JUG

Publication of the Northern California Contest Club

NCCC

Issue 528

May 2016

Inside this Issue:

June - NCCC Meeting

Mark your Calendar

Sunday 5th June

11:30am to 3:00pm

Venue:

El Tapatio 40 Golf Club Rd
Pleasant Hill, CA 94523

See Page 7 for details!

President's Report

Welcome to summer, KB'ers, and the seasonal loss of propagation! Well, at least on the high HF bands. It will come back during contest season, right? Perhaps a third solar peak? Fat chance! We're on our way to the minimum, but we can still have fun on the lower bands.

I'm taking a break, during WPX CW to write this (because if I don't, Ian W6TCP will put pins in my coax!), I have actually been amazed at the propagation to Europe. From my QTH, I have been hearing the EU's on 20 meters well into the night and just about all day long. There are periods of strong signals and weak signals, but I always seem to be able to hear them. When strong enough, I have been able to do short runs, but gosh do I miss running Europe from New England.

Several have asked me what I thought of my first visit to the Dayton Hamvention. My first reaction:

- Junk outside as far as the eye can see!
- There sure are a lot of old guys on motorized scooter's. One ran over my foot!
- The Dayton club does a great job putting this together.
- Hara Arena is a dump!
- The entire side of Dayton within about 5 miles of Hara Arena seems to be a really depressed area, with multiple abandoned shopping centers. It was sad to see that.
- Great indoor exhibits.

Officers:

President	Bob Hess	W1RH	w1rh@yahoo.com
Vice President /Contest Chair	Steve Dyer	W1SRD	w1srd@arrl.net
Treasurer	Dick Wilson	K6LRN	treasurer.nccc@gmail.com
Secretary	Ian Parker	W6TCP	secretary.nccc@gmail.com
Past President	Rick Karlquist	N6RK	richard@karlquist.com
Director	Rusty Epps	W6OAT	w6oat@sbcglobal.net
Director:	Rich Cutler	WC6H	wc6h@yahoo.com
Director:	Ron Castro	N6IE	ronc@sonic.net

Volunteers:

New Member Mentor	Al Rendon	WT6K	wt6k@arrl.net
Charter Member	Rusty Epps	W6OAT	w6oat@sbcglobal.net
Awards Chair	Joanna Dilley	K6YL	joanna.k6yl@gmail.com
CQP Chair	Kevin Rowett	K6TD	k6td@arrl.net
CQP Certificates	John Miller	K6MM	k6mm@arrl.net
K6ZM QSL Manager	George Daughters	K6GT	k6gt@arrl.net
K6CQP,N6CQP,W6CQP QSL Mgr	Ed Muns	W0YK	w0yk@arrl.net
NCCC Email reflector Admin	Phil Verinsky	W6PK	kb-w6tqg@verinsky.com
Webmaster	John Miller	K6MM	k6mm@arrl.net
Webinars	Chris Hoffman	KG6O	choffma@gmail.com
JUG Editor	Ian Parker	W6TCP	w6tcpian@gmail.com
jug@nccc.cc			

NCCC Net

Thursday 8 PM

Freq: 3.610 +/-

NCCC

Visit the meetings page of the NCCC website here for details of the next meeting

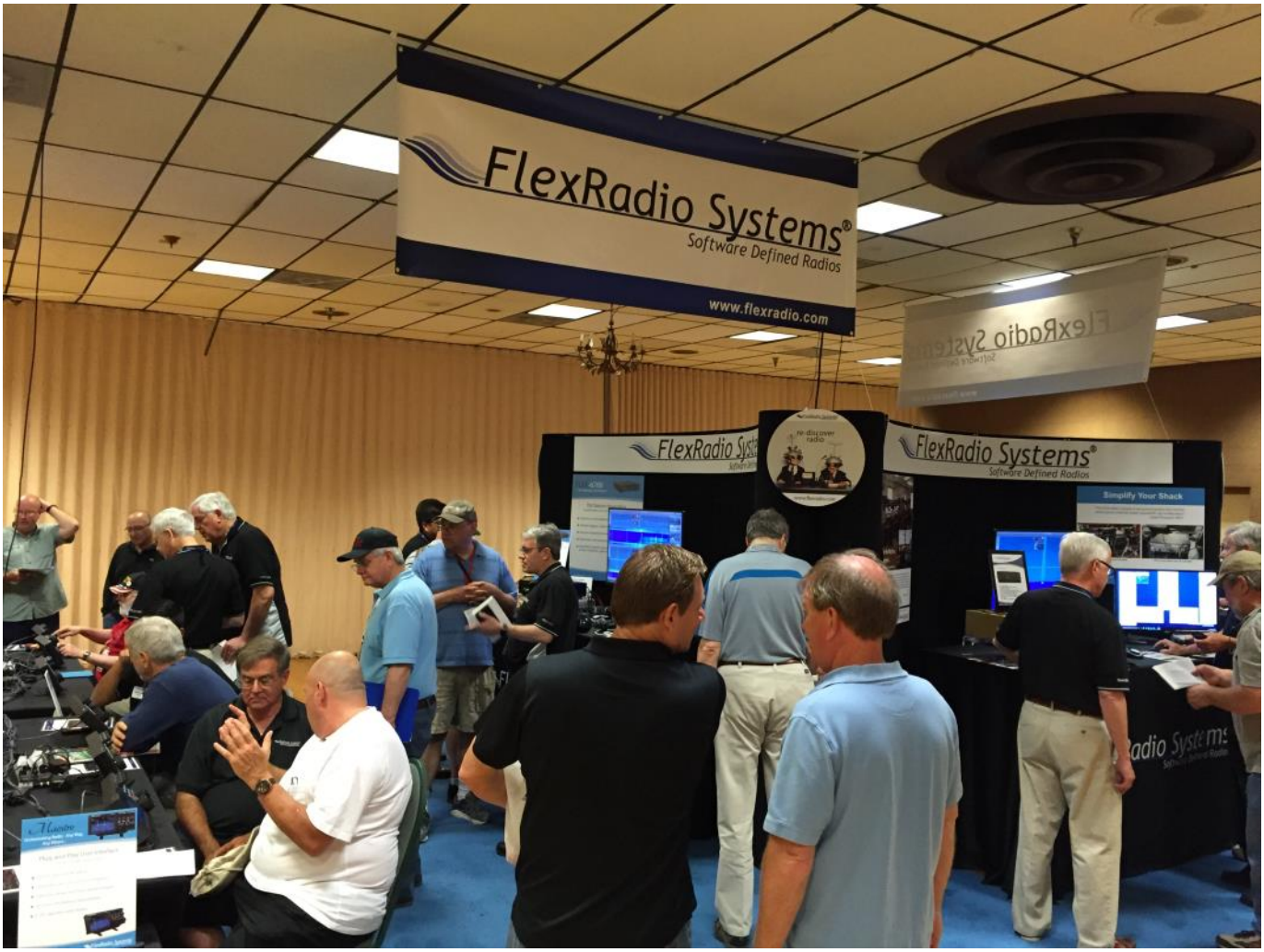
NCCC Membership Information

If you wish to join NCCC, you must fill out an application for membership, which will be read and voted upon at the next monthly meeting. (PDF application form)

To join, you must reside within club territory which is defined as the maximum of:

- Northern California, anything north of the Tehachapi's up to the Oregon border, and
- A part of north-western Nevada (anything within our ARRL 175-mile radius circle centered at 10 miles North of Auburn on Highway 49).

spent some quality time at several booths, especially the Flex booth, where I heard that I may finally get my 6700 and Maestro by the end of June. Both the Flex and Elecraft booths were packed, even on Sunday morning. Every time I walked by the Elecraft booth, I saw K6XX busy with future customers.



I'll also note that I have commented to many that the best thing about going to Dayton for the Hamvention, besides seeing many of my friends from different parts of the country, was not the Hamvention but rather the Air Force Museum. If you are going to the Hamvention next year, and have not seen the Air Force Museum, take an extra day and allow several hours. This is a world class museum.

I thought the Contest Forum was excellent and really enjoyed K9CT's talk about converting his station over to the Flex radios. Paul, K1XM, and Charlotte, KQ1F, gave a really interesting talk about their experiences building the ED8X station. There was also a WRTC-2018 update and a talk by a husband/wife team who, while being relatively new hams, went out, did their homework, and built a really nice contest station (that probably cost them a bundle of denario!).

Unfortunately, due to some work related issues, I missed the RTTY contesting forum, which was hosted by our own W0YK and featured, among others, talks by Ed, W0YK, and Mark, K6UFO.

I spent much of my time with what I can best describe as a loosely knit group of really good guys from all different walks of life. These guys meet at Dayton every year and do fabulous dinners every night. One guy organizes it all, with the entire group staying on the Concierge floor at the Marriott. My counterpart, at WCBS-TV, has been encouraging me to go along with them for several years, and I finally did it. I'll note that Dave, W6DR, is a member of this group and it was really nice to enjoy dinner with Dave and share stories.

Because of the dinner schedule with this group, I didn't ever make it to the Contest Super Suite, I did enjoy the Contest Dinner and was honored to have a seat at the table with Sandy, DL1QQ, and the WRTC-2018 crew. Needless to say, beer was the drink of choice at this table!

Speaking of Sandy, she stayed with us for the better part of a week. My wife and I thoroughly enjoyed her company and learned a lot about her. It was most amusing to hear the stories about her wonderful family, including her mother and grandmother who live across the street from her apartment. Her grandmother, at age 81, plays a mean guitar and keeps the family and friends entertained in the party room at their house, which seems to be a very popular room in the small village Sandy and her family live in.

Sandy was dead set on working the Florida QSO Party from my station. I did warn her that this would not be quite like WRTC-2014, and there may be periods equivalent to watching paint dry. She worked the entire Saturday contest period without ever leaving the chair. I believe that was 9 or 10 hours of continuous time in the chair. Her lunch consisted of a quart of ice cream and one Mountain Dew (that's what she wanted)! I believe she ended up with about 400 Q's. It was amusing to hear her complain about all of the guys - who were NOT in Florida – calling her. I do believe the German accent and female voice might have had something to do with that!

Our meeting this month will be on Sunday, June 5th. I'm really looking forward to TV Bob's talk on recording an entire contest and learning from it. Steve, W1SRD, and I will also talk about the Club's contest plan for the 2016/2017 season, which will involve both an individual and team competition within the club as well as the usual focus contests.

See you at the meeting!

Bob W1RH

K6TU asked "Why Do You Contest?" **See March JUG, page 13**

I recently had this discussion with friends.

Stu and my friends listed many good reasons. All are part of my equation. But they didn't directly hit on my two most importation motivations: 1. Shared Endeavor and 2. Camaraderie.

W6SX First Corollary: Share the fun.

W6SX Second Corollary: We all get better together.

I can't contest without other hams. Cooperating with them is a shared endeavor. For me the mutual pleasure of a well-executed contact is sometimes sublime. Add in the respect, recognition, and camaraderie of the contest community, in particular NCCC and my friends, and I'm in contest heaven.

Shared endeavor and camaraderie are the main reasons I contest.

Contest Exuberantly,

Hank, W6SX

Welcome New Member

Stefan Stefanov AF6SA

First licensed in1979 and operated form LZ1KPG club station and later used my LZ3PG call sign. Main interests where: Fox hunting / building DF receivers. VHF weak signal, meteor scatter and EME. Active on Packet radio, building digipeaters and LZ0BBS SysOp.

Relocated to US and licensed in 2009 as AF6SA.

Next Meeting– Sunday 5th June

Date: **SUNDAY, June 5th, 2016**

Time: 11:30 am Social Hour; 12:00 pm Lunch, 12:30 pm Program

Venue:
El Tapatio 40 Golf Club Rd
Pleasant Hill, CA 94523

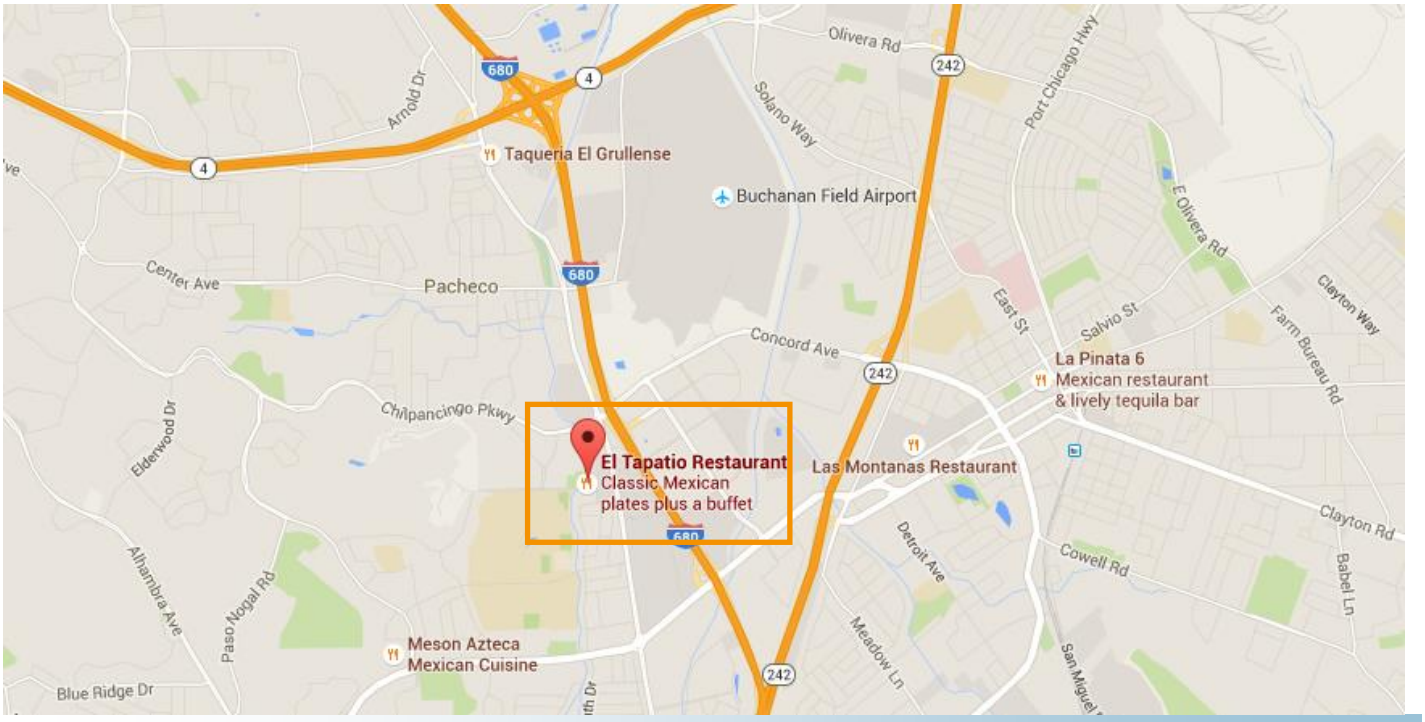
Phone: (925) 676-2420

Website: http://eltaps.com/banquet-catering-menus

Program:

1) "How to Record an Entire Contest, and Learn from your Mistakes," - Bob N6TV

2) 2016/7 Contest Strategy - Bob W1RH, Steve W1SRD



VP/CC Report

Greeting KB'ers.

All Asia

A reminder to all. Rusty has volunteered to coordinate All Asia again this year. Dates are June 18 0000 UTC to June 19 2400 UTC. Same team structure as last year and same goal - win ALL 9 categories. In 2015 we almost made it, winning all categories but M/S which went to NX6T (N6CY, N6EEG, N6KI, NN6X, WQ6X) of the San Diego Contest Club. Good chance they will try a repeat, especially if they noticed NCCC's participation last year. We need a strong M/S entry. Let's KB and make this 40 year old goal a reality! The sign up form is at http://www.nccc.cc./ Rules at 2016-The 57th ALL ASIAN DX CONTEST

Sweep Stakes

2015 results have been posted since our last newsletter and we have two new gavels in NCCC territory. Congratulations to Pizza Lover 259 took the local category and MLDXCC took medium. Winning for the first time in that clubs history. Congratulations to both clubs for a fantastic show. Individually we had some great results across NCCC. We had some great efforts across NCCC, but a huge shout out to the top ten winners.

CW
N6TV@W7RN 6th place SOHP
K7GK 8th place SOLP
N7MH@W6YX 3rd place SOQRP
W6JTI 8th place SOQRP
WA6O@N6XG 5th place SOUHP
N6RO+N6BV 10th place MOHP

SSB
WX5S@W7RN 6th place SOUHP
N6WM@K6LRG (N6NU, N6WM) 5th MOHP
N6BV@N6RO (K3EST, N6BV, N6KLS, N6RO) 10th place MOHP
W6YX (K2YY, KZ2V, N7MH) 6th place MOLP

After All Asia, don't forget to participate in a Field Day operation. Great opportunity to show new hams what rate is and how much fun it is!

Very KB,
Steve
W1SRD

WRTC 2018 WORLD RADIOSPORT TEAM CHAMPIONSHIP

Presentation and confirmation of NCCC sponsorship of Tent #6 taken at the WRTC 2018 booth, in Dayton. See next page for a close-up of the certificate. The following page you can see the Cert in memory of Carl Cook AI6V.

Picture taken by Sandy, DL1QQ.

WRTC 2018

Acknowledgement

This serves to confirm that WRTC 2018 has reserved

Tent NA#6

to be sponsored by

Northern California Contest Club (NCCC)

WRTC 2018 would like to express its sincere thanks for the support rendered to bring about the World Radio Team Championship in Germany in 2018.

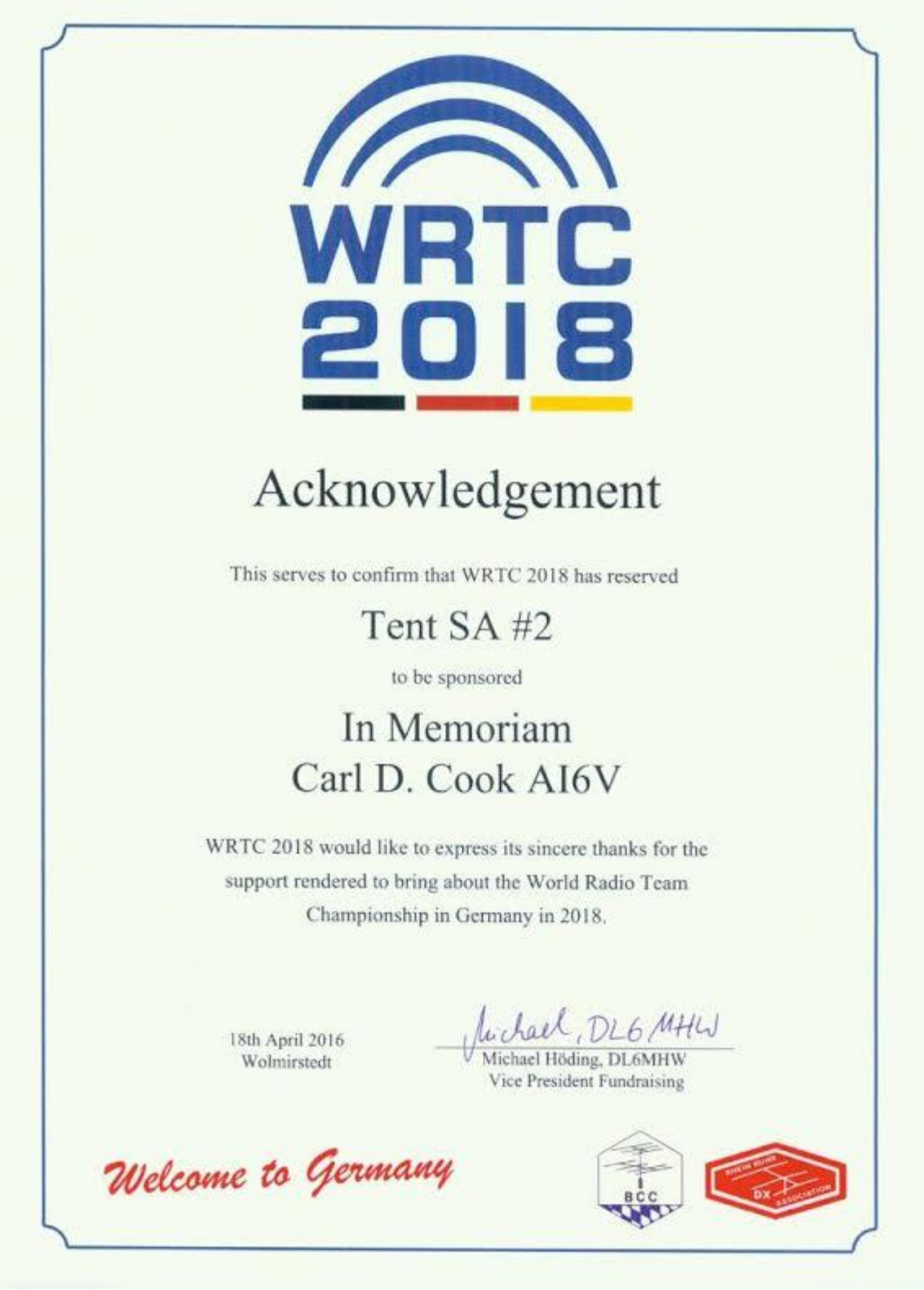
18th April 2016
Wolmirstedt

Michael, DL6MHW
Michael Höding, DL6MHW
Vice President Fundraising

Welcome to Germany

BCC

RHEIN RUHR DX ASSOCIATION



WRTC 2018

Acknowledgement

This serves to confirm that WRTC 2018 has reserved

Tent SA #2

to be sponsored

In Memoriam
Carl D. Cook AI6V

WRTC 2018 would like to express its sincere thanks for the support rendered to bring about the World Radio Team Championship in Germany in 2018.

18th April 2016
Wolmirstedt

Michael, DL6MHW
Michael Höding, DL6MHW
Vice President Fundraising

Welcome to Germany

BCC

Contributors to AI6V WRTC 2018 Tent April 25, 2016
N3ZZ, Tom Hutton, K5RC, Tom Taormina, W5AJ, Robert Wood, AD6E, Al Maenchen, AE6Y, Andy Faber, K6GT, George Daughters, K6KR, Dick Dievendorff, N6WM, Chris Tate, N6XI, Rick Tavan, N7TR, Rich Hallman, NK7U, Joe Rudi, W0YK, Ed Muns, W1RH, Bob Hess, W1SRD, Steve Dyer, W6LD, John Fore, W6TCP, Ian Parker,

JUG Erratum

Correction: April edition page 4 says "...a hand-built key (provided by George K6GT for Bob K6XX), " and there is a nice picture of it (thanks to N6TV). BUT, it is not a "hand built key". It is a genuine vintage 1895 J.H. Bunnel telegraph sounder. It was lovingly restored by K6GT, but I don't want any credit for building it. I makes a satisfying click-clack sound when activated with about 2 volts, but it isn't a key at all.

vy 73,

George T Daughters, K6GT

QSL Card Trivia

Any idea who these two, currently active, KB'ers are?

Find out on page 39!

Northern California Contest Club Reflector—Guidelines

This reflector is devoted to the discussion of contesting.

This includes contests, station building, dxpeditions, technical questions, contesting questions, amateur radio equipment wants/sales, score posting, amateur radio meetings/conventions, and membership achievements.

This does not include personal attacks, politics, or off-subject posts which will be considered a violation of the Guidelines.

Violations may result in removal of the violator from the reflector and possibly from club membership in good standing.

Building Contesting Scores by Killing Receive Noise

by Jim Brown K9YC

As a west coast contester, I'm not competitive in DX contests, so I often operate QRP in pursuit of the personal challenge of 5BDXCC with 5W. I've been very pleasantly surprised how much I can work when the station on the other end can hear well. The problem is that many stations with big transmitted signals have poor receive capability. When you can't hear well, it's easy to turn into a CQ machine, and miss a lot of QSOs. This article is about tracking down and killing the noise that is killing your RX and costing you QSOs! We'll begin by talking about the three basic kinds of noise, then how to identify them by type, how to track them down, and how to suppress the noise they generate.

How Much Noise is Normal? The noise we hear when the band is open is propagated like any other signal from a distant QTH. A good rule of thumb is that for a reasonably quiet QTH, noise on the HF bands should increase by at least 10 dB when the band opens. A QTH inside most cities and suburbs may be a lot noisier, but increasing the observed difference at your QTH will help you hear more of the weaker stations on the band. And even in a quiet QTH, the noise should drop to the level of its own circuit noise when we disconnect our antenna from the radio. If this doesn't happen, either the antenna is performing poorly on that band or the radio needs a preamp.

To evaluate noise levels, and the effectiveness of our attempts at noise reduction, we need some reasonably accurate and reproducible method of measuring it. That can be the S-meter in our radio, or a spectrum display or analyzer, but whatever we use, it must provide readings that are consistent from one setup to the next on the same band.

Most S-Meters Are Inaccurate – they may be calibrated at S9, but the difference between S-units typically varies from 5 dB near S9 to 3 dB at S6 and below, and the "dB over S9" may be equally inaccurate. Calibration of the meter in the Elecraft K3 and K3S is much better than average, and can be user calibrated from the "tech" menu with a calibrated signal source. Calibration also carries over to the P3 spectrum display.

Noise on our ham bands is of three basic types. The one we're most familiar with is ***impulse noise***, most often generated by defective equipment in the ***mains power system*** and by ***lightning***. In the power system, impulse noise is generated by something arcing, typically a defective insulator, transformer, or a broken conductor that's intermittent. ***Defective neon signs*** are another source of impulse noise. WX5L notes that ***forced air attic ventilators thermostats*** can create impulse noise as they age especially if they are near the fan as it vibrates the surrounding area.

The ordinary "static" we hear from the AM broadcast band up to about 40M is impulse noise – lightning from millions of sources, propagated like any other radio wave, from discharges near and far. The loudest crashes are nearby; the more distant lightning blends together to form a more uniform din. Impulse noise is quite broadband, and consists of the infinite harmonics of the impulse.

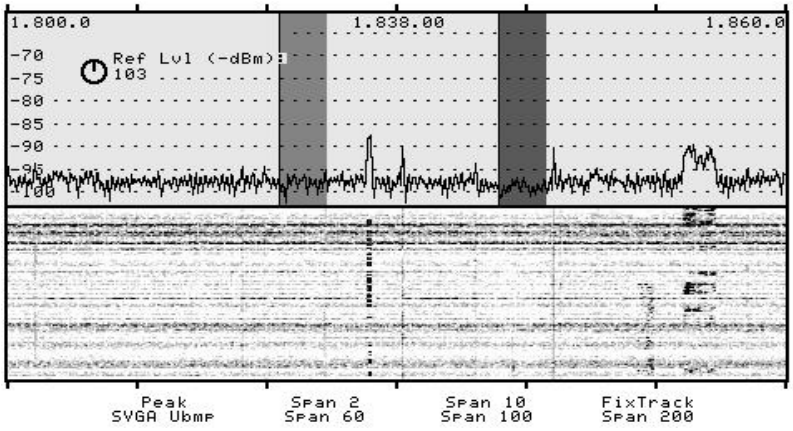


Fig 1 – Static Crashes On 160M

The strength of impulse noise tends to fall off both with increasing frequency and in increasing distance from the source. The strength of power line noise (and even whether it is present at all) also varies with weather, especially humidity.

In Fig 1, the horizontal lines in the waterfall are static crashes, the vertical ones are signals. The one around 1828 kHz is a CW signal, the weak ones around 1831 and 1839 kHz are probably electronic noise, and there's an LSB signal around 1854 kHz.

Electronically Generated Noise is the second basic type, and in recent years have become the dominant sources for most of us. Electronic noise sources include anything with a microprocessor, any digital electronics, variable-speed motor controllers,DC-AC inverters, charge controllers in solar power systems, and switch-mode power supplies (SMPS). SMPS are used as the low voltage power supply (mostly in the range of 5 – 24VDC) for cable TV decoders, the electronics in home entertainment systems, laptops, phones, and low voltage lighting. These power supplies often come in the form of wall warts and cord lumps that power all sorts of electronics, and that charge batteries for everything from mobility scooters and power tools to cell phones. They may also be built into the electronics themselves – TV sets, computers, refrigerators – virtually anything that plugs into the 120VAC line. The charge controllers and DC to AC inverters that are part of solar power systems can generate high noise levels if poorly designed and/or poorly installed. We'll discuss solar power systems later on.

The average home in the developed world typically has at least thirty such potential noise sources (and often more), and we hear not only our own but those in our neighbors' homes. The noise produced by these sources is mostly radiated by cables attached to the sources, although in larger appliances like refrigerators and the variable speed motors in a furnace, wiring internal to the source may radiate the trash. It's simple antenna action – by virtue of poor design, the noise source leaks common mode current onto external cables and differential current onto internal wiring, both of which become antennas.

Signal Leakage from equipment or wiring is a third type of interference. Fig 2 shows leakage from a VDSL modem from about 3.7 – 5 MHz that strongly affects the 75M band. With help from W0QE, W0IVJ captured this spectral plot from an SDR in his Toyota as he drove around his neighborhood. The broad hump of noise is from the modem – the spikes are from an SMPS in his Toyota, as well as from other noise sources in the neighborhood. The spike at 5 MHz is WWV's carrier. This RFI will be heard as noise or hash. Tom recorded this as a video, which he has posted at https://www.youtube.com/watch?v=HIGMmEgzhv0&feature=youtu.be There's more about this form of RFI later in this document where we address issues and solutions with specific product types.

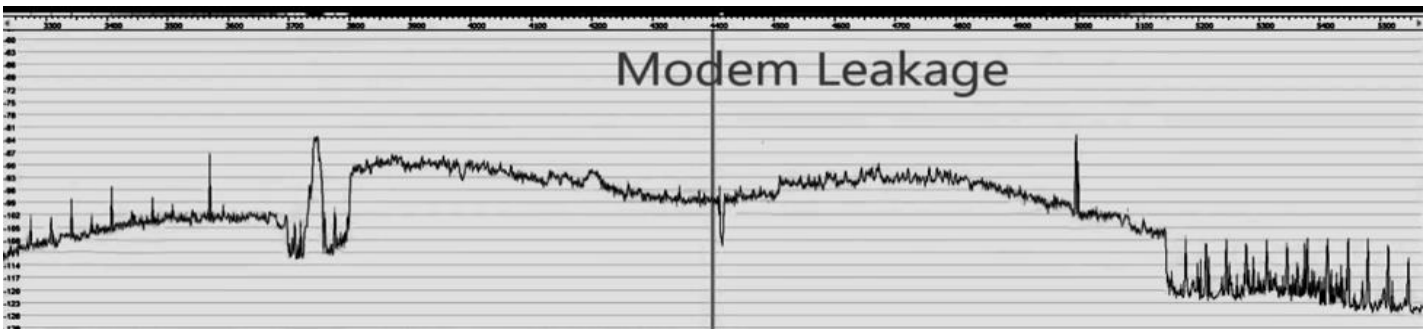


Fig 2 –VDSL/Cable Modem 3.2MHz – 5.6 MHz, 3dB/div

Optimize Your Station First

There are some things we can do with our stations, and that ***we should do before chasing noise sources***. We can 1) ***use antenna directivity*** to point away from noise and toward the stations we want to work; 2) ***locate antennas*** as far as practical from noise sources – height helps with this, and generally makes them better DX antennas; 3) use an effective ***ferrite common mode choke at the feedpoint of every antenna***; 4) ***horizontal antenna***s are usually (but not always) quieter than vertical antennas; 5) implement ***proper bonding and grounding*** within your station and throughout your home. [I'll be writing about grounding and bonding for a future NCJ edition; in the meantime, see http://k9yc.com/GroundingAndAudio.pdf and W9RE's "Station Tending" column from Sept/Oct 2015 NCJ.]

Use A Common Mode Choke <u>At The Feedpoint</u> of Every Receive (and Transmit) Antenna to prevents the antenna feedline from becoming part of the antenna. This reduces receive noise because 1) our antennas are usually up in the air and more distant from noise sources, so they receive less noise by virtue of their distance from sources in our own home and those of our neigh-

bors; and 2) antennas reject some noise by virtue of their directivity. An effective choke on the feedline at the feedpoint also prevents signals picked up on the feedline from entering the cable as differential mode signals, and from filling in the nulls of the antenna's directional pattern. For general and specific guidelines for feedline chokes see http://k9yc.com/RFI-Ham.pdf and the companion Power Point slides http://k9yc.com/CoaxChokesPPT.pdf

Locating Noise Sources

Common Mode and Differential Mode Transmission: Most RF noise is transmitted as a ***Common Mode*** signal on wiring connected to the source – that is, the wiring radiates because noise current is flowing on a coax shield, or in the same direction on all conductors. It's simple antenna action. ***Differential Mode*** transmission is a voltage ***between*** the wires that make up the path, with current on the pair flowing in opposition. Very little RFI is the result of differential mode transmission, so filters are rarely of any use. If a filter is used, it must be carefully designed so that it does not degrade transmission of the desired signal.

Power Line Noise Current (and the current from arcing neon signs) flows on wires connected to the arcing source, and is radiated by those conductors by simple antenna action. Low frequency components of the noise use very long lengths of those conductors, while higher frequency components use the parts of the conductors that are very close to the source. Those low frequency components can travel pretty long distances – it's not at all uncommon for hams in rural areas to hear arcing power lines 10-20 miles away on the lower ham bands.

It's quite difficult to locate the source of power line noise at low frequencies, both because the wires radiating those components them are so long, and also because the noise may travel along the lines as a differential signal, creating peaks and nulls in voltage and current (power lines are transmission lines at RF as well at power frequencies). The key to locating the source of power line noise and other impulse noise is to search for it at VHF and UHF. I own several tools that work well for this. If the source is within walking distance, a handheld AM RX that can tune to VHF and/or UHF is a big help. I have two – a Kenwood TH-F6A talkie, and a Tecsun PL660. The Tecsun PL660 and PL880 receive AM on the MF and LF AM bands, and from just above the 160M band to nearly 30 MHz. The PL660 also receives AM on the 118-137 MHz aviation band, while the PL880 does not. The PL880 got a positive review from ARRL Labs a few years back. The Tecsun radios use DSP technology, and happen to be excellent AM and FM receivers for both SWL and entertainment. The TH-F6A can receive AM from just above the audio spectrum to 1.3 GHz (although it's not very sensitive below VHF), and maintains maximum sensitivity to about 550 MHz. If the source is beyond easy walking distance, a VHF/UHF FM mobile rig that also tunes AM is a great tool. My current favorite is a Kenwood TM-V71A.

The two Kenwood rigs have many memories that can be programmed either manually or from an accessory computer program. In addition to repeater frequencies, I've programmed my TH-F6A and TM-V71A for AM on 160, 200, 300, 400 MHz, and that highest frequency of maximum sensitivity around 550 MHz. When searching for the source of power line noise, I drive around tuned to 160 MHz looking for the signal; when I find it, I switch to higher frequencies as it gets stronger. When I'm hearing it peak at 550 MHz, I get out of the car with the talkie tuned to that frequency.

Foxhunts held by my Chicago area ham club taught me that placing a talkie with a rubber duck close to my chest would block signals from behind me, making it a simple directional antenna. This makes it possible to locate the source by direction, then move toward it. We could get even more directivity by attaching a small 440 MHz Yagi and setting the radio for AM around 440 MHz.

Fig 3 – Some RFI Hunting Tools

Ideally, we want to identify the source location as precisely as possible before calling the power company. By all means, get an address, intersection, or lat/long coordinates, even the identifying numbers on a pole nearby. (Record ALL of the numbers on the pole – every service on the pole will assign it a different ID. The power company will know which one is theirs.) The closer we can get the power company's investigating team to the source, the more likely it is to be found and fixed (and the more your expertise will be respected). ARRL can provide advice on contacting the power com-pany, and what to do if things don't go as well as you hope. Power companies generally re-spond fairly well to find the source, because it often points to a potentially dangerous condition or a likely point of failure. But here in California, those same power companies have a poor record of fix-ing problems that only cause noise; Garry, NI6T, has learned that it's because administrators of the teams that fix things are rewarded if they have spent less of their budget at the end of a year. At least one local ham, an attorney, has had good results contacting the state agency that regulates his local power company when this has oc-curred.

ARRL has great resources for understanding and dealing with Power-Line Noise. Start with this well written and comprehensive webpage. http://www.arrl.org/power-line-noise

Electronic Noise Sources: Just as with power line noise, our first task is to identify the noise as electronically generated, zero in on the source, and once we've found it, apply suppression to kill it. Electronic noise sources, (except for those sources that generate arcing), are some form of square wave. Square waves produced by ***Switch-Mode Power Supplies*** (SMPS) are usually in the range of 10-30 kHz, and they are not stable in frequency. They are free-running oscillators, and, to get around FCC Rules for radiated noise at a single frequency, are frequency-modulated by ran-dom noise. This produces the characteristic carriers spaced 20-60 kHz apart (2X the frequency of the square wave), each carrier surrounded by sidebands of noise, that drift up and down the band as they warm up, or as their load condition changes. When we hear (or see on our rig's spectrum display) these drifting carriers surrounded by humps of noise, we know that the culprit is some form of switching power supply or DC to AC inverter. If the carriers don't move, the source is most likely circuitry linked to the clock for a microprocessor or other digital electronics.

Fig 4 shows the classic spectral signature of a Switch-Mode power supply (SMPS), as well as elev-en signals that are likely generated by a stable clock for digital electronics. This screen shot shows the lower 60 kHz of the 160M band; the total height (duration) of the waterfall displays about 165 seconds. The noise source is an SMPS in my shack that was turned on (about 30 seconds above the bottom of the waterfall). The repetition rate of this SMPS is about 14 kHz, half the spacing be-tween frequency peaks. The straight vertical lines in the waterfall are electronic noise produced by digital equipment, probably from several different sources. At least one, the weak signal just to the right of the pulsed signal around 1840 kHz, is drifting down in frequency at a much slower rate, so it

is also an SMPS. An SMPS sounds like a gurgly carrier surrounded by noise. If it's weak, we'll hear only the carrier.

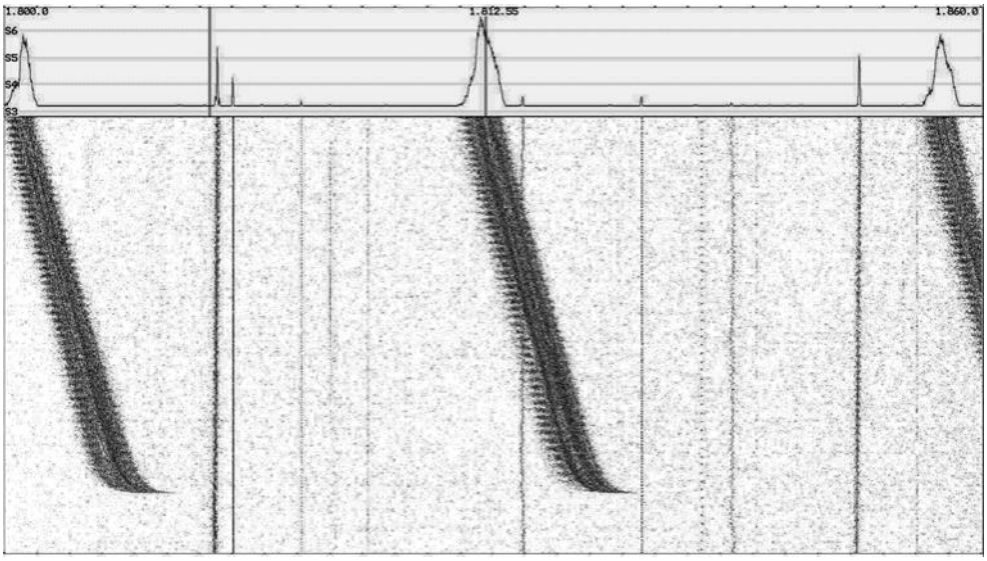


Fig 4 – Spectrum of a Switch Mode Power Supply

Electronically generated noise is generally not broadband, but rather is stronger in some frequency ranges than others. The 33V power supplies that SteppIR supplied for their controllers when long cable runs would be used generated extremely strong RFI on the higher HF bands, especially on 12M. Even with heroic efforts I was unable to choke it effectively, and I eventually replaced it with a home brew linear supply.

Wired Ethernet cables radiate what sounds like White noise at VHF, and individual carriers in the HF and low VHF spectrum. Those carriers are stable in frequency and synchronized to the Ethernet switch, but the tolerance on frequency is wide enough that you'll typically hear your own and your neighbors' at slightly different frequencies centered around 14,030 kHz, 21,052 kHz, the low ends of 10M and 6M, and a few frequencies on 30M. These are only some of the carriers, but I'm a CW guy, so they're the ones I've identified. I don't know of any Ethernet noise components below 30M.

When chasing electronic noise, it's always best to start at home. In doing so, we lower our noise level so that we can hear our neighbors' noise, and we also learn to identify the sources and suppress them. A good start is to first kill power to your home while listening to your rig while it's running on batteries. Most rigs draw only 1-2A on receive, so a 12V battery of relatively modest capacity is sufficient for short listening periods. There are a couple of bear traps though; first, we need power for accessories like antenna switching that keep our rig connected to the desired antenna(s). This can be tricky in some stations. Second, we must make sure that a UPS doesn't keep noisy equipment going when we think it's turned off. For most of us, that means unplugging and putting to sleep laptops and tablets, and temporarily shutting down other computers. The noise that remains with our own home shut down is outside our home. [For this series of tests, it's best to listen on antennas close to the house; if your primary antennas are more distant, try rigging a random wire near the house for this test.]

The next step is to turn power back on, one circuit at a time, and carefully listen to all bands and all antennas for any noise that wasn't there with the power off. Each time a new source appears, identify and record what's connected to the circuit that just turned on, make notes of what's connected to it, and then using our portable radio as a signal probe to see if we hear noise. Alternatively, turn off each piece of equipment on that circuit and listen for the noise to disappear. As you identify each source, suppress it, before moving on to the next one.

This process goes a lot faster and works a lot better with another ham who either flips breakers and turns equipment on and off or listens in the shack as you do the power switching, using VHF radios

to communicate. While doing this, consider that most SMPS drift as they warm up, so will have shifted in frequency from when you turned them off, so it may be necessary to tune around to find them. A spectrum display is a big help here, and should be set for the widest practical frequency width.

The ARRL website lists some common home appliances that can be sources of RF noise. Being on this list doesn't mean that it will cause RFI, but that some appliances of its type have been found to generate RFI. The list includes Electric Blankets, Heating Pads, Clean Air Machines (table top and furnace type) Aquarium Heaters, Furnaces and Furnace Control Circuits, Refrigerators, Amplified Antennas, Door Bell Transformers, Light Dimmers, Ceiling Light Fixtures, Low Energy Compact (screw-in) Florescent Lights, Touch Control Lamps, Photocells,.

Peeling the Onion: All of us here in the real world hear noise from many sources, the strongest ones obscuring the weaker ones. Finding and killing RFI is a many-layered process, like peeling an onion – when we kill those strong ones, we can go after the weaker ones.

Tools For Identifying Sources: W6GJB reports that an MFJ-805 current probe was helpful in finding RF noise currents on cables. The unit is quite simple, and can easily be home-brewed for a lot less than the $100 cost of the MFJ. It's simply a coupling coil wound on a clamp-on ferrite core that is temporarily clamped around the cable we want to check for noise; the coil feeds a diode detector, filter capacitor, DC meter, and series pot to set meter sensitivity. These applications notes describe several good ways to do it. http://www.w8ji.com/building_a_current_meter.htm
http://www.interferencetechnology.com/the-hf-current-probe-theory-and-application/
http://www.nonstopsystems.com/radio/frank_radio_antenna_rf-ammeter.htm

Portable radios that use a ferrite loopstick antenna make a much more sensitive probe for common mode current at frequencies where the radio uses the loopstick (below 10 MHz for the TH-F6A). Simply hold the loopstick perpendicular to the cable you're probing. At higher frequencies, use the rubber duck as an RF probe. A menu selection also allows the SMA connector to be used at any frequency, and the Tecsun PL660 has an antenna input in the form of a 1/8-in TRS jack.

How Noise is Coupled Into and Out of Equipment and Systems

Noise Is Conducted From Equipment Onto Cables when cable shields are not bonded to a shielding enclosure at the point of entry, or when unshielded cables are not properly by-passed to the shielding enclosure. The failure to properly terminate shields was first ad-dressed by Neil Muncy, ex-W3WJE (SK) in a landmark paper first published in the Journal of the Audio Engineering Society in June 1995. He called it "**The Pin One Problem**" be-cause Pin 1 of the XL connectors used for microphones and other audio interconnections is the shield contact. Pin One Problems are a primary cause of RFI, providing a path both into and out of equipment for hum, buzz, and RF noise.

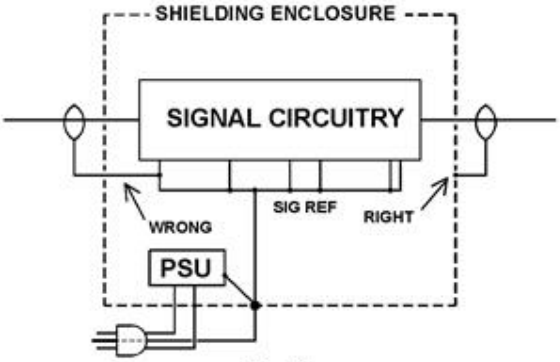


Fig 5a

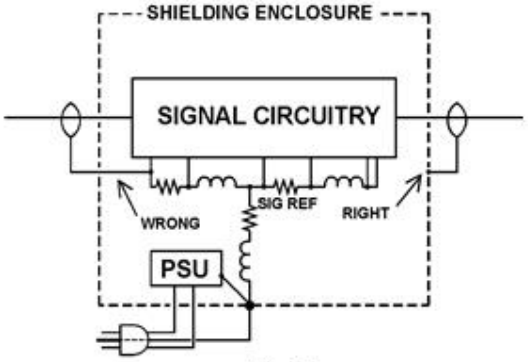


Fig 5b

Fig 5a illustrates "The Pin One Problem and Fig 5b shows how it couples shield current into active circuitry. Shield current on the output cable flows to the shielding enclosure and from there to the power system equipment ground conductor (the "green wire"). All noise current stays outside the equipment, so it can't couple to the equipment.

Shield current on the input cable flows to a return trace on the circuit board on a path at the whim of the PC board layout artist, and eventually gets to the same power system ground conductor. As it traverses the return trace(s), IZ voltage drops are established across the R and L of the path, and the potential difference is injected at the input of one or more active stages where it is amplified (and, if it's RF, is detected by diode action at a stage input).

Pin One Problems on both input and output cables cause hum, buzz, and RFI, and signal flow logic cannot be used to find them, because layout of the signal return path, which often has nothing to do with the signal path, determines where noise is injected. ***And because the cable shield connects to some random point inside the unit, any noise present at that point will couple onto the cable shield and be radiated by the shield. <u>This is a major cause of RFI from equipment.</u>***

Because of the way printed circuit boards are manufactured and mounted in equipment, it is rarely practical to correct Pin One Problems without major surgery that is likely to turn into a major engineering project to fix circuit instability. And, of course, we don't want to do anything that affects a product warranty, nor do we want to open up our neighbor's TV set, computer, or WiFi router. The far better solution is to kill the current on the cable shield, both 1) by choking it with a suitable ferrite choke, and 2) by shunting the current away from it by bonding all equipment chassis together and to the ground system for the shack and the building.

Magnetic Field Coupling of noise is proportional to the strength of the current, the area of the loop in which the current flows, and the loop area of the receiving circuit. Loop area is minimized when forward and return conductors are run closely in parallel, and is in-creased when conductors are spread out – for example, at battery terminals of a solar power system, or to circulate through multiple batteries wired in series. Magnetic field coupling is a primary coupling mechanism in DC power circuits, like solar power systems and variable speed motor control systems.

Noise Can Be Radiated By the Equipment Itself if circuit layout is poor and the unit is unshielded or poorly shielded. One common design error is wiring that forms an antenna or a current loop with a large loop area. A common design error producing this result is breaking the "ground" layer on a multi-layer printed circuit board. At radio frequencies, the return current for a trace on a circuit board with a "ground" layer will be confined to a narrow area directly underneath the trace; the trace and the "ground" layer form a trans-mission line, so there can be no radiation from that circuit trace. All of that breaks down if the "ground" layer is broken under the trace – it's like any other coax with an open shield! When this happens, the return current takes whatever unintended path is available, and the result is both an antenna and strong magnetic coupling.

The only known fixes for such equipment are: 1) rewire/rebuild the equipment to eliminate the current loops; 2) completely shield it, bypassing all cables that penetrate the shield to the shielding enclosure; 3) give it "the bucket treatment." [The Bucket Treatment: Find a bucket large enough to hold the defective device, fill it with water, put the defective equipment in twice, and take it out once.]

Twisted Pair is far superior to parallel conductor cable (zip cord) in minimizing noise coupling. All noise sensitive circuits and all circuits carrying noise currents, especially those carrying large currents, should utilize twisted pair. It's easy to make your own twisted pair. All the DC wiring for my small solar system uses #10-2 THHN that I twist by cutting equal lengths of black and white stranded #10, clamping one end of both conductors in a bench vise and twisting them with a portable drill motor. Over the years, I've solved many RFI issues with home entertainment systems by replacing the zip cord used for loudspeaker wiring with twisted pair.

Suppressing Electronic Noise: Now that we've identified a source and know how noise is coupled, it's time to suppress it. There are two good ways to skin this particular cat. Often it's easiest to replace the noisy component with one that isn't noisy. I've scoured flea markets and second hand stores to put together a large box of old wall warts for equipment that I no longer own. They're bigger and heavier than a modern switch-mode wall wart, because they contain a linear power supply – that is, a simple transformer followed by a rectifier and a filter capacitor. They're a bit less efficient, but they're dead quiet!

Replace The SMPS: There are (at least) two good ways to utilize these old linear supplies. First, we must determine their open circuit voltage and their voltage under load. Next, we must determine the voltage and current needed by the electronics that it must power. When we find a linear supply that matches the equipment in question, we simply cut the cables for the two supplies and splice the linear supply to the cable that feeds the equipment. For greater flexibility, I install a Red/ Black Power Pole connector pair s on cables from the linear power supply and the equipment.

Float-Charge a Lead Acid Battery: A second technique I've used extensively is to obtain a fairly small ordinary sealed lead-acid (SLA) battery of the voltage used by the equipment and use a linear wall wart to float-charge it. I use Power Pole connectors universally for DC power in my home and shack. It's easy to make a few parallel adapters to connect the charger and several pieces of equipment to a single battery. In my home, one such setup powers my cable modem and wi-fi router. [El Nino rains caused us to lose power for 18 hours during ARRL DX SSB; the internet router and WiFi system was still running when power was restored!] Another float-charged battery powers four 12V accessories in my home entertainment system (a cable box, a Roku box, a DVD player, an Apple TV, and a "trucker's" FM modulator that feed an internet "radio" around my home and yard). I have three more small float-charged batteries running Samsung computer monitors that run on 12-14VDC, and another with a 6V battery running an "internet radio" for which the specified voltage is 7.5V.

When implementing this strategy, carefully select a supply that provides enough current to run the equipment without over-charging the battery. SLA batteries will generally accept a charge less than their 10 hour discharge current without degradation. These linear supplies may or may not include a capacitor input filter, and their DC voltage will vary under load. Always measure battery voltage and charging current after the battery is charged and the equipment is running. A silicon diode in series with the charger will reduce charging voltage by 0.6 – 0.7 V; one or more diodes can prevent over-charging. Over-charging a battery can ruin it, so make sure that charging current is no greater than battery's rated 10-hour discharge current. I find the inline Watts Up digital meter (Fig xx) to be a convenient way to monitor voltage and current. One caution though – it measures current in the negative lead, so can give wrong answers if there' a return path through interconnected equipment.

Fig 6 – Digital Meter

Likewise, in the shack, all the rigs and their 12V accessories run from a big 12V battery that is float charged by a 20A supply and, during the summer months, four solar panels. Equipment powered from this system includes three more Samsung monitors, antenna switching, etc. Each one of these setups functions as a simple UPS. When power fails, my internet, WiFi, the internet "radio," FM modulator, and those computer monitors keep right on going. And since those computers are laptops, so do they. Good bye switch-mode power supply noise!

Kill the Current With Ferrite Common Mode Chokes Sometimes it isn't practical to get rid of the noisy equipment – it may be expensive, something rather specialized, your XYL's favorite lamp, or something in your neighbor's home –so we must suppress the noise. The most useful technique is to apply a suitable ferrite common mode to the cable(s) that carry the noise current and radiate or receive the noise current. Our weapons of choice for the HF bands are clamp-on cores and toroids made with Fair-Rite Products #31 and #43 material. #31 is superior below 5 MHz, #43 is a bit superior above 14 MHz. I've always recommended #31 be-cause it's a far more universally usable part, so we can save money by buying only #31 in larger quantity.

What Cables Should be Choked: Start by choking every cable connected to each noise source that you discover. If you can't kill the noise from that source, turn it off and move on to the next source. Continue choking all the noise sources until all are either success-fully choked or turned off. Now you know what products are not fixable, and can think about replacing them with something better.

How Many Turns? For 40-10M, wind 5 turns through the clamps in Table 1; for 80-160 wind 7 turns, and for 6M use two turns, with several chokes in series. For chokes on toroids, use the data

for small diameter wire in Appendix One of http://k9yc.com/RFI-Ham.pdf or the guidelines for small diameter coax in the Choke Cookbook in the same document. When counting turns, it's the number of times the cable passes through the ferrite core (one more than visible in the loop). See Fig 7.

Fig 7 – 5 turn choke, good for 7–30 MHz

Fair–Rite Part Number	Shape	i.d. inch	o.d. inch	Length inch
0431164181	Clamp–on	0.5	1.55	1.22
0431173551	Clamp–on	0.74	1.15	1.65
0431177081	Clamp–on	1.0	1.7	2.2
2631803802	Toroid	1.4	2.4	0.5

Table 1 – Useful Ferrite Cores

Buying Ferrite Cores: Never buy ferrite cores from vendors that advertise in ham magazines – they're selling at insanely high markups, and often the wrong parts for what we need. Instead, put together a quantity order for members of local ham clubs and buy from one of several good industrial vendors. You'll pay about 25-30% of what those ham vendors charge, and you'll get the right part. My current favorite vendor is Dexter Magnetics (near Chicago), others speak well of Lodestone-Pacific, and these two vendors are usually most competitive, but sometimes Allied and Newark are as well. I've been happy with Kreger Components, but their prices have not been competitive in recent years. All of these vendors will bill a credit card and charge it when they ship. This usually provides enough time to collect most of the money from your buyers. Don't go by catalog prices -- once you have some idea about quantity, call them for quotes (and price breaks) for the quantities you think you might buy. Add to those quotes the cost of shipping and sales tax for your state.

Always buy full boxes – ferrites are brittle and break easily, but there will be virtually no breakage if they come packed by the factory – ask about box quantities. These vendors can ship a single order to 2-3 locations if that makes it easier for you to deliver, but don't ask them to split boxes. Never re-ship ferrite cores –they must be very well packed to prevent breakage, they're heavy, and they're expensive to re-ship. Insist at all buyers in the group pick up their order at a club meeting, or passed along from another member who does the pickup for them. Our first ferrite buy was split between clubs around Los Angeles and SMC members in three cities.

Table 1 [see Part One of this article] lists part numbers for cores I find most useful for suppression at HF and on 160M. All are #31 material. Lately I've been buying the 0.74-in i.d. clamps because I find them most universally useful. They're large enough for the medium-size cables I need to choke, like cables to video monitors and many power cables. The 0.5-in i.d. clamps are large enough for smaller cables, and are cheaper. The 1-in i.d. cores are pretty expensive (about $10) but are equivalent to three 2.4-in o.d. toroids; I save them for the largest cables.

Commercial Power Line Filters are generally effective only if installed inside equipment and bonded to the shielding enclosure. They are generally not effective when mounted outside equipment. The reason is simple – RF noise gets onto the Equipment Ground conductor (the "Green Wire" when it is not properly terminated to the chassis where it enters the noisy product (just like "The Pin One Problem," and the "Green Wire" does not go through the filter! This fact is further confused by the way in which "differential mode" and "common mode" is defined for power systems – differential mode voltage is that between Line (hot) and Neutral, and common mode is that between Neutral and the Equipment Ground (the Green wire). This is very different from how we as communications engineers define common mode, and the way we define it is what causes antenna action. Filters are specified as having common mode suppression, but they do nothing about suppressing common mode current! The same sort of common mode choke we would use on coax will be equally effective on power wiring.

This concludes Part One of this article. Part Two will address issues associated with a number of specific product types, including Low Voltage Lighting, Grow Lights LED Lighting, Plasma TVs, Variable Speed Motor Controllers, Wired and Wireless Ethernet, CATV systems, including VDSL leakage in the 75M band, computers and computer monitors, USB-powered equipment, doorbell transformers, and solar power systems.

If you have encountered any issues that you would like me to address, or have learned something that might help others, please email me at k9yc@arrl.net

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How Ferrite Chokes Work

Jim K9YC

Common mode chokes work by adding a large value of ***resistive*** impedance in series with the common mode circuit. Most hams think of a common mode choke as an inductor. That is VERY wrong. Common mode chokes work using the ***resistance*** of the ***parallel resonant circuit*** formed by the inductance of the winding, the stray capacitance of the winding, and the resistance coupled from the core.

The self-resonance of a conductor passing once through most ferrite cores used for suppression is in the range of 150 MHz, and this is where a core simply clamped around a cable will be effective. To obtain good suppression in the range of 1-50 MHz, we must wind multiple turns through the ferrite core to lower the resonant frequency. Inductance, of course, is the inductance of a single pass through the core multiplied by N squared, where N is the number of times the wire passes through the core. Because that resistance is inductively coupled, it is also multiplied by N squared. C is mostly the capacitance between turns, so it increases approximately proportional with the number of turns, and is a bit greater with large diameter cables. It can also be increased by squeezing the turns very close together (outside the core), or reduced by forcing them apart.

At low frequencies, the fundamental equivalent circuit is simply that series R and L (because the value of C is too small to matter at low frequency), but as frequency increases and we approach resonance, C is in parallel, and for an octave or two both sides of resonance, the circuit simplifies to parallel R, L, and C, where L is the inductance at low frequencies, C is the capacitance well above resonance, and R is the parallel equivalent resistance transformed from the series value.

The reason we want high resistance in our choke is that in the common mode circuit, which is really an antenna, the rest of the circuit can look inductive or capacitive depending on its length. A simple example is a dipole fed with coax, with the shield grounded at the transmitter. The common mode circuit consists of the dipole plus the coax – the coax looks like a grounded vertical long wire with top-loading wires. If, for example, that vertical wire is between λ/4 and 3λ/4 wavelength, it will look inductive; if it is shorter than λ/4 or between 3λ/4 and 5λ/4 it will look capacitive. These relationships will repeat as the electrical length increases. If we had a choke with little resistance, it would still have parallel L and C values, which would form a series resonance with the L or C of that wire at some frequencies. When that happens, the common mode current will INCREASE, and be limited only by the resistance of the choke. But if the choke has enough resistance, that R will limit the current. Another example of a common mode circuit is a cable running between two pieces of equipment.

In the real world, we rarely model these circuits, because there are far too many variables that are subject to change from one installation to another. Instead, we take a "brute force" approach, making the resistive component of the choking Z as high as possible for the widest practical frequency range in which we need suppression. And if we need suppression over a wider range than one choke can cover, we add a second choke tuned to the rest of the operating range.

Ferrite materials that have "good" suppression characteristics are lossy in the frequency range where suppression is desired, although nearly all have low loss at much lower frequencies. Fair-Rite materials #31, #43, #44, #61, and a few others are optimized for suppression, and in that operating range, the circuit Q of their parallel resonance is on the order of 0.5. This allows a choke with a well placed resonance to cover a bit more than an octave (2:1 frequency range). #61 material is an example of a material that is lossy at UHF, and thus useful for suppression above about 400 MHz, but has low enough loss below 20 MHz that it can be used as a core for high power transformers for the HF bands.

Most of these materials are NiZn compounds, and possess only the circuit resonance described above. #31 material is unique – because it is a very special MnZn compound, it exhibits both the circuit resonance at higher frequencies and a dimensional resonance at lower frequencies. When the circuit resonance is below about 6 MHz, this gives its impedance curve a very broad "double-humped" response, much like a stagger-tuned IF, providing nearly an extra octave of effective suppression. Its equivalent circuit is two parallel resonant circuits in series. Note that all MnZn materials exhibit dimensional resonance, but only in Fair-Rite's #31 is it carefully controlled to provide the broadband suppression described here.

JUG Articles Wanted!

Without your help we cannot reproduce a quality newsletter so please consider submitting a suitable article!

We welcome any and all relevant articles for inclusion in the JUG.

Deadline is 7 days before month end.

Preferred format is MS Word, Arial 12 point and pictures should be full resolution.

Send your material to Ian, W6TCP at w6tcpian@gmail.com

Don't worry about the formatting, we can take care of that if necessary !

Point Generator Profile

Bob, W1RH

Vicki, N6KLS, joined NCCC while visiting our table at Pacificon last year. I believe Vicki told me that Joanna (K6YL) happened to be staffing the table at the time.

How many of you recognize that call? Probably not that many, and I don't say that in a bad way. Vicki is, indeed, a point generator for NCCC, but most of those points have been generated at N6RO's station. In researching the contests that our members participate in, I have seen Vicki's call sign many times as part of a multi-op at Ken's place. Vicki was part of the N6O CQP effort at N6RO, along with some of the most prominent contesters in our club. What a way to learn the art of ham radio contesting!

That fact that Vicki does most of her contesting at N6RO's does not diminish the fact that she has a very nice station of her own, as you can see in the pictures.

With that, let's meet Vicki!

Name/Call Sign: Vicki Zumwalt, N6KLS

Past calls: KB6DOR

Location: Bay Point, CA

How much property do you have? Quarter of an acre in a housing development with no CC&R's

Describe your antenna system:

Current: Tom Schiller, N6BT and owner of Next Generation Antennas installed a multi band yagi antenna - 11 elements covering 6 bands (20-10) and 6 meters off the front, as well as a 40 meter rotatable dipole 5 ft above the yagi. The 40 meter does not interact with the antenna below. All is sitting on a 55 ft. tower. Tom did a professional job of building and installing these antennas and the results are remarkable. Installation of the antennas was not easy because of my location, however Tom found a method to make it work. He is a genius and has years of experience in his many fields of expertise including the use of his quad copter, which he is using to test antenna patterns.

Future: Planning to have Tom build an 80 meter antenna.

What's in your shack? Elecraft K3s, radio, antenna tuner, amplifier and pan adapter-Love it all! Also I have a computer hooked up to the system.

Check out my QRZ page for photos of my station and antenna.

If you're working, what is your career? I am a Senior Manager in Kaiser Permanente's National Compliance office in Oakland, and plan to retire Dec. 1 of this year. Really looking forward to it after a 26 year career with them.

Married? My husband Glenn, KJ6EN became a Silent Key a year ago. We met on field day one year and after we married we both upgraded our licenses through to Extra Class together. My brother came to live with me after Glenn's death and he studied and passed both the Tech and General class tests. He is Jose, KK6WRZ, and although he is not a contester I am really proud of him. My Mother, Jane, N6NVA, has her general ham license, so we are a 3 ham family! **Kids?** 1 married

daughter, Rochelle and 1 granddaughter, Meilani Jane who will turn 5 this summer.

How many DXCC entities have you worked? Not enough!

What's your favorite contest? CQP. I contest with the best, Ken Keeler, N6RO and his crew in Oakley and have for many years. I used to work with Ken at Tektronix and he has been my mentor and friend for a long time. I love his station and being part of an cracker jack KB team of ham radio operators!

I also really enjoy field day and working with new hams who have never been on the air, seeing the thrill of a contact they have just made is very exciting.

Any tips for contesters? I consider myself a novice even though I have been at this for awhile and have a great mentor. My tip is for expert contesters to share their knowledge, be a mentor and help new people learn and gain confidence in this area. This helps contesting grow and makes it more fun for everyone.

What would you like to see changed in NCCC? More outreach to new members and help them navigate what is available to them. A welcome packet of information would be great. Also at the lunches mix people up so everyone has experience getting to know new members.

Any other hobbies besides ham radio? I love to travel and have been to Portugal, Italy, Spain, Moldova, France, England, Scotland, Wales, Philippines and have traveled all over the US and Canada. I am taking my daughter to Egypt in January and my brother to Italy in October and a trip to Disneyland for the entire family late this year.

I love to 4 wheel off road and just bought a brand new Jeep Wrangler Unlimited Rubicon, bright red and black with all the bells and whistles. I bought a shack on a belt mobile dual band radio for it and will enjoy trips all over the country when I retire.

I am very involved in local ham radio groups including being the Chair for the Contra Costa Repeater Association. I have assisted with Pacificon Conventions for the Mt. Diablo Amateur Radio Club and was a 2 year past Chair for the MDARC group. I am a volunteer examiner for both W5YI and ARRL and enjoy helping interested people obtain their ham ticket.

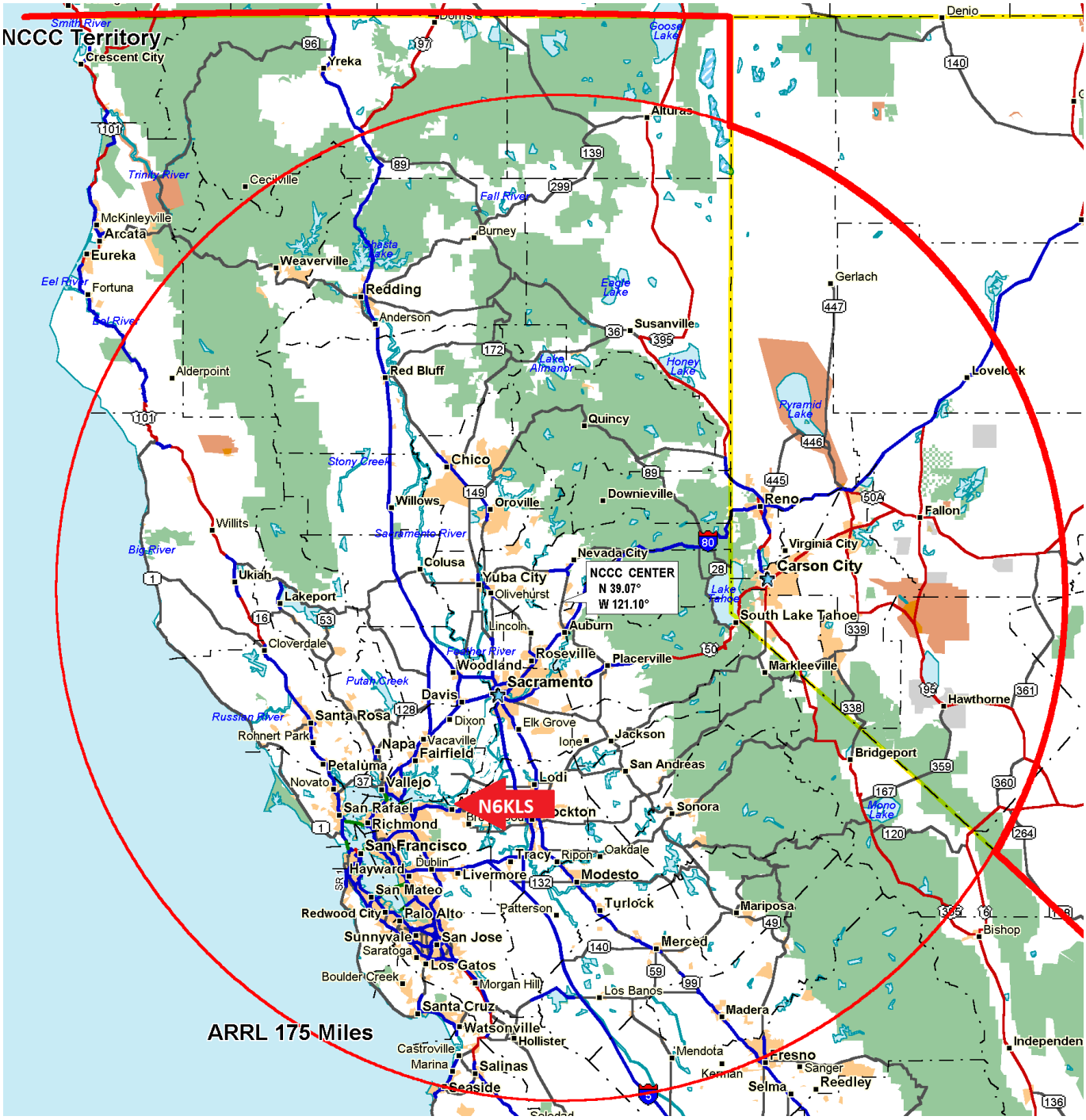
I am also a member of the Quarter Century Wireless Association, and proud of it!

Vicki N6KLS

Vicki N6KLS and brother Jose KK6WRZ

Tom Schiller, N6BT and owner of Next Generation Antennas installing my multi band yagi antenna - 11 elements covering 6 bands (20-10) and 6 meters off the front, as well as a 40 meter rotatable dipole 5 ft above the yagi. The 40 meter does not interact with the antenna below. All is sitting on a 55 ft. tower.

Pink Flamingo-1 covering 20-10.



Can you guess who will be the PGP next month ?

TUBE OF THE MONTH

Visit the museum at N6JV.com

Norm N6JV

GRIDLESS GAMMATRON

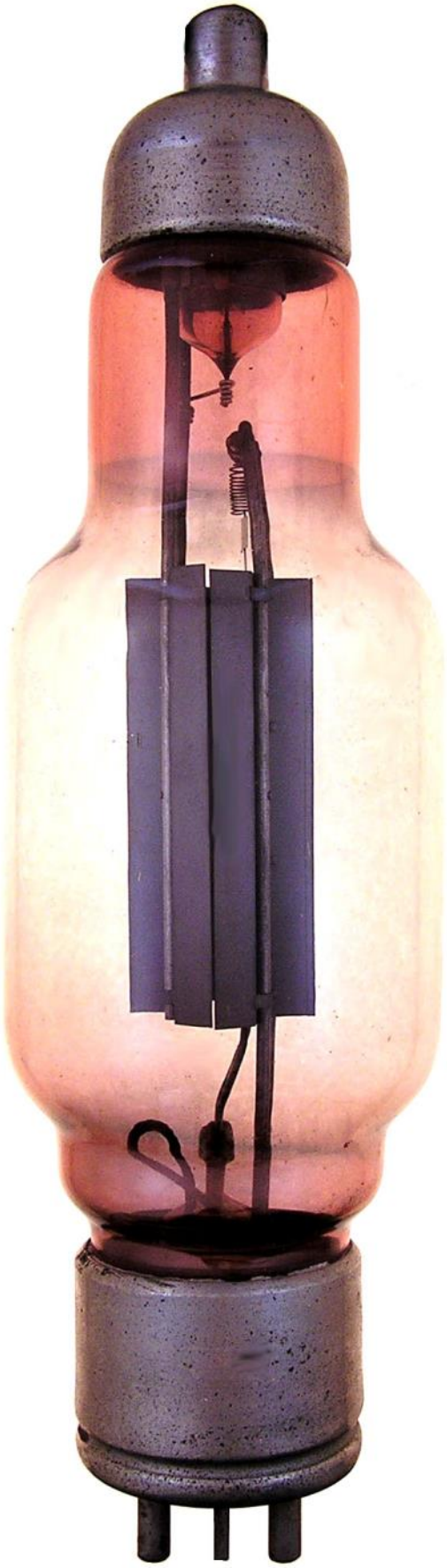
In the late 1920s, the Robert Dollar Steamship Company wanted to install powerful transmitters on all their ships and land stations. They approached Ralph Heintz, W6RH, to research circuits that wouldn't infringe on the existing oscillator patents. Heintz and his partner, Jack Kaufman, had formed Heintz and Kaufman in 1924. Dollar had possession of a patent for a "Simpson" oscillator through their acquisition of the Simpson Radio Co. The circuit worked, but RCA refused to sell them tubes. Heintz and other young engineers from UC Berkley and Stanford began research on a different type of tube that wouldn't infringe on the patents for the triode, the getter, the thoriated tungsten filament and the internal insulator. They explored the work done by Goddard, of rocket fame, and decided to build prototype tubes based on this research.

The new tube was to be much like a full wave rectifier with two large plates and a single filament. The filament was mounted very close to one plate they called a "gamma" plate. A conventional triode used a grid between the filament and plate to control the electron flow, but this tube utilized the gamma plate that had a high potential and created a field around it and the filament. Modulation or switching of the field would release electrons towards the plate. Both anodes were to be made from tantalum metal that had the nature of absorbing gas when operated at high temperatures. A pure tungsten filament and no internal insulators should solve the patent problems.

Heintz had hired two young hams to build their prototype tubes and they set up shop in South San Francisco. They chose the commonly available "250" watt envelope from Corning Glass and produced their first tubes. They worked, but the amplification factor was only 2 or 3 at best. Not a problem in a free running oscillator. The new tubes were a great success and could be run red hot, but were still underpowered for their intended application. They called their new tubes "Gridless Gammatrons". They made a few larger versions and eventually produced 1 KW transmitters for all of Dollar's ships and shore stations mostly using a tube named the HK-255. These tubes worked well at 1 KW with 5000 volts on the plate. None of these tubes were intended for public sale.

RCA was not pleased and quickly sued H&K. Seven RCA lawyers showed up for the trial, but Heintz had built an excellent set of demonstrations for this technology and before the trial started, they dropped the suit.

As the depression went on, the finances of Dollar slumped so Heintz convinced the company to start selling tubes to the public and make some money now that RCA had been found to be running a monopoly and was required to allow others to make gridded tubes. By 1934 they produced an excellent tube designated the HK-354 and sales looked promising, but Dollar's financial problems forced staff reductions. The two young hams that Heintz had first hired and helped him set up the tube manufacturing, could see little future working for H&K so started their own tube making company. They were Bill Eitel, W6UF, and Jack McCullough, W6CHE, and their new company was called EIMAC.



GOLDRUSH—TEAM

W6H - Mono

W6H at W6SX

I was honored and delighted when K6MM asked if I would like to be W6H. I accepted on the spot.

Adding to the delight was learning that my friend W6KC was going to be K6H. Jim often activates W6ML here in Mammoth Lakes as a CQP California County Expedition entry. He sets up in a condo he owns less than a half mile from me. We both have K3s, so we coexist with no issues. Over the last decade we have swapped the Mono County record back and forth a few times. But, this year

Jim was K6H from his home QTH in Santa Monica.

CQP as W6H was a blast. No special preparations—used my normal W6SX setup. I spent most of my time on CW. But, mindful that there were lots of phone ops trying to Gold Rush, I spent much more time on phone than if I had been going for score. My goal was to hand our contacts, regardless of mode—I didn't care about score. One nice benefit of being W6H was greatly reduced Sunday doldrums.

Gold Rush was the closest I've been to being DX. I count 2015 CQP along with 2014 ARRL Centennial (100-point Charter Life Member brought me 20,870 QSOs) as highpoints of my sixty-year ham career. Thank you CQP committee—Gold Rush will be a hard act to follow.

W6H - Mono

Hank W6SX

Mammoth Lakes, California

Elevation 8083 feet in John Muir's Range of Light

GOLDRUSH—TEAM

K6H - Los Angeles

K6H / W6KC

I

was very excited to receive an email offering me the opportunity to operate in the 50th anniversary CQP using one of the 1x1 Gold Rush call signs. I quickly accepted.

This was my 2nd year operating CQP from my home QTH in LANG. I had done County Expeditions in Mammoth Lakes, Mono County the prior 22 years. I am still trying to adjust from operating at 8,000 feet with a forest of pine trees for getting my wire antenna high in the air, to my home QTH in Santa Monica at 75 feet elevation and no trees for antenna wires. For my county expeditions in Mono County, in addition to dipoles, I used 3 elements wire beams on 15 and 20 Meters. All of the antenna were launched high in the pine trees and worked very well. I always really enjoyed the challenge of operating a county expedition in the beautiful High Sierra of central California.

For this CQP, at my home QTH, I was able to put up my 80m dipole by extended it across my neighbor's roof to a tree on the other side of his property. My TA33jr beam is mounted just above the roof on my 2 story house and my 40M inverted V is not too much higher. My QTH is on top a hill providing me a very nice take off angle towards most of the US and with my AL-80B amplifier it works out pretty well. My Elecraft K3 and P3 helps make CQP even more enjoyable.

Sunday morning I still needed NE ant NT but never heard either one all weekend so it was another 56-muilt year. One highlight was finding 10m open on Sunday morning. It only lasted about 30 minutes, but I had a great rate while it lasted. The rest of Sunday was a challenge...I just kept making band and mode changes trying to get new stations logged. I finished with 945 CW and 619 Phone contacts for a total of 1,564 QSOs x 56 mults and 228,088 points. This was enough to keep me in good company with the top 20 wine winners.

I really enjoyed being one of the Gold Rush 1x1 stations and it was nice to work 20 of the other 23 Gold Rush stations.

Thanks to all for another excellent CQP!

73, Jim K6H/W6KC

Wire antenna used in prior CQP County Expedition in Mono >

K6H - Los Angeles

Jim W6KC

California QSO Party

G O L D R U S H —T E A M

N6H - El Dorado

California QSO Party

This Certificate of Achievement Is Awarded To

DICK WILSON, K6LRN (OP)

N6H

Class: SO-H Rank: #1-El Dorado #19-CA Gold Rush Station
El Dorado County

50th Running of The CQP - October 3-4, 2015

991 Contacts
56 Multipliers
143,920 Total Points

John Miller
John, K6MM, CQP Webmaster

NCCC

Kevin Rowett
Kevin, K6TD, CQP Chairman

My station consists of a Yaesu FT-1000 MP driving an Alpha amp. Antennas are a SteppIR on one tower & two element 'shorty forty' + 80 meter dipole on another. Location is at 3400' about 25 miles south-east of Placerville in the Sierras.

Thanks to all for the Qs.

Dick K6LRN

El Dorado

GOLDRUSH—TEAM

Thank you to all the stations that provided CQP write-ups over the last 8 months

October — G	
K6NR, K6RBS, AF6GL	**San Bernardino—K6G**
W6TCP, KQ6DI, WB6ETY, KI6OY, KG6YYY, KK6DF	**Tuolumne—N6G**
November— O	
AF6WX, K3EST, K6AW, N6BV, N6KLS, N6RO, WX5S, WZ6Z	**Contra Costa—N6O**
December—L	
W6TK, N6WS, KA3DRR, K6YR, W6SL, W6SZG	**San Luis Obispo—K6O**
K6LA	**Los Angeles—N6L**
K6WX	**Alpine—W6L**
N6WM, NS6T	**Alameda—K6L**
January—D	
W6VI	**Los Angeles—K6D**
K6XX	**Santa Cruz—W6D**
February—R	
AE6Y	**Amador—N6R**
March—U	
K6MM	**Santa Clara—N6U**
April– S	
WK6I	**Calaveras—W6S**
K6SRZ, KU6F	**Sonoma—K6S**
May-H	
W6SX	**Mono—W6H**
W6KC	**Los Angeles—K6H**
K6LRN	**El Dorado—N6H**

Contesting from the West Coast – Musings on West Coast relevant contests
by N6WM

(Opinions are specifically those of the author and do not represent any official statement of the NCCC)

With Dayton Hamvention come and sadly WPX CW gone, we bid adieu to the 2015/2016 contest season. June is truly slow and time for us to work on antennas, rotors and fine tune our stations.

Having had this slot during the regular contest season, I have spoken quite a bit about the contests that work for us here in Northern California. Now that its slow if you will all permit me I wanted to share some thoughts and hopes for Amateur Radio contesting from the San Francisco bay area.

How and why is there a Northern California Contest Club (NCCC)? You would think it would not exist. North W6 by its location is one of the most temperate and cosmopolitan locations one can live on our small planet. It's the cradle of technology and certainly a great place to find employment, High wages and subsequently costly housing and as a side effect, HOA restrictions and of course dense population, and with that small lots and RFI from every new tech (and some not so tech) device that exists.

With the attract of Silicon Valley employment, innovation and a wonderful location including two of the best Higher education institutions in the world, followed by a number of others right up there comes some of the best technical minds on our little globe. It seems that many of those great minds happen also, like ourselves to find solace in our great radio sport.

You would think that this would be the winning center of radio sport. However, as wonderful as the San Francisco bay area is, from a competitive contesting standpoint we have a lot stacked against us. The 3000 miles between the East and West coast puts us at an obvious disadvantage from the gold mine of multipliers in the EU.. so easily reached with a simple dipole from the east coast. Yes we have Asia, and a good run of Japan and Asia PAC with fill up your log, but alas.. that gold mine of country mults is at best available to us for a couple of morning, (sometimes early morning) hours as propagation allows.

I sit down in the Mighty N6RO station, look around the group of Experienced and World class contesters, dxpeditioneers, CQ contest hall of famers. My friends. My Elmers. With FULL knowledge we are sitting down to lose a contest. We simply have no chance of bringing home the trophy.

Or are we losing?

Much like the controversy of the DXCC program, another challenge here from North W6(an 8 band dxcc is a completely different honor and achievement from our propagation challenged qth), your contest is indeed YOUR contest and your only competitor is yourself, your will and how well you think YOU did. Why? Because the trophies may be awarded to the high scorers, but the highest score is not necessarily reflective of the best of the best. Yes, that's right. You know it, I know it and of course your competition knows it. The system does not accurately award excellence by skill or

dedication. It awards based on raw score. This is an undisputable fact.

So how do we make it work? Well.. one way is to say we declare a line of scrimmage and judge our performance against others in that area. That works ok and almost is enough to put us in the chair. We also love the competition itself. The adrenalin of competition with hundreds from all over the world. The quality of our signal. The ability to drop that S9+ into Europe when we can. That adds to it as well. Working the modes at their best.. the CW pile up.. the SSB operator that can pick a call out of a cloud of noise. The RTTY contester that uses 3 different decoders to copy just one more call then the others in the area. You get the picture. Operating the contest is our passion and attracts us over and over again to give it a shot.

NCCC territory is indeed a special place and you.. yes you the reader of this are a special operator. Because ham operators who operate in conditions that are stacked against them makes them better. Just like a soccer player in training will put a parachute on to make their run more difficult, it builds strength. We are More skilled. More adept at recognizing propagation advantages, more in tune with optimizing our stations and technology available to us to give us that slight tick of advantage and overall makes the dedicated W6 contesters best contesters in the world.

Our hobby is one of the greatest fellowships in the world. And our subset in Radio sport is indeed its own fellowship of operators who enjoy our passion and love for our sport. I hope one day that this group of tight knit fellows finds a way to compete on an even playing field. I hope that the rules can reflect the differences of locations and challenges.

But make no mistake. Our disadvantage propagation wise gives us strength. And skill. And indeed makes us all some of the best competitors in radio sport. And after contesting here you happened to find yourself.. say in a contest station in W1/W2.. or P4… or ZF.. or wherever.. you are very likely to find yourself as a superstar of radio sport. Because you, against all odds with everything stacked against you.. got on the air and into the competition and sometimes even won!

So indeed that is why the NCCC is one of the most elite radio sport clubs in the world. I am proud to be a member, and you should be as well.

I look forward to operating the 2016/2017 contest season with you all at my side.

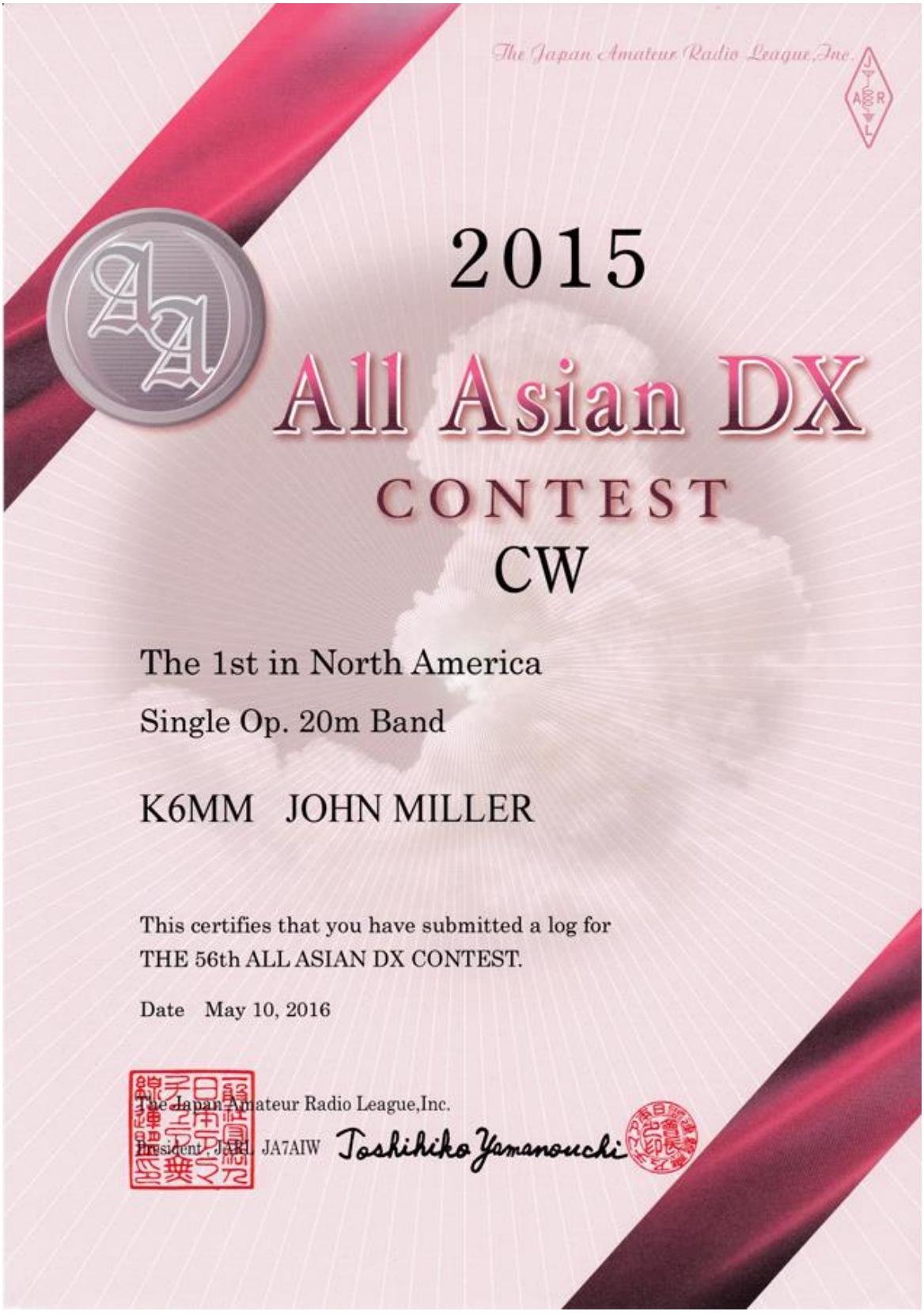
73
Chris
N6WM

QSL Card Trivia—Answer!

WN6FPP is Bob Frostholm, now KO6LU. In October, 1963, Bob worked WN6EUQ. WN6EUQ is Bob Hess, now W1RH.

Do you have an old card from a current or former NCCC member? If so, please scan it and send it to w6tcpian@gmail.com

NCCC Member Awards—John K6MM



Contest Calendar– June page 1

Phone Fray	0230Z-0300Z, Jun 1
CWops Mini-CWT Test	1300Z-1400Z, Jun 1 and 1900Z-2000Z, Jun 1 and 0300Z-0400Z, Jun 2
NRAU 10m Activity Contest	1700Z-1800Z, Jun 2 (CW) and 1800Z-1900Z, Jun 2 (SSB) and 1900Z-2000Z, Jun 2 (FM) and 2000Z-2100Z, Jun 2 (Dig)
NCCC RTTY Sprint	0145Z-0215Z, Jun 3
NCCC Sprint	0230Z-0300Z, Jun 3
HA3NS Sprint Memorial Contest	1900Z-1929Z, Jun 3 (40m) and 1930Z-1959Z, Jun 3 (80m)
PVRC Reunion	0000Z-0400Z, Jun 4 (CW) and 0000Z-0400Z, Jun 5 (SSB)
10-10 Int. Open Season PSK Contest	0000Z, Jun 4 to 2400Z, Jun 5
DigiFest	0400Z-1200Z, Jun 4 and 2000Z, Jun 4 to 0400Z, Jun 5 and 1200Z-2000Z, Jun 5
Wake-Up!QRP Sprint	0600Z-0629Z, Jun 4 and 0630Z-0659Z, Jun 4 and 0700Z-0729Z, Jun 4 and 0730Z-0800Z, Jun 4
SEANET Contest	1200Z, Jun 6 to 1200Z, Jun 7
UKSMG Summer Contest	1300Z, Jun 4 to 1300Z, Jun 5
IARU Region 1 Field Day, CW	1500Z, Jun 4 to 1459Z, Jun 5
RSGB National Field Day	1500Z, Jun 4 to 1500Z, Jun 5
Dutch Kingdom Contest	1500Z, Jun 4 to 1500Z, Jun 5
Alabama QSO Party	1600Z, Jun 4 to 0400Z, Jun 5
RSGB 80m Club Championship, Data	1900Z-2030Z, Jun 6

Contest Calendar– June page 2

ARS Spartan Sprint	0100Z-0300Z, Jun 7
Phone Fray	0230Z-0300Z, Jun 8
CWops Mini-CWT Test	1300Z-1400Z, Jun 8 and 1900Z-2000Z, Jun 8 and 0300Z-0400Z, Jun 9
NCCC RTTY Sprint	0145Z-0215Z, Jun 10
NCCC Sprint	0230Z-0300Z, Jun 10
DRCG WW RTTY Contest	0000Z-0759Z, Jun 11 and 1600Z-2359Z, Jun 11 and 0800Z-1559Z, Jun 12
VK Shires Contest	0600Z, Jun 11 to 0600Z, Jun 12
Asia-Pacific Sprint, SSB	1100Z-1300Z, Jun 11
SKCC Weekend Sprintathon	1200Z, Jun 11 to 2400Z, Jun 12
Portugal Day Contest	1200Z, Jun 11 to 1200Z, Jun 12
GACW WWSA CW DX Contest	1500Z, Jun 11 to 1500Z, Jun 12
REF DDFM 6m Contest	1600Z, Jun 11 to 1600Z, Jun 12
ARRL June VHF Contest	1800Z, Jun 11 to 0259Z, Jun 13
NAQCC CW Sprint	0030Z-0230Z, Jun 15
Phone Fray	0230Z-0300Z, Jun 15
CWops Mini-CWT Test	1300Z-1400Z, Jun 15 and 1900Z-2000Z, Jun 15 and 0300Z-0400Z, Jun 16
RSGB 80m Club Championship, CW	1900Z-2030Z, Jun 15
NCCC RTTY Sprint	0145Z-0215Z, Jun 17
NCCC Sprint	0230Z-0300Z, Jun 17
All Asian DX Contest, CW	0000Z, Jun 18 to 2400Z, Jun 19
SMIRK Contest	0000Z, Jun 18 to 2400Z, Jun 19
Ukrainian DX Classic RTTY Contest	1200Z, Jun 18 to 1159Z, Jun 19
IARU Region 1 50 MHz Contest	1400Z, Jun 18 to 1400Z, Jun 19
AGCW VHF/UHF Contest	1400Z-1700Z, Jun 18 (144) and 1700Z-1800Z, Jun 18 (432)
Stew Perry Topband Challenge	1500Z, Jun 18 to 1500Z, Jun 19
West Virginia QSO Party	1600Z, Jun 18 to 0200Z, Jun 19
Kid's Day Contest	1800Z-2359Z, Jun 18
Feld Hell Sprint	2000Z-2159Z, Jun 18
WAB 50 MHz Phone	0900Z-1500Z, Jun 19
Run for the Bacon QRP Contest	0100Z-0300Z, Jun 20
SKCC Sprint	0000Z-0200Z, Jun 22
Phone Fray	0230Z-0300Z, Jun 22

Contest Calendar– June

CWops Mini-CWT Test	1300Z-1400Z, Jun 22 and 1900Z-2000Z, Jun 22 and 0300Z-0400Z, Jun 23
NAQCC CW Sprint	0030Z-0230Z, Jun 23
RSGB 80m Club Championship, SSB	1900Z-2030Z, Jun 23
NCCC RTTY Sprint	0145Z-0215Z, Jun 24
NCCC Sprint	0230Z-0300Z, Jun 24
Ukrainian DX DIGI Contest	1200Z, Jun 25 to 1200Z, Jun 26
His Maj. King of Spain Contest, SSB	1200Z, Jun 25 to 1200Z, Jun 26
ARRL Field Day	1800Z, Jun 25 to 2100Z, Jun 26
Phone Fray	0230Z-0300Z, Jun 29
CWops Mini-CWT Test	1300Z-1400Z, Jun 29 and 1900Z-2000Z, Jun 29 and 0300Z-0400Z, Jun 30

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The radio

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