



Publication of the  
Northern California  
Contest Club



Issue 538

March 2017



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### NCCC April Meeting

**Saturday, April 29th**

11:30 AM Social Hour, 12:00 PM Lunch 12:30 PM Program

**Location**

40 Golf Club Rd, Pleasant Hill, CA 94523

**Program**

Jim K9YC, Locating stubs for harmonic suppression

**See You There !**



### President's Report

Hello KB'ers!

I think the highlight of being the President of this great club is presiding over the annual NCCC Awards Banquet. This year, I believe we had about 50 in attendance at the traditional location, the Tied House, in Mountain View. To preside at an event like our Awards Banquet is truly an honor. What I love about the awards tradition in this club is that we recognize not only the best of the best, but we also recognize those of you, with the smaller stations, who work so hard to make points for our club.

I want to thank Gary, NA6O, our Awards Manager, for the terrific job he did in coordinating a new look to our plaques and certificates. They are really outstanding! Gary also did a fine job presenting the KB Awards. In addition, John, K6MM, did an outstanding job with the CQP awards; Ian handled all of the details of the banquet; Ron, N6IE, shined in his presentation of our RTTY awards; Dick, K6LRN, somehow managed to find a way to pay for all of the awards. Nice job, guys!

I also can't forget to thank Jeff, WK6I, for donating four cases of wine from his Twisted Oak Winery. Most of these went to the CQP awards, but he also threw in a few bottles to present to the best of the best in the first annual KB Competition.

Continued on page 3



## 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	Gary Johnson	NA6O	gwj@wb9jps.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	Ian Parker	W6TCP	w6tcpian@gmail.com
JUG Editor	Ian Parker	W6TCP	w6tcpian@gmail.com



### 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.

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).

Although I credited John, K6MM, for a job well done with the CQP awards, the credit also goes to John's entire CQP team: N6TV (County Activation), W6OAT (Rules), NS6T (Log Submission Form, Adjudication Software, Production of Results), AD6E (Technical Support), N6DE (Technical Support), W6TCP (General Support), WK6I (CQP Wine Donation), K6LRN (Financial Support), and K6YL (Award Checking).

In addition to the CQP awards, presented by K6MM, and the RTTY awards, presented by N6IE, it was my pleasure to present the annual NCCC Operating Awards. Our Rookie of the Year was Tyler, K6TLR. Gary, NA6O, got the Most Improved award. Ed, W0YK, who has done so much for NCCC's RTTY efforts (along with WK6I), got the Elmer of the Year award. Ian, W6TCP, got TWO awards.....the Team Builder award and the NCCC MVP award. Frank, W6JTI, who somehow manages to score big with 5 watts and inspires us all, got the Inspiration Award. Our Operating Excellence awards went to Mike, N7MH (CW), Rich, N6KT (Phone), and Ron, N6IE (RTTY). The Contester of the Year award, and much deserved, went to Bob, K6XX. I gave the President's award to Fred, K6DGW, who has done an exceptional job coordinating our NAQP teams, flogging the NAQP's, running the California Counties award program, and for just being a great cheerleader for the Club.

And then there were the KB awards, presented by Gary, NA6O. A little background:

When I took over as President, in 2015, I wanted to know just how many of our members were active contesters. Since no one knew the answer, I began compiling a massive spreadsheet, listing 31 of the major contests and began tracking the scores of each member, and even those who lived in our circle who were not members. What I found was that about two-thirds of our members actually participated in at least one contest, but there was a quite a difference in the types of contests our members participated in. Some only do the VHF contests. Some do primarily the Sprints. I found many who almost never participated in our Focus Contests but were always there, some with huge scores, in the international DX contests. Since NCCC's focus contests are almost always weighted towards the domestic, or everyone-works-everyone, competitions, those who worked the international DX contests almost never got honored at the Awards Banquets over the years.

When I was staring at the spreadsheet, the idea occurred to me that we could start of an internal competition as a way to recognize the best of the best in our club. I presented the idea to the Board, and we decided to try it out. We leveled the playing field by assigning mults to each contest. For instance, 1000 Q's in the CQWW would result in a considerably higher score than 1,000 Q in Sweepstakes. So, in the KB Competition, the mult for CQWW was 1 and the mult for SS was 20. Huge mults were also given to the scores of those who worked the ARRL June VHF contest and to those who worked the Sprints.

Matt, WX5S, has been working on a way to automate the scorekeeping, but it all depends on the membership posting their scores on 3830.....and just about everyone does. When it came time for the numbers to be tallied for the awards, Gary, NA6O, spent considerable time checking my spreadsheet. Thank you, Gary! It all really needs to be automated, and we're hoping Matt can pull it off. Elsewhere in this edition of the Jug you'll find the actual list, beginning with Alan, K6SRZ, at the very top as the winner of the first of what I hope will be an annual competition within the Club.

I'll see many of you soon, in Visalia, and then at our April meeting.



# KB Competition

## First Place with 1,408,700,064 Points



Alan K6SRZ (photo N6TV)

# The First Annual NCCC KB Competition

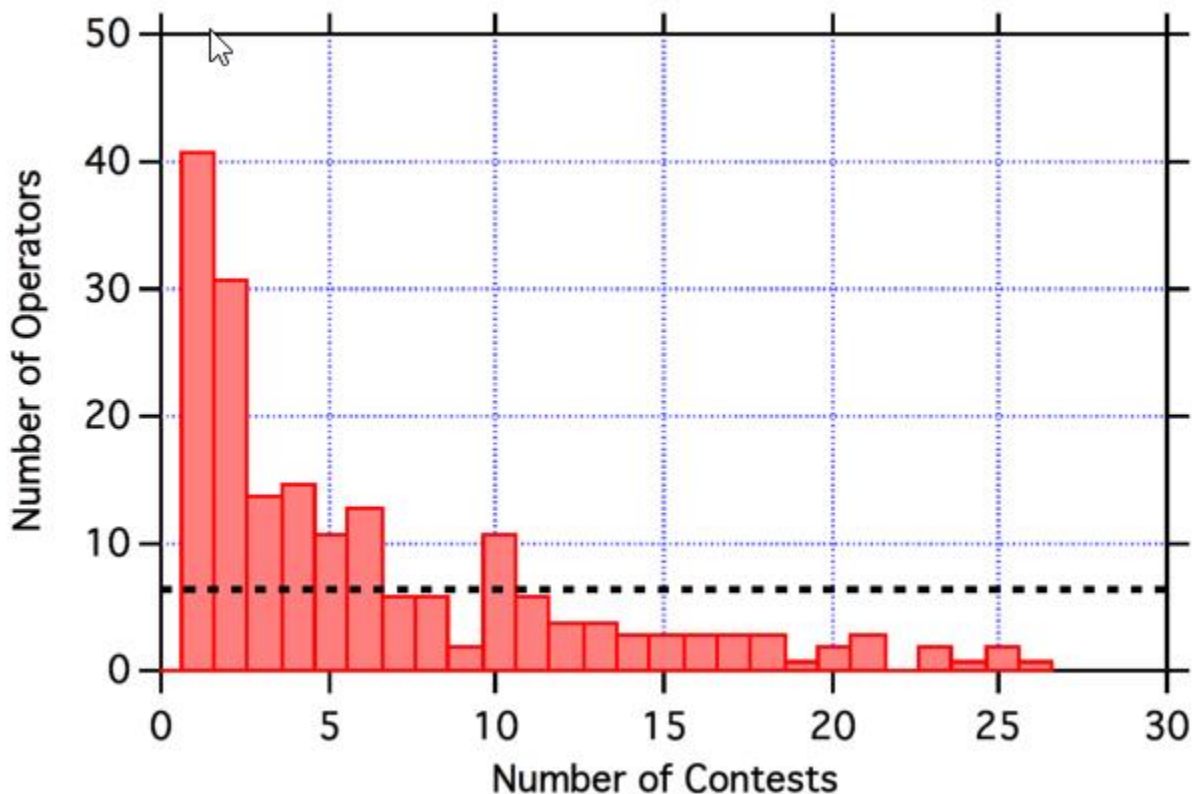
## Bob, W1RH

The NCCC KB Competition (named by Gary, NA6O), consisted of points earned in a total of 31 contests. To level the playing field, each contest was assigned a multiplier, resulting in a "Weighted" score. The NCCC Sprints were counted as one contest in the competition. The score credited was the total of all of the weekly Sprints over the year. Likewise, the NCCC RTTY Sprints were treated the same way. Some of the more popular QSO parties will probably be added to this year's competition (2017-2018).

The contests in the 2016-2017 KB Competition were: (Focus Contests Highlighted)

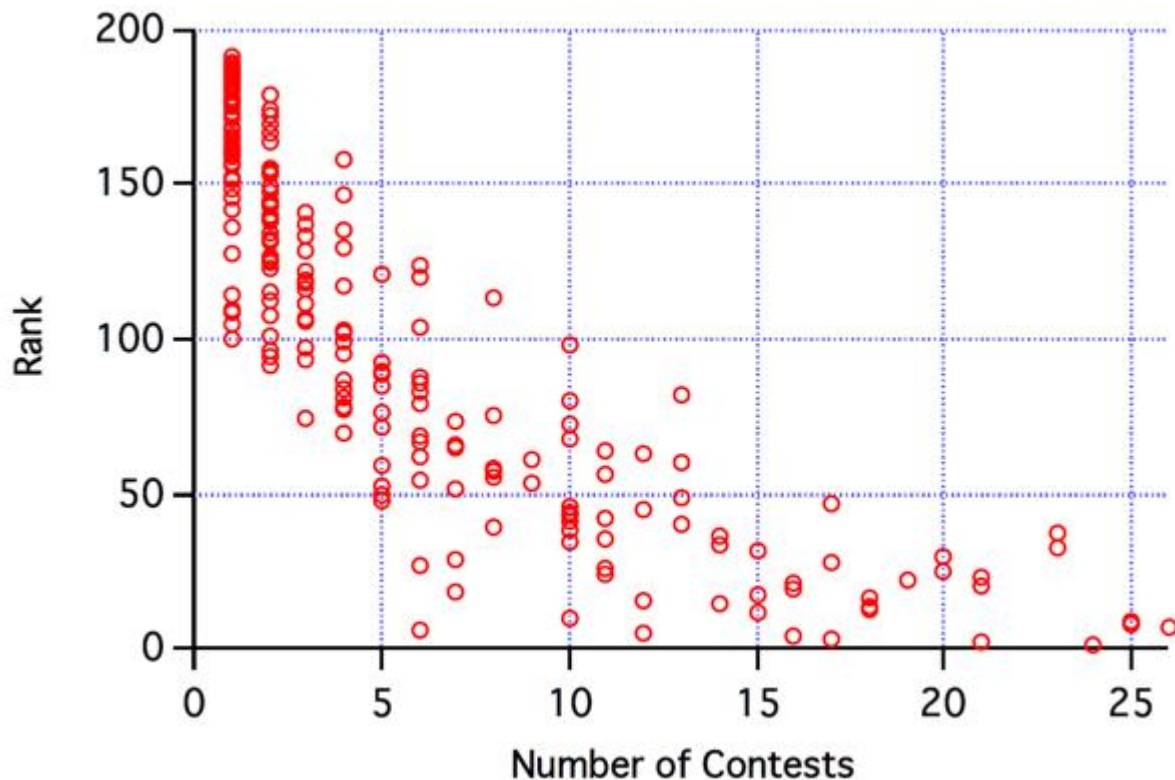
CONTEST	MULTIPLIER
CQ WPX CW	2
ARRL June VHF	200
All Asia CW	10
IARU	5
NAQP RTTY Summer	50
NAQP CW Summer	50
NAQP SSB Summer	50
CQWW RTTY	1
CQP	20
CQWW SSB	1
ARRL Sweepstakes CW	20
ARRL Sweepstakes SSB	20
CQWW CW	1
ARRL 160 Meter	50
ARRL 10 Meter	10
ARRL RTTY Roundup	50
NAQP RTTY Winter	50
NAQP CW Winter	50
NAQP SSB Winter	50
ARRL DX SSB	5
ARRL DX CW	5
NCCC RTTY Sprint (all of them)	100
NCCC Sprint (all of them)	100
CQ WPX RTTY	2
NA Sprint SSB Spring	100
NA Sprint CW Spring	100
NA Sprint SSB Fall	100
NA Sprint CW Fall	100
10 Meter RTTY	100
CQ WPX SSB	2
JARTS RTTY	5

Alan, K6SRZ, won this year's KB Competition. He won because he participated in 24 of the 31 contests and he participated in virtually all of the Focus Contests. It doesn't hurt to have high scores, but Alan didn't necessarily score high in all of these contests.



You become the best of the best by working our Focus Contests, which have relatively high multipliers, and by working the majority of the contests.

Gary, NA6O, prepared the charts shown in this article. The chart, below, shows the rankings vs the number of contests our operators participated in.



Thanks to Steve, W1SRD, for allowing me to bounce ideas off of him, and to Gary, NA6O, for naming the competition and designing the KB graphic.

About two-thirds of our members participated in at least one of these contests and all of you, from #1 to #188, should be congratulated. We're a contest club, and you helped the club. We appreciate all of our members, including those who participate in other ways, can no longer contest for health or financial reasons, etc., but those of you who actually participate in a contest are in the special group of Point Generators for the Club.

If you want to place in the top 50 in the KB Competition, you need to be active in at least two of the three modes.

Below is the list of the top 100 (out of 188) in the Club who participated in at least one contest in the KB Competition.

(Large plaque winners in red. Small plaque winners in green. Certificate winners in blue)

TOTAL CONTESTS	TOTAL WEIGHTED	CALL	RANK
24	1,408,700,064	K6SRZ	1
21	1,186,585,743	K6MR	2
17	1,114,776,734	KA6BIM	3
16	1,048,164,727	N7MH	4

12	993,356,832	AE6Y	5
6	938,257,276	W2SC	6
26	850,697,202	N6RO	7
25	838,232,975	W6SX	8
25	801,041,411	NA6O	9
10	787,045,473	W0YK	10
15	779,863,643	N6TV	11
18	721,612,142	W1SRD	12
18	708,598,434	N6WM	13
14	669,370,254	N6IE	14
12	667,617,384	K6XX	15
18	626,639,526	N6ZFO	16
15	593,140,642	K9YC	17
7	572,512,664	W6LD	18
16	484,686,791	W1RH	19
21	462,499,065	W6OAT	20
16	452,927,906	WX5S	21
19	449,075,393	K6GHA	22
21	429,429,315	K6MM	23
11	408,742,834	WC6H	24
20	408,379,940	K6LRN	25
11	342,869,802	AD6E	26
6	326,666,388	N6KT	27
17	316,079,147	K2RD	28
20	267,135,100	KR6N	29
15	262,677,662	K5RC	30
23	242,913,960	N2NS	31
14	240,748,520	ND2T	32
10	201,010,180	N3ZZ	33
14	200,224,187	K6NV	34
23	187,756,981	N0KQ	35
10	171,649,051	K3EST	36
8	147,643,320	N6JV	37
13	137,700,550	K6UFO	38
10	132,796,970	N6EE	39
11	132,389,070	K6RIM	40
10	118,787,630	W6JTI	41
10	116,422,130	K7XC	42
12	102,701,976	AF6SA	43
10	100,639,460	W6FA	44
17	97,276,533	KM6I	45



5	96,540,750	WK6I	46
13	88,299,774	NW6P	47
5	87,579,875	KX7M	48
7	86,455,087	N6NU	49
5	86,215,200	K6TU	50
9	83,734,227	K6JS	51
6	82,365,600	N6RK	52
8	79,136,584	K6SCA	53
11	78,193,742	W6SR	54
8	77,802,324	K6TLR	55
8	76,786,233	N6XI	56
5	74,768,063	W6NL	57
13	69,109,079	K6KNS	58
9	68,678,085	K6EU	59
6	66,851,413	WA6O	60
12	63,913,680	WB6JJJ	61
11	60,754,914	K6XN	62
7	50,432,480	K6DGW	63
7	45,180,310	AJ6V	64
6	44,203,650	W6SFK	65
6	39,813,168	WX6V	66
4	37,589,203	N6BV	67
5	36,523,930	W6DR	68
10	34,153,370	NJ6G	69
7	26,441,534	W6EU	70
3	26,242,920	NR6Q	71
8	25,271,280	N6AJS	72
5	23,186,205	K6RB	73
14	22,257,984	K6CSL	74
4	22,246,149	K7GK	75
4	21,656,848	N6PN	76
6	21,508,890	KH2TJ	77
10	21,159,200	N3RC	78
10	20,946,550	KO6LU	79
4	20,732,560	KG6N	80
6	20,204,700	K6MI	81
4	18,436,979	K6AW	82
5	17,999,875	K6JEB	83
6	16,454,286	KD6WKY	84
4	15,989,920	N5KO	85
6	14,460,360	W6RKC	86

5	13,762,780	N6DQ	87
5	12,987,920	N6NUL	88
2	12,492,367	DG1CMZ	89
5	12,086,200	W6FB	90
3	11,761,800	N6YEU	91
2	11,332,080	KU6F	92
4	10,745,320	K6TD	93
2	10,659,040	N6NZ	94
3	10,432,020	K9JM	95
10	10,407,400	K6CTA	96
4	9,086,304	W6RGG	97
1	8,986,600	W6UQZ	98
2	8,743,708	N6TU	99
4	8,507,520	K6XV	100

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## 2017 Hamvention's Technical Achievement Award.

Congratulations to Rob, K6RB for winning the 2017 Hamvention's Technical Achievement Award.

Here's the announcement from the ARRL:

Rob Brownstein, K6RB, is the recipient of the Hamvention 2017 Technical Achievement Award. Licensed in 1958 at age 11, Brownstein could hardly wait to upgrade to General and get on SSB, but he soon discovered that he enjoyed operating CW much more. So, he put his microphone aside and never looked back. In January 2010, Brownstein was among about a dozen hams on several continents who founded the CW Operators Club (CWops).

In 2012, he was elected president of CWops and served two consecutive terms. During his tenure as president, Brownstein encouraged and participated in all aspects of the club, from rag-chewing and contesting to mentoring, through CW Academy, begun in earnest in 2012. Since then, the Academy has mentored more than 800 radio amateurs through its beginner, intermediate, and advanced CW courses.



Official award presentations will take place at Hamvention, May 19-21, at the Greene County Fairgrounds and Expo Center in Xenia, Ohio.

# NCCC—Award Presentation—2016 Achievement Plaques

2017 K6XX 4,079,970 POINTS	2017 President's Award  K6DGW Skip Jensen
2017 Rookie of the Year  K6TLR Tyler Laursen	2017 Contester of the Year  K6XX Bob Wolbert
2017 Most Improved Contester  NA6O Gary Johnson	2017 Inspiration Award  W6JTI Frank Letton
2017 Elmer of the Year  WØYK Ed Muns	2017 Operating Excellence Award, CW Mode N7MH Mike Heideman
2017 Team Builder Award  W6TCP Ian Parker	2017 Operating Excellence Award, SSB Mode N6KT Rich Smith
2017 Operating Excellence Award, RTTY Mode N6IE Ron Castro	2017 Most Valuable Player  W6TCP Ian Parker

## Award Presentation—RTTY WPX 2017

Call	Operators	CERT / PLAQUE	QSO'S
P49X	W0YK	CERT	3783
WQ6K	N6IE	CERT	1710
KU6W	K9YC	PLAQUE	1472
KA6BIM		PLAQUE	1184
AG1RL	W1SRD	PLAQUE	1293
AG6AU	K6TLR W1RH	CERT	1206
WV6I	N6WM	PLAQUE	1011
NA6O		PLAQUE	815
W6SX		CERT	1011
AF6SA		CERT	742
W6SFK		CERT	760
NC6DX	K6XN K6XXN	PLAQUE	643
N2NS		CERT	555
K6GHA		CERT	512
KR6N		CERT	506
WE6Z	W6ZO WE6Z	CERT	448
N6EE		CERT	390
K6LRN		CERT	351
AK6M	K6MM	CERT	331
NJ6G		CERT	330
K6KNS		CERT	358
NW6P	NW6P WX5S	CERT	307
WU6TT	N9YS W6DR	CERT	205
WU6X		CERT	250
K6SRZ		CERT	203
KM6I		CERT	190
WB6JJJ		CERT	180
W6SR		CERT	163
W6OAT		CERT	150
K6RIM		CERT	128
N0KQ		CERT	100



## Award Presentation—RTTY RU

<b>Call</b>	<b>Name</b>	<b>Level</b>
AF6SA	RU KB700 CERTIFICATE	700
K2RD	RU KB600 CERTIFICATE	600
K6CTA	RU KB100 CERTIFICATE	100
K6GHA	RU KB600 CERTIFICATE	600
K6KNS	RU KB300 CERTIFICATE	300
K6LRN	RU KB300 CERTIFICATE	300
K6MM	RU KB600 CERTIFICATE	600
K6NV	RU KB500 CERTIFICATE	500
K6UFO	RU KB1000 CERTIFICATE	1000
K6XN	RU KB300 CERTIFICATE	300
K9YC	RU KB900 CERTIFICATE	900
KM6I	RU KB100 CERTIFICATE	100
KR6N	RU KB400 CERTIFICATE	400
N2NS	RU KB300 CERTIFICATE	300
N6DZR	RU KB500 CERTIFICATE	500
N6IE	RU KB1500 CERTIFICATE	1500
N6WM @ N6RO	RU KB2000 CERTIFICATE	2000
NØKQ	RU KB300 CERTIFICATE	300
NW6P	RU KB100 CERTIFICATE	100
P49X (WØYK)	RU KB3500 CERTIFICATE	3500
W1RH (K6TLR, W1RH)	RU KB1200 CERTIFICATE	1200
W1SRD	RU KB600 CERTIFICATE	600
W6DR (KJ6GMT, W6DR)	RU KB200 CERTIFICATE	200
W6EU	RU KB400 CERTIFICATE	400
W6SR	RU KB200 CERTIFICATE	200
W6SX	RU KB800 CERTIFICATE	800
WB6JJJ	RU KB400 CERTIFICATE	400
WC6H	RU KB1200 CERTIFICATE	1200

## Awards Shipping Department

Gary NA6O @ Plaque Shipping department ships the first half of about 50 plaques. About 45 certificates have also been mailed.!



## NCCC Meetings April

Here are the dates and venue for April. Bob W1RH is looking for presenters for the April meeting dates, of course.

### **April 29th - Saturday,**

11:30 AM Social Hour, 12:00 PM Lunch 12:30 PM Program  
40 Golf Club Rd, Pleasant Hill, CA 94523  
Program: TBD

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## Election of Officers

NCCC holds its annual election in April. The Board of Directors consists of President, Vice President/Contest Chairman, Secretary/Treasurer, Past President, and three Directors.

If you are interested in any of the BOD positions, please contact John K6MM.

In addition, a volunteer panel steps forward each year to assist the club in its many activities. We're always looking for more volunteers, so if interested, please contact any member of the current BOD.

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## NCCC Life Membership

NCCC Life Membership is available for a one-off payment of \$250.00

If you would like to apply for life membership, please submit your request using this link [here](#)

Each request will be reviewed by the NCCC BOD at the regular monthly BOD meeting.

For further information, contact Ian W6TCP





# WORLD RADIOSPORT TEAM CHAMPIONSHIP JULY 12-16, 2018



## Our way to 2018

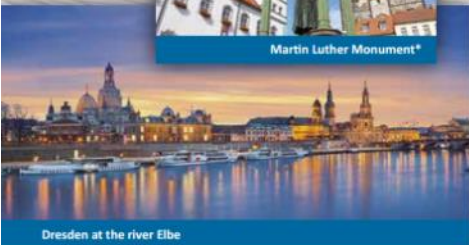
Having been elected to host the WRTC 2018 in Germany is a great honor, a thrill, and a big challenge for us. The critical tasks have been clearly defined. Dedicated and highly motivated teams are addressing the challenges.

For the competition itself we have chosen the Jessen area south of Berlin for its flatness providing level playing fields for all competitors. Jessen is strategically situated between the German capital of Berlin and such fascinating historic cities like Dresden and Leipzig.

Nearby you find important cultural attractions, e.g. the historic city of Wittenberg where Martin Luther launched the Protestant Reformation in 1517. Additionally, the scenic countryside and a lot of entertainment will make the WRTC an exciting experience for families and friends as well.



Martin Luther Monument\*



Dresden at the river Elbe

\* Source: Lutherstadt Wittenberg Marketing GmbH ©

## We need your support!

You need deep pockets to finance such a huge event. Our preliminary cost estimates add up to close to half a million US Dollars and cannot be shouldered by the German contesting fraternity alone. We need substantial financial support of contesters from all over the world, from contest clubs, individuals and business. Any amount is welcome! We will do our level best to translate this support into an event that is worth to take part in - be it as a competitor or spectator, either on the spot or remotely via Internet. You are welcome to donate via PayPal to:

[spende@wrtc2018.de](mailto:spende@wrtc2018.de)

or to use wire transfer (see Web Page for details).

## For US taxpayers

The World Wide Radio Operators Foundation (WWROF) is recognized by the IRS as a tax-exempt public charity. In order to be eligible for Income Tax treatment of your donation to WRTC 2018 just contribute to WRTC2018 in one of the following ways, either via PayPal to:

[WRTC2018@wwrof.org](mailto:WRTC2018@wwrof.org)

or by check - remit and mail to:

WWROF Inc. - WRTC2018 Fund  
P O Box 10424  
Midland, TX 79702



Note: It is important that mailed contributions include notification that the donation is specifically for WRTC2018.

## Contact the WRTC Team

[www.wrtc2018.de](http://www.wrtc2018.de)  
[contact@wrtc2018.de](mailto:contact@wrtc2018.de)

E-Mail: [contact@wrtc2018.de](mailto:contact@wrtc2018.de) | Web: [www.wrtc2018.de](http://www.wrtc2018.de) | Facebook: [wrtc2018](https://www.facebook.com/wrtc2018) | Twitter: [wrtc2018](https://twitter.com/wrtc2018)



WORLD RADIOSPORT  
TEAM CHAMPIONSHIP

## Welcome to Germany!



Proud bronze medalists at WRTC 2014 - Manfred Wolf, DJ5MW and Stefan von Baltz, DL1IAO (Foto: DK9IP)

## Competition with Friends

Lifetime Experience

Make it happen!

Contesters' Olympics





# WORLD RADIOSPORT TEAM CHAMPIONSHIP

JULY 12-16, 2018



## Welcome to Germany

Germany has been awarded to stage the WRTC 2018. The Federal Republic is subdivided into sixteen federal states such as Bavaria or Saxony. Some 80 million inhabitants share a plot of less than 140 thousand square miles, about the size of the US state of Montana. Sometimes the German language is criticized for its harshness; however, a countless number of students around the world start learning German every year as it offers an insight into a fascinating culture and a world ranked economy.

## Radiocommunications in Germany



Heinrich Hertz

Here the fundamentals of wireless communication have been developed as young Heinrich Hertz has proved the existence of electromagnetic waves and Nobel Prize Winner Ferdinand Braun introduced the closed tuned circuit as part of the radio transmitter.

The German Hams were late bloomers after all, as only after WWII a more liberal legislation made a wide ham culture possible. Today Germany is the home base of the world's second largest contest community hosted by two notable clubs: the Bavarian Contest Club (BCC) and the Rhein Ruhr DX Association (RRDXA). That is why you will find such a great number of German call signs in your log as well as multipliers from German radio activities like CR3L or VK9LM.



## WRTC 2018 in Germany

World Radiosport Team Championships (WRTC) are being held every four years. More than 60 of the best 2-OP-teams from all over the world meet for a competition. Quite different from other radiosport contests, competitors in WRTCs operate with identical power and antennas on level playing fields from the same geographical region eliminating all variables except their own operational skill. Previous WRTCs were held at Seattle/USA (1990), San Francisco/USA (1996), Slovenia (2000), Finland (2002), Brazil (2006), Russia (2010), and New England (2014).

To participate in WRTC 2018 teams have to qualify in up to 28 different HF contests during 2015 and 2016. Qualification started with the ARRL-DX-CW contest 2015.

To watch your own qualification standings and those of all of your competitors or friends at any time, have a look at our website [www.wrtc2018.de](http://www.wrtc2018.de). The standings are regularly updated after receiving the results from the contest organizers of each qualification contest.

WRTC 2018 Qualification Standings

Standings in NA #1 area

Area rank	Operator	Qualification points	Qualified contest entries	Quality mark
1	DL2 KSLZ	7889	8	80.00
2	DL2 GRTN	7202	10	68.00
3	DL2 KQNF	7176	9	68.00
4	DL2 UJF	6712	9	67.00

## WRTC - Fieldday Style



## Catch the organizers

The members of the WRTC 2018 Organizing Committee are active in many contests using special event call signs like "DLØWRTC" or "DKØWRTC". They are active on all bands from 160m up to 3 cm from various locations in Germany. They hand out the special DOK "WRTC" for DARC awards.

## Enjoy the award program

WRTC 2018 sponsors the "Worked WRTC Qualification Regions" award. You can apply online for the WWQR Award via [dci.darc.de](http://dci.darc.de). It can be worked on an annual basis in 3 classes, in different modes and on different bands. It shows European radio pioneers on a background in black, red and gold representing the colours of the German flag. Your application will support WRTC 2018 with a small donation.



Germany calling!

Competition with Friends

Join the Fun

# Launching W6VMW

## *Gordon Good, KM6I*

This article describes our efforts over the past 5 years to get the VMware Amateur Radio Club started and how we got a club station established. I'll also talk about how we've made the W6VMW HF station available remotely, and provide some information about the RemoteHams software/hardware. Enjoy!

### **What's That Yagi?**

Back in 2012, the startup I was working for was acquired by VMware, and we moved to their campus in Stanford Research Park. The first thing that caught my eye was a nice Force-12 antenna on some Rohn 25 atop the "Hilltop A" building on campus.



I was really busy with my job at the time, so I didn't put a lot of work into finding out the story behind the antenna, but eventually on the VMware internal social networking site, I got in touch with some other hams at VMware. As it turns out, the tower and antenna was originally installed when Roche Pharmaceuticals occupied the building, and the installation was directed by Jerry Haag, K6GAC, of Roche's security department. Sadly, Jerry became a silent key in 2016, and was the Mountain View ARES/RACES Emergency Coordinator until he passed away.

In 2011, when VMware expanded and occupied the entire Hillview/Foothill/Aratstradero triangle, it took over the building from Roche. Brad Horak, N6BDE, part of VMware's IT staff at the time, had the foresight to preserve the tower and Yagi. From our conversations with Brad, the Roche ham shack was originally in the basement of the building, but when it was remodeled, the room was repurposed.

## **Gaining Traction**

We ran into many roadblocks creating a company-supported ham station. While the VMware REW (Real Estate and Workplace) group and VMware Security were open to the idea of a ham station, other groups were concerned about how our presence would negatively impact the company image during a significant incident like an earthquake. For a couple of years, these roadblocks prevented any significant progress, so we fell back to plan B.

During this time, hams at VMware began self-assembling into a club of sorts. We aligned ourselves with VMware Security, and we encouraged all of our members to get certified as part of the VMware Emergency Response Team (ERT). The VMware ERT program is a lot like city CERTs (Community Emergency Response Teams), and offers training in Mass Casualty Incidents (MCI), Triage, and CPR.

Finally, after a reshuffling of the opposing groups, and after much, much persistence on the part of club members Curt Kolovson, W6RQ, Patrick Dirks, N6PWD, Jay Krishna, KD6AMA, Faisal Akber, VA3SFA, Jack Brindle, W6FB (now at Logitech), and myself, we broke through the wall of resistance, and plans for a permanent station got off the ground. We applied for and were granted the club callsign W6VMW.

## **Budgets and Acquisition**

Once we had REW and Security fully on board, the next phase was getting an equipment budget. Getting to a final budget figure took a lot of back and forth, but eventually we got to a plan that included a VHF/UHF station with packet capabilities, and an HF station, including a new HF yagi, since the existing Force 12 antenna was quite old.

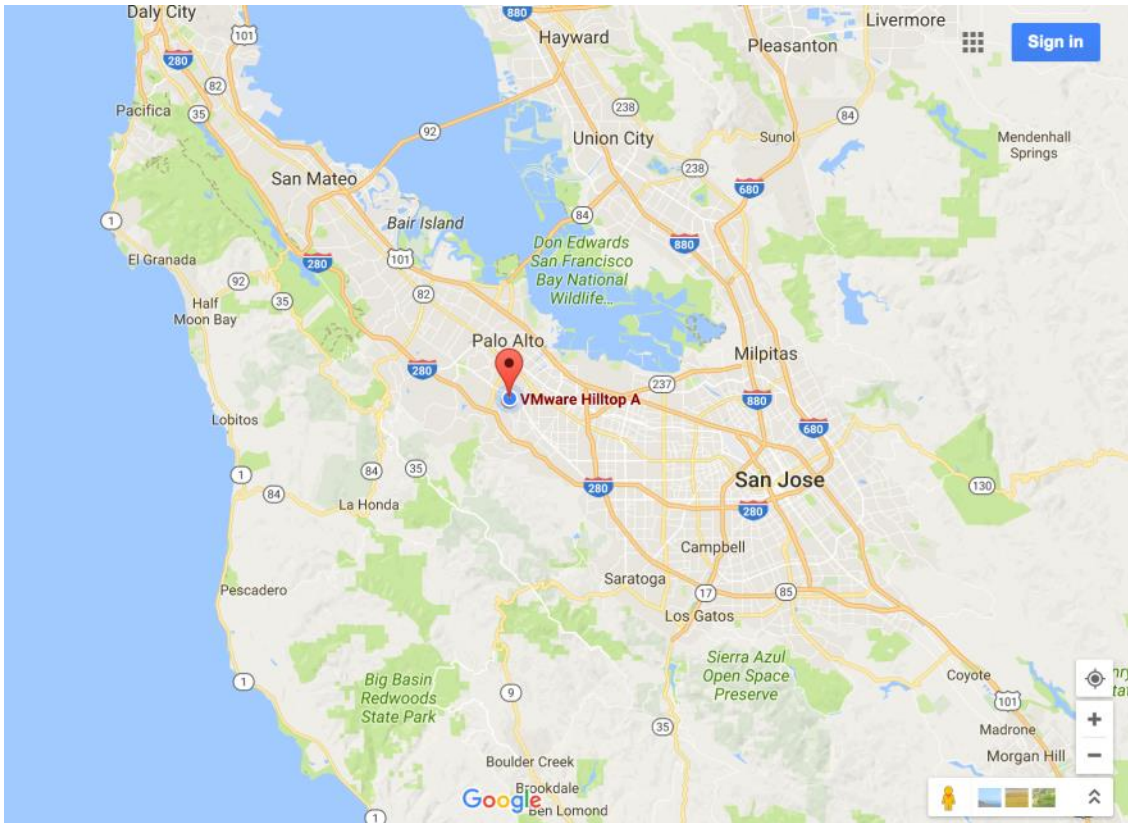
Agreeing on a final budget for the station was handled mostly by the people in the club who know how to do deals. I'm a software guy, so I left all that up to them, but eventually, we ended up with a budget that was a decent compromise. It wasn't the full-featured station we wanted, but it would certainly play well.

## **But... Where?**

The obvious choice for the station was to put it in the same place it had been when Roche occupied the building. But everything in the building had been remodeled, and there was no longer a suitable location in the basement of Hilltop A. So we looked, and looked. After many walks on roofs, banging foreheads on HVAC ductwork, and ducking under solar panel arrays, we eventually decided to re-use the existing tower, and to find a new location in the Hilltop A building. And this is where things get a little weird...



The space we finally got to use is shared space in a “wellness room”. For those not familiar with the term, it’s a place where employees can go to have a quiet space. So, we have a locked cabinet in a room that might be in use at any particular time during the day. It’s not ideal, but it’s at least a foot in the door. And... it has internet access. Here’s where the station is located.



We’re about 6,500 feet from W6YX. I’ll bet we work them in a few contests.

## Installation

With the project green-lighted, our IT department engaged with contractors to install feedlines and control cables from the roof to the new station location. They were able to re-use a lot of conduit that already existed and housed the old station’s cable. When they were finished, we had a nice wall-mounted panel with three coax connectors and a rotator control cable egress.

The IT group also engaged with VMware’s communications vendor Telepath to schedule the antenna system installation. At first, we were concerned that they would not have much experience with HF antenna systems, since their expertise is mostly with commercial VHF/UHF systems. But when the day came, a familiar and very welcome face was on the crew.





*Git along lil' yagi: K6XX removes our old Yagi*

Telepath contracted with JV & Associates to perform our antenna installation. The crew consisted of JV Rudnick, K6HJU, Reed, N1WC, and NCCC's own Bob Wolbert, K6XX. They did a fabulous job of getting the existing yagi down and wrestling our new HF Yagi, 40m rotatable dipole, and VHF/UHF vertical onto the tower.



*Bob points north*

During the installation, we ran into some odd problems trying to verify that the antenna element lengths were correct. SWR readings taken from two different MFJ antenna analyzers were really odd, and readings on 15 and 10 meters showed severe instability, with the readings jumping all over the place. Finally, we hooked the K3S up to the antenna and used its SWR meter to check the antennas, and everything looked good. Our suspicion is that there are some strong RF fields up on the roof, perhaps in the VHF/UHF range, and the MFJ analyzer's front end is just too wide to reject them.

Other than that, the other big challenge was physically threading the antennas through the labyrinth of cement columns on the roof. In the next two photos you can get an idea of how tricky this was.





*The roof of Hilltop A before removing the existing Yagi – not flat!*



*Tower bracketing, with old Force-12 antenna in place*

In the end, however, we were victorious. The new antennas were up, they worked, they rotated, and north was north! Here's the view from the top of the tower, taken by K6XX (it's a panoramic photo, so the antenna elements appear bent).





*Panoramic photo to the north from W6VMW*

## **The Station**

In our “shack” (wellness room) we have a locked cabinet with the following:

- A Yaesu FT-8900R VHF/UHF transceiver. We use this for on-campus communications during weekly nets and drills. We also have a Kantronics KPC-3+ packet TNC connected, and are connected to the Santa Clara County ARES/RACES packet network.
- An Elecraft K3S transceiver.
- A Green Heron RT-21 rotator controller.
- Battery back-up and automatic switching systems to keep the system up in the event of power mains failure.
- A Dell laptop computer running the RemoteHams server software. This allows the K3S and rotator to be accessed remotely using a laptop computer and free software.
- A Raspberry Pi computer, that monitors in-cabinet temperature and availability of the RemoteHams host and software (not shown in photo).



*Inside the W6VMW cabinet*

On the roof:

- Diamond X-50A 2m/70cm vertical
- JK Antennas Navassa-5 Yagi (20-10 meters + WARC bands)
- JK Antennas JK-401 rotatable 40m dipole



*W6VMW Antennas*

## **Monitoring**

We have a Raspberry Pi computer inside the cabinet that monitors in-cabinet temperature and availability of the RemoteHams host computer and software. Club members can view the current status by opening a web page.

W6VMW

vmarc-station-control.eng.vrr

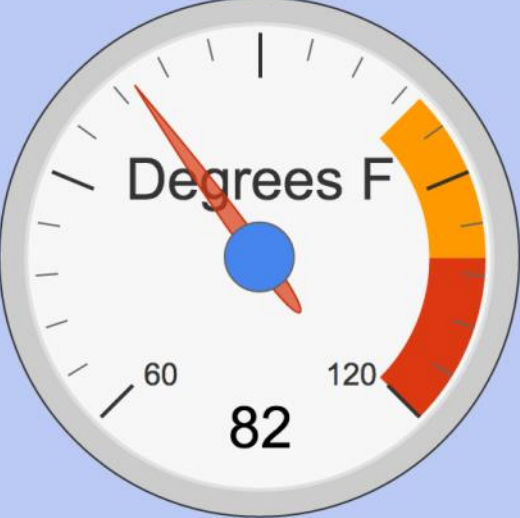
Search

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# W6VMW Cabinet Environment

Mar 27 2017 17:19:18 Local Time

RCForb Server ping: up  
RCForb Server process: up  
Last checked: Mar 27 2017 17:15:06



Degrees F

60 120

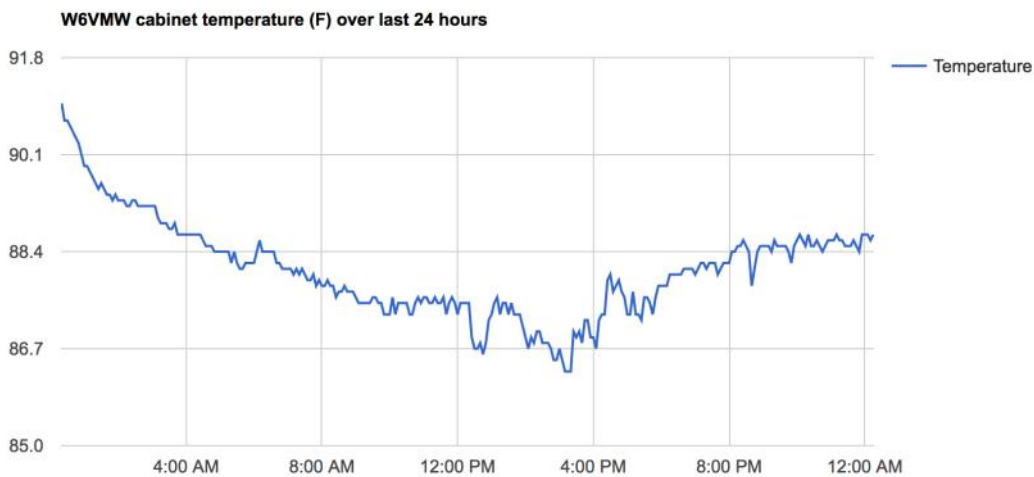
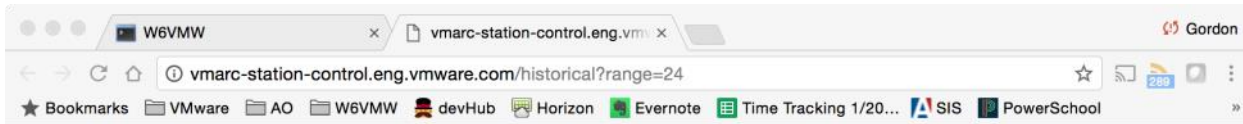
82

Historical Temperature Charts:

[1 hour](#) [4 hours](#) [12 hours](#) [24 hours](#) [48 hours](#) [1 week](#)

The data source where we store our historical data can be a bit flaky. If the chart doesn't load within about 30 seconds, try the refresh button in your browser.

The cabinet temperature data is logged, so that historical charts can be produced, like the following.



*W6VMW Cabinet Temperature*

## Weekly VHF/UHF Nets

We hold weekly nets on Wednesday afternoons, and each week we explore how well our VHF/UHF station covers the campus and the Stanford Research Park complex. As you might expect, 50 watts at the highest point on campus covers quite well.

## Remote Access

At the time we planned the station, we budgeted for a RemoteRig setup and included that in our purchase order. While RemoteRig works very well, one disadvantage is that the client side requires either a hardware appliance plus a console like the K3-0, or a \$200 software package. I realized that it would be hard to explain to every VMware club member that they needed to incur this expense to access the station remotely.

Once the station equipment arrived, I became aware of the RemoteHams RCForb software. RCForb stands for Radio Control Framework Online Remote Base. It offers free server software that runs at the remote site, and it supports many different radios, due to the fact that it uses the open-source Radio Control Framework software.



The RCForb software includes a free Windows client that allows full access of the rig. Here's a screenshot.



The client is very full-featured. It allows keyboard CW sending, and also supports external devices like rotator controllers and antenna switches. In the screenshot above, you can see that our antennas are pointed at about 350 degrees. This is all running on my laptop, sitting at home. Audio is good, and depending on your network connection, latency is not too bad (a few hundred milliseconds). The RCForb client keeps track of the delay between when the radio hears something and when it's audible on the remote – see the “Delay: 0.30s” at the top of the screenshot.

That's all great, but the real “killer feature” of the client for contesters is that it also includes “virtual serial port” support that lets you run logging software like N1MM+, and it convinces the logging software that a real K3 is connected to a serial port on my laptop.

If that was a little confusing, here's the bottom line. Once I've fired up the RCForb client on my laptop, I can then start N1MM+, configure it to talk to the virtual serial port, and operate a contest just like I have a local radio, with some small caveats\*. All the N1MM+ features like logging the actual QSO frequency, clicking on the bandmap to tune, automatic rotator control... they all just work. In this screenshot, you can see how I've typed 7032 into the N1MM+ entry window and the radio has tuned to that frequency.

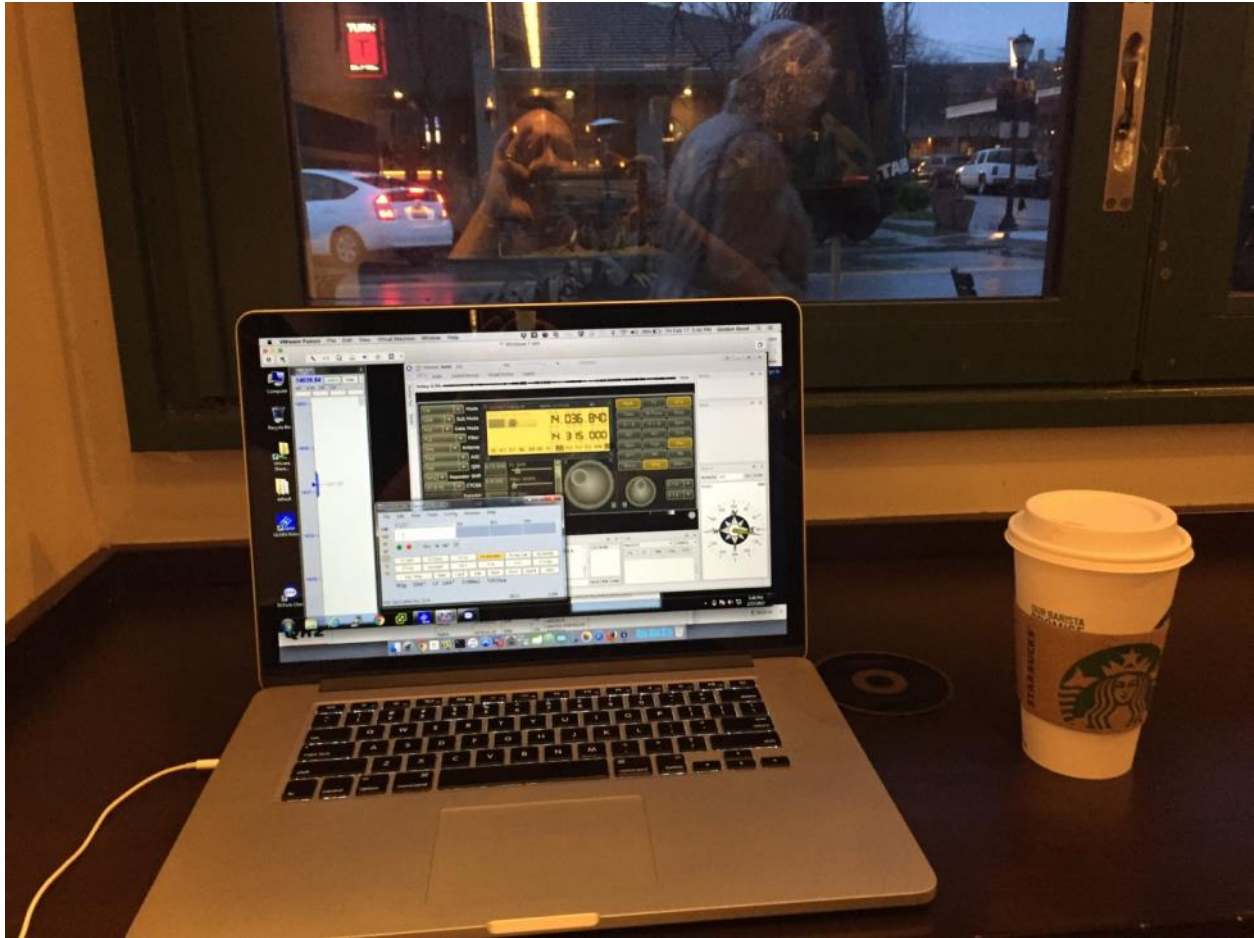


## Caveats

- At this point in time, you can only use a CW paddle with RCForb if you buy their ORB control device. To work around this, I click in the RCForb client CW window and type the text when I need to send ad-hoc CW text.
- When programming CW messages, I've needed to program them as K3 keyer macros, using the K3's KY macro. This has the unfortunate side-effect that once you launch a message with a function key, pressing Esc will not abort the message.
- Our VHF/UHF transceiver, a Yaesu FT-8900R, doesn't support CAT control, so we're unable to remotely control it. If you intend to remotely control a VHF/UHF transceiver, be sure to check if it supports rig control of some kind.

## Battle Testing

Once we got everything running, I gave the remote station a test in the ARRL DX CW contest. I'm happy to report that it works really well, both when I'm connected to the station on campus and when I'm remote over the corporate virtual private network (VPN). It even worked well from the Los Altos Starbucks, although there was a lot of audio QRM from the rude people sitting next to me having a conversation!



*Running JAs in ARRL DX CW from the Los Altos Starbucks*

For the observant, yes, that's a Mac laptop, running Windows and N1MM+ in a VMware Fusion virtual machine (shameless plug for my employer).

### **What's Next?**

We have plans to add a DMR (Digital Mobile Radio) repeater that will be linked with other DMR repeaters over the internet. One of our club members is an avid DMR user and repeater builder, and has constructed a repeater with controller using open source software.

We also plan to integrate our emergency communications capabilities with the larger Stanford Research Park emergency communications effort. This effort includes participation from many of the companies in the park, which covers 700 acres in Palo Alto and has more than ten million square feet of office space.

If you hear W6VMW on the air, be sure to say hello!

# Point Generator Profile

By Bob, W1RH

Stefan, AF6SA, is a relatively new member of the club. Like KR6N, K6KNS, K6SCA, and a few others, Stefan was referred to NCCC by the Mother Lode DX/Contest Club.

Stefan has become a serious contributor to both our contest efforts and those of the Mother Lode club. He was a key player in RTTY RU, and WPX RTTY. I'm amazed at his scores, considering his lot size and wire antennas. He is an engineer, however, so he knows how to make the best out of what he has.

In the NCCC KB Competition, Stefan placed 43 out of 191 operators. Not bad for wire antennas! He operated in 12 of the KB Competition contests, got one of the top 50 certificates, and vows to make top 25 for a plaque next year.

Now, more from Stefan:

**Name/Call Sign:** Stefan Nicov / AF6SA

**Past calls:** LZ3PG, LZ1KPG club

**Location:** El Dorado Hills, CA, QRA: CM98lq

**How much property do you have?** 140ft. x 110ft. residential lot with CC&R's antenna restrictions.

**Describe your antenna system:**

**Current:** Windom 80M-10M; Modified W8JK 20M-10M; Vert. Delta loop 40M, Inv. L 80M; VHF 9el + UHF 19el Xpol Yagis Sat/EME with Az/ El rotor and preamps.

**Future:** 160M Inv L. Low bands RX loop. Trying to fix that S8 noise on 2M.

**What's in your shack?** Shack is a separate building with AC/Heat pump. TRX: TS-2000; IC-7100; Modified ALS-600 PA; Remote AT-600Proll tuner and ANT switches. Measuring / soldering equipment. More info about my station and projects at: <http://www.af6sa.com>

**If you're working, what is your career?** Still working as R&D Engineer at Logosol Inc, 26 years.

**Married? Yes Kids?** Daughter: Eva(17), Son: Alexander(12) KK6VIX

**How many DXCC entities have you worked?** Logbook software shows 215 worked and LoTW confirmed 148 mixed. Work them first, count later.

**What's your favorite contest?** RTTY RU, CQP, WPX



**Any tips for contesters?** Chasing DX and contesting from a small pistol station can be challenging and fun. Try to maximize BIC time, S&P hard and work/spot fellow KBers. It feels good when I hear 'KB' or 'zdravo' from 6Y1LZ or LZ7A. Contest Exuberantly!

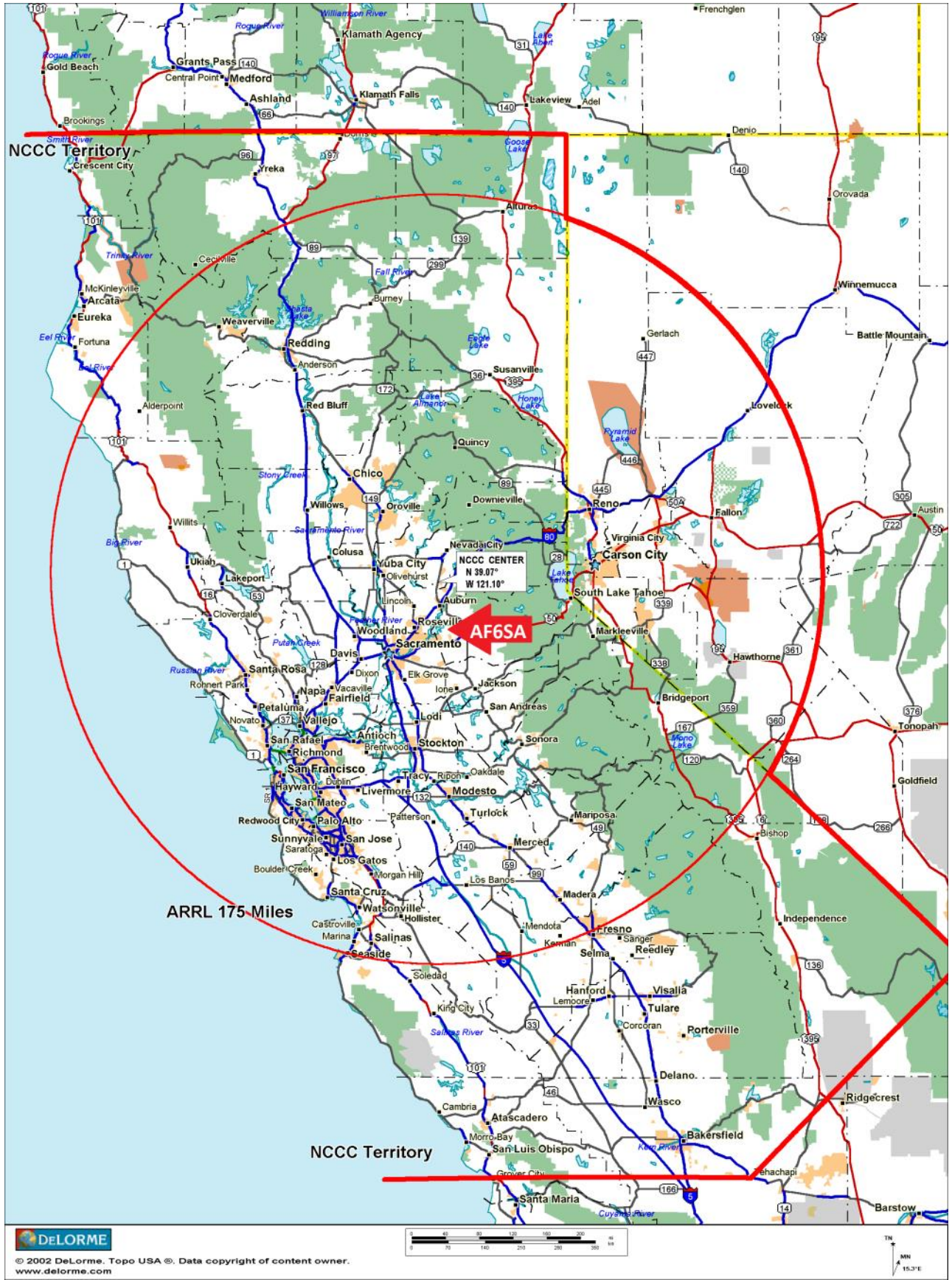
**Any other hobbies besides ham radio?** DIY electronics, Cars maintenance and repair.





**AF6SA Antenna Farm**





AF6SA Location

# TUBE OF THE MONTH

Visit the museum at [N6JV.com](http://N6JV.com)

Norm N6JV

## The Arc Rectifier

Early in the last century, there was a combination of DC and AC voltage equipment being used in the World. In the US, the advantages of AC over DC lighting was finally established, but many cities were using the old DC lighting equipment installed by Edison. In 1902, Peter Cooper Hewitt discovered that a vacuum tube with an AC anode and a negative cathode made from a pool of mercury would act as a very efficient rectifier. Once the mercury was made partially into its vapor phase, the conduction would continue. The problem was getting the arc going as there was no heating circuit and everything was in a vacuum. One common solution was a mechanical machine that would rotate the bulb until the mercury made contact with a positive electrode. The bulb was then rotated back into position. Any interruption in the input voltage would stop the rectifier and it would have to be tilted again. Large units could be 1, 3, 6 or 12 phase. The multi phase units provided well-filtered DC.

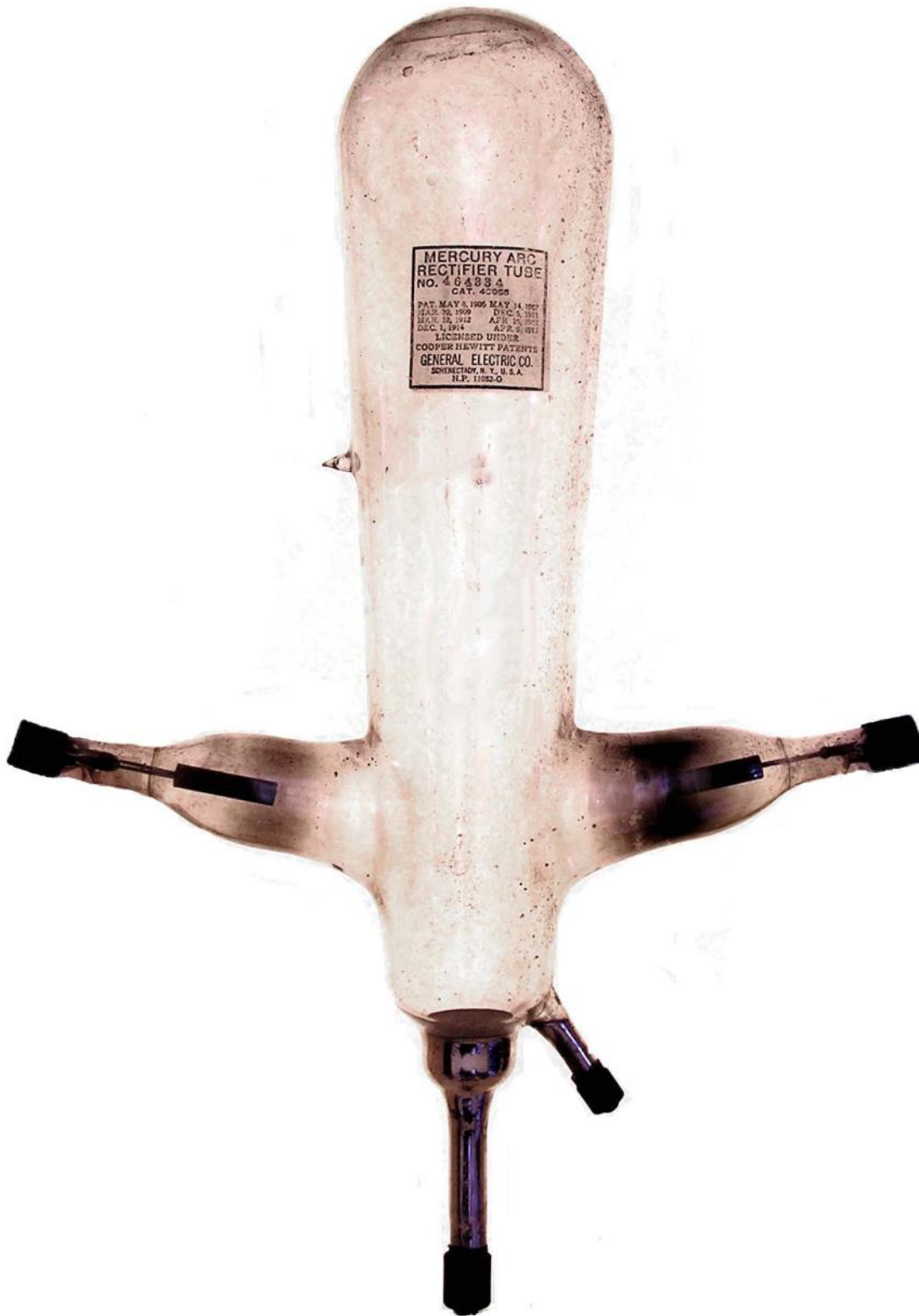
These units were commonly used in lighting and very large DC supplies like those used for electric trains. My grandfather turned in his horse for an electric streetcar in the Netherlands back about 1910. Larger units were made to handle up to a million watts. By 1920, the vacuum tube rectifier had been developed, but large transmitters were still a problem as the available tubes were small. Hams could get used ARC rectifiers and old pole pigs, so the age of QRO was started. The hams developed solutions to the "keep alive" problems including large relays to tilt the bulbs and using Model "T" spark coils to provide a constant low current voltage to keep the reaction going. Today those few rectifiers that have survived are feared by museums due to the large pool of mercury.



# TUBE OF THE MONTH

Visit the museum at [N6JV.com](http://N6JV.com)

Norm N6JV



## **Election of Officers**

NCCC holds its annual election in April. The Board of Directors consists of President, Vice President/Contest Chairman, Secretary/Treasurer, Past President, and three Directors.

If you are interested in any of the BOD positions, please contact Bob W1RH.

In addition, a volunteer panel steps forward each year to assist the club in its many activities. We're always looking for more volunteers, so if interested, please contact any member of the current BOD.

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## **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.

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## **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](mailto:w6tcpian@gmail.com) Don't worry about the formatting, we can take care of that if necessary !



# Contest Calendar— April page 1

15-Meter SSTV Dash Contest	0000Z, Apr 1 to 2359Z, Apr 2
LZ Open 40m Sprint Contest	0400Z-0800Z, Apr 1
PODXS 070 Club PSK 31 Flavors Contest	1000Z, Apr 1 to 0400Z, Apr 2
Florida State Parks on the Air	1400Z-2200Z, Apr 1
Mississippi QSO Party	1400Z, Apr 1 to 0200Z, Apr 2
Missouri QSO Party	1400Z, Apr 1 to 0400Z, Apr 2 and 1400Z-2000Z, Apr 2
SP DX Contest	1500Z, Apr 1 to 1500Z, Apr 2
EA RTTY Contest	1600Z, Apr 1 to 1600Z, Apr 2
North American SSB Sprint Contest	0000Z-0400Z, Apr 2
RSGB RoLo SSB	1900Z-2030Z, Apr 2
IQRP Quarterly Marathon	0800Z, Apr 3 to 2000Z, Apr 9
RSGB 80m Club Championship, CW	1900Z-2030Z, Apr 3
ARS Spartan Sprint	0100Z-0300Z, Apr 4
Phone Fray	0230Z-0300Z, Apr 5
CWops Mini-CWT Test	1300Z-1400Z, Apr 5 and 1900Z-2000Z, Apr 5 and 0300Z-0400Z, Apr 6
UKEICC 80m Contest	2000Z-2100Z, Apr 5
NRAU 10m Activity Contest	1700Z-1800Z, Apr 6 (CW) and 1800Z-1900Z, Apr 6 (SSB) and 1900Z-2000Z, Apr 6 (FM) and 2000Z-2100Z, Apr 6 (Dig)
SARL 80m QSO Party	1700Z-2000Z, Apr 6
NCCC RTTY Sprint	0145Z-0215Z, Apr 7
NCCC Sprint	0230Z-0300Z, Apr 7
JIDX CW Contest	0700Z, Apr 8 to 1300Z, Apr 9
QRP ARCI Spring QSO Party	1200Z, Apr 8 to 2359Z, Apr 9
SKCC Weekend Sprintathon	1200Z, Apr 8 to 2400Z, Apr 9
OK/OM DX Contest, SSB	1200Z, Apr 8 to 1200Z, Apr 9
Texas State Parks on the Air	1400Z, Apr 8 to 0200Z, Apr 9 and 1400Z-2000Z, Apr 9



# Contest Calendar— April page 2

New Mexico QSO Party	1400Z, Apr 8 to 0200Z, Apr 9
Georgia QSO Party	1800Z, Apr 8 to 0359Z, Apr 9 and 1400Z-2359Z, Apr 9
Yuri Gagarin International DX Contest	2100Z, Apr 8 to 2100Z, Apr 9
International Vintage Contest HF	0700Z-1100Z, Apr 9 and 1300Z-1900Z, Apr 9
Hungarian Straight Key Contest	1500Z-1700Z, Apr 9
4 States QRP Group Second Sunday Sprint	0000Z-0200Z, Apr 10
NAQCC CW Sprint	0030Z-0230Z, Apr 12
Phone Fray	0230Z-0300Z, Apr 12
CWops Mini-CWT Test	1300Z-1400Z, Apr 12 and 1900Z-2000Z, Apr 12 and 0300Z-0400Z, Apr 13
RSGB 80m Club Championship, SSB	1900Z-2030Z, Apr 12
NCCC RTTY Sprint	0145Z-0215Z, Apr 14
NCCC Sprint	0230Z-0300Z, Apr 14
Holyland DX Contest	2100Z, Apr 14 to 2100Z, Apr 15
ES Open HF Championship	0500Z-0559Z, Apr 15 and 0600Z-0659Z, Apr 15 and 0700Z-0759Z, Apr 15 and 0800Z-0859Z, Apr 15
Worked All Provinces of China DX Contest	0600Z, Apr 15 to 0559Z, Apr 16
YU DX Contest	1200Z, Apr 15 to 1159Z, Apr 16
CQ Manchester Mineira DX Contest	1200Z, Apr 15 to 2359Z, Apr 16
Michigan QSO Party	1600Z, Apr 15 to 0400Z, Apr 16
EA-QRP CW Contest	1700Z-2000Z, Apr 15 (10-20m) and 2000Z-2300Z, Apr 15 (40-80m) and 0700Z-0900Z, Apr 16 (40m) and 0900Z-1200Z, Apr 16 (20-10m)
North Dakota QSO Party	1800Z, Apr 15 to 1800Z, Apr 16
Ontario QSO Party	1800Z, Apr 15 to 0500Z, Apr 16 and 1200Z-1800Z, Apr 16
Feld Hell Sprint	1800Z-2159Z, Apr 15
WAB 3.5/7/14 MHz Data Modes	1200Z-1400Z, Apr 16 (RTTY) and 1400Z-1600Z, Apr 16 (PSK) and 1800Z-2000Z, Apr 16 (RTTY) and 2000Z-2200Z, Apr 16 (PSK)





# Contest Calendar— April page 3

ARRL Rookie Roundup, SSB	1800Z-2359Z, Apr 16
Run for the Bacon QRP Contest	0100Z-0300Z, Apr 17
Low Power Spring Sprint	1400Z-2000Z, Apr 17
144 MHz Spring Sprint	1900 local - 2300 local, Apr 17
Phone Fray	0230Z-0300Z, Apr 19
CWops Mini-CWT Test	1300Z-1400Z, Apr 19 and 1900Z-2000Z, Apr 19 and 0300Z-0400Z, Apr 20
NCCC RTTY Sprint	0145Z-0215Z, Apr 21
NCCC Sprint	0230Z-0300Z, Apr 21
QRP to the Field	0800-1800 local, Apr 22
UK/EI DX Contest, CW	1200Z, Apr 22 to 1200Z, Apr 23
SP DX RTTY Contest	1200Z, Apr 22 to 1200Z, Apr 23
Nebraska QSO Party	1300Z, Apr 22 to 0100Z, Apr 23 and 1300Z-2200Z, Apr 23
BARTG Sprint 75	1700Z-2059Z, Apr 23
222 MHz Spring Sprint	1900 local - 2300 local, Apr 25
SKCC Sprint	0000Z-0200Z, Apr 26
Phone Fray	0230Z-0300Z, Apr 26
CWops Mini-CWT Test	1300Z-1400Z, Apr 26 and 1900Z-2000Z, Apr 26 and 0300Z-0400Z, Apr 27
UKEICC 80m Contest	2000Z-2100Z, Apr 26
RSGB 80m Club Championship, Data	1900Z-2030Z, Apr 27
NCCC RTTY Sprint	0145Z-0215Z, Apr 28
NCCC Sprint	0230Z-0300Z, Apr 28
Feld Hell Sprint	0000Z-2359Z, Apr 29
10-10 Int. Spring Contest, Digital	0001Z, Apr 29 to 2359Z, Apr 30
Helvetia Contest	1300Z, Apr 29 to 1259Z, Apr 30
Florida QSO Party	1600Z, Apr 29 to 0159Z, Apr 30 and 1200Z-2159Z, Apr 30

# HAM RADIO OUTLET

14 STORE BUYING POWER!

**ICOM**



**IC-7600 | All Mode Transceiver**

- 100W HF/6m Transceiver, gen cov. receiver • Dual DSP 32 bit • Three roofing filters- 3, 6, 15kHz • 5.8 in WQVGA TFT display • Hi-res real time spectrum scope



**IC-7200 | HF Transceiver**

- 160-10M • 100W • Simple & tough with IF DSP • AGC Loop Management • Digital IF Filter • Digital Twin PBT • Digital Noise Reduction • Digital Noise Blanker • USB Port for PC Control



**IC-7100 | All Mode Transceiver**

- HF/50/144/430/440 MHz Multi-band, Multi-mode, IF DSP • D-STAR DV Mode (Digital Voice + Data) • Intuitive Touch Screen Interface • Built-in RTTY Functions



**ID-5100A | VHF/UHF Dual Band Digital Transceiver**

- Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch • FM Analog/DV Repeater List Function

**ID-51A | VHF/UHF Dual Band Transceiver**

- 5/2.5/1.0/0.5/0.1W Output • RX: 0.52-1.71, 88-174, 380-479 MHz\*\* • AM/FM/FM-N/WFM/DV • 1304 Alphanumeric Memory Chls • Integrated GPS • D-STAR Repeater Directory • IPX7 Submersible



**TH-F6A | 2M/220/440**

- Dual channel receive • .1 - 1300 MHz (cell blocked) RX • FM, AM, SSB • 5W 2M/220/440 TX, FM • 435 Memories • Li-Ion Battery

**KENWOOD**



**TS-590SG | HF/50MHz Transceiver**

- Equipped with 500 Hz/2.7 kHz roofing filter as standard • ALC derived from TS-990S eliminating spike issues • Antenna output function (shared with DRV connector) • CW - morse code decoder function



**TM-D710G | 2M/440 Dualband**

- V+V/V+U/U+U operation • Built-in GPS • Built-in TNC for APRS & DX-Cluster operation • 50W 2M & UHF • 1,000 memories • Dual receive • Green or amber backlight colors • Latest APRS firmware w/new features • Sky Command II remote functions



**TM-V71A | 2M/440 Dualband**

- High RF output (50W) • Multiple Scan • Dual receive on same band (VxV, UxU) • Echolink® memory (auto dialer) • Echolink® Sysop mode for node terminal ops • Invertible front panel • Choice of green/amber for LCD panel • 104 code digital code squelch



**TM-281A | 2 Mtr Mobile**

- 65 Watt • 200 Memories • CTCSS/DCS • Mil-Std specs • Hi-quality audio



**FT-60R | 2M/440 5W HT**

- Wide receiver coverage • AM air band receive • 1000 memory channels w/alpha labels • Huge LCD display • Rugged die-cast, water resistant case • NOAA severe weather alert with alert scan

**YAESU**  
The radio



**FT-991 | HF/50MHz/2M/440 Transceiver**

- 160 M-440MHz - SSB/CW/FM/C4FM Digital/AM/RTTY/PSK • 100 W (2M/440: 50 Watts) • 3.5" TFT full-color touch panel operation • High speed spectrum scope • Roofing filters: 3kHz & 15kHz • 32-bit high speed floating point IF DSP



**FTDX1200 | 100W HF + 6M Transceiver**

- Triple Conversion Receiver With 32-bit Floating Point DSP • 40 MHz 1st IF with selectable 3 kHz, 6kHz & 15 kHz Roofing Filters • Optional FFT-1 Supports AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode/Auto Zero-In • Full Color 4.3" TFT Display



**FT-450D | A100W HF + 6M Transceiver**

- 100W HF/6M • Auto tuner built-in • DSP built-in • 500 memories • DNR, IF Notch, IF Shift



**FTM-400DR | 2M/440 Mobile**

- Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band



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