. I really needed to do something better.

After many hair brain ideas that didn't work out too well, I reluctantly decided to try a copper pipe J-Pole for 2 meters. It wasn't hard to make. I bought the copper pipe, elbows, and tees at a local plumbing store. I used a hack saw to cut the pipe pieces to length and a K-mart torch to solder the pieces together. It was kind of fun. Then for the big test. The 2 meter antenna worked perfectly on the first try! It has a flat 1 : 1 SWR across the entire 2 meter band. I followed that with a 440 MHz J-Pole. That one worked well also, but was a little harder to tune.

A J-Pole antenna, like the one shown in Figure 1, is an end fed half wavelength antenna with a quarter wave tuning stub (the J part of the antenna) at one end that matches the coax feed line to the half

wavelength radiating element. The total length of the antenna is thus 3/4 of a wavelength. The coax is connected to the tuning stub a short distance up from the based of the stub.

The J-Pole antenna is an adaptation of a 1/2 wavelength radiator end fed by a 1/4 wavelength transmission line that was developed as a trailing HF antenna for Zeppelin airships in the 1930s. Used as a vertical VHF/UHF antenna, the J-Pole has the advantage that it is omnidirectional, has a low angle of radiation, and does not require a ground plane as do 1/4 and 5/8 wavelength verticals.

There are a lot of articles on J-Pole antennas. In what follows, Rory and I describe an approach which we collectively arrived at to build copper pipe J-Pole antennas that are easy to construct, durable, and easy to tune. We also try to take the ϵ magic ψ out of the J-Pole design by explaining how we arrived at the appropriated lengths for the various sections of the antenna.

Technical Background

The upper section of the antenna, Section A shown in Figure 1, is the antenna's 1/2 wavelength radiator. The lower section, Section B, is the 1/4 wavelength tuning stub. So how long is a half wavelength? The wavelength for a very thin bare wire antenna in free space (an antenna wire with no insulation) is equal to the speed of light (300 mega-meters per second) divided by the frequency f in MHz of the radio signal to be radiated by the antenna ($f = 146$ MHz for the center of the 2 meter band). To convert the wavelength to inches, multiply the wavelength in meters by 100 to express the length in centimeters, and then divide by 2.54 centimeters per inches. This wavelength number must be multiplied by a factor K , where $K < 1$, to account for the fact that the antenna will be constructed from 1/2 inch diameter copper pipe instead of a very thin wire. So wavelength

$$L = K [(300 / f)(100)] / 2.54 \text{ inches} = K (11811 / f) \text{ inches.}$$

The factor K for bare wire (and bare copper pipe) can be determined from the graph show in Figure 2 that was obtained from the ARRL Antenna Book. The numbers along the bottom of the graph are equal to the ratio r of the wavelength for a very thin wire to the diameter d of the wire (or pipe) to be used in building the antenna. That is

$$r = (11811 / f) / d$$

For 1/2 inch copper pipe, $d = 0.625$ and at $f = 146$ MHz, $r = 129$.

Reading vertically from 129 at the bottom of the graph up to the solid line curve and then horizontally to the left hand axis shows that $K = 0.958$, approximately, for 1/2 inch copper pipe at 146 MHz. Doing the same calculation for $f = 440$ MHz arrives at a value of $K = 0.945$. We can simplify our work by using an approximate value for K which is equal to average of the 2 meter and 440 MHz numbers. This approximate value of $K = 0.952$, and is suitable for building 2 meters through 440 MHz antennas. Notice that values of $K < 1$ created by using thicker antenna wire or pipe makes the antenna shorter than it would otherwise be. Thicker ϵ wire ψ also broadens the bandwidth of the antenna, which is a good thing.

The above procedure can be used to arrive at the K value for any size bare copper or aluminum pipe (for example 3/4 inch pipe which might be used to make a larger 6 meter J-Pole). If you are making a ϵ roll up ψ J-Pole antenna out of TV twin lead or ladder line, then you must obtain the value of K (the velocity factor) for that particular type of cable from the manufacture or tables such as found in the ARRL antenna books.

Plugging in the average value for K obtained above in the wavelength equation gives

$$L = 11244 / f \text{ in inches}$$

for 1/2 inch copper pipe J-Pole antennas. We will use this wavelength equation for all of our calculations.

For a 2 meter $f = 146$ MHz J-Pole antenna, the 1/2 wavelength radiating section (Section A) is equal to

$$A = 0.5 L = 0.5 (11244 / 146) = 38.5 \text{ inches}$$

and the 1/4 wavelength stub section (Section B) is equal to

$$B = 0.25 L = 0.25 (11244 / 146) = 19.25 \text{ inches.}$$

The length of the spacing Section S between the two 1/4 wavelength stub elements is not too critical. The primary consideration is to use a spacing that makes the antenna easy to build. Since the stub is actually a 1/4 wavelength transmission line, changing the spacing changes the stub's characteristic impedance and thus the tap point D at which the coax feed line is attached. The characteristic impedance Z of the stub is equal to

$$Z = 276 \log (2S / d)$$

where S is the spacing between the elements and d is the diameter of the copper pipes.

The impedance at the bottom of the stub is approximately 0 ohms (the stub is short circuited at the bottom) and very high at the top end where it is an open circuit. In the middle the stub is equal to its characteristic impedance which is on the order of 225 ohms. Somewhere between the bottom of the stub and the middle, the impedance will be roughly equal to 50 ohms. The tuning process consists of moving the coax tap point up and down the lower part of the stub until the 50 ohm position is found represented by a minimum SWR reading.

Reasonable values for S

BAND	S
2 meters:	2.5 inches
223 MHz:	1.75 inches
440 MHz:	1.25 inches.

Building VHF and UHF J-Pole Antennas

The following table summarizes the dimensions (in inches) for 1/2 inch copper pipe J-Pole antennas designed for the center of the 2 meter, 223 MHz, and 440 MHz amateur radio bands.

Band	1/2 L Radiator (A)	1/4 L Stub (B)	Spacer (S)	Tap Point (D) Approximate
146.0 MHz	38.5	19.25	2.50	4.0

223.5 MHz	25.2	12.6	1.75	v2.5
440.0 MHz	12.8	6.4	1.25	1.25

To build an antenna, begin by cutting a section of copper pipe to length A (see Table). Cut two pieces of pipe to length B, and cut one piece to length S. Also cut a Section M to any desired length. Section M is for mounting the antenna to a mast. Generally about one to two feet long is a good length for Section M. Assemble Section M and the stub part of the antenna, including the in-line coupler on the top of the inside stub element (the one inserted into the T), as shown in Figure 1. Do not install Section A. Solder all of the joints. Push the lower end of the Section A pipe into the in-line coupler at the top of the stub and temporarily secure it with a hose clamp. Place and end cap on the top end of the Section A pipe, but do not solder it to the pipe yet.

Next cut a section of RG-8X coax to about 2 to 4 feet in length. Solder a PL-259 connector on the bottom of the coax in the usual manner. Solder a second PL-259 connector at the top of the coax, but leave the outer shell off this connector. Cut two pieces of #12 solid wire to a length of about 6 inches. Solder one to the center pin of the upper PL-259 connector. Solder the second one to the outer part of the connector as shown in Figure 3. Using a hose clamp, clamp the center conductor wire to the D tap point on the inside stub element (the one soldered into the T). Hose clamp the other wire to the D tap point on the outside stub element.

To test the antenna, connect it through an SWR meter to your VHF/UHF radio and tune the radio to the center frequency of the band. By loosening and repositioning the tap point hose clamps and wires, move the coax tap point up and down the lower part of the stub until the lowest SWR reading is obtained. If the lowest SWR is not 1 : 1, then tune the radio up and down in frequency to locate the 1 : 1 SWR point. If this frequency is lower than the band center frequency, then the Section A element is too long. Remove it from the top of the stub and cut a small amount off, about 1/4 inch. Reinsert Section A into the top of the stub, reconnecting the hose clamp. This should move the SWR 1 : 1 point up in frequency. Continue doing this until the 1 : 1 point reaches the band center frequency. If the 1 : 1 point is above the band's center frequency, then Section A is too short. If this is the case you will have to cut a new longer Section A piece. When that is done, hose clamp it into the coupler at the top of the stub and proceed as above to adjust the antenna to the band's center frequency. Once the antenna is tuned, check its bandwidth. The antenna should cover the entire band with an SWR of less than 1.5 : 1. If it does not, you may have to shift the antenna center frequency (the 1 : 1 SWR frequency) so that you get a 1.5 : 1 or less SWR across the section of the band that you are most interested in.

Once the antenna is tuned, remove the hose clamps and solder the coax wires to the final D tap points. Cut off any excess wire. Test the antenna again to insure that it has remained tuned. Next remove the hose clamp and solder Section A into the coupler at the top of the stub. Also, solder the end cap on the top of Section A. Finally, use two UV Tie Wraps, installed in a crossing configuration, to secure the coax to Section S. The Tie Wraps act as a strain relief minimizing stress on the two coax feed line tap points.

The final step in building the antenna is to protect it against the elements. Apply 30 year silicon sealant, it comes in a tube that you can buy for \$3 at Home Depot, to the end of the upper coax connector to keep water out of it. Next sand the entire antenna using fine grain sand paper. Then use rubbing alcohol to clean the antenna. Finally, paint the antenna with gray gloss primer paint. The paint will protect the copper pipe from corroding. The gray color causes the antenna to blend into the sky so that it is not as noticeable when installed.

This completes the antenna. It should provide you with many years of excellent service.

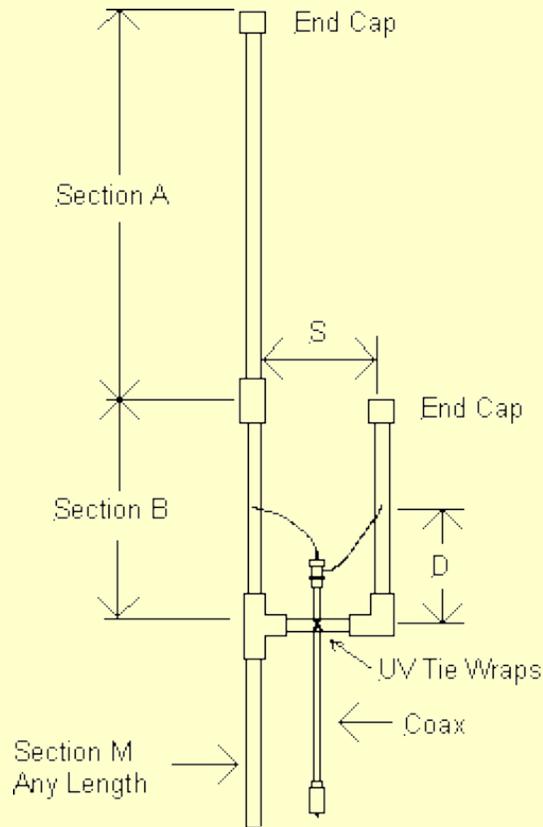


FIGURE - 1

FIGURE - 3

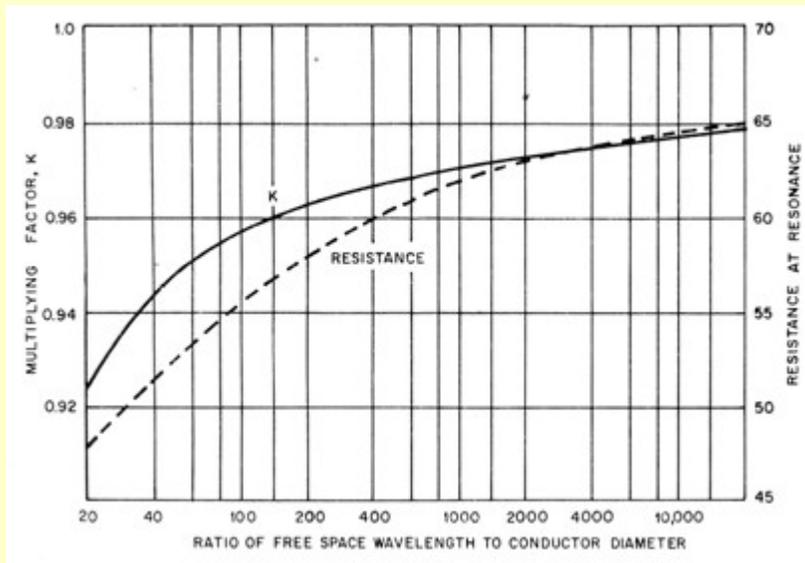


FIGURE - 2

Event Calendar 2004

Date	Event	Comments
Jan. 8	CVARC Meeting	General CVARC Meeting
Jan. 11	So. Cal. Orienteering	In Griffith Park near Travel Town Arrive 9:30 AM
Jan. 13	CVARC Radio Class	New class for Amateur Technician Lic.
Feb. 8	FCC License Exam	Begins at 8:30AM at East County Sheriff Station
Feb. 12	CVARC Club Meeting	General Club Meeting
Feb. 20-23	Coyote 4 Play	3 day Cross Country Race in Ojai & Santa Monica Mts.
Mar. 1	CVARC Meeting	General Club Meeting
Mar 13	ARES/RACES Meeting	Open House at East County Sheriff Station
Mar. 14	CROP Walk	Radio Support for T.O. CROP Walk
Mar. 28	Westlake Street Fair	Radio Support for street fair set up
April 8	CVARC Meeting	General Meeting
Apr 24-25	Baker to Vegas Run	Supporting Ventura County Sheriff Dept.
May 8	Cruisin Conejo Bike Ride	Radio communications support for the bike ride
May 13	CVARC Meeting	Club Meeting
May 15	Sea To Summit Bike Ride	Radio support for bike ride from Ventura to Mt. Pinos
June 10	CVARC Club Meeting	General CVARC Club meeting
June 12-13	VHF QSO Party	ARRL VHF QSO Party
June 13	FCC License Exam	Begins at 8:30 am at East County Sheriff's Station
June 26-27	Field Day	CVARC annual field day event, you don't want to miss it!
July 3	Moorpark Fireworks	Support for Moorpark's 3rd of July Fireworks

July 8	CVARC Club Meeting	General CVARC Club meeting
July 20	CVARC Radio Class	Spouses Amateur Radio License class
Aug. 8	FCC License Exam	Begins at 8:30 am at East County Sheriff's Station
Aug. 12	CVARC Club Meeting	General CVARC Club meeting
Aug. 15	CVARC Picnic	CVARC Picnic at Conejo Community Park - 3 PM
Sept. 9	CVARC Club Meeting	General CVARC Club meeting
Sept. 11-12	VHF QSO Party	ARRL VHF QSO Party
Oct. 2	Country Days	Moorpark country Days Parade (www.countrydays.org)
Oct 10	FCC License Exam	Begins at 8:30 am at East County Sheriff's Station
Oct. 14	CVARC Club Meeting	General CVARC Club meeting
Nov 11	CVARC Club Meeting	General CVARC Club meeting
Dec 4	CVARC Holiday Party	Annual CVARC Holiday Party at Rory's House

Radio Amateur Civil Emergency Service

Ventura County Area 2 R.A.C.E.S. members are encouraged to check in every Tuesday night at 7:00 pm on the Area 2 Check-in Net. Specific ARES/RACES times and frequencies are as follows:

ARES/RACES Times And Frequencies

Area	Time	Mode	Frequency	PI	Repeater
County	7:30-8 pm	Voice	146.880 -	127.3	WA6ZTT
County	7:30-8 pm	Voice	224.020 -	127.3	WB6ZTR
County	Before 6:30 pm	Packet	145.710	No pl	Hospital Net
County	RACES Simplex	Voice	147.570	No pl	_____

Area 1	7:00-7:30 pm	Voice	147.930 -	127.3	WB6WEY
Area 2	7:00-7:30 pm	Voice	147.885 -	127.3	Bozo - N6JMI
Area 2	Simplex	Voice	147.555	No pl	---
Area 2	Backup Repeater	Voice	146.850 -	94.8	Grissom - K6AER
Area 2	Amgen Repeater	Voice	449.440 -	131.8	KE6SWS
Area 3	7:15-7:30 pm	Voice	147.915 -	127.3	WB6ZTQ
Area 4	7:15-7:30 pm	Voice	146.970 -	127.3	WB6YQN
Area 5	7:00-7:30 pm	Voice	145.400 -	No pl	N6FL
Area 6	7:00-7:30 pm	Voice	147.975 -	127.3	N6AHI
Area 7	7:00-7:30 pm	Voice	146.985 -	127.3	WB6ZTX
Area 8	7:00-7:30 pm	Voice	145.280 -	100	KN6OK
6 Meter	6:45-7:00 pm	Voice	052.980 -	082.5	K6SMR

The Net Controller's script for the Area 2 weekly RACES check-in net is on the CVARC website, in printable form. Every member is encouraged to periodically serve as net controller. RACES members should remember that their RACES card is issued for only two years. When your card is due to expire call Jackie at the Office of Emergency Services in Ventura for an appointment to renew your card. Call (805) 654-2551 or toll free from the east half of the county at (800) 660-5474. For packet, call coordinator Dan Dicke KE6NYT (805) 983-1401. To register for Red Cross Disaster Services Classes, call (805) 339-2234 ext 0 Ventura County ARES/RACES web site: <http://home1.gte.net/res19999/>

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The Conejo Valley Amateur Radio Club is an ARRL affiliated Special Service Club. Meetings are held on the second Thursday of each month, unless otherwise noted. Meeting location is at the Elks Lodge, 158 Conejo School Rd., Thousand Oaks, CA. Meetings start at 7:30 pm. with a pre-meeting social and technical assistance session, for those who are interested at 7:15 pm. Meetings are open to the public, and members are encouraged to bring their friends.

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Editors: Ken and Paula Larson